

EQUITY THREE HOLDINGS INC.

3085 AND 3105 HURONTARIO STREET, MISSISSAUGA, ONTARIO

PHASE TWO ENVIRONMENTAL SITE ASSESSMENT

NOVEMBER 1, 2019





**3085 AND 3105
HURONTARIO STREET,
MISSISSAUGA, ONTARIO**

**PHASE TWO
ENVIRONMENTAL SITE
ASSESSMENT**

EQUITY THREE HOLDINGS INC.

PROJECT NO.: 191-02120-01
DATE: NOVEMBER 01, 2019

WSP
582 LANCASTER STREET WEST
KITCHENER, ON
CANADA N2K 1M3

T: +1 519 743-8778
F: +1 905 687-1773
WSP.COM



November, 01, 2019

Ash Singh
EQUITY THREE HOLDINGS INC.
53 Village Centre Place,
Mississauga, ON
L4Z 1V9

Dear Sir:

**Subject: 3085 AND 3105 HURONTARIO STREET, MISSISSAUGA, ONTARIO
PHASE TWO ENVIRONMENTAL SITE ASSESSMENT**

We are pleased to forward our report documenting the results of the Phase Two Environmental Site Assessment (ESA) completed at the above-noted property.

The Phase Two ESA assessment was completed according to Ontario Regulation 153/04 (as amended). The report describes the interpreted environmental conditions at the property and provides conclusions for your consideration. It is understood that the ESA is required for filing a Record of Site Condition (RSC) for the Site at this time.

We trust that this information is sufficient for your current needs. If you have any questions or require further information, please contact us.

Yours truly,
WSP Canada Inc.

A handwritten signature in blue ink, appearing to read 'L. Levesque'.

Lindsay Levesque, B. Sc., EP
Project Manager

582 LANCASTER STREET WEST
KITCHENER, ON
CANADA N2K 1M3

T: +1 519 743-8778
F: +1 905 687-1773
wsp.com


SIGNATURES

PREPARED BY



Lindsay Levesque, B. Sc., EP
Project Manager
Environment

REVIEWED BY



Bailey Walters, MSc, PGeo, QPESAJRA
Senior Geoscientist, Environment

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1 EXECUTIVE SUMMARY

WSP was retained by Equity Three Holdings Inc. to conduct a Phase Two Environmental Site Assessment (ESA) for the property located at the municipal addresses of 3081, 3085, 3095, 3105 Hurontario Street, collectively herein referred to as 3085 and 3105 Hurontario Street, in Mississauga, Ontario (the 'Site').

The Site is located on the northeast side of Hurontario Street, as shown on **Figure 1**. The Site is irregularly shaped and measures approximately 1.47 hectares. The Site is occupied by a two-story commercial plaza, situated in the southern portion of the Site. The northeast portion of the Site consists of a two-story parking structure.

A Phase One ESA was recently completed by WSP at the Site in August 2018. The Phase One ESA recommended that a Phase Two ESA be completed to address four (4) areas of potential environmental concern (APEC) at the Site.

Based on information obtained as part of the Phase One ESA, it was concluded that APEC(s) associated with past activities/operations exist at the Site. The table of APECs investigated during this Phase Two ESA is presented below.

Table 1-1 Summary of Areas of Potential Environmental Concern Identified in Phase One ESA

AREA OF POTENTIAL ENVIRONMENTAL CONCERN	LOCATION OF AREA OF POTENTIAL ENVIRONMENTAL CONCERN ON PHASE ONE PROPERTY	POTENTIALLY CONTAMINATING ACTIVITY	LOCATION OF PCA (ON-SITE OR OFF-SITE)	CONTAMINANTS OF POTENTIAL CONCERN	MEDIA POTENTIALLY IMPACTED (GROUND WATER, SOIL AND/OR SEDIMENT)
1	Under the northwest portion of the Site	37 Operation of Dry Cleaning Equipment (where chemicals are used)	Off-Site	VOCs	GW
2	Under the northwest portion of the Site	10 Commercial Autobody Shops	Off-Site	VOCs PHCs BTEX	GW
3	Under the northwest portion of the Site	10 Commercial Autobody Shops	Off-Site	VOCs PHCs BTEX	GW
4	Under the northwest portion of the Site	NA - A Spills - Related to multiple water, coolant, hydraulic oil, gasoline and diesel spills that occurred at 3210 Hurontario Street (250 m west of the Site)	Off-Site	VOCs PHCs BTEX	GW

Intrusive soil sampling through the advancement of boreholes and ground water sampling from monitoring wells installed as part of the drilling program were used to investigate the subsurface conditions at the Site.

The borehole drilling included advancement of two (2) boreholes, both of which were completed as monitoring wells. Borehole drilling was completed by Strata Drilling Group on July 3, 2019 using a Geoprobe 420M equipped with direct-push core samplers and solid-stem augers for monitoring well installation. In addition, an existing monitoring well BH2, advanced by Soil-Mat Engineers in May 2019, was utilized during this assessment.

Analytical results were compared to the Ministry of the Environment, Conservation and Parks (MECP) Table 2: Full Depth Generic Site Condition Standards (SCSs) for Use in a Potable Ground Water Condition, with coarse textured soils for residential/parkland/institutional (RPI) property use as outlined in the **Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the *Environmental Protection Act*** (April 15, 2011), hereinafter referred to as the “MECP Table 2 SCS”.

Based on the findings and analytical results of the Phase Two ESA, the following conclusions are presented:

- The Site is occupied by a two-story commercial plaza, situated in the southern portion of the Site. The northeast portion of the Site consists of a two-story parking structure.
- The surficial geology at the Site consists of native sand underlain by stiff clayey silt followed by shale bedrock.
- Shallow ground water is found within the native sand unit above the clayey silt till aquitard, within the clayey silt as well as within the shale bedrock. Monitoring well BH/MW19-3 was installed within the sand unit, monitoring well BH/MW19-4 was installed within the clayey silt unit. The inferred shallow ground water flow direction is southeast.
- Concentrations of PHCs and VOCs in the soil samples analyzed were below the applicable MECP Table 2 SCS for the locations and parameters tested.
- Concentrations of PHCs and VOCs in the ground water samples analyzed were below the applicable MECP Table 2 SCS for the locations and parameters tested.

Based on the information obtained as part of the Phase Two ESA, it is concluded that the soil and ground water quality at the Site meets the applicable MECP Table 2 SCS.

2 INTRODUCTION

2.1 SITE DESCRIPTION

The Site is located on the northeast side of Hurontario Street at the municipal addresses of 3081, 3085, 3095, 3105 Hurontario Street, collectively herein referred to as 3085 and 3105 Hurontario Street, in Mississauga, Ontario, as shown on **Figure 1**. The Site is irregularly shaped and measures approximately 1.47 hectares. The Site is occupied by a two-story commercial plaza, situated in the southern portion of the Site. The northeast portion of the Site consists of a two-story parking structure. Property information for the Site is provided in the table below.

Table 2-1 Property Information

CRITERIA	DESCRIPTION
Municipal Address(es)	3081, 3085, 3095 and 3105 Hurontario Street, Toronto, ON (collectively referred to as 3085 and 3105 Hurontario Street, as per parcel register and land transfer documents).
Property Identification Number (PIN)	13157-0181 (LT)
Assessment Roll Number	21-05-040-094-13300-0000 (3085 Hurontario Street) 21-05-040-094-13400-0000 (3105 Hurontario Street)
Legal Description	FIRSTLY: PT LT 15, CON 1 NDS, TWP TOR, DES AS PT 1 PL 43R33188; SECONDLY: PT LT 15, CON 1 NDS, TWP TOR; PT BLKS A & B, PL 645; PT LT 9 SAVIGNEY'S PLAN OF COOKSVILLE BEING A SUBDIVISION OF PT OF LT 15 REFERRED TO AS PL TOR-12 DES AS PT 1 PL 43R17198; CITY OF MISSISSAUGA

A legal survey, dated August 23, 2018 was provided by the owner of the property. The Plan of Survey is included in **Appendix F**.

2.2 PROPERTY OWNERSHIP

Property ownership information for the Site is provided in the table below.

Table 2-2 Property Ownership Information

CRITERION	DESCRIPTION
Current Site Owner	Mr. Ash Singh Equity Three Holdings Inc. 53 Village Centre Place, Mississauga, ON L4Z 1V9
Owner's Representative	Mr. Ash Singh Equity Three Holdings Inc. 53 Village Centre Place, Mississauga, ON L4Z 1V9

2.3 CURRENT AND PROPOSED FUTURE USES

The Site is occupied by a two-story commercial plaza, situated in the southern portion of the property. The northeast portion of the Site consists of a two-story parking structure. As such, the current land use of the Site is commercial. It is our understanding that the Site will be re-developed for residential purposes.

2.4 APPLICABLE SITE CONDITION STANDARD

Analytical results were compared to Table 2: Full-Depth Generic Site Condition Standards (SCSs) in a Non-Potable Ground Water Condition for residential/parkland/institutional property uses set out in the MECP publication *Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act* (April 15, 2011), hereinafter referred to as the “MECP Table 2 SCS”. This evaluation standard for the Site was selected for comparison purposes based on the following:

- The Site is not considered an “environmentally sensitive” site, as defined by O.Reg. 153/04 based on the following rationale:
 - Soil pH assessed as part of this Phase Two ESA indicated pH between 7.44 and 7.47. The soil pH results fall within the acceptable range for use of Table 2 SCS.
 - According to the Ministry of Natural Resources online mapping, the City of Mississauga’s Official Plan, and ERIS, there are no Provincially Significant Life Science or Earth Science Areas of Natural and Scientific Interest (ANSIs), as defined by O.Reg 153/04, on the Site or within 30 m of the Site boundaries.
- The Site is not located within 30 m of a permanent water body. The nearest water body to the Site is Cooksville Creek, located approximately 150 m northeast of the Site.
- Based on available geology information for the Site (presented in Section 3.3.2), the depth to bedrock is greater than 2.0 m below ground surface (bgs). Therefore, the Site is not considered to be a shallow soil property, as defined by O.Reg.153/04. Shale has been identified at the Site, between 2.5 and 4.3 mBGS.
- The Site and surrounding area is serviced by a municipal drinking water system. Potable water for the City of Mississauga is taken from surface water (Lake Ontario). One well, located 200 m north of the Site, was reportedly installed for potable purposes in the 1950s. WSP suspects that this well has since been abandoned or decommissioned; however, Table 2 standards were applied to the Site as a conservative approach.
- Grain size testing was conducted in two (2) soil samples collected from the Site. Based on the grain size analysis (provided in **Appendix E**), the soil at the Site is coarse grained. As such, coarse-grained standards were used for the Site.

3 BACKGROUND INFORMATION

3.1 PHYSICAL SETTING

A summary of the Site's physical attributes determined through the Phase One ESA (WSP, 2019) is included in the following table.

Table 3-1 Summary of Physical Setting

CRITERIA	DESCRIPTION										
i. Water Bodies and Areas of Natural Significance	There are no surface water bodies on the Site. The nearest surface water body is the Cooksville Creek, located approximately 150 m northeast of the Site. Lake Ontario is located approximately 4.5 km east of the Site. There were no Areas of Natural Significance identified within the Phase One ESA Study Area (WSP, 2019).										
ii. Topography, Hydrology, Geology	<p>Topography: The Site and Phase One Study Area are characterized by relatively flat topography with an average elevation of 117 mASL. There is a slight decrease in elevation towards the east and south of the Phase One Study Area.</p> <p>Hydrology: Cooksville Creek, located approximately 150 m northeast of the Site. Lake Ontario is located approximately 4.5 km east of the Site. Groundwater at the Site is expected to flow to the southeast, towards Lake Ontario.</p> <p>Regional Geology: The physiographic region is described as "sand plains" in the east portion and "beaches" in the most western portion of the Site (Chapman and Putnam, 2007). The surficial geology of the Site is described as "deltaic and lacustrine deposits", consisting of sand with high permeability (OGS, 2010). The underlying bedrock within the area is shale, limestone, dolostone and siltstone part of the Georgian Bay Formation, Blue Mountain Formation and Billings Formation (OGS, 2011). Based on the well records available on the MECP website and well records in the ERIS report, bedrock in the area is encountered between approximately 1.0 and 7.6 meters below ground surface.</p> <p>Bedrock at the Site was encountered between 2.5 and 4.3 mBGS. Based on grain size analyses completed as part of the Phase Two ESA, the soil at the Site was determined to be coarse textured.</p> <p>Site Geology: Based on the recent Phase Two ESA conducted at the Site, the following stratigraphic units at the Site are present:</p> <table> <tr> <th>UNIT THICKNESS (m)</th><th>UNIT DESCRIPTION</th></tr> <tr> <td>0.01</td><td>Topsoil or Concrete</td></tr> <tr> <td>0.1 to 3.35</td><td>Native sand, some silt</td></tr> <tr> <td>3.35 to 4.27</td><td>Clayey silt, trace gravel</td></tr> <tr> <td>>4.27</td><td>Shale</td></tr> </table> <p>Hydrogeology: Two (2) monitoring wells were installed as part of WSP's Phase Two ESA. Both wells were installed in the overburden. Monitoring well MW19-3 was installed in the sand layer and monitoring well MW19-4 was installed in the clayey silt layer. One existing monitoring well (installed by Soil Mat in April 2019) was installed within the shale layer. Based on the ground water levels obtained as part of this assessment, as well as the local topography and location of nearest water bodies, ground water is expected to flow towards the southeast, towards Lake Ontario. It should be noted that the three monitoring wells installed at the Site are not within the same stratigraphic layer, and as such, the ground water flow direction may vary slightly.</p>	UNIT THICKNESS (m)	UNIT DESCRIPTION	0.01	Topsoil or Concrete	0.1 to 3.35	Native sand, some silt	3.35 to 4.27	Clayey silt, trace gravel	>4.27	Shale
UNIT THICKNESS (m)	UNIT DESCRIPTION										
0.01	Topsoil or Concrete										
0.1 to 3.35	Native sand, some silt										
3.35 to 4.27	Clayey silt, trace gravel										
>4.27	Shale										

3.2 PAST ASSESSMENTS AND INVESTIGATIONS

The following previous report was available for the Site at the time of this report preparation.

Report Title:	Geotechnical Investigation, Proposed Condominium Development 3085 Hurontario Street Mississauga, ON
Date:	May 8, 2019
Author:	Soil-Mat Engineers & Consultants Ltd (Soil-Mat)
Report/work completed for:	Mr. Ash Singh
Relevant findings:	<p>Based on a review of the report, the following pertinent information can be summarized:</p> <ul style="list-style-type: none"> — The proposed development of the Site is four (4) residential towers between 18 and 40 stories in height, with one shared common underground parking level. — Soil-Mat was retained to complete a Geotechnical Investigation for the proposed development. — Soil-Mat advanced two (2) boreholes (BH1 and BH/MW2); one of the boreholes was finished with a monitoring well (MW2) in order to measure static ground water levels. Both boreholes were advanced to the west of the current Site building. — On May 7, 2019, the static water level in BH2 was 3.0 m below ground surface. — Based on Soil-Mat's drilling, shale bedrock was encountered at approximately 2.7 m below ground surface. The water level in BH2 was within the shale. — Soil-Mat provided various recommendations regarding the construction of the building

Most recently, WSP completed a Phase One Environmental Site Assessment in 2019 for the Site:

Report Title:	3085 and 3105 Hurontario Street, Mississauga, ON, Phase One Environmental Site Assessment
Date:	November 1, 2019
Author:	WSP Canada Inc
Report/work completed for:	Mr. Ash Singh
Relevant findings:	<p>Based on information obtained as part of the Phase One ESA records search, Site reconnaissance and interview process, the following findings are presented:</p> <ul style="list-style-type: none"> — The Site appears to have been first developed in 1920 with a Public School. Prior to 1920, the Site was likely used for residential and/or agricultural purposes. The current Site building was constructed in 1980. The Site has been used for commercial purposes from 1980 to present day. — The nearest water body is Cooksville Creek, 150 m northeast of the Site. Lake Ontario is located approximately 4.5 km southeast of the Site. — The surficial geology of the Site is described as "deltaic and lacustrine deposits", consisting of sand with high permeability. — The underlying bedrock within the area is shale, limestone, dolostone and siltstone part of the Georgian Bay Formation, Blue Mountain Formation and Billings Formation. — Regional ground water flow in the overburden and bedrock is inferred to be east/southeast

	<p>towards Lake Ontario.</p> <ul style="list-style-type: none"> — A dry cleaning operation, Rathburn Cleaners, located approximately 140 m northwest of the Site was listed in the ERIS report as a generator of halogenated solvents from 1992 to 2001. — Various commercial auto shops were located upgradient to the Site between 1966 and 2000. — According to ERIS, multiple water, coolant, hydraulic oil, gasoline and diesel spills occurred at 3210 Hurontario Street (250 m west of the Site), reported by Cooksville Go Station, WSP Canada Inc and Ellis-Done Corporation between 2017 and 2018.
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The above-noted PCAs were deemed to be contributing to four (4) APECS in, on, or under the Phase One Property. The APECS are summarized on Table 3-2.

Table 3-2 Summary of APECs Identified in Phase One ESA

AREA OF POTENTIAL ENVIRONMENTAL CONCERN	LOCATION OF AREA OF POTENTIAL ENVIRONMENTAL CONCERN ON PHASE ONE PROPERTY	POTENTIALLY CONTAMINATING ACTIVITY	LOCATION OF PCA (ON-SITE OR OFF-SITE)	CONTAMINANTS OF POTENTIAL CONCERN	MEDIA POTENTIALLY IMPACTED (GROUND WATER, SOIL AND/OR SEDIMENT)
1	Under the northwest portion of the Site	37 Operation of Dry Cleaning Equipment (where chemicals are used)	Off-Site	VOCs	GW
2	Under the northwest portion of the Site	10 Commercial Autobody Shops	Off-Site	VOCs PHCs BTEX	GW
3	Under the northwest portion of the Site	10 Commercial Autobody Shops	Off-Site	VOCs PHCs BTEX	GW
4	Under the northwest portion of the Site	NA - A Spills - Related to multiple water, coolant, hydraulic oil, gasoline and diesel spills that occurred at 3210 Hurontario Street (250 m west of the Site)	Off-Site	VOCs PHCs BTEX	GW

BTEX – Benzene, Toluene, Ethylbenzene, and Xylenes

GW – Ground water

PHCs – Petroleum Hydrocarbons

VOCs – Volatile Organic Compounds

Based on the information obtained during the Phase One ESA, APECs were identified at the Phase One property. WSP recommended a Phase Two ESA to investigate the APECs identified.

4 SCOPE OF THE INVESTIGATION

This report section discusses:

- an overview of the site investigation,
- the media investigated
- the Phase One Conceptual Site Model
- deviations from the sampling and analysis plan, and
- any impediments that were encountered during the execution of this Phase Two ESA.

4.1 OVERVIEW OF SITE INVESTIGATION

The primary objectives of the Phase Two ESA are as follows:

- Investigate subsurface soil and ground water conditions in relation to APECs as identified in the Phase One ESA (WSP, 2019) for the Site.
- Compare soil and ground water results to the applicable MECP Table 2 SCS.

The Phase Two ESA was carried out according to O. Reg. 153/04 (last amendment: O. Reg. 269/11). The Site investigation activities were limited to visible and accessible locations of the Site. Subsurface investigations, testing, sampling, and laboratory analyses were completed based on available historical findings, Site access, and current Site observations.

4.1.1 SAMPLING AND ANALYSIS PLAN

See **Appendix A** for the Sampling and Analysis Plan.

Per O. Reg. 153/04 Schedule E, Condition 3(5) WSP developed the Standard Operating Procedures (SOPs) used in the field investigation, listed in the following table and are included in **Appendix C**.

Field work for this Phase Two ESA was undertaken following the SOPs. Deviations from the Sampling and Analysis Plan and SOPs, if any, are detailed in Section 4.4 Deviations from Sampling and Analysis Plan.

Table 4-1 List of Standard Operating Procedures Used in Field Investigation

CATEGORY	SOP
1. Drilling	Auger/Boring Rigs Monitoring Well and Borehole Abandonment Hollow Stem Auger Advancement Soil Sample Material Descriptions
2. Soil Sampling	Split Spoon Sampling Continuous Soil Core Sampling Field Soil Sampling for VOC Analysis Composite Sampling

CATEGORY	SOP
3. Soil Field Testing	Odour Identification Field Screening of Samples for Organic Vapours
4. Monitor Construction	Monitoring Well Construction Monitoring Well Development
5. Field Measurement of Water Quality Indicators	Temperature Measurement Conductivity Measurement pH Measurement Dissolved Oxygen Measurement
6. Ground water Monitoring/Sampling	Water Level Monitoring Non-Aqueous Phase Liquid Level Monitoring Monitor Purging Monitoring Well Sampling Volatile Organic Sampling
7. Quality Assurance/Quality Control (QA/QC) Program	Quality Assurance (QA) Quality Control (QC)

4.2 MEDIA INVESTIGATED

A summary of the media investigated at the Site during the Phase Two ESA is provided in the table below.

Table 4-2 Media Investigated During Phase Two ESA

ENVIRONMENTAL CONCERN	MEDIA INVESTIGATED
<u>Off-Site former dry-cleaning operation</u> <p>According to ERIS, the property at 25 John Street, located approximately 140 m northwest of the Site, was occupied by Rathburn Cleaners and was listed as a generator of halogenated solvents between 1992 and 2001. Given the up-gradient location of the property relative to the Site, this property is considered to be contributing to an APEC for the Site.</p>	<u>Ground water</u> <p>VOCs</p>
<u>Off-Site former autobody shops</u> <p>According to the City Directory search, the property at 3168 Hurontario Street was occupied by various auto body shops between 1989 and 2000. Given the up-gradient location of the property relative to the Site, this property is considered to be contributing to an APEC for the Site.</p>	<u>Ground water</u> <p>VOCs PHCs BTEX</p>
<u>Off-Site former autobody shops</u> <p>According to the City Directory search, the property at 3184 Hurontario Street was occupied by Cam Auto Service in 1966. Given the up-gradient location of the property relative to the Site, this property is considered to be contributing to an APEC for the Site.</p>	<u>Ground water</u> <p>VOCs PHCs BTEX</p>
<u>Off-Site spills</u> <p>According to ERIS, multiple water, coolant, hydraulic oil, gasoline and diesel spills occurred at 3210 Hurontario Street (250 m west of the Site), reported by Cooksville Go Station, WSP Canada Inc and Ellis-Done Corporation between 2017 and 2018. Given the up-gradient location of the property relative to the Site, this property is considered to be contributing to an APEC for the Site.</p>	<u>Ground water</u> <p>VOCs PHCs BTEX</p>

Notes:

BTEX – benzene, toluene, ethylbenzene, and xylenes

PHCs – petroleum hydrocarbons

4.3 PHASE ONE CONCEPTUAL SITE MODEL

A Phase One Conceptual Site Model (CSM) was presented in the Phase One ESA report (WSP, 2019) and is presented in this report as **Figure 2**. The Phase One CSM identified the PCAs and APECs for the Site, as described in Section 3.2.

4.4 DEVIATIONS FROM SAMPLING AND ANALYSIS PLAN

Only one deviation from the sampling and analysis plan was encountered during this Phase Two ESA. It was not proposed to collect and submit any soil samples for chemical analysis as part of this program, as all APECs were related to off-Site PCAs and the media of concern was ground water. Elevated vapour readings were measured in BH19-4 S4A at a depth of 3.1 to 3.3 mBGS, and as such, a soil sample for PHCs and VOCs was submitted from this location. In addition, due to low recovery of ground water in BH/MW19-4, a ground water was collected from BH/MW18-3 instead. However, upon returning to the Site multiple times, ground water samples for BH/MW19-4 were eventually collected.

4.5 IMPEDIMENTS

There were no impediments that limited access to the planned borehole locations.

5 INVESTIGATION METHOD

5.1 GENERAL

This section provides a brief description of all methods employed in undertaking this Phase Two ESA. Where the method differs from the associated standard operating procedure, a detailed description of the method used and a rationale for the change in method is provided in the appropriate subsection below.

5.2 DRILLING AND EXCAVATING

WSP staff inspected the Site and identified the preferred borehole locations based on the APECs identified in the most recent Phase One ESA (WSP, 2019) (see Section 3.2). The borehole locations are shown on **Figure 3**. The location of underground services and utilities within the Site were cleared prior to the commencement of the drilling program. WSP arranged for the service locates to be completed through Ontario One Call and Faults & Locates.

Table 5-1 Summary of Drilling/Excavation

INFORMATION PARAMETER	DETAILS
Name of Drilling/Excavation Contractor	Strata Drilling Group (Strata)
Drilling/Excavating Equipment Used	Geoprobe 420 M (limited access)
Measures taken to minimize the potential for cross-contamination	Disposable PVC liners were used for each core
Frequency of sample collection	Continuous

On July 3, 2019, two (2) boreholes (BH/MW19-3 and BH/MW19-4) instrumented with monitoring wells were drilled on-Site using a hand held Geoprobe 420 M machine provided by Strata. The locations were labeled so as to follow the current numbering of the previous boreholes/monitoring wells installed by Soil Mat (BH1 and BH2). The boreholes were advanced until refusal, which was a maximum of 4.3 mBGS. Soil samples were collected using a 32-mm diameter, 1.52-m long stainless steel continuous sampler equipped with disposable PVC liners. Upon completion of soil sampling activities, the two boreholes were drilled using 114-mm diameter hollow-stem direct push rods or 108-mm diameter solid-stem direct push rods to accommodate the installation of ground water monitoring wells.

5.3 SOIL

5.3.1 SOIL SAMPLING

A 1.52-m stainless steel continuous sampler equipped with disposable PVC liners was used to collect soil samples from the boreholes. Disposable nitrile gloves were used during sample collection and changed between each sample to

minimize the potential for cross-contamination. Soil samples were described in the field by WSP staff and observations were recorded in a dedicated field book. Soil samples were collected directly into laboratory-supplied 120-mL amber glass jars and 40-mL methanol-preserved vials and were stored at a temperature of less than 10°C. Samples selected for laboratory analysis were handled under standard chain of custody procedures until received at the laboratory. The soil samples selected for laboratory analysis were considered representative of worst-case conditions in the boreholes based on field screening results and visual and olfactory observations.

Four (4) soil samples, including one (1) field duplicate sample, were submitted to AGAT Laboratories in Mississauga, Ontario. The soil samples submitted for chemical and physical analysis are summarized in the following table:

Table 5-2 Summary of Soil Samples Submitted for Soil Quality Analysis

BOREHOLE ID	SOIL SAMPLE ID	DEPTH (MBGS)	SOIL TYPE	LABORATORY ANALYSES
BH/MW19-3	S1A	0.1 – 0.6	Sand	pH
BH/MW19-3	S5A	3.7 – 4.3	Clayey Silt	grain size, hydrometer
BH/MW19-4	S3A	1.8 – 2.4	Native sand	pH, grain size
BH/MW19-4	S4A	3.1 – 3.3	Native sand	PHCs, BTEX and VOCs
BH/MW19-4 (duplicate of S4A)	QAQC	3.1 – 3.3	Native sand	PHCs, BTEX and VOCs

Notes:

BTEX: Benzene, toluene, ethylbenzene, xylenes

PHCs: Petroleum hydrocarbon fractions F1 to F4

VOCs: Volatile organic compounds

mBGS: metres below ground surface

5.3.2 FIELD SCREENING MEASUREMENTS

Soil samples collected from the boreholes were field screened for total organic vapours (TOV) using a MiniRae 3000 photo-ionization detector (PID). In addition to visual and olfactory observations, the results of field screening were used to determine worst-case samples to select the samples to submit to the laboratory for analysis of BTEX and PHC parameters.

Table 5-3 Summary of Field Screening Information

CRITERIA	DESCRIPTION
i. Make and Model of Field Screening Instrument	MiniRae 3000 PID
ii. Chemicals that Field Screening Instrument Detects and Respective Detection Limits	Volatile organic compounds with dynamic range of 1 parts per billion to 10 000 parts per million (ppm)
iii. Precision of the Measurements	0.1 ppm
iv. Accuracy of the Measurements	± 5% display reading ± one digit
v. Calibration Reference Standards	isobutylene
vi. Calibration Procedures	The instrument is factory-calibrated on an annual basis and the calibration was checked on a daily basis both prior to and after use in the field using 100 ppm hexane and isobutylene according to manufacturer procedures.

Screening measurements (PID readings) are discussed in Section 6.3.1.2 and presented on the finalized borehole logs, included in **Appendix D**.

5.4 GROUND WATER

5.4.1 GROUND WATER MONITORING WELL INSTALLATION

Ground water monitoring wells were installed in both boreholes at the Site by Strata. A hand-held drill rig, equipped with 114 mm-diameter hollow stem direct push rods and 108 mm-diameter solid stem direct push rods were used for the installation of monitoring wells on July 3, 2019 upon completion of soil sampling activities. Nitrile gloves were used to handle the well casings and screens during installation to minimize the potential for cross contamination during installation.

The wells were screened to capture any ground water within the native sand and clayey silt units. The wells were constructed using 51-millimeter (mm) Schedule 40 PVC riser and included a 1.5-m well screen (slot 10). A sand pack was placed in the borehole annulus around the well screen from the bottom of the well to approximately 0.3 m above the well screen. Bentonite holeplug seal was placed above the sand pack to 0.3 mBGS. The wells were completed with flushmount casings. The monitoring well construction details are provided in Table 1 and shown on the attached borehole logs included as **Appendix D**.

Each monitoring well was equipped with dedicated bailers to facilitate ground water development and sampling. Following installation, the wells were then developed by removing three (3) well volumes of ground water. If the well was unable to produce three (3) well volumes, ground water was removed until the well ran dry three (3) times.

5.4.2 GROUND WATER FIELD MEASUREMENT OF WATER QUALITY PARAMETERS

On July 3, 2018, following the drilling, the wells were developed by removing three well volumes or by purging the well dry three times. Monitoring well BH19-4 was dry on July 3, 2019 and on July 8, 2019. A portable Hanna HI98130 instrument (Hanna pen) was used to measure pH, conductivity, total dissolved solids in the field, prior to sampling. The Hanna pen was calibrated at the start of each day using 4.00 and 7.00 pH buffer solutions. Field ground water quality measurements were obtained after the removal of each well volume and were recorded in a dedicated field book.

5.4.3 GROUND WATER SAMPLING

Ground water samples were collected on July 8, July 16 and on August 9, 2019. Ground water sampling was conducted using dedicated bailers for each monitoring well. The samples were collected directly into laboratory-supplied bottles, containing preservative where required, stored on ice at a temperature of less than 10°C and handled under standard chain of custody procedures until received at the laboratory. Vials used for VOC/BTEX and PHC F1 analysis were filled to achieve zero headspace.

Seven (7) ground water samples including four (4) samples for QA/QC purposes, were submitted to the laboratory for chemical analysis. The ground water samples collected as part of this Phase Two ESA are summarized in the following table:

Table 5-4 Ground Water Samples Submitted for Chemical Analysis

SAMPLE ID	LABORATORY ANALYSES
BH2	PHCs, BTEX, VOCs
MW19-3	PHCs, BTEX
MW19-4	VOCs, PHCs
DUP1 (duplicate of BH2)	PHCs, BTEX, VOCs
DUP2 (duplicate of BH19-3)	PHCs, BTEX
DUP3 (duplicate of BH19-4)	VOCs
Trip blank	VOCs

Notes:

PHCs: Petroleum hydrocarbon fractions F1 to F4

VOCs: Volatile organic compounds

BTEX: Benzene, toluene, ethylbenzene, xylenes

It should be noted that ground water samples collected from BH/MW19-3 were not part of the original program. Due to low recovery of ground water in BH/MW19-4 at the time of sampling, a ground water was collected from BH/MW18-3 instead. However, upon returning to the Site multiple times, ground water samples for BH/MW19-4 were eventually collected.

5.5 SEDIMENT SAMPLING

Sediment sampling was not conducted as part of this Phase Two ESA.

5.6 ANALYTICAL TESTING

Soil and ground water samples were submitted to AGAT Laboratories (AGAT), in Mississauga, Ontario, for chemical analysis for the above listed parameters. AGAT is certified by the Canadian Association for Laboratory Accreditation (CALA).

5.7 RESIDUE MANAGEMENT PROCEDURES

The management of residues such as soil cuttings, purge and development ground water, and fluids from equipment cleaning was conducted as indicated in the following table.

Table 5-5 Summary of Residue Management Procedures

RESIDUE	MANAGEMENT PROCEDURE
i. Soil cuttings from drilling and excavations	No soil cuttings were generated as part of the drilling program.
ii. Water from well development and purging	Minimal amounts of ground water from the development and purging of the monitoring wells was generated on-Site (<20L). The water was stored in a plastic pail and brought back to the office.
iii. Fluids from equipment cleaning.	No fluids from equipment cleaning were generated as part of this program.

5.8 ELEVATION SURVEYING

Topographic surveying was conducted using a Sokkia Network GCX2 Rover Global Positioning System (GPS). Due to the parking garage, there was a signal interference and an elevation for MW19-3 could not be measured with the Sokkia. As such, a laser level was used to tie-in the elevation of MW19-3 to a manhole located at the entrance of the parking structure, which was previously surveyed with the Sokkia.

The accuracy and reliability of high-precision GPSs may be subject to anomalies due to multipath, obstructions, satellite geometry, and atmospheric conditions. The average degree of precision recorded for the survey was 0.0012 m in the horizontal plane (HDOP), 0.0015 m in the vertical (VDOP). The ground surface elevations are included on the borehole logs in **Appendix D**.

5.9 QUALITY ASSURANCE AND QUALITY CONTROL MEASURES

The project-specific QA/QC measures are described in the table below while WSP's generic QA/QC program is provided in **Appendix B**.

QA/QC MEASURE	DESCRIPTION
i. Sample containers, preservation, labelling, handling and custody for samples submitted for laboratory analysis, including any deviations from the SAP.	<p>Soil samples from the boreholes were collected in 40 mL methanol-preserved vials for PHC F1/VOCs/BTEX analysis, and 250 mL glass jars without preservative for analysis of all other parameters at the sample locations.</p> <p>Ground water samples from the monitoring wells were collected using the following laboratory supplied containers:</p> <ul style="list-style-type: none">• PHC F1/BTEX – two (2) 40 mL clear glass vials, NaHSO₄ preservative• PHC F2-F4 – two (2) 100 mL amber glass bottle, NaHSO₄ preservative <p>Ground water samples were collected using dedicated sampling equipment (dedicated bailer) for each well. Ground water containers used for PHC F1/BTEX analysis were filled to achieve zero headspace. Sample containers were labelled with unique sample identification, the project number, and the sampling date. A laboratory-supplied chain of custody was completed. One (1) copy was sent with the samples to the laboratory, and one (1) copy was retained for the project file.</p>
ii. Equipment cleaning procedures during sampling	<p>Nitrile gloves were replaced after each sample was collected to reduce the potential for cross-contamination of the samples.</p> <p>Field equipment was cleaned with soap and water and was rinsed with distilled water between samples.</p>
iii. Field QC measures	<p>Blind field duplicate samples of soil and ground water were collected and submitted for laboratory analysis as part of this investigation. A laboratory-prepared VOC trip blank was brought to the Site during the ground water sampling and was submitted to the laboratory for analysis.</p>
iv. Deviations from the procedures set out in the QA/QC program set out in the SAP.	<p>On August 9, 2019, a ground water sample was collected from monitoring well MW19-4, which was dry on several occasions and had very low recharge. A duplicate ground water sample could not be collected from this well during the sampling on August 9, 2019, due to the limited recovery after taking the original sample from the well.</p>

AGAT Laboratories also performed QA/QC procedures as outlined in their CALA procedures. These procedures included analysis of lab duplicates and blanks as well as analysis of surrogate recovery as outlined in the Certificates of Analysis provided in **Appendix B**.

6 REVIEW AND EVALUATION

6.1 GEOLOGY

A summary of the subsurface conditions encountered at the Site is presented below. Borehole logs are included in **Appendix D**. A ground water contour map is provided as **Figure 3**. The borehole logs were used to create northwest-southeast and west-east cross sections for the Site, provided as Figures 4 and 5, respectively.

The surficial geology at the Site consists of approximately 4.3 m of native sand, below which a stiff clayey silt (glacial till) was observed. Shale was encountered in both boreholes at approximately 4.3 mBGS.

6.2 HYDROGEOLOGY

6.2.1 ELEVATIONS AND FLOW DIRECTION

Shallow ground water is found within the native sand and native clayey silt till aquitard. As part of this Phase Two ESA, monitoring wells advanced by WSP were screened in the native sand unit and native clayey silt.

Ground water levels were measured on August 9, 2019. A summary of the ground water elevations is presented in Table 2 and are presented on **Figure 3** and the geological cross-sections **Figure 4** and **Figure 5**.

Ground water elevations in the monitoring wells ranged from 113.0 to 115.13 mASL. Based on the ground water contour map, ground water at the Site is flowing toward the southeast. WSP notes that there may be variations in the ground water flows patterns across stratigraphy units, given that the wells were installed in different units. Groundwater levels are presented in Table 2.

No LNAPL or DNAPL were present in any of the monitoring wells on-Site.

6.2.2 HYDRAULIC GRADIENTS

Ground water elevations in monitoring wells installed as part of this investigation indicated an average hydraulic gradient of 0.01. Vertical hydraulic gradients were not calculated as part of this assessment since nested monitoring wells were not installed.

6.3 RESULTS OF ANALYSIS

6.3.1 SOIL

6.3.1.1 COARSE SOIL TEXTURE

CRITERIA	DESCRIPTION
i. rationale for the use of the coarse soil texture category,	Two (2) soil samples, one from native sand (BH19-4 S3A) and one from native clayey silt (BH19-3 S5A), underwent grain size analysis. Soil sample from the native sand was on average 92% coarse and the soil sample from native clayey silt was on average 81% fine. Therefore, the coarse-textured criteria were applied, as a more conservative approach.
ii. a description of the results of the required grain size analysis	The results of the grain size analysis showed that the native sand sample contained on average 92% by mass of particles that are greater than 75 µm in mean diameter, and, the grain size analysis showed that the native clayey silt sample contained on average 81% by mass of particles that were less than 75 µm in mean diameter.
iii. a description and rationale for the number of samples collected and analyzed	BH19-4 S3A: within the native sand, water table present. BH19-3 S5A: within the native clayey silt, water table present.

6.3.1.2 FIELD SCREENING

Seventeen (17) soil samples were screened for total organic vapours (TOV) using a MiniRae 3000 PID instrument. TOV concentrations ranged from 0.0 ppm to 125.4 ppm. The TOV readings are included on the borehole logs included in **Appendix D** and tabulated below; the soil samples that were submitted for laboratory analysis of organic parameters (VOCs, PHCs) are indicated in Table 6-1.

Table 6-1 Summary of Field Screening (TOV) Measurements

BOREHOLE ID	SOIL SAMPLE ID	DEPTH (mBGS)	TOV (ppm)	PARAMETERS ANALYSED	
				VOC	PHC
BH19-3	S1A	0.1 – 0.6	0		
BH19-3	S2A	0.6 – 1.2	0		
BH19-3	S2B	1.2 – 1.8	0		
BH19-3	S3A	1.8 – 2.4	0.1		
BH19-3	S3B	2.4 – 3.1	0		
BH19-3	S4A	3.1 – 3.3	0.2		
BH19-3	S4B	3.3 – 3.8	0		
BH19-3	S5A	3.8 – 4.3	0.2		
BH19-3	S5B	4.3 – 4.4	0		
BH19-4	S1A	0.1 – 0.6	125.4		

BOREHOLE ID	SOIL SAMPLE ID	DEPTH (mBGS)	TOV (ppm)	PARAMETERS ANALYSED	
				VOC	PHC
BH19-4	S2A	0.6 – 1.2	2.1		
BH19-4	S2B	1.2 – 1.8	0.3		
BH19-4	S3A	1.8 – 2.4	0.3		
BH19-4	S3B	2.4 – 3.1	0.1		
BH19-4	S4A	3.1 – 3.3	15.7	■	■
BH19-4	S4B	3.3 – 3.8	0.1		
BH19-4	S5A	3.8 – 4.3	0.1		

Notes:
TOV: Total organic vapours
mBGS: metres below ground surface

It should be noted that the elevated vapour reading in BH19-4 S1A was attributed to spray paint from the private locates and was not considered representative of the subsurface conditions at the Site. As such, a soil sample from this location was not collected nor submitted for analysis.

6.3.2 SOIL QUALITY

The soil analysis results from the present investigation are presented in Table 3. Although not originally proposed, given that elevated vapour readings were measured at 3.1-3.8 mBGS in borehole BH19-4, it was decided to submit a soil sample for the analysis of PHCs, BTEX and VOCs.

The Laboratory Certificates of Analysis for the soil analysis completed during the present investigation in are provided in **Appendix E**.

6.3.2.1 VOLATILE ORGANIC COMPOUNDS (VOCs)

One (1) soil sample (plus one field duplicate) was submitted for analysis of VOCs.

Laboratory analyses indicated that concentrations of VOCs parameters were below the applicable MECP Table 2 SCS for the samples analyzed.

6.3.2.2 PETROLEUM HYDROCARBONS (PHCS) AND BENZENE, TOLUENE, ETHYLBENZENE AND XYLENES (BTEX)

One (1) soil sample (plus one field duplicate) was submitted for analysis of PHCs and BTEX.

Laboratory analyses indicated that concentrations of PHCs and BTEX parameters were below the applicable MECP Table 2 SCS for the samples analyzed.

6.3.3 GROUND WATER QUALITY

A summary of the results of ground water analyses is included as Table 4.

The Laboratory Certificates of Analysis for the ground water analysis completed during the present Phase Two ESA are provided in **Appendix E**.

6.3.3.1 VOLATILE ORGANIC COMPOUNDS (VOCs)

As part of this Phase Two ESA, two (2) ground water samples (plus three ground water samples QA/QC purposes) were submitted for analysis of VOCs.

Laboratory analyses indicated that concentrations of VOCs parameters were below the applicable MECP Table 2 SCS for the samples analyzed.

There were no measurable thicknesses of non-aqueous phase liquids observed in the monitoring wells on-Site.

6.3.3.2 PETROLEUM HYDROCARBONS (PHCS) AND BENZENE, TOLUENE, ETHYLBENZENE AND XYLENES (BTEX)

As part of this Phase Two ESA, three (3) ground water samples (plus two ground water samples for QA/QC purposes) were submitted for analysis of PHCs and BTEX.

Laboratory analyses indicated that concentrations of PHCs and BTEX parameters were below the applicable MECP Table 2 SCS for the samples analyzed.

There were no measurable thicknesses of non-aqueous phase liquids observed in the monitoring wells on-Site.

6.3.4 SEDIMENT QUALITY

Sediment sampling was not conducted as part of this Phase Two ESA.

6.4 QUALITY ASSURANCE AND QUALITY CONTROL RESULTS

Field protocols for sample collection and handling were followed by all WSP personnel to ensure sample integrity was maintained. All field equipment was decontaminated before and between sample collection and clean nitrile gloves were used for each sample to eliminate the potential for cross contamination of samples. All soil and ground water samples were collected directly into laboratory-supplied containers, preserved as required, and stored and shipped in ice-filled coolers. Chain of custody procedures were followed by WSP and the laboratory during sample transfer.

Field duplicate samples were assessed as part of the QA/QC program during the Phase Two ESA. A minimum of one field duplicate sample was collected and analyzed for every ten samples for both soil and ground water. Field duplicate samples were evaluated based on the relative percent difference (RPD) in parameter concentrations. Where measured parameter concentrations were greater than five times the laboratory reportable detection limit (RDL), a RPD of less than 20% was deemed acceptable; for concentrations less than five times the RDL, a concentration difference of equal to or less than the RDL was deemed acceptable.

Table 6-2, below provides a summary of the field duplicate samples and the results of the QA/QC comparisons of the duplicate samples.

Table 6-2 Summary of QA/QC Results

DATE	SAMPLE ID	FIELD DUPLICATE ID	MEDIA	QA/QC RESULTS
July 3, 2019	BH19-4-S4A	QAQC	Soil	All results were within the QA/QC guidelines.

July 8, 2019	BH2	DUP1	GW	All results were within the QA/QC guidelines.
July 16, 2019	MW19-3	DUP2	GW	All results were within the QA/QC guidelines.
July 16, 2019	MW19-4	DUP3	GW	All results were within the QA/QC guidelines.

A trip blank (distilled water sample), prepared by the laboratory, travelled along with the July 8, 2019 ground water samples and was analyzed by the laboratory for VOCs. All concentrations were below the RDL, indicating no contamination from the sample containers, preservatives, and transportation and storage conditions. The results also indicate that the laboratory instrument was not detecting false interference.

AGAT carried out internal QA/QC measures including process recoveries, blanks, and replicate samples. The laboratory QA/QC results are provided on the Certificates of Analysis in **Appendix E**; the results were acceptable and therefore suitable for interpretation.

With respect to subsection 47(3) of O. Reg. 153/04, all certificates of analysis of analytical reports received pursuant to clause 47(2)(b) of the regulation comply with subsection 47(3), a certificate of analysis of analytical report has been received for each sample submitted for analysis, and all certificates of analysis or analytical reports received have been included in full in **Appendix E** of this report.

6.5 PHASE TWO CONCEPTUAL SITE MODEL

A Phase Two Conceptual Site Model was developed through the analysis and interpretation of the Phase One ESA, Phase One CSM, and field data gathered during this Phase Two ESA.

Based on information obtained as part of the Phase One ESA, it was concluded that APEC(s) associated with past activities/operations exist at the Site. The table of APECs, prepared in accordance with clause 16(2)(a), Schedule D, O. Reg. 153/04, is presented below.

AREA OF POTENTIAL ENVIRONMENTAL CONCERN	LOCATION OF AREA OF POTENTIAL ENVIRONMENTAL CONCERN ON PHASE ONE PROPERTY	POTENTIALLY CONTAMINATING ACTIVITY	LOCATION OF PCA (ON-SITE OR OFF- SITE)	CONTAMINANTS OF POTENTIAL CONCERN	MEDIA POTENTIALLY IMPACTED (GROUND WATER, SOIL AND/OR SEDIMENT)
1	Under the northwest portion of the Site	37 Operation of Dry Cleaning Equipment (where chemicals are used)	Off-Site	VOCs	GW
2	Under the northwest portion of the Site	10 Commercial Autobody Shops	Off-Site	VOCs PHCs BTEX	GW
3	Under the northwest portion of the Site	10 Commercial Autobody Shops	Off-Site	VOCs PHCs BTEX	GW

4	Under the northwest portion of the Site	NA - A	Spills - Related to multiple water, coolant, hydraulic oil, gasoline and diesel spills that occurred at 3210 Hurontario Street (250 m west of the Site)	Off-Site	VOCs PHCs BTEX	GW
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Table 6-3 Summary of Areas of Potential Environmental Concern Identified in Phase One ESA

The following table provides a summary discussion of the interpreted field data that is incorporated into the Phase Two CSM.

Table 6-4 Summary of Phase Two Conceptual Site Model

CRITERIA	DISCUSSION
<p>i. a description and assessment of,</p> <p>A. areas where potentially contaminating activity has occurred,</p> <p>B. areas of potential environmental concern, and</p> <p>C. any subsurface structures and utilities on, in or under the phase two property that may affect contaminant distribution and transport</p>	<p>A. The Phase One ESA identified potentially contaminating activities (PCAs) that contributed to the identification of areas of potential environmental concern (APECs); detailed in Table 6-3 of this report.</p> <p>The Phase One Conceptual Site Model (Figure 2) and the Phase Two Conceptual Site Model (Figure 3 through Figure 5) for the Site incorporates the information and data collected as part of this Phase Two ESA and Phase One ESA (WSP, 2019).</p> <p>In summary, off-Site PCAs that were identified as contributing to on-Site APECs were:</p> <ul style="list-style-type: none"> ■ 37: Operation of Dry Cleaning Equipment (where chemicals are used), located off-Site to the northwest of the Site. ■ 10: Commercial Autobody Shops, located northwest of the Site. Garages and Maintenance and Repair of Railcars, Marine Vehicles and Aviation Vehicles ■ A: Spills, historically occurred northwest of the Site. <p>B. The on-Site APECs that were interpreted from the occurrence of the PCAs were:</p> <ul style="list-style-type: none"> ■ APEC #1 - Under the northwest portion of the Phase One Property <p>The following off-Site PCAs were identified According to ERIS, the property at 25 John Street, located approximately 140 m northwest of the Site, was occupied by Rathburn Cleaners and was listed as a generator of halogenated solvents between 1992 and 2001.</p> <p>BH/MW 19-4 was advanced within the Phase One Property and ground water quality did not indicate impacts from the historical dry cleaner. Analytical results for the ground water sample did not exceed the Table 2 SCS.</p> <ul style="list-style-type: none"> ■ APEC #2 and #3 - Under the northwest portion of the Phase One Property <p>Historical auto repair shops were located northwest of the Site: the property at 3168 Hurontario Street was occupied by various auto body shops between 1989 and 2000; and, the property at 3184 Hurontario Street was occupied by Cam Auto Service in 1966.</p> <p>BH19-4 was advanced within the Phase One Property and ground water quality did not indicate impacts from the historical auto shops. Analytical results for the ground water sample did not exceed the Table 2 SCS.</p> <ul style="list-style-type: none"> ■ APEC #4 - Under the northwest portion of the Phase One Property <p>According to ERIS, multiple water, coolant, hydraulic oil, gasoline and diesel</p>

CRITERIA

DISCUSSION

	<p>spills occurred at 3210 Hurontario Street (250 m west of the Site), reported by Cooksville Go Station, WSP Canada Inc and Ellis-Done Corporation between 2017 and 2018.</p> <p>BH19-4 was advanced within the Phase One Property and ground water quality did not indicate impacts from the historical spills. Analytical results for the ground water sample did not exceed the Table 2 SCS.</p> <p>C. Underground utilities can affect contaminant distribution and transport. Given that the surficial soil in the area of the Site is sand, the buried structures do not represent a significant preferential pathway for ground water flow. Embedded services at the Site were likely installed within the upper native sand and clayey silt, the hydraulic conductivities of which are assumed relatively high to moderate—backfill in the service trenches is therefore not anticipated to provide preferential pathways for contaminant migration from the Site. At the time of the investigation, a buried water line centrally located running east west and drain line running north, east and south centrally located were identified on-Site.</p>
<p>ii. a description of and, as appropriate, figures illustrating, the physical setting of the phase two property and any areas under it including,</p> <p>A. stratigraphy from ground surface to the deepest aquifer or aquitard investigated,</p> <p>B. hydrogeological characteristics, including aquifers, aquitards and, in each hydrostratigraphic unit where one or more contaminants is present at concentrations above the applicable site condition standards, lateral and vertical gradients,</p> <p>C. approximate depth to bedrock,</p> <p>D. approximate depth to water table,</p> <p>E. any respect in which section 41 or 43.1 of the regulation applies to the property,</p> <p>F. areas where soil has been brought from another property and placed on, in or under the phase two property, and</p>	<p>A. Overburden soils within the Phase One Study Area are described as “sand plains” in the east portion and “beaches” in the most western portion of the Site (Chapman and Putnam, 2007). The surficial geology of the Site is described as “deltaic and lacustrine deposits”, consisting of sand with high permeability (OGS, 2010).</p> <p>The Site stratigraphy consists of:</p> <ul style="list-style-type: none"> • A sand layer, which was identified below the topsoil or concrete to depths ranging between 2.1 and 3.6 mBGS. • A clayey silt layer with a thickness ranging from 0.6 to 2.2 m below the sand layer, in the boreholes advanced at the site. • Shale was encountered at approximately 4.3 mBGS in the boreholes advanced by WSP. <p>Grain size analysis of the native soil shows that the native sand is a coarse-grained soil.</p> <p>Geological cross-sections are provided as Figures 4 and 5. BH2 advanced by Soil Mat Engineers is included on the cross-sections.</p> <p>B. The native sand unit is considered an unconfined overburden aquifer and the clayey silt, an aquitard unit, isolating the shale below from the overburden aquifer. Based on August 8, 2019 ground water elevations, the average horizontal hydraulic gradient in the sand is 0.01. Vertical hydraulic gradients were not assessed as part of this investigation.</p> <p>C. The depth to bedrock is approximately 4.3 mBGS, based on the drilling program.</p> <p>D. The depth to shallow ground water in the overburden is ranges from 2.4 to 3.4 mBGS. Groundwater flow direction was measured to the southeast. WSP notes that the wells were installed to intercept the water table, which resulted in monitoring wells screened in different stratigraphic units. The actual ground water flow direction by vary slightly.</p> <p>E. Section 41 of O. Reg. 153/04 does not apply to the Site based on the following rationale:</p> <ul style="list-style-type: none"> • Section 41(1)(a) does not apply as the Site is not (i) within an area of natural significance, nor does it (ii) include or is adjacent to an area of natural significance or part of such an area, nor does it (iii) include land that is within 30 metres of an area of natural significance or part of such an area; • Section 41(1)(b) does not apply as soil at the Site has pH values between 7.5 and 8. • Section 41(1)(b) does not apply as the Site is not located within 30 m of a permanent water body. The nearest waterbody to the Site is Cooksville

CRITERIA

DISCUSSION

<p>G. approximate locations, if known, of any proposed buildings and other structures</p>	<p>Creek, located approximately 150 m northeast of the Site.</p> <p>Section 43.1 of O. Reg. 153/04 does not apply to the Site based on the following rationale:</p> <ul style="list-style-type: none"> Section 43.1(a) does not apply to the Site – The Site is not a shallow soil site, as defined in Section 43.1(3); overburden thickness is 3.4 m. <p>F. Soil was not brought from another property and placed on, in, or under the Site, as part of this Phase Two ESA.</p> <p>G. It is not known if, or where, future buildings or structures may be located on the Site. As the footprints of the existing buildings cover the majority of the Site, any future buildings likely would have similar footprint/coverage.</p>
<p>iii. where a contaminant is present on, in or under the phase two property at a concentration greater than the applicable site condition standard, identification of,</p> <p>A. each area where a contaminant is present on, in or under the phase two property at a concentration greater than the applicable site condition standard,</p> <p>B. the contaminants associated with each of the areas referred to in subparagraph A,</p> <p>C. each medium in which a contaminant associated with an area referred to in subparagraph is present,</p> <p>D. a description and assessment of What is known about each of the areas referred to in subparagraph A,</p> <p>E. the distribution, in each of the areas referred to in subparagraph A, of each contaminant present in the area at a concentration greater than the applicable site condition standard, for each medium in which the contaminant is present, together with figures showing the distribution,</p> <p>F. anything known about the reason for the discharge of the contaminants present on, in or under the phase two property at a concentration greater than the applicable site</p>	<p>The analytical results for the soil and ground water samples collected as part of this Phase Two ESA indicated that concentrations of contaminants of potential concern were below the applicable Table 2 SCS.</p>

CRITERIA

DISCUSSION

<p>condition standard into the natural environment,</p> <p>G. anything known about migration of the contaminants present on, in or under the phase two property at a concentration greater than the applicable site condition standard away from any area of potential environmental concern, including the identification of any preferential pathways,</p> <p>H. climatic or meteorological conditions that may have influenced distribution and migration of the contaminants, such as temporal fluctuations in ground water levels, and</p> <p>I. if applicable, information concerning soil vapour intrusion of the contaminants into buildings including,</p> <ol style="list-style-type: none"> 1. relevant construction features of a building, such as a basement or crawl space, 2. building heating, ventilating and air conditioning design and operation, and 3. subsurface utilities, 	
<p>iv. where contaminants on, in or under the phase two property are present at concentrations greater than the applicable site condition standard, one or more cross-sections showing,</p> <p>A. the lateral and vertical distribution of a contaminant in each area where the contaminants is present at concentrations greater than the applicable site condition standard in soil, ground water and sediment,</p> <p>B. approximate depth to water table in each area referred to in</p>	<p>A.</p> <p>Plan view figures that indicate the horizontal distribution of contaminants were not provided as concentrations of contaminants in excess of the MECF Table 2 SCS were not identified on Site.</p> <p>Cross-sections that include the required information are provided as Figures 4 and 5.</p> <p>B. Ground water levels are provided in Figures 3, 4 and 5.</p> <p>C. Stratigraphy from ground surface to the deepest strata investigated is provided in Figures 4 and 5.</p> <p>D. Building footings likely are to the competent bedrock and embedded services at the Site likely are within the upper native sand and clayey silt, the hydraulic conductivities of which are assumed relatively high to moderate—backfill in the service trenches is therefore not anticipated to provide preferential pathways for ground water migration from the Site.</p>

CRITERIA

DISCUSSION

<p>subparagraph A,</p> <p>C. stratigraphy from ground surface to the deepest aquifer or aquitard investigated, and</p> <p>D. any subsurface structures and utilities that may affect contaminant distribution and transport in each area referred to in subparagraph A</p>	
<p>v. for each area where a contaminant is present on, in or under the property at a concentration greater than the applicable site condition standard for the contaminant, a diagram identifying, with narrative explanatory notes,</p> <p>A. the release mechanisms,</p> <p>B. contaminant transport pathway,</p> <p>C. the human and ecological receptors located on, in or under the phase two property,</p> <p>D. receptor exposure points, and</p> <p>E. routes of exposure.</p>	<p>Diagrams that present the requested contaminant information were not provided as the analytical results for the soil and ground water samples collected as part of this Phase Two ESA indicated that concentrations of contaminants of potential concern were below the applicable MECP Table 2 SCS.</p>

7 CONCLUSIONS

Based on the findings and analytical results of the Phase Two ESA, the following conclusions are presented:

- The Site is occupied by a two-story commercial plaza, situated in the southern portion of the Site. The northeast portion of the Site consists of a two-story parking structure.
- The surficial geology at the Site consists of native sand underlain by stiff clayey silt followed by shale bedrock.
- Shallow ground water is found within the native sand unit above the clayey silt till aquitard, within the clayey silt as well as within the shale bedrock. Monitoring well MW19-3 was installed within the sand unit, monitoring well MW19-4 was installed. The inferred shallow ground water flow direction is southeast.
- Concentrations of PHCs and VOCs in the soil samples analyzed were below the applicable MECP Table 2 SCS for the locations and parameters tested.
- Concentrations of PHCs and VOCs in the ground water samples analyzed were below the applicable MECP Table 2 SCS for the locations and parameters tested.

Based on the information obtained as part of the Phase Two ESA, it is concluded that the soil and ground water quality at the Site meets the applicable MECP Table 2 SCS.

7.1 QUALIFICATIONS OF THE ASSESSORS

Lindsay Levesque, BSc. EP, is a Project Manager with WSP with approximately seven (7) years of experience. Ms. Levesque graduated with a Bachelors of Science degree from the University of Guelph and obtained a certificate for the program “Environmental Control” from Sheridan College. More recently, she has obtained her Environmental Professional (EP) Certification with Eco Canada. She has experience with a variety of environmental assessment and remediation projects. She has managed environmental investigation projects for many industrial, commercial and residential properties in Canada. She also has experience with Phase I Environmental Site Assessments in other provinces such as Quebec and Alberta. She has experience in conducting Phase I and Two Environmental Site Assessments on numerous residential, commercial, and industrial properties.

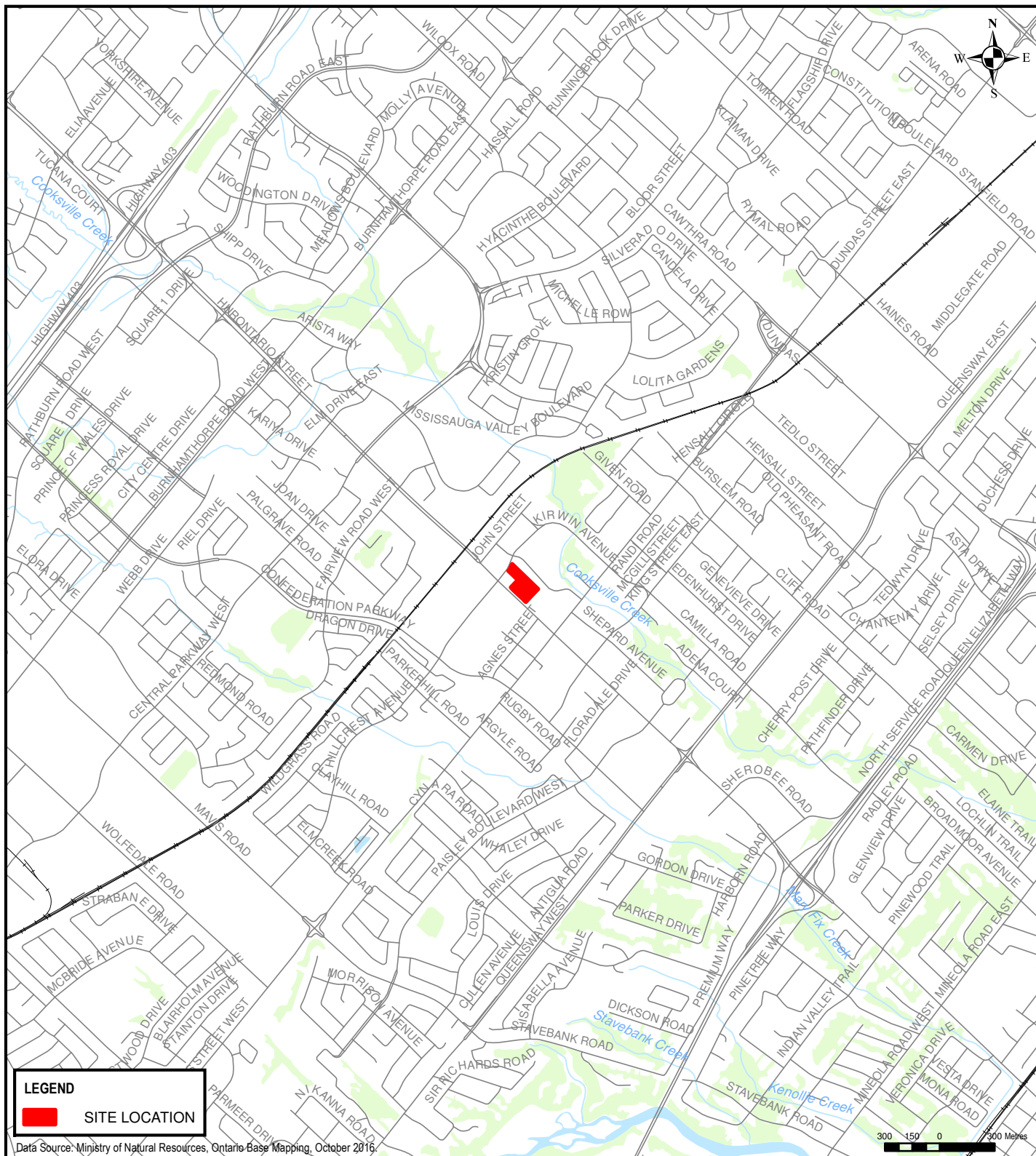
Mr. Bailey Walters, MSc, PGeo, QP_{ESA/RA}, is a Senior Geoscientist in the Hamilton, Ontario office of WSP Canada Inc. He obtained a Master of Science degree in Watershed Ecosystem with a thesis in hydrogeology. Since joining WSP in 2002, Bailey has worked on numerous subsurface geotechnical and environmental investigations, environmental site assessment and remediation projects, contaminant delineation at Brownfield sites, environmental media sampling, implementation of environmental remediation and ground water treatment technologies, and detailed site characterization. Bailey is a Qualified Person (QP_{ESA/RA}) with the Ministry of the Environment, Conservation and Parks (MECP) to complete Records of Site Condition (RSCs) under Ontario Regulation 153/04.

8 REFERENCES

- Chapman, L.J., and D.F. Putnam. 1984. The Physiography of Southern Ontario; Ontario Geological Survey. Special Volume 2. 270p. Accompanied by Map P.2715 (coloured), scale 1:600 000.
- Environmental Protection Act, R.R.O 1990, Regulation 153/04, Records of Site Condition, as amended by Ontario Regulation 269/11.
- Ministry of the Environment, Conservation and Parks (MECP). 2011. Soil, Ground Water and Sediment Standards for Use under Part XV.1 of the Environmental Protection Act, dated April 15
- Soil-Mat Engineers & Consultants Ltd (Soil-Mat). 2019. Geotechnical Investigation, Proposed Condominium Development, 3085 Hurontario Street, Mississauga, ON, dated May 8, 2019.
- WSP Canada Inc (WSP). 2019. Phase One Environmental Site Assessment, 3085 and 3105 Hurontario Street, Mississauga, ON, dated November 2019.

FIGURES





LEGEND

SITE LOCATION

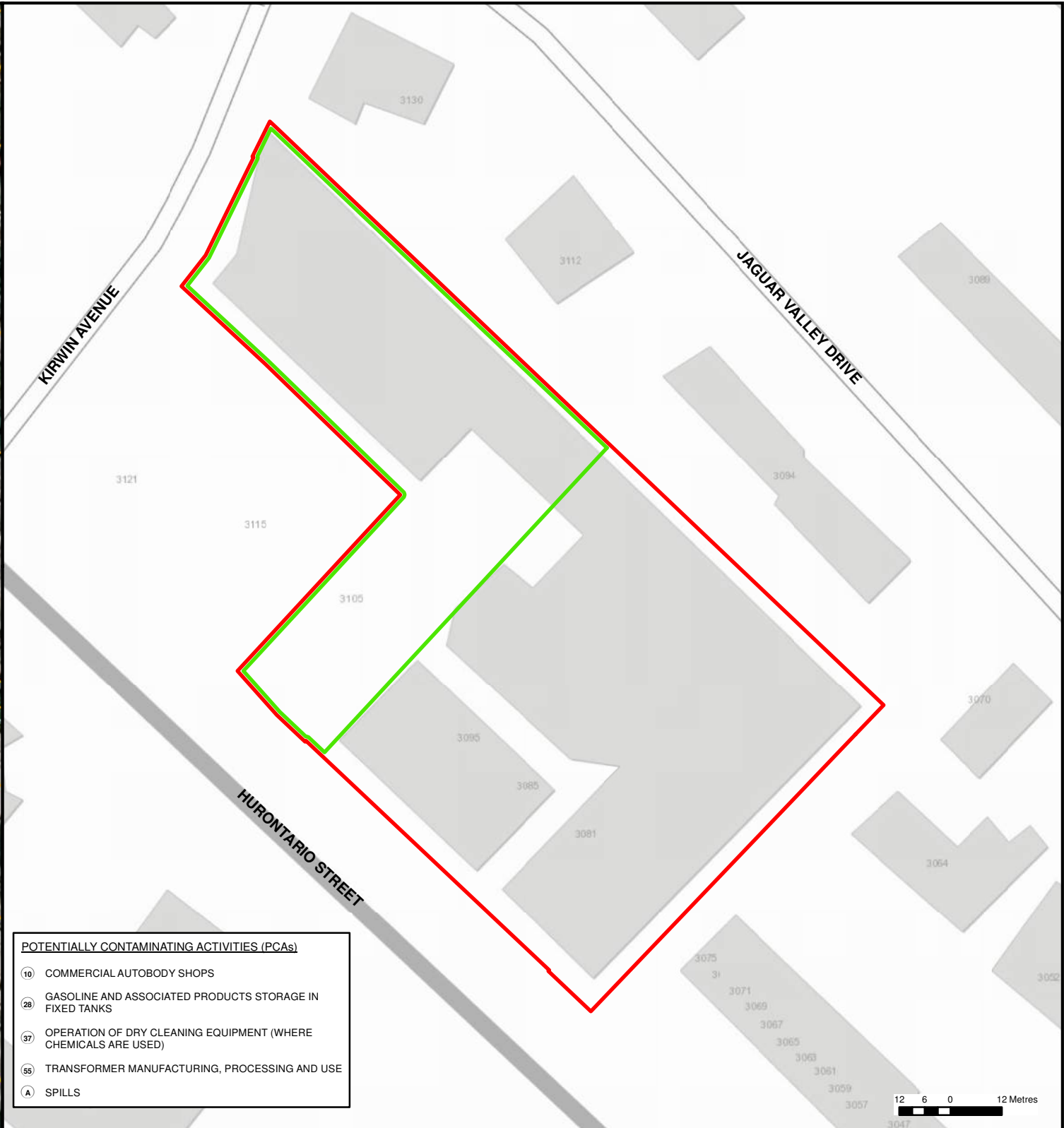
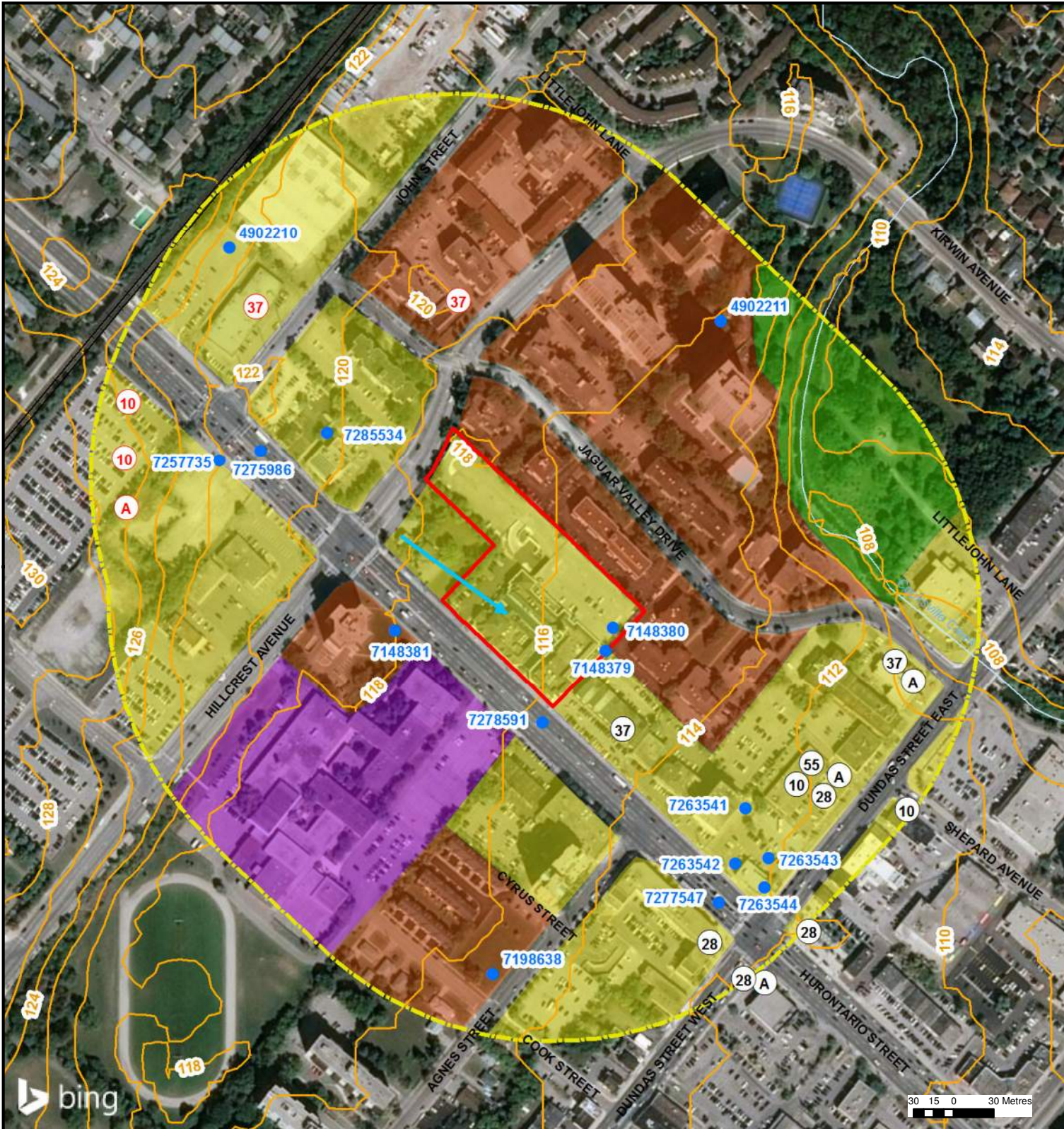
Data Source: Ministry of Natural Resources, Ontario Base Mapping, October 2016.



4 HUGHSON STREET SOUTH STREET, SUITE 300
HAMILTON, ONTARIO CANADA L8N 3Z1
TEL.: 905-529-4414 | WWW.WSP.COM

PROJECT:	PHASE TWO ENVIRONMENTAL SITE ASSESSMENT 3085 & 3105 HURONTARIO STREET MISSISSAUGA, ONTARIO	
TITLE:	SITE LOCATION MAP	
CLIENT:	EQUITY THREE HOLDINGS INC.	

SCALE:	1:30,000	
DRAWN BY:	TP	CHECKED BY: BW
PROJECT NO:	191-02120-01 100	
DATE:	SEPTEMBER 2019	
FIGURE NO:	1	



- POTENTIALLY CONTAMINATING ACTIVITIES (PCAs)**
- (10) COMMERCIAL AUTOBODY SHOPS
 - (28) GASOLINE AND ASSOCIATED PRODUCTS STORAGE IN FIXED TANKS
 - (37) OPERATION OF DRY CLEANING EQUIPMENT (WHERE CHEMICALS ARE USED)
 - (55) TRANSFORMER MANUFACTURING, PROCESSING AND USE
 - (A) SPILLS



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LEGEND

- | | |
|-------------------------------------|--|
| SITE BOUNDARY | COMMERCIAL LAND USE |
| STUDY AREA BOUNDARY (250 m) | INSTITUTIONAL LAND USE |
| 2 m INTERVAL TOPOGRAPHIC CONTOURS | PARKLAND |
| WATERCOURSE | RESIDENTIAL LAND USE |
| INFERRED GROUNDWATER FLOW DIRECTION | PCA NOT CONTRIBUTING TO APEC |
| WATER WELL RECORD | PCA CONTRIBUTING TO APEC |
| | AREAS OF POTENTIAL ENVIRONMENTAL CONCERN |
| | APEC 1-4 |

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



CLIENT:

EQUITY THREE HOLDINGS INC.

PROJECT:

PHASE TWO ENVIRONMENTAL SITE ASSESSMENT
3085 & 3105 HURONTARIO STREET
MISSISSAUGA, ONTARIO

PROJECT NO:

191-02120-01 100

DESIGNED BY:

LL

DRAWN BY:

TP

CHECKED BY:

BW

SCALE:

AS SHOWN

DATE:

SEPTEMBER 2019

TITLE:

PHASE ONE
CONCEPTUAL SITE MODEL

DISCIPLINE:

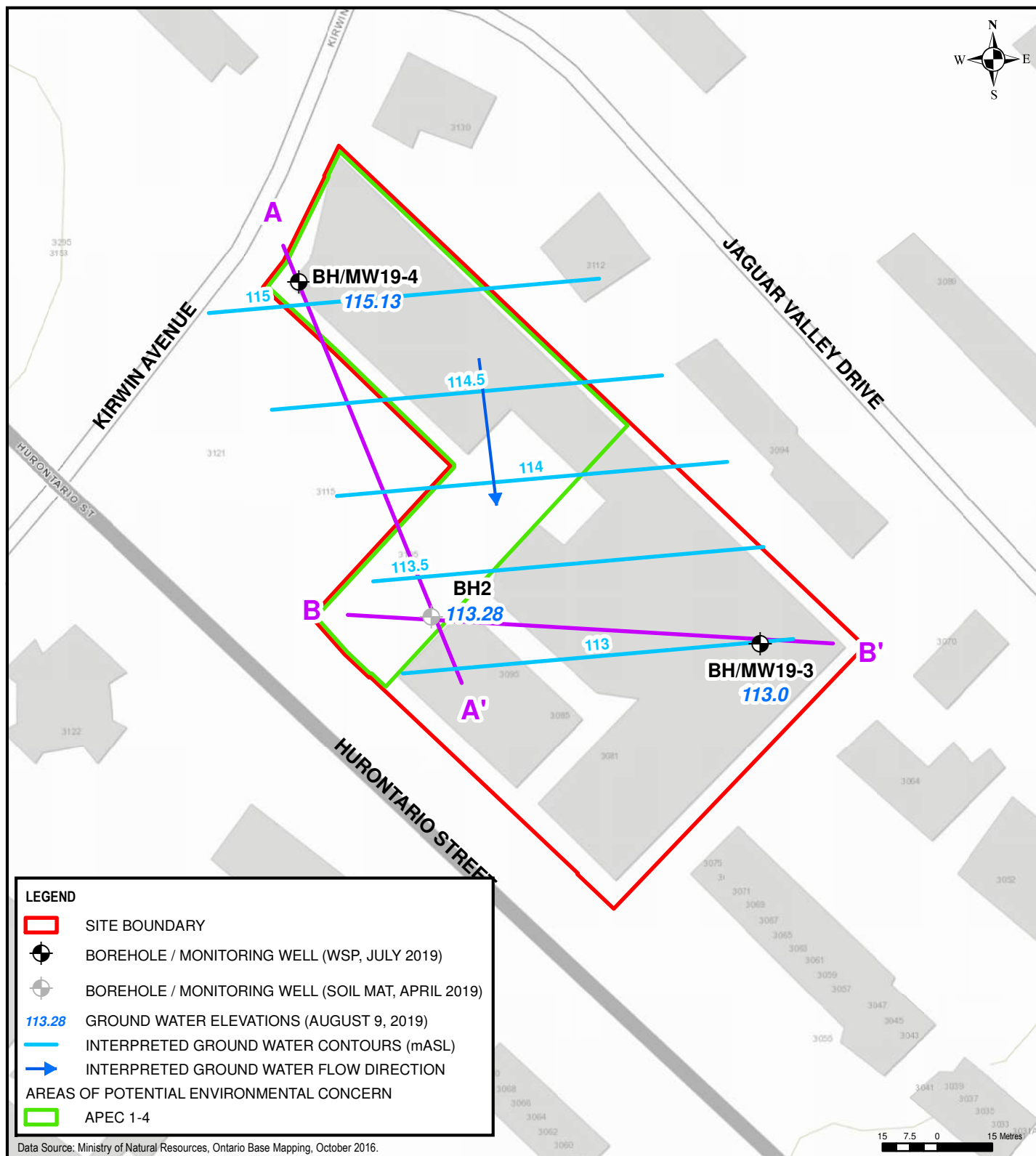
ENVIRONMENT

ISSUE:

-

FIGURE NO:

2



LEGEND

- ▬ SITE BOUNDARY
- BOREHOLE / MONITORING WELL (WSP, JULY 2019)
- BOREHOLE / MONITORING WELL (SOIL MAT, APRIL 2019)
- 113.28 GROUND WATER ELEVATIONS (AUGUST 9, 2019)
- ▬ INTERPRETED GROUND WATER CONTOURS (mASL)
- ➔ INTERPRETED GROUND WATER FLOW DIRECTION
- ▬ AREAS OF POTENTIAL ENVIRONMENTAL CONCERN
- ▬ APEC 1-4

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



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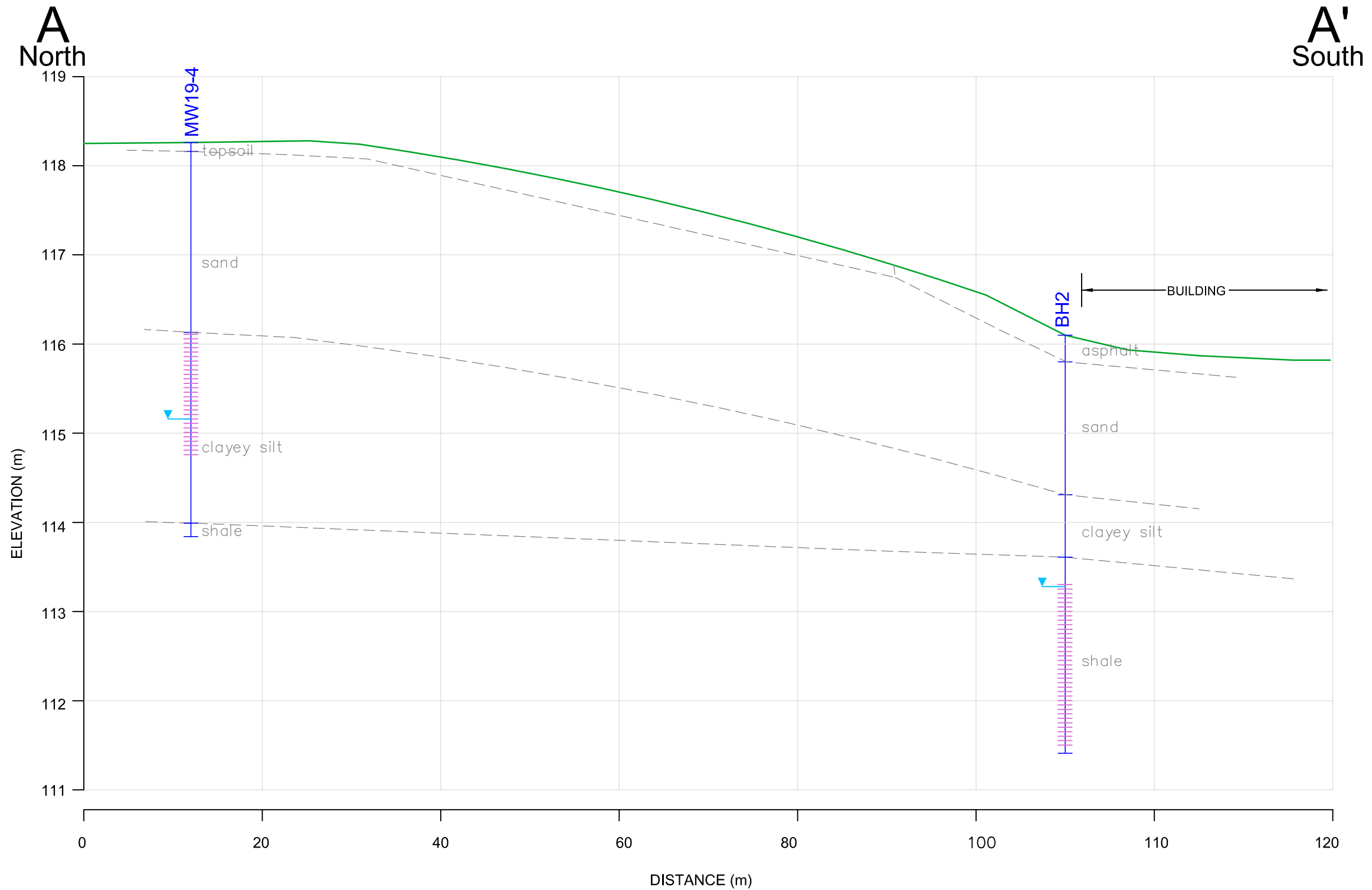
PROJECT: PHASE TWO ENVIRONMENTAL SITE ASSESSMENT
3085 & 3105 HURONTARIO STREET
MISSISSAUGA, ONTARIO

TITLE: SITE PLAN AND GROUND WATER CONTOUR DRAWING

CLIENT: EQUITY THREE HOLDINGS INC.

SCALE: 1:1,500

DRAWN BY: TP	CHECKED BY: BW
PROJECT NO: 191-02120-01 100	
DATE: SEPTEMBER 2019	
FIGURE NO: 3	



NOTE:
THE ACTUAL SOIL
STRATIFICATION HAS BEEN
VERIFIED FROM DATA
OBTAINED AT THE BOREHOLE
AND WATER WELL LOCATIONS
ONLY. THE INFERRED
CONTACTS SHOWN ARE BASED
ON GEOLOGICAL EVIDENCE
AND THESE MAY VARY FROM
THOSE SHOWN BETWEEN
BORINGS.



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LEGEND

- BH2 HOLE DESIGNATION
- APPROXIMATE GROUND SURFACE
- CHANGE IN STRATIGRAPHY
- GROUND WATER ELEVATION (AUG. 9, 2019)
- WELL SCREEN
- END OF BORING

CLIENT:

EQUITY THREE HOLDINGS INC.

CLIENT REF. #:

PROJECT:

PHASE TWO ENVIRONMENTAL SITE ASSESSMENT
3085 & 3105 HURONTARIO STREET
MISSISSAUGA, ONTARIO

PROJECT NO:

191-02120-01 100

DESIGNED BY:

LL

DRAWN BY:

TP

CHECKED BY:

BW

FIGURE NO:

4

DATE:

SEPT. 2019

SCALE:

AS SHOWN

TITLE:

CROSS SECTION A -A'

DISCIPLINE:

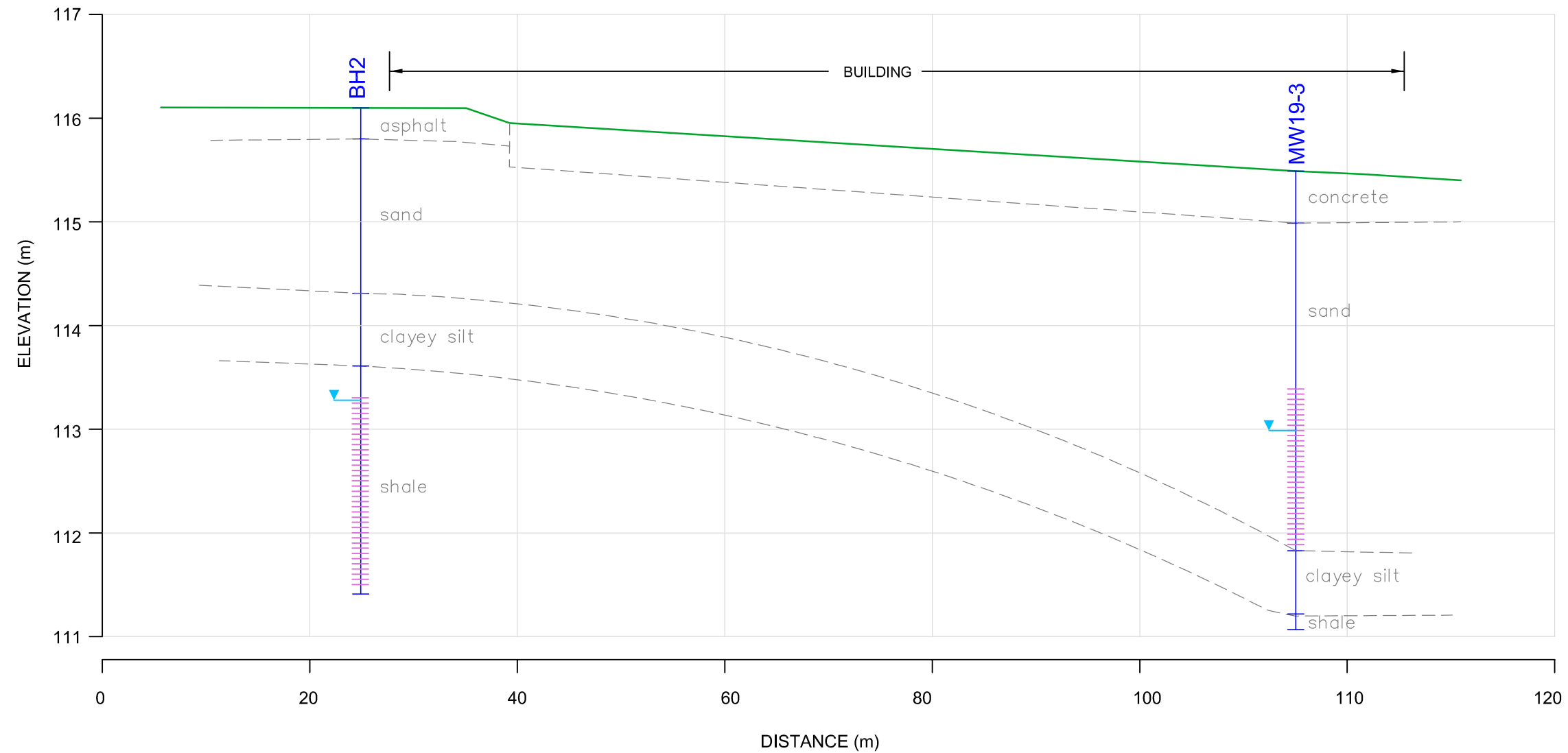
ENVIRONMENT

ISSUE:

DATE OF:--

B
West

B'
East



NOTE:
THE ACTUAL SOIL
STRATIFICATION HAS BEEN
VERIFIED FROM DATA
OBTAINED AT THE BOREHOLE
AND WATER WELL LOCATIONS
ONLY. THE INFERRED
CONTACTS SHOWN ARE BASED
ON GEOLOGICAL EVIDENCE
AND THESE MAY VARY FROM
THOSE SHOWN BETWEEN
BORINGS.



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LEGEND

- BH2 HOLE DESIGNATION
- APPROXIMATE GROUND SURFACE
- CHANGE IN STRATIGRAPHY
- GROUND WATER ELEVATION (AUG. 9, 2019)
- WELL SCREEN
- END OF BORING

CLIENT:

EQUITY THREE HOLDINGS INC.

CLIENT REF. #:

PROJECT:

PHASE TWO ENVIRONMENTAL SITE ASSESSMENT
3085 & 3105 HURONTARIO STREET
MISSISSAUGA, ONTARIO

PROJECT NO:

191-02120-01 100

DESIGNED BY:

LL

DRAWN BY:

TP

CHECKED BY:

BW

FIGURE NO:

5

DATE:

SEPT. 2019

SCALE:

AS SHOWN

TITLE:

CROSS SECTION B -B'

DISCIPLINE:

ENVIRONMENT

ISSUE:

DATE OF:--

TABLES



Table 1: Monitoring Well Installation
Phase Two Environmental Site Assessment
3085 & 3105 Hurontario Street, Mississauga, ON

Monitoring Well ID	BH/MW19-3	BH/MW19-4	BH2
Installed By	WSP	WSP	SOIL MAT
Installation Date	03/07/2019	03/07/2019	08/04/2019
Well Status	Active	Active	Active
Easting	NA	611465	611503
Northing	NA	4826526	4826436
Well Inner Diameter (mm)	32	32	50
Top of Pipe Elevation (m)	115.44	118.18	116.01
Ground Surface Elevation (m)	115.51	118.26	116.10
Bottom of Concrete Seal/Top of Bentonite Seal (mBGS)	0.50	0.50	0.50
Bottom of Concrete Seal/Top of Bentonite Seal (mASL)	115.01	117.76	115.60
Bottom of Bentonite Seal/Top of Sand Pack (mBGS)	1.53	1.53	2.15
Bottom of Bentonite Seal/Top of Sand Pack (mASL)	113.98	116.73	113.95
Top of Well Screen (mBGS)	2.13	2.13	2.75
Top of Well Screen (mASL)	113.38	116.13	113.35
Screen Length (m)	1.5	1.5	1.5
Bottom of Screen (mBGS)	3.57	3.57	4.54
Bottom of Screen (mASL)	111.94	114.69	111.56

Notes:

1. All elevations are given in metres above sea level (mASL).
2. UTM coordinates and elevations were surveyed on July 22, 2019 by WSP. GPS coordinates could not be taken for MW19-3, due to interference of the parking structure.
3. Well construction details for BH2 were provided in Soil Mat's 2019 Report.

Table 2: Groundwater Elevations
Phase Two Environmental Site Assessment
3085 & 3105 Hurontario Street, Mississauga, ON

Page 1 of 1

Monitoring Well ID	BH/MW19-3	BH/MW19-4	BH2
Date			
03/07/2019	113.06	DRY	113.04
08/07/2019	113.06	DRY	112.68
16/07/2019	NM	114.81	NM
09/08/2019	113.00	115.13	113.28

Notes:

1. NM = Not Measured
2. All elevations are given in metres above sea level (mASL)

Table 3: Soil Data
Phase Two Environmental Site Assessment
3085 & 3105 Hurontario Street, Mississauga, ON

Parameter ⁽¹⁾	SCS	Sample ID BH19-4 S4A QAQC BH19-3 S1A BH19-4 S3A					
		Sample Medium		Soil	Soil	Soil	Soil
	Table 2	Sample Date		03/07/2019	03/07/2019	03/07/2019	03/07/2019
	Soil (µg/g)	Sample Depth (mBGS)		3.1 - 3.3	3.1 - 3.3	0.1 - 0.6	1.8 - 2.4
	Full	Sampled by		WSP	WSP	WSP	WSP
	Coarse	Laboratory Report #		19T488924	19T488924	19T488924	19T488924
	Residential/ Parkland/ Institutional Property Use	Laboratory Sample ID		331015	331016	331010	331014
		UNITS	RDL				
PETROLEUM HYDROCARBONS (PHCs)							
Petroleum Hydrocarbons F1	55	ug/g dry	5	8	<5	-	-
Petroleum Hydrocarbons F2	98	ug/g dry	10	<10	<10	-	-
Petroleum Hydrocarbons F3	300	ug/g dry	50	<50	<50	-	-
Petroleum Hydrocarbons F4	2800	ug/g dry	50	<50	<50	-	-
VOLATILE ORGANIC COMPOUNDS (VOCs)							
Acetone	16	ug/g dry	0.5	<0.50	<0.50	-	-
Benzene	0.21	ug/g dry	0.02	<0.02	<0.02	-	-
Bromodichloromethane	1.5	ug/g dry	0.05	<0.05	<0.05	-	-
Bromoform	0.27	ug/g dry	0.05	<0.05	<0.05	-	-
Bromomethane	0.05	ug/g dry	0.05	<0.05	<0.05	-	-
Carbon Tetrachloride	0.05	ug/g dry	0.05	<0.05	<0.05	-	-
Chlorobenzene	2.4	ug/g dry	0.05	<0.05	<0.05	-	-
Chloroform	0.05	ug/g dry	0.05	<0.04	<0.04	-	-
Dibromochloromethane	2.3	ug/g dry	0.05	<0.05	<0.05	-	-
Dichlorobenzene, 1,2-	1.2	ug/g dry	0.05	<0.05	<0.05	-	-
Dichlorobenzene, 1,3-	4.8	ug/g dry	0.05	<0.05	<0.05	-	-
Dichlorobenzene, 1,4-	0.083	ug/g dry	0.05	<0.05	<0.05	-	-
Dichlorodifluoromethane	16	ug/g dry	0.05	<0.05	<0.05	-	-
Dichloroethane, 1,1-	0.47	ug/g dry	0.05	<0.02	<0.02	-	-
Dichloroethane, 1,2-	0.05	ug/g dry	0.05	<0.03	<0.03	-	-
Dichloroethylene, 1,1-	0.05	ug/g dry	0.05	<0.05	<0.05	-	-
Dichloroethylene, 1,2-cis-	1.9	ug/g dry	0.05	<0.02	<0.02	-	-
Dichloroethylene, 1,2-trans-	0.084	ug/g dry	0.05	<0.05	<0.05	-	-
Dichloropropane, 1,2-	0.05	ug/g dry	0.05	<0.03	<0.03	-	-
Dichloropropene, 1,3-	0.083	ug/g dry	0.05	<0.04	<0.04	-	-
Ethylbenzene	1.1	ug/g dry	0.05	<0.05	<0.05	-	-
Ethylene Dibromide	0.05	ug/g dry	0.05	<0.04	<0.04	-	-
Hexane (n)	2.8	ug/g dry	0.05	<0.05	<0.05	-	-
Methyl Ethyl Ketone	16	ug/g dry	0.5	<0.50	<0.50	-	-
Methyl Isobutyl Ketone	1.7	ug/g dry	0.5	<0.50	<0.50	-	-
Methyl tert-Butyl Ether MTBE)	0.75	ug/g dry	0.05	<0.05	<0.05	-	-
Methylene Chloride	0.1	ug/g dry	0.05	<0.05	<0.05	-	-
Styrene	0.7	ug/g dry	0.05	<0.05	<0.05	-	-
Tetrachloroethane, 1,1,1,2-	0.058	ug/g dry	0.05	<0.04	<0.04	-	-
Tetrachloroethane, 1,1,2,2-	0.05	ug/g dry	0.05	<0.05	<0.05	-	-
Tetrachloroethylene	0.28	ug/g dry	0.05	<0.05	<0.05	-	-
Toluene	2.3	ug/g dry	0.05	<0.05	<0.05	-	-
Trichloroethane, 1,1,1-	0.38	ug/g dry	0.05	<0.05	<0.05	-	-
Trichloroethane, 1,1,2-	0.05	ug/g dry	0.05	<0.04	<0.04	-	-
Trichloroethylene	0.061	ug/g dry	0.05	<0.03	<0.03	-	-
Trichlorofluoromethane	4	ug/g dry	0.05	<0.05	<0.05	-	-
Vinyl Chloride	0.02	ug/g dry	0.02	<0.02	<0.02	-	-
Xylene Mixture	3.1	ug/g dry	0.05	<0.05	<0.05	-	-
pH							
pH (unitless)	5.0-9.0 or 5.0-11.0 ⁽⁴⁾	pH Units		-	-	7.47	7.44

Notes:

1. All concentrations in µg/g, unless indicated otherwise.
2. Table 3 SCS = Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act (April 15, 2011) Table 3: Full Depth Generic Site Condition Standards for Use in a Non-Potable Groundwater Condition, Residential/Institutional/Parkland Property Use. Coarse soil texture standards.
3. Blind field duplicate samples pass QA/QC check if RPD<20 or, where parameter concentration<5MDL, the difference is less than MDL.
4. The acceptable pH range in order to apply the MECF Table 3 SCS is 5.0 to 9.0 for surface soils (0-1.5 mbgs) and 5.0 to 11.0 for subsurface soil (below 1.5 mbgs)
5. Yellow highlighting indicates that parameter concentration exceeds the Table 3 SCS.

Table 4: Groundwater Data
Phase Two Environmental Site Assessment
3085 & 3105 Hurontario Street, Mississauga, ON

Parameter ⁽¹⁾	SCS	<div> <div>Sample ID</div> <div>BH2</div> <div>MW19-3</div> <div>MW19-4</div> <div>MW19-4</div> <div>DUP1 (Duplicate of BH2)</div> <div>DUP2 (Duplicate of BH19-3)</div> <div>DUP3 (Duplicate of BH19-4)</div> <div>Trip Blank</div> </div>									
		<div> <div>Sample Medium</div> <div>GW</div> <div>GW</div> <div>GW</div> <div>GW</div> <div>GW</div> <div>GW</div> <div>GW</div> <div>GW</div> <div>GW</div> </div>									
	Table 2	<div> <div>Sample Date</div> <div>08/07/2019</div> <div>16/07/2019</div> <div>16/07/2019</div> <div>09/08/2019</div> <div>08/07/2019</div> <div>16/07/2019</div> <div>16/07/2019</div> <div>08/07/2019</div> </div>									
	GW (µg/L)	Screen Interval (mBGS)									
	Full	<div> <div>Sampled by</div> <div>WSP</div> <div>WSP</div> <div>WSP</div> <div>WSP</div> <div>WSP</div> <div>WSP</div> <div>WSP</div> <div>WSP</div> </div>									
	Medium/Fine	<div> <div>Laboratory Report #</div> <div>19T489576</div> <div>19T493233</div> <div>19T493233</div> <div>19T503378</div> <div>19T489576</div> <div>19T493233</div> <div>19T493233</div> <div>19T489576</div> </div>									
	All Types of Property Use	<div> <div>Laboratory Sample ID</div> <div>331832</div> <div>355324</div> <div>355339</div> <div>424884</div> <div>331833</div> <div>355338</div> <div>355341</div> <div>331834</div> </div>									
		UNITS	RDL								
PETROLEUM HYDROCARBONS (PHCs)											
Petroleum Hydrocarbons F1	750	ug/L	25	<25	<25	-	<25	<25	<25	-	-
Petroleum Hydrocarbons F2	150	ug/L	100	<100	<100	-	<100	<100	<100	-	-
Petroleum Hydrocarbons F3	500	ug/L	100	<100	<100	-	190	<100	<100	-	-
Petroleum Hydrocarbons F4	500	ug/L	100	<100	<100	-	<100	<100	<100	-	-
VOLATILE ORGANIC COMPOUNDS (VOCs)											
Acetone	2700	ug/L	5	<1.0	-	<4.0	-	<1.0	-	<4.0	<1.0
Benzene	5	ug/L	0.5	<0.20	<0.20	<0.80	<0.20	<0.20	<0.20	<0.80	<0.20
Bromodichloromethane	16	ug/L	0.5	<0.20	-	<0.80	-	<0.20	-	<0.80	<0.20
Bromoform	25	ug/L	0.5	<0.10	-	<0.40	-	<0.10	-	<0.40	<0.10
Bromomethane	0.89	ug/L	0.5	<0.20	-	<0.80	-	<0.20	-	<0.80	<0.20
Carbon Tetrachloride	0.79	ug/L	0.2	<0.20	-	<0.79	-	<0.20	-	<0.79	<0.20
Chlorobenzene	30	ug/L	0.5	<0.10	-	<0.40	-	<0.10	-	<0.40	<0.10
Chloroform	2.4	ug/L	0.5	<0.20	-	<0.80	-	<0.20	-	<0.80	<0.20
Dibromochloromethane	25	ug/L	0.5	<0.10	-	<0.40	-	<0.10	-	<0.40	<0.10
Dichlorobenzene, 1,2-	3	ug/L	0.5	<0.10	-	<0.40	-	<0.10	-	<0.40	<0.10
Dichlorobenzene, 1,3-	59	ug/L	0.5	<0.10	-	<0.40	-	<0.10	-	<0.40	<0.10
Dichlorobenzene, 1,4-	1	ug/L	0.5	<0.10	-	<0.40	-	<0.10	-	<0.40	<0.10
Dichlorodifluoromethane	590	ug/L	1	<0.20	-	<0.80	-	<0.20	-	<0.80	<0.20
Dichloroethane, 1,1-	5	ug/L	0.5	<0.30	-	<1.20	-	<0.30	-	<1.20	<0.30
Dichloroethane, 1,2-	1.6	ug/L	0.5	<0.20	-	<0.80	-	<0.20	-	<0.80	<0.20
Dichloroethylene, 1,1-	1.6	ug/L	0.5	<0.30	-	<1.20	-	<0.30	-	<1.20	<0.30
Dichloroethylene, 1,2-cis-	1.6	ug/L	0.5	<0.20	-	<0.80	-	<0.20	-	<0.80	<0.20
Dichloroethylene, 1,2-trans-	1.6	ug/L	0.5	<0.20	-	<0.80	-	<0.20	-	<0.80	<0.20
Dichloropropane, 1,2-	5	ug/L	0.5	<0.20	-	<0.80	-	<0.20	-	<0.80	<0.20
Dichloropropene, 1,3-	0.5	ug/L	0.5	<0.30	-	<0.50	-	<0.30	-	<0.50	<0.30
Ethylbenzene	2.4	ug/L	0.5	<0.10	<0.10	<0.40	<0.10	<0.10	<0.10	<0.40	<0.10
Ethylene Dibromide	0.2	ug/L	0.2	<0.10	-	<0.20	-	<0.10	-	<0.20	<0.10
Hexane (n)	51	ug/L	1	<0.20	-	<0.80	-	<0.20	-	<0.80	<0.20
Methyl Ethyl Ketone	1800	ug/L	5	<1.0	-	<4.0	-	<1.0	-	<4.0	<1.0
Methyl Isobutyl Ketone	640	ug/L	5	<1.0	-	<4.0	-	<1.0	-	<4.0	<1.0
Methyl tert-Butyl Ether MTBE)	15	ug/L	2	<0.20	-	<0.80	-	<0.20	-	<0.80	<0.20
Methylene Chloride	50	ug/L	5	<0.30	-	<1.20	-	<0.30	-	<1.20	<0.30
Styrene	5.4	ug/L	0.5	<0.10	-	<0.40	-	<0.10	-	<0.40	<0.10
Tetrachloroethane, 1,1,1,2-	1.1	ug/L	0.5	<0.10	-	<0.40	-	<0.10	-	<0.40	<0.10
Tetrachloroethane, 1,1,2,2-	1	ug/L	0.5	<0.10	-	<0.40	-	<0.10	-	<0.40	<0.10
Tetrachloroethylene	1.6	ug/L	0.5	<0.20	-	<0.80	-	<0.20	-	<0.80	<0.20
Toluene	24	ug/L	0.5	<0.20	<0.20	<0.80	<0.20	<0.20	<0.20	<0.80	<0.20
Trichloroethane, 1,1,1-	200	ug/L	0.5	<0.30	-	<1.20	-	<0.30	-	<1.20	<0.30
Trichloroethane, 1,1,2-	4.7	ug/L	0.5	<0.20	-	<0.80	-	<0.20	-	<0.80	<0.20
Trichloroethylene	1.6	ug/L	0.5	<0.20	-	<0.80	-	<0.20	-	<0.80	<0.20
Trichlorofluoromethane	150	ug/L	1	<0.40	-	<1.60	-	<0.40	-	<1.60	<0.40
Vinyl Chloride	0.5	ug/L	0.5	<0.17	-	<0.50	-	<0.17	-	<0.50	<0.17
Xylene Mixture	300	ug/L	0.5	<0.20	<0.20	<0.80	<0.20	<0.20	<0.20	<0.80	<0.20

Notes:

1. All concentrations in µg/L, unless indicated otherwise.
2. Table 3 SCS = Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act (April 15, 2011) Table 3: Full Depth Generic Site Condition Standards for Use in a Non-Potable Groundwater Condition, All Types of Property Use. Coarse soil texture standards.
3. Blind field duplicate samples pass QA/QC check if RPD<20 or, where parameter concentration<5MDL, the difference is less than MDL.
4. Yellow highlighting indicates that parameter concentration exceeds the Table 3 SCS.

APPENDIX

A

SAMPLING AND ANALYSIS PLAN

APPENDIX A SAMPLING AND ANALYSIS PLAN

WSP was retained by Equity Three Holdings Inc. to conduct a Phase One and Two Environmental Site Assessment (ESA) for the land municipally identified as 3085 Hurontario Street, Mississauga, Ontario (Site).

The purpose of the Phase One ESA was to assess the Phase One Property and the Phase One Study Area for potentially contaminating activities (PCAs) in order to identify areas of potential environmental concern (APECs). The draft Phase One ESA report prepared in August 2019 (WSP, 2019). From the information obtained as part of the Phase One ESA, APECs were found to exist on the Site.

The Phase One ESA findings were used to support the development of the proposed Phase Two ESA program to assess the current subsurface environmental conditions and assist in the development of a recommended remedial or risk management strategy that may be considered for redevelopment of the Site.

A proposal for Phase Two ESA and filing of RSC was submitted to the client on June 19, 2019. The proposal outlines the following sampling and analysis plan.

PROPOSED SAMPLING AND ANALYSIS PLAN

We anticipate that the subsurface soil and ground water investigation will include the tasks listed below.

- Public and private underground utilities and services will be cleared prior to commencement of intrusive investigation activities.
- Two boreholes will be advanced on the Site to a maximum depth of 5 mBGS using a track-mounted drill rig equipped with a direct push soil sampling system. The soil profile from each borehole will be logged in the field and samples will be screened for total combustible vapours / total organic vapours with a gas detector / photo- ionization detector. The location of the boreholes will be selected to investigate any areas of potential environmental concern identified during the Phase One ESA as well as to delineate the horizontal and vertical extents of relevant parameters of concern.
- Ground water monitoring wells will be installed in two (2) of the boreholes to assess ground water quality below the Site and determine the direction of ground water flow.
- Given that the APECs identified at the Site are due to off-Site PCAs, the media of concern is groundwater. As such, it was not proposed to submit soil samples. Soil samples will be collected continuously for classification, field screening and visual/olfactory observations. Should elevated vapour readings be measured or should any visual/olfactory signs of possible contamination, worst-case/representative soil samples from the boreholes will be submitted for laboratory testing of relevant parameters of concern.
- The ground water levels in the wells will be measured at least 24 hours after well development has been completed, to determine the ground water table elevation. The wells will be surveyed to a geodetic benchmark to determine ground water flow direction.
- The ground water wells will be purged to remove stagnant water and sampled for laboratory testing of relevant parameters of concern.

Ground water samples will be collected and submitted to an accredited laboratory for analysis. Anticipated contaminants of concern to be tested include VOCs and PHC fractions F1-F4.

We will provide an estimate of the horizontal and vertical extent of any contamination present on-site and an estimate of the volume of impacted soil.

It is noted that if the Phase Two ESA reveals parameter concentrations greater than the applicable standards set out in *Ontario Regulation 153/04*, then additional work (i.e., supplemental delineation, additional drilling, sampling, analysis, and/or site remediation activities) will be required prior to RSC filing. The costs for any additional work, if necessary, are beyond the current scope of work.

FINALIZED SAMPLING & ANALYSIS PLAN

The finalized sampling and analysis plan (SAP) was created based on the APECs identified in the Phase One ESA. The SAP was compiled to collect data to provide information on soil and/or ground water quality in each APEC.

Additional delineation may be required following the implementation of this SAP to meet the requirements of O. Reg. 153/04 which requires delineation of all areas where concentrations are above the applicable SCS such as in the following conditions:

- Unexpected contamination not previously discovered, or not related to identified APECs, will need to be further delineated to identify source(s); and
- Requirement for a minimum of three monitoring wells per stratigraphic unit would have to extend to underlying units if there is evidence of contamination extending into it; the SAP assumes contamination is limited to the upper stratigraphic unit (confirmed with clean sample) then the underlying units do not necessarily have to be characterized. The SAP has been developed using the available data, and may require additional delineation if sampling results come out suggesting impacts are deeper than initially expected.

Attachments:

Table 1	Areas of Potential Environmental Concern
Table 2	Sampling and Analysis Plan

TABLE 1 - SAP
AREAS OF POTENTIAL ENVIRONMENTAL CONCERN
(Refer to clause 16(2)(a), Schedule D, O. Reg. 153/04)

Area of Potential Environmental Concern	Location of Area of Potential Environmental Concern on Phase One Property	Potentially Contaminating Activity		Location of PCA (on-site or off-site)	Contaminants of Potential Concern	Media Potentially Impacted (Ground water, soil and/or sediment)
1	Under the northwest portion of the Site	37	Operation of Dry Cleaning Equipment (where chemicals are used)	Off-Site	VOCs	GW
2	Under the northwest portion of the Site	10	Commercial Autobody Shops	Off-Site	VOCs PHCs BTEX	GW
3	Under the northwest portion of the Site	10	Commercial Autobody Shops	Off-Site	VOCs PHCs BTEX	GW
4	Under the northwest portion of the Site	NA - A	Spills. Related to multiple water, coolant, hydraulic oil, gasoline and diesel spills that occurred at 3210 Hurontario Street (250 m west of the Site)	Off-Site	VOCs PHCs BTEX	GW

Notes:

- 1 - Area of Potential Environmental Concern means the area on, in or under a phase one property where one or more contaminants are potentially present, as determined through the phase one environmental site assessment, including through,
 - (a) identification of past or present uses on, in or under the phase one property, and
 - (b) identification of potentially contaminating activity.
- 2 - Potentially Contaminating Activity means a use or activity set out in Column A of Table 2 of Schedule D that is occurring or has occurred in a phase one study area
- 3 - When completing this column, identify all contaminants of potential concern using the Method Groups as identified in the Protocol for in the Assessment of Properties under Part XV.1 of the Environmental Protection Act, March 9, 2004, amended as of July 1, 2011, as specified below:
 ABNs, PCBs, Metals, Electrical Conductivity, SAR, CPs, PAHs, As, Sb, Se, Cr (VI),
 1,4-Dioxane, THMs, Na, Hg, Dioxins/Furans, PCDDs/PCDFs VOCs, B-HWS, Methyl Mercury,
 OCs, BTEX, Cl-, high pH, PHCs, Ca, Mg, CN-, low pH
- 4 - when submitting a record of site condition for filing, a copy of this table must be attached

BTEX – Benzene, Toluene, Ethylbenzene, and Xylenes

GW – Groundwater

PAHs – Polycyclic Aromatic Hydrocarbons

PHCs – Petroleum Hydrocarbons

VOCs – Volatile Organic Compounds

Issue 1	Location ID	Media	Number of Locations	Depth of BH (m)	1,4-Dioxane	ABNs	As	B-HWS	BTEX	Anion Scan (Br-, Cl-)	Cation Scan (Ca, Mg)	Ca	Cl-	CN- (free)	CN- (total)	CPs	Cr (VI)	Dioxins/Furans	EC	Hg	Metals	Methyl Mercury	Mg	Na	OCs/PCBs	PAHs	PCDDs/PCDFs	pH	PHCs	SAR	Sb	Se	THMs	VOCs	Purpose and Justification	Sampling Instructions
APEC 1 - (Former Historical Dry Cleaner). According to ERIS, the property at 25 John Street, located approximately 140 m northwest of the Site, was occupied by Rathburn Cleaners and was listed as a generator of halogenated solvents between 1992 and 2001.	MW19-4 and BH2	GW	2	5																													1	Characterize groundwater along the western property limits.	Screen at water table.	
APEC 2 - (Former auto shop). According to the City Directory search, the property at 3168 Hurontario Street was occupied by various auto body shops between 1989 and 2000.	MW19-4 and BH2	GW	2	5					1																			1						1	Characterize groundwater along the western property limits.	Screen at water table.
APEC 3 - (Former auto shop). According to the City Directory search, the property at 3184 Hurontario Street was occupied by Cam Auto Service in 1966.	MW19-4 and BH2	GW	2	5					1																			1						1	Characterize groundwater along the western property limits.	Screen at water table.
APEC 4 - (Historical spills). According to ERIS, multiple water, coolant, hydraulic oil, gasoline and diesel spills occurred at 3210 Hurontario Street (250 m west of the Site), reported by Cooksville Go Station, WSP Canada Inc and Ellis-Done Corporation between 2017 and 2018.	MW19-4 and BH2	GW	2	5					1																			1						1	Characterize groundwater along the western property limits.	Screen at water table.

APPENDIX

B

QA/QC PROGRAM

APPENDIX B QA/QC PROGRAM

Proper field protocols for sample collection and handling will be followed by all WSP personnel to ensure that sample integrity is maintained. All field equipment will be decontaminated before and between sample collection and clean nitrile gloves will be used for each sample to eliminate the potential for cross-contamination of samples. All soil and ground water samples will be collected directly into laboratory-supplied containers, preserved as required, and stored and shipped in ice-filled coolers. Proper chain of custody procedures are to be followed by WSP and the laboratory during sample transfer.

To determine and maintain analytical laboratory precision, WSP will collect quality assurance/quality control (QA/QC), blind duplicate samples in the field at a frequency of one (1) duplicate sample for every ten (10) field samples submitted. The laboratory is not notified that this is a duplicate (that is, a blind duplicate is provided).

Trip blanks will additionally be submitted for ground water VOC analysis.

DATA QUALITY OBJECTIVES

WSP will receive soil and ground water certificates of analysis from the laboratory electronically to reduce the possibility of transcription errors. Analyses will be compiled into a database. The automation of data transfers from laboratory instruments to laboratory information management systems will also reduce the possibility of transcription errors. The results reported by the laboratory will be quality-checked, reviewed and validated internally by a project chemist. The data review and validation will include the following:

- Verification that samples were analyzed for the methods requested
- Verification that the appropriate methods were performed as outlined in Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act, as amended (MOE, 2011c)
- Review of the data for outliers and anomalies
- Review of the laboratory case narrative for events in the laboratory that might have affected the accuracy or precision of the data.

Field duplicate samples will be assessed as part of the QA/QC program during the Phase Two ESA through a comparison of the analytical results of the original samples to the field duplicate samples. Field duplicates measure the cumulative effects of both field and laboratory precision and hence provide an indication of overall precision. Therefore, field duplicates may have greater variability than laboratory duplicates which measure only laboratory precision. It is also expected that non-aqueous matrices will have a greater variance than aqueous matrices due to the heterogeneity of most non-aqueous samples (such as soil/sediment samples). Field duplicates will be evaluated based on the relative percent difference (RPD) in parameter concentrations:

- Aqueous field sample duplicate analyses have control limits of ± 20 RPD (or \pm RDL for sample results less than 5 times the RDL).
- Solid (non-aqueous) field sample duplicate analyses have control limits of ± 35 RPD (or ± 2 times the RDL for sample results less than 5 times the RDL).
- Examine the raw data and recalculate and document in worksheets all of the Field Duplicate RPDs using the equation below:

$$RPD = \frac{|S - D|}{(S + D)/2} * 100$$

- S=Field sample result. D=Field duplicate result.

A trip blank (distilled water sample), prepared by the laboratory, will travel along with the ground water/surface water VOC samples and will be analyzed by the laboratory for VOCs. Positive results in the trip blank could indicate contamination from the sample containers, preservatives, transportation, or storage conditions. The results also indicate if the laboratory instrument was detecting false interference.

WSP contracts accredited laboratories which undertake thorough internal QA/QC measures including process recoveries, blanks, and replicate samples. With respect to subsection 47(3) of O. Reg. 153/04, all certificates of analysis of analytical reports received pursuant to clause 47(2)(b) of the regulation will comply with subsection 47(3), being that the certificate of analysis of analytical report for each sample submitted for analysis, and all certificates of analysis or analytical reports will be included in full in an appendix to the Phase Two Environmental Site Assessment report.

The project manager will review the entire data package and the data review results and use professional judgment to identify any inconsistencies, anomalies, additive effects of technical problems, impacts on data quality, or other concerns which should be brought to the attention of the data user. They will determine whether there is any need to qualify data that were not qualified based on the criteria previously assessed.

APPENDIX

C

STANDARD OPERATING PROCEDURES

1 GENERAL

1.1 UTILITY CLEARANCES

Subject:	Utility Clearances	Procedure No. FS 1.8	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

1.1.1 Procedure

- 1.1 Project Managers and technical employees shall complete the required requests for locates in order to co-ordinate utility clearances with the appropriate locate services. Utility clearances must be completed well in advance of the commencement of any project that involves subsurface work.

1.1.2 Purpose

- 2.1 To ensure that the appropriate service locates are conducted in order to reduce the potential of damage to services at a project work site and for worker safety.

1.1.3 Scope

- 3.1 This procedure applies to Project Managers and technical employees involved in any project that involves subsurface work.

1.1.4 Responsibility

- 4.1 It is the responsibility of Project Managers and technical employees to follow the Utility Clearance procedures.
- 4.2 It is the responsibility of technical field staff to ensure that utility clearances are completed prior to subsurface investigations.
- 4.3 This procedure shall be updated as required by the Field Services Committee.

1.1.5 Definitions

- 5.1 Utility represents the following: Telephone, Gas, Fibre Optic Lines, Pipeline (Trans Canada, Enbridge), Cable TV, municipal water and sewer, Hydro and any other services.

1.1.6 References and Related Procedures

- 6.1 None

1.1.7 Methodology

- 7.1 When the project start date is confirmed, a list of utility considerations will be tallied by the Project Manager and/or technical employees as part of the Health and Safety Plan.
- 7.2 The appropriate locator request forms will be promptly obtained from the project coordinator and completed.
- 7.3 Completed forms will be forwarded to the appropriate locate service for completion.
- 7.4 Confirm the time and date that the locate(s) will be conducted, and co-ordinate to be at the project site during the locating process where possible. Utilities shall be marked in the field in consideration of ground cover.
- 7.5 You must have a signed form from the locate service confirming utility locate completion.
- 7.6 Keep all confirmed forms with the project file. A copy of utility clearance forms shall be included in the project field book.

1.1.8 Attachments

- 8.1 Request for Locates Form
- 8.2 Ontario One Call – Locate Request Form
- 8.3 Ontario One Call – Multiple Locate Request Form

8.4 Rogers Cable – Locate Request FAX Form

2 SURVEYING

2.1 LASER AND AUTO LEVEL SURVEYING

Subject:	Laser and Auto Level Surveying	Procedure No. FS 2.1	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

2.1.1 Procedure

- 1.1 Technical employees shall use either the laser or auto level and perform surveying as projects require by following this standardized methodology.

2.1.2 Purpose

- 2.1 To determine changes in the grade or elevation at a site. Leveling can also be used to obtain the elevation of objects such as monitoring wells.

2.1.3 Scope

- 3.1 This procedure applies to technical employees that perform level surveying.

2.1.4 Responsibility

- 4.1 It is the responsibility of technical employees to ensure that level surveying is performed accurately and that equipment is signed out when in use and signed in when the job is completed. The laser and auto level are expensive to repair or replace, so employees must take extra care to ensure that the equipment is not damaged during transport or use.
- 4.2 This procedure shall be updated as required by the Field Services Committee.

2.1.5 Definitions

- 5.1 Bench Mark (BM) – A permanent point of known elevation. BM elevations and locations are published by federal, provincial and municipal agencies.
- 5.2 Temporary Bench Mark (TBM) – A semi permanent point of known or set elevation. If a BM is not available or cannot be located, a TBM can be used by selecting an object that will not move and setting the level at that point. Objects that may be suitable for a TBM are nails hammered into hydro poles or boulders.
- 5.3 Turning Point (TP) – A point of known elevation, which allows the instrument to be moved when readings can no longer be taken at the current instrument location.
- 5.4 Backsight (BS) – A rod reading taken on a point of known elevation in order to establish the elevation of the laser.
- 5.5 Height of instrument (HI) – The elevation of the laser. $(BM \text{ or } TBM \text{ or } TP) + BS = HI$
- 5.6 Foresight (FS) – A rod reading taken on a TP, BM or TBM in order to determine its elevation. $(HI - FS = \text{elevation})$
- 5.7 Intermediate Foresight (IS) – A reading taken at any other point where the elevation is required. $(HI - IS = \text{elevation})$

2.1.6 References and Related Procedures

- 6.1 Kavanagh, B.F., and Bird, S.J. Glen, 1989. *Surveying Principles and Applications, Second Edition*. Prentice-Hall Inc., Englewood Cliffs, New Jersey.

The textbook referenced above is available for use in the library.

2.1.7 Methodology

- 7.1 Determine which level instrument you require. Essentially there are only minor differences between the actual use of an auto level versus the use of a laser level. The laser level requires batteries in the level and rod sensor. The auto level operates independent of power.

- 7.2 Review project objectives and identify the area that requires surveying. Identify permanent benchmarks which can be used or identify an object that can be used as a temporary benchmark.
- 7.3 Obtain either the laser level or the auto level, and related stand and rod from the designated storage location. Ensure that the laser level and rod sensor batteries are working and that there are 3 spare D cell batteries and one spare 9-volt battery in the carrying case.
- 7.4 Ensure that proper personal safety equipment is available and being used.
- 7.5 Set-up the level tri-pod stand ensuring that the legs are extended to a suitable height and that the ends have been placed in the ground to ensure stability. Do not place the tripod stand on rocks or ground surfaces where the stand cannot be properly stabilized.
- 7.6 Secure the level to the tripod stand using the hand screw in the center of the base. Tighten the level in place to ensure that the level will not move during use. Use the black turn screws at the base to level the instrument. The instrument is level when the bubble on the level indicator is in the center of the circle located on the front of the instrument.
- 7.7 Use the survey rod and if using the laser level, the rod level sensor to record the required shots and level information. All information will be recorded in a PFB or survey book.
- 7.8 All equipment shall be cleaned, taken apart and put away into its proper location. If the batteries in either the laser level or level sensor were replaced during use, the old batteries must be disposed of properly and fresh batteries put into the case as spares.

2.1.8 Health and Safety Considerations

- 8.1 Laser beams can cause eye injuries if used incorrectly.
- 8.2 Do not look directly into the laser beam.
- 8.3 Set up laser so that the laser beam will be above or below eye level to avoid inadvertently looking into beam.
- 8.4 Warn people on site that a laser is being used and to avoid direct eye contact with the laser beam.
- 8.5 Care should be taken while carrying and setting up the tripod due to the sharp tips on the legs.
- 8.6 Never use when wet due to risk of fire or electric shock from battery.

2.1.9 Attachments

- 9.1 Example of leveling procedure with more than one step.
- 9.2 Example of profile leveling along with survey notes.

3 FIELD TESTING

3.1 ODOUR IDENTIFICATION

Subject:	Odour Identification	Procedure No. FS 3.1	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

3.1.1 Procedure

- 1.1 Technical employees shall use the Odour Identification Procedure for the identification of odours during the completion of field tasks.

3.1.2 Purpose

- 2.1 To provide a consistent and repeatable methodology for the identification of odours. As each employee will react differently to different odours, a systematic procedure of identification is required.

3.1.3 Scope

- 3.1 The requirement to follow the Odour Identification procedure applies to each employee that is responsible for completing field tasks.

3.1.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow the Odour Identification procedure during the completion of field tasks where odours are present.
- 4.2 The Project Manager is responsible for ensuring that technical employees are aware that odour identification is required as part of the assigned field tasks.
- 4.3 This procedure shall be updated as required by the Field Services Committee.

3.1.5 Definitions

- 5.1 Odour - Is a sensation detected by the olfactory glands.
- 5.2 Odourant – The volatile chemical, vapour, mist, or dust that produces the odour.
- 5.3 TLV - Threshold Limit Value.
- 5.4 Detection – A threshold concentration where a chemical odour is noted.
- 5.5 Recognition – A threshold concentration where a chemical can be identified by its odour.

3.1.6 References and Related Procedures

- 6.1 Hazardous Materials Compliance Sheet – Templegate Information Services Inc.
- 6.2 Health and Safety Policy and Procedures

3.1.7 Methodology

- 7.1 Prior to completion of an assigned field task, identify the chemicals of concern. Determine the odour threshold and TLV for each chemical of concern. Obtain the required personal protective equipment.
- 7.2 Where an odour is detected, record the following.
 - Identify the technical employee making the observation.
 - Location on the site.
 - Ambient odour of the site.
 - Date and time.
 - Weather conditions.
 - Probable source of the odour.
- 7.3 Complete the odour identification as outlined in the following steps.
 - Physical Reaction - Watery eyes, sore throat, taste, stuffy nose, etc.
 - Physiological Reaction - Does the odour induce an increased heart rate, breathing rate, etc.
 - Resemblance - Does the odour resemble odours from a known material? Use one of the following more common descriptors.
 - Alcohol
 - Ammonia
 - Diesel
 - Gas
 - Garlic
 - Fishy
 - Hydrogen sulphide (rotten eggs)
 - Manure
 - Mothballs
 - Sewage
 - Solvent
 - Swampy
 - Do not use the following descriptors: organic, leachate.

3.1.8 Health and Safety Considerations

- 8.1 Strong odours can evoke pronounced physiological responses, decrease the heart rate, dilate peripheral blood vessels, and flood the bloodstream with adrenaline. Responses may include watery eyes, stuffy nose, constricted throat and shallow respiration, and death.
- 8.2 An understanding of the chemicals of concern for each task is essential to identify the dangerous threshold limit values (TLV) and odour thresholds.

3.1.9 Attachments

- 9.1 Odour Threshold Values from Hazardous Materials Compliance Sheet

3.2 TEMPERATURE MEASUREMENT

Subject:	Temperature Measurement	Procedure No. FS 3.3	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

3.2.1 Procedure

- 1.1 Technical employees shall measure the temperature of a liquid using the following standardized methodology.

3.2.2 Purpose

- 2.1 To provide a consistent and repeatable methodology for the measurement of the temperature of a liquid.

3.2.3 Scope

- 3.1 The requirement to follow the Temperature Measurement procedure applies to technical employees who are responsible for completing field tasks.

3.2.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow the Temperature Measurement procedure for the measurement of temperature in a liquid.
- 4.2 The Project Manager is responsible for ensuring that technical employees are aware that temperature measurements of liquids are required as part of the assigned field tasks.
- 4.3 This procedure shall be updated as required by the Field Services Committee.

3.2.5 Definitions

- 5.1 None

3.2.6 References and Related Procedures

- 6.1 Equipment Documentation – FS 12.4

3.2.7 Methodology

- 7.1 Ensure that the instrument is functioning properly prior to use.
- 7.2 Equipment shall be calibrated according to the manufacturer's direction before use each day.
Confirmatory calibration shall also be made periodically throughout the day. Record the calibration results on the Equipment Calibration Record form within the dedicated project field book.
- 7.3 If the temperature probe cannot be placed directly into the liquid, extract the liquid from the source and place it into an appropriate container. Of note, a larger container will reduce atmospheric effects. Testing should be completed within one minute of extraction for results most representative of actual conditions.
- 7.4 Immerse the temperature probe into the liquid and allow it to stabilize. Record the stable reading on the appropriate form in the project field book.
- 7.5 Decontaminate the probe with a detergent and distilled water solution followed by a distilled water rinse.

3.2.8 Attachments

8.1 None

3.3 CONDUCTIVITY MEASUREMENT

Subject:	Conductivity Measurement	Procedure No. FS 3.4	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

3.3.1 Procedure

1.1 Technical employees shall measure the conductivity of a liquid using the following standardized methodology.

3.3.2 Purpose

2.1 To provide a consistent and repeatable methodology for the measurement of the conductivity of a liquid.

3.3.3 Scope

3.1 The requirement to follow the Conductivity Measurement procedure applies to technical employees who are responsible for completing field tasks.

3.3.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow the Conductivity Measurement procedure for the measurement of conductivity in a liquid.
- 4.2 The Project Manager is responsible for ensuring that technical employees are aware that conductivity measurements of liquids are required as part of the assigned field tasks.
- 4.3 This procedure shall be updated as required by the Field Services Committee.

3.3.5 Definitions

5.1 Conductivity – may also be referred to as specific conductance or electrical conductivity.

3.3.6 References and Related Procedures

6.1 Equipment Decontamination – FS 12.4

3.3.7 Methodology

- 7.1 Ensure that the instrument is functioning properly prior to use.
- 7.2 Equipment shall be calibrated according to the manufacturer's direction before use each day. For reference, an operations manual is contained within the travel case for the instrument. Confirmatory calibration shall also be made periodically throughout the day. Record the calibration results on the Equipment Calibration Record form within the dedicated project field book.
- 7.3 Conductivity measurements shall be completed before pH measurements.
- 7.4 If the conductivity probe cannot be placed directly into the liquid, extract the liquid from the source and place it into an appropriate container. Of note, a larger container will reduce atmospheric effects. Testing should be completed within one minute of extraction for results most representative of actual conditions.
- 7.5 Immerse the calibrated conductivity probe into the liquid and allow readings to stabilize. Record the stable reading on the appropriate form in the project field book.
- 7.5 Decontaminate the probe with a detergent and distilled water solution followed by a distilled water rinse.

3.3.8 Attachments

8.1 None

3.4 PH MEASUREMENT

Subject:	pH Measurement	Procedure No. FS 3.5	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

3.4.1 Procedure

- 1.1 Technical employees shall measure the pH of a liquid using the following standardized methodology.

3.4.2 Purpose

- 2.1 To provide a consistent and repeatable methodology for the measurement of pH in a liquid.

3.4.3 Scope

- 3.1 The requirement to follow the pH Measurement procedure applies to technical employees who are responsible for completing field tasks.

3.4.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow the pH Measurement procedure for the measurement of temperature in a liquid.
- 4.2 The Project Manager is responsible for ensuring that technical employees are aware that pH measurements of a liquid are required as part of the assigned field tasks.
- 4.3 The procedure shall be updated as required by the Field Services Committee.

3.4.5 Definitions

- 5.1 None

3.4.6 References and Related Procedures

- 6.1 Equipment Decontamination - FS 12.4

3.4.7 Methodology

- 7.1 Ensure that the equipment is functioning properly prior to use.
- 7.2 Equipment shall be calibrated according to the manufacturer's direction before use each day. For reference, an operations manual is contained within the travel case for the instrument. Confirmatory calibration shall also be made periodically throughout the day. Record the calibration results on the Equipment Calibration Record form within the dedicated project field book.
- 7.3 If the pH probe cannot be placed directly into the liquid, extract the liquid from the source and place it into an appropriate container. Of note, a larger container will reduce atmospheric effects. Testing should be completed within one minute of extraction for results most representative of actual conditions.
- 7.4 Immerse the pH probe into the liquid, stir slowly with probe, and allow readings to stabilize. Record the stable reading on the appropriate form in the project field book.
- 7.5 Decontaminate the probe with a detergent and distilled water solution followed by a distilled water rinse.

3.4.8 Attachments

- 8.1 None.

3.5 FIELD SCREENING OF SAMPLES FOR ORGANIC VAPOURS

Subject:	Field Screening of Samples for Organic Vapours	Procedure No. FS 3.7	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

3.5.1 Procedure

- 1.1 Technical employees shall screen samples in the field for organic vapours and combustible gas emissions from boreholes using the following standardized methodology.

3.5.2 Purpose

- 2.1 To detect ionisable vapours and combustible gas emissions from boreholes and test pits while investigating refuse and contaminated soils for health and safety concerns.
- 2.2 To screen soils for the selection of samples for detailed chemical analyses.

3.5.3 Scope

- 3.1 The requirement to follow the Field Screening of Samples for Organic Vapours procedure applies to technical employees who are responsible for completing field tasks.

3.5.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow the Field Screening of Samples for Organic Vapours Procedure to ensure soils are screened for organic vapours and gas emissions for health and safety purposes, as well as a sample selection tool.
- 4.2 The Project Manager is responsible for ensuring that technical employees are aware that soils are to be screened in the field for organic vapours and gas emissions when investigating refuse and contaminated soil.
- 4.3 This procedure shall be updated as required by the Field Services Committee.

3.5.5 Definitions

- 5.1 Drift – Deviations from the standard readings

3.5.6 References and Related Procedures

- 6.1 Sample Storage – FS 5.2

3.5.7 Methodology

- 7.1 Calibrate the required equipment at the start of each day. Complete an Equipment Calibration Record form in the project field book. Calibrations should be carried out according to the manufacturer's specifications.
- 7.2 Vapour readings shall be monitored regularly within the breathing zone, auger cuttings, and auger annulus during borehole advancement.
- 7.3 Record background vapour reading.
- 7.4 Retrieve soil sample from the borehole or test pit.
- 7.5 Samples shall be checked immediately upon opening the soil-sampling device. The entire sample is to be screened for vapours.
- 7.6 Scrape away 2 mm to 4 mm of disturbed soil from the soil sample. Disturb the soil sample using a decontaminated stainless steel spatula. Insert the probe tip of the instrument into every cavity created by the spatula and record the readings.
- 7.7 If the field temperature is below 4°C, place the soil sample in a Ziploc bag and store at room temperature for 10 minutes. Insert the probe tip into a small opening in the Ziploc bag.
- 7.8 Record the highest reading of the instrument.
- 7.9 If recalibration is required due to suspect instrument readings, halt field operations while recalibration is carried out.
- 7.10 Samples selected for laboratory analysis should be based on the highest readings for the sample interval. Samples shall be collected and stored according to sampling protocols.
- 7.11 The instrument shall be checked against the standard gas for drift at the end of each day. The drift of the instrument is to be recorded in the project field book.

3.5.8 Attachments

- 8.1 None.

4 DRILLING

4.1 AUGER/BORING RIGS

Subject:	Auger/Boring Rigs	Procedure No. FS 4.2	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

4.1.1 Procedure

- 1.1 Technical employees shall use the following standardized methodology for drilling with auger/boring drill rigs such as the “Sterling auger”, Caisson rig”, and similar rigs.

4.1.2 Purpose

- 2.1 To provide a standardized methodology for drilling with auger/boring drill rigs.

4.1.3 Scope

- 3.1 The requirement to follow the Auger/Boring Rigs procedure applies to technical employees who are responsible for completing field tasks.

4.1.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow the Auger/Boring Rigs procedure.
- 4.2 The Project Manager is responsible for ensuring that technical employees are aware of augering/boring requirements for assigned project tasks.
- 4.3 This procedure will be updated as required by the Field Services Committee.

4.1.5 Definitions

- 5.1 None

4.1.6 References and Related Procedures

- 6.1 Monitoring Well and Borehole Abandonment – FS 4.3.
- 6.2 Sample Storage – FS 5.2.
- 6.3 Soil Sampling – FS 8.0.
- 6.4 Soil Sample Descriptions – FS 10.1.
- 6.5 Rock Descriptions – FS 10.2.
- 6.6 Sign in of Soil/Rock Samples – FS 10.3.
- 6.7 Monitoring Well Construction – FS 11.1.

4.1.7 Methodology

- 7.1 Review the project requirements and establish the required objectives.
- 7.2 Have the contractor mobilize the drill rig to the site. Ensure requested equipment is present. Inspect the drill for cleanliness and look for any oil leaks. Ensure that the drill was properly cleaned prior to mobilizing onto the client’s property.
- 7.3 Ensure that proper personal safety equipment is available and is used. Subsurface penetration should not be further than the total length of an auger at any given time. Record the auger penetration rate (distance/time).
- 7.5 Confirm borehole depth by pulling out the solid stem auger, and measuring the penetrated depth. For hollow stem augers the depth may be confirmed through the auger stem. Have the driller remove the “A” rod drill string and attached centre plug. Using a tape measure with a weighted end, measure the borehole depth, subtracting any length of the auger above the ground level.
- 7.6 Soil samples shall be collected per procedures in FS 8.0.
- 7.7 Relevant information shall be recorded in the project field book, i.e. borehole depth measurement checks.

- 7.8 Samples shall be stored as outlined in FS 5.2.
- 7.9 For situations where auger/boring rigs are used for roadside investigations, legal sized traffic control signs and certified personnel shall be used.
- 7.10 Boreholes shall be abandoned in conformance with procedure FS 4.3.
- 7.11 Installation of groundwater monitoring wells shall be completed according to procedure FS 11.1.

4.1.8 Health and Safety Considerations

- 8.1 Utility clearance certificates shall be obtained prior to subsurface drilling.
- 8.2 WSIB forms shall be obtained from contractors before any work is started.

4.1.9 Attachments

- 9.1 None.

4.2 HOLLOW STEM AUGER ADVANCEMENT

Subject:	Hollow Stem Auger Advancement	Procedure No. FS 4.4	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

4.2.1 Procedure

- 1.1 Technical employees shall use this standardized methodology for hollow stem auger drilling in order to:
 - (a) obtain representative subsurface soil/rock samples for identification and laboratory testing, and
 - (b) permit the emplacement of monitors and monitoring equipment.

4.2.2 Purpose

- 2.1 To provide a standardized methodology for supervising hollow stem auger advancement.

4.2.3 Scope

- 3.1 The requirement to follow the Hollow Stem Auger Advancement procedure applies to technical employees who are responsible for completing field tasks.

4.2.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow the Hollow Stem Auger Advancement procedure.
- 4.2 The Project Managers are responsible for ensuring that technical employees are aware of hollow stem augering requirements.
- 4.3 This procedure shall be updated as required by the Field Services Committee.

4.2.5 Definitions

- 5.1 None

4.2.6 References and Related Procedures

- 6.1 Equipment Decontamination – FS 12.4.
- 6.2 Monitoring Well and Borehole Abandonment – FS 4.3.
- 6.3 Corporate Guideline – Drilling Program Preparation.

4.2.7 Methodology

- 7.1 Review the project and establish the required objective(s).
- 7.2 Review the master drilling checklist. This ensures that the driller has the appropriate equipment as specified for the specific undertaking. Fax details to the driller where required.
- 7.3 Obtain the appropriate clearance certificates for all the utilities at or near the designated drilling location.
- 7.4 Mobilize the drill rig, which should be clean and in good repair, to the borehole location.

- 7.5 Ensure the proper personal safety equipment is being used by all site personnel. Level D personal safety wear is a minimum requirement.
- 7.6 Check the assembling of the augers and drill rods and the rate at which the augers are advanced. Note any irregularities with the drilling penetration rate as irregularities can indicate changes in the subsurface conditions. Consult with the driller and clarify these irregularities. Ensure that the augering is terminated at the desired depth for either sampling or monitor installation.
- 7.7 At the target depth, note the removal of drill rods and the centre plug from the augers and examine any material lifted to surface. Record a water level within the augers. Note the presence of any odours or gases, i.e. methane.
- 7.8 If a groundwater monitor screen or water well screen is to be installed in fine-grained soil, one of the following two methods should be adopted for reducing borehole smearing as a result of augering.
 - (a) Instruct the driller to advance the augers from the top of the desired screen interval by reducing the auger torque while increasing the downward pressure on the augers until the bottom of the desired screen interval is obtained. Once this depth is achieved, instruct the driller to raise the augers to above the top of the screen interval without rotating the augers. This method will remove a soil "plug" from the borehole and reduce the degree of borehole smearing within the desired screen interval.
 - (b) Instruct the driller to advance the continuous core barrel soil sampler or similar device over the desired screen interval. Remove the sampler and replace the standard sampler tip with an inside beveled tip. Advance the modified sampler through the desired screen interval then slowly raise the sampler to reduce smearing created by the continuous core sampler.
- 7.9 Groundwater monitoring devices will be installed according to the consultant's instructions and in accordance with applicable procedures.
- 7.10 All information will be recorded in a project field book.
- 7.11 After removal of the augers from the borehole, measure and record the depth of the borehole with a clean weighted and calibrated tape.
- 7.12 If boreholes were advanced into contaminated or potentially contaminated soils decontamination of the drilling equipment should be carried out according to decontamination procedures.
- 7.13 Boreholes that will not contain a groundwater-monitoring device will be abandoned following the borehole abandonment procedure.

4.2.8 Attachments

- 8.1 Drilling Guideline Equipment Checklist.

4.3 ROTARY DRILLING

Subject:	Rotary Drilling	Procedure No. FS 4.6	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

4.3.1 Procedure

- 1.1 Technical employees shall follow this standardized procedure for the rotary drilling process.

4.3.2 Purpose

- 2.1 To provide a standardized methodology for rotary drilling.

4.3.3 Scope

- 3.1 The requirement to follow the Rotary Drilling procedure applies to technical employees who are responsible for completing field tasks.

4.3.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow the Rotary Drilling procedure.
- 4.2 The Project Managers are responsible for ensuring that technical employees are aware of rotary drilling requirements.

4.3 This procedure shall be updated as required by the Field Services Committee.

4.3.5 Definitions

5.1 None.

4.3.6 References and Related Procedures

6.1 Monitoring Well Construction – FS 11.1.

6.2 Soil Sampling – FS 8.0.

6.3 Sample Storage – FS 5.2.

6.4 Monitor Development – FS 14.1.

4.3.7 Methodology

7.1 Review the project and establish the required objectives.

7.2 Review the master drilling checklist. This ensures that the driller has the appropriate equipment as specified for the specific undertaking. Fax details to the driller where required.

7.3 Obtain the appropriate clearance certificates for all the utilities at or near the designated drilling location(s).

7.4 Mobilize the drill rig, which should be clean and in good repair, to the borehole location.

7.5 Advance the drill string into the subsurface using a formulated drill fluid. The boring may be advanced intermittently to accommodate the sampling of the subsurface soils.

7.6 Information shall be recorded in a Project Field Book.

7.7 Samples shall be collected and stored as outlined in the applicable procedures.

7.8 Drilling fluid will be composed of a natural bentonite powder or polymerized additive and mixed with potable water. Note the brand or type of commercial bentonite powder. If required, collect a sample of the drilling water from the tank of the delivering water truck.

7.9 Upon obtaining a stratigraphically suitable formation, a domestic water well screen will be installed in accordance with the applicable procedures and appropriate MOE guidelines.

7.10 Groundwater monitoring devices shall be installed in accordance with applicable procedures.

7.11 The drill rig shall develop the constructed well or groundwater monitoring device in accordance with the applicable procedure.

7.12 The drill rig shall be demobilized from the project site in a clean state following decontamination procedures.

4.3.8 Attachments

8.1 None

4.4 PERCUSSION DRILLING

Subject:	Percussion Drilling	Procedure No. FS 4.7	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

4.4.1 Procedure

1.1 Technical employees shall use this standardized methodology for advancing a borehole by the percussion drilling process.

4.4.2 Purpose

2.1 To provide a standardized methodology for percussion drilling.

4.4.3 Scope

- 3.1 The requirement to follow the Percussion Drilling procedure applies to technical employees who are responsible for completing field tasks.

4.4.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow the Percussion Drilling procedure.
- 4.2 The Project Managers are responsible for ensuring that technical employees are aware of percussion drilling requirements.
- 4.3 This procedure shall be updated as required by the Field Services Committee.

4.4.5 Definitions

- 5.1 None.

4.4.6 References and Related Procedures

- 6.1 Rock Description – FS 10.2.
- 6.2 Sample Labelling – FS 5.1.
- 6.3 Sample Storage – 5.2.
- 6.4 Monitoring Well and Borehole Abandonment – FS 4.3.

4.4.7 Methodology

- 7.1 Review the project and establish the required objectives.
- 7.2 Review the master drilling checklist. This ensures that the driller has the appropriate equipment as specified for the specific undertaking. Fax details to the driller where required.
- 7.3 Obtain the appropriate clearance certificates for all the utilities at or near the designated drilling location.
- 7.4 Mobilize the drill rig, which should be clean and in good repair, to the borehole location.
- 7.5 Have the driller advance the drill string, through a steel working casing into the subsurface. The boring may be advanced intermittently to accommodate the sampling of the subsurface soils.
- 7.6 Upon encountering a stratigraphically suitable formation, a domestic water well screen may be installed in accordance with the appropriate MOE guidelines.
- 7.7 Groundwater monitoring devices shall be installed in accordance with applicable procedures.
- 7.8 Information shall be recorded in a Project Field Book.
- 7.9 Samples shall be collected and stored as outlined in the applicable procedures.
- 7.10 When pressurized air is to be used for the removal of drill cuttings, the air path will be such that any residual oil contained in the air is reduced by filtering to an acceptable level. This shall be done by using a series of filters to reduce the oil fraction.
- 7.11 The drill rig will be used to develop the constructed well or monitors in accordance with the applicable procedure.
- 7.12 The drill rig shall be demobilized from the project site in a clean state following decontamination procedures.

4.4.8 Attachments

- 8.1 None

4.5 MONITORING WELL AND BOREHOLE ABANDONMENT

Subject:	Monitoring Well and Borehole Abandonment	Procedure No. FS 4.3	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

4.5.1 Procedure

- 1.1 Technical employees shall use the three standardized methods of abandonment for monitoring wells or boreholes.

4.5.2 Purpose

- 2.1 To provide a standardized methodology for the abandonment of monitoring wells or boreholes.

4.5.3 Scope

- 3.1 The requirement to follow the Monitoring Well and Borehole abandonment procedure applies to technical employees who are responsible for completing field tasks.

4.5.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow the Monitoring Well and Borehole Abandonment procedure.
- 4.2 The Project Manager is responsible for ensuring that technical employees are aware of monitoring well and borehole abandonment requirements for a project.
- 4.3 This procedure will be updated as required by the field services committee.

4.5.5 Definitions

- 5.1 PFB – Project Field Book

4.5.6 References and Related Procedures

- 6.1 Monitoring Well Construction – FS 11.1.
- 6.2 Monitor Purging – FS 14.3.

4.5.7 Methodology***Monitoring Well Remaining in Place***

The monitoring well can remain in place, provided that the monitoring well installation was completed in accordance with procedure FS 11.1.

- 7.1 Remove the locking protective casing from the monitoring well.
- 7.2 Determine if the monitoring well has a fast or slow hydraulic recovery rate. If the recovery rate is fast, then proceed cautiously by slowly dropping the bentonite pellets down (inside) the monitoring well casing. Periodically check the rising level of pellets*. If the monitoring well has a slow hydraulic recovery rate, then purge 75% of the standing liquid volume per FS 14.3. The remaining water within the monitor will hydrate the bentonite.
- 7.3 The level of bentonite pellets should be placed to within 1 m of ground surface.
- 7.4 As required add water to the inside of the monitor and allow for the hydration of the bentonite pellets.
- 7.5 Cut the monitor casing at the level of the bentonite plug below ground level, replace the PVC cap, and backfill with excavated soils. To ensure a tight fit of the PVC cap make several rough cuts on the monitor casing where the cap will slide on.
- 7.6 Record all procedures in the PFB.

*Note: The bentonite pellets may bridge within the standing liquid volume if care is not taken to drop the pellets slowly. By placing a seal locator down the monitor first, before introducing any pellets will allow you to break up any minor bridging should they occur.

Removal of Monitoring Well

- 7.7 Remove the locking protective casing from the monitoring well.
- 7.8 Complete steps 7.02 to 7.03 in the event the monitoring well casing breaks.
- 7.9 Have the drill rig positioned over the top of the existing borehole. If possible, pull the monitoring casing from the borehole by winching with the rig cables.

- 7.10 From the existing records or actual field measurement, determine the original borehole diameter. Overdrill the original borehole such that the new boring is the same size or larger than the original bored diameter. Various drilling methods may be employed.
- 7.11 Proceed carefully until target depth has been attained and extend boring at least 1 m beyond the original depth, where practical.
- 7.12 Retract drill tools or casing slowly while simultaneously backfilling the borehole with bentonite pellets or bentonite grout for shallow (<10 m) and deep (>10 m) boreholes respectively.
- 7.13 Record the density measurements of the bentonite grout for each batch of grout mixed.
- 7.14 Backfill borehole to within 1 m of ground surface.
- 7.15 Backfill remainder with native soils.

Open Borehole

- 7.16 Record all procedures in PFB.
- 7.17 Open boreholes shall be abandoned with material of similar or lower hydraulic conductivity. Where possible, portions of the borehole within an aquifer shall not reduce the hydraulic conductivity of the aquifer.
- 7.18 Boreholes within aquitards shall be abandoned with bentonite pellets or bentonite grout.
- 7.19 Auger cuttings shall only be used for shallow boreholes that do not fully penetrate a confining aquitard.

4.5.8 Attachments

- 8.1 None.

5 SAMPLE MANAGEMENT

5.1 SAMPLE LABELLING

Subject:	Sample Labelling	Procedure No. FS 5.1	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

5.1.1 Procedure

- 1.1 All samples shall be labeled on the sample container sticker label, on pre-stamped tags with ties for soil, on the soil sample box, or on the rock core box.

5.1.2 Purpose

- 2.1 To provide detailed sample information for reference and/or laboratory analysis.

5.1.3 Scope

- 3.1 The requirement to follow the Sample Labelling procedures applies to technical employees that are collecting, storing and/or dispersing samples for analysis.

5.1.4 Responsibility

- 4.1 It is the responsibility of Project Managers and technical employees to follow the standardized labelling procedures.
- 4.2 This procedure shall be updated as required by the Field Services Committee.

5.1.5 Definitions

- 5.1 None

5.1.6 References and Related Procedures

- 6.1 Sign-In of Soil/Rock Samples – FS 10.3.

5.1.7 Methodology

- 7.1 Groundwater, surface water, air, and building material samples shall be labeled on the label stickers provided on the side of the sample containers, such as bottles, vials, bags, etc. The labelling procedure shall include at a minimum the Sample Identification, Company Name (WSP), Type of Analysis to be Conducted, Contaminant Level (if known), Project Reference Number, Date, and Time.
- 7.2 Soil sample labelling will be completed on a pre-stamped tag and attached to the sample bag.
The minimum information will include Sample Identification, Sample Depth, Standard Penetration Resistance (if applicable), Date, Project Number, and Staff Initials. Boxes containing sample bags will be labeled as detailed in the Sign-in of Soil/Rock Samples procedure.
- 7.3 Rock core boxes will be labeled on the lid and ends of the core box as detailed on the Sign-in of Soil/Rock Samples procedure. In addition, the core depths shall be noted on the inside top and bottom of each core box, spaces with no sample present shall be identified, and an arrow on each core piece shall point to the top of the core.
- 7.4 All labels shall be legible and completed in pen, permanent marker, or wax pencil.

5.1.8 Attachments

- 8.1 None.

5.2 SAMPLE STORAGE

Subject:	Sample Storage	Procedure No. FS 5.2	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

5.2.1 Procedure

- 1.1 Samples shall be stored in the allocated areas of the storage facilities.

5.2.2 Purpose

- 2.1 To provide easy access for referencing and sample management.
- 2.2 To reduce slip, trip, fall hazards in the storage facilities.

5.2.3 Scope

- 3.1 The Sample Storing procedure applies to all project managers and technical employees that are storing samples for future reference.

5.2.4 Responsibility

- 4.1 It is the responsibility of Project Managers and technical employees to follow the standardized Sample Storage procedures.
- 4.2 Project Managers are responsible for informing technical employees of the location and duration of sample storage.
- 4.3 The procedure shall be updated as required by the Field Services Committee.

5.2.5 Definitions

- 5.1 Contaminated Soil/Rock – Chemical concentrations exceed, or are expected to exceed, Ministry of the Environment Guidelines for Contaminated Sites in Ontario (revised 1997).

5.2.6 References and Related Procedures

- 6.1 Sample Labelling – FS 5.1.
- 6.2 Sign In of Soil/Rock Samples – FS 10.3.

5.2.7 Methodology

- 7.1 Soil/rock samples shall be signed-in in the red book provided on the soil identification table. All samples must be labeled in the field. Water samples must be labeled in the field before temporarily being stored in the fridge in storage.
- 7.2 All stored samples shall be orientated in a fashion that allows for quick visual identification and referencing.
- 7.3 Samples are to be removed from storage when analyses are complete and/or expiry date is past due.
- 7.4 For samples that are to be stored for a prolonged period of time (beyond six month), the Project Manager shall charge the client a rental rate of \$100.00/Project/Month.

5.2.8 Health and Safety Considerations

- 8.1 No contaminated soil/rock is to be stored within a WSP storage area.
- 8.2 Contaminated soil/rock should be left on the site within appropriate containers or discarded in accordance with regulations.

5.2.9 Attachments

- 9.1 None

5.3 SAMPLE TRANSPORT

Subject:	Sample Transport	Procedure No. FS 5.3	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

5.3.1 Procedure

- 1.1 Technical employees shall transport sample containers to analytical laboratories using the following standardized procedure.

5.3.2 Purpose

- 2.1 To provide a consistent and repeatable methodology for the transport of sample containers to analytical laboratories.

5.3.3 Scope

- 3.1 The requirement to follow the Transport of Sample Containers procedure applies to technical employees who are responsible for completing field tasks.

5.3.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow the Transport of Sample Containers procedure to ensure samples arrive at their destination in a timely fashion and in an acceptable condition.
- 4.2 The Project Manager is responsible for ensuring that technical employees are aware that proper transport of storage containers is required as part of the assigned field tasks.
- 4.3 This procedure shall be updated as required by the Field Services Committee.

5.3.5 Definitions

- 5.1 None.

5.3.6 References and Related Procedures

- 6.1 Sample Storage –FS 5.2

5.3.7 Methodology

- 7.1 Secure samples in the transport container according to FS 5.2.
- 7.2 Label the exterior of the container with the address of the destination (i.e. analytical laboratory).

- 7.3 Hand/direct delivery of samples by technical staff to the destination is preferred. However, if not, arrange for a reputable courier company to deliver the samples. Usually a courier is available on a daily basis from each Branch office.
- 7.4 Chain of Custody forms located in the transport container should be signed by the receiving laboratory and returned to the project manager. A sample Chain of Custody form is attached.

5.3.8 Attachments

- 8.1 Chain of Custody form – WSP
- 8.2 Chain of Custody form – PSC
- 8.3 Chain of Custody form, Drinking Water – PSC

5.4 SAMPLE FILTRATION

Subject:	Sample Filtration	Procedure No. FS 5.4	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

5.4.1 Procedure

- 1.1 Technical employees shall follow a standard methodology for the filtration of groundwater samples.

5.4.2 Purpose

- 2.1 To provide a consistent and repeatable methodology for filtering groundwater samples.

5.4.3 Scope

- 3.1 The requirement to follow the Filtration procedure applies to technical employees who are responsible for completing field tasks.

5.4.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow the Filtration procedure for all monitoring wells being sampled where sample filtering is required.
- 4.2 The Project Manager is responsible for ensuring that technical employees are knowledgeable in filtration methods and procedures prior to beginning a sampling program.
- 4.3 This procedure shall be updated as required by the Field Services Committee.

5.4.5 Definitions

- 5.1 Filtration is the method of removing suspended materials from groundwater through a membrane to exclude any undissolved (suspended) material present at the sample source.

5.4.6 References and Related Procedures

- 6.1 Keith, L.H. "Environmental Sampling and Analysis; A Practical Guide", Lewis Publishers, ISBN 0-87371-381, 1991.
- 6.2 Ministry of the Environment Guidance on Sampling and Analytical Methods, February 1999.
- 6.3 Equipment Decontamination – 12.4.

5.4.7 Methodology

Standard Filter Barrel Apparatus Methodology

- 7.1 Ensure that the barrel filter is cleaned using proper decon procedures prior to using it under field conditions.
- 7.2 Ensure that proper safety equipment is worn when using this apparatus (i.e. latex or nitrile gloves).
- 7.3 Remove water from the groundwater monitor by means of purging or bailing and pour 300±mL into the barrel filter unit.
- 7.4 Rinse barrel filter with the sample medium.

- 7.5 Secure the top of the filter apparatus.
- 7.6 Repeat step 7.03.
- 7.7 Position the filter papers into the barrel filter following the instructions on the side of the unit. The filter order from the barrel filter outlet is 0.45 µm cellulose acetate filter, glass fibre filler, plastic barrel filler.
- 7.8 Apply positive pressure slowly to the sample via a foot pump and tubing assembly.
- 7.9 Discard the first 20 mL of the sample.
- 7.10 Collect the filtered sample into the laboratory provided sample bottle directly.
- 7.11 Secure sample container and place it in the sample transport containers (coolers).
- 7.12 Disassemble the filter unit carefully and clean using proper decontamination procedures.

Inline Filters Methodology

- 8.1 Ensure that the inline filter package has not been opened.
- 8.2 Ensure that proper safety equipment is worn when using this apparatus (i.e. latex or nitrile gloves).
- 8.3 Remove the inline filter from the protective wrapping and attach it to the mechanical apparatus to be used to extract the sample (i.e. inertial pump system, peristaltic pump or submersible pump).
- 8.4 Slowly allow the flow from the monitor to pass through the filter unit.
- 8.5 Discard the first 20 mL.
- 8.6 Discharge the water directly into the laboratory sample bottle.
- 8.7 Secure the sample and place it in the transport container (coolers).
- 8.8 Remove the inline filter from the sampling mechanism and discard appropriately.
- 8.9 Use a new/unused filter for each new sample location.

5.4.8 Attachments

- 9.1 None.

5.5 SAMPLE PRESERVATION

Subject:	Sample Preservation	Procedure No. FS 5.5	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

5.5.1 Procedure

- 1.1 Project Managers and technical staff shall ensure minimal holding time for samples and preserve samples as required in the field.

5.5.2 Purpose

- 2.1 To maintain acceptable sample conditions in order to obtain representative accurate laboratory results.

5.5.3 Scope

- 3.1 Sample preservation procedures apply to all Project Managers and technical employees who are collecting, storing and/or dispersing samples for analysis.

5.5.4 Responsibility

- 4.1 It is the responsibility of Project Managers and technical employees to follow the standardized preservation procedures.
- 4.2 Project Managers are responsible for ensuring that technical employees are familiar with sample requirements for the assigned task.
- 4.3 This procedure shall be updated as required by the Field Services Committee.

5.5.5 Definitions

- 5.1 Acid Preservative – Nitric Acid – Metals, Sulphuric Acid – Nutrients (Ammonia)

5.5.6 References and Related Procedures

- 6.1 Sample Labelling – FS 5.1.
 6.2 Sample Storage – FS 5.2.
 6.3 Sample Transport – FS 5.3.
 6.4 Sample Filtration – FS 5.4.

5.5.7 Methodology

- 7.1 When collecting samples, Project Managers and field employees shall know the type of parameters for analysis to ensure the proper preservatives for the designated sample bottles are available.
 7.2 Ensure the laboratory-preserved bottles are current. The effectiveness of preservatives decreases with time.
 7.3 Confirm the preservative requirements with the laboratory. An example of typical preservatives is attached.
 7.4 Confirm with the laboratory the amount of sample required for each preserved bottle.
 7.5 The appropriate bottles are to be ordered from the laboratory that will be conducting the analyses. Laboratories should be providing sample bottles with the appropriate preservative inside the container. Otherwise preservatives shall be obtained and added manually in the field.
 7.6 Samples shall be filtered, if required, prior to preservation.
 7.7 Samples shall be placed directly into the preserved bottle. If required, decant water from an unpreserved bottle into the preserved bottle.

5.5.8 Attachments

- 8.1 Typical Preservatives and Holding Times.

6 SOIL SAMPLING

6.1 SPLIT SPOON SAMPLING

Subject:	Split Spoon Sampling	Procedure No. FS 8.1	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

6.1.1 Procedure

- 1.1 Technical employees shall use the following standardized methodology for soil sampling to obtain representative soil samples for identification and to complete standard penetration testing.

6.1.2 Purpose

- 2.1 To provide a standardized methodology for sampling soil and standard penetration testing.

6.1.3 Scope

- 3.1 The requirement to follow the Split Spoon Sampling procedure applies to technical employees who are responsible for completing field tasks.

6.1.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow the Split Spoon Sampling procedure.
 4.2 The Project Manager is responsible for ensuring that technical employees are aware the split spoon sampling is required.

- 4.3 This procedure shall be updated as required by the Field Services Committee.

6.1.5 Definitions

- 5.1 None.

6.1.6 References and Related Procedures

- 6.1 Equipment Decontamination – FS 12.4.
6.2 Soil Sample Descriptions – FS 10.1.

6.1.7 Methodology

- 7.1 Measure the length of the split spoon sampler to ensure it conforms to specifications. Decide on the need for a leaf spring core retainer for cohesive soil or a sand trap for non-cohesive sand and advise the driller accordingly.
- 7.2 Ensure that the sampler is clean of foreign substances such as grease and mud per the equipment decontamination procedure.
- 7.3 Remove the drill rods from the annular space of the augers and attach to them the sampler.
- 7.4 Lower the sampler carefully to the bottom of the borehole so that the sampler rests on the undisturbed soil formation.
- 7.5 The driller will attach a 63.5 kg (140 lb) hammer to the drill rods without the weight resting on the rods.
- 7.6 The driller will mark three lines at 152 mm (6 inch) intervals relative to a reference point. With the sampler resting on the bottom of the boring the driller will advance the sampler with the 63.5 kg (140 lb) hammer falling freely over its 0.76 m (30 inch) fall. This will continue until 457 (18 inches) or 608 (24 inches) have penetrated or 50 blows have been applied to an interval of 150 mm (6 inches) or less.
- 7.7 Record the number of blows in the Project Field Book on the appropriate form per 150 mm (6 inch) interval. The standard penetration resistance “N” value is the sum of blows for the second and third 150 mm (6 inch) interval, or the total blows if less than 150 mm (6 inches) is penetrated.
- 7.8 After the penetration has been achieved, the driller will rotate the drill rods clockwise and slowly remove the sampler from the formation with a continuous pulling action.
- 7.9 Open the sampler and collect a moisture sample from the lower tip of the split spoon if only one soil type is present, and collect additional samples if more than one soil type is present. Extract the moisture sample without manually manipulating the sample into a proper moisture container.
- 7.10 Examine the sample and complete that portion of the field borehole log pertaining to the sample depth per the applicable procedure.
- 7.11 Place the soil sample in a proper sample container as required.

6.1.8 Attachments

- 8.1 None.

6.2 CONTINUOUS SOIL CORE SAMPLING

Subject:	Continuous Soil Core Sampling	Procedure No. FS 8.3	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

6.2.1 Procedure

- 1.1 Technical employees shall use this standardized method for the retrieval of representative continuous core samples of soil during the advancement of select boreholes for identification and laboratory testing.

6.2.2 Purpose

- 2.1 To provide a standardized methodology for continuous soil core sampling.

6.2.3 Scope

- 3.1 The requirement to follow the Continuous Soil Core Sampling procedure applies to technical employees who are responsible for completing field tasks.

6.2.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow the Continuous Soil Core Sampling procedure.
- 4.2 The Project Manager is responsible for ensuring that technical employees are aware of soil sampling requirements.
- 4.3 This procedure shall be updated as required by the Field Services Committee.

6.2.5 Definitions

- 5.1 None

6.2.6 References and Related Procedures

- 6.1 Split Spoon Sampling – FS 8.2.
- 6.2 Sample Labelling – FS 5.1.
- 6.3 Sample Storage – FS 5.2.

6.2.7 Methodology

- 7.1 Measure the length and diameter of the core barrel for continuous soil sampling and check the condition of the equipment. Decide on whether a core spring retainer for clays or a sand trap for non-cohesive sands is required and advise the driller accordingly.
- 7.2 Ensure that the sampling device is clean of foreign substances such as grease or mud.
- 7.3 The driller will attach the sampling device to the drill rod and place it at the base of the auger hollow stem, then simultaneously advance the augers and the sampling device the specified distance. The distance of auger advance should not exceed the length of the sampling device.
- 7.4 Allow the core to sit for about one minute. The driller will then turn the sampling device one complete rotation and carefully remove the sampling device from the formation with a continuous pulling motion to minimize disturbance of the sample.
- 7.5 The driller will then employ the use of the split spoon sampler following procedures outlined in FS 8.2.
- 7.6 Remove the core barrel from the drill stem and place it on the core barrel rack for soil core removal. Remove the soil core from the core barrel and place in the prepared (cleaned) PVC storage casing. Examine and describe the soil sample according to FS 10.1.
- 7.7 The sample shall be labeled and stored per FS 5.1 and FS 5.2.

6.2.8 Attachments

- 8.1 None

6.3 FIELD SOIL SAMPLING FOR VOC ANALYSIS

Subject:	Field Soil Sampling for VOC Analysis	Procedure No. FS TBD	Revision:	1
To:	All Field Staff	Issue Date:	2012-06-01	
Issued by:	Field Services Committee	Review Date:	2014-06-27	

6.3.1 Procedure

- 1.1 Technical employees shall use the following standardized methodology for Field Soil Sampling for VOC Analysis.

6.3.2 Purpose

- 2.1 To provide a standardized methodology for sampling soil or waste for VOC analysis under O. Reg. 153/04.

- 2.2 For Phase Two ESAs or remediation that will be submitted to support the filing of a Record of Site Condition, in their guidance document the Ontario Ministry of the Environment states that US EPA Method 5035A shall be following during the collection and analysis of soil or waste samples for VOC parameters.

6.3.3 Scope

- 3.1 The requirement to follow the Field Soil Sampling for VOC Analysis procedure applies to technical employees who are responsible for completing field tasks.

6.3.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow the Field Soil Sampling for VOC Analysis procedure.
- 4.2 The Project Manager is responsible for ensuring that technical employees are aware that the Field Soil Sampling procedure for VOC Analysis is required.
- 4.3 This procedure shall be updated as required by the Field Services Committee.

6.3.5 Definitions

- 5.1 VOC – volatile organic compounds

6.3.6 References and Related Procedures

- 6.1 Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples—EPA 5035A

6.3.7 Methodology

- 7.1 Sample Preservation, Containers, Storage, and Handling

- 7.1.1 Sample Preservation

Note: Method 5035 suggests several other options (e.g. freezing in water, freezing in the VOA vial, polyethylene glycol, etc.). None of these other preservation options have been validated and are not recommended unless validated prior to use.

- 7.1.2 Containers

- Specific sample containers required will depend on the sampling methodology and corresponding laboratory analytical method. The most common soil VOC container is a 40 mL glass vial with a special frit and equipped with two TFE-faced silicon septa. These are large enough to contain at least 5 g of soil or solid material and at least 10 mL of liquid. 60 mL vials of equivalent materials and construction may be used.
- Another container is the plastic coring device which holds about 5 g of soil and can be tightly fitted with a cap equipped with a seal of inert rubber. These are commercially available (EnCore™); however, the receiving laboratory must have special tools to open this core.

- 7.1.3 Handling

- 7.1.3.1 Encore™ Samples (Protocol #1)

- Ideally, the samples should be transferred to a VOA vial with a chemical preservative on the day of sample receipt. If this is done, a 14-day holding time will apply. If this action cannot be performed, either due to carbonaceous soils scheduled for low level analysis, or due to laboratory logistical issues, the samples should be stored in a freezer (-12°C) until the day of analysis. Such samples can be held for up to 7 days after sample collection.

- 7.1.4 Shipping & Storage

- 7.2.1 Once samples are collected, it is imperative that they be stored in conditions which maintain the integrity. All samples should be placed in shipping containers or other suitable containers with ice to reduce the temperature as soon as possible. Ideally, samples should be shipped the day of collection for overnight delivery to the laboratory. If overnight transit is not feasible due to site logistics, samples should be held at 4°C until shipping. Samples collected in the Encore™ sampler should be received at the laboratory within 4 days of sampling. Note: DOT regulations associated with the use of preservatives in the field may be avoided by using Encore™ samplers.

- 7.2.2 Chemically preserved samples should be stored at 4°C until analysis. A 14-day holding time is applicable.
- 7.3 Whether sampling from the surface or from depth using such devices as a split spoon, collection of the sample will be the same. Samples should be collected as quickly as possible (< 10-15 seconds). Temporary storage of soil in split spoons, jars, or Ziploc bags is not permitted. Field screening may still be used to decide which samples will be submitted for analysis but all potential samples must be immediately chemically preserved or placed in a coring device. All protocols have been written assuming that both medium and low-level sample will need to be collected.
- 7.4 In order to help maintain the physical structure of samples, for cohesive granular material, a hand-operated coring device must be used to collect samples of appropriate size for laboratory analysis (e.g., cylindrical soil plugs are extruded into vials using disposable plastic syringes with the tapered front ends removed). Field personnel transfer samples into pre-weighed vials containing liquid preservatives (e.g., sodium bisulfate solution or methanol). The vials are weighed in the field before use and are subsequently reweighed after the sample aliquots are added to obtain the net sample weights.

Preparation of sample vials

- 7.5 Sample vials should be prepared in a fixed laboratory or other controlled environment, sealed, and shipped to the field location.

NOTE: Vials containing methanol should be re-weighed the day they are used. Vials found to have lost methanol (reduced weight by >0.02g) should not be used for sample collection. Surrogates, internal standards, and matrix spikes (as applicable) will be added to the sample in the laboratory prior to analysis.

Sample Collection

- 7.6 Protocol #1: Field collection with coring type samplers followed by laboratory preservation.
- 7.6.1 Expose a fresh surface using a clean spatula or other suitable tool. Collect a sample using a coring device (e.g., the hand-held Encore™) and immediately cap following manufacturer's directions. Collect two five-gram cores for the low level (if needed) and one five-gram core for the medium level. Label cores and transfer to laboratory on ice as soon as possible, but within four days.
- Unconsolidated Materials
 - Certain soil types may not be sufficiently consolidated to collect a core sample. Two examples would be dry sand or sludges/sediments with a very high moisture content. In such cases, the plunger of the Encore™ should be pulled back and locked. The Encore™ should be held with the opening facing upward and the sample transferred by spatula or pouring until the Encore™ is filled. The Encore™ is then capped and handled as previously outlined. Note: unconsolidated samples should be labelled as such on the chain of custody so that the laboratory can handle these samples with additional caution.
 - Aggregate or Cemented Material
 - The Encore™ sampler should not be used for these materials. It can only be used for soil types that can be collected using a small-diameter coring device. For other materials, the only collection technique which will maintain the integrity of the sample is field collection with methanol—protocol #3.
- 7.7 Protocol #2: Low-level soil samples Field-preserved with Sodium Bisulfate
- 7.7.1 The sample vials for the low-level method are designed to be placed directly in the laboratory's instrument so that they remain hermetically sealed until the VOCs are withdrawn during analysis. The entire content of each vial is processed during analysis. Hence, when low-level VOC analyses are required, it is necessary to collect at least two co-located samples. This gives the laboratory an opportunity to perform an additional analysis should the first analysis be unacceptable. Since the vials remain sealed, dilutions cannot be performed. When low-level VOC analyses are required, an extra co-located sample for the medium-level method must be collected with each set of low-level samples. Also aqueous acidic solutions are used to preserve samples for the low-level analyses; therefore, low-level samples must be initially tested for carbonate interferences in the field before samples are collected.
- 7.7.2 Laboratory Preparation
- Add 1 gram of sodium bisulfate, clean magnetic stir bar, and 5 mL of deionized water to a 40 mL

VOC vial. Label vial and record weight ± 0.01 grams.

- Note: VOC vials with special low bleed septa must be used to prevent false positives due to siloxane peaks from standard septa. Teflon coated stir bars absorb VOCs. This is a potential loss of VOCs. Disposable stir bars should be used or if stir bars are to be re-used, the stir bars should be cleaned and the cleanliness verified.

7.7.3 Field sampling

- Whenever possible, samples should be collected using a coring device (modified plastic syringe) as a transfer tool. A simple coring device can be made by cutting off the front part (with tip) of a disposable non-lubricated syringe, removing the rubber plunger tip and (with repeated experimentation) marking the length of core (2-3 cm) that corresponds to 5.0 ± 0.5 g.

Note: Use disposable syringes and ensure that they are NOT lubricated to avoid contaminating the VOC sample.

- If the test sample passes the initial test for both effervescence and pH (section below), use the plastic syringe to collect approximately 5 g of sample as soon as possible after the surface of the soil or other solid material has been exposed to the atmosphere: generally within a few minutes at most.
- Transfer the 5 g soil sample ("or plug") into the prepared and pre-labeled sample vial by placing the syringe tip inside the vial and squeezing the syringe plunger. Cap immediately and carefully wipe the exterior of the sample collection device with a clean cloth towel.
- For each sampling point, use a new plastic syringe to collect soil. Quickly brush any soil off the vial threads and immediately seal the vial with the septum and screw-cap.
- An initial test sample should be collected to evaluate effervescence and chemical preservation ($\text{pH} \leq 2$).
 - A five-gram core should be placed in a VOA vial which contains the acid solution. If effervescence occurs, the sample should be collected in a VOA vial with no sodium bisulfate. (Note: if effervescence does occur, immediately unscrew the cap to release built up pressure.) The unpreserved sample should be analyzed within 48 hours, the holding time. Results from the analysis may be biased low and should be flagged as estimated.
 - The test sample must also have the pH evaluated either by a pH meter or test strip to ensure that the pH has been reduced to <2 to limit biodegradation. If the sample has not been properly acidified, there are two options:
 - Vials can be used which contain a higher amount of sodium bisulfate. This additional sodium bisulfate should be added in the lab when the vial is prepared since addition in the field would affect tare weight. The exact amount of sodium bisulfate will be determined by the buffering capacity of the soil which makes pre-screening of the site prior to the actual sampling event a necessity. Sodium bisulfate can be added in the field if the field personnel record the weights of the additional preservative and sample.
 - Analyze the sample within the 48-hour holding time and flag the data as estimated.
- Hints:
 - When practical, use a portable balance to weigh the sealed vial containing the sample to ensure that $5.0 \text{ g} \pm 0.5 \text{ g}$ of sample were added. The balance should be calibrated in the field using an appropriate weight for the sample containers employed. Record the weight of the sealed vial containing the sample to the nearest 0.01 g.
 - Alternately, collect several trial samples with plastic syringes. Weigh each trial sample and note the length of soil in the syringe that corresponds to $5.0 \pm 0.5 \text{ g}$. Discard each trial sample.
 - As with the collection of aqueous samples for volatiles, collect at least two replicate samples. This will allow the laboratory an additional sample for reanalysis. The second sample should be taken from the same soil stratum or the same section of the solid waste being sampled, and within close proximity to the location from which the original sample was collected.
- In addition, since the soil vial cannot be opened without compromising the integrity of the sample, at least one additional aliquot of sample must be collected for screening, dry weight determination, and medium concentration analysis (if necessary). This third vial may be

collected in a 60 ml vial or another 40 mL soil sample vial. However, this third vial must not contain the sample preservation solution, as an aliquot will be used to determine dry weight. If medium concentration samples are collected in vials containing methanol, then two additional vials should be collected, one for medium concentration analysis collected in a vial containing methanol, and another for the dry weight determination in a vial without either methanol or the low concentration aqueous preservative solution.

- If samples are known or expected to contain target analytes over a wide range of concentrations, thereby requiring the analyses of multiple sample aliquots, it may be advisable and practical to take an additional sample aliquot in a low concentration soil vial containing the preservative, but collecting only 1-2 g instead of 5 g as described in section 7.2.3.

NOTE: When the low level samples are strongly alkaline or highly calcareous in nature, the sodium bisulfate solution may not be strong enough to reduce the pH of the soil/water solution to below 2. Additional steps may be required to preserve the samples. Such steps include: addition of larger amount of the sodium bisulfate preservative to non-calcareous samples, storage of low level sample as -12°C, or significantly reduce the maximum holding time for low concentration soil samples. Whichever steps are employed, they should be clearly described in the sampling and QA project plans and distributed to both the field and laboratory personnel.

- Record weight and transfer to ice.
- A duplicate low level sample should be collected for the laboratory since low level samples cannot be reanalyzed. Ship to the laboratory per DOT regulations. (Corrosive.) Note: Additional samples need to be collected for matrix spikes or other QC objectives.
- Aggregate or Cemented Material
 - Protocol #2 should not be used for these materials. For other materials, the only collection technique which will maintain the integrity of the sample is field collection with methanol-protocol #3.

7.8 Protocol # 3: Medium level samples field preserved with Methanol

7.8.1 This particular sampling protocol has been suggested by some as a combined preservation and extraction procedure. Carbonates are not problematic for methanol preservation and methanol sample extracts may be diluted in the laboratory when concentrations exceed the calibration range of the instrument. In addition, when samples are preserved with methanol, field personnel are not limited to single grab samples (as in the low-level method) but may composite subsamples from several locations.

7.8.2 Laboratory Preparation

- Add 5 mL of methanol to a 40 mL VOA vial. Label vial and record weight ± 0.01 grams.

7.8.3 Field Sampling

- Vials containing methanol must be reweighed (in the field) on the day of use to ensure that there has been no significant loss of methanol. Vials which exhibit a difference of greater than 0.2 grams should not be used. Quickly collect a 5 gram sample using a coring device as in 7.2.1 above and transfer soil plug into VOA vial containing methanol. Take care to ensure that no soil particles exist on vial threads.
- Weigh to 0.2 grams and complete label. Ship to lab per DOT regulations. (Flammable liquid, Poison.) Samples which have been preserved but are not submitted to the laboratory must be treated as hazardous waste. Note: Other sample sizes may be used. The 1:1 soil to methanol ratio by weight should be maintained and a larger bottle may be required.
- Using the appropriate sample collection device, collect approximately 5 g of sample immediately (15 mins.) after the surface of the soil or other solid material has been exposed to the atmosphere. Carefully wipe the exterior of the sample collection device with a clean cloth or towel.
- Using the collection device, add about 5 g (2--3 cm) of soil to the vial containing 10 mL of methanol. Brush any soil off the vial threads and seal the vial with the septum and screw-cap. Total sampling time not to exceed 10 minutes. Store samples on ice at 4°C.
- When practical, use a portable balance to weigh the sealed vial containing the sample to ensure that 5.0 g \pm 0.5 g of sample were added. The balance should be calibrated in the field using an

appropriate weight for the sample containers employed. Record the weight of the sealed vial containing the sample to the nearest 0.01 g.

- Alternately, collect several trial samples with plastic syringes. Weigh each trial sample and note the length of the soil column in the syringe. Use these data to determine the length of soil in the syringe that corresponds to $5.0 \text{ g} \pm 0.5 \text{ g}$. Discard each trial sample.
- Other sample weights and volumes of methanol may be employed, provided that the analyst can demonstrate the sensitivity of the overall analytical procedure is appropriate for the intended application.
- The collection of at least one additional sample aliquot is required for the determination of the dry weight, as described in sec. 7.3. Samples collected in methanol should be shipped as described in Sec. 12 and must be clearly labeled as containing methanol, so the that the samples are not analyzed using the closed system purge and trap equipment described in this procedure.

NOTE: Collection of medium concentration soil samples that are NOT preserved in the field generally follow similar procedures as for the other types of samples described above, with the obvious exception that the sample vials contain neither the aqueous preservative solution nor methanol. However, when field preservation is not employed, it is better to collect a larger volume sample, filling the sample container as full as practical in order to minimize the headspace. Such collection procedures generally do not require the collection of a separate aliquot for dry weight determination, but it may be advisable to collect a second sample aliquot for screening purposes, in order to minimize the loss of volatiles in either aliquot.

7.8.4 Large Aggregate and Cemented Materials

- Sample will need to be placed in a larger, wide mouth, 120 mL glass jar and preserved with a proportionately larger volume of methanol (to maintain the 1:1 ratio). In this event, the weight or volume of methanol must be recorded.

7.9 Protocol # 4: No preservation

7.9.1 Under limited circumstances, the collection of unpreserved samples is permitted, such as hard or cementitious materials, debris, or large aggregates which cannot be easily collected using the options above. Field methanol preservation is the preferred approach for these types of materials. Losses of VOCs are likely and all results should be considered as estimated values.

7.10 Moisture Content Sample

7.10.1 In addition to the samples collected as described above, a separate container must be collected to determine moisture content. This sample can be any conveniently sized container, of glass or plastic. Ordinary soil sampling procedures are used to collect samples to measure moisture content. If samples are being collected for other analytes (e.g. metals, semi-volatiles) that sample container can serve as the container for moisture content.

6.3.8 Health and Safety Considerations

8.1 Methanol is a toxic and flammable liquid. Therefore, methanol must be handled with all safety precautions related to toxic and flammable liquids. Inhalation of methanol vapors must be avoided. Vials would be opened quickly during the sample preservation procedure. Methanol must be handled in a ventilated area. Protective gloves should be worn when vials containing methanol are handled. Methanol should be stored away from open flames, areas of extreme heat, and other ignition sources. Vials containing methanol should be refrigerated (e.g., stored in coolers with ice).

8.1 Aqueous sodium bisulfate is a strong mineral acid. Therefore, solutions must be handled with all safety precautions related to mineral acids. Protective clothing (gloves, safety glasses, etc.) should be worn when vials containing sodium bisulfate are handled.

6.3.9 Attachments

8.1 None.

6.4 COMPOSITE SAMPLING

Subject:	Composite Sampling	Procedure No. FS 8.5	Revision:	1
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To:	All Field Staff	Issue Date:	January 1, 2004
Issued by:	Field Services Committee	Review Date:	August 2014

6.4.1 Procedure

- 1.1 Technical employees shall use the following standardized methodology for soil composite sampling.

6.4.2 Purpose

- 2.1 To provide a standardized methodology for composite sampling.

6.4.3 Scope

- 3.1 The requirement to follow the Composite Sampling procedure applies to technical employees who are responsible for completing field tasks.

6.4.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow the Composite Sampling procedure.
- 4.2 The Project Manager is responsible for ensuring that technical employees are aware of composite sampling is required.
- 4.3 This procedure shall be updated as required by the Field Services Committee.

6.4.5 Definitions

- 5.1 Composite:
 - (a) A sample representing several individual samples that have been merged together into one larger composite sample.
 - (b) A sample comprised of several portions of soil collected from various individual locations.

6.4.6 References and Related Procedures

- 6.1 Equipment Decontamination – FS 12.4.
- 6.2 Soil Sample Descriptions – FS 10.1.

6.4.7 Methodology

- 7.1 For a composite sample comprised of previously collected samples. (Not applicable for volatile organic sampling.)
 - 7.1.1 Assemble previously collected samples in an organized fashion in front of you. Only include the samples from which you want to create a composite sample.
 - 7.1.2 Take each sample jar or bag and begin to mix the soil through gently inverting, shaking or kneading to mix the contents thoroughly.
 - 7.1.3 Label the container or bag that will represent the composite sample.
 - 7.1.4 Using an appropriately sized hand trowel or small spade, dig into and remove equal portions of the loose soil from each container and place within the composite sample container. Do not include any material that may have dropped onto the ground.
- 7.5 Clean the sampling tool between each sampling location by following the appropriate decontamination procedure.
- 7.2 For a composite sample comprised of several portions of soil collected from various individual locations.
 - 7.2.1 Label the container or bag that will represent the composite sample.
 - 7.2.2 Using an appropriately sized hand trowel or small spade, dig into and remove equal portions of the loose soil from selected location. Do not include any material that may have dropped onto the ground.
 - 7.2.3 Clean the sampling tool between each sampling location by following the appropriate decontamination procedure.
- 7.3 Complete soil descriptions per procedure FS 10.1.
- 7.4 Store the soil samples per procedure FS 5.2.

6.4.8 Attachments

8.1 None

7 MATERIAL DESCRIPTIONS

7.1 SOIL SAMPLE DESCRIPTIONS

Subject:	Soil Sample Descriptions	Procedure No. FS 10.1	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

7.1.1 Procedure

- 1.1 Technical employees shall describe soil samples collected in the field using the standardized methodology.

7.1.2 Purpose

- 2.1 To provide a standardized methodology for the proper identification of soil.

7.1.3 Scope

- 3.1 The requirement to follow the Soil Sample Description procedure applies to technical employees who are responsible for completing field tasks.

7.1.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow the Soil Sample Description procedure for the description of soil samples.
- 4.2 The Project Manager is responsible for ensuring that technical employees are aware that soil is to be described in the field and which soil description format shall be used.
- 4.3 The Project Manager is responsible for assuring that the field notes and rock samples are reviewed with technical employees and discrepancies are discussed and adjustments made within the project field book.
- 4.4 This procedure shall be updated as required by the Field Services Committee.

7.1.5 Definitions

- 5.1 HCl – Hydrochloric acid.

7.1.6 References and Related Procedures

- 6.1 Ministry of the Environment Guidance on Sampling and Analytical Methods, February 1999.

7.1.7 Methodology

- 7.1 Field descriptions of soil samples shall be completed for samples obtained from boreholes, probe holes, test pits, and excavations. Information shall be recorded on the pertinent log forms that are attached. The WSP soil description format is provided as Attachment 8.01. Projects that require the Unified Soil Classification shall use Attachment 8.04.
- 7.2 Characteristics of the sample are to be noted in the following order: colour; texture/type; soil mass properties; moisture conditions; and consistency or compactness. Detailed descriptions for determining these characteristics are appended. Table 1 of the appended documents is to be included as part of the project field book.
- 7.2.1 Colour is to be described using the Munsell Soil Colour Chart. If a colour chart is not available describe the colours you see in simple words (i.e. light brown). If the sample contains obvious layers or patches of varying colours, this should be emphasized separately by the use of terms spotted, mottled, streaked or stained. If the colour represents a dry condition, this should be noted. Colour is important in identifying organic matter, fluctuating water levels, oxidation and geologic origin.
- 7.2.2 Texture/Type characteristics of soils include particle size and shape, grading/sorting, percentage composition, and texture of organic matter.

- 7.2.3 Soil Mass Properties are described as structure, degree of weathering, cementation, reaction with HCl and odour. Odour is only to be mentioned if organic or unusual.
- 7.2.4 Moisture Condition field tests should be carried out on representative samples. Tests should be completed quickly with minimum handling of the soils. Cohesive soils are described relative to their plastic limit (DTPL, APL, WTPL) and cohesionless soils are described by the soil's moisture condition (dry, moist, wet, saturated). For organic soils, a visual/physical examination for moisture content is to be used (dry, damp, wet, very wet).
- 7.2.5 Consistency or Compactness is used to describe cohesive and cohesionless soils respectively.
- 7.3 In finer grained soils the following characteristics should also be noted
 - 7.3.1 Dry strength: none, low, medium, very high.
 - 7.3.2 Dilatancy: none, slow, rapid.
 - 7.3.3 Toughness: low, medium, high
 - 7.3.4 Plasticity of fines: non-plastic, low, medium, high
- 7.4 Note details with respect to the sample, caving or sloughing of the auger hole or trench sides, difficulty in auguring or excavating, and details with respect to depth of water.
- 7.5 For contaminated soils, record the degree of contamination as noted by monitoring equipment.

7.1.8 Attachments

- 8.1 Table 1: Field Soil Description Summary.
- 8.2 Field Borehole Log.
- 8.3 Test Pit Log.
- 8.4 Unified Soil Classification Table.

7.2 SIGN-IN OF SOIL/ROCK SAMPLES

Subject:	Sign-In of Soil/Rock Samples	Procedure No. FS 10.3	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

7.2.1 Procedure

- 1.1 Technical employees shall use the standardized methodology to sign-in soil and/or rock samples.

7.2.2 Purpose

- 2.1 To provide a standardized methodology for the sign-in of soil/rock samples.

7.2.3 Scope

- 3.1 This procedure applies to technical employees who are storing soil/rock samples.

7.2.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow the Sign-In of Soil/Rock Samples procedure to ensure that the soil/rock storage area remains clean and organized for health and safety purposes as well as allowing for ease of project reference.
- 4.2 Project Managers are responsible for ensuring that technical employees are aware of the soil/rock storage requirements for each project.
- 4.3 This procedure shall be updated as required by the Field Services Committee.

7.2.5 Definitions

- 5.1 None

7.2.6 References and Related Procedures

- 6.1 Sample Storage – FS 5.2.

7.2.7 Methodology

- 7.1 Sign-in soil and/or rock samples within the log-in binder located on the review table. See Attachment 9.01 for a sample of the Soil/Rock Samples Checklist.
- 7.2 Soil samples are to be placed in the cardboard boxes that are provided. On one side of each box the following information is to be labeled: Project Title, Project Number, Date of Collection, Project Managers Initials, Field Tech's Initials and the Borehole or Test Pit Number(s). Finally, indicate the date the sample is to be discarded. If there is more than one box, indicate the total number of boxes. For example, indicate box 1 of 3. Refer to the information template example for guidance. The template is posted above the review table.
- 7.3 For rock samples, please refer to the log-in procedure in 7.01 and 7.02. For rock core storage, log-in the wooden core boxes similarly to the soil sample boxes. Ensure that the boxes are labeled with the project number, borehole number and sampling interval on the end of each box. Place the core boxes either on a pallet or on an approved designated shelf with the end indicating relevant information facing outward.
- 7.4 Soil samples that require review by the Project Manager should be placed on the shelf immediately to the left of the review table. The soil sample boxes are to be left in this location until review is complete. Samples that have been reviewed by the project manager are stored for the indicated duration on the pallets below the shelf to the left. The soil sample boxes placed on these pallets will be transferred to the appropriate storage shelf depending on the required storage duration.
- 7.5 Due to limited storage space, it is vital that all staff be diligent and practical when designating the required storage duration of the soil and rock samples.

7.2.8 Health and Safety Considerations

- 8.1 Once all the soil/rock sign-in procedures are complete, the review table and floor area shall be cleaned, swept and all debris disposed of appropriately. Slip, trip and fall hazards shall be eliminated.

7.2.9 Attachments

- 9.1 Soil/Rock Samples Checklist.

8 MONITOR CONSTRUCTION

8.1 MONITORING WELL CONSTRUCTION

Subject:	Monitoring Well Construction	Procedure No. FS 11.1	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

8.1.1 Procedure

- 1.1 Technical employees shall follow a standardized methodology for the design requirements, construction materials, and installation techniques for groundwater monitoring wells.

8.1.2 Purpose

- 2.1 To provide a standardized methodology for the proper installation of groundwater monitoring wells meeting or exceeding the minimum requirements as detailed in Ontario Regulation 903 "Wells".

8.1.3 Scope

- 3.1 The requirement to follow the Monitoring Well Construction procedure applies to technical employees who are responsible for completing field tasks.

8.1.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow the Monitoring Well Construction procedure for the installation of groundwater monitoring wells.
- 4.2 The Project Manager is responsible for ensuring that technical employees are aware of the type of groundwater monitoring well to be installed and the purpose of installing each monitoring well.
- 4.3 This procedure shall be updated as required by the Field Services Committee.

8.1.5 Definitions

- 5.1 PVC – Polyvinyl Chloride.

8.1.6 References and Related Procedures

- 6.1 Corporate Guideline – Drilling Program Preparation
6.2 Ontario Regulation 903 “Wells”

8.1.7 Construction Materials

- 7.1 Typically each well screen and pipe will be constructed of 50 mm diameter PVC or stainless steel and connected by flush threaded ends. If a screen is required, it will be selected on the basis of the formation materials. Pre-slotted PVC screen with a standard slot size of 10 is generally used for fine sands, silts and clay type soils. A screen with a slot size of 20 is used for coarser grained soils larger than fine sand. A threaded well point cap will be placed over the screen end. A slip-on cap will be placed over the monitor stickup end. A vent will be saw cut through the top of the slip-on cap.
- 7.2 If a centralizer is required it will be constructed of the same material as the monitoring pipe and secured using stainless steel clamps.
- 7.3 The filter pack will consist of clean, inert rounded to sub-rounded 1 mm, 2 mm, or 3 mm diameter silica unless specified otherwise by the Project Manager.
- 7.4 A seal will be constructed above the sand pack. A non-permeable seal will be formed using the clay mineral bentonite. The bentonite will be either in pellet or granular form and free of chemical additives.
- 7.5 A borehole annular seal will be constructed along the well casing to the ground surface. A high solids bentonite grout backfill will be mixed with water in the ratio of 10% bentonite (by weight) to 90% water.
- 7.6 The water to mix the bentonite will originate from a potable water source. The water supply source and/or supplier will be noted in the Project Field Book. If specified by the Project Manager, collect a water sample of the potable water source.
- 7.7 A steel protective casing and locking cap will be installed over the monitor riser pipe. The diameter of the protective casing should be at least 25 mm larger than the monitor pipe and extend at least 50 mm above the monitoring well cap.

8.1.8 Installation Methodology

- 8.1 Upon completion of the borehole, install or supervise the installation of the groundwater monitoring well. During advancement of deep boreholes, a silt or clay slurry may develop within the base of the borehole. It may be appropriate to flush this material out of the borehole before installing the groundwater monitor.
- 8.2 Maintain clean working conditions during emplacement of the monitoring well. Keep the pipe material remote from the working area until required. Clean nitrile or latex gloves are required while handling the pipe.
- 8.3 Place a threaded well point cap over the base of the screen. Measure the screen length and sump portion. Record this data on the monitor details sheet within the Project Field Book.
- 8.4 Saw cut a slot within the base of the well point cap attached to the screen section.
- 8.5 Thread one section of the riser pipe into the screen and insert down through the temporary borehole casing typically consisting of hollow stem augers or rock coring casing.
- 8.6 Lower the monitor pipe through the hollow stem auger or casing, continually adding riser pipe until the target depth is achieved. Ensure that the monitor pipe rests solidly on the base of the borehole or filter sand. If the borehole has advanced beyond the target depth, backfill the borehole with bentonite pellets then filter sand until target depth is achieved. There should be at least 0.3 m of filter pack below the bottom of the monitor pipe and above the target depth. Allow for the groundwater monitor to extend at least 0.75 m above grade unless a flush mounted cap is required. Cap the monitor with a vented PVC cap, then duct tape the cap to the riser pipe. Record measurements on the monitor details sheet within the Project Field Book.
- 8.7 Place the filter pack either by tremmie line or free fall around the screen to a level of 0.3 m above the top of the screen. Ensure that the filter material is dry and clean prior to placement. Confirm the thickness of the filter pack, measuring with a clean, calibrated tape. Record measurements on the monitor details sheet within the Project Field Book.

- 8.8 Place a bentonite seal to about 1.0 m above the filter pack. Add the bentonite pellets down the annular space between the casing wall and the monitor pipe slowly to prevent bridging. Ensure that the pellets are dry and uncontaminated prior to emplacement. Confirm the depth of the seal by measuring with a clean, calibrated tape. Record the measurements on the monitor details sheet within the Project Field Book. Add water to initiate the hydration process and allow the bentonite to initiate expansion. If possible, allow 30 to 45 minutes for the seal to set.
- 8.9 If the formation is such that the augers or casing can be extracted from the borehole without compromising the borehole integrity do so at this point.
- 8.10 Backfill the annular space to within 0.5 m of the surface with a bentonite grout or bentonite pellets. Record seal measurements on the monitor details sheet within the Project Field Book.
- 8.11 Place the steel protective casing over the monitoring pipe and complete the backfilling using either bentonite pellets or where required a cement mixture. Mound topsoil around the casing to encourage runoff away from the well. This procedure is required per Ontario Regulation 903 "Wells".
- 8.12 Cut a small "v" slot in the monitor pipe as a monitoring reference point. Cut slots in the cap to identify the monitor within the well. Use one cut to represent the deepest monitor and increasing the number of cuts for each additional shallower monitor. Use a paint pen or permanent marker to label the monitor number(s) on the inside lid of the casing.
- 8.13 Using a fine textured half round hand file, begin to round off the inner edge of the monitor casing such that no sharp edges remain.
- 8.14 Per O. Reg. 903 attach a completed tag to the monitoring well.
- 8.15 Lock the steel protective casing using the appropriate key coded padlock.
- 8.16 Installations at contaminated sites require the same steps. A greater awareness of personal safety and cleanliness is required to prevent cross-contamination of monitor construction materials. Monitor installations in more contaminated areas should occur after all other monitors have been installed.

8.1.9 Health and Safety Considerations

- 9.1 Filter sand can produce silica dust which should not be inhaled.
- 9.2 Wear gloves while handling bentonite pellets. Bentonite will dry out skin and cause severe cracking. Thoroughly wash your hands after handling.

8.1.10 Attachments

- 10.1 Field Monitor Construction Details form.
- 10.2 Drilling Guideline Equipment Checklist.

8.2 DRIVE POINT CONSTRUCTION

Subject:	Drive Point Construction	Procedure No. FS 11.2	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

8.2.1 Procedure

- 1.1 Technical employees shall follow a standardized methodology for the design requirements, construction materials, and installation techniques for drive points.

8.2.2 Purpose

- 2.1 To provide a standardized methodology for the proper installation of drive points.

8.2.3 Scope

- 3.1 The requirement to follow the Drive Point Construction procedure applies to technical employees who are responsible for completing field tasks.

8.2.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow the Drive point Construction procedure for the installation of drive points.

- 4.2 The Project Manager is responsible for ensuring that technical employees are aware of the type of drive point to be installed and the purpose of the installation.
- 4.3 This procedure shall be updated as required by the Field Services Committee.

8.2.5 Definitions

- 5.1 PVC – Polyvinyl Chloride.

8.2.6 References and Related Procedures

- 6.1 Hand Augering - FS 4.1

8.2.7 Construction Materials

- 7.1 Typically each drive point will be constructed of 31.8 mm ID diameter pre-cleaned galvanized steel pipe usually in lengths of 1.5 metres and connected by threaded couplings. A drive point screen will be attached using a threaded coupling. The screen size is commercially set and is wire wound with perforated steel mesh. A galvanized steel cap will be threaded on to the portion of the pipe left above the ground surface.
- 7.2 The filter pack will consist of clean, inert rounded to sub-rounded silica sand. Where appropriate native formation granular materials will be used as directed by the Project Manager.
- 7.3 A surface seal will be constructed using the clay mineral bentonite. The commercial name of this product is "Hole Plug". The bentonite will be either in pellet or granular form and free of chemical additives.
- 7.4 A protective casing and locking cap installed over the monitor pipe is optional. Typically, the access to the monitor is secured by tightening the thread-on cap using pipe wrenches. If a protective casing is used, the diameter of the protective casing should be at least 25 mm larger than the monitor pipe and extend at least 50 mm above the monitoring well cap.

8.2.8 Installation Methodology

- 8.1 Upon completion of the hand-augered borehole, install the preassembled screen and length of galvanized pipe to the base of the borehole.
- 8.2 Maintain clean working conditions during emplacement of the drive point. Keep the pipe material and screen remote from the working area until required.
- 8.3 Measure the screen length and sump portion. Record this data on the monitor details sheet within the Project Field Book.
- 8.4 Thread one section of the galvanized pipe into the coupling already attached to the screen.
Tighten using two pipe wrenches and then insert down the borehole.
- 8.5 Where the advancement of a hand auger is unsuitable in such environments as saturated organics, sands, and gravels, the drive point monitor should be installed through the combined efforts of hand augering to start the borehole then driving the pipe string into the underlying soils. The driving process is accomplished by using a weighted fence post pounder placed over top of the drive point pipe string. A coupling is first threaded onto the top and is then used as a protective head for the post pounder to land on while lifting and dropping it. The drive point is slowly advanced downward under the repeated blows of the post pounder until the desired target depth is reached or refusal.
- 8.6 Where drive points are installed within creek beds, temporary casing can be used to maintain borehole wall integrity. As the borehole is advanced, the temporary casing is driven downward using a sledgehammer. Lower the monitor pipe through the temporary casing, continually adding riser pipe as required until the target depth is achieved. Ensure that the monitor pipe rests solidly on the base of the borehole. There should be at least 0.3 m of filter pack below the bottom of the monitor pipe and above the target depth. Allow for the drive point monitor pipe to extend at least 0.75 m above grade. Cap the monitor with a thread on galvanized cap. Record the monitor pipe stickup measurement on the monitor details sheet within the Project Field Book.
- 8.7 Place the filter pack by free fall around the screen to a level of 0.3 m above the top of the screen. Ensure that the filter material is dry and clean prior to placement. Confirm the thickness of the filter pack, measuring with a clean, calibrated tape. Record measurements on the monitor details sheet within the Project Field Book.

- 8.8 Place a bentonite seal to about 1.0 m above the filter pack or to surface as the situation dictates. Add the bentonite pellets down the annular space between the temporary casing wall if used, or the borehole and the monitor pipe slowly to prevent bridging. Ensure that the pellets are dry and uncontaminated prior to emplacement. Confirm the depth of the seal by measuring with a clean, calibrated tape. Record the measurements on the monitor details sheet within the Project Field Book. Add water to initiate the hydration process and allow the bentonite to initiate expansion. If possible, allow 30 to 45 minutes for the seal to set. Where bentonite pellets are installed as a seal around a drive point monitor constructed within a creek bed it is important to work quickly to place the seal before the bentonite pellets hydrate to the point where the pellets will no longer free fall under their own weight.
- 8.9 In the situation where a temporary casing is used during an installation process, the casing is gradually pulled up out of the borehole as the sand pack and seal is emplaced around the drive point monitor pipe. If a steel protective casing will be used, then the hand augered borehole may have to be enlarged and deepened. Once the casing is in place, the inner annulus of this casing can be backfilled with bentonite to surface thereby securing a proper seal around the drive point monitor pipe. Mound topsoil around the casing if used or around the monitor pipe.
- 8.10 Use a paint pen or permanent marker to label the monitor number on the inside lid of the casing.
- 8.12 Lock the casing using a padlock.
- 8.13 Installations at contaminated sites require the same steps. A greater awareness of personal safety and cleanliness is required to prevent cross-contamination of monitor construction materials. Monitor installations in more contaminated areas should occur after all other monitors have been installed.
- 8.14 Where shallow standpipes constructed of PVC are installed through hand augered boreholes the required steps are the same except step 8.05, where PVC pipe is not usually driven into the underlying soils.
- 8.15 For the installation of a standpipe constructed of PVC, pre packed screens are available in 25.4 mm ID diameter. Typically, 00 or 1 mm silica sand is used for the sand pack. The required steps for installation are the same omitting step 8.06.
- 8.2.9 Health and Safety Considerations**
- 9.1 Filter sand can produce silica dust which should not be inhaled.
- 8.2.10 Attachments**
- 10.1 Field Monitor Construction Details form.

8.3 GAS MONITORING WELL CONSTRUCTION

Subject:	Gas Monitoring Well Construction	Procedure No. FS 11.4	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

8.3.1 Procedure

- 1.1 Technical employees shall follow a standardized methodology for the design, construction, and installation of a gas monitoring well.

8.3.2 Purpose

- 2.1 To provide a standardized methodology for the proper installation of gas monitoring well.

8.3.3 Scope

- 3.1 The requirement to follow the Gas Monitoring Well Construction procedure applies to technical employees who are assigned to completing this task.

8.3.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow this procedure for the construction of a gas monitoring well.

- 4.2 The Project Manager is responsible for ensuring that technical employees who are assigned to complete this procedure are aware of the design requirements of the gas monitoring wells to be installed.
- 4.3 Any deviation from this procedure shall be noted in detail within the site-specific project field book. Any deviations will be discussed with the project manager.
- 4.4 This procedure shall be updated as required by the Field Services Committee.

8.3.5 Definitions

- 5.1 PVC - Polyvinyl Chloride.
- mBGL – metres below ground level
- MCDS – Monitor Construction Details Sheet

8.3.6 References and Related Procedures

- 6.1 Corporate Guideline – Drilling Program Preparation

8.3.7 Construction Materials

- 7.1 A typical monitoring well (groundwater or gas monitor) is constructed of 50.8 mm internal diameter PVC. Stainless steel is used in either a corrosive or caustic environment such as a landfill cell. The gas monitoring well screen should have a slot size number of 20 in order to promote the movement of gas into the well casing.
- 7.2 A centralizer is used to position the well screen in the centre of the borehole and should be routinely used during construction of a gas monitoring well.
- 7.3 The filter pack will consist of clean, rounded to sub-rounded pea-stone. The use of 3 mm diameter silica sand may be used where pea-stone is not available.
- 7.4 A non-permeable surface seal will be formed using bentonite. The bentonite will be either in pellet or granular form and free of chemical additives. Initiate the bentonite with potable water, in order to promote swelling of the bentonite chips.
- 7.5 A protective steel casing with a lockable cap will be installed over the monitor riser pipe that extends above ground level.
- 7.6 A lock will be secured onto the lid of the steel protective casing.

8.3.8 Installation Methodology

- 8.1 The water table is taken to represent the lower limit of movement of soil gas, such as methane gas. The screened section of a gas monitor should extend down to, and into, the water table, unless otherwise specified by the project manager.
- 8.2 Upon completion of the borehole, install or supervise the installation of the gas monitoring well.
- 8.3 Maintain clean working conditions during construction of the gas monitoring well. Keep the pipe material within the plastic sock-wraps until required. Clean nitrile or latex gloves are required while handling the pipe.
- 8.4 Thread a well point cap onto the base of the screen. Measure the screen length and sump portion. Record these measurements on the Monitor Construction Details Sheet within the Project Field Book.
- 8.5 Use a hand saw to slot the base of the well point cap. Note this on the Monitor Construction Details Sheet.
- 8.6 Once the end cap has been installed onto the lead section of screen, begin to lower the screen pipe down through the string of hollow stem augers. Attach additional sections of screen as required. Then begin adding solid wall riser pipe until the pipe extends above grade.
- 8.7 Ensure that the monitor pipe rests solidly on the base of the borehole or filter material. If the borehole was advanced beyond the target depth, backfill the borehole with bentonite pellets then filter material until the target depth is achieved. There should be at least 0.3 m of filter material below the base of the monitor screen. Cut the gas monitor riser pipe to at least 0.75 m above grade unless a flush mounted cap is required. Cap the monitor with a non-slotted PVC slip-cap. Record these measurements on the Monitor Construction Details Sheet within the Project Field Book.

- 8.8 If the formation is such that the augers or casing can be extracted from the borehole without compromising the borehole integrity do so at this point.
- 8.9 Place the filter pack material either by tremmie line or free fall around the screen interval to a level of 0.3 m (or as specified by the Project Manager) above the top of the screen. Ensure that the filter material is dry and clean prior to placement. Confirm the length of the filter pack, measuring with a clean tape. Record final measurements on the Monitor Construction Details Sheet within the Project Field Book.
- 8.10 Place a bentonite surface seal from the top of the filter pack to (approximately 0.3 mBGL). Ensure that the pellets are dry and uncontaminated prior to placement. Confirm the depth of the seal by measuring with a clean tape. Record the measurements on the Monitor Construction Details Sheet within the Project Field Book. Use clean potable water to initiate the hydration process and allow the bentonite to expand. If possible, allow 30 to 45 minutes for the seal to set.
- 8.11 Place the steel protective casing over the monitoring pipe and complete the backfilling using either bentonite pellets or where required a concrete mixture. Mound topsoil around the casing to encourage runoff away from the wellhead. Record the surface seal measurements on the
- 8.11 Use a paint pen or permanent marker; mark a small inverted “v” on the outside of the monitor riser pipe as a monitoring reference point. Write the monitor number on the inside lid of the protective steel casing, and on the outside of the slip-on cap.
- 8.12 Using a fine textured half round hand file; begin to round off the inner edge of the monitor riser pipe such that no sharp edges remain.
- 8.13 Secure the slip-on cap onto the riser pipe.
- 8.14 Per Ont. Reg. 903, attach a completed tag to the newly constructed gas monitoring well if required. Only one well per property must have a tag.
- 8.15 Lock the steel protective casing using the appropriate key coded padlock. Record the lock model and key number on the Monitor Construction Details Sheet within the Project Field Book.
- 8.3.9 Health and Safety Considerations**
- 9.1 Silica sand can produce silica dust which should not be inhaled.
- 9.2 Wear gloves while handling bentonite pellets. Bentonite will dry out skin and cause severe cracking. Thoroughly wash your hands after handling.
- 8.3.10 Attachments**
- 10.1 Field Monitor Construction Details Sheet.
- 10.2 Drilling Guideline Equipment Checklist.

9 CLEAN-UP PROCEDURES

9.1 SITE CLEAN-UP

Subject:	Site Clean-Up	Procedure No. FS 12.1	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

9.1.1 Procedure

- 1.1 Employees shall follow a standardized methodology for site clean-up upon completion of field work.

9.1.2 Purpose

- 2.1 To provide a standardized methodology for the proper clean-up of a site upon completion of fieldwork.

9.1.3 Scope

- 3.1 The requirement to follow the Site Clean-Up procedure applies to technical employees who are responsible for completing field tasks.

9.1.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow the Site Clean-Up procedure following fieldwork.
- 4.2 The Project Manager is responsible for ensuring that technical employees follow the Site Clean-Up procedure once the fieldwork has been completed.
- 4.3 This procedure shall be updated as required by the Field Services Committee.

9.1.5 Definitions

- 5.1 None.

9.1.6 References and Related Procedures

- 6.1 None.

9.1.7 Methodology for Clean-up of Non-hazardous Sites

- 7.1 All garbage shall be removed from each site upon completion of the fieldwork.
- 7.2 Any material/equipment stored on the site shall be labeled and stored in a designated area.
- 7.3 Depressions caused by vehicle access shall be filled in with the soil cuttings or topsoil.
- 7.4 Record any site disturbances on a sketch or by photograph and note in the Project Field Book.

9.1.8 Methodology for Clean-up of Hazardous Sites

- 8.1 Soil cuttings generated from the drilling or testing processes are to be placed in waste drums.
Soil cuttings should be sampled according to Hazardous Disposal Regulations (Reg. 558) and disposed at a licensed facility.
- 8.2 Garbage, excess supplies, protective clothing, etc., are to be deposited into the waste drums upon completion of proper decontamination procedures and disposed at a licensed facility.
- 8.3 Work pad area and plastic sheet liners are to be removed and placed into waste drums for disposal at a licensed facility.
- 8.4 Waste drums are to be properly sealed and labeled as to content and borehole number.
- 8.5 Drums should remain in a designated area on-site until disposal at a licensed facility.
- 8.6 Obtain pertinent waste generation numbers prior to waste movement off the site.
- 8.7 Record any site disturbances, spill(s), etc. on a sketch or by photograph and record in the Project Field Book.

9.1.9 Attachments

- 9.1 None

9.2 INTERFACE PROBE DECONTAMINATION

Subject:	Interface Probe Decontamination	Procedure No. FS 12.2	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

9.2.1 Procedure

- 1.1 Employees shall follow a standardized methodology for site clean-up upon completion of field work.

9.2.2 Purpose

- 2.1 To provide a standardized methodology for the proper clean-up of a site upon completion of fieldwork.

9.2.3 Scope

- 3.1 The requirement to follow the Site Clean-Up procedure applies to technical employees who are responsible for completing field tasks.

9.2.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow the Site Clean-Up procedure following fieldwork.
- 4.2 The Project Manager is responsible for ensuring that technical employees follow the Site Clean-Up procedure once the fieldwork has been completed.
- 4.3 This procedure shall be updated as required by the Field Services Committee.

9.2.5 Definitions

- 5.1 None.

9.2.6 References and Related Procedures

- 6.1 None.

9.2.7 Methodology for Clean-up of Non-hazardous Sites

- 7.1 All garbage shall be removed from each site upon completion of the fieldwork.
- 7.2 Any material/equipment stored on the site shall be labeled and stored in a designated area.
- 7.3 Depressions caused by vehicle access shall be filled in with the soil cuttings or topsoil.
- 7.4 Record any site disturbances on a sketch or by photograph and note in the Project Field Book.

9.2.8 Methodology for Clean-up of Hazardous Sites

- 8.1 Soil cuttings generated from the drilling or testing processes are to be placed in waste drums.
Soil cuttings should be sampled according to Hazardous Disposal Regulations (Reg. 558) and disposed at a licensed facility.
- 8.2 Garbage, excess supplies, protective clothing, etc., are to be deposited into the waste drums upon completion of proper decontamination procedures and disposed at a licensed facility.
- 8.3 Work pad area and plastic sheet liners are to be removed and placed into waste drums for disposal at a licensed facility.
- 8.4 Waste drums are to be properly sealed and labeled as to content and borehole number.
- 8.5 Drums should remain in a designated area on-site until disposal at a licensed facility.
- 8.6 Obtain pertinent waste generation numbers prior to waste movement off the site.
- 8.7 Record any site disturbances, spill(s), etc. on a sketch or by photograph and record in the Project Field Book.

9.2.9 Attachments

- 9.1 None

9.3 FIELD EQUIPMENT CLEAN-UP

Subject:	Field Equipment Clean-Up	Procedure No. FS 12.3	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

9.3.1 Procedure

- 1.1 Technical employees shall follow a standardized methodology for field equipment clean-up upon completion of field tasks.

9.3.2 Purpose

- 2.1 To provide a standardized methodology for the proper completion of field equipment clean-up upon completion of field tasks.

9.3.3 Scope

- 3.1 The requirement to follow the field equipment clean-up procedure applies to technical employees who are responsible for completing field tasks.

9.3.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow the field equipment clean-up procedure after certain field tasks are completed and once the fieldwork program has been completed.
- 4.2 The Project Manager is responsible for ensuring that technical employees follow the field equipment clean-up procedure after certain field tasks are complete and once the fieldwork program has been completed.
- 4.3 This procedure shall be updated as required by the Field Services Committee.

9.3.5 Definitions

- 5.1 PPE - Personal Protective Equipment.
- 5.2 MSDS – Material Safety Data Sheet(s)

9.3.6 References and Related Procedures

- 6.1 Interface Probe Decontamination – FS 12.2.
- 6.2 Equipment Decontamination – FS 12.4.

9.3.7 Methodology

- 7.1 Equipment shall be safely and properly stored or carried within designated instrument cases, boxes, or bags during the fieldwork program. Where possible, all equipment shall be cleaned in the field following the prescribed use of the particular piece of equipment. Water level meters, chemistry meters, soil probe, hand auger and various hand tools will be rinsed off between each use and kept clean and free of gross particulates such as mud, vegetation, and ice and snow.
- 7.2 When performing field tasks on a contaminated site, each piece of equipment will be properly decontaminated between each sampling and monitoring location and before removal from the site, by following the proper decontamination procedure(s). By maintaining relatively clean equipment throughout the fieldwork program, the amount of time and energy required to perform final cleaning of all field equipment will be kept to a minimum.
- 7.3 After completion of the fieldwork program, return all of the equipment you have signed out and used on the project, to the designated equipment storage facility. It is now time to inspect and thoroughly clean all of the equipment.
- 7.4 Equipment that has been previously decontaminated prior to leaving a contaminated site may be placed back onto the storage shelf you originally obtained it from. The equipment that still requires additional cleaning will now be cleaned.
- 7.5 For most equipment, such as meters and various hand tools, the method of the cleaning procedure is similar. Organize the equipment around the area of the cleaning sink. While wearing appropriate personal protective clothing such as nitrile gloves and eye protection, begin cleaning each piece of equipment. Where some gross particulate matter is still visible, use a nylon brush or your gloved hands to clean off the material.
- 7.6 Decontaminate the equipment by using a spray or squirt bottle containing a solution of potable water and 5 percent Decon 75. Thoroughly, rinse each piece of equipment and final rinse using potable water.
- 7.7 Perform a final rise using analyte-free water for chemistry meters and water level meters. Pad dry prior to storing on shelves.
- 7.8 The rinse water will be directed into the cleaning sink. Any excess rinse water splashed over the sides of the sink will be thoroughly cleaned up by mopping the floor and wiping down the countertop using a cotton cleaning rag or paper towel.
- 7.9 If the piece of equipment requires air-drying, then leave it at one end of the countertop and tag it indicating it has been cleaned and is air-drying.
- 7.10 When the equipment has been clean-up, then place it back onto the storage shelf.
- 7.11 Repeat steps 7.06 to 7.11 for each piece of equipment that requires cleaning.
- 7.12 Ensure the countertop, sink and immediate floor area are thoroughly cleaned up and if applicable, decontaminated and sterilized using a solution of potable water and 5 percent Decon 75.

- 7.13 Submersible pumps require cleaning and can be effectively cleaned within a water trough or the sink depending on the pump's size and weight. For a large pump, use one of the available water troughs and fill it to a third or a half, ensuring that the pump intake is covered with water. Angle the pump down if necessary. Add 1 litre of chlorine bleach to the water and a cup of Decon 75. Re-circulate the water through the pump for 10 minutes and then let stand for a minimum of four hours or overnight if practical. If the water trough is left unattended, then place a notice tag on it indicating the contents of the water solution. Drain the water trough and pad dry the pump. Insert the pump within its clean PVC container and replace back onto the storage shelf.
- 7.14 Follow step 7.13 when a submersible pump will be used in a residential water well for the purposes of a pumping test. Document the decontamination/sterilization procedure within the proper section of the Project Field Book. Step 7.13 shall be completed before and after the pump is used in a residential water well.
- 7.15 Large equipment such as the van and ATV/trailer, require the use of the pressure washer for proper cleaning. Power-wash large equipment outside of the storage facility. Where available, run the van through a commercial vehicle wash bay.
- 7.16 Sign-in **ALL** of the equipment you brought back within the equipment logbook.
- 7.17 If equipment requires servicing or repair, place it on the floor in the area designated "project equipment staging area" or onto the "equipment repair table" and tag it using the "equipment repair notice" form. This form can be found in the form holder mounted next to the equipment repair table

9.3.8 Health and Safety Considerations

- 8.1 Care is required in handling of decontamination materials. Read the pertinent MSDS sheets of each contained material prior to use.

9.3.9 Attachments

- 9.1 None

9.4 WASTE MANAGEMENT DURING DRILLING AND SAMPLING TASKS

Subject:	Waste Management During Drilling and Sampling Tasks	Procedure No.	FS 12.7	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004		
Issued by:	Field Services Committee	Review Date:	August 2014		

9.4.1 Procedure

- 1.1 Technical employees shall properly dispose of wastes generated during drilling and sampling tasks at clean sites and potentially hazardous sites.

9.4.2 Purpose

- 2.1 To provide a standardized methodology for the handling of wastes generated during drilling and sampling activities at clean and potentially hazardous sites.

9.4.3 Scope

- 3.1 The requirement to follow the Waste Management during Drilling and Samples Tasks procedure applies to technical employees who are responsible for completing field tasks.

9.4.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow the Waste Management during Drilling and Sampling Tasks procedure to properly dispose of wastes created during drilling and sampling activities at clean and potentially hazardous sites.
- 4.2 The Project Manager is responsible for ensuring that technical employees are aware that proper clean up of drilling and sampling wastes is required as part of the assigned field tasks.
- 4.3 This procedure shall be updated as required by the Field Services Committee.

9.4.5 Definitions

- 5.1 None.

9.4.6 References and Related Procedures

- 6.1 None.

9.4.7 Methodology

Clean Sites – Drilling Related Wastes

- 7.1 All soil cuttings derived during the drilling process shall be collected into a pile near the borehole.
- 7.2 Upon completion of the borehole, the soils shall be collected and transported off-site. If this is not possible, soils shall be dispersed, leveled and spread around the borehole location so as not to create an obstacle near the completed borehole.
- 7.3 Wastes which may be picked up shall be disposed in a waste container.
- 7.4 The final condition of the borehole area shall be described in the Project Field Book and, if possible, photographed.

Clean Site – Groundwater Monitoring

- 7.5 Water derived through development or purging of monitors shall be collected in a calibrated container.
- 7.6 All volumes removed shall be documented in the Project Field Book.
- 7.7 Non-contaminated water may be disposed on the ground, a sufficient distance away from the groundwater monitor so as not to interfere with the recharge potential.
- 7.8 Wastes generated through the purging or sampling process shall be collected and disposed in the proper manner.

Contaminated Sites – Drilling Related Wastes

- 7.9 Position a steel waste drum sufficiently close to simplify the easy transfer of contaminated soil waste into the drum.
- 7.10 Position drums on a wooden pallet within, or near the edge of the Exclusion Zone.
- 7.11 Soil samples shall be screened using a photoionization detector to determine safe working conditions, as well as to aid in segregating the soils according to the degrees of contamination.
- 7.12 Contaminated soils shall be collected in securable steel drums, labeled and stored in a safe area away from local activity until such a time for proper disposal.
- 7.13 Each steel drum shall be labeled as to its contents and borehole sources.
- 7.14 Wastes generated at each drill location shall be disposed into the same steel drum as the soils.

Contaminated Sites – Groundwater Monitoring

- 7.15 Unlock protective enclosures of the groundwater monitors.
- 7.16 Follow proper safety procedures ensuring that proper safety equipment is used.
- 7.17 Water purged from groundwater monitors is to be collected into calibrated containers. Record all volumes and observations into the Project Field Book.
- 7.18 Upon half filling a calibrated container, transport purged water into the designated water disposal container. Containers may consist of steel drums or pre-arranged onsite holding tanks.
- 7.19 Water used the decontamination of equipment during the purging process shall be dealt with in the same manner as outlined in Step 7.18. Do not recycle wastewater.
- 7.20 Purged water stored in the steel containers is to be stored in a designed storage location. Drums **shall** be secured and properly labeled as to their content and date of filling.

9.4.8 Attachments

- 8.1 None.

10 GROUNDWATER MONITORING

10.1 DATA LOGGER INSTALLATION AND RETRIEVAL

Subject:	Data Logger Installation and Retrieval	Procedure No. FS 13.5	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

10.1.1 Procedure

- 1.1 Technical employees shall follow a standardized methodology for the installation of a data logger in groundwater residential water supply well, pumping well, groundwater monitoring well, still well or a shallow drive-point well.

10.1.2 Purpose

- 2.1 To provide a standardized methodology for the proper installation of a data logger regardless of the type of monitoring well.

10.1.3 Scope

- 3.1 This procedure applies to all technical employees who are required to manage and install data loggers.

10.1.4 Responsibility

- 4.1 Each technical employee is responsible to review and adequately understand the data logger installation procedure when conducting fieldwork that involves the use of data loggers.
- 4.2 The project manager is responsible for ensuring that technical employees are aware of the installation procedure and who are adequately knowledgeable of the use and the type of data logger(s) to be used and managed on a project.
- 4.3 This procedure will be updated as required by the Field Services Committee.

10.1.5 Definitions

- 5.1 Data logger – An electronic stainless steel (silver series) or Zirconium nitrate coating (gold series) device that records sensor readings from one or more sensors and store data 40 000 points in a form suitable for later analysis. The data logger may be housed within a box that is remote from the sensor and connected through a communication cable. A data logger may be combined with a pressure transducer and contained within a common metal housing usually in the shape of a tube. A level logger distributed by Solinst Inc. is an example of the latter. This combined unit may be referred as a data logger, level logger or data logger transducer. Battery life of the unit is 10 years.

This type of data logger transducer is commonly used within the environmental industry and by staff of WSP. Information presented in this procedure is orientated to the Solinst Inc. model of data logger transducer. The data logger is an absolute (non-vented-data logger) that measures groundwater and surface water levels and temperature.

- 5.2 Transducer – A pressure sensitive device that is capable of measuring the total pressure above the point which the sensor is placed, (water pressure and barometric pressure) as well ambient temperature of the water immediately surrounding the sensor. If required, conductivity may also be measured depending on the model of transducer. A transducer may be positioned remotely through the application of a communication cable.
- 5.3 Barologger – A term often used to define the function of a data logger transducer that records barometric pressure only. A Barologger is usually placed within the monitoring well at a position below the frost line. Barologger has an operating temperature -20C-40C. This placement is dependent on static water level, as the Barologger is to remain out of the water. Where multiple data loggers are stationed on one project site, the Barologger may be centrally positioned to the established network of monitoring wells.

Barologger have a range of 1.5 m to provide accurate atmosphere changes as well as air temperature.

Models	Full Scale	Water Fluctuat	Accuracy	Resolu
		Range	(Typical)	

F5, M1	4.92 ft., 1.5 m	Air Only	± 0.003 ft., 0.91 cm	0.0029
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- 5.4 Operating Range – Each data logger transducer is marked with an operation range and may be M1.5, M5, M10, M20, M30 and M100. The number refers to the water fluctuation range for a specific model of data logger. The numeric value implies the sensitivity of the model, the lower the number the higher the sensitivity. Typically, the maximum submergence for the sensor should be limited to a maximum of 1 m less than the indicated range limit. For example an M10 operating range would be 0.1 m to 9.0 m submergence. An M1.5 may also be used as a Barologger and data measurements recorded by that model are accurate to +/- 0.1 cm while an M30 model would have an accuracy of 1.5 cm.

LT Models	Full Scale (ft)	Water Fluctuation Range	Accuracy (Typical)	Resolution
F15, M5	16.4 ft., 5 m	13.1 ft., 4 m	± 0.010 ft., 0.3 cm	0.001% FS
F30, M10	32.8 ft., 10 m	29.5 ft., 9 m	± 0.016 ft., 0.5 cm	0.0006% FS
F60, M20	65.6 ft., 20 m	62.3 ft., 19 m	±0.032 ft., 1 cm	0.0006% FS
F100, M30	98.4 ft., 30 m	95.1 ft., 29 m	±0.064 ft., 1.5 cm	0.0006% FS
F300, M100	328.1 ft., 100 m	325 ft., 99 m	±0.164 ft., 5 cm	0.0006% FS

When selecting a data logger for use, the optimum operating range for data collection is between

20% and 80% of that model's specified capacity. Use this as a guideline when installing a data logger transducer.

Also marked on the outside of the logger is a number under the bar code that applies solely to that logger. It is an I.D. number that is to be recorded in the PFB. Readings obtained by the Barologger will be used to compensate the water levels obtained at all the other wells on site. Barologger readings will be applied individually per well.

10.1.6 References and Related Procedures

- 6.1 Procedure Manual – FS 14.2 Water Level Monitoring
- 6.2 Solinst website – www.solinst.com

10.1.7 Installation Procedure

- 7.1 Ensure that all hardware components that will be installed within a well to be monitored are clean. The data logger, cable and connectors shall be pre-cleaned using a solution of Decon 75 and clean potable water and followed by triple rinsing using clean potable water. Record notes in the project field book indicating the equipment and completion of the cleaning/decontamination procedure.
- 7.2 Measure and record an initial water level in the well to be monitored by utilizing a clean water level meter with a graduated cable. Reference historical water level data, if available and compare to ensure quality assurance of the water level measurement.
- 7.3 Using a data logger transducer suitable for the intended purpose calculate the installation depth in meters below the top-edge of the well casing, (steel or PVC as appropriate). As a guideline position the data logger such that approximately 75% of its operating range is submerged assuming the monitoring well depth is sufficient. This would be a typical setup prior to conducting a pump test. Where the monitoring of seasonal variation is the intent, consider the time of year and the season at the time of installation. The groundwater table is seasonally higher during the Spring and to a lesser extent the late-Fall. Consider groundwater fluctuation trends in terms of seasonal rises and declines within the geological formation to be monitored, i.e. unconsolidated overburden sediment or consolidated fractured bedrock. The magnitude to an overburden setting. Discuss installation requirements with the Project Manager or designated technical advisor.
- 7.4 A direct-read communication cable may be attached to a data logger transducer and dedicated to a monitoring well, usually for long-term application and/or installed in very deep wells. The communication cable functions both as a support cable and communication cable for the data logger transducer. The communication cable allows for direct communication to the data logger transducer such that programming and data retrieval is performed without the need to remove the data logger transducer from the well. Communication cables are ideally suited for installation into contaminated monitoring wells. The associated expense of a communication cable may be cost prohibitive for routine application. Refer to 5.04 as depth of installation is also critical, once the logger is installed at the required depth wind up the remaining cable and use a cable wrap to secure the leftover cable.

- 7.5 Programming both the data logger transducer and Barologger from the same computer or data collector is imperative. The program file for both units and additional units as required should be synchronized to the computer clock. The event frequency must be the same between the Barologger and the data logger transducer(s). Event based measurement data obtained by the Barologger is used to compensate the event based measurement data obtained by the data logger transducer(s). Review information that is detailed in the manufacture's operating guide. Programming may be completed in the office or in the field. A future start time may be an option invoked during initial programming. Allow for sufficient time (1-2 hours) for the transducer to equilibrate with the water environment before the start time of data recording.
- 7.6 Stainless steel down rigger fishing cable is commonly used to support data logger transducers and Barologger from the top edge of a well casing. Other material may be used and include small diameter aircraft cable, solid stainless steel wire, small diameter polypropylene rope and Teflon cord. The following procedural steps outline the use of downrigger cable. Using the appropriate type and size of cable connectors slide at least three connectors onto the downrigger cable. Pass the loose end of the cable through the plastic cap of the data logger transducer and back through each of the cable connectors. Secure the cable loop by squeezing the connectors with a pair of pliers. Spread-out each connector so that there is a least 0.5 cm between each connector. Do not over squeeze. Check the connectors for appropriate tightness onto the cable by pulling on the cable and observe for any slippage of the cable through the cable connectors.
- 7.7 Salvage cable loops are created and attached to the plastic cap should a break occur of the main support cable. Using a 10 cm length of cable, loop through the plastic cap and create 3 to 4 salvage loops of cable. Secure using the cable connectors as previously described. Each salvage loop should be approximately 5 cm to 8 cm in diameter. Refer to Section 8 for information regarding how to retrieve a lost data logger.
- 7.8 Measure the appropriate length of downrigger cable to suspend the data logger transducer at the desired depth below the top of the well casing. Consider the information presented under subsection 7.03 when determining the target depth.
- 7.9 To appropriately secure one end of the support cable to the well casing, it is desirable to pre-drill two small diameter holes near the top edge of the well casing in a horizontal relative position. These holes may be drilled through the PVC rise pipe or the steel well casing depending on the type of well. The final position of these holes should consider the routine function of the well cap, being a slip-on PVC cap, hinged lid or bolted lid. Using the appropriate type and size of cable connectors slide at least three connectors onto the downrigger cable. Pass the loose end of the cable through one of the small diameter holes that were drilled through the well casing and back through the adjacent hole. Securely attach the cable by using at least three cable connectors. Review subsection 7.05 for appropriate methodology. Ensure to be careful not to attach a hinged lid where opening the well will disturb the position of the data logger transducer. **NEVER LOWER A DATA LOGGER TRANSDUCER DOWN A WELL WITHOUT FIRST SECURING THE SUPPORT CABLE TO THE WELL CASING OR ALTERNATE SECURE OBJECT.**

When installing a data logger transducer in a well that is equipped with a pump, try to lower the data logger transducer down the well casing opposite the side of the pitless adapter in order to minimize the potential of fouling the cable with the pump support cable and electrical wires. Centralizer discs are commonly used on deep wells to maintain the position of the support cable, waterline and electrical wires which aids during installation and remove and inspection of the pump. Also torque arrestors can be placed above the pump, also increasing the change of the data logger getting stuck. In this case, it may be necessary to remove the pump to install a data logger transducer. Alternatively, have 1" tremmie line installed in the well to provide a secure environment for the data logger, i.e. for a pump test or step test.

- 7.10 Lower the data logger transducer slowly down the well casing until the desired depth has been reached. Should the data logger transducer be accidentally dropped down the well casing, it should be removed and assessed for proper function. The pressure diaphragm may be damaged due to the extreme change in pressure over a short time period.
- 7.11 Inspect the support cable and connectors each time the data logger transducer is removed. Assess the degree of corrosion and/or damage and replaced as required.
- 7.12 Inspect the support cable and connectors each time the data logger transducer is removed. Assess the degree of corrosion and/or damage and replaced as required.

- 7.13 The Barologger may be attached in a similar manner as the data logger transducer. Ensure the Barologger is suspended above the high water table position or as appropriate based on site-specific groundwater information. Protect the Barologger from freezing during colder months, typically from early-October through early-May.

10.1.8 Retrieving a Lost Data Logger Transducer

- 8.1 Should a data logger transducer be lost down a well due to breakage of the support cable or failure of the cable connectors, the unit may be retrieved by using a “fishing” tool. A fishing tool may be assembled using the following components: downrigger cable, 13 mm diameter steel rod that measures approximately 15 cm long and a hole drilled through each end, treble hooks and cable connectors.
- 8.2 At each end of the rod drill one small diameter hole through the steel rod of suitable diameter to allow the cable to pass through. Attach a length of downrigger cable to one end of the rod that is of sufficient length to reach the bottom of the well and the lost equipment.
- 8.3 Using approximately a 15 cm length of downrigger cable slide two or three treble hooks onto the cable. Guide one end of the cable through the drilled hole at the unused end of steel rod. Form a loop and secure using three cable connectors.
- 8.4 Once the fishing tool is assembled and secure, begin to lower the fishing tool down the well. The metal rod provides the weight to send the fishing apparatus down the well. Once at the bottom of the well, begin to move the fishing tool up and down in a slow gentle manner. The treble hooks should capture the salvage loops that are attached to the cap of the data logger transducer.

When additional weight is felt on the end of the cable, you likely have been successful to capture the lost data logger transducer. Gently pull the cable up and remove the fishing tool and captured data logger transducer out of the well.

- 8.5 Confirm that the retrieved data logger is functional by running a test cycle. Never reinstall a data logger without first confirming the functional status of the unit.

10.1.9 Health and Safety Considerations

- 9.1 Carefully handle the downrigger cable as the cut-ends are sharp and may accidentally jab into your skin. Wear gloves to handle the cable while lowering a data logger transducer down in a well. A broken metal strand may cause injury while slipping the cable through your hands.

10.1.10 Attachments

None

10.2 MONITOR DEVELOPMENT

Subject:	Monitor Development	Procedure No. FS 14.1	Revision: 1
To:	All Field Staff	Issue Date:	January 1, 2004
Issued by:	Field Services Committee	Review Date:	August 2014

10.2.1 Procedure

- 1.1 Technical employees shall follow a standardized methodology for developing groundwater monitoring wells.

10.2.2 Purpose

- 2.1 To provide a standardized methodology for the development of groundwater monitoring wells

10.2.3 Scope

- 3.1 The requirement to follow the Monitor Development procedure applies to technical employees who are responsible for completing field tasks.

10.2.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow the Monitor Development procedure for all monitoring wells installed.

4.2 The Project Manager is responsible for ensuring that technical employees are knowledgeable in well development methods and procedures prior to beginning a drilling program.

4.3 This procedure shall be updated as required by the Field Services Committee.

10.2.5 Definitions

5.1 None

10.2.6 References and Related Procedures

6.1 None.

10.2.7 Methodology

7.1 The development of a monitor occurs on completion of monitor installation. Monitors are developed to remove sediments and repair damage caused to the formation by the drilling process and to improve hydraulic properties of the filter pack.

7.2 Maintain clean working conditions during monitor development. Clean latex gloves shall be used. The development equipment shall be permanently dedicated to a monitor or decontaminated between monitors following proper decontamination procedures.

7.3 Select an appropriate monitor development method based on monitor diameter, depth to fluid level, hydraulic productivity of the monitor, and the sediment content of the water.

7.4 Well development options include: bailing and purging; manual pumping using an inertial lift pump; QED positive displacement well development pump, and; airlifting using clean compressed gases (air or nitrogen).

7.5 Develop the monitor until a visual improvement is noticed in the turbidity level of the water.

7.6 During development, repetitive measuring of pH, temperature and conductivity shall be recorded on the Development/Purging Record form in the Project Field Book after each monitor volume is removed. Observe and record changes in water quality and appearance in the Project Field Book. Development should continue until visible signs of drilling fluids are not apparent or stable water quality field readings are obtained. It is recommended that a minimum of three (3) monitor volumes be removed.

7.7 In fine-grained soil (silty clay and silty), removal of multiple well bore volumes may be required. It is important that the water level in the monitor not be drawn below the upper level of the well screen to avoid mixing of air and formation.

7.8 Dedicated sampling/development devices may be stored within the monitoring well pipe.

7.9 Sampling/development devices that are not dedicated to the monitoring wells shall be cleaned according to proper decontamination procedures and placed into storage containers. Prior to their use in other monitoring wells, they shall be rinsed with deionized water. Storage containers shall also be washed and rinsed with deionized water.

10.2.8 Attachments

8.1 Development/Purging Record form.

10.3 WATER LEVEL MONITORING

Subject:	Water Level Monitoring	Procedure No.	FS 14.2	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004		
Issued by:	Field Services Committee	Review Date:	August 2014		

10.3.1 Procedure

1.1 Technical employees shall follow a standardized methodology for water level monitoring.

10.3.2 Purpose

2.1 To provide a standardized methodology for monitoring of aqueous and non-aqueous phase liquids.

10.3.3 Scope

- 3.1 The requirement to follow the Water Level Monitoring procedure applies to technical employees who are responsible for completing field tasks.

10.3.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow the Water Level Monitoring procedure for all aqueous and non-aqueous phase liquids.
- 4.2 The Project Manager is responsible for ensuring that technical employees are instructed in the proper method for collecting water levels and are aware of site conditions.
- 4.3 This procedure shall be updated as required by the Field Services Committee.

10.3.5 Definitions

- 5.1 None

10.3.6 References and Related Procedures

- 6.1 Equipment Decontamination – FS 12.4.

10.3.7 Methodology

- 7.1 Ensure that calibrated water level tape or co-axial cable and probe are cleaned prior to use, using proper decontamination procedures.
- 7.2 A water level meter designated for leachate shall be used in leachate contaminated monitoring wells only.
- 7.3 A clean water level tape shall be used in domestic wells. The water level tape shall to be cleaned before and after collecting a water level at each individual well using proper decontamination procedures.
- 7.4 Water level tapes used at contaminated sites shall be cleaned before and after collecting a water level at each individual well using proper decontamination procedures.
- 7.5 Test water level tapes using the test button.
- 7.6 Lower the probe and calibrated tape or co-axial cable down the monitoring well until the meter indicates probe contact with the liquid.
- 7.7 Raise and lower the tape slightly so that the audible meter sounds on and off confirming liquid contact. Unless otherwise instructed by the Project Manager, record the liquid level where the calibrated tape or co-axial cable intersects the highest point on the monitoring well. Use a meter measure in combination with the co-axial cable.
- 7.8 Record the water level to the nearest 0.01 m onto the Groundwater Level Monitoring Field Record form.
- 7.9 Repeat steps 7.06 and 7.07 to confirm the water level measurement.
- 7.10 Check the water level against previously recorded water levels to ensure conformity of the reading.
- 7.11 Decontaminate the water level tape and probe before use in any other monitor on the same site.
- 7.12 For monitoring wells that are equipped with poly tubing for the purpose of purging and sampling, and where there is insufficient space to use a standard tape and probe, measure and record a water level using a co-axial meter. Do not disturb the poly tubing any more than necessary to allow the meter probe to pass along the length of the tubing to the groundwater level.

10.3.8 Attachments

- 8.1 Groundwater Level Monitoring Field Record form.

10.4 MONITOR PURGING

Subject:	Monitor Purging	Procedure No. FS 14.3	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

10.4.1 Procedure

- 1.1 Technical employees shall follow a standardized methodology for purging groundwater-monitoring wells.

10.4.2 Purpose

- 2.1 To provide a standardized methodology for the purging of groundwater monitoring wells.

10.4.3 Scope

- 3.1 The requirement to follow the Monitor Purging procedure applies to technical employees who are responsible for completing field tasks.

10.4.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow the Monitor Purging procedure for all monitoring wells being sampled.
- 4.2 The Project Manager is responsible for ensuring that technical employees are knowledgeable in well purging procedures prior to beginning a sampling program.
- 4.3 This procedure shall be updated as required by the Field Services Committee.

10.4.5 Definitions

- 5.1 Purging is the method of removing standing water from a monitor prior to the sampling.

10.4.6 References and Related Procedures

- 6.1 Keith, L.H. "Environmental Sampling and Analysis; A Practical Guide", Lewis Publishers, ISBN 0-87371-381, 1991.
- 6.2 Ministry of the Environment Guidance on Sampling and Analytical Methods, February 1999.
- 6.3 Water Level Monitoring – FS 14.2.
- 6.4 Equipment Decontamination – FS 12.4.

10.4.7 Methodology

- 7.1 Carefully unlock the protective well cover and remove the inner monitor cap. Avoid the introduction of any foreign material into the well.
- 7.2 Measure the monitor liquid level in accordance with the applicable procedures.
- 7.3 Calculate the standing volume of liquid in the monitoring well using the following method: $\text{Volume (L)} = 0.000785 [\text{Monitor Pipe Internal Diameter (mm)}]^2 \times [\text{Total Monitor Length (m)} - \text{Water Level Below Top of Pipe (m)}]$
- 7.4 Ensure that purging equipment (if not dedicated) is cleaned using standard decontamination procedures.
- 7.5 Commence purging by one of the following methods:
 - Bailer – bottom filling Teflon, stainless steel or plastic. This method is recommended for low yield monitors.
 - Inertial life pumps (i.e. Waterra tubing and a check (foot) valve);
 - Positive displacement pumps such as QED or RediFlo.
- 7.6 In fine-grained soils, one standing monitor volume should be purged prior to liquid sampling.
- 7.7 In coarse-grained soils, three standing monitor volumes should be removed prior to sampling.
- 7.8 Purge volumes should be removed by starting at the air/water interface and continue downward as the water level falls.
- 7.9 Record all volumes removed on the development/Purging Record form in the Project Field Book.
- 7.10 On the purging record sheets in the Project Field Book, record pH, conductivity and temperature after each standing monitor volume is removed.

7.11 Upon completion of monitor purging, carefully remove non-dedicated purging equipment and decontaminate according to proper procedures. Dedicated equipment shall be properly secured in the monitor.

7.12 Replace and secure locking mechanism to the protective casing and monitor.

10.4.8 Attachments

8.1 Development/Purging Record form.

10.5 MONITORING WELL SAMPLING

Subject:	Monitoring Well Sampling	Procedure No. FS 14.4	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

10.5.1 Procedure

1.1 Technical employees shall follow a standardized methodology for monitoring well sampling.

10.5.2 Purpose

2.1 To provide a standardized methodology for monitoring well sampling.

10.5.3 Scope

3.1 The requirement to follow the Monitoring Well Sampling procedure applies to technical employees who are responsible for completing field tasks.

10.5.4 Responsibility

4.1 It is the responsibility of technical employees to follow the Monitoring Well Sampling procedure for all monitoring wells being sampled.

4.2 The Project Manager is responsible for ensuring that technical employees are knowledgeable in monitoring well sampling procedures prior to beginning a sampling program.

4.3 This procedure shall be updated as required by the Field Services Committee.

10.5.5 Definitions

5.1 None.

10.5.6 References and Related Procedures

6.1 Equipment Decontamination – FS 12.4.

6.2 Water Level Monitoring – FS 14.2.

6.3 Sample Filtration – FS 5.4.

10.5.7 Methodology

7.1 Ensure that the sampling equipment which comes in contact with the liquid has been properly decontaminated, unless the sampling equipment is dedicated to the groundwater monitor.

7.2 Measure the liquid level in the monitor prior to sampling. Compare to previous readings to confirm validity.

7.3 Retrieve the liquid sample as soon as practical after purging. If recovery is slow, or if there is an insufficient volume for complete sampling, then sample retrieval should be prioritized.

7.4 Analyses will be prioritized in order of the parameters volatilization sensitivity. When applicable, the order of sampling should be as follows:

a) volatile and semi volatile organics

b) isotopes

c) general chemistry

Samples will also be required for determination of field parameters and periodically for duplicate samples.

- 7.5 Volatile and semi-volatile organics shall be sampled using a depth specific sampler, syringe sampler bottom filling stainless steel or Teflon bailer. The bailer shall be equipped with a stainless steel leader or in combination connected to a 6 mm diameter nylon rope. Dedicated inertial type pumps may also be used.
- 7.6 Slowly lower the sampling apparatus to below the air/water interface such that the sample is not in contact with the nylon rope. Whenever possible the sample shall be collected in the upper portion of the screened interval.
- 7.7 Retrieve the sample and carefully transfer the liquid to a prepared sample bottle. Hold the sample bottle at a 45-degree angle and carefully fill.
- 7.8 Filter the sample if required.
- 7.9 Place a small volume of the sampled water into a clear glass container and measure the field parameters of pH, temperature and specific conductance. When air temperatures drop, use polyethylene containers to avoid sudden temperature changes to the liquid.
- 7.10 Record all the sampling information on the Water Sampling Field Data Sheet in the project field book.

10.5.8 Attachments

- 8.1 Water Sampling Field Data Sheet.
- 8.2 Routine Groundwater and Surface Water Monitoring Equipment and Supplies Checklist.

10.6 NON-AQUEOUS PHASE LIQUID LEVEL MONITORING

Subject:	Non-Aqueous Phase Liquid Level Monitoring	Procedure No.	FS 14.6	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004		
Issued by:	Field Services Committee	Review Date:	August 2014		

10.6.1 Procedure

- 1.1 Technical employees shall follow a standardized methodology for monitoring levels of non-aqueous phase liquid levels.

10.6.2 Purpose

- 2.1 To provide a standardized methodology for non-aqueous phase liquid level monitoring.

10.6.3 Scope

- 3.1 The requirement to follow the Non-Aqueous Phase Liquid Level Monitoring procedure applies to technical employees who are responsible for completing field tasks.

10.6.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow the Non-Aqueous Phase Liquid Level Monitoring procedure for all monitoring wells being sampled.
- 4.2 The Project Manager is responsible for ensuring that technical employees are knowledgeable in monitoring procedures prior to beginning a sampling program.
- 4.3 This procedure shall be updated as required by the Field Services Committee.

10.6.5 Definitions

- 5.1 None.

10.6.6 References and Related Procedures

- 6.1 Equipment Decontamination –FS 12.4.
- 6.2 Water Level Monitoring – FS 14.2.

10.6.7 Methodology

- 7.1 Ensure that the water level and interface probes are properly cleaned prior to use using proper decon procedures.

- 7.2 Test the function of the probes prior to lowering down monitoring well.
- 7.3 Lower the interface probe and calibrated tape down the monitoring well until the meter and probe contacts the liquid surface.
- 7.4 If a lighter than water non-aqueous phase liquids (LNAPL) are found in the monitoring well, then the probe will sound at one pitch frequency. When lowering the probe and another fluid level is detected (i.e. water), then the tone frequency will typically change.
- 7.5 Raise and lower the tape so that the audible changes are noted and record to the nearest 0.01 m this level.
- 7.6 Further lower the probe down to the bottom of the monitoring well.
- 7.7 If a denser than water non-aqueous phase liquids (DNAPL) is present, then a change in the audible frequency will occur.
- 7.8 Repeat step 5.
- 7.9 Record level to the nearest 0.01 m onto the appropriate field data sheets.
- 7.10 Retract liquid level meter carefully.
- 7.11 Decon calibrated tape and probe according to decon procedures.

10.6.8 Attachments

- 8.1 None.

10.7 VOLATILE ORGANIC SAMPLING

Subject:	Volatile Organic Sampling	Procedure No. FS 14.8	Revision:	1
To:	All Field Staff	Issue Date:	January 1, 2004	
Issued by:	Field Services Committee	Review Date:	August 2014	

10.7.1 Procedure

- 1.1 Technical employees shall follow a standardized methodology for volatile organic sampling for water.

10.7.2 Purpose

- 2.1 To provide a standardized methodology for volatile organic sampling.

10.7.3 Scope

- 3.1 The requirement to follow the Volatile Organic Sampling procedure applies to technical employees who are responsible for completing field tasks.

10.7.4 Responsibility

- 4.1 It is the responsibility of technical employees to follow the Volatile Organic Sampling procedure for water samples.
- 4.2 The Project Manager is responsible for ensuring that technical employees are knowledgeable in monitoring well sampling procedures prior to beginning a sampling program.
- 4.3 This procedure shall be updated as required by the Field Services Committee.

10.7.5 Definitions

- 5.1 None.

10.7.6 References and Related Procedures

- 6.1 Equipment Decontamination – FS 12.4.
- 6.2 Water Level Monitoring – FS 14.2.
- 6.3 Monitor Sampling – FS 14.4.

10.7.7 Methodology

- 7.1 Ensure that the sampling equipment which comes in contact with the liquid has been properly decontaminated, unless the sampling equipment is dedicated to the groundwater monitor which typically is either Waterra tubing or a bailer.
- 7.2 Measure the liquid level in the monitor prior to sampling. Compare to previous readings to confirm validity.
- 7.3 Retrieve the liquid sample as soon as practical after purging. If recovery is slow, or if there is an insufficient volume for complete sampling, then sample retrieval should be prioritized.
- 7.4 Volatile organics shall be sampled using a depth specific sampler, syringe sampler bottom filling stainless steel, Teflon bailer or modified inertial lift pump. The bailer shall be equipped with a stainless steel leader or in combination connected to a 6 mm diameter nylon rope. Dedicated inertial type pumps may also be used, (Waterra tubing and attached foot valve).
- 7.5 Slowly lower the sampling apparatus to below the air/water interface such that the sample is not in contact with the nylon rope. Whenever possible the sample shall be collected in the upper portion of the screened interval.
- 7.6 Retrieve the sample and carefully transfer the liquid to a prepared sample bottle. Hold the sample bottle at a 45 degree angle and carefully fill. Use glass vials with Teflon septum caps.
- 7.7 Place a small volume of the sampled water into a clear glass container and measure the field parameters of pH, temperature and specific conductance. When air temperatures drop, use polyethylene containers to avoid sudden temperature changes to the liquid.
- 7.8 Keep samples cool (4° C).
- 7.9 If analyses can't proceed within four days (96 hours), add HCl to minimize bacterial activity.
- 7.10 Holding times are 14 days.
- 7.11 Maintain zero headspace in samples by having no bubbles present. When filling, cap the bottle when it has a reverse meniscus.
- 7.12 Record all the sampling information on the Water Sampling Field Data Sheet in the project field book.

10.7.8 Attachments

- 8.1 None.

11 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) PROGRAM**11.1 QUALITY ASSURANCE (QA)**

Subject:	Quality Assurance	Procedure No. FS	Revision:
To:	All Staff	Issue Date:	2014-01-01
Issued by:	Field Services Committee	Review Date:	

11.1.1 Procedure

- 1.1 QA is a set of activities for ensuring quality in the data generated from fieldwork undertaken.

11.1.2 Purpose

- 2.1 QA aims to prevent defects with a focus on the process used. It is a proactive quality process.
- 2.2 The goal of QA is to improve field data and sampling procedures so that defects do not arise during data analysis.

11.1.3 Scope

- 3.1 Establish a good quality management system and the assessment of its adequacy.
- 3.2 Prevention of quality problems through planned and systematic activities including documentation and periodic conformance audits of the operations of the system.

11.1.4 Responsibility

- 4.1 Everyone on the team involved in field data gathering and sampling is responsible for quality assurance.

11.1.5 Methodology

- 5.1 Proper field protocols for sample collection and handling will be followed by all WSP personnel to ensure that sample integrity is maintained. All field equipment will be decontaminated before and between sample collection and clean nitrile gloves will be used for each sample to eliminate the potential for cross-contamination of samples. All soil and groundwater samples will be collected directly into laboratory-supplied containers, preserved as required, and stored and shipped in ice-filled coolers. Proper chain of custody procedures are to be followed by WSP and the laboratory during sample transfer.
- 5.2 To determine and maintain analytical laboratory precision, WSP will collect quality assurance/quality control (QA/QC), blind duplicate samples in the field at a frequency of one (1) duplicate sample for every ten (10) field samples submitted. The laboratory is not notified that this is a duplicate (that is, a blind duplicate is provided).
- 5.3 Trip blanks will additionally be submitted for groundwater/surface water VOC analysis. If non-dedicated sampling equipment is used and subsequently decontaminated, one equipment rinsate sample will be analyzed per sampling event (that is to say, one rinsate sample per borehole sampling program).
- 5.4 Equipment blanks will be collected as appropriate by pouring laboratory-grade, high purity, de-ionized water over a decontaminated sampling device and collecting the rinsate in laboratory-prepared bottles.
- 5.5 WSP will receive soil and groundwater certificates of analysis from the laboratory electronically to reduce the possibility of transcription errors. Analyses will be compiled into a database. The automation of data transfers from laboratory instruments to laboratory information management systems will also reduced the possibility of transcription errors.

11.2 QUALITY CONTROL (QC)

Subject:	Quality Control	Procedure No. FS	Revision:
To:	All Staff	Issue Date:	2014-01-01
Issued by:	Field Services Committee	Review Date:	

11.2.1 Procedure

- 1.1 QC is a set of activities/procedures for ensuring data quality. The activities focus on identifying defects in the actual data generated.

11.2.2 Purpose

- 2.1 QC aims to identify (and correct) defects in the data. Quality control, therefore, is a reactive process, the goal of which is to identify defects after the data is generated and before it is released in a report.

11.2.3 Scope

- 3.1 Finding and eliminating sources of quality problems through tools and equipment so that client and regulatory requirements are continually met.
- 3.2 QC includes the activities or techniques used to achieve and maintain the data quality, process, and service.

11.2.4 Responsibility

- 4.1 Quality control is usually the responsibility of the project manager or technical lead that analyses the data for defects.

11.2.5 Methodology

- 5.1 The results reported by the laboratory will be quality-checked, reviewed and validated internally by a project chemist. The data review and validation will include the following:
- Verification that samples were analyzed for the methods requested
 - Verification that the appropriate methods were performed as outlined in *Protocol for Analytical*

Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act, as amended (MOE, 2011c)

- Review of the data for outliers and anomalies
- Review of the laboratory case narrative for events in the laboratory that might have affected the accuracy or precision of the data.

5.2 Field duplicate samples will be assessed as part of the QA/QC program during the Phase Two ESA through a comparison of the analytical results of the original samples to the field duplicate samples. Field duplicates measure the cumulative effects of both field and laboratory precision and hence provide an indication of overall precision. Therefore, field duplicates may have greater variability than laboratory duplicates which measure only laboratory precision. It is also expected that non-aqueous matrices will have a greater variance than aqueous matrices due to the heterogeneity of most non-aqueous samples (such as soil/sediment samples). Field duplicates will be evaluated based on the relative percent difference (RPD) in parameter concentrations:

- Aqueous field sample duplicate analyses have control limits of ± 20 RPD (or \pm RDL for sample results less than 5 times the RDL).
- Solid (non-aqueous) field sample duplicate analyses have control limits of ± 35 RPD (or ± 2 times the RDL for sample results less than 5 times the RDL).
- Examine the raw data and recalculate and document in worksheets all of the Field Duplicate RPDs using the equation below:

$$RPD = \frac{|S - D|}{(S + D)/2} * 100$$

- S=Field sample result. D=Field duplicate result.

5.3 Review the entire data package and the data review results and use professional judgment to identify any inconsistencies, anomalies, additive effects of technical problems, impacts on data quality, or other concerns which should be brought to the attention of the data user. Determine whether there is any need to qualify data that were not qualified based on the criteria previously assessed.

APPENDIX

D

FINALIZED FIELD LOGS



MONITORING WELL DRILLING RECORD : BH19-3

Project Number: 191-02120-01

3085 Hurontario Street, Mississauga, Ontario
Phase Two Environmental Site Assessment
Equity Builders

DRILLING DETAILS		SURVEY DETAILS		ODOUR		SAMPLE TYPE		CHEMICAL ANALYSIS							
Date (Start): 7/3/2019 Date (End): 7/3/2019 Drilling Company: Strata Drilling Group Drilling Equipment: CME 420M Drilling Method: Solid Stem Auger Borehole Diameter: 38.1 mm Drilling Fluid: N/A		Easting: m Northing: m Surface Elevation: 115.51 masl Top of Well Elevation: 115.44 masl		L - Light M - Medium S - Strong VISUAL D - Dispersed with Product S - Saturated with Product		DC - Diamond Corer SS - Split Spoon MA - Manual Auger TR - Trowel ST - Shelby Tube DT - Dual Tube MC - Macro Core NR - No Recovery		Metals: Sb As Ba Be B Cd Cr Co Cu Pb Mo Ni Se Ag Ti U V Zn Inorg. Inorganic Compounds PHC Petroleum Hydrocarbons (F1-F4) BTEX Benzene, Toluene, Ethylbenzene, Xylene VOC Volatile Organic Compounds PAH Polycyclic Aromatic Hydrocarbons PCB Polychlorinated Biphenyl D/F Dioxins & Furans Phenol Phenolic Compounds GSA Grain-size Analysis							
(m) DEPTH ELEVATION (masl)	STRATIGRAPHY	LITHOLOGY / GEOLOGY DESCRIPTION	P/D CGD (ppm)	OBSERVATIONS				SAMPLES				MONITORING WELL		REMARKS	
				ODOUR	VISUAL			SAMPLE TYPE & No.	% RECOVERY	N (Blow/15cm)	CHEMICAL ANALYSIS	DUPLICATE	DIAGRAM		DESCRIPTION
				L	M	S	D	S							
115.46		CONCRETE : approximately 165.1 mm													
0.5		SAND : trace gravel, light brown, moist	0						DT1A	50%					
1.0		some silt	0						DT2A	67%					
1.5			0						DT2B	67%					
2.0			0.1						DT3A	58%					
2.5		light brown, wet	0						DT3B	58%					
3.0		some silt, trace boulder, light brown, wet @ 3.05m	0.2						DT4A	100%					
3.5			0						DT4B	100%					
3.66															
111.85		CLAYEY SILT : grey, very moist, dense	0.2						DT5A	100%					
4.0															
4.27															
111.24		SHALE : moist, grey							DT5B	83%					
4.42		END OF BOREHOLE Bedrock refusal @ 4.48m; MW Installed at 3.57 m.	0												
4.5															

SCREEN
Length: 1.52 m
Diam.: 38.1 mm
Slot: #10

WATER MARKER
Depth : 2.51 m
Elev. : 113 m
Date : 8/9/2019

Project : DATABASE_MASTER.GPJ Report : WSP_EN_WELL-ENVIRONMENTAL 8/13/2019



























MONITORING WELL DRILLING RECORD : BH19-4

Project Number: 191-02120-01

3085 Hurontario Street, Mississauga, Ontario

Phase Two Environmental Site Assessment

Equity Builders

DRILLING DETAILS		SURVEY DETAILS		ODOUR		SAMPLE TYPE		CHEMICAL ANALYSIS							
Date (Start): 7/3/2019 Date (End): 7/3/2019 Drilling Company: Strata Drilling Group Drilling Equipment: CME 420M Drilling Method: Solid Stem Auger Borehole Diameter: 38.1 mm Drilling Fluid: N/A		Easting: 611464.98 m Northing: 4826526.176 m Surface Elevation: 118.26 masl Top of Well Elevation: 118.18 masl		L - Light M - Medium S - Strong VISUAL D - Dispersed with Product S - Saturated with Product		DC - Diamond Corer SS - Split Spoon MA - Manual Auger TR - Trowel ST - Shelby Tube DT - Dual Tube MC - Macro Core NR - No Recovery		Metals Inorg. PHC BTEX VOC PAH PCB D/F Phenol GSA Sb As Ba Be B Cd Cr Co Cu Pb Mo Ni Se Ag Ti U V Zn Inorganic Compounds Petroleum Hydrocarbons (F1-F4) Benzene, Toluene, Ethylbenzene, Xylene Volatile Organic Compounds Polycyclic Aromatic Hydrocarbons Polychlorinated Biphenyl Dioxins & Furans Phenolic Compounds Grain-size Analysis							
(m) DEPTH ELEVATION (masl)	LITHOLOGY / GEOLOGY			OBSERVATIONS			SAMPLES			MONITORING WELL		REMARKS			
	STRATIGRAPHY	DESCRIPTION	PID CGD (ppm)	ODOUR			VISUAL	SAMPLE TYPE & No.	% RECOVERY	N (Blow/15cm)	CHEMICAL ANALYSIS		DUPLICATE	DIAGRAM	DESCRIPTION
				L	M	S									
118.26 118.16		TOPSOIL : approximately 101.6 mm												CONCRETE (FLUSH MOUNT)	
0.5		SAND : light brown, moist, loose	125.4					DT1A	83%						0.5
1.0		some silt, light brown, moist	2.1					DT2A	75%						1.0
1.5		very moist	0.3					DT2B	75%						1.5
2.0			0.3					DT3A	63%		pH GSA Gr % Sa % Si % Cl %				2.0
2.13 116.13		CLAYEY SILT : grey, very moist to wet,													2.5
2.5			0.1					DT3B	42%						3.0
3.0		trace boulders, coarse sand seam @ 3.05m, wet	15.7					DT4A	100%		PHC VOC			SAND Length: 1.52 m Diam: 38.1 mm Slot: #10	3.5
3.5			0.1					DT4B	100%						4.0
4.0			0.1					DT5A	44%						4.5
4.27 113.99 4.42		SHALE : moist, grey Bedrock refusal at 4.48 m. MW Install at 3.57m.													
4.5															
WATER MARKER Depth : 3.13 m Elev. : 115.13 m Date : 8/9/2019															

Project : DATABASE_MASTER.GPJ Report : WSP_EN_WELL-ENVIRONMENTAL 8/13/2019

APPENDIX

E

LABORATORY CERTIFICATES OF ANALYSIS

**CLIENT NAME: WSP CANADA INC.
51 CONSTELLATION COURT
TORONTO, ON M9W1K4
(416) 798-0065**

ATTENTION TO: Sheema Everett

PROJECT: 191-02120-01

AGAT WORK ORDER: 19T488924

SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Supervisor

TRACE ORGANICS REVIEWED BY: Neli Popnikolova, Senior Chemist

DATE REPORTED: Jul 12, 2019

PAGES (INCLUDING COVER): 13

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.

AGAT Laboratories (V1)

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. Measurement Uncertainty is not taken into consideration when stating conformity with a specified requirement.

*Results relate only to the items tested. Results apply to samples as received.
All reportable information as specified by ISO 17025:2017 is available from AGAT Laboratories upon request*



Certificate of Analysis

AGAT WORK ORDER: 19T488924

PROJECT: 191-02120-01

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

CLIENT NAME: WSP CANADA INC.

ATTENTION TO: Sheema Everett

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - ORPs (Soil)

DATE RECEIVED: 2019-07-05

DATE REPORTED: 2019-07-12

		SAMPLE DESCRIPTION:		BH19-3 S1A	BH19-4 S3A
		SAMPLE TYPE:		Soil	Soil
		DATE SAMPLED:		2019-07-03	2019-07-03
Parameter	Unit	G / S	RDL	331010	331014
pH, 2:1 CaCl2 Extraction	pH Units		NA	7.47	7.44

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

331010-331014 pH was determined on the 0.01M CaCl2 extract obtained from 2:1 leaching procedure (2 parts extraction fluid:1 part wet soil).

Analysis performed at AGAT Toronto (unless marked by *)

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CLIENT NAME: WSP CANADA INC.

SAMPLING SITE:

ATTENTION TO: Sheema Everett

SAMPLED BY:

Particle Size by Sieve (Wet)

DATE RECEIVED: 2019-07-05

DATE REPORTED: 2019-07-12

		SAMPLE DESCRIPTION:		BH19-3 S5A	BH19-4 S3A
		SAMPLE TYPE:		Soil	Soil
		DATE SAMPLED:		2019-07-03	2019-07-03
Parameter	Unit	G / S	RDL	331013	331014
Sieve Analysis - 75 µm (retained)	%		NA	18.90	92.00
Sieve Analysis - 75 µm (passing)	%		NA	81.10	8.00
Soil Texture (Toronto)				Fine	Coarse

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

331013-331014 Value reported is the amount of sample passing through or retained on sieve after wash with water and represents proportion by weight particles smaller or larger than indicated sieve size.

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MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
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CLIENT NAME: WSP CANADA INC.

SAMPLING SITE:

ATTENTION TO: Sheema Everett

SAMPLED BY:

Soil Analysis - Texture

DATE RECEIVED: 2019-07-05

DATE REPORTED: 2019-07-12

SAMPLE DESCRIPTION: BH19-3 S5A

SAMPLE TYPE: Soil

DATE SAMPLED: 2019-07-03

Parameter	Unit	G / S	RDL	331013
Particle Size Distribution (Sand)	%		2	29
Particle Size Distribution (Silt)	%		2	35
Particle Size Distribution (Clay)	%		2	36
Soil Texture				Clay Loam

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Analysis performed at AGAT Calgary (unless marked by *)

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Certificate of Analysis

AGAT WORK ORDER: 19T488924

PROJECT: 191-02120-01

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MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
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CLIENT NAME: WSP CANADA INC.

ATTENTION TO: Sheema Everett

SAMPLING SITE:

SAMPLED BY:

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

DATE RECEIVED: 2019-07-05

DATE REPORTED: 2019-07-12

		SAMPLE DESCRIPTION:		BH19-4 S4A	QAQC
		SAMPLE TYPE:		Soil	Soil
		DATE SAMPLED:		2019-07-03	2019-07-03
Parameter	Unit	G / S	RDL	331015	331016
F1 (C6 to C10)	µg/g	55	5	8	<5
F1 (C6 to C10) minus BTEX	µg/g	55	5	8	<5
F2 (C10 to C16)	µg/g	98	10	<10	<10
F3 (C16 to C34)	µg/g	300	50	<50	<50
F4 (C34 to C50)	µg/g	2800	50	<50	<50
Gravimetric Heavy Hydrocarbons	µg/g	2800	50	NA	NA
Moisture Content	%		0.1	13.8	11.8
Surrogate	Unit	Acceptable Limits			
Terphenyl	%	60-140		110	130

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition - Soil - Residential/Parkland/Institutional Property Use - Coarse Textured Soils
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.

331015-331016 Results are based on sample dry weight.
The C6-C10 fraction is calculated using toluene response factor.
C6-C10 (F1 minus BTEX) is a calculated parameter. The calculated value is F1 minus BTEX.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of nC50.
Total C6 - C50 results are corrected for BTEX contribution.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified without the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.

Analysis performed at AGAT Toronto (unless marked by *)

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CANADA L4Z 1Y2
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CLIENT NAME: WSP CANADA INC.

ATTENTION TO: Sheema Everett

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - VOCs (Soil)

DATE RECEIVED: 2019-07-05

DATE REPORTED: 2019-07-12

Parameter	Unit	SAMPLE DESCRIPTION:		BH19-4 S4A		QAQC	
		SAMPLE TYPE:		Soil		Soil	
		DATE SAMPLED:		2019-07-03		2019-07-03	
		G / S	RDL	331015	331016	331015	331016
Dichlorodifluoromethane	ug/g	16	0.05	<0.05	<0.05		
Vinyl Chloride	ug/g	0.02	0.02	<0.02	<0.02		
Bromomethane	ug/g	0.05	0.05	<0.05	<0.05		
Trichlorofluoromethane	ug/g	4	0.05	<0.05	<0.05		
Acetone	ug/g	16	0.50	<0.50	<0.50		
Dichloroethylene, 1,1-	ug/g	0.05	0.05	<0.05	<0.05		
Methylene Chloride	ug/g	0.1	0.05	<0.05	<0.05		
Dichloroethylene, Trans- 1,2-	ug/g	0.084	0.05	<0.05	<0.05		
Methyl tert-butyl Ether	ug/g	0.75	0.05	<0.05	<0.05		
Dichloroethane, 1,1-	ug/g	3.5	0.02	<0.02	<0.02		
Methyl Ethyl Ketone	ug/g	16	0.50	<0.50	<0.50		
Dichloroethylene, Cis- 1,2-	ug/g	3.4	0.02	<0.02	<0.02		
Chloroform	ug/g	0.05	0.04	<0.04	<0.04		
Dichloroethane, 1,2-	ug/g	0.05	0.03	<0.03	<0.03		
Trichloroethane, 1,1,1-	ug/g	0.38	0.05	<0.05	<0.05		
Carbon Tetrachloride	ug/g	0.05	0.05	<0.05	<0.05		
Benzene	ug/g	0.21	0.02	<0.02	<0.02		
Dichloropropane, 1,2-	ug/g	0.05	0.03	<0.03	<0.03		
Trichloroethylene	ug/g	0.061	0.03	<0.03	<0.03		
Bromodichloromethane	ug/g	13	0.05	<0.05	<0.05		
Methyl Isobutyl Ketone	ug/g	1.7	0.50	<0.50	<0.50		
Trichloroethane, 1,1,2-	ug/g	0.05	0.04	<0.04	<0.04		
Toluene	ug/g	2.3	0.05	<0.05	<0.05		
Dibromochloromethane	ug/g	9.4	0.05	<0.05	<0.05		
Ethylene Dibromide	ug/g	0.05	0.04	<0.04	<0.04		
Tetrachloroethylene	ug/g	0.28	0.05	<0.05	<0.05		
Tetrachloroethane, 1,1,1,2-	ug/g	0.058	0.04	<0.04	<0.04		
Chlorobenzene	ug/g	2.4	0.05	<0.05	<0.05		
Ethylbenzene	ug/g	2	0.05	<0.05	<0.05		
Bromoform	ug/g	0.27	0.05	<0.05	<0.05		

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TEL (905)712-5100
FAX (905)712-5122
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CLIENT NAME: WSP CANADA INC.

ATTENTION TO: Sheema Everett

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - VOCs (Soil)

DATE RECEIVED: 2019-07-05

DATE REPORTED: 2019-07-12

		SAMPLE DESCRIPTION:		BH19-4 S4A	QAQC
		SAMPLE TYPE:		Soil	Soil
		DATE SAMPLED:		2019-07-03	2019-07-03
Parameter	Unit	G / S	RDL	331015	331016
Styrene	ug/g	0.7	0.05	<0.05	<0.05
Tetrachloroethane, 1,1,2,2-	ug/g	0.05	0.05	<0.05	<0.05
Dichlorobenzene, 1,3-	ug/g	4.8	0.05	<0.05	<0.05
Dichlorobenzene, 1,4-	ug/g	0.083	0.05	<0.05	<0.05
Dichlorobenzene, 1,2-	ug/g	3.4	0.05	<0.05	<0.05
Xylene Mixture	ug/g	3.1	0.05	<0.05	<0.05
Dichloropropene, 1,3-	µg/g	0.05	0.04	<0.04	<0.04
Hexane, n-	µg/g	2.8	0.05	<0.05	<0.05
Surrogate	Unit	Acceptable Limits			
Toluene-d8	% Recovery	50-140	105	98	
4-Bromofluorobenzene	% Recovery	50-140	117	111	

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition - Soil - Residential/Parkland/Institutional Property Use - Coarse Textured Soils
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.

331015-331016 The sample was analyzed using the high level technique. The sample was extracted using methanol, a small amount of the methanol extract was diluted in water and the purge & trap GC/MS analysis was performed. Results are based on the dry weight of the soil.
Xylenes total is a calculated parameter. The calculated value is the sum of m&p-Xylene + o-Xylene.
1,3-Dichloropropene total is a calculated parameter. The calculated value is the sum of Cis-1,3-Dichloropropene and Trans-1,3-Dichloropropene.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



Quality Assurance

CLIENT NAME: WSP CANADA INC.

PROJECT: 191-02120-01

SAMPLING SITE:

AGAT WORK ORDER: 19T488924

ATTENTION TO: Sheema Everett

SAMPLED BY:

Soil Analysis

RPT Date: Jul 12, 2019			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) - ORPs (Soil)

PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits	Recovery	Acceptable Limits	Recovery	Acceptable Limits
pH, 2:1 CaCl ₂ Extraction	330825		7.17	7.28	1.5%	NA	100%	90% 110%	NA		NA	

Comments: NA signifies Not Applicable.

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

Particle Size by Sieve (Wet)

PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits	Recovery	Acceptable Limits	Recovery	Acceptable Limits
Sieve Analysis - 75 µm (retained)	331594		58.31	55.66	4.7%	NA	100%	70% 130%	NA		NA	
Sieve Analysis - 75 µm (passing)	331594		41.69	44.34	6.2%	NA	NA		NA		NA	

Comments: NA signifies Not Applicable

Soil Analysis - Texture

PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits	Recovery	Acceptable Limits	Recovery	Acceptable Limits
Particle Size Distribution (Sand)	278874		33	33	0.0%	< 2	105%	80% 120%				
Particle Size Distribution (Silt)	278874		29	29	0.0%	< 2	93%	80% 120%				
Particle Size Distribution (Clay)	278874		38	38	0.0%	< 2	103%	80% 120%				

Comments: If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

Certified By:




Quality Assurance

CLIENT NAME: WSP CANADA INC.

PROJECT: 191-02120-01

SAMPLING SITE:

AGAT WORK ORDER: 19T488924

ATTENTION TO: Sheema Everett

SAMPLED BY:

Trace Organics Analysis

RPT Date: Jul 12, 2019			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) - VOCs (Soil)															
Dichlorodifluoromethane	330832		< 0.05	< 0.05	0.0%	< 0.05	72%	50%	140%	70%	50%	140%	77%	50%	140%
Vinyl Chloride	330832		< 0.02	< 0.02	0.0%	< 0.02	78%	50%	140%	99%	50%	140%	87%	50%	140%
Bromomethane	330832		< 0.05	< 0.05	0.0%	< 0.05	111%	50%	140%	101%	50%	140%	77%	50%	140%
Trichlorofluoromethane	330832		< 0.05	< 0.05	0.0%	< 0.05	74%	50%	140%	78%	50%	140%	88%	50%	140%
Acetone	330832		< 0.50	< 0.50	0.0%	< 0.50	121%	50%	140%	82%	50%	140%	81%	50%	140%
Dichloroethylene, 1,1-	330832		< 0.05	< 0.05	0.0%	< 0.05	77%	50%	140%	85%	60%	130%	90%	50%	140%
Methylene Chloride	330832		< 0.05	< 0.05	0.0%	< 0.05	84%	50%	140%	112%	60%	130%	71%	50%	140%
Dichloroethylene, Trans- 1,2-	330832		< 0.05	< 0.05	0.0%	< 0.05	106%	50%	140%	74%	60%	130%	91%	50%	140%
Methyl tert-butyl Ether	330832		< 0.05	< 0.05	0.0%	< 0.05	88%	50%	140%	83%	60%	130%	75%	50%	140%
Dichloroethane, 1,1-	330832		< 0.02	< 0.02	0.0%	< 0.02	116%	50%	140%	101%	60%	130%	98%	50%	140%
Methyl Ethyl Ketone	330832		< 0.50	< 0.50	0.0%	< 0.50	102%	50%	140%	82%	50%	140%	81%	50%	140%
Dichloroethylene, Cis- 1,2-	330832		< 0.02	< 0.02	0.0%	< 0.02	124%	50%	140%	92%	60%	130%	82%	50%	140%
Chloroform	330832		< 0.04	< 0.04	0.0%	< 0.04	88%	50%	140%	77%	60%	130%	74%	50%	140%
Dichloroethane, 1,2-	330832		< 0.03	< 0.03	0.0%	< 0.03	87%	50%	140%	79%	60%	130%	97%	50%	140%
Trichloroethane, 1,1,1-	330832		< 0.05	< 0.05	0.0%	< 0.05	80%	50%	140%	89%	60%	130%	93%	50%	140%
Carbon Tetrachloride	330832		< 0.05	< 0.05	0.0%	< 0.05	73%	50%	140%	88%	60%	130%	110%	50%	140%
Benzene	330832		< 0.02	< 0.02	0.0%	< 0.02	97%	50%	140%	90%	60%	130%	92%	50%	140%
Dichloropropane, 1,2-	330832		< 0.03	< 0.03	0.0%	< 0.03	90%	50%	140%	91%	60%	130%	82%	50%	140%
Trichloroethylene	330832		< 0.03	< 0.03	0.0%	< 0.03	87%	50%	140%	88%	60%	130%	94%	50%	140%
Bromodichloromethane	330832		< 0.05	< 0.05	0.0%	< 0.05	82%	50%	140%	83%	60%	130%	79%	50%	140%
Methyl Isobutyl Ketone	330832		< 0.50	< 0.50	0.0%	< 0.50	71%	50%	140%	84%	50%	140%	84%	50%	140%
Trichloroethane, 1,1,2-	330832		< 0.04	< 0.04	0.0%	< 0.04	88%	50%	140%	92%	60%	130%	84%	50%	140%
Toluene	330832		< 0.05	< 0.05	0.0%	< 0.05	84%	50%	140%	89%	60%	130%	110%	50%	140%
Dibromochloromethane	330832		< 0.05	< 0.05	0.0%	< 0.05	116%	50%	140%	106%	60%	130%	98%	50%	140%
Ethylene Dibromide	330832		< 0.04	< 0.04	0.0%	< 0.04	91%	50%	140%	85%	60%	130%	107%	50%	140%
Tetrachloroethylene	330832		< 0.05	< 0.05	0.0%	< 0.05	99%	50%	140%	88%	60%	130%	99%	50%	140%
Tetrachloroethane, 1,1,1,2-	330832		< 0.04	< 0.04	0.0%	< 0.04	112%	50%	140%	124%	60%	130%	115%	50%	140%
Chlorobenzene	330832		< 0.05	< 0.05	0.0%	< 0.05	109%	50%	140%	98%	60%	130%	85%	50%	140%
Ethylbenzene	330832		< 0.05	< 0.05	0.0%	< 0.05	79%	50%	140%	73%	60%	130%	87%	50%	140%
Bromoform	330832		< 0.05	< 0.05	0.0%	< 0.05	105%	50%	140%	116%	60%	130%	75%	50%	140%
Styrene	330832		< 0.05	< 0.05	0.0%	< 0.05	88%	50%	140%	89%	60%	130%	94%	50%	140%
Tetrachloroethane, 1,1,2,2-	330832		< 0.05	< 0.05	0.0%	< 0.05	96%	50%	140%	79%	60%	130%	111%	50%	140%
Dichlorobenzene, 1,3-	330832		< 0.05	< 0.05	0.0%	< 0.05	120%	50%	140%	121%	60%	130%	88%	50%	140%
Dichlorobenzene, 1,4-	330832		< 0.05	< 0.05	0.0%	< 0.05	104%	50%	140%	111%	60%	130%	72%	50%	140%
Dichlorobenzene, 1,2-	330832		< 0.05	< 0.05	0.0%	< 0.05	100%	50%	140%	125%	60%	130%	73%	50%	140%
Dichloropropene, 1,3-	330832		< 0.04	< 0.04	0.0%	< 0.04	81%	50%	140%	88%	60%	130%	86%	50%	140%
Hexane, n-	330832		< 0.05	< 0.05	0.0%	< 0.05	85%	50%	140%	96%	60%	130%	82%	50%	140%

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

AGAT QUALITY ASSURANCE REPORT (V1)

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Results relate only to the items tested. Results apply to samples as received.

Quality Assurance

CLIENT NAME: WSP CANADA INC.

PROJECT: 191-02120-01

SAMPLING SITE:

AGAT WORK ORDER: 19T488924

ATTENTION TO: Sheema Everett

SAMPLED BY:

Trace Organics Analysis (Continued)

RPT Date: Jul 12, 2019			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
F1 (C6 to C10)	326909		< 5	< 5	NA	< 5	88%	60%	130%	90%	85%	115%	86%	70%	130%
F2 (C10 to C16)	317733		< 10	< 10	NA	< 10	100%	60%	130%	95%	80%	120%	78%	70%	130%
F3 (C16 to C34)	317733		< 50	< 50	NA	< 50	102%	60%	130%	106%	80%	120%	80%	70%	130%
F4 (C34 to C50)	317733		< 50	< 50	NA	< 50	97%	60%	130%	114%	80%	120%	85%	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:



Method Summary

CLIENT NAME: WSP CANADA INC.

PROJECT: 191-02120-01

SAMPLING SITE:

AGAT WORK ORDER: 19T488924

ATTENTION TO: Sheema Everett

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
pH, 2:1 CaCl ₂ Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	pH METER
Sieve Analysis - 75 µm (retained)	INOR-93-6065	ASTM D1140	SIEVE
Sieve Analysis - 75 µm (passing)	INOR-93-6065	ASTM D1140	SIEVE
Particle Size Distribution (Sand)	SOIL 0520; SOIL 0110; SOIL 0120	JONES 2001	HYDROMETER
Particle Size Distribution (Silt)	SOIL 0520; SOIL 0110; SOIL 0120	JONES 2001	HYDROMETER
Particle Size Distribution (Clay)	SOIL 0520; SOIL 0110; SOIL 0120	JONES 2001	HYDROMETER

Method Summary

CLIENT NAME: WSP CANADA INC.
PROJECT: 191-02120-01
SAMPLING SITE:
AGAT WORK ORDER: 19T488924
ATTENTION TO: Sheema Everett
SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
F1 (C6 to C10)	VOL-91-5009	CCME Tier 1 Method, SW846 5035	P&T GC/FID
F1 (C6 to C10) minus BTEX	VOL-91-5009	CCME Tier 1 Method, SW846 5035	P&T GC/FID
F2 (C10 to C16)	VOL-91-5009	CCME Tier 1 Method	GC/FID
F3 (C16 to C34)	VOL-91-5009	CCME Tier 1 Method	GC/FID
F4 (C34 to C50)	VOL-91-5009	CCME Tier 1 Method	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	CCME Tier 1 Method	GC/FID
Dichlorodifluoromethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Vinyl Chloride	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Bromomethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Trichlorofluoromethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Acetone	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Dichloroethylene, 1,1-	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Methylene Chloride	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Dichloroethylene, Trans- 1,2-	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Methyl tert-butyl Ether	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Dichloroethane, 1,1-	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Methyl Ethyl Ketone	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Dichloroethylene, Cis- 1,2-	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Chloroform	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Dichloroethane, 1,2-	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Trichloroethane, 1,1,1-	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Carbon Tetrachloride	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Benzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Dichloropropane, 1,2-	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Trichloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Bromodichloromethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Methyl Isobutyl Ketone	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Trichloroethane, 1,1,2-	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Toluene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Dibromochloromethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Ethylene Dibromide	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Tetrachloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Tetrachloroethane, 1,1,1,2-	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Chlorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Ethylbenzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Bromoform	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Styrene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Tetrachloroethane, 1,1,2,2-	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Dichlorobenzene, 1,3-	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Dichlorobenzene, 1,4-	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Dichlorobenzene, 1,2-	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Xylene Mixture	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Dichloropropene, 1,3-	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Hexane, n-	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Toluene-d8	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
4-Bromofluorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS

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
Contact: Sheema Everett; Lindsay Levesque
Address: 51 constellation court
Toronto, ON, M9W 1K4
Phone: 647-730-7071 Fax: _____
Reports to be sent to:
1. Email: lhasheema.everett@wsp.com
2. Email: lindsay.levesque@wsp.com

Project Information:

Project: 191-02120-01
Site Location: 3150 Hurontario Street
Sampled By: L. Everett
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: WSP - Accounts payable
Contact: _____
Address: _____
Email: _____

Regulatory Requirements:

(Please check all applicable boxes)

☒ Regulation 153/04

Table 3
Indicate One
☒ 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

Sample Matrix Legend

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

Field Filtered - Metals, Hg, CrVI

0. 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 ☐ NH₃ ☐ TKN
☐ NO₃ ☐ NO₂ ☐ NO₃+NO₂

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

Grain size (150µm sieve) / Hydromed

Grain size

Potentially Hazardous or High Concentration (Y/N)

Laboratory Use Only

Work Order #: 19T488924
Cooler Quantity: 10 large
Arrival Temperatures: 5.0 4.9 5.0
Custody Seal Intact: ☐ Yes ☐ No ☐ N/A
Notes: Ice

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

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Y / N	Metals and Inorganics	Full Metals Scan	Regulation/Custom Metals	Nutrients	Volatiles	PHCs F1 - F4	ABNS	PAHs	PCBs	Organochlorine Pesticides	TCLP	Sewer Use	Potentially Hazardous or High Concentration (Y/N)
BH19-3 S1A	2019/07/03	A.M.	1	Soil			<input type="checkbox"/> All Metals <input type="checkbox"/> Hydride	<input checked="" type="checkbox"/> ORPs: <input type="checkbox"/> <input type="checkbox"/> Cr6+ <input type="checkbox"/> <input type="checkbox"/> pH <input type="checkbox"/>											
BH19-3 S5A			1																
BH19-4 S3A			1																
BH19-4 S4A			2		limited sample														
QAC			2																

Samples Relinquished By (Print Name and Sign): <u>Lhasheema Everett</u>	Date: <u>2019/07/05</u>	Time: <u>2:17</u>	Samples Received By (Print Name and Sign): <u>Jorge A. Diaz</u>	Date: <u>July 05/19</u>	Time: <u>2:20pm</u>	Page <u>1</u> of <u>1</u>
Samples Relinquished By (Print Name and Sign):	Date:	Time:	Samples Received By (Print Name and Sign):	Date:	Time:	Nº: T 090998
Samples Relinquished By (Print Name and Sign):	Date:	Time:	Samples Received By (Print Name and Sign):	Date:	Time:	

**CLIENT NAME: WSP CANADA INC.
51 CONSTELLATION COURT
TORONTO, ON M9W1K4
(416) 798-0065**

ATTENTION TO: Lindsay Levesque

PROJECT: 191-02120-01

AGAT WORK ORDER: 19T489576

TRACE ORGANICS REVIEWED BY: Neli Popnikolova, Senior Chemist

DATE REPORTED: Jul 12, 2019

PAGES (INCLUDING COVER): 8

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.

Certificate of Analysis

AGAT WORK ORDER: 19T489576

PROJECT: 191-02120-01

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

CLIENT NAME: WSP CANADA INC.

SAMPLING SITE: 3105 Hurontario Street

ATTENTION TO: Lindsay Levesque

SAMPLED BY: L. Everett

O. Reg. 153(511) - PHCs F1 - F4 (-BTEX) (Water)

DATE RECEIVED: 2019-07-08

DATE REPORTED: 2019-07-12

		SAMPLE DESCRIPTION:		BH2
		SAMPLE TYPE:		Water
		DATE SAMPLED:		2019-07-08
Parameter	Unit	G / S	RDL	331832
F1 (C6 - C10)	µg/L	750	25	<25
F1 (C6 to C10) minus BTEX	µg/L	750	25	<25
F2 (C10 to C16)	µg/L	150	100	<100
F3 (C16 to C34)	µg/L	500	100	<100
F4 (C34 to C50)	µg/L	500	100	<100
Gravimetric Heavy Hydrocarbons	µg/L	500	500	NA
Surrogate	Unit	Acceptable Limits		
Terphenyl	%	60-140	96	

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition - Non-Potable Ground Water - All Types of Property Uses - Coarse Textured Soils
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.

331832 The C6-C10 fraction is calculated using Toluene response factor.
C6-C10 (F1 minus BTEX) is a calculated parameter. The calculated value is F1 minus BTEX.
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 indicated that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of n-C50.
Total C6-C50 results are corrected for BTEX contribution.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
n-C6 and n-C10 response factors are within 30% of Toluene response factor.
n-C10, n-C16 and n-C34 response factors are within 10% of their average.
C50 response factor is within 70% of n-C10 + n-C16 n-C34 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.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:


Certificate of Analysis

AGAT WORK ORDER: 19T489576

PROJECT: 191-02120-01

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CLIENT NAME: WSP CANADA INC.

SAMPLING SITE: 3105 Hurontario Street

ATTENTION TO: Lindsay Levesque

SAMPLED BY: L. Everett

O. Reg. 153(511) - VOCs (Water)

DATE RECEIVED: 2019-07-08

DATE REPORTED: 2019-07-12

Parameter	Unit	SAMPLE DESCRIPTION:		BH2	QAQC	Trip Blank
		SAMPLE TYPE:		Water	Water	Water
		DATE SAMPLED:		2019-07-08	2019-07-08	2019-07-08
		G / S	RDL	331832	331833	331834
Dichlorodifluoromethane	µg/L	4400	0.20	<0.20	<0.20	<0.20
Vinyl Chloride	µg/L	0.5	0.17	<0.17	<0.17	<0.17
Bromomethane	µg/L	5.6	0.20	<0.20	<0.20	<0.20
Trichlorofluoromethane	µg/L	2500	0.40	<0.40	<0.40	<0.40
Acetone	µg/L	130000	1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	µg/L	1.6	0.30	<0.30	<0.30	<0.30
Methylene Chloride	µg/L	610	0.30	<0.30	<0.30	<0.30
trans- 1,2-Dichloroethylene	µg/L	1.6	0.20	<0.20	<0.20	<0.20
Methyl tert-butyl ether	µg/L	190	0.20	<0.20	<0.20	<0.20
1,1-Dichloroethane	µg/L	320	0.30	<0.30	<0.30	<0.30
Methyl Ethyl Ketone	µg/L	470000	1.0	<1.0	<1.0	<1.0
cis- 1,2-Dichloroethylene	µg/L	1.6	0.20	<0.20	<0.20	<0.20
Chloroform	µg/L	2.4	0.20	<0.20	<0.20	<0.20
1,2-Dichloroethane	µg/L	1.6	0.20	<0.20	<0.20	<0.20
1,1,1-Trichloroethane	µg/L	640	0.30	<0.30	<0.30	<0.30
Carbon Tetrachloride	µg/L	0.79	0.20	<0.20	<0.20	<0.20
Benzene	µg/L	44	0.20	<0.20	<0.20	<0.20
1,2-Dichloropropane	µg/L	16	0.20	<0.20	<0.20	<0.20
Trichloroethylene	µg/L	1.6	0.20	<0.20	<0.20	<0.20
Bromodichloromethane	µg/L	85000	0.20	<0.20	<0.20	<0.20
Methyl Isobutyl Ketone	µg/L	140000	1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	µg/L	4.7	0.20	<0.20	<0.20	<0.20
Toluene	µg/L	18000	0.20	<0.20	<0.20	<0.20
Dibromochloromethane	µg/L	82000	0.10	<0.10	<0.10	<0.10
Ethylene Dibromide	µg/L	0.25	0.10	<0.10	<0.10	<0.10
Tetrachloroethylene	µg/L	1.6	0.20	<0.20	<0.20	<0.20
1,1,1,2-Tetrachloroethane	µg/L	3.3	0.10	<0.10	<0.10	<0.10
Chlorobenzene	µg/L	630	0.10	<0.10	<0.10	<0.10
Ethylbenzene	µg/L	2300	0.10	<0.10	<0.10	<0.10
m & p-Xylene	µg/L		0.20	<0.20	<0.20	<0.20

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 19T489576

PROJECT: 191-02120-01

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

CLIENT NAME: WSP CANADA INC.

SAMPLING SITE: 3105 Hurontario Street

ATTENTION TO: Lindsay Levesque

SAMPLED BY: L. Everett

O. Reg. 153(511) - VOCs (Water)

DATE RECEIVED: 2019-07-08

DATE REPORTED: 2019-07-12

		SAMPLE DESCRIPTION:		BH2	QAQC	Trip Blank
		SAMPLE TYPE:		Water	Water	Water
		DATE SAMPLED:		2019-07-08	2019-07-08	2019-07-08
Parameter	Unit	G / S	RDL	331832	331833	331834
Bromoform	µg/L	380	0.10	<0.10	<0.10	<0.10
Styrene	µg/L	1300	0.10	<0.10	<0.10	<0.10
1,1,2,2-Tetrachloroethane	µg/L	3.2	0.10	<0.10	<0.10	<0.10
o-Xylene	µg/L		0.10	<0.10	<0.10	<0.10
1,3-Dichlorobenzene	µg/L	9600	0.10	<0.10	<0.10	<0.10
1,4-Dichlorobenzene	µg/L	8	0.10	<0.10	<0.10	<0.10
1,2-Dichlorobenzene	µg/L	4600	0.10	<0.10	<0.10	<0.10
1,3-Dichloropropene	µg/L	5.2	0.30	<0.30	<0.30	<0.30
Xylene Mixture	µg/L	4200	0.20	<0.20	<0.20	<0.20
n-Hexane	µg/L	51	0.20	<0.20	<0.20	<0.20
Surrogate	Unit	Acceptable Limits				
Toluene-d8	% Recovery	50-140		82	81	107
4-Bromofluorobenzene	% Recovery	50-140		72	74	91

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition - Non-Potable Ground Water - All Types of Property Uses - Coarse Textured Soils
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.

331832-331834 Xylenes total is a calculated parameter. The calculated value is the sum of m&p-Xylene and o-Xylene.
1,3-Dichloropropene total is a calculated parameter. The calculated value is the sum of Cis-1,3-Dichloropropene and Trans-1,3-Dichloropropene.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



Quality Assurance

CLIENT NAME: WSP CANADA INC.

PROJECT: 191-02120-01

SAMPLING SITE: 3105 Hurontario Street

AGAT WORK ORDER: 19T489576

ATTENTION TO: Lindsay Levesque

SAMPLED BY: L. Everett

Trace Organics Analysis

RPT Date: Jul 12, 2019			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) - VOCs (Water)															
Dichlorodifluoromethane	325499		< 0.20	< 0.20	NA	< 0.20	80%	50%	140%	118%	50%	140%	78%	50%	140%
Vinyl Chloride	325499		< 0.17	< 0.17	NA	< 0.17	92%	50%	140%	105%	50%	140%	82%	50%	140%
Bromomethane	325499		< 0.20	< 0.20	NA	< 0.20	84%	50%	140%	87%	50%	140%	80%	50%	140%
Trichlorofluoromethane	325499		< 0.40	< 0.40	NA	< 0.40	80%	50%	140%	121%	50%	140%	79%	50%	140%
Acetone	325499		< 1.0	< 1.0	NA	< 1.0	113%	50%	140%	119%	50%	140%	118%	50%	140%
1,1-Dichloroethylene	325499		< 0.30	< 0.30	NA	< 0.30	75%	50%	140%	79%	60%	130%	79%	50%	140%
Methylene Chloride	325499		< 0.30	< 0.30	NA	< 0.30	94%	50%	140%	114%	60%	130%	100%	50%	140%
trans- 1,2-Dichloroethylene	325499		< 0.20	< 0.20	NA	< 0.20	92%	50%	140%	87%	60%	130%	78%	50%	140%
Methyl tert-butyl ether	325499		< 0.20	< 0.20	NA	< 0.20	86%	50%	140%	108%	60%	130%	109%	50%	140%
1,1-Dichloroethane	325499		< 0.30	< 0.30	NA	< 0.30	112%	50%	140%	88%	60%	130%	88%	50%	140%
Methyl Ethyl Ketone	325499		< 1.0	< 1.0	NA	< 1.0	70%	50%	140%	95%	50%	140%	91%	50%	140%
cis- 1,2-Dichloroethylene	325499		< 0.20	< 0.20	NA	< 0.20	105%	50%	140%	80%	60%	130%	100%	50%	140%
Chloroform	325499		< 0.20	< 0.20	NA	< 0.20	119%	50%	140%	86%	60%	130%	101%	50%	140%
1,2-Dichloroethane	325499		< 0.20	< 0.20	NA	< 0.20	116%	50%	140%	85%	60%	130%	96%	50%	140%
1,1,1-Trichloroethane	325499		< 0.30	< 0.30	NA	< 0.30	77%	50%	140%	75%	60%	130%	87%	50%	140%
Carbon Tetrachloride	325499		< 0.20	< 0.20	NA	< 0.20	73%	50%	140%	81%	60%	130%	79%	50%	140%
Benzene	325499		< 0.20	< 0.20	NA	< 0.20	120%	50%	140%	75%	60%	130%	96%	50%	140%
1,2-Dichloropropane	325499		< 0.20	< 0.20	NA	< 0.20	116%	50%	140%	79%	60%	130%	100%	50%	140%
Trichloroethylene	325499		< 0.20	< 0.20	NA	< 0.20	97%	50%	140%	78%	60%	130%	96%	50%	140%
Bromodichloromethane	325499		< 0.20	< 0.20	NA	< 0.20	109%	50%	140%	81%	60%	130%	93%	50%	140%
Methyl Isobutyl Ketone	325499		< 1.0	< 1.0	NA	< 1.0	104%	50%	140%	89%	50%	140%	102%	50%	140%
1,1,2-Trichloroethane	325499		< 0.20	< 0.20	NA	< 0.20	108%	50%	140%	111%	60%	130%	92%	50%	140%
Toluene	325499		< 0.20	< 0.20	NA	< 0.20	98%	50%	140%	118%	60%	130%	109%	50%	140%
Dibromochloromethane	325499		< 0.10	< 0.10	NA	< 0.10	101%	50%	140%	114%	60%	130%	111%	50%	140%
Ethylene Dibromide	325499		< 0.10	< 0.10	NA	< 0.10	101%	50%	140%	105%	60%	130%	118%	50%	140%
Tetrachloroethylene	325499		< 0.20	< 0.20	NA	< 0.20	98%	50%	140%	106%	60%	130%	109%	50%	140%
1,1,1,2-Tetrachloroethane	325499		< 0.10	< 0.10	NA	< 0.10	93%	50%	140%	114%	60%	130%	119%	50%	140%
Chlorobenzene	325499		< 0.10	< 0.10	NA	< 0.10	99%	50%	140%	112%	60%	130%	96%	50%	140%
Ethylbenzene	325499		< 0.10	< 0.10	NA	< 0.10	109%	50%	140%	105%	60%	130%	114%	50%	140%
m & p-Xylene	325499		< 0.20	< 0.20	NA	< 0.20	106%	50%	140%	103%	60%	130%	113%	50%	140%
Bromoform	325499		< 0.10	< 0.10	NA	< 0.10	114%	50%	140%	108%	60%	130%	119%	50%	140%
Styrene	325499		< 0.10	< 0.10	NA	< 0.10	84%	50%	140%	105%	60%	130%	111%	50%	140%
1,1,2,2-Tetrachloroethane	325499		< 0.10	< 0.10	NA	< 0.10	91%	50%	140%	106%	60%	130%	93%	50%	140%
o-Xylene	325499		< 0.10	< 0.10	NA	< 0.10	119%	50%	140%	107%	60%	130%	117%	50%	140%
1,3-Dichlorobenzene	325499		< 0.10	< 0.10	NA	< 0.10	97%	50%	140%	118%	60%	130%	108%	50%	140%
1,4-Dichlorobenzene	325499		< 0.10	< 0.10	NA	< 0.10	102%	50%	140%	115%	60%	130%	102%	50%	140%
1,2-Dichlorobenzene	325499		< 0.10	< 0.10	NA	< 0.10	102%	50%	140%	115%	60%	130%	102%	50%	140%
1,3-Dichloropropene	325499		< 0.30	< 0.30	NA	< 0.30	83%	50%	140%	84%	60%	130%	95%	50%	140%
n-Hexane	325499		< 0.20	< 0.20	NA	< 0.20	89%	50%	140%	99%	60%	130%	83%	50%	140%

AGAT QUALITY ASSURANCE REPORT (V1)

Page 5 of 8

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. RPDs calculated using raw data. The RPD may not be reflective of duplicate values shown, due to rounding of final results.

Results relate only to the items tested. Results apply to samples as received.

Quality Assurance

CLIENT NAME: WSP CANADA INC.

PROJECT: 191-02120-01

SAMPLING SITE: 3105 Hurontario Street

AGAT WORK ORDER: 19T489576

ATTENTION TO: Lindsay Levesque

SAMPLED BY: L. Everett

Trace Organics Analysis (Continued)

RPT Date: Jul 12, 2019			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) - PHCs F1 - F4 (-BTEX) (Water)

F1 (C6 - C10)	330833		< 25	< 25	NA	< 25	93%	60%	140%	85%	60%	140%	91%	60%	140%
F2 (C10 to C16)		TW	< 100	< 100	NA	< 100	105%	60%	140%	111%	60%	140%	104%	60%	140%
F3 (C16 to C34)		TW	< 100	< 100	NA	< 100	105%	60%	140%	109%	60%	140%	118%	60%	140%
F4 (C34 to C50)		TW	< 100	< 100	NA	< 100	87%	60%	140%	114%	60%	140%	96%	60%	140%

Comments: Tap water analysis has been performed as QC sample testing for duplicate and matrix spike due to insufficient sample volume.

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:



Method Summary

CLIENT NAME: WSP CANADA INC.

PROJECT: 191-02120-01

SAMPLING SITE: 3105 Hurontario Street

AGAT WORK ORDER: 19T489576

ATTENTION TO: Lindsay Levesque

SAMPLED BY: L. Everett

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
F1 (C6 - C10)	VOL-91- 5010	MOE PHC E3421	(P&T)GC/FID
F1 (C6 to C10) minus BTEX	VOL-91-5010	MOE PHC E3421	(P&T)GC/FID
F2 (C10 to C16)	VOL-91-5010	MOE PHC E3421	GC / FID
F3 (C16 to C34)	VOL-91-5010	MOE PHC E3421	GC / FID
F4 (C34 to C50)	VOL-91-5010	MOE PHC E3421	GC / FID
Gravimetric Heavy Hydrocarbons	VOL-91-5010	MOE PHC E3421	BALANCE
Terphenyl	VOL-91-5010		GC/FID
Dichlorodifluoromethane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Vinyl Chloride	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Bromomethane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Trichlorofluoromethane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Acetone	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,1-Dichloroethylene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Methylene Chloride	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
trans- 1,2-Dichloroethylene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Methyl tert-butyl ether	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,1-Dichloroethane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Methyl Ethyl Ketone	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
cis- 1,2-Dichloroethylene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Chloroform	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,2-Dichloroethane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,1,1-Trichloroethane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Carbon Tetrachloride	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Benzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,2-Dichloropropane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Trichloroethylene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Bromodichloromethane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Methyl Isobutyl Ketone	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,1,2-Trichloroethane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Toluene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Dibromochloromethane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Ethylene Dibromide	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Tetrachloroethylene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,1,1,2-Tetrachloroethane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Chlorobenzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Ethylbenzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
m & p-Xylene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Bromoform	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Styrene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,1,2,2-Tetrachloroethane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
o-Xylene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,3-Dichlorobenzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,2-Dichlorobenzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,3-Dichloropropene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Xylene Mixture	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
n-Hexane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Toluene-d8	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
4-Bromofluorobenzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS

**CLIENT NAME: WSP CANADA INC.
51 CONSTELLATION COURT
TORONTO, ON M9W1K4
(416) 798-0065**

ATTENTION TO: Sheema Everett

PROJECT: 191-02120-01

AGAT WORK ORDER: 19T493233

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

DATE REPORTED: Aug 30, 2019

PAGES (INCLUDING COVER): 9

VERSION*: 1

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

***NOTES**

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



Certificate of Analysis

AGAT WORK ORDER: 19T493233

PROJECT: 191-02120-01

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

CLIENT NAME: WSP CANADA INC.

ATTENTION TO: Sheema Everett

SAMPLING SITE:

SAMPLED BY:

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

DATE RECEIVED: 2019-07-16

DATE REPORTED: 2019-08-30

		SAMPLE DESCRIPTION:		BH19-3	QAQC2
		SAMPLE TYPE:		Water	Water
		DATE SAMPLED:		2019-07-16	2019-07-16
Parameter	Unit	G / S	RDL	355324	355338
Benzene	µg/L	5.0	0.20	<0.20	<0.20
Toluene	µg/L	24	0.20	<0.20	<0.20
Ethylbenzene	µg/L	2.4	0.10	<0.10	<0.10
Xylene Mixture	µg/L	300	0.20	<0.20	<0.20
F1 (C6 - C10)	µg/L	750	25	<25	<25
F1 (C6 to C10) minus BTEX	µg/L	750	25	<25	<25
F2 (C10 to C16)	µg/L	150	100	<100	<100
F3 (C16 to C34)	µg/L	500	100	<100	<100
F4 (C34 to C50)	µg/L	500	100	<100	<100
Gravimetric Heavy Hydrocarbons	µg/L	500	500	NA	NA
Surrogate	Unit	Acceptable Limits			
Terphenyl	%	60-140		81	95

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Potable Ground Water - All Types of Property Uses - Coarse Textured Soils

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.

355324-355338

The C6-C10 fraction is calculated using Toluene response factor.

Xylenes total is a calculated parameter. The calculated value is the sum of m&p-Xylene and o-Xylene.

C6-C10 (F1 minus BTEX) is a calculated parameter. The calculated value is F1 minus BTEX.

The 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 indicated that hydrocarbons >C50 are present.

The chromatogram has returned to baseline by the retention time of n-C50.

Total C6-C50 results are corrected for BTEX contribution.

This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.

nC6 and nC10 response factors are within 30% of Toluene response factor.

nC10, nC16 and nC34 response factors are within 10% of their average.

C50 response factor is within 70% of nC10 + nC16 nC34 average.

Linearity is within 15%.

Extraction and holding times were met for this sample.

Fractions 1-4 are quantified with the contribution of PAHs. Under Ontario Regulation 153/04, results are considered valid without determining the PAH contribution if not requested by the client.

NA = Not Applicable

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 19T493233

PROJECT: 191-02120-01

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

CLIENT NAME: WSP CANADA INC.

ATTENTION TO: Sheema Everett

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - VOCs (Water)

DATE RECEIVED: 2019-07-16

DATE REPORTED: 2019-08-30

Parameter	Unit	SAMPLE DESCRIPTION:		BH19-4	QAQC1
		SAMPLE TYPE:		Water	Water
		DATE SAMPLED:		2019-07-16	2019-07-16
		G / S	RDL	355339	355341
Dichlorodifluoromethane	µg/L	590	0.80	<0.80	<0.80
Vinyl Chloride	µg/L	0.5	0.50	<0.50	<0.50
Bromomethane	µg/L	0.89	0.80	<0.80	<0.80
Trichlorofluoromethane	µg/L	150	1.60	<1.60	<1.60
Acetone	µg/L	2700	4.0	<4.0	<4.0
1,1-Dichloroethylene	µg/L	1.6	1.20	<1.20	<1.20
Methylene Chloride	µg/L	50	1.20	<1.20	<1.20
trans- 1,2-Dichloroethylene	µg/L	1.6	0.80	<0.80	<0.80
Methyl tert-butyl ether	µg/L	15	0.80	<0.80	<0.80
1,1-Dichloroethane	µg/L	5	1.20	<1.20	<1.20
Methyl Ethyl Ketone	µg/L	1800	4.0	<4.0	<4.0
cis- 1,2-Dichloroethylene	µg/L	1.6	0.80	<0.80	<0.80
Chloroform	µg/L	2.4	0.80	<0.80	<0.80
1,2-Dichloroethane	µg/L	1.6	0.80	<0.80	<0.80
1,1,1-Trichloroethane	µg/L	200	1.20	<1.20	<1.20
Carbon Tetrachloride	µg/L	0.79	0.79	<0.79	<0.79
Benzene	µg/L	5.0	0.80	<0.80	<0.80
1,2-Dichloropropane	µg/L	5	0.80	<0.80	<0.80
Trichloroethylene	µg/L	1.6	0.80	<0.80	<0.80
Bromodichloromethane	µg/L	16	0.80	<0.80	<0.80
Methyl Isobutyl Ketone	µg/L	640	4.0	<4.0	<4.0
1,1,2-Trichloroethane	µg/L	4.7	0.80	<0.80	<0.80
Toluene	µg/L	24	0.80	<0.80	<0.80
Dibromochloromethane	µg/L	25	0.40	<0.40	<0.40
Ethylene Dibromide	µg/L	0.2	0.20	<0.20	<0.20
Tetrachloroethylene	µg/L	1.6	0.80	<0.80	<0.80
1,1,1,2-Tetrachloroethane	µg/L	1.1	0.40	<0.40	<0.40
Chlorobenzene	µg/L	30	0.40	<0.40	<0.40
Ethylbenzene	µg/L	2.4	0.40	<0.40	<0.40
m & p-Xylene	µg/L		0.80	<0.80	<0.80

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 19T493233

PROJECT: 191-02120-01

5835 COOPERS AVENUE
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TEL (905)712-5100
FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: WSP CANADA INC.

ATTENTION TO: Sheema Everett

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - VOCs (Water)

DATE RECEIVED: 2019-07-16

DATE REPORTED: 2019-08-30

		SAMPLE DESCRIPTION:		BH19-4	QAQC1
		SAMPLE TYPE:		Water	Water
		DATE SAMPLED:		2019-07-16	2019-07-16
Parameter	Unit	G / S	RDL	355339	355341
Bromoform	µg/L	25	0.40	<0.40	<0.40
Styrene	µg/L	5.4	0.40	<0.40	<0.40
1,1,2,2-Tetrachloroethane	µg/L	1	0.40	<0.40	<0.40
o-Xylene	µg/L		0.40	<0.40	<0.40
1,3-Dichlorobenzene	µg/L	59	0.40	<0.40	<0.40
1,4-Dichlorobenzene	µg/L	1	0.40	<0.40	<0.40
1,2-Dichlorobenzene	µg/L	3	0.40	<0.40	<0.40
1,3-Dichloropropene	µg/L	0.5	0.50	<0.50	<0.50
Xylene Mixture	µg/L	300	0.80	<0.80	<0.80
n-Hexane	µg/L	51	0.80	<0.80	<0.80
Surrogate	Unit	Acceptable Limits			
Toluene-d8	% Recovery	50-140		106	103
4-Bromofluorobenzene	% Recovery	50-140		93	88

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Potable Ground Water - All Types of Property Uses - Coarse Textured Soils
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.

355339 Dilution factor=4
The sample was diluted because it was foamy. The reporting detection limit has been corrected for the dilution factor used.
Xylenes total is a calculated parameter. The calculated value is the sum of m&p-Xylene and o-Xylene.
1,3-Dichloropropene total is a calculated parameter. The calculated value is the sum of Cis-1,3-Dichloropropene and Trans-1,3-Dichloropropene.

355341 Client provided only one vial for VOC analysis. Prescreen and analysis was performed using the same vial that can lead to loss of volatiles from the sample and subsequent erroneously low results.
Dilution factor=4
The sample was diluted because it was foamy. The reporting detection limit has been corrected for the dilution factor used.
Xylenes total is a calculated parameter. The calculated value is the sum of m&p-Xylene and o-Xylene.
1,3-Dichloropropene total is a calculated parameter. The calculated value is the sum of Cis-1,3-Dichloropropene and Trans-1,3-Dichloropropene.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

Quality Assurance

CLIENT NAME: WSP CANADA INC.

PROJECT: 191-02120-01

SAMPLING SITE:

AGAT WORK ORDER: 19T493233

ATTENTION TO: Sheema Everett

SAMPLED BY:

Trace Organics Analysis

RPT Date: Aug 30, 2019			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) - PHCs F1 - F4 (Water)

Benzene	356778		< 0.20	< 0.20	NA	< 0.20	109%	50%	140%	103%	60%	130%	96%	50%	140%
Toluene	356778		< 0.20	< 0.20	NA	< 0.20	109%	50%	140%	105%	60%	130%	95%	50%	140%
Ethylbenzene	356778		< 0.10	< 0.10	NA	< 0.10	97%	50%	140%	88%	60%	130%	92%	50%	140%
Xylene Mixture	356778		< 0.20	< 0.20	NA	< 0.20	95%	50%	140%	94%	60%	130%	98%	50%	140%
F1 (C6 - C10)	356778		< 25	< 25	NA	< 25	94%	60%	140%	90%	60%	140%	89%	60%	140%
F2 (C10 to C16)		TW	< 100	< 100	NA	< 100	94%	60%	140%	109%	60%	140%	89%	60%	140%
F3 (C16 to C34)		TW	< 100	< 100	NA	< 100	98%	60%	140%	85%	60%	140%	79%	60%	140%
F4 (C34 to C50)		TW	< 100	< 100	NA	< 100	106%	60%	140%	80%	60%	140%	80%	60%	140%

O. Reg. 153(511) - VOCs (Water)

Dichlorodifluoromethane	355406		< 0.20	< 0.20	NA	< 0.20	88%	50%	140%	84%	50%	140%	81%	50%	140%
Vinyl Chloride	355406		< 0.17	< 0.17	NA	< 0.17	106%	50%	140%	94%	50%	140%	85%	50%	140%
Bromomethane	355406		< 0.20	< 0.20	NA	< 0.20	106%	50%	140%	86%	50%	140%	91%	50%	140%
Trichlorofluoromethane	355406		< 0.40	< 0.40	NA	< 0.40	88%	50%	140%	89%	50%	140%	82%	50%	140%
Acetone	355406		< 1.0	< 1.0	NA	< 1.0	88%	50%	140%	81%	50%	140%	96%	50%	140%
1,1-Dichloroethylene	355406		< 0.30	< 0.30	NA	< 0.30	85%	50%	140%	92%	60%	130%	104%	50%	140%
Methylene Chloride	355406		< 0.30	< 0.30	NA	< 0.30	102%	50%	140%	105%	60%	130%	89%	50%	140%
trans- 1,2-Dichloroethylene	355406		< 0.20	< 0.20	NA	< 0.20	96%	50%	140%	101%	60%	130%	98%	50%	140%
Methyl tert-butyl ether	355406		< 0.20	< 0.20	NA	< 0.20	89%	50%	140%	89%	60%	130%	93%	50%	140%
1,1-Dichloroethane	355406		< 0.30	< 0.30	NA	< 0.30	111%	50%	140%	113%	60%	130%	105%	50%	140%
Methyl Ethyl Ketone	355406		< 1.0	< 1.0	NA	< 1.0	97%	50%	140%	91%	50%	140%	108%	50%	140%
cis- 1,2-Dichloroethylene	355406		< 0.20	< 0.20	NA	< 0.20	99%	50%	140%	103%	60%	130%	99%	50%	140%
Chloroform	355406		< 0.20	< 0.20	NA	< 0.20	101%	50%	140%	114%	60%	130%	92%	50%	140%
1,2-Dichloroethane	355406		< 0.20	< 0.20	NA	< 0.20	89%	50%	140%	114%	60%	130%	97%	50%	140%
1,1,1-Trichloroethane	355406		< 0.30	< 0.30	NA	< 0.30	89%	50%	140%	74%	60%	130%	89%	50%	140%
Carbon Tetrachloride	355406		< 0.20	< 0.20	NA	< 0.20	98%	50%	140%	89%	60%	130%	103%	50%	140%
Benzene	355406		< 0.20	< 0.20	NA	< 0.20	93%	50%	140%	104%	60%	130%	86%	50%	140%
1,2-Dichloropropane	355406		< 0.20	< 0.20	NA	< 0.20	117%	50%	140%	107%	60%	130%	87%	50%	140%
Trichloroethylene	355406		< 0.20	< 0.20	NA	< 0.20	108%	50%	140%	105%	60%	130%	97%	50%	140%
Bromodichloromethane	355406		< 0.20	< 0.20	NA	< 0.20	99%	50%	140%	95%	60%	130%	116%	50%	140%
Methyl Isobutyl Ketone	355406		< 1.0	< 1.0	NA	< 1.0	92%	50%	140%	96%	50%	140%	93%	50%	140%
1,1,2-Trichloroethane	355406		< 0.20	< 0.20	NA	< 0.20	96%	50%	140%	113%	60%	130%	113%	50%	140%
Toluene	355406		< 0.20	< 0.20	NA	< 0.20	104%	50%	140%	111%	60%	130%	109%	50%	140%
Dibromochloromethane	355406		< 0.10	< 0.10	NA	< 0.10	100%	50%	140%	82%	60%	130%	82%	50%	140%
Ethylene Dibromide	355406		< 0.10	< 0.10	NA	< 0.10	109%	50%	140%	106%	60%	130%	104%	50%	140%
Tetrachloroethylene	355406		< 0.20	< 0.20	NA	< 0.20	108%	50%	140%	108%	60%	130%	103%	50%	140%
1,1,1,2-Tetrachloroethane	355406		< 0.10	< 0.10	NA	< 0.10	106%	50%	140%	90%	60%	130%	86%	50%	140%
Chlorobenzene	355406		< 0.10	< 0.10	NA	< 0.10	109%	50%	140%	111%	60%	130%	108%	50%	140%
Ethylbenzene	355406		< 0.10	< 0.10	NA	< 0.10	100%	50%	140%	105%	60%	130%	100%	50%	140%

Quality Assurance

CLIENT NAME: WSP CANADA INC.

PROJECT: 191-02120-01

SAMPLING SITE:

AGAT WORK ORDER: 19T493233

ATTENTION TO: Sheema Everett

SAMPLED BY:

Trace Organics Analysis (Continued)

RPT Date: Aug 30, 2019			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
m & p-Xylene	355406		< 0.20	< 0.20	NA	< 0.20	115%	50%	140%	110%	60%	130%	104%	50%	140%
Bromoform	355406		< 0.10	< 0.10	NA	< 0.10	92%	50%	140%	75%	60%	130%	74%	50%	140%
Styrene	355406		< 0.10	< 0.10	NA	< 0.10	118%	50%	140%	110%	60%	130%	99%	50%	140%
1,1,2,2-Tetrachloroethane	355406		< 0.10	< 0.10	NA	< 0.10	109%	50%	140%	120%	60%	130%	120%	50%	140%
o-Xylene	355406		< 0.10	< 0.10	NA	< 0.10	93%	50%	140%	109%	60%	130%	105%	50%	140%
1,3-Dichlorobenzene	355406		< 0.10	< 0.10	NA	< 0.10	102%	50%	140%	101%	60%	130%	113%	50%	140%
1,4-Dichlorobenzene	355406		< 0.10	< 0.10	NA	< 0.10	112%	50%	140%	114%	60%	130%	114%	50%	140%
1,2-Dichlorobenzene	355406		< 0.10	< 0.10	NA	< 0.10	99%	50%	140%	118%	60%	130%	110%	50%	140%
1,3-Dichloropropene	355406		< 0.30	< 0.30	NA	< 0.30	87%	50%	140%	91%	60%	130%	78%	50%	140%
n-Hexane	355406		< 0.20	< 0.20	NA	< 0.20	89%	50%	140%	112%	60%	130%	107%	50%	140%

Comments: Tap water analysis has been performed as QC sample testing for duplicate and matrix spike due to insufficient sample volume.

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:


Method Summary

CLIENT NAME: WSP CANADA INC.

PROJECT: 191-02120-01

SAMPLING SITE:
AGAT WORK ORDER: 19T493233

ATTENTION TO: Sheema Everett

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Benzene	VOL-91-5010	MOE PHC-E3421	P&T GC/MS
Toluene	VOL-91-5010	MOE PHC-E3421	P&T GC/MS
Ethylbenzene	VOL-91-5010	MOE PHC-E3421	P&T GC/MS
Xylene Mixture	VOL-91-5010	MOE PHC-E3421	P&T GC/MS
F1 (C6 - C10)	VOL-91- 5010	MOE PHC-E3421	P&T GC/FID
F1 (C6 to C10) minus BTEX	VOL-91-5010	MOE PHC-E3421	P&T GC/FID
F2 (C10 to C16)	VOL-91-5010	MOE PHC-E3421	GC/FID
F3 (C16 to C34)	VOL-91-5010	MOE PHC-E3421	GC/FID
F4 (C34 to C50)	VOL-91-5010	MOE PHC-E3421	GC/FID
Gravimetric Heavy Hydrocarbons	VOL-91-5010	MOE PHC-E3421	BALANCE
Terphenyl	VOL-91-5010	MOE PHC-E3421	GC/FID
Dichlorodifluoromethane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Vinyl Chloride	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Bromomethane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Trichlorofluoromethane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Acetone	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,1-Dichloroethylene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Methylene Chloride	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
trans- 1,2-Dichloroethylene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Methyl tert-butyl ether	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,1-Dichloroethane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Methyl Ethyl Ketone	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
cis- 1,2-Dichloroethylene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Chloroform	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,2-Dichloroethane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,1,1-Trichloroethane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Carbon Tetrachloride	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Benzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,2-Dichloropropane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Trichloroethylene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Bromodichloromethane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Methyl Isobutyl Ketone	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,1,2-Trichloroethane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Toluene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Dibromochloromethane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Ethylene Dibromide	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Tetrachloroethylene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,1,1,2-Tetrachloroethane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Chlorobenzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Ethylbenzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
m & p-Xylene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Bromoform	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Styrene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,1,2,2-Tetrachloroethane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
o-Xylene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,3-Dichlorobenzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,2-Dichlorobenzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,3-Dichloropropene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS

Method Summary

CLIENT NAME: WSP CANADA INC.

PROJECT: 191-02120-01

SAMPLING SITE:

AGAT WORK ORDER: 19T493233

ATTENTION TO: Sheema Everett

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Xylene Mixture	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
n-Hexane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Toluene-d8	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
4-Bromofluorobenzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS



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)

Report Information:

Company: WSP
Contact: 252 Galaxy Blvd, Toronto, ON
Address: Sheema Everett; Lindsay Leresque
647-730-3071 Fax: _____
Phone: _____
Reports to be sent to:
1. Email: llasheema.everett@wsp.com
2. Email: lindsay.leresque@wsp.com

Regulatory Requirements:

☐ No Regulatory Requirement

(Please check all applicable boxes)

☒ Regulation 153/04

☐ Sewer Use

☐ Regulation 558

Table 3 Indicate One

☐ Ind/Com

☐ Sanitary

☐ CCME

☐ Res/Park

☐ Storm

☐ Prov. Water Quality Objectives (PWQO)

☐ Agriculture

Soil Texture (Check One)

Region _____

Indicate One

☐ Coarse

☐ Fine

☐ MISA

Indicate One

Is this submission for a
Record of Site Condition?

☒ Yes ☐ No

Report Guideline on
Certificate of Analysis

☒ Yes ☐ No

Sample Matrix Legend

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

Field Filtered - Metals, Hg, CVI

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 ☐ NH₃ ☐ TKN
☐ NO₃ ☐ NO₂ ☐ NO₂-N

Volatiles: ☐ VOC ☐ BTEX ☐ THM

PHCs F1 - F4 + BTEX

ABNs

PAHs

PCBs: ☐ Total ☐ Aroclors

Organochlorine Pesticides

TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs

Sewer Use

Potentially Hazardous or High Concentration (Y/N)

Project Information:

Project: 191-02120-01
Site Location: 3105 Hurontario Street
Sampled By: L. Everett
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: WSP - Accounts payable
Contact: _____
Address: _____
Email: _____

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Y/N	Metals and Inorganics	O. Reg 153	ORPs	Full Metals Scan	Regulation/Custom Metals	Nutrients	Volatiles	PHCs F1 - F4 + BTEX	ABNs	PAHs	PCBs	Organochlorine Pesticides	TCLP	Sewer Use	Potentially Hazardous or High Concentration (Y/N)
BH19-3	2019/07/16	A.M.	3	GW																	
QAQC 2			3																		
BH19-4			2																		
QAQC 1			1		*limited volume*																

Samples Relinquished By (Print Name and Sign): <u>Hashema Everett</u>	Date: <u>2019/07/16</u>	Time: <u>1:40pm</u>	Samples Received By (Print Name and Sign): <u>Sima</u>	Date: <u>19/7/16</u>	Time: <u>3:55</u>
Samples Relinquished By (Print Name and Sign): <u>John Gauthier</u>	Date: <u>2019/07/16</u>	Time: <u>3:30pm</u>	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:

Page 1 of 1

CLIENT NAME: WSP CANADA INC.
4 Hughson Street South, Suite 300
Hamilton, ON L8N3Z1
(905) 529-4414

ATTENTION TO: Lindsay Levesque

PROJECT: 191-02120-01

AGAT WORK ORDER: 19T503378

TRACE ORGANICS REVIEWED BY: Pinkal Patel, Report Reviewer

DATE REPORTED: Aug 15, 2019

PAGES (INCLUDING COVER): 5

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.



AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 19T503378

PROJECT: 191-02120-01

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

CLIENT NAME: WSP CANADA INC.

SAMPLING SITE:

ATTENTION TO: Lindsay Levesque

SAMPLED BY:

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

DATE RECEIVED: 2019-08-09

DATE REPORTED: 2019-08-15

		SAMPLE DESCRIPTION:		MW-4
		SAMPLE TYPE:		Water
		DATE SAMPLED:		2019-08-09
Parameter	Unit	G / S	RDL	424884
Benzene	µg/L	5.0	0.20	<0.20
Toluene	µg/L	24	0.20	<0.20
Ethylbenzene	µg/L	2.4	0.10	<0.10
Xylene Mixture	µg/L	300	0.20	<0.20
F1 (C6 - C10)	µg/L	750	25	<25
F1 (C6 to C10) minus BTEX	µg/L	750	25	<25
F2 (C10 to C16)	µg/L	150	100	<100
F3 (C16 to C34)	µg/L	500	100	190
F4 (C34 to C50)	µg/L	500	100	<100
Gravimetric Heavy Hydrocarbons	µg/L	500	500	NA
Surrogate	Unit	Acceptable Limits		
Terphenyl	%	60-140		94

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Potable Ground Water - All Types of Property Uses - Coarse Textured Soils

424884

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.

Small amount of sediment was observed in the sample. Entire sample was extracted and bottle rinsed with solvent.

The C6-C10 fraction is calculated using Toluene response factor.

Xylenes total is a calculated parameter. The calculated value is the sum of m&p-Xylene and o-Xylene.

C6-C10 (F1 minus BTEX) is a calculated parameter. The calculated value is F1 minus BTEX.

The 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 indicated that hydrocarbons >C50 are present.

The chromatogram has returned to baseline by the retention time of nC50.

Total C6-C50 results are corrected for BTEX contribution.

This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.

nC6 and nC10 response factors are within 30% of Toluene response factor.

nC10, nC16 and nC34 response factors are within 10% of their average.

C50 response factor is within 70% of nC10 + nC16 nC34 average.

Linearity is within 15%.

Extraction and holding times were met for this sample.

Fractions 1-4 are quantified with the contribution of PAHs. Under Ontario Regulation 153/04, results are considered valid without determining the PAH contribution if not requested by the client.

NA = Not Applicable

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

Jinkal Patel

Quality Assurance

CLIENT NAME: WSP CANADA INC.

PROJECT: 191-02120-01

SAMPLING SITE:

AGAT WORK ORDER: 19T503378

ATTENTION TO: Lindsay Levesque

SAMPLED BY:

Trace Organics Analysis

RPT Date: Aug 15, 2019

RPT Date: Aug 15, 2019			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) - PHCs F1 - F4 (Water)

Benzene	423794		< 0.20	< 0.20	NA	< 0.20	82%	50%	140%	85%	60%	130%	89%	50%	140%
Toluene	423794		< 0.20	< 0.20	NA	< 0.20	82%	50%	140%	85%	60%	130%	88%	50%	140%
Ethylbenzene	423794		< 0.10	< 0.10	NA	< 0.10	85%	50%	140%	89%	60%	130%	89%	50%	140%
Xylene Mixture	423794		< 0.20	< 0.20	NA	< 0.20	85%	50%	140%	89%	60%	130%	91%	50%	140%
F1 (C6 - C10)	423794		< 25	< 25	NA	< 25	95%	60%	140%	95%	60%	140%	94%	60%	140%
F2 (C10 to C16)		TW	< 100	< 100	NA	< 100	92%	60%	140%	102%	60%	140%	93%	60%	140%
F3 (C16 to C34)		TW	< 100	< 100	NA	< 100	99%	60%	140%	96%	60%	140%	119%	60%	140%
F4 (C34 to C50)		TW	< 100	< 100	NA	< 100	96%	60%	140%	80%	60%	140%	104%	60%	140%

Comments: Tap water analysis has been performed as QC sample testing for duplicate and matrix spike due to insufficient sample volume.
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:



Method Summary

CLIENT NAME: WSP CANADA INC.

PROJECT: 191-02120-01

SAMPLING SITE:

AGAT WORK ORDER: 19T503378

ATTENTION TO: Lindsay Levesque

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Benzene	VOL-91-5010	MOE PHC-E3421	P&T GC/MS
Toluene	VOL-91-5010	MOE PHC-E3421	P&T GC/MS
Ethylbenzene	VOL-91-5010	MOE PHC-E3421	P&T GC/MS
Xylene Mixture	VOL-91-5010	MOE PHC-E3421	P&T GC/MS
F1 (C6 - C10)	VOL-91- 5010	MOE PHC-E3421	P&T GC/FID
F1 (C6 to C10) minus BTEX	VOL-91-5010	MOE PHC-E3421	P&T GC/FID
F2 (C10 to C16)	VOL-91-5010	MOE PHC-E3421	GC/FID
F3 (C16 to C34)	VOL-91-5010	MOE PHC-E3421	GC/FID
F4 (C34 to C50)	VOL-91-5010	MOE PHC-E3421	GC/FID
Gravimetric Heavy Hydrocarbons	VOL-91-5010	MOE PHC-E3421	BALANCE
Terphenyl	VOL-91-5010	MOE PHC-E3421	GC/FID

APPENDIX

F

SURVEY OF PHASE TWO PROPERTY

PEEL STANDARD
CONDOMINIUM PLAN No

LEVEL 1
UNITS 1 TO 31, INCLUSIVE
AND LEVEL 2
UNITS 1 TO 23, INCLUSIVE

REGISTERED IN THE LAND REGISTRY OFFICE FOR THE LAND
TITLES DIVISION OF PEEL (43) AT O'CLOCK
ON THE DAY OF 2018.

REPRESENTATIVE FOR LAND REGISTRAR

SURVEYOR'S CERTIFICATE

- I CERTIFY THAT:
- 1) THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT, THE CONDOMINIUM ACT, 1998 AND THE LAND TITLES ACT AND THE REGULATIONS MADE UNDER THEM;
 - 2) THE SURVEY WAS COMPLETED ON THE 22nd DAY OF AUGUST, 2018.
 - 3) THE DIAGRAMS OF THE UNITS SHOWN ON THIS PLAN ARE SUBSTANTIALLY ACCURATE.

AUGUST 23, 2018

DECLARATION REGISTERED AS NUMBER

THIS PLAN COMPRISES ALL OF PIN 13157-0181(LT)

SCHEDULE OF APPURTENANT AND SERVIENT INTERESTS

(UNDER CLAUSES 157 (1) (4) AND (5) OF THE CONDOMINIUM ACT 1998)

TOGETHER WITH	APURTENANT INTERESTS
	NONE
SUBJECT TO	SERVIENT INTERESTS
	NONE

PLAN OF SURVEY OF
PART OF LOT 15, CONCESSION 1
NORTH OF DUNDAS STREET
GEOGRAPHIC TOWNSHIP OF TORONTO,
PART OF BLOCKS A AND B
REGISTERED PLAN 645 AND
PART OF VILLAGE LOT 9
SAVIGNEY'S PLAN OF COOKSVILLE
(REFERRED TO AS PLAN TOR. 12)

ALL IN THE
CITY OF MISSISSAUGA
REGIONAL MUNICIPALITY OF PEEL
SCALE 1 : 250

DONALD G. CHAMBERS
ONTARIO LAND SURVEYOR

METRIC NOTE

DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND
CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

NOTES

UNIT DEFINITION: THE MONUMENTS CONTROLLING THE EXTENT AND
LOCATION OF THE UNITS ARE THE WALLS, THE
FLOORS AND THE CEILINGS AS MORE PARTICULARLY
DESCRIBED IN SCHEDULE "C" OF THE DECLARATION.

FOR DESCRIPTION OF APPURTENANT AND SERVIENT INTERESTS SEE
SCHEDULE "A" OF THE DECLARATION.

--- DENOTES BOUNDARY OF THIS CONDOMINIUM
--- DENOTES BOUNDARIES OF UNITS AND COMMON ELEMENTS
--- DENOTES FACE OF WALL

BEARING NOTE

BEARINGS ARE UTM GRID, DERIVED FROM OBSERVED REFERENCE POINTS A AND
B BY REAL TIME NETWORK (RTN) OBSERVATIONS, UTM ZONE 17, NAD83
(ORIGINAL).

FOR BEARING COMPARISONS: A ROTATION OF 0°56'34" COUNTER-CLOCKWISE
WAS APPLIED TO BEARINGS ON PLANS 43R-17198 AND 43R-33188.

DISTANCE NOTE

DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING
BY THE COMBINED SCALE FACTOR OF 0.999740.

OBSERVED REFERENCE POINTS (ORP): UTM ZONE 17, NAD 83 (ORIGINAL).

CO-ORDINATES TO URBAN ACCURACY PER SEC. 14 (2) OF OREG. 218/10

POINT ID	NORTHING	EASTING
ORP A	4826355.14	611552.73
ORP B	4826254.77	611456.87

CO-ORDINATES CANNOT, IN THEMSELVES, BE USED TO
RE-ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.

NOTES AND LEGEND

BUILDING TIES ARE MEASURED AT GRADE AND AT RIGHT ANGLES TO THE
BOUNDARY UNLESS SHOWN OTHERWISE.

BOLDLY UNDERLINED SHORT OTHERWISE:	
DENOTES	BOUNDARY OF THE COMMON ELEMENT
—	BOUNDARIES OF THE UNITS
—	SURVEY MONUMENT FOUND
SIB	SURVEY MONUMENT SET
SPB	STANDARD IRON BAR
IB	IRON BAR
CP	CONCRETE PIN
IPB	IRON PIPE BAR
IP	IRON PIPE
MEAS	MEASURED
WIT	WITNESS
CU	ORIGIN UNKNOWN
N/S/E/W	NORTH/SOUTH/EAST/WEST
NKA	NOW KNOWN AS
PN	PROPERTY IDENTIFICATION NUMBER
P1	DEPOSITED PLAN 43R-17198
P2	DEPOSITED PLAN 43R-33188
1225/DBS	D. G. SEARLES, O.L.S.
1620	D. H. BROWN, O.L.S.
1718	D. H. BROWN, O.L.S.
IP	UNIT BOUNDARY BEING THE VERTICAL PLANE AS DETERMINED BY HORIZONTAL MEASUREMENT

PLANNING ACT APPROVAL

Parts approved and Part exempted under Section 9 of the
Condominium Act, S.O. 1998, c. 19, and Section 51 of the
Planning Act, R.S.O. 1990, c.P. 13, as amended.

This day of 2018
Andrew Whitemore
Commissioner of Planning and Building
City of Mississauga

CERTIFICATE OF DECLARANT

THIS IS TO CERTIFY THAT THE PROPERTY INCLUDED IN THIS PLAN
HAS BEEN LAID OUT INTO UNITS AND COMMON ELEMENTS IN
ACCORDANCE WITH OUR INSTRUCTIONS.

I HAVE AUTHORITY TO BIND THE CORPORATION.

DATED AT MISSISSAUGA THIS DAY OF 2018.

DATE ASH SINGH - PRESIDENT
EQUITY THREE HOLDINGS INC.

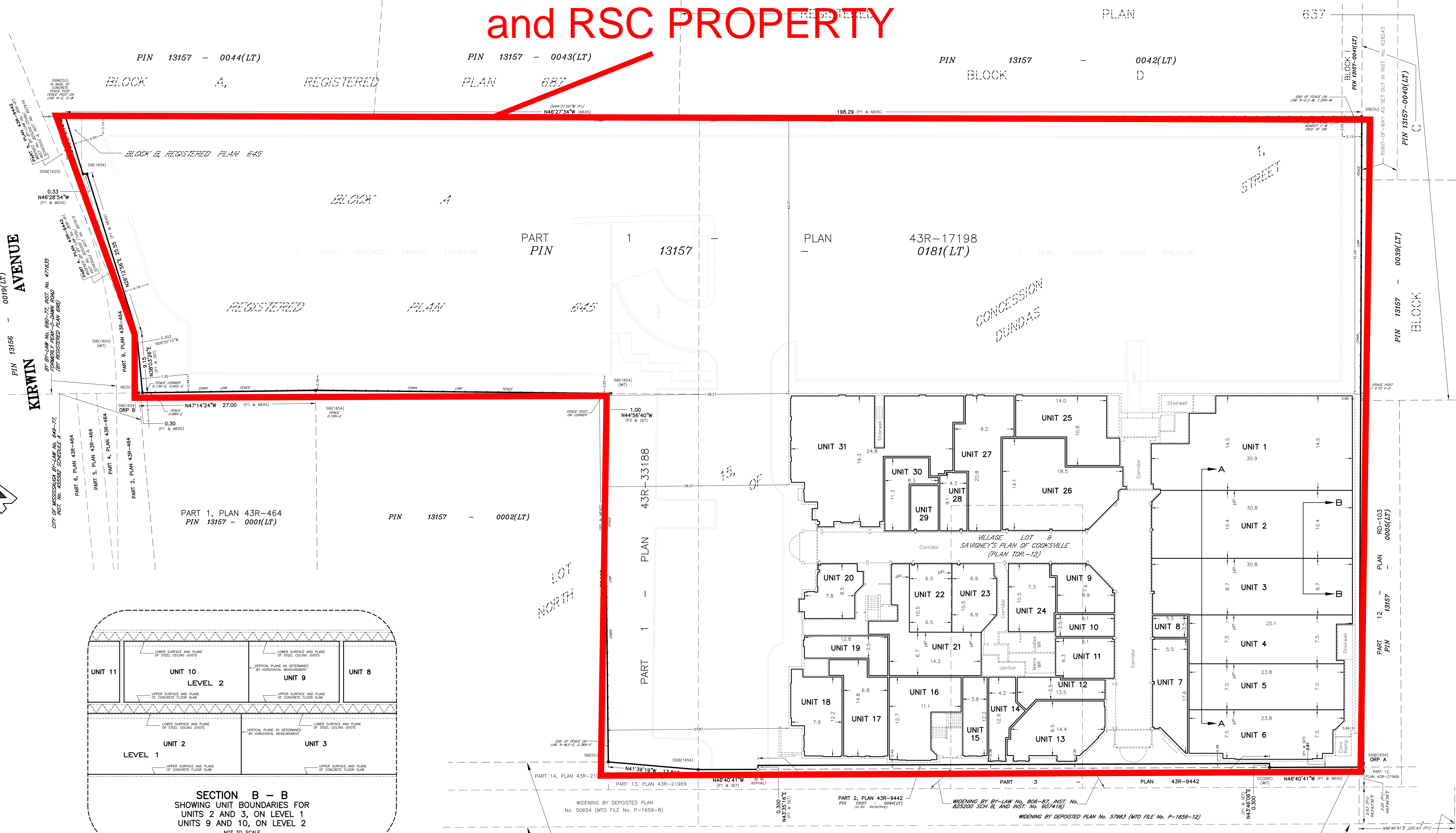
CHAMBERS AND ASSOCIATES
SURVEYING LTD
12 THOROLD ROAD EAST
WILLOWDALE, ONTARIO
M2H 3T2
TEL: (905) 735-7841 / 735-7844
FAX: (905) 735-7833
WWW.CHAS-SURVEYING.COM

DRAWN BY: D. H. T. 10012 DWG: 10012-C1-REV3 FILE: 10-12

INDEX OF PARTS

PART	SHEET(S)	DESCRIPTION
1	1	PLAN OF SURVEY OF THE CONDOMINIUM PROPERTY AND THE DESIGNATION OF UNITS ON LEVELS 1 AND 2
2	NONE	PLAN OF SURVEY OF THE EXCLUSIVE USE PORTIONS OF THE COMMON ELEMENTS
3	17	ARCHITECTURAL PLANS
4	NONE	STRUCTURAL PLANS

PHASE ONE, TWO
and RSC PROPERTY



LEVEL 2
UNITS 1 TO 23, INCLUSIVE
SCALE 1 : 250

REPRESENTATIVE SECTION TO SHOW TYPICAL
UNIT BOUNDARIES FOR UNITS 1 TO 31,
INCLUSIVE, ON LEVEL 1 AND UNITS
1 TO 23, INCLUSIVE, ON LEVEL 2
NOT TO SCALE

SECTION A - A
SHOWING UNIT BOUNDARIES FOR
UNITS 1 TO 6, INCLUSIVE, ON LEVEL 1
AND UNITS 2 TO 3, ON LEVEL 2
NOT TO SCALE

PART 1, PLAN 43R-464
PIN 13157 - 0001(LT)

PIN 13157 - 0002(LT)

SECTION B - B
SHOWING UNIT BOUNDARIES FOR
UNITS 2 AND 3, ON LEVEL 1
UNITS 9 AND 10, ON LEVEL 2
NOT TO SCALE

HURONTARIO (FORMERLY HIGHWAY No. 10) STREET

ROAD ALLOWANCE BETWEEN LOTS 15 AND 16, CONCESSION 1, NORTH OF DUNDAS STREET
TRANSFERRED TO THE CITY OF MISSISSAUGA BY ORDER IN COUNCIL 06-921/70, REGISTERED AS 137826 (P-1659-104)