# PHASE TWO ENVIRONMENTAL SITE ASSESSMENT PROPOSED STUDENT RESIDENCE -CARLETON UNIVERSITY, OTTAWA

#### NOVEMBER 28, 2019

CONFIDENTIAL





# **NSD**

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CARLETON UNIVERSITY

CONFIDENTIAL

PROJECT NO.: 191-12948-00 DATE: NOVEMBER 28, 2019

WSP SUITE 300 2611 QUEENSVIEW DRIVE OTTAWA, ON, CANADA K2B 8K2

T: +1 613 829-2800 F: +1 613 829-8299 WSP.COM



November 28, 2019 CONFIDENTIAL

CARLETON UNIVERSITY 1125 Colonel By Drive Ottawa, Ontario K1S 5B6

#### Attention: Dawn Blackman, Senior Project Manager

Dear Madam:

#### Subject: Phase Two Environmental Site Assessment - Proposed Student Residence, Carleton University

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

We trust that this information is sufficient for your current needs.

Please do not hesitate to contact the undersigned should you have any questions or require further assistance.

Yours sincerely,

Adrian Menyhart, P.Eng., ing., QPESA Environmental Engineer

WSP ref.: 191-12948-00

SUITE 300 2611 QUEENSVIEW DRIVE OTTAWA, ON, CANADA K2B 8K2

T: +1 613 829-2800 F: +1 613 829-8299 wsp.com

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# CONTRIBUTORS

#### CARLETON UNIVERSITY

Senior Project Manager

Dawn Blackman

#### WSP

Senior Environmental Engineer Natalia Codoban

Environmental Engineer/Project Manager Adrian Menyhart

# vsp

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# EXECUTIVE SUMMARY

WSP Canada Inc. (WSP) was retained by Ms. Dawn Blackman of Carleton University to conduct a Phase Two Environmental Site Assessment (ESA) at a portion of the Ottawa campus in Ottawa, Ontario (herein referred to as the "subject site" or the "Phase Two Property"), following the recommendations of the Phase One ESA completed by WSP Canada Inc. in November 2019. The subject site is being proposed for the future site of a student residence. As there will be no change in land use, the filing of a Record of Site Condition is not required.

The Site is an irregular-shaped parcel of land with an area of approximately 1.2 hectares. It is located near the Campus Avenue and University Drive intersection, towards the north end of the Ottawa campus. The subject site skirts the Leeds residence, the Stormont Dundas residence and the and the P18 parking garage. Based on the Phase One ESA completed for the Site, the subject site was first developed with a farmstead in the early 1900's, but has been used as parking, roadway and landscaped areas since the 1960's.

Based on the findings of the Phase One ESA, two potential contaminating activities (PCAs) contributing to the areas of potential environmental concern (APECs) included: PCA 30 Importation of fill material of unknown quality and PCA 46 rail yard, tracks and spurs. These PCAs resulted in two APECs at the subject, as follows: APEC1, east side of subject site, and APEC2, the east side of subject site. Investigation was recommended to assess the soil and groundwater conditions at the APECs. The potential contaminants of concern (PCOCs) associated with the APECs include metals, petroleum hydrocarbon compounds (PHCs), volatile organic compounds (VOCs), and polycyclic aromatic hydrocarbons (PAHs). The PCOCs associated with each APEC are as follows:

#### Table 0-1 Potential Environmental Concern and Potential Contaminant of Concern

POTENTIALLY CONTAMINATING ACTIVITY	POTENTIAL CONTAMINANTS OF CONCERN
PCA 30: Fill Material of Unknown Quality	Metals, PHCs, VOCs, PAHs
PCA 46. Rail yards, tracks and spurs	Metals, PHC, PAHs

Between October 23 and October 28, 2019, 12 environmental and geotechnical boreholes (three of which were completed as monitoring wells) were advanced to maximum depths ranging between 7.6 m and 12.6 m below grade. Three (3) boreholes were cored to depths between 15.5 and 19.3 m below grade

Based on the information collected in this Phase Two ESA, WSP provides the following findings:

#### **Subsurface Condition**

Based on the findings of the drilling investigation, the soil stratigraphy, with increasing depth, beneath the Phase Two subject site generally consisted of a layer of asphalt or topsoil, underlain by fill consisting of silty sand and gravel, silty clay and sand and gravel. Part of the sand and gravel fill layer is considered to be reworked native soils, either from the subject site or from areas off-site. Fill material was noted to extend to depths between 3.8 m and 7.6 m below grade. Beneath the fill layer, was native silty sand and gravel (glacial till). Bedrock was cored at three (3) borehole locations, to final depths of 15.5, 18.6 and 19.3 m below grade, at BH19-8, BH19-7 and BH19-2, respectively.

For the purposes of this assessment, the analytical results have been compared to the 2011 MECP Table 3 for full depth generic site conditions in a non-potable groundwater condition.

#### Soil Condition

 All soils were found to be in compliance with MECP Table 3 standards, with the exception of vanadium at borehole BH19-4, which was identified in the upper fill material.

#### **Groundwater Condition**

 All groundwater samples were found to be in compliance with MECP Table 3 standards, and is not considered to have been adversely impacted by historical activities.

#### Recommendations

Based on the findings of the Phase Two ESA, vanadium is present within a small area of the subject site, related to poor quality fill material. Given the scope of the proposed redevelopment of the site, the soils in the vicinity of the vanadium exceedance should be excavated and disposed of at a licensed landfill facility as part of site excavation works. It is recommended that WSP be present at the time of excavation, such that confirmatory samples can be collected following remedial excavation works.

Prior to site redevelopment, all three (3) groundwater monitoring wells must be decommissioned as per Ontario Regulation 903.

# 1 INTRODUCTION

# 1.1 BACKGROUND

WSP Canada Inc. (WSP) was retained by Ms. Dawn Blackman, Senior Project Manager with Carleton University, to conduct a Phase Two Environmental Site Assessment (ESA) for a portion of the Ottawa Campus, located at 1125 Colonel By Drive. The Phase Two subject site (herein is referred to as the "subject site") is located north of the Stormont and Dundas residence, and east of the Leeds residence, and bordered to the east by Campus Avenue. The location of the Phase Two Property is shown in **Figure 1**.

A Phase Two ESA was recommended to be carried out by WSP following completion of a Phase One ESA, prepared for the same subject site on November 5, 2019. The Phase One ESA identified two (2) areas of potential environmental concern (APECs) related to the importation of potentially impacted fill material at the subject site, and the presence of railway lines (former and present) to the east of the subject site. Locations of APEC-1 and APEC-2 and the 250-m Phase One ESA study area are shown in **Figure 1**.

# **1.2 SITE DESCRIPTION AND PROPERTY OWNERSHIP**

The subject site is situated within the larger legal property known municipally as 1125 Colonel By Drive (refer to **Figure 1**), bearing the following legal description:

Nepean Concession B, Rideau Front, Part of Lots L, M, and N, of Registered Plan 4R196, Part 4

PINs Part of 04087-0065 (LT) and Part of 04087-0068 (LT).

The subject site is irregular in shape and is approximately 1.3 hectare in area. The subject site consists of landscaped lands, roadways and parking areas. No buildings are present on the site.

A preliminary survey sketch was provided to WSP for review. The site was surveyed by Fairhall, Moffatt and Woodland Limited on November 6, 2019. The sketch is included in **Appendix A**.

The current Site Owner is Carleton University. The Owner's Representative for this project is Ms. Dawn Blackman.

# 1.3 CURRENT AND PROPOSED FUTURE USES

Based on the Phase One ESA completed for the Site, the subject site was first developed with a farmstead in the early 1900's, but has been used as parking, roadway and landscaped areas since the 1960's. The proposed redevelopment will consist of a new student residence, and, as such, the filing of an RSC would not be required, as the land use within the University property will not be changing.

# **1.4 APPLICABLE SITE CONDITION STANDARDS**

Soil and groundwater analytical results for this Phase Two ESA were compared to standards identified in the Ministry of the Environment, Conservation and Parks (MECP) publication, "*Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act*," published on April 15, 2011 (hereinafter referred to as the "MECP SCS").

This selection of the applicable standard was applied based on the following:

- The proposed land use is residential (i.e. student residence);
- The water supply is the municipal water supplied by the City of Ottawa;
- The Phase Two Property is not considered to be environmentally sensitive as per Section 41 of Ontario Regulation (O. Reg.) 153/04; and
- The Phase Two Property is not a shallow soil property based on overburden thickness, or a property that includes all or

part of a water body or is adjacent to a water body or includes land that is within 30 meters of a water body, as per Section 43.1 of O. Reg. 153/04.

Based on the factors listed above, the MECP SCS listed in Table 3, Full Generic SCS in a Non-Potable Groundwater Water Condition. The applicable land use and soil texture would be residential, parkland, and institutional (RPI) property use for coarse-textured soils.

In the scope of the proposed redevelopment project of the subject site, it is anticipated that a large amount of soil will be excavated from the site, and will require disposal off-site. For soil management purposes, analytical results tables also included a comparison to MECP Table 1 Full Depth Background Site Condition Standards, which represent background standards in Ontario.

# **2 BACKGROUND INFORMATION**

# 2.1 PHYSICAL SETTING

Based on Ministry of Energy, Northern Development and Mines mapping (accessed via Ontario Geological Survey (OGS) Earth, published by the Ontario Ministry of Natural Development, Mines and Forestry), the regional surficial geology on-site is clay plains, however, past investigations conducted in the study area have identified presence of fill material, underlined by till.

Based on physiography maps available through the OGS earth website (Chapman and Putnam, 1984), the Phase Two ESA Property is situated within clay plains of the St. Lawrence Lowlands.

According to bedrock maps provided by the OGS Earth website, bedrock in the area of the subject site consists of shale of the Billings Formation. Past investigations prepared by SPL Consultants (now WSP) in January 2013 and April 2013 identified depths to bedrock of approximately 12 to 13 m below grade at the subject site.

As part of the Phase One ESA site reconnaissance, a visual inspection of adjacent lands located within the Phase One Study Area was conducted from the boundary of the Site and from publicly accessible areas to identify any potentially contaminating activities. At the time of the Phase One ESA Site reconnaissance, adjacent land uses within the Phase One Study Area consisted of institutional and residential uses (university campus setting).

#### 2.1.1 WATER BODIES AND AREAS OF NATURAL SIGNIFICANCE

The Rideau Canal is situated approximately 170 m to the west of the subject site, and an unevaluated wetland is located approximately 70 m to the west (see **Figure 1**).

There are no areas of natural significance registered within the subject site or Phase One ESA study area.

#### 2.1.2 TOPOGRAPHY AND SURFACE WATER DRAINAGE

Topographic mapping available through the Natural Resources of Canada Website, Atlas of Canada Toporama, was reviewed. The surface topography in the area of the subject site is generally flat, with no significant topographic features. The mapping data shows a railway line to the east of the subject site, and several large buildings further to the south (off-site). The Rideau Canal is located to the west, and the Rideau River is located to the east.

Surface water drainage on-site is considered to occur through surface run-off to catch basins (along Campus Avenue and the parking areas), surface run-off to a storm grate located within the landscaped area, and through infiltration within grass covered areas.

### 2.2 PAST INVESTIGATIONS

SPL Consultants Limited (now WSP), conducted a Phase One ESA and Phase Two ESA for a portion of land immediately to the north of the Subject Site, however, the north end of the subject site overlaps south end of the former ESA study area.

The Phase One ESA, prepared by SPL in 2013, indicated that the land has been owned by Carleton University since the 1950's, and that the former property consisted of marshland, which had been filled to raise the grade. Fill is expected to be present between 5 to 6 meters below the ground. Impacted soil (with hydrocarbons, and polycyclic aromatic hydrocarbons) was identified on parts of that property. The SPL report also identified a landfill to the southeast of the 2012 Subject Site, with soil impacts identified by others in the past.

SPL later conducted a Phase Two ESA, in April 2013, for the same portion of land studied in for the Phase One ESA. SPL advanced 10 boreholes on the site (four of which were instrumented with monitoring wells). One borehole2 fell within the current Subject Site. Soils analysed from the borehole did not identify any exceedances of the applicable MECP Table 2 site condition standards, however, fill material was noted to extend to approximately 6 m below surrounding grade. In general,

the Phase Two ESA identified presence of fill with traces of wood, brick and slag. MECP Table 2 standards were selected based on various factors, including the potential presence of potable groundwater use. Based on a review of well records, a drilled well was located north of the subject site; the record indicated that the purposes of the well was for cooling associated with the University, and as such is not considered to be a potable source.

The nearest monitoring well installed as part of this 2013 investigation (located approximately 20 to 25 m north of the current subject site) had identified presence of several polycyclic aromatic hydrocarbon parameters above the site standard for groundwater.

A geotechnical report by Houle Chevrier in 2011 was prepared for the parking lot located immediately north of the Subject Site. The south end of their study area overlaps with the north end of the present Subject Site. One borehole was identified in this overlapped area, and fill material was identified in that borehole. Other boreholes drilled during the Houle Chevrier study identified fill material in all 12 boreholes (located across their subject site), and elevated concentrations of hydrocarbon and polycyclic aromatic hydrocarbon parameters in the fill (at a borehole located north of the subject site).

Other reports prepared for areas to the north, and northeast of the Subject Site also identified fill material of poor quality at depths extending to approximately 6 m below grade. Fill material located along the former and current railway line appeared to be impacted in many places, as evidenced by traces of wood, brick, ash, mortar and coal.

# 2.3 POTENTIAL CONTAMINANTS OF CONCERN

The areas of potential environmental concerns at the subject site and their associated potential contaminants of concern as identified in the Phase One ESAs are summarized as follows:

#### Table 2-1 Potential Environmental Concerns and Potential Contaminants of Concern

POTENTIALLY CONTAMINATING ACTIVITY	POTENTIAL CONTAMINANTS OF CONCERN
APEC1: Fill material (PCA30: Importation of Fill Material of Unknown Quality)	Metals, Petroleum Hydrocarbons, Volatile Organic Compounds, Polycyclic Aromatic Hydrocarbons.
APEC2: Railway lines (PCA 46. Rail yards, tracks and spurs)	Metals, Petroleum Hydrocarbons, Polycyclic Aromatic Hydrocarbons

Based on the identification of these PCAs, a Phase Two ESA was completed to further investigate these concerns and address any data gaps from previous ESA foe the subject site.

# **3 SCOPE OF THE INVESTIGATION**

# 3.1 OVERVIEW OF THE SITE INVESTIGATION

The Phase Two ESA was conducted in general accordance with the general and specific objectives outlined in O. Reg. 153/04, as amended. The sampling methods complied with the requirements established by the MECP in the Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario, 1997 and technical updates provided to support regulatory amendments. Previous investigations provided an initial information base for the Phase Two Property; however, newer data were required to meet the requirements of O. Reg. 153/04. The tasks completed for the Phase Two ESA included:

- Preparation of a sampling and analysis plan (SAP) for the investigation to identify the required sampling of soil and groundwater in relation to the PCAs and APECs identified in the Phase One ESA for the Phase Two Property;
- During the drilling investigation, advancing 12 environmental/geotechnical boreholes of which three (3) were considered environmental boreholes, and completed as 51 mm monitoring wells to a maximum depth of 7.9 meter below the ground surface (mBGS) on the Phase Two Property between October 22 to October 26, 2019;
- Collection of groundwater samples from the three monitoring wells on November 4, 2019;
- Submitting soil and groundwater samples to a qualified laboratory for laboratory analysis of contaminant of Potential Concern (COPCs), including quality assurance/quality control (QA/QC) duplicates. Soil samples submitted were selected based on field observations and screened with a photoionization device (PID) and combustible gas indicator (CGI), to characterize the vertical and lateral extents of impacts. QA/QC duplicate samples were collected at a frequency of a minimum of 10% throughout the field program, in compliance with regulatory requirements; and
- Comparing results of analysis for soil and groundwater to the MECP Table 3 SCS.

# 3.2 MEDIA INVESTIGATED

Soil and groundwater at the APECs identified in the Phase One ESA were investigated as part of the Phase Two ESA investigation for the subject site. A SAP was developed by WSP prior to the field investigations, which outlined the proposed sample locations, analytical sampling, and rationale for sampling and analysis at each location. Sample locations are shown on **Figure 2** and the SAP is provided in **Appendix B**.

Sediment, as defined in O.Reg.153, is not present onsite. Therefore, samples of sediment were not collected during this Phase Two ESA.

# 3.3 PHASE ONE CONCEPTUAL SITE MODEL

A Phase One Conceptual Site Model (CSM) was developed in the Phase One ESA for the subject site. Two (2) APECs with potential for impacts to soil and/or groundwater have been identified on the Phase One Property and are presented as **Figure 1**.

Based on the review of records, interviews, and the site reconnaissance completed as part of the Phase One ESA, WSP identified two (2) PCAs for the subject site, including:

- 30. Importation of Fill of Unknown Quality
- 46. Rail Yards, Tracks and Spurs

Based on the above information, three APECs were identified for the Phase One Property:

<u>APEC1</u>: Central to Eastern portion of the subject site – Historical photos show the importation and storage of fill material of unknown quality. Poor quality fill material was identified on other areas of the Carleton University property. Filling appears to have been concentrated to the eastern side of the site.

<u>APEC2</u>: Eastern portion of the subject site – A railway line was formerly located at grade (immediately off-site to the east) from as early as the 1920's until the 1960's, when the line was shifted to a trench immediately adjacent to it. The railway lines (both older and newer) are located off-site to the east and are considered to have created an APEC along the eastern side

of the property.

Other PCAs, including a former landfill were identified within the Phase One Study Area, however, these activities were determined to not result in an APEC due to the nature of the landfill operation and the down-gradient location of the landfill, relative to the Phase One Property.

Information considered for the development of the Phase One CSM was gathered by WSP from numerous sources (i.e., historical aerial photographs, environmental database searches, physical setting sources, historical reports, interviews and a site reconnaissance), which reduces the potential for not identifying a former property use or PCA.

# 3.3.1 POTENTIAL ENVIRONMENTAL CONCERNS AND POTENTIAL CONTAMINANTS OF CONCERN

The potential environmental concerns at the Phase One Property and their associated potential contaminants of concern are summarized in Section 0 and Table 2-1.

#### 3.3.2 IMPACT OF UNDERGROUND UTILITIES

Underground utility trenches, typically backfilled with permeable granular materials, have the potential to affect contaminant distribution and transport. Utilities servicing the subject site (natural gas, water, sewer, and hydro) may be a concern for contaminant transport on the subject site. Adjacent underground utilities may also affect local migration of contaminants in the subsurface.

#### 3.3.3 GEOLOGICAL AND HYDROGEOLOGICAL INFORMATION

The Phase One Property slopes slightly to the southwest.

The inferred groundwater flow direction is anticipated to be towards the Rideau Canal to the west, or the Rideau River to the southeast.

Geological records indicate bedrock at the subject site consists consisting mainly of shale.

### 3.4 DEVIATIONS FROM SAMPLING AND ANALYSIS PLAN

The Phase Two ESA was conducted in general accordance with the sampling and analysis plan completed for the Phase Two ESA investigation, attached as **Appendix** B.

# 3.5 IMPEDIMENTS

Physical impediments encountered during the investigation included the presence of various subsurface utilities. As a result, certain boreholes were shifted slightly from locations established prior to the field work. The impediments are not considered to have altered the quality of the subsurface conditions or interpretation of results for this investigation.

# **4 INVESTIGATION METHOD**

# 4.1 GENERAL

All methods used to complete the Phase Two ESA were in accordance with O. Reg. 153/04 and WSP Standard Operating Procedures (SOPs), and generally accepted industry practices.

# 4.2 DRILLING AND EXCAVATING

A WSP field representative inspected the subject site and identified the preferred borehole locations as per the SAP during each investigation program. The borehole and test pit location plan and cross-sections are depicted in **Figure 3**. The groundwater elevation contours based on the recent groundwater monitoring data are presented in **Figure 4**.

WSP arranged for the public and private service locates to be completed at the subject site, through Ontario One Call (ON1Call) and USL-1, respectively. Borehole drilling and well installation was completed during the week of October 21, 2019, by MECP's licensed drillers Marathon Underground and CCC Geotechnical and Environmental Drilling Ltd., both of Ottawa, Ontario. The drilling was completed using CME55 or CME75 drilling equipment. All drilling operations were conducted under full-time WSP supervision.

Between October 22, and October 26, 2019, 12 boreholes (BH19-1 to BH19-12) were drilled on-site using hollow-auger drilling equipment. The boreholes served for both environmental purposes as well as geotechnical purposes (geotechnical report presented under a separate cover). The majority of the boreholes were advanced to auger refusal, between 7.6 and 12.6 m below surrounding grade. Three of these boreholes were cored into bedrock, to depths between 15.5 and 19.3 mBGS. Boreholes BH19-4, BH19-6 and BH19-10 were considered to be of environmental importance, based on their locations within APECs. As such, these were instrumented with monitoring wells. Due to their auger depths and the anticipated groundwater levels, BH19-6 and BH19-10 were backfilled using slough and bentonite, such that the well screens intercept the groundwater table.

The borehole logs are included in Appendix C.

### 4.3 SOIL SAMPLING

Soil samples from the boreholes were collected and handled by WSP in accordance with generally accepted sampling and handling procedures used by the environmental consulting industry, WSP SOPs, and in general accordance with O. Reg. 153/04 and the guidelines provided by the MECP's Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario.

During the drilling program, soil samples were collected through continuous sampling in conjunction with standard auger drilling. Samples were collected from split spoons (SS), or rock cores (CORE). All non-dedicated equipment used at the environmental sampling locations was brushed, washed, and rinsed prior to being reused during the sampling program. 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 field staff and observations were recorded in a dedicated field book.

Representative soil samples were conveyed directly into laboratory-supplied jars and methanol-preserved vials and were stored in a cooler at a temperature between 1 and 10°C. Samples selected for laboratory analysis were handled under standard chain of custody procedures and maintained on ice until received at the laboratory. The soil samples selected for laboratory analysis were considered representative of worst-case conditions, based on field screening results and visual and olfactory observations.

The soil sampling and analysis plan is provided in Appendix B.

# 4.4 FIELD SCREENING MEASUREMENTS

All soil samples recovered from the environmental boreholes were field screened for combustible and organic vapours using a RKI Eagle Type 2 with photoionization detector (PID) and combustible gas detector (CGD); the majority of the soil samples from remaining boreholes were also screened. The RKI Eagle Type 2 was rented from an specialist equipment rental supplier, Maxim Environmental and Safety Inc. (Maxim). Soil samples were also examined in the field for lithology as well as for aesthetic evidence of impacts (i.e., staining and odours).

Measurements were collected from each sample at the environmental borehole locations, as well as other borehole locations, where possible. All readings were below 15 ppm, and no reading were indicative of significant potential environmental concerns.

The PID was equipped with a 10.6 electron-volt (eV) lamp, which was calibrated with a known concentration of isobutylene. This instrument detects VOCs that emit below an ionization potential of 10.6 eV, which includes a wide range of chemicals such as solvents and fuels. The detection limit of the instrument ranges from 0 to 15,000 ppm and accuracy is +/- 10% for VOCs in the range of 0 and 2,000 ppm and +/- 20% of the reading above 2,000 ppm. The resolution of this instrument is 0.1 ppm for VOCs in the range of 0 and 1,000 ppm and 1 ppm for readings above 1,000 ppm. The PID provides an indication of total organic contamination in soil but does not measure concentrations of individual contaminants.

The CGI detects combustible vapours such as those associated with fuels. This instrument measures total combustible gases, calibrated to a known concentration of hexane. The instrument was operated in the methane elimination mode. The detection limit of the instrument ranges from 0 to 11,000 ppm (i.e., 100 % LEL of hexane). The CGI has an accuracy of 25 ppm below 1,000 ppm and 5% of the lower explosive limit (LEL) between 1,000 ppm and 100% LEL. As with the PID, it provides an indication of contamination but not specific chemical concentrations.

# 4.5 GROUNDWATER: MONITORING WELL INSTALLATION

As indicated in **Section 4.2**, three (3) boreholes were instrumented with a monitoring well, constructed as follows:

- Each monitoring well was constructed using 51 mm diameter well screens and PVC riser pipe;
- The screened interval was 3.05 m long with a No. 10 slot size screen;
- Sand pack, consisting of No. 2 silica sand, was placed around the well screen and the sand pack was extended to 0.3 m above the top of the screen;
- A bentonite seal was then placed around the PVC riser pipe up to within 0.3 m of the ground surface; and,
- The monitoring wells were completed with monument protective covers, with the exception of BH19-4, which was
  installed within flushmount casing.

The monitoring wells were completed in accordance with O. Reg. 903, by licenced well technicians from Marathon Underground.

# 4.6 GROUNDWATER: FIELD MEASUREMENT OF WATER QUALITY PARAMETERS

The groundwater prior to sampling was assessed using a YSI 556 handheld multi-parameter instrument, which measures pH, temperature, electrical conductivity (EC), dissolved oxygen (DO), oxidation-reduction potential (ORP), and total dissolved solids (TDSs). These field groundwater quality measurements were obtained after the removal of each well volume and were recorded in a dedicated field book. The instrument is calibrated by Maxim, with certificate of calibration available to WSP upon rental events.

### 4.7 GROUNDWATER: MONITORING AND SAMPLING

Groundwater levels were measured using a groundwater level (Solinst Dipper T-2) prior to purging and sampling activities.

The

monitoring data is presented in **Table 1** and the inferred groundwater elevation contours based on the November 4<sup>th</sup> 2019, groundwater monitoring elevations are presented in **Figure 4**.

Wells were developed by WSP by purging three well volumes or to dry (whichever occurred first) using intertia pump Waterra, and samples were collected from all five newly-installed wells. Water was sampled using a peristaltic pump using low-flow sampling techniques due to the high sediment content in wells BH19-6 and BH19-10. Groundwater was conveyed directly into dedicated laboratory-supplied bottles, stored at a temperature below 10°C, and maintained on ice prior to submittal to the laboratory.

### 4.8 SEDIMENT SAMPLING

As there are no surface water bodies on the Phase Two Property, no sediment was sampled as part of this investigation.

### 4.9 ANALYTICAL TESTING

Samples were submitted for chemical analysis to Paracel Laboratories, located in Ottawa, Ontario. Paracel Laboratories is a laboratory certified by the Canadian Association for Laboratory Accreditation (CALA).

### 4.10 RESIDUE MANAGEMENT PRACTICES

Excess soil cuttings from drilling operations were collected and contained in drums for removal off-site pending the laboratory results. Purged water collected from groundwater sampling was stored in the drums with the soil. All the drummed soil will be removed in conjunction with site redevelopment.

# 4.11 ELEVATION SURVEYING

The ground surface elevations of the completed monitoring wells were surveyed by Fairhall, Moffatt and Woodland Limited. Geodetic elevations of the ground surfaces at borehole locations was provided to WSP in a preliminary survey sketch, which was conducted on November 6, 2019. Note that elevations are missing for two (2) boreholes, BH19-8 and BH19-12, due to surveyor field error.

The ground surface elevations are included on the borehole logs in Appendix C.

# 4.12 QUALITY ASSURANCE AND QUALITY CONTROL MEASURES

Quality assurance (QA) and quality control (QC) of the soil samples was monitored and maintained in a number of ways:

- The field investigation was completed using WSP's standard operating procedures for soil and groundwater sampling;
- Samples were given unique identifications as they were collected, typically identifying the project number, date, sample location and depth. The sample numbers were recorded in field notes for each location;
- All non-dedicated sampling and monitoring equipment (e.g. interface probe) was cleaned using Alconox<sup>™</sup> and distilled water following each use;
- A chain-of-custody form was filled out for the samples prior to submitting the samples to the laboratory. The chain-ofcustody documented sample movement from collection to receipt at the laboratory and provided sample identification, requested analysis and conditions of samples upon arrival at the laboratory (e.g., temperature, container status, etc.);
- Soil samples were randomly selected by the WSP field staff for duplicate testing. The number of QC samples submitted is equivalent to a minimum of 10% of the total number of samples submitted; and,
- Samples were randomly selected by the laboratory for QA checks. Generally, one sample for every ten samples submitted is checked. For each parameter, there is an acceptable upper and lower limit for the measured concentration of the parameter. Measured concentrations of analysed samples must fall within the upper and lower acceptable limits in order for the sample to be valid. If a result exceeds the upper or lower acceptable limits, the sample must be re-analysed.

The duplicate samples collected during this Phase Two ESA is summarized in Table 4-1.

Table 4-1	Summary of Parameters Analyzed (Duplicate Samples)						
MEDIA	SAMPLE IDS (DUPLICATE IDS)	PARAMETER ANALYZED					
Soil	BH19-6-DUP (duplicate sample of BH19-6-SS3)	РАН					
Groundwater	DUP (duplicate sample of BH19-4)	PHC, PAH, Metals					

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# **5 REVIEW AND EVALUATION**

# 5.1 GEOLOGY

A brief summary of the subsurface conditions encountered at the subject site is presented below. Borehole logs are included in **Appendix C**. The borehole log stratigraphy was used to create a north-south and east-west cross-sections for the subject site, provided as **Figures 5** and **6**.

Based on the findings of the drilling investigation, the soil stratigraphy, beneath the Phase Two subject site generally consisted of a layer of asphalt or topsoil, underlain by fill consisting of silty sand to silty sand and gravel, with occasional presence of silty clay fill. The sand and gravel fill layer is considered to be reworked native soils, either from the subject site or from areas immediately off-site. Fill material was noted to extend to depths ranging between 3.8 m and 7.6 mBGS. Beneath the fill layer, there was native silty sand and gravel till (glacial till), with some fragments of rock.

Bedrock was cored at three (3) borehole locations, to final depths of 15.5, 18.6 and 19.3 mBGS, at BH19-8, BH19-7 and BH19-2, respectively. Descriptions of the subsurface soil conditions at each borehole location are provided on the borehole logs (**Appendix C**).

# 5.2 GROUNDWATER: ELEVATIONS AND FLOW DIRECTION

A summary of the measured groundwater levels, well screen details, and calculated groundwater elevations are presented in **Table 1**. The groundwater levels measured on November 4, 2019 are also presented as groundwater elevation contours (see **Figure 4**). Based on groundwater elevations, the inferred groundwater flow direction at the subject site is in an eastern direction, towards the railway.

### 5.3 GROUNDWATER: HYDRAULIC GRADIENTS

The calculated horizontal hydraulic gradient was 0.01, based on groundwater levels measured on November 4, 2019 between the monitoring wells at BH19-4, BH19-6 and BH19-10.

The vertical hydraulic gradient cannot be calculated using existing wells onsite, however the vertical hydraulic flow direction is anticipated to be in a downward direction.

# 5.4 SOIL TEXTURE

Based on field observations and the high sand and gravel content, the subsurface soil conditions are classified as coarse textured. Therefore, the guidelines chosen for the Phase Two ESA are MECP SCS listed in Table 3, Full Generic SCS in a Non-Potable Groundwater Water Condition. The applicable land use and soil texture would be residential, parkland, and institutional (RPI) property use for coarse-textured soils.

# 5.5 SOIL: FIELD SCREENING

Soil headspace combustible and organic vapour concentrations recorded during the field screening procedures collected from environmental boreholes during this Phase Two ESA ranged from 0 to 5 ppm (CGD)/15 ppm (PID). The readings are recorded on the logs presented in **Appendix C**.

# 5.6 SOIL QUALITY

A summary of the soil samples submitted for laboratory analyses, including details of sampling location and depths is presented below

in Table 5-1:

BOREHOLE		DEPTH	DATE	PARAMETERS			APEC #	
ID	ID	(MBGS)		Metals	PHCs	VOCs	PAHs	
BH12-3	SS2	0.8 – 1.4	1-Dec-12	√				1,2
BH12-3	SS4	1.8 – 2.4	1-Dec-12				4	1,2
BH12-3	SS5	2.4 - 3.1	1-Dec-12		√			1,2
BH12-3	SS8	6.1 – 6.7	1-Dec-12	4				1,2
BH12-3	SS10	9.1 – 9.8	1-Dec-12			4		1,2
BH19-2	SS5	2.3 - 2.9	23-Oct-19	4	√	1	1	1
BH19-4	SS2	1.8 - 2.4	28-Oct-19	4	√	1	1	1
BH19-6	SS3	1.5 - 2.1	24-Oct-19	4	1	1	1	1,2
BH19-6	DUP	1.5 - 2.1	24-Oct-19				1	1,2
BH19-6	SS8	5.3 - 5.9	24-Oct-19		✓	1	1	1,2
BH19-8	SS8	5.3 - 5.9	24-Oct-19	4	✓	4	1	1
BH19-10	SS8	5.3 - 5.9	24-Oct-19	4	1	1	1	1,2
BH19-10	SS10	6.9 - 7.5	24-Oct-19	4		1		1,2

#### Table 5-1Summary of Soil Samples

The soil analysis results from the present investigation are presented in Tables 4 to 7 and are discussed below.

Soil samples, with corresponding number of QA/QC samples, collected from the boreholes were submitted to the laboratory and analyzed for the following PCOCs: metals, PHCs, VOCs, and/or PAHs. One sample was also submitted for analysis of Toxicity Characteristic Leaching Procedure (TCLP), for evaluation of possible landfill disposal options.

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

#### 5.6.1 METALS

The soil analytical results for metals are summarized in **Table 4.** All soils and results that exceeded the MECP Table 3 SCS are presented in Table 5-2. Further comparison to MECP Table 1 standards is included in **Table 4**:

Table 5-2	Metals Exceedances	Greater Than MECP	Table 3 SCS in Soil
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Sample ID	MEOD	BH19-4-SS2
Sample Depth (mbgs)	MECP Table 3	0 – 1.2
Description of Material	SCS	Fill (silty sand)
Vanadium	86	104

All units in µg/g

- - values met the MECP Table 3 SCS

NA – not analyzed

104 - Analytical result greater than the MECP Table 3 SCS

All other analytical results were found to be in compliance with MECP Table 3 standards.

#### 5.6.2 PETROLEUM HYDROCARBONS (PHCS)

No exceedances of MECP Table 3 SCS were identified in the soil samples submitted for PHC analysis. One sample BH19-2-SS5 exceeded MECP Table 1 SCS for F1(C6 to C10) and F4 (C34 to C50). The soil analytical results for PHCs are summarized in **Table 5**.

#### 5.6.3 VOLATILE ORGANIC COMPOUNDS (VOCS)

No exceedances of MECP Table 3 SCS were identified in the soil samples submitted for VOC analysis. The soil analytical results for VOCs are summarized in **Table 6**.

#### 5.6.4 POLYCYCLIC AROMATIC HYDROCARBONS (PAHS)

No exceedances of MECP Table 3 SCS were identified in the soil samples submitted for PAH analysis. The soil analytical results for PAHs are summarized in **Table 7**.

#### 5.6.5 TCLP

One composite sample, created by WSP using fill material from samples BH19-4-SS2, BH19-6-SS3 and BH19-10-SS8 was submitted for analysis. Based on a comparison with Ontario Regulation 558, Schedule 4, the soil material is not considered to be hazardous waste. C of As are included in **Appendix D-2**.

# 5.7 GROUNDWATER QUALITY

A summary of the groundwater samples submitted for laboratory analysis, including details of sampling location and screened depths is presented below in Table 5-3:

MONITORING SCREENED WELL ID INTERVAL (MBGS)		DATE PARAMETERS			APEC #		
			Metals	PHCs	VOCs	PAHs	
BH19-4	4.5 - 7.5	Nov 4 2019	1	1	1	1	1,2
BH19-4 (DUP)	4.5 - 7.5	Nov 4 2019	1	1	1	1	1,2
BH19-6	4.6 - 7.9	Nov 4 2019	1	1	1	1	1,2
BH19-10	4.6 - 7.6	Nov 4 2019	1	1	1	1	1,2

#### Table 5-3 Summary of Groundwater Samples

Groundwater samples, including QA/QC samples were submitted to the laboratory and analyzed for the following PCOCs: Metals, PHCs, VOCs, and PAHs.

Summaries of the analytical results for each analyzed parameter are provided in Tables 8 to 11 and are discussed below.

The Laboratory Certificates of Analysis for the groundwater analysis completed during the Phase Two ESA are provided in **Appendix D-3**.

#### 5.7.1 METALS

No exceedances of MECP Table 3 SCS were identified in the groundwater samples submitted for metals analysis. The groundwater analytical results for metals are summarized in **Table 8**.

#### 5.7.2 PETROLEUM HYDROCARBONS (PHCS)

No exceedances of MECP Table 3 SCS were identified in the groundwater samples submitted for PHC analysis. The groundwater analytical results for PHCs are summarized in **Table 9**.

#### 5.7.3 VOLATILE ORGANIC COMPOUNDS (VOCS)

No exceedances of MECP Table 3 SCS were identified in the groundwater samples submitted for VOC analysis. The groundwater analytical results for VOCs are summarized in **Table 10**.

#### 5.7.4 POLYCYLIC AROMATIC HYDROCARBONS (PAHS)

No exceedances of MECP Table 3 SCS were identified in the groundwater samples submitted for PAHs analysis. The groundwater analytical results for PAHs are summarized in **Table 11**.

### 5.8 SEDIMENT QUALITY

No sediment sampling was conducted as part of this investigation.

### 5.9 QUALITY ASSURANCE AND QUALITY CONTROL RESULTS

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 one field duplicate on each day of groundwater sampling. 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 50% for soils and less than 30% for groundwater with the exception of certain parameters (see

Table 5-4 below) was deemed acceptable; for concentrations less than five times the RDL, the RPD could not be reliably calculated. A summary of the required performance standard for soil and groundwater sample homogeneity for QA/QC comparisons of the original to its duplicate sample is provided in Table 5-4.

#### Table 5-4 Required Performance Standards for Soil and Groundwater for QA/QC

REQUIRED QA/QC PARAMETER	REQUIRED PERFORMANCE STANDARD
Petroleum hydrocarbons	RPD should be ≤ 30% for water and ≤ 40% for soils
Polycyclic aromatic hydrocarbons	RPD should be ≤ 30% for water and ≤ 40% for soils
Volatile organic compounds	RPD should be ≤ 30% for water and ≤50% for soils
Hexavalent chromium	RPD should be $\leq 20\%$ for water and $\leq 35\%$ for soils

REQUIRED QA/QC PARAMETER	REQUIRED PERFORMANCE STANDARD

Mercury	RPD should be $\leq 20\%$ for water and $\leq 30\%$ for soils
Metals, Hydrid metals, boron hot water soluble (BHWS)	RPD should be $\leq$ 20% for water and $\leq$ 30% for soils. BHWS $\leq$ 30% water and $\leq$ 40% soils

A summary of the field duplicates for soil and groundwater samples exceeding the acceptable RPDs are shown in Table 5-5.

#### Table 5-5 Summary of Soil and Groundwater QA/QC control Results

DATE SAMPLED	SAMPLE ID	FIELD DUPLICATE ID	MEDIA SAMPLED	RPD EXCEEDING REQUIRED STANDARDS
2019-10-24	BH19-6-SS3	BH19-6-DUP	Soil – PAHs	Benzo(b)fluoranthene, RPD = 42%
2019-11-04	BH19-4	-	GW – Metals, PHCs,BTEX,PAHs	No exceedances reported.

The only RPD exceedances was identified in a soil sample submitted for PAH analysis. The detected RPD consisted on only a marginal exceedance of the required standard, likely due to the heterogeneity of the fill material, and is not considered to affect the interpretation of the results.

Paracel Laboratories 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 D**; the results were acceptable and, therefore, suitable for consideration of the results in the interpretation of site conditions.

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 D**.

### 5.10 PHASE TWO CONCEPTUAL SITE MODEL

Through analysis and interpretation of the Phase One ESA, Phase One CSM, and field data gathered during this Phase Two ESA, a Phase Two Conceptual Site Model was developed, which also included the following figures:

FIGURE 1	PHASE ONE CONCEPTUAL SITE MODEL
FIGURE 2	PHASE ONE SITE PLAN
FIGURE 3	BOREHOLE AND CROSS-SECTION LOCATION PLAN
	Plan view of all environmental sample locations, and location of cross-sections
FIGURE 4	GROUNDWATER CONTOURS
	Inferred groundwater contour prepared based on groundwater levels measured in on-site monitoring wells on November 4, 2019.
FIGURE 5	STRATIGRAPHIC CROSS-SECTION A-A'
	Stratigraphy shown parallel to groundwater flow. Extent of contamination shown is based on excavation completed at the time of remediation.
FIGURE 6	STRATIGRAPHIC CROSS-SECTION B-B'
	Stratigraphy shown perpendicular to groundwater flow. Extent of contamination shown is based on excavation completed at the time of remediation.
FIGURE 7	ANALYTICAL TESTING PLAN - SOIL

Plan view of all the soil samples collected and submitted for metals, PHCs, VOCs, and PAHs. This plan also identifies suspected areas of vanadium impacts.

FIGURE 8 ANALYTICAL TESTING PLAN - GROUNDWATER

Plan view of all the groundwater samples collected and submitted for metals, PHCs, VOCs, and PAHs.

FIGURE 9 CONCEPTUAL SITE MODEL FOR HUMAN RECEPTORS

Conceptual Site Model showing the source, contaminant release mechanism, exposure routes and human receptors based on the site condition.

FIGURE 10 CONCEPTUAL SITE MODEL FOR ECOLOGICAL RECEPTORS

Conceptual Site Model showing the source, contaminant release mechanism, exposure routes and ecological receptors based on the site condition.

Based on information obtained as part of the Phase One ESA, it was concluded that two areas of potential environmental concern (APECs) 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 summarized in **Table 5-6**.

 Table 5-6
 Summary of Areas of Potential Concern

AREAS OF POTENTIAL ENVIRONMENTAL CONCERN (APEC)	LOCATION OF APEC ON PHASE TWO PROPERTY	POTENTIALLY CONTAMINATING ACTIVITY (PCA)	LOCATION OF PCA ON-SITE OR OFF-SITE)	CONTAMINANT(S) OF POTENTIAL CONCERN	MEDIA POTENTIALLY IMPACTED (GROUNDWTER AND/OR SOIL)
APEC 1	Central portion side of subject site.	30. Fill Material of Unknown Quality	On-site	Metals, PHCs, VOCs, PAHs	Soil and Groundwater
APEC 2	East portion of subject site.	46. Rail yards, tracks and spurs	Off site	Metals, PHCs, PAHs	Soil and Groundwater

PHC – Petroleum hydrocarbons, including benzene, toluene, ethylbenzene and xylenes

VOCs – volatile organic compounds

PAHs – polycyclic aromatic hydrocarbons

#### 5.10.1 PCAS AND APECS

#### 5.10.1.1 AREAS WHERE POTENTIALLY CONTAMINATING ACTIVITY HAS OCCURRED

One on-site PCA and one off-site PCA were identified as Areas of Potential Environmental Concern on the subject site. These are related to the historical importation of fill material of unknown quality, and the presence of a historical and current rail line to the east of the subject site.

#### 5.10.1.2 AREAS OF POTENTIAL ENVIRONMENTAL CONCERN

There are two APECs where PCAs may have affected the soil and/or groundwater at the Phase Two Property:

- <u>APEC 1 (Eastern portion of the Subject Site)</u>: The importation and storage of fill material of unknown quality from historical commercial operations at the site has the potential to impact soil at the subject site;
- <u>APEC 2 (Central and Eastern portion of the Subject Site)</u>: A railway line was formerly located at grade from as early as the 1920's until the 1960's, when the line was shifted to a trench immediately adjacent to it. The rail lines (both older and newer) are located offsite to the east.

#### 5.10.1.3 SUBSURFACE STRUCTURES AND UTILITIES

Underground utilities can affect contaminant distribution and transport. Trenches excavated to install utility services, and the associated granular backfill may provide preferential pathways for horizontal contaminant migration in the shallow subsurface.

Based on utility drawings made available by Carleton University, as well as public and private locates obtained by WSP during the Phase Two ESA investigation, service lines were located at various locations on the subject site, including sanitary and storm sewers, natural gas lines, electrical conduits and water lines. As there are no identified groundwater impacts on the Phase Two Property, subsurface utilities are not anticipated to contribute to contaminant migration.

#### 5.10.2 PHYSICAL SETTING

# 5.10.2.1 STRATIGRAPHY FROM GROUND SURFACE TO THE DEEPEST AQUIFER OR AQUITARD INVESTIGATED

Based on the findings of the drilling investigation, the soil stratigraphy, with increasing depth, beneath the Phase Two subject site generally consisted of a layer of asphalt or topsoil, underlain by fill consisting of silty sand to silty sand and gravel, with occasional presence of silty clay fill. The sand and gravel fill layer is considered to be reworked native soils, either from the subject site or from areas immediately off-site. Fill material was noted to extend to depths ranging between 3.8 m and 7.6 mBGS. Beneath the fill layer, there was native silty sand and gravel till (glacial till). Bedrock was cored at three (3) borehole locations, to final depths of 15.5, 18.6 and 19.3 mBGS, at BH19-8, BH19-7 and BH19-2, respectively.

Stratigraphic cross section is presented in **Figures 5** and **6**. Stratigraphic cross-sections A-A' and B-B' depict the subsurface condition oriented parallel and perpendicular to groundwater flow.

The groundwater elevation contours based on recent groundwater monitoring shown on Figure 4.

#### 5.10.2.2 HYDROGEOLOGICAL CHARACTERISTICS

The results of the groundwater monitoring indicated that the primary near surface water table resides within the fill material (at boreholes BH19-4 and BH19-10), and within the glacial till layer, at BH19-6. No visual, olfactory or analytical evidence of impact was noted in the groundwater. The groundwater elevation contours based on recent groundwater monitoring in the wells are included in **Figure 4.** The average horizontal hydraulic gradient was calculated to be 0.01, using the groundwater elevation measured on November 4, 2019.

#### 5.10.2.3 APPROXIMATE DEPTH TO BEDROCK

Inferred bedrock was encountered between 7.6 m and 12.6 mBGS (based on refusal to auger advancement). Bedrock was cored at BH19-2, BH19-7 and BH19-8, where bedrock was encountered at 11.4, 11.8 and 10.7 mBGS (respectively). Bedrock consisted of shale and limestone.

#### 5.10.2.4 APPROXIMATE DEPTH TO WATER TABLE

Within the subject site, groundwater was observed to range between 4.5 m and 6.7 mBGS (elevations of 60.23 and 59.55 m).

#### 5.10.2.5 SECTION 41 OR 43.1 OF THE REGULATION

Section 41 of O. Reg. 153/04 does not apply to the Site based on the following:

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 43.1 of O. Reg. 153/04 does not apply to the Site based on the following:

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 greater than 7.6 metres based on the drilling investigation completed onsite.

Based on the factors listed above, the MECP SCS Table 3 SCS would apply to the Phase Two Property.

#### 5.10.2.6 SOIL BROUGHT FROM ANOTHER PROPERTY

Fill material of unknown quality imported for on-site grading was identified as a PCA on-site. The quality of this fill material was assessed.

The fill material was found to be in compliance with site standards, with one exception: vanadium was encountered above the site standards at BH19-4.

#### 5.10.2.7 PROPOSED BUILDINGS AND STRUCTURES

The subject site is intended to be developed with a student residence building.

#### 5.10.3 CONTAMINANT PRESENCE ONSITE

#### 5.10.3.1 AREAS WHERE A CONTAMINANT IS PRESENT

Soil with contaminant concentrations greater than the Table 3 SCS was present in a localised location at BH19-4. Soil was marginally impacted with vanadium, a metals parameter.

#### 5.10.3.2 ASSOCIATED CONTAMINANTS

Based on the initial Phase Two ESA, the associated contaminants in soil onsite was limited to vanadium. No other contaminants were identified on the subject site.

#### 5.10.3.3 ASSOCIATED MEDIUM

Contaminants were only found in soil. No contaminants were identified in groundwater.

5.10.3.4 WHAT IS KNOWN ABOUT THE AREAS OF ENVIRONMENTAL IMPACT

Soil with contaminant concentrations greater than the Table 3 SCS was present in the fill material (silty clay) at BH19-4.

#### 5.10.3.5 HORIZONTAL DISTRIBUTION OF CONTAMINANTS

The horizontal distribution of vanadium in soil is presented in **Figure 5** and vertical distribution of vanadium in soil is presented in cross-section **Figures 7**.

The area of impact is limited to an area surrounding BH19-4.

#### 5.10.3.6 REASON FOR DISCHARGE

The majority of the imported fill material identified at the subject site was found to be compliant with the applicable site condition standards. The vanadium exceedance may be related to naturally occurring vanadium in silty clay fill, as there were no real sources of vanadium at the subject site, however, vanadium was not encountered within other fill samples.

#### 5.10.3.7 MIGRATION OF CONTAMINANTS

**Figure 5** provides delineation of the vanadium in plan view. Vanadium was the only contaminant identified on the subject site, and only limited to one soil sample, collected from BH19-4. All metals parameters in groundwater were found to be in compliance with site standards at that borehole monitoring well location, specifically, vanadium was not detected above laboratory detection limits.

As such, the on-site contaminant, vanadium, is not considered to have migrated vertically or horizontally with any significant distance and is considered to be localised around the upper fill material at BH19-4.

#### 5.10.3.8 CLIMATIC OR METEOROLOGICAL CONDITIONS

Climatic or meteorological conditions are not considered to affect migration of the vanadium, as the borehole/monitoring

well was installed within a asphalt-covered surface. Infiltration through the asphalt would be considered negligible.

#### 5.10.3.9 SOIL VAPOUR INTRUSION

Soil vapour intrusion is not considered to be a concern with respect to the identified contaminant due to the fact that metals do not readily volatilize and that as part of site redevelopment works, much of the shallow fill material where vanadium was identified would likely be removed from the property.

#### 5.10.4 CONTAMINANT DISTRIBUTION

#### 5.10.4.1 LATERAL AND VERTICAL DISTRIBUTION OF A CONTAMINANT

Cross-sections that include the required information are provided as:

Figure 5 Cross-section A-A'

Plan view figures that indicate the horizontal distribution of contaminants are provided as:

- Figure 7 Analytical Testing Plan – Soil.

#### 5.10.5 PHASE TWO CSM

The subject site had no building onsite and the area where impacted soil was paved. The release mechanisms and transport pathways for human and ecological receptors are discussed herein and are shown in **Figures 9** and **10**.

#### 5.10.5.1 THE RELEASE MECHANISMS AND CONTAMINANT TRANSPORT PATHWAY

The release mechanisms and transport pathway for the contaminants (vanadium) include:

- Ingestion and skin contact with contaminated soil during excavation works; and
- Wind Erosion for airborne particles for metals.

#### 5.10.5.2 THE HUMAN AND ECOLOGICAL RECEPTOR

The potential human and ecological receptors exposed to the COCs include:

Human (onsite):

- Site worker, construction workers and utilities workers;

Ecological:

Soil organism.

As the contamination is limited to soil only, and that soils in that area are asphalt-covered, exposure to on-site and offsite receptor is limited.

# 5.10.5.3 RECEPTOR EXPOSURE POINTS AND ROUTES OF EXPOSURE 5.10.5.3.1 HUMAN RECEPTOR

Exposure point and complete exposure pathways for on-site human receptors include:

- Onsite soil ingestion, dermal contact (soil skin contact), and inhalation of particulate matter and vapours both outdoor and indoor air; and
- Offsite inhalation of particulate matter and vapours both outdoor and indoor air.

These would only be applicable if the soils are uncovered.

#### 5.10.5.3.2 ECOLOGICAL RECEPTOR

Exposure point and complete exposure pathways for on-site ecological receptors include infiltration and adsorption to soil via the following:

- Root and volatilized contaminants update for terrestrial plants;
- Direct update via dermal contact and inhalation of volatilized contaminants for soil invertebrates;
- Ingestion, vapour and soil inhalation of plant and invertebrates effected by impacted soil for birds, mammals and amphibians; and
- Ingestion, vapour and soil inhalation of contaminants for birds, mammals and amphibians.

Impact to ecological receptors is considered to be minimal, due to the fact that impacted soils are currently asphalt-covered.

# 6 CONCLUSIONS

# 6.1 SUMMARY OF PHASE TWO ESA INVESTIGATION FINDINGS

The following assessments were completed at the Phase Two Property where soil and groundwater samples were collected and submitted for laboratory analysis for the PCOCs, including metals, PHCs, PAHs and VOCs as identified during the Phase One ESA.

Between October 23 and October 28, 2019, 12 environmental and geotechnical boreholes (three of which were completed as monitoring wells) were advanced to maximum depths ranging between 7.6 m and 12.6 mBGS. Three (3) boreholes were cored to depths between 15.5 and 19.3 mBGS.

Based on the information collected in this Phase Two ESA, WSP provides the following findings:

#### **Subsurface Condition**

Based on the findings of the drilling investigation, the soil stratigraphy, beneath the Phase Two subject site generally consisted of a layer of asphalt or topsoil, underlain by fill consisting of silty sand to silty sand and gravel, with occasional presence of silty clay fill. Part of the sand and gravel fill layer is considered to be reworked native soils, either from the subject site or from areas off-site. Fill material was noted to extend to depths between 3.8 m and 7.6 mBGS. Beneath the fill layer, there was native silty sand and gravel till (glacial till). Bedrock was cored at three (3) borehole locations, to final depths of 15.5, 18.6 and 19.3 mBGS, at BH19-8, BH19-7 and BH19-2, respectively.

For the purposes of this assessment, the analytical results have been compared to the 2011 MECP Table 3 for full depth generic site conditions in a non-potable groundwater condition.

#### Soil Condition

 All soils were found to be in compliance with MECP Table 3 standards, with the exception of vanadium at borehole BH19-4, which was identified in the upper fill material.

#### **Groundwater Condition**

 All groundwater samples were found to be in compliance with MECP Table 3 standards and is not considered to have been adversely impacted by historical activities.

# 6.2 RECOMMENDATIONS

Based on the findings of the Phase Two ESA, vanadium is present within a small area of the subject site, related to poor quality fill material. Given the scope of the proposed redevelopment of the site, the soils in the vicinity of the vanadium exceedance should be excavated and disposed of at a licensed landfill facility as part of site excavation works. It is recommended that WSP be present at the time of excavation, such that confirmatory samples can be collected following remedial excavation works.

Prior to site redevelopment, all three (3) groundwater monitoring wells must be decommissioned as per Ontario Regulation 903.

# 7 QUALIFICATIONS OF ASSESSORS

# 7.1 WSP CANADA INC.

WSP is a leading, full-service engineering company that has seen successful growth in the past decade with a Canadian contingent of approximately 8,000 people making a significant contribution to our 34,000 global staff, based in more than 500 offices, across 40 countries. WSP employs about 450 environment staff in Ontario including Professional Engineers, Professional Geoscientists, Biologists and Certified Technicians. The firm provides services to transform the built environment and restore the natural environment, and its expertise ranges from environmental remediation to urban planning, from engineering iconic buildings to designing sustainable transport networks, and from developing the energy sources of the future to enabling new ways of extracting essential resources.

# 7.2 QUALIFIED PERSON

#### Natalia Codoban, M.Eng., P.Eng, QP<sub>ESA</sub> –Senior Hydrogeologist/Senior Env. Engineer

Natalia is a Senior Hydrogeologist / Environmental Engineer and Project Manager with over 14 years of experience in the environmental consulting field. She has academic background in Earth / Environmental Sciences and Geology and Environmental Engineering. She is a Professional Engineer in good standing and is a QP<sub>ESA</sub>. Natalia has provided expertise to numerous Phase One and Phase Two ESAs, Contamination Overview Studies, landfill studies, hydrogeological investigations, and modelling groundwater flow and contaminant transport migration. Natalia reviewed the Phase Two ESA for this project.

#### Adrian Menyhart, P.Eng., ing. QPESA – Environmental Engineer/Project Manager

Adrian Menyhart is a Project Manager in the Ottawa, Ontario office of WSP Canada Inc. He has experience in conducting Phase One and Two Environmental Site Assessments on numerous residential, commercial, and industrial properties throughout Ontario and Quebec, from the conception stages, sampling programs, and reporting. Adrian has also successfully submitted several Record of Site Condition with the Ontario Ministry of the Environment, Conservation and Parks. Adrian managed completion of the Phase One ESA and Phase Two ESA and prepared ESA reports for this project.

# 7.3 SIGNATURES

This Phase Two ESA was conducted by the undersigned Qualified Person in general accordance with the requirements of O. Reg. 153/04.



Adrian Menyhart, P.Eng., ing., QP<sub>ESA</sub> Project Engineer, Environment

CCA	
TMP	

Natalia Codoban, M.Eng., P.Eng., QP<sub>ESA</sub> Senior Environmental Engineer, Environment

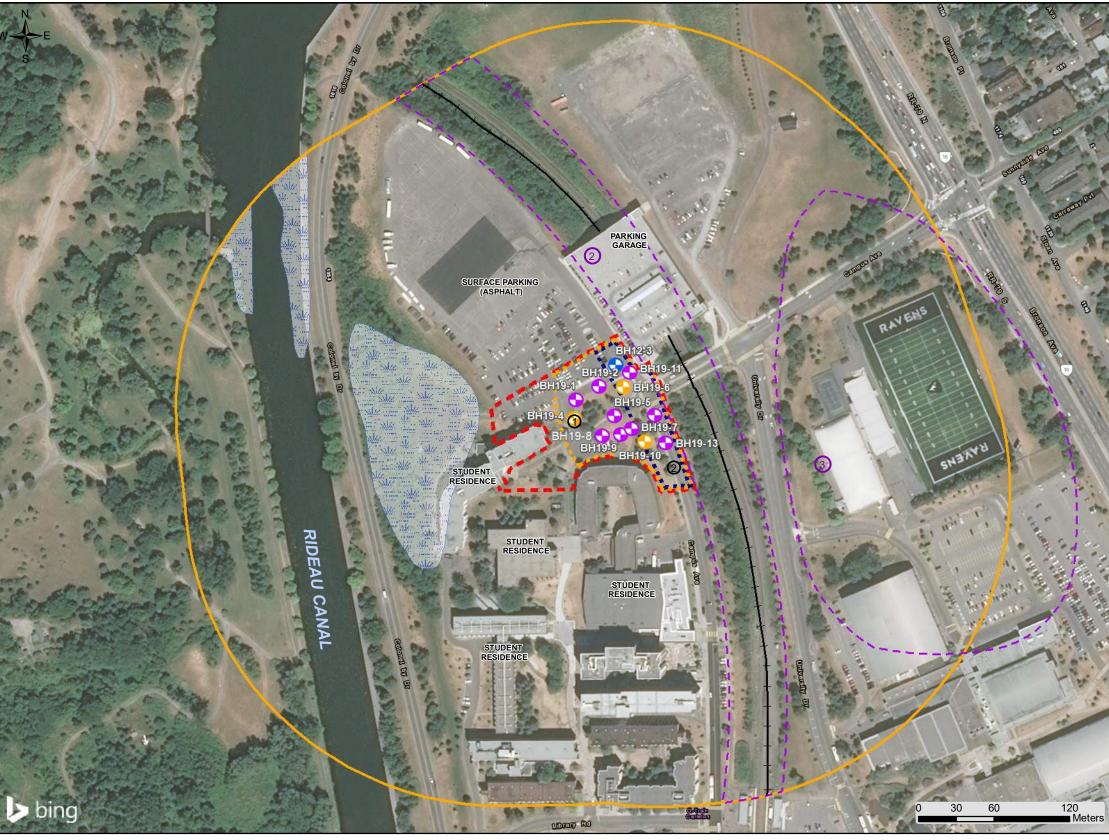
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- Ontario Geological Survey. 2011. 1:250,000 Scale Bedrock Geology of Ontario; Ontario Geological Survey, Miscellaneous Release Data 126-Revision 1.
- SPL Consultants Limited, January 10, 2013. Phase One Environmental Site Assessment, North Property Development, Carleton University, Ottawa, Ontario. Draft report.
- SPL Consultants Limited, April 3, 2013. Phase Two Environmental Site Assessment, North Property Development, Carleton University, 1125 Colonel By Drive, Ottawa, Ontario.

#### Table 1 Monitoring Well Installation and Groundwater Levels

	ng Well ID	BH19-4	BH19-6	BH19-10	
	Installed By		WSP	WSP	WSP
	Installation Date		28-Oct-19	24-Oct-19	24-Oct-19
	Well Status		Active	Active	Active
We	ell Inner Diameter	(mm)	50	50	50
Casing Type (Flushmo	ount / Monument)		Flushmount	Monument	Monument
Ground Surface Elevation		(masl)	64.740	66.440	65.400
Bottom of Concrete Seal/Top of		(mbgs)	0.3	0.3	0.3
Bentonite Seal		(masl)	64.44	66.14	65.1
Bottom of Bentonite Seal/Top of Sand		(mbgs)	3.5	3.5	4.3
	Pack	(masl)	61.2	62.9	61.1
т	op of Well Screen	(mbgs)	4.6	4.9	4.6
		(masl)	60.1	61.5	60.8
Screen Length		(m)	3.0	3.0	3.0
Bottom of Screen		(mbgs)	7.5	7.9	7.6
		(masl)	57.2	58.5	57.8
04-Nov-19	Depth of GW	(mbgs)	4.5	6.7	5.9
04-1100-19	GW Elevation	(masl)	60.2	59.8	59.6

wsp



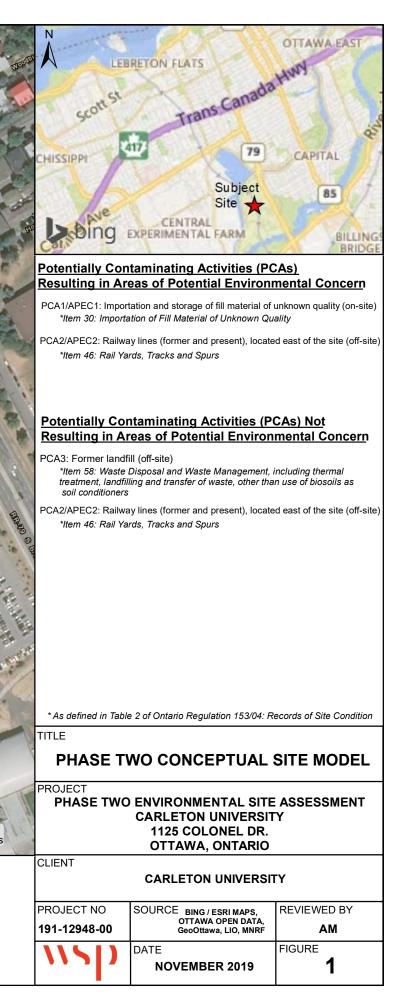
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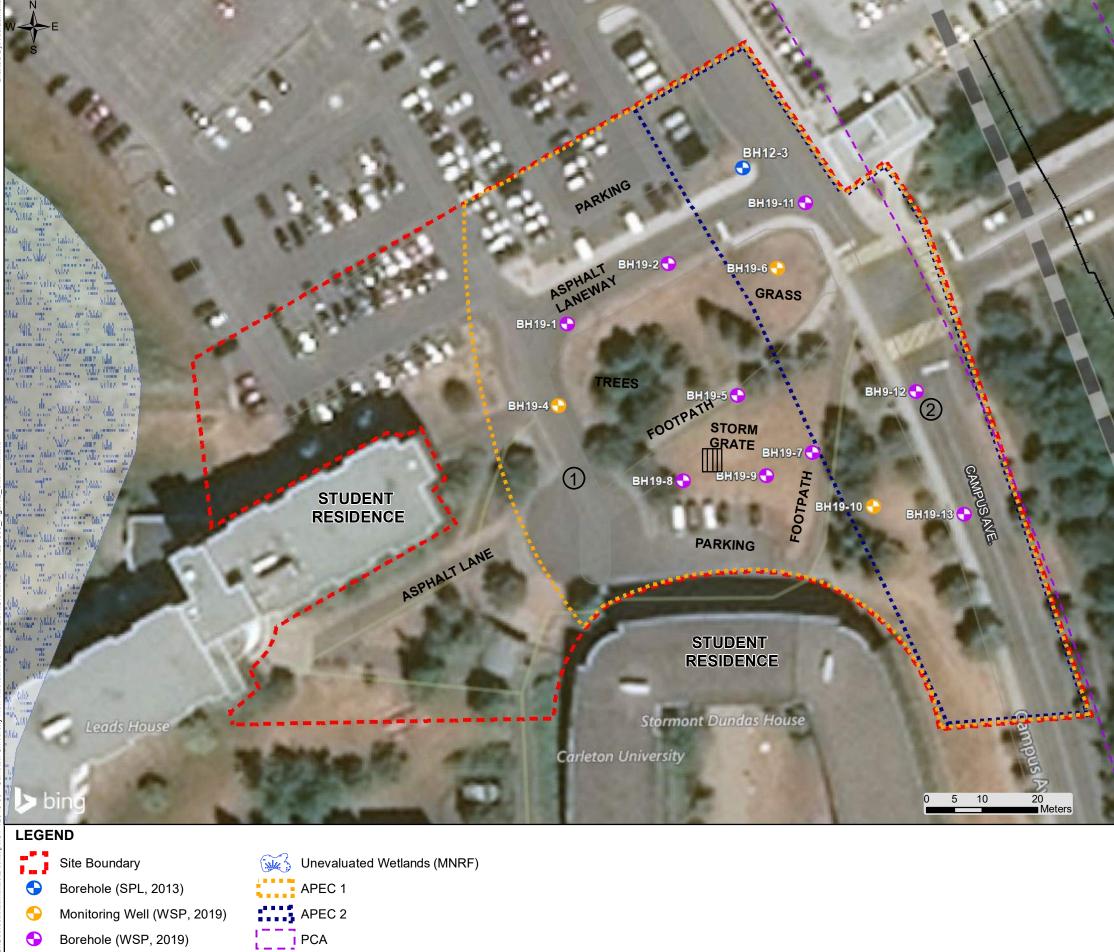
- Site Boundary
- 250 m Study Area
   Borehole (SPL, 2013)
- Monitoring Well (WSP, 2019)
- Borehole (WSP, 2019)
- →→→ Railway APEC 1

Unevaluated Wetlands (MNRF)

- APEC 2
- PCA

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### Potentially Contaminating Activities (PCAs) Resulting in Areas of Potential Environmental Concern

PCA1/APEC1: Importation and storage of fill material of unknown quality (on-site) \*Item 30: Importation of Fill Material of Unknown Quality

PCA2/APEC2: Railway lines (former and present), located east of the site (off-site) \*Item 46: Rail Yards, Tracks and Spurs

\*As defined in Table 2 of Ontario Regulation 153/04: Records of Site Condition

TITLE

### PHASE TWO SITE PLAN

#### PROJECT PHASE TWO ENVIRONMENTAL SITE ASSESSMENT CARLETON UNIVERSITY 1125 COLONEL By DR. OTTAWA, ONTARIO

CLIENT

#### CARLETON UNIVERSITY

PROJECT NO		SOURCE BING / ESRI MAPS, OTTAWA OPEN DATA,	REVIEWED BY		
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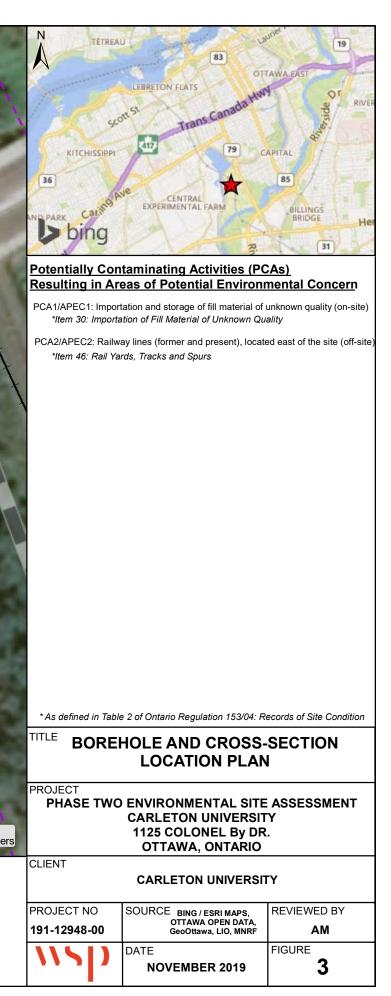


Borehole (SPL, 2013)

PCA

Borehole (WSP, 2019)

 $\bullet$ 



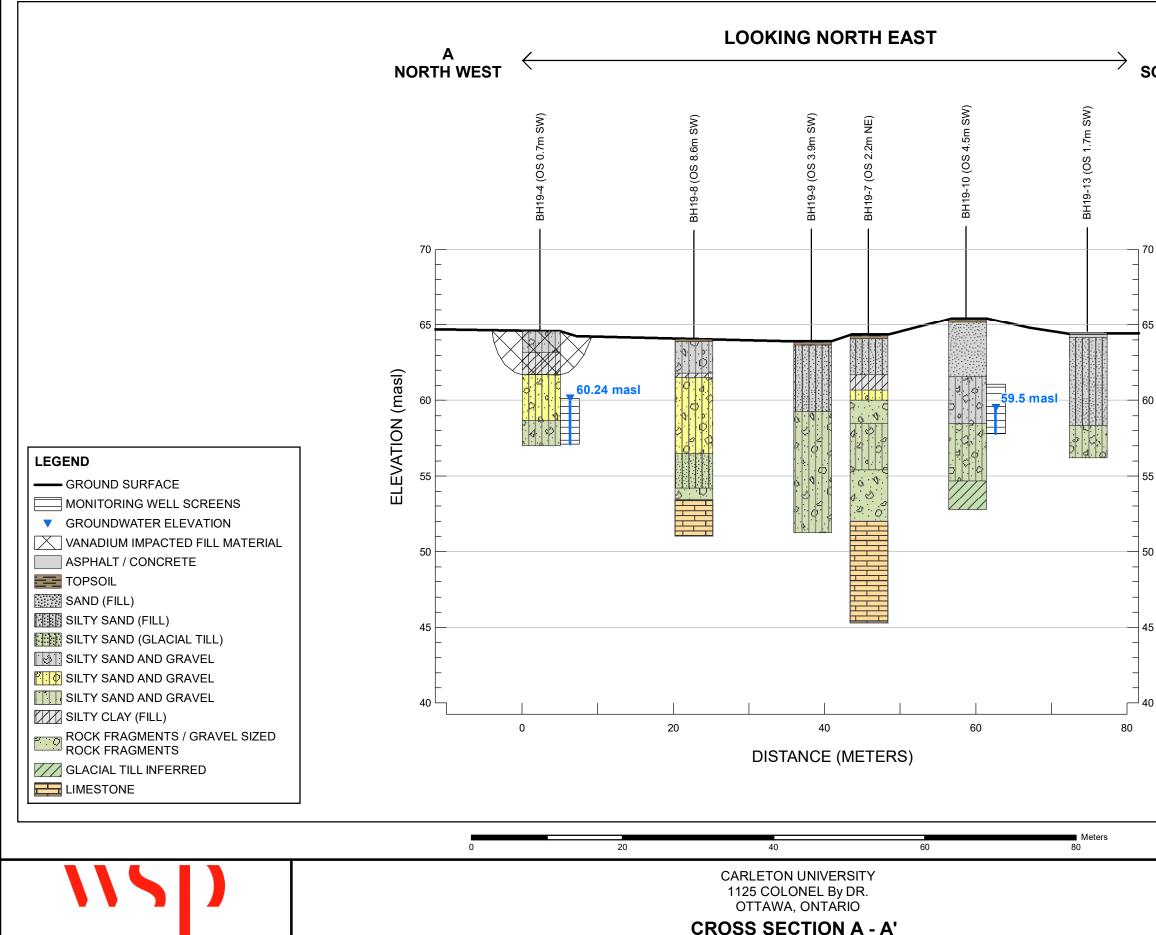


- Monitoring Well (WSP, 2019)\*
- Borehole (WSP, 2019)
- Borehole (SPL, 2013)
- APEC 1

\*Geodetic Groundwater elevations, Nov. 4, 20 (based on Preliminary survey sketch prepared Fairhall, Moffatt, Woodland Lt

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\\caott1dat01.gcg.local\SPL Ottawa\Projects\191-12948-00 - Carleton University New Residence\Phase II ESA\GIS\MXD\Figure 5 Cross Section A-A'.mxd

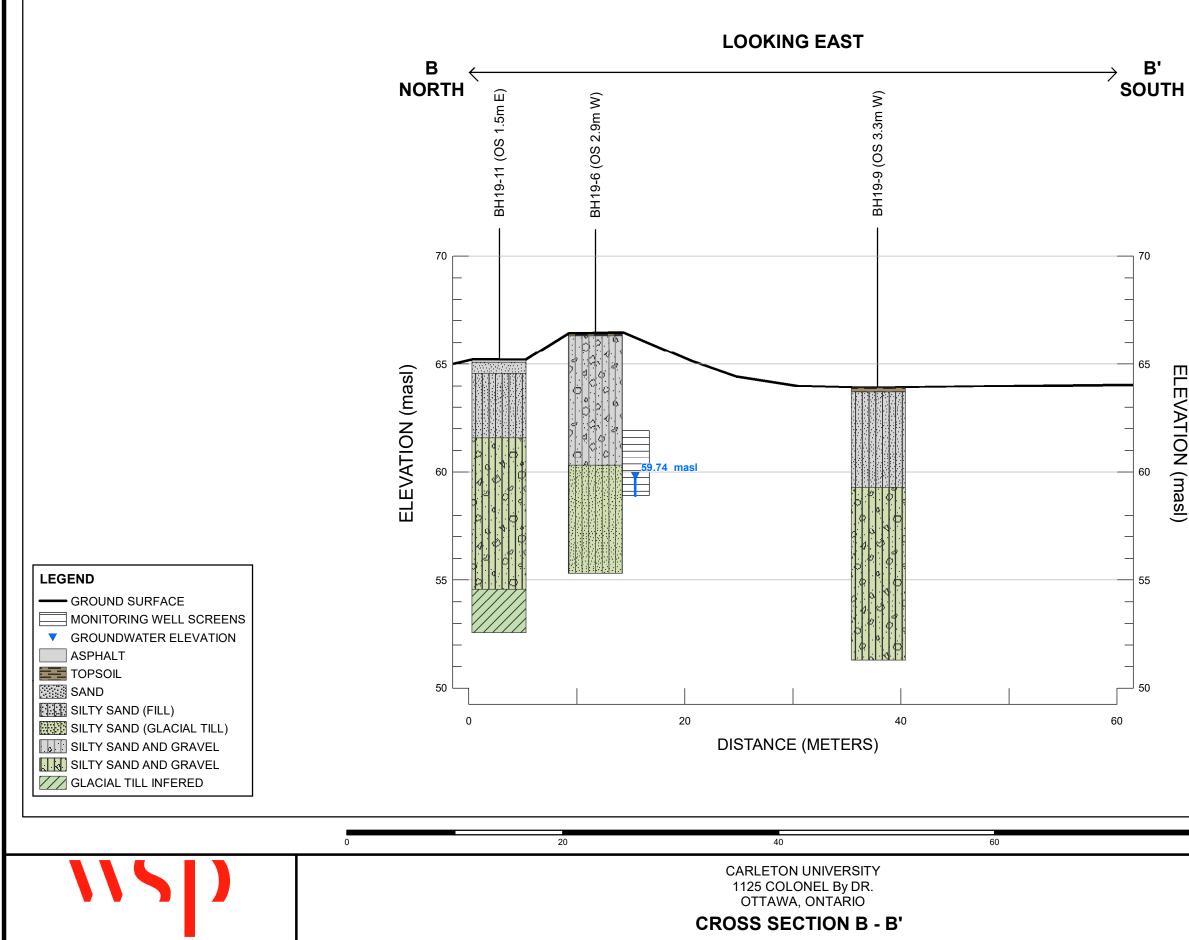


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DATE: NOVEMBER 2019	FIGURE
PROJECT: 191-12948-00	5

ELEVATION (masl)

### A' SOUTH EAST

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- Site Boundary
- Constant Con
- Solution Monitoring Well (WSP, 2019)
- Borehole (WSP, 2019)
- Borehole (SPL, 2013)
- PCA APEC 1 APEC 2 Area of Vanadium Impacted Fill Material

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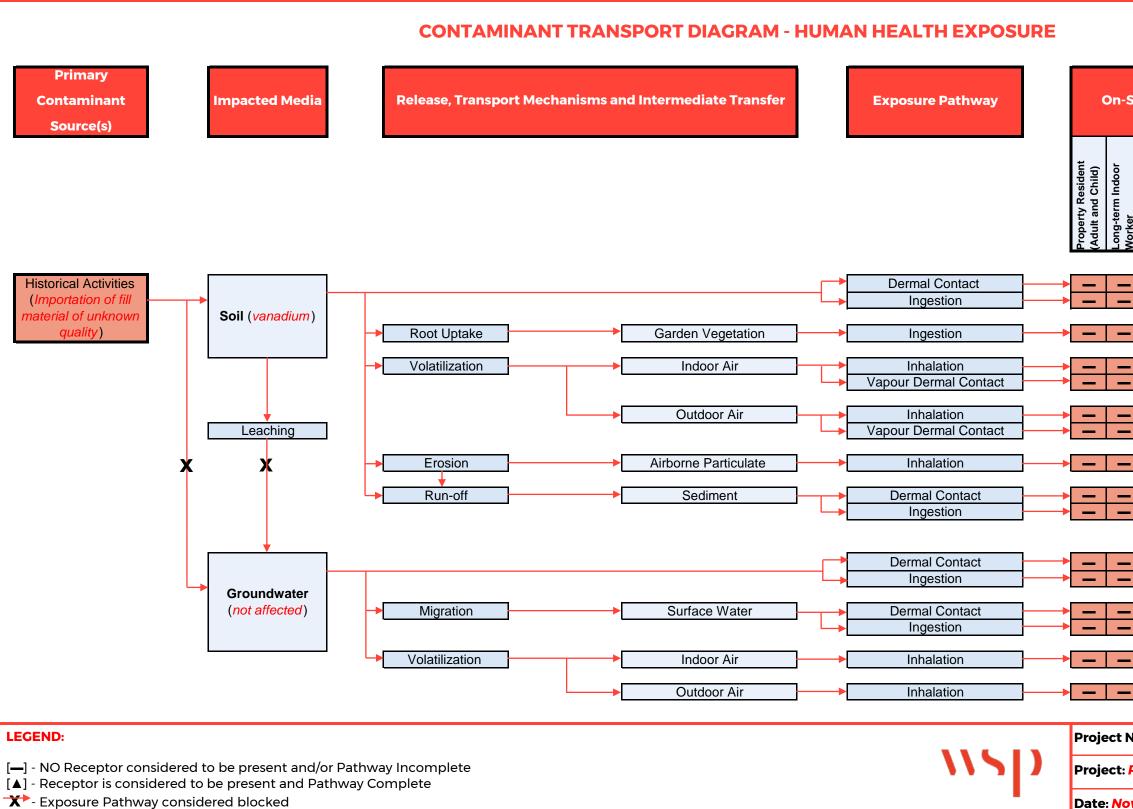


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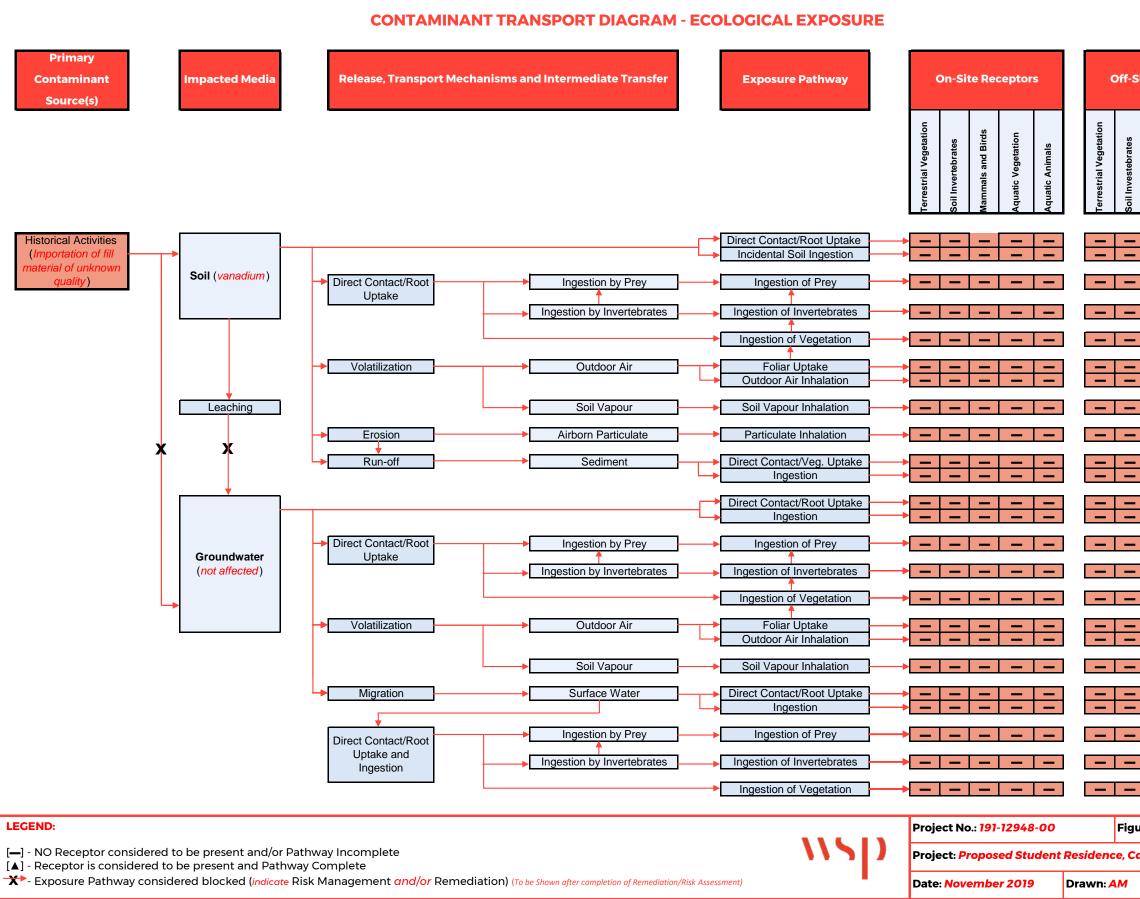
**NOVEMBER 2019** 

Borehole (WSP, 2019)

Borehole (SPL, 2013)



-Sit	te Rec	eptor	S		Off-Site Receptors					
Worker	<b>Construction Worker</b>	Landscape Worker	Property Visitor/ Trespasser		Property Resident (Adult and Child)	Long-term Indoor Worker	Construction Worker	Landscape Worker	Property Visitor/ Trespasser	
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ove	embe	r 2019	)	Dra	wn: A	M	Appr	oved:	NC	



-Si	te Rec	eptor	s						
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Borehole	Sample	Depth	Date		Parameters						
		m		Metals	PHCs	VOCs	PAHs				
BH19-2	SS5	2.3 - 2.9	23-Oct-19	√	✓	✓	✓	1			
BH19-4	SS2	1.8 - 2.4	28-Oct-19	✓	✓	1	✓	1			
BH19-6	SS3	1.5 - 2.1	24-Oct-19	✓	✓	1	✓	1,2			
BH19-6	DUP	1.5 - 2.1	24-Oct-19			1		1,2			
BH19-6	SS8	5.3 - 5.9	24-Oct-19		✓	1	✓	1,2			
BH19-8	SS8	5.3 - 5.9	24-Oct-19	✓	✓	1	✓	1			
BH19-10	SS8	5.3 - 5.9	24-Oct-19	√	✓	1	✓	1,2			
BH19-10	SS10	6.9 - 7.5	24-Oct-19	√				1,2			
BH12-3	SS2	0.89 - 1.4	1-Dec-12	√				1			
BH12-3	SS4	1.8 - 2.4	1-Dec-12				✓	1			
BH12-3	SS5	2.4 - 3.1	1-Dec-12		✓			1			
BH12-3	SS8	6.1 - 6.7	1-Dec-12	✓				1			
BH12-3	SS10	9.1 - 9.8	1-Dec-12			✓		1			

#### Table 2 Summary of Soil Samples Submitted for Chemical Analysis

### Table 3 Summary of Groundwater Samples Submitted for Chemical Analysis

Monitoring Well ID	Screened Interval (mbgs)	Date		Parameters					
			Metals	PHCs	VOCs	PAHs			
BH19-4	4.5 - 7.5	Nov 4 2019	✓	✓	~	~	1,2		
BH19-4 (DUP)	4.5 - 7.5	Nov 4 2019	~	~	*	~	1,2		
BH19-6	4.6 - 7.9	Nov 4 2019	✓	✓	✓	✓	1,2		
BH19-10	4.6 - 7.6	Nov 4 2019		~	*		1,2		

#### Table 4 Soil Analytical Results - Metals

Parameter			BH19-2-SS5	BH19-4-SS2	BH19-6-SS3	BH19-8-SS8	BH19-10-SS8	BH19-10-SS10
Date of Collection	Table 2 DDI	Table 1	Oct 23, 2019	28-Oct-19	Oct 24, 2019	Oct 24, 2019	Oct 24, 2019	Oct 24, 2019
Date Reported	Table 3 RPI CT	Table 1 RPIICC	Oct 31, 2019	Nov 01, 2019	Oct 31, 2019	Nov 08, 2019	Nov 08, 2019	Nov 08, 2019
Sampling Depth (mbgs)		NI IICC	2.3 - 2.9	1.8 - 2.4	1.5 - 2.1	5.3 - 5.9	5.3 - 5.9	6.9 - 7.5
Antimony	7.5	1.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Arsenic	18	18	3.6	3.9	1.7	1.9	4.4	2.2
Barium	390	220	197	<u>359</u>	48.2	152	123	54.9
Beryllium	4	2.5	0.6	0.7	<0.5	<0.5	<0.5	<0.5
Boron	120	36	9.6	6.5	5.7	11.5	7.8	7.5
Cadmium	1.2	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	160	70	59.1	<u>118</u>	12.9	14.5	20.3	14.7
Chromium VI	8	0.66	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cobalt	22	21	12.6	<u>21.5</u>	3.2	6.3	6.8	6.4
Copper	140	92	29.8	54.3	9.7	12.5	18.5	11.8
Lead	120	120	11.9	16.3	14.6	4.4	61.4	4.2
Mercury	0.27	0.27	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Molybdenum	6.9	2	1	<1.0	<1.0	<1.0	<u>2.6</u>	1.1
Nickel	100	82	33.8	62.8	6.3	12.3	14.9	10.6
Selenium	2.4	1.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Silver	20	0.5	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Thallium	1	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vanadium	86	86	<1.0	104	<1.0	1.1	<1.0	<1.0
Zinc	340	290	62.9	121	20.3	26	25.9	24.7
	104	Concentration e	xceeds MECP Ta	able 3 site stand	ard			

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Concentrations exceeds MECP Table 1 background standard

#### Table 4 Soil Analytical Results - Metals

Parameter		BH12-3-SS2	BH12-3-SS8
Date of Collection	Table 3 RPI	Dec 01, 2012	Dec 01, 2012
Date Reported	CT	Dec 10, 2012	Dec 10, 2012
Sampling Depth (mbgs)	01	0.8 - 1.4	6.1 - 6.7
Antimony	7.5	<1.0	<1.0
Arsenic	18	6.1	<1.0
Barium	390	31.3	32
Beryllium	4	<0.5	<0.5
Boron	120	-	-
Cadmium	1.2	<0.5	<0.5
Chromium	160	9.3	16.9
Chromium VI	8	<0.2	<0.2
Cobalt	22	5.8	2.6
Copper	140	8.5	7.8
Lead	120	13.9	2.5
Mercury	0.27	0.013	< 0.01
Molybdenum	6.9	3.8	<1.0
Nickel	100	11.3	4.5
Selenium	2.4	<1.0	<1.0
Silver	20	<0.2	<0.2
Thallium	1	<0.5	<0.5
Vanadium	86	16.1	17.2
Zinc	340	11.6	11.3

### wsp

#### Table 5 Soil Analytical Results - PHCs & BTEX

Parameter			BH19-2-SS5	BH19-4-SS2	BH19-6-SS3	BH19-6-SS8	BH19-8-SS8	BH19-10-SS8
Date of Collection	Table 3 RPI	Table 1	Oct 23, 2019	28-Oct-91	Oct 24, 2019	Oct 24, 2019	Oct 24, 2019	Oct 24, 2019
Date Reported	CT	RPIICC	Oct 31, 2019	Nov 01, 2019	Oct 31, 2019	Nov 08, 2019	Nov 08, 2019	Nov 08, 2019
Sampling Depth (mbgs)			2.3 - 2.9	1.8 - 2.4	1.5 - 2.1	5.3 - 5.9	5.3 - 5.9	5.3 - 5.9
Benzene	0.21	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Toluene	2.3	0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ethylbenzene	2	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Xylenes	3.1	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
F1 (C6 to C10) minus BTEX	55	7	<7	<7	<u>27</u>	<7	<7	<7
F2 (C10 to C16)	98	4	<4	<4	<4	<4	<4	<4
F3 (C16 to C34)	300	8	<8	<8	75	<8	<8	<8
F4 (C34 to C50)	2800	6	<6	<6	<u>123</u>	<6	<6	<6
			104	Concentration e	xceeds MECP T	able 3 site standa	ard	

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Concentrations exceeds MECP Table 1 background standard

### Table 5 Soil Analytical Results - PHCs & BTE)

Parameter	BH12-3-SS5	
Date of Collection	Table 3 RPI	Dec 01, 2012
Date Reported		Dec 10, 2012
Sampling Depth (mbgs)	01	2.4 - 3.1
Benzene	0.21	-
Toluene	2.3	-
Ethylbenzene	2	-
Total Xylenes	3.1	-
F1 (C6 to C10) minus BTEX	55	<5
F2 (C10 to C16)	98	<10
F3 (C16 to C34)	300	117
F4 (C34 to C50)	2800	<50

### wsp

### Table 6 Soil Analytical Results - VOCs

Parameter			BH19-2-SS5	BH19-4-SS2	BH19-6-SS3	BH19-10-SS8
Date of Collection	Table 2 DDI	Toble 1	Oct 23, 2019	28-Oct-91	Oct 24, 2019	Oct 24, 2019
Date Reported	Table 3 RPI CT	Table 1 RPIICC	Oct 31, 2019	Nov 01, 2019	Oct 31, 2019	Nov 08, 2019
Sampling Depth (mbgs)	CI	KFIICC	2.3 - 2.9	1.8 - 2.4	1.5 - 2.1	5.3 - 5.9
Acetone	16	0.5	<0.50	<0.50	<0.50	<0.50
Benzene	0.21	0.02	<0.02	<0.02	<0.02	<0.02
Bromodichloromethane	13	0.05	<0.05	<0.05	<0.05	<0.05
Bromoform	0.27	0.05	<0.05	<0.05	<0.05	<0.05
Bromomethane	0.05	0.05	<0.05	<0.05	<0.05	<0.05
Carbon Tetrachloride	0.05	0.05	<0.05	<0.05	<0.05	<0.05
Chlorobenzene	2.4	0.05	<0.05	<0.05	<0.05	<0.05
Chloroform	0.05	0.05	<0.05	<0.05	<0.05	<0.05
Dibromochloromethane	9.4	0.05	<0.05	<0.05	<0.05	<0.05
Dichlorobenzene, 1,2-	3.4	0.05	<0.05	<0.05	<0.05	<0.05
Dichlorobenzene, 1,3-	4.8	0.05	<0.05	<0.05	<0.05	<0.05
Dichlorobenzene, 1,4-	0.083	0.05	<0.05	<0.05	<0.05	<0.05
Dichlorodifluoromethane	16	0.05	<0.05	<0.05	<0.05	<0.05
Dichloroethane, 1,1-	3.5	0.05	<0.05	<0.05	<0.05	<0.05
Dichloroethane, 1,2-	0.05	0.05	<0.05	<0.05	<0.05	<0.05
Dichloroethylene, 1,1-	0.05	0.05	<0.05	<0.05	<0.05	<0.05
Dichloroethylene, cis- 1,2-	3.4	0.05	<0.05	<0.05	<0.05	<0.05
Dichloroethylene, trans- 1,2-	0.084	0.05	<0.05	<0.05	<0.05	<0.05
Dichloropropane, 1,2-	0.05	0.05	<0.05	<0.05	<0.05	<0.05
Dichloropropene, 1,3-	0.05	0.05	<0.05	<0.05	<0.05	<0.05
Ethylbenzene	2	0.05	<0.05	<0.05	<0.05	<0.05
Ethylene Dibromide	0.05	0.05	<0.05	<0.05	<0.05	<0.05
Hexane, n-	2.8	0.05	<0.05	<0.05	<0.05	<0.05
Methyl Ethyl Ketone	16	0.5	<0.50	<0.50	<0.50	<0.50
Methyl Isobutyl Ketone	1.7	0.5	<0.50	<0.50	<0.50	<0.50
Methyl tert-butyl ether	0.75	0.05	<0.05	<0.05	<0.05	<0.05
Methylene Chloride	0.1	0.05	<0.05	<0.05	<0.05	<0.05
Styrene	0.7	0.05	<0.05	<0.05	<0.05	<0.05
Tetrachloroethane, 1,1,1,2-	0.058	0.05	<0.05	<0.05	<0.05	<0.05
Tetrachloroethane, 1,1,2,2-	0.05	0.05	<0.05	<0.05	<0.05	<0.05
Tetrachloroethylene	0.28	0.05	<0.05	<0.05	<0.05	<0.05
Toluene	2.3	0.2	<0.05	<0.05	<0.05	<0.05
Trichloroethane, 1,1,1-	0.38	0.05	<0.05	<0.05	<0.05	<0.05
Trichloroethane, 1,1,2-	0.05	0.05	<0.05	<0.05	<0.05	<0.05
Trichloroethylene	0.061	0.05	<0.05	<0.05	<0.05	<0.05
Trichlorofluoromethane	4	0.25	<0.05	<0.05	<0.05	<0.05
Vinyl Chloride	0.02	0.02	<0.02	<0.02	<0.02	<0.02
Xylene Mixture	3.1	0.05	<0.05	<0.05	<0.05	<0.05
		104	Concentration e	xceeds MECP Ta	able 3 site standa	ard

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Concentrations exceeds MECP Table 1 background standard

### Table 6 Soil Analytical Results - VOCs

Parameter		BH12-3-SS10
Date of Collection		Dec 01, 2012
Date Reported	Table 3 RPI CT	Dec 10, 2012
Sampling Depth (mbgs)	CI	9.1 - 9.8
Acetone	16	<0.50
Benzene	0.21	<0.02
Bromodichloromethane	13	<0.05
Bromoform	0.27	<0.05
Bromomethane	0.05	<0.05
Carbon Tetrachloride	0.05	<0.05
Chlorobenzene	2.4	<0.05
Chloroform	0.05	<0.05
Dibromochloromethane	9.4	<0.05
Dichlorobenzene, 1,2-	3.4	<0.05
Dichlorobenzene, 1,3-	4.8	<0.05
Dichlorobenzene, 1,4-	0.083	<0.05
Dichlorodifluoromethane	16	<0.05
Dichloroethane, 1,1-	3.5	<0.05
Dichloroethane, 1,2-	0.05	<0.05
Dichloroethylene, 1,1-	0.05	<0.05
Dichloroethylene, cis- 1,2-	3.4	<0.05
Dichloroethylene, trans- 1,2-	0.084	<0.05
Dichloropropane, 1,2-	0.05	<0.05
Dichloropropene, 1,3-	0.05	<0.05
Ethylbenzene	2	<0.05
Ethylene Dibromide	0.05	<0.05
Hexane, n-	2.8	<0.05
Methyl Ethyl Ketone	16	<0.50
Methyl Isobutyl Ketone	1.7	<0.50
Methyl tert-butyl ether	0.75	<0.05
Methylene Chloride	0.1	<0.05
Styrene	0.7	<0.05
Tetrachloroethane, 1,1,1,2-	0.058	<0.05
Tetrachloroethane, 1,1,2,2-	0.05	<0.05
Tetrachloroethylene	0.28	<0.05
Toluene	2.3	<0.2
Trichloroethane, 1,1,1-	0.38	<0.05
Trichloroethane, 1,1,2-	0.05	<0.05
Trichloroethylene	0.061	<0.05
Trichlorofluoromethane	4	<0.05
Vinyl Chloride	0.02	<0.02
Xylene Mixture	3.1	<0.05

### wsp

#### Table 7 Soil Analytical Results - PAHs

Parameter			BH19-2-SS5	BH19-4-SS2	BH19-6-SS3	BH19-6-DUP	BH19-6-SS8	BH19-8-SS8
Date of Collection		Table 4	Oct 23, 2019	Oct 28, 2019	Oct 24, 2019	Oct 24, 2019	Oct 24, 2019	Oct 24, 2019
Date Reported	Table 3 RPI CT	Table 1 RPIICC	Oct 31, 2019	Nov 01, 2019	Oct 31, 2019	Oct 31, 2019	Nov 08, 2019	Nov 08, 2019
Sampling Depth (mbgs)	C1	NI IICC	2.3 - 2.9	1.8 - 2.4	1.5 - 2.1	1.5 - 2.1	5.3 - 5.9	5.3 - 5.9
Acenaphthene	7.9	0.072	<0.02	0.02	0.02	0.04	<0.02	<0.02
Acenaphthylene	0.15	0.093	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Anthracene	0.67	0.16	0.03	0.05	0.04	0.1	<0.02	<0.02
Benz(a)anthracene	0.5	0.36	0.05	0.07	0.09	0.2	<0.02	<0.02
Benzo(a)pyrene	0.3	0.3	0.04	0.05	0.08	0.16	<0.02	<0.02
Benzo(b/j)fluoranthene	0.78	0.47	0.06	0.06	0.13	0.2	<0.02	<0.02
Benzo(ghi)perylene	6.6	0.68	0.03	0.03	0.05	0.13	<0.02	<0.02
Benzo(k)fluoranthene	0.78	0.48	0.03	0.03	0.06	0.11	<0.02	<0.02
Chrysene	7	2.8	0.07	0.07	0.1	0.2	<0.02	<0.02
Dibenz(a,h)anthracene	0.1	0.1	<0.02	<0.02	<0.02	0.03	<0.02	<0.02
Fluoranthene	0.69	0.56	0.14	0.19	0.21	0.46	<0.02	<0.02
Fluorene	62	0.12	<0.02	0.02	0.02	0.05	<0.02	<0.02
Indeno(1,2,3-cd)pyrene	0.38	0.23	0.02	0.03	0.05	0.1	<0.02	<0.02
1-Methylnaphthalene	0.99	0.59	<0.02	0.02	<0.02	<0.02	<0.02	<0.02
2-Methylnaphthalene	0.99	0.59	<0.02	0.04	<0.02	0.02	<0.02	<0.02
Naphthalene	0.6	0.09	<0.01	0.03	0.02	0.02	<0.01	<0.01
Phenanthrene	6.2	0.69	0.09	0.16	0.16	0.38	<0.02	<0.02
Pyrene	78	1	0.11	0.15	0.16	0.37	<0.02	<0.02
Methylnaphthalene, 2-(1-)	0.99	0.59	<0.04	0.06	<0.04	<0.04	<0.04	<0.04
· · · ·			104	Concentration e	xceeds MECP T	able 3 site stand	ard	

1

Concentrations exceeds MECP Table 1 background standard

### Table 7 Soil Analytical Results - PAHs

Parameter	BH19-10-SS8	BH12-3-SS4	
Date of Collection	Table 3 RPI	Oct 24, 2019	Dec 01, 2012
Date Reported	CT	Nov 08, 2019	Dec 10, 2019
Sampling Depth (mbgs)	5	5.3 - 5.9	1.8 - 2.4
Acenaphthene	7.9	<0.02	0.253
Acenaphthylene	0.15	<0.02	<0.05
Anthracene	0.67	<0.02	0.13
Benz(a)anthracene	0.5	<0.02	0.314
Benzo(a)pyrene	0.3	<0.02	0.279
Benzo(b/j)fluoranthene	0.78	<0.02	0.28
Benzo(ghi)perylene	6.6	<0.02	0.167
Benzo(k)fluoranthene	0.78	<0.02	0.251
Chrysene	7	<0.02	0.337
Dibenz(a,h)anthracene	0.1	<0.02	<0.05
Fluoranthene	0.69	<0.02	0.671
Fluorene	62	<0.02	0.14
Indeno(1,2,3-cd)pyrene	0.38	<0.02	0.186
1-Methylnaphthalene	0.99	<0.02	0.177
2-Methylnaphthalene	0.99	<0.02	0.111
Naphthalene	0.6	<0.01	0.388
Phenanthrene	6.2	<0.02	<0.05
Pyrene	78	<0.02	0.511
Methylnaphthalene, 2-(1-)	0.99	<0.04	0.288

### Table 8 Groundwater Analytical Results - Metals

Parameter		BH19-4	DUP	BH19-6
Date of Collection	Table 3 RPI	Nov 04, 2019	Nov 04, 2019	Nov 04, 2019
Date Reported	CT	Nov 12, 2019	Nov 12, 2019	Nov 12, 2019
Screened Depth (mbgs)	01	4.5 - 7.5	4.5 - 7.5	4.6 - 7.9
Antimony	7.5	<0.5	<0.5	<0.5
Arsenic	18	<1	<1	<1
Barium	390	181	184	236
Beryllium	4	<0.5	<0.5	<0.5
Boron	120	72	71	55
Cadmium	1.2	<0.1	<0.1	<0.1
Chromium	160	<1	<1	<1
Chromium VI	8	<10	<10	<10
Cobalt	22	<0.5	<0.5	0.9
Copper	140	<0.5	<0.5	0.5
Lead	120	<0.1	<0.1	<0.1
Mercury	0.27	<0.1	<0.1	<0.1
Molybdenum	6.9	0.7	0.5	3.3
Nickel	100	<1	<1	2
Selenium	2.4	<1	<1	<1
Silver	20	<0.1	<0.1	<0.1
Thallium	1	<0.1	<0.1	<0.1
Uranium	23	0.2	0.1	0.3
Vanadium	86	<0.5	<0.5	<0.5
Zinc	340	6	<5	<5
Sodium	NA	402000	397000	651000

Parameter		BH19-4	DUP	BH19-6	BH19-10
Date of Collection	Table 3 RPI	Nov 04, 2019	Nov 04, 2019	Nov 04, 2019	Nov 04, 2019
Date Reported	CT	Nov 12, 2019	Nov 12, 2019	Nov 12, 2019	Nov 12, 2019
Screened Depth (mbgs)	01	4.5 - 7.5	4.5 - 7.5	4.6 - 7.9	4.6 - 7.6
Benzene	0.21	<0.5	<0.5	<0.5	<0.5
Toluene	2.3	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	2	<0.5	<0.5	<0.5	<0.5
Xylene Mixture	3.1	<0.5	<0.5	<0.5	<0.5
F1 (C6 to C10) minus BTEX	55	<25	<25	<25	<25
F2 (C10 to C16)	98	<100	<100	<100	<100
F3 (C16 to C34)	300	<100	<100	<100	<100
F4 (C34 to C50)	2800	<100	<100	<100	<100

### Table 9 Groundwater Analytical Results - PHCs&BTEX

### Table 10 Groundwater Analytical Results - VOCs

Parameter		BH19-6	BH19-10
Date of Collection	Table 3 RPI	Nov 04, 2019	Nov 04, 2019
Date Reported	CT	Nov 12, 2019	Nov 12, 2019
Screened Depth (mbgs)	01	4.6 - 7.9	4.6 - 7.6
Acetone	16	<5.0	<5.0
Benzene	0.21	<0.5	<0.5
Bromodichloromethane	13	<0.5	<0.5
Bromoform	0.27	<0.5	<0.5
Bromomethane	0.05	<0.5	<0.5
Carbon Tetrachloride	0.05	<0.2	<0.2
Chlorobenzene	2.4	<0.5	<0.5
Chloroform	0.05	<0.5	<0.5
Dibromochloromethane	9.4	<0.5	<0.5
Dichlorobenzene, 1,2-	3.4	<0.5	<0.5
Dichlorobenzene, 1,3-	4.8	<0.5	<0.5
Dichlorobenzene, 1,4-	0.083	<0.5	<0.5
Dichlorodifluoromethane	16	<1.0	<1.0
Dichloroethane, 1,1-	3.5	<0.5	<0.5
Dichloroethane, 1,2-	0.05	<0.5	<0.5
Dichloroethylene, 1,1-	0.05	<0.5	<0.5
Dichloroethylene, cis- 1,2-	3.4	<0.5	<0.5
Dichloroethylene, trans- 1,2-	0.084	<0.5	<0.5
Dichloropropane, 1,2-	0.05	<0.5	<0.5
Dichloropropene, 1,3-	0.05	<0.5	<0.5
Ethylbenzene	2	<0.5	<0.5
Ethylene Dibromide	0.05	<0.2	<0.2
Hexane, n-	2.8	<1.0	<1.0
Methyl Ethyl Ketone	16	<5.0	<5.0
Methyl Isobutyl Ketone	1.7	<5.0	<5.0
Methyl tert-butyl ether	0.75	<2.0	<2.0
Methylene Chloride	0.1	<5.0	<5.0
Styrene	0.7	<0.5	<0.5
Tetrachloroethane, 1,1,1,2-	0.058	<0.5	<0.5
Tetrachloroethane, 1,1,2,2-	0.05	<0.5	<0.5
Tetrachloroethylene	0.28	<0.5	<0.5
Toluene	2.3	<0.5	<0.5
Trichloroethane, 1,1,1-	0.38	<0.5	<0.5
Trichloroethane, 1,1,2-	0.05	<0.5	<0.5
Trichloroethylene	0.061	<0.5	<0.5
Trichlorofluoromethane	4	<1.0	<1.0
Vinyl Chloride	0.02	<0.5	<0.5
Xylene Mixture	3.1	<0.5	<0.5

### Table 11 Groundwater Analytical Results - PAHs

Parameter		BH19-4	DUP	BH19-6
Date of Collection	Table 3 RPI	Nov 04, 2019	Nov 04, 2019	Nov 04, 2019
Date Reported	CT	Nov 12, 2019	Nov 12, 2019	Nov 12, 2019
Screened Depth (mbgs)	5	4.5 - 7.5	4.5 - 7.5	4.6 - 7.9
Acenaphthene	7.9	<0.05	<0.05	<0.05
Acenaphthylene	0.15	<0.05	<0.05	<0.05
Anthracene	0.67	<0.01	<0.01	<0.01
Benz(a)anthracene	0.5	<0.01	<0.01	<0.01
Benzo(a)pyrene	0.3	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	0.78	<0.05	<0.05	<0.05
Benzo(g,h,i)perylene	6.6	<0.05	<0.05	<0.05
Benzo(k)fluoranthene	0.78	<0.05	<0.05	<0.05
Chrysene	7	<0.05	<0.05	<0.05
Dibenz(a,h)anthracene	0.1	<0.05	<0.05	<0.05
Fluoranthene	0.69	<0.01	<0.01	<0.01
Fluorene	62	<0.05	<0.05	<0.05
Indeno(1,2,3-cd)pyrene	0.38	<0.05	<0.05	<0.05
Methyl Naphthalene, 2-and 1-	0.99	<0.10	<0.10	<0.10
Naphthalene	0.6	<0.05	<0.05	<0.05
Phenanthrene	6.2	<0.05	<0.05	<0.05
Pyrene	78	<0.01	<0.01	<0.01

Group	Parameter	Table 3 RPI CT	Maximum Concentration	Location
	Arsenic	18	6.1	BH12-3-SS2
	Barium	390	359	BH19-4-SS2
	Beryllium	4	0.7	BH19-4-SS2
	Boron	120	11.5	BH19-8-SS8
	Chromium	160	118	BH19-4-SS2
<u>s</u>	Cobalt	22	21.5	BH19-4-SS2
Metals	Copper	140	54.3	BH19-4-SS2
Σ	Lead	120	61.4	BH19-10-SS8
	Mercury	0.27	0.013	BH12-3-SS2
	Molybdenum	6.9	3.8	BH12-3-SS2
	Nickel	100	62.8	BH19-4-SS2
	Vanadium	86	104	BH19-4-SS2
	Zinc	340	121	BH19-4-SS2
S	F1 (C6 to C10) minus BTEX	55	27	BH19-6-SS3
PHCs	F3 (C16 to C34)	300	117	BH12-3-SS5
<u>۵</u>	F4 (C34 to C50)	2800	123	BH19-6-SS3
	Acenaphthene	7.9	0.253	BH12-3-SS4
	Anthracene	0.67	0.13	BH12-3-SS4
	Benz(a)anthracene	0.5	0.314	BH12-3-SS4
	Benzo(a)pyrene	0.3	0.279	BH12-3-SS4
	Benzo(b/j)fluoranthene	0.78	0.28	BH12-3-SS4
S	Benzo(ghi)perylene	6.6	0.167	BH12-3-SS4
PAHs	Benzo(k)fluoranthene	0.78	0.251	BH12-3-SS4
<u>C</u>	Chrysene	7	0.337	BH12-3-SS4
	Dibenz(a,h)anthracene	0.1	0.03	BH19-6-DUP
	Fluoranthene	0.69	0.671	BH12-3-SS4
	Fluorene	62	0.14	BH12-3-SS4
	Indeno(1,2,3-cd)pyrene	0.38	0.186	BH12-3-SS4
	1-Methylnaphthalene	0.99	0.177	BH12-3-SS4
	2-Methylnaphthalene	0.99	0.111	BH12-3-SS4
<u>v</u>	Naphthalene	0.6	0.388	BH12-3-SS4
PAHs	Phenanthrene	6.2	0.38	BH19-6-DUP
Δ.	Pyrene	78	0.511	BH12-3-SS4
	Methylnaphthalene, 2-(1-)	0.99	0.288	BH12-3-SS4

### Table 12 Summary of Maximum Concentrations in Soil

All other parameters below laboratory detection limits



#### Table 13 Summary of Maximum Concentrations in Groundwater

Group	Parameter	Table 3 RPI CT	Maximum Concentration	Location
	Barium	390	236	BH19-6
	Boron	120	72	BH19-4
	Cobalt	22	0.9	BH19-6
<u>0</u>	Copper	140	0.5	BH19-6
Metals	Molybdenum	6.9	3.3	BH19-6
Σ	Nickel	100	2	BH19-6
	Uranium	23	0.3	BH19-6
	Zinc	340	6	BH19-4
	Sodium	NA	651000	BH19-6

All other parameters below laboratory detection limits



# A PLAN OF SURVEY OF PHASE TWO PROPERTY



ETCH SHOWING REHOLE AND MONITORING WELL LOCATIONS
REHULE AND MUNITORING WELL LOCATIONS
R
W STUDENT RESIDENCE
RLETON UNIVERSITY
TY OF OTTAWA
E 1 : 200
5 10 20 metres
RIO LAND SURVEYORS
<u>.</u>
ATIONS SHOWN HEREON ARE REFERRED TO DETIC DATUM (CGVD28).
OF SURVEY: NOVEMBER 06, 2019
CB - CATCH BASIN
<ul> <li>○ WMH – WATER MANHOLE</li> <li>○ MH – MANHOLE</li> </ul>

ш	CD		CATCH DASIN
Ο	WMH	_	WATER MANHOLE
Ο	MH	_	MANHOLE
M	WV	_	WATER VALVE
¢	FH	_	FIRE HYDRANT
9	BHOL	-	BORE HOLE
W		-	MONITORING WELL
•		-	SIGN
۲		_	BOLLARD
۲	LS	_	LAMP STANDARD
郄		_	CONIFEROUS TREE
$\odot$		-	DECIDUOUS TREE



# B SAMPLING AND ANALYSIS PLAN

#### Sampling and Analysis Plan for Phase II ESA, Soil, Ottawa, Ontario

					Soil			
Sample Location	Proposed Borehole Depth (mbgs)	Туре	Reg 153 Metals and Inorganics (1 x 250 ml jar)	Reg 153 VOCs (1 x methanol vial and 1 x 120 ml jar)	Reg 153 PAHs (1 x 250 ml jar)	Reg 153 PHC F1-F4 and BTEX (1 x 120 ml jar and x 1 methanol vial)	Comments / Sampling Rationale	APEC #
			Submit	Submit	Submit	Submit		
BH19-2-SS5	11.4 (to bedrock)	ВН	1	1	1	1	Hydrocarbon odour noted during field program.	1,2
BH19-4-SS2	7.6	ВН	1	1	1	1	Assessment of upper fill material.	1,2
BH19-6-SS3	11.1	ВН	1	1	1 (plus 1 dup)	1	Assessment of upper fill material.	1,2
BH19-6-SS8	11.1	ВН		1	1	1	Assessment of deeper fill/native interface.	1,2
BH19-8-SS8	15.5		1	1	1	1	Assessment of deeper fill material.	1
BH19-10-SS8	12.6	ВН	1	1	1	1	Sample with 10 ppm vapour reading.	1,2
BH19-10-SS10	12.6	ВН	1	1			Assessment of native material.	1,2
Blind Field D	Duplicates				1			
тота	LS		6	7	6	6		

			Gro	oundwater	Frankright and the station Nation		
Sample Location	APEC	Monitoring Well Depth (mbgs)	Reg 153 Metals and Inorganics	Reg 153 VOCs	PAHs	Reg 153 PHC F1-F4	Environmental Investigation Notes
BH19-4	BH19-4 APEC1				1 (plus 1 dup)	1 (plus 1 dup)	
BH19-6	APEC1, APEC2	7.9	1	1	1		Water may be silty. Develop/purge wells one
BH19-10	APEC1, APEC2	7.6		1			week before sampling. Sample using peristaltic pump, at a low flow rate to avoid
Blin	d Field Duplicates		1		1		silty water.
	TOTALS		2	2	2	3	



# C BOREHOLE LOGS

CLIEN	ECT: Carleton University Northern Prop IT: Carleton University ECT LOCATION: Parking Lots P-6 and	,	Devel	opme	nt			Meth		<b>DATA</b> Ilow St		-	oring					<b>)</b> • 1/	105 7	10/720	
	M: Geodetic	1 - 7								01/201							NCL N		+00-7	10/720	
BH LC	CATION: See Borehole Location Plan SOIL PROFILE		S	AMPL	ES			DYNA	MIC CC			TION						<u> </u>		0.514	
(m) ELEV EPTH	DESCRIPTION	STRATA PLOT	NUMBER	E	BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	SHE. OU	AR ST	RENG	TH (kf +				CON	TENT N O	LIQUID LIMIT W <sub>L</sub>	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (Mg/m <sup>3</sup> )	AN GRAIN DISTRII	
<u>65.6</u> 0.0	Topsoil, some sand, some gravel, organics, brown, frozen, stiff (Fill)	STF	INN 1	SS	۳ ۳		Sand			00 15				1	0 2	20	30			GR SA	SI (
65.0 0.6	Silty Sand, gravelly, trace organics, brown, damp, compact (Fill)		2	SS	15		9 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	;							0			-		24 48	28
					24		XQX														
<u>63.8</u> 1.8	Silty Sand and Gravel, trace brick and slag fragments, moist,		3	SS	24										r			1		44 26	30
	compact (Fill)		4	SS	20			,							0					28 43	29
<u>62.6</u> 3.0	Silty Clay, trace sand, grey, firm		5	SS	14										0						
	(Fill)		6	SS	7		Cuttir	ngs							0						
61.0 4.6	Silty Sand and Gravel, brown, moist, compact (Fill)		7	SS	26									0							
								)													
<u>59.5</u> 6.1	Gravel and Sand, trace silt, brown,						W. L. Dec 1	195.5 8, 201	 m 2											52 38	10
	wet, very dense (Till)		8	SS	54		G G W. L. Dec 1 G G G G G G G G G G G G G G G G G G G	)						0							
							ĝ														
58.0 7.6	Silty sand, trace gravel, brown, wet, compact (Till)		9	SS	13		58 -Bento									0					
							57	,													
56.5	Olf Orand a survey of the																			19 59	22
9.1	Silty Sand, some gravel, brown, wet, dense (Till)		10	SS	33		56	;							>						
	Continued Next Page													at Failur							

SPL SOIL LOG CARLETON UNIVERSITY NORTH PROPERTY DEVELOPMENT.GPJ SPL.GDT 3/4/13

SPL Consultants Limited

-	Geotechnical Environmental Materials Hydro	ogeolo	зgy		L	OG O	F BC	RE	IOLE	12-3	•											
CLIEN PROJ DATU	ECT: Carleton University Northern Prop IT: Carleton University ECT LOCATION: Parking Lots P-6 and IM: Geodetic DCATION: See Borehole Location Plan		Deve	lopme	nt			Meth Diam	eter: 2	DATA Ilow Ste 03mm/I 01/2012	N size	-	oring				EF. NC		105-7	10/720		
	SOIL PROFILE		5	AMPL	ES			DYNA	MIC CO	NE PEN PLOT	ETRAT											
		1				н				-				PLASTI LIMIT	C NATI	URAL TURE	LIQUID LIMIT		TW.	REMARKS AND		
(m) <u>ELEV</u> DEPTH							ELEVATION	20 40 60 80 100 SHEAR STRENGTH (kPa) ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 50 100 150 200 250										POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (Mg/m <sup>3</sup> )	GRAIN SIZE DISTRIBUTION (%) GR SA SI CI		
54.9	Silty Sand, some gravel, brown, wet, dense (Till)		2		-		-Sand.													GR SA	SI CL	
10.7	Silty Sand, trace gravel, grey, wet, compact (Till)		11	SS	17		Scree	n							0					1 83	16	
53.6	- Auger Refusal at 12.0 m.						54											-				
12.0	Fresh to slightly weathered, very closely bedded shale with limestone partings. Completely fractured.		RC	CORE		··	53											-				
52.0	TCR = 39% SCR = 31% RQD = 0%		1	OUNE			-Bento	1														
13.6	Fresh to slightly weathered, very closely bedded shale with limestone partings. Completely fractured.		RC 2	CORE		-	52															
<u>51.0</u> 14.6	TCR = 93% SCR = 16% <del>RQD = 16%</del>						51															
14.0	END OF BOREHOLE																					
	Waterlevels:																					
	<u>_Date</u> <u>Depth</u> Dec 18th, 2012 6.0 m																					

SPL SOIL LOG CARLETON UNIVERSITY NORTH PROPERTY DEVELOPMENT.GPJ SPL.GDT 3/4/13

SPL Consultants Limited

	_W	/SP				BC	DR	EF	10	LE DF	RILLIN	١G	REC	ORD : Pa	<b>19-01</b> ge 1 of 2			
										Prepared Reviewed				Date (Start) Date (End):	2019-10-2 2019-10-2			
Project Nar Site: Sector: Client:	Ca	rleton University New Residence rleton University rleton University	Project Number: Geographic Coordinate: Surface Elevation: Top of PVC Elevation:										<b>191-12948-00</b> X = 367595.99354 mE Y = 5027711.34136 mN 65.51 m ( <i>Geodetic</i> )					
Drilling Cor Drilling Equ Drilling Met Borehole D Drilling Flui Sampling N	uipment: thod: Diameter: id:	Hollow Stem Auger	ODOUR F - Light M - Mediu P - Persis VISUAL D - Dissei S - Satura	tent minated F	Produc	DC SS MA DP ST TU MC	C - Diar S - Split A - Mar P - Dire - Shel I - DT3 C - Mac	TYPE nond Co Spoon Jual Aug ct Push by Tube 2 Liner cro Core e Phase	orer P ger Ir e V e Liner D	CHEMICAL AN/ CCB Poly DTEX Ben: Xyle horganics Inorg henol. C. Phei (OC Vola & C/ Diox. & Fur. Diox CAH Chlc	ALYSIS -Chlorinated Big zene, Toluene, I ne ganic Compound nolic Compound til Organic Com AH)	ohenyls Ethylbenz ds ds ipounds (l	PH C <sub>10</sub> - PH F1- Metals	Semi Volatile Orga Polycyclic Aromati C <sub>50</sub> Petroleum Hydroc E4 Petroleum Hydroc Arsenic, Barium, C Cobalt, Copper, Le Molybdenum, Nick Leacheate Tests (	c Hydrocarbons arbons C <sub>10</sub> -C <sub>50</sub> arbons F1-F4 (C Cadmium, Chrom ad, Manganese cel, Silver, Tin, Z			
		GEOLOGY / LITHOLOGY		OBSE		IONS			5	SAMPLES			MONI					
<u>DEPTH</u> ELEVATION (m)	ГІТНОГОĞY	DESCRIPTION		VAPOR CONC. I - Isobutylene (ppm) H - Hexane (ppm)		NSIA	SAMPLE TYPE	% RECOVERY	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS			
0.08		Ground surface.																
65.43		ASPHALT- 80 mm		1			AS											
).5 <del>-</del> - - -		SILTY SAND AND GRAVEL trace cla brown, moist, loose to compact (FILL)											-					
				l - 0, H - 0			SS	25	3433	SS1			-					
1.5 - - - 2.0 -				l - 0, H - 0	-		SS	25	5 4 24 13	SS2			-					
2.30 - 63.21		SILTY CLAY, grey, moist, stiff (FILL)		I - 0, H - 0			SS	75	4233	SS3			_					
i.0				l - 0, H - 0			SS	60	WH 1 1	SS4			-					
- <u>3.80</u> - 61.71		SAND AND GRAVEL cobbles and boulder infered, some silt, brown, mo	ist,	l - 0, H - 0	-		SS	75	4 31 50/100 mm	) SS5			-					
- - - - - -		very dense		1 - 0,	-		SS		13 50/150				-					
.0				H - 0			ss		50/75	330			-					
.5 - - - - - - - - - - - - - - - - - - -				H - 0				·	mm	SS7			-					
.5		SILTY SAND AND GRAVEL trace cla grey, moist (GLACIAL TILL)	ıy,	l - 0, H - 0			SS	50	WH 91 9	SS8			_					
		←- wet below 6.8 m		l - 0, H - 0			SS	66	2 7 8 11	SS9			-					
7.5 <del>-</del>									6 11 15									

							В	OF	REF	ю	LE DF	RILLIN	lG	REC	ORD :	19-01		
		<b>_</b> N	/SP													ge 2 of 2		
											Prepared Reviewed					2019-10-23 2019-10-23		
	Project Na Site: Sector: Client:	Ca	arleton University New Residence arleton University arleton University								Surface	lumber: hic Coordi Elevation: VC Elevati		<b>191-12948-00</b> s: X = 367595.99354 mE Y = 5027711.34136 mN 65.51 m ( <i>Geodetic</i> )				
	Drilling Co Drilling Eq Drilling Me Borehole I Drilling Flu Sampling	uipment ethod: Diameter uid:	Hollow Stem Auger	S - Satura	nt DC SS MA DP sT TU vd with Product MC			TYPE mond Ca t Spoon nual Aug ct Push lby Tube 2 Liner cro Core e Phase	orer F ger II e F Liner C	CHEMICAL ANALYSIS PCB Poly-Chlorinated Biphenyls BTEX Benzene, Toluene, Ethylbenz Xylene Inorganics Inorganic Compounds Phenolic Compounds VOC Volatil Organic Compounds (1)			PH C <sub>10</sub> - PH F1-F Metals	Semi Volatile Orge Polycyclic Aromati C <sub>50</sub> Petroleum Hydroc A resenic, Barium, C Cobalt, Copper, Le Molybdenum, Nick Leacheate Tests (I	c Hydrocarbons arbons C <sub>10</sub> -C <sub>50</sub> arbons F1-F4 (C <sub>10</sub> -C <sub>50</sub> admium, Chromium, ead, Manganese, el, Silver, Tin, Zinc.			
			GEOLOGY / LITHOLOGY		OBSE			s		:	SAMPLES			MONIT	ORING WELL			
17-	<u>DEPTH</u> ELEVATION (m)	гітногоду	DESCRIPTION		VAPOR CONC. I - Isobutylene (ppm) H - Hexane (ppm)			_\%_	% RECOVERY	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS		
	_	\$H.XD3						-		12								
קובטו.פחו צ	8.5 -		SILTY SAND AND GRAVEL trace cla grey, moist (GLACIAL TILL)	y,	I - 0, H - 0			SS	40	27 10 14 11	SS11			-		- - 8.5 <del>-</del> - -		
й Л	9.0									11						9.0 —		
	9.5 -				l - 0, H - 0			SS	75	3 7 89	SS12			-		- - - 9.5 <del>-</del> -		
a rempiate : v	- - 10.0 - - - - -															- 10.0		
	10.5 <u>10.50</u> - 55.01	<i>661,787,77</i>	END OF BOREHOLE     1) Auguer refusal at 10.5 m in depth													10.5		
	11.0 — - - - 11.5 —		End of borehole at 10.50 m.													11.0 — - - 11.5 —		
	- - - 12.0															- - - 12.0 —		
perapport : w	12.5 -															- - 12.5 — -		
2	13.0 <del>-</del> - - -															13.0 <del>-</del> - -		
	13.5															13.5 -		
	14.0 — - - 14.5 —															14.0 — - - - 14.5 —		
	15.0															15.0 <del>-</del>		
	- - 15.5 — - -															- - 15.5 — - -		
Ď.	160															16.0		

	-W	/SP				R(	JF	κΕŀ	HO	LE DI	KILLIN	IG	REC	ORD : Pa	<b>19-02</b> ge 1 of 3
		•••								Prepared Reviewed				Date (Start) Date (End):	2019-10-2 2019-10-2
Project Na Site: Sector: Client:	Cai	rleton University New Residence rleton University rleton University								Surface	Number: ohic Coordin Elevation: PVC Elevation		: X = Y =	<b>1-12948-</b> 367614.3589 5027722.245 31 m <i>(Geodeti</i>	6 mE 75 mN
Drilling Con Drilling Equ Drilling Me Borehole D Drilling Flu Sampling N	uipment: thod: Diameter: id:	CCC CME 850 Hollow Stem Auger 203 mm Water Split Spoon	ODOUR F - Light M - Mediu P - Persis VISUAL D - Disse S - Satura	tent minated F	Produc	D SS DF ST st M	C - Dia S - Spli A - Mai P - Dire T - She J - DT3 C - Mai	TYPE mond Ci Spoon nual Aug ct Push by Tube 2 Liner cro Core e Phas	orer B ger Ir e V e Liner	CHEMICAL AN CB Pol TEX Ber Xyl, horganics Inor yhenol. C. Phe (OC Vol. & C Oiox. & Fur. Dio CAH Chi	IALYSIS y-Chlorinated Bipl nzene, Toluene, E ene rganic Compounds anolic Compounds atil Organic Comp AH)	henyls thylbenz s soounds (	PH C <sub>10</sub> - PH F1-I Metals	Semi Volatile Org; Polycyclic Aromati C <sub>20</sub> Petroleum Hydroc 4 Petroleum Hydroc Arsenic, Barium, ( Cobalt, Copper, L Molyddenum, Nick Leacheate Tests (	c Hydrocarbons arbons C <sub>10</sub> -C <sub>50</sub> arbons F1-F4 (C cadmium, Chrom ead, Manganese cel, Silver, Tin, Zi
		GEOLOGY / LITHOLOGY		OBSE	RVAT	IONS	5			SAMPLES			MONI		
<u>DEPTH</u> ELEVATION (m)	ГІТНОГОСҮ	DESCRIPTION		VAPOR CONC. 1 - Isobutylene (ppm) H - Hexane (ppm)	F M F	+ -	SAMPLE TYPE	% RECOVERY	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS
0.08		Ground surface.													
0.5 - -		ASPHALT- 75 mm SILTY SAND AND GRAVEL trace cla brown, moist, loose to very dense (FII	•				AS								(
- - 1.0 <u>-</u> - - -				l - 0, H - 0			SS	60 5	3 8 50/129 mm	5 SS1					
1.5 - - - 2.0 -				l - 0, H - 0			SS	10	31 6 3 6	SS2			-		:
2.5 —				l - 0, H - 15			SS	75	4 3 2 3	SS3			-		:
3.0 - <u>3.05</u> - 62.56 		SILTY CLAY, grey, moist, stiff (FILL)		l - 0, H - 0			ss	50	1 1 2 2	SS4	Metals PHCs F1-F4 VOC PAH		-		:
4.0 -		►- rock fragments below 3.8 m in depth	ז	l - 0, H - 15			ss	60	3 2 6 32	SS5			-		
4.60 - 61.01		SAND AND GRAVEL cobbles and boulder infered, some silt, brown, moi	ist,	l - 0, H - 0			ss	40	10 36 50/75	SS6			-		
5.5 <b>—</b>		very dense		l - 0, H - 0			ss		mm 50 50/75 mm				-		
5.0 — - - - -				1 - 0,			ss	100	5 4 16 16				-		
6.90 7.0 - 58.71		SILTY SAND AND GRAVEL trace cla	IV.	H - 0			ss	100	16 16 11 15 17 16	SS8			-		
1		grey, moist (GLACIAL TILL)	·,	H - 0					17	SS9					

		VSP				B	OF	REF	Ю	LE DF	RILLIN	1G	REC	ORD : Pa	<b>19-02</b> ge 2 of 3
										Prepared Reviewed					2019-10-23 2019-10-23
Project Site: Sector:		Carleton University New Residence Carleton University									hic Coordi	inates	: X = Y =	<b>1-12948-</b> 367614.35890 5027722.245	6 mE 75 mN
Client:		Carleton University	-1							Top of P	Elevation: VC Elevat	ion:	65.6	61 m (Geodeti	c)
Drilling Drilling Borehol Drilling	Company Equipmer Method: le Diamete Fluid: ng Methoo	nt: CME 850 Hollow Stem Auger er: 203 mm Water	ODOUR F - Light M - Mediu P - Persis VISUAL D - Dissee S - Satura	tent minated F	Produc	D S M D S T t M	C - Dia S - Spli IA - Ma P - Dire T - She U - DT3 IC - Ma	E TYPE mond C t Spoon nual Aug ect Push lby Tub 2 Liner cro Core ee Phas	orer ger e e Liner	BTEX Ben Xyle Inorganics Inor Phenol. C. Phe VOC Vola & C. Diox. & Fur. Dioo CAH Chic	-Chlorinated Bip zene, Toluene, E ne ganic Compound nolic Compound til Organic Com AH)	Ethylbenz ds s pounds (	PH C <sub>10</sub> - PH F1-F Metals	Semi Volatile Org Polycyclic Aromat C <sub>50</sub> Petroleum Hydroc Arsenic, Barium, ( Cobalt, Copper, L Molybdenum, Nic Leacheate Tests (	c Hydrocarbons arbons C <sub>10</sub> -C <sub>50</sub> arbons F1-F4 (C <sub>10</sub> -C cadmium, Chromium, ad, Manganese, cel, Silver, Tin, Zinc.
		GEOLOGY / LITHOLOGY		OBSE		IONS	5		1	SAMPLES			MONIT		
DEPTH ELEVATIO (m)	гітногосү	DESCRIPTION		VAPOR CONC. I - Isobutylene (ppm) H - Hexane (nnm)			5	% RECOVERY	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS
		**													
		SILTY SAND AND GRAVEL trace cla grey, moist (GLACIAL TILL)	ay,	l - 0, H - 0	-		SS	100	10 17 16 15	SS10			-		8.5 -
9.0					-				15				-		9.0 -
9.5				1 - 0,	-		SS	100	11				-		9.5 10.0 -
				H - 0	-			100	11 18 28 26	SS11			-		10.5
11.0 11.5 11.5 12.0 12.5 12.5															11.0
11.5 – 54.2		SHALE, black, fresh													11.5
12.0															12.0
															12.5 13.0
13.5															13.5
14.0		- Run 1: 14.1 m - 14.6 m													14.0 -
14.5 — _ _ _		TCR - 100% SCR - 45% RQD- 25%													14.5
15.0 <del>-</del> - - -		Run 2: 14.6 m - 16.5 m TCR - 66% SCR - 17%													15.0 -
		RQD- 0%													15.5 -

		-0	/SP				B	OF	REF	HC	LE DI	RILLIN	IG	REC	ORD : Pa	<b>19-02</b> ge 3 of 3
											Prepared Reviewed					2019-10-23 2019-10-23
Site Sec	e: stor:	Ca	rleton University New Residence rleton University									Number: hic Coordi Elevation:	nates	s: X = Y =	<b>1-12948-</b> 367614.35890 5027722.245 61 m ( <i>Geodeti</i>	6 mE 75 mN
Clie			rleton University						- 11/05		Top of P	VC Elevati	on:	05.0		
Dril Dril Bor Dril	ling Eq ling Me ehole [ ling Flu	Diameter:	Hollow Stem Auger	ODOUR F - Light M - Mediu P - Persis VISUAL D - Disse S - Satura	tent minated F	Product	D S D S T M	IC - Dia S - Spli IA - Ma IP - Dire T - She U - DT IC - Ma	E TYPE mond C t Spoon nual Aug ect Push lby Tube 32 Liner cro Core ee Phas	orer ger e e Liner	BTEX Ben Xyle Inorganics Inor Phenol. C. Phe VOC Vola & C Diox. & Fur. Diox CAH Chik	r-Chlorinated Bip zene, Toluene, E ene ganic Compound nolic Compounds atil Organic Comp AH)	ithylben: Is s bounds (	PH C <sub>10</sub> - PH F1- Metals	Semi Volatile Org; Polycyclic Aromati C <sub>50</sub> Petroleum Hydroc F4 Petroleum Hydroc Arsenic, Barium, C Gobalt, Copper, L Molybdenum, Nick Leacheate Tests (	c Hydrocarbons arbons C <sub>10</sub> -C <sub>50</sub> arbons F1-F4 (C <sub>10</sub> -C Cadmium, Chromiun ad, Manganese, tel, Silver, Tin, Zinc.
			GEOLOGY / LITHOLOGY		OBSE		ONS	S			SAMPLES			MONI		
ELEV	<u>PTH</u> /A <i>TION</i> m)	ГІТНОГОСУ	DESCRIPTION		VAPOR CONC. I - Isobutylene (ppm) H - Hexane (ppm)	F M P		<u></u>	% RECOVERY	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS
		×///XX/														
16.5	<u>16.20</u> 49.41		LIMESTONE with shale partings, fresh slightly weathered, grey	n to												16.5
- 17.0			Run 3: 16.2 m - 17.8 m TCR - 87% SCR - 87%													17.0
17.5 <del>-</del> - - -			RQD- 87% Run 4: 17.8 m - 19.3 m TCR - 100%													17.5
18.0			SCR - 100% RQD- 100%													18.0
_																19.0
9.5 –	19.30 46.31	Refusal	<ul> <li>END OF BOREHOLE</li> <li>1) Auger refusal at 14.1 m in depth.</li> </ul>		-											19.5
- 20.0			Switch to NQ coring. 2) Coring completed at 19.3 m in dep End of borehole at 19.30 m.	th.												20.0
20.5 -																20.5
21.0																21.0
21.5 - - - - - - -																21.5
22.5																22.5
																23.0
- - 23.5 - -																23.5
40																24 6

Proiect Na		/SP								Prepareo Reviewe					2019-10-2 2019-10-2
Site: Sector: Client:	Cai	rleton University New Residence rleton University rleton University								Geogra Surface	Number: phic Coordir Elevation:		s: X = Y = 64	91-12948-( = 367594.58573 = 5027696.5254 .74 m ( <i>Geodeti</i>	3 mE 46 mN c <i>)</i>
Drilling Cor Drilling Equ Drilling Mer Borehole D Drilling Flui Sampling N	mpany: uipment: thod: Diameter: id:	Marathon CME 55 Hollow Stem Auger	ODOUR F - Light M - Mediu P - Persis VISUAL D - Disse S - Satura	stent minated P	Product	Di Si Di S <sup>-</sup> TL M	C - Diar S - Split A - Mar P - Dire T - She J - DT3 C - Mac	TYPE mond C Spoon nual Aug ct Push by Tub 2 Liner cro Core e Phas	orer [ ger [ e ] e Liner	CHEMICAL AI PCB Po BTEX Be Xy Inorganics Inc Phenol. C. Ph VOC Vo & C Chiox. & Fur. Dic CAH Ch	PVC Elevation NALYSIS ly-Chlorinated Biph nzene, Toluene, Elene organic Compounds enolic Compounds latil Organic Comp CAH) oxins & Furans loinnated Aliphatic drocarbons	henyls thylben: s soounds (	SVOC zene, PAH PH C, PH F1 Metals	Polycyclic Aromati 10-C <sub>50</sub> Petroleum Hydroc 1-F4 Petroleum Hydroc	nic Compounds c Hydrocarbons arbons C <sub>10</sub> -C <sub>50</sub> arbons F1-F4 (C cadmium, Chromi ad, Manganese, vel, Silver, Tin, Zii
		GEOLOGY / LITHOLOGY		OBSE	RVATI					SAMPLES			MON		
<u>DEPTH</u> ELEVATION (m)	ГІТНОГОGY	DESCRIPTION		VAPOR CONC. I - Isobutylene (ppm) H - Hexane (ppm)	F M P		SAMPLE TYPE	% RECOVERY	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS
		Ground surface.													
0.5 - - - 0.5 - - - - - - - - - -		ASPHALT- 38 mm SILTY GRAVELLY SAND light brown damp to moist, compact (FILL)	] ı,				<b>SRA</b> I	3							C
.0				1 - 0.			ss	67	6					Bentonite	
.5 - 63.39		SILTY CLAY, trace sand, trace organ grey, moist (FILL)	nics,	H - 0					6655 5	SS1			-	Riser	
2.0				I - 0, H - 0			SS	100	1 2 2 3	SS2	Metals PHCs F1-F4 VOC PAH				:
2.90 .0 - 61.84		SILTY SAND AND GRAVEL to grave		I - 0, H - 0			SS	75	5 6 15 14	SS3					
i.5 — - -		cobbles and boulder infered, brown, r dense to very dense	noist,	1 - 0,			SS	67	22 19 40 50/10	664					:
				H - 0					mm					— Bentonite	
.5 <b>–</b> – –				I - 0, H - 0			SS	21	50 50/75 mm	5 SS5					
5.0 — - - 5.5 —				l - 0, H - 0			SS	42	29 28 15 12	SS6				Screen	
.0 <u>58.84</u>		SILTY SAND AND GRAVEL trace cla	ay,	1-0,			ss	54	4 4 20 16	007				SCREEN Diam.: 51 mm Open.: 0.25 mm	
.5 —		grey, wet, compact to very dense (GLACIAL TILL)		H - 0			ss	38		SS7				Unit 2015 Control Cont	
7.0				H - 0					3 4 8 10	SS8					
7.5 - <u>7.60</u> - 57.14	<u>MM</u>	END OF BOREHOLE	ı	1 - 0,			SS	4	50/75 mm				<u>.    .</u>  -		1
				H - 0,			00	4	mm	SS9	1	1	1	1	

	_			MC	DNI	ТС	DF	RI	IN	G٧	NE	ELL DF	RILLIN	IG	REC	ORD :	19-04
		• N	/SP									Prepared	by:				ge 2 of 2
												Reviewed	by:		40	Date (End):	2019-10-25
S	Site:		arleton University New Residence arleton University									Project N Geograp	lumber: hic Coordi	nates	s: X =	<b>1-12948</b> -0 367594.58573 5027696.5254	3 mE
	Sector: Client:	Ca	arleton University										Elevation: VC Elevati	on:	64.7	74 m (Geodeti 66 m (Geodeti	c)
	Drilling Cor Drilling Equ Drilling Me Borehole D Drilling Flu Bampling N	uipment thod: Diameter id:	Hollow Stem Auger	ODOUR F - Light M - Mediu P - Persis VISUAL D - Disser S - Satura	tent ninated F	Produ		DC SS MA DP ST TU MC	C - Dia S - Spli A - Mai P - Dire - She J - DT3 C - Mai	E TYPE mond Ci t Spoon nual Aug ict Push lby Tube 2 Liner cro Core ee Phas	orer ger e Liner	BTEX Ben Xyle Inorganics Inor Phenol. C. Phe VOC Vola & C. Diox. & Fur. Dios CAH Chlo	-Chlorinated Bipl zene, Toluene, E ne ganic Compound nolic Compounds til Organic Comp AH)	thylbenz s s oounds (	PH C <sub>10</sub> - PH F1-I Metals	Semi Volatile Orga Polycyclic Aromati C <sub>50</sub> Petroleum Hydroc Arsenic, Barium, C Cobalt, Copper, L Molybdenum, Nick Leacheate Tests (	c Hydrocarbons arbons C <sub>10</sub> -C <sub>50</sub> arbons F1-F4 (C <sub>10</sub> -C <sub>50</sub> aadmium, Chromium, aad, Manganese, el, Silver, Tin, Zinc.
			GEOLOGY / LITHOLOGY		OBSE			NS				SAMPLES			MONI		
	<u>DEPTH</u> .EVATION (m)	гітногобу	DESCRIPTION		VAPOR CONC. I - Isobutylene (ppm) H - Hexane (ppm)			_	SAMPLE TYPE	% RECOVERY	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS
	-		2) 37.5 mm monitoring well installed a	at 7.5		+											
8.5			m in depth 3) <u>DATE WATER LEVE</u>														8.5 -
9.0	-		<i>Nov 4, 2019</i> 4.5 m End of borehole at 7.60 m.														- - 9.0 —
	-																-
9.5	-																9.5
10.0	-																10.0
10.5	-																- 10.5 —
11.0																	- - 11.0 —
	-																-
11.5																	11.5 — - -
12.0	-																- 12.0 — -
12.5																	- - 12.5 —
2 13.0	-																- - 13.0 —
13.5																	13.5 — - -
14.0																	14.0 —
14.5																	- - 14.5 –
15.0																	- - 15.0 —
15.5																	- - - 15.5 —

		-W	/SP				B	OF	REF	HO	LE D	RILLIN	١G	REC	ORD : Pa	<b>19-05</b> ge 1 of 2
		_ • •									Prepareo Reviewe					2019-10-2 2019-10-2
Site	e: ctor:	Cai	rleton University New Residence rleton University rleton University								Geogra	Number: phic Coord Elevation: PVC Elevat		: X = Y =	<b>1-12948-</b> 367626.86549 5027698.3936 54 m <i>(Geodeti</i>	9 mE 69 mN
Dril Dril Bor Dril	ling Eq ling Me rehole [ ling Flu	Diameter:	Marathon CME 55 Hollow Stem Auger 203mm None Split Spoon	ODOUR F - Light M - Mediu P - Persis VISUAL D - Disser S - Satura	tent minated F	Produc	D S M DI S T U	C - Dia S - Spli A - Mai P - Dire T - She U - DT3 C - Ma	E TYPE mond C t Spoon hual Aug ct Push by Tube 2 Liner cro Core	orer E ger I e F e Liner	CHEMICAL AN PCB Po BTEX Be Xy norganics Inc Phenol. C. Ph /OC Vo Oiox. & Fur. Dic CAH Ch		ohenyls Ethylbenz ds Is pounds (I	PH C <sub>10</sub> - PH F1-I Metals	Semi Volatile Org Polycyclic Aromati C <sub>10</sub> Petroleum Hydroc 4 Petroleum Hydroc Arsenic, Barium, C Cobalt, Copper, L Molyddenum, Nick Leacheate Tests (	c Hydrocarbons arbons C <sub>10</sub> -C <sub>50</sub> arbons F1-F4 (C cadmium, Chrom ad, Manganese, tel, Silver, Tin, Zi
			GEOLOGY / LITHOLOGY		OBSE		IONS	5			SAMPLES			MONI		
ELEV	<u>PTH</u> /ATION m)	ГІТНОГОБҮ	DESCRIPTION		VAPOR CONC. I - Isobutylene (ppm) H - Hexane (ppm)	F M		SAMPLE TYPE	% RECOVERY	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS
			Ground surface.													
).5	0.20 64.34		TOPSOIL SAND and GRAVEL (to gravelly)dar brown, moist, very dense (FILL)	·k	l - 0, H - 0			SS	21	6655	SS1			_		(
0.					l - 0, H - 0			SS	83	45 40 30 26	SS2			-		
.5 –	1.50 63.04 1.80		SILTY SAND, brown, moist (FILL)		1 - 0,			ss	46	5 6 4 5				-		
2.0	62.74 2.30		SILTY SAND, with organics, dark bro moist (FILL)	wn,	H - 0					4 5	SS3			-		:
2.5	62.24		<b>SILTY CLAY,</b> mixed with organics, so sand, dark brown, moist, firm (FILL)	me	l - 0, H - 0			SS	92	2 1 3 3	SS4			-		:
.0   - 	<u>3.05</u> 61.49		SAND and GRAVEL,some silt to silty brown, moist, compact to very dense	,	l - 0, H - 0			SS	38	6 4 8 20	SS5			-		:
- - - - - -					l - 0, H - 0			SS	67	20 42 43 46	SS6			-		
i.5   					l - 0, H - 0			ss	21	35 50/50 mm	SS7			-		
.5	5.30 59.24		SILTY SAND AND GRAVEL trace cla grey, wet (GLACIAL TILL)	ıy,	l - 0, H - 0			ss	67	7 8 9 16	SS8			-		:
.0					l - 0, H - 0			ss	67	48 18 12 21	SS9			-		
- - - - - - -					I - 0, H - 0			ss	33	10 16 22 37	SS10			-		
'.5 — - -					1 - 0,			ss	46	37 25 18 29				-		

								E	BC	R	Eŀ	ю	LE DF	RILLIN	lG	REC	ORD :	19-05
			JN	<b>VSP</b>									<b>_</b>					ge 2 of 2
													Prepared Reviewed					2019-10-22 2019-10-22
	Proj Site Sec Clie	: tor:	C	arleton University New Residence arleton University arleton University									Surface	lumber: hic Coordi Elevation: VC Elevati		s: X = Y =	<b>1-12948-</b> 367626.86549 5027698.3936 54 m <i>(Geodeti</i>	9 mE 69 mN
	Drill Drill Bore Drill	ing Eq ing Me ehole [ ing Flu	Diamete	Hollow Stem Auger r: 203 mm None	ODOUR F - Light M - Mediu P - Persis VISUAL D - Disser S - Satura	tent ninated f	Produ	ct	DC - SS - MA - DP - ST - TU - MC -	- Dian - Split - Man - Direc - Shelt - DT32 - Mac	TYPE spoon ual Aug t Push by Tube 2 Liner ro Core	prer P ger Ir e V Liner C	CHEMICAL ANA PCB Poly BTEX Ben Xyle norganics Inor Phenol. C. Phe /OC Vola & Ca Diox. & Fur. Diox CAH Chlo	ALYSIS -Chlorinated Bip zene, Toluene, E ne ganic Compound: nolic Compound: til Organic Comp AH)	henyls Ethylben: Is s pounds (	PH C <sub>10</sub> - PH F1-I Metals	Semi Volatile Org: Polycyclic Aromat C <sub>50</sub> Petroleum Hydroc Arsenic, Barium, ( Cobalt, Copper, L Molybdenum, Nick Leacheate Tests (	c Hydrocarbons arbons C <sub>10</sub> -C <sub>50</sub> arbons F1-F4 (C <sub>10</sub> -C <sub>50</sub> cadmium, Chromium, ad, Manganese, rel, Silver, Tin, Zinc.
				GEOLOGY / LITHOLOGY		OBSE			NS			\$	SAMPLES			MONI		
17-	<u>DEF</u> ELEV/ (n	ATION	ГІТНОГОСУ	DESCRIPTION		VAPOR CONC. I - Isobutylene (ppm) H - Hevane (ppm)		P D	_	SAMPLE TYPE	% RECOVERY	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS
	-			SILTY SAND AND GRAVEL trace cla	V		+	$\square$				50/150 mm	φ					-
In <sup>2</sup>	8.5 -			grey, wet (GLACIAL TILL)	y,													- - 8.5 – - -
ורנאוב פני	9.0					I - 0, H - 0				ss	58	34 17 25 30	SS12					9.0 — 
	9.5 -																	9.5 — - -
1 emplate	0.0																	10.0 — - -
IN IAL Data	0.5																	10.5 — - -
	1.0 -	<u>11.30</u> 53.24		END OF BOREHOLE	Г													11.0
	1.5 - - -			1) Auguer refusal at 11.3 m in depth														11.5 — - -
	2.0-			End of borehole at 11.30 m.														12.0
1 hpe rappo	2.5 -																	12.5 — - -
	3.0																	13.0 — - - -
	3.5 -																	13.5 — - - -
	4.0																	14.0—
	4.5 -																	14.5
20-04	5.0																	15.0 —
	5.5																	15.5

		/SP	МС	DNI	ТС	R	IN <sup>.</sup>	GΝ	VE	Prepareo Reviewe	l by:	IG	REC	Date (Start):	<b>19-06</b> ge 1 of 2 2019-10-24 2019-10-24
Project Site: Sector: Client:	Ca	arleton University New Residence arleton University arleton University								Geogra Surface	Number: phic Coordi Elevation: PVC Elevati		: X = Y = 66.4	367633.9725 5027721.4950 44 m (Geodetid 24 m (Geodetid	1 mE 01 mN c <i>)</i>
Drilling Drilling Boreho Drilling	Company: Equipment Method: e Diameter Fluid: ng Method:	Hollow Stem Auger	ODOUR F - Light M - Mediu P - Persis VISUAL D - Disser S - Satura	tent ninated f	Produc		IC - Dia IS - Spli IA - Ma IP - Dire IT - She IU - DT IC - Ma	E TYPE mond Co ti Spoon nual Aug ect Push elby Tube 32 Liner cro Core ee Phas	orer ger e Liner	CHEMICAL AI PCB Po 3TEX Be Xy norganics Inc Phenol. C. Ph /OC Vo & 0 C Vo C Vo C AC CDiox. & Fur. Dio CAH Ch		henyls Sthylbenz S Sounds (I	SVOC zene, PAH PH C <sub>10</sub> PH F1- Metals	Semi Volatile Orga Polycyclic Aromati -C <sub>50</sub> Petroleum Hydroc; F4 Petroleum Hydroc;	Inic Compounds c Hydrocarbons arbons C <sub>10</sub> -C <sub>50</sub> arbons F1-F4 (C <sub>10</sub> -C <sub>5</sub> admium, Chromium, sad, Manganese, el, Silver, Tin, Zinc.
		GEOLOGY / LITHOLOGY		OBSE			s			SAMPLES			MONI	TORING WELL	
<u>DEPTH</u> ELEVATIO (m)	∠	DESCRIPTION		VAPOR CONC. I - Isobutylene (ppm) H - Hevane (nnm)			5	% RECOVERY	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS
- 0.1	3 3 3 1/2 3 1/2	Ground surface.													
		TOPSOIL - 125 mm SILTY SAND AND GRAVEL brown, moist, loose to compact (FILL)	ſ	l - 0, H - 0	_		SS	71	4 10 12 30	SS1					0.5 -
- - - - - - - - - -				l - 0, H - 0	-		SS	75	13 15 11 21	SS2					1.0 -
0.5 1.0 1.5 2.0 2.5 3.0 3.5 3.5 3.5 3.5 3.5 6.0 6.1 60. 6.5 7.0 7.5 3.0 7.5 6.0 6.1 60.				I - 0, H - 0	-		SS	71	7 10 10 9	SS3	Metals PHCs F1-F4 VOC PAH	DUP		— Bentonite	1.5 - 2.0 <del>-</del>
2.5 -				l - 0, H - 0	_		SS	71	8 7 7 6	SS4				— Riser	2.5 -
3.0 - - - - 3.5 -				l - 0, H - 0	-		SS	42	7 9 12 8	SS5					3.0 - 3.5 -
4.0				l - 0, H - 0	-		SS	50	19 6 5 5	SS6				■—— Sand	4.0 -
4.5 -				1 - 0,	-		ss	38	2232	007					4.5 -
5.0				H - 0					3 2	SS7					5.0 -
5.5 -				l - 0, H - 0			SS	63	3 6 11 9	SS8	PHCs F1-F4 VOC PAH			Screen	5.5 -
6.0 <u>6.1</u> 6.5 <u>6.1</u>		SILTY SAND, some gravel to gravelly trace clay, grey, wet, compact to very		l - 0, H - 0			SS	42	9 11 50/7 mm	5 SS9				Diam.: 51 mm Open.: 0.25 mm Length: 3.05 m WATER Depth: 6.69 m	6.0 - 6.5 -
7.0 -		dense (GLACIAL TILL)		I - 0, H - 0	-		ss		16 50/12 mm					Elev: 60.55 m Date: 2019-11-04	7.0 -
7.5				I - 0, H - 0			ss		3 10 13	SS10				· · ·	7.5 -

				MC	DNI	T	O	RI	IN	G١	NE	ELL DI	RILLIN	IG	REC	ORD :	
		<b>N</b>	/SP									Prepared				Date (Start)	ge 2 of 2
Sit Se	-	Ca	rleton University New Residence Irleton University Irleton University									Surface			s: X = Y = 66.4	Date (End): <b>1-12948-</b> 367633.9725 5027721.4950 14 m (Geodetii 24 m (Geodetii	1 mE 01 mN c)
Dr Dr Bo Dr	illing Ed illing M orehole illing Fl	Diameter	Hollow Stem Auger	ODOUR F - Light M - Mediu P - Persis VISUAL D - Disser S - Satura	tent minated l	Proc	luct	DC SS DF ST TU MC	C - Diar S - Split A - Mar P - Dire - She J - DT3 C - Mac	TYPE mond C t Spoon nual Aug ct Push lby Tub 2 Liner cro Core	orer E ger I e F e Liner	CHEMICAL AN. PCB Poly BTEX Ben Xyle norganics Inor Phenol. C. Phe /OC Vola AC & C. Diox. & Fur. Dioy CAH Chic	ALYSIS -Chlorinated Bip zene, Toluene, E ne ganic Compound nolic Compound til Organic Comj AH)	henyls Ethylbenz Is s pounds (	SVOC zene, PAH PH C <sub>10</sub> - PH F1-F Metals	Semi Volatile Orga Polycyclic Aromati C <sub>50</sub> Petroleum Hydroc F4 Petroleum Hydroc	anic Compounds ic Hydrocarbons arbons C10 <sup>-</sup> C50 arbons F1-F4 (C10 <sup>-</sup> C50 admium, Chromium, ead, Manganese, ed, Silver, Tin, Zinc.
			GEOLOGY / LITHOLOGY		OBSE		ATIC	ONS			;	SAMPLES	1		MONIT		
ELE	<u>EPTH</u> VATION (m)	ГІТНОГОСУ	DESCRIPTION		VAPOR CONC. I - Isobutylene (ppm)			-	SAMPLE TYPE	% RECOVERY	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS
-	-	KHIXDI				+					16						-
8.5 -			SILTY SAND, some gravel to gravelly trace clay, grey, wet, compact to very dense (GLACIAL TILL)	,											-		
9.0 -																	9.0
9.5 -					I - 0, H - 0				SS	83	9 12 13 15	SS12			-		
10.0 -																	10.0
	-					$\left  \right $				- 10	50/75				+		- 10.5 - - -
11.0 -	<u>11.10</u> 55.34		- END OF BOREHOLE	ſ	I - 0, H - 0				SS	13	mm	SS13			-		- 11.0 <del>-</del> -
11.5 -	-		1) Auguer refusal at 11.1 m in depth 2) 37.5 mm monitoring well installed a	nt 7.9													- 11.5 – -
12.0 -	-		<i>m in depth</i> 3) <u>DATE WATER LEVEL</u> Nov 4, 2019 6.7 m														- - 12.0 —
12.5 -	-		End of borehole at 11.10 m.														- - 12.5 <del>-</del> -
13.0 -	-																13.0
13.5 -	-																- - 13.5 <del>-</del>
14.0 -																	- - - 14.0—
14.5 -	-																- - - 14.5 —
15.0 -	-																
15.5 -	-																
13.5	-																

		-W	/SP				B	OF	REF	10	LE D	RILLIN	IG	REC	ORD : Pa	<b>19-07</b> ge 1 of 3
											Preparec Reviewe					2019-10-2 2019-10-2
Proj Site: Sect Clier	tor:	Ca	rleton University New Residence rleton University rleton University								Geogra Surface	Number: ohic Coordi Elevation: PVC Elevati		: X = Y =	<b>1-12948-</b> 367640.4787 5027688.217 29 m <i>(Geodeti</i>	1 mE 78 mN
Drilli Drilli Bore Drilli	ing Eq ing Me shole [ ing Flu	Diameter:	Marathon CME 55 Hollow Stem Auger 203 mm Water Split Spoon	ODOUR F - Light M - Medii P - Persis VISUAL D - Disse S - Saturi	tent minated F	Produc	D S M D S T T M	S - Split IA - Mar IP - Dire T - She U - DT3 IC - Mac	mond Co Spoon nual Aug ct Push by Tube	prer f	CHEMICAL AN PCB Po BTEX Be Xy Inorganics Inc Phenol. C. Ph VOC Vo & C Diox. & Fur. Dio CAH Ch	IALYSIS ly-Chlorinated Bip nzene, Toluene, E ene rganic Compound enolic Compound latil Organic Comp 2AH)	henyls Ethylbenz Is s pounds (	PH C <sub>10</sub> - PH F1-F Metals	Semi Volatile Orga Polycyclic Aromati C <sub>50</sub> Petroleum Hydroc 4 Petroleum Hydroc Arsenic Barium, ( Cobalt, Copper, Lu Molyddenum, Nick Leacheate Tests (	c Hydrocarbons arbons C <sub>10</sub> -C <sub>50</sub> arbons F1-F4 (C cadmium, Chrom ad, Manganese tel, Silver, Tin, Zi
			GEOLOGY / LITHOLOGY	1	OBSE		IONS	S			SAMPLES			MONI		
<u>DEF</u> ELEVA (m	ATION	ГІТНОГОБУ	DESCRIPTION		VAPOR CONC. 1 - Isobutylene (ppm) H - Hexane (ppm)			l's	% RECOVERY	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS
			Ground surface.													
	<u>0.15</u> 64.14		TOPSOIL - 150 mm SILTY SANDgravelly to trace gravel, brown, moist, dense to very dense (F					ss	2	36 57	SS1			-		C
- - - - - -								ss	54	29 35 23 22	SS2			-		
.5 - - - 2.0 -						-		SS	79	5 8 27 17	SS3			-		
2.5	2.30 61.99 2.60 61.69		SILTY SAND with organics, dark brow	vn,		-		SS	8	7 3 4 4	SS4			-		:
- - - - -	<u>3.05</u> 61.24		SILTY CLAY, with gravel, trace sand trace organics, grey, moist (FILL) SILTY SAND AND GRAVEL,brown,	,/		-		ss	58	4 12 9 11 15	SS5			-		:
8.5 - - - -	<u>3.80</u> 60.49		moist, compact			-								-		:
.0	-		ROCK FRAGMENTS					SS	46	49 40 56 59	SS6			-		
- c - - - - - - 0.0								SS	38	3 38 49 28	SS7					
.5 -	<u>5.30</u> 58.99		SILTY SAND AND GRAVEL trace cla grey, wet, compact to very dense (GLACIAL TILL)	ay,				SS	33	13 32 14 8	SS8					
.0			·					SS	8	9 12 21 17	SS9			-		
								SS	58	28 26 12 5	SS10			-		
7.5 — - - -								ss	29	5 5 11 12	SS11					

		-N	/SP				B	OF	REF	10	LE DI	RILLIN	IG	REC	ORD : Pa	<b>19-07</b> ge 2 of 3
											Prepared Reviewed					2019-10-27 2019-10-27
Proj Site Sec	:		rleton University New Residence rleton University									hic Coordi	nates	: X = Y =	<b>1-12948-</b> 367640.4787 5027688.217	1 mE 78 mN
Clie			rleton University									Elevation: VC Elevati	on:	64.2	29 m <i>(Geodeti</i>	c)
Drill Drill Bor Drill	ling Eq ling Me ehole [ ling Flu	Diameter	Hollow Stem Auger	ODOUR F - Light M - Mediu P - Persis VISUAL D - Disse S - Satura	tent minated P	Product	D S M D S T M	C - Dia S - Spli IA - Ma P - Dire T - She U - DT3 IC - Ma	TYPE mond Co t Spoon nual Aug ct Push lby Tube 2 Liner cro Core e Phas	orer ger e Liner	BTEX Ben Xyle Inorganics Inor Phenol. C. Phe VOC Vola & C Diox. & Fur. Dioo CAH Chie	r-Chlorinated Bip zene, Toluene, E me ganic Compound nolic Compound atil Organic Comp AH)	Ethylben: Is s pounds (	PH C <sub>10</sub> - PH F1-F Metals	Semi Volatile Org; Polycyclic Aromati C <sub>50</sub> Petroleum Hydroc Arsenic, Barium, ( Cobalt, Copper, L. Molybdenum, Nick Leacheate Tests (	ic Hydrocarbons arbons C <sub>10</sub> -C <sub>50</sub> arbons F1-F4 (C <sub>10</sub> -C <sub>5</sub> Cadmium, Chromium, ead, Manganese, kel, Silver, Tin, Zinc.
			GEOLOGY / LITHOLOGY		OBSE		ONS	s			SAMPLES		1	MONIT		
ELEV. (r	<u>PTH</u> A <i>TION</i> n)	гітногоду	DESCRIPTION		VAPOR CONC. I - Isobutylene (ppm) H - Hexane (ppm)	T M F		S.	% RECOVERY	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS
12-11-6102		*****								18						
	8.40							-		10				-		-
5 8.5 -	55.89		<b>ROCK FRAGMENTS</b> ,(Shale fragmer	nts				ss	29	16 17 17 12	SS12					8.5 -
			with occasional granite fragments) (GLACIAL TILL)								5512			-		9.0 -
								SS	8	36 10 5	SS13			-		9.5
								SS	21	15 15 16 10	SS14			-		10.0 -
								SS	29	9 21 17	SS15			-		10.5 -
										17 16						
11.5 -	11.80							ss	33	11 50 50	SS16					11.5 -
	52.49		LIMESTONE with shale partings, fres slightly weathered, grey Run 1: 11.8 m - 12.4 m	sh to				CORI	E					-		12.0 -
odd 12.5 -			TCR - 9" Run 2: 12.4 m - 13.8 m				•	CORI	E							12.5 ·
			TCR - 34%													13.0 -
			<del>- R</del> un 3: 13.8 m - 15.4 m													13.5 -
			TCR - 55" RQD - 91%					CORI	Ξ							14.0 -
иова: технико-съчите помонахите и помонахи Помонахите и помонахите и																14.5 -
15.0			← Run 4: 15.4 m - 17.0 m													15.0 -
			TCR - 100% RQD - 33%					COR	Ξ							15.5 -

	_\	/SP				B	OF	REF	łC	LE DF	RILLIN	lG	REC	ORD : Pa	<b>19-07</b> ge 3 of 3
										Prepared Reviewed					2019-10-27 2019-10-27
Project Na Site: Sector: Client:	Ca	arleton University New Residence arleton University arleton University								Surface I	lumber: hic Coordi Elevation: VC Elevati		s: X = Y =	<b>1-12948-</b> 367640.4787 5027688.2177 29 m <i>(Geodetic</i>	1 mE 78 mN
Drilling Co Drilling Eq Drilling Me Borehole I Drilling Flu Sampling I	uipment: ethod: Diameter iid:	Hollow Stem Auger	ODOUR F - Light M - Mediu P - Persis VISUAL D - Dissee S - Satura	tent minated P	Product	D S M D S T M	C - Dia S - Spli IA - Ma P - Dire T - She U - DT3 IC - Ma	TYPE mond Co t Spoon nual Aug ct Push lby Tube 2 Liner cro Core e Phase	orer ger e Liner	BTEX Ben Xyle Inorganics Inorg Phenol. C. Pher VOC Vola & C/ Diox. & Fur. Diox	-Chlorinated Bip zene, Toluene, E ne ganic Compound nolic Compound til Organic Comp AH)	thylben: Is s bounds (	PH C <sub>10</sub> - PH F1-I Metals	Semi Volatile Orga Polycyclic Aromati C <sub>50</sub> Petroleum Hydroc A Petroleum Hydroc Arsenic, Barium, C Cobat, Copper, L Molybdenum, Nick Leacheate Tests (	ic Hydrocarbons arbons C <sub>10</sub> -C <sub>50</sub> arbons F1-F4 (C <sub>10</sub> -C 2admium, Chromium ad, Manganese, kel, Silver, Tin, Zinc.
		GEOLOGY / LITHOLOGY		OBSE		ONS	5			SAMPLES			MONI		
<u>DEPTH</u> ELEVATION (m)	гітногобу	DESCRIPTION		VAPOR CONC. I - Isobutylene (ppm) H - Hexane (ppm)			<u>0</u>	% RECOVERY	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS
	×///XX														
16.5 17.0 17.5 18.0 18.5 18.60		LIMESTONE with shale partings, fres slightly weathered, grey	h to												16.5
- - 17.0 - - - -		←Run 5: 17.0 m - 17.4 m TCR - 100% _ RQD - 67%					COR	E							17.0
17.5		<sup>R</sup> un 6: 17.4 m - 18.6 m TCR - 100% RQD - 97%					COR	Ξ							17.5
18.5 <u>18.60</u> - 45.69		← End of borehole	/							_					18.5
19.0	Refusal	End of borehole at 18.60 m.													19.0
- 19.5 <del>-</del> - - -															19.5
20.0															20.0
20.5 <del>-</del> - - -															20.5
21.0 — - - - -															21.0
21.5															21.5
22.5															22.5
23.0 -															23.0
45.69 19.0 19.5 20.0 20.5 21.0 21.5 22.0 22.5 23.0 23.5 24.0															23.5
24.0															24.0

	W	/SP				B	OF	(EF	10	LE L		IG	REC		<b>19-08</b> ge 1 of 3 : <b>2019-10-2</b> 4
										Reviewe	ed by:		- 10	Date (End):	2019-10-24
Site: Sector:	Ca	rleton University New Residence rleton University								Geogra	t Number: aphic Coordi e Elevation:	nates	: X = Y =	<b>1-12948-</b> mE mN <i>Geodetic</i> )	00
Client: Drilling Co		rleton University Marathon	ODOUR			s		TYPE			PVC Elevati	on:		,	
Drilling Equ Drilling Me Borehole I Drilling Flu Sampling I	uipment: ethod: Diameter: iid:	CME 55 Hollow Stem Auger	F - Light M - Medi P - Persis VISUAL D - Disse S - Satur		Product	DC SS MJ DF ST TU M	C - Dia S - Spli A - Mai P - Dire T - She J - DT3 C - Mai	mond Co t Spoon nual Aug ct Push lby Tube 2 Liner cro Core ee Phas	orer ger e Liner	PCB P BTEX B Inorganics Ir Phenol. C. P VOC V 8 Diox. & Fur. D CAH C	voly-Chlorinated Bip Benzene, Toluene, E Sylene horganic Compound /henolic Compound /olatil Organic Comp (CAH) Dioxins & Furans Chlorinated Aliphatic lydrocarbons	thylbenz s oounds (I	PH C <sub>10</sub> - PH F1-F Metals	Semi Volatile Orga Polycyclic Aromati C <sub>50</sub> Petroleum Hydroc 4 Petroleum Hydroc Arsenic, Barium, C Cobalt, Coper, Le Molybdenum, Nick Leacheate Tests (	ic Hydrocarbons arbons C <sub>10</sub> -C <sub>50</sub> arbons F1-F4 (C Cadmium, Chrom ead, Manganese kel, Silver, Tin, Zi
		GEOLOGY / LITHOLOGY		OBSE		IONS	6			SAMPLES			MONI		
<u>DEPTH</u> ELEVATION (m)	ГІТНОГОБУ	DESCRIPTION		VAPOR CONC. I - Isobutylene (ppm) H - Hexane (ppm)	F M F	VISUAL	SAMPLE TYPE	% RECOVERY	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS
		Ground surface.		-											
0.18		TOPSOIL - 175 mm SILTY SAND AND GRAVEL (to gra dark brown, moist, compact (FIL		- I - 0, H - 0			SS	79	3 7 8 26	SS1			_		C
1.0		, ,	,	l - 0, H - 0			ss	58	20 14 12 13	SS2			-		
1.5 — — — 2.0 —				l - 0, H - 0			ss	54	8 15 7 2	SS3			-		
2.0 - 2.30 - 2.30 - 2.5 - 2.60		SILTY CLAY, moist, firm (FILL)		I - 0, H - 0			ss	38	4446	SS4			-		2
3.0 <del>-</del> - -		SILTY SAND and GRAVEL (rock fragments), brown, wet, compact to dense	o very	1 - 0,			ss	46	6 59 28 50				-		
3.5 <del>-</del> - -				H - 0						SS5			-		:
4.0 — - - 4.5 —				I - 0, H - 0			SS	54	15 57 66 62	SS6			-		
				l - 0, H - 0			SS	25	5 22 10 7	SS7			-		
5.5 -				l - 0, H - 0			SS	42	6 19 10 11	SS8	Metals PHCs F1-F4 VOC PAH				
5.0 <del>-</del> - - - -				I - 0, H - 0			ss	8	17 13 18 16	SS9			-		
5.5								EO					-		-
7.5 7.60				I - 0, H - 0			SS	58	44 55	SS10			-		
	VIIII)			I - 0,			ss	21	32 43 38	1					1

	W	/SP				В	OF	REF	HC	PLE DF		lG	REC		<b>19-08</b> ge 2 of 3
	ame: Ca	rleton University New Residence rleton University								Reviewed Project N	by:	nates			2019-10-24
Sector: Client:		rleton University									Elevation: VC Elevati	on:		mN (Geodetic)	
Drilling Co Drilling Eq Drilling Me Borehole I Drilling Flu Sampling	uipment: ethod: Diameter: uid:	Hollow Stem Auger	ODOUR F - Light M - Mediu P - Persis VISUAL D - Disser S - Satura	tent minated F	Produc		GAMPLE DC - Dia SS - Spli AA - Ma DP - Dire ST - She CU - DT MC - Ma V - Fre	mond C t Spoon nual Au ect Push lby Tub 2 Liner	orer ger 1 e e Liner	BTEX Ben Xyle Inorganics Inorg Phenol. C. Phel VOC Vola & C/ Diox. & Fur. Diox CAH Chic	-Chlorinated Bip zene, Toluene, E ne ganic Compound nolic Compound til Organic Comp AH)	Ethylbenz Is s pounds (	PH C <sub>10</sub> - PH F1-I Metals	Semi Volatile Orga Polycyclic Aromati C <sub>50</sub> Petroleum Hydroc A Petroleum Hydroc Arsenic, Barium, C Cobalt, Copper, L Molybdenum, Nick Leacheate Tests (	c Hydrocarbons arbons $C_{10}$ - $C_{50}$ arbons F1-F4 (C $_{10}$ - $C_{50}$ admium, Chromium, ad, Manganese, el, Silver, Tin, Zinc.
		GEOLOGY / LITHOLOGY		OBSE		ION	s			SAMPLES			MONI		
DEPTH ELEVATION (m)	ГІТНОГОБУ	DESCRIPTION		VAPOR CONC. I - Isobutylene (ppm) H - Hexane (ppm)	P M F		5	% RECOVERY	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS
	() () () () () () () () () () () () () (	SILTY SAND, some gravel to gravelly	,		$\mathbb{H}$	+			46						
		trace clay, grey, wet, compact to very dense (GLACIAL TILL)	,	l - 0, H - 0			SS	13	14 15 14 25	SS12			-		- - 8.5 <del>-</del> - - -
9.0				l - 0, H - 0	-		ss	75	15 27 31 36	SS13			-		9.0   9.5
8.5 9.0 9.0 9.0 9.5 9.9 9.9 9.9 9.9 9.9 9.9 9.9 9.9 9.9		<b>GRAVEL SIZED ROCK FRAGMENT</b> trace to some sand, sized fragments,		I - 0, H - 0	-		ss	17	11 55 98 46	SS14			-		
10.5 - 10.70									46				-		10.5 <del>-</del> -
		LIMESTONE with shale partings, fresh slightly weathered, grey	n to				COR	Ξ							11.0-
11.5 -		Run1: 10.7 m - 11.9 m TCR - 40% RQD - 7%													- 11.5 – - -
12.0		<del>-</del> Run 2: 11.9 - 12.5					COR	E							12.0 —
		<del>-</del> Run 3: 12.5 m - 13.9 m					COR	E		-					- 12.5 <del>-</del> - -
															13.0
13.5 <del>-</del> - - -															- 13.5 — - -
		<del>«</del> Run 4: 13.9 m - 15.5 m					COR	E		1					
14.5 -															- 14.5 — - - -
15.5 - 15.50	Refusal	- END OF BOREHOLE	[	-						-					15.5 —
	Refusal	1) Auguer refusal at 10.7 m in depth.													

							E	30	DF	REF	ю	LE DF	RILLIN	IG	REC	ORD :	19-08
		•N	/SP									Prepared	by:				ge 3 of 3
												Reviewed				Date (End):	2019-10-24
Proje Site: Secto Clier	or:	Ca	arleton University New Residence arleton University arleton University									Surface	lumber: hic Coordi Elevation: VC Elevati		: X = Y =	<b>1-12948-</b> mE mN <i>Geodetic)</i>	00
Drillin Drillin Bore Drillin	ng Equ ng Me ehole D ng Flu	Diameter	Hollow Stem Auger r: 203 mm Water	ODOUR F - Light M - Mediu P - Persis VISUAL D - Disser S - Satura	tent minated F	Prod	uct	DC SS MA DP ST TU MC	C - Diar - Split - Mar - Dire - She - She - DT3 C - Mac	TYPE nond Ce Spoon Jual Aug ct Push by Tube 2 Liner cro Core e Phase	prer F ger In e F Liner	CHEMICAL AN/ PCB Poly BTEX Ben Xyle norganics Inor Phenol. C. Phe /OC Vola & C. Diox. & Fur. Diox	ALYSIS -Chlorinated Bipl zene, Toluene, E ne ganic Compound nolic Compounds til Organic Comp AH)	nenyls thylbenz s ounds (	PH C <sub>10</sub> - PH F1-F Metals	Semi Volatile Orga Polycyclic Aromati C <sub>20</sub> Petroleum Hydroc 4 Petroleum Hydroc Arsenic, Barium, C Cobait, Copper, Le Molybdenum, Nick Leacheate Tests (I	c Hydrocarbons arbons $C_{10}$ - $C_{50}$ arbons F1-F4 (C $_{10}$ - $C_{5i}$ admium, Chromium, ad, Manganese, rel, Silver, Tin, Zinc.
			GEOLOGY / LITHOLOGY		OBSE			ONS			1	SAMPLES			MONIT	ORING WELL	
DEP ELEVA (m	TION	ГІТНОГОСҮ	DESCRIPTION		VAPOR CONC. I - Isobutylene (ppm) H - Hexane (nnm)		1 P [	_	SAMPLE TYPE	% RECOVERY	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS
			Switch to NQ coring	1													-
			2) Borehole terminated at 15.5 m in o End of borehole at 15.50 m.	lepth													- - - - - - - - - - -
17.0																	17.0 —
17.5 -																	17.5 -
18.0 -																	18.0
18.5 -																	18.5 -
19.0																	19.0 —
19.5 -																	19.5 -
20.0																	20.0 -
20.5 -																	20.5 -
21.0																	21.0
21.5 -																	21.5 -
																	22.0-
																	22.5 -
																	23.0
23.5																	23.5

			/SP				B	OF	REF	10			IG	REC		ge 1 of 2
											Prepareo	ed by:		- 10	Date (End):	2019-10-22 2019-10-22
Sit	-		rleton University New Residence rleton University									Number: phic Coordi	nates	s: X =	<b>1-12948-</b> 367632.18573 5027684.1607	3 mE
Cli	ent:		rleton University	1							Top of I	e Elevation: PVC Elevati	on:	63.9	) m (Geodetic)	)
Dr Dr Bo Dr	illing Ed illing Mo orehole illing Fl	Diameter:	Marathon CME 55 Hollow Stem Auger 203mm None Split Spoon	ODOUR F - Light M - Mediu P - Persis VISUAL D - Dissei S - Satura	tent minated F	Produc	D S M D S T t M	IC - Dia S - Spli IA - Ma IP - Dire T - She U - DT3 IC - Ma	E TYPE mond C t Spoon nual Aug ect Push lby Tub 32 Liner cro Core ee Phas	orer ger e e Liner	BTEX Be Xy Inorganics In Phenol. C. Ph VOC Vo & Diox. & Fur. Di CAH C	NALYSIS oly-Chlorinated Bipl anzene, Toluene, E ylene organic Compound alatil Organic Comp CAH) oxins & Furans hlorinated Aliphatic ydrocarbons	thylbenz s sounds (	PH C <sub>10</sub> - PH F1-F Metals	Semi Volatile Orga Polycyclic Aromati C <sub>50</sub> Petroleum Hydroc Arsenic, Barium, C Cobalt, Copper, Le Molybdenum, Nick Leacheate Tests (	c Hydrocarbons arbons C <sub>10</sub> -C <sub>50</sub> arbons F1-F4 (C <sub>10</sub> -C <sub>50</sub> cadmium, Chromium, ad, Manganese, tel, Silver, Tin, Zinc.
			GEOLOGY / LITHOLOGY		OBSE			s			SAMPLES			монт	ORING WELL	
ELE	<u>EPTH</u> VATION (m)	ГІТНОГОĞY	DESCRIPTION		VAPOR CONC. I - Isobutylene (ppm) H - Hexane (ppm)			<u></u>	% RECOVERY	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS
19-11-2		<u>x<sup>1</sup>1<sub>x</sub></u> <u>x<sup>1</sup>1<sub>x</sub></u>	Ground surface.													
0.5 -	0.20 63.70		TOPSOIL - 200 mm SILTY SAND, with possible boulder/cobble, some gravel, trace cla	^ ay,				SS	63	1 3 5 10	SS1			-		0.5 -
			brown, moist. loose to dense (FILL)					ss	50	36 32 19 20	SS2			+		- - 1.0 — -
1.5 -	-							ss	50	12 9 5 5	SS3			+		1.5 -
2.0 -	-					-								-		2.0
2.5 -	-							SS	50	1 8 9 18	SS4			-		2.5
3.5 -	-							SS	100	28 36 37 28	SS5			-		3.5 -
4.0 -	-					-		SS	33	21 50/7: mm	5 SS6			-		
100dd 4.5 -	<u>4.60</u> 59.30		SILTY SAND AND GRAVEL trace cla			-		ss	50	5 7 12 15	SS7			-		4.5
5.0-	-		grey, wet, loose to very dense (GLAC TILL)	IAL						12 15	557			-		5.0
5.5 -																5.5 - - - 6.0
6.5 -	-							SS	8	1 1 1	SS8					- - - 6.5 –
- 0.7 CARLE ION								SS	50	2 6 8 6	SS9					- - 7.0 - -
- 1.0	-							ss	50	6 WH 23	SS10					- 7.5 — - - - -

Control         Reviewe Dir.         Date (End)         291-12948-00           State:         Carleton University State:         Surgiery Electorolinate:         Y = 97-9241457 and Y = 97-9241457 and Y = 97-9241457 and Y = 97-9241457 and Y = 97-92414577 and Y = 97-924145777 and Y = 97-92414577777777777777777777777777777777777			<b>.</b> W	/SP				В	OF	REF	10	LE DF	RILLIN	١G	REC	ORD : Pa	<b>19-09</b>
Site:       Carleton University       Geographic Corollates:       X = 36763.218573 mE Y = 5027684.16079 mN         Sector:       Carleton University       Surface Elevation:       Go 3.9 m (Geodetic)         Drilling Company:       Marathon       ODUR       Sample       Sector:       Surface Elevation:       Sol 3.9 m (Geodetic)         Drilling Company:       Marathon       ODUR       Sample       Sample       Sector:       Sol 1000000000000000000000000000000000000																Date (End):	2019-10-22
Drilling Company: Drilling Equipment: Drilling Huid: Sampling Method: Sampling Method: Drilling Fluid: Monte     Marathon CME 55 Hollow Stem Auger 203 mm     ODUR F : Light Modum     SAMPLE TYFE So-Split Spon Pre- So-Split Spon Companies     Sync Split Spon Split Spon     Sync Split Spon     Sync Split Spon Split Spon     Split Spon Split Spon Split Spon Split Spon     Split Spon Split Split Spon Split Split Spon Split Split Spon Split Split Spon Split Split Spon Split Split	Site: Secto	or:	Ca	rleton University								Geograp Surface	hic Coordi Elevation:		s: X = Y =	367632.1857 5027684.160	3 mE 79 mN
DEPTH (m)         VO 00 01         DESCRIPTION         VI VI VI VI VI VI VI VI VI VI VI VI VI V	Drillin Drillin Drillin Boreh Drillin	ng Cor ng Equ ng Me hole D ng Flu	mpany: uipment: thod: Diameter: id:	Marathon CME 55 Hollow Stem Auger 203 mm None	F - Light M - Mediu P - Persis VISUAL D - Disser S - Satura	tent minated F ated with	Produ	t t t t t	C - Dia S - Spli IA - Mai P - Dire T - She U - DT3 IC - Ma	mond Co t Spoon hual Aug ct Push by Tube 2 Liner cro Core	prer jer Liner	CHEMICAL AN/ PCB Poly BTEX Ben Xyle Inorganics Inor Phenol. C. Phe VOC Vola & Ci Diox. & Fur. Dios CAH Chic	ALYSIS Chlorinated Bip zene, Toluene, E ine ganic Compound nolic Compound: till Organic Comp AH) cins & Furans prinated Aliphatic	henyls Ethylben ds s pounds (	zene, PAH PH C <sub>10</sub> - PH F1-F Metals MAH	Polycyclic Aromati C <sub>50</sub> Petroleum Hydroc F4 Petroleum Hydroc Arsenic, Barium, C Cobalt, Copper, Lo Molybdenum, Nick	ic Hydrocarbons carbons $C_{10}$ - $C_{50}$ carbons F1-F4 (C $_{10}$ - $C_{50}$ Cadmium, Chromium, ead, Manganese, kel, Silver, Tin, Zinc.
Siltry Sand And GRAVEL trace clay, grey, wet, loose to very dense (GLACIAL TILL)         A         A         A         A           8.5         - <th></th> <th></th> <th></th> <th>GEOLOGY / LITHOLOGY</th> <th></th> <th></th> <th></th> <th></th> <th>5</th> <th></th> <th></th> <th>SAMPLES</th> <th></th> <th></th> <th>MONIT</th> <th></th> <th>-</th>				GEOLOGY / LITHOLOGY					5			SAMPLES			MONIT		-
8.5     -<	ELEVAT (m)	TION	ГІТНОГОĞY	DESCRIPTION		VAPOR CONC. I - Isobutylene (ppm) H - Hexane (ppm)	F M	$\bot$	δ.	% RECOVERY	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS
grey, wet, loose to very dense (GLACIAL       9.0       9.0       9.0       9.0       10.0       10.0       10.0       10.5											4						
300       31       4       SS       SS <td< td=""><td></td><td></td><td></td><td>grey, wet, loose to very dense (GLAC</td><td></td><td></td><td>-</td><td></td><td>SS</td><td>8</td><td>561</td><td>SS11</td><td></td><td></td><td>-</td><td></td><td></td></td<>				grey, wet, loose to very dense (GLAC			-		SS	8	561	SS11			-		
9.5       0.0       0	9.0						-		ss	13					-		9.0-
10.0       Image: Simple state s	9.5 -						-				6 4 3	SS12			-		9.5 -
11.0       -	10.0								SS	79	8 10 8 18	SS13					10.0 - - - 
11.5       11.5	11.0						-		SS	79	9 19 25	SS14			-		11.0-
12.0       12.60       END OF BOREHOLE       1) Auguer refusal at 12.6 m in depth         13.0       1) Auguer refusal at 12.60 m.       1) Auguer refusal at 12.60 m.         13.5       End of borehole at 12.60 m.         14.5       Image: Ima	11.5 -						-		SS	71		SS15			-		11.5 -
12.5       12.60       22       SS16         13.0       1) Auguer refusal at 12.6 m in depth       50       50         13.5       End of borehole at 12.60 m.       10       10       10         14.0       14.5       10       10       10       10       10         14.5       15.5       10       10       10       10       10       10         15.5       15.5       10       10       10       10       10       10       10	12.0						-		ss	100					+		12.0 -
End of borehole at 12.60 m.	12.5 - 1	2.60 51.30	IBA.		[						20 22 50	SS16					12.5 -
	13.5 -																13.5 -
	- - - 14.0																14.0-
	- - - 14.5 - -																14.5 -
	15.0																15.0 -
	15.5																15.5 – - - -

		•W	/SP	MC	DNI	TC	R	IN	G١	NE	Prepare	ed by:	IG	REC	Date (Start):	ge 1 of 2 2019-10-22
Site	e: ctor:	Cai	rleton University New Residence rleton University rleton University								Geogr	t Number: aphic Coordii e Elevation:		s: X = Y = 65.	<b>1-12948-</b> 367651.57696 5027678.510 <sup>-</sup> 4 m ( <i>Geodetic</i> )	6 mE I7 mN
Dril Dril Bor Dril	ling Eq ling Me rehole [ ling Flu	mpany: uipment: thod: Diameter:	Marathon CME 55 Hollow Stem Auger	ODOUR F - Light M - Mediu P - Persis VISUAL D - Disser S - Satura	tent minated f	Produc	D S D S T S T M	IC - Dia S - Spli IA - Ma IP - Dire T - She U - DT3 IC - Ma	E TYPE mond C t Spoon nual Au ect Push lby Tub 32 Liner cro Con	Corer Iger h e E E Liner	CHEMICAL PCB F BTEX F Phenol. C. F /OC 2 Diox. & Fur. [ CAH (	PVC Elevati ANALYSIS Poly-Chlorinated Bipl Benzene, Toluene, E Kylene norganic Compound Phenolic Compound Alatti Organic Comp (Jolatti Organic Comp (Joixtins & Furans Chlorinated Aliphatic Vidrocarboons	nenyls thylbenz s	SVOC zene, PAH PH C <sub>10</sub> PH F1 Metals	Polycyclic Aromati -C <sub>50</sub> Petroleum Hydroc -F4 Petroleum Hydroc	nic Compounds c Hydrocarbons arbons C <sub>10</sub> -C <sub>50</sub> arbons F1-F4 (C <sub>10</sub> -C <sub>50</sub> admium, Chromium, ad, Manganese, el, Silver, Tin, Zinc.
			GEOLOGY / LITHOLOGY		OBSE	RVAT		1			SAMPLES	,		MON	ITORING WELL	
ELEV (I	<u>PTH</u> ⁄ATION m)	ПТНОГОСУ	DESCRIPTION		VAPOR CONC. I - Isobutylene (ppm) H - Hevane (ppm)			5	% RECOVERY	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS
9-11-2			Ground surface.													
1	0.15 65.25		<b>SAND</b> , some silty to silty, trace grave gravely, brown, moist. compact to der		l - 0, H - 0	-		SS	83	1 4 7 15	SS1					0.5
			(FILL)		l - 0, H - 0			SS	92	15 15 22 14	SS2					1.0— 
					l - 0, H - 0	-		SS	67	7 8 8 10	SS3				Bentonite	1.5 - - 2.0 -
					l - 0, H - 0			SS	92	8 20 13 8	SS4				— Riser	- - 2.5 — - - -
3.0					l - 0, H - 0			SS	13	17 13 6 13	SS5					3.0
4.0	3.80 61.60		SILTY SAND AND GRAVEL trace cla grey, wet, loose to very dense (FILL) - Metalic fragments noted at 3.8 m in o		l - 0, H - 0			SS	67	25 39 50/12 mm	5 SS6				Sand	4.0
					I - 3, H - 10			SS	46	32 50/10 mm	0 SS7					4.5 - - - - 5.0 -
					I - 3, H - 10			ss	71	8 17 18 14	SS8	Metals PHCs F1-F4 VOC PAH			Screen	- - - 5.5 <del>-</del> -
					l - 0, H - 0			ss	58	5635	SS9				SCREEN Diam.: 51 mm Open.: 0.25 mm Length: 3.05 m WATER	6.0 — - - 6.5 —
	6.90 58.50		SILTY SAND AND GRAVEL trace cla grey, wet, loose to compact (GLACIAI		1-0,			ss	13	5 3 2 7 7	0040	Metals VOC			Depth: 5.85 m Elev.: 60.40 m Date: 2019-11-04	0.5 - - - 7.0
Project: ENVIKO- CARLETON UNIVERSITY NEW RESIDENCE.64-01 June 1       1 <t< td=""><td></td><td></td><td>TILL)</td><td>-</td><td>H - 0 I - 0, H - 0</td><td></td><td></td><td>SS</td><td>25</td><td>7 7 14 3 3</td><td>SS10 SS11</td><td></td><td></td><td></td><td>· · ·</td><td></td></t<>			TILL)	-	H - 0 I - 0, H - 0			SS	25	7 7 14 3 3	SS10 SS11				· · ·	

			• •		MC	DNI	TC	DF	RIN	١G	i W	/E	LL DF	RILLIN	IG	REC	ORD :	
				/SP									Prepared				Date (Start)	ge 2 of 2 2019-10-22
:	Proj Site Sec Clie	: tor:	Ca	arleton University New Residence arleton University arleton University									Surface	•		s: X = Y = 65.4	Date (End): <b>1-12948-</b> 367651.57690 5027678.510 4 m (Geodetic, 25 m (Geodetic)	6 mE 17 mN )
1 1 1 1	Drill Drill Bore Drill	ing Eq ing Me ehole [ ing Flu	Diameter	Hollow Stem Auger	ODOUR F - Light M - Mediu P - Persis VISUAL D - Disse S - Satura	itent minated f	Produ	ct	DC - SS - S MA - DP - I ST - S TU - I MC -	PLE TY Diamor Split Sp Manua Direct F Shelby DT32 L Macro Free F	nd Coro boon I Auge Push Tube iner Core L	er P B In P V	CHEMICAL ANA CB Poly ITEX Ben Xyle horganics Inor henol. C. Phe OC Vola & Ca Volax. & Fur. Diox CAH Chic	ALYSIS -Chlorinated Bip zene, Toluene, E ne ganic Compound oolic Compound til Organic Com AH)	henyls thylbenz s sounds (	SVOC zene, PAH PH C <sub>10</sub> - PH F1-f Metals	Semi Volatile Orga Polycyclic Aromati C <sub>50</sub> Petroleum Hydroc F4 Petroleum Hydroc Arsenic Barium (	anic Compounds c Hydrocarbons arbons C <sub>10</sub> -C <sub>50</sub> arbons F1-F4 (C <sub>10</sub> -C <sub>50</sub> admium, Chromium, ead, Manganese, rel, Silver, Tin, Zinc.
				GEOLOGY / LITHOLOGY		OBSE			۱s			s	SAMPLES			MONIT		
E	<u>DEF</u> LEV/ (n	ATION	ГІТНОГОСУ	DESCRIPTION		VAPOR CONC. I - Isobutylene (ppm) H - Hexano (ppm)		PD	-	TYPE	% RECOVERY	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS
			CHIXIX.								5	0/50						
01ECH.GUI	5   -			SILTY SAND AND GRAVEL trace cla grey, wet, loose to compact (GLACIA TILL)							r	nm				-		- - 8.5 - - - -
9.1 9 9	0-															+		9.0
0.	5   1					I - 1, H - 0	-		s	SS 1	00	1 6 13 35	SS12			-		
. 10.0	-																	
10.3 NEN 14	-	10.70 54.70		- Glacial TIII Inferred														10.5
	-																	11.0
	-																	11.5
	-																	12.0 —
і уре га	-	12.60 52.80	\$771 <u>3</u> 21	END OF BOREHOLE     1) Augering ended at 10.7 m due to fi	lowing													12.5
13.0 13.0 13.0 13.0	-			sands. Switch to DCPT. 2) DCPT Refusal at 12.6 m in depth	-													13.0—
13. 13. 20 20 20 20 20 20 20 20 20 20 20 20 20	-			<ul> <li>3) 37.5 mm monitoring well installed a m in depth</li> <li>4) <u>DATE</u> <u>WATER LEVEL</u></li> </ul>	at 7.6													13.5 — - - -
	0			<i>Nov 4, 2019</i> 5.9 m End of borehole at 12.60 m.														14.0 — - -
	5																	14.5 — - -
15.0 15.0	0																	15.0 <del>-</del> - -
15.5 15.5	5																	15.5 — - -
عه آ	<u> </u>																	

			-N	/SP				В	OF	REF	HO	LE DI	RILLIN	IG	REC	ORD : Pa	<b>19-11</b> ge 1 of 2
												Prepared Reviewed					2019-10-25 2019-10-25
	Site	e: ctor:	Ca	rleton University New Residence rleton University rleton University								Geograp Surface	Number: ohic Coordin Elevation: PVC Elevatio		: X = Y =	<b>1-12948-</b> 367638.98308 5027733.1863 27 m <i>(Geodeti</i>	8 mE 39 mN
	Dril Dril Bor Dril	ling Eq ling Me rehole I ling Flu	Diameter	Hollow Stem Auger	ODOUR F - Light M - Mediu P - Persis VISUAL D - Disset S - Satura	stent minated F	Produ	t T	DC - Dia SS - Spli MA - Ma DP - Dire ST - She TU - DT MC - Ma	E TYPE mond Co t Spoon nual Aug ect Push lby Tube 32 Liner cro Core	orer ger e e Liner	CHEMICAL AN PCB Pol BTEX Ber Xyl Inorganics Inor Phenol. C. Phe VOC Vol & Co Diox. & Fur. Dio CAH Chi	IALYSIS y-Chlorinated Bipł zcene, Toluene, E ene rganic Compounds anolic Compounds atil Organic Comp AH)	henyls thylbenz s soounds (	PH C <sub>10</sub> - PH F1-F Metals	Semi Volatile Org; Polycyclic Aromati C <sub>50</sub> Petroleum Hydroc 4 Petroleum Hydroc Arsenic, Barium, ( Cobalt, Copper, Le Molyddenum, Nick Leacheate Tests (	ic Hydrocarbons arbons C <sub>10</sub> -C <sub>50</sub> arbons F1-F4 (C <sub>10</sub> -C <sub>50</sub> Cadmium, Chromium, ead, Manganese, kel, Silver, Tin, Zinc.
				GEOLOGY / LITHOLOGY		OBSE	RVA		1			SAMPLES			моні	ORING WELL	
2	ELEV	<u>PTH</u> ⁄ATION m)	гітногобу	DESCRIPTION		VAPOR CONC. I - Isobutylene (ppm) H - Hexane (ppm)			_%_	% RECOVERY	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS
19-11-2		0.10		Ground surface.													
TECH.GDT 20	- - - 0.5 -	65.17 0.60 64.67		ASPHALT- 50 mm     SAND, some gravel, some silt, brown     moist. loose to dense (Granular Base)					GRA	β							- - - - 0.5 - - -
IPLATE_GE01	- - 1.0 - - -			<b>SILTY SAND</b> ,trace to some gravel, brown, moist (FILL)		l - 0, H - 0			SS	75	14 11 11 14	SS1			_		- - 1.0 - - -
: WSP_	1.5 - - - 2.0 -					l - 0, H - 0	-		SS	71	5 4 5 5	SS2			-		1.5 - - - 2.0
ENTAL Data Ter	2.5					l - 0, H - 0	-		SS	79	8 8 10 13	SS3			-		2.5 -
VELL-ENVIRONM	3.0 — - - 3.5 — -	3.80				l - 0, H - 0	-		SS	79	6 12 20 11	SS4			-		3.0
ort : WSP_EN_	+.0  - - - -	61.47		SILTY SAND and GRAVEL trace clay brown, moist, compact to very dense (Glacial Till)	Ι,	l - 0, H - 0			SS	75	7 12 13 25	SS5			-		4.0
.GPJ Type rapp	4.5 - - - 5.0 -					l - 0, H - 0			SS	33	17 38 22 26	SS6			-		4.5
EW RESIDENCE	5.5   - - -					l - 0, H - 0			SS	83	40 57 63 63	SS7			-		5.5 -
UNIVERSITY NE	6.0					l - 0, H - 0			SS	25	18 59	SS8			-		6.0 — - - 6.5 —
RO - CARLETON	- - 7.0 - - - -					l - 0, H - 0			ss	42	5 22 18 13	SS9			-		
Projet : ENVIF	7.5 — - - - - 3.0			<ul> <li>heaving sand noted at 7.6 m in dept</li> </ul>	h	I - 0, H - 0			SS	50	6 6 3	SS10			-		7.5 - - - - - - - - - - - - - - - - - - -

		_\A	/SP				В	OF	REF	10	LE DI	RILLIN	lG	REC	ORD : Pa	<b>19-11</b> ge 2 of 2
			51								Prepared Reviewed					2019-10-25 2019-10-25
Si Se	roject Na ite: ector: lient:	Ca	rrleton University New Residence Irleton University Irleton University								Surface	Number: phic Coordi Elevation: VC Elevat		: X = Y =	<b>1-12948-</b> 367638.98308 5027733.1863 27 m <i>(Geodetic</i> )	3 mE 39 mN
Di Di Bi Di	rilling Me orehole I rilling Flu	luipment: ethod: Diameter	Hollow Stem Auger	ODOUR F - Light M - Mediu P - Persis VISUAL D - Disser S - Satura	tent minated F	Produ		IC - Dia IS - Spl IA - Ma IP - Din IT - She IU - DT IC - Ma	TYPE mond C t Spoon nual Aug ect Push lby Tub 32 Liner cro Core ee Phas	orer ger e e Liner	CHEMICAL AN PCB Poly BTEX Ber Xyla Inorganics Inor Phenol. C. Phe VOC Voli & C Diox. & Fur. Dio	ALYSIS y-Chlorinated Bip Izene, Toluene, E ene ganic Compound atil Organic Com AH)	henyls Ethylbenz Is s pounds (	PH C <sub>10</sub> - PH F1-F Metals	Semi Volatile Org Polycyclic Aromati C <sub>50</sub> Petroleum Hydroc F4 Petroleum Hydroc Arsenic, Barium, C Cobalt, Copper, Le Molybdenum, Nick Leacheate Tests (	c Hydrocarbons arbons $C_{10}$ - $C_{50}$ arbons F1-F4 (C $_{10}$ - $C_{50}$ cadmium, Chromium, cad, Manganese, cel, Silver, Tin, Zinc.
			GEOLOGY / LITHOLOGY		OBSE	RVA	TION	-			SAMPLES	liocarbons		MONIT		
ELI	DEPTH EVATION (m)	ГІТНОГОСУ	DESCRIPTION		VAPOR CONC. I - Isobutylene (ppm) H - Hexane (ppm)	P ODOUR		5	% RECOVERY	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS
GEOTECH.GDT 2019-11-27 5'8 5'8			SILTY SAND and GRAVEL trace clay brown, moist, compact to very dense (Glacial Till)	',		-				7				-		8.5
Data Template : WSP_TEMPLATE_GEOTECH.GDT 0.01 2.06 2.07 2.08 2.08 2.08 2.08 2.08 2.08 2.08 2.08																9.0 — - - 9.5 — - - -
1TAL Data Template 2.01 2.01	- - - - - - - - - - - - - - - - - - -		GLACIAL TILL INFERED		l - 0, H - 0	-		ss	50	11 16 19 27	SS11			-		10.0 — - - - 10.5 — - - -
																11.0
12.0 ·	- - - - - - - - - - - - - - - - - - -		- END OF BOREHOLE	Г												12.0 – 12.5 –
13.0 · 13.0 · 13.5			<ol> <li>Augering ended at 10.7 m due to flisands. Switch to DCPT.</li> <li>DCPT Refusal at 12.6 m in depth</li> </ol>	owing												13.0 - 13.5 -
14.0	-		End of borehole at 12.60 m.													14.0-
Projet:         ERVIRO - CARLETON UNIVERSITY NEW RESIDENCE: GP1         Type Tapport:         WELL-ENVIRONMENTAL           Projet:         ENVIRO - CARLETON UNIVERSITY NEW RESIDENCE: GP1         17.00         17.00         17.00           1004:         ENVIRO - CARLETON UNIVERSITY NEW RESIDENCE: GP1         17.00         17.00         17.00           1004:         ENVIRO - CARLETON UNIVERSITY NEW RESIDENCE: GP1         17.00         17.00         17.00           1004:         ENVIRO - CARLETON UNIVERSITY NEW RESIDENCE: GP1         17.00         17.00         17.00           1004:         ENVIRO - CARLETON UNIVERSITY NEW RESIDENCE: GP1         17.00         17.00         17.00           1004:         ENVIRO - CARLETON UNIVERSITY NEW RESIDENCE: GP1         17.00         17.00         17.00           1004:         ENVIRO - CARLETON UNIVERSITY         ENVIRO - CARLETON UNIVERSITY         17.00         17.00																14.5 - - - - 15.0 - - -
15.5																- - - - - - - - - - - - - - - - - - -

								В	OF	REF	HO	LE DI	RILLIN	١G	REC	ORD :	19-12
			-N	/SP												Pa	ge 1 of 1
												Prepared Reviewed					2019-10-25 2019-10-25
	Proj Site Sec Clie	: tor:	Ca	arleton University New Residence arleton University arleton University								Surface	hic Coord		s: X = Y =	<b>1-12948-</b> mE mN 35 m <i>(Geodeti</i>	
			mpany:	Marathon	ODOUR			s	SAMPLI	E TYPE		CHEMICAL AN					
	Drill Bor Drill	ling Me ehole [ ling Flu	Diameter	Hollow Stem Auger	F - Light M - Mediu P - Persis VISUAL D - Disse S - Satura	tent minated P	rodu	t T t t t	SS - Spl MA - Ma DP - Dire T - She U - DT MC - Ma	mond Co it Spoon nual Aug ect Push Iby Tube 32 Liner cro Core ee Phas	orer E ger II e F e \ E	BTEX Ben Xyle Inorganics Inor Phenol. C. Phe VOC Vola & C. Diox. & Fur. Dioo CAH Chia	ganic Compound nolic Compound atil Organic Com AH)	Ethylben: ds ls pounds (	PH C <sub>10</sub> PH F1- Metals	Semi Volatile Org Polycyclic Aromati C <sub>50</sub> Petroleum Hydroc Arsenic, Barium, C Cobalt, Copper, Le Molybdenum, Nick Leacheate Tests (	c Hydrocarbons arbons $C_{10}$ - $C_{50}$ arbons F1-F4 (C $_{10}$ - $C_{5i}$ admium, Chromium, ad, Manganese, rel, Silver, Tin, Zinc.
				GEOLOGY / LITHOLOGY		OBSE	RVAT		s	1	;	SAMPLES		1	MONI	TORING WELL	
		<u>PTH</u> A <i>TION</i> n)	ПТНОГОСУ	DESCRIPTION		VAPOR CONC. I - Isobutylene (ppm) H - Hexane (ppm)			SAMPLE	% RECOVERY	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS
2019-11-27				Ground surface.													
	-	64.82		ASPHALT- 30 mm	ʃ												-
CH.GD	.5 -	0.55		SAND AND GRAVEL trace to some \ light brown, brown, moist (Granular B		-				8100		=					0.5 -
Projet : ENVIRO - CARLETON UNIVERSITY NEW RESIDENCE.GPJ Type rapport : WSP_EN_WELL-ENVIRONMENTAL Data Template : WSP_TEMPLATE_GEOTECH.GDT	- - 0. -			SAND, trace gravel, light brown, mois (FILL)					<u>GRA</u>	<u>3100</u>							- - 1.0 —
NSP_TEMPL	.5 -	1.50 63.35		END OF BOREHOLE	. [	-											- - - - - -
Template : \	- - 0. - -			1) Borehole terminated at 1.5 m in de End of borehole at 1.50 m.	pth												2.0-
ENTAL Data	.5 - - -																2.5 -
	.0																3.0 — - - - - - - - - - - - - - - - - - - -
	- - - - 0-																4.0-
rapport : WS	.5 –																4.5 -
E.GPJ Type	- - 0. -																5.0-
V RESIDENC	- - - - -																5.5 -
ERSITY NEV	- - 0. - -																6.0 -
ETON UNIV	.5																6.5 -
/IRO - CARL	.0 0.																7.0-
Projet : ENV	.5																7.5

			-W	/SP				B	OF	REF	HC	LE D	RILLIN	IG	REC	ORD : Pa	<b>19-13</b> ge 1 of 2
												Preparec Reviewe					2019-10-25 2019-10-25
	Proj Site Sec	:		rleton University New Residence rleton University								-	Number: phic Coordi	nates	s: X =	<b>1-12948-</b> 367668.0083 5027677.104	mE
	Clie	nt:		rleton University								Top of F	Elevation: PVC Elevati	on:	64.4	m (Geodetic)	
	Drilli Drilli Bore Drilli	ing Eq ing Me ehole [ ing Flu	Diameter:	Hollow Stem Auger	ODOUR F - Light M - Mediu P - Persis VISUAL D - Disser S - Satura	tent minated F	Produc	D S D S T T M	IC - Dia S - Spli IA - Ma IP - Dire T - She U - DT IC - Ma	E TYPE mond C t Spoon nual Aug ect Push lby Tub 32 Liner cro Core ee Phas	orer ger 1 e e Liner	BTEX Be Xy Inorganics Inc Phenol. C. Ph VOC Vo & C Diox. & Fur. Dic CAH Ch	ly-Chlorinated Bip nzene, Toluene, E lene organic Compound enolic Compounds latil Organic Comp CAH)	Ethylben: Is s bounds (	PH C <sub>10</sub> - PH F1-F Metals	Semi Volatile Org Polycyclic Aromati C <sub>50</sub> Petroleum Hydroc Arsenic, Barium, C Cobalt, Copper, Le Molybdenum, Nick Leacheate Tests (	c Hydrocarbons arbons C <sub>10</sub> -C <sub>50</sub> arbons F1-F4 (C <sub>10</sub> -C <sub>50</sub> admium, Chromium, ad, Manganese, vel, Silver, Tin, Zinc.
				GEOLOGY / LITHOLOGY		OBSE			s			SAMPLES	1		монп		
	<u>DEF</u> ELEV/ (n	ATION	ГІТНОГОGY	DESCRIPTION		VAPOR CONC. I - Isobutylene (ppm) H - Hexane (ppm)			<u></u>	% RECOVERY	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS
2019-11-27		0.10		Ground surface.													
DCH.GDT 20		0.30 64.10		∖ ASPHALT - 100 mm	/ /												- - - 0.5 - - -
IPLATE_GEO	- - - - -			very dense (FILL)		I - 0, H - 0			SS	67	1 18 28 32	SS1					- - 1.0 - - -
Projet: ENVIRO - CARLETON UNIVERSITY NEW RESIDENCE.GPJ Type rapport: WSP_EN_WELL-ENVIRONMENTAL Data Temptate: WSP_TEMPLATE_GEOTECH.GDT D 2 2 3 5 5 7 7 7 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	-					l - 0, H - 0			SS	50	1 20 28 34	SS2			-		1.5 - - - 2.0 -
TAL Data Temp	.5					l - 0, H - 0			SS	75	9 37 36 44	SS3			-		- - 2.5 - - -
NAMEN 3.	.0 _														ł		3.0
MELL-ENVIR	.5 -					I - 0, H - 0			SS	75	4 18 20 21	SS4			-		- - 3.5 - - -
	-																4.0 — - - -
4 4	-					l - 0, H - 0			SS	50	27 30 28 30	SS5					4.5 - - - 5.0 - -
CENDENCE.G	.5 -														ł		- - - 5.5 - - -
A NEW F		6.10															- - 6.0 —
ON UNIVERSIT	-	58.30		SILTY SAND and GRAVEL trace clay brown, moist, compact (Glacial Till)	Ι,	I - 0, H - 0			SS	33	5 5 6 5	SS6					- - 6.5 <del>-</del> - -
KO - CARLETC																	- - 7.0 - - - -
Projet : ENVIE	.5					l - 0, H - 0			SS	50	4 11 15	SS7					7.5 - - - - - - - -

		<b>-</b> W	/SP				E	BC	DR	EF	10			IG	REC		ge 2 of 2
												Prepare Reviewe					2019-10-25 2019-10-25
	Project Na Site: Sector:		rleton University New Residence Irleton University									Geogra	t Number: aphic Coordi	nates	s: X = Y =	<b>1-12948-</b> 367668.0083 5027677.104	mE I1 mN
	Client:		rleton University									Top of	e Elevation: PVC Elevati	on:	64.4	1 m (Geodetic)	
	Drilling Co Drilling Eq Drilling Me Borehole I Drilling Flu Sampling	uipment: ethod: Diameter uid:	Hollow Stem Auger	ODOUR F - Light M - Mediu P - Persis VISUAL D - Disser S - Satura	tent minated F	Produ	ct uct	DC SS MA DP ST TU MC	- Dian - Split - Man - Direo - Shell - DT32 - Mac	TYPE nond Co Spoon ual Aug the Push by Tube 2 Liner ro Core e Phas	orer ger e e Liner	BTEX B X Inorganics Ir Phenol. C. P VOC V Diox. & Fur. <u>C</u> CAH C	ANALYSIS Poly-Chlorinated Bipl Jenzene, Toluene, E (ylene norganic Compound /henolic Compounds /olatil Organic Comp & CAH) Dioxins & Furans /hlorinated Aliphatic łydrocarbons	thylben: s soounds (	PH C <sub>10</sub> PH F1- Metals	Semi Volatile Orga Polycyclic Aromati C <sub>50</sub> Petroleum Hydroc F4 Petroleum Hydroc Arsenic, Barium, C Cobalt, Copper, Le Molybdenum, Nick Leacheate Tests (	c Hydrocarbons arbons C <sub>10</sub> -C <sub>50</sub> arbons F1-F4 (C <sub>10</sub> -C <sub>50</sub> admium, Chromium, ad, Manganese, el, Silver, Tin, Zinc.
			GEOLOGY / LITHOLOGY		OBSE			NS				SAMPLES		-	MONI		
2	<u>DEPTH</u> ELEVATION (m)	ГІТНОГОСҮ	DESCRIPTION		VAPOR CONC. I - Isobutylene (ppm) H - Hexane (ppm)	BUODO F M			SAMPLE TYPE	% RECOVERY	N (Blow/6")	NUMBER	ANALYSIS	DUPLICATE	DIAGRAM	DESCRIPTION	REMARKS
19-11-2		KATKI M									16						
Projet: ENVIRO - CARLETON UNIVERSITY NEW RESIDENCE.GPJ Type rapport: WSP_EN_WELL-ENVIRONMENTAL Data Template: WSP_TEMPLATE_GEOTECH.GDT 2019-11-27	3.5 - - - - - - - - - - - - - - - - - - -		<ul> <li>END OF BOREHOLE</li> <li>1) Borehole terminated at 8.2 m in dep 2) Water level upon completion of dril.</li> </ul>												ł		- - - 8.5 – - - -
TEGE	9.0		was 6.9m below the existing ground surface														9.0
WSP_TEMPLA	9.5 — - -		End of borehole at 8.20 m.														- - 9.5 - - - -
)ata Template : -	0.0 - - - - - - -																- 10.0 - - - - 10.5
ONMENIAL L	1.0																
	- - 1.5 - - - -																- - - - - - - - - - - - - - - - - - -
2 1 2 2 2 2 2	2.0																- 12.0 — -
lype rapport : v L	2.5																- - - - - - - - - - - - - - -
GH2	3.0																13.0
N RESIDENCE	3.5 <del>-</del> - - - -																- - - - - - - - - - - - - - - - - - -
∐√NE)	4.0																- 14.0
ON UNIVERSI	4.5 — - - - - -																- - 14.5 – - -
RO - CARLET	5.0																- - 15.0 — - - - -
	5.5																15.5



# D CERTIFICATES OF ANALYSIS

# APPENDIX D-1 SOIL





RELIABLE.

# Certificate of Analysis

### WSP Canada Inc. (Ottawa)

2611 Queensview Dr Ottawa, ON K2B 8K2 Attn: Adrian Menyhart

Client PO: Project: 191-12948-00 Custody: 119297

Report Date: 31-Oct-2019 Order Date: 25-Oct-2019

Order #: 1943704

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1943704-01	BH19-2-SS5
1943704-02	BH19-6-SS3
1943704-03	BH19-10-SS8
1943704-04	BH19-6-DUP

Approved By:

Mark Frata

Mark Foto, M.Sc. Lab Supervisor

Any use of these results implies your agreement that our total liability in connection with this work, however arising, shall be limited to the amount paid by you for this work, and that our employees or agents shall not under any circumstances be liable to you in connection with this work.



Order #: 1943704

Report Date: 31-Oct-2019 Order Date: 25-Oct-2019

Project Description: 191-12948-00

## **Analysis Summary Table**

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	24-Oct-19	28-Oct-19
Mercury by CVAA	EPA 7471B - CVAA, digestion	28-Oct-19	28-Oct-19
PHC F1	CWS Tier 1 - P&T GC-FID	29-Oct-19	30-Oct-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	25-Oct-19	30-Oct-19
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	28-Oct-19	28-Oct-19
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	23-Oct-19	29-Oct-19
REG 153: VOCs by P&T GC/MS	EPA 8260 - P&T GC-MS	29-Oct-19	30-Oct-19
Solids, %	Gravimetric, calculation	28-Oct-19	28-Oct-19



Order #: 1943704

Report Date: 31-Oct-2019 Order Date: 25-Oct-2019

Project Description: 191-12948-00

	Client ID: Sample Date:	BH19-2-SS5 23-Oct-19 09:00	BH19-6-SS3 24-Oct-19 09:00	BH19-10-SS8 23-Oct-19 09:00	BH19-6-DUP 24-Oct-19 09:00
	Sample ID:	1943704-01	1943704-02	1943704-03	1943704-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics			T		
% Solids	0.1 % by Wt.	84.4	92.1	90.6	92.4
Metals			1	r	1
Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Arsenic	1.0 ug/g dry	3.6	1.7	4.4	-
Barium	1.0 ug/g dry	197	48.2	123	-
Beryllium	0.5 ug/g dry	0.6	<0.5	<0.5	-
Boron	5.0 ug/g dry	9.6	5.7	7.8	-
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	-
Chromium	5.0 ug/g dry	59.1	12.9	20.3	-
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	-
Cobalt	1.0 ug/g dry	12.6	3.2	6.8	-
Copper	5.0 ug/g dry	29.8	9.7	18.5	-
Lead	1.0 ug/g dry	11.9	14.6	61.4	-
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	-
Molybdenum	1.0 ug/g dry	1.0	<1.0	2.6	-
Nickel	5.0 ug/g dry	33.8	6.3	14.9	-
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	-
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Vanadium	10.0 ug/g dry	62.9	20.3	25.9	-
Zinc	20.0 ug/g dry	64.7	<20.0	30.5	-
Volatiles			_		
Acetone	0.50 ug/g dry	<0.50	<0.50	<0.50	-
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Bromodichloromethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Bromoform	0.05 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	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Chloroform	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Dibromochloromethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Dichlorodifluoromethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,2-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,3-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	-



Order #: 1943704

Report Date: 31-Oct-2019 Order Date: 25-Oct-2019

Project Description: 191-12948-00

Γ	Client ID: Sample Date: Sample ID: MDL/Units	BH19-2-SS5 23-Oct-19 09:00 1943704-01 Soil	BH19-6-SS3 24-Oct-19 09:00 1943704-02 Soil	BH19-10-SS8 23-Oct-19 09:00 1943704-03 Soil	BH19-6-DUP 24-Oct-19 09:00 1943704-04 Soil
1,4-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,1-Dichloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,2-Dichloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,1-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
cis-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
trans-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,2-Dichloropropane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
cis-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
trans-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,3-Dichloropropene, total	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Ethylene dibromide (dibromoetha	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Hexane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	<0.50	<0.50	<0.50	-
Methyl Isobutyl Ketone	0.50 ug/g dry	<0.50	<0.50	<0.50	-
Methyl tert-butyl ether	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Methylene Chloride	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Styrene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Tetrachloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,1,1-Trichloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,1,2-Trichloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Trichloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Trichlorofluoromethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Vinyl chloride	0.02 ug/g dry	<0.02	<0.02	<0.02	-
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	-
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	-
4-Bromofluorobenzene	Surrogate	104%	104%	107%	-
Dibromofluoromethane	Surrogate	64.8%	67.7%	67.8%	-
Toluene-d8	Surrogate	110%	111%	112%	-
Hydrocarbons					· · · · · · · · · · · · · · · · · · ·
F1 PHCs (C6-C10)	7 ug/g dry	<7	27	<7	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	-



Order #: 1943704

Report Date: 31-Oct-2019 Order Date: 25-Oct-2019

Project Description: 191-12948-00

	Client ID:	BH19-2-SS5	BH19-6-SS3	BH19-10-SS8	BH19-6-DUP
	Sample Date:	23-Oct-19 09:00	24-Oct-19 09:00	23-Oct-19 09:00	24-Oct-19 09:00
	Sample ID:	1943704-01	1943704-02	1943704-03	1943704-04
r	MDL/Units	Soil	Soil	Soil	Soil
F3 PHCs (C16-C34)	8 ug/g dry	<8	75	<8	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	123	<6	-
Semi-Volatiles			-		-
Acenaphthene	0.02 ug/g dry	<0.02	0.02	<0.02	0.04
Acenaphthylene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Anthracene	0.02 ug/g dry	0.03	0.04	<0.02	0.10
Benzo [a] anthracene	0.02 ug/g dry	0.05	0.09	<0.02	0.20
Benzo [a] pyrene	0.02 ug/g dry	0.04	0.08	<0.02	0.16
Benzo [b] fluoranthene	0.02 ug/g dry	0.06	0.13	<0.02	0.20
Benzo [g,h,i] perylene	0.02 ug/g dry	0.03	0.05	<0.02	0.13
Benzo [k] fluoranthene	0.02 ug/g dry	0.03	0.06	<0.02	0.11
Chrysene	0.02 ug/g dry	0.07	0.10	<0.02	0.20
Dibenzo [a,h] anthracene	0.02 ug/g dry	<0.02	<0.02	<0.02	0.03
Fluoranthene	0.02 ug/g dry	0.14	0.21	<0.02	0.46
Fluorene	0.02 ug/g dry	<0.02	0.02	<0.02	0.05
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	0.02	0.05	<0.02	0.10
1-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
2-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	<0.02	0.02
Methylnaphthalene (1&2)	0.04 ug/g dry	<0.04	<0.04	<0.04	<0.04
Naphthalene	0.01 ug/g dry	<0.01	0.02	<0.01	0.02
Phenanthrene	0.02 ug/g dry	0.09	0.16	<0.02	0.38
Pyrene	0.02 ug/g dry	0.11	0.16	<0.02	0.37
2-Fluorobiphenyl	Surrogate	77.8%	84.1%	66.6%	76.0%
Terphenyl-d14	Surrogate	89.5%	110%	93.2%	71.1%



Order #: 1943704

Report Date: 31-Oct-2019 Order Date: 25-Oct-2019

Project Description: 191-12948-00

# Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals			00						
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver Thallium	ND	0.3	ug/g						
	ND	1.0	ug/g						
Uranium Vanadium	ND ND	1.0 10.0	ug/g						
Zinc	ND	20.0	ug/g						
	ND	20.0	ug/g						
Semi-Volatiles			,						
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02 0.02	ug/g						
Benzo [a] anthracene	ND ND	0.02	ug/g						
Benzo [a] pyrene Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	1.26		ug/g		94.1	50-140			
Surrogate: Terphenyl-d14	1.47		ug/g		110	50-140			
Volatiles									
Acetone	ND	0.50	ug/g						
Benzene	ND	0.02	ug/g						
Bromodichloromethane	ND	0.05	ug/g						
Bromoform	ND	0.05	ug/g						
Bromomethane	ND	0.05	ug/g						
Carbon Tetrachloride	ND	0.05	ug/g						
Chlorobenzene	ND	0.05	ug/g						
Chloroform	ND	0.05	ug/g						
Dibromochloromethane Dichlorodifluoromethane	ND ND	0.05 0.05	ug/g ug/g						



### Order #: 1943704

Report Date: 31-Oct-2019 Order Date: 25-Oct-2019

Project Description: 191-12948-00

# Method Quality Control: Blank

1,3-Dichlorobenzene ND 1,4-Dichlorobenzene ND	0.05 0.05 0.05 0.05 0.05 0.05	ug/g ug/g ug/g ug/g				
1,4-Dichlorobenzene ND	0.05 0.05 0.05	ug/g				
	0.05 0.05	ug/g				
1,1-Dichloroethane ND	0.05	ug/g				
1,2-Dichloroethane ND		ug/g				
1,1-Dichloroethylene ND	0.05	ug/g				
cis-1,2-Dichloroethylene ND	0.05	ug/g				
trans-1,2-Dichloroethylene ND	0.05	ug/g				
1,2-Dichloropropane ND	0.05	ug/g				
cis-1,3-Dichloropropylene ND	0.05	ug/g				
trans-1,3-Dichloropropylene ND	0.05	ug/g				
	0.05	ug/g				
Ethylbenzene ND	0.05	ug/g				
Ethylene dibromide (dibromoethane ND	0.05	ug/g				
	0.05	ug/g				
Methyl Ethyl Ketone (2-Butanone) ND	0.50	ug/g				
Methyl Isobutyl Ketone ND	0.50	ug/g				
Methyl tert-butyl ether ND	0.05	ug/g				
Methylene Chloride ND	0.05	ug/g				
Styrene ND	0.05	ug/g				
1,1,1,2-Tetrachloroethane ND	0.05	ug/g				
1,1,2,2-Tetrachloroethane ND	0.05	ug/g				
	0.05	ug/g				
	0.05	ug/g				
1,1,1-Trichloroethane ND	0.05	ug/g				
1,1,2-Trichloroethane ND	0.05	ug/g				
Trichloroethylene ND	0.05	ug/g				
Trichlorofluoromethane ND	0.05	ug/g				
	0.02	ug/g				
	0.05	ug/g				
	0.05	ug/g				
	0.05	ug/g				
Surrogate: 4-Bromofluorobenzene 3.38		ug/g	106	50-140		
Surrogate: Dibromofluoromethane 2.64		ug/g	82.6	50-140		
Surrogate: Toluene-d8 3.44		ug/g ug/g	107	50-140		



Order #: 1943704

Report Date: 31-Oct-2019 Order Date: 25-Oct-2019

Project Description: 191-12948-00

# Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND				30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND				30	
Metals			0.0-1						
Antimony	1.2	1.0	ug/g dry	ND			0.0	30	
Arsenic	5.0	1.0	ug/g dry	5.3			7.4	30	
Barium	97.2	1.0	ug/g dry	104			6.9	30	
Beryllium	0.9	0.5	ug/g dry	0.8			12.4	30	
Boron	9.3	5.0	ug/g dry	9.6			2.7	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	34.3	5.0	ug/g dry	37.7			9.4	30	
Cobalt	7.5	1.0	ug/g dry	8.0			5.8	30	
Copper	16.3	5.0	ug/g dry	17.9			9.4	30	
Lead	10.6	1.0	ug/g dry	12.4			15.8	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	30	
Molybdenum	ND	1.0	ug/g dry	ND			0.0	30	
Nickel	20.0	5.0	ug/g dry	21.8			8.6	30	
Selenium	ND	1.0	ug/g dry	ND			0.0	30	
Silver	ND	0.3	ug/g dry	ND			0.0	30	
Thallium	ND	1.0	ug/g dry	ND			0.0	30	
Uranium	ND	1.0	ug/g dry	ND			0.0	30	
Vanadium	36.3	10.0	ug/g dry	39.6			8.8	30	
Zinc	65.2	20.0	ug/g dry	68.8			5.3	30	
Physical Characteristics									
% Solids	92.3	0.1	% by Wt.	93.0			0.8	25	
Semi-Volatiles			<b>,</b>				-	-	
Acenaphthene	ND	0.02	ug/g dry	ND			0.0	40	
Acenaphthylene	ND	0.02	ug/g dry ug/g dry	ND			0.0	40	
Anthracene	0.026	0.02	ug/g dry ug/g dry	ND			0.0	40	
Benzo [a] anthracene	0.020	0.02	ug/g dry ug/g dry	0.032			69.1	40	QR-01
Benzo [a] pyrene	0.053	0.02	ug/g dry ug/g dry	0.022			62.4	40	QR-01
Benzo [b] fluoranthene	0.035	0.02	ug/g dry ug/g dry	0.020			62.2	40	QR-01
Benzo [g,h,i] perylene	0.070	0.02	ug/g dry	0.041			53.0	40	QR-01
Benzo [k] fluoranthene	0.038	0.02	ug/g dry	0.020			60.4	40	QR-01
Chrysene	0.074	0.02	ug/g dry	0.020			72.3	40	QR-01
Dibenzo [a,h] anthracene	ND	0.02	ug/g dry	ND			0.0	40	
Fluoranthene	0.151	0.02	ug/g dry	0.068			76.5	40	QR-01
Fluorene	ND	0.02	ug/g dry	ND			0.0	40	
Indeno [1,2,3-cd] pyrene	0.032	0.02	ug/g dry	ND			0.0	40	
1-Methylnaphthalene	ND	0.02	ug/g dry	ND			0.0	40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND			0.0	40	
Naphthalene	ND	0.01	ug/g dry	ND			0.0	40	
Phenanthrene	0.111	0.02	ug/g dry	0.040			93.3	40	QR-01
Pyrene	0.127	0.02	ug/g dry	0.059			72.6		QR-01
Surrogate: 2-Fluorobiphenyl	1.34		ug/g dry		89.1	50-140	-	-	
Surrogate: Terphenyl-d14	1.45		ug/g dry		96.6	50-140			
Volatiles									
Acetone	ND	0.50	ug/g dry	ND				50	
Benzene	ND	0.02	ug/g dry ug/g dry	ND				50	
Bromodichloromethane	ND	0.02	ug/g dry ug/g dry	ND				50	
Bromoform	ND	0.05	ug/g dry	ND				50	
								50	
Bromomethane	NI)	0.05	uu/uuv						
Bromomethane Carbon Tetrachloride	ND ND	0.05 0.05	ug/g dry ug/g dry	ND ND				50	



Order #: 1943704

Report Date: 31-Oct-2019 Order Date: 25-Oct-2019

Project Description: 191-12948-00

# Method Quality Control: Duplicate

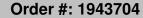
Chloroform         ND         0.05         ug/g dry         ND         50           Dirbornochloromethane         ND         0.05         ug/g dry         ND         50           Dirbornochloromethane         ND         0.05         ug/g dry         ND         50           Dirbornochloromethane         ND         0.05         ug/g dry         ND         50           1,2-Dichlorobenzene         ND         0.05         ug/g dry         ND         50           1,4-Dichlorobenzene         ND         0.05         ug/g dry         ND         50           1,4-Dichlorobenzene         ND         0.05         ug/g dry         ND         50           1,4-Dichlorobenzene         ND         0.05         ug/g dry         ND         50           1,1-Dichloroethylene         ND         0.05         ug/g dry         ND         50           1,2-Dichloroethylene         ND         0.05         ug/g dry         ND         50           1,2-Dichloropropylene         ND         0.05         ug/g dry         ND         50           1,2-Dichloropropylene         ND         0.05         ug/g dry         ND         50           Ethylene dibromide (dibromoethane         N	nalyte	F Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Dibromochloromethane         ND         0.05         ugʻgʻdy'         ND         50           Dichlorodfiluoromethane         ND         0.05         ugʻgʻdy'         ND         50           1,3-Dichlorobenzene         ND         0.05         ugʻgʻdy'         ND         50           1,3-Dichlorobenzene         ND         0.05         ugʻgʻdy'         ND         50           1,4-Dichlorobenzene         ND         0.05         ugʻgʻdy'         ND         50           1,4-Dichlorobenzene         ND         0.05         ugʻgʻdy'         ND         50           1,1-Dichloroethane         ND         0.05         ugʻgʻdy'         ND         50           1,2-Dichloroethylene         ND         0.05         ugʻgʻdy'         ND         50           trans-1,2-Dichloroethylene         ND         0.05         ugʻgʻdy'         ND         50           trans-1,3-Dichloropropane         ND         0.05         ugʻgʻdy'         ND         50           Ethylene dibromide (dibromoethane         ND         0.05         ugʻgʻdy'         ND         50           Ethylene dibromide (dibromoethane         ND         0.05         ugʻgʻdy'         ND         50           Ethylene	•		-			, SI ILO			-	
Dickhorodifiluoromethane         ND         0.05         ug'g dry         ND         50           1,2-Dichlorobenzene         ND         0.05         ug/g dry         ND         50           1,3-Dichlorobenzene         ND         0.05         ug/g dry         ND         50           1,4-Dichlorobenzene         ND         0.05         ug/g dry         ND         50           1,1-Dichloroethane         ND         0.05         ug/g dry         ND         50           1,2-Dichloroethylene         ND         0.05         ug/g dry         ND         50           1,2-Dichloroethylene         ND         0.05         ug/g dry         ND         50           cis-1,2-Dichloroethylene         ND         0.05         ug/g dry         ND         50           cis-1,3-Dichloroethylene         ND         0.05         ug/g dry         ND         50           trans-1,3-Dichloropropane         ND         0.05         ug/g dry         ND         50           trans-1,3-Dichloropropylene         ND         0.05         ug/g dry         ND         50           Ethylene dibromide (dibromoethane         ND         0.05         ug/g dry         ND         50           Methyl Ethy										
1,2-Dichlorobenzene       ND       0.05       ug/g dry       ND       50         1,3-Dichlorobenzene       ND       0.05       ug/g dry       ND       50         1,4-Dichlorobenzene       ND       0.05       ug/g dry       ND       50         1,1-Dichloroethane       ND       0.05       ug/g dry       ND       50         1,2-Dichloroethane       ND       0.05       ug/g dry       ND       50         1,2-Dichloroethylene       ND       0.05       ug/g dry       ND       50         1,2-Dichloroethylene       ND       0.05       ug/g dry       ND       50         1,2-Dichloropropane       ND       0.05       ug/g dry       ND       50         1,2-Dichloropropylene       ND       0.05       ug/g dry       ND       50         Ethylene dibromide (dibromoethane       ND       0.05       ug/g dry       ND       50         Ethylene dibromide (dibromoethane       ND       0.05       ug/g dry       ND       50         Ethylene dibromide (dibromoethane       ND       0.05       ug/g dry       ND       50         Hexane       ND       0.05       ug/g dry       ND       50       50										
1,3-Dichlorobenzene       ND       0.05       ugʻg dry       ND       50         1,4-Dichlorobenzene       ND       0.05       ugʻg dry       ND       50         1,1-Dichloroethane       ND       0.05       ugʻg dry       ND       50         1,2-Dichloroethane       ND       0.05       ugʻg dry       ND       50         1,1-Dichloroethylene       ND       0.05       ugʻg dry       ND       50         1,2-Dichloroethylene       ND       0.05       ugʻg dry       ND       50         1,2-Dichloroethylene       ND       0.05       ugʻg dry       ND       50         1,2-Dichloropropane       ND       0.05       ugʻg dry       ND       50         1,2-Dichloropropylene       ND       0.05       ugʻg dry       ND       50         Ethylene dibromide (dibromoethane       ND       0.05       ugʻg dry       ND       50         Hexane       ND       0.05       ugʻg dry       ND       50       50         Hetylare       ND       0.05       ugʻg dry       ND       50       50         Hetylane       ND       0.05       ugʻg dry       ND       50       50         Met				ug/g dry						
1,3-Dichlorobenzene       ND       0.05       ugʻg dry       ND       50         1,4-Dichlorobenzene       ND       0.05       ugʻg dry       ND       50         1,1-Dichloroethane       ND       0.05       ugʻg dry       ND       50         1,2-Dichloroethane       ND       0.05       ugʻg dry       ND       50         1,1-Dichloroethylene       ND       0.05       ugʻg dry       ND       50         1,2-Dichloroethylene       ND       0.05       ugʻg dry       ND       50         1,2-Dichloroethylene       ND       0.05       ugʻg dry       ND       50         1,2-Dichloropropane       ND       0.05       ugʻg dry       ND       50         1,2-Dichloropropylene       ND       0.05       ugʻg dry       ND       50         Ethylene dibromide (dibromoethane       ND       0.05       ugʻg dry       ND       50         Hexane       ND       0.05       ugʻg dry       ND       50       50         Hetylare       ND       0.05       ugʻg dry       ND       50       50         Hetylane       ND       0.05       ugʻg dry       ND       50       50         Met	,									
1,1-Dickloroethane       ND       0.05       ug'g dry       ND       50         1,2-Dickloroethane       ND       0.05       ug'g dry       ND       50         1,1-Dickloroethylene       ND       0.05       ug'g dry       ND       50         cis-1,2-Dickloroethylene       ND       0.05       ug'g dry       ND       50         trans-1,2-Dickloroethylene       ND       0.05       ug'g dry       ND       50         1,2-Dickloropropane       ND       0.05       ug'g dry       ND       50         trans-1,3-Dickloropropylene       ND       0.05       ug'g dry       ND       50         Ethylenzene       ND       0.05       ug'g dry       ND       50         Ethylene dibromide (dibromoethane       ND       0.05       ug'g dry       ND       50         Ethylene dibromide (dibromoethane       ND       0.05       ug'g dry       ND       50         Methyl Isobutyl Ketone (2-Butanone)       ND       0.50       ug'g dry       ND       50         Methyl Isobutyl Ketone       ND       0.55       ug'g dry       ND       50         Styrene       ND       0.05       ug'g dry       ND       50				ug/g dry						
1,2-Dichloroethane       ND       0.05       ug/g dry       ND       50         1,1-Dichloroethylene       ND       0.05       ug/g dry       ND       50         cis-1,2-Dichloroethylene       ND       0.05       ug/g dry       ND       50         trans-1,2-Dichloroethylene       ND       0.05       ug/g dry       ND       50         cis-1,2-Dichloroptopane       ND       0.05       ug/g dry       ND       50         cis-1,3-Dichloroptopylene       ND       0.05       ug/g dry       ND       50         Ethylene dibromide (dibromothane       ND       0.05       ug/g dry       ND       50         Hexane       ND       0.05       ug/g dry       ND       50         Methyl Ethyl Ketone (2-Butanone)       ND       0.50       ug/g dry       ND       50         Methyl Isobutyl Ketone       ND       0.05       ug/g dry       ND       50         Styrene       ND       0.05       ug/g dry       ND       50         Methyl Isobutyl Ketone       ND       0.05       ug/g dry       ND       50         Styrene       ND       0.05       ug/g dry       ND       50         1,1,2-Tetrachloroethan										
1,1-Dichloroethylene       ND       0.05       ug'g dry       ND       50         cis-1,2-Dichloroethylene       ND       0.05       ug'g dry       ND       50         trans-1,2-Dichloroethylene       ND       0.05       ug'g dry       ND       50         1,2-Dichloroethylene       ND       0.05       ug'g dry       ND       50         1,2-Dichloropropane       ND       0.05       ug'g dry       ND       50         1,2-Dichloropropylene       ND       0.05       ug'g dry       ND       50         trans-1,3-Dichloropropylene       ND       0.05       ug'g dry       ND       50         Ethylene dibromide (dibromoethane       ND       0.05       ug'g dry       ND       50         Hexane       ND       0.05       ug'g dry       ND       50         Methyl Isobutyl Ketone (2-Butanone)       ND       0.50       ug'g dry       ND       50         Methyle Isobutyl Ketone       ND       0.05       ug'g dry       ND       50         Methyle Isobutyl Ketone       ND       0.05       ug'g dry       ND       50         Styrene       ND       0.05       ug'g dry       ND       50         1,	,									
cis-1,2-Dichloroéthylene         ND         0.05         ug'g dry         ND         50           trans-1,2-Dichloroéthylene         ND         0.05         ug'g dry         ND         50           1,2-Dichloroéthylene         ND         0.05         ug'g dry         ND         50           cis-1,3-Dichloropropylene         ND         0.05         ug'g dry         ND         50           trans-1,3-Dichloropropylene         ND         0.05         ug'g dry         ND         50           Ethylene dibromide (dibromoethane         ND         0.05         ug'g dry         ND         50           Hexane         ND         0.05         ug'g dry         ND         50           Methyl Isobutyl Ketone (2-Butanone)         ND         0.50         ug'g dry         ND         50           Methyl Isobutyl Ketone         ND         0.05         ug'g dry         ND         50           Styrene         ND         0.05         ug'g dry         ND         50           Styrene         ND         0.05         ug'g dry         ND         50           Styrene         ND         0.05         ug'g dry         ND         50           1,1,2-Tetrachloroethane         ND<										
cis-1,2-DichloroethyleneND0.05ug/g dryND50trans-1,2-DichloroethyleneND0.05ug/g dryND501,2-DichloropropaneND0.05ug/g dryND50cis-1,3-DichloropropyleneND0.05ug/g dryND50EthylenzeneND0.05ug/g dryND50EthylenzeneND0.05ug/g dryND50HexaneND0.05ug/g dryND50Methyl Ethyl Ketone (2-Butanone)ND0.50ug/g dryND50Methyl Isobutyl KetoneND0.50ug/g dryND50Methyl Isobutyl KetoneND0.50ug/g dryND50Methyl Isobutyl KetoneND0.50ug/g dryND50Methylene ChlorideND0.05ug/g dryND50StyreneND0.05ug/g dryND501,1,2-TetrachloroethaneND0.05ug/g dryND501,1,1-TrichloroethaneND0.05ug/g dryND501,1,2-TetrachloroethaneND0.05ug/g dryND501,1,1-TrichloroethaneND0.05ug/g dryND501,1,1-TrichloroethaneND0.05ug/g dryND501,1,1-TrichloroethaneND0.05ug/g dryND501,1,1-TrichloroethaneND0.05ug/g dryND501,1,1-Trichlor				ug/g dry						
trans-1,2-Dichloroethylene       ND       0.05       ug'g dry       ND       50         1,2-Dichloropropane       ND       0.05       ug'g dry       ND       50         cis-1,3-Dichloropropylene       ND       0.05       ug'g dry       ND       50         Ethylbenzene       ND       0.05       ug'g dry       ND       50         Ethylene dibromide (dibromoethane       ND       0.05       ug'g dry       ND       50         Hexane       ND       0.05       ug'g dry       ND       50         Ethylene dibromide (dibromoethane       ND       0.05       ug'g dry       ND       50         Methyl Ethyl Ketone (2-Butanone)       ND       0.50       ug'g dry       ND       50         Methyl Isobutyl Ketone       ND       0.05       ug'g dry       ND       50         Methyl Isobutyl Ketone       ND       0.05       ug'g dry       ND       50         Methyl Isobutyl Ketone       ND       0.05       ug'g dry       ND       50         Styrene       ND       0.05       ug'g dry       ND       50         1,1,2-Tetrachloroethane       ND       0.05       ug'g dry       ND       50         1,1,				ug/g dry						
1,2-Dichloropropane       ND       0.05       ug/g dry       ND       50         cis-1,3-Dichloropropylene       ND       0.05       ug/g dry       ND       50         trans-1,3-Dichloropropylene       ND       0.05       ug/g dry       ND       50         Ethylenzene       ND       0.05       ug/g dry       ND       50         Ethylenzene       ND       0.05       ug/g dry       ND       50         Methyl Ethyl Ketone (2-Butanone)       ND       0.05       ug/g dry       ND       50         Methyl Isobutyl Ketone       ND       0.05       ug/g dry       ND       50         Methyl Isobutyl Ketone       ND       0.05       ug/g dry       ND       50         Methyl Isobutyl Ketone       ND       0.05       ug/g dry       ND       50         Methyl Isobutyl Ketone       ND       0.05       ug/g dry       ND       50         Methylene Chloride       ND       0.05       ug/g dry       ND       50         Styrene       ND       0.05       ug/g dry       ND       50         1,1,2-Z-Tetrachloroethane       ND       0.05       ug/g dry       ND       50         1,1,1-Z-Trichloroethane			0.05	ug/g dry						
cis-1,3-Dichloropropylene         ND         0.05         ug/g dry         ND         50           trans-1,3-Dichloropropylene         ND         0.05         ug/g dry         ND         50           Ethylenzene         ND         0.05         ug/g dry         ND         50           Ethylene dibromide (dibromoethane         ND         0.05         ug/g dry         ND         50           Methyl Ethyl Ketone (2-Butanone)         ND         0.50         ug/g dry         ND         50           Methyl Isobutyl Ketone (2-Butanone)         ND         0.50         ug/g dry         ND         50           Methyl Isobutyl Ketone (2-Butanone)         ND         0.50         ug/g dry         ND         50           Methyl Isobutyl Ketone         ND         0.50         ug/g dry         ND         50           Methyl Isobutyl Ketone         ND         0.05         ug/g dry         ND         50           Styrene         ND         0.05         ug/g dry         ND         50           1,1,2-Tetrachloroethane         ND         0.05         ug/g dry         ND         50           1,1,1,2-Trichloroethane         ND         0.05         ug/g dry         ND         50				ug/g drv						
trans-1,3-Dichloropropylene       ND       0.05       ug/g dry       ND       50         Ethylbenzene       ND       0.05       ug/g dry       ND       50         Methyl Ethyl Ketone (2-Butanone)       ND       0.50       ug/g dry       ND       50         Methyl Isobutyl Ketone       ND       0.50       ug/g dry       ND       50         Methyl Isobutyl Ketone       ND       0.05       ug/g dry       ND       50         Methyl tert-butyl ether       ND       0.05       ug/g dry       ND       50         Methyl tert-butyl ether       ND       0.05       ug/g dry       ND       50         Styrene       ND       0.05       ug/g dry       ND       50       50         1,1,2.2-Tetrachloroethane       ND       0.05       ug/g dry       ND       50       50         1,1,2.2-Tickhoroethane       ND       0.05       ug/g dry       ND       50       50	is-1,3-Dichloropropylene									
Ethylbenzene         ND         0.05         ug/g dry         ND         50           Ethylene dibromide (dibromoethane         ND         0.05         ug/g dry         ND         50           Methyl Ethyl Ketone (2-Butanone)         ND         0.50         ug/g dry         ND         50           Methyl Ethyl Ketone (2-Butanone)         ND         0.50         ug/g dry         ND         50           Methyl Isobutyl Ketone         ND         0.50         ug/g dry         ND         50           Methyl Isobutyl Ketone         ND         0.50         ug/g dry         ND         50           Methyl tert-butyl ether         ND         0.05         ug/g dry         ND         50           Methyl enc Chloride         ND         0.05         ug/g dry         ND         50           Styrene         ND         0.05         ug/g dry         ND         50           1,1,1,2-Tetrachloroethane         ND         0.05         ug/g dry         ND         50           Toluene         ND         0.05         ug/g dry         ND         50         50           1,1,1-Trichloroethane         ND         0.05         ug/g dry         ND         50         50      1										
Ethylene dibromide (dibromoethane         ND         0.05         ug'g dry         ND         50           Hexane         ND         0.05         ug/g dry         ND         50           Methyl Ethyl Ketone (2-Butanone)         ND         0.50         ug/g dry         ND         50           Methyl Isobutyl Ketone         ND         0.50         ug/g dry         ND         50           Methyl Iert-butyl ether         ND         0.55         ug/g dry         ND         50           Methyl Iert-butyl ether         ND         0.05         ug/g dry         ND         50           Methyl ene Chloride         ND         0.05         ug/g dry         ND         50           Styrene         ND         0.05         ug/g dry         ND         50           1,1,2-Tetrachloroethane         ND         0.05         ug/g dry         ND         50           Tetrachloroethylene         ND         0.05         ug/g dry         ND         50           Toluene         ND         0.05         ug/g dry         ND         50           1,1,2-Trichloroethane         ND         0.05         ug/g dry         ND         50           1,1,1-Z-Trichloroethane         ND										
Hexane         ND         0.05         ug/g dry         ND         50           Methyl Ethyl Ketone (2-Butanone)         ND         0.50         ug/g dry         ND         50           Methyl Isobutyl Ketone         ND         0.50         ug/g dry         ND         50           Methyl Isobutyl Ketone         ND         0.05         ug/g dry         ND         50           Methyl ene Chloride         ND         0.05         ug/g dry         ND         50           Styrene         ND         0.05         ug/g dry         ND         50           1,1,2-Tetrachloroethane         ND         0.05         ug/g dry         ND         50           1,1,2-Tetrachloroethane         ND         0.05         ug/g dry         ND         50           1,1,2-Tetrachloroethane         ND         0.05         ug/g dry         ND         50           1,1,2-Trichloroethane         ND         0.05         ug/g dry         ND         50           Toluene         ND         0.05         ug/g dry         ND         50           1,1,1-Trichloroethane         ND         0.05         ug/g dry         ND         50           Trichloroethane         ND         0.05	5									
Methyl Ethyl Ketone (2-Butanone)ND $0.50$ $ug/g dry$ ND $50$ Methyl Isobutyl KetoneND $0.50$ $ug/g dry$ ND $50$ Methyl tert-butyl etherND $0.05$ $ug/g dry$ ND $50$ Methylene ChlorideND $0.05$ $ug/g dry$ ND $50$ StyreneND $0.05$ $ug/g dry$ ND $50$ $1,1,2$ -TetrachloroethaneND $0.05$ $ug/g dry$ ND $50$ $1,1,2,2$ -TetrachloroethaneND $0.05$ $ug/g dry$ ND $50$ TolueneND $0.05$ $ug/g dry$ ND $50$ $1,1,2,2$ -TrichloroethaneND $0.05$ $ug/g dry$ ND $50$ TrichloroethaneND $0.05$ $ug/g dry$ N										
Methyl Isobutyl Ketone         ND         0.50         ug/g dry         ND         50           Methyl tert-butyl ether         ND         0.05         ug/g dry         ND         50           Methyl tert-butyl ether         ND         0.05         ug/g dry         ND         50           Methylene Chloride         ND         0.05         ug/g dry         ND         50           Styrene         ND         0.05         ug/g dry         ND         50           1,1,1,2-Tetrachloroethane         ND         0.05         ug/g dry         ND         50           1,1,2,2-Tetrachloroethane         ND         0.05         ug/g dry         ND         50           1,1,2,2-Tetrachloroethane         ND         0.05         ug/g dry         ND         50           Tetrachloroethane         ND         0.05         ug/g dry         ND         50           Toluene         ND         0.05         ug/g dry         ND         50           1,1,1-Trichloroethane         ND         0.05         ug/g dry         ND         50           1,1,2-Trichloroethane         ND         0.05         ug/g dry         ND         50           Trichloroethane         ND										
Methyl tert-butyl ether         ND         0.05         ug/g dry         ND         50           Methylene Chloride         ND         0.05         ug/g dry         ND         50           Styrene         ND         0.05         ug/g dry         ND         50           1,1,1,2-Tetrachloroethane         ND         0.05         ug/g dry         ND         50           1,1,2,2-Tetrachloroethane         ND         0.05         ug/g dry         ND         50           1,1,2,2-Tetrachloroethane         ND         0.05         ug/g dry         ND         50           1,1,2,2-Tetrachloroethane         ND         0.05         ug/g dry         ND         50           Tetrachloroethylene         ND         0.05         ug/g dry         ND         50           1,1,1-Trichloroethane         ND         0.05         ug/g dry         ND         50           1,1,2-Trichloroethane         ND         0.05         ug/g dry         ND         50           1,1,2-Trichloroethane         ND         0.05         ug/g dry         ND         50           Trichlorofluoromethane         ND         0.05         ug/g dry         ND         50           Vinyl chloride <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>										
Methylene Chloride         ND         0.05         ug/g dry         ND         50           Styrene         ND         0.05         ug/g dry         ND         50           1,1,2.7         Tetrachloroethane         ND         0.05         ug/g dry         ND         50           1,1,2.2         Tetrachloroethane         ND         0.05         ug/g dry         ND         50           1,1,2.2         Tetrachloroethane         ND         0.05         ug/g dry         ND         50           Tetrachloroethylene         ND         0.05         ug/g dry         ND         50           Toluene         ND         0.05         ug/g dry         ND         50           1,1,2-Trichloroethane         ND         0.05         ug/g dry         ND         50           1,1,2-Trichloroethane         ND         0.05         ug/g dry         ND         50           1,1,2-Trichloroethane         ND         0.05         ug/g dry         ND         50           Trichloroethylene         ND         0.05         ug/g dry         ND         50           Vinyl chloride         ND         0.05         ug/g dry         ND         50           wnp-Xylenes<				ua/a drv						
Styrene         ND         0.05         ug/g dry         ND         50           1,1,1,2-Tetrachloroethane         ND         0.05         ug/g dry         ND         50           1,1,2,2-Tetrachloroethane         ND         0.05         ug/g dry         ND         50           1,1,2,2-Tetrachloroethane         ND         0.05         ug/g dry         ND         50           Tetrachloroethylene         ND         0.05         ug/g dry         ND         50           Toluene         ND         0.05         ug/g dry         ND         50           1,1,1-Trichloroethane         ND         0.05         ug/g dry         ND         50           1,1,1-Trichloroethane         ND         0.05         ug/g dry         ND         50           1,1,2-Trichloroethane         ND         0.05         ug/g dry         ND         50           1,1,1-Trichloroethane         ND         0.05         ug/g dry         ND         50           1,1,2-Trichloroethane         ND         0.05         ug/g dry         ND         50           Trichloroethylene         ND         0.05         ug/g dry         ND         50           Vinyl chloride         ND         0										
1,1,1,2-Tetrachloroethane       ND       0.05       ug/g dry       ND       50         1,1,2,2-Tetrachloroethane       ND       0.05       ug/g dry       ND       50         Tetrachloroethane       ND       0.05       ug/g dry       ND       50         Tetrachloroethylene       ND       0.05       ug/g dry       ND       50         Toluene       ND       0.05       ug/g dry       ND       50         1,1,1-Trichloroethane       ND       0.05       ug/g dry       ND       50         1,1,2-Trichloroethane       ND       0.05       ug/g dry       ND       50         1,1,1-Trichloroethane       ND       0.05       ug/g dry       ND       50         1,1,2-Trichloroethane       ND       0.05       ug/g dry       ND       50         1,1,2-Trichloroethane       ND       0.05       ug/g dry       ND       50         Trichloroethylene       ND       0.05       ug/g dry       ND       50         Trichloroethane       ND       0.05       ug/g dry       ND       50         Vinyl chloride       ND       0.02       ug/g dry       ND       50         o-Xylene       ND										
1,1,2,2-TetrachloroethaneND $0.05$ $ug/g dry$ ND $50$ TetrachloroethyleneND $0.05$ $ug/g dry$ ND $50$ TolueneND $0.05$ $ug/g dry$ ND $50$ TolueneND $0.05$ $ug/g dry$ ND $50$ 1,1,1-TrichloroethaneND $0.05$ $ug/g dry$ ND $50$ 1,1,2-TrichloroethaneND $0.05$ $ug/g dry$ ND $50$ 1,1,2-TrichloroethaneND $0.05$ $ug/g dry$ ND $50$ TrichloroethyleneND $0.05$ $ug/g dry$ ND $50$ TrichlorofluoromethaneND $0.05$ $ug/g dry$ ND $50$ Vinyl chlorideND $0.02$ $ug/g dry$ ND $50$ o-XylenesND $0.05$ $ug/g dry$ ND $50$ Surrogate: 4-Bromofluorobenzene $4.57$ $ug/g dry$ $111$ $50-140$ Surrogate: Dibromofluoromethane $3.01$ $ug/g dry$ $73.0$ $50-140$										
Tetrachloroethylene         ND         0.05         ug/g dry         ND         50           Toluene         ND         0.05         ug/g dry         ND         50           Toluene         ND         0.05         ug/g dry         ND         50           1,1,1-Trichloroethane         ND         0.05         ug/g dry         ND         50           1,1,2-Trichloroethane         ND         0.05         ug/g dry         ND         50           1,1,2-Trichloroethane         ND         0.05         ug/g dry         ND         50           Trichloroethylene         ND         0.05         ug/g dry         ND         50           Trichlorofluoromethane         ND         0.05         ug/g dry         ND         50           Vinyl chloride         ND         0.02         ug/g dry         ND         50           wn,p-Xylenes         ND         0.05         ug/g dry         ND         50           o-Xylene         ND         0.05         ug/g dry         ND         50           Surrogate: 4-Bromofluorobenzene         4.57         ug/g dry         ND         50           Surrogate: Dibromofluoromethane         3.01         ug/g dry         73.0 </td <td></td>										
Toluene         ND         0.05         ug/g dry         ND         50           1,1,1-Trichloroethane         ND         0.05         ug/g dry         ND         50           1,1,2-Trichloroethane         ND         0.05         ug/g dry         ND         50           1,1,2-Trichloroethane         ND         0.05         ug/g dry         ND         50           Trichloroethylene         ND         0.05         ug/g dry         ND         50           Trichlorofluoromethane         ND         0.05         ug/g dry         ND         50           Vinyl chloride         ND         0.02         ug/g dry         ND         50           m,p-Xylenes         ND         0.05         ug/g dry         ND         50           o-Xylene         ND         0.05         ug/g dry         ND         50           Surrogate: 4-Bromofluorobenzene         4.57         ug/g dry         111         50-140           Surrogate: Dibromofluoromethane         3.01         ug/g dry         73.0         50-140										
1,1,1-Trichloroethane       ND       0.05       ug/g dry       ND       50         1,1,2-Trichloroethane       ND       0.05       ug/g dry       ND       50         Trichloroethylene       ND       0.05       ug/g dry       ND       50         Trichloroethylene       ND       0.05       ug/g dry       ND       50         Trichlorofluoromethane       ND       0.05       ug/g dry       ND       50         Vinyl chloride       ND       0.02       ug/g dry       ND       50         m,p-Xylenes       ND       0.05       ug/g dry       ND       50         o-Xylene       ND       0.05       ug/g dry       ND       50         Surrogate: 4-Bromofluorobenzene       4.57       ug/g dry       111       50-140         Surrogate: Dibromofluoromethane       3.01       ug/g dry       73.0       50-140										
1,1,2-Trichloroethane       ND       0.05       ug/g dry       ND       50         Trichloroethylene       ND       0.05       ug/g dry       ND       50         Trichloroethylene       ND       0.05       ug/g dry       ND       50         Trichloroethylene       ND       0.05       ug/g dry       ND       50         Vinyl chloride       ND       0.02       ug/g dry       ND       50         m,p-Xylenes       ND       0.05       ug/g dry       ND       50         o-Xylene       ND       0.05       ug/g dry       ND       50         Surrogate: 4-Bromofluorobenzene       4.57       ug/g dry       111       50-140         Surrogate: Dibromofluoromethane       3.01       ug/g dry       73.0       50-140										
Trichloroethylene         ND         0.05         ug/g dry         ND         50           Trichlorofluoromethane         ND         0.05         ug/g dry         ND         50           Vinyl chloride         ND         0.02         ug/g dry         ND         50           m,p-Xylenes         ND         0.05         ug/g dry         ND         50           o-Xylene         ND         0.05         ug/g dry         ND         50           Surrogate: 4-Bromofluorobenzene         4.57         ug/g dry         111         50-140           Surrogate: Dibromofluoromethane         3.01         ug/g dry         73.0         50-140										
Trichlorofluoromethane         ND         0.05         ug/g dry         ND         50           Vinyl chloride         ND         0.02         ug/g dry         ND         50           m,p-Xylenes         ND         0.05         ug/g dry         ND         50           o-Xylene         ND         0.05         ug/g dry         ND         50           Surrogate:         4-Bromofluorobenzene         4.57         ug/g dry         111         50-140           Surrogate:         Dibromofluoromethane         3.01         ug/g dry         73.0         50-140				ug/g ury ug/a dry						
Vinyl chloride         ND         0.02         ug/g dry         ND         50           m,p-Xylenes         ND         0.05         ug/g dry         ND         50           o-Xylene         ND         0.05         ug/g dry         ND         50           surrogate: 4-Bromofluorobenzene         4.57         ug/g dry         111         50-140           Surrogate: Dibromofluoromethane         3.01         ug/g dry         73.0         50-140										
m,p-Xylenes         ND         0.05         ug/g dry         ND         50           o-Xylene         ND         0.05         ug/g dry         ND         50           surrogate: 4-Bromofluorobenzene         4.57         ug/g dry         111         50-140           Surrogate: Dibromofluoromethane         3.01         ug/g dry         73.0         50-140										
o-Xylene         ND         0.05         ug/g dry         ND         50           Surrogate: 4-Bromofluorobenzene         4.57         ug/g dry         111         50-140           Surrogate: Dibromofluoromethane         3.01         ug/g dry         73.0         50-140										
Surrogate: 4-Bromofluorobenzene4.57ug/g dry11150-140Surrogate: Dibromofluoromethane3.01ug/g dry73.050-140										
Surrogate: Dibromofluoromethane 3.01 ug/g dry 73.0 50-140			0.05		ND		E0 1 40		50	
Surrogate: Joluene-d8 4.62 ug/a drv 112 50-140										
	iurrogate: Toluene-d8	4.62		ug/g dry		112	50-140			



# Method Quality Control: Spike

Hydrocarbons       F       PHCs (C45 C10)       196       7       ugig       97.9       80-120         F1 PHCs (C45 C10)       199       8       ugig       ND       82.5       80-140         F3 PHCs (C45 C34)       199       8       ugig       ND       80.7       60-140         Harbas (C45 C34)       199       8       ugig       ND       80.7       60-140         Attamony       45.1       ugiL       ND       91.8       70-130         Baryling       85.7       ugiL       ND       91.3       70-130         Baryling       85.7       ugiL       ND       91.3       70-130         Baryling       51.3       ugiL       ND       91.3       70-130         Cabring       54.4       ugiL       ND       91.5       71.30       0.40.5         Cabring       73.8       ugiL       72.9       70.130       0.40.5         Cabring       63.4       ugiL       7.0       90.7       70.130         Cabring       63.1       ugiL       ND       90.3       70.130         Cabring       63.1       ugiL       ND       90.3       70.130         Cabring	Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit Notes
F1       P1 G2 (C0-C10)       196       7       ug/g       ND       82.5       60-140         F3       PLG2 (C10-C36)       199       8       ug/g       ND       85.7       60-140         F4       PLG2 (C10-C36)       199       8       ug/g       ND       85.7       60-140         Metals       ug/g       ND       91.8       70-130       70-130         Arsenic       57.2       ug/g       ND       91.8       70-130         Barium       98.7       ug/g       ND       91.8       70-130         Codmium       55.1       ug/g       ND       91.3       70-130         Boron       49.5       ug/g       ND       91.3       70-130         Chomium (V1)       0.1       ug/g       ND       91.3       70-130         Cobat       52.7       ug/g       ND       95.0       70-130         Cobat       52.7       ug/g       ND       95.0       70-130         Lead       54.4       ug/g       ND       96.6       70-130         Koruy       1.72       ug/g       ND       96.7       70-130         Koruy       1.72       ug/g	Hydrocarbons								
F3 PHCs (C16-C34)       199       8       ugg       ND       85.7       60-140         Hetals       ugg       ND       91.8       70-130         Antimony       46.1       ugl_       ND       91.8       70-130         Arsenic       57.2       ugl_       ND       91.8       70-130         Barium       98.7       ugl_       ND       91.8       70-130         Barium       98.7       ugl_       ND       91.8       70-130         Cadmium       94.4       ugl_       ND       91.3       70-130         Cadmium       94.4       ugl_       ND       91.3       70-130       GM:05         Chromium (V1)       0.1       ugl_       15.1       70-130       GM:05       Choraium         Cobat       52.7       ugl_       ND       98.1       70-130       GM:05         Lead       54.4       ugl_       ND       96.6       70-130       GM:05         Neckel       63.1       ugl_       ND       96.8       70-130       GM:05         Neckel       63.1       ugl_       ND       96.8       70-130       GM:05         Silver       45.2		196	7	ug/g		97.9	80-120		
F3 PH2s (C16-C34)       199       8       ug'g       ND       8.7       60-140         Hetals       ug'L       NL       91.8       70-130         Antimony       46.1       ug'L       NL       91.8       70-130         Barium       98.7       ug'L       NL       91.8       70-130         Barium       98.7       ug'L       ND       91.8       70-130         Cadmium       56.1       ug/L       ND       91.8       70-130         Cadmium       54.4       ug/L       ND       58.7       70-130         Chromium (Vi)       0.1       mg/L       ND       58.0       70-130         Cobalt       52.7       ug/L       3.2       90.0       70-130         Cobalt       52.7       ug/L       ND       96.6       70-130         Laad       53.5       ug/L       ND       96.6       70-130         Mercury       1.70       0.1       ug/L       ND       96.7       70-130         Nokal       63.1       ug/L       ND       96.6       70-130         Selenium       52.0       ug/L       ND       96.1       70-130         Vanad	F2 PHCs (C10-C16)	78	4		ND	82.5	60-140		
Metals         ND         91.8         70-130           Antimony         46.1         ug/L         ND         91.8         70-130           Arsenic         57.2         ug/L         41.7         114         70-130           Barkim         98.7         ug/L         ND         91.8         70-130           Boron         49.5         ug/L         ND         91.8         70-130           Cadmium         54.4         ug/L         ND         98.7         70-130           Chromium (VI)         0.1         mg/L         ND         58.0         70-130           Chromium (VI)         0.1         mg/L         ND         58.0         70-130           Cobalt         52.7         ug/L         3.2         99.0         70-130           Cobalt         52.7         ug/L         ND         68.6         70-130           Mercury         1.70         0.1         ug/L         ND         70-130           Mercury         1.70         0.1         ug/L         ND         90.3         70-130           Silver         45.2         ug/L         ND         90.3         70-130         11110           Vanadum	F3 PHCs (C16-C34)	199	8		ND	85.7	60-140		
Metals       vig/L       ND       91.8       70-130         Antimony       46.1       ug/L       2.1       110       70-130         Barium       98.7       ug/L       ND       91.8       70-130         Bernium       98.7       ug/L       ND       91.3       70-130         Cadmium       54.4       ug/L       ND       91.3       70-130         Cadmium       54.4       ug/L       ND       58.7       70-130         Chromium       73.8       ug/L       15.1       77       70-130         Cobalt       52.7       ug/L       5.0       98.1       70-130         Cobalt       52.7       ug/L       7.1       70-130         Cobalt       53.5       ug/L       ND       96.6       70-130         Lead       53.6       ug/L       ND       96.6       70-130         Nickel       63.1       ug/L       ND       98.3       70-130         Stiver       45.2       ug/L       ND       98.3       70-130         Stiver       45.3       ug/L       ND       93.3       70-130         Uranium       52.0       ug/L       ND	F4 PHCs (C34-C50)	149	6	ug/g	ND	102	60-140		
Arsenio <sup>1</sup> 57.2       ug/L       2.1       110       70-130         Barium       56.1       ug/L       41.7       114       70-130         Beryllium       56.1       ug/L       ND       111       70-130         Catanium       54.4       ug/L       ND       113       70-130         Chromium (Vi)       0.1       mg/L       15.1       117       70-130         Cobalt       52.7       ug/L       5.2       106       70-130         Cobalt       52.7       ug/L       5.0       98.1       70-130         Cobalt       62.4       ug/L       5.0       98.1       70-130         Mercury       1.70       0.1       ug/L       5.0       98.1       70-130         Mercury       1.70       0.1       ug/L       ND       166       70-130         Sterr       45.2       ug/L       ND       166       70-130         Sterr       45.2       ug/L       ND       96.1       50-140         Thallum       47.3       ug/L       ND       96.1       50-140         Zinc       0.23       ug/L       ND       96.1       50-140 <tr< td=""><td>Metals</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr<>	Metals								
Barlum         98.7         ug/L         41.7         11.1         70-130           Borynlium         56.1         ug/L         ND         91.3         70-130           Cadmium         54.4         ug/L         ND         91.3         70-130           Cadmium         54.4         ug/L         ND         10.8         70-130           Chromium (Vi)         0.1         mg/L         ND         68.0         70-130           Cobalt         ug/L         7.2         10.6         70-130         0.4055           Cobalt         ug/L         7.2         10.6         70-130         1.1           Mercury         1.70         0.1         ug/L         8.7         10.9         70-130           Nickal         63.1         ug/L         ND         90.6         70-130         1.1           Nickal         63.1         ug/L         ND         90.3         70-130           Selenium         52.5         ug/L         ND         90.3         70-130           Vanadium         74.8         ug/L         ND         90.3         70-130           Vanadium         74.8         ug/L         ND         85.1         50-140	Antimony	46.1		ug/L	ND	91.8	70-130		
Barlum         98.7         ug/L         ND         111         70-130           Boron         49.5         ug/L         ND         91.3         70-130           Cadmium         54.4         ug/L         ND         91.3         70-130           Chromium (Vi)         0.1         mg/L         ND         56.0         70-130           Chromium (Vi)         0.1         mg/L         ND         60.4         0.4         0.4           Cobalt         0.9         7.2         10.6         70-130         0.4           Cobalt         0.9         ND         11.8         70-130         0.4           Mercury         1.70         0.1         ug/L         8.7         109         70-130           Nickel         63.1         ug/L         8.7         109         70-130         100           Selentum         52.5         ug/L         ND         106         70-130         114           Varadum         7.4         ug/L         ND         103         70-130         114           Varadum         7.4         ug/L         ND         103         70-130         114           Vanadum         7.4         ug/L	-	57.2		-	2.1	110	70-130		
Boron         49.5         ug/L         ND         91.3         70-130           Cadmium         54.4         ug/L         ND         58.0         70-130         QM-05           Chromium (VI)         0.1         mg/L         ND         58.0         70-130         QM-05           Chromium         73.8         ug/L         15.1         117         70-130         Copper           Cobalt         ug/L         7.2         99.0         70-130         Copper         60.4         ug/L         7.2         97.0         70-130           Lead         64.0         ug/L         8.7         70-130         70-130         View	Barium	98.7		ug/L	41.7	114	70-130		
Boron         49.5         ug/L         ND         91.3         70-130           Cadmium         54.4         ug/L         ND         58.0         70-130         QM-05           Chromium (VI)         0.1         mg/L         ND         58.0         70-130         QM-05           Chromium         73.8         ug/L         15.1         117         70-130         Copper           Cobalt         ug/L         7.2         99.0         70-130         Copper         60.4         ug/L         7.2         97.0         70-130           Lead         64.0         ug/L         8.7         70-130         70-130         View	Beryllium	56.1			ND	111	70-130		
Cadmium         54.4         ug/L         ND         108         70-130           Chromium (Vi)         0.1         mg/L         ND         58.0         70-130         CM-05           Chromium         73.8         ug/L         15.1         117         70-130         CM-05           Cobalt         52.7         ug/L         3.2         99.0         70-130         CM-05           Cobalt         52.7         ug/L         5.0         98.1         70-130         CM-05           Mercury         1.70         0.1         ug/L         ND         96.6         70-130           Molydenum         48.5         ug/L         ND         96.6         70-130           Salenium         53.5         ug/L         ND         94.6         70-130           Salenium         52.0         ug/L         ND         94.4         70-130           Uranium         74.8         ug/L         ND         94.4         70-130           Zanc         ug/L         ND         94.4         70-130         20           Vanadium         74.8         ug/L         ND         96.1         50-140           Acenaphthone         0.160         0.0	-	49.5			ND	91.3	70-130		
Chromium (VI)         0.1         mg/L         ND         58.0         70-130         QM-05           Chromium         73.8         ug/L         15.1         117         70-130         Cobalt         22.2         99.0         70-130           Copper         60.4         ug/L         7.2         106         70-130         Copper           Lead         54.0         ug/L         5.0         98.1         70-130         Communication         100         96.6         70-130           Mercury         1.70         0.1         ug/L         ND         96.6         70-130         Selenium         53.5         ug/L         ND         90.6         70-130           Steler         ug/L         ND         94.3         70-130 <td< td=""><td>Cadmium</td><td>54.4</td><td></td><td>-</td><td>ND</td><td>108</td><td>70-130</td><td></td><td></td></td<>	Cadmium	54.4		-	ND	108	70-130		
Chromium       73.8       ug/L       15.1       117       70-130         Copper       60.4       ug/L       3.2       99.0       70-130         Copper       60.4       ug/L       5.0       98.1       70-130         Mercury       1.70       0.1       ug/L       5.0       98.1       70-130         Molydohum       48.5       ug/L       ND       91.6       70-130         Nickel       63.1       ug/L       ND       90.3       70-130         Silver       45.2       ug/L       ND       90.3       70-130         Thallium       47.3       ug/L       ND       90.3       70-130         Vanadium       74.8       ug/L       ND       90.4       70-130         Zinc       80.2       ug/L       ND       91.4       70-130         Vanadium       74.8       ug/L       27.5       105       70-130         Zinc       80.2       ug/L       27.5       105       70-130         Acenaphthylene       0.160       0.02       ug/g       ND       85.3       50-140         Acenaphthylene       0.160       0.02       ug/g       0.032       91.3 <td>Chromium (VI)</td> <td>0.1</td> <td></td> <td>-</td> <td>ND</td> <td>58.0</td> <td>70-130</td> <td></td> <td>QM-05</td>	Chromium (VI)	0.1		-	ND	58.0	70-130		QM-05
Cobait         52.7         ug/L         3.2         99.0         70-130           Copper         60.4         ug/L         7.2         106         70-130           Lead         54.0         ug/L         5.0         98.1         70-130           Mercury         1.70         0.1         ug/g         ND         96.6         70-130           Nickel         63.1         ug/L         8.7         108         70-130           Selenium         53.5         ug/L         ND         90.6         70-130           Silver         45.2         ug/L         ND         90.3         70-130           Uranium         52.0         ug/L         ND         94.4         70-130           Vanadium         74.8         ug/L         15.9         118         70-130           Zinc         80.2         ug/g         ND         96.1         50-140           Aconaphthene         0.181         0.02         ug/g         ND         95.2         50-140           Anthracene         0.179         0.02         ug/g         0.028         79.3         50-140           Aconaphthene         0.203         0.02         ug/g         0.021		73.8			15.1	117	70-130		
Copper         60.4         ug/L         7.2         106         70-130           Lead         54.0         ug/L         5.0         98.1         70-130           Melydenum         48.5         ug/L         ND         91.3         70-130           Molydenum         48.5         ug/L         ND         96.6         70-130           Selenium         53.5         ug/L         ND         106         70-130           Silver         45.2         ug/L         ND         90.3         70-130           Uranium         47.3         ug/L         ND         94.4         70-130           Vanadium         74.8         ug/L         ND         94.4         70-130           Zinc         80.2         ug/L         ND         96.1         50-140           Accenaphthene         0.160         0.02         ug/g         ND         95.2         50-140           Accenaphthene         0.179         0.02         ug/g         0.028         79.3         50-140           Benzo [a] anthracene         0.23         0.02         ug/g         0.028         79.3         50-140           Benzo [a] anthracene         0.177         0.02	Cobalt	52.7					70-130		
Lead         54.0         ug/L         5.0         98.1         70-130           Mercury         1.70         0.1         ug/g         ND         91.6         70-130           Nickel         63.1         ug/L         ND         96.6         70-130           Selenium         53.5         ug/L         ND         90.3         70-130           Silver         45.2         ug/L         ND         90.3         70-130           Vandum         74.8         ug/L         ND         90.4         70-130           Vandum         74.8         ug/L         15.9         118         70-130           Zine         0.2         ug/L         ND         96.1         50-140           Acenaphthene         0.181         0.02         ug/g         ND         85.2         50-140           Benzo [a] anthracene         0.177         0.02         ug/g         0.032         91.3         50-140           Benzo [a] ubranthene         0.23         0.02         ug/g         0.021         95.140           Benzo [a] ubranthene         0.23         0.02         ug/g         0.021         95.140           Benzo [a] ubranthene         0.23         0.0	Copper	60.4		-			70-130		
Mercury         1.70         0.1         ug/g         ND         113         70-130           Molybdenum         48.5         ug/L         ND         96.6         70-130           Nickel         63.1         ug/L         8.7         109         70-130           Selenium         53.5         ug/L         ND         106         70-130           Silver         46.2         ug/L         ND         94.4         70-130           Vanadium         74.8         ug/L         15.9         70-130           Zinc         80.2         ug/L         15.9         108         70-130           Acenaphthene         0.181         0.02         ug/L         27.5         105         70-130           Acenaphthene         0.160         0.02         ug/g         ND         96.1         50-140           Acenaphthene         0.160         0.02         ug/g         0.03         50-140           Benzo [a] anthracene         0.03         0.02         ug/g         0.041         129         50-140           Benzo [a] anthracene         0.171         0.02         ug/g         0.021         128         50-140           Benzo [a] anthracene         <		54.0		-			70-130		
Motyckerum         48.5         ug/L         ND         96.6         70-130           Nickel         63.1         ug/L         ND         90.6         70-130           Silver         45.2         ug/L         ND         90.3         70-130           Silver         45.2         ug/L         ND         90.3         70-130           Thallium         47.3         ug/L         ND         94.4         70-130           Vanadium         74.8         ug/L         15.9         118         70-130           Vanadium         74.8         ug/L         27.5         105         70-130           Semi-Volatiles         -         -         27.5         105         70-130           Acenaphthylen         0.160         0.02         ug/g         ND         95.3         50-140           Acthracene         0.179         0.02         ug/g         ND         95.2         50-140           Benzo [a] antracene         0.23         0.02         ug/g         0.028         91.3         50-140           Benzo [a] hiloranthene         0.231         0.02         ug/g         0.021         79.3         50-140           Chrysene         0.5140 <td>Mercury</td> <td>1.70</td> <td>0.1</td> <td>-</td> <td></td> <td></td> <td>70-130</td> <td></td> <td></td>	Mercury	1.70	0.1	-			70-130		
Nickel         63.1         ug/L         8.7         109         70-130           Selenium         53.5         ug/L         ND         106         70-130           Silver         45.2         ug/L         ND         94.3         70-130           Thallum         47.3         ug/L         ND         94.4         70-130           Vanadium         74.8         ug/L         15.9         118         70-130           Zinc         80.2         ug/L         15.9         118         70-130           Acenaphthene         0.161         0.02         ug/g         ND         95.3         50-140           Acenaphthylene         0.160         0.02         ug/g         ND         95.2         50-140           Benzo [a] anthracene         0.179         0.02         ug/g         0.02         119         50-140           Benzo [b] fluoranthene         0.283         0.02         ug/g         0.021         129         50-140           Benzo [b] fluoranthene         0.231         0.02         ug/g         0.021         129         50-140           Chrysene         0.177         0.02         ug/g         0.021         129         50-140 <td>-</td> <td>48.5</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	-	48.5							
Selenium         53.5         ug/L         ND         106         70-130           Silver         45.2         ug/L         ND         90.3         70-130           Data         47.3         ug/L         ND         94.4         70-130           Uranium         52.0         ug/L         ND         103         70-130           Vanadium         74.8         ug/L         15.9         118         70-130           Zinc         80.2         ug/L         27.5         105         70-130           Acenaphthene         0.181         0.02         ug/g         ND         96.1         50-140           Acenaphthylene         0.160         0.02         ug/g         ND         95.2         50-140           Benzo [a pyrene         0.177         0.02         ug/g         0.02         91.3         50-140           Benzo [a pyrene         0.177         0.02         ug/g         0.02         91.3         50-140           Benzo [a pyrene         0.231         0.02         ug/g         0.021         79.3         50-140           Benzo [a furanthene         0.233         0.02         ug/g         0.035         119         50-140 <t< td=""><td></td><td>63.1</td><td></td><td>-</td><td></td><td></td><td></td><td></td><td></td></t<>		63.1		-					
Silver       45.2       ug/L       ND       90.3       70-130         Thallum       47.3       ug/L       ND       94.4       70-130         Vanadium       74.8       ug/L       15.9       118       70-130         Zinc       80.2       ug/L       15.9       118       70-130         Semi-Volatiles       -       -       -       70-130         Acenaphthene       0.181       0.02       ug/g       ND       96.1       50-140         Acenaphthene       0.160       0.02       ug/g       ND       95.2       50-140         Benzo [a] anthracene       0.203       0.02       ug/g       0.032       91.3       50-140         Benzo [a] pyrene       0.177       0.02       ug/g       0.021       79.8       50-140         Benzo [a] pyrene       0.171       0.02       ug/g       0.021       79.8       50-140         Benzo [a,h] perylene       0.174       0.02       ug/g       0.021       79.8       50-140         Chrysene       0.283       0.02       ug/g       0.021       79.8       50-140         Dibenzo [a,h] anthracene       0.159       0.02       ug/g       ND				-					
Thallium       47.3       ug/L       ND       94.4       70-130         Uranium       52.0       ug/L       ND       103       70-130         Zinc       80.2       ug/L       27.5       105       70-130         Semi-Volatiles	Silver						70-130		
Uranium         52.0         ug/L         ND         103         70-130           Vanadium         74.8         ug/L         15.9         118         70-130           Zinc         80.2         ug/L         27.5         105         70-130           Semi-Volatiles									
Vanadium         74.8         ug/L         15.9         118         70-130           Zinc         80.2         ug/L         27.5         105         70-130           Semi-Volatiles				-					
Zinc       80.2       ug/L       27.5       105       70-130         Semi-Volatiles				-					
Semi-Volatiles           Acenaphthene         0.181         0.02         ug/g         ND         96.1         50-140           Acenaphthylene         0.160         0.02         ug/g         ND         85.3         50-140           Anthracene         0.179         0.02         ug/g         ND         95.2         50-140           Benzo [a] anthracene         0.203         0.02         ug/g         0.032         91.3         50-140           Benzo [a] pyrene         0.177         0.02         ug/g         0.028         79.3         50-140           Benzo [b] fluoranthene         0.283         0.02         ug/g         0.021         12.9         50-140           Benzo [k], fluoranthene         0.231         0.02         ug/g         0.021         12         50-140           Benzo [k], fluoranthene         0.231         0.02         ug/g         0.020         112         50-140           Chrysene         0.258         0.02         ug/g         0.035         119         50-140           Fluoranthene         0.159         0.02         ug/g         ND         84.8         50-140           Fluoranthene         0.174         0.02         ug/g         N				-					
Acenaphthene0.1810.02ug/gND96.150-140Acenaphthylene0.1600.02ug/gND85.350-140Anthracene0.1790.02ug/g0.03291.350-140Benzo [a] anthracene0.2030.02ug/g0.02879.350-140Benzo [b] fluoranthene0.2830.02ug/g0.04112950-140Benzo [g,h,i] perylene0.1710.02ug/g0.02179.850-140Benzo [g,h,i] perylene0.2580.02ug/g0.03511950-140Chrysene0.2580.02ug/g0.03511950-140Dibenzo [a,h] anthracene0.1740.02ug/gND84.850-140Fluoranthene0.2330.02ug/gND84.850-140Fluoranthene0.1740.02ug/gND84.850-140Fluoranthene0.1740.02ug/gND96.750-140Fluoranthene0.1740.02ug/gND96.750-140Fluoranthene0.1820.02ug/gND96.750-140Indeno [1,2,3-cd] pyrene0.1840.01ug/gND96.750-140Naphthalene0.1840.01ug/gND96.750-140Naphthalene0.2370.02ug/g0.5994.550-140Naphthalene0.2370.02ug/g0.5994.550-140 <t< td=""><td>Semi-Volatiles</td><td></td><td></td><td>0</td><td></td><td></td><td></td><td></td><td></td></t<>	Semi-Volatiles			0					
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Anthracene0.1790.02ug/gND95.250-140Benzo [a] anthracene0.2030.02ug/g0.03291.350-140Benzo [a] pyrene0.1770.02ug/g0.02879.350-140Benzo [b] fluoranthene0.2830.02ug/g0.02179.850-140Benzo [k] fluoranthene0.2310.02ug/g0.02179.850-140Benzo [k] fluoranthene0.2310.02ug/g0.02011250-140Chrysene0.2580.02ug/g0.03511950-140Dibenzo [a,h] anthracene0.1740.02ug/g0.08888.250-140Fluoranthene0.2330.02ug/gND84.850-140Dibenzo [a,h] anthracene0.1740.02ug/gND84.850-140Fluoranthene0.2330.02ug/gND92.850-140Indeno [1,2,3-cd] pyrene0.1500.02ug/gND96.750-140Indeno [1,2,3-cd] pyrene0.1600.02ug/gND97.750-140Indeno [1,2,3-cd] pyrene0.2370.02ug/g0.04090.450-140Pyrene0.2370.02ug/g0.04090.450-140Pyrene0.2370.02ug/g0.05994.550-140Surrogate: 2-Fluorobiphenyl1.27ug/g84.350-140Pyrene0.2370.02ug/g0.5994.5 <td>•</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	•								
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Benzo [a] pyrene0.1770.02ug/g0.02879.350-140Benzo [b] fluoranthene0.2830.02ug/g0.04112950-140Benzo [g,h,i] perylene0.1710.02ug/g0.02179.850-140Benzo [k] fluoranthene0.2310.02ug/g0.02511950-140Chrysene0.2580.02ug/g0.03511950-140Dibenzo [a,h] anthracene0.1590.02ug/gND84.850-140Fluoranthene0.2330.02ug/gND84.850-140Fluoranthene0.1740.02ug/gND92.850-140Indeno [1,2,3-cd] pyrene0.1500.02ug/gND96.750-1401-Methylnaphthalene0.1820.02ug/gND96.750-1402-Methylnaphthalene0.1840.01ug/gND97.750-140Naphthalene0.2370.02ug/g0.04090.450-140Naphthalene0.2100.02ug/g0.05994.550-140Surrogate: 2-Fluorobiphenyl1.7ug/g80.350-140Volatiles1.77ug/g0.5994.550-140Surrogate: 2-Fluorobiphenyl1.77ug/g63.760-130Benzene2.790.02ug/g63.760-130Berzene2.790.02ug/g63.760-130Berzene2.480.05ug/g <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>									
Benzo [b] fluoranthene       0.283       0.02       ug/g       0.041       129       50-140         Benzo [g,h,i] perylene       0.171       0.02       ug/g       0.020       112       50-140         Benzo [k] fluoranthene       0.231       0.02       ug/g       0.020       112       50-140         Chrysene       0.258       0.02       ug/g       0.035       119       50-140         Dibenzo [a,h] anthracene       0.159       0.02       ug/g       ND       84.8       50-140         Fluoranthene       0.233       0.02       ug/g       ND       94.8       50-140         Fluoranthene       0.174       0.02       ug/g       ND       92.8       50-140         Indeno [1,2,3-cd] pyrene       0.150       0.02       ug/g       ND       96.7       50-140         1-Methylnaphthalene       0.182       0.02       ug/g       ND       96.7       50-140         2-Methylnaphthalene       0.233       0.02       ug/g       ND       97.7       50-140         Naphthalene       0.210       0.02       ug/g       0.040       90.4       50-140         Surrogate: 2-Fluorobiphenyl       1.27       ug/g       84.3									
Benzo [g,h,i] perylene       0.171       0.02       ug'g       0.021       79.8       50-140         Benzo [k] fluoranthene       0.231       0.02       ug/g       0.020       112       50-140         Chrysene       0.258       0.02       ug/g       0.035       119       50-140         Dibenzo [a,h] anthracene       0.159       0.02       ug/g       ND       84.8       50-140         Fluoranthene       0.233       0.02       ug/g       ND       92.8       50-140         Fluoranthene       0.174       0.02       ug/g       ND       92.8       50-140         Indeno [1,2,3-cd] pyrene       0.150       0.02       ug/g       ND       79.6       50-140         1-Methylnaphthalene       0.182       0.02       ug/g       ND       93.6       50-140         2-Methylnaphthalene       0.203       0.02       ug/g       ND       96.7       50-140         Naphthalene       0.210       0.02       ug/g       ND       94.5       50-140         Pyrene       0.237       0.02       ug/g       0.040       90.4       50-140         Surrogate: 2-Fluorobiphenyl       1.27       ug/g       84.3       50-140<									
Benzo [k] fluoranthene       0.231       0.02       ug/g       0.020       112       50-140         Chrysene       0.258       0.02       ug/g       0.035       119       50-140         Dibenzo [a,h] anthracene       0.159       0.02       ug/g       ND       84.8       50-140         Fluoranthene       0.233       0.02       ug/g       0.068       88.2       50-140         Fluorene       0.1774       0.02       ug/g       ND       92.8       50-140         Indeno [1,2,3-cd] pyrene       0.150       0.02       ug/g       ND       79.6       50-140         2-Methylnaphthalene       0.182       0.02       ug/g       ND       96.7       50-140         Naphthalene       0.184       0.01       ug/g       ND       97.7       50-140         Naphthalene       0.237       0.02       ug/g       0.040       90.4       50-140         Pyrene       0.237       0.02       ug/g       0.059       94.5       50-140         Surrogate: 2-Fluorobiphenyl       1.27       ug/g       84.3       50-140         Pyrene       0.237       0.02       ug/g       69.7       60-140         Benzene<									
Chrysene0.2580.02ug/g0.03511950-140Dibenzo [a,h] anthracene0.1590.02ug/gND84.850-140Fluoranthene0.2330.02ug/g0.06888.250-140Fluorene0.1740.02ug/gND92.850-140Indeno [1,2,3-cd] pyrene0.1500.02ug/gND79.650-1401-Methylnaphthalene0.1820.02ug/gND96.750-1402-Methylnaphthalene0.2030.02ug/gND97.750-140Naphthalene0.2100.02ug/g0.04090.450-140Phenanthrene0.2100.02ug/g0.05994.550-140Pyrene0.2370.02ug/g0.05994.550-140Surrogate: 2-Fluorobiphenyl1.27ug/g84.350-140VolatilesAcetone7.540.50ug/g75.450-140Benzene2.790.02ug/g69.760-130Bromodichloromethane2.480.05ug/g62.060-130									
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Fluorene0.1740.02ug/gND92.850-140Indeno [1,2,3-cd] pyrene0.1500.02ug/gND79.650-1401-Methylnaphthalene0.1820.02ug/gND96.750-1402-Methylnaphthalene0.2030.02ug/gND10850-140Naphthalene0.1840.01ug/gND97.750-140Naphthalene0.2100.02ug/g0.04090.450-140Phenanthrene0.2370.02ug/g0.05994.550-140Surrogate: 2-Fluorobiphenyl1.27ug/g84.350-140VolatilesAcetone7.540.50ug/g75.450-140Benzene2.790.02ug/g69.760-130Bromodichloromethane2.480.05ug/g62.060-130									
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1-Methylnaphthalene       0.182       0.02       ug/g       ND       96.7       50-140         2-Methylnaphthalene       0.203       0.02       ug/g       ND       108       50-140         Naphthalene       0.184       0.01       ug/g       ND       97.7       50-140         Phenanthrene       0.210       0.02       ug/g       0.040       90.4       50-140         Pyrene       0.237       0.02       ug/g       0.059       94.5       50-140         Surrogate: 2-Fluorobiphenyl       1.27       ug/g       84.3       50-140         Volatiles									
2-Methylnaphthalene       0.203       0.02       ug/g       ND       108       50-140         Naphthalene       0.184       0.01       ug/g       ND       97.7       50-140         Phenanthrene       0.210       0.02       ug/g       0.040       90.4       50-140         Pyrene       0.237       0.02       ug/g       0.059       94.5       50-140         Surrogate: 2-Fluorobiphenyl       1.27       ug/g       84.3       50-140         Volatiles									
Naphthalene         0.184         0.01         ug/g         ND         97.7         50-140           Phenanthrene         0.210         0.02         ug/g         0.040         90.4         50-140           Pyrene         0.237         0.02         ug/g         0.059         94.5         50-140           Surrogate: 2-Fluorobiphenyl         1.27         ug/g         84.3         50-140           Volatiles         Surrogate:         2-Fluorobiphenyl         7.54         0.50         ug/g         69.7         60-130           Benzene         2.79         0.02         ug/g         62.0         60-130           Bromodichloromethane         2.48         0.05         ug/g         62.0         60-130									
Phenanthrene         0.210         0.02         ug/g         0.040         90.4         50-140           Pyrene         0.237         0.02         ug/g         0.059         94.5         50-140           Surrogate: 2-Fluorobiphenyl         1.27         ug/g         84.3         50-140           Volatiles         Surrogate:         Solution         Solution         Solution         Solution           Benzene         2.79         0.02         ug/g         69.7         60-130           Bromodichloromethane         2.48         0.05         ug/g         62.0         60-130	, ,								
Pyrene         0.237         0.02         ug/g         0.059         94.5         50-140           Surrogate: 2-Fluorobiphenyl         1.27         ug/g         84.3         50-140           Volatiles         Volatiles         Volatiles         Volatiles         Volatiles         Volatiles         Volatiles         94.5         50-140           Benzene         7.54         0.50         ug/g         75.4         50-140           Bromodichloromethane         2.79         0.02         ug/g         69.7         60-130									
Surrogate: 2-Fluorobiphenyl         1.27         ug/g         84.3         50-140           Volatiles         Volati									
Volatiles         7.54         0.50         ug/g         75.4         50-140           Benzene         2.79         0.02         ug/g         69.7         60-130           Bromodichloromethane         2.48         0.05         ug/g         62.0         60-130	,								
Acetone7.540.50ug/g75.450-140Benzene2.790.02ug/g69.760-130Bromodichloromethane2.480.05ug/g62.060-130				- 3, 3					
Benzene         2.79         0.02         ug/g         69.7         60-130           Bromodichloromethane         2.48         0.05         ug/g         62.0         60-130		7.54	0.50	na/a		75.4	50-140		
Bromodichloromethane 2.48 0.05 ug/g 62.0 60-130									

# OTTAWA • HAMILTON • CALGARY • MISSISSAUGA • KINGSTON • LONDON • NIAGARA • WINDSOR



Report Date: 31-Oct-2019

Order Date: 25-Oct-2019



### Order #: 1943704

Report Date: 31-Oct-2019 Order Date: 25-Oct-2019

Project Description: 191-12948-00

# Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Bromomethane	2.91	0.05	ug/g		72.7	50-140			
Carbon Tetrachloride	2.85	0.05	ug/g		71.2	60-130			
Chlorobenzene	3.59	0.05	ug/g		89.8	60-130			
Chloroform	2.46	0.05	ug/g		61.5	60-130			
Dibromochloromethane	3.98	0.05	ug/g		99.6	60-130			
Dichlorodifluoromethane	2.04	0.05	ug/g		51.0	50-140			
1,2-Dichlorobenzene	3.01	0.05	ug/g		75.3	60-130			
1,3-Dichlorobenzene	3.04	0.05	ug/g		76.0	60-130			
1,4-Dichlorobenzene	3.31	0.05	ug/g		82.7	60-130			
1,1-Dichloroethane	2.90	0.05	ug/g		72.6	60-130			
1,2-Dichloroethane	2.46	0.05	ug/g		61.6	60-130			
1,1-Dichloroethylene	2.88	0.05	ug/g		72.0	60-130			
cis-1,2-Dichloroethylene	2.59	0.05	ug/g		64.8	60-130			
trans-1,2-Dichloroethylene	2.92	0.05	ug/g		73.1	60-130			
1,2-Dichloropropane	3.55	0.05	ug/g		88.8	60-130			
cis-1,3-Dichloropropylene	2.85	0.05	ug/g		71.2	60-130			
trans-1,3-Dichloropropylene	2.72	0.05	ug/g		67.9	60-130			
Ethylbenzene	3.56	0.05	ug/g		89.0	60-130			
Ethylene dibromide (dibromoethane	3.04	0.05	ug/g		76.0	60-130			
Hexane	2.76	0.05	ug/g		68.9	60-130			
Methyl Ethyl Ketone (2-Butanone)	7.38	0.50	ug/g		73.8	50-140			
Methyl Isobutyl Ketone	6.36	0.50	ug/g		63.6	50-140			
Methyl tert-butyl ether	8.97	0.05	ug/g		89.7	50-140			
Methylene Chloride	3.16	0.05	ug/g		78.9	60-130			
Styrene	3.54	0.05	ug/g		88.4	60-130			
1,1,1,2-Tetrachloroethane	4.21	0.05	ug/g		105	60-130			
1,1,2,2-Tetrachloroethane	3.79	0.05	ug/g		94.8	60-130			
Tetrachloroethylene	3.40	0.05	ug/g		85.0	60-130			
Toluene	3.72	0.05	ug/g		93.1	60-130			
1,1,1-Trichloroethane	2.60	0.05	ug/g		64.9	60-130			
1,1,2-Trichloroethane	2.72	0.05	ug/g		68.0	60-130			
Trichloroethylene	2.95	0.05	ug/g		73.6	60-130			
Trichlorofluoromethane	3.38	0.05	ug/g		84.5	50-140			
Vinyl chloride	2.96	0.02	ug/g		74.1	50-140			
m,p-Xylenes	7.42	0.05	ug/g		92.8	60-130			
o-Xylene	3.73	0.05	ug/g		93.3	60-130			



#### **Qualifier Notes:**

#### **QC** Qualifiers :

QM-05 : The spike recovery was outside acceptance limits for the matrix spike due to matrix interference.

QR-01 : Duplicate RPD is high, however, the sample result is less than 10x the MDL.

#### Sample Data Revisions

None

#### Work Order Revisions / Comments:

None

#### **Other Report Notes:**

n/a: not applicable ND: Not Detected MDL: Method Detection Limit Source Result: Data used as source for matrix and duplicate samples %REC: Percent recovery. RPD: Relative percent difference.

Soil results are reported on a dry weight basis when the units are denoted with 'dry'. Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

#### CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.

- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.
- When reported, data for F4G has been processed using a silica gel cleanup.

GPARACEL				Paracel II	0: 19437	04				lead Office 00-2319 St. Laurent Blvd. Ittawa, Ontario K1G 4J8 : 1-800-749-1947 : paracel@paracellabs.cor					(	Lab Use	Custod Only) 1297	
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2611 Quequesview M.				STA Email Address:	NDWG O	Pres	2	-		-				021	Day		OR	egular
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Criteria: 🗹 O. Reg. 153/04 (As Amended) Table 3 🗆 RSC F	iling C	] O. Rej	3. 558/00	D DPWQO D	CCME D'SU	B (Sto	orm)		UB (	Sanit	ary) I	Municipalit	y:		0	Other:		
Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS	(Storm	Sanitary S	iewer) P	(Paint) A (Air) O (	Other)	Re	quire	ed A	naly	ses								
Paracel Order Number:	rix	Air Volume	of Containers	Sample	Taken	F1-F4+BTEX			s by ICP			6						
Sample ID/Location Name	Matrix	Air	# of	Date	Time	PHICs	VOCS	PAHS	Metals	Flg	CrVI	(1) (1)						
1 BHBh- BH19-2-555	5		2	OCT 2.3'19		/	/	1	1	1	-1	H					1	
2 BH19-6-553				OCT 24'19		1	1	1	1	1	1							
3 BH19-10-558				09 23/19		-	-	-	-	-	1							
4 BH19-10-SS12 # HOLD			Y	0523 19		1	1											
5 B119-6-DUP			1	04 24 19				1		_	_		_					
6								_		_	_							L
7						-	_	_		-	+				-	-	-	
8			-			-	_	_		+	+					-	-	-
10								_		+	-					-		-
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			129	7.6	with.	2,	50	7.							c	Nit		
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Relinquithed By (Print): BULINA WEAVIERALT Date/Time: OCT 25 Card	Date/Til Temper		~		Date/Ti Temper		14	12	200	pin	0		ate/Tin	ied [ ] ]	1C	<u> </u>	45	91s
Chain of Custody (Env) - Rev 0.7 Feb. 2016	B	1	1-									P						



RELIABLE.

351 Nash Road North, unit 9B Hamilton, ON L8H 7P4 1-800-749-1947 www.paracellabs.com

# Certificate of Analysis

# WSP Canada Inc. (Ottawa)

2611 Queensview Dr Ottawa, ON K2B 8K2 Attn: Adrian Menyhart

Client PO: Project: 191-12948-00 Custody: 124106

Report Date: 8-Nov-2019 Order Date: 1-Nov-2019

Order #: 1944618

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID **Client ID** 1944618-01 BH19-6-SS8 1944618-02 BH19-8-SS8 1944618-03 BH19-10-SS10

Approved By:

Dale Robertson, BSc Laboratory Director

Any use of these results implies your agreement that our total liability in connection with this work, however arising, shall be limited to the amount paid by you for this work, and that our employees or agents shall not under any circumstances be liable to you in connection with this work.



# Order #: 1944618

Report Date: 08-Nov-2019 Order Date: 1-Nov-2019 Project Description: 191-12948-00

# **Analysis Summary Table**

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	5-Nov-19	6-Nov-19
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	4-Nov-19	7-Nov-19
Mercury by CVAA	EPA 7471B - CVAA, digestion	5-Nov-19	5-Nov-19
PHC F1	CWS Tier 1 - P&T GC-FID	5-Nov-19	6-Nov-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	5-Nov-19	7-Nov-19
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	5-Nov-19	5-Nov-19
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	4-Nov-19	6-Nov-19
Solids, %	Gravimetric, calculation	5-Nov-19	5-Nov-19



Order #: 1944618

Report Date: 08-Nov-2019 Order Date: 1-Nov-2019

	Client ID: Sample Date: Sample ID: MDL/Units	BH19-6-SS8 24-Oct-19 09:00 1944618-01 Soil	BH19-8-SS8 24-Oct-19 09:00 1944618-02 Soil	BH19-10-SS10 24-Oct-19 09:00 1944618-03 Soil	- - - -
Physical Characteristics					
% Solids	0.1 % by Wt.	93.7	93.5	91.5	-
Metals					
Antimony	1.0 ug/g dry	-	<1.0	<1.0	-
Arsenic	1.0 ug/g dry	-	1.9	2.2	-
Barium	1.0 ug/g dry	-	152	54.9	-
Beryllium	0.5 ug/g dry	-	<0.5	<0.5	-
Boron	5.0 ug/g dry	-	11.5	7.5	-
Cadmium	0.5 ug/g dry	-	<0.5	<0.5	-
Chromium	5.0 ug/g dry	-	14.5	14.7	-
Chromium (VI)	0.2 ug/g dry	-	<0.2	<0.2	-
Cobalt	1.0 ug/g dry	-	6.3	6.4	-
Copper	5.0 ug/g dry	-	12.5	11.8	-
Lead	1.0 ug/g dry	-	4.4	4.2	-
Mercury	0.1 ug/g dry	-	<0.1	<0.1	-
Molybdenum	1.0 ug/g dry	-	<1.0	1.1	-
Nickel	5.0 ug/g dry	-	12.3	10.6	-
Selenium	1.0 ug/g dry	_	<1.0	<1.0	-
Silver	0.3 ug/g dry	_	<0.3	<0.3	-
Thallium	1.0 ug/g dry	-	<1.0	<1.0	-
Uranium	1.0 ug/g dry	-	1.1	<1.0	-
Vanadium	10.0 ug/g dry	-	26.0	24.7	-
Zinc	20.0 ug/g dry	_	<20.0	<20.0	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	-	-
Toluene	0.05 ug/g dry	<0.05	<0.05	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	-	-
o-Xylene	0.05 ug/g dry	<0.05	<0.05	-	-
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	-	-
Toluene-d8	Surrogate	112%	110%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	-	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	-	-
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	-	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	-	-



Order #: 1944618

Report Date: 08-Nov-2019 Order Date: 1-Nov-2019

	Client ID:	BH19-6-SS8	BH19-8-SS8	BH19-10-SS10	-
	Sample Date:	24-Oct-19 09:00	24-Oct-19 09:00	24-Oct-19 09:00	-
	Sample ID:	1944618-01	1944618-02	1944618-03	-
	MDL/Units	Soil	Soil	Soil	-
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	<0.02	<0.02	-	-
Acenaphthylene	0.02 ug/g dry	<0.02	<0.02	-	-
Anthracene	0.02 ug/g dry	<0.02	<0.02	-	-
Benzo [a] anthracene	0.02 ug/g dry	<0.02	<0.02	-	-
Benzo [a] pyrene	0.02 ug/g dry	<0.02	<0.02	-	-
Benzo [b] fluoranthene	0.02 ug/g dry	<0.02	<0.02	-	-
Benzo [g,h,i] perylene	0.02 ug/g dry	<0.02	<0.02	-	-
Benzo [k] fluoranthene	0.02 ug/g dry	<0.02	<0.02	-	-
Chrysene	0.02 ug/g dry	<0.02	<0.02	-	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	<0.02	<0.02	-	-
Fluoranthene	0.02 ug/g dry	<0.02	<0.02	-	-
Fluorene	0.02 ug/g dry	<0.02	<0.02	-	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	<0.02	<0.02	-	-
1-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	-	-
2-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	-	-
Methylnaphthalene (1&2)	0.04 ug/g dry	<0.04	<0.04	-	-
Naphthalene	0.01 ug/g dry	<0.01	<0.01	-	-
Phenanthrene	0.02 ug/g dry	<0.02	<0.02	-	-
Pyrene	0.02 ug/g dry	<0.02	<0.02	-	-
2-Fluorobiphenyl	Surrogate	91.4%	101%	-	-
Terphenyl-d14	Surrogate	121%	133%	-	-



Order #: 1944618

Report Date: 08-Nov-2019

Order Date: 1-Nov-2019

Project Description: 191-12948-00

# Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals			00						
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND ND	1.0	ug/g						
Uranium		1.0	ug/g						
Vanadium Zinc	ND ND	10.0 20.0	ug/g						
	ND	20.0	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene Dibenzo [a,h] anthracene	ND ND	0.02 0.02	ug/g						
Fluoranthene	ND	0.02	ug/g ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	0.982		ug/g		73.6	50-140			
Surrogate: Terphenyl-d14	1.33		ug/g		99.6	50-140			
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	3.43		ug/g		107	50-140			
-									



Order #: 1944618

Report Date: 08-Nov-2019

Order Date: 1-Nov-2019

Project Description: 191-12948-00

# Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND				30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND				30	
Metals									
Antimony	2.1	1.0	ug/g dry	2.0			4.6	30	
Arsenic	1.6	1.0	ug/g dry	1.3			22.0	30	
Barium	23.5	1.0	ug/g dry	21.6			8.4	30	
Beryllium	ND	0.5	ug/g dry	0.5			0.0	30	
Boron	8.0	5.0	ug/g dry	7.3			9.4	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND			10.0	35	
Chromium	10.4	5.0	ug/g dry	9.4			10.0	30	
Cobalt	4.2	1.0	ug/g dry	3.9			5.6	30	
Copper	9.3	5.0	ug/g dry	8.6			7.6	30	
Lead	3.0 ND	1.0	ug/g dry	2.7			9.1	30 30	
Mercury Molybdenum	ND	0.1 1.0	ug/g dry	ND ND			0.0 0.0	30 30	
Nickel	ND 7.7	5.0	ug/g dry	6.9				30 30	
Selenium	ND	1.0	ug/g dry	ND			11.4 0.0	30	
Silver	0.4	0.3	ug/g dry ug/g dry	ND			0.0	30	
Thallium	ND	0.3 1.0	ug/g dry ug/g dry	ND			0.0	30	
Uranium	ND	1.0	ug/g dry ug/g dry	ND			0.0	30	
Vanadium	17.9	10.0	ug/g dry ug/g dry	16.2			9.7	30	
Zinc	ND	20.0	ug/g dry ug/g dry	ND			0.0	30	
	ND	20.0	ug/g ury	ND			0.0	50	
Physical Characteristics % Solids	86.1	0.1	% by Wt.	85.6			0.6	25	
Semi-Volatiles	00.1	0.1	70 Dy VVI.	00.0			0.0	25	
Acenaphthene	ND	0.40	ug/g dry	ND				40	
Acenaphthylene	ND	0.40	ug/g dry ug/g dry	ND			0.0	40	
Anthracene	ND	0.40	ug/g dry ug/g dry	ND			0.0	40	
Benzo [a] anthracene	ND	0.40	ug/g dry ug/g dry	ND			0.0	40	
Benzo [a] pyrene	ND	0.40	ug/g dry	ND			0.0	40	
Benzo [b] fluoranthene	ND	0.40	ug/g dry	ND			0.0	40	
Benzo [g,h,i] perylene	ND	0.40	ug/g dry	ND			0.0	40	
Benzo [k] fluoranthene	ND	0.40	ug/g dry	ND			0.0	40	
Chrysene	ND	0.40	ug/g dry	ND			0.0	40	
Dibenzo [a,h] anthracene	ND	0.40	ug/g dry	ND			0.0	40	
Fluoranthene	ND	0.40	ug/g dry	ND			0.0	40	
Fluorene	ND	0.40	ug/g dry	ND			0.0	40	
Indeno [1,2,3-cd] pyrene	ND	0.40	ug/g dry	ND			0.0	40	
1-Methylnaphthalene	ND	0.40	ug/g dry	ND			0.0	40	
2-Methylnaphthalene	ND	0.40	ug/g dry	ND			0.0	40	
Naphthalene	ND	0.20	ug/g dry	ND			0.0	40	
Phenanthrene	ND	0.40	ug/g dry	ND			0.0	40	
Pyrene	ND	0.40	ug/g dry	ND			0.0	40	
Surrogate: 2-Fluorobiphenyl	1.25		ug/g dry		88.4	50-140			
Surrogate: Terphenyl-d14	1.39		ug/g dry		98.6	50-140			
Volatiles			, .	•					
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND	440	50 4 40		50	
Surrogate: Toluene-d8	3.91		ug/g dry		112	50-140			



Certificate of Analysis Client: WSP Canada Inc. (Ottawa) **Client PO:** 

# Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	192	7	ug/g		95.8	80-120			
F2 PHCs (C10-C16)	84	4	ug/g	ND	98.8	60-140			
F3 PHCs (C16-C34)	240	8	ug/g	ND	115	60-140			
F4 PHCs (C34-C50)	172	6	ug/g	ND	130	60-140			
Metals									
Antimony	40.8		ug/L	ND	80.0	70-130			
Arsenic	45.8		ug/L	ND	90.7	70-130			
Barium	51.9		ug/L	8.6	86.5	70-130			
Beryllium	50.1		ug/L	ND	99.8	70-130			
Boron	45.4		ug/L	ND	85.0	70-130			
Cadmium	46.4		ug/L	ND	92.7	70-130			
Chromium (VI)	0.1		mg/L	ND	70.5	70-130			
Chromium	52.5		ug/L	ND	97.5	70-130			
Cobalt	49.3		ug/L	1.6	95.5	70-130			
Copper	51.2		ug/L	ND	95.4	70-130			
Lead	43.3		ug/L	1.1	84.5	70-130			
Mercury	1.41	0.1	ug/g	ND	94.1	70-130			
Molybdenum	51.2		ug/L	ND	102	70-130			
Nickel	50.2		ug/L	ND	94.8	70-130			
Selenium	47.0		ug/L	ND	93.5	70-130			
Silver	45.2		ug/L	ND	90.2	70-130			
Thallium	43.7		ug/L	ND	87.2	70-130			
Uranium	45.3		ug/L	ND	90.2	70-130			
Vanadium	57.7		ug/L	ND	102	70-130			
Zinc	53.0		ug/L	ND	95.0	70-130			
Semi-Volatiles									
Acenaphthene	0.161	0.02	ug/g		96.4	50-140			
Acenaphthylene	0.136	0.02	ug/g		81.3	50-140			
Anthracene	0.164	0.02	ug/g		98.5	50-140			
Benzo [a] anthracene	0.158	0.02	ug/g		94.5	50-140			
Benzo [a] pyrene	0.130	0.02	ug/g		77.8	50-140			
Benzo [b] fluoranthene	0.206	0.02	ug/g		124	50-140			
Benzo [g,h,i] perylene	0.138	0.02	ug/g		82.9	50-140			
Benzo [k] fluoranthene	0.187	0.02	ug/g		112	50-140			
Chrysene	0.193	0.02	ug/g		116	50-140			
Dibenzo [a,h] anthracene	0.140	0.02	ug/g		84.0	50-140			
Fluoranthene	0.163	0.02	ug/g		97.6	50-140			
Fluorene	0.166	0.02	ug/g		99.6	50-140			
Indeno [1,2,3-cd] pyrene	0.119	0.02	ug/g		71.3	50-140			
1-Methylnaphthalene	0.151	0.02	ug/g		90.4	50-140			
2-Methylnaphthalene	0.166	0.02	ug/g		99.9	50-140			
Naphthalene	0.160	0.01	ug/g		95.9	50-140			
Phenanthrene	0.170	0.02	ug/g		102	50-140			
Pyrene	0.167	0.02	ug/g		100	50-140			
Surrogate: 2-Fluorobiphenyl	1.40		ug/g		105	50-140			

## Order #: 1944618

Project Description: 191-12948-00

Report Date: 08-Nov-2019

Order Date: 1-Nov-2019



Report Date: 08-Nov-2019 Order Date: 1-Nov-2019

Project Description: 191-12948-00

# Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
o-Xylene	4.37	0.05	ug/g		109	60-130			



#### Login Qualifiers :

Container(s) - Labeled improperly/insufficient information -Applies to samples: BH19-8-SS8, BH19-10-SS10

#### Sample Data Revisions

None

#### Work Order Revisions / Comments:

None

#### **Other Report Notes:**

n/a: not applicable ND: Not Detected MDL: Method Detection Limit Source Result: Data used as source for matrix and duplicate samples %REC: Percent recovery. RPD: Relative percent difference.

Soil results are reported on a dry weight basis when the units are denoted with 'dry'. Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

#### CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.

- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.
- When reported, data for F4G has been processed using a silica gel cleanup.

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Client Name: WSP CANA Contact Name: ANILAN Address: 1611 OLENS VIEU Telephone: 742 - 961 -	MENYHART U DHIVE		Project Quote PO #: E-mail:	#:	191 - 129 19-029	1	im						T   1 dəy   2 dəy e Requir	urnar	ge <u>/</u> oround T	ime	3 day Regular
Regulation 153/04	Other Regulation	N	1atrix T	ype: S	(Soil/Sed.) GW (G (ater) SS (Storm/Sa	iround Water)						Requ	uired Ar	nalysis			
Table 1 Res/Park Med/Fine Table 2 Ind/Comm C Coarse Table 3 Agri/Other Table For RSC: Yes No	CCME MISA SU-Sani SU-Storm Mun: Other:	ix	Air Volume	Containers	aint) A (Air) O (Ot Sampk	her) e Taken	PHCs F1-F4+BTEX	2	PAHS			B (HWS)					
Sample ID/Locatio		Matrix	Air V	to #	Date	Time	рна	VOCs	PAHS	HgH	Crvi	B (F		~	_	-	
1 <u>BH9-6-5</u> 2 <u>BH19-6-5</u> 3 <u>BH19-10-5</u> 4	(8	S		1 1	.our 24 		/		/ /		1			26	1201		al -
5 6 7										-							
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Comments: -110, & Vate on No. 3, Vate on Relinquished By (Sign): Autor Relinquished By (Print): An Kithy Date/Time: A No. 1, 2019	Received By Date/Time: MEN/HART Temperature			19	300 3° PH	Received at Lat	201,2	5	1.00	nai 1,5	Ver Dat	rified I	IVA (I BY: MA	21	1-19	11	724



RELIABLE.

# Certificate of Analysis

# WSP Canada Inc. (Ottawa)

2611 Queensview Dr Ottawa, ON K2B 8K2 Attn: Adrian Menyhart

Client PO: Project: 191-12948-00 Custody: 124408

Report Date: 1-Nov-2019 Order Date: 28-Oct-2019

Order #: 1944109

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID **Client ID** 1944109-01 BH19-4-SS2

Approved By:

Mark Frata

Mark Foto, M.Sc. Lab Supervisor

Any use of these results implies your agreement that our total liability in connection with this work, however arising, shall be limited to the amount paid by you for this work, and that our employees or agents shall not under any circumstances be liable to you in connection with this work.



# **Analysis Summary Table**

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	29-Oct-19	29-Oct-19
Mercury by CVAA	EPA 7471B - CVAA, digestion	29-Oct-19	29-Oct-19
PHC F1	CWS Tier 1 - P&T GC-FID	29-Oct-19	30-Oct-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	28-Oct-19	30-Oct-19
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	29-Oct-19	29-Oct-19
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	28-Oct-19	1-Nov-19
REG 153: VOCs by P&T GC/MS	EPA 8260 - P&T GC-MS	29-Oct-19	30-Oct-19
Solids, %	Gravimetric, calculation	29-Oct-19	29-Oct-19

Report Date: 01-Nov-2019 Order Date: 28-Oct-2019



Report Date: 01-Nov-2019

Order Date: 28-Oct-2019

			т <u>і</u>		
	Client ID: Sample Date:	BH19-4-SS2 28-Oct-19 13:20	-	-	-
	Sample ID:	1944109-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	64.6	-	-	-
Metals					
Antimony	1.0 ug/g dry	<1.0	-	-	-
Arsenic	1.0 ug/g dry	3.9	-	-	-
Barium	1.0 ug/g dry	359	-	-	-
Beryllium	0.5 ug/g dry	0.7	-	-	-
Boron	5.0 ug/g dry	6.5	-	-	-
Cadmium	0.5 ug/g dry	<0.5	-	-	-
Chromium	5.0 ug/g dry	118	-	-	-
Chromium (VI)	0.2 ug/g dry	<0.2	-	-	-
Cobalt	1.0 ug/g dry	21.5	-	-	-
Copper	5.0 ug/g dry	54.3	-	-	-
Lead	1.0 ug/g dry	16.3	-	-	-
Mercury	0.1 ug/g dry	<0.1	-	-	-
Molybdenum	1.0 ug/g dry	<1.0	-	-	-
Nickel	5.0 ug/g dry	62.8	-	-	-
Selenium	1.0 ug/g dry	<1.0	-	-	-
Silver	0.3 ug/g dry	<0.3	-	-	-
Thallium	1.0 ug/g dry	<1.0	-	-	-
Uranium	1.0 ug/g dry	<1.0	-	-	-
Vanadium	10.0 ug/g dry	104	-	-	-
Zinc	20.0 ug/g dry	121	-	-	-
Volatiles	•				
Acetone	0.50 ug/g dry	<0.50	-	-	-
Benzene	0.02 ug/g dry	<0.02	-	-	-
Bromodichloromethane	0.05 ug/g dry	<0.05	-	-	-
Bromoform	0.05 ug/g dry	<0.05	-	-	-
Bromomethane	0.05 ug/g dry	<0.05	-	-	-
Carbon Tetrachloride	0.05 ug/g dry	<0.05	-	-	-
Chlorobenzene	0.05 ug/g dry	<0.05	-	-	-
Chloroform	0.05 ug/g dry	<0.05	-	-	-
Dibromochloromethane	0.05 ug/g dry	<0.05	-	-	-
Dichlorodifluoromethane	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-
1,3-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-



# Order #: 1944109

Report Date: 01-Nov-2019 Order Date: 28-Oct-2019

		BU140.4.000	,		
	Client ID: Sample Date:	BH19-4-SS2 28-Oct-19 13:20	-	-	-
	Sample ID:	1944109-01	-	-	-
]	MDL/Units	Soil	-	-	-
1,4-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-
1,1-Dichloroethane	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichloroethane	0.05 ug/g dry	<0.05	-	-	-
1,1-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
cis-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
trans-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichloropropane	0.05 ug/g dry	<0.05	-	-	-
cis-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	-	-	-
trans-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	-	-	-
1,3-Dichloropropene, total	0.05 ug/g dry	<0.05	-	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	-	-	-
Ethylene dibromide (dibromoethar	0.05 ug/g dry	<0.05	-	-	-
Hexane	0.05 ug/g dry	<0.05	-	-	-
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	<0.50	-	-	-
Methyl Isobutyl Ketone	0.50 ug/g dry	<0.50	-	-	-
Methyl tert-butyl ether	0.05 ug/g dry	<0.05	-	-	-
Methylene Chloride	0.05 ug/g dry	<0.05	-	-	-
Styrene	0.05 ug/g dry	<0.05	-	-	-
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	<0.05	-	-	-
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	<0.05	-	-	-
Tetrachloroethylene	0.05 ug/g dry	<0.05	-	-	-
Toluene	0.05 ug/g dry	<0.05	-	-	-
1,1,1-Trichloroethane	0.05 ug/g dry	<0.05	-	-	-
1,1,2-Trichloroethane	0.05 ug/g dry	<0.05	-	-	-
Trichloroethylene	0.05 ug/g dry	<0.05	-	-	-
Trichlorofluoromethane	0.05 ug/g dry	<0.05	-	-	-
Vinyl chloride	0.02 ug/g dry	<0.02	-	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	-	-	-
o-Xylene	0.05 ug/g dry	<0.05	-	-	-
Xylenes, total	0.05 ug/g dry	<0.05	-	-	-
4-Bromofluorobenzene	Surrogate	103%	-	-	-
Dibromofluoromethane	Surrogate	107%	-	-	-
Toluene-d8	Surrogate	107%	-	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	-	-	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	-	-	-



Report Date: 01-Nov-2019 Order Date: 28-Oct-2019

			1		
	Client ID:	BH19-4-SS2 28-Oct-19 13:20	-	-	-
	Sample Date: Sample ID:	1944109-01	-	-	-
	MDL/Units	Soil	-	_	-
F3 PHCs (C16-C34)	8 ug/g dry	<8	-	-	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	-	-	-
Semi-Volatiles			łł		
Acenaphthene	0.02 ug/g dry	0.02	-	-	-
Acenaphthylene	0.02 ug/g dry	<0.02	-	-	-
Anthracene	0.02 ug/g dry	0.05	-	-	-
Benzo [a] anthracene	0.02 ug/g dry	0.07	-	-	-
Benzo [a] pyrene	0.02 ug/g dry	0.05	-	-	-
Benzo [b] fluoranthene	0.02 ug/g dry	0.06	-	-	-
Benzo [g,h,i] perylene	0.02 ug/g dry	0.03	-	-	-
Benzo [k] fluoranthene	0.02 ug/g dry	0.03	-	-	-
Chrysene	0.02 ug/g dry	0.07	-	-	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	<0.02	-	-	-
Fluoranthene	0.02 ug/g dry	0.19	-	-	-
Fluorene	0.02 ug/g dry	0.02	-	-	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	0.03	-	-	-
1-Methylnaphthalene	0.02 ug/g dry	0.02	-	-	-
2-Methylnaphthalene	0.02 ug/g dry	0.04	-	-	-
Methylnaphthalene (1&2)	0.04 ug/g dry	0.06	-	-	-
Naphthalene	0.01 ug/g dry	0.03	-	-	-
Phenanthrene	0.02 ug/g dry	0.16	-	-	-
Pyrene	0.02 ug/g dry	0.15	-	-	-
2-Fluorobiphenyl	Surrogate	56.4%	-	-	-
Terphenyl-d14	Surrogate	58.8%	-	-	-



Order #: 1944109

Report Date: 01-Nov-2019 Order Date: 28-Oct-2019

Project Description: 191-12948-00

# Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND ND	1.0 5.0	ug/g						
Copper Lead	ND	5.0 1.0	ug/g						
Mercury	ND	0.1	ug/g ug/g						
Molybdenum	ND	1.0	ug/g ug/g						
Nickel	ND	5.0	ug/g ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND ND	0.02	ug/g						
Chrysene Dibenzo [a,h] anthracene	ND	0.02 0.02	ug/g ug/g						
Fluoranthene	ND	0.02	ug/g ug/g						
Fluorene	ND	0.02	ug/g ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g		<b>a</b> c -				
Surrogate: 2-Fluorobiphenyl	1.19		ug/g		89.2	50-140			
Surrogate: Terphenyl-d14	1.42		ug/g		106	50-140			
Volatiles									
Acetone	ND	0.50	ug/g						
Benzene	ND	0.02	ug/g						
Bromodichloromethane	ND	0.05	ug/g						
Bromoform	ND	0.05	ug/g						
Bromomethane	ND	0.05	ug/g						
Carbon Tetrachloride	ND	0.05	ug/g						
Chlorobenzene	ND	0.05	ug/g						
Chloroform Dibromochloromethane	ND	0.05	ug/g						
Dibromocnioromethane	ND ND	0.05	ug/g						
Dichiorodifiuorometriane	ND	0.05	ug/g						



# Order #: 1944109

Report Date: 01-Nov-2019 Order Date: 28-Oct-2019

Project Description: 191-12948-00

# Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
1,2-Dichlorobenzene	ND	0.05	ug/g						
1,3-Dichlorobenzene	ND	0.05	ug/g						
1,4-Dichlorobenzene	ND	0.05	ug/g						
1,1-Dichloroethane	ND	0.05	ug/g						
1,2-Dichloroethane	ND	0.05	ug/g						
1,1-Dichloroethylene	ND	0.05	ug/g						
cis-1,2-Dichloroethylene	ND	0.05	ug/g						
trans-1,2-Dichloroethylene	ND	0.05	ug/g						
1,2-Dichloropropane	ND	0.05	ug/g						
cis-1,3-Dichloropropylene	ND	0.05	ug/g						
trans-1,3-Dichloropropylene	ND	0.05	ug/g						
1,3-Dichloropropene, total	ND	0.05	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Ethylene dibromide (dibromoethane	ND	0.05	ug/g						
Hexane	ND	0.05	ug/g						
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g						
Methyl Isobutyl Ketone	ND	0.50	ug/g						
Methyl tert-butyl ether	ND	0.05	ug/g						
Methylene Chloride	ND	0.05	ug/g						
Styrene	ND	0.05	ug/g						
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g						
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g						
Tetrachloroethylene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
1,1,1-Trichloroethane	ND	0.05	ug/g						
1,1,2-Trichloroethane	ND	0.05	ug/g						
Trichloroethylene	ND	0.05	ug/g						
Trichlorofluoromethane	ND	0.05	ug/g						
Vinyl chloride	ND	0.02	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: 4-Bromofluorobenzene	9.34	0.00	ug/g		117	50-140			
Surrogate: Dibromofluoromethane	8.56		ug/g ug/g		107	50-140			
Surrogate: Toluene-d8	8.22				107	50-140 50-140			
Surroyale. Toluene-uo	0.22		ug/g		105	50-140			



Order #: 1944109

Report Date: 01-Nov-2019 Order Date: 28-Oct-2019

Project Description: 191-12948-00

# Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	137	4	ug/g dry	120			13.2	30	
F3 PHCs (C16-C34)	218	8	ug/g dry ug/g dry	188			14.8	30	
F4 PHCs (C34-C50)	155	6 6	ug/g dry ug/g dry	148			5.0	30	
Metals		-	- 3- 3 7						
Antimony	2.1	1.0	ug/g dry	ND			0.0	30	
Arsenic	ND	1.0	ug/g dry	1.1			0.0	30	
Barium	37.1	1.0	ug/g dry	47.4			24.3	30	
Beryllium	ND	0.5	ug/g dry	ND			0.0	30	
Boron	5.5	5.0	ug/g dry	5.6			1.1	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND			0.0	35	
Chromium	8.7	5.0	ug/g dry	10.4			17.0	30	
Cobalt	2.6	1.0	ug/g dry ug/g dry	3.3			24.7	30	
Copper	5.5	5.0	ug/g dry ug/g dry	6.9			23.3	30	
Lead	2.9	1.0		3.7			23.3 22.1	30	
	2.9 ND	0.1	ug/g dry	3.7 ND			0.0	30	
Mercury	ND		ug/g dry					30 30	
Molybdenum		1.0	ug/g dry	ND			0.0		
Nickel	5.9	5.0	ug/g dry	7.1			19.6	30	
Selenium	ND	1.0	ug/g dry	ND			0.0	30	
Silver	ND	0.3	ug/g dry	ND			0.0	30	
Thallium	ND	1.0	ug/g dry	ND			0.0	30	
Uranium	ND	1.0	ug/g dry	ND			0.0	30	
Vanadium	12.6	10.0	ug/g dry	14.7			15.2	30	
Zinc	ND	20.0	ug/g dry	ND			0.0	30	
Physical Characteristics									
% Solids	80.6	0.1	% by Wt.	80.4			0.2	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	ND				40	
Acenaphthylene	ND	0.02	ug/g dry	ND				40	
Anthracene	0.027	0.02	ug/g dry	ND			0.0	40	
Benzo [a] anthracene	ND	0.02	ug/g dry	ND			0.0	40	
Benzo [a] pyrene	ND	0.02	ug/g dry	ND			0.0	40	
Benzo [b] fluoranthene	ND	0.02	ug/g dry	ND			0.0	40	
Benzo [g,h,i] perylene	ND	0.02	ug/g dry	ND				40	
Benzo [k] fluoranthene	ND	0.02	ug/g dry	ND				40	
Chrysene	ND	0.02	ug/g dry	ND			0.0	40	
Dibenzo [a,h] anthracene	ND	0.02	ug/g dry	ND				40	
Fluoranthene	0.027	0.02	ug/g dry	0.027			0.3	40	
Fluorene	ND	0.02	ug/g dry	ND			••••	40	
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g dry	ND				40	
1-Methylnaphthalene	ND	0.02	ug/g dry	ND				40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND				40	
Naphthalene	ND	0.02	ug/g dry ug/g dry	ND				40	
Phenanthrene	0.025	0.02	ug/g dry ug/g dry	0.025			1.5	40	
Pyrene	0.023	0.02	ug/g dry ug/g dry	0.023			2.4	40	
Surrogate: 2-Fluorobiphenyl	0.896	0.02	ug/g dry ug/g dry	0.020	52.0	50-140	<b>L</b> . <b>T</b>	.0	
Surrogate: Terphenyl-d14	0.890		ug/g dry ug/g dry		52.0 56.1	50-140 50-140			
Volatiles	0.307		ug/g ury		50.1	00-1 <del>4</del> 0			
		0.50						50	
Acetone	ND	0.50	ug/g dry	ND				50	
Benzene	ND	0.02	ug/g dry	ND				50	
Bromodichloromethane	ND	0.05	ug/g dry	ND				50	
Bromoform	ND	0.05	ug/g dry	ND				50	
Bromomethane	ND	0.05	ug/g dry	ND				50	
Carbon Tetrachloride	ND	0.05	ug/g dry	ND				50	
Chlorobenzene	ND	0.05	ug/g dry	ND				50	



Order #: 1944109

Report Date: 01-Nov-2019 Order Date: 28-Oct-2019

Project Description: 191-12948-00

# Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
2		-			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			-	
Chloroform	ND	0.05	ug/g dry	ND				50	
Dibromochloromethane	ND	0.05	ug/g dry	ND				50	
Dichlorodifluoromethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,3-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,4-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
cis-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
trans-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
1,2-Dichloropropane	ND	0.05	ug/g dry	ND				50	
cis-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
trans-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Ethylene dibromide (dibromoethane	ND	0.05	ug/g dry	ND				50	
Hexane	ND	0.05	ug/g dry	ND				50	
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g dry	ND				50	
Methyl Isobutyl Ketone	ND	0.50	ug/g dry	ND				50	
Methyl tert-butyl ether	ND	0.05	ug/g dry	ND				50	
Methylene Chloride	ND	0.05	ug/g dry	ND				50	
Styrene	ND	0.05	ug/g dry	ND				50	
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
Tetrachloroethylene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
1,1,1-Trichloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2-Trichloroethane	ND	0.05	ug/g dry ug/g dry	ND				50	
Trichloroethylene	ND	0.05	ug/g dry ug/g dry	ND				50	
Trichlorofluoromethane	ND	0.05	ug/g dry ug/g dry	ND				50 50	
Vinyl chloride	ND	0.03	ug/g dry ug/g dry	ND				50 50	
m,p-Xylenes	ND	0.02	ug/g dry ug/g dry	ND				50 50	
o-Xylene	ND	0.05		ND				50 50	
	ND 8.69	0.05	ug/g dry	ND	00 5	50-140		50	
Surrogate: 4-Bromofluorobenzene			ug/g dry		99.5 107				
Surrogate: Dibromofluoromethane	9.37		ug/g dry		107	50-140			
Surrogate: Toluene-d8	9.52		ug/g dry		109	50-140			



# Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	178	7	ug/g		88.9	80-120			
F2 PHCs (C10-C16)	193	4	ug/g	120	84.1	60-140			
F3 PHCs (C16-C34)	387	8	ug/g	188	93.3	60-140			
F4 PHCs (C34-C50)	276	6	ug/g	148	94.6	60-140			
Metals									
Antimony	42.7		ug/L	ND	85.3	70-130			
Arsenic	47.1		ug/L	ND	93.2	70-130			
Barium	70.4		ug/L	19.0	103	70-130			
Beryllium	52.4		ug/L	ND	105	70-130			
Boron	46.0		ug/L	ND	87.6	70-130			
Cadmium	50.0		ug/L	ND	100	70-130			
Chromium (VI)	4.5	0.2	ug/g		90.5	70-130			
Chromium	57.3		ug/L	ND	106	70-130			
Cobalt	50.6		ug/L	1.3	98.5	70-130			
Copper	53.5		ug/L	ND	102	70-130			
Lead	46.2		ug/L	1.5	89.5	70-130			
Mercury	1.22	0.1	ug/g	ND	81.5	70-130			
Molybdenum	48.5		ug/L	ND	96.8	70-130			
Nickel	53.7		ug/L	ND	102	70-130			
Selenium	49.3		ug/L	ND	98.4	70-130			
Silver	46.0		ug/L	ND	92.0	70-130			
Thallium	47.7		ug/L	ND	95.3	70-130			
Uranium	46.0		ug/L	ND	91.9	70-130			
Vanadium	57.5		ug/L	ND	103	70-130			
Zinc	57.6		ug/L	ND	99.4	70-130			
Semi-Volatiles									
Acenaphthene	0.137	0.02	ug/g	ND	63.6	50-140			
Acenaphthylene	0.120	0.02	ug/g	ND	55.8	50-140			
Anthracene	0.139	0.02	ug/g	ND	64.5	50-140			
Benzo [a] anthracene	0.131	0.02	ug/g	ND	61.0	50-140			
Benzo [a] pyrene	0.118	0.02	ug/g		70.6	50-140			
Benzo [b] fluoranthene	0.164	0.02	ug/g	ND	76.1	50-140			
Benzo [g,h,i] perylene	0.114	0.02	ug/g		68.6	50-140			
Benzo [k] fluoranthene	0.138	0.02	ug/g	ND	64.0	50-140			
Chrysene	0.170	0.02	ug/g	ND	79.0	50-140			
Dibenzo [a,h] anthracene	0.116	0.02	ug/g		69.6	50-140			
Fluoranthene	0.154	0.02	ug/g	0.027	58.9	50-140			
Fluorene	0.126	0.02	ug/g	ND	58.7	50-140			
Indeno [1,2,3-cd] pyrene	0.116	0.02	ug/g		69.6	50-140			
1-Methylnaphthalene	0.131	0.02	ug/g	ND	60.7	50-140			
2-Methylnaphthalene	0.141	0.02	ug/g	ND	65.4	50-140			
Naphthalene	0.131	0.01	ug/g	ND	60.8	50-140			
Phenanthrene	0.157	0.02	ug/g	0.025	61.5	50-140			
Pyrene	0.154	0.02	ug/g	0.023	60.7	50-140			
Surrogate: 2-Fluorobiphenyl	0.959		ug/g		55.7	50-140			
Volatiles									
Acetone	8.99	0.50	ug/g		89.9	50-140			
Benzene	3.54	0.02	ug/g		88.6	60-130			
Bromodichloromethane	3.98	0.05	ug/g		99.4	60-130			
Bromoform	3.69	0.05	ug/g		92.3	60-130			

Report Date: 01-Nov-2019 Order Date: 28-Oct-2019



# Order #: 1944109

Report Date: 01-Nov-2019 Order Date: 28-Oct-2019

Project Description: 191-12948-00

# Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Bromomethane	2.53	0.05	ug/g		63.3	50-140			
Carbon Tetrachloride	3.65	0.05	ug/g		91.3	60-130			
Chlorobenzene	3.91	0.05	ug/g		97.8	60-130			
Chloroform	3.96	0.05	ug/g		99.1	60-130			
Dibromochloromethane	3.70	0.05	ug/g		92.5	60-130			
Dichlorodifluoromethane	3.57	0.05	ug/g		89.3	50-140			
1,2-Dichlorobenzene	3.83	0.05	ug/g		95.7	60-130			
1,3-Dichlorobenzene	4.02	0.05	ug/g		100	60-130			
1,4-Dichlorobenzene	3.97	0.05	ug/g		99.2	60-130			
1,1-Dichloroethane	4.04	0.05	ug/g		101	60-130			
1,2-Dichloroethane	3.95	0.05	ug/g		98.7	60-130			
1,1-Dichloroethylene	3.26	0.05	ug/g		81.5	60-130			
cis-1,2-Dichloroethylene	3.68	0.05	ug/g		92.0	60-130			
trans-1,2-Dichloroethylene	3.27	0.05	ug/g		81.8	60-130			
1,2-Dichloropropane	3.79	0.05	ug/g		94.8	60-130			
cis-1,3-Dichloropropylene	3.53	0.05	ug/g		88.1	60-130			
trans-1,3-Dichloropropylene	3.67	0.05	ug/g		91.8	60-130			
Ethylbenzene	4.15	0.05	ug/g		104	60-130			
Ethylene dibromide (dibromoethane	3.43	0.05	ug/g		85.6	60-130			
Hexane	3.85	0.05	ug/g		96.3	60-130			
Methyl Ethyl Ketone (2-Butanone)	9.19	0.50	ug/g		91.9	50-140			
Methyl Isobutyl Ketone	7.32	0.50	ug/g		73.2	50-140			
Methyl tert-butyl ether	6.38	0.05	ug/g		63.8	50-140			
Methylene Chloride	3.14	0.05	ug/g		78.6	60-130			
Styrene	3.83	0.05	ug/g		95.7	60-130			
1,1,1,2-Tetrachloroethane	4.13	0.05	ug/g		103	60-130			
1,1,2,2-Tetrachloroethane	3.34	0.05	ug/g		83.5	60-130			
Tetrachloroethylene	3.39	0.05	ug/g		84.6	60-130			
Toluene	3.72	0.05	ug/g		92.9	60-130			
1,1,1-Trichloroethane	3.53	0.05	ug/g		88.1	60-130			
1,1,2-Trichloroethane	2.96	0.05	ug/g		74.1	60-130			
Trichloroethylene	3.19	0.05	ug/g		79.7	60-130			
Trichlorofluoromethane	3.21	0.05	ug/g		80.4	50-140			
Vinyl chloride	4.40	0.02	ug/g		110	50-140			
m,p-Xylenes	7.79	0.05	ug/g		97.4	60-130			
o-Xylene	4.17	0.05	ug/g		104	60-130			



#### **Qualifier Notes:**

None

**Sample Data Revisions** None

#### Work Order Revisions / Comments:

None

#### **Other Report Notes:**

n/a: not applicable ND: Not Detected MDL: Method Detection Limit Source Result: Data used as source for matrix and duplicate samples %REC: Percent recovery. RPD: Relative percent difference.

Soil results are reported on a dry weight basis when the units are denoted with 'dry'. Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

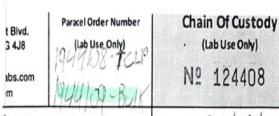
#### CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.

- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.
- When reported, data for F4G has been processed using a silica gel cleanup.







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Table 2 Ind/Comm 🛛 Coarse		-	<b>—</b>	T	1		BTEX											
Table 3 Agri/Other	SU - Sani SU - Storm			iners	Samo	e Taken	+			by ICP			2	5				
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Chain of Custody (Env.) xlsx

Revision 3.0

# APPENDIX D-2 TCLP





RELIABLE.

# Certificate of Analysis

# WSP Canada Inc. (Ottawa)

2611 Queensview Dr Ottawa, ON K2B 8K2 Attn: Adrian Menyhart

Client PO: Project: 191-12948-00 Custody: 124408

Report Date: 4-Nov-2019 Order Date: 28-Oct-2019

Order #: 1944108

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID **Client ID** 1944108-01 TCLP

Approved By:

Mark Frata

Mark Foto, M.Sc. Lab Supervisor

Any use of these results implies your agreement that our total liability in connection with this work, however arising, shall be limited to the amount paid by you for this work, and that our employees or agents shall not under any circumstances be liable to you in connection with this work.



## **Analysis Summary Table**

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Flashpoint	ASTM D93 - Pensky-Martens Closed Cup	29-Oct-19	29-Oct-19
Metals, ICP-MS	TCLP EPA 6020 - Digestion - ICP-MS	30-Oct-19	30-Oct-19
REG 558 - Cyanide	MOE E3015- Auto Colour	30-Oct-19	30-Oct-19
REG 558 - Fluoride	EPA 340.2 - ISE	30-Oct-19	30-Oct-19
REG 558 - Mercury by CVAA	EPA 7470A - Cold Vapour AA	30-Oct-19	30-Oct-19
REG 558 - NO3/NO2	EPA 300.1 - IC	30-Oct-19	30-Oct-19
REG 558 - PAHs	EPA 625 - GC-MS	31-Oct-19	1-Nov-19
REG 558 - VOCs	EPA 624 - P&T GC-MS	31-Oct-19	1-Nov-19
Solids, %	Gravimetric, calculation	29-Oct-19	29-Oct-19

Report Date: 04-Nov-2019 Order Date: 28-Oct-2019

Order #: 1944108



Report Date: 04-Nov-2019 Order Date: 28-Oct-2019

Project Description: 191-12948-00

7

	Client ID:	TCLP	1	i	
	Sample Date:	28-Oct-19 13:35	_	-	-
	Sample ID:	1944108-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	92.9	-	-	-
Flashpoint	°C	>70	-	-	-
EPA 1311 - TCLP Leachate Inorga					
Fluoride	0.05 mg/L	0.23	-	-	-
Nitrate as N	1 mg/L	<1	-	-	-
Nitrite as N	1 mg/L	<1	-	-	-
Cyanide, free	0.02 mg/L	<0.02	-	-	-
EPA 1311 - TCLP Leachate Metal	S				
Arsenic	0.05 mg/L	<0.05	-	-	-
Barium	0.05 mg/L	1.13	-	-	-
Boron	0.05 mg/L	<0.05	-	-	-
Cadmium	0.01 mg/L	<0.01	-	-	-
Chromium	0.05 mg/L	<0.05	-	-	-
Lead	0.05 mg/L	<0.05	-	-	-
Mercury	0.005 mg/L	<0.005	-	-	-
Selenium	0.05 mg/L	<0.05	-	-	-
Silver	0.05 mg/L	<0.05	-	-	-
Uranium	0.05 mg/L	<0.05	-	-	-
EPA 1311 - TCLP Leachate Volati					
Benzene	0.005 mg/L	<0.005	-	-	-
Carbon Tetrachloride	0.005 mg/L	<0.005	-	-	-
Chlorobenzene	0.004 mg/L	<0.004	-	-	-
Chloroform	0.006 mg/L	<0.006	-	-	-
1,2-Dichlorobenzene	0.004 mg/L	<0.004	-	-	-
1,4-Dichlorobenzene	0.004 mg/L	<0.004	-	-	-
1,2-Dichloroethane	0.005 mg/L	<0.005	-	-	-
1,1-Dichloroethylene	0.006 mg/L	<0.006	-	-	-
Methyl Ethyl Ketone (2-Butanone)	0.30 mg/L	<0.30	-	-	-
Methylene Chloride	0.04 mg/L	<0.04	-	-	-
Tetrachloroethylene	0.005 mg/L	<0.005	-	-	-
Trichloroethylene	0.004 mg/L	<0.004	-	-	-
Vinyl chloride	0.005 mg/L	<0.005	-	-	-
4-Bromofluorobenzene	Surrogate	107%	-	-	-
Dibromofluoromethane	Surrogate	87.4%	-	-	-
Toluene-d8	Surrogate	97.8%	-	-	-

EPA 1311 - TCLP Leachate Organics



Client: WSP Canada Inc. (Ottawa)

Certificate of Analysis

# Order #: 1944108

Report Date: 04-Nov-2019 Order Date: 28-Oct-2019

Project Description: 191-12948-00

	Sample Date:	28-Oct-19 13:35	-	-	-
	Sample ID:	1944108-01	-	-	-
	MDL/Units	Soil	-	-	-
Benzo [a] pyrene	0.0001 mg/L	<0.0001	-	-	-
Terphenyl-d14	Surrogate	119%	-	-	-



Order #: 1944108

Report Date: 04-Nov-2019 Order Date: 28-Oct-2019

Project Description: 191-12948-00

# Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
EPA 1311 - TCLP Leachate Inorga									
Fluoride	ND	0.05	mg/L						
Nitrate as N	ND	1	mg/L						
Nitrite as N	ND	1	mg/L						
Cyanide, free	ND	0.02	mg/L						
EPA 1311 - TCLP Leachate Metals	5								
Arsenic	ND	0.05	mg/L						
Barium	ND	0.05	mg/L						
Boron	ND	0.05	mg/L						
Cadmium	ND	0.01	mg/L						
Chromium	ND	0.05	mg/L						
Lead	ND	0.05	mg/L						
Mercury	ND	0.005	mg/L						
Selenium	ND	0.05	mg/L						
Silver	ND	0.05	mg/L						
Uranium	ND	0.05	mg/L						
EPA 1311 - TCLP Leachate Organ	ics								
Benzo [a] pyrene	ND	0.0001	mg/L						
Surrogate: Terphenyl-d14	0.21		mg/L		106	37.1-155.6			
EPA 1311 - TCLP Leachate Volatil	es								
Benzene	ND	0.005	mg/L						
Carbon Tetrachloride	ND	0.005	mg/L						
Chlorobenzene	ND	0.004	mg/L						
Chloroform	ND	0.006	mg/L						
1.2-Dichlorobenzene	ND	0.004	mg/L						
1,4-Dichlorobenzene	ND	0.004	mg/L						
1,2-Dichloroethane	ND	0.005	mg/L						
1,1-Dichloroethylene	ND	0.006	mg/L						
Methyl Ethyl Ketone (2-Butanone)	ND	0.30	mg/L						
Methylene Chloride	ND	0.04	mg/L						
Tetrachloroethylene	ND	0.005	mg/L						
Trichloroethylene	ND	0.004	mg/L						
Vinyl chloride	ND	0.005	mg/L						
Surrogate: 4-Bromofluorobenzene	0.719		mg/L		105	83-134			
Surrogate: Dibromofluoromethane	0.671		mg/L		97.5	78-124			
Surrogate: Toluene-d8	0.685		mg/L		99.6	76-118			
-			-						



Order #: 1944108

Report Date: 04-Nov-2019 Order Date: 28-Oct-2019

Project Description: 191-12948-00

# Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
EPA 1311 - TCLP Leachate Ind	organics								
Fluoride	0.11	0.05	mg/L	0.11			7.8	20	
Nitrate as N	ND	1	mg/L	ND				20	
Nitrite as N	ND	1	mg/L	ND				20	
Cyanide, free	ND	0.02	mg/L	ND				20	
EPA 1311 - TCLP Leachate Me	etals		-						
Arsenic	ND	0.05	mg/L	ND			0.0	29	
Barium	0.381	0.05	mg/L	0.373			2.1	34	
Boron	0.050	0.05	mg/L	ND			0.0	33	
Cadmium	ND	0.01	mg/L	ND			0.0	33	
Chromium	ND	0.05	mg/L	ND			0.0	32	
Lead	ND	0.05	mg/L	ND			0.0	32	
Mercury	ND	0.005	mg/L	ND			0.0	30	
Selenium	ND	0.05	mg/L	ND			0.0	28	
Silver	ND	0.05	mg/L	ND			0.0	28	
Uranium	ND	0.05	mg/L	ND			0.0	27	
Physical Characteristics			5						
% Šolids	80.6	0.1	% by Wt.	80.4			0.2	25	



# Method Quality Control: Spike

Report Date: 04-Nov-2019 Order Date: 28-Oct-2019

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
EPA 1311 - TCLP Leachate I	norganics								
Fluoride	0.69	0.05	mg/L	0.11	114	70-130			
Nitrate as N	11	1	mg/L	ND	107	81-112			
Nitrite as N	9	1	mg/L	ND	90.4	76-107			
Cyanide, free	0.054	0.02	mg/L	ND	109	60-136			
EPA 1311 - TCLP Leachate	<b>Netals</b>								
Arsenic	49.3		ug/L	0.211	98.2	83-119			
Barium	87.3		ug/L	37.3	100	83-116			
Boron	45.8		ug/L	4.83	82.0	71-128			
Cadmium	49.5		ug/L	0.185	98.6	78-119			
Chromium	57.3		ug/L	0.306	114	80-124			
Lead	42.2		ug/L	0.896	82.7	77-126			
Mercury	0.0327	0.005	mg/L	ND	109	70-130			
Selenium	41.8		ug/L	0.196	83.2	81-125			
Silver	42.6		ug/L	0.104	85.0	70-128			
Uranium	46.6		ug/L	0.751	91.7	70-131			
EPA 1311 - TCLP Leachate (	Drganics								
Benzo [a] pyrene	0.0466	0.0001	mg/L		93.2	39-123			
Surrogate: Terphenyl-d14	0.22		mg/L		109	37.1-155.6			
EPA 1311 - TCLP Leachate \	/olatiles								
Benzene	44.8		ug/L		112	55-141			
Carbon Tetrachloride	27.9		ug/L		69.8	49-149			
Chlorobenzene	35.9		ug/L		89.8	64-137			
Chloroform	33.2		ug/L		83.1	58-138			
1,2-Dichlorobenzene	40.4		ug/L		101	60-150			
1,4-Dichlorobenzene	39.1		ug/L		97.8	63-132			
1,2-Dichloroethane	26.8		ug/L		66.9	50-140			
1,1-Dichloroethylene	38.4		ug/L		95.9	43-153			
Methyl Ethyl Ketone (2-Butanone)	75.0		ug/L		75.0	26-153			
Methylene Chloride	33.3		ug/L		83.3	58-149			
Tetrachloroethylene	37.5		ug/L		93.8	51-145			
Trichloroethylene	46.9		ug/L		117	52-135			
Vinyl chloride	37.5		ug/L		93.7	31-159			



Login Qualifiers :

Sample - F1/BTEX/VOCs (soil) not submitted according to Reg. 153/04, Amended 2011 - not field preserved Applies to samples: TCLP

**Sample Data Revisions** 

None

Work Order Revisions / Comments:

None

#### **Other Report Notes:**

n/a: not applicable ND: Not Detected MDL: Method Detection Limit Source Result: Data used as source for matrix and duplicate samples %REC: Percent recovery. RPD: Relative percent difference.

Soil results are reported on a dry weight basis when the units are denoted with 'dry'. Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

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Regulation 153/04	Other Rep	D PWQO	M	atrix Ty W (Sur	face W	(Soil/Sed.) GW (ater) SS (Storm, aint) A (Air) O (	(Ground Water) /Sanitary Sewer) Other)						Req	uired Ar	nalysis			
Table 2 Ind/Comm X Coarse Table 3 Agri/Other Table For RSC: Yes No	CCME SU - Sani Mun : Other:	☐ MISA ☐ SU - Storm	Matrix	Air Volume	of Containers		ple Taken	PHCs F1-F4+BTEX	vocs	PAHS	Metals by ICP	Hg	B (HWS)	Telp &				
Sample ID/Location 1 BH19-9-552 2 TCLP 3	n Name		S S	Air	# 2 -	Date 0.4.28 0.4.28	Time 1:20 pm 1:35pm		> /	4	/	1 C		/	< 00	_	(+14) 502~	-
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A Flashford REG 558: MET Relinquished By (Print): Relinquished By (Print): MM (UN) Date/Time: OCT 28 2019	HINORG SSI MUNYHART	Date/Time:	78	Jenot:	Sec	DUSE		800 89 13	2010	n °c	00	Ump ,28		1	роф 13-2 Ву:	2-1		1/30

Chain of Custody (Env.) xlsx

# APPENDIX

## **D-3** GROUNDWATER





351 Nash Road North, unit 9B Hamilton, ON L8H 7P4 1-800-749-1947 www.paracellabs.com

### Certificate of Analysis

### WSP Canada Inc. (Ottawa)

2611 Queensview Dr Ottawa, ON K2B 8K2 Attn: Adrian Menyhart

Client PO: Project: 191-12948-00 Custody: 124027

Report Date: 12-Nov-2019 Order Date: 5-Nov-2019

Order #: 1945295

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Approved By:

Dale Robertson, BSc Laboratory Director



### Certificate of Analysis Client: WSP Canada Inc. (Ottawa) Client PO:

### Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	8-Nov-19	8-Nov-19
Chromium, hexavalent - water	MOE E3056 - colourimetric	7-Nov-19	7-Nov-19
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	6-Nov-19	7-Nov-19
Metals, ICP-MS	EPA 200.8 - ICP-MS	6-Nov-19	6-Nov-19
PHC F1	CWS Tier 1 - P&T GC-FID	7-Nov-19	8-Nov-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	12-Nov-19	10-Nov-19
REG 153: PAHs by GC-MS	EPA 625 - GC-MS, extraction	6-Nov-19	8-Nov-19
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	7-Nov-19	8-Nov-19



Certificate of Analysis Client: WSP Canada Inc. (Ottawa) Client PO: Report Date: 12-Nov-2019 Order Date: 5-Nov-2019 Project Description: 191-12948-00

### **Summary of Exceedances**

(If this page is blank then there are no exceedances)

Only those criteria that a sample exceeds will be highlighted in red

#### **Regulatory Comparison:**

Paracel Laboratories has provided regulatory guidelines on this report for informational purposes only and makes no representations or warranties that the data is accurate or reflects the current regulatory values. The user is advised to consult with the appropriate official regulations to evaluate compliance. Sample results that are highlighted have exceeded the selected regulatory limit. Calculated uncertainty estimations have not been applied for determining regulatory exceedances. Regulatory limits displayed in brackets, (), applies to medium and fine textured soils.

Criteria:

Client ID	Analyte	MDL / Units	Result	Reg 153/04 (2011)-Table 3 Non-Potable Groundwater
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### Certificate of Analysis Client: WSP Canada Inc. (Ottawa)

Client PO:

Report Date: 12-Nov-2019 Order Date: 5-Nov-2019

 BH19-10
 DUP

 04-Nov-2019
 04-Nov-2019

 1945295-03
 1945295-04

 Reg 153/04 (2011)-Table 3 Non-Potable

 Groundwater

	Campie Date:	011101 2010	011101 2010	011101 2010	011107 2010	Criteria	a:
	Sample ID:	1945295-01	1945295-02	1945295-03	1945295-04	Reg 153/04 (2011)-Tabl	
	Matrix:	Water	Water	Water	Water	Groundwa	ater
	MDL/Units						
Metals				i	i		
Mercury	0.1 ug/L	<0.1	<0.1	-	<0.1	0.29	ug/L
Antimony	0.5 ug/L	<0.5	<0.5	-	<0.5	20,000	ug/L
Arsenic	1 ug/L	<1	<1	-	<1	1,900	ug/L
Barium	1 ug/L	236	181	-	184	29,000	ug/L
Beryllium	0.5 ug/L	<0.5	<0.5	-	<0.5	67	ug/L
Boron	10 ug/L	55	72	-	71	45,000	ug/L
Cadmium	0.1 ug/L	<0.1	<0.1	-	<0.1	2.7	ug/L
Chromium	1 ug/L	<1	<1	-	<1	810	ug/L
Chromium (VI)	10 ug/L	<10	<10	-	<10	140	ug/L
Cobalt	0.5 ug/L	0.9	<0.5	-	<0.5	66	ug/L
Copper	0.5 ug/L	0.5	<0.5	-	<0.5	87	ug/L
Lead	0.1 ug/L	<0.1	<0.1	-	<0.1	25	ug/L
Molybdenum	0.5 ug/L	3.3	0.7	-	0.5	9,200	ug/L
Nickel	1 ug/L	2	<1	-	<1	490	ug/L
Selenium	1 ug/L	<1	<1	-	<1	63	ug/L
Silver	0.1 ug/L	<0.1	<0.1	-	<0.1	1.5	ug/L
Sodium	200 ug/L	651000	402000	-	397000	2,300,000	ug/L
Thallium	0.1 ug/L	<0.1	<0.1	-	<0.1	510	ug/L
Uranium	0.1 ug/L	0.3	0.2	-	0.1	420	ug/L
Vanadium	0.5 ug/L	<0.5	<0.5	-	<0.5	250	ug/L
Zinc	5 ug/L	<5	6	-	<5	1,100	ug/L
/olatiles			•	•	•		
Acetone	5.0 ug/L	<5.0	-	<5.0	-	130,000	ug/L

BH19-4

04-Nov-2019

BH19-6

04-Nov-2019

Client ID: Sample Date:

### PARACEL LABORATORIES LTD.

### Certificate of Analysis Client: WSP Canada Inc. (Ottawa) Client PO:

Report Date: 12-Nov-2019 Order Date: 5-Nov-2019

Project Description: 191-12948-00

	Client ID:	BH19-6	BH19-4	BH19-10	DUP	
	Sample Date:	04-Nov-2019	04-Nov-2019	04-Nov-2019	04-Nov-2019	Criteria:
	Sample ID:	1945295-01	1945295-02	1945295-03	1945295-04	Reg 153/04 (2011)-Table 3 Non-Potable
	Matrix:	Water	Water	Water	Water	Groundwater
	MDL/Units					
Benzene	0.5 ug/L	<0.5	-	<0.5	-	44 ug/L
Bromodichloromethane	0.5 ug/L	<0.5	-	<0.5	-	85,000 ug/L
Bromoform	0.5 ug/L	<0.5	-	<0.5	-	380 ug/L
Bromomethane	0.5 ug/L	<0.5	-	<0.5	-	5.6 ug/L
Carbon Tetrachloride	0.2 ug/L	<0.2	-	<0.2	-	0.79 ug/L
Chlorobenzene	0.5 ug/L	<0.5	-	<0.5	-	630 ug/L
Chloroform	0.5 ug/L	<0.5	-	<0.5	-	2.4 ug/L
Dibromochloromethane	0.5 ug/L	<0.5	-	<0.5	-	82,000 ug/L
Dichlorodifluoromethane	1.0 ug/L	<1.0	-	<1.0	-	4,400 ug/L
1,2-Dichlorobenzene	0.5 ug/L	<0.5	-	<0.5	-	4,600 ug/L
1,3-Dichlorobenzene	0.5 ug/L	<0.5	-	<0.5	-	9,600 ug/L
1,4-Dichlorobenzene	0.5 ug/L	<0.5	-	<0.5	-	8 ug/L
1,1-Dichloroethane	0.5 ug/L	<0.5	-	<0.5	-	320 ug/L
1,2-Dichloroethane	0.5 ug/L	<0.5	-	<0.5	-	1.6 ug/L
1,1-Dichloroethylene	0.5 ug/L	<0.5	-	<0.5	-	1.6 ug/L
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	<0.5	-	1.6 ug/L
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	<0.5	-	1.6 ug/L
1,2-Dichloropropane	0.5 ug/L	<0.5	-	<0.5	-	16 ug/L
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	<0.5	-	
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	<0.5	-	
1,3-Dichloropropene, total	0.5 ug/L	<0.5	-	<0.5	-	5.2 ug/L
Ethylbenzene	0.5 ug/L	<0.5	-	<0.5	-	2,300 ug/L
Ethylene dibromide (dibromoeth	0.2 ug/L	<0.2	-	<0.2	-	0.25 ug/L

### PARACEL LABORATORIES LTD.

### Certificate of Analysis Client: WSP Canada Inc. (Ottawa) Client PO:

Report Date: 12-Nov-2019 Order Date: 5-Nov-2019 Project Description: 191-12948-00

BH19-6 BH19-4 BH19-10 DUP Client ID: Sample Date: 04-Nov-2019 04-Nov-2019 04-Nov-2019 04-Nov-2019 Criteria: 1945295-01 1945295-02 1945295-03 1945295-04 Sample ID: Reg 153/04 (2011)-Table 3 Non-Potable Groundwater Matrix: Water Water Water Water **MDL/Units** Hexane 1.0 ug/L <1.0 <1.0 -\_ 51 ug/L Methyl Ethyl Ketone (2-Butanon 5.0 ug/L <5.0 <5.0 --470,000 ug/L Methyl Isobutyl Ketone 5.0 ug/L < 5.0 < 5.0 --140.000 ug/L Methyl tert-butyl ether 2.0 ug/L <2.0 <2.0 190 ug/L --Methylene Chloride <5.0 <5.0 5.0 ug/L -610 ug/L Styrene 0.5 ug/L <0.5 <0.5 --1,300 ug/L 1,1,1,2-Tetrachloroethane 0.5 ug/L < 0.5 < 0.5 -3.3 ug/L -1.1.2.2-Tetrachloroethane 0.5 ug/L < 0.5 < 0.5 -3.2 ug/L \_ 0.5 ug/L Tetrachloroethylene < 0.5 < 0.5 -1.6 ug/L -Toluene 0.5 ug/L < 0.5 < 0.5 --18,000 ug/L 1.1.1-Trichloroethane 0.5 ug/L < 0.5 < 0.5 --640 ug/L 1,1,2-Trichloroethane 0.5 ug/L < 0.5 < 0.5 -4.7 ug/L -Trichloroethylene 0.5 ug/L < 0.5 < 0.5 -\_ 1.6 ug/L Trichlorofluoromethane 1.0 ug/L <1.0 <1.0 --2,500 ug/L Vinyl chloride 0.5 ug/L < 0.5 < 0.5 0.5 ug/L -< 0.5 < 0.5 m,p-Xylenes 0.5 ug/L --0.5 ug/L o-Xylene < 0.5 < 0.5 --< 0.5 Xvlenes, total 0.5 ug/L < 0.5 -\_ 4,200 ug/L Surrogate 112% 112% 4-Bromofluorobenzene -\_ Dibromofluoromethane 111% Surrogate 109% --97.9% Toluene-d8 Surrogate 96.9% --< 0.5 Benzene 0.5 ug/L --< 0.5 44 ug/L Ethvlbenzene 0.5 ug/L < 0.5 <0.5 2,300 ug/L --Toluene 0.5 ug/L < 0.5 < 0.5 --18.000 ug/L

### PARACEL LABORATORIES LTD.

### Certificate of Analysis Client: WSP Canada Inc. (Ottawa)

Client PO:

Report Date: 12-Nov-2019 Order Date: 5-Nov-2019 Project Description: 191-12948-00

	Client ID:	BH19-6	BH19-4	BH19-10	DUP	
	Sample Date:	04-Nov-2019	04-Nov-2019	04-Nov-2019	04-Nov-2019	Criteria:
	Sample ID:	1945295-01	1945295-02	1945295-03	1945295-04	Reg 153/04 (2011)-Table 3 Non-Potable
	Matrix:	Water	Water	Water	Water	Groundwater
	MDL/Units					
m,p-Xylenes	0.5 ug/L	-	<0.5	-	<0.5	
o-Xylene	0.5 ug/L	-	<0.5	-	<0.5	
Xylenes, total	0.5 ug/L	-	<0.5	-	<0.5	4,200 ug/L
Toluene-d8	Surrogate	-	97.9%	-	97.5%	
Hydrocarbons						
F1 PHCs (C6-C10)	25 ug/L	<25	<25	<25	<25	750 ug/L
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100 [1]	<100	150 ug/L
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100 [1]	<100	500 ug/L
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100 [1]	<100	500 ug/L
Semi-Volatiles						
Acenaphthene	0.05 ug/L	<0.05	<0.05	-	<0.05	600 ug/L
Acenaphthylene	0.05 ug/L	<0.05	<0.05	-	<0.05	1.8 ug/L
Anthracene	0.01 ug/L	<0.01	<0.01	-	<0.01	2.4 ug/L
Benzo [a] anthracene	0.01 ug/L	<0.01	<0.01	-	<0.01	4.7 ug/L
Benzo [a] pyrene	0.01 ug/L	<0.01	<0.01	-	<0.01	0.81 ug/L
Benzo [b] fluoranthene	0.05 ug/L	<0.05	<0.05	-	<0.05	0.75 ug/L
Benzo [g,h,i] perylene	0.05 ug/L	<0.05	<0.05	-	<0.05	0.2 ug/L
Benzo [k] fluoranthene	0.05 ug/L	<0.05	<0.05	-	<0.05	0.4 ug/L
Chrysene	0.05 ug/L	<0.05	<0.05	-	<0.05	1 ug/L
Dibenzo [a,h] anthracene	0.05 ug/L	<0.05	<0.05	-	<0.05	0.52 ug/L
Fluoranthene	0.01 ug/L	<0.01	<0.01	-	<0.01	130 ug/L
Fluorene	0.05 ug/L	<0.05	<0.05	-	<0.05	400 ug/L
Indeno [1,2,3-cd] pyrene	0.05 ug/L	<0.05	<0.05	-	<0.05	
1-Methylnaphthalene	0.05 ug/L	<0.05	<0.05	-	<0.05	1,800 ug/L



### Certificate of Analysis Client: WSP Canada Inc. (Ottawa)

Client PO:

	Client ID: Sample Date: Sample ID:	BH19-6 04-Nov-2019 1945295-01	BH19-4 04-Nov-2019 1945295-02	BH19-10 04-Nov-2019 1945295-03	DUP 04-Nov-2019 1945295-04	Criteria: Reg 153/04 (2011)-Table 3 Non-Potable Groundwater
	Matrix: MDL/Units	Water	Water	Water	Water	
2-Methylnaphthalene	0.05 ug/L	<0.05	<0.05	-	<0.05	1,800 ug/L
Methylnaphthalene (1&2)	0.10 ug/L	<0.10	<0.10	-	<0.10	1,800 ug/L
Naphthalene	0.05 ug/L	<0.05	<0.05	-	<0.05	1,400 ug/L
Phenanthrene	0.05 ug/L	<0.05	<0.05	-	<0.05	580 ug/L
Pyrene	0.01 ug/L	<0.01	<0.01	-	<0.01	68 ug/L
2-Fluorobiphenyl	Surrogate	80.9%	85.3%	-	79.4%	
Terphenyl-d14	Surrogate	110%	120%	-	112%	

Certificate of Analysis Client: WSP Canada Inc. (Ottawa)

Client PO:

### **Method Quality Control: Blank**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
drocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
etals			0						
Mercury	ND	0.1	ug/L						
Antimony	ND	0.5	ug/L						
Arsenic	ND	1	ug/L						
Barium	ND	1	ug/L						
Beryllium	ND	0.5	ug/L						
Boron	ND	10	ug/L						
Cadmium	ND	0.1	ug/L						
	ND		ug/L						
Chromium (VI) Chromium	ND	10	ug/L						
		1	ug/L						
Cobalt	ND	0.5	ug/L						
Copper	ND	0.5	ug/L						
Lead	ND	0.1	ug/L						
Molybdenum	ND	0.5	ug/L						
Nickel	ND	1	ug/L						
Selenium	ND	1	ug/L						
Silver	ND	0.1	ug/L						
Sodium	ND	200	ug/L						
Thallium	ND	0.1	uğ/L						
Uranium	ND	0.1	ug/L						
Vanadium	ND	0.5	ug/L						
Zinc	ND	5	ug/L						
mi-Volatiles									
Acenaphthene	ND	0.05	ug/L						
Acenaphthylene	ND	0.05	ug/L						
Anthracene	ND	0.01	ug/L						
Benzo [a] anthracene	ND	0.01	ug/L						
Benzo [a] pyrene	ND	0.01	ug/L						
Benzo [b] fluoranthene	ND	0.05	ug/L						
Benzo [g,h,i] perylene	ND	0.05	ug/L						
Benzo [k] fluoranthene	ND	0.05	ug/L						
Chrysene	ND	0.05	ug/L						
Dibenzo [a,h] anthracene	ND	0.05	ug/L						
Fluoranthene	ND	0.03	ug/L						
Fluorene	ND	0.05	ug/L						
Indeno [1,2,3-cd] pyrene	ND	0.05	ug/L						

### Certificate of Analysis Client: WSP Canada Inc. (Ottawa)

Client PO:

### Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
I-Methylnaphthalene	ND	0.05	ug/L						
2-Methylnaphthalene	ND	0.05	ug/L						
Methylnaphthalene (1&2)	ND	0.10	ug/L						
Naphthalene	ND	0.05	ug/L						
Phenanthrene	ND	0.05	ug/L						
Pyrene	ND	0.01	ug/L						
Surrogate: 2-Fluorobiphenyl	19.2	0.01	ug/L		96.1	50-140			
Surrogate: Terphenyl-d14	22.3		ug/L		112	50-140			
	22.5		ug/L		112	50-140			
	ND	5.0							
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane	ND	0.2	uğ/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						

### Certificate of Analysis Client: WSP Canada Inc. (Ottawa) Client PO:

### Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	86.2		ug/L		108	50-140			
Surrogate: Dibromofluoromethane	83.6		ug/L		105	50-140			
Surrogate: Toluene-d8	79.2		ug/L		99.0	50-140			
Benzene	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: Toluene-d8	79.2		ug/L		99.0	50-140			

Certificate of Analysis Client: WSP Canada Inc. (Ottawa)

Client PO:

Analyte

### Method Quality Control: Duplicate

Reporting

Result Limit

Hydrocarbons							
F1 PHCs (C6-C10)	ND	25	ug/L	ND		30	
Metals			0				
Mercury	ND	0.1	ug/L	ND	0.0	20	
Antimony	ND	0.5	ug/L	ND	0.0	20	
Arsenic	ND	1	ug/L	ND	0.0	20	
Barium	64.1	1	ug/L	61.8	3.6	20	
Beryllium	ND	0.5	ug/L	ND	0.0	20	
Boron	82	10	ug/L	86	5.0	20	
Cadmium	ND	0.1	ug/L	ND	0.0	20	
Chromium (VI)	ND	10	ug/L	ND	0.0	20	
Chromium	ND	1	ug/L	ND	0.0	20	
Cobalt	ND	0.5	ug/L	ND	0.0	20	
Copper	1.10	0.5	ug/L	1.13	2.8	20	
Lead	0.13	0.5	ug/L	ND	0.0	20	
Molybdenum	ND	0.5	ug/L	ND	0.0	20	
Nickel	ND	1	ug/L	ND	0.0	20	
Selenium	1.4	1		1.4	2.4	20	
Silver	ND	0.1	ug/L ug/L	ND	2.4	20	
Sodium	63700	200	ug/L	69900	9.2	20	
Thallium	ND	0.1	ug/L	ND	9.2 0.0	20	
Uranium	0.4	0.1	ug/L	0.4	12.7	20	
Vanadium	ND	0.1		ND	0.0	20	
Zinc	ND	0.5 5	ug/L	ND	0.0	20	
	ND	5	ug/L	ND	0.0	20	
Volatiles							
Acetone	ND	5.0	ug/L	ND		30	
Benzene	ND	0.5	ug/L	ND		30	
Bromodichloromethane	ND	0.5	ug/L	ND		30	
Bromoform	ND	0.5	ug/L	ND		30	
Bromomethane	ND	0.5	ug/L	ND		30	
Carbon Tetrachloride	ND	0.2	ug/L	ND		30	
Chlorobenzene	ND	0.5	ug/L	ND		30	
Chloroform	ND	0.5	ug/L	ND		30	
Dibromochloromethane	ND	0.5	ug/L	ND		30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND		30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND		30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND		30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND		30	
1,1-Dichloroethane	ND	0.5	ug/L	ND		30	
1,2-Dichloroethane	ND	0.5				30	

Source

Result

Units

%REC

%REC

Limit

RPD

Limit

RPD

Report Date: 12-Nov-2019 Order Date: 5-Nov-2019 Project Description: 191-12948-00

Notes

### Certificate of Analysis Client: WSP Canada Inc. (Ottawa) Client PO:

### Method Quality Control: Duplicate

1,1-Dichloroethylene         ND         0.5         ug/L         ND         30           cis-1,2-Dichloroethylene         ND         0.5         ug/L         ND         30           rtrans-1,2-Dichloroethylene         ND         0.5         ug/L         ND         30           1,2-Dichloroethylene         ND         0.5         ug/L         ND         30           cis-1,3-Dichloroethylene         ND         0.5         ug/L         ND         30           cis-1,3-Dichloropropylene         ND         0.5         ug/L         ND         30           Ethyleneraler         ND         0.5         ug/L         ND         30           Ethylene dibromide (dibromoethane         ND         0.5         ug/L         ND         30           Ethylene dibromide (dibromoethane         ND         0.5         ug/L         ND         30           Methyl Ethyl Ketone (2-Butanone)         ND         5.0         ug/L         ND         30           Methyl fer-butyl ether         ND         2.0         ug/L         ND         30           Styrene         ND         0.5         ug/L         ND         30           1,1.1.2-Etrachloroethane         ND         0	Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
cis.1.2-DichloroethyleneND0.5uğl.ND301.2-DichloropropaneND0.5ugl.ND301.2-DichloropropaneND0.5ugl.ND301:1.3-DichloropropyleneND0.5ugl.ND30trans.1.3-DichloropropyleneND0.5ugl.ND30EthylenzeneND0.5ugl.ND30HexaneND0.2ugl.ND30HexaneND5.0ugl.ND30Hethyl Esobuly Ketone (2-Butanone)ND5.0ugl.ND30Methyl Isobuly KetoneND5.0ugl.ND30Methyl Isobuly KetoneND5.0ugl.ND30Methyl Isobuly KetoneND5.0ugl.ND30Methyl Isobuly KetoneND5.0ugl.ND30Methyl Isobuly KetoneND5.0ugl.ND30Methyl Isobuly KetoneND5.0ugl.ND301,1,2-TetrachoroethaneND0.5ugl.ND301,1,1,2-TetrachoroethaneND0.5ugl.ND301,1,1,2-TetrachoroethaneND0.5ugl.ND301,1,1,2-TetrachoroethaneND0.5ugl.ND301,1,1,2-TetrachoroethaneND0.5ugl.ND301,1,1,2-TetrachoroethaneND0.5ugl.ND30<	1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
1.2-Dichloropropylene       ND       0.5       ug/L       ND       30         cis:1.3-Dichloropropylene       ND       0.5       ug/L       ND       30         Ethylbenzene       ND       0.5       ug/L       ND       30         Ethylbenzene       ND       0.5       ug/L       ND       30         Ethylbenzene       ND       0.5       ug/L       ND       30         Hexane       ND       1.0       ug/L       ND       30         Methyl Ethyl Ketone (2-Butanone)       ND       5.0       ug/L       ND       30         Methyl Isobutyl Ketone       ND       5.0       ug/L       ND       30         Methyl Isobutyl Ketone       ND       5.0       ug/L       ND       30         Methyl Isobutyl Ketone       ND       5.0       ug/L       ND       30         Styrene       ND       0.5       ug/L       ND       30         Styrene       ND       0.5       ug/L       ND       30         Tickloroethane       ND       0.5       ug/L       ND       30         Tickloroethane       ND       0.5       ug/L       ND       30	cis-1,2-Dichloroethylene	ND	0.5		ND				30	
1.2-Dichloropropylene       ND       0.5       ug/L       ND       30         cis:1.3-Dichloropropylene       ND       0.5       ug/L       ND       30         Ethylbenzene       ND       0.5       ug/L       ND       30         Ethylbenzene       ND       0.5       ug/L       ND       30         Ethylbenzene       ND       0.5       ug/L       ND       30         Methyl Ethyl Kotone (2-Butanone)       ND       5.0       ug/L       ND       30         Methyl Ethyl Kotone (2-Butanone)       ND       5.0       ug/L       ND       30         Methyl Ethyl Kotone (2-Butanone)       ND       5.0       ug/L       ND       30         Methyl terbuly ether       ND       5.0       ug/L       ND       30         Methyl terbuly ether       ND       0.5       ug/L       ND       30         Strorene       ND       0.5       ug/L       ND       30         1,1,2.2 Tetrachloroethane       ND       0.5       ug/L       ND       30         1,1,2.2 Tetrachloroethane       ND       0.5       ug/L       ND       30         1,1,1.7 tichloroethane       ND       0.5	trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene         ND         0.5         ug/L         ND         30           trans-1,3-Dichloropropylene         ND         0.5         ug/L         ND         30           Ethylene aftormide (ditormoethane.         ND         0.5         ug/L         ND         30           Hexane         ND         1.0         ug/L         ND         30           Methyl Ethyl Ketone (2-Butanone)         ND         5.0         ug/L         ND         30           Methyl bert-buly ether         ND         5.0         ug/L         ND         30           Methyl terbuly ether         ND         5.0         ug/L         ND         30           Styrene         ND         0.5         ug/L         ND         30           Styrene         ND         0.5         ug/L         ND         30           1,1,1.2-Tetrachloroethane         ND         0.5         ug/L         ND         30           Totlene         ND         0.5         ug/L         ND         30           1,1,1.2-Tickloroethane         ND         0.5         ug/L         ND         30           Tickloroethylene         ND         0.5         ug/L         ND		ND	0.5	ug/L	ND				30	
Ethylpenzene         ND         0.5         uğl.         ND         30           Ethylene dibromide (dibromoethane.         ND         0.2         ugl.         ND         30           Hexane         ND         1.0         ugl.         ND         30           Methyl Ethyl Ketone (2-Butanone)         ND         5.0         ugl.         ND         30           Methyl Ethyl tert-butyl ether         ND         5.0         ugl.         ND         30           Methyl tert-butyl ether         ND         5.0         ugl.         ND         30           Methyl tert-butyl ether         ND         5.0         ugl.         ND         30           Styrene         ND         0.5         ugl.         ND         30           1,1,2-2 Tetrachioroethane         ND         0.5	cis-1,3-Dichloropropylene	ND		ug/L	ND					
Ethylpenzene       ND       0.5       ug/L       ND       30         Ethylpenzen formide (diromeethane.       ND       1.0       ug/L       ND       30         Metnyl Ethyl Ketone (2-Butanone)       ND       5.0       ug/L       ND       30         Metnyl Isbolutyl Ketone       ND       5.0       ug/L       ND       30         Styrene       ND       0.5       ug/L       ND       30         1,1,2:Tetrachloroethane       ND       0.5       ug/L       ND       30         Tollower       ND       0.5       ug/L       ND       30         1,1,2:Tetrachloroethane       ND       0.5       ug/L       ND       30         1,1,2:Tetrachloroethane       ND       0.5 <t< td=""><td></td><td>ND</td><td>0.5</td><td>ug/L</td><td>ND</td><td></td><td></td><td></td><td>30</td><td></td></t<>		ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane         ND         0.2         ug/L         ND         30           Hexane         ND         1.0         ug/L         ND         30           Methyl Ethyl Ketone (2-Butanone)         ND         5.0         ug/L         ND         30           Methyl Isobutyl Ketone         ND         2.0         ug/L         ND         30           Methyl Iet-butyl ether         ND         2.0         ug/L         ND         30           Methyl Etri-butyl ether         ND         5.0         ug/L         ND         30           Styrene         ND         0.5         ug/L         ND         30           1,1,2.2-Tetrachloroethane         ND         0.5         ug/L         ND         30           Toluene         ND         0.5         ug/L         ND         30           Tichioroethane         ND         0.5         ug/L         ND         30	Ethylbenzene	ND	0.5	ug/L	ND				30	
Hexane     ND     1.0     ug/L     ND     30       Methyl Etyl Ketone (2)     ND     5.0     ug/L     ND     30       Methyl Isobutyl Ketone     ND     5.0     ug/L     ND     30       Methyl terb-butyl ether     ND     2.0     ug/L     ND     30       Methyl terb-butyl ether     ND     2.0     ug/L     ND     30       Styrene     ND     0.5     ug/L     ND     30       Styrene     ND     0.5     ug/L     ND     30       1,1,2-Tetrachloroethane     ND     0.5     ug/L     ND     30       1,1,2-Tetrachloroethane     ND     0.5     ug/L     ND     30       1,1,1-Trichloroethane     ND     0.5     ug/L     ND     30       1,1,1-Trichloroethane     ND     0.5     ug/L     ND     30       1,1,1-Trichloroethane     ND     0.5     ug/L     ND     30       Trichloroethylene     ND     0.5     ug/L     ND     30       Trichloroethylene     ND     0.5     ug/L     ND     30       Trichlorofluoromethane     ND     0.5     ug/L     ND     30       Surrogate: 4-Bromofluorobenzene     87.4     ug/L	Ethylene dibromide (dibromoethane	ND	0.2	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)     ND     5.0     ug/L     ND     30       Methyl Isobulyl Ketone     ND     5.0     ug/L     ND     30       Methyl Ier-bulyl ether     ND     5.0     ug/L     ND     30       Methyl Ier-bulyl ether     ND     5.0     ug/L     ND     30       Methyl Ier-bulyl ether     ND     5.0     ug/L     ND     30       Styrene     ND     0.5     ug/L     ND     30       1,1,2-Tetrachloroethane     ND     0.5     ug/L     ND     30       Tetrachloroethylene     ND     0.5     ug/L     ND     30       Toluene     ND     0.5     ug/L     ND     30       1,1,1-Trichloroethane     ND     0.5     ug/L     ND     30       1,1,1-Trichloroethane     ND     0.5     ug/L     ND     30       1,1,1-Trichloroethane     ND     0.5     ug/L     ND     30       Trichlorofthylene     ND     0.5     ug/L     ND     30       Trichlorofthylene     ND     0.5     ug/L     ND     30       Vinyl chloride     ND     0.5     ug/L     ND     30       Surrogate: A-Bronofluorobenzene     87.4 <td< td=""><td></td><td>ND</td><td>1.0</td><td></td><td>ND</td><td></td><td></td><td></td><td>30</td><td></td></td<>		ND	1.0		ND				30	
Methyl Isobutyl Ketone         ND         5.0         ug/L         ND         30           Methyl tert-butyl ether         ND         2.0         ug/L         ND         30           Methylene Chloride         ND         5.0         ug/L         ND         30           Styrene         ND         0.5         ug/L         ND         30           1,1,2,2-Tetrachloroethane         ND         0.5         ug/L         ND         30           Tetrachloroethylen         ND         0.5         ug/L         ND         30           1,1,2,2-Tetrachloroethane         ND         0.5         ug/L         ND         30           Toluene         ND         0.5         ug/L         ND         30           1,1,2-Trichloroethane         ND         0.5         ug/L         ND         30           1,1,2-Trichloroethane         ND         0.5         ug/L         ND         30           Trichloroethylene         ND         0.5         ug/L         ND         30           Trichloroethylene         ND         0.5         ug/L         ND         30           Vinyl chloride         ND         0.5         ug/L         ND         30	Methyl Ethyl Ketone (2-Butanone)	ND	5.0		ND				30	
Methyl teherND2.0ug/LND30Methyl teherND5.0ug/LND30StyreneND0.5ug/LND301,1,1,2-TetrachloroethaneND0.5ug/LND30TetrachloroethaneND0.5ug/LND30TetrachloroethaneND0.5ug/LND30TetrachloroethaneND0.5ug/LND30TolueneND0.5ug/LND301,1,1-2-TrichloroethaneND0.5ug/LND301,1,1-2-TrichloroethaneND0.5ug/LND301,1,2-TrichloroethaneND0.5ug/LND301,1,2-TrichloroethaneND0.5ug/LND30TrichlorofluoromethaneND0.5ug/LND30TrichlorofluoromethaneND0.5ug/LND30Vinyl chlorideND0.5ug/LND30o-XyleneND0.5ug/LND30Surrogate: A-BromofluoromethaneS7.4ug/L10950-140Surrogate: Toluene-d878.9ug/LND30Toluene-d878.9ug/LND30Toluene-d8ND0.5ug/LND30Toluene-MD0.5ug/LND30Toluene-MD0.5ug/LND30Surrogate: Toluene-d878.9u		ND		ug/L						
Methylene Chloride         ND         5.0         ug/L         ND         30           Styrene         ND         0.5         ug/L         ND         30           1,1,2-Tetrachloroethane         ND         0.5         ug/L         ND         30           1,1,2-Tetrachloroethane         ND         0.5         ug/L         ND         30           Tetrachloroethane         ND         0.5         ug/L         ND         30           Toluene         ND         0.5         ug/L         ND         30           1,1,2-Trichloroethane         ND         0.5         ug/L         ND         30           1,1,1-Trichloroethane         ND         0.5         ug/L         ND         30           1,1,2-Trichloroethane         ND         0.5         ug/L         ND         30           Trichloroethane         ND         0.5         ug/L         ND         30           Trichloroethylene         ND         0.5         ug/L         ND         30           Vinyl chloride         ND         0.5         ug/L         ND         30           Surrogate: ABromofluorobenzene         87.4         ug/L         109         50-140	Methyl tert-butyl ether	ND	2.0		ND				30	
Styrene     ND     0.5     ug/L     ND     30       1,1,2.7Etrachloroethane     ND     0.5     ug/L     ND     30       1,1,2.2Tetrachloroethane     ND     0.5     ug/L     ND     30       Tetrachloroethylene     ND     0.5     ug/L     ND     30       Toluene     ND     0.5     ug/L     ND     30       1,1.1-Trichloroethane     ND     0.5     ug/L     ND     30       1,1.1.7trichloroethane     ND     0.5     ug/L     ND     30       1,1.1-Trichloroethane     ND     0.5     ug/L     ND     30       1,1.2-Trichloroethane     ND     0.5     ug/L     ND     30       Trichloroethylene     ND     0.5     ug/L     ND     30       Trichloroethane     ND     0.5     ug/L     ND     30       Trichloroethane     ND     0.5     ug/L     ND     30       Vinyl chloride     ND     0.5     ug/L     ND     30       Surrogate: ABromofluorobenzene     87.4     ug/L     109     50-140       Surrogate: Toluene-d8     78.9     ug/L     98.7     50-140       Eenzene     ND     0.5     ug/L     ND     30<		ND	5.0		ND				30	
1, 1, 1, 2-TetrachloroethaneND0.5ug/LNDND301, 1, 2, 2-TetrachloroethaneND0.5ug/LND30TetrachloroethyleneND0.5ug/LND30TolueneND0.5ug/LND301, 1, 1-TrichloroethaneND0.5ug/LND301, 1, 2-TrichloroethaneND0.5ug/LND30TrichloroethaneND0.5ug/LND30TrichloroethaneND0.5ug/LND30TrichloroethaneND0.5ug/LND30TrichlorofluoromethaneND0.5ug/LND30TrichlorofluoromethaneND0.5ug/LND30Mp-XylenesND0.5ug/LND30Surrogate:ABromofluorobenzene83.1ug/LND30Surrogate:78.9ug/LND30Surrogate:78.9ug/L10950-140Surrogate:78.9ug/L98.750-140Surrogate:78.9ug/LND30TolueneND0.5ug/LND30TolueneND0.5ug/LND30TolueneND0.5ug/LND30TolueneND0.5ug/LND30TolueneND0.5ug/LND30TolueneND0.5ug/L </td <td></td> <td>ND</td> <td>0.5</td> <td>ug/L</td> <td>ND</td> <td></td> <td></td> <td></td> <td>30</td> <td></td>		ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane       ND       0.5       ug/L       ND       30         Tetrachloroethylene       ND       0.5       ug/L       ND       30         Toluene       ND       0.5       ug/L       ND       30         1,1,1-Trichloroethane       ND       0.5       ug/L       ND       30         1,1,2-Trichloroethane       ND       0.5       ug/L       ND       30         1,1,2-Trichloroethane       ND       0.5       ug/L       ND       30         Trichloroethylene       ND       0.5       ug/L       ND       30         Trichloroethylene       ND       0.5       ug/L       ND       30         Vinyl chloride       ND       0.5       ug/L       ND       30         Vinyl chloride       ND       0.5       ug/L       ND       30         o-Xylene       ND       0.5       ug/L       ND       30         Surrogate: 1biornofluoromethane       53.1       ug/L       109       50-140         Surrogate: Toluene-d8       78.9       ug/L       109       50-140         Surrogate: Toluene-d8       78.9       ug/L       ND       30         Toluene	1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
TetrachloroethyleneND $0.5$ $ug/L$ ND $30$ TolueneND $0.5$ $ug/L$ ND $30$ 1, 1, 1-TrichloroethaneND $0.5$ $ug/L$ ND $30$ 1, 1, 2-TrichloroethaneND $0.5$ $ug/L$ ND $30$ TrichloroethaneND $0.5$ $ug/L$ ND $30$ TrichloroethaneND $0.5$ $ug/L$ ND $30$ TrichloroethyleneND $0.5$ $ug/L$ ND $30$ TrichloroethyleneND $0.5$ $ug/L$ ND $30$ Vinyl chlorideND $0.5$ $ug/L$ ND $30$ o-XyleneND $0.5$ $ug/L$ ND $30$ o-XyleneND $0.5$ $ug/L$ ND $30$ Surrogate: <i>Ibiromofluoromethane</i> $53.1$ $ug/L$ $109$ $50-140$ Surrogate: <i>Toluene-d878</i> $ug/L$ $98.7$ $50-140$ BenzeneND $0.5$ $ug/L$ $ND$ $30$ TolueneND $0.5$ $ug/L$ $ND$ $30$ TolueneND $0.5$ $ug/L$ $ND$ $30$ TolueneND $0.5$ $ug/L$ ND $30$ o-XyleneND $0.5$ $ug/L$ ND $30$ o-thyleneND $0.5$ $ug/L$ ND $30$ o-thyleneND $0.5$ $ug/L$ ND $30$ o-tyleneND $0.5$ $ug/L$ ND $30$ o-tylene	1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
TolueneND0.5ug/LND301,1,1-TrichloroethaneND0.5ug/LND301,1,2-TrichloroethaneND0.5ug/LND301,1,2-TrichloroethyleneND0.5ug/LND30TrichlorofluoromethaneND1.0ug/LND30Vinyl chlorideND0.5ug/LND30Vinyl chlorideND0.5ug/LND30o-XyleneND0.5ug/LND30o-XyleneND0.5ug/LND30Surrogate: A-Bromofluorobenzene87.4ug/LND30Surrogate: Toluene-d878.9ug/L10950-140Surrogate: Toluene-d878.9ug/L98.750-140EenzeneND0.5ug/LND30EthylbenzeneND0.5ug/LND30TolueneND0.5ug/LND30o-XylenesND0.5ug/LND30o-XyleneND0.5ug/LND30o-XyleneND0.5ug/LND30o-XyleneND0.5ug/LND30o-XyleneND0.5ug/LND30o-XyleneND0.5ug/LND30o-XyleneND0.5ug/LND30o-XyleneND0.5ug/LND30 <t< td=""><td>Tetrachloroethylene</td><td>ND</td><td></td><td>ug/L</td><td>ND</td><td></td><td></td><td></td><td></td><td></td></t<>	Tetrachloroethylene	ND		ug/L	ND					
1,1,1-Trichloroethane       ND       0.5       ug/L       ND       30         1,1,2-Trichloroethane       ND       0.5       ug/L       ND       30         Trichloroethane       ND       0.5       ug/L       ND       30         Trichloroethylene       ND       0.5       ug/L       ND       30         Trichloroethane       ND       1.0       ug/L       ND       30         Vinyl chloride       ND       0.5       ug/L       ND       30         m,p-Xylenes       ND       0.5       ug/L       ND       30         o-Xylene       ND       0.5       ug/L       ND       30         Surrogate: A-Bromofluorobenzene       87.4       ug/L       109       50-140         Surrogate: Dibromofluoromethane       53.1       ug/L       66.4       50-140         Surrogate: Toluene-d8       78.9       ug/L       98.7       50-140         Benzene       ND       0.5       ug/L       ND       30         Toluene       ND       0.5       ug/L       ND       30         Toluene       ND       0.5       ug/L       ND       30         o-Xylene       ND	Toluene	ND	0.5		ND				30	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
TrichloroethyleneND $0.5$ $ug/L$ ND $30$ TrichlorofluoromethaneND $1.0$ $ug/L$ ND $30$ Vinyl chlorideND $0.5$ $ug/L$ ND $30$ m,p-XylenesND $0.5$ $ug/L$ ND $30$ o-XyleneND $0.5$ $ug/L$ ND $30$ Surrogate: 4-Bromofluorobenzene $87.4$ $ug/L$ $109$ $50-140$ Surrogate: Dibromofluoromethane $53.1$ $ug/L$ $98.7$ $50-140$ Surrogate: Toluene-d8 $78.9$ $ug/L$ $98.7$ $50-140$ BenzeneND $0.5$ $ug/L$ $98.7$ $50-140$ TolueneND $0.5$ $ug/L$ $ND$ $30$ TolueneND $0.5$ $ug/L$ $ND$ $30$ TolueneND $0.5$ $ug/L$ $ND$ $30$ o-XylenesND $0.5$ $ug/L$ ND $30$ o-XyleneND $0.5$ $ug/L$ ND $30$ o-XyleneND $0.5$ $ug/L$ ND $30$	1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
TrichlorofluoromethaneND1.0ug/LND30Vinyl chlorideND0.5ug/LND30m,p-XylenesND0.5ug/LND30o-XyleneND0.5ug/LND30Surrogate: 4-Bromofluorobenzene $87.4$ ug/L109 $50-140$ Surrogate: Dibromofluoromethane $53.1$ ug/L98.7 $50-140$ Surrogate: Toluene-d878.9ug/L98.7 $50-140$ BenzeneND0.5ug/LND $30$ EthylbenzeneND0.5ug/LND $30$ TolueneND0.5ug/LND $30$ m,p-XylenesND0.5ug/LND $30$ o-XyleneND0.5ug/LND $30$	Trichloroethylene	ND	0.5	ug/L	ND					
m,p-XylenesND $0.5$ $ug/L$ ND $30$ o-XyleneND $0.5$ $ug/L$ ND $30$ Surrogate: 4-Bromofluorobenzene $87.4$ $ug/L$ $109$ $50-140$ Surrogate: Dibromofluoromethane $53.1$ $ug/L$ $66.4$ $50-140$ Surrogate: Toluene-d8 $78.9$ $ug/L$ $98.7$ $50-140$ BenzeneND $0.5$ $ug/L$ ND $30$ EthylbenzeneND $0.5$ $ug/L$ ND $30$ TolueneND $0.5$ $ug/L$ ND $30$ m,p-XylenesND $0.5$ $ug/L$ ND $30$ o-XyleneND $0.5$ $ug/L$ ND $30$	Trichlorofluoromethane	ND	1.0		ND				30	
m,p-XylenesND $0.5$ ug/LND $30$ o-XyleneND $0.5$ ug/LND $30$ Surrogate: 4-Bromofluorobenzene $87.4$ ug/L $109$ $50-140$ Surrogate: Dibromofluoromethane $53.1$ ug/L $66.4$ $50-140$ Surrogate: Toluene-d8 $78.9$ ug/L $98.7$ $50-140$ BenzeneND $0.5$ ug/LND $30$ EthylbenzeneND $0.5$ ug/LND $30$ TolueneND $0.5$ ug/LND $30$ m,p-XylenesND $0.5$ ug/LND $30$ o-XyleneND $0.5$ ug/LND $30$	Vinyl chloride	ND	0.5	ug/L	ND					
o-XyleneND $0.5$ ug/LND $30$ Surrogate: A-Bromofluorobenzene $87.4$ ug/L $109$ $50-140$ Surrogate: Dibromofluoromethane $53.1$ ug/L $66.4$ $50-140$ Surrogate: Toluene-d8 $78.9$ ug/L $98.7$ $50-140$ BenzeneND $0.5$ ug/LND $30$ EthylbenzeneND $0.5$ ug/LND $30$ TolueneND $0.5$ ug/LND $30$ m,p-XylenesND $0.5$ ug/LND $30$ o-XyleneND $0.5$ ug/LND $30$	m,p-Xylenes	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene $87.4$ ug/L $109$ $50-140$ Surrogate: Dibromofluoromethane $53.1$ ug/L $66.4$ $50-140$ Surrogate: Toluene-d8 $78.9$ ug/L $98.7$ $50-140$ BenzeneND $0.5$ ug/LND $30$ EthylbenzeneND $0.5$ ug/LND $30$ TolueneND $0.5$ ug/LND $30$ m,p-XylenesND $0.5$ ug/LND $30$ o-XyleneND $0.5$ ug/LND $30$		ND	0.5	ug/L	ND				30	
Surrogate: Toluene-d8         78.9         ug/L         98.7         50-140           Benzene         ND         0.5         ug/L         ND         30           Ethylbenzene         ND         0.5         ug/L         ND         30           Toluene         ND         0.5         ug/L         ND         30           m,p-Xylenes         ND         0.5         ug/L         ND         30           o-Xylene         ND         0.5         ug/L         ND         30	Surrogate: 4-Bromofluorobenzene	87.4				109	50-140			
Surrogate: Toluene-d8         78.9         ug/L         98.7         50-140           Benzene         ND         0.5         ug/L         ND         30           Ethylbenzene         ND         0.5         ug/L         ND         30           Toluene         ND         0.5         ug/L         ND         30           m,p-Xylenes         ND         0.5         ug/L         ND         30           o-Xylene         ND         0.5         ug/L         ND         30	Surrogate: Dibromofluoromethane	53.1				66.4	50-140			
Benzene         ND         0.5         ug/L         ND         30           Ethylbenzene         ND         0.5         ug/L         ND         30           Toluene         ND         0.5         ug/L         ND         30           m,p-Xylenes         ND         0.5         ug/L         ND         30           o-Xylene         ND         0.5         ug/L         ND         30		78.9				98.7	50-140			
Ethylbenzene         ND         0.5         ug/L         ND         30           Toluene         ND         0.5         ug/L         ND         30           m,p-Xylenes         ND         0.5         ug/L         ND         30           o-Xylene         ND         0.5         ug/L         ND         30			0.5		ND				30	
Toluene         ND         0.5         ug/L         ND         30           m,p-Xylenes         ND         0.5         ug/L         ND         30           o-Xylene         ND         0.5         ug/L         ND         30				ua/L						
m,p-Xylenes         ND         0.5         ug/L         ND         30           o-Xylene         ND         0.5         ug/L         ND         30				ua/L						
o-Xylene ND 0.5 ug/L ND 30										
						98.7	50-140			

Certificate of Analysis Client: WSP Canada Inc. (Ottawa)

Client PO:

### Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
lydrocarbons									
F1 PHCs (C6-C10)	1690	25	ug/L		84.6	68-117			
F2 PHCs (C10-C16)	1560	100	ug/L		97.3	60-140			
F3 PHCs (C16-C34)	4050	100	ug/L		103	60-140			
F4 PHCs (C34-C50)	3230	100	ug/L		130	60-140			
letals									
Mercury	2.98	0.1	ug/L	ND	99.4	70-130			
Antimony	45.8		ug/L	ND	91.1	80-120			
Arsenic	49.6		ug/L	ND	98.9	80-120			
Barium	106		ug/L	61.8	88.3	80-120			
Beryllium	50.4		ug/L	ND	101	80-120			
Boron	123		ug/L	86	73.1	80-120			QM-07
Cadmium	45.2		ug/L	ND	90.4	80-120			
Chromium (VI)	179	10	ug/L	ND	89.5	70-130			
Chromium	56.8		ug/L	ND	113	80-120			
Cobalt	51.1		ug/L	ND	102	80-120			
Copper	49.0		ug/L	1.13	95.7	80-120			
Lead	42.7		ug/L	ND	85.1	80-120			
Molybdenum	49.6		ug/L	ND	98.8	80-120			
Nickel	48.4		ug/L	ND	96.4	80-120			
Selenium	46.7		ug/L	1.4	90.6	80-120			
Silver	43.6		ug/L	ND	87.1	80-120			
Sodium	9540		ug/L		95.4	80-120			
Thallium	36.7		ug/L	ND	73.3	80-120			QM-07
Uranium	40.9		ug/L	0.4	81.0	80-120			
Vanadium	58.2		ug/L	ND	116	80-120			
Zinc	47		ug/L	ND	90.4	80-120			
emi-Volatiles									
Acenaphthene	4.90	0.05	ug/L		98.1	50-140			
Acenaphthylene	4.28	0.05	ug/L		85.5	50-140			
Anthracene	4.18	0.01	ug/L		83.6	50-140			
Benzo [a] anthracene	3.98	0.01	ug/L		79.6	50-140			
Benzo [a] pyrene	3.41	0.01	ug/L		68.2	50-140			
Benzo [b] fluoranthene	5.59	0.05	ug/L		112	50-140			
Benzo [g,h,i] perylene	3.44	0.05	ug/L		68.8	50-140			
Benzo [k] fluoranthene	5.98	0.05	ug/L		120	50-140			

Report Date: 12-Nov-2019 Order Date: 5-Nov-2019

Project Description: 191-12948-00

### Certificate of Analysis Client: WSP Canada Inc. (Ottawa)

Client PO:

### Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Chrysene	4.64	0.05	ug/L		92.8	50-140			
Dibenzo [a,h] anthracene	3.81	0.05	ug/L		76.3	50-140			
Fluoranthene	4.26	0.01	ug/L		85.2	50-140			
Fluorene	4.16	0.05	ug/L		83.2	50-140			
Indeno [1,2,3-cd] pyrene	3.18	0.05	ug/L		63.7	50-140			
1-Methylnaphthalene	4.73	0.05	ug/L		94.6	50-140			
2-Methylnaphthalene	5.23	0.05	ug/L		105	50-140			
Naphthalene	5.46	0.05	ug/L		109	50-140			
Phenanthrene	3.95	0.05	ug/L		79.0	50-140			
Pyrene	4.30	0.01	ug/L		86.1	50-140			
Surrogate: 2-Fluorobiphenyl	20.4		ug/L		102	50-140			
/olatiles									
Acetone	68.7	5.0	ug/L		68.7	50-140			
Benzene	31.2	0.5	ug/L		78.0	60-130			
Bromodichloromethane	32.4	0.5	ug/L		81.1	60-130			
Bromoform	31.1	0.5	ug/L		77.8	60-130			
Bromomethane	31.0	0.5	ug/L		77.4	50-140			
Carbon Tetrachloride	27.7	0.2	ug/L		69.2	60-130			
Chlorobenzene	35.3	0.5	ug/L		88.2	60-130			
Chloroform	31.2	0.5	ug/L		78.1	60-130			
Dibromochloromethane	31.0	0.5	ug/L		77.6	60-130			
Dichlorodifluoromethane	40.7	1.0	ug/L		102	50-140			
1,2-Dichlorobenzene	37.8	0.5	ug/L		94.6	60-130			
1,3-Dichlorobenzene	39.2	0.5	ug/L		97.9	60-130			
1,4-Dichlorobenzene	37.2	0.5	ug/L		93.0	60-130			
1,1-Dichloroethane	28.8	0.5	ug/L		71.9	60-130			
1,2-Dichloroethane	30.5	0.5	ug/L		76.2	60-130			
1,1-Dichloroethylene	26.2	0.5	ug/L		65.6	60-130			
cis-1,2-Dichloroethylene	28.2	0.5	ug/L		70.6	60-130			
trans-1,2-Dichloroethylene	25.7	0.5	ug/L		64.2	60-130			
1,2-Dichloropropane	35.2	0.5	ug/L		88.0	60-130			
cis-1,3-Dichloropropylene	35.9	0.5	ug/L		89.8	60-130			
trans-1,3-Dichloropropylene	34.6	0.5	ug/L		86.5	60-130			
Ethylbenzene	33.8	0.5	ug/L		84.4	60-130			
Ethylene dibromide (dibromoethane	39.8	0.2	ug/L		99.5	60-130			
Hexane	49.0	1.0	ug/L		122	60-130			
Methyl Ethyl Ketone (2-Butanone)	78.0	5.0							

Report Date: 12-Nov-2019 Order Date: 5-Nov-2019 Project Description: 191-12948-00

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### Certificate of Analysis Client: WSP Canada Inc. (Ottawa)

Client PO:

### Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Methyl Isobutyl Ketone	59.5	5.0	ug/L		59.5	50-140			
Methyl tert-butyl ether	58.9	2.0	ug/L		58.9	50-140			
Methylene Chloride	28.5	5.0	ug/L		71.2	60-130			
Styrene	41.9	0.5	ug/L		105	60-130			
1,1,1,2-Tetrachloroethane	37.0	0.5	ug/L		92.4	60-130			
1,1,2,2-Tetrachloroethane	43.0	0.5	ug/L		108	60-130			
Tetrachloroethylene	37.6	0.5	ug/L		93.9	60-130			
Toluene	34.1	0.5	ug/L		85.2	60-130			
1,1,1-Trichloroethane	30.2	0.5	ug/L		75.5	60-130			
1,1,2-Trichloroethane	28.2	0.5	ug/L		70.4	60-130			
Trichloroethylene	29.0	0.5	ug/L		72.4	60-130			
Trichlorofluoromethane	36.1	1.0	ug/L		90.2	60-130			
Vinyl chloride	40.1	0.5	ug/L		100	50-140			
m,p-Xylenes	70.1	0.5	ug/L		87.6	60-130			
o-Xylene	34.8	0.5	ug/L		86.9	60-130			
Benzene	31.2	0.5	ug/L		78.0	60-130			
Ethylbenzene	33.8	0.5	ug/L		84.4	60-130			
Toluene	34.1	0.5	ug/L		85.2	60-130			
m,p-Xylenes	70.1	0.5	ug/L		87.6	60-130			
o-Xylene	34.8	0.5	ug/L		86.9	60-130			



#### Certificate of Analysis Client: WSP Canada Inc. (Ottawa) Client PO:

Report Date: 12-Nov-2019 Order Date: 5-Nov-2019 Project Description: 191-12948-00

### **Qualifier Notes:**

#### Sample Qualifiers :

1: Sample decanted prior to analysis due to sediments.

### **QC Qualifiers :**

QM-07 : The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

#### Sample Data Revisions

None

#### Work Order Revisions / Comments:

None

#### **Other Report Notes:**

n/a: not applicable ND: Not Detected MDL: Method Detection Limit Source Result: Data used as source for matrix and duplicate samples %REC: Percent recovery. RPD: Relative percent difference.

#### CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.

- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.
- When reported, data for F4G has been processed using a silica gel cleanup.

Any use of these results implies your agreement that our total liability in connection with this work, however arising, shall be limited to the amount paid by you for this work, and that our employees or agents shall not under any circumstances be liable to you in connection with this work.

<b>OPARAC</b>					racel ID: 1945295					ber		Chain Of Custody (Lab Use Only) Nº 124027					
ent Name: <u>WSP Cona da</u> In ntact Name: <u>Adrian Menyi</u> 3dress: Z611 Queensuiew O	Dr. Hdua.ON		Quote # PO #:	:	19-12948-0 9-029		l.com				t	T ] 1 day ] 2 day te Requir	urnaro	of_ und Tir			
Telephone:         343-961-1434           Regulation 153/04         Other Regulation           □ Table 1         Res/Park         Med/Fine         REG 558         PWQO				Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)							Rec	Required Analysis					
] Table 2 [] Ind/Comm [2] Coal &	CCME MISA SU-Store Mun: Other: Name	n Gu Gu		L U L # of Containers	Sample T Date <u>Nov.</u> 4, 2019 11 11 11	Time 13: 40 16:00 17: 30 16:00	X X PHCs F1-F4+BTEX	X X PAHS	X X Metals by ICP	H X X X	X X Crvi						
9 10 Comments: Relinquistical By Sigh): Have Mar Relinquisted By (Print): AdjR (DW) Date/Time: NM C 2019	Received MENTING Date/Tim Tempera		/Depot:	8co 119	41E 2:05 °C PH	Received at Date/Time(	WOR, 2	9 9	-		Verifi Date/	ed By:	lorli	el Hann 1	19:1 B.S.	5	

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