Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Services

patersongroup

Phase II – Environmental Site Assessment

Trail's Edge: Phase 4 (South)
Northern Parcel (Mixed-Use Zone)
Ottawa, Ontario

Prepared For

Richcraft Group of Companies

January 18, 2021

Report: PE4999-2

Paterson Group Inc.

Consulting Engineers
154 Colonnade Road South
Ottawa (Nepean), Ontario
Canada K2E 7J5

Tel: (613) 226-7381
Fax: (613) 226-6344
www.patersongroup.ca

TABLE OF CONTENTS

PAGE

List of Figures

List of Appendices

EXECUTIVE SUMMARY

Assessment

A Phase II ESA was conducted for a parcel of land situated within the north eastern portion of the proposed Trail's Edge: Phase 4 (South) residential subdivision development, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address the potentially contaminating activities (PCAs) that were identified during the Phase I ESA and are considered to result in areas of potential environmental concern (APECs) on the subject site.

The subsurface investigation for this assessment was conducted on September 29, October 19, and November 6, 2020. The field program consisted of drilling five (5) boreholes (BH1-20, BH1B-20, BH2-20, BH2B-20, and BH7-20), of which three (3) were equipped with groundwater monitoring wells (BH1B-20, BH2-20, and BH7-20) as well as excavating nine (9) test pits (TP1-TP9). The boreholes were advanced to depths ranging from approximately 2.90 m to 5.94 m below ground surface and terminated within a layer of native silty clay. The test pits were advanced to depths ranging from approximately 1.28 m to 2.61 m below ground surface and terminated within the underlying native soils.

Site soils generally consist of fill material (brown silty sand and/or brown silty clay with crushed stone), underlain by stiff brown silty clay over top of soft grey silty clay. Bedrock was not encountered in any of the borehole or test pit locations at the time of the field program.

Seven (7) soil samples, recovered from the boreholes, were submitted for laboratory analysis of either: BTEX, PHCs (F_1-F_4), PAHs, and/or metals parameters. An additional six (6) soil samples, recovered from the test pits, were submitted for laboratory analysis of either: PHCs (F_2-F_4), PAHs, and metals parameters. Based on the analytical test results, the concentration of several PAHs and metals, in soil samples BH2-20-AU1 and TP4-G2 respectively, are in excess of the selected MECP Table 2 residential standards.

Three (3) groundwater samples were recovered from the monitoring wells installed in BH1B-20, BH2-20, and BH7-20 and submitted for laboratory analysis of BTEX, PHCs (F_1-F_4), and/or PAHs. Based on the analytical test results, none of the aforementioned parameter concentrations were detected in the groundwater samples analyzed, thus the results are in compliance with the selected MECP Table 2 residential standards.

Recommendations

PAH and metal impacted soil/fill material was identified within the vicinity of BH2-20 and TP4, located in the northern and eastern portions of the subject site respectively, requiring some remedial work. Therefore, it is our recommendation that an environmental site remediation program be completed, which will require the segregation of clean soils from impacted soils, the latter of which will require disposal at an approved waste disposal facility.

It is recommended that Paterson personnel be present on-site during remediation activities to direct the excavation and segregation of impacted soil, as well as to conduct confirmatory sampling as required.

Prior to off-site disposal at a licenced landfill site, a leachate analysis of a representative sample of this soil must be conducted in accordance with Ontario Regulation 347/558.

While in compliance with the site-specific standards, it should be noted that the concentration of chromium in soil sample TP7-G1 is in excess of the MECP Table 1 standards. This exceedance is not considered to pose an environmental concern to the subject site, however, if the soil is ever to be removed from the subject site, it may be classified as contaminated and may have to be disposed of at an approved waste disposal facility.

It is recommended that the groundwater monitoring wells installed in BH1B-20, BH2-20, and BH7-20 be maintained for future resampling if required. If the wells are not going to be used in the future, or will be destroyed during development activities, then they must be decommissioned according to Ontario Regulation 903 (Ontario Water Resources Act). The monitoring wells will be registered with the MECP under this regulation. Further information can be provided upon request in this regard.

1.0 INTRODUCTION

At the request of Richcraft Group of Companies (Richcraft), Paterson Group (Paterson) conducted a Phase II – Environmental Site Assessment (Phase II ESA) for a parcel of land situated within the northern portion of the proposed Trail's Edge: Phase 4 (South) residential subdivision development, in the City of Ottawa, Ontario. The purpose of this Phase II ESA has been to address the areas of potential environmental concern (APECs) identified on the subject site as a result the findings of the Phase I ESA Update, conducted by Paterson in September 2020.

1.1 Subject Site Information

Address:	No Municipal Address.
Legal Description:	Part of Lots 1, 2, and 3, Concession 3 (Ottawa Front), Formerly the Geographic Township of Gloucester, in the City of Ottawa.
Location:	The subject site is located on the west side of Mer Bleue Road, north of Brian Coburn Boulevard, in the City of Ottawa, Ontario. Refer to Figure 1 – Key Plan for the site location.
Latitude and Longitude:	45° 26' 47" N, 75° 30' 00" W

Site Description

Configuration:	Rectangular
Site Area:	20,279 m^2 (approximate)
Zoning:	DR – Development Reserve Zone.
Current Use:	The subject site is currently vacant.
Services:	The subject site does not contain any municipal services.

1.2 Property Ownership

The subject property is currently owned by Richcraft Homes Ltd. Paterson was retained to complete this Phase II ESA by Mr. Patrick Gaudreault of Richcraft, whose offices are located at 2280 St. Laurent Boulevard, Suite 201, Ottawa, Ontario. Mr. Gaudreault can be contacted by telephone at 613-739-1111.

1.3 Current and Proposed Future Uses

The subject site is currently vacant and consists entirely of grassland.

It is our understanding that the property is to be redeveloped for mixed-use purposes as part of the development of the subdivision.

1.4 Applicable Site Condition Standard

The site condition standards for the subject property were obtained from Table 2 of the document entitled, *"Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act"*, prepared by the Ministry of the Environment, Conservation and Parks (MECP), and dated April 15, 2011. The selected MECP standards are based on the following considerations:

- ❒ Fine-grained soil conditions;
- ❒ Potable groundwater conditions;
- ❒ Residential land use.

The residential standards were selected based on the possible future land use of the subject site.

Based on the grain size analysis test results, the fine-grained soil standards were selected as an appropriate standard with respect to the on-site soil conditions.

The MECP Table 1 standards for Full Depth Background Site Conditions were also selected for additional consideration in order to assess the on-site soil conditions prior to future off-site disposal.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The subject site is located on the west side of Mer Bleue Road, north of Brian Coburn Boulevard, in the City of Ottawa, Ontario. The subject site is currently vacant and consists of grassland. Historically, the neighbouring contractor business to the north had placed fill material onto the northern portion of the subject site.

The subject site is considered to be at-grade with the adjacent roads as well as the neighbouring properties. The site topography is relatively flat, whereas the regional topography slopes very gently down towards the south, in the general direction of Mer Bleue Bog. Water drainage on the subject site occurs primarily via infiltration throughout the property, as well as via surface run-off towards drainage ditches present along the adjacent roads.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation for this assessment was conducted on September 29, October 19, and November 6, 2020. The field program consisted of drilling five (5) boreholes (BH1-20, BH1B-20, BH2-20, BH2B-20, and BH7-20), of which three (3) were equipped with groundwater monitoring wells (BH1B-20, BH2-20, and BH7-20) as well as excavating nine (9) test pits (TP1-TP9). The boreholes were advanced to depths ranging from approximately 2.90 m to 5.94 m below ground surface and terminated within a layer of native silty clay. The test pits were advanced to depths ranging from approximately 1.28 m to 2.61 m below ground surface and terminated within the underlying native silty clay.

3.2 Media Investigated

During the subsurface investigation, soil and groundwater samples were obtained and submitted for laboratory analysis. The rationale for sampling and analyzing these media is based on the contaminants of potential concern identified in the Phase I ESA.

The contaminants of potential concern for the soil and groundwater on the subject site include the following:

- ❒ Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX);
- ❒ Petroleum Hydrocarbons, fractions 1 - 4 (PHCs F_1-F_4);
- ❒ Polycyclic Aromatic Hydrocarbons (PAHs);
- ❒ Metals (including Mercury and Hexavalent Chromium).

3.3 Phase I ESA Conceptual Site Model

Existing Buildings and Structures

No buildings or structures are currently present on the subject site.

Water Bodies and Areas of Natural and Scientific Interest

No areas of natural and scientific interest are known to exist within the Phase I study area. The nearest named water body with respect to the subject site is Mer Bleue Bog, located approximately 2.75 km to the south.

Geological and Hydrogeological Setting

Based on the available mapping information, the bedrock within the area of the subject site consist of interbedded limestone and shale of the Lindsay Formation, whereas the surficial geology consists of offshore marine deposits (clay and silt) with an overburden ranging from approximately 15 m to 25 m in thickness. Based on the regional topography, the groundwater is interpreted to be moving in a southerly direction towards Mer Bleue Bog.

Neighbouring Land Use

The neighbouring lands within the Phase I study area consist predominantly of residential properties, a contractor equipment storage yard, or vacant land.

Drinking Water Wells

Based on the available MECP water well records, it is likely that some of the residential properties adjacent to Mer Bleue Road may still utilize private drinking water wells.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

Based on the findings of the Phase I ESA Update, two (2) potentially contaminating activities (PCAs), resulting in areas of potential environmental concern (APECs), were identified as pertaining to the subject site:

- The presence of fill material of unknown quality, located throughout the subject site;
- The presence of a contractor's equipment storage yard, located immediately to the north.

Other off-site PCAs were identified within the Phase I study area but were deemed not to be of concern based on their separation distances as well as their down-gradient or cross-gradient orientations.

Contaminants of Potential Concern

The contaminants of potential concern (CPCs) associated with the aforementioned APECs are considered to be:

- Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX);
- Petroleum Hydrocarbons, fractions 1 - 4 (PHCs F_1-F_4);
- Polycyclic Aromatic Hydrocarbons (PAHs);
- Metals (including Mercury and Hexavalent Chromium).

These CPCs have the potential to be present in the soil matrix and/or the groundwater situated beneath the subject site.

Assessment of Uncertainty and/or Absence of Information

The information available for review as part of the preparation of the Phase I ESA is considered to be sufficient to conclude that there are PCAs and APECs associated with the subject site.

The presence of these PCAs were confirmed by a variety of independent sources, and as such, the conclusions of this report are not affected by uncertainty which may be present with respect to the individual sources.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation for this assessment was conducted on September 29, October 19, and November 6, 2020. The field program consisted of drilling five (5) boreholes (BH1-20, BH1B-20, BH2-20, BH2B-20, and BH7-20), of which three (3) were equipped with groundwater monitoring wells (BH1B-20, BH2-20, and BH7-20) as well as excavating nine (9) test pits (TP1-TP9). The boreholes were advanced to depths ranging from approximately 2.90 m to 5.94 m below ground surface and terminated within a layer of native silty clay. The test pits were advanced to depths ranging from approximately 1.28 m to 2.61 m below ground surface and terminated within the underlying native soils.

Under the full-time supervision of Paterson personnel, the boreholes were drilled using a track-mounted drill rig provided by George Downing Estate Drilling of Hawkesbury, Ontario; whereas the test pits were excavated using a backhoe provided by Quast Excavating of Ottawa, Ontario.

The locations of the boreholes and test pits are illustrated on Drawing PE4999-8 – Test Hole Location Plan, appended to this report.

4.2 Soil Sampling

Soil sampling protocols were followed using the MECP document entitled, *"Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario"*, dated May 1996. The samples were recovered using a stainless-steel split spoon while wearing protective gloves (changed after each sample), and immediately placed into plastic bags. If significant contamination was encountered, the samples were instead placed into glass jars. Sampling equipment was routinely washed in soapy water and rinsed with methylhydrate after each split spoon to prevent any cross contamination of the samples. The samples were also stored in coolers to reduce analyte volatilization during transportation.

Thirty-three (33) soil samples were obtained from the boreholes by means of auger and split spoon sampling, with samples taken at approximate 0.76 m intervals. The depths at which auger and split spoon samples were obtained from the boreholes are shown as "**AU**" and "**SS**", respectively, on the Soil Profile and Test Data Sheets, appended to this report.

Nineteen (19) soil samples were obtained from the test pits by means of grab sampling. The depths at which grab samples were obtained from the test pits are shown as "**G**", on the Soil Profile and Test Data Sheets, appended to this report.

Site soils generally consist of fill material (brown silty sand and/or brown silty clay with some crushed stone), underlain by stiff brown silty clay over top of soft grey silty clay. Bedrock was not encountered in any of the boreholes or test pits.

4.3 Field Screening Measurements

All soil samples collected were subjected to a preliminary screening procedure, which included visual screening for colour and evidence of metals, as well as soil vapour screening with a Photo Ionization Detector.

The recovered soil samples were placed immediately into airtight plastic bags with nominal headspace. All lumps of soil inside the bags were broken by hand, and the soil was allowed to come to room temperature prior to conducting the vapour survey, ensuring consistency of readings between samples. To measure the soil vapours, the analyser probe was inserted into the nominal headspace above the sample. The sample was then agitated and manipulated gently by hand as the measurement was taken. The peak reading registered within the first 15 seconds was recorded as the vapour measurement. The parts per million (ppm) scale was used to measure concentrations of organic vapours.

The results of the vapour survey are presented on the Soil Profile and Test Data Sheets, appended to this report.

4.4 Groundwater Monitoring Well Installation

Three (3) groundwater monitoring wells were installed on the subject site as part of this assessment. These monitoring wells were constructed using 50 mm diameter Schedule 40 threaded PVC risers and screens. A sand pack consisting of silica sand was placed around the screen and a bentonite seal was placed above the screen to minimize cross-contamination.

The monitoring well construction details are listed below in Table 1 as well as on the Soil Profile and Test Data Sheets provided in Appendix 1.

Upon completion, the groundwater monitoring wells were developed using a dedicated inertial lift pump, with a minimum of three (3) well volumes being removed from the wells at the time of installation. The wells were developed until the appearance of the water was noted to be stabilized. In addition, the ground surface elevations of each borehole were subsequently surveyed with respect to a known geodetic elevation.

Table 1
Monitoring Well Construction Details

Well ID	Ground Surface Elevation (m ASL)	Total Depth (m BGS)	Screened Interval (m BGS)	Sand Pack (m BGS)	Bentonite Seal (m BGS)	Casing Type
BH1B-20	88.29	4.42	1.25-4.25	0.70-4.25	0.40-0.70	Stick-Up
BH2-20	87.98	5.94	2.94-5.94	2.42-5.94	0.20-2.42	Stick-Up
BH7-20	88.09	4.42	1.25-4.25	0.70-4.25	0.40-0.70	Stick-Up

4.5 Field Measurement of Water Quality Parameters

Groundwater sampling was conducted at BH1B-20, BH2-20, and BH7-20 on October 2 and November 12, 2020. No water quality parameters were measured in the field at that time.

4.6 Groundwater Sampling

Groundwater sampling protocols were followed using the MECP document entitled, *"Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario"*, dated May 1996. Standing water was purged from each monitoring well prior to the recovery of the groundwater samples using dedicated sampling equipment. The samples were then stored in coolers to reduce possible analyte volatilization during their transportation. Further details of our standard operating procedure for groundwater sampling are provided in the Sampling and Analysis Plan, appended to this report.

4.7 Residue Management

Soil cuttings, purge water, and equipment cleaning fluids were retained on-site.

4.8 Analytical Testing

The following soil and groundwater samples were submitted for laboratory analysis:

Table 2
Testing Parameters for Submitted Soil Samples

Sample ID	Sample Depth & Stratigraphic Unit	Parameters Analyzed						Rationale
		BTEX	PHCs F_1-F_4	PHCs F_2-F_4	PAHs	Metals[1]	pH	
BH1B-20-AU1	0.31 – 0.61 m Fill Material				X			To assess for potential impacts resulting from the presence of fill material of unknown quality and/or the neighbouring contractor's equipment storage yard to the north.
BH2-20-AU1	0.00 – 0.61 m Fill Material				X	X		
BH2-20-SS5	3.05 – 3.66 m Grey Silty Clay	X	X					
BH2B-20-SS2	0.76 – 1.37 m Brown Silty Clay				X		X	
BH2B-20-SS4	2.29 – 2.90 m Grey Silty Clay						X	
BH7-20-AU1	0.31 – 0.61 m Fill Material					X		
BH7-20-SS2	0.76 – 1.37 m Brown Silty Clay	X	X					
TP1-G2	0.50 – 0.80 m Fill Material			X	X	X		
TP2-G1	0.10 – 0.20 m Fill Material			X	X	X		
TP4-G2	0.40 – 0.60 m Fill Material			X	X	X		
TP5-G2	0.30 – 0.50 m Fill Material			X	X	X		
TP7-G1	0.50 – 0.80 m Fill Material			X	X	X		
TP8-G2	0.40 – 0.60 m Fill Material			X	X	X		
BH10-SS2[2]	0.76 – 1.37 m Brown Silty Clay	X	X					

1 – Including Mercury and Hexavalent Chromium
2 – Duplicate sample of BH7-20-SS2

Table 3
Testing Parameters for Submitted Groundwater Samples

Sample ID	Screened Interval & Stratigraphic Unit	Parameters Analyzed			Rationale
		BTEX	PHCs F_1-F_4	PAHs	
BH2-20-GW1	1.25 – 4.25 m Grey Silty Clay	X	X	X	To assess for potential impacts resulting from the presence of fill material of unknown quality as well as the neighbouring contractor's equipment storage yard to the north.
BH1B-20-GW1	2.94 – 5.94 m Grey Silty Clay	X	X	X	
BH7-20-GW1	1.25 – 4.25 m Grey Silty Clay	X	X		
DUP[1]	2.94 – 5.94 m Grey Silty Clay	X			
1 – Duplicate sample of BH1B-20-GW1					

Paracel Laboratories (Paracel), of Ottawa, Ontario, performed the laboratory analysis on the samples submitted for analytical testing. Paracel is a member of the Standards Council of Canada/Canadian Association for Laboratory Accreditation (SCC/CALA) and is accredited and certified by the SCC/CALA for specific tests registered with the association.

4.9 Elevation Surveying

The ground surface elevations at each borehole location were surveyed using a GPS device by Paterson personnel and referenced to a geodetic datum.

4.10 Quality Assurance and Quality Control Measures

A summary of the quality assurance and quality control (QA/QC) measures, undertaken as part of this assessment, is provided in the Sampling and Analysis Plan in Appendix 1.

5.0 REVIEW AND EVALUATION

5.1 Geology

Generally, the subsurface profile encountered at the test hole locations consists of either topsoil or fill material, underlain by stiff brown silty clay over top of soft grey silty clay. The fill material encountered on-site was observed to consist of brown silty sand or brown silty clay with some crushed stone and extended to depths ranging from approximately 0.38 m to 1.28 m below ground surface.

It should be noted that trace amounts of brick and/or asphalt were encountered within several of the test pits (TP2, TP3, TP4, TP5, and TP7) at the time of the field program. Bedrock was not encountered in any of the boreholes or test pits.

Site geology details are provided in the Soil Profile and Test Data Sheets in Appendix 1.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured using an electronic water level meter at the monitoring wells installed in BH1B-20, BH2-20, and BH7-20 on November 12, 2020. The groundwater levels are summarized below in Table 4.

Table 4
Groundwater Level Measurements

Borehole Location	Ground Surface Elevation (m)	Water Level Depth (m below grade)	Water Level Elevation (m ASL)	Date of Measurement
BH1B-20	88.29	0.85	87.44	November 12, 2020
BH2-20	87.98	0.54	87.44	
BH7-20	88.09	0.67	87.42	

The groundwater at the subject site was encountered within the native silty clay, at depths ranging from approximately 0.54 m to 0.85 m below the existing ground surface. No unusual visual or olfactory observations were noted in the groundwater samples recovered from the boreholes.

Using the groundwater elevations recorded during the November 12, 2020 sampling event, groundwater contour mapping was completed as part of this assessment. According to the mapped contour data, illustrated on Drawing PE4999-8 – Test Hole Location Plan in the appendix, the groundwater flow on the subject site is interpreted to be in a southerly direction.

A horizontal hydraulic gradient of approximately 0.001 m/m was also calculated as part of this assessment.

It should be noted that groundwater levels are expected to fluctuate throughout the year with seasonal variations.

5.3 Fine/Coarse Soil Texture

As part of this assessment, two (2) soil samples were submitted for grain size analysis. The results of the analysis are presented below in Table 5.

Table 5
Grain Size Analysis Summary

Physical Characteristics	MDL (Units)	Soil Samples (µg/g) November 6, 2020	
		BH1B-20-SS4	BH7-20-SS4
> 75 µm	0.1 %	0.4	3.2
< 75 µm	0.1 %	99.6	96.8
Texture	0.1 %	Med/Fine	Med/Fine

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- Underlined – Value exceeds MECP Table 1 standards
- **Bold and Underlined** – value exceeds selected MECP standards

Based on the grain size analysis test results, the fine-grained soil standards were deemed to be appropriate with respect to the on-site soil conditions.

5.4 Field Screening

Field screening of the soil samples collected during the drilling program resulted in organic vapour readings ranging from 0.0 ppm to 10.4 ppm. The organic vapour readings obtained from the field screening indicate that there is a negligible potential for the presence of volatile substances.

Field screening results of each individual soil sample are provided on the Soil Profile and Test Data Sheets appended to this report.

5.5 Soil Quality

Seven (7) soil samples, recovered from the boreholes, were submitted for laboratory analysis of either: BTEX, PHCs (F_1-F_4), PAHs, metals, and/or pH parameters.

Six (6) soil samples, recovered from the test pits, were submitted for laboratory analysis of either: PHCs (F_2-F_4), PAHs, and metals parameters.

The results of the analytical testing are presented in Tables 6 to 12, as well as on the laboratory certificates of analysis included in Appendix 1.

Table 6
Analytical Test Results – Soil (Boreholes)
(BTEX & PHCs F_1-F_4)

Parameter	MDL (µg/g)	Soil Samples (µg/g)		MECP Table 1 Background Soil Standards (µg/g)	MECP Table 2 Residential Soil Standards (µg/g)
		Sept. 29, 2020	Nov. 6, 2020		
		BH2-20-SS5	BH7-20-SS2		
Benzene	0.05	nd	nd	0.02	0.17
Ethylbenzene	0.05	nd	nd	0.05	1.6
Toluene	0.05	nd	nd	0.2	6
Xylenes	0.05	nd	nd	0.05	25
PHCs F_1	7	nd	nd	25	65
PHCs F_2	4	nd	nd	10	150
PHCs F_3	8	nd	nd	240	1,300
PHCs F_4	6	nd	nd	120	5,600

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- Underlined – Value exceeds MECP Table 1 standards
- **Bold and Underlined** – value exceeds selected MECP standards

No BTEX or PHC parameters were detected in the soil samples analyzed. The results are in compliance with the selected MECP Table 2 residential standards as well as the MECP Table 1 standards.

Table 7
Analytical Test Results – Soil (Test Pits)
(PHCs F_2-F_4)

Parameter	MDL (µg/g)	Soil Samples (µg/g)						MECP Table 1 Background Soil Standards (µg/g)	MECP Table 2 Residential Soil Standards (µg/g)
		Oct. 19, 2020							
		TP1-G2	TP2-G1	TP4-G2	TP5-G2	TP7-G1	TP8-G2		
PHCs F_2	4	nd	nd	nd	nd	nd	nd	10	150
PHCs F_3	8	nd	nd	nd	nd	nd	nd	240	1,300
PHCs F_4	6	nd	nd	nd	nd	nd	nd	120	5,600

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- Underlined – Value exceeds MECP Table 1 standards
- **Bold and Underlined** – value exceeds selected MECP standards

No PHC parameters were detected in the soil samples analyzed. The results are in compliance with the selected MECP Table 2 residential standards as well as the MECP Table 1 standards.

Table 8
Analytical Test Results – Soil (Boreholes)
PAHs

Parameter	MDL (µg/g)	Soil Samples (µg/g)			MECP Table 1 Background Soil Standards (µg/g)	MECP Table 2 Residential Soil Standards (µg/g)
		Sept. 29, 2020	Nov. 6, 2020			
		BH2-20-AU1	BH1B-20-AU1	BH2B-20-SS2		
Acenaphthene	0.02	0.08	nd	nd	0.072	29
Acenaphthylene	0.02	0.15	nd	nd	0.093	0.17
Anthracene	0.02	0.27	nd	nd	0.16	0.74
Benzo[a]anthracene	0.02	**0.72**	nd	nd	0.36	0.63
Benzo[a]pyrene	0.02	**0.92**	nd	nd	0.3	0.3
Benzo[b]fluoranthene	0.02	0.59	nd	nd	0.47	0.78
Benzo[g,h,i]perylene	0.02	0.62	nd	nd	0.68	7.8
Benzo[k]fluoranthene	0.02	0.57	nd	nd	0.48	0.78
Chrysene	0.02	0.68	nd	nd	2.8	7.8
Dibenzo[a,h]anthracene	0.02	**0.16**	nd	nd	0.1	0.1
Fluoranthene	0.02	**1.37**	0.02	nd	0.56	0.69
Fluorene	0.02	0.10	nd	nd	0.12	69
Indeno[1,2,3-cd]pyrene	0.02	**0.57**	nd	nd	0.23	0.48
1-Methylnaphthalene	0.02	0.03	0.09	nd	0.59	3.4
2-Methylnaphthalene	0.02	0.05	0.14	nd	0.59	3.4
Methylnaphthalene (1&2)	0.04	0.08	0.23	nd	0.59	3.4
Naphthalene	0.01	0.11	0.04	nd	0.09	0.75
Phenanthrene	0.02	0.94	nd	nd	0.69	7.8
Pyrene	0.02	1.26	nd	nd	1	78

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- Underlined – Value exceeds MECP Table 1 standards
- **Bold and Underlined** – value exceeds selected MECP standards

The concentration of several PAH parameters in soil sample BH2-AU1 are in excess of the MECP Table 2 residential standards. All detected PAH parameter concentrations in the remaining soil samples analyzed are in compliance with the MECP Table 2 residential standards as well as the MECP Table 1 standards.

The PAH concentrations are considered to be related to the occasional pieces of asphaltic concrete identified in the fill material on-site.

Table 9
Analytical Test Results – Soil (Test Pits)
PAHs

Parameter	MDL (µg/g)	Soil Samples (µg/g) October 19, 2020						MECP Table 1 Soil Standards (µg/g)	MECP Table 2 Soil Standards (µg/g)
		TP1-G2	TP2-G1	TP4-G2	TP5-G2	TP7-G1	TP8-G2		
Acenaphthene	0.02	nd	nd	nd	nd	nd	nd	0.072	29
Acenaphthylene	0.02	nd	nd	nd	nd	nd	nd	0.093	0.17
Anthracene	0.02	nd	nd	nd	nd	nd	0.02	0.16	0.74
Benzo[a]anthracene	0.02	nd	0.05	nd	nd	nd	0.06	0.36	0.63
Benzo[a]pyrene	0.02	nd	0.07	nd	nd	nd	0.08	0.3	0.3
Benzo[b]fluoranthene	0.02	nd	0.09	nd	nd	nd	0.10	0.47	0.78
Benzo[g,h,i]perylene	0.02	nd	0.05	nd	nd	nd	0.06	0.68	7.8
Benzo[k]fluoranthene	0.02	nd	0.04	nd	nd	nd	0.05	0.48	0.78
Chrysene	0.02	nd	0.07	nd	nd	nd	0.08	2.8	7.8
Dibenzo[a,h]anthracene	0.02	nd	nd	nd	nd	nd	nd	0.1	0.1
Fluoranthene	0.02	nd	0.13	nd	0.03	nd	0.14	0.56	0.69
Fluorene	0.02	nd	nd	nd	nd	nd	nd	0.12	69
Indeno[1,2,3-cd]pyrene	0.02	nd	0.05	nd	nd	nd	0.05	0.23	0.48
1-Methylnaphthalene	0.02	nd	nd	nd	nd	nd	nd	0.59	3.4
2-Methylnaphthalene	0.02	nd	nd	nd	nd	nd	nd	0.59	3.4
Methylnaphthalene (1&2)	0.04	nd	nd	nd	nd	nd	nd	0.59	3.4
Naphthalene	0.01	nd	nd	nd	nd	nd	nd	0.09	0.75
Phenanthrene	0.02	nd	0.04	nd	nd	nd	0.05	0.69	7.8
Pyrene	0.02	nd	0.11	nd	0.02	nd	0.12	1	78

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- Underlined – Value exceeds MECP Table 1 standards
- **Bold and Underlined** – value exceeds selected MECP standards

All detected PAH concentrations in the soil samples analyzed are in compliance with the selected MECP Table 2 residential standards as well as the MECP Table 1 standards.

Table 10
Analytical Test Results – Soil (Boreholes)
Metals

Parameter	MDL (µg/g)	Soil Samples (µg/g)		MECP Table 1 Background Soil Standards (µg/g)	MECP Table 2 Residential Soil Standards (µg/g)
		Sept. 29, 2020	Nov. 6, 2020		
		BH2-20-AU1	BH7-20-AU1		
Antimony	1.0	nd	1.0	1.3	7.5
Arsenic	1.0	4.2	3.1	18	18
Barium	1.0	101	148	220	390
Beryllium	0.5	nd	nd	2.5	5
Boron	5.0	5.3	6.9	36	120
Cadmium	0.5	nd	nd	1.2	1.2
Chromium	5.0	27.6	17.6	70	160
Chromium (VI)	0.2	nd	nd	0.66	10
Cobalt	1.0	6.7	4.3	21	22
Copper	5.0	17.9	9.3	92	180
Lead	1.0	38.2	12.4	120	120
Mercury	0.05	0.1	nd	0.27	1.8
Molybdenum	1.0	nd	nd	2	6.9
Nickel	5.0	17.4	11.3	82	130
Selenium	1.0	nd	nd	1.5	2.4
Silver	0.3	nd	nd	0.5	25
Thallium	1.0	nd	nd	1	1
Uranium	1.0	nd	nd	2.5	23
Vanadium	10.0	31.3	15.6	86	86
Zinc	20.0	72.2	56.5	290	340

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- Underlined – Value exceeds MECP Table 1 standards
- **Bold and Underlined** – value exceeds selected MECP standards

All detected metal parameters in the soil samples analyzed are in compliance with the selected MECP Table 2 residential standards as well as the MECP Table 1 standards.

Table 11
Analytical Test Results – Soil (Test Pits)
Metals

Parameter	MDL (µg/g)	Soil Samples (µg/g) October 19, 2020						MECP Table 1 Background Soil Standards (µg/g)	MECP Table 2 Residential Soil Standards (µg/g)
		TP1-G2	TP2-G1	TP4-G2	TP5-G2	TP7-G1	TP8-G2		
Antimony	1.0	nd	nd	nd	nd	nd	nd	1.3	7.5
Arsenic	1.0	3.5	2.6	4.1	3.9	3.2	2.9	18	18
Barium	1.0	152	45.2	300	149	209	106	220	390
Beryllium	0.5	0.6	nd	0.8	0.6	0.7	nd	2.5	5
Boron	5.0	nd	nd	5.9	nd	5.6	nd	36	120
Cadmium	0.5	nd	nd	nd	nd	nd	nd	1.2	1.2
Chromium	5.0	70.0	19.5	118	66.8	102	41.8	70	160
Chromium (VI)	0.2	nd	nd	nd	nd	nd	nd	0.66	10
Cobalt	1.0	13.3	5.1	**22.3**	11.9	18.0	8.6	21	22
Copper	5.0	23.5	11.3	50.5	22.3	31.5	16.5	92	180
Lead	1.0	10.8	8.2	7.7	13.9	13.7	23.9	120	120
Mercury	0.05	nd	nd	nd	nd	nd	nd	0.27	1.8
Molybdenum	1.0	nd	nd	nd	nd	nd	nd	2	6.9
Nickel	5.0	34.2	12.7	62.6	31.7	50.5	21.0	82	130
Selenium	1.0	nd	nd	nd	nd	nd	nd	1.5	2.4
Silver	0.3	nd	nd	nd	nd	nd	nd	0.5	25
Thallium	1.0	nd	nd	nd	nd	nd	nd	1	1
Uranium	1.0	1.7	nd	nd	2.2	1.8	1.2	2.5	23
Vanadium	10.0	59.9	23.2	**104**	57.2	78.6	39.0	86	86
Zinc	20.0	77.4	33.3	118	84.2	98.2	78.3	290	340

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- Underlined – Value exceeds MECP Table 1 standards
- **Bold and Underlined** – value exceeds selected MECP standards

The concentrations of cobalt and vanadium in soil sample TP4-G2 are in excess of the selected MECP Table 2 residential standards. All detected metal parameter concentrations in the remaining soil samples analyzed are in compliance with the selected MECP Table 2 residential standards.

The concentration of chromium in soil sample TP7-G1 is in excess of the MECP Table 1 standards. This exceedance is not considered to pose an environmental concern to the subject site, however, if the soil is ever to be removed from the subject site, it may be classified as contaminated and have to be disposed of at an approved waste disposal facility.

Table 12
Analytical Test Results – Soil (Boreholes)
pH

Parameter	MDL (units)	Soil Samples (µg/g)		MECP Table 2 Residential Soil Standards (units)
		Nov. 6, 2020		
		BH2B-20-SS2	BH2B-20-SS4	
pH	0.05	7.27	7.63	5.00 – 11.00

Notes:
- MDL – Method Detection Limit
- **Bold and Underlined** – value exceeds selected MECP standards

All detected pH levels in the soil samples analyzed are in compliance with the selected MECP Table 2 residential standards.

Table 13
Maximum Concentrations – Soil

Parameter	Maximum Concentration (µg/g)	Sample ID	Depth Interval (m BGS)
Acenaphthene	0.08	BH2-20-AU1	0.00 – 0.61 m
Acenaphthylene	0.15	BH2-20-AU1	0.00 – 0.61 m
Anthracene	0.27	BH2-20-AU1	0.00 – 0.61 m
Benzo[a]anthracene	**0.72**	BH2-20-AU1	0.00 – 0.61 m
Benzo[a]pyrene	**0.92**	BH2-20-AU1	0.00 – 0.61 m
Benzo[b]fluoranthene	0.59	BH2-20-AU1	0.00 – 0.61 m
Benzo[g,h,i]perylene	0.62	BH2-20-AU1	0.00 – 0.61 m
Benzo[k]fluoranthene	0.57	BH2-20-AU1	0.00 – 0.61 m
Chrysene	0.68	BH2-20-AU1	0.00 – 0.61 m
Dibenzo[a,h]anthracene	**0.16**	BH2-20-AU1	0.00 – 0.61 m
Fluoranthene	**1.37**	BH2-20-AU1	0.00 – 0.61 m
Fluorene	0.10	BH2-20-AU1	0.00 – 0.61 m
Indeno[1,2,3-cd]pyrene	**0.57**	BH2-20-AU1	0.00 – 0.61 m
1-Methylnaphthalene	0.09	BH1B-20-AU1	0.31 – 0.61 m
2-Methylnaphthalene	0.14	BH1B-20-AU1	0.31 – 0.61 m
Methylnaphthalene (1&2)	0.23	BH1B-20-AU1	0.31 – 0.61 m
Naphthalene	0.11	BH2-20-AU1	0.00 – 0.61 m
Phenanthrene	0.94	BH2-20-AU1	0.00 – 0.61 m
Pyrene	1.26	BH2-20-AU1	0.00 – 0.61 m
Antimony	1.0	BH7-20-AU1	0.76 – 1.37 m
Arsenic	4.2	BH2-20-AU1	0.00 – 0.61 m
Barium	300	TP4-G2	0.40 – 0.60 m
Beryllium	0.8	TP4-G2	0.40 – 0.60 m
Boron	6.9	BH7-20-AU1	0.76 – 1.37 m
Chromium	118	TP4-G2	0.40 – 0.60 m
Cobalt	**22.3**	TP4-G2	0.40 – 0.60 m
Copper	50.5	TP4-G2	0.40 – 0.60 m
Lead	38.2	BH2-20-AU1	0.00 – 0.61 m
Mercury	0.1	BH2-20-AU1	0.00 – 0.61 m
Nickel	62.6	TP4-G2	0.40 – 0.60 m
Uranium	2.2	TP5-G2	0.30 – 0.50 m
Vanadium	**104**	TP4-G2	0.40 – 0.60 m
Zinc	118	TP4-G2	0.40 – 0.60 m
pH	7.63	BH2B-20-SS4	2.29 – 2.90 m

Notes:
- **Bold and Underlined** – value exceeds selected MECP standards

All other parameter concentrations analyzed were below the laboratory detection limits. The laboratory certificates of analysis are provided in Appendix 1.

5.6 Groundwater Quality

Groundwater samples were recovered from the monitoring wells installed in BH1B-20, BH2-20, and BH7-20 and submitted for laboratory analysis of either: BTEX, PHCs (F_1-F_4) and/or PAHs. The results of the analytical testing are presented below in Tables 14 and 15, as well as on the laboratory certificates of analysis included in Appendix 1.

Table 14
Analytical Test Results – Groundwater
BTEX & PHCs (F_1-F_4)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)			MECP Table 2 Residential Groundwater Standards (µg/L)
		Oct. 2, 2020	Nov. 12, 2020		
		BH2-20-GW1	BH1B-20-GW1	BH7-20-GW1	
Benzene	0.5	nd	nd	nd	5
Ethylbenzene	0.5	nd	nd	nd	2.4
Toluene	0.5	nd	nd	nd	24
Xylenes	0.5	nd	nd	nd	300
PHC F_1	25	nd	nd	nd	750
PHC F_2	100	nd	nd	nd	150
PHC F_3	100	nd	nd	nd	500
PHC F_4	100	nd	nd	nd	500

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold and Underlined** – value exceeds selected MECP standards

No BTEX or PHC parameters were detected in the groundwater samples analyzed. The results are in compliance with the selected MECP Table 2 residential standards.

Table 15
Analytical Test Results – Groundwater
PAHs

Parameter	MDL (µg/L)	Soil Samples (µg/L)			MECP Table 2 Residential Groundwater Standards (µg/L)
		Oct. 2, 2020	Nov. 12, 2020		
		BH2-GW1	BH1B-20-GW1	BH2-20-GW1	
Acenaphthene	0.05	nd	nd	nd	4.1
Acenaphthylene	0.05	nd	nd	nd	1
Anthracene	0.01	nd	nd	nd	2.4
Benzo[a]anthracene	0.01	nd	nd	nd	1
Benzo[a]pyrene	0.01	nd	nd	nd	0.01
Benzo[b]fluoranthene	0.05	nd	nd	nd	0.1
Benzo[g,h,i]perylene	0.05	nd	nd	nd	0.2
Benzo[k]fluoranthene	0.05	nd	nd	nd	0.1
Chrysene	0.05	nd	nd	nd	0.1
Dibenzo[a,h]anthracene	0.05	nd	nd	nd	0.2
Fluoranthene	0.01	nd	nd	nd	0.41
Fluorene	0.05	nd	nd	nd	120
Indeno[1,2,3-cd]pyrene	0.05	nd	nd	nd	0.2
1-Methylnaphthalene	0.05	nd	nd	nd	3.2
2-Methylnaphthalene	0.05	nd	nd	nd	3.2
Methylnaphthalene (1&2)	0.10	nd	nd	nd	3.2
Naphthalene	0.05	nd	nd	nd	11
Phenanthrene	0.05	nd	nd	nd	1
Pyrene	0.01	nd	nd	nd	4.1

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold and Underlined** – value exceeds selected MECP standards

No PAH parameters were detected in the groundwater samples analyzed. The results are in compliance with the selected MECP Table 2 residential standards.

5.7 Quality Assurance and Quality Control Results

All samples submitted as part of this Phase II ESA were handled in accordance with the analytical protocols with respect to holding time, preservation method, storage requirement, and container type. As per Subsection 47(3) of O.Reg. 153/04, as amended by the Environmental Protection Act, the certificates of analysis have been received for each sample submitted for laboratory analysis and have been appended to this report.

As per the Sampling and Analysis Plan, a duplicate soil sample was obtained from BH7-20 and analyzed for BTEX and PHC parameters. A duplicate groundwater sample was also obtained from the monitoring well installed in BH1B-20 and analyzed for BTEX parameters.

No parameter concentrations were detected in the original or the duplicate samples, and as such, the RPD results are considered to be acceptable. As a result, the quality of the field data collected during this Phase II ESA is considered to be sufficient to meet the overall objectives of this assessment.

5.8 Phase II Conceptual Site Model

The following section has been prepared in accordance with the requirements of O.Reg. 153/04 amended by the Environmental Protection Act. Conclusions and recommendations are discussed in a subsequent section.

Site Description

Potentially Contaminating Activity and Areas of Potential Environmental Concern

As described in the Phase I ESA Update report, as well as in Section 2.2 of this report, the following PCAs, as described by Table 2 of O.Reg. 153/04, are considered to result in APECs on the subject site:

- *Item 28: "Gasoline and Associated Products Storage in Fixed Tanks"*

This PCA was identified as a result of the neighbouring contractor's equipment storage yard to the north.

- *Item 30: "Importation of Fill Material of Unknown Quality"*

This PCA was identified as a result of fill material located on the subject site.

Contaminants of Potential Concern

The contaminants of potential concern (CPCs) associated with the aforementioned APECs are considered to be:

- Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX);
- Petroleum Hydrocarbons, fractions 1 - 4 (PHCs F_1-F_4);
- Polycyclic Aromatic Hydrocarbons (PAHs);
- Metals (including Mercury and Hexavalent Chromium).

These CPCs have the potential to be present in the soil matrix and/or the groundwater situated beneath the subject site.

Subsurface Structures and Utilities

Underground service locates were completed prior to the subsurface investigation. No underground utilities were identified on the subject site.

Physical Setting

Site Stratigraphy

The stratigraphy of the subject site generally consists of:

- Topsoil, encountered at ground surface and extending to depths of approximately 0.27 m to 0.86 m below ground surface;
- Fill material, consisting of brown silty sand or brown silty clay with crushed stone as well as occasional brick and/or asphalt; encountered at ground surface and extending to depths of approximately 0.38 m to 1.28 m below ground surface;
- Stiff native brown silty clay; encountered at depths ranging from approximately 0.38 m to 1.28 m below ground surface;
- Soft native grey silty clay; encountered at a depths ranging from approximately 2.10 m to 2.30 m below ground surface to the maximum depth of the test holes.

The site stratigraphy, from ground surface to the deepest aquifer or aquitard investigated, is provided in the Soil Profile and Test Data Sheets in Appendix 1.

Hydrogeological Characteristics

The groundwater beneath the subject site was typically encountered within the native silty clay, at depths ranging from approximately 0.54 m to 0.85 m below the existing ground surface. Based on the regional topography, in combination with the measured groundwater levels, the groundwater is interpreted to flow in a southerly direction towards Mer Bleue Bog.

Approximate Depth to Bedrock

Bedrock was not encountered in any of the test hole locations. According to the available mapping information, the bedrock is interpreted to lie at a depth of approximately 15 m to 25 m below ground level.

Approximate Depth to Water Table

The depth to the water table is approximately 0.54 m to 0.85 m below the existing ground surface.

Sections 41 and 43.1 of Ontario Regulation 153/04

Section 41 of the Regulation does not apply to the subject site, as there are no bodies of water or areas of natural significance located on or within 30 m of the subject site. The subject site is therefore not considered to be environmentally sensitive.

Section 43.1 of the Regulation does not apply to the subject site, since the bedrock is not situated at a depth of less than 2 m below ground surface, and thus is not considered to be a shallow soil property.

Existing Buildings and Structures

There are no buildings or structures present on the subject site.

Fill Placement

Fill material, consisting of brown silty sand and/or brown silty clay with some crushed stone, was identified throughout the majority of the subject site.

Proposed Buildings and Other Structures

It is our understanding that the parcels are to be redeveloped for mixed-use purposes in conjunction with the development of the surrounding subdivision.

Water Bodies and Areas of Natural and Scientific Interest

No areas of natural and scientific interest are known to exist within the Phase I study area. The nearest named water body with respect to the subject site is Mer Bleue Bog, located approximately 2.75 km to the south.

Environmental Condition

Areas Where Contaminants are Present

According to the analytical test results, PAH impacted soil/fill material was identified in BH2-20, located in the northern portion of the subject site, and metal impacted soil/fill material was identified in TP4, located in the eastern portion of the subject site.

Types of Contaminants

According to the analytical test results, the concentrations of PAHs (benzo[a]anthracene, benzo[a]pyrene, dibenzo[a,h]anthracene, fluoranthene, indeno[1,2,3-cd]pyrene) detected in soil/fill sample BH2-20, as well as the concentrations of metals (cobalt and vanadium) detected in soil/fill sample TP4-G2, are in excess of the MECP Table 2 residential standards.

Contaminated Media

As noted above, the soil/fill within the vicinity of BH2-20 and TP4 is in excess of the MECP Table 2 residential standards.

According to the analytical test results, the groundwater beneath the subject site is not contaminated.

What Is Known About Areas Where Contaminants Are Present

BH2-20 is located adjacent to the northern property boundary, whereas TP4 is located in the eastern portion of the subject site. The PAH and metal contaminants identified at these locations, respectively, are likely the result of poor-quality fill material placed in this area.

Distribution and Migration of Contaminants

As noted above, PAH and metal impacted soil/fill material was identified within the northern and eastern portions of the subject site, in the vicinity of BH2-20 and TP4, respectively. Based on their low mobility, as well as the clean groundwater results, it is anticipated that the PAH and metal contaminants are contained within the soil/fill in these areas of the subject site.

Discharge of Contaminants

The PAH and metal impacted soil/fill material identified in the vicinity of BH2-20 and TP4 are considered to have resulted from the importation and placement of poor-quality fill material.

Potential for Vapour Intrusion

During development of the subject site, all soils exceeding the selected MECP Table 2 residential standards will be removed and disposed of off-site. As such, there is no anticipated potential for future vapour intrusion at the subject site.

Climatic and Meteorological Conditions

In general, climatic and meteorological conditions have the potential to affect contaminant distribution. Two (2) ways by which climatic and meteorological conditions may affect contaminant distribution include the downward leaching of contaminants via the infiltration of precipitation, and the migration of contaminants via groundwater levels and/or flow, which may fluctuate seasonally.

The downward migration of PAH contaminants in the vicinity of BH2-20 is not suspected to have occurred, based on their low mobility and the clean groundwater results obtained at this location. The downward migration of metal contaminants in the vicinity of TP4 is not suspected to have occurred, based on their low mobility. Fluctuations in the groundwater level and groundwater flow are not considered to have affected any contaminant distribution at this location due to the depth of the water table below the shallow fill material.

6.0 CONCLUSION

Assessment

A Phase II ESA was conducted for a parcel of land situated within the north eastern portion of the proposed Trail's Edge: Phase 4 (South) residential subdivision development, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address the potentially contaminating activities (PCAs) that were identified during the Phase I ESA and are considered to result in areas of potential environmental concern (APECs) on the subject site.

The subsurface investigation for this assessment was conducted on September 29, October 19, and November 6, 2020. The field program consisted of drilling five (5) boreholes (BH1-20, BH1B-20, BH2-20, BH2B-20, and BH7-20), of which three (3) were equipped with groundwater monitoring wells (BH1B-20, BH2-20, and BH7-20) as well as excavating nine (9) test pits (TP1-TP9). The boreholes were advanced to depths ranging from approximately 2.90 m to 5.94 m below ground surface and terminated within a layer of native silty clay. The test pits were advanced to depths ranging from approximately 1.28 m to 2.61 m below ground surface and terminated within the underlying native soils.

Site soils generally consist of fill material (brown silty sand and/or brown silty clay with crushed stone), underlain by stiff brown silty clay over top of soft grey silty clay. Bedrock was not encountered in any of the borehole or test pit locations at the time of the field program.

Seven (7) soil samples, recovered from the boreholes, were submitted for laboratory analysis of either: BTEX, PHCs (F_1-F_4), PAHs, and/or metals parameters. An additional six (6) soil samples, recovered from the test pits, were submitted for laboratory analysis of either: PHCs (F_2-F_4), PAHs, and metals parameters. Based on the analytical test results, the concentration of several PAHs and metals, in soil samples BH2-20-AU1 and TP4-G2 respectively, are in excess of the selected MECP Table 2 residential standards.

Three (3) groundwater samples were recovered from the monitoring wells installed in BH1B-20, BH2-20, and BH7-20 and submitted for laboratory analysis of BTEX, PHCs (F_1-F_4), and/or PAHs. Based on the analytical test results, none of the aforementioned parameter concentrations were detected in the groundwater samples analyzed, thus the results are in compliance with the selected MECP Table 2 residential standards.

Recommendations

PAH and metal impacted soil/fill material was identified within the vicinity of BH2-20 and TP4, located in the northern and eastern portions of the subject site respectively, requiring some remedial work. Therefore, it is our recommendation that an environmental site remediation program be completed for the subject site, which will require the segregation of clean soils from impacted soils, the latter of which will require disposal at an approved waste disposal facility.

It is recommended that Paterson personnel be present on-site during remediation activities to direct the excavation and segregation of impacted soil, as well as to conduct confirmatory sampling as required.

Prior to off-site disposal at a licenced landfill site, a leachate analysis of a representative sample of this soil must be conducted in accordance with Ontario Regulation 347/558.

While in compliance with the site-specific standards, it should be noted that the concentration of chromium in soil sample TP7-G1 is in excess of the MECP Table 1 standards. This exceedance is not considered to pose an environmental concern to the subject site, however, if the soil is ever to be removed from the subject site, it may be classified as contaminated and may have to be disposed of at an approved waste disposal facility.

It is recommended that the groundwater monitoring wells installed in BH1B-20, BH2-20, and BH7-20 be maintained for future resampling if required. If the wells are not going to be used in the future, or will be destroyed during development activities, then they must be decommissioned according to Ontario Regulation 903 (Ontario Water Resources Act). The monitoring wells will be registered with the MECP under this regulation. Further information can be provided upon request in this regard.

7.0 STATEMENT OF LIMITATIONS

This Phase II – Environmental Site Assessment report has been prepared in general accordance with O.Reg. 153/04, as amended, and meets the requirements of CSA Z769-00. The conclusions presented herein are based on information gathered from a limited sampling and testing program. The test results represent conditions at specific test locations at the time of the field program.

The client should be aware that any information pertaining to soils and all test hole logs are furnished as a matter of general information only and test hole descriptions or logs are not to be interpreted as descriptive of conditions at locations other than those of the test holes themselves.

Should any conditions be encountered at the subject site and/or historical information that differ from our findings, we request that we be notified immediately in order to allow for a reassessment.

This report was prepared for the sole use of Richcraft Homes Ltd. Permission and notification from the Richcraft Homes Ltd. and Paterson Group will be required prior to the release of this report to any other party.

Paterson Group Inc.

Nick Sullivan, B.Sc.

Mark S. D'Arcy, P.Eng., QP$_{ESA}$

Report Distribution:

- Richcraft Group of Companies
- Paterson Group Inc.

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE4999-8 – TEST HOLE LOCATION PLAN

DRAWING PE4999-9 – ANALYTICAL TESTING PLAN – SOIL (PAHs)

DRAWING PE4999-9A – CROSS SECTION A-A' – SOIL (PAHs)

DRAWING PE4999-10 – ANALYTICAL TESTING PLAN – SOIL (Metals)

DRAWING PE4999-10A – CROSS SECTION A-A' – SOIL (Metals)

DRAWING PE4999-11 – ANALYTICAL TESTING PLAN – SOIL (BTEX, PHCs, pH)

DRAWING PE4999-11A – CROSS SECTION A-A' – SOIL (BTEX, PHCs, pH)

DRAWING PE4999-12 – ANALYTICAL TESTING PLAN – GROUNDWATER

DRAWING PE4999-12A – CROSS SECTION A-A' – GROUNDWATER

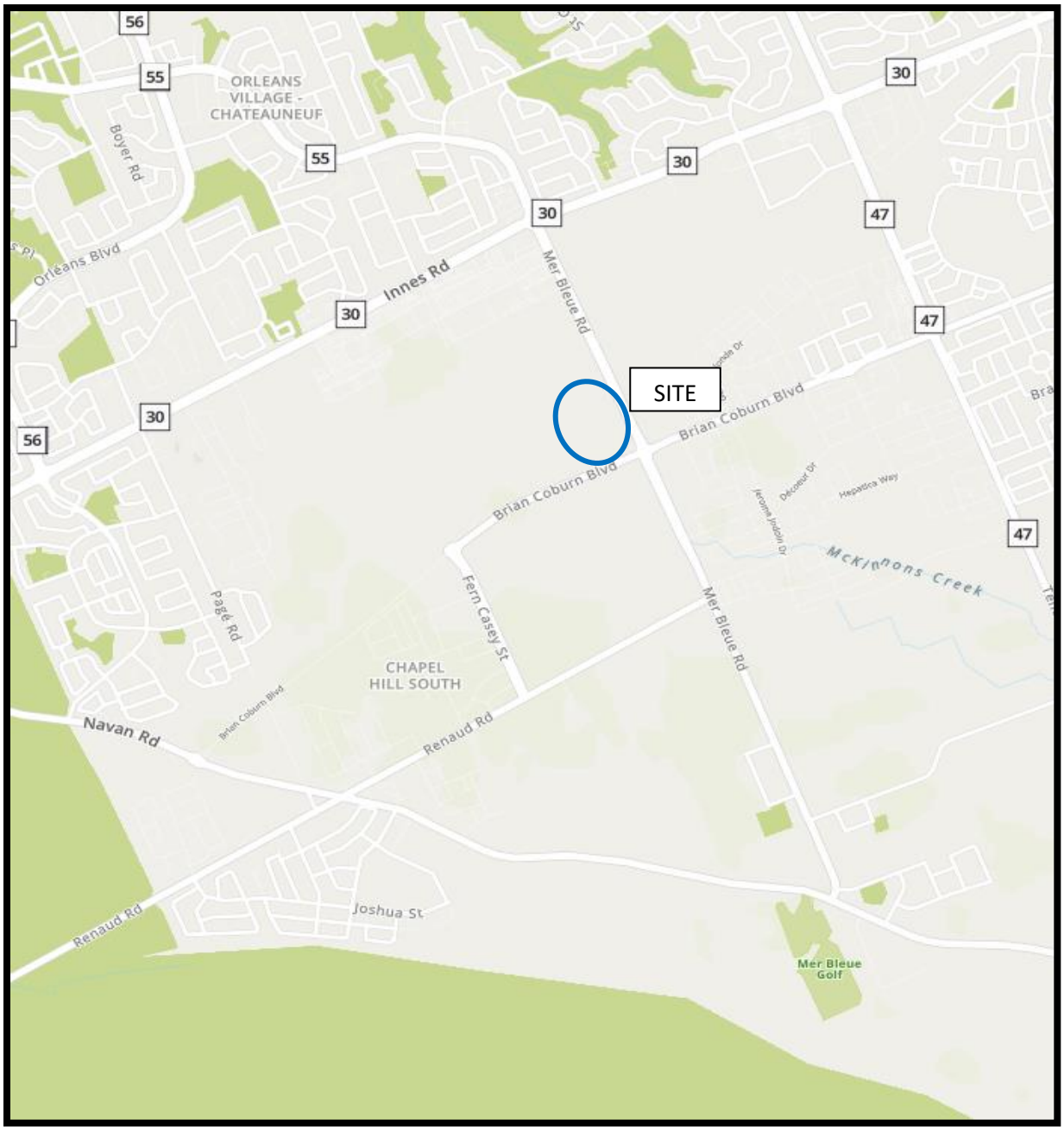
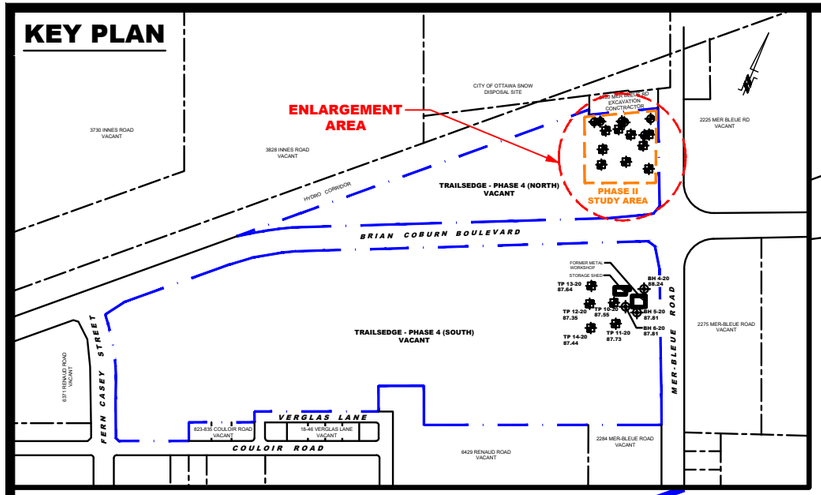


FIGURE 1

KEY PLAN

KEY PLAN



2220 MER BLEUE RD
EXCAVATION CONCTRACTOR

2225 MER BLEUE RD
VACANT

TRAILSEDGE - PHASE 4 (SOUTH)
VACANT

MER-BLEUE ROAD

A

A'

BH 2-20
87.98
(87.44)

BH 1B-20
88.29
(87.44)

BH 1-20
88.30

BH 3-20
87.79

BH 2B-20
87.93

87.434
87.432
87.43
87.428
87.426

TP 5-20
88.01

TP 1-20
88.05

(0.001m/m)

TP 3-20
87.93

TP 2-20
88.07

BH 7-20
88.09
(87.42)

TP 4-20
88.10

TP 9-20
88.06

TP 7-20
88.25

TP 8-20
88.02

TP 6-20
87.63

LEGEND:

- PROPERTY BOUNDARY
- PHASE II STUDY AREA BOUNDARY
- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- TEST PIT LOCATION
- 87.81 GROUND SURFACE ELEVATION (m)
- (87.35) GROUNDWATER SURFACE ELEVATION (m) (NOVEMBER 12, 2020)
- 87.43 GROUNDWATER CONTOURS (m)
- APPROX. GROUNDWATER FLOW DIRECTION (HORIZONTAL HYDRAULIC GRADIENT) (0.001m/m)
- A — A' CROSS SECTION

GROUND SURFACE ELEVATIONS AT TEST HOLE LOCATIONS ARE REFERENCED TO A GEODETIC DATUM.

patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

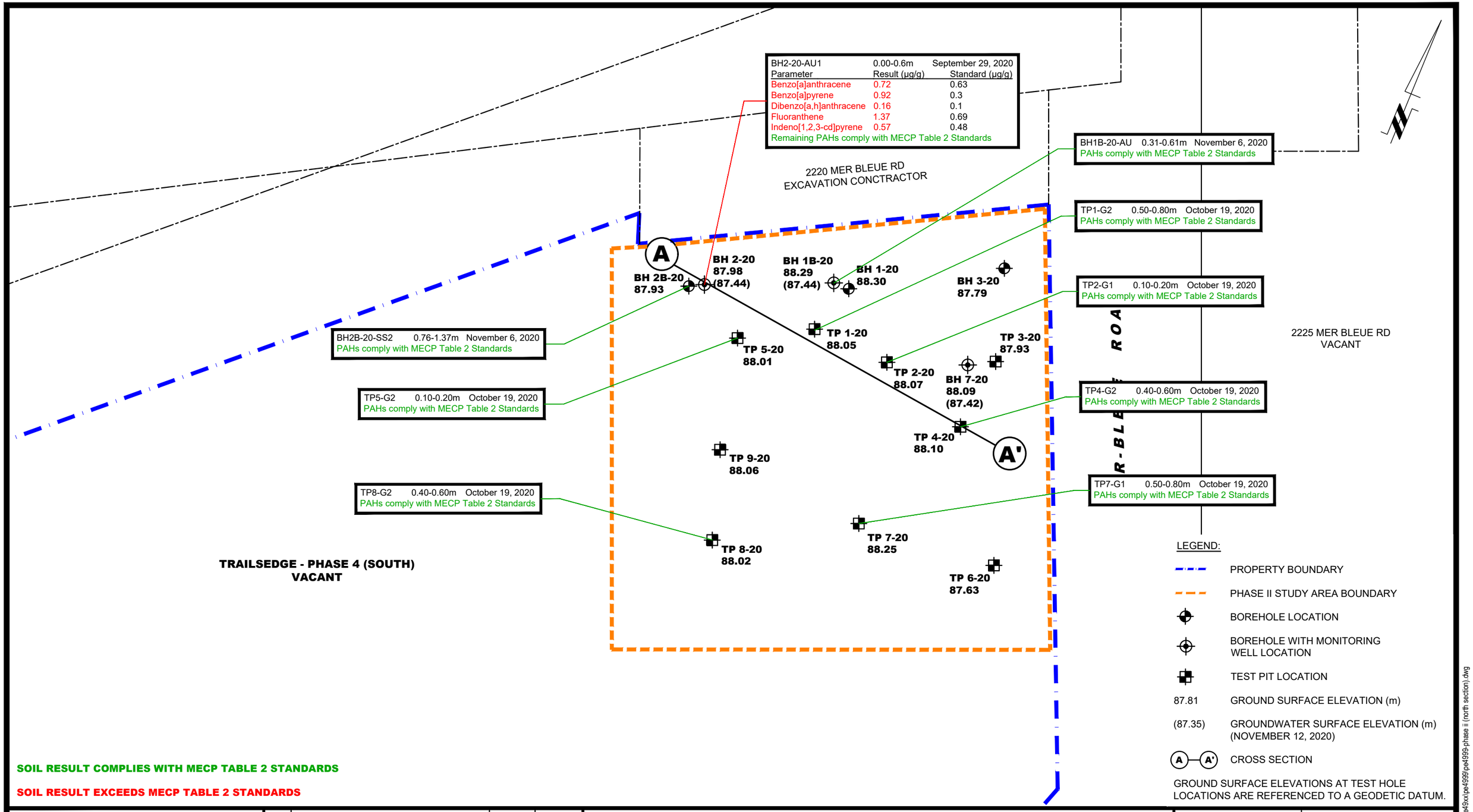
NO.	REVISIONS	DATE	INITIAL

RICHCRAFT GROUP OF COMPANIES
PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TRAIL'S EDGE - PHASE 4 (SOUTH)
NORTHERN PARCEL (MIXED-USE ZONE)
OTTAWA, ONTARIO

Title:
TEST HOLE LOCATION PLAN

Scale: 1:1000	Date: 01/2021
Drawn by: YA	Report No.: PE4999-2
Checked by: NS	Dwg. No.: PE4999-8
Approved by: MSD	Revision No.:

p:\autocad drawings\environmental\pe49xx\pe4999\pe4999-phase ii (north section).dwg



SOIL RESULT COMPLIES WITH MECP TABLE 2 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 2 STANDARDS

patersongroup
consulting engineers
154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL

RICHCRAFT GROUP OF COMPANIES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TRAIL'S EDGE - PHASE 4 (SOUTH)
NORTHERN PARCEL (MIXED-USE ZONE)

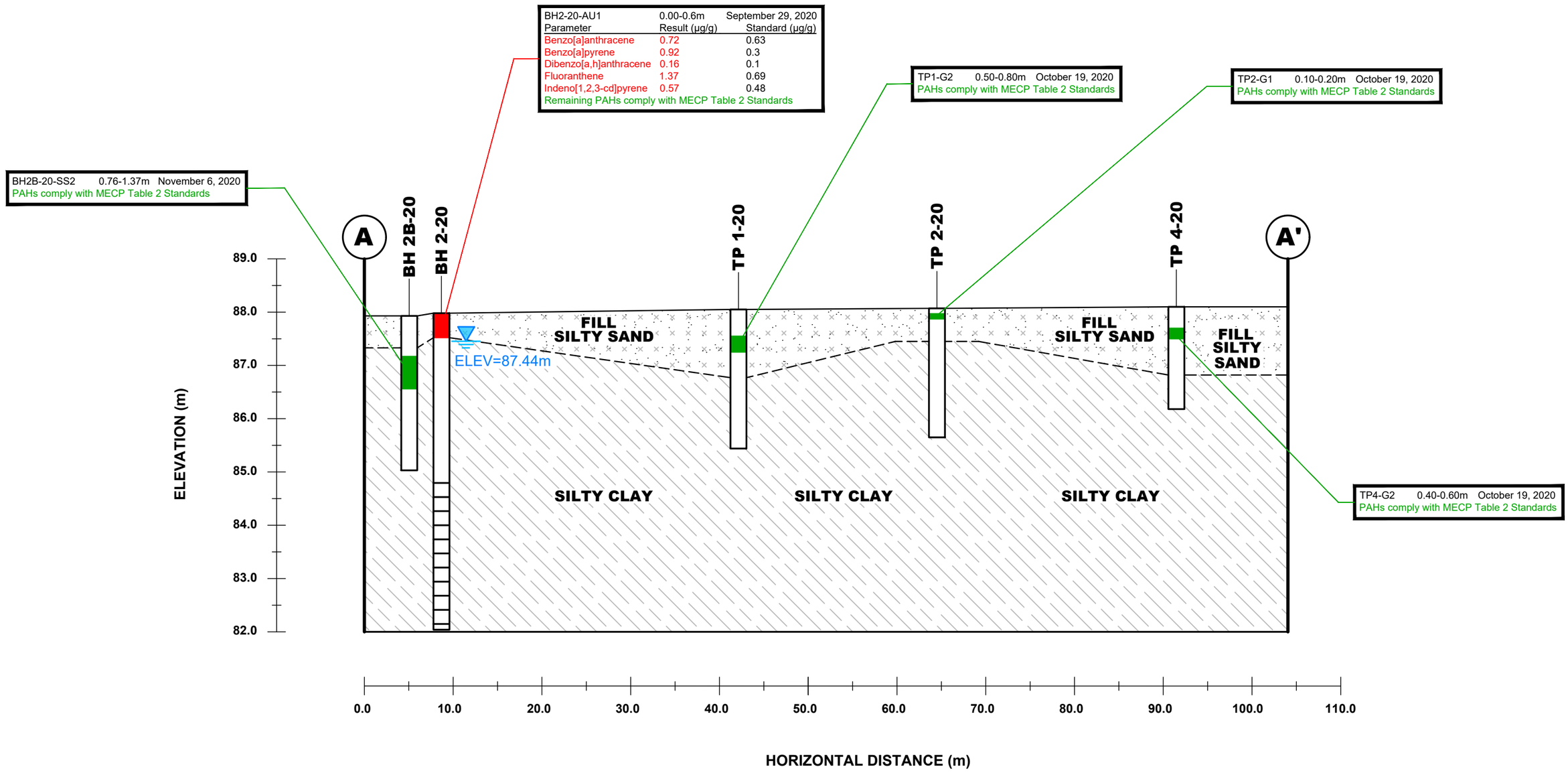
OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL (PAHs)

Scale: 1:1000	Date: 01/2021
Drawn by: YA	Report No.: PE4999-2
Checked by: NS	Dwg. No.: PE4999-9
Approved by: MSD	Revision No.:

p:\autocad drawings\environmental\pe4999\pe4999-phase ii (north section).dwg



SOIL RESULT COMPLIES WITH MECP TABLE 2 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 2 STANDARDS

patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL

RICHCRAFT GROUP OF COMPANIES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TRAIL'S EDGE - PHASE 4 (SOUTH)
NORTHERN PARCEL (MIXED-USE ZONE)

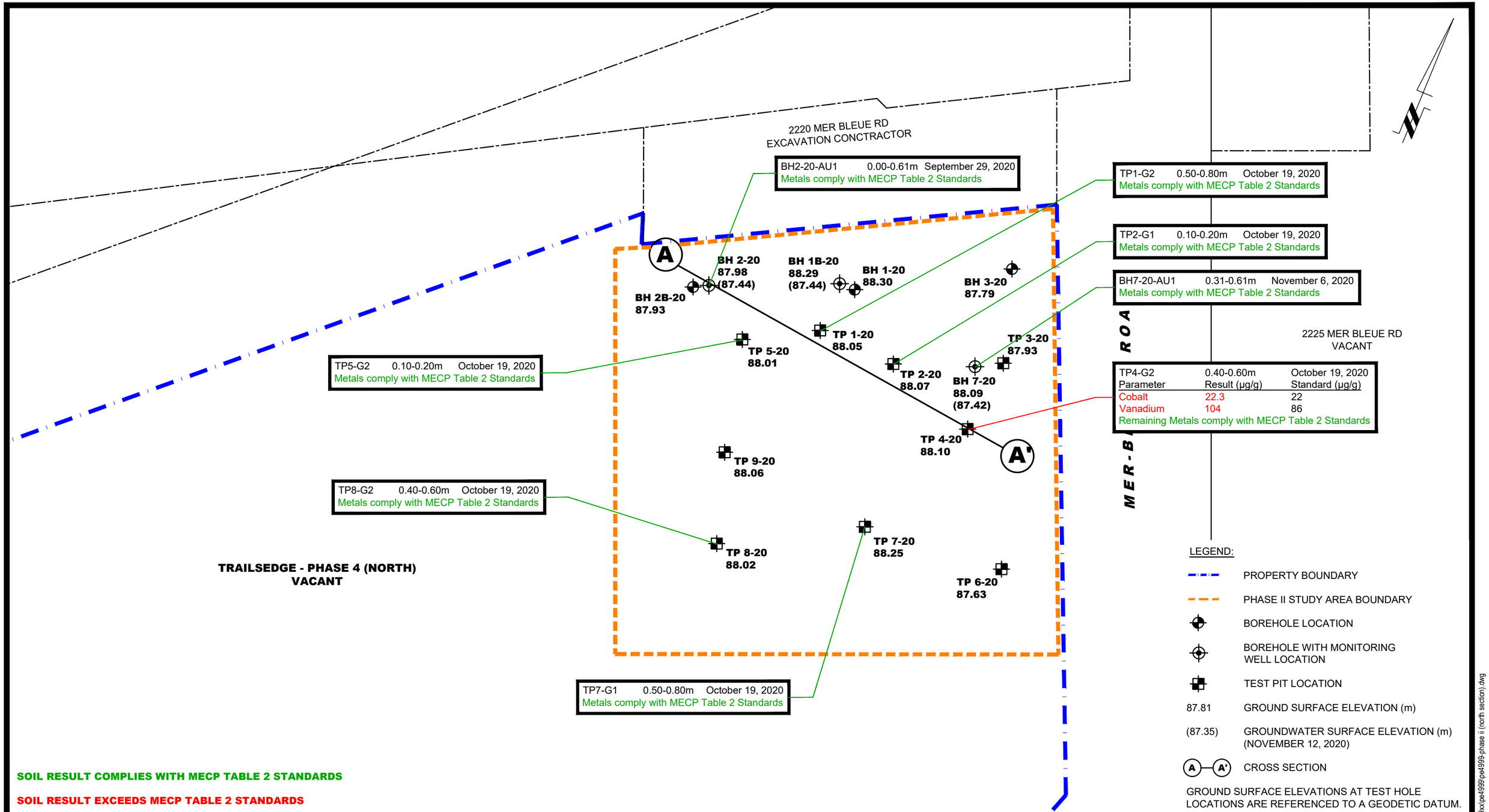
OTTAWA, ONTARIO

Title:

CROSS SECTION A-A' - SOIL (PAHs)

Scale: AS SHOWN	Date: 01/2021
Drawn by: YA	Report No.: PE4999-2
Checked by: NS	Dwg. No.: PE4999-9A
Approved by: MSD	Revision No.:

p:\autocad drawings\environmental\pe4999\pe4999-phase ii (north section).dwg



SOIL RESULT COMPLIES WITH MECP TABLE 2 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 2 STANDARDS

patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL

RICHCRAFT GROUP OF COMPANIES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TRAIL'S EDGE - PHASE 4 (SOUTH)
NORTHERN PARCEL (MIXED-USE ZONE)

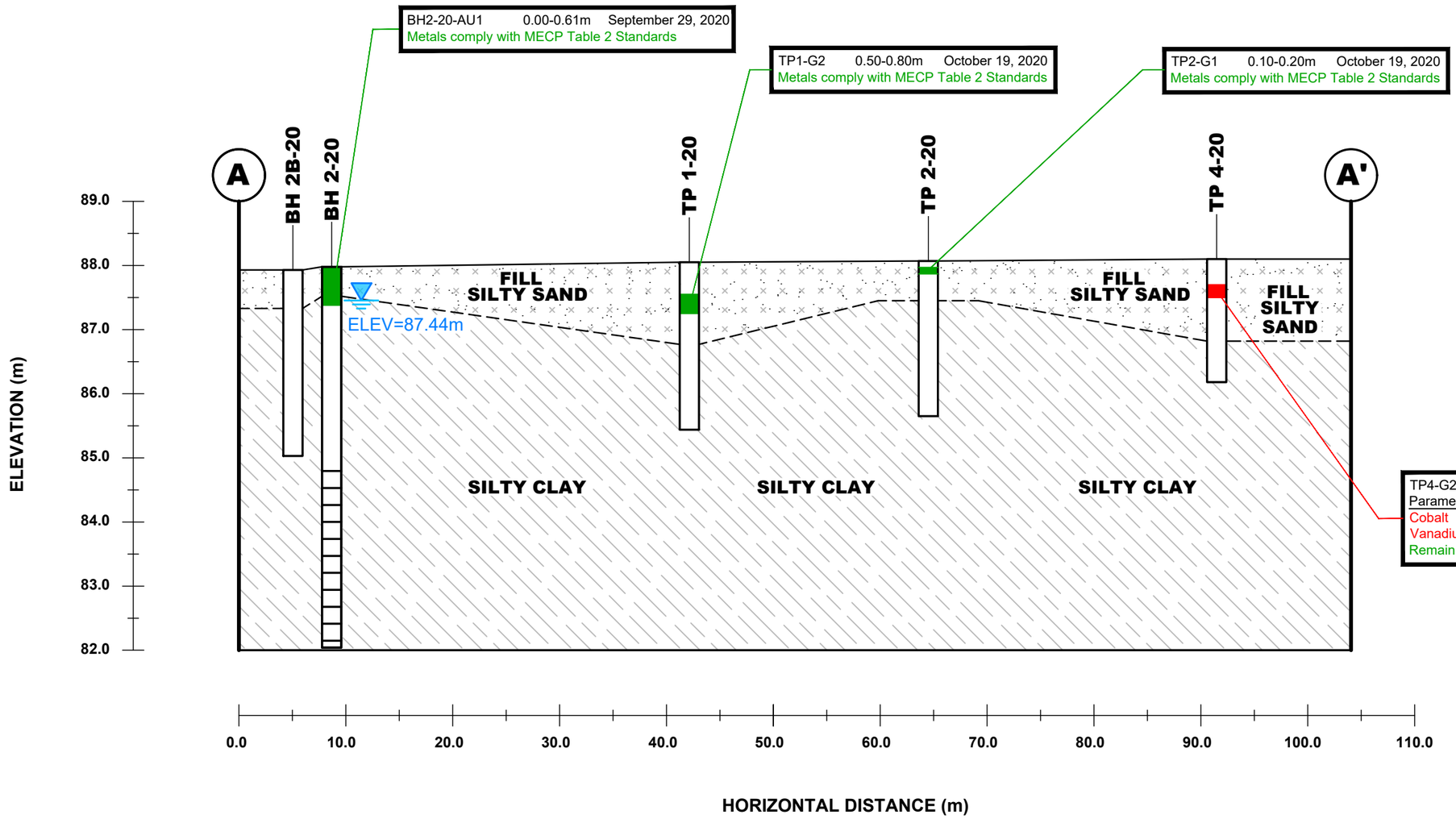
OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL (METALS)

Scale: 1:1000	Date: 01/2021
Drawn by: YA	Report No.: PE4999-2
Checked by: NS	Dwg. No.: PE4999-10
Approved by: MSD	Revision No.:

p:\autocad drawings\environmental\pe4999\xx\pe4999(pe4999-phase ii (north section).dwg



SOIL RESULT COMPLIES WITH MECP TABLE 2 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 2 STANDARDS

patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

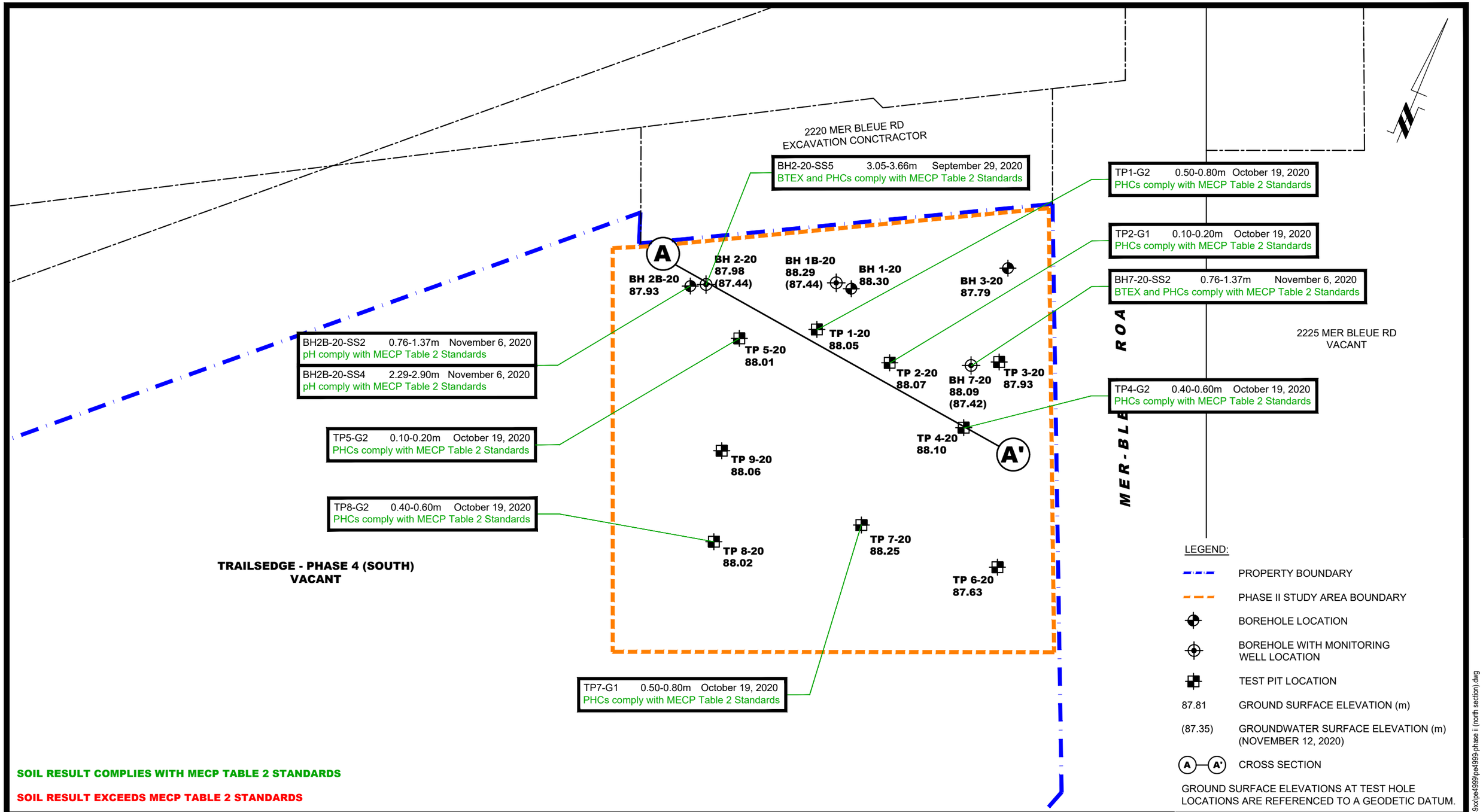
NO.	REVISIONS	DATE	INITIAL

RICHCRAFT GROUP OF COMPANIES
PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TRAIL'S EDGE - PHASE 4 (SOUTH)
NORTHERN PARCEL (MIXED-USE ZONE)
OTTAWA, ONTARIO

Title:
CROSS SECTION A-A' - SOIL (METALS)

Scale: AS SHOWN	Date: 01/2021
Drawn by: YA	Report No.: PE4999-2
Checked by: NS	Dwg. No.: PE4999-10A
Approved by: MSD	Revision No.:

p:\autocad drawings\environmental\pe49xx\pe4999\pe4999-phase ii (north section).dwg



SOIL RESULT COMPLIES WITH MECP TABLE 2 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 2 STANDARDS

patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL

RICHCRAFT GROUP OF COMPANIES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TRAIL'S EDGE - PHASE 4 (SOUTH)
NORTHERN PARCEL (MIXED-USE ZONE)

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL (BTEX,PHCs,pH)

Scale: 1:1000	Date: 01/2021
Drawn by: YA	Report No.: PE4999-2
Checked by: NS	Dwg. No.: PE4999-11
Approved by: MSD	Revision No.:

p:\autocad drawings\environmental\pe4999\xx\pe4999-phase ii (north section).dwg

BH2B-20-SS2 0.76-1.37m November 6, 2020
pH comply with MECP Table 2 Standards

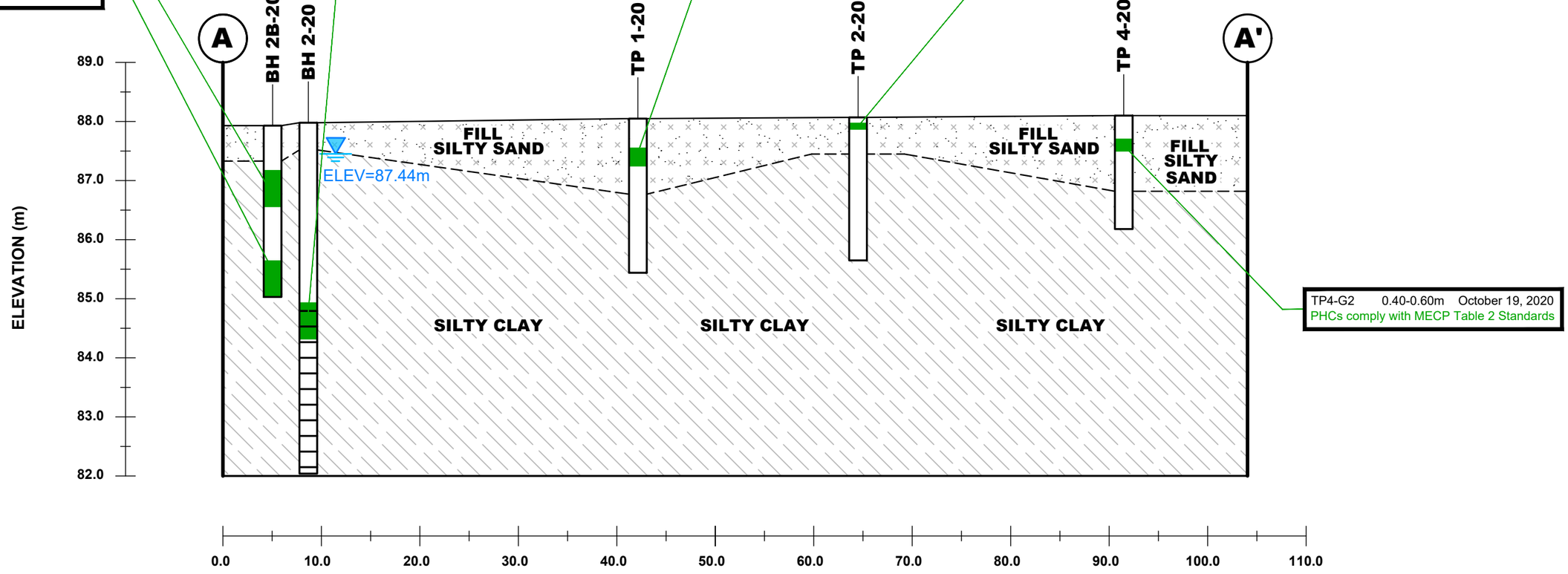
BH2B-20-SS4 2.29-2.90m November 6, 2020
pH comply with MECP Table 2 Standards

BH2-20-SS5 3.05-3.66m September 29, 2020
BTEX and PHCs comply with MECP Table 2 Standards

TP1-G2 0.50-0.80m October 19, 2020
PHCs comply with MECP Table 2 Standards

TP2-G1 0.10-0.20m October 19, 2020
PHCs comply with MECP Table 2 Standards

TP4-G2 0.40-0.60m October 19, 2020
PHCs comply with MECP Table 2 Standards



SOIL RESULT COMPLIES WITH MECP TABLE 2 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 2 STANDARDS

patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

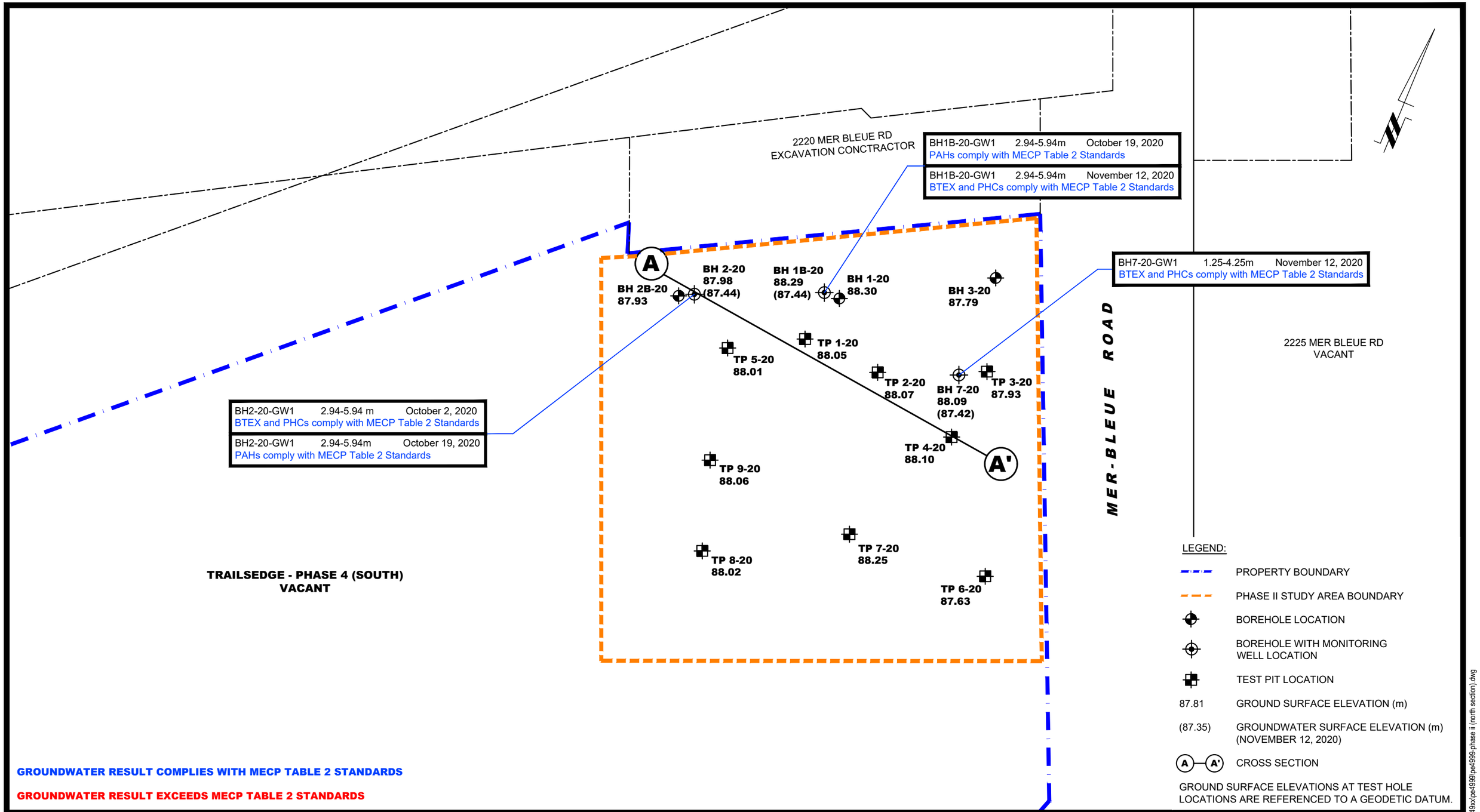
NO.	REVISIONS	DATE	INITIAL

RICHCRAFT GROUP OF COMPANIES
PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TRAIL'S EDGE - PHASE 4 (SOUTH)
NORTHERN PARCEL (MIXED-USE ZONE)
OTTAWA, ONTARIO

Title:
CROSS SECTION A-A' - SOIL (BTEX, PHCs, pH)

Scale: AS SHOWN	Date: 01/2021
Drawn by: YA	Report No.: PE4999-2
Checked by: NS	Dwg. No.: PE4999-11A
Approved by: MSD	Revision No.:

p:\autocad drawings\environmental\pe49xx\pe4999\pe4999-phase ii (north section).dwg



GROUNDWATER RESULT COMPLIES WITH MECP TABLE 2 STANDARDS

GROUNDWATER RESULT EXCEEDS MECP TABLE 2 STANDARDS

patersongroup
consulting engineers
154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL

RICHCRAFT GROUP OF COMPANIES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TRAIL'S EDGE - PHASE 4 (SOUTH)
NORTHERN PARCEL (MIXED-USE ZONE)

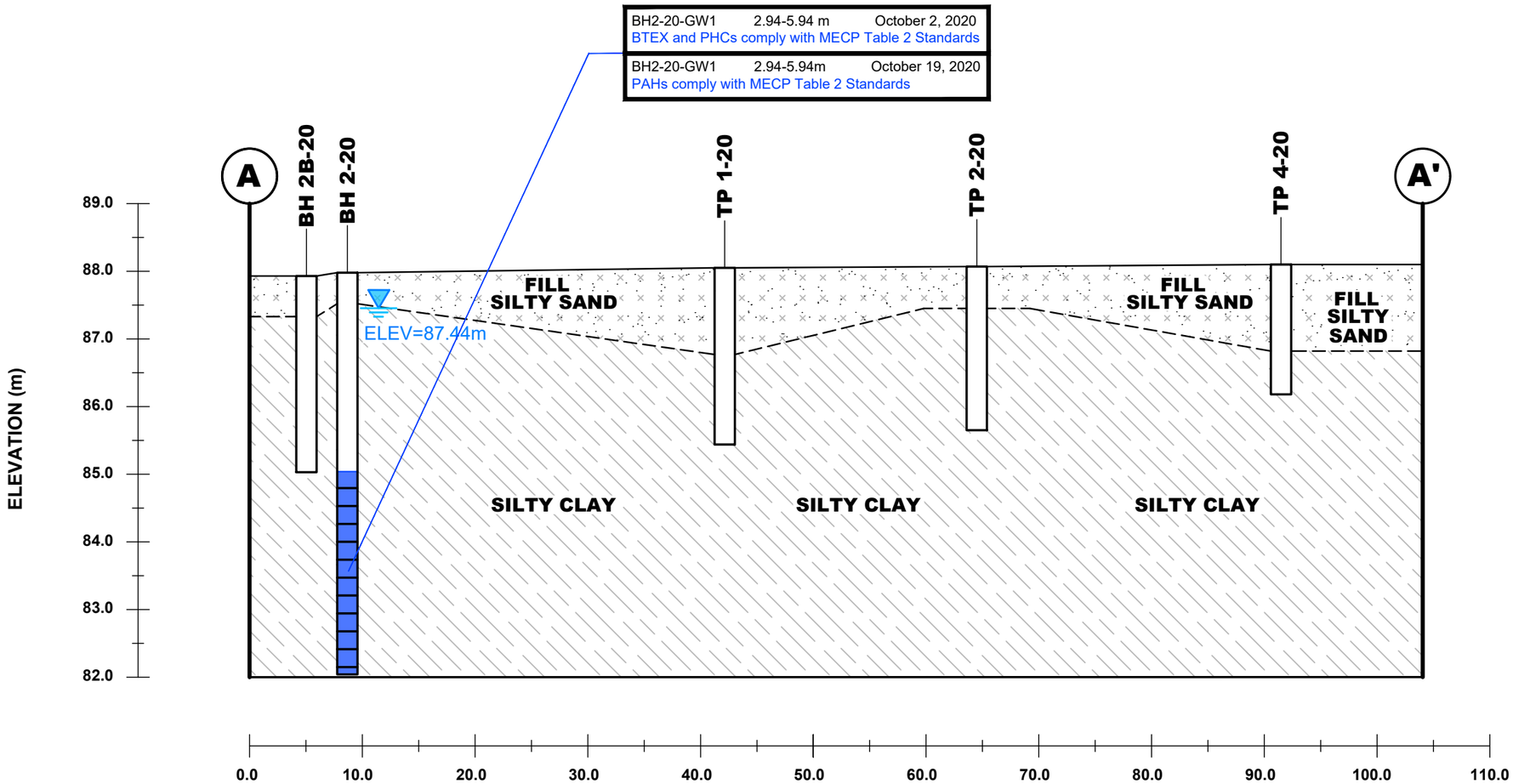
OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - GROUNDWATER (BTEX, PHCs, PAHs)

Scale: 1:1000	Date: 01/2021
Drawn by: YA	Report No.: PE4999-2
Checked by: NS	Dwg. No.: **PE4999-12**
Approved by: MSD	Revision No.:

p:\autocad drawings\environmental\pe4999xx\pe4999\pe4999-phase ii (north section).dwg



GROUNDWATER RESULT COMPLIES WITH MECP TABLE 2 STANDARDS

GROUNDWATER RESULT EXCEEDS MECP TABLE 2 STANDARDS

patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL

RICHCRAFT GROUP OF COMPANIES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TRAIL'S EDGE - PHASE 4 (SOUTH)
NORTHERN PARCEL (MIXED-USE ZONE)

OTTAWA, ONTARIO

Title:
CROSS SECTION A-A' - GROUNDWATER (BTEX, PHCs, PAHs)

Scale: AS SHOWN	Date: 01/2021
Drawn by: YA	Report No.: PE4999-2
Checked by: NS	Dwg. No.: PE4999-12A
Approved by: MSD	Revision No.:

p:\autocad drawings\environmental\pe49xx\pe4999\pe4999-phase ii (north section).dwg

APPENDIX 1

SAMPLING AND ANALYSIS PLAN

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

LABORATORY CERTIFICATES OF ANALYSIS

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Services

Paterson Group Inc.

Consulting Engineers
154 Colonnade Road South
Ottawa (Nepean), Ontario
Canada K2E 7J5

Tel: (613) 226-7381
Fax: (613) 226-6344
www.patersongroup.ca

patersongroup

Sampling & Analysis Plan

Phase II – Environmental Site Assessment
Trail's Edge: Phase 4 (South)
Northern Parcel (Mixed-Use Zone)
Ottawa, Ontario

Prepared For

Richcraft Group of Companies

September 21, 2020

Report: PE4999-2-SAP

TABLE OF CONTENTS

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Richcraft Group of Companies to conduct a Phase II – Environmental Site Assessment (Phase II ESA) for a portion of land within the proposed Trail's Edge: Phase 4 (South) subdivision development, in the City of Ottawa, Ontario. This Phase II ESA was completed in conjunction with the Phase II ESA work carried out on another portion of the Trail's Edge: Phase 4 (South) development.

Based on the findings of the Phase I ESA, the following subsurface investigation program was developed.

Borehole/ Test Pit	Location & Rationale	Proposed Depth & Rationale
BH1-20	Northwestern portion of Phase II study area; to assess for potential impacts resulting from the presence of fill material of unknown quality.	4-7 m; for general coverage purposes.
BH1B-20	Northwestern portion of Phase II study area; to assess for potential impacts resulting from the presence of fill material of unknown quality as well as a neighbouring contractor's equipment storage yard to the north.	4-7 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH2-20	Northern portion of Phase II study area; to assess for potential impacts resulting from the presence of fill material of unknown quality as well as a neighbouring contractor's equipment storage yard to the north.	4-7 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH2B-20	Northern portion of Phase II study area; to assess for potential impacts resulting from the presence of fill material of unknown quality.	4-7 m; for general coverage purposes.
BH3-20	Northeastern portion of Phase II study area; to assess for potential impacts resulting from the presence of fill material of unknown quality.	4-7 m; for general coverage purposes.
BH7-20	East-central portion of Phase II study area; to assess for potential impacts resulting from the presence of fill material of unknown quality as well as a neighbouring contractor's equipment storage yard to the north.	4-7 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
TP1-TP9	Throughout the Phase II study area; to assess for potential impacts resulting from the presence of fill material of unknown quality.	1-3 m; for general coverage purposes.

Borehole and grab sample locations are shown on Drawing PE4999-8 – Test Hole Location Plan, appended to the main report.

At each borehole, split-spoon samples of the overburden soils will be obtained at 0.76 m (2'6") intervals until practical refusal to augering. All soil samples will be retained, and samples will be selected for submission following a preliminary screening analysis. Following the borehole drilling, groundwater monitoring wells will be installed in boreholes BH1B-20, BH2-20, and BH7-20 for the collection of groundwater samples.

2.0 ANALYTICAL TESTING PROGRAM

The analytical testing program for soil at the subject site is based on the following general considerations:

- ❒ At least one sample from each borehole should be submitted, in order to delineate the horizontal extent of contamination across the site.
- ❒ At least one sample from each stratigraphic unit should be submitted, in order to delineate the vertical extent of contamination at the site.
- ❒ In boreholes where there is visual or olfactory evidence of contamination, or where organic vapour meter or photoionization detector readings indicate the presence of contamination, the 'worst-case' sample from each borehole should be submitted for comparison with MECP site condition standards.
- ❒ In boreholes with evidence of contamination as described above, a sample should be submitted from the stratigraphic unit below the 'worst-case' sample to determine whether the contaminant(s) have migrated downward.
- ❒ Parameters analyzed should be consistent with the Contaminants of Potential Concern identified in the Phase I ESA.

The analytical testing program for soil at the subject site is based on the following general considerations:

- ❒ Groundwater monitoring wells should be installed in all boreholes with visual or olfactory evidence of soil contamination, in stratigraphic units where soil contamination was encountered, where those stratigraphic units are at or below the water table (i.e. a water sample can be obtained).
- ❒ Groundwater monitoring well screens should straddle the water table at sites where the contaminants of concern are suspected to be LNAPLs.
- ❒ At least one groundwater monitoring well should be installed in a stratigraphic unit below the suspected contamination, where said stratigraphic unit is water-bearing.
- ❒ Parameters analyzed should be consistent with the Contaminants of Concern identified in the Phase I ESA and with the contaminants identified in the soil samples.

3.0 STANDARD OPERATING PROCEDURES

3.1 Environmental Drilling Procedure

Purpose

The purpose of environmental boreholes is to identify and/or delineate contamination within the soil and/or to install groundwater monitoring wells in order to identify contamination within the groundwater.

Equipment

The following is a list of equipment that is in addition to regular drilling equipment stated in the geotechnical drilling SOP:

- ❒ Glass soil sample jars
- ❒ two buckets
- ❒ cleaning brush (toilet brush works well)
- ❒ dish detergent
- ❒ methyl hydrate
- ❒ water (if not available on site - water jugs available in trailer)
- ❒ latex or nitrile gloves (depending on suspected contaminant)
- ❒ RKI Eagle organic vapour meter or MiniRae photoionization detector (depending on contamination suspected)

Determining Borehole Locations

If conditions on site are not as suspected, and planned borehole locations cannot be drilled, **call the office to discuss**. Alternative borehole locations will be determined in conversation with the field technician and supervising engineer.

After drilling is completed a plan with the borehole locations must be provided. Distances and orientations of boreholes with respect to site features (buildings, roadways, etc.) must be provided. Distances should be measured using a measuring tape or wheel rather than paced off. Ground surface elevations at each borehole should be surveyed relative to a geodetic benchmark, if one is available, or a temporary site benchmark which can be tied in at a later date if necessary.

Drilling Procedure

The actual drilling procedure for environmental boreholes is the same as geotechnical boreholes (see SOP for drilling and sampling) with a few exceptions as follows:

- ❒ Continuous split spoon samples (every 0.6 m or 2') or semi-continuous (every 0.76 m or 2'6") are required.
- ❒ Make sure samples are well sealed in plastic bags with no holes prior to screening and are kept cool but unfrozen.
- ❒ If sampling for VOCs, BTEX, or PHCs F_1, a soil core from each soil sample, which may be analyzed, must be taken and placed in the laboratory-provided methanol vial.
- ❒ Note all and any odours or discolouration of samples.
- ❒ Split spoon samplers must be washed between samples.
- ❒ If obvious contamination is encountered, continue sampling until vertical extent of contamination is delineated.
- ❒ As a general rule, environmental boreholes should be deep enough to intercept the groundwater table (unless this is impossible/impractical - call project manager to discuss).
- ❒ If at all possible, soil samples should be submitted to a preliminary screening procedure on site, either using a RKI Eagle, PID, etc. depending on type of suspected contamination.

Spoon Washing Procedure

All sampling equipment (spilt spoons, etc.) must be washed between samples in order to prevent cross contamination of soil samples.

- ❒ Obtain two buckets of water (preferably hot if available)
- ❒ Add a small amount of dish soap to one bucket
- ❒ Scrub spoons with brush in soapy water, inside and out, including tip
- ❒ Rinse in clean water
- ❒ Apply a small amount of methyl hydrate to the inside of the spoon. (A spray bottle or water bottle with a small hole in the cap works well)
- ❒ Allow to dry (takes seconds)
- ❒ Rinse with distilled water, a spray bottle works well.

The methyl hydrate eliminates any soap residue that may be on the spoon and is especially important when dealing with suspected VOCs.

Screening Procedure

The RKI Eagle is used to screen most soil samples, particularly where petroleum hydrocarbon contamination is suspected. The MiniRae is used when VOCs are suspected, however it also can be useful for detecting petroleum. These tools are for screening purposes only and cannot be used in place of laboratory testing. Vapour results obtained from the RKI Eagle and the PID are relative and must be interpreted.

Screening equipment should be calibrated on an approximately monthly basis, more frequently if heavily used.

- ❒ Samples should be brought to room temperature; this is specifically important in colder weather. Soil must not be frozen.
- ❒ Turn instrument on and allow to come to zero - calibrate if necessary
- ❒ If using RKI Eagle, ensure instrument is in methane elimination mode unless otherwise directed.
- ❒ Ensure measurement units are ppm (parts per million) initially. RKI Eagle will automatically switch to %LEL (lower explosive limit) if higher concentrations are encountered.
- ❒ Break up large lumps of soil in the sample bag, taking care not to puncture bag.
- ❒ Insert probe into soil bag, creating a seal with your hand around the opening.
- ❒ Gently manipulate soil in bag while observing instrument readings.
- ❒ Record the highest value obtained in the first 15 to 25 seconds
- ❒ Make sure to indicate scale (ppm or LEL); also note which instrument was used (RKI Eagle 1 or 2, or MiniRae).
- ❒ Jar samples and refrigerate as per Sampling and Analysis Plan.

3.2 Monitoring Well Installation Procedure

Equipment

- ❒ 5' x 2" threaded sections of Schedule 40 PVC slotted well screen (5' x 1 ¼" if installing in cored hole in bedrock)
- ❒ 5' x 2" threaded sections of Schedule 40 PVC riser pipe (5' x 1 ¼" if installing in cored hole in bedrock)
- ❒ Threaded end-cap
- ❒ Slip-cap or J-plug
- ❒ Asphalt cold patch or concrete
- ❒ Silica Sand
- ❒ Bentonite chips (Holeplug)
- ❒ Steel flushmount casing

Procedure

- ❒ Drill borehole to required depth, using drilling and sampling procedures described above.
- ❒ If borehole is deeper than required monitoring well, backfill with bentonite chips to required depth. This should only be done on wells where contamination is not suspected, in order to prevent downward migration of contamination.
- ❒ Only one monitoring well should be installed per borehole.
- ❒ Monitoring wells should not be screened across more than one stratigraphic unit to prevent potential migration of contaminants between units.
- ❒ Where LNAPLs are the suspected contaminants of concern, monitoring wells should be screened straddling the water table in order to capture any free product floating on top of the water table.
- ❒ Thread the end cap onto a section of screen. Thread second section of screen if required. Thread risers onto screen. Lower into borehole to required depth. Ensure slip-cap or J-plug is inserted to prevent backfill materials entering well.
- ❒ As drillers remove augers, backfill borehole annulus with silica sand until the level of sand is approximately 0.3 m above the top of the screen.
- ❒ Backfill with holeplug until at least 0.3 m of holeplug is present above the top of the silica sand.
- ❒ Backfill remainder of borehole with holeplug or with auger cuttings (if contamination is not suspected).
- ❒ Install flushmount casing. Seal space between flushmount and borehole annulus with concrete, cold patch, or holeplug to match surrounding ground surface.

3.3 Monitoring Well Sampling Procedure

Equipment

- ❒ Water level metre or interface probe on hydrocarbon/LNAPL sites
- ❒ Spray bottles containing water and methanol to clean water level tape or interface probe
- ❒ Peristaltic pump
- ❒ Polyethylene tubing for peristaltic pump
- ❒ Flexible tubing for peristaltic pump
- ❒ Latex or nitrile gloves (depending on suspected contaminant)
- ❒ Allen keys and/or 9/16" socket wrench to remove well caps
- ❒ Graduated bucket with volume measurements
- ❒ pH/Temperature/Conductivity combo pen
- ❒ Laboratory-supplied sample bottles

Sampling Procedure

- ❒ Locate well and use socket wrench or Allan key to open metal flush mount protector cap. Remove plastic well cap.
- ❒ Measure water level, with respect to existing ground surface, using water level meter or interface probe. If using interface probe on suspected NAPL site, measure the thickness of free product.
- ❒ Measure total depth of well.
- ❒ Clean water level tape or interface probe using methanol and water. Change gloves between wells.
- ❒ Calculate volume of standing water within well and record.
- ❒ Insert polyethylene tubing into well and attach to peristaltic pump. Turn on peristaltic pump and purge into graduated bucket. Purge at least three well volumes of water from the well. Measure and record field chemistry. Continue to purge, measuring field chemistry after every well volume purged, until appearance or field chemistry stabilizes.
- ❒ Note appearance of purge water, including colour, opacity (clear, cloudy, silty), sheen, presence of LNAPL, and odour. Note any other unusual features (particulate matter, effervescence (bubbling) of dissolved gas, etc.).
- ❒ Fill required sample bottles. If sampling for metals, attach 75-micron filter to discharge tube and filter metals sample. If sampling for VOCs, use low flow rate to ensure continuous stream of non-turbulent flow into sample bottles. Ensure no headspace is present in VOC vials.
- ❒ Replace well cap and flushmount casing cap.

4.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

The QA/QC program for this Phase II ESA is as follows:

- ❒ All non-dedicated sampling equipment (split spoons) will be decontaminated according to the SOPs listed above.
- ❒ All groundwater sampling equipment is dedicated (polyethylene and flexible peristaltic tubing is replaced for each well).
- ❒ Where groundwater samples are to be analyzed for VOCs, one laboratory-provided trip blank will be submitted for analysis with every laboratory submission.
- ❒ Approximately one (1) field duplicate will be submitted for every ten (10) samples submitted for laboratory analysis. A minimum of one (1) field duplicate per project will be submitted. Field duplicates will be submitted for soil and groundwater samples
- ❒ Where combo pens are used to measure field chemistry, they will be calibrated on an approximately monthly basis, according to frequency of use.

5.0 DATA QUALITY OBJECTIVES

The purpose of setting data quality objectives (DQOs) is to ensure that the level of uncertainty in data collected during the Phase II ESA is low enough that decision-making is not affected, and that the overall objectives of the investigation are met.

The quality of data is assessed by comparing field duplicates with original samples. If the relative percent difference (RPD) between the duplicate and the sample is within 20%, the data are considered to be of sufficient quality so as not to affect decision-making. The RPD is calculated as follows:

$$RPD = \left| \frac{x_1 - x_2}{(x_1 + x_2)/2} \right| \times 100\%$$

Where x_1 is the concentration of a given parameter in an original sample and x_2 is the concentration of that same parameter in the field duplicate sample.

For the purpose of calculating the RPD, it is desirable to select field duplicates from samples for which parameters are present in concentrations above laboratory detection limits, i.e. samples which are expected to be contaminated. If parameters are below laboratory detection limits for selected samples or duplicates, the RPD may be calculated using a concentration equal to one half the laboratory detection limit.

It is also important to consider data quality in the overall context of the project. For example, if the DQOs are not met for a given sample, yet the concentrations of contaminants in both the sample and the duplicate exceed the MOE site remediation standards by a large margin, the decision-making usefulness of the sample may not be considered to be impaired. The proximity of other samples which meet the DQOs must also be considered in developing the Phase II Conceptual Site Model; often there are enough data available to produce a reliable Phase II Conceptual Site Model even if DQOs are not met for certain individual samples.

These considerations are discussed in the body of the report.

6.0 PHYSICAL IMPEDIMENTS

Physical impediments to the Sampling and Analysis plan may include:

- ❒ The location of underground utilities
- ❒ Poor recovery of split-spoon soil samples
- ❒ Insufficient groundwater volume for groundwater samples
- ❒ Breakage of sampling containers following sampling or while in transit to the laboratory
- ❒ Elevated detection limits due to matrix interference (generally related to soil colour or presence of organic material)
- ❒ Elevated detection limits due to high concentrations of certain parameters, necessitating dilution of samples in laboratory
- ❒ Drill rig breakdowns
- ❒ Winter conditions
- ❒ Other site-specific impediments

Site-specific impediments to the Sampling and Analysis plan are discussed in the body of the Phase II ESA report.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Trail's Edge: Phase 4 (South)
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4999

REMARKS

HOLE NO. BH 1-20

BORINGS BY Track-Mount Power Auger **DATE** September 29, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	88.30		
TOPSOIL		AU	1						
0.86						1	87.30		
		SS	2	79	9				
		SS	3	100	9	2	86.30		
Stiff, brown **SILTY CLAY**									
- firm to soft and grey by 2.3m depth		SS	4	100	2				
		SS	5	100	2	3	85.30		
		SS	6	100	W	4	84.30		
		SS	7	100	W	5	83.30		
		SS	8	100	W				
5.94									
End of Borehole									

Photo Ionization Detector: ● Volatile Organic Rdg. (ppm); ○ Lower Explosive Limit %

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Trail's Edge: Phase 4 (South)
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4999

REMARKS

HOLE NO. BH 1B-20

BORINGS BY CME-55 Low Clearance Drill **DATE** November 6, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
TOPSOIL 0.04						0	88.29
FILL: Brown silty sand, some organics, trace gravel		AU	1				
0.76							
		SS	2	100	11	1	87.29
Stiff, brown **SILTY CLAY,** some sand		SS	3	100	7	2	86.29
- firm to soft and grey by 2.4m depth		SS	4	100	4		
		SS	5	100	2	3	85.29
		SS	6	100	W	4	84.29
4.42							
End of Borehole							
(GWL @ 0.85m - Nov. 12, 2020)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Trail's Edge: Phase 4 (South)
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4999

REMARKS

HOLE NO. BH 2-20

BORINGS BY Track-Mount Power Auger **DATE** September 29, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.98
FILL: Crushed stone with brown silty sand		AU	1				
0.46							
		SS	2	100	9	1	86.98
		SS	3	92	5	2	85.98
Stiff to firm, brown **SILTY CLAY**		SS	4	100	4		
- soft and grey by 3.0m depth		SS	5	100	2	3	84.98
		SS	6	100	W	4	83.98
		SS	7	100	W	5	82.98
		SS	8	100	W		
5.94							
End of Borehole							
(GWL @ 0.54m - Nov. 12, 2020)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Trail's Edge: Phase 4 (South)
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4999

REMARKS

HOLE NO. BH 2B-20

BORINGS BY CME-55 Low Clearance Drill **DATE** November 6, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.93
FILL: Crushed stone with brown silty sand		AU	1				
0.60							
		SS	2	100	12	1	86.93
Stiff to firm, brown **SILTY CLAY,** some sand		SS	3	100	9		
- grey by 2.1m depth						2	85.93
		SS	4	100	3		
2.90							
End of Borehole							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Trail's Edge: Phase 4 (South)
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4999

REMARKS

HOLE NO. BH 3-20

BORINGS BY Track-Mount Power Auger **DATE** September 29, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.79
TOPSOIL 0.46		AU	1				
		SS	2	100	7	1	86.79
		SS	3	100	5	2	85.79
Stiff, brown **SILTY CLAY**							
- firm to soft and grey by 2.3m depth		SS	4	100	2	3	84.79
		SS	5	100	W		
		SS	6	100	W	4	83.79
		SS	7	100	W	5	82.79
5.18 End of Borehole							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Trail's Edge: Phase 4 (South)
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4999

REMARKS

HOLE NO. BH 4-20

BORINGS BY Track-Mount Power Auger **DATE** September 29, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	88.24
FILL: Crushed stone with organics		AU	1				
- with brown sand by 0.8m depth							
0.84							
		SS	2	62	7	1	87.24
		SS	3	100	8	2	86.24
Stiff, brown **SILTY CLAY**							
- firm to soft and grey by 2.3m depth		SS	4	100	3	3	85.24
		SS	5	100	W		
		SS	6	100	W	4	84.24
		SS	7	100	W	5	83.24
		SS	8	100	W		
5.94							
End of Borehole							
(GWL @ 1.04m - Nov. 12, 2020)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Trail's Edge: Phase 4 (South)
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4999

REMARKS

HOLE NO. BH 5-20

BORINGS BY Track-Mount Power Auger **DATE** September 29, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.81
FILL: Crushed stone with sand and clay		AU	1				
0.23							
		SS	2	92	9	1	86.81
		SS	3	100	6	2	85.81
Stiff, brown **SILTY CLAY**							
- firm to soft and grey by 2.3m depth		SS	4	100	2	3	84.81
		SS	5	100	W		
		SS	6	100	W	4	83.81
		SS	7	100	W	5	82.81
		SS	8	100	W		
5.94							
End of Borehole							
(GWL @ 0.37m - Nov. 12, 2020)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)
○ **Lower Explosive Limit %**
20 40 60 80

Monitoring Well Construction

100 200 300 400 500
RKI Eagle Rdg. (ppm)
▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Trail's Edge: Phase 4 (South)
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY CME-55 Low Clearance Drill **DATE** November 6, 2020

FILE NO. PE4999

HOLE NO. BH 6-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.81
FILL: Crushed stone							
0.30							
		AU	1				
FILL: Brown silty sand with gravel							
1.07		SS	2	50	10	1	86.81
Stiff, brown **SILTY CLAY,** some sand		SS	3	100	6	2	85.81
- firm to soft and grey by 2.0m depth		SS	4	100	2		
		SS	5	100	W	3	84.81
		SS	6	100	W	4	83.81
4.42							
End of Borehole							
(GWL @ 0.46m - Nov. 12, 2020)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Trail's Edge: Phase 4 (South)
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4999

REMARKS

HOLE NO. BH 7-20

BORINGS BY CME-55 Low Clearance Drill **DATE** November 6, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	88.09
TOPSOIL 0.04							
FILL: Brown silty sand with gravel, trace organics 0.60		AU	1				
		SS	2	58	15	1	87.09
		SS	3	100	8		
Stiff, brown **SILTY CLAY,** some sand						2	86.09
- firm to soft and grey by 2.6m depth		SS	4	100	4		
		SS	5	100	W	3	85.09
		SS	6	100	W	4	84.09
4.42							
End of Borehole							
(GWL @ 0.67m - Nov. 12, 2020)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Trail's Edge: Phase 4 (South)
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4999

REMARKS

HOLE NO. TP 1

BORINGS BY Backhoe **DATE** October 19, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	88.05		
TOPSOIL		G	1						
0.20									
FILL: Brown silty clay, some sand, trace brick and asphalt		G	2						
0.84						1	87.05		
Brown **SILTY CLAY**		G	3			2	86.05		
2.61									
End of Test Pit									

Photo Ionization Detector: ○ Lower Explosive Limit % — 20 40 60 80

RKI Eagle Rdg. (ppm): 100 200 300 400 500

▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Trail's Edge: Phase 4 (South)
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Backhoe **DATE** October 19, 2020

FILE NO. PE4999

HOLE NO. TP 2

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	88.07		
FILL: Brown silty sand, some gravel, trace clay, asphalt and organics		G	1						
0.38									
TOPSOIL: Brown silty clay, some organics									
0.62									
		G	2			1	87.07		
Red-brown **SILTY CLAY**									
- brown by 1.5m depth									
						2	86.07		
2.42									
End of Test Pit									

Photo Ionization Detector: ● Volatile Organic Rdg. (ppm); ○ Lower Explosive Limit %

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Trail's Edge: Phase 4 (South)
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4999

REMARKS

HOLE NO. TP 3

BORINGS BY Backhoe **DATE** October 19, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	87.93		
FILL: Brown silty clay, trace gravel, brick and organics		G	1						
						1	86.93		
1.15									
Brown **SILTY CLAY**		G	2						
1.71									
End of Test Pit									

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)
○ Lower Explosive Limit %
20 40 60 80
100 200 300 400 500
RKI Eagle Rdg. (ppm)
▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Trail's Edge: Phase 4 (South)
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4999

REMARKS

HOLE NO. TP 4

BORINGS BY Backhoe **DATE** October 19, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	88.10
TOPSOIL		G	1				
0.28							
FILL: Brown silty sand, some gravel, clay, trace cobbles, brick, asphalt, domestic waste		G	2				
						1	87.10
1.28							
Brown **SILTY CLAY**							
1.92							
End of Test Pit							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Trail's Edge: Phase 4 (South)
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4999

REMARKS

HOLE NO. TP 5

BORINGS BY Backhoe **DATE** October 19, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	88.01
TOPSOIL		G	1				
0.28							
		G	2				
FILL: Brown silty clay, some sand, brick and asphalt							
		G	3				
						1	87.01
1.14							
Brown **SILTY CLAY**							
1.62							
End of Test Pit							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)
○ **Lower Explosive Limit %**
20 40 60 80
100 200 300 400 500
RKI Eagle Rdg. (ppm)
▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Trail's Edge: Phase 4 (South)
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4999

REMARKS

HOLE NO. TP 6

BORINGS BY Backhoe **DATE** October 19, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	87.63		
TOPSOIL		G	1						
0.27									
		G	2						
Brown **SILTY CLAY**						1	86.63		
1.28									
End of Test Pit									

Photo Ionization Detector: ● Volatile Organic Rdg. (ppm); ○ Lower Explosive Limit %

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Trail's Edge: Phase 4 (South)
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4999

REMARKS

HOLE NO. TP 7

BORINGS BY Backhoe **DATE** October 19, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	88.25		
TOPSOIL									
0.26									
FILL: Brown silty clay, some sand, trce gravel, cobbles and domestic waste		G	1						
0.96						1	87.25		
Brown **SILTY CLAY**		G	2						
2.54						2	86.25		
End of Test Pit									

Photo Ionization Detector: ○ Lower Explosive Limit % — 20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Trail's Edge: Phase 4 (South)
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4999

REMARKS

HOLE NO. TP 8

BORINGS BY Backhoe **DATE** October 19, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	88.02		
TOPSOIL		G	1						
0.27									
FILL: Brown silty clay, some sand, trace gravel and cobbles		G	2						
0.96						1	87.02		
Brown **SILTY CLAY**									
2.13						2	86.02		
End of Test Pit									

Photo Ionization Detector: ● Volatile Organic Rdg. (ppm); ○ Lower Explosive Limit %

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Trail's Edge: Phase 4 (South)
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4999

REMARKS

HOLE NO. TP 9

BORINGS BY Backhoe **DATE** October 19, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	88.06		
TOPSOIL									
0.28									
FILL: Brown silty clay, some sand, trace topsoil, gravel and cobbles		G	1						
0.66									
Brown **SILTY CLAY**						1	87.06		
						2	86.06		
2.18									
End of Test Pit									

Photo Ionization Detector: ● Volatile Organic Rdg. (ppm); ○ Lower Explosive Limit %

Scale: 20 40 60 80 / 100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

SYMBOLS AND TERMS

SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure.
Varved	-	composed of regular alternating layers of silt and clay.
Stratified	-	composed of alternating layers of different soil types, e.g. silt and sand or silt and clay.
Well-Graded	-	Having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution).
Uniformly-Graded	-	Predominantly of one grain size (see Grain Size Distribution).

The standard terminology to describe the relative strength of cohesionless soils is the compactness condition, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm. An SPT N value of "P" denotes that the split-spoon sampler was pushed 300 mm into the soil without the use of a falling hammer.

Compactness Condition	'N' Value	Relative Density %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory shear vane tests, unconfined compression tests, or occasionally by the Standard Penetration Test (SPT). Note that the typical correlations of undrained shear strength to SPT N value (tabulated below) tend to underestimate the consistency for sensitive silty clays, so Paterson reviews the applicable split spoon samples in the laboratory to provide a more representative consistency value based on tactile examination.

Consistency	Undrained Shear Strength (kPa)	'N' Value
Very Soft	<12	<2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their "sensitivity". The sensitivity, S_t, is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil. The classes of sensitivity may be defined as follows:

Low Sensitivity:	$S_t < 2$
Medium Sensitivity:	$2 < S_t < 4$
Sensitive:	$4 < S_t < 8$
Extra Sensitive:	$8 < S_t < 16$
Quick Clay:	$S_t > 16$

ROCK DESCRIPTION

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NQ or larger size core. However, it can be used on smaller core sizes, such as BQ, if the bulk of the fractures caused by drilling stresses (called "mechanical breaks") are easily distinguishable from the normal in situ fractures.

RQD %	**ROCK QUALITY**
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube, generally recovered using a piston sampler
G	-	"Grab" sample from test pit or surface materials
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size BQ, NQ, HQ, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

WC%	-	Natural water content or water content of sample, %
LL	-	Liquid Limit, % (water content above which soil behaves as a liquid)
PL	-	Plastic Limit, % (water content above which soil behaves plastically)
PI	-	Plasticity Index, % (difference between LL and PL)
Dxx	-	Grain size at which xx% of the soil, by weight, is of finer grain sizes These grain size descriptions are not used below 0.075 mm grain size
D10	-	Grain size at which 10% of the soil is finer (effective grain size)
D60	-	Grain size at which 60% of the soil is finer
Cc	-	Concavity coefficient = $(D30)^2 / (D10 \times D60)$
Cu	-	Uniformity coefficient = D60 / D10

Cc and Cu are used to assess the grading of sands and gravels:
Well-graded gravels have: $1 < Cc < 3$ and $Cu > 4$
Well-graded sands have: $1 < Cc < 3$ and $Cu > 6$
Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.
Cc and Cu are not applicable for the description of soils with more than 10% silt and clay (more than 10% finer than 0.075 mm or the #200 sieve)

CONSOLIDATION TEST

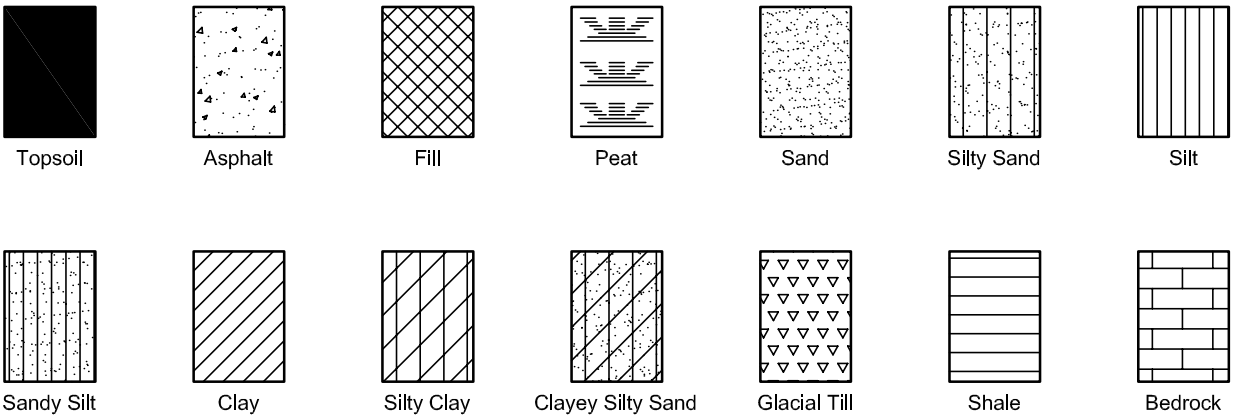
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void Ratio		Initial sample void ratio = volume of voids / volume of solids
Wo	-	Initial water content (at start of consolidation test)

PERMEABILITY TEST

k	-	Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test.

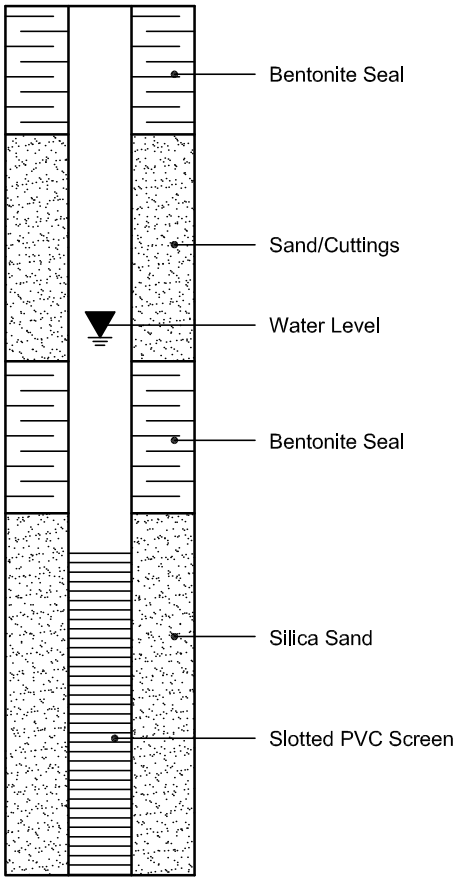
SYMBOLS AND TERMS (continued)

STRATA PLOT

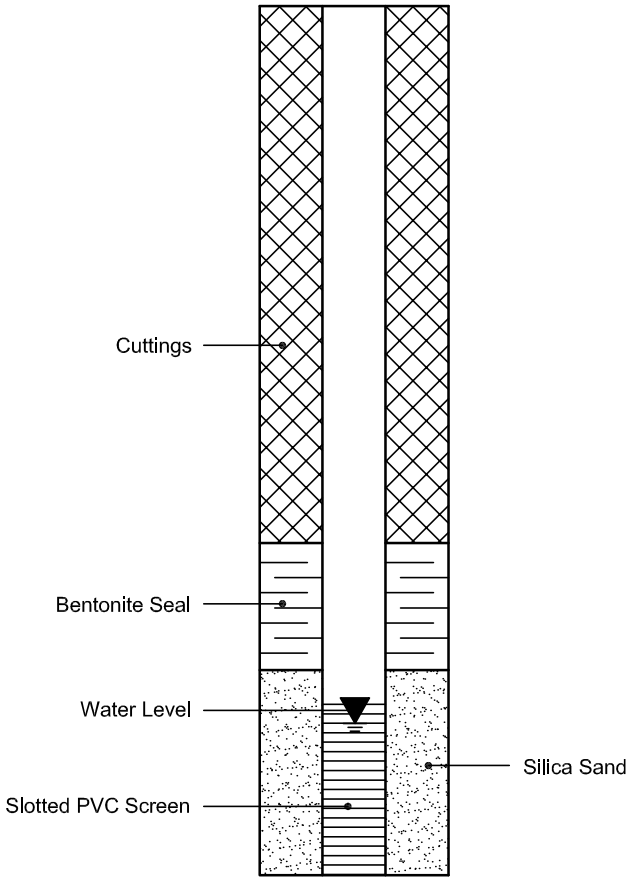


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Nick Sullivan

Client PO: 30902
Project: PE4999
Custody: 128222

Report Date: 5-Oct-2020
Order Date: 30-Sep-2020

Order #: 2040420

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

Paracel ID	Client ID
2040420-01	BH2-20-AU1
2040420-02	BH2-20-SS5
2040420-03	BH4-20-SS5
2040420-04	BH5-20-SS4

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 05-Oct-2020

Client: Paterson Group Consulting Engineers

Order Date: 30-Sep-2020

Client PO: 30902

Project Description: PE4999

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	1-Oct-20	1-Oct-20
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	1-Oct-20	3-Oct-20
Mercury by CVAA	EPA 7471B - CVAA, digestion	5-Oct-20	5-Oct-20
PHC F1	CWS Tier 1 - P&T GC-FID	1-Oct-20	1-Oct-20
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	1-Oct-20	5-Oct-20
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	2-Oct-20	2-Oct-20
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	1-Oct-20	4-Oct-20
Solids, %	Gravimetric, calculation	1-Oct-20	2-Oct-20

Certificate of Analysis

Report Date: 05-Oct-2020

Client: Paterson Group Consulting Engineers

Order Date: 30-Sep-2020

Client PO: 30902

Project Description: PE4999

	Client ID:	BH2-20-AU1	BH2-20-SS5	BH4-20-SS5	BH5-20-SS4
	Sample Date:	29-Sep-20 09:00	29-Sep-20 09:00	29-Sep-20 12:00	29-Sep-20 12:00
	Sample ID:	2040420-01	2040420-02	2040420-03	2040420-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	94.6	59.7	59.9	60.9
Metals					
Antimony	1.0 ug/g dry	<1.0	-	-	-
Arsenic	1.0 ug/g dry	4.2	-	-	-
Barium	1.0 ug/g dry	101	-	-	-
Beryllium	0.5 ug/g dry	<0.5	-	-	-
Boron	5.0 ug/g dry	5.3	-	-	-
Cadmium	0.5 ug/g dry	<0.5	-	-	-
Chromium	5.0 ug/g dry	27.6	-	-	-
Chromium (VI)	0.2 ug/g dry	<0.2	-	-	-
Cobalt	1.0 ug/g dry	6.7	-	-	-
Copper	5.0 ug/g dry	17.9	-	-	-
Lead	1.0 ug/g dry	38.2	-	-	-
Mercury	0.1 ug/g dry	0.1	-	-	-
Molybdenum	1.0 ug/g dry	<1.0	-	-	-
Nickel	5.0 ug/g dry	17.4	-	-	-
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	31.3	-	-	-
Zinc	20.0 ug/g dry	72.2	-	-	-
Volatiles					
Benzene	0.02 ug/g dry	-	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	-	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	-	<0.05	<0.05	<0.05
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
Toluene-d8	Surrogate	-	114%	114%	114%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	-	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	-	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	-	<8	<8	<8
F4 PHCs (C34-C50)	6 ug/g dry	-	<6	<6	<6

Certificate of Analysis

Report Date: 05-Oct-2020

Client: Paterson Group Consulting Engineers

Order Date: 30-Sep-2020

Client PO: 30902

Project Description: PE4999

	Client ID:	BH2-20-AU1	BH2-20-SS5	BH4-20-SS5	BH5-20-SS4
	Sample Date:	29-Sep-20 09:00	29-Sep-20 09:00	29-Sep-20 12:00	29-Sep-20 12:00
	Sample ID:	2040420-01	2040420-02	2040420-03	2040420-04
	MDL/Units	Soil	Soil	Soil	Soil
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	0.08	-	-	-
Acenaphthylene	0.02 ug/g dry	0.15	-	-	-
Anthracene	0.02 ug/g dry	0.27	-	-	-
Benzo [a] anthracene	0.02 ug/g dry	0.72	-	-	-
Benzo [a] pyrene	0.02 ug/g dry	0.92	-	-	-
Benzo [b] fluoranthene	0.02 ug/g dry	0.59	-	-	-
Benzo [g,h,i] perylene	0.02 ug/g dry	0.62	-	-	-
Benzo [k] fluoranthene	0.02 ug/g dry	0.57	-	-	-
Chrysene	0.02 ug/g dry	0.68	-	-	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	0.16	-	-	-
Fluoranthene	0.02 ug/g dry	1.37	-	-	-
Fluorene	0.02 ug/g dry	0.10	-	-	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	0.57	-	-	-
1-Methylnaphthalene	0.02 ug/g dry	0.03	-	-	-
2-Methylnaphthalene	0.02 ug/g dry	0.05	-	-	-
Methylnaphthalene (1&2)	0.04 ug/g dry	0.08	-	-	-
Naphthalene	0.01 ug/g dry	0.11	-	-	-
Phenanthrene	0.02 ug/g dry	0.94	-	-	-
Pyrene	0.02 ug/g dry	1.26	-	-	-
2-Fluorobiphenyl	Surrogate	112%	-	-	-
Terphenyl-d14	Surrogate	86.5%	-	-	-

Certificate of Analysis

Report Date: 05-Oct-2020

Client: Paterson Group Consulting Engineers

Order Date: 30-Sep-2020

Client PO: 30902

Project Description: PE4999

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	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	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	0.02	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	*1.18*		*ug/g*		*88.1*	*50-140*			
Surrogate: Terphenyl-d14	*1.16*		*ug/g*		*87.3*	*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	*9.09*		*ug/g*		*114*	*50-140*			

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			NC	40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND			NC	30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND			NC	30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND			NC	30	
Metals									
Antimony	ND	1.0	ug/g dry	ND			NC	30	
Arsenic	1.9	1.0	ug/g dry	2.1			9.2	30	
Barium	45.7	1.0	ug/g dry	46.7			2.3	30	
Beryllium	ND	0.5	ug/g dry	ND			NC	30	
Boron	6.0	5.0	ug/g dry	5.7			5.4	30	
Cadmium	ND	0.5	ug/g dry	ND			NC	30	
Chromium (VI)	ND	0.2	ug/g dry	ND			NC	35	
Chromium	16.4	5.0	ug/g dry	16.4			0.3	30	
Cobalt	4.9	1.0	ug/g dry	4.7			3.9	30	
Copper	9.2	5.0	ug/g dry	9.4			1.5	30	
Lead	4.3	1.0	ug/g dry	4.5			2.8	30	
Mercury	ND	0.1	ug/g dry	ND			NC	30	
Molybdenum	ND	1.0	ug/g dry	ND			NC	30	
Nickel	9.3	5.0	ug/g dry	9.3			0.2	30	
Selenium	ND	1.0	ug/g dry	ND			NC	30	
Silver	ND	0.3	ug/g dry	ND			NC	30	
Thallium	ND	1.0	ug/g dry	ND			NC	30	
Uranium	ND	1.0	ug/g dry	ND			NC	30	
Vanadium	26.4	10.0	ug/g dry	26.4			0.1	30	
Zinc	24.1	20.0	ug/g dry	23.8			1.6	30	
Physical Characteristics									
% Solids	96.9	0.1	% by Wt.	95.9			1.0	25	
Semi-Volatiles									
Acenaphthene	0.094	0.02	ug/g dry	0.083			12.8	40	
Acenaphthylene	0.124	0.02	ug/g dry	0.146			17.0	40	
Anthracene	0.296	0.02	ug/g dry	0.273			7.9	40	
Benzo [a] anthracene	0.663	0.02	ug/g dry	0.720			8.2	40	
Benzo [a] pyrene	0.835	0.02	ug/g dry	0.921			9.8	40	
Benzo [b] fluoranthene	0.951	0.02	ug/g dry	0.589			47.1	40	QR-04
Benzo [g,h,i] perylene	0.562	0.02	ug/g dry	0.623			10.2	40	
Benzo [k] fluoranthene	0.509	0.02	ug/g dry	0.571			11.5	40	
Chrysene	0.637	0.02	ug/g dry	0.679			6.4	40	
Dibenzo [a,h] anthracene	0.141	0.02	ug/g dry	0.157			10.5	40	
Fluoranthene	1.36	0.02	ug/g dry	1.37			0.9	40	
Fluorene	0.112	0.02	ug/g dry	0.098			12.6	40	
Indeno [1,2,3-cd] pyrene	0.513	0.02	ug/g dry	0.572			10.8	40	
1-Methylnaphthalene	0.036	0.02	ug/g dry	0.032			12.1	40	
2-Methylnaphthalene	0.054	0.02	ug/g dry	0.047			13.7	40	
Naphthalene	0.128	0.01	ug/g dry	0.107			17.6	40	
Phenanthrene	1.04	0.02	ug/g dry	0.943			9.7	40	
Pyrene	1.22	0.02	ug/g dry	1.26			3.5	40	
Surrogate: 2-Fluorobiphenyl	*1.53*		*ug/g dry*		*109*	*50-140*			
Surrogate: Terphenyl-d14	*1.17*		*ug/g dry*		*82.8*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g dry	ND			NC	50	
Ethylbenzene	ND	0.05	ug/g dry	ND			NC	50	
Toluene	ND	0.05	ug/g dry	ND			NC	50	
m,p-Xylenes	ND	0.05	ug/g dry	ND			NC	50	
o-Xylene	ND	0.05	ug/g dry	ND			NC	50	
Surrogate: Toluene-d8	*15.4*		*ug/g dry*		*115*	*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)	181	7	ug/g	ND	90.7	80-120			
F2 PHCs (C10-C16)	144	4	ug/g	ND	107	60-140			
F3 PHCs (C16-C34)	359	8	ug/g	ND	109	60-140			
F4 PHCs (C34-C50)	229	6	ug/g	ND	111	60-140			
Metals									
Antimony	44.8	1.0	ug/g	ND	89.2	70-130			
Arsenic	53.1	1.0	ug/g	ND	105	70-130			
Barium	68.5	1.0	ug/g	18.7	99.7	70-130			
Beryllium	48.7	0.5	ug/g	ND	97.1	70-130			
Boron	43.9	5.0	ug/g	ND	83.3	70-130			
Cadmium	49.3	0.5	ug/g	ND	98.6	70-130			
Chromium (VI)	0.1	0.2	ug/g	ND	60.5	70-130			QM-05
Chromium	58.7	5.0	ug/g	6.6	104	70-130			
Cobalt	52.0	1.0	ug/g	1.9	100	70-130			
Copper	52.2	5.0	ug/g	ND	96.9	70-130			
Lead	50.4	1.0	ug/g	1.8	97.3	70-130			
Mercury	1.53	0.1	ug/g	ND	102	70-130			
Molybdenum	49.5	1.0	ug/g	ND	98.8	70-130			
Nickel	52.5	5.0	ug/g	ND	97.6	70-130			
Selenium	48.4	1.0	ug/g	ND	96.7	70-130			
Silver	42.6	0.3	ug/g	ND	85.3	70-130			
Thallium	49.3	1.0	ug/g	ND	98.5	70-130			
Uranium	52.0	1.0	ug/g	ND	104	70-130			
Vanadium	62.2	10.0	ug/g	10.6	103	70-130			
Zinc	55.8	20.0	ug/g	ND	92.6	70-130			
Semi-Volatiles									
Acenaphthene	0.123	0.02	ug/g	ND	74.0	50-140			
Acenaphthylene	0.107	0.02	ug/g	ND	64.3	50-140			
Anthracene	0.116	0.02	ug/g	ND	69.7	50-140			
Benzo [a] anthracene	0.095	0.02	ug/g	ND	57.3	50-140			
Benzo [a] pyrene	0.093	0.02	ug/g	ND	56.0	50-140			
Benzo [b] fluoranthene	0.144	0.02	ug/g	ND	86.2	50-140			
Benzo [g,h,i] perylene	0.112	0.02	ug/g	ND	67.0	50-140			
Benzo [k] fluoranthene	0.130	0.02	ug/g	ND	78.2	50-140			
Chrysene	0.124	0.02	ug/g	ND	74.6	50-140			
Dibenzo [a,h] anthracene	0.108	0.02	ug/g	ND	64.6	50-140			
Fluoranthene	0.113	0.02	ug/g	ND	67.8	50-140			
Fluorene	0.113	0.02	ug/g	ND	67.6	50-140			
Indeno [1,2,3-cd] pyrene	0.111	0.02	ug/g	ND	66.3	50-140			
1-Methylnaphthalene	0.135	0.02	ug/g	ND	81.0	50-140			
2-Methylnaphthalene	0.149	0.02	ug/g	ND	89.5	50-140			
Naphthalene	0.129	0.01	ug/g	ND	77.5	50-140			
Phenanthrene	0.121	0.02	ug/g	ND	72.4	50-140			
Pyrene	0.114	0.02	ug/g	ND	68.2	50-140			
Surrogate: 2-Fluorobiphenyl	*0.960*		*ug/g*		*72.0*	*50-140*			
Surrogate: Terphenyl-d14	*0.962*		*ug/g*		*72.2*	*50-140*			
Volatiles									
Benzene	3.93	0.02	ug/g	ND	98.3	60-130			

Certificate of Analysis

Report Date: 05-Oct-2020

Client: Paterson Group Consulting Engineers

Order Date: 30-Sep-2020

Client PO: 30902

Project Description: PE4999

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Ethylbenzene	3.97	0.05	ug/g	ND	99.2	60-130			
Toluene	3.88	0.05	ug/g	ND	97.0	60-130			
m,p-Xylenes	8.28	0.05	ug/g	ND	104	60-130			
o-Xylene	4.06	0.05	ug/g	ND	101	60-130			
Surrogate: Toluene-d8	*7.89*		*ug/g*		*98.6*	*50-140*			

Qualifier Notes:

QC Qualifiers :

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

QR-04 : Duplicate results exceeds RPD limits due to non-homogeneous matrix.

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.
NC: Not Calculated

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.

PARAC LABORATORIES

Paracel ID: 2040420

ent Blvd.
K1G 4J8
ellabs.com
.com

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2040420	Nº 128222

Client Name: Paterson Group	Project Ref: PE4999	Page 1 of 1
Contact Name: Nick Sullivan	Quote #:	Turnaround Time
Address: 154 Colonnade Rd. S.	PO #: 30902	☐ 1 day ☐ 3 day ☐ 2 day ☒ Regular
Telephone: 613-226-7381	E-mail: nsullivan@patersongroup.ca	Date Required:

Regulation 153/04	Other Regulation
☐ Table 1 ☒ Res/Park ☐ Med/Fine	☐ REG 558 ☐ PWQO
☐ Table 2 ☐ Ind/Comm ☒ Coarse	☐ CCME ☐ MISA
☒ Table 3 ☐ Agri/Other	☐ SU - Sani ☐ SU - Storm
☐ Table ___	Mun: ___
For RSC: ☐ Yes ☐ No	☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)
1	BH2-20-AU1	S		1	Sept. 29/20	AM			X	X	X	X	
2	BH2-20-SS5	S		2	↓	↓	X						
3	BH4-20-SS5	S		2	↓	PM	X						
4	BH5-20-SS4	S		2	↓	↓	X						
5													
6													
7													
8													
9													
10													

Comments:

Method of Delivery: Paracel Courier

Relinquished By (Sign): N. Sullivan	Received By Driver/Depot: R. Deane	Received at Lab:	Verified By:
Relinquished By (Print): Nick Sullivan	Date/Time: 30/09/20 3:20	Date/Time: 01-30-20 16:29	Date/Time: 01-30-20 16:29
Date/Time: Sept. 30, 2020	Temperature: °C	Temperature: 15.0°C	pH Verified: ☐ By:

PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Nick Sullivan

Client PO: 31420
Project: PE4999
Custody: 55010/11

Report Date: 26-Oct-2020
Order Date: 20-Oct-2020

Order #: 2043350

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

Paracel ID	Client ID
2043350-01	TP1-G2
2043350-02	TP2-G1
2043350-03	TP4-G2
2043350-04	TP5-G2
2043350-05	TP7-G1
2043350-06	TP8-G2
2043350-07	TP10-G1
2043350-08	TP11-G1
2043350-09	TP12-G1
2043350-10	TP13-G1
2043350-11	TP14-G1

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 26-Oct-2020

Client: Paterson Group Consulting Engineers

Order Date: 20-Oct-2020

Client PO: 31420

Project Description: PE4999

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	21-Oct-20	23-Oct-20
Mercury by CVAA	EPA 7471B - CVAA, digestion	23-Oct-20	23-Oct-20
PHC F4G (gravimetric)	CWS Tier 1 - Extraction Gravimetric	26-Oct-20	26-Oct-20
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	21-Oct-20	22-Oct-20
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	23-Oct-20	23-Oct-20
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	21-Oct-20	23-Oct-20
Solids, %	Gravimetric, calculation	21-Oct-20	22-Oct-20

Certificate of Analysis

Report Date: 26-Oct-2020

Client: Paterson Group Consulting Engineers

Order Date: 20-Oct-2020

Client PO: 31420

Project Description: PE4999

	Client ID:	TP1-G2	TP2-G1	TP4-G2	TP5-G2
	Sample Date:	19-Oct-20 09:00	19-Oct-20 09:00	19-Oct-20 09:00	19-Oct-20 09:00
	Sample ID:	2043350-01	2043350-02	2043350-03	2043350-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	77.8	85.9	69.1	75.6
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	3.5	2.6	4.1	3.9
Barium	1.0 ug/g dry	152	45.2	300	149
Beryllium	0.5 ug/g dry	0.6	<0.5	0.8	0.6
Boron	5.0 ug/g dry	<5.0	<5.0	5.9	<5.0
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5.0 ug/g dry	70.0	19.5	118	66.8
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	<0.2
Cobalt	1.0 ug/g dry	13.3	5.1	22.3	11.9
Copper	5.0 ug/g dry	23.5	11.3	50.5	22.3
Lead	1.0 ug/g dry	10.8	8.2	7.7	13.9
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Nickel	5.0 ug/g dry	34.2	12.7	62.6	31.7
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	1.7	<1.0	<1.0	2.2
Vanadium	10.0 ug/g dry	59.9	23.2	104	57.2
Zinc	20.0 ug/g dry	77.4	33.3	118	84.2
Hydrocarbons					
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	<8	<8
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	<6
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Acenaphthylene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Anthracene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Benzo [a] anthracene	0.02 ug/g dry	<0.02	0.05	<0.02	<0.02
Benzo [a] pyrene	0.02 ug/g dry	<0.02	0.07	<0.02	<0.02
Benzo [b] fluoranthene	0.02 ug/g dry	<0.02	0.09	<0.02	<0.02
Benzo [g,h,i] perylene	0.02 ug/g dry	<0.02	0.05	<0.02	<0.02
Benzo [k] fluoranthene	0.02 ug/g dry	<0.02	0.04	<0.02	<0.02

Certificate of Analysis

Report Date: 26-Oct-2020

Client: Paterson Group Consulting Engineers

Order Date: 20-Oct-2020

Client PO: 31420

Project Description: PE4999

	Client ID:	TP1-G2	TP2-G1	TP4-G2	TP5-G2
	Sample Date:	19-Oct-20 09:00	19-Oct-20 09:00	19-Oct-20 09:00	19-Oct-20 09:00
	Sample ID:	2043350-01	2043350-02	2043350-03	2043350-04
	MDL/Units	Soil	Soil	Soil	Soil
Chrysene	0.02 ug/g dry	<0.02	0.07	<0.02	<0.02
Dibenzo [a,h] anthracene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Fluoranthene	0.02 ug/g dry	<0.02	0.13	<0.02	0.03
Fluorene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	<0.02	0.05	<0.02	<0.02
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	<0.01	<0.01	<0.01
Phenanthrene	0.02 ug/g dry	<0.02	0.04	<0.02	<0.02
Pyrene	0.02 ug/g dry	<0.02	0.11	<0.02	0.02
2-Fluorobiphenyl	Surrogate	70.4%	84.9%	68.2%	72.3%
Terphenyl-d14	Surrogate	104%	132%	101%	110%

Certificate of Analysis

Report Date: 26-Oct-2020

Client: Paterson Group Consulting Engineers

Order Date: 20-Oct-2020

Client PO: 31420

Project Description: PE4999

	Client ID:	TP7-G1	TP8-G2	TP10-G1	TP11-G1
	Sample Date:	19-Oct-20 09:00	19-Oct-20 09:00	19-Oct-20 09:00	19-Oct-20 09:00
	Sample ID:	2043350-05	2043350-06	2043350-07	2043350-08
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	72.6	78.8	93.2	76.5
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	3.2	2.9	1.8	3.3
Barium	1.0 ug/g dry	209	106	55.3	167
Beryllium	0.5 ug/g dry	0.7	<0.5	<0.5	0.6
Boron	5.0 ug/g dry	5.6	<5.0	<5.0	<5.0
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5.0 ug/g dry	102	41.8	15.4	69.2
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	<0.2
Cobalt	1.0 ug/g dry	18.0	8.6	3.6	13.7
Copper	5.0 ug/g dry	31.5	16.5	5.4	26.8
Lead	1.0 ug/g dry	13.7	23.9	4.0	7.8
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Nickel	5.0 ug/g dry	50.5	21.0	9.3	38.5
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	1.8	1.2	<1.0	<1.0
Vanadium	10.0 ug/g dry	78.6	39.0	15.9	54.5
Zinc	20.0 ug/g dry	98.2	78.3	<20.0	65.9
Hydrocarbons					
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	<8	<8
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	<6
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Acenaphthylene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Anthracene	0.02 ug/g dry	<0.02	0.02	<0.02	<0.02
Benzo [a] anthracene	0.02 ug/g dry	<0.02	0.06	<0.02	<0.02
Benzo [a] pyrene	0.02 ug/g dry	<0.02	0.08	<0.02	<0.02
Benzo [b] fluoranthene	0.02 ug/g dry	<0.02	0.10	<0.02	<0.02
Benzo [g,h,i] perylene	0.02 ug/g dry	<0.02	0.06	<0.02	<0.02
Benzo [k] fluoranthene	0.02 ug/g dry	<0.02	0.05	<0.02	<0.02

Certificate of Analysis

Report Date: 26-Oct-2020

Client: Paterson Group Consulting Engineers

Order Date: 20-Oct-2020

Client PO: 31420

Project Description: PE4999

	Client ID:	TP7-G1	TP8-G2	TP10-G1	TP11-G1
	Sample Date:	19-Oct-20 09:00	19-Oct-20 09:00	19-Oct-20 09:00	19-Oct-20 09:00
	Sample ID:	2043350-05	2043350-06	2043350-07	2043350-08
	MDL/Units	Soil	Soil	Soil	Soil
Chrysene	0.02 ug/g dry	<0.02	0.08	<0.02	<0.02
Dibenzo [a,h] anthracene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Fluoranthene	0.02 ug/g dry	<0.02	0.14	<0.02	<0.02
Fluorene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	<0.02	0.05	<0.02	<0.02
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	<0.01	<0.01	<0.01
Phenanthrene	0.02 ug/g dry	<0.02	0.05	<0.02	<0.02
Pyrene	0.02 ug/g dry	<0.02	0.12	<0.02	<0.02
2-Fluorobiphenyl	Surrogate	61.8%	75.2%	76.5%	66.0%
Terphenyl-d14	Surrogate	83.5%	118%	102%	70.6%

Certificate of Analysis

Report Date: 26-Oct-2020

Client: Paterson Group Consulting Engineers

Order Date: 20-Oct-2020

Client PO: 31420

Project Description: PE4999

	Client ID:	TP12-G1	TP13-G1	TP14-G1	-
	Sample Date:	19-Oct-20 09:00	19-Oct-20 09:00	19-Oct-20 09:00	-
	Sample ID:	2043350-09	2043350-10	2043350-11	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	81.0	80.8	87.2	-
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Arsenic	1.0 ug/g dry	4.4	3.0	3.1	-
Barium	1.0 ug/g dry	157	116	138	-
Beryllium	0.5 ug/g dry	0.6	<0.5	<0.5	-
Boron	5.0 ug/g dry	6.2	6.2	5.4	-
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	-
Chromium	5.0 ug/g dry	69.1	48.2	53.5	-
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	-
Cobalt	1.0 ug/g dry	12.0	9.0	10.9	-
Copper	5.0 ug/g dry	22.8	17.2	23.3	-
Lead	1.0 ug/g dry	12.8	11.6	15.1	-
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	-
Molybdenum	1.0 ug/g dry	1.2	<1.0	<1.0	-
Nickel	5.0 ug/g dry	35.5	25.0	31.1	-
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	2.4	1.3	<1.0	-
Vanadium	10.0 ug/g dry	56.1	39.6	51.3	-
Zinc	20.0 ug/g dry	84.2	53.7	65.1	-
Hydrocarbons					
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	-
F3 PHCs (C16-C34)	8 ug/g dry	40	<8	60	-
F4 PHCs (C34-C50)	6 ug/g dry	122	<6	188 [1]	-
F4G PHCs (gravimetric)	50 ug/g dry	-	-	722	-
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Acenaphthylene	0.02 ug/g dry	<0.02	0.02	0.04	-
Anthracene	0.02 ug/g dry	<0.02	0.07	0.09	-
Benzo [a] anthracene	0.02 ug/g dry	0.05	0.16	0.36	-
Benzo [a] pyrene	0.02 ug/g dry	0.18	0.16	0.41	-
Benzo [b] fluoranthene	0.02 ug/g dry	0.50	0.18	0.79	-
Benzo [g,h,i] perylene	0.02 ug/g dry	0.22	0.10	0.34	-

Certificate of Analysis

Report Date: 26-Oct-2020

Client: Paterson Group Consulting Engineers

Order Date: 20-Oct-2020

Client PO: 31420

Project Description: PE4999

	Client ID:	TP12-G1	TP13-G1	TP14-G1	-
	Sample Date:	19-Oct-20 09:00	19-Oct-20 09:00	19-Oct-20 09:00	-
	Sample ID:	2043350-09	2043350-10	2043350-11	-
	MDL/Units	Soil	Soil	Soil	-
Benzo [k] fluoranthene	0.02 ug/g dry	0.14	0.09	0.44	-
Chrysene	0.02 ug/g dry	0.06	0.16	0.42	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	0.04	0.03	0.08	-
Fluoranthene	0.02 ug/g dry	0.11	0.35	0.84	-
Fluorene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	0.13	0.09	0.29	-
1-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
2-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Methylnaphthalene (1&2)	0.04 ug/g dry	<0.04	<0.04	<0.04	-
Naphthalene	0.01 ug/g dry	<0.01	<0.01	<0.01	-
Phenanthrene	0.02 ug/g dry	0.06	0.17	0.29	-
Pyrene	0.02 ug/g dry	0.16	0.27	0.67	-
2-Fluorobiphenyl	Surrogate	103%	71.1%	107%	-
Terphenyl-d14	Surrogate	107%	112%	110%	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 31420

Report Date: 26-Oct-2020

Order Date: 20-Oct-2020

Project Description: PE4999

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
F4G PHCs (gravimetric)	ND	50	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	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	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	0.02	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	*0.869*		*ug/g*		*65.1*	*50-140*			
Surrogate: Terphenyl-d14	*1.59*		*ug/g*		*119*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND			NC	30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND			NC	30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND			NC	30	
Metals									
Antimony	ND	1.0	ug/g dry	ND			NC	30	
Arsenic	3.8	1.0	ug/g dry	3.5			6.2	30	
Barium	170	1.0	ug/g dry	152			11.0	30	
Beryllium	0.7	0.5	ug/g dry	0.6			18.8	30	
Boron	6.1	5.0	ug/g dry	ND			NC	30	
Cadmium	ND	0.5	ug/g dry	ND			NC	30	
Chromium (VI)	ND	0.2	ug/g dry	ND			NC	35	
Chromium	77.6	5.0	ug/g dry	70.0			10.3	30	
Cobalt	14.6	1.0	ug/g dry	13.3			8.7	30	
Copper	26.2	5.0	ug/g dry	23.5			10.8	30	
Lead	12.2	1.0	ug/g dry	10.8			11.6	30	
Mercury	ND	0.1	ug/g dry	ND			NC	30	
Molybdenum	ND	1.0	ug/g dry	ND			NC	30	
Nickel	37.7	5.0	ug/g dry	34.2			9.9	30	
Selenium	ND	1.0	ug/g dry	ND			NC	30	
Silver	ND	0.3	ug/g dry	ND			NC	30	
Thallium	ND	1.0	ug/g dry	ND			NC	30	
Uranium	2.0	1.0	ug/g dry	1.7			16.0	30	
Vanadium	66.5	10.0	ug/g dry	59.9			10.5	30	
Zinc	86.0	20.0	ug/g dry	77.4			10.4	30	
Physical Characteristics									
% Solids	84.7	0.1	% by Wt.	84.6			0.0	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	ND			NC	40	
Acenaphthylene	ND	0.02	ug/g dry	ND			NC	40	
Anthracene	0.023	0.02	ug/g dry	ND			NC	40	
Benzo [a] anthracene	0.036	0.02	ug/g dry	0.028			22.8	40	
Benzo [a] pyrene	0.037	0.02	ug/g dry	0.028			27.5	40	
Benzo [b] fluoranthene	0.046	0.02	ug/g dry	0.036			25.6	40	
Benzo [g,h,i] perylene	0.028	0.02	ug/g dry	ND			NC	40	
Benzo [k] fluoranthene	0.020	0.02	ug/g dry	ND			NC	40	
Chrysene	0.044	0.02	ug/g dry	0.030			37.0	40	
Dibenzo [a,h] anthracene	ND	0.02	ug/g dry	ND			NC	40	
Fluoranthene	0.097	0.02	ug/g dry	0.079			21.3	40	
Fluorene	ND	0.02	ug/g dry	ND			NC	40	
Indeno [1,2,3-cd] pyrene	0.023	0.02	ug/g dry	ND			NC	40	
1-Methylnaphthalene	ND	0.02	ug/g dry	ND			NC	40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND			NC	40	
Naphthalene	0.021	0.01	ug/g dry	0.013			NC	40	
Phenanthrene	0.091	0.02	ug/g dry	0.059			NC	40	
Pyrene	0.078	0.02	ug/g dry	0.062			22.4	40	
Surrogate: 2-Fluorobiphenyl	*0.852*		*ug/g dry*		*55.6*	*50-140*			
Surrogate: Terphenyl-d14	*1.47*		*ug/g dry*		*95.7*	*50-140*			

Certificate of Analysis

Report Date: 26-Oct-2020

Client: Paterson Group Consulting Engineers

Order Date: 20-Oct-2020

Client PO: 31420

Project Description: PE4999

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F2 PHCs (C10-C16)	110	4	ug/g	ND	107	60-140			
F3 PHCs (C16-C34)	280	8	ug/g	ND	111	60-140			
F4 PHCs (C34-C50)	175	6	ug/g	ND	109	60-140			
F4G PHCs (gravimetric)	980	50	ug/g	ND	98.0	80-120			
Metals									
Antimony	40.3	1.0	ug/g	ND	80.3	70-130			
Arsenic	47.6	1.0	ug/g	1.4	92.3	70-130			
Barium	109	1.0	ug/g	60.9	95.3	70-130			
Beryllium	43.0	0.5	ug/g	ND	85.5	70-130			
Boron	38.0	5.0	ug/g	ND	72.1	70-130			
Cadmium	42.6	0.5	ug/g	ND	85.0	70-130			
Chromium (VI)	4.1	0.2	ug/g	ND	81.5	70-130			
Chromium	75.7	5.0	ug/g	28.0	95.4	70-130			
Cobalt	50.3	1.0	ug/g	5.3	89.9	70-130			
Copper	53.2	5.0	ug/g	9.4	87.6	70-130			
Lead	46.0	1.0	ug/g	4.3	83.3	70-130			
Mercury	1.66	0.1	ug/g	ND	111	70-130			
Molybdenum	42.4	1.0	ug/g	ND	84.1	70-130			
Nickel	57.6	5.0	ug/g	13.7	87.9	70-130			
Selenium	44.1	1.0	ug/g	ND	87.8	70-130			
Silver	36.5	0.3	ug/g	ND	73.0	70-130			
Thallium	44.7	1.0	ug/g	ND	89.3	70-130			
Uranium	46.0	1.0	ug/g	ND	90.6	70-130			
Vanadium	71.3	10.0	ug/g	23.9	94.7	70-130			
Zinc	74.7	20.0	ug/g	31.0	87.5	70-130			
Semi-Volatiles									
Acenaphthene	0.201	0.02	ug/g	ND	105	50-140			
Acenaphthylene	0.154	0.02	ug/g	ND	80.6	50-140			
Anthracene	0.265	0.02	ug/g	ND	138	50-140			
Benzo [a] anthracene	0.275	0.02	ug/g	0.028	128	50-140			
Benzo [a] pyrene	0.294	0.02	ug/g	0.028	139	50-140			
Benzo [b] fluoranthene	0.294	0.02	ug/g	0.036	135	50-140			
Benzo [g,h,i] perylene	0.218	0.02	ug/g	ND	114	50-140			
Benzo [k] fluoranthene	0.265	0.02	ug/g	ND	139	50-140			
Chrysene	0.292	0.02	ug/g	0.030	136	50-140			
Dibenzo [a,h] anthracene	0.175	0.02	ug/g	ND	91.3	50-140			
Fluoranthene	0.112	0.02	ug/g	ND	67.1	50-140			
Fluorene	0.213	0.02	ug/g	ND	111	50-140			
Indeno [1,2,3-cd] pyrene	0.220	0.02	ug/g	ND	115	50-140			
1-Methylnaphthalene	0.120	0.02	ug/g	ND	62.7	50-140			
2-Methylnaphthalene	0.136	0.02	ug/g	ND	71.2	50-140			
Naphthalene	0.181	0.01	ug/g	0.013	87.6	50-140			
Phenanthrene	0.109	0.02	ug/g	ND	65.2	50-140			
Pyrene	0.108	0.02	ug/g	ND	65.0	50-140			
Surrogate: 2-Fluorobiphenyl	*0.829*		*ug/g*		*54.1*	*50-140*			
Surrogate: Terphenyl-d14	*1.66*		*ug/g*		*108*	*50-140*			

Qualifier Notes:

Sample Qualifiers :

1 : GC-FID signal did not return to baseline by C50

QC Qualifiers :

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.
NC: Not Calculated

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.

PARACEL LABORATORIES LTD

Paracel ID: 2043350

Paracel Order Number (Lab Use Only): 2043350

Chain Of Custody (Lab Use Only) № 55010

Client Name: Paterson Group	Project Ref: PE4999		Page 1 of 2
Contact Name: Nick Sullivan	Quote #:		**Turnaround Time**
Address: 154 Colonnade Rd. S.	PO #: 31420		☐ 1 day ☐ 3 day
	E-mail: nsullivan@patersongroup.ca		☐ 2 day ☒ Regular
Telephone: 613-226-7381			Date Required:

Regulation 153/04			Other Regulation	
☐ Table 1	☒ Res/Park	☐ Med/Fine	☐ REG 558	☐ PWQO
☐ Table 2	☐ Ind/Comm	☒ Coarse	☐ CCME	☐ MISA
☒ Table 3	☐ Agri/Other		☐ SU - Sani	☐ SU - Storm
☐ Table ___			Mun:	
For RSC: ☐ Yes ☐ No			☐ Other:	

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analysis

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHC F2-F4	PAHs	Metals (ICP)	Mercury	Chromium VI							
1	TP1-G2	S		1	oct. 19.20	AM	x	x	x	x	x							
2	TP2-G1	↓		1	↓	↓	↓	↓	↓	↓	↓							
3	TP4-G2	↓		1	↓	↓	↓	↓	↓	↓	↓							
4	TP5-G2	↓		1	↓	↓	↓	↓	↓	↓	↓							
5	TP7-G1	↓		1	↓	↓	↓	↓	↓	↓	↓							
6	TP8-G2	↓		1	↓	↓	↓	↓	↓	↓	↓							
7	TP10-G1	↓		1	↓	↓	↓	↓	↓	↓	↓							
8	TP11-G1	↓		1	↓	↓	↓	↓	↓	↓	↓							
9	TP12-G1	↓		1	↓	↓	↓	↓	↓	↓	↓							
10	TP13-G1	↓		1	↓	↓	↓	↓	↓	↓	↓							

Comments:

Method of Delivery: Paracel Courier

Relinquished By (Sign): N. Sullivan	Received By Driver/Depot: M. [illegible]	Received at Lab: Juneeporn Dhmaj	Verified By: [signature]
Relinquished By (Print): Nick Sullivan	Date/Time: 20/10/20 3:25 PM	Date/Time: Oct 20, 2020 04:50	Date/Time: Oct 21, 2020 13:30
Date/Time: oct. 20.20	Temperature: °C	Temperature: 10.1 °C	pH Verified: ☐ By:

PARACEL LABORATORIES LTD.

Paracel ID: 2043350

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2043350	№ 55011

Client Name: Paterson Group	Project Ref: PE4999	Page 2 of 2
Contact Name: Nick Sullivan	Quote #:	Turnaround Time
Address: 154 Colonnade Rd. S.	PO #: 31420	☐ 1 day ☐ 3 day
	E-mail: nsullivan@patersongroup.ca	☐ 2 day ☒ Regular
Telephone: 613-226-7381		Date Required:

Regulation 153/04	Other Regulation	Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)
☐ Table 1 ☒ Res/Park ☐ Med/Fine	☐ REG 558 ☐ PWQO	
☐ Table 2 ☐ Ind/Comm ☒ Coarse	☐ CCME ☐ MISA	
☒ Table 3 ☐ Agri/Other	☐ SU - Sani ☐ SU - Storm	
☐ Table ___	Mun:	
For RSC: ☐ Yes ☐ No	☐ Other:	

Required Analysis

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4	PAHs	Metals (ICP)	Mercury	Chromium VI							
1	TP14-G1	S		1	Oct. 19.20	AM	X	X	X	X	X							
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

Comments:

Method of Delivery: Paracel Courier

Relinquished By (Sign): N. Sullivan	Received By Driver/Depot: T. Rouse	Received at Lab: Suneepom Dohmai	Verified By: SAM
Relinquished By (Print): Nick Sullivan	Date/Time: 20/10/20 3:25	Date/Time: Oct 20, 2020 04:50	Date/Time: Oct 21, 2020 13:30
Date/Time: Oct. 20. 20	Temperature: °C PM	Temperature: 10.1 °C	pH Verified: ☐ By:

PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mark D'Arcy

Client PO: 31208
Project: PE4999
Custody: 52579

Report Date: 16-Nov-2020
Order Date: 10-Nov-2020

Order #: 2046231

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

Paracel ID	Client ID
2046231-01	BH1B-20-AU1
2046231-02	BH2B-20-SS2
2046231-03	BH7-20-AU1
2046231-04	BH7-20-SS2
2046231-05	BH10-SS2

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 16-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 10-Nov-2020

Client PO: 31208

Project Description: PE4999

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	12-Nov-20	13-Nov-20
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	11-Nov-20	12-Nov-20
Mercury by CVAA	EPA 7471B - CVAA, digestion	13-Nov-20	13-Nov-20
PHC F1	CWS Tier 1 - P&T GC-FID	12-Nov-20	13-Nov-20
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	11-Nov-20	13-Nov-20
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	13-Nov-20	13-Nov-20
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	11-Nov-20	12-Nov-20
Solids, %	Gravimetric, calculation	11-Nov-20	12-Nov-20

Certificate of Analysis

Report Date: 16-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 10-Nov-2020

Client PO: 31208

Project Description: PE4999

	Client ID:	BH1B-20-AU1	BH2B-20-SS2	BH7-20-AU1	BH7-20-SS2
	Sample Date:	06-Nov-20 09:00	06-Nov-20 09:00	06-Nov-20 09:00	06-Nov-20 09:00
	Sample ID:	2046231-01	2046231-02	2046231-03	2046231-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	83.2	75.1	94.3	72.5
Metals					
Antimony	1.0 ug/g dry	-	-	1.0	-
Arsenic	1.0 ug/g dry	-	-	3.1	-
Barium	1.0 ug/g dry	-	-	148	-
Beryllium	0.5 ug/g dry	-	-	<0.5	-
Boron	5.0 ug/g dry	-	-	6.9	-
Cadmium	0.5 ug/g dry	-	-	<0.5	-
Chromium	5.0 ug/g dry	-	-	17.6	-
Chromium (VI)	0.2 ug/g dry	-	-	<0.2	-
Cobalt	1.0 ug/g dry	-	-	4.3	-
Copper	5.0 ug/g dry	-	-	9.3	-
Lead	1.0 ug/g dry	-	-	12.4	-
Mercury	0.1 ug/g dry	-	-	<0.1	-
Molybdenum	1.0 ug/g dry	-	-	<1.0	-
Nickel	5.0 ug/g dry	-	-	11.3	-
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	-	-	15.6	-
Zinc	20.0 ug/g dry	-	-	56.5	-
Volatiles					
Benzene	0.02 ug/g dry	-	-	-	<0.02
Ethylbenzene	0.05 ug/g dry	-	-	-	<0.05
Toluene	0.05 ug/g dry	-	-	-	<0.05
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
Toluene-d8	Surrogate	-	-	-	120%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	-	-	-	<7
F2 PHCs (C10-C16)	4 ug/g dry	-	-	-	<4
F3 PHCs (C16-C34)	8 ug/g dry	-	-	-	<8
F4 PHCs (C34-C50)	6 ug/g dry	-	-	-	<6

Certificate of Analysis

Report Date: 16-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 10-Nov-2020

Client PO: 31208

Project Description: PE4999

	Client ID:	BH1B-20-AU1	BH2B-20-SS2	BH7-20-AU1	BH7-20-SS2
	Sample Date:	06-Nov-20 09:00	06-Nov-20 09:00	06-Nov-20 09:00	06-Nov-20 09:00
	Sample ID:	2046231-01	2046231-02	2046231-03	2046231-04
	MDL/Units	Soil	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	0.09	<0.02	-	-
2-Methylnaphthalene	0.02 ug/g dry	0.14	<0.02	-	-
Methylnaphthalene (1&2)	0.04 ug/g dry	0.23	<0.04	-	-
Naphthalene	0.01 ug/g dry	0.04	<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	80.4%	57.0%	-	-
Terphenyl-d14	Surrogate	122%	89.7%	-	-

Certificate of Analysis

Report Date: 16-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 10-Nov-2020

Client PO: 31208

Project Description: PE4999

	Client ID:	BH10-SS2	-	-	-
	Sample Date:	06-Nov-20 09:00	-	-	-
	Sample ID:	2046231-05	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	75.3	-	-	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	-	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	-	-	-
Toluene	0.05 ug/g dry	<0.05	-	-	-
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	-	-	-
Toluene-d8	Surrogate	120%	-	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	-	-	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	-	-	-
F3 PHCs (C16-C34)	8 ug/g dry	<8	-	-	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	-	-	-

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	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	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	0.02	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	*0.860*		*ug/g*		*64.5*	*50-140*			
Surrogate: Terphenyl-d14	*1.41*		*ug/g*		*106*	*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	*9.47*		*ug/g*		*118*	*50-140*			

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			NC	40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND			NC	30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND			NC	30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND			NC	30	
Metals									
Antimony	ND	1.0	ug/g dry	ND			NC	30	
Arsenic	3.5	1.0	ug/g dry	2.8			22.9	30	
Barium	79.8	1.0	ug/g dry	69.2			14.2	30	
Beryllium	0.7	0.5	ug/g dry	ND			NC	30	
Boron	8.1	5.0	ug/g dry	6.2			26.8	30	
Cadmium	ND	0.5	ug/g dry	ND			NC	30	
Chromium (VI)	ND	0.2	ug/g dry	ND			NC	35	
Chromium	27.4	5.0	ug/g dry	21.7			22.9	30	
Cobalt	7.6	1.0	ug/g dry	6.3			18.9	30	
Copper	15.1	5.0	ug/g dry	12.8			17.0	30	
Lead	8.5	1.0	ug/g dry	8.5			0.4	30	
Mercury	ND	0.1	ug/g dry	ND			NC	30	
Molybdenum	ND	1.0	ug/g dry	ND			NC	30	
Nickel	17.1	5.0	ug/g dry	14.3			17.9	30	
Selenium	ND	1.0	ug/g dry	ND			NC	30	
Silver	ND	0.3	ug/g dry	ND			NC	30	
Thallium	ND	1.0	ug/g dry	ND			NC	30	
Uranium	ND	1.0	ug/g dry	ND			NC	30	
Vanadium	33.3	10.0	ug/g dry	28.0			17.1	30	
Zinc	51.2	20.0	ug/g dry	47.0			8.5	30	
Physical Characteristics									
% Solids	91.5	0.1	% by Wt.	91.2			0.3	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	ND			NC	40	
Acenaphthylene	ND	0.02	ug/g dry	ND			NC	40	
Anthracene	ND	0.02	ug/g dry	ND			NC	40	
Benzo [a] anthracene	ND	0.02	ug/g dry	ND			NC	40	
Benzo [a] pyrene	ND	0.02	ug/g dry	ND			NC	40	
Benzo [b] fluoranthene	ND	0.02	ug/g dry	ND			NC	40	
Benzo [g,h,i] perylene	ND	0.02	ug/g dry	ND			NC	40	
Benzo [k] fluoranthene	ND	0.02	ug/g dry	ND			NC	40	
Chrysene	ND	0.02	ug/g dry	ND			NC	40	
Dibenzo [a,h] anthracene	ND	0.02	ug/g dry	ND			NC	40	
Fluoranthene	ND	0.02	ug/g dry	ND			NC	40	
Fluorene	ND	0.02	ug/g dry	ND			NC	40	
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g dry	ND			NC	40	
1-Methylnaphthalene	ND	0.02	ug/g dry	ND			NC	40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND			NC	40	
Naphthalene	ND	0.01	ug/g dry	ND			NC	40	
Phenanthrene	ND	0.02	ug/g dry	ND			NC	40	
Pyrene	ND	0.02	ug/g dry	ND			NC	40	
Surrogate: 2-Fluorobiphenyl	*1.01*		*ug/g dry*		*70.1*	*50-140*			
Surrogate: Terphenyl-d14	*1.51*		*ug/g dry*		*105*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g dry	ND			NC	50	
Ethylbenzene	ND	0.05	ug/g dry	ND			NC	50	
Toluene	ND	0.05	ug/g dry	ND			NC	50	
m,p-Xylenes	ND	0.05	ug/g dry	ND			NC	50	
o-Xylene	ND	0.05	ug/g dry	ND			NC	50	
Surrogate: Toluene-d8	*10.9*		*ug/g dry*		*119*	*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)	163	7	ug/g	ND	81.5	80-120			
F2 PHCs (C10-C16)	93	4	ug/g	ND	91.3	60-140			
F3 PHCs (C16-C34)	226	8	ug/g	ND	90.6	60-140			
F4 PHCs (C34-C50)	140	6	ug/g	ND	88.9	60-140			
Metals									
Antimony	42.2	1.0	ug/g	ND	84.4	70-130			
Arsenic	46.9	1.0	ug/g	1.1	91.7	70-130			
Barium	64.8	1.0	ug/g	27.7	74.3	70-130			
Beryllium	48.5	0.5	ug/g	ND	96.6	70-130			
Boron	43.5	5.0	ug/g	ND	82.0	70-130			
Cadmium	43.6	0.5	ug/g	ND	87.2	70-130			
Chromium (VI)	0.1	0.2	ug/g	ND	72.5	70-130			
Chromium	55.2	5.0	ug/g	8.7	93.0	70-130			
Cobalt	47.0	1.0	ug/g	2.5	88.9	70-130			
Copper	48.2	5.0	ug/g	5.1	86.1	70-130			
Lead	44.7	1.0	ug/g	3.4	82.7	70-130			
Mercury	1.63	0.1	ug/g	ND	108	70-130			
Molybdenum	44.9	1.0	ug/g	ND	89.4	70-130			
Nickel	49.9	5.0	ug/g	5.7	88.3	70-130			
Selenium	45.5	1.0	ug/g	ND	90.9	70-130			
Silver	40.6	0.3	ug/g	ND	81.2	70-130			
Thallium	43.6	1.0	ug/g	ND	87.2	70-130			
Uranium	44.3	1.0	ug/g	ND	88.3	70-130			
Vanadium	56.5	10.0	ug/g	11.2	90.5	70-130			
Zinc	57.6	20.0	ug/g	ND	77.6	70-130			
Semi-Volatiles									
Acenaphthene	0.146	0.02	ug/g	ND	80.8	50-140			
Acenaphthylene	0.132	0.02	ug/g	ND	73.0	50-140			
Anthracene	0.149	0.02	ug/g	ND	82.7	50-140			
Benzo [a] anthracene	0.113	0.02	ug/g	ND	62.8	50-140			
Benzo [a] pyrene	0.128	0.02	ug/g	ND	70.7	50-140			
Benzo [b] fluoranthene	0.148	0.02	ug/g	ND	82.1	50-140			
Benzo [g,h,i] perylene	0.133	0.02	ug/g	ND	73.6	50-140			
Benzo [k] fluoranthene	0.157	0.02	ug/g	ND	86.9	50-140			
Chrysene	0.134	0.02	ug/g	ND	74.2	50-140			
Dibenzo [a,h] anthracene	0.129	0.02	ug/g	ND	71.2	50-140			
Fluoranthene	0.166	0.02	ug/g	ND	91.8	50-140			
Fluorene	0.124	0.02	ug/g	ND	68.7	50-140			
Indeno [1,2,3-cd] pyrene	0.135	0.02	ug/g	ND	74.9	50-140			
1-Methylnaphthalene	0.134	0.02	ug/g	ND	74.4	50-140			
2-Methylnaphthalene	0.154	0.02	ug/g	ND	85.0	50-140			
Naphthalene	0.190	0.01	ug/g	ND	105	50-140			
Phenanthrene	0.143	0.02	ug/g	ND	79.0	50-140			
Pyrene	0.168	0.02	ug/g	ND	92.9	50-140			
Surrogate: 2-Fluorobiphenyl	*1.41*		*ug/g*		*97.5*	*50-140*			
Surrogate: Terphenyl-d14	*1.47*		*ug/g*		*102*	*50-140*			
Volatiles									
Benzene	3.55	0.02	ug/g	ND	88.7	60-130			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Ethylbenzene	3.97	0.05	ug/g	ND	99.3	60-130			
Toluene	4.21	0.05	ug/g	ND	105	60-130			
m,p-Xylenes	8.32	0.05	ug/g	ND	104	60-130			
o-Xylene	3.89	0.05	ug/g	ND	97.2	60-130			
Surrogate: Toluene-d8	*8.32*		*ug/g*		*104*	*50-140*			

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.
NC: Not Calculated

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.

PARACEL LABORATORIES LTD.

Paracel ID: 2046231

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2046231	№ 52579

Client Name: Paterson	Project Ref: PE 4999	Page __ of __
Contact Name: Mark D'Arcy	Quote #:	Turnaround Time
Address: 154 Colonnade Rd	PO #: 31209	☐ 1 day ☐ 3 day
	E-mail: MDarcy@Patersongroup.ca	☐ 2 day ☑ Regular
Telephone: 613 226 7381		Date Required:

Regulation 153/04	Other Regulation
☐ Table 1 ☐ Res/Park ☐ Med/Fine	☐ REG 558 ☐ PWQO
☐ Table 2 ☐ Ind/Comm ☐ Coarse	☐ CCME ☐ MISA
☑ Table 3 ☐ Agri/Other	☐ SU - Sani ☐ SU - Storm
☐ Table ___	Mun:
For RSC: ☑ Yes ☐ No	☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	Required Analysis: PAHs	Metals	CrVI	Hg	Btex + PHCs
1	BH1B-20-AV1	S		1	NOV 6 2020		✓				
2	BH2B-20-SS2	S		1	1		✓				
3	BH7-20-AV1	S		1				✓	✓	✓	
4	BH7-20-AMSS2	S		2							✓
5	BH10-SS2	S		2							✓
6											
7											
8											
9											
10											

Comments:

Method of Delivery: PARACEL COURIER

Relinquished By (Sign):	Received By Driver/Depot:	Received at Lab:	Verified By:
G Pat	M. DeLouse		
Relinquished By (Print): Grant Paterson	Date/Time: 10/11/20 4:14	Date/Time: NOV 10,20 16:50	Date/Time: NOV 10,2020 17:18
Date/Time: Nov 10 2020	Temperature: °C PH.	Temperature: 18.1 °C	pH Verified: ☐ By:

PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Nick Sullivan

Client PO: 31249
Project: PE4999
Custody: 52595

Report Date: 19-Nov-2020
Order Date: 17-Nov-2020

Order #: 2047244

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

Paracel ID	Client ID
2047244-01	BH2B-20-SS2
2047244-02	BH2B-20-SS4

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 19-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 17-Nov-2020

Client PO: 31249

Project Description: PE4999

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	19-Nov-20	19-Nov-20

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'.

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 31249

Report Date: 19-Nov-2020

Order Date: 17-Nov-2020

Project Description: PE4999

Sample Results

pH

Matrix: Soil

Sample Date: 06-Nov-20

Paracel ID	Client ID	Units	MDL	Result
2047244-01	BH2B-20-SS2	pH Units	0.05	7.27
2047244-02	BH2B-20-SS4	pH Units	0.05	7.63

Laboratory Internal QA/QC

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Matrix Duplicate									
pH	7.15	0.05	pH Units	7.20			0.70	2.3	

PARA
LABORATOF

Paracel ID: 2047244

ice
St. Laurent Blvd.
Ontario K1G 4J8
-749-1947
el@paracellabs.com
racellabs.com

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2047244	Nº 52595

Client Name: Paterson	Project Ref: PE 4999	Page __ of __
Contact Name: Nick Sullivan	Quote #:	Turnaround Time
Address: 154 Colonnade rd	PO #: 31249	☐ 1 day ☐ 3 day
Telephone: 613 226 7381	E-mail: NSullivan @ Patersongroup.ca	☑ 2 day ☐ Regular
		Date Required:

Regulation 153/04	Other Regulation
☐ Table 1 ☐ Res/Park ☐ Med/Fine	☐ REG 558 ☐ PWQO
☐ Table 2 ☐ Ind/Comm ☐ Coarse	☐ CCME ☐ MISA
☐ Table 3 ☐ Agri/Other	☐ SU - Sani ☐ SU - Storm
☐ Table ___	Mun: ___
For RSC: ☐ Yes ☐ No	☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Required Analysis: PH
1	BH2B-20-SS2	S		1	Nov 6 2020		✓
2	BH2B-20-SS4	S		1	Nov 6 2020		✓
3							
4							
5							
6							
7							
8							
9							
10							

Comments:

Method of Delivery: D/B

Relinquished By (Sign): G Pat	Received By Driver/Depot:	Received at Lab:	Verified By:
Relinquished By (Print): Grant Paterson	Date/Time:	Date/Time: 11-17-20 15:45	Date/Time: 11-17-20 16:45
Date/Time: Nov 17	Temperature: °C	Temperature: 11.8 °C	pH Verified: ☐ By:

PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Nick Sullivan

Client PO: 31302
Project: PE4999
Custody: 55516

Report Date: 1-Dec-2020
Order Date: 27-Nov-2020

Order #: 2048623

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

Paracel ID	Client ID
2048623-01	BH1B-20-SS4
2048623-02	BH7-20-SS4

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 01-Dec-2020

Client: Paterson Group Consulting Engineers

Order Date: 27-Nov-2020

Client PO: 31302

Project Description: PE4999

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Texture - Coarse Med/Fine	Based on ASTM D2487	30-Nov-20	1-Dec-20

Certificate of Analysis

Report Date: 01-Dec-2020

Client: Paterson Group Consulting Engineers

Order Date: 27-Nov-2020

Client PO: 31302

Project Description: PE4999

	Client ID:	BH1B-20-SS4	BH7-20-SS4	-	-
	Sample Date:	06-Nov-20 12:00	06-Nov-20 12:00	-	-
	Sample ID:	2048623-01	2048623-02	-	-
	MDL/Units	Soil	Soil	-	-
Physical Characteristics					
>75 um	0.1 %	0.4	3.2	-	-
<75 um	0.1 %	99.6	96.8	-	-
Texture	0.1 %	Med/Fine	Med/Fine	-	-

Qualifier Notes:

Sample Qualifiers :

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.
NC: Not Calculated

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.

PARACE LABORATORIES LT

Paracel ID: 2048623

lvd.
J8
s.com

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2048623	№ 55516

Client Name: Paterson Group	Project Ref: PE4999	Page 1 of 1
Contact Name: Nick Sullivan	Quote #:	Turnaround Time
Address: 154 Colonnade Rd. S.	PO #: 31302	☐ 1 day ☐ 3 day
	E-mail:	☒ 2 day ☐ Regular
Telephone: 613-226-7381	nsullivan@patersongroup.ca	Date Required:

Regulation 153/04	Other Regulation
☐ Table 1 ☐ Res/Park ☐ Med/Fine	☐ REG 558 ☐ PWQO
☐ Table 2 ☐ Ind/Comm ☐ Coarse	☐ CCME ☐ MISA
☐ Table 3 ☐ Agri/Other	☐ SU - Sani ☐ SU - Storm
☐ Table ___	Mun: ___
For RSC: ☐ Yes ☐ No	☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	Required Analysis: Grain size Analysis *
1	BH18-20-SS4	S		1	Nov. 6. 20	PM	X
2	BH7-20-SS4	S		1	↓	↓	X
3							
4							
5							
6							
7							
8							
9							
10							

Comments: * Grain Size (Soil texture as per MOE coarse/fine determination)

Method of Delivery: D/R

Relinquished By (Sign): N. Sullivan	Received By Driver/Depot:	Received at Lab:	Verified By:
Relinquished By (Print): Nick Sullivan	Date/Time:	Date/Time: 11-27-20 17:35	Date/Time: 11-27-2017:35
Date/Time: Nov. 27. 20	Temperature: °C	Temperature: 11.9 °C	pH Verified: ☐ By:

PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Nick Sullivan

Client PO: 31397
Project: PE4999
Custody: 116611

Report Date: 8-Oct-2020
Order Date: 5-Oct-2020

Order #: 2041094

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

Paracel ID	Client ID
2041094-01	BH2-GW1
2041094-02	BH4-GW1
2041094-03	BH5-GW1
2041094-04	DUP1

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 08-Oct-2020

Client: Paterson Group Consulting Engineers

Order Date: 5-Oct-2020

Client PO: 31397

Project Description: PE4999

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	6-Oct-20	6-Oct-20
PHC F1	CWS Tier 1 - P&T GC-FID	6-Oct-20	6-Oct-20
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	7-Oct-20	7-Oct-20
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	6-Oct-20	6-Oct-20

Certificate of Analysis

Report Date: 08-Oct-2020

Client: Paterson Group Consulting Engineers

Order Date: 5-Oct-2020

Client PO: 31397

Project Description: PE4999

	Client ID:	BH2-GW1	BH4-GW1	BH5-GW1	DUP1
	Sample Date:	02-Oct-20 12:00	02-Oct-20 12:00	02-Oct-20 12:00	02-Oct-20 12:00
	Sample ID:	2041094-01	2041094-02	2041094-03	2041094-04
	MDL/Units	Water	Water	Water	Water
Volatiles					
Acetone	5.0 ug/L	-	<5.0	<5.0	<5.0
Benzene	0.5 ug/L	-	<0.5	<0.5	<0.5
Bromodichloromethane	0.5 ug/L	-	<0.5	<0.5	<0.5
Bromoform	0.5 ug/L	-	<0.5	<0.5	<0.5
Bromomethane	0.5 ug/L	-	<0.5	<0.5	<0.5
Carbon Tetrachloride	0.2 ug/L	-	<0.2	<0.2	<0.2
Chlorobenzene	0.5 ug/L	-	<0.5	<0.5	<0.5
Chloroform	0.5 ug/L	-	<0.5	<0.5	<0.5
Dibromochloromethane	0.5 ug/L	-	<0.5	<0.5	<0.5
Dichlorodifluoromethane	1.0 ug/L	-	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	0.5 ug/L	-	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	0.5 ug/L	-	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	0.5 ug/L	-	<0.5	<0.5	<0.5
1,1-Dichloroethane	0.5 ug/L	-	<0.5	<0.5	<0.5
1,2-Dichloroethane	0.5 ug/L	-	<0.5	<0.5	<0.5
1,1-Dichloroethylene	0.5 ug/L	-	<0.5	<0.5	<0.5
cis-1,2-Dichloroethylene	0.5 ug/L	-	<0.5	<0.5	<0.5
trans-1,2-Dichloroethylene	0.5 ug/L	-	<0.5	<0.5	<0.5
1,2-Dichloropropane	0.5 ug/L	-	<0.5	<0.5	<0.5
cis-1,3-Dichloropropylene	0.5 ug/L	-	<0.5	<0.5	<0.5
trans-1,3-Dichloropropylene	0.5 ug/L	-	<0.5	<0.5	<0.5
1,3-Dichloropropene, total	0.5 ug/L	-	<0.5	<0.5	<0.5
Ethylbenzene	0.5 ug/L	-	<0.5	<0.5	<0.5
Ethylene dibromide (dibromoethane, 1,2-)	0.2 ug/L	-	<0.2	<0.2	<0.2
Hexane	1.0 ug/L	-	<1.0	<1.0	<1.0
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	-	<5.0	<5.0	<5.0
Methyl Isobutyl Ketone	5.0 ug/L	-	<5.0	<5.0	<5.0
Methyl tert-butyl ether	2.0 ug/L	-	<2.0	<2.0	<2.0
Methylene Chloride	5.0 ug/L	-	<5.0	<5.0	<5.0
Styrene	0.5 ug/L	-	<0.5	<0.5	<0.5
1,1,1,2-Tetrachloroethane	0.5 ug/L	-	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	0.5 ug/L	-	<0.5	<0.5	<0.5
Tetrachloroethylene	0.5 ug/L	-	<0.5	<0.5	<0.5
Toluene	0.5 ug/L	-	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	0.5 ug/L	-	<0.5	<0.5	<0.5

Certificate of Analysis

Report Date: 08-Oct-2020

Client: Paterson Group Consulting Engineers

Order Date: 5-Oct-2020

Client PO: 31397

Project Description: PE4999

	Client ID:	BH2-GW1	BH4-GW1	BH5-GW1	DUP1
	Sample Date:	02-Oct-20 12:00	02-Oct-20 12:00	02-Oct-20 12:00	02-Oct-20 12:00
	Sample ID:	2041094-01	2041094-02	2041094-03	2041094-04
	MDL/Units	Water	Water	Water	Water
1,1,2-Trichloroethane	0.5 ug/L	-	<0.5	<0.5	<0.5
Trichloroethylene	0.5 ug/L	-	<0.5	<0.5	<0.5
Trichlorofluoromethane	1.0 ug/L	-	<1.0	<1.0	<1.0
Vinyl chloride	0.5 ug/L	-	<0.5	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	-	<0.5	<0.5	<0.5
o-Xylene	0.5 ug/L	-	<0.5	<0.5	<0.5
Xylenes, total	0.5 ug/L	-	<0.5	<0.5	<0.5
4-Bromofluorobenzene	Surrogate	-	97.0%	97.0%	96.3%
Dibromofluoromethane	Surrogate	-	98.1%	98.2%	79.0%
Toluene-d8	Surrogate	-	104%	105%	106%
Benzene	0.5 ug/L	<0.5	-	-	-
Ethylbenzene	0.5 ug/L	<0.5	-	-	-
Toluene	0.5 ug/L	<0.5	-	-	-
m,p-Xylenes	0.5 ug/L	<0.5	-	-	-
o-Xylene	0.5 ug/L	<0.5	-	-	-
Xylenes, total	0.5 ug/L	<0.5	-	-	-
Toluene-d8	Surrogate	105%	-	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	<25	-
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	-
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	-
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
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						
Volatiles									
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, 1,2	ND	0.2	ug/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						
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	*77.9*		*ug/L*		*97.4*	*50-140*			
Surrogate: Dibromofluoromethane	*76.5*		*ug/L*		*95.6*	*50-140*			
Surrogate: Toluene-d8	*84.3*		*ug/L*		*105*	*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	*84.3*		*ug/L*		*105*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND			NC	30	
Volatiles									
Acetone	ND	5.0	ug/L	ND			NC	30	
Benzene	ND	0.5	ug/L	ND			NC	30	
Bromodichloromethane	ND	0.5	ug/L	ND			NC	30	
Bromoform	ND	0.5	ug/L	ND			NC	30	
Bromomethane	ND	0.5	ug/L	ND			NC	30	
Carbon Tetrachloride	ND	0.2	ug/L	ND			NC	30	
Chlorobenzene	ND	0.5	ug/L	ND			NC	30	
Chloroform	ND	0.5	ug/L	ND			NC	30	
Dibromochloromethane	ND	0.5	ug/L	ND			NC	30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND			NC	30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,1-Dichloroethane	ND	0.5	ug/L	ND			NC	30	
1,2-Dichloroethane	ND	0.5	ug/L	ND			NC	30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
1,2-Dichloropropane	ND	0.5	ug/L	ND			NC	30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND			NC	30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND			NC	30	
Ethylbenzene	ND	0.5	ug/L	ND			NC	30	
Ethylene dibromide (dibromoethane, 1,2-	ND	0.2	ug/L	ND			NC	30	
Hexane	ND	1.0	ug/L	ND			NC	30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND			NC	30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND			NC	30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND			NC	30	
Methylene Chloride	ND	5.0	ug/L	ND			NC	30	
Styrene	ND	0.5	ug/L	ND			NC	30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND			NC	30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND			NC	30	
Tetrachloroethylene	ND	0.5	ug/L	ND			NC	30	
Toluene	ND	0.5	ug/L	ND			NC	30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND			NC	30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND			NC	30	
Trichloroethylene	ND	0.5	ug/L	ND			NC	30	
Trichlorofluoromethane	ND	1.0	ug/L	ND			NC	30	
Vinyl chloride	ND	0.5	ug/L	ND			NC	30	
m,p-Xylenes	ND	0.5	ug/L	ND			NC	30	
o-Xylene	ND	0.5	ug/L	ND			NC	30	
Surrogate: 4-Bromofluorobenzene	*78.2*		*ug/L*		*97.7*	*50-140*			
Surrogate: Dibromofluoromethane	*77.6*		*ug/L*		*97.0*	*50-140*			
Surrogate: Toluene-d8	*83.6*		*ug/L*		*104*	*50-140*			
Benzene	ND	0.5	ug/L	ND			NC	30	
Ethylbenzene	ND	0.5	ug/L	ND			NC	30	
Toluene	ND	0.5	ug/L	ND			NC	30	
m,p-Xylenes	ND	0.5	ug/L	ND			NC	30	
o-Xylene	ND	0.5	ug/L	ND			NC	30	
Surrogate: Toluene-d8	*83.6*		*ug/L*		*104*	*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)	1740	25	ug/L	ND	86.8	68-117			
F2 PHCs (C10-C16)	1840	100	ug/L	ND	115	60-140			
F3 PHCs (C16-C34)	4590	100	ug/L	ND	117	60-140			
F4 PHCs (C34-C50)	2840	100	ug/L	ND	115	60-140			
Volatiles									
Acetone	96.6	5.0	ug/L	ND	96.6	50-140			
Benzene	40.3	0.5	ug/L	ND	101	60-130			
Bromodichloromethane	41.9	0.5	ug/L	ND	105	60-130			
Bromoform	42.4	0.5	ug/L	ND	106	60-130			
Bromomethane	47.4	0.5	ug/L	ND	119	50-140			
Carbon Tetrachloride	41.7	0.2	ug/L	ND	104	60-130			
Chlorobenzene	41.3	0.5	ug/L	ND	103	60-130			
Chloroform	41.6	0.5	ug/L	ND	104	60-130			
Dibromochloromethane	43.5	0.5	ug/L	ND	109	60-130			
Dichlorodifluoromethane	44.2	1.0	ug/L	ND	110	50-140			
1,2-Dichlorobenzene	41.9	0.5	ug/L	ND	105	60-130			
1,3-Dichlorobenzene	42.4	0.5	ug/L	ND	106	60-130			
1,4-Dichlorobenzene	41.9	0.5	ug/L	ND	105	60-130			
1,1-Dichloroethane	42.4	0.5	ug/L	ND	106	60-130			
1,2-Dichloroethane	40.4	0.5	ug/L	ND	101	60-130			
1,1-Dichloroethylene	40.7	0.5	ug/L	ND	102	60-130			
cis-1,2-Dichloroethylene	41.5	0.5	ug/L	ND	104	60-130			
trans-1,2-Dichloroethylene	42.4	0.5	ug/L	ND	106	60-130			
1,2-Dichloropropane	41.7	0.5	ug/L	ND	104	60-130			
cis-1,3-Dichloropropylene	39.5	0.5	ug/L	ND	98.8	60-130			
trans-1,3-Dichloropropylene	39.2	0.5	ug/L	ND	98.0	60-130			
Ethylbenzene	40.2	0.5	ug/L	ND	101	60-130			
Ethylene dibromide (dibromoethane, 1,2-	39.0	0.2	ug/L	ND	97.5	60-130			
Methyl Ethyl Ketone (2-Butanone)	86.2	5.0	ug/L	ND	86.2	50-140			
Methyl Isobutyl Ketone	89.7	5.0	ug/L	ND	89.7	50-140			
Methyl tert-butyl ether	87.2	2.0	ug/L	ND	87.2	50-140			
Methylene Chloride	37.0	5.0	ug/L	ND	92.6	60-130			
Styrene	38.6	0.5	ug/L	ND	96.6	60-130			
1,1,1,2-Tetrachloroethane	40.2	0.5	ug/L	ND	101	60-130			
1,1,2,2-Tetrachloroethane	39.8	0.5	ug/L	ND	99.4	60-130			
Tetrachloroethylene	40.6	0.5	ug/L	ND	102	60-130			
Toluene	40.8	0.5	ug/L	ND	102	60-130			
1,1,1-Trichloroethane	41.7	0.5	ug/L	ND	104	60-130			
1,1,2-Trichloroethane	40.2	0.5	ug/L	ND	100	60-130			
Trichloroethylene	42.7	0.5	ug/L	ND	107	60-130			
Trichlorofluoromethane	43.3	1.0	ug/L	ND	108	60-130			
Vinyl chloride	46.8	0.5	ug/L	ND	117	50-140			
m,p-Xylenes	81.0	0.5	ug/L	ND	101	60-130			
o-Xylene	40.0	0.5	ug/L	ND	100	60-130			
Surrogate: 4-Bromofluorobenzene	*83.9*		*ug/L*		*105*	*50-140*			
Surrogate: Dibromofluoromethane	*84.2*		*ug/L*		*105*	*50-140*			
Surrogate: Toluene-d8	*81.2*		*ug/L*		*102*	*50-140*			
Benzene	40.3	0.5	ug/L	ND	101	60-130			

Certificate of Analysis

Report Date: 08-Oct-2020

Client: Paterson Group Consulting Engineers

Order Date: 5-Oct-2020

Client PO: 31397

Project Description: PE4999

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Ethylbenzene	40.2	0.5	ug/L	ND	101	60-130			
Toluene	40.8	0.5	ug/L	ND	102	60-130			
m,p-Xylenes	81.0	0.5	ug/L	ND	101	60-130			
o-Xylene	40.0	0.5	ug/L	ND	100	60-130			
Surrogate: Toluene-d8	*81.2*		*ug/L*		*102*	*50-140*			

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.
NC: Not Calculated

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.

PARACEL LABORATORIES LTD.

Paracel ID: 2041094

Head Office
300-2319 St. Laurent Blvd.
Ottawa, Ontario K1G 4J8
p: 1-800-749-1947
e: paracel@paracellabs.com

Chain of Custody
(Lab Use Only)
№ 116611

Page 1 of 1

Client Name: Paterson Group	Project Reference: PE4999
Contact Name: Nick Sullivan	Quote #
Address: 154 Colonnade Rd. S.	PO # 31397
Telephone: 613-226-7381	Email Address: nsullivan@patersongroup.ca

Turnaround Time:
☐ 1 Day ☐ 3 Day
☐ 2 Day ☒ Regular
Date Required: _____

Criteria: ☒ O. Reg. 153/04 (As Amended) Table 3 ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) Municipality: _____ ☐ Other: _____

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analyses

Paracel Order Number: 2041094

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	PHCs F1-F4						
1	BH2-GW1	GW		3	Oct. 2.20	PM	X													
2	BH4-GW1	↓		3	↓	↓		X						X						
3	BH5-GW1	↓		3	↓	↓		X						X						
4	DUP1	↓		2	↓	↓		X												
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: PARACEL COURIER

Relinquished By (Sign): N. Sullivan	Received by Driver/Depot: A. Clause	Received at Lab: [illegible]
Relinquished By (Print): Nick Sullivan	Date/Time: 05/10/20 3pm	Date/Time: 5 Oct 2020 15:57
Date/Time: October 5, 2020	Temperature: °C PH	Temperature: 17.2 °C

Verified By: [illegible]
Date/Time: 10-5-2016 17
pH Verified [ ] By: _____

PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Nick Sullivan

Client PO: 31400
Project: PE4999
Custody: 56767

Report Date: 9-Oct-2020
Order Date: 6-Oct-2020

Order #: 2041239

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

Paracel ID	Client ID
2041239-01	BH2-GW1

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 09-Oct-2020

Client: Paterson Group Consulting Engineers

Order Date: 6-Oct-2020

Client PO: 31400

Project Description: PE4999

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
REG 153: PAHs by GC-MS	EPA 625 - GC-MS, extraction	8-Oct-20	8-Oct-20

Certificate of Analysis

Report Date: 09-Oct-2020

Client: **Paterson Group Consulting Engineers**

Order Date: 6-Oct-2020

Client PO: **31400**

Project Description: **PE4999**

	Client ID:	BH2-GW1	-	-	-
	Sample Date:	02-Oct-20 09:00	-	-	-
	Sample ID:	2041239-01	-	-	-
	MDL/Units	Water	-	-	-
Semi-Volatiles					
Acenaphthene	0.05 ug/L	<0.05	-	-	-
Acenaphthylene	0.05 ug/L	<0.05	-	-	-
Anthracene	0.01 ug/L	<0.01	-	-	-
Benzo [a] anthracene	0.01 ug/L	<0.01	-	-	-
Benzo [a] pyrene	0.01 ug/L	<0.01	-	-	-
Benzo [b] fluoranthene	0.05 ug/L	<0.05	-	-	-
Benzo [g,h,i] perylene	0.05 ug/L	<0.05	-	-	-
Benzo [k] fluoranthene	0.05 ug/L	<0.05	-	-	-
Chrysene	0.05 ug/L	<0.05	-	-	-
Dibenzo [a,h] anthracene	0.05 ug/L	<0.05	-	-	-
Fluoranthene	0.01 ug/L	<0.01	-	-	-
Fluorene	0.05 ug/L	<0.05	-	-	-
Indeno [1,2,3-cd] pyrene	0.05 ug/L	<0.05	-	-	-
1-Methylnaphthalene	0.05 ug/L	<0.05	-	-	-
2-Methylnaphthalene	0.05 ug/L	<0.05	-	-	-
Methylnaphthalene (1&2)	0.10 ug/L	<0.10	-	-	-
Naphthalene	0.05 ug/L	<0.05	-	-	-
Phenanthrene	0.05 ug/L	<0.05	-	-	-
Pyrene	0.01 ug/L	<0.01	-	-	-
2-Fluorobiphenyl	Surrogate	105%	-	-	-
Terphenyl-d14	Surrogate	103%	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Semi-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	0.01	ug/L						
Fluorene	ND	0.05	ug/L						
Indeno [1,2,3-cd] pyrene	ND	0.05	ug/L						
1-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	*21.5*		*ug/L*		*108*	*50-140*			
Surrogate: Terphenyl-d14	*19.3*		*ug/L*		*96.5*	*50-140*			

Certificate of Analysis

Report Date: 09-Oct-2020

Client: Paterson Group Consulting Engineers

Order Date: 6-Oct-2020

Client PO: 31400

Project Description: PE4999

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Semi-Volatiles									
Acenaphthene	4.77	0.05	ug/L	ND	95.4	50-140			
Acenaphthylene	4.37	0.05	ug/L	ND	87.3	50-140			
Anthracene	4.26	0.01	ug/L	ND	85.2	50-140			
Benzo [a] anthracene	4.17	0.01	ug/L	ND	83.4	50-140			
Benzo [a] pyrene	4.29	0.01	ug/L	ND	85.9	50-140			
Benzo [b] fluoranthene	5.42	0.05	ug/L	ND	108	50-140			
Benzo [g,h,i] perylene	4.71	0.05	ug/L	ND	94.2	50-140			
Benzo [k] fluoranthene	5.62	0.05	ug/L	ND	112	50-140			
Chrysene	4.60	0.05	ug/L	ND	91.9	50-140			
Dibenzo [a,h] anthracene	4.93	0.05	ug/L	ND	98.7	50-140			
Fluoranthene	4.05	0.01	ug/L	ND	81.1	50-140			
Fluorene	4.22	0.05	ug/L	ND	84.4	50-140			
Indeno [1,2,3-cd] pyrene	5.06	0.05	ug/L	ND	101	50-140			
1-Methylnaphthalene	5.18	0.05	ug/L	ND	104	50-140			
2-Methylnaphthalene	5.63	0.05	ug/L	ND	113	50-140			
Naphthalene	4.89	0.05	ug/L	ND	97.8	50-140			
Phenanthrene	4.03	0.05	ug/L	ND	80.6	50-140			
Pyrene	4.15	0.01	ug/L	ND	82.9	50-140			
Surrogate: 2-Fluorobiphenyl	*20.9*		*ug/L*		*104*	*50-140*			
Surrogate: Terphenyl-d14	*19.3*		*ug/L*		*96.5*	*50-140*			

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.
NC: Not Calculated

PARACEL ID: 2041239

PARA LABORATORI

[illegible]t. Laurent Blvd.
[illegible]tario K1G 4J8
[illegible]9-1947
[illegible]@paracellabs.com
[illegible]cellabs.com

Paracel Order Number (Lab Use Only): 2041239

Chain Of Custody (Lab Use Only) № 56767

Page 1 of 1

Client Name: Paterson Group	Project Ref: PE4999
Contact Name: Nick Sullivan	Quote #:
Address: 154 Colonnade Rd. S.	PO #: 31400
Telephone: 613-226-7381	E-mail: nsullivan@patersongroup.ca

Turnaround Time

☐ 1 day ☐ 3 day
☐ 2 day ☒ Regular
Date Required: _____

Regulation 153/04

☐ Table 1 ☒ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☒ Coarse
☒ Table 3 ☐ Agri/Other
☐ Table ___
For RSC: ☐ Yes ☐ No

Other Regulation

☐ REG 558 ☐ PWQO
☐ CCME ☐ MISA
☐ SU - Sani ☐ SU - Storm
Mun: _____
☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	Required Analysis: PAHs
1	BH2-GW1	GW		1	Oct. 2. 20	AM	X
2							
3							
4							
5							
6							
7							
8							
9							
10							

Comments:

Method of Delivery: PARACEL COURIER

Relinquished By (Sign): N. Sullivan	Received By Driver/Depot: M. Plouffe	Received at Lab: [illegible]	Verified By: [illegible]
Relinquished By (Print): Nick Sullivan	Date/Time: 06/10/20 3 30	Date/Time: 6 Oct 20 20 1605	Date/Time: 6 Oct 2020 1618
Date/Time: Oct. 5, 20	Temperature: °C	Temperature: 17.9 °C	pH Verified: ☐ By:

PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mark D'Arcy

Client PO: 31219
Project: PE4999
Custody: 54894

Report Date: 18-Nov-2020
Order Date: 12-Nov-2020

Order #: 2046444

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

Paracel ID	Client ID
2046444-01	BH1B-20-GW1
2046444-02	BH2-20-GW1
2046444-03	BH7-20-GW1
2046444-04	DUP

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 18-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 12-Nov-2020

Client PO: 31219

Project Description: PE4999

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	14-Nov-20	14-Nov-20
PHC F1	CWS Tier 1 - P&T GC-FID	13-Nov-20	14-Nov-20
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	17-Nov-20	18-Nov-20
REG 153: PAHs by GC-MS	EPA 625 - GC-MS, extraction	17-Nov-20	17-Nov-20

Certificate of Analysis

Report Date: 18-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 12-Nov-2020

Client PO: 31219

Project Description: PE4999

	Client ID:	BH1B-20-GW1	BH2-20-GW1	BH7-20-GW1	DUP
	Sample Date:	12-Nov-20 09:00	12-Nov-20 09:00	12-Nov-20 09:00	12-Nov-20 09:00
	Sample ID:	2046444-01	2046444-02	2046444-03	2046444-04
	MDL/Units	Water	Water	Water	Water
Volatiles					
Benzene	0.5 ug/L	<0.5	-	<0.5	<0.5
Ethylbenzene	0.5 ug/L	<0.5	-	<0.5	<0.5
Toluene	0.5 ug/L	<0.5	-	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	<0.5	-	<0.5	<0.5
o-Xylene	0.5 ug/L	<0.5	-	<0.5	<0.5
Xylenes, total	0.5 ug/L	<0.5	-	<0.5	<0.5
Toluene-d8	Surrogate	116%	-	115%	114%
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	-	<25	-
F2 PHCs (C10-C16)	100 ug/L	<100	-	<100	-
F3 PHCs (C16-C34)	100 ug/L	<100	-	<100	-
F4 PHCs (C34-C50)	100 ug/L	<100	-	<100	-
Semi-Volatiles					
Acenaphthene	0.05 ug/L	<0.05	<0.05	-	-
Acenaphthylene	0.05 ug/L	<0.05	<0.05	-	-
Anthracene	0.01 ug/L	<0.01	<0.01	-	-
Benzo [a] anthracene	0.01 ug/L	<0.01	<0.01	-	-
Benzo [a] pyrene	0.01 ug/L	<0.01	<0.01	-	-
Benzo [b] fluoranthene	0.05 ug/L	<0.05	<0.05	-	-
Benzo [g,h,i] perylene	0.05 ug/L	<0.05	<0.05	-	-
Benzo [k] fluoranthene	0.05 ug/L	<0.05	<0.05	-	-
Chrysene	0.05 ug/L	<0.05	<0.05	-	-
Dibenzo [a,h] anthracene	0.05 ug/L	<0.05	<0.05	-	-
Fluoranthene	0.01 ug/L	<0.01	<0.01	-	-
Fluorene	0.05 ug/L	<0.05	<0.05	-	-
Indeno [1,2,3-cd] pyrene	0.05 ug/L	<0.05	<0.05	-	-
1-Methylnaphthalene	0.05 ug/L	<0.05	<0.05	-	-
2-Methylnaphthalene	0.05 ug/L	<0.05	<0.05	-	-
Methylnaphthalene (1&2)	0.10 ug/L	<0.10	<0.10	-	-
Naphthalene	0.05 ug/L	<0.05	<0.05	-	-
Phenanthrene	0.05 ug/L	<0.05	<0.05	-	-
Pyrene	0.01 ug/L	<0.01	<0.01	-	-
2-Fluorobiphenyl	Surrogate	79.4%	82.3%	-	-
Terphenyl-d14	Surrogate	103%	103%	-	-

Certificate of Analysis

Report Date: 18-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 12-Nov-2020

Client PO: 31219

Project Description: PE4999

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
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						
Semi-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	0.01	ug/L						
Fluorene	ND	0.05	ug/L						
Indeno [1,2,3-cd] pyrene	ND	0.05	ug/L						
1-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	*15.9*		*ug/L*		*79.7*	*50-140*			
Surrogate: Terphenyl-d14	*21.4*		*ug/L*		*107*	*50-140*			
Volatiles									
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	*95.2*		*ug/L*		*119*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND			NC	30	
Volatiles									
Benzene	ND	0.5	ug/L	ND			NC	30	
Ethylbenzene	ND	0.5	ug/L	ND			NC	30	
Toluene	ND	0.5	ug/L	ND			NC	30	
m,p-Xylenes	ND	0.5	ug/L	ND			NC	30	
o-Xylene	ND	0.5	ug/L	ND			NC	30	
Surrogate: Toluene-d8	*93.6*		*ug/L*		*117*	*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)	2120	25	ug/L	ND	106	68-117			
F2 PHCs (C10-C16)	1800	100	ug/L	ND	112	60-140			
F3 PHCs (C16-C34)	4220	100	ug/L	ND	108	60-140			
F4 PHCs (C34-C50)	2940	100	ug/L	ND	119	60-140			
Semi-Volatiles									
Acenaphthene	4.72	0.05	ug/L	ND	94.3	50-140			
Acenaphthylene	3.79	0.05	ug/L	ND	75.8	50-140			
Anthracene	5.30	0.01	ug/L	ND	106	50-140			
Benzo [a] anthracene	4.68	0.01	ug/L	ND	93.5	50-140			
Benzo [a] pyrene	4.66	0.01	ug/L	ND	93.1	50-140			
Benzo [b] fluoranthene	6.47	0.05	ug/L	ND	129	50-140			
Benzo [g,h,i] perylene	5.50	0.05	ug/L	ND	110	50-140			
Benzo [k] fluoranthene	5.63	0.05	ug/L	ND	113	50-140			
Chrysene	5.01	0.05	ug/L	ND	100	50-140			
Dibenzo [a,h] anthracene	5.69	0.05	ug/L	ND	114	50-140			
Fluoranthene	5.11	0.01	ug/L	ND	102	50-140			
Fluorene	4.50	0.05	ug/L	ND	90.0	50-140			
Indeno [1,2,3-cd] pyrene	5.57	0.05	ug/L	ND	111	50-140			
1-Methylnaphthalene	4.33	0.05	ug/L	ND	86.6	50-140			
2-Methylnaphthalene	3.47	0.05	ug/L	ND	69.3	50-140			
Naphthalene	4.80	0.05	ug/L	ND	96.0	50-140			
Phenanthrene	4.38	0.05	ug/L	ND	87.6	50-140			
Pyrene	5.25	0.01	ug/L	ND	105	50-140			
Surrogate: 2-Fluorobiphenyl	*12.1*		*ug/L*		*60.5*	*50-140*			
Surrogate: Terphenyl-d14	*21.1*		*ug/L*		*106*	*50-140*			
Volatiles									
Benzene	36.6	0.5	ug/L	ND	91.4	60-130			
Ethylbenzene	40.6	0.5	ug/L	ND	102	60-130			
Toluene	42.6	0.5	ug/L	ND	106	60-130			
m,p-Xylenes	85.0	0.5	ug/L	ND	106	60-130			
o-Xylene	39.8	0.5	ug/L	ND	99.6	60-130			
Surrogate: Toluene-d8	*83.3*		*ug/L*		*104*	*50-140*			

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.
NC: Not Calculated

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.

PARACEL LABORATORIES LTD.

Paracel ID: 2046444

Paracel Order Number (Lab Use Only): 2046444

Chain Of Custody (Lab Use Only) № 54894

Client Name: PATERSON	Project Ref: PE 4999
Contact Name: MARK D'ARCY	Quote #:
Address: 154 COLONNADE Rd. S. OTTAWA, ONT.	PO #: 31219
Telephone: (613) 226 7381	E-mail: Mdarcy@PATERSON Group.ca

Page 1 of 1

Turnaround Time

☐ 1 day ☒ 3 day

☐ 2 day ☑ Regular

Date Required:

Regulation 153/04

☐ Table 1 ☐ Res/Park ☐ Med/Fine

☐ Table 2 ☐ Ind/Comm ☐ Coarse

☑ Table 3 ☐ Agri/Other

☐ Table 3

For RSC: ☑ Yes ☐ No

Other Regulation

☐ REG 558 ☐ PWQO

☐ CCME ☐ MISA

☐ SU - Sani ☐ SU - Storm

Mun:

☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analysis

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	BTEX	PHC's	PAH's									
1	BH1B-20-GW1	GW	\	4	Nov 12/2020	—	✓	✓	✓									
2	BH2-20-GW1	GW	\	1	↓	↓			✓									
3	BH7-20-GW1	GW	\	3	↓	↓	✓	✓										
4	Dup	GW	\	2	Nov 12/2020	—	✓											
5																		
6																		
7																		
8																		
9																		
10																		

Comments:

Method of Delivery: PARACEL COURIER

Relinquished By (Sign): [signature]	Received By Driver/Depot: M. Tlouie	Received at Lab: Suneeporn Dohmai	Verified By: [signature]
Relinquished By (Print): Dominic Lanon	Date/Time: 12/11/20 3:45	Date/Time: Nov 12, 2020 04.31	Date/Time: Nov 12, 2020 17:07
Date/Time: NOV. 12/2020	Temperature: °C	Temperature: 14.6 °C	pH Verified: ☐ By: