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Phase II – Environmental Site Assessment

78, 84, 86, 90 Beechwood Avenue &
69, 73, 77, 83, 85, 89, 93 Barrette Street
Ottawa, Ontario

Prepared For

Minto Communities

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EXECUTIVE SUMMARY

Assessment

A Phase II ESA was conducted for the properties addressed 78-90 Beechwood Avenue and 69-93 Barrette Street, 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 were considered to result in areas of potential environmental concern (APECs) on the subject site.

The subsurface investigation consisted of drilling fifteen (15) boreholes (BH1-BH14 and BH8B) on May 23-24, and July 15, 2019, as well as on August 24, 2020. Upon completion, ten (10) of the boreholes were instrumented with groundwater monitoring wells (BH2, BH3, BH4, BH7, BH8 BH8B, BH9, BH10, BH11, and BH13). The boreholes were drilled to depths ranging from approximately 3.25 m to 9.14 m below ground surface and terminated within weathered black shale bedrock.

Nineteen (19) soil samples were submitted for laboratory analysis of either: BTEX, PHCs F_1-F_4, VOCs, PAHs, metals, and/or pH parameters. According to the analytical results, the concentrations of some PHC, VOC, PAH, and/or metal parameters in the soil samples tested from BH1, BH3, BH7, BH8, BH10, and BH11 were in excess of the selected MECP Table 3 residential standards.

Twelve (12) groundwater samples were submitted for laboratory analysis of either: BTEX, PHCs F_1-F_4, VOCs, and/or PAHs parameters. According to the analytical results, all detected parameter concentrations in the groundwater samples analyzed comply with the selected MECP Table 3 residential standards.

Recommendations

Soil

Based on the findings of this assessment, PHC, VOC, PAH, and/or metal impacted soil was identified in the vicinity of BH1, BH3, BH7, BH8, BH10, and BH11, requiring some remedial work. It is our understanding that the subject site is to be redeveloped with a multi-storey residential high-rise building in the near future. Therefore, it is our recommendation that an environmental site remediation program be completed in conjunction with site redevelopment. This will require the segregation of clean soils from impacted soils, the latter of which will require disposal at an approved waste disposal facility.

It should be noted that several PHC, VOC, PAH, and metal parameters were detected in BH1, BH2, BH3, BH7 BH9, BH11, and/or BH14 at concentrations exceeding the MECP Table 1 background standards. These exceedances are not considered to pose an environmental concern to the subject site, however, if the soil is to be removed from the property for construction purposes, it should be classified as contaminated and disposed of at an approved waste disposal site.

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

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.

Monitoring Wells

If the groundwater monitoring wells installed on-site are not going to be used in the future, or will be destroyed during future redevelopment activities, then they must be decommissioned according to Ontario Regulation Reg. 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 Minto Communities, Paterson Group (Paterson) conducted a Phase II – Environmental Site Assessment for the properties addressed 78-90 Beechwood Avenue and 69-93 Barrette Street, in the City of Ottawa, Ontario. The purpose of this investigation was to assess the areas of potential environmental concern identified in the Phase I ESA report.

1.1 Site Description

Address:	78, 84, 86, 90 Beechwood Avenue, Ottawa, ON 69, 73, 77, 83, 85, 89, 93 Barrette Street Ottawa, ON.
Legal Description:	Part of Lot 4, Junction Gore Concession, Rideau Front, Formerly the Township of Gloucester, in the City of Ottawa, Ontario.
Location:	The subject site is situated between the south side of Beechwood Avenue and the north side of Barrette Street, approximately 40 m west of St. Charles Street, in the City of Ottawa, Ontario. Refer to Figure 1 - Key Plan, appended to this report.
Latitude and Longitude:	45° 26’ 25" N, 75° 40' 27" W
Configuration:	Rectangular
Site Area:	4,170 m^2 (approximate)
Zoning:	TM – Traditional Mainstreet Zone R4T – Residential Fourth Density Zone
Current Use:	The subject site is currently occupied by twelve (12) buildings of mixed commercial and residential uses.
Services:	The subject site is located in a municipally serviced area.

1.2 Property Ownership

The subject property is currently owned by Minto Communities. Paterson was engaged to conduct this Phase II ESA by Mr. Kevin Harper of Minto Communities. Minto's offices are located at 180 Kent Street, Suite 200, Ottawa, Ontario. Mr. Harper can be reached at 613-751-2857.

1.3 Current and Proposed Future Uses

The subject site is currently occupied by twelve (12) buildings of mixed commercial and residential uses.

It is our understanding that the subject property is to be redeveloped with a multi-storey residential building, with ground floor commercial units and underground parking.

1.4 Applicable Site Condition Standard

The site condition standards for the subject property were obtained from Table 3 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:

- ❒ Coarse-grained soil conditions;
- ❒ Non-potable groundwater conditions;
- ❒ Residential land use.

The residential standards were selected based on the future land use of the subject site. Grain size analysis was not conducted as part of this assessment, however, the coarse-grained soil standards were chosen as a conservative approach.

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 occupied by the twelve (12) aforementioned buildings which occupy the majority of the site area. The remainder of the site consists of asphaltic concrete laneways or gravel parking areas. The subject site is considered to be at grade with respect to the neighbouring properties and the adjacent streets.

The site topography appears to be relatively flat, whereas the regional topography appears to slope down to the south, in the general direction of the Rideau River.

Water drainage on the subject site occurs primarily via infiltration in the gravel and landscaped areas, as well as via surface run-off towards catch basins located on the adjacent streets.

2.2 Past Investigations

The following report was reviewed prior to conducting this assessment:

- *"Phase I - Environmental Site Assessment, 92 Beechwood Avenue, City of Ottawa, Ontario",* prepared by Kollaard Associates and dated June 2009.

This Phase I ESA report discusses several landfill sites as posing a potential source of contamination with respect to the subject site. The report also makes reference to a geotechnical investigation completed by Fondex Ontario Limited in 2004 in which debris consisting of brick, ceramic, wood, plastic bags, cans, glass and asphalt was encountered during the borehole drilling program. The debris was considered to be representative of the types of materials described in the aforementioned Landfill Management Strategy as having been interred.

The report recommended that a soil and groundwater sampling program be carried out.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigations

The subsurface investigation for this assessment was conducted on May 23-24, and July 15, 2019, as well as on August 24, 2020. The field program consisted of drilling fifteen (15) boreholes (BH1-BH14 and BH8B) throughout the subject site, of which ten (10) were instrumented with groundwater monitoring wells (BH2, BH3, BH4, BH7, BH8 BH8B, BH9, BH10, BH11, and BH13). The boreholes were drilled to depths ranging from approximately 3.25 m to 9.14 m below ground surface and terminated within weathered black shale bedrock.

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 are considered to be:

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

3.3 Phase I Conceptual Site Model

Existing Buildings and Structures

The subject site is currently occupied by twelve (12) buildings of mixed residential and commercial uses.

Drinking Water Wells

Based on the availability of municipal services, no drinking water wells are expected to be present within the Phase I study area.

Geological and Hydrogeological Setting

Based on the available information, the bedrock in the area of the subject site consists of shale of the Billings Formation, whereas the surficial geology consists of fine-textured glaciomarine deposits, with an overburden thickness of approximately 3 m.

The site topography appears to be relatively flat, whereas the regional topography appears to slope down to the south, in the general direction of the Rideau River. Based on the regional topography, the groundwater in the area of the subject site is interpreted to be flowing in a southerly direction.

Neighbouring Land Use

Neighbouring land use in the Phase I study area consists mainly of residential and commercial properties.

Water Bodies and Areas of Natural and Scientific Interest

There are no waterbodies or areas of natural and scientific interest located on the subject site or within the Phase I study area. The nearest named waterbody with respect to the subject site is the Rideau River, approximately 315 m to the south.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

As per Section 7.1 of the Phase I ESA report, four (4) PCAs were determined to result in APECs with respect to the subject site. These PCAs include:

- A former autobody shop and service garage, located at 89 Barrette Street and situated in the central portion of the subject site;
- The presence of a former landfill site, located throughout the Phase I study area and situated beneath the entirety of the subject site;
- A dry cleaners, located at the property addressed 110 Beechwood Avenue and situated approximately 20 m to the east of the subject site;
- A former retail fuel outlet, located at the property addressed 64 Beechwood Avenue and situated immediately to the west of the subject site.

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 subject site are considered to be:

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

These contaminants have the potential to be present in the soil/fill matrix as well as the groundwater on 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.

3.4 Deviations from Sampling and Analysis Plan

The Sampling and Analysis Plan for this project is included in Appendix 1 of this report. There were no deviations made from the Sampling and Analysis Plan.

3.5 Impediments

No physical impediments or denial of access was encountered during this Phase II – Environmental Site Assessment.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation for this assessment was conducted on May 23-24, and July 15, 2019, as well as on August 24, 2020. The field program consisted of drilling fifteen (15) boreholes (BH1-BH14 and BH8B) throughout the subject site, of which ten (10) were instrumented with groundwater monitoring wells (BH2, BH3, BH4, BH7, BH8 BH8B, BH9, BH10, BH11, and BH13). The boreholes were drilled to depths ranging from approximately 3.25 m to 9.14 m below ground surface and terminated within an underlying layer of weathered black shale bedrock.

Under the full-time supervision of Paterson personnel, the boreholes were drilled using a low-clearance drill rig provided by George Downing Estate Drilling of Hawkesbury, Ontario. The locations of the boreholes are illustrated on Drawing PE4614-4 – 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.

One hundred (100) soil samples obtained as part of the current and previous subsurface investigations were recovered from the boreholes by means of auger and split spoon sampling, with samples taken at approximate 0.76 m intervals. The depths at which split spoon, auger flight, and rock core samples were obtained from the boreholes are shown as "**SS**", "**AU**", and "**RC**" on the Soil Profile and Test Data Sheets in Appendix 1.

The soil profile at the subject site generally consisted of gravel or asphaltic concrete over gravel, followed by shaley till or fill material over shaley till. The till graded into a weathered shale bedrock deposit at various depths. Specific details of the soil profile at each test hole location are presented on the Soil Profile and Test Data sheets appended to this report.

4.3 Field Screening Measurements

All soil samples collected were subjected to a preliminary screening procedure, which included a visual screening for colour and evidence of metals, as well as soil vapour screening with a Photo Ionization Detector. The soil vapours were measured by inserting the analyzer probe into the nominal headspace above the soil sample. The samples were then agitated/manipulated gently as the measurements were taken, and the peak reading registered within the first 15 seconds was recorded as the vapour measurement.

Samples with the highest vapour readings within a given borehole were generally selected as candidates for laboratory analysis. Additional samples were selected from different stratigraphic units to attempt to delineate the vertical extent of the contamination within a given borehole.

The measured vapour readings are depicted on the Soil Profile and Test Data Sheets in Appendix 1

4.4 Groundwater Monitoring Well Installation

Ten (10) groundwater monitoring wells were installed on the subject site as part of this Phase II ESA investigation. 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. A summary of 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	Total Depth (m BGS)	Screened Interval (m BGS)	Sand Pack (m BGS)	Bentonite Seal (m BGS)	Casing Type
BH2	57.94	6.86	5.36 – 6.86	4.90 – 6.86	0.00 – 4.90	Flushmount
BH3	58.66	9.14	7.64 – 9.14	7.32 – 9.14	6.10 – 7.32	Flushmount
BH4	58.43	5.94	2.94 – 5.94	2.40 – 5.94	0.00 – 2.40	Flushmount
BH7	58.59	6.10	3.97 – 6.10	2.44 – 6.10	0.15 – 2.44	Flushmount
BH8	58.67	6.70	3.81 – 6.10	3.51 – 6.10	0.15 – 3.51	Flushmount
BH8B	58.67	8.84	7.34 – 8.84	6.71 – 8.84	0.15 – 6.71	Flushmount
BH9	58.71	6.86	3.71 – 6.71	3.35 – 6.71	0.15 – 3.35	Flushmount
BH10	58.66	6.70	3.81 – 6.10	3.35 – 6.71	0.15 – 3.35	Flushmount
BH11	58.11	5.84	2.84 – 5.84	2.52 – 5.84	0.23 – 2.52	Flushmount
BH13	58.73	5.89	2.89 – 5.89	2.46 – 5.89	0.10 – 2.46	Flushmount

4.5 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. Groundwater samples were obtained from each monitoring well using dedicated sampling equipment. Standing water was purged from each well prior to sampling. Samples were stored in coolers to reduce analyte volatilization during transportation. Details of our standard operating procedure for groundwater sampling are provided in the Sampling and Analysis Plan in Appendix 1.

4.6 Residue Management

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

4.7 Analytical Testing

The following soil and groundwater samples were submitted for laboratory analysis as part of this Phase II ESA:

Table 2
Testing Parameters for Submitted Soil Samples

Sample ID	Sample Depth & Stratigraphic Unit	Parameters Analyzed						Rationale
		BTEX	PHCs	VOCs	PAHs	Metals[1]	pH	
BH1-SS2	0.76 – 1.37 m Fill Material	X	X		X	X	X	Assess for potential impacts resulting from a former landfill site.
BH2-SS3	1.52 – 2.13 m Clayey Silt Till	X	X				X	Assess for potential impacts resulting from a former off-site retail fuel outlet.
BH3-AU1	0.00 – 0.61 m Fill Material	X				X		Assess for potential impacts resulting from a former landfill site.
BH3-SS9/10	6.10 – 7.47 m Silty Sand Till			X				Assess for potential impacts resulting from an off-site dry-cleaners.
BH7-AU1	0.00 – 0.61 m Fill Material					X		Assess for potential impacts resulting from a former landfill site.
BH7-SS3	1.52 – 2.13 m Shale Bedrock			X				Assess for potential impacts resulting from an off-site dry-cleaners.
BH8-SS4	2.29 – 2.90 m Silty Sand Till		X	X				Assess for potential impacts resulting from an off-site dry-cleaners
BH8-SS9	6.10 – 6.71 m Shale Bedrock			X				Assess for potential impacts resulting from an off-site dry-cleaners.
BH9-AU1	0.00 – 0.61 m Fill Material		X					Assess for potential impacts resulting from a former landfill site.
BH9-SS6	3.81 – 4.42 m Silty Sand Till			X				Assess for potential impacts resulting from an off-site dry-cleaners.
BH9-SS9	6.10 – 6.71 m Silty Sand Till			X				Assess for potential impacts resulting from an off-site dry-cleaners.
BH10-SS2	0.76 – 1.37 m Fill Material				X	X		Assess for potential impacts resulting from a former autobody shop.
BH11-AU1	0.00 – 0.61 m Fill Material		X					Assess for potential impacts resulting from a former landfill site.
BH11-SS2	0.76 – 1.37 m Silty Sand Till				X	X		Assess for potential impacts resulting from a former landfill site.
BH11-SS4	2.29 – 2.90 m Silty Sand Till	X	X					Assess for potential impacts resulting from a former off-site retail fuel outlet.
BH13-AU1	0.00 – 0.61 m Fill Material		X					Assess for potential impacts resulting from a former autobody shop.
BH13-SS3	1.52 – 2.13 m Silty Sand Till		X			X		Assess for potential impacts resulting from a former autobody shop.
BH13-SS7	4.57 – 4.83 m Shale Bedrock			X				Assess for potential impacts resulting from an off-site dry-cleaners.
BH14-SS2	0.76 – 1.37 m Fill Material					X		Assess for potential impacts resulting from a former landfill site.

1 – Including Mercury and Chromium VI

Table 3
Testing Parameters for Submitted Soil Samples

Sample ID	Sample Depth & Stratigraphic Unit	Parameters Analyzed				Rationale
		BTEX	PHCs	VOCs	PAHs	
BH2-GW1	5.36 – 6.86 m Shale Bedrock	X	X	X	X	Assess for potential impacts resulting from a former off-site retail fuel outlet.
BH3-GW1	7.64 – 9.14 m Shale Bedrock	X	X	X	X	Assess for potential impacts resulting from an off-site dry-cleaners.
BH3-GW2	7.64 – 9.14 m Shale Bedrock			X		Assess for potential impacts resulting from an off-site dry-cleaners.
BH3-GW3	7.64 – 9.14 m Shale Bedrock			X		Assess for potential impacts resulting from an off-site dry-cleaners.
BH4-GW1	2.94 – 5.94 m Shale Bedrock		X	X	X	Assess for potential impacts resulting from a former landfill site.
BH7-GW1	3.97 – 6.10 m Shale Bedrock		X	X		Assess for potential impacts resulting from a former landfill site.
BH8B-GW1	7.34 – 8.84 m Shale Bedrock			X		Assess for potential impacts resulting from an off-site dry-cleaners.
BH8B-GW2	7.34 – 8.84 m Shale Bedrock			X		Assess for potential impacts resulting from an off-site dry-cleaners.
BH9-GW1	3.71 – 6.71 m Silty Sand Till			X		Assess for potential impacts resulting from an off-site dry-cleaners.
BH10-GW1	3.81 – 6.10 m Shale Bedrock		X	X		Assess for potential impacts resulting from a former autobody shop.
BH11-GW1	2.84 – 5.84 m Shale Bedrock		X	X		Assess for potential impacts resulting from a former off-site retail fuel outlet.
BH13-GW1	2.89 – 5.89 m Shale Bedrock		X	X		Assess for potential impacts resulting from a former autobody shop.

1 – Including Mercury and Chromium VI

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 Environmental Analytical Laboratories (SCC/CAEAL). Paracel is accredited and certified by SCC/CAEAL for specific tests registered with the association.

4.8 Elevation Surveying

Monitoring well locations were surveyed using a laser level device, with the elevations surveyed relative to a magnetic nail, located on the southern sidewalk of Beechwood Avenue, which contains a known geodetic elevation. The elevations of the monitoring wells are shown on Drawing PE4614-4 – Test Hole Location Plan.

4.9 Quality Assurance and Quality Control Measures

A summary of quality assurance and quality control (QA/QC) measures, including sampling containers, preservation, labelling, handling, and custody, equipment cleaning procedures, and field quality control measurements is provided in the Sampling and Analysis Plan in Appendix 1.

5.0 REVIEW AND EVALUATION

5.1 Geology

Site geology details are provided in the Soil Profile and Test Data Sheets provided in Appendix 1. Site soils generally consist of fill material, consisting of either crushed stone and/or brown silty sand and gravel, underlain by either brown clayey silt till or brown silty sand till. Bedrock, consisting of weathered shale, was generally encountered at depths ranging from approximately 1.52 m to 6.86 m below the existing ground surface.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured at the subject site during the September 3, 2020 sampling event, using an electronic water level meter. It should be noted that BH7 and BH9 could not be located at the time of the sampling event. The groundwater levels are summarized below in Table 4.

Table 4
Groundwater Level Measurements

Borehole Location	Ground Surface Elevation	Water Level Depth (m below grade)	Water Level Elevation (m ASL)	Date of Measurement
BH2	57.94	3.61	54.33	September 3, 2020
BH3	58.66	5.79	52.87	
BH4	58.43	4.06	54.37	
BH7	58.59	Could Not Locate	-	
BH8	58.67	6.34	52.33	
BH8B	58.67	6.37	52.30	
BH9	58.71	Could Not Locate	-	
BH10	58.66	4.72	53.94	
BH11	58.11	4.28	53.83	
BH13	58.73	3.20	55.53	

The groundwater on-site was typically encountered within the underlying shale bedrock unit at depths ranging from approximately 3.20 m to 6.37 m below ground surface. No unusual visual or olfactory observations were noted in the groundwater samples obtained from the boreholes.

Using the groundwater elevations recorded during the September 3, 2020 sampling event, groundwater contour mapping was completed as part of this assessment. According to the mapped contour data, illustrated on Drawing PE4614-4 Test Hole Location Plan in the appendix, the groundwater flow on the subject site is interpreted to be in a northerly direction. A horizontal hydraulic gradient of approximately 0.07 m/m was also calculated as part of this assessment.

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

5.3 Field Screening

Field screening of the soil samples collected during the drilling programs resulted in organic vapour readings ranging from 0.0 ppm to 51.8 ppm. These vapour readings indicate that there is a negligible potential for the presence of volatile substances. Heavier substances, such as heavy oil, may not be detected by the above field screening method, however, visual observations did not suggest the presence of hydrocarbon contamination. Field screening results of each individual soil sample are provided on the Soil Profile and Test Data Sheets appended to this report.

5.4 Fine/Coarse Soil Texture

Grain size analysis was not completed as part of this investigation. Coarse grained soil standards were chosen based on the nature of the recovered soil samples.

5.5 Soil Quality

As part of this assessment, nineteen (19) soil samples were submitted for laboratory analysis of either: BTEX, PHCs F_1-F_4, VOCs, PAHs, Metals, and/or pH parameters. The results of the analytical testing are presented below in Tables 5 to 9. The laboratory certificates of analysis are provided in Appendix 1.

Table 5
Analytical Test Results – Soil
BTEX & PHCs (F_1-F_4)

Parameter	MDL (µg/g)	Soil Samples (µg/g) May 23, 2019				MECP Table 1 Residential Soil Standards (µg/g)	MECP Table 3 Residential Soil Standards (µg/g)
		BH1-SS2	BH2-SS3	BH3-AU1	BH3-SS9/10		
Benzene	0.05	nd	nd	nd	nd	0.02	0.21
Ethylbenzene	0.05	nd	nd	nd	nd	0.05	2
Toluene	0.05	0.05	nd	nd	nd	0.2	2.3
Xylenes	0.05	0.73	nd	nd	0.29	0.05	3.1
PHCs F_1	7	44	nd	15	nt	25	55
PHCs F_2	4	22	80	**1,040**	nt	10	98
PHCs F_3	8	42	29	**2,370**	nt	240	300
PHCs F_4	6	12	nd	2,590	nt	120	2,800
PHCs F_{4G}	50	nt	nt	**9,490**	nt	120	2,800

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

Table 5 (continued)
Analytical Test Results – Soil
BTEX & PHCs (F_1-F_4)

Parameter	MDL (µg/g)	Soil Samples (µg/g) July 15, 2019						MECP Table 1 Residential Soil Standards (µg/g)	MECP Table 3 Residential Soil Standards (µg/g)
		BH7-SS3	BH8-SS4	BH8-SS9	BH9-AU1	BH9-SS6	BH9-SS9		
Benzene	0.05	nd	nd	nd	nt	nd	nd	0.02	0.21
Ethylbenzene	0.05	nd	nd	nd	nt	nd	nd	0.05	2
Toluene	0.05	nd	nd	nd	nt	nd	nd	0.2	2.3
Xylenes	0.05	nd	nd	nd	nt	0.87	nd	0.05	3.1
PHCs F_1	7	nt	**60**	nt	nt	nt	nt	25	55
PHCs F_2	4	nt	**2,980**	nt	nd	nt	nt	10	98
PHCs F_3	8	nt	**888**	nt	98	nt	nt	240	300
PHCs F_4	6	nt	nd	nt	171	nt	nt	120	2,800
PHCs F_{4G}	50	nt	nt	nt	nt	nt	nt	120	2,800

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

Table 5 (continued)
Analytical Test Results – Soil
BTEX & PHCs (F_1-F_4)

Parameter	MDL (µg/g)	Soil Samples (µg/g) August 24, 2020				MECP Table 1 Residential Soil Standards (µg/g)	MECP Table 3 Residential Soil Standards (µg/g)
		BH11-AU1	BH11-SS4	BH13-AU1	BH13-SS3		
Benzene	0.05	nt	nd	nt	nt	0.02	0.21
Ethylbenzene	0.05	nt	nd	nt	nt	0.05	2
Toluene	0.05	nt	nd	nt	nt	0.2	2.3
Xylenes	0.05	nt	nd	nt	nt	0.05	3.1
PHCs F_1	7	nt	nd	nt	nt	25	55
PHCs F_2	4	nd	35	5	nd	10	98
PHCs F_3	8	131	83	54	nd	240	300
PHCs F_4	6	877	36	57	nd	120	2,800
PHCs F_{4G}	50	1,730	nt	nt	nt	120	2,800

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

The concentrations of PHCs F_2, F_3, and F_{4G} in sample BH3-AU1, as well as the concentrations of PHCs F_1, F_2, and F_3 in sample BH8-SS4 are in excess of the MECP Table 3 residential standards and MECP Table 1 background standards.

While in compliance with the selected MECP Table 3 standards, several BTEX and/or PHC parameters were detected in samples: BH1-SS2, BH2-SS3, BH3-SS9/10, BH9-AU1, BH9-SS6, BH11-AU1, and BH11-SS4 at concentrations exceeding the MECP Table 1 standards. These exceedances are not considered to pose an environmental concern to the subject site, however, if this soil is ever to be removed from the property, it should be classified as contaminated and disposed of at an approved waste disposal site.

Table 6
Analytical Test Results – Soil
VOCs

Parameter	MDL (µg/g)	Soil Samples (ug/g)				MECP Table 1 Residential Soil Standards (µg/g)	MECP Table 3 Residential Soil Standards (µg/g)
		May 23, 2019	July 15, 2019				
		BH3-SS9/10	BH7-SS3	BH8-SS4	BH8-SS9		
Acetone	0.50	nd	nd	nd	nd	0.5	16
Benzene	0.02	nd	nd	nd	nd	0.02	0.21
Bromodichloromethane	0.05	nd	nd	nd	nd	0.05	13
Bromoform	0.05	nd	nd	nd	nd	0.05	0.27
Bromomethane	0.05	nd	nd	nd	nd	0.05	0.05
Carbon Tetrachloride	0.05	nd	nd	nd	nd	0.05	0.05
Chlorobenzene	0.05	nd	nd	nd	nd	0.05	2.4
Chloroform	0.05	nd	nd	nd	nd	0.05	0.05
Dibromochloromethane	0.05	nd	nd	nd	nd	0.05	9.4
Dichlorodifluoromethane	0.05	nd	nd	nd	nd	0.05	16
1,2-Dichlorobenzene	0.05	nd	nd	nd	nd	0.05	3.4
1,3-Dichlorobenzene	0.05	nd	nd	nd	nd	0.05	4.8
1,4-Dichlorobenzene	0.05	nd	nd	nd	nd	0.05	0.083
1,1-Dichloroethane	0.05	nd	nd	nd	nd	0.05	3.5
1,2-Dichloroethane	0.05	nd	nd	nd	nd	0.05	0.05
1,1-Dichloroethylene	0.05	nd	nd	nd	nd	0.05	0.05
cis-1,2-Dichloroethylene	0.05	nd	nd	nd	nd	0.05	3.4
trans-1,2-Dichloroethylene	0.05	nd	nd	nd	nd	0.05	0.084
1,2-Dichloropropane	0.05	nd	nd	nd	nd	0.05	0.05
1,3-Dichloropropene	0.05	nd	nd	nd	nd	0.05	0.05
Ethylbenzene	0.05	nd	nd	nd	nd	0.05	2
Ethylene Dibromide	0.05	nd	nd	nd	nd	0.05	0.05
Hexane	0.05	nd	nd	nd	nd	0.05	2.8
Methyl Ethyl Ketone	0.50	nd	nd	nd	nd	0.5	16
Methyl Isobutyl Ketone	0.50	nd	nd	nd	nd	0.5	1.7
Methyl tert-butyl ether	0.05	nd	nd	nd	nd	0.05	0.75
Methylene Chloride	0.05	nd	nd	nd	nd	0.05	0.1
Styrene	0.05	nd	nd	nd	nd	0.05	0.7
1,1,1,2-Tetrachloroethane	0.05	nd	nd	nd	nd	0.05	0.058
1,1,2,2-Tetrachloroethane	0.05	nd	nd	nd	nd	0.05	0.05
Tetrachloroethylene	0.05	**1.79**	nd	nd	nd	0.05	0.28
Toluene	0.05	nd	nd	nd	nd	0.2	2.3
1,1,1-Trichloroethane	0.05	nd	nd	nd	nd	0.05	0.38
1,1,2-Trichloroethane	0.05	nd	nd	nd	nd	0.05	0.05
Trichloroethylene	0.05	nd	nd	nd	nd	0.05	0.061
Trichlorofluoromethane	0.05	nd	nd	nd	nd	0.25	4
Vinyl Chloride	0.02	nd	nd	nd	nd	0.02	0.02
Xylenes	0.05	0.29	nd	nd	nd	0.05	3.1

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

Table 6 (continued)
Analytical Test Results – Soil
VOCs

Parameter	MDL (µg/g)	Soil Samples (ug/g)			MECP Table 1 Residential Soil Standards (µg/g)	MECP Table 3 Residential Soil Standards (µg/g)
		July 15, 2019		August 24, 2020		
		BH9-SS6	BH9-SS9	BH13-SS7		
Acetone	0.50	nd	nd	nd	0.5	16
Benzene	0.02	nd	nd	nd	0.02	0.21
Bromodichloromethane	0.05	nd	nd	nd	0.05	13
Bromoform	0.05	nd	nd	nd	0.05	0.27
Bromomethane	0.05	nd	nd	nd	0.05	0.05
Carbon Tetrachloride	0.05	nd	nd	nd	0.05	0.05
Chlorobenzene	0.05	nd	nd	nd	0.05	2.4
Chloroform	0.05	nd	nd	nd	0.05	0.05
Dibromochloromethane	0.05	nd	nd	nd	0.05	9.4
Dichlorodifluoromethane	0.05	nd	nd	nd	0.05	16
1,2-Dichlorobenzene	0.05	nd	nd	nd	0.05	3.4
1,3-Dichlorobenzene	0.05	nd	nd	nd	0.05	4.8
1,4-Dichlorobenzene	0.05	nd	nd	nd	0.05	0.083
1,1-Dichloroethane	0.05	nd	nd	nd	0.05	3.5
1,2-Dichloroethane	0.05	nd	nd	nd	0.05	0.05
1,1-Dichloroethylene	0.05	nd	nd	nd	0.05	0.05
cis-1,2-Dichloroethylene	0.05	nd	nd	nd	0.05	3.4
trans-1,2-Dichloroethylene	0.05	nd	nd	nd	0.05	0.084
1,2-Dichloropropane	0.05	nd	nd	nd	0.05	0.05
1,3-Dichloropropene	0.05	nd	nd	nd	0.05	0.05
Ethylbenzene	0.05	nd	nd	nd	0.05	2
Ethylene Dibromide	0.05	nd	nd	nd	0.05	0.05
Hexane	0.05	nd	nd	nd	0.05	2.8
Methyl Ethyl Ketone	0.50	nd	nd	nd	0.5	16
Methyl Isobutyl Ketone	0.50	nd	nd	nd	0.5	1.7
Methyl tert-butyl ether	0.05	nd	nd	nd	0.05	0.75
Methylene Chloride	0.05	nd	nd	nd	0.05	0.1
Styrene	0.05	nd	nd	nd	0.05	0.7
1,1,1,2-Tetrachloroethane	0.05	nd	nd	nd	0.05	0.058
1,1,2,2-Tetrachloroethane	0.05	nd	nd	nd	0.05	0.05
Tetrachloroethylene	0.05	nd	nd	nd	0.05	0.28
Toluene	0.05	nd	nd	nd	0.2	2.3
1,1,1-Trichloroethane	0.05	nd	nd	nd	0.05	0.38
1,1,2-Trichloroethane	0.05	nd	nd	nd	0.05	0.05
Trichloroethylene	0.05	nd	nd	nd	0.05	0.061
Trichlorofluoromethane	0.05	nd	nd	nd	0.25	4
Vinyl Chloride	0.02	nd	nd	nd	0.02	0.02
Xylenes	0.05	0.87	nd	nd	0.05	3.1

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

All detected VOC parameter concentrations are in compliance with the selected MECP Table 3 residential standards, with one (1) exception. The concentration of tetrachloroethylene in sample BH3-SS9/10 is in excess of the MECP Table 3 residential standards and the MECP Table 1 background standards.

While in compliance with the selected MECP Table 3 standards, the concentrations of xylenes detected in samples: BH3-SS9/10 and BH9-SS6 are in excess of the MECP Table 1 standards. These exceedances are not considered to pose an environmental concern to the subject site, however, if the soil is ever to be removed from the property, it should be classified as contaminated and disposed of at an approved waste disposal site.

Table 7
Analytical Test Results – Soil
PAHs

Parameter	MDL (µg/g)	Soil Samples (µg/g)			MECP Table 1 Residential Soil Standards (µg/g)	MECP Table 3 Residential Soil Standards (µg/g)
		May 23, 2019	July 15, 2019	August 24, 2020		
		BH1-SS2	BH10-SS2	BH11-SS2		
Acenaphthene	0.02	0.06	nd	nd	0.072	7.9
Acenaphthylene	0.02	0.05	nd	0.05	0.093	0.15
Anthracene	0.02	0.13	nd	0.05	0.16	0.67
Benzo[a]anthracene	0.02	0.37	0.04	0.13	0.36	0.5
Benzo[a]pyrene	0.02	0.29	0.03	0.14	0.3	0.3
Benzo[b]fluoranthene	0.02	0.45	0.04	0.19	0.47	0.78
Benzo[g,h,i]perylene	0.02	0.2	0.03	0.10	0.68	6.6
Benzo[k]fluoranthene	0.02	0.31	0.03	0.10	0.48	0.78
Chrysene	0.02	0.38	0.06	0.13	2.8	7
Dibenzo[a,h]anthracene	0.02	0.07	nd	0.03	0.1	0.1
Fluoranthene	0.02	**0.78**	0.09	0.27	0.56	0.69
Fluorene	0.02	0.06	nd	nd	0.12	62
Indeno[1,2,3-cd]pyrene	0.02	0.16	nd	0.09	0.23	0.38
1-Methylnaphthalene	0.02	nd	nd	nd	0.59	0.99
2-Methylnaphthalene	0.02	0.03	nd	nd	0.59	0.99
Methylnaphthalene (1&2)	0.04	0.03	nd	nd	0.59	0.99
Naphthalene	0.01	0.04	nd	nd	0.09	0.6
Phenanthrene	0.02	0.58	0.07	0.15	0.69	6.2
Pyrene	0.02	0.62	0.09	0.24	1	78

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

All detected PAH parameter concentrations are in compliance with the selected MECP Table 3 residential standards, with one (1) exception. The concentration of fluoranthene in sample BH1-SS2 is in excess of the MECP Table 3 residential standards and the MECP Table 1 background standards.

While in compliance with the selected MECP Table 3 standards, the concentration of benzo[a]anthracene detected in samples: BH1-SS2 is in excess of the MECP Table 1 standards. This exceedances is not considered to pose an environmental concern to the subject site, however, if the soil is ever to be removed from the property, it should be classified as contaminated and disposed of at an approved waste disposal site.

Table 8
Analytical Test Results – Soil
Metals

Parameter	MDL (µg/g)	Soil Samples (µg/g)				MECP Table 1 Residential Soil Standards (µg/g)	MECP Table 3 Residential Soil Standards (µg/g)
		May 23, 2019		July 15, 2019			
		BH1-SS2	BH3-AU1	BH7-AU1	BH10-SS2		
Antimony	1.0	nd	nd	1.5	nd	1.3	7.5
Arsenic	1.0	7.7	4.0	10.8	5.8	18	18
Barium	1.0	256	54.9	293	171	220	390
Beryllium	0.5	0.6	nd	0.7	0.6	2.5	4
Boron	5.0	15.8	6.8	7.8	6.7	36	120
Cadmium	0.5	nd	nd	0.7	nd	1.2	1.2
Chromium	5.0	30.1	10.1	26.8	19.7	70	160
Chromium (VI)	0.2	nd	nd	nd	nd	0.66	8
Cobalt	1.0	11.7	4.7	9.1	8.1	21	22
Copper	5.0	37.5	13.5	77.6	43.8	92	140
Lead	1.0	**181**	44.7	**295**	**255**	120	120
Mercury	0.1	**0.3**	nd	0.2	**0.3**	0.27	0.27
Molybdenum	1.0	3.3	2.2	2.7	1.5	2	6.9
Nickel	5.0	31.6	16.0	27.8	21.0	82	100
Selenium	1.0	nd	nd	1.0	nd	1.5	2.4
Silver	0.3	0.5	nd	0.3	nd	0.5	20
Thallium	1.0	nd	nd	nd	nd	1	1
Uranium	1.0	1.4	nd	nd	nd	2.5	23
Vanadium	10.0	27.5	24.7	28.0	23.0	86	86
Zinc	20.0	143	41.6	279	186	290	340

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

Table 8 (continued)
Analytical Test Results – Soil
Metals

Parameter	MDL (µg/g)	Soil Samples (µg/g) August 24, 2020			MECP Table 1 Residential Soil Standards (µg/g)	MECP Table 3 Residential Soil Standards (µg/g)
		BH11-SS2	BH13-SS3	BH14-SS2		
Antimony	1.0	nd	nd	3.9	1.3	7.5
Arsenic	1.0	8.2	2.0	2.3	18	18
Barium	1.0	180	14.8	99.5	220	390
Beryllium	0.5	0.8	nd	nd	2.5	4
Boron	5.0	9.0	nd	7.6	36	120
Cadmium	0.5	nd	nd	nd	1.2	1.2
Chromium	5.0	30.4	7.9	13.7	70	160
Chromium (VI)	0.2	nd	nd	0.3	0.66	8
Cobalt	1.0	9.5	3.5	5.4	21	22
Copper	5.0	63.1	8.0	18.4	92	140
Lead	1.0	**226**	3.6	22.7	120	120
Mercury	0.1	**1.4**	nd	0.2	0.27	0.27
Molybdenum	1.0	2.2	nd	nd	2	6.9
Nickel	5.0	34.8	10.1	11.6	82	100
Selenium	1.0	nd	nd	nd	1.5	2.4
Silver	0.3	1.1	nd	nd	0.5	20
Thallium	1.0	nd	nd	nd	1	1
Uranium	1.0	2.4	nd	nd	2.5	23
Vanadium	10.0	30.5	14.6	16.5	86	86
Zinc	20.0	175	nd	36.6	290	340

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

The concentration of lead in sample BH7-AU1, as well as the concentrations of lead and mercury in samples BH1-SS2, BH10-SS2, and BH11-SS2 are in excess of the selected MECP Table 3 residential standards and the MECP Table 1 background standards.

While in compliance with the selected MECP Table 3 standards, several metal parameters were detected in samples: BH1-SS2, BH3-AU1, BH7-AU1, BH11-SS2, and BH14-SS2 at concentrations exceeding the MECP Table 1 standards. These exceedances are not considered to pose an environmental concern to the subject site, however, if the soil is ever to be removed from the property, it should be classified as contaminated and disposed of at an approved waste disposal site.

Table 9
Analytical Test Results – Soil
pH

Parameter	MDL (units)	Soil Samples (µg/g)		MECP Table 3 Residential Standards (units)
		May 23, 2019		
		BH1-SS2	BH2-SS3	
pH	0.05	7.94	7.39	5.00 – 9.00

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

The pH levels detected in the soil samples analyzed are in compliance with the selected MECP Table 3 residential standards.

Table 10
Maximum Concentrations – Soil

Parameter	Maximum Concentration (µg/g)	Sample ID	Depth Interval (m BGS)
Toluene	0.05	BH1-SS2	0.76 – 1.37 m
Xylenes	0.87	BH9-SS6	3.81 – 4.42 m
PHCs F_1	**60**	BH8-SS4	2.29 – 2.90 m
PHCs F_2	**2,980**	BH8-SS4	2.29 – 2.90 m
PHCs F_3	**2,370**	BH3-AU1	0.00 – 0.61 m
PHCs F_4	2,590	BH3-AU1	0.00 – 0.61 m
PHCs F_{4G}	**9,490**	BH3-AU1	0.00 – 0.61 m
Tetrachloroethylene	**1.79**	BH3-SS9/10	6.10 – 7.47 m
Acenaphthene	0.06	BH1-SS2	0.76 – 1.37 m
Acenaphthylene	0.05	BH1-SS2 / BH11-SS2	0.76 – 1.37 m / 0.76 – 1.37 m
Anthracene	0.13	BH1-SS2	0.76 – 1.37 m
Benzo[a]anthracene	0.37	BH1-SS2	0.76 – 1.37 m
Benzo[a]pyrene	0.29	BH1-SS2	0.76 – 1.37 m
Benzo[b]fluoranthene	0.45	BH1-SS2	0.76 – 1.37 m
Benzo[g,h,i]perylene	0.2	BH1-SS2	0.76 – 1.37 m
Benzo[k]fluoranthene	0.31	BH1-SS2	0.76 – 1.37 m
Chrysene	0.38	BH1-SS2	0.76 – 1.37 m
Dibenzo[a,h]anthracene	0.07	BH1-SS2	0.76 – 1.37 m
Fluoranthene	**0.78**	BH1-SS2	0.76 – 1.37 m
Fluorene	0.06	BH1-SS2	0.76 – 1.37 m
Indeno[1,2,3-cd]pyrene	0.16	BH1-SS2	0.76 – 1.37 m
2-Methylnaphthalene	0.03	BH1-SS2	0.76 – 1.37 m
Methylnaphthalene (1&2)	0.03	BH1-SS2	0.76 – 1.37 m
Naphthalene	0.04	BH1-SS2	0.76 – 1.37 m
Phenanthrene	0.58	BH1-SS2	0.76 – 1.37 m
Pyrene	0.62	BH1-SS2	0.76 – 1.37 m
Antimony	3.9	BH14-SS2	0.76 – 1.37 m
Arsenic	10.8	BH7-AU1	0.00 – 0.61 m
Barium	293	BH7-AU1	0.00 – 0.61 m
Beryllium	0.8	BH11-SS2	0.76 – 1.37 m
Boron	15.8	BH1-SS2	0.76 – 1.37 m
Cadmium	0.7	BH7-AU1	0.00 – 0.61 m
Chromium	30.4	BH11-SS2	0.76 – 1.37 m
Chromium (VI)	0.3	BH14-SS2	0.76 – 1.37 m
Cobalt	11.7	BH1-SS2	0.76 – 1.37 m
Copper	77.6	BH7-AU1	0.00 – 0.61 m
Lead	**295**	BH7-AU1	0.00 – 0.61 m
Mercury	**1.4**	BH11-SS2	0.76 – 1.37 m
Molybdenum	3.3	BH1-SS2	0.76 – 1.37 m
Nickel	34.8	BH11-SS2	0.76 – 1.37 m
Selenium	1.0	BH7-AU1	0.00 – 0.61 m
Silver	1.1	BH11-SS2	0.76 – 1.37 m
Uranium	2.4	BH11-SS2	0.76 – 1.37 m
Vanadium	30.5	BH11-SS2	0.76 – 1.37 m
Zinc	279	BH7-AU1	0.00 – 0.61 m
pH	7.94	BH1-SS2	0.76 – 1.37 m

Notes:
- Underlined – Value exceeds MECP Table 1 standards
- **Bold and Underlined** – value exceeds selected MECP standards

All other parameter concentrations analyzed were below the laboratory detection limits.

5.6 Groundwater Quality

As part of this assessment, twelve (12) groundwater samples, were submitted for laboratory analysis of either: BTEX, PHCs, VOCs, and/or PAHs parameters. The results of the analytical testing are presented below in Tables 11 to 13. The laboratory certificates of analysis are provided in Appendix 1.

Table 11
Analytical Test Results – Groundwater
BTEX & PHCs (F_1-F_4)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)							MECP Table 3 Residential Groundwater Standards (µg/L)
		June 3, 2019			July 19, 2019				
		BH2-GW1	BH3-GW1	BH4-GW1	BH3-GW2	BH7-GW1	BH9-GW1	BH10-GW1	
Benzene	0.5	nd	nd	nd	nd	nd	nd	nd	44
Ethylbenzene	0.5	nd	nd	nd	nd	nd	nd	nd	2,300
Toluene	0.5	nd	nd	nd	nd	nd	nd	nd	18,000
Xylenes	0.5	nd	nd	nd	nd	nd	nd	nd	4,200
PHC F_1	25	nd	nd	nd	nt	nd	nt	nd	750
PHC F_2	100	nd	nd	nd	nt	nd	nt	nd	150
PHC F_3	100	nd	nd	nd	nt	nd	nt	nd	500
PHC F_4	100	nd	nd	nd	nt	nd	nt	nd	500

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

Table 11 (continued)
Analytical Test Results – Groundwater
BTEX & PHCs (F_1-F_4)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)				MECP Table 3 Residential Groundwater Standards (µg/L)
		September 3, 2020				
		BH3-GW3	BH8B-GW1	BH11-GW1	BH13-GW1	
Benzene	0.5	nd	nd	nd	nd	44
Ethylbenzene	0.5	nd	nd	0.6	nd	2,300
Toluene	0.5	nd	nd	nd	nd	18,000
Xylenes	0.5	nd	nd	0.7	nd	4,200
PHC F_1	25	nt	nt	nd	nd	750
PHC F_2	100	nt	nt	nd	nd	150
PHC F_3	100	nt	nt	nd	nd	500
PHC F_4	100	nt	nt	nd	nd	500

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

All detected BTEX and PHC parameters are in compliance with the selected MECP Table 3 residential standards.

Table 12
Analytical Test Results – Groundwater
VOCs

Parameter	MDL (µg/L)	Groundwater Sample (ug/L)						MECP Table 3 Residential Groundwater Standards (µg/L)
		June 3, 2019			July 19, 2019			
		BH2-GW1	BH3-GW1	BH4-GW1	BH3-GW2	BH7-GW1	BH9-GW1	
Acetone	5.0	nd	nd	nd	nd	nd	nd	130,000
Benzene	0.5	nd	nd	nd	nd	nd	nd	44
Bromodichloromethane	0.5	nd	nd	nd	nd	nd	nd	85,000
Bromoform	0.5	nd	nd	nd	nd	nd	nd	380
Bromomethane	0.5	nd	nd	nd	nd	nd	nd	5.6
Carbon Tetrachloride	0.2	nd	nd	nd	nd	nd	nd	0.79
Chlorobenzene	0.5	nd	nd	nd	nd	nd	nd	630
Chloroform	0.5	nd	nd	nd	nd	nd	nd	2.4
Dibromochloromethane	0.5	nd	nd	nd	nd	nd	nd	82,000
Dichlorodifluoromethane	1.0	nd	nd	nd	nd	nd	nd	4,400
1,2-Dichlorobenzene	0.5	nd	nd	nd	nd	nd	nd	4,600
1,3-Dichlorobenzene	0.5	nd	nd	nd	nd	nd	nd	9,600
1,4-Dichlorobenzene	0.5	nd	nd	nd	nd	nd	nd	8
1,1-Dichloroethane	0.5	nd	nd	nd	nd	nd	nd	320
1,2-Dichloroethane	0.5	nd	nd	nd	nd	nd	nd	1.6
1,1-Dichloroethylene	0.5	nd	nd	nd	nd	nd	nd	1.6
cis-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	nd	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	nd	nd	1.6
1,2-Dichloropropane	0.5	nd	nd	nd	nd	nd	nd	16
1,3-Dichloropropene	0.5	nd	nd	nd	nd	nd	nd	5.2
Ethylbenzene	0.5	nd	nd	nd	nd	nd	nd	2,300
Ethylene Dibromide	0.2	nd	nd	nd	nd	nd	nd	0.25
Hexane	1.0	nd	nd	nd	nd	nd	nd	51
Methyl Ethyl Ketone	5.0	nd	nd	nd	nd	nd	nd	470,000
Methyl Isobutyl Ketone	5.0	nd	nd	nd	nd	nd	nd	140,000
Methyl tert-butyl ether	2.0	nd	nd	nd	nd	nd	nd	190
Methylene Chloride	5.0	nd	nd	nd	nd	nd	nd	610
Styrene	0.5	nd	nd	nd	nd	nd	nd	1,300
1,1,1,2-Tetrachloroethane	0.5	nd	nd	nd	nd	nd	nd	3.3
1,1,2,2-Tetrachloroethane	0.5	nd	nd	nd	nd	nd	nd	3.2
Tetrachloroethylene	0.5	nd	nd	nd	nd	nd	nd	1.6
Toluene	0.5	nd	nd	nd	nd	nd	nd	18,000
1,1,1-Trichloroethane	0.5	nd	nd	nd	nd	nd	nd	640
1,1,2-Trichloroethane	0.5	nd	nd	nd	nd	nd	nd	4.7
Trichloroethylene	0.5	nd	nd	nd	nd	nd	nd	1.6
Trichlorofluoromethane	1.0	nd	nd	nd	nd	nd	nd	2,500
Vinyl Chloride	0.5	nd	nd	nd	nd	nd	nd	0.5
Xylenes	0.5	nd	nd	nd	nd	nd	nd	4,200

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

Table 12 (continued)
Analytical Test Results – Groundwater
VOCs

Parameter	MDL (µg/L)	Groundwater Sample (ug/L)					MECP Table 3 Residential Groundwater Standards (µg/L)
		July 19, 2019	September 3, 2020				
		BH10-GW1	BH3-GW3	BH8B-GW1	BH11-GW1	BH13-GW1	
Acetone	5.0	nd	nd	nd	nd	nd	130,000
Benzene	0.5	nd	nd	nd	nd	nd	44
Bromodichloromethane	0.5	nd	nd	nd	nd	nd	85,000
Bromoform	0.5	nd	nd	nd	nd	nd	380
Bromomethane	0.5	nd	nd	nd	nd	nd	5.6
Carbon Tetrachloride	0.2	nd	nd	nd	nd	nd	0.79
Chlorobenzene	0.5	nd	nd	nd	nd	nd	630
Chloroform	0.5	nd	nd	nd	nd	nd	2.4
Dibromochloromethane	0.5	nd	nd	nd	nd	nd	82,000
Dichlorodifluoromethane	1.0	nd	nd	nd	nd	nd	4,400
1,2-Dichlorobenzene	0.5	nd	nd	nd	nd	nd	4,600
1,3-Dichlorobenzene	0.5	nd	nd	nd	nd	nd	9,600
1,4-Dichlorobenzene	0.5	nd	nd	nd	nd	nd	8
1,1-Dichloroethane	0.5	nd	nd	nd	nd	nd	320
1,2-Dichloroethane	0.5	nd	nd	nd	nd	nd	1.6
1,1-Dichloroethylene	0.5	nd	nd	nd	nd	nd	1.6
cis-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	nd	1.6
1,2-Dichloropropane	0.5	nd	nd	nd	nd	nd	16
1,3-Dichloropropene	0.5	nd	nd	nd	nd	nd	5.2
Ethylbenzene	0.5	nd	nd	nd	0.6	nd	2,300
Ethylene Dibromide	0.2	nd	nd	nd	nd	nd	0.25
Hexane	1.0	nd	nd	nd	nd	nd	51
Methyl Ethyl Ketone	5.0	nd	nd	nd	nd	nd	470,000
Methyl Isobutyl Ketone	5.0	nd	nd	nd	nd	nd	140,000
Methyl tert-butyl ether	2.0	nd	nd	nd	nd	nd	190
Methylene Chloride	5.0	nd	nd	nd	nd	nd	610
Styrene	0.5	nd	nd	nd	nd	nd	1,300
1,1,1,2-Tetrachloroethane	0.5	nd	nd	nd	nd	nd	3.3
1,1,2,2-Tetrachloroethane	0.5	nd	nd	nd	nd	nd	3.2
Tetrachloroethylene	0.5	nd	nd	nd	nd	nd	1.6
Toluene	0.5	nd	nd	nd	nd	nd	18,000
1,1,1-Trichloroethane	0.5	nd	nd	nd	nd	nd	640
1,1,2-Trichloroethane	0.5	nd	nd	nd	nd	nd	4.7
Trichloroethylene	0.5	nd	nd	nd	nd	nd	1.6
Trichlorofluoromethane	1.0	nd	nd	nd	nd	nd	2,500
Vinyl Chloride	0.5	nd	nd	nd	nd	nd	0.5
Xylenes	0.5	nd	nd	nd	0.7	nd	4,200

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

All detected VOC parameter concentrations are in compliance with the selected MECP Table 3 residential standards.

Table 13
Analytical Test Results – Groundwater
PAHs

Parameter	MDL (µg/L)	Groundwater Sample (µg/L)			MECP Table 3 Residential Groundwater Standards (µg/L)
		May 23, 2019			
		BH2-GW1	BH3-GW1	BH4-GW1	
Acenaphthene	0.05	nd	nd	nd	600
Acenaphthylene	0.05	nd	nd	nd	1.8
Anthracene	0.01	0.05	nd	nd	2.4
Benzo[a]anthracene	0.01	nd	nd	nd	4.7
Benzo[a]pyrene	0.01	0.03	nd	nd	0.81
Benzo[b]fluoranthene	0.05	nd	nd	nd	0.75
Benzo[g,h,i]perylene	0.05	nd	nd	nd	0.2
Benzo[k]fluoranthene	0.05	nd	nd	nd	0.4
Chrysene	0.05	nd	nd	nd	1
Dibenzo[a,h]anthracene	0.05	nd	nd	nd	0.52
Fluoranthene	0.01	0.07	nd	nd	130
Fluorene	0.05	nd	nd	nd	400
Indeno[1,2,3-cd]pyrene	0.05	nd	nd	nd	0.2
1-Methylnaphthalene	0.05	nd	nd	nd	1,800
2-Methylnaphthalene	0.05	nd	nd	nd	1,800
Methylnaphthalene (1&2)	0.10	nd	nd	nd	1,800
Naphthalene	0.05	nd	nd	nd	1,400
Phenanthrene	0.05	nd	nd	nd	580
Pyrene	0.01	0.06	nd	nd	60

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

All detected PAH parameter concentrations are in compliance with the selected MECP Table 3 residential standards.

Table 14
Maximum Concentrations – Groundwater

Parameter	Maximum Concentration (µg/L)	Sample ID	Depth Interval (m BGS)
Ethylbenzene	0.6	BH11-GW1	2.84 – 5.84 m
Xylenes	0.7	BH11-GW1	2.84 – 5.84 m
Anthracene	0.05	BH2-GW1	5.36 – 6.86 m
Benzo[a]pyrene	0.03	BH2-GW1	5.36 – 6.86 m
Fluoranthene	0.07	BH2-GW1	5.36 – 6.86 m
Pyrene	0.06	BH2-GW1	5.36 – 6.86 m

Notes:
- Underlined – Value exceeds MECP Table 1 standards
- **Bold and Underlined** – value exceeds selected MECP standards

5.7 Quality Assurance and Quality Control Results

As per the Sampling and Analysis Plan, a duplicate groundwater sample was obtained from BH3 during the July 19, 2019 sampling event as well as from BH13 during the September 3, 2020 sampling event, and analyzed for VOCs. Based on the analytical test results, no VOC parameters were detected above the laboratory method detection limits in either the original sample or the field duplicate sample. 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.

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.

5.8 Updated Phase II Conceptual Site Model

The following section has been prepared in accordance with the requirements of O.Reg. 269/11, amending O.Reg. 153/04 - Record of Site Condition regulation, made under the Environmental Protection Act. Conclusions and recommendations are discussed in a subsequent section.

Site Description

Potentially Contaminating Activities (PCAs) and Areas of Potential Environmental Concern (APECs)

As described in Section 6.1 of the Phase I ESA 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 10: Commercial Autobody Shops"*

  This PCA was identified as a result of the presence of a former autobody shop and service garage located at 89 Barrette Street.

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

  This PCA was identified as a result of the presence of a former retail fuel outlet located at 64 Beechwood Avenue.

- *"Item 37: Operation of Dry-Cleaning Equipment (Where Chemicals Are Used)"*

  This PCA was identified as a result of the presence of a dry cleaners located at 110 Beechwood Avenue.

- *"Item 52: Storage, Maintenance, Fuelling, and Repair of Equipment, Vehicles, and Material Used to Maintain Transportation Systems"*

  This PCA was identified as a result of the presence of a former autobody shop and service garage located at 89 Barrette Street.

- *"Item 58: Waste Disposal and Waste Management, including thermal treatment, landfilling and transfer of waste, other than use of biosoils as soil conditioners"*

  This PCA was identified as a result of the presence of a former landfill site, located throughout the Phase I study area and situated beneath the entirety of the subject site.

Contaminants of Potential Concern

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

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

These contaminants have the potential to be present in the soil/fill matrix as well as the groundwater on the subject site.

Subsurface Structures and Utilities

Underground service locates were completed as part of a Phase II ESA conducted for the subject site in tandem with this assessment. According to the locates, underground gas lines, electrical cables, as well as water and sewer pipes are present on the subject site.

Physical Setting

Site Stratigraphy

The stratigraphy of the subject site generally consists of:

- Fill material, consisting of either crushed stone and/or brown silty sand and gravel, extending to depths ranging from approximately 0.28 m to 3.20 m below ground surface.
- Glacial till, consisting of either brown clayey silt or brown silty sand and gravel, extending to depths of approximately 1.52 m to 6.86 m below ground surface.
- Weathered shale bedrock; encountered at depths ranging from approximately 1.52 m to 6.86 m below the existing ground surface.

Hydrogeological Characteristics

Groundwater levels at the subject site were measured at each monitoring well, with the exception of BH7 and BH9, on September 3, 2020. The water table at the subject site was encountered within the underlying bedrock unit, at depths ranging from approximately 3.20 m to 6.37 m below the existing ground surface.

Based on the measured groundwater levels, the groundwater flow in the vicinity of the subject site is towards the north.

Approximate Depth to Bedrock

Bedrock was encountered in all boreholes at depths ranging from approximately 1.52 m to 6.86 m below ground surface, at the time of the drilling program.

Approximate Depth to Water Table

Based on the findings of the current groundwater sampling event, the depth to water table at the subject property is approximately 3.20 m to 6.37 m below the existing ground surface.

Fill Placement

Fill material, consisting of either crushed stone and/or brown silty sand and gravel with construction/demolition debris, was encountered throughout the entire subject site area and extending to depths ranging from approximately 0.28 m to 3.20 m below ground surface.

Sections 41 and 43.1 of the Regulation

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

Section 43.1 of the Regulation does not apply to the subject site since the bedrock is located at a depth of greater than 2 m below the ground surface, and thus is not considered to be a Shallow Soil Property.

Existing Buildings and Structures

The subject site is currently occupied by twelve (12) buildings of mixed residential and commercial uses.

Proposed Buildings and Other Structures

It is our understanding that the subject site is to be redeveloped with a multi-storey residential building with ground floor commercial units and underground parking. A Record of Site Condition (RSC) will be required due to the conversion to a more sensitive land use.

Water Bodies and Areas of Natural Significance

There are no waterbodies or areas of natural and scientific interest located on the subject site or within the Phase I study area. The nearest named waterbody with respect to the subject site is the Rideau River, located approximately 315 m to the south.

Environmental Condition

Areas Where Contaminants are Present

Based on the findings of this assessment, the soil/fill within the following areas were identified as being contaminated with various contaminants:

- Petroleum Hydrocarbons: identified within the soil at BH3 and BH8, located within the northeastern portion of the subject site;
- Volatile Organic Compounds: identified within the soil at BH3, located in the northeastern portion of the subject site;
- Polycyclic Aromatic Hydrocarbons: identified within the soil at BH1, located in the north-central portion of the subject site;
- Metals: identified within the soil at BH1, BH7, BH10, and BH11, located in the central, and western portions of the subject site.

No impacted groundwater was identified on the subject site. The analytical test results for all soil and groundwater samples tested are shown on the Analytical Testing Plans, appended to this report.

Types of Contaminants

Based on the findings of this assessment, the contaminants of concern identified on the subject site are summarized below in Table 15:

Table 15
Contaminants of Concern (CPCs)

SOIL

Contaminant Group	Parameters	Contaminant Locations
Petroleum Hydrocarbons (PHCs)	PHCs F_1	BH3 / BH8
	PHCs F_2	
	PHCs F_3	
	PHCs F_4	
	PHCs F_{4G}	
Volatile Organic Compounds (VOCs)	Tetrachloroethylene	BH3
Polycyclic Aromatic Hydrocarbons (PAHs)	Fluoranthene	BH1
Metals	Lead	BH1 / BH7/ BH10 / BH11
	Mercury	

Contaminated Media

As noted above in Table 15, PHC, VOC, PAH, and/or metal impacted soil/fill was identified at BH1, BH3, BH7, BH8, BH10, and BH11. These boreholes are located within the northeastern, central, and western portions of the subject site.

Based on the analytical results, the groundwater is not contaminated.

What Is Known About Areas Where Contaminants Are Present

Based on the findings of this assessment, PHC, VOC, PAH, and/or metal impacted soil was identified in the vicinity of BH1, BH3, BH7, BH8, BH10, and BH11.

The metal and PAH contaminants are likely a result of historical landfilling on the subject site. The PHC contaminants are likely the result of an unknown discharge on the subject site. The VOC contaminants are likely the result of the neighbouring dry cleaners.

Distribution and Migration of Contaminants

PHC impacted soil was identified in the vicinity of BH3 and BH8, located in the northeastern portion of the subject site. Based on their low mobility, as well as the clean groundwater results, it is anticipated that these contaminants are primarily contained within the fill material in this portion of the subject site. Some limited vertical migration of these contaminants is expected to have occurred, based on their detection within a deeper native soil sample (BH8-SS4).

VOC impacted soil was identified in the vicinity of BH3, located in the northeastern portion of the subject site. Based on its depth, as well as the clean groundwater results, it is anticipated that this contaminant likely originated from the neighbouring dry-cleaners at 110 Beechwood Avenue.

PAH impacted soil was identified in the vicinity of BH1, located in the north-central portion of the subject site. Based on their low mobility, it is anticipated that these contaminants are primarily contained within the fill material in this portion of the subject site.

Metal impacted soil was identified in the vicinity of BH1, BH7, BH10, and BH11, located in the central and western portions of the subject site. Based on their low mobility, it is anticipated that these contaminants are primarily contained within the fill material in these portions of the subject site.

Discharge of Contaminants

The PHC impacted soil in the vicinity of BH3 and BH8, located in the northeastern portion of the subject site, is considered to have resulted from the importation of poor-quality fill material and/or the presence of building debris.

The VOC impacted soil in the vicinity of BH3, located in the northeastern portion of the subject site, is considered to have resulted from the neighbouring dry-cleaners at 110 Beechwood Avenue.

The PAH impacted soil in the vicinity of BH1, located in the north-central portion of the subject site, is considered to have resulted from the importation of poor-quality fill material and/or the presence of building debris.

The metal impacted soil in the vicinity of BH1, BH7, BH10, and BH11, located in the central, and western portions of the subject site, is considered to have resulted from the importation of poor-quality fill material and/or the presence of building debris.

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.

Downward leaching is not considered to have affected any contaminant distribution at the subject site, since the groundwater test results comply with the MECP Table 3 residential standards. Fluctuations in the groundwater level and flow are also not considered to have affected any contaminant distribution, due to the depth of the water table within the bedrock, well below the shallow fill material.

Potential for Vapour Intrusion

Given the location of impacted soil outside of the building footprints, as well as their relatively low-volatility, the potential for vapours to be present within the subject structures is considered to be low and does not pose a safety hazard to the current occupants. During redevelopment, all soil exceeding the MECP Table 3 residential standards will be removed and disposed off-site. As such, there is no anticipated potential for future vapour intrusion at the subject site.

6.0 CONCLUSION

A Phase II ESA was conducted for the properties addressed 78-90 Beechwood Avenue and 69-93 Barrette Street, 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 were considered to result in areas of potential environmental concern (APECs) on the subject site.

The subsurface investigation consisted of drilling fifteen (15) boreholes (BH1-BH14 and BH8B) on May 23-24, and July 15, 2019, as well as on August 24, 2020. Upon completion, ten (10) of the boreholes were instrumented with groundwater monitoring wells (BH2, BH3, BH4, BH7, BH8 BH8B, BH9, BH10, BH11, and BH13). The boreholes were drilled to depths ranging from approximately 3.25 m to 9.14 m below ground surface and terminated within weathered black shale bedrock.

Nineteen (19) soil samples were submitted for laboratory analysis of either: BTEX, PHCs F_1-F_4, VOCs, PAHs, metals, and/or pH parameters. According to the analytical results, the concentrations of some PHC, VOC, PAH, and/or metal parameters in the soil samples tested from BH1, BH3, BH7, BH8, BH10, and BH11 were in excess of the selected MECP Table 3 residential standards.

Twelve (12) groundwater samples were submitted for laboratory analysis of either: BTEX, PHCs F_1-F_4, VOCs, and/or PAHs parameters. According to the analytical results, all detected parameter concentrations in the groundwater samples analyzed comply with the selected MECP Table 3 residential standards.

Recommendations

Soil

Based on the findings of this assessment, PHC, VOC, PAH, and/or metal impacted soil was identified in the vicinity of BH1, BH3, BH7, BH8, BH10, and BH11, requiring some remedial work. It is our understanding that the subject site is to be redeveloped with a multi-storey residential high-rise building in the near future. Therefore, it is our recommendation that an environmental site remediation program be completed in conjunction with site redevelopment. This will require the segregation of clean soils from impacted soils, the latter of which will require disposal at an approved waste disposal facility.

It should be noted that several PHC, VOC, PAH, and metal parameters were detected in BH1, BH2, BH3, BH7 BH9, BH11, and/or BH14 at concentrations exceeding the MECP Table 1 background standards. These exceedances are not considered to pose an environmental concern to the subject site, however, if the soil is to be removed from the property for construction purposes, it should be classified as contaminated and disposed of at an approved waste disposal site.

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

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.

Monitoring Wells

If the groundwater monitoring wells installed on-site are not going to be used in the future, or will be destroyed during future redevelopment activities, then they must be decommissioned according to Ontario Regulation Reg. 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 as per the agreed scope-of-work, in general accordance with O.Reg. 153/04, as amended by O.Reg. 269/11, 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 Minto Communities. Permission and notification from Minto Communities and Paterson will be required to release this report to any other party.

Paterson Group Inc.

Nick Sullivan, B.Sc.

Mark S. D'Arcy, P.Eng., QP_{ESA}

Report Distribution:

- ❒ Minto Communities
- ❒ Paterson Group Inc.

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE4614-4 – TEST HOLE LOCATION PLAN

DRAWING PE4614-5 – ANALYTICAL TESTING PLAN – SOIL (BTEX & PHCs)

DRAWING PE4614-5A – CROSS SECTION A-A' – SOIL (BTEX & PHCs)

DRAWING PE4614-5B – CROSS SECTION B-B' – SOIL (BTEX & PHCs)

DRAWING PE4614-6 – ANALYTICAL TESTING PLAN – SOIL (VOCs)

DRAWING PE4614-6A – CROSS SECTION A-A' – SOIL (VOCs)

DRAWING PE4614-6B – CROSS SECTION B-B' – SOIL (VOCs)

DRAWING PE4614-7 – ANALYTICAL TESTING PLAN – SOIL (METALs)

DRAWING PE4614-7A – CROSS SECTION A-A' – SOIL (METALs)

DRAWING PE4614-7B – CROSS SECTION B-B' – SOIL (METALs)

DRAWING PE4614-8 – ANALYTICAL TESTING PLAN – SOIL (PAHs)

DRAWING PE4614-8A – CROSS SECTION A-A' – SOIL (PAHs)

DRAWING PE4614-8B – CROSS SECTION B-B' – SOIL (PAHs)

DRAWING PE4614-9 – ANALYTICAL TESTING PLAN – GROUNDWATER

DRAWING PE4614-9A – CROSS SECTION A-A' – GROUNDWATER

DRAWING PE4614-9B – CROSS SECTION B-B' – GROUNDWATER

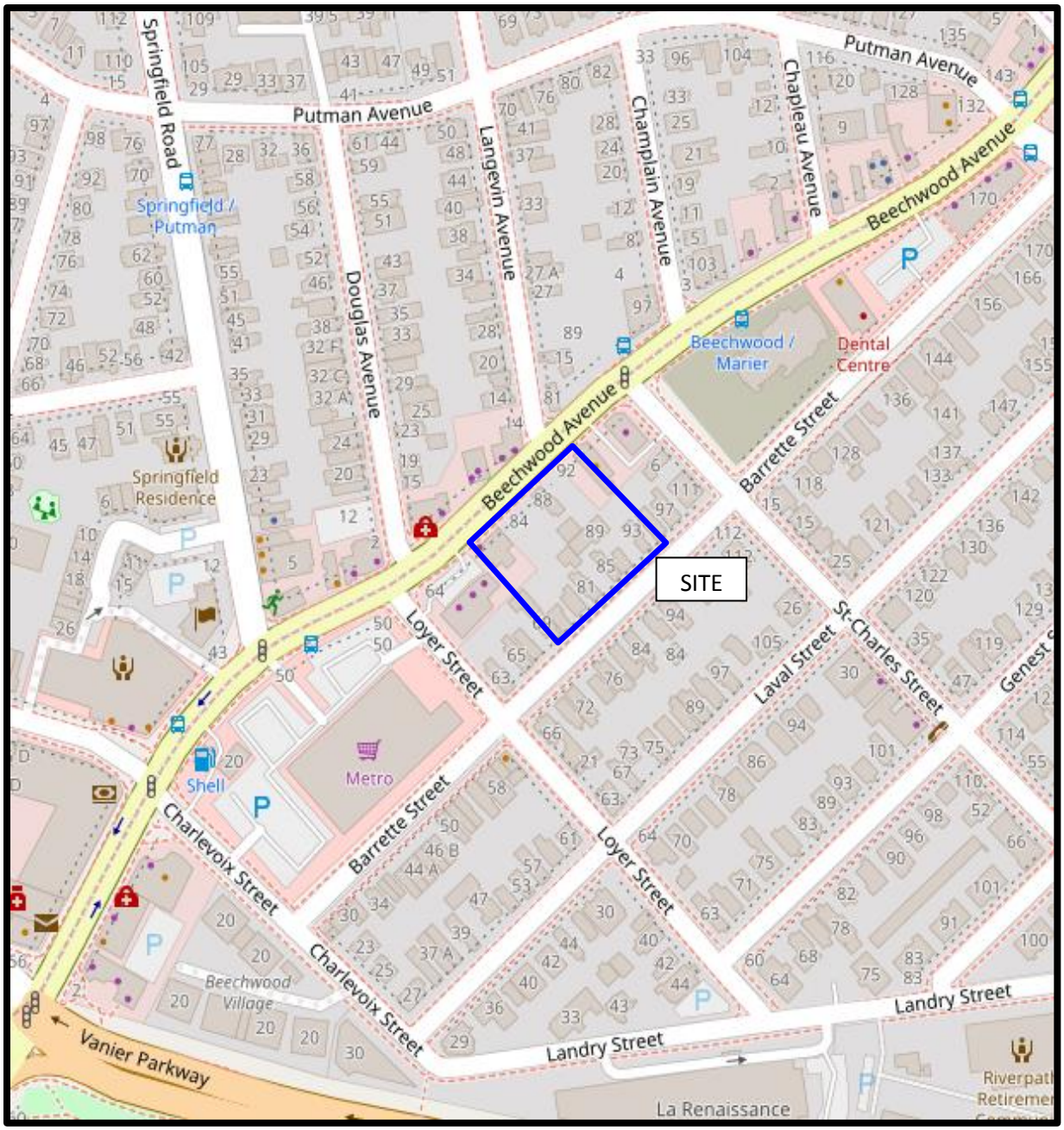
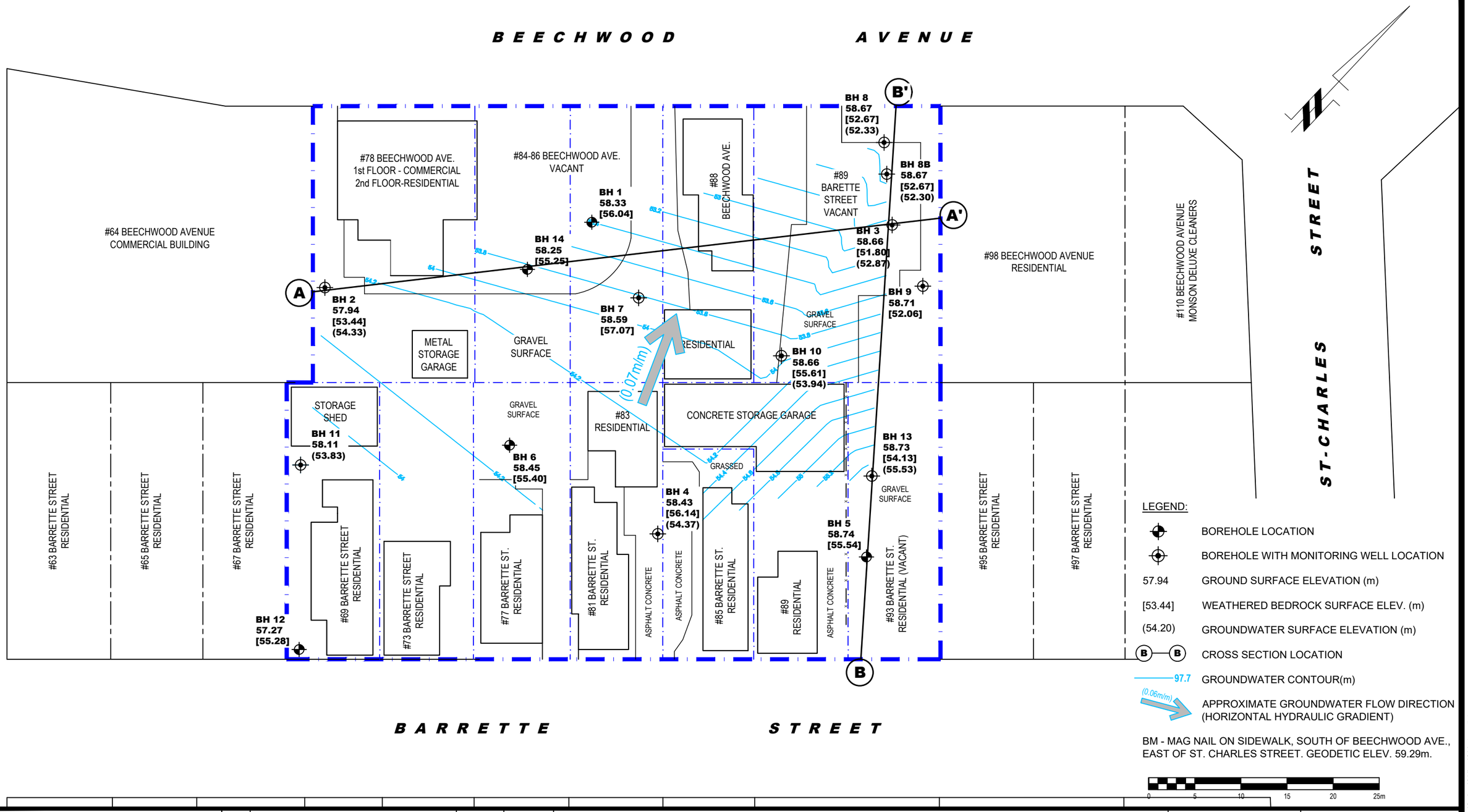


FIGURE 1

KEY PLAN



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NO.	REVISIONS	DATE	INITIAL
0			

MINTO COMMUNITIES INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT

78, 84, 86 & 90 BEECHWOOD AVE. AND 77, 83, 85, 89 & 93 BARRETTE ST.

OTTAWA, ONTARIO

Title: TEST HOLE LOCATION PLAN

Scale: 1:500	Date: 09/2020
Drawn by: MPG	Report No.: PE4614-2
Checked by: PP	PE4614-4
Approved by: MSD	Revision No.:

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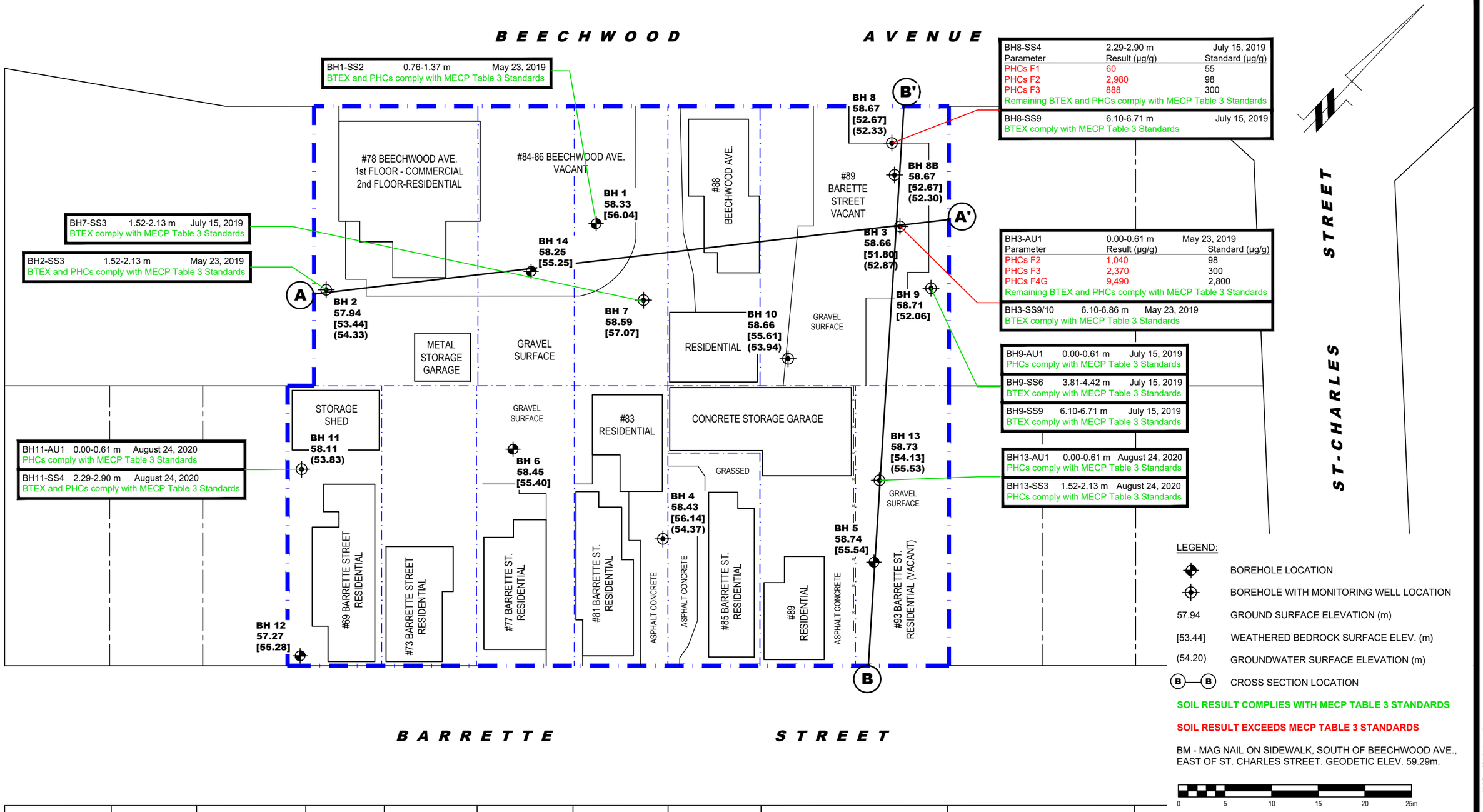

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NO.	REVISIONS	DATE	INITIAL
0			

MINTO COMMUNITIES INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT

78, 84, 86 & 90 BEECHWOOD AVE. AND 77, 83, 85, 89 & 93 BARRETTE ST.

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL (BTEX, PHCs)

Scale: 1:400	Date: 09/2020
Drawn by: RCG	Report No.: PE4614-2
Checked by: NS	PE4614-5
Approved by: MSD	Revision No.:

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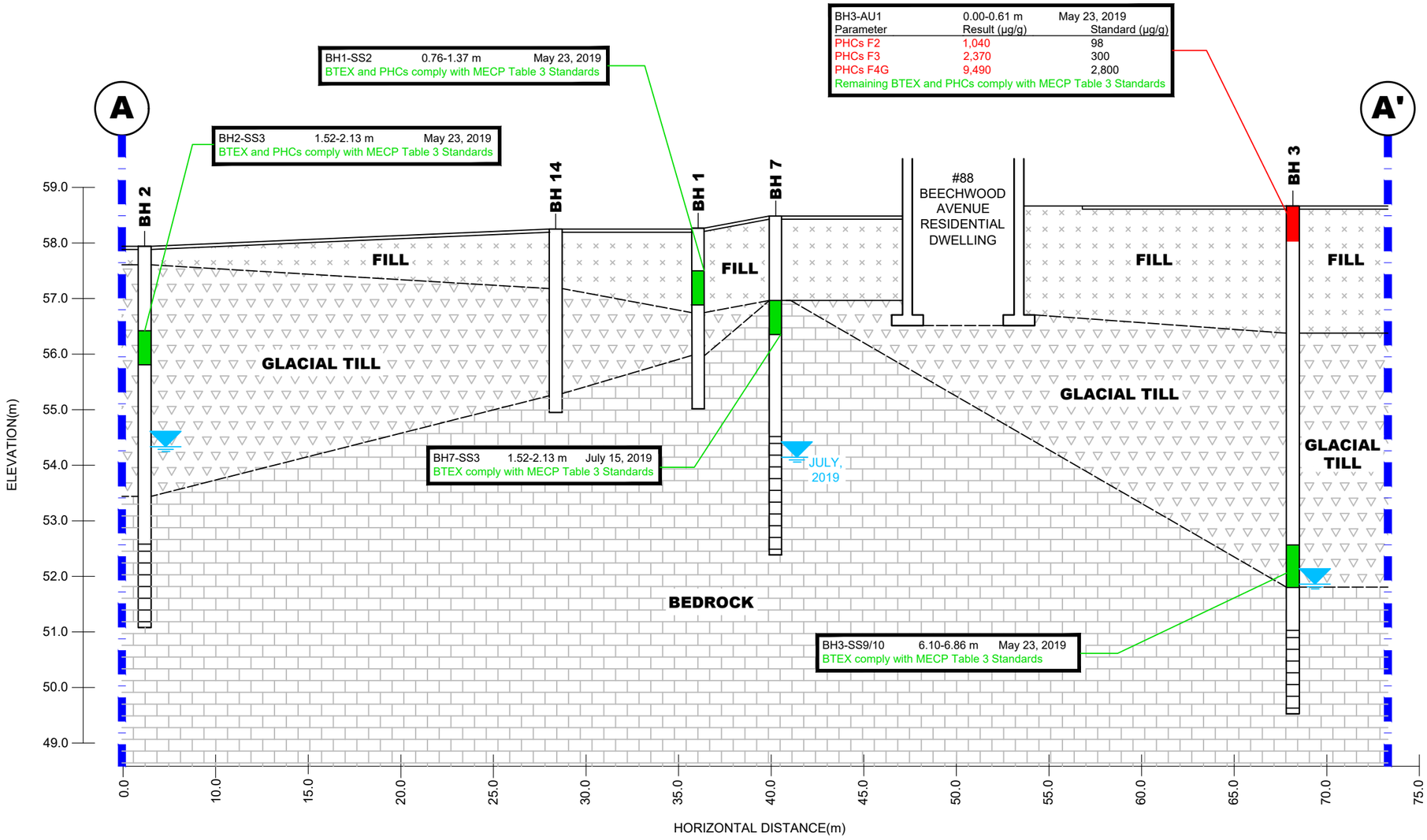

SOIL RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 3 STANDARDS

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consulting engineers

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
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OTTAWA, ONTARIO

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

Scale: AS SHOWN	Date: 09/2020
Drawn by: RCG	Report No.: PE4614-2
Checked by: NS	PE4614-5A
Approved by: MSD	Revision No.:

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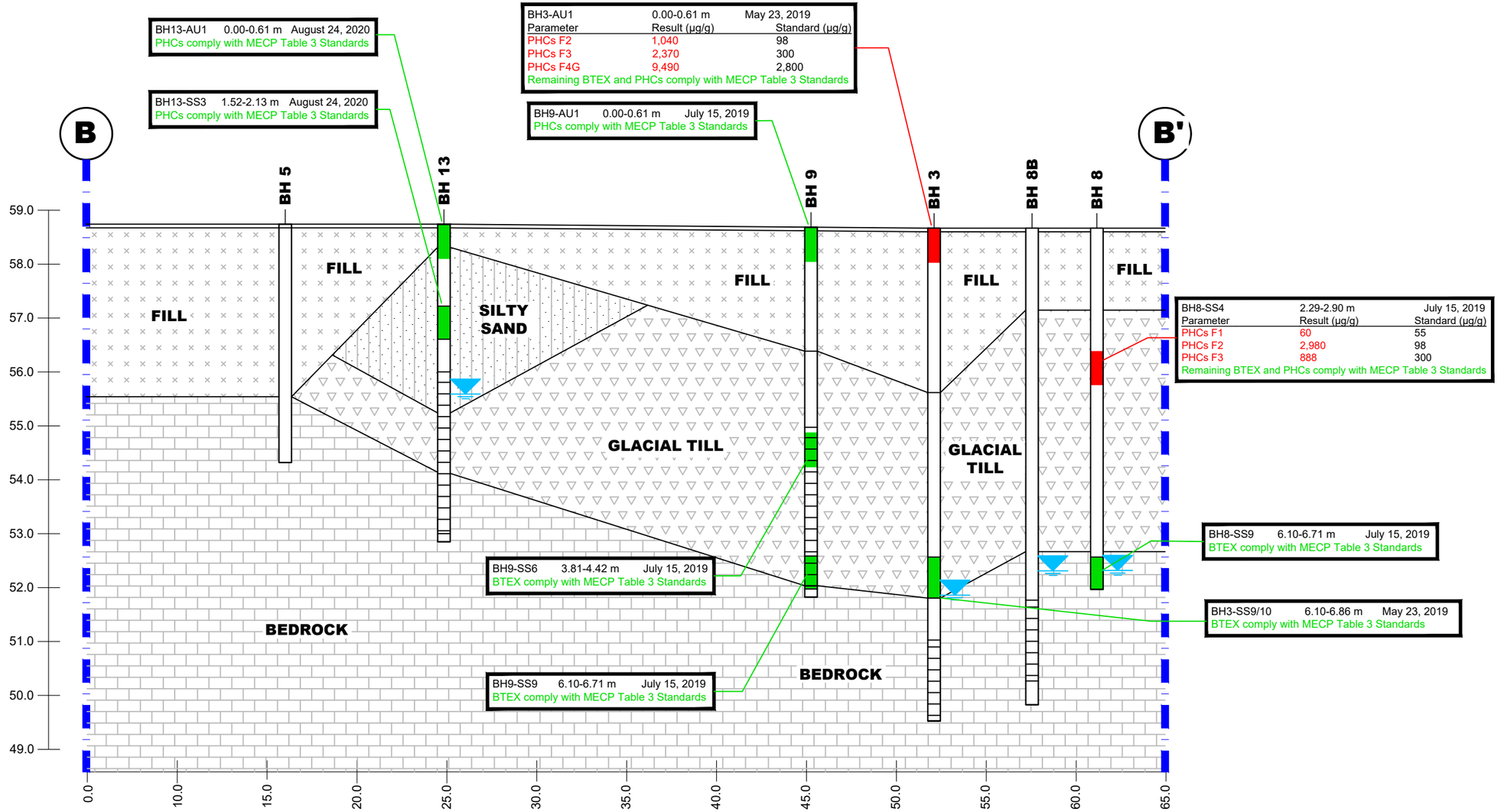

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OTTAWA, ONTARIO

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

Scale: AS SHOWN	Date: 09/2020
Drawn by: RCG	Report No.: PE4614-2
Checked by: NS	PE4614-5B
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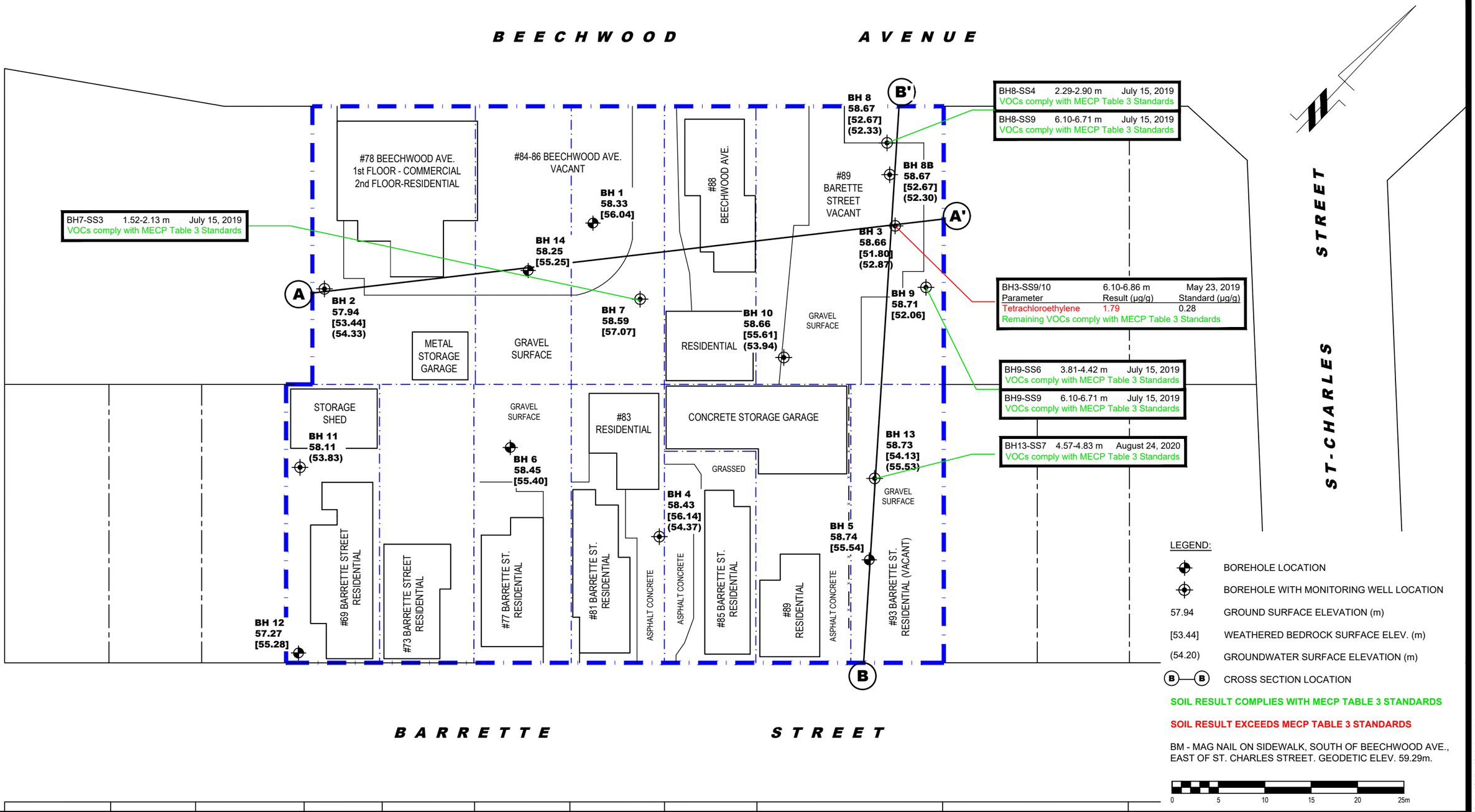

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Title:

ANALYTICAL TESTING PLAN - SOIL (VOCs)

Scale: 1:400	Date: 09/2020
Drawn by: RCG	Report No.: PE4614-2
Checked by: NS	PE4614-6
Approved by: MSD	Revision No.:

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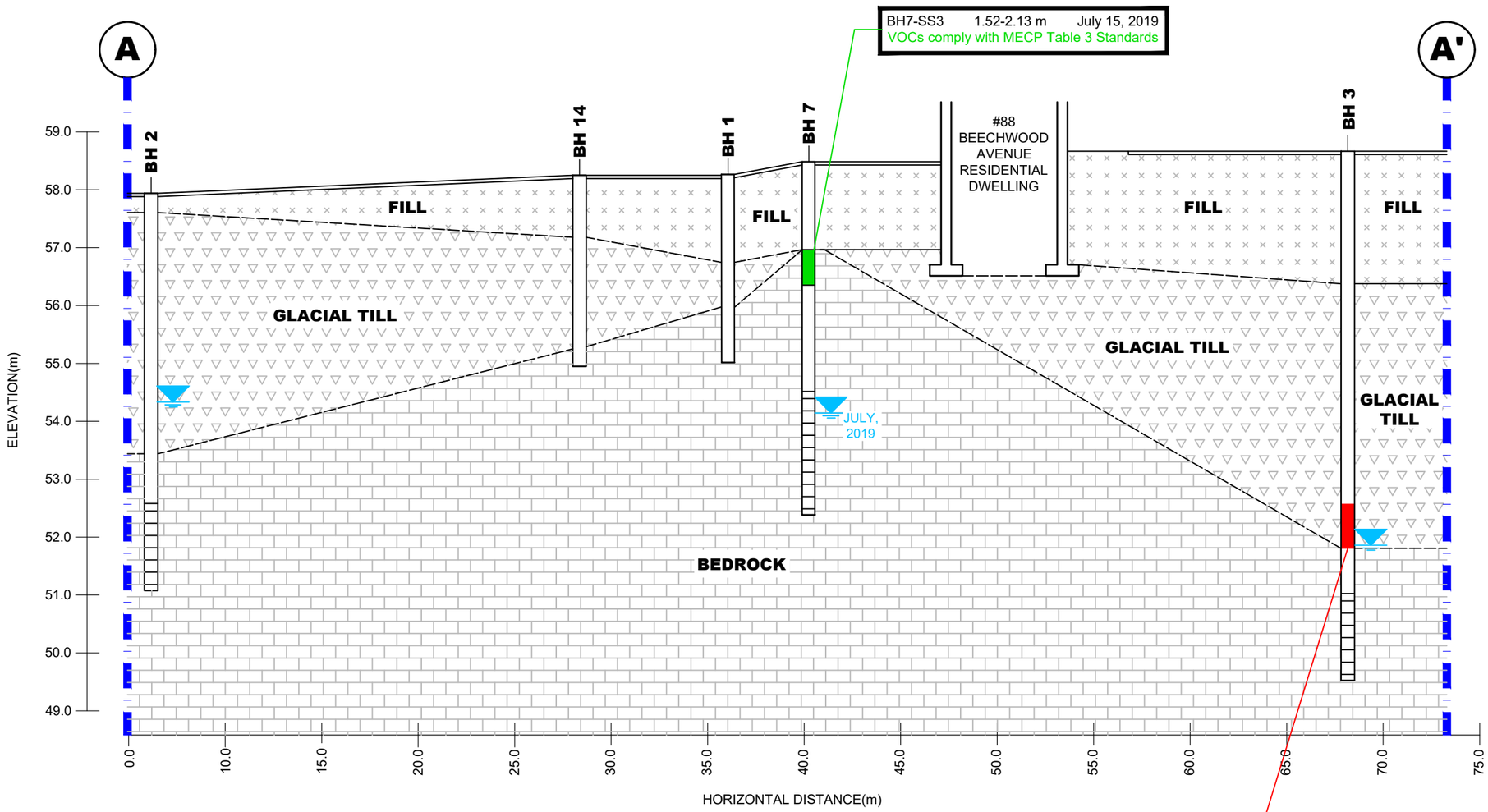

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Title:
CROSS SECTION A-A' - SOIL (VOCs)

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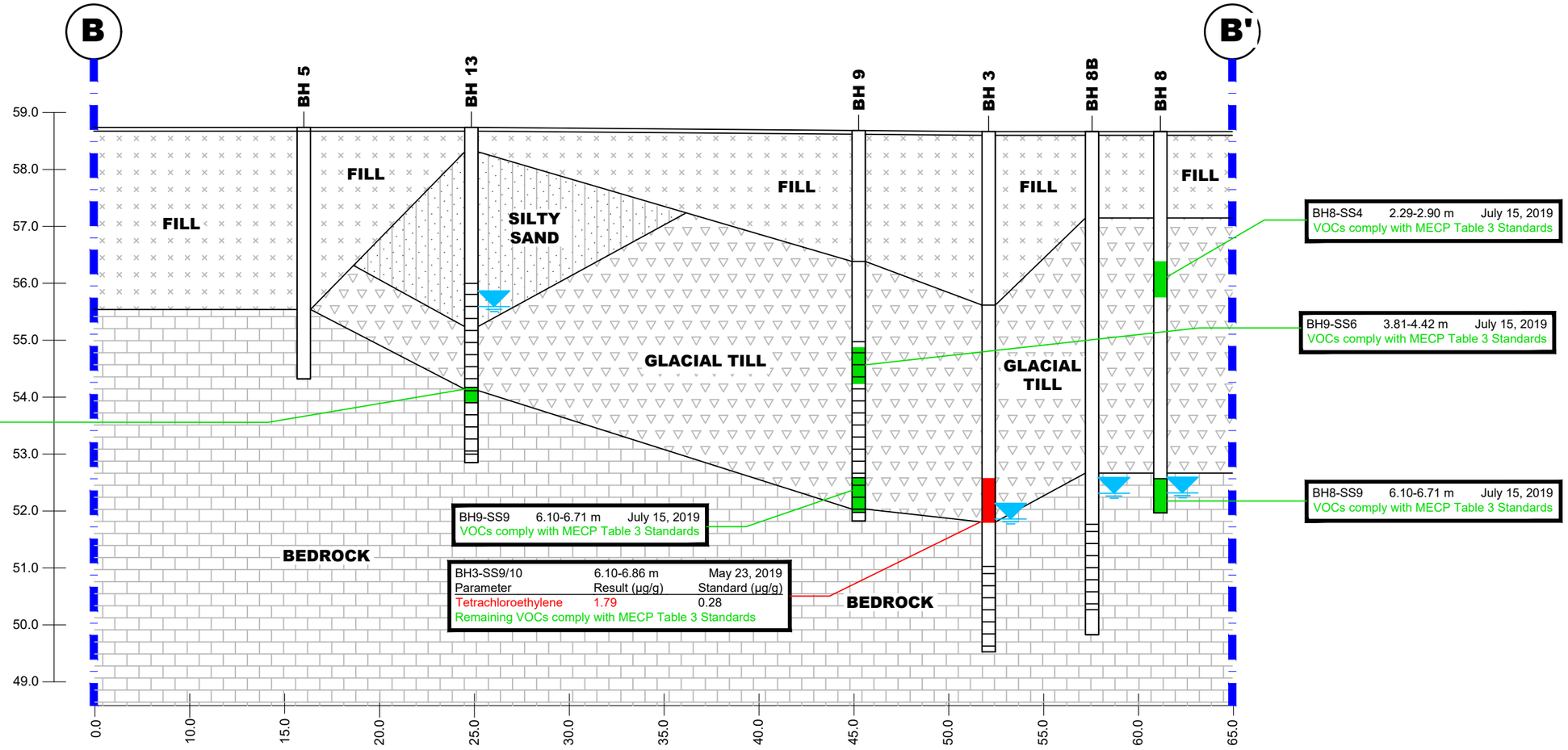

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OTTAWA, ONTARIO

Title:
CROSS SECTION B-B' - SOIL (VOCs)

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Drawn by: RCG	Report No.: PE4614-2
Checked by: NS	PE4614-6B
Approved by: MSD	Revision No.:

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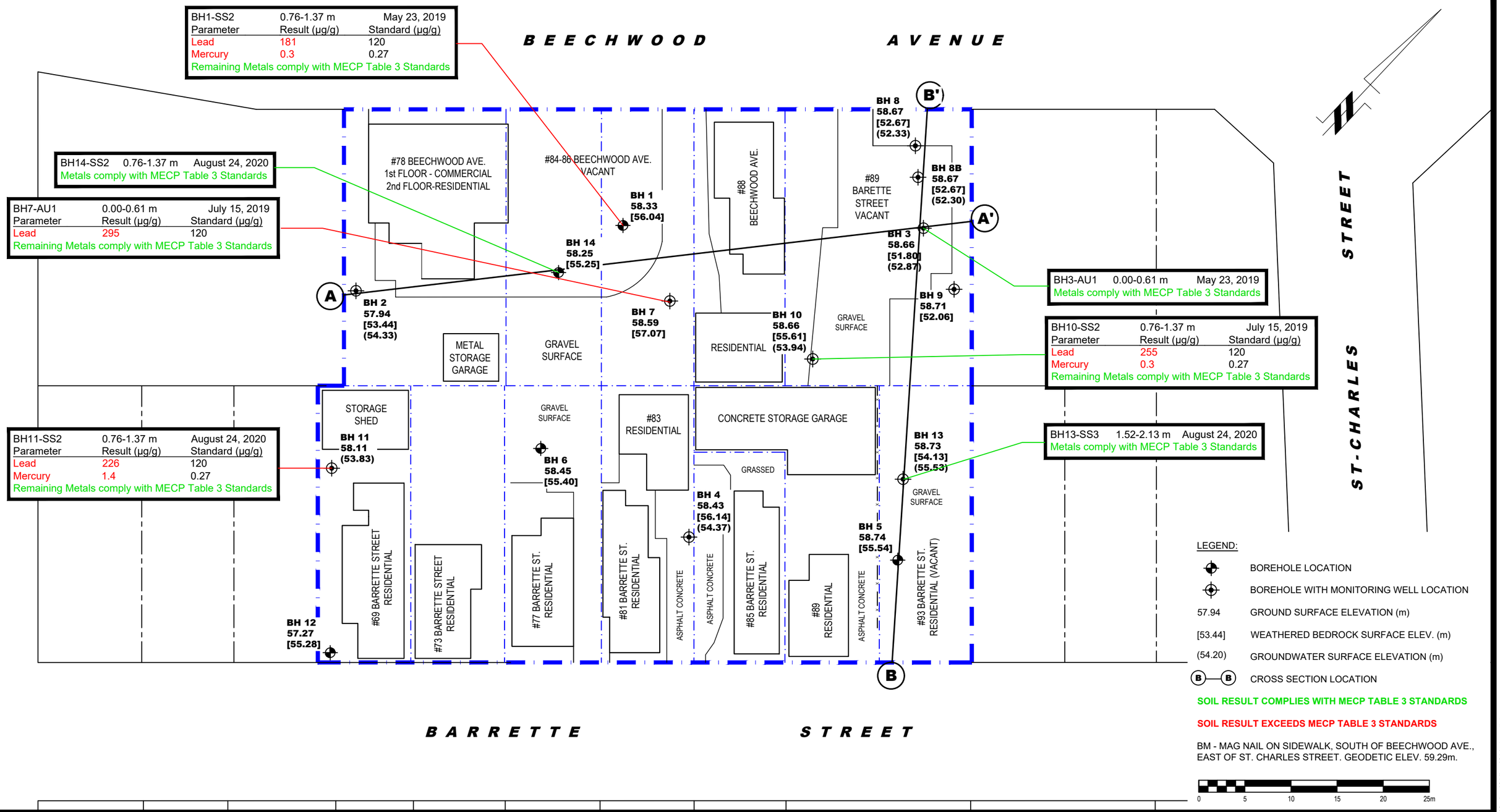

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78, 84, 86 & 90 BEECHWOOD AVE. AND 77, 83, 85, 89 & 93 BARRETTE ST.
OTTAWA, ONTARIO

Title:
ANALYTICAL TESTING PLAN - SOIL (METALS)

Scale: 1:400	Date: 09/2020
Drawn by: RCG	Report No.: PE4614-2
Checked by: NS	PE4614-7
Approved by: MSD	Revision No.:

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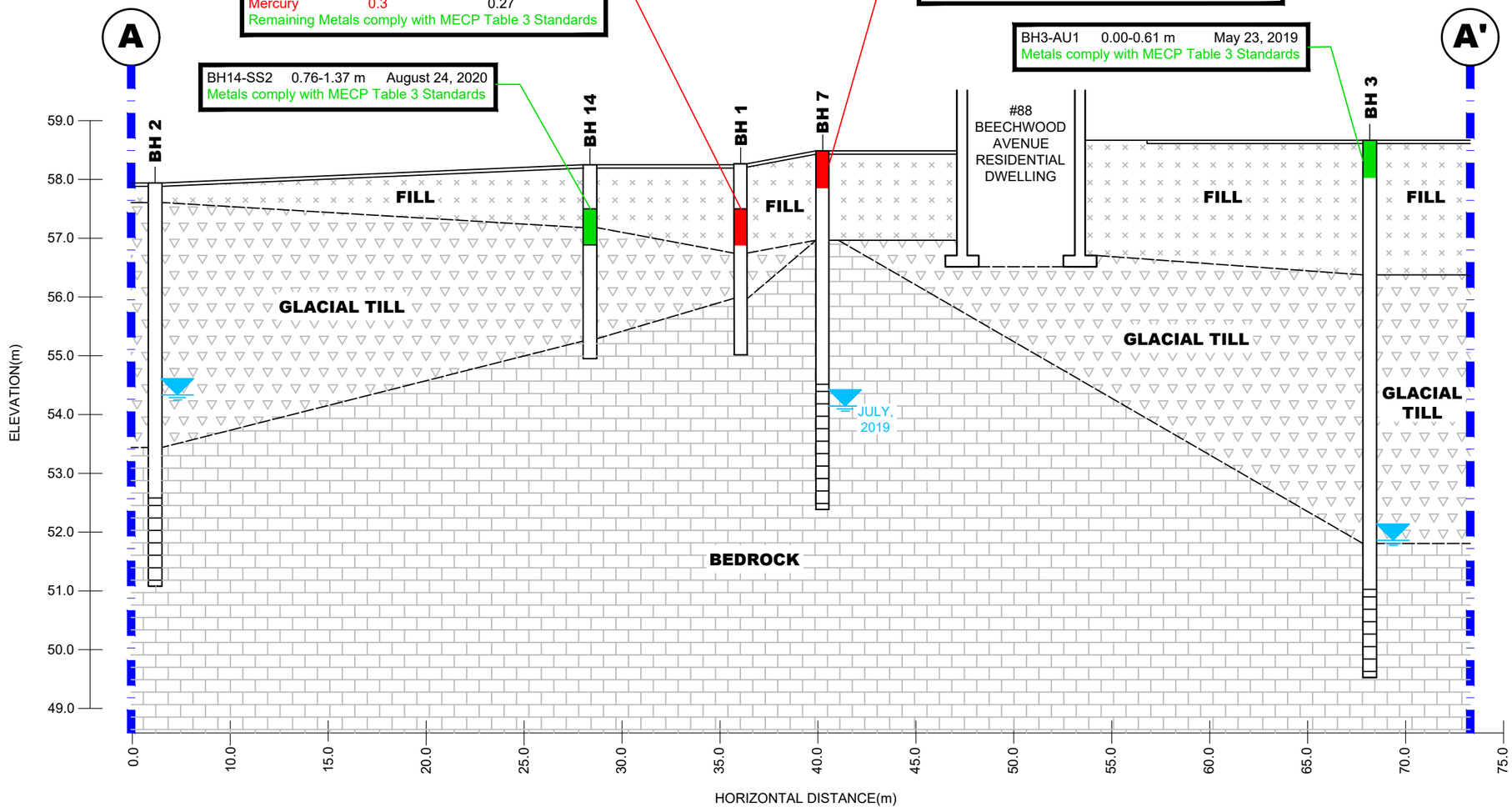

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
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OTTAWA, ONTARIO

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

Scale: AS SHOWN	Date: 09/2020
Drawn by: RCG	Report No.: PE4614-2
Checked by: NS	PE4614-7A
Approved by: MSD	Revision No.:

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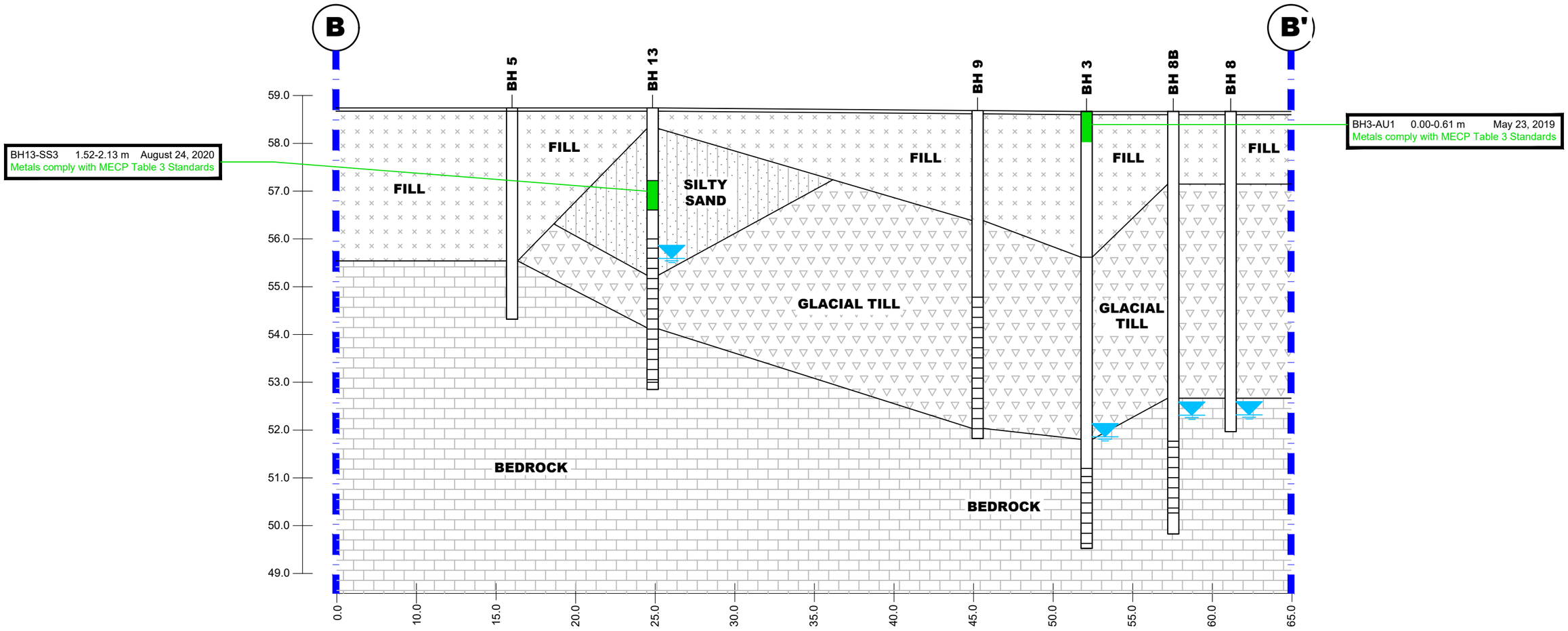

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
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OTTAWA, ONTARIO

Title:

CROSS SECTION B-B' - SOIL (METALS)

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Approved by: MSD	Revision No.:

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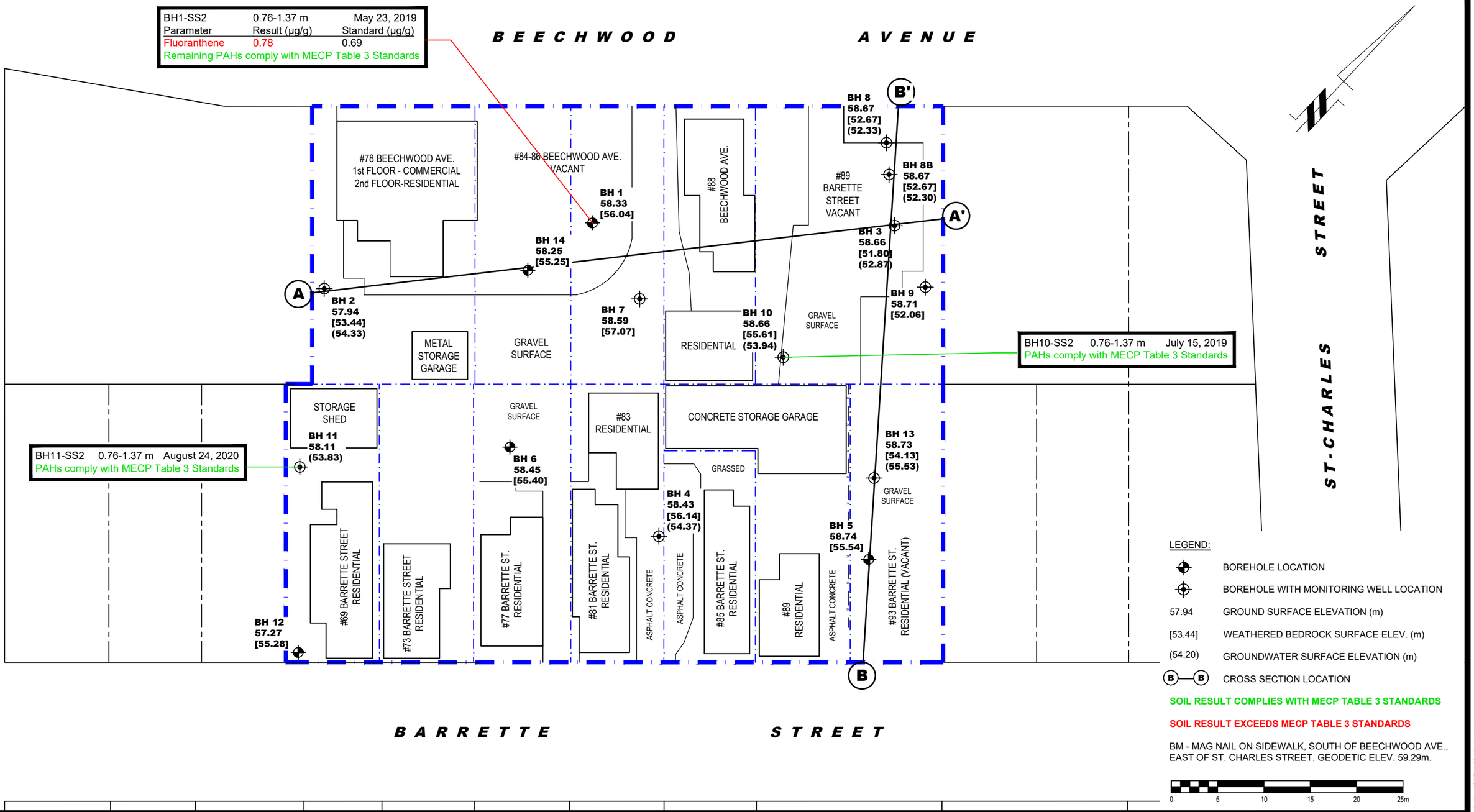

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
78, 84, 86 & 90 BEECHWOOD AVE. AND 77, 83, 85, 89 & 93 BARRETTE ST.
OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL (PAHs)

Scale: 1:400	Date: 09/2020
Drawn by: RCG	Report No.: PE4614-2
Checked by: NS	PE4614-8
Approved by: MSD	Revision No.:

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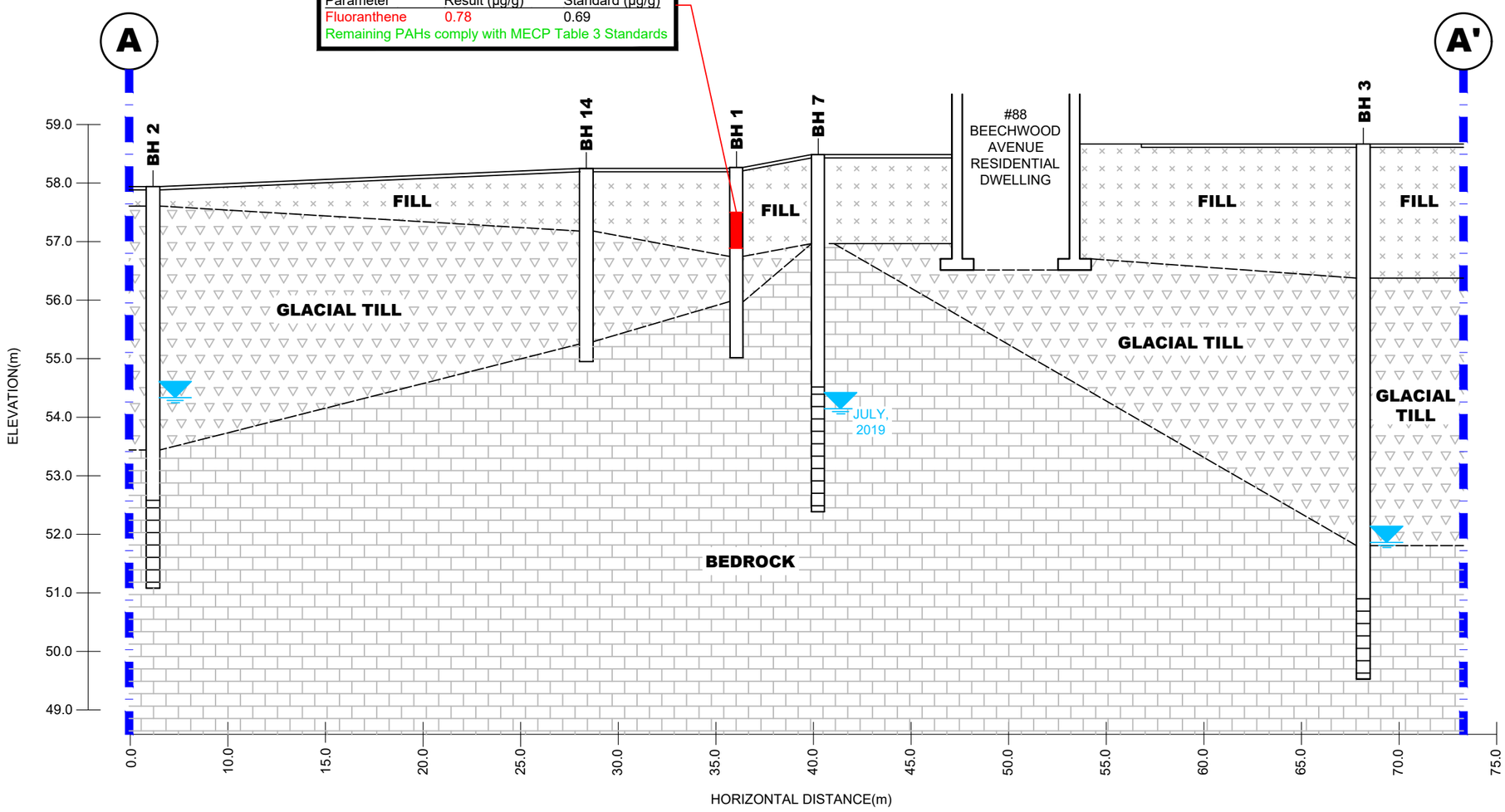
BH1-SS2	0.76-1.37 m	May 23, 2019
Parameter	Result (µg/g)	Standard (µg/g)
Fluoranthene	0.78	0.69
Remaining PAHs comply with MECP Table 3 Standards		



SOIL RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
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OTTAWA, ONTARIO

Title:

CROSS SECTION A-A' - SOIL (PAHs)

Scale: AS SHOWN	Date: 09/2020
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Checked by: NS	PE4614-8A
Approved by: MSD	Revision No.:

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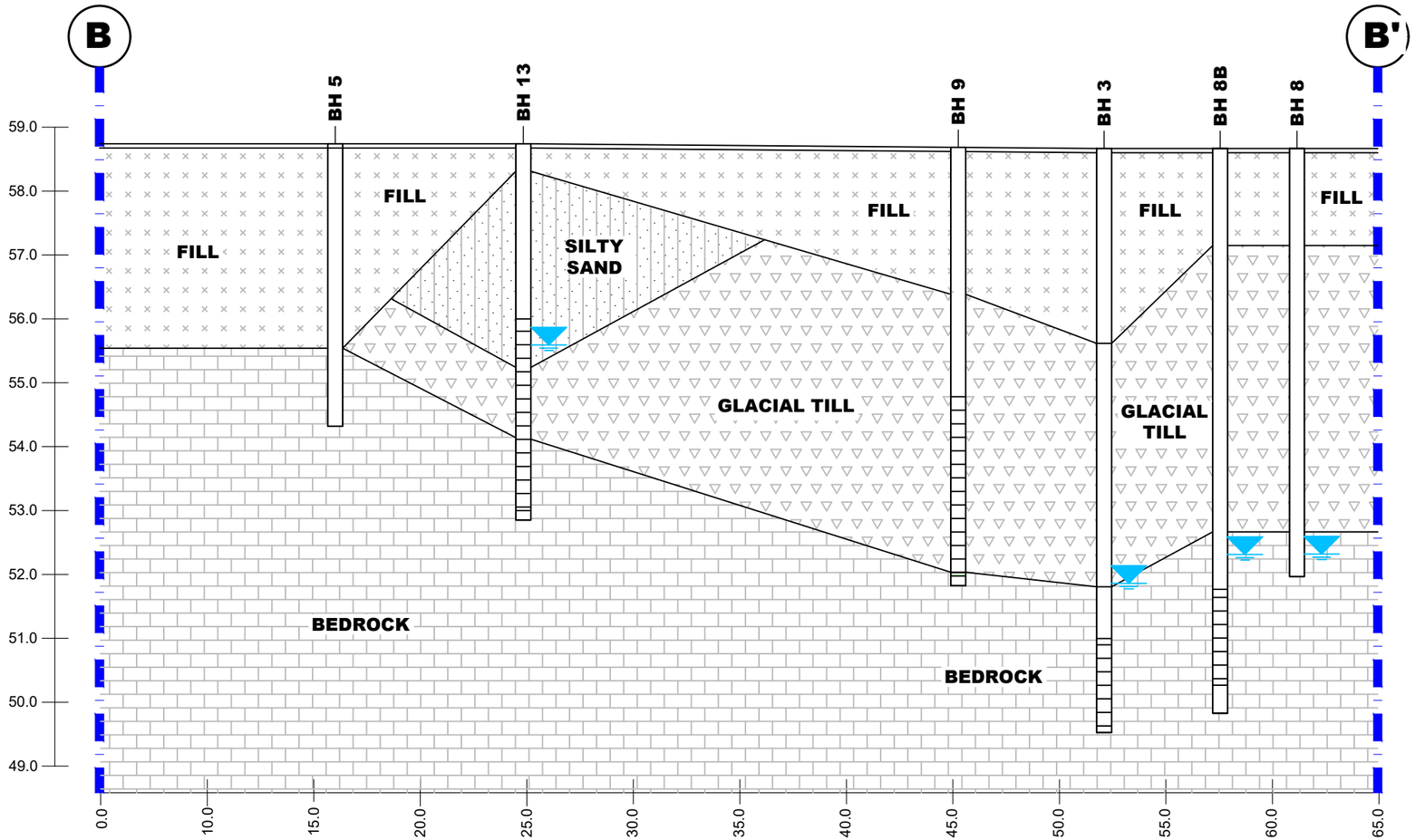

SOIL RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

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OTTAWA, ONTARIO

Title:
CROSS SECTION B-B' - SOIL (PAHs)

Scale: AS SHOWN	Date: 09/2020
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Checked by: NS	PE4614-8B
Approved by: MSD	Revision No.:

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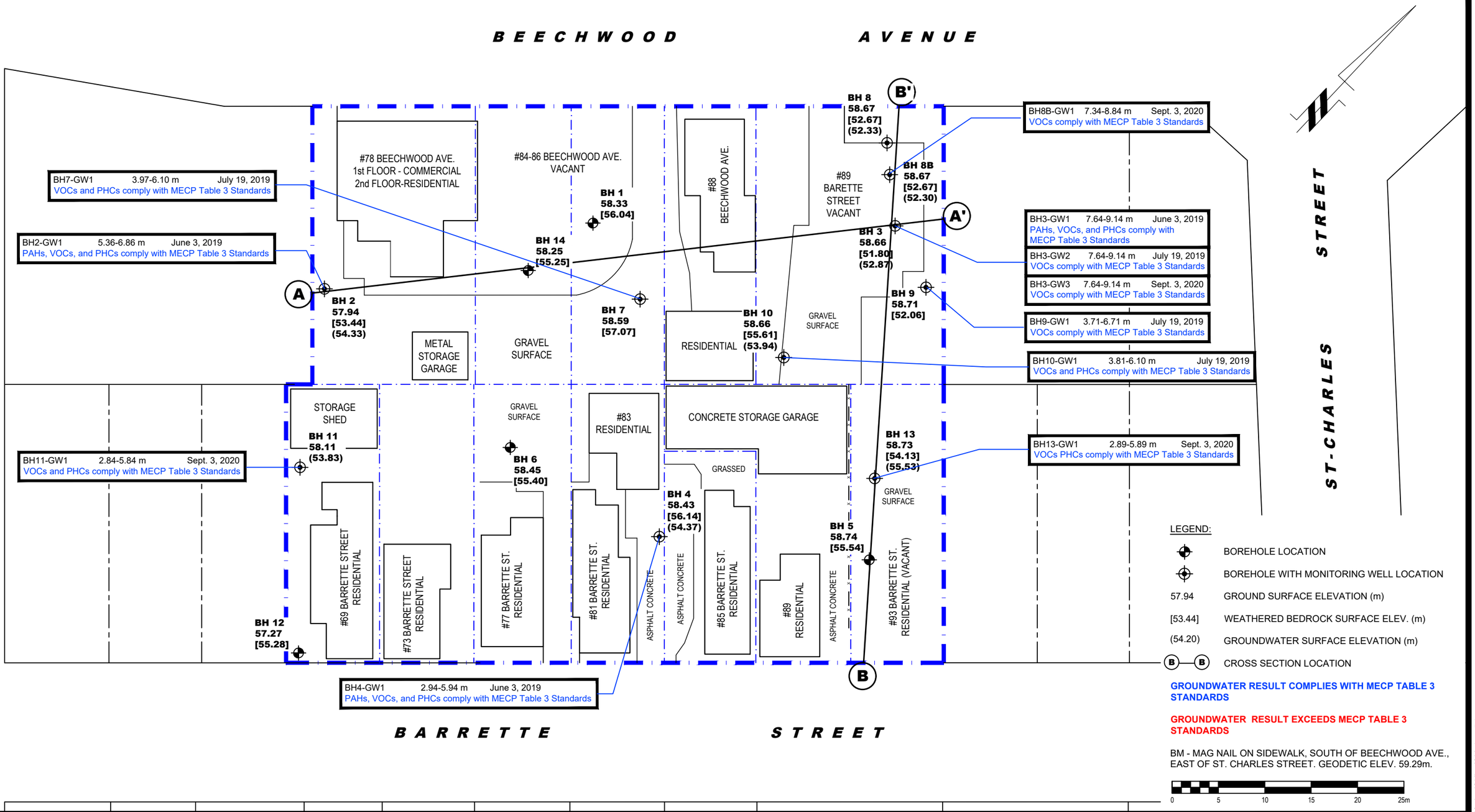

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OTTAWA, ONTARIO

Title:
ANALYTICAL TESTING PLAN - GROUNDWATER

Scale: 1:400	Date: 09/2020
Drawn by: RCG	Report No.: PE4614-2
Checked by: NS	PE4614-9
Approved by: MSD	Revision No.:

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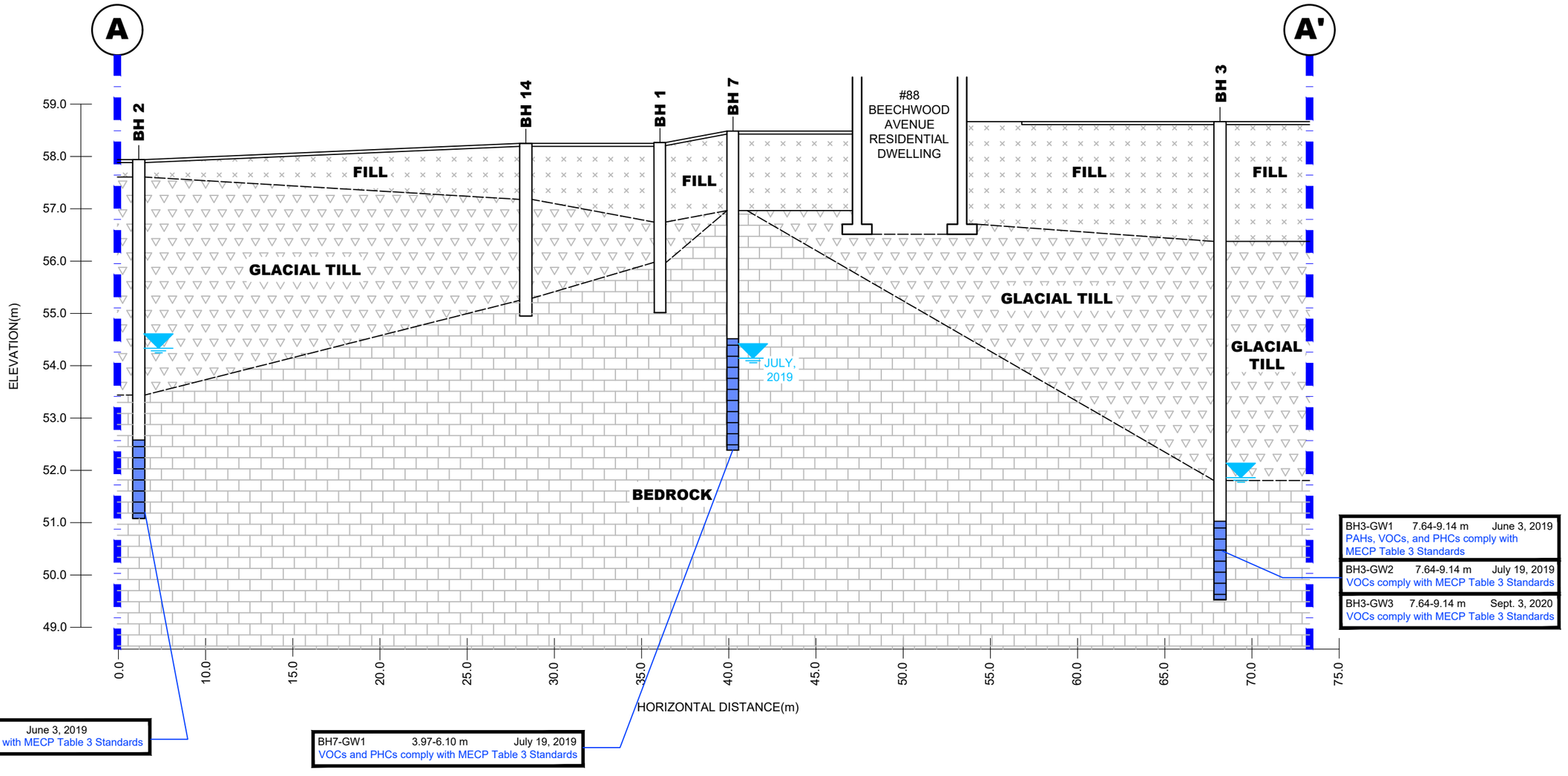

GROUNDWATER RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

GROUNDWATER RESULT EXCEEDS MECP TABLE 3 STANDARDS

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OTTAWA, ONTARIO

Title:
CROSS SECTION A-A' - GROUNDWATER

Scale: AS SHOWN	Date: 09/2020
Drawn by: RCG	Report No.: PE4614-2
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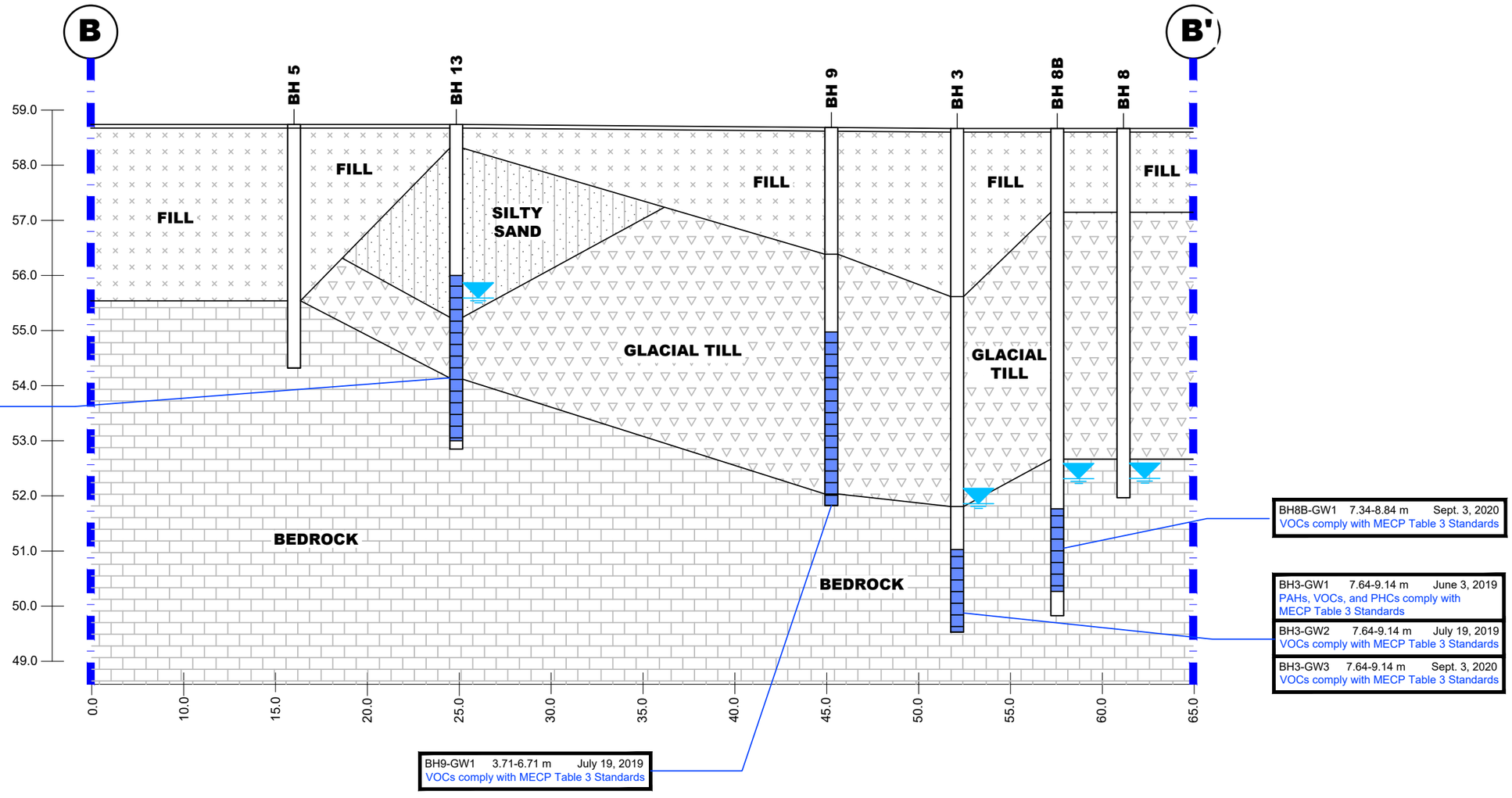

GROUNDWATER RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

GROUNDWATER RESULT EXCEEDS MECP TABLE 3 STANDARDS

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Checked by: NS	**PE4614-9B**
Approved by: MSD	Revision No.:

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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

patersongroup

Sampling & Analysis Plan

Phase II – Environmental Site Assessment
78-90 Beechwood Avenue & 69-93 Barrette Street
Ottawa, Ontario

Prepared For

Minto Communities

May 1, 2019

Report: PE4614-SAP

Paterson Group Inc.

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TABLE OF CONTENTS

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Minto Communities, to conduct a Phase II – Environmental Site Assessment (Phase II ESA) for the properties addressed 78-90 Beechwood Avenue & 69-93 Barrette Street, in the City of Ottawa, Ontario.

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

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1	Central portion of subject site; to assess for potential impacts resulting from a former landfill site.	3-6 m; for general coverage purposes.
BH2	Western portion of subject site; to assess for potential impacts resulting from a former off-site retail fuel outlet.	6-10 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH3	Northeastern portion of subject site: to assess for potential impacts resulting from an off-site dry-cleaners.	6-10 m; to intercept the groundwater table for the purpose of installing a deeper screen in the shale bedrock.
BH4	Southern portion of subject site; to assess for potential impacts resulting from a former on-site autobody shop.	6-10 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH5	Southeastern portion of subject site; to assess for potential impacts resulting from a former on-site autobody shop.	3-6 m; for general coverage purposes.
BH6	Central portion of subject site; to assess for potential impacts resulting from a former landfill site.	3-6 m; for general coverage purposes.
BH7	Central portion of subject site; to assess for potential impacts resulting from a former landfill site.	6-10 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH8	Northeastern portion of subject site: to assess for potential impacts resulting from an off-site dry-cleaners.	6-10 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH8B	Northeastern portion of subject site: to assess for potential impacts resulting from an off-site dry-cleaners.	6-10 m; to intercept the groundwater table for the purpose of installing a deeper screen in the shale bedrock.
BH9	Northeastern portion of subject site: to assess for potential impacts resulting from an off-site dry-cleaners.	6-10 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH10	Eastern portion of subject site; to assess for potential impacts resulting from a former on-site autobody shop.	6-10 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH11	Western portion of subject site; to assess for potential impacts resulting from a former off-site retail fuel outlet.	6-10 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH12	Southwestern portion of subject site; to assess for potential impacts resulting from a former landfill site.	3-6 m; for general coverage purposes.
BH13	Eastern portion of subject site; to assess for potential impacts resulting from a former on-site autobody shop.	6-10 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH14	Central portion of subject site; to assess for potential impacts resulting from a former landfill site.	3-6 m; for general coverage purposes.

Borehole locations are shown on Drawing PE4614-4 – 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 BH2, BH3, BH4, BH7, BH8, BH8B, BH9, BH10, BH11, and BH13 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 PROCEEDURES

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.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
78, 84, 86 and 90 Beechwood Avenue
83, 85, 89, 93 Barrette Street, Ottawa, Ontario

DATUM BM - Mag nail on sidewalk, south of Beechwood Ave., east of St. Charles Street. Geodetic elevation = 59.29m.

FILE NO. PE4614

REMARKS

HOLE NO. BH 1

BORINGS BY CME-55 Low Clearance Drill **DATE** May 23, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	58.33
FILL: Crushed stone		AU	1				
0.46							
FILL: Brown silty sand, some gravel		SS	2	50	19	1	57.33
1.52							
GLACIAL TILL: Very dense, brown clayey silty sand with gravel and shale		SS	3	62	52	2	56.33
2.29							
		SS	4	100	50+		
Weathered shale **BEDROCK**						3	55.33
3.25		SS	5	100	50+		
End of Borehole							
Practical refusal to augering at 3.25m depth							
(BH dry upon completion)							

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

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
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FILE NO. PE4614

REMARKS

HOLE NO. BH 2

BORINGS BY CME-55 Low Clearance Drill **DATE** May 23, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	57.94
FILL: Crushed stone, some sand		AU	1				
0.33							
		SS	2	79	14	1	56.94
		SS	3	100	35	2	55.94
GLACIAL TILL: Brown clayey silt with sand and shaley gravel		SS	4	100	50+		
		SS	5	100	50+	3	54.94
		SS	6	100	82	4	53.94
4.50							
		SS	7	100	50+	5	52.94
		SS	8	100	50+		
Weathered black shale **BEDROCK**						6	51.94
6.86							
End of Borehole							
Practical refusal to augering at 6.86m depth.							
(GWL @ 3.61m - Sept. 3, 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

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
78, 84, 86 and 90 Beechwood Avenue
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DATUM BM - Mag nail on sidewalk, south of Beechwood Ave., east of St. Charles Street. Geodetic elevation = 59.29m.

FILE NO. PE4614

REMARKS

HOLE NO. BH 3

BORINGS BY CME-55 Low Clearance Drill **DATE** May 23, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	58.66
FILL: Crushed stone, some sand 0.23		AU	1				
FILL: Brown silty sand, trace gravel, brick and concrete		SS	2	92	7	1	57.66
		SS	3	92	14	2	56.66
2.29							
FILL: Brown silty sand, some gravel, trace clay		SS	4	91	88		
3.05		SS	5	80	50+	3	55.66
GLACIAL TILL: Brown sand silty/silty sand with shale		SS	6	92	70	4	54.66
		SS	7	100	50+	5	53.66
		SS	8	100	50+		
		SS	9	100	50+	6	52.66
6.86		SS	10	100	50+	7	51.66
Weathered black shale **BEDROCK**						8	50.66
9.14						9	49.66
End of Borehole							
(GWL @ 5.79m - Sept. 3, 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.

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SOIL PROFILE AND TEST DATA

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FILE NO. PE4614

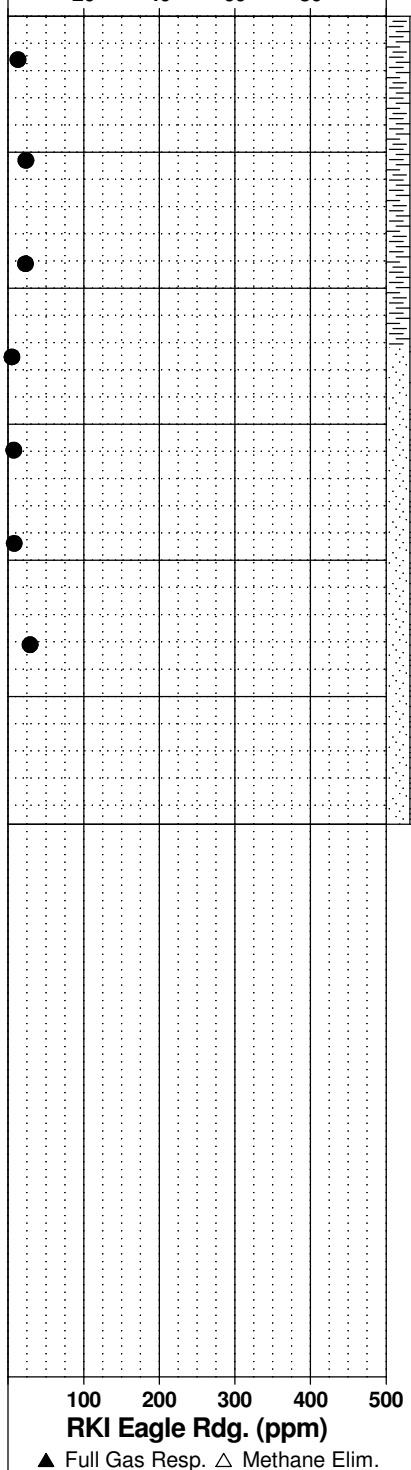
REMARKS

HOLE NO. BH 4

BORINGS BY CME-55 Low Clearance Drill **DATE** May 23, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
Asphaltic concrete 0.06						0	58.43
FILL: Crushed stone, some sand 0.28		AU	1				
GLACIAL TILL: Brown silty sand with shale		SS	2	79	13	1	57.43
		SS	3	100	54	2	56.43
2.29		SS	4	100	50+		
		SS	5	91	50+	3	55.43
		SS	6	80	50+	4	54.43
Weathered black shale **BEDROCK**		SS	7	100	50+		
						5	53.43
5.94							
End of Borehole							
(GWL @ 4.06m - Sept. 3, 2020)							

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



Monitoring Well Construction

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
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FILE NO. PE4614

REMARKS

HOLE NO. BH 5

BORINGS BY CME-55 Low Clearance Drill **DATE** May 24, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	58.74
Asphaltic concrete 0.05							
FILL: Brown silty sand with crushed stone 0.25		AU	1				
		SS	2	88	10	1	57.74
FILL: Brown silty sand, trace gravel		SS	3	92	15	2	56.74
		SS	4	88	23		
3.20		SS	5	100	50+	3	55.74
Weathered black shale **BEDROCK**		SS	6	67	50+	4	54.74
4.42							
End of Borehole							
Practical refusal to augering at 4.42m depth							
(BH dry upon completion)							

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

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
78, 84, 86 and 90 Beechwood Avenue
83, 85, 89, 93 Barrette Street, Ottawa, Ontario

DATUM BM - Mag nail on sidewalk, south of Beechwood Ave., east of St. Charles Street. Geodetic elevation = 59.29m.

FILE NO. PE4614

REMARKS

HOLE NO. BH 6

BORINGS BY CME-55 Low Clearance Drill **DATE** May 24, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
Asphaltic concrete 0.06						0	58.45
FILL: Brown silty sand with crushed stone 0.30		AU	1				
		SS	2	79	16	1	57.45
GLACIAL TILL: Brown clayey silt with shale, trace sand and gravel		SS	3	83	38	2	56.45
		SS	4	91	89		
3.05		SS	5	67	50+	3	55.45
Weathered black shale **BEDROCK** 3.66							
End of Borehole							
Practical refusal to augering at 3.66m depth							
(BH dry upon completion)							

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

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
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DATUM BM - Mag nail on sidewalk, south of Beechwood Ave., east of St. Charles Street. Geodetic elevation = 59.29m.

FILE NO. PE4614

REMARKS

HOLE NO. BH 7

BORINGS BY CME 55 Power Auger **DATE** July 15, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	58.59
FILL: Brown silty sand with crushed stone 0.25		AU	1				
FILL: Brown/black silty sand, some gravel		SS	2	25	8	1	57.59
1.52		SS	3	83	67	2	56.59
		SS	4	42	70		
		SS	5	75	38	3	55.59
Weathered black shale **BEDROCK**		SS	6	88	50+	4	54.59
		SS	7	80	50+		
		SS	8		50+	5	53.59
6.10						6	52.59
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

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
78, 84, 86 and 90 Beechwood Avenue
83, 85, 89, 93 Barrette Street, Ottawa, Ontario

DATUM BM - Mag nail on sidewalk, south of Beechwood Ave., east of St. Charles Street. Geodetic elevation = 59.29m.

FILE NO. PE4614

REMARKS

HOLE NO. BH 8

BORINGS BY CME 55 Power Auger **DATE** July 15, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	58.67
FILL: Brown slty sand with gravel, trace organics 0.30		AU	1				
FILL: Brown silty sand with gravel and construction debris		SS	2	29	9	1	57.67
1.52		SS	3	38	49	2	56.67
		SS	4	33	34		
GLACIAL TILL: Dense to very dense, brown silty sand with gravel, cobbles and shale		SS	5	58	73	3	55.67
		SS	6	75	80	4	54.67
		SS	7	83	89	5	53.67
		SS	8	71	61		
6.00						6	52.67
Weathered black shale **BEDROCK**		SS	9		56		
6.70							
End of Borehole							
(GWL @ 6.34m - Sept. 3, 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.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
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DATUM BM - Mag nail on sidewalk, south of Beechwood Ave., east of St. Charles Street. Geodetic elevation = 59.29m.

FILE NO. PE4614

REMARKS

HOLE NO. BH 8B

BORINGS BY CME 55 Power Auger **DATE** July 15, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	58.67
FILL: Brown slty sand with gravel, trace organics — 0.30							
FILL: Brown silty sand with gravel and construction debris						1	57.67
— 1.52							
						2	56.67
GLACIAL TILL: Dense to very dense, brown silty sand with gravel, cobbles and shale						3	55.67
						4	54.67
						5	53.67
— 6.00						6	52.67
Weathered black shale **BEDROCK**						7	51.67
						8	50.67
— 8.84							
End of Borehole							
(GWL @ 6.37m - Sept. 3, 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.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
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83, 85, 89, 93 Barrette Street, Ottawa, Ontario

DATUM BM - Mag nail on sidewalk, south of Beechwood Ave., east of St. Charles Street. Geodetic elevation = 59.29m.

FILE NO. PE4614

REMARKS

HOLE NO. BH 9

BORINGS BY CME 55 Power Auger **DATE** July 15, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	58.71
FILL: Brown silty sand with crushed stone (0.33)		AU	1				
FILL: Brown silty sand		SS	2	8	9	1	57.71
		SS	3	42	18	2	56.71
(2.30)		SS	4	53	50+		
		SS	5	80	50+	3	55.71
GLACIAL TILL: Dense to very dense, grey silty sand with gravel and shale fragments		SS	6	75	38	4	54.71
		SS	7	71	51	5	53.71
		SS	8	71	52		
		SS	8	64	66	6	52.71
(6.65)							
Weathered black shale **BEDROCK** (6.86)							
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

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
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DATUM BM - Mag nail on sidewalk, south of Beechwood Ave., east of St. Charles Street. Geodetic elevation = 59.29m.

FILE NO. PE4614

REMARKS

HOLE NO. BH10

BORINGS BY CME 55 Power Auger **DATE** July 15, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	58.66
FILL: Brown silty sand with crushed stone 0.25		AU	1				
FILL: Brown silty sand, some gravel, trace organics		SS	2	62	9	1	57.66
1.50		SS	3	100	34	2	56.66
GLACIAL TILL: Dense to very dense, brown silty sand, some gravel and shale		SS	4	100	50+		
3.05		SS	5	70	50+	3	55.66
		SS	6	100	50+	4	54.66
Weathered black shale **BEDROCK**		SS	7	100	50+	5	53.66
		SS	8	100	50+		
		SS	9	50	50+	6	52.66
6.70							
End of Borehole							
(GWL @ 4.72m - Sept. 3, 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

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SOIL PROFILE AND TEST DATA

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DATUM BM - Mag nail on sidewalk, south of Beechwood Ave., east of St. Charles Street. Geodetic elevation = 59.29m.

FILE NO. PE4614

REMARKS

HOLE NO. BH11

BORINGS BY CME-55 Low Clearance Drill **DATE** August 24, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
Asphaltic concrete 0.10		AU	1			0	58.11
FILL: Brown silty sand with crushed stone 0.60		SS	2	62	6	1	57.11
		SS	3	54	40	2	56.11
GLACIAL TILL: Dense to very dense, brown silty sand with shale		SS	4	79	44	3	55.11
		SS	5	76	50+		
3.80		SS	6	78	50+	4	54.11
		SS	7	100	50+		
Possible weathered **BEDROCK**						5	53.11
5.84							
End of Borehole							
(GWL @ 4.28m - Sept. 3, 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
78, 84, 86 and 90 Beechwood Avenue
83, 85, 89, 93 Barrette Street, Ottawa, Ontario

DATUM BM - Mag nail on sidewalk, south of Beechwood Ave., east of St. Charles Street. Geodetic elevation = 59.29m.

FILE NO. PE4614

REMARKS

HOLE NO. BH12

BORINGS BY CME-55 Low Clearance Drill **DATE** August 24, 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									
Asphaltic concrete 0.10									
FILL: Brown silty sand with crushed stone 0.63		AU	1			0	57.57		
GLACIAL TILL: Compact to very dense, brown silty sand with shale		SS	2	46	10	1	56.57		
		SS	3	58	52	2	55.57		
2.30									
Weathered black shale **BEDROCK**		SS	4	71	50+				
3.28		SS	5	11	50+	3	54.57		
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
78, 84, 86 and 90 Beechwood Avenue
83, 85, 89, 93 Barrette Street, Ottawa, Ontario

DATUM BM - Mag nail on sidewalk, south of Beechwood Ave., east of St. Charles Street. Geodetic elevation = 59.29m.

FILE NO. PE4614

REMARKS

HOLE NO. BH13

BORINGS BY CME-55 Low Clearance Drill **DATE** August 24, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
FILL: Brown silty sand with crushed stone		AU	1			0	58.73
0.43							
		SS	2	83	11	1	57.73
Compact, brown **SILTY SAND,** some gravel		SS	3	67	24	2	56.73
		SS	4	75	17	3	55.73
3.50		SS	5	62	20		
GLACIAL TILL: Very dense, brown silty sand with shale		SS	6	90	50+	4	54.73
4.60		SS	7	90	50+	5	53.73
Weathered black shale **BEDROCK**							
5.89							
End of Borehole							
(GWL @ 3.20m - Sept. 3, 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
78, 84, 86 and 90 Beechwood Avenue
83, 85, 89, 93 Barrette Street, Ottawa, Ontario

DATUM BM - Mag nail on sidewalk, south of Beechwood Ave., east of St. Charles Street. Geodetic elevation = 59.29m.

FILE NO. PE4614

REMARKS

HOLE NO. BH14

BORINGS BY CME-55 Low Clearance Drill **DATE** August 24, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	58.25
FILL: Brown silty sand with crushed stone		AU	1				
1.07		SS	2	67	38	1	57.25
GLACIAL TILL: Very dense, brown/black silty sand with shale		SS	3	71	60	2	56.25
		SS	4	73	50+		
3.00						3	55.25
Weathered black shale **BEDROCK** 3.30		SS	5	50	50+		
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

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

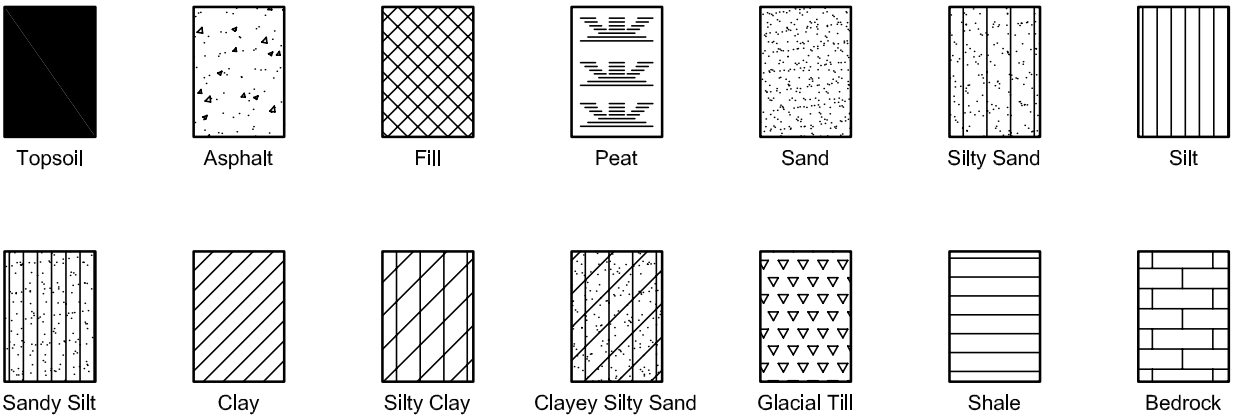
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void 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.

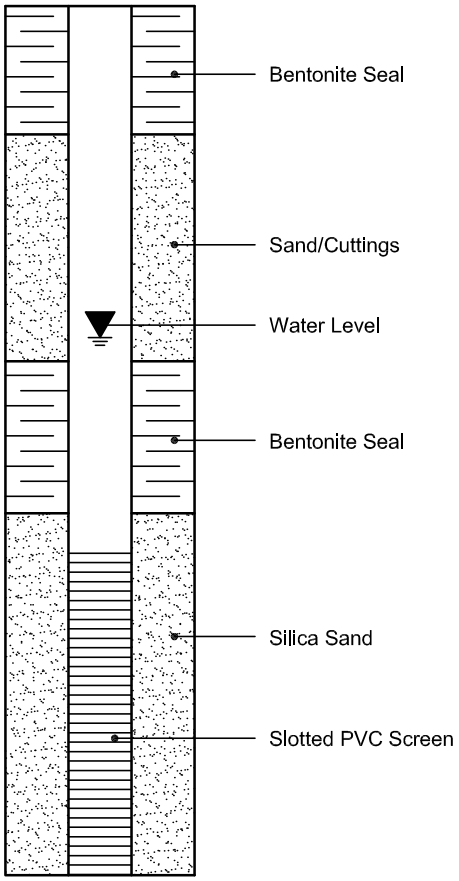
SYMBOLS AND TERMS (continued)

STRATA PLOT

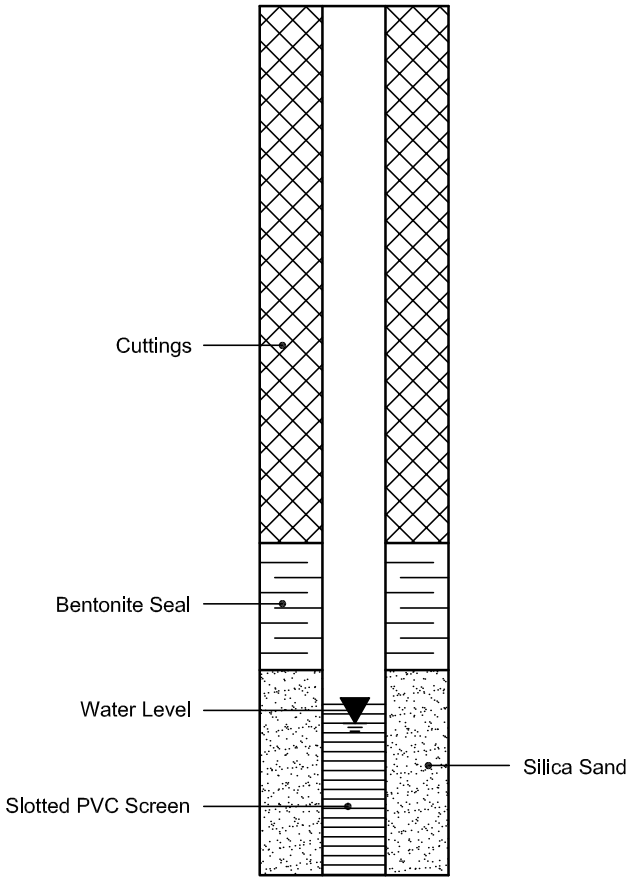


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 26494
Project: PE4614
Custody: 122147

Report Date: 30-May-2019
Order Date: 24-May-2019

Order #: 1921505

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

Paracel ID	Client ID
1921505-01	BH1-SS2
1921505-02	BH2-SS3
1921505-03	BH3-AU1
1921505-04	BH3-SS9/10

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26494

Report Date: 30-May-2019
Order Date: 24-May-2019
Project Description: PE4614

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	29-May-19	30-May-19
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	24-May-19	28-May-19
Mercury by CVAA	EPA 7471B - CVAA, digestion	30-May-19	30-May-19
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	28-May-19	28-May-19
PHC F1	CWS Tier 1 - P&T GC-FID	29-May-19	30-May-19
PHC F4G (gravimetric)	CWS Tier 1 - Extraction Gravimetric	29-May-19	30-May-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	24-May-19	27-May-19
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	29-May-19	29-May-19
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	24-May-19	27-May-19
REG 153: VOCs by P&T GC/MS	EPA 8260 - P&T GC-MS	29-May-19	30-May-19
Solids, %	Gravimetric, calculation	29-May-19	29-May-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26494

Report Date: 30-May-2019

Order Date: 24-May-2019

Project Description: PE4614

	Client ID:	BH1-SS2	BH2-SS3	BH3-AU1	BH3-SS9/10
	Sample Date:	23-May-19 09:00	23-May-19 10:30	23-May-19 12:00	23-May-19 09:00
	Sample ID:	1921505-01	1921505-02	1921505-03	1921505-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	96.7	90.5	98.6	89.8
General Inorganics					
pH	0.05 pH Units	7.94	7.39	-	-
Metals					
Antimony	1.0 ug/g dry	<1.0	-	<1.0	-
Arsenic	1.0 ug/g dry	7.7	-	4.0	-
Barium	1.0 ug/g dry	256	-	54.9	-
Beryllium	0.5 ug/g dry	0.6	-	<0.5	-
Boron	5.0 ug/g dry	15.8	-	6.8	-
Cadmium	0.5 ug/g dry	<0.5	-	<0.5	-
Chromium	5.0 ug/g dry	30.1	-	10.1	-
Chromium (VI)	0.2 ug/g dry	<0.2	-	<0.2	-
Cobalt	1.0 ug/g dry	11.7	-	4.7	-
Copper	5.0 ug/g dry	37.5	-	13.5	-
Lead	1.0 ug/g dry	181	-	44.7	-
Mercury	0.1 ug/g dry	0.3	-	<0.1	-
Molybdenum	1.0 ug/g dry	3.3	-	2.2	-
Nickel	5.0 ug/g dry	31.6	-	16.0	-
Selenium	1.0 ug/g dry	<1.0	-	<1.0	-
Silver	0.3 ug/g dry	0.5	-	<0.3	-
Thallium	1.0 ug/g dry	<1.0	-	<1.0	-
Uranium	1.0 ug/g dry	1.4	-	<1.0	-
Vanadium	10.0 ug/g dry	27.5	-	24.7	-
Zinc	20.0 ug/g dry	143	-	41.6	-
Volatiles					
Acetone	0.50 ug/g dry	-	-	-	<0.50
Benzene	0.02 ug/g dry	-	-	-	<0.02
Bromodichloromethane	0.05 ug/g dry	-	-	-	<0.05
Bromoform	0.05 ug/g dry	-	-	-	<0.05
Bromomethane	0.05 ug/g dry	-	-	-	<0.05
Carbon Tetrachloride	0.05 ug/g dry	-	-	-	<0.05
Chlorobenzene	0.05 ug/g dry	-	-	-	<0.05
Chloroform	0.05 ug/g dry	-	-	-	<0.05
Dibromochloromethane	0.05 ug/g dry	-	-	-	<0.05
Dichlorodifluoromethane	0.05 ug/g dry	-	-	-	<0.05

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26494

Report Date: 30-May-2019

Order Date: 24-May-2019

Project Description: PE4614

	Client ID:	BH1-SS2	BH2-SS3	BH3-AU1	BH3-SS9/10
	Sample Date:	23-May-19 09:00	23-May-19 10:30	23-May-19 12:00	23-May-19 09:00
	Sample ID:	1921505-01	1921505-02	1921505-03	1921505-04
	MDL/Units	Soil	Soil	Soil	Soil
1,2-Dichlorobenzene	0.05 ug/g dry	-	-	-	<0.05
1,3-Dichlorobenzene	0.05 ug/g dry	-	-	-	<0.05
1,4-Dichlorobenzene	0.05 ug/g dry	-	-	-	<0.05
1,1-Dichloroethane	0.05 ug/g dry	-	-	-	<0.05
1,2-Dichloroethane	0.05 ug/g dry	-	-	-	<0.05
1,1-Dichloroethylene	0.05 ug/g dry	-	-	-	<0.05
cis-1,2-Dichloroethylene	0.05 ug/g dry	-	-	-	<0.05
trans-1,2-Dichloroethylene	0.05 ug/g dry	-	-	-	<0.05
1,2-Dichloropropane	0.05 ug/g dry	-	-	-	<0.05
cis-1,3-Dichloropropylene	0.05 ug/g dry	-	-	-	<0.05
trans-1,3-Dichloropropylene	0.05 ug/g dry	-	-	-	<0.05
1,3-Dichloropropene, total	0.05 ug/g dry	-	-	-	<0.05
Ethylbenzene	0.05 ug/g dry	-	-	-	<0.05
Ethylene dibromide (dibromoethan	0.05 ug/g dry	-	-	-	<0.05
Hexane	0.05 ug/g dry	-	-	-	<0.05
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	-	-	-	<0.50
Methyl Isobutyl Ketone	0.50 ug/g dry	-	-	-	<0.50
Methyl tert-butyl ether	0.05 ug/g dry	-	-	-	<0.05
Methylene Chloride	0.05 ug/g dry	-	-	-	<0.05
Styrene	0.05 ug/g dry	-	-	-	<0.05
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	-	-	-	<0.05
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	-	-	-	<0.05
Tetrachloroethylene	0.05 ug/g dry	-	-	-	1.79
Toluene	0.05 ug/g dry	-	-	-	<0.05
1,1,1-Trichloroethane	0.05 ug/g dry	-	-	-	<0.05
1,1,2-Trichloroethane	0.05 ug/g dry	-	-	-	<0.05
Trichloroethylene	0.05 ug/g dry	-	-	-	<0.05
Trichlorofluoromethane	0.05 ug/g dry	-	-	-	<0.05
Vinyl chloride	0.02 ug/g dry	-	-	-	<0.02
m,p-Xylenes	0.05 ug/g dry	-	-	-	0.21
o-Xylene	0.05 ug/g dry	-	-	-	0.09
Xylenes, total	0.05 ug/g dry	-	-	-	0.29
4-Bromofluorobenzene	Surrogate	-	-	-	89.7%
Dibromofluoromethane	Surrogate	-	-	-	81.5%
Toluene-d8	Surrogate	-	-	-	79.5%
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	-

Certificate of Analysis
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Report Date: 30-May-2019
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	Client ID:	BH1-SS2	BH2-SS3	BH3-AU1	BH3-SS9/10
	Sample Date:	23-May-19 09:00	23-May-19 10:30	23-May-19 12:00	23-May-19 09:00
	Sample ID:	1921505-01	1921505-02	1921505-03	1921505-04
	MDL/Units	Soil	Soil	Soil	Soil
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	0.67	<0.05	<0.05	-
o-Xylene	0.05 ug/g dry	0.06	<0.05	<0.05	-
Xylenes, total	0.05 ug/g dry	0.73	<0.05	<0.05	-
Toluene-d8	Surrogate	75.3%	76.7%	88.2%	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	44	<7	15	-
F2 PHCs (C10-C16)	4 ug/g dry	22	80	1040	-
F3 PHCs (C16-C34)	8 ug/g dry	42	29	2370	-
F4 PHCs (C34-C50)	6 ug/g dry	12	<6	2590 [1]	-
F4G PHCs (gravimetric)	50 ug/g dry	-	-	9490	-
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	0.06	-	-	-
Acenaphthylene	0.02 ug/g dry	0.05	-	-	-
Anthracene	0.02 ug/g dry	0.13	-	-	-
Benzo [a] anthracene	0.02 ug/g dry	0.37	-	-	-
Benzo [a] pyrene	0.02 ug/g dry	0.29	-	-	-
Benzo [b] fluoranthene	0.02 ug/g dry	0.45	-	-	-
Benzo [g,h,i] perylene	0.02 ug/g dry	0.20	-	-	-
Benzo [k] fluoranthene	0.02 ug/g dry	0.31	-	-	-
Chrysene	0.02 ug/g dry	0.38	-	-	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	0.07	-	-	-
Fluoranthene	0.02 ug/g dry	0.78	-	-	-
Fluorene	0.02 ug/g dry	0.06	-	-	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	0.16	-	-	-
1-Methylnaphthalene	0.02 ug/g dry	<0.02	-	-	-
2-Methylnaphthalene	0.02 ug/g dry	0.03	-	-	-
Methylnaphthalene (1&2)	0.04 ug/g dry	0.04	-	-	-
Naphthalene	0.01 ug/g dry	0.04	-	-	-
Phenanthrene	0.02 ug/g dry	0.58	-	-	-
Pyrene	0.02 ug/g dry	0.62	-	-	-
2-Fluorobiphenyl	Surrogate	84.3%	-	-	-
Terphenyl-d14	Surrogate	117%	-	-	-

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						
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	*1.38*		*ug/g*		*104*	*50-140*			
Surrogate: Terphenyl-d14	*1.66*		*ug/g*		*125*	*50-140*			
Volatiles									
Acetone	ND	0.50	ug/g						
Benzene	ND	0.02	ug/g						
Bromodichloromethane	ND	0.05	ug/g						
Bromoform	ND	0.05	ug/g						
Bromomethane	ND	0.05	ug/g						
Carbon Tetrachloride	ND	0.05	ug/g						
Chlorobenzene	ND	0.05	ug/g						
Chloroform	ND	0.05	ug/g						
Dibromochloromethane	ND	0.05	ug/g						

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Dichlorodifluoromethane	ND	0.05	ug/g						
1,2-Dichlorobenzene	ND	0.05	ug/g						
1,3-Dichlorobenzene	ND	0.05	ug/g						
1,4-Dichlorobenzene	ND	0.05	ug/g						
1,1-Dichloroethane	ND	0.05	ug/g						
1,2-Dichloroethane	ND	0.05	ug/g						
1,1-Dichloroethylene	ND	0.05	ug/g						
cis-1,2-Dichloroethylene	ND	0.05	ug/g						
trans-1,2-Dichloroethylene	ND	0.05	ug/g						
1,2-Dichloropropane	ND	0.05	ug/g						
cis-1,3-Dichloropropylene	ND	0.05	ug/g						
trans-1,3-Dichloropropylene	ND	0.05	ug/g						
1,3-Dichloropropene, total	ND	0.05	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Ethylene dibromide (dibromoethane	ND	0.05	ug/g						
Hexane	ND	0.05	ug/g						
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g						
Methyl Isobutyl Ketone	ND	0.50	ug/g						
Methyl tert-butyl ether	ND	0.05	ug/g						
Methylene Chloride	ND	0.05	ug/g						
Styrene	ND	0.05	ug/g						
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g						
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g						
Tetrachloroethylene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
1,1,1-Trichloroethane	ND	0.05	ug/g						
1,1,2-Trichloroethane	ND	0.05	ug/g						
Trichloroethylene	ND	0.05	ug/g						
Trichlorofluoromethane	ND	0.05	ug/g						
Vinyl chloride	ND	0.02	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: 4-Bromofluorobenzene	*3.47*		*ug/g*		*108*	*50-140*			
Surrogate: Dibromofluoromethane	*3.76*		*ug/g*		*117*	*50-140*			
Surrogate: Toluene-d8	*3.03*		*ug/g*		*94.6*	*50-140*			
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*3.03*		*ug/g*		*94.6*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
pH	6.82	0.05	pH Units	6.79			0.4	10	
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND				30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND				30	
Metals									
Antimony	ND	1.0	ug/g dry	ND			0.0	30	
Arsenic	7.1	1.0	ug/g dry	6.4			9.0	30	
Barium	60.9	1.0	ug/g dry	54.7			10.8	30	
Beryllium	0.6	0.5	ug/g dry	0.5			10.3	30	
Boron	9.7	5.0	ug/g dry	8.5			13.2	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	18.0	5.0	ug/g dry	16.5			8.4	30	
Cobalt	7.0	1.0	ug/g dry	6.0			14.5	30	
Copper	45.5	5.0	ug/g dry	40.3			12.0	30	
Lead	26.1	1.0	ug/g dry	29.0			10.5	30	
Mercury	0.245	0.1	ug/g dry	0.259			5.6	30	
Molybdenum	ND	1.0	ug/g dry	ND			0.0	30	
Nickel	15.9	5.0	ug/g dry	14.8			6.9	30	
Selenium	ND	1.0	ug/g dry	ND			0.0	30	
Silver	ND	0.3	ug/g dry	ND			0.0	30	
Thallium	ND	1.0	ug/g dry	ND			0.0	30	
Uranium	ND	1.0	ug/g dry	ND			0.0	30	
Vanadium	26.4	10.0	ug/g dry	22.9			14.4	30	
Zinc	124	20.0	ug/g dry	125			0.9	30	
Physical Characteristics									
% Solids	90.5	0.1	% by Wt.	90.2			0.3	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	ND				40	
Acenaphthylene	ND	0.02	ug/g dry	ND			0.0	40	
Anthracene	ND	0.02	ug/g dry	ND			0.0	40	
Benzo [a] anthracene	0.056	0.02	ug/g dry	0.059			5.4	40	
Benzo [a] pyrene	0.079	0.02	ug/g dry	0.098			22.4	40	
Benzo [b] fluoranthene	0.130	0.02	ug/g dry	0.132			1.6	40	
Benzo [g,h,i] perylene	0.067	0.02	ug/g dry	0.089			27.9	40	
Benzo [k] fluoranthene	0.051	0.02	ug/g dry	0.070			30.1	40	
Chrysene	0.087	0.02	ug/g dry	0.086			0.6	40	
Dibenzo [a,h] anthracene	0.022	0.02	ug/g dry	ND			0.0	40	
Fluoranthene	0.118	0.02	ug/g dry	0.116			1.8	40	
Fluorene	ND	0.02	ug/g dry	ND				40	
Indeno [1,2,3-cd] pyrene	0.059	0.02	ug/g dry	0.077			26.2	40	
1-Methylnaphthalene	ND	0.02	ug/g dry	ND			0.0	40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND			0.0	40	
Naphthalene	ND	0.01	ug/g dry	ND			0.0	40	
Phenanthrene	0.041	0.02	ug/g dry	0.042			3.4	40	
Pyrene	0.103	0.02	ug/g dry	0.100			3.2	40	
Surrogate: 2-Fluorobiphenyl	*1.41*		*ug/g dry*		*80.6*	*50-140*			
Surrogate: Terphenyl-d14	*1.57*		*ug/g dry*		*90.1*	*50-140*			
Volatiles									
Acetone	ND	0.50	ug/g dry	ND				50	
Benzene	ND	0.02	ug/g dry	ND				50	
Bromodichloromethane	ND	0.05	ug/g dry	ND				50	
Bromoform	ND	0.05	ug/g dry	ND				50	
Bromomethane	ND	0.05	ug/g dry	ND				50	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Carbon Tetrachloride	ND	0.05	ug/g dry	ND				50	
Chlorobenzene	ND	0.05	ug/g dry	ND				50	
Chloroform	ND	0.05	ug/g dry	ND				50	
Dibromochloromethane	ND	0.05	ug/g dry	ND				50	
Dichlorodifluoromethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,3-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,4-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
cis-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
trans-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
1,2-Dichloropropane	ND	0.05	ug/g dry	ND				50	
cis-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
trans-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Ethylene dibromide (dibromoethane	ND	0.05	ug/g dry	ND				50	
Hexane	ND	0.05	ug/g dry	ND				50	
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g dry	ND				50	
Methyl Isobutyl Ketone	ND	0.50	ug/g dry	ND				50	
Methyl tert-butyl ether	ND	0.05	ug/g dry	ND				50	
Methylene Chloride	ND	0.05	ug/g dry	ND				50	
Styrene	ND	0.05	ug/g dry	ND				50	
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
Tetrachloroethylene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
1,1,1-Trichloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2-Trichloroethane	ND	0.05	ug/g dry	ND				50	
Trichloroethylene	ND	0.05	ug/g dry	ND				50	
Trichlorofluoromethane	ND	0.05	ug/g dry	ND				50	
Vinyl chloride	ND	0.02	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: 4-Bromofluorobenzene	*3.40*		*ug/g dry*		*98.6*	*50-140*			
Surrogate: Dibromofluoromethane	*3.88*		*ug/g dry*		*113*	*50-140*			
Surrogate: Toluene-d8	*3.40*		*ug/g dry*		*98.6*	*50-140*			
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*3.40*		*ug/g dry*		*98.6*	*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)	201	7	ug/g		100	80-120			
F2 PHCs (C10-C16)	95	4	ug/g	ND	78.8	60-140			
F3 PHCs (C16-C34)	259	8	ug/g	ND	87.3	60-140			
F4 PHCs (C34-C50)	153	6	ug/g	ND	81.4	60-140			
F4G PHCs (gravimetric)	810	50	ug/g		81.0	80-120			
Metals									
Antimony	44.9		ug/L	ND	89.6	70-130			
Arsenic	57.1		ug/L	2.6	109	70-130			
Barium	71.2		ug/L	21.9	98.7	70-130			
Beryllium	53.3		ug/L	ND	106	70-130			
Boron	50.1		ug/L	ND	93.4	70-130			
Cadmium	47.2		ug/L	ND	94.2	70-130			
Chromium (VI)	4.3	0.2	ug/g	ND	74.0	70-130			
Chromium	61.5		ug/L	6.6	110	70-130			
Cobalt	55.1		ug/L	2.4	105	70-130			
Copper	67.1		ug/L	16.1	102	70-130			
Lead	61.6		ug/L	11.6	100	70-130			
Mercury	1.97	0.1	ug/g	0.259	114	70-130			
Molybdenum	52.5		ug/L	ND	105	70-130			
Nickel	57.7		ug/L	5.9	103	70-130			
Selenium	54.5		ug/L	ND	109	70-130			
Silver	49.6		ug/L	ND	99.2	70-130			
Thallium	50.5		ug/L	ND	101	70-130			
Uranium	54.2		ug/L	ND	108	70-130			
Vanadium	62.8		ug/L	ND	107	70-130			
Zinc	102		ug/L	50.1	105	70-130			
Semi-Volatiles									
Acenaphthene	0.180	0.02	ug/g	ND	82.4	50-140			
Acenaphthylene	0.179	0.02	ug/g	ND	82.2	50-140			
Anthracene	0.182	0.02	ug/g	ND	83.6	50-140			
Benzo [a] anthracene	0.244	0.02	ug/g	0.059	84.8	50-140			
Benzo [a] pyrene	0.233	0.02	ug/g	0.098	61.7	50-140			
Benzo [b] fluoranthene	0.430	0.02	ug/g	0.132	137	50-140			
Benzo [g,h,i] perylene	0.335	0.02	ug/g	0.089	113	50-140			
Benzo [k] fluoranthene	0.347	0.02	ug/g	0.070	127	50-140			
Chrysene	0.288	0.02	ug/g	0.086	92.5	50-140			
Dibenzo [a,h] anthracene	0.299	0.02	ug/g	ND	137	50-140			
Fluoranthene	0.306	0.02	ug/g	0.116	87.3	50-140			
Fluorene	0.170	0.02	ug/g	ND	77.9	50-140			
Indeno [1,2,3-cd] pyrene	0.362	0.02	ug/g	0.077	130	50-140			
1-Methylnaphthalene	0.152	0.02	ug/g	ND	69.7	50-140			
2-Methylnaphthalene	0.171	0.02	ug/g	ND	78.6	50-140			
Naphthalene	0.181	0.01	ug/g	ND	83.0	50-140			
Phenanthrene	0.232	0.02	ug/g	0.042	87.2	50-140			
Pyrene	0.278	0.02	ug/g	0.100	81.6	50-140			
Surrogate: 2-Fluorobiphenyl	*1.34*		*ug/g*		*76.8*	*50-140*			
Volatiles									
Acetone	9.83	0.50	ug/g		98.3	50-140			
Benzene	3.44	0.02	ug/g		85.9	60-130			
Bromodichloromethane	3.55	0.05	ug/g		88.8	60-130			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Bromoform	3.95	0.05	ug/g		98.9	60-130			
Bromomethane	2.47	0.05	ug/g		61.7	50-140			
Carbon Tetrachloride	3.22	0.05	ug/g		80.4	60-130			
Chlorobenzene	2.98	0.05	ug/g		74.5	60-130			
Chloroform	3.56	0.05	ug/g		89.0	60-130			
Dibromochloromethane	4.40	0.05	ug/g		110	60-130			
Dichlorodifluoromethane	2.44	0.05	ug/g		61.0	50-140			
1,2-Dichlorobenzene	3.54	0.05	ug/g		88.5	60-130			
1,3-Dichlorobenzene	3.48	0.05	ug/g		87.0	60-130			
1,4-Dichlorobenzene	2.82	0.05	ug/g		70.5	60-130			
1,1-Dichloroethane	3.39	0.05	ug/g		84.7	60-130			
1,2-Dichloroethane	3.17	0.05	ug/g		79.2	60-130			
1,1-Dichloroethylene	3.30	0.05	ug/g		82.4	60-130			
cis-1,2-Dichloroethylene	2.64	0.05	ug/g		66.0	60-130			
trans-1,2-Dichloroethylene	3.01	0.05	ug/g		75.2	60-130			
1,2-Dichloropropane	3.61	0.05	ug/g		90.1	60-130			
cis-1,3-Dichloropropylene	3.12	0.05	ug/g		78.1	60-130			
trans-1,3-Dichloropropylene	3.49	0.05	ug/g		87.3	60-130			
Ethylbenzene	2.83	0.05	ug/g		70.8	60-130			
Ethylene dibromide (dibromoethane	3.85	0.05	ug/g		96.2	60-130			
Hexane	3.68	0.05	ug/g		92.0	60-130			
Methyl Ethyl Ketone (2-Butanone)	9.05	0.50	ug/g		90.5	50-140			
Methyl Isobutyl Ketone	9.74	0.50	ug/g		97.4	50-140			
Methyl tert-butyl ether	8.00	0.05	ug/g		80.0	50-140			
Methylene Chloride	3.41	0.05	ug/g		85.3	60-130			
Styrene	2.80	0.05	ug/g		70.0	60-130			
1,1,1,2-Tetrachloroethane	3.86	0.05	ug/g		96.5	60-130			
1,1,2,2-Tetrachloroethane	4.61	0.05	ug/g		115	60-130			
Tetrachloroethylene	3.40	0.05	ug/g		85.1	60-130			
Toluene	3.61	0.05	ug/g		90.3	60-130			
1,1,1-Trichloroethane	3.39	0.05	ug/g		84.8	60-130			
1,1,2-Trichloroethane	4.29	0.05	ug/g		107	60-130			
Trichloroethylene	4.30	0.05	ug/g		108	60-130			
Trichlorofluoromethane	2.75	0.05	ug/g		68.8	50-140			
Vinyl chloride	2.94	0.02	ug/g		73.6	50-140			
m,p-Xylenes	8.49	0.05	ug/g		106	60-130			
o-Xylene	3.75	0.05	ug/g		93.7	60-130			
Benzene	3.44	0.02	ug/g		85.9	60-130			
Ethylbenzene	2.83	0.05	ug/g		70.8	60-130			
Toluene	3.61	0.05	ug/g		90.3	60-130			
m,p-Xylenes	8.49	0.05	ug/g		106	60-130			
o-Xylene	3.75	0.05	ug/g		93.7	60-130			

Qualifier Notes:

Sample Qualifiers :

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

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.
- When reported, data for F4G has been processed using a silica gel cleanup.

PARACEL LABORATORIES LTD.

Paracel ID: 1921505

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Chain of Custody
(Lab Use Only)
No. 122147

Page 1 of 1

Client Name: Paterson	Project Reference: PE4614
Contact Name: Mark D'Arcy	Quote #
Address:	PO # 26494
Telephone: 226-7381	Email Address:

Turnaround Time:
☐ 1 Day ☐ 3 Day
☐ 2 Day ☑ Regular
Date Required:

Criteria: ☑ O. Reg. 153/04 (As Amended) Table __ ☐ 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: 1921505

	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)	pH						
1	BH1-SS2	S	-	3	May 23/19	9 am	✓		✓	✓	✓	✓		✓						
2	BH2-AU1	S	-	2	"	10 am									ON HOLD					
3	BH2-SS3	S	-	2	"	10:30 am	✓							✓						
4	BH3-AU1	S	-	2	"	12 pm	✓			✓	✓	✓								
5	BH3-SS9/10	S	-	2	"			✓												
6																				
7	↳ Jar reads 9, vial reads 10.																			
8																				
9																				
10																				

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: M. Scouse	Received at Lab:	Verified By:
Relinquished By (Print): Nick Gilmberceding	Date/Time: 24/05/19 1:00 pm	Date/Time: May 24/19 2:15p	Date/Time: 05-24-19 15:27
Date/Time: 1:00pm, May 24, 2019.	Temperature: °C	Temperature: 6.2°C	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 26976
Project: PE4614
Custody: 122828

Report Date: 22-Jul-2019
Order Date: 16-Jul-2019

Order #: 1929255

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

Paracel ID	Client ID
1929255-01	BH7-AU1
1929255-02	BH7-SS3
1929255-03	BH8-SS4
1929255-04	BH8-SS9
1929255-05	BH9-AU1
1929255-06	BH9-SS6
1929255-07	BH9-SS9
1929255-08	BH10-SS2

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26976

Report Date: 22-Jul-2019
Order Date: 16-Jul-2019
Project Description: PE4614

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	17-Jul-19	19-Jul-19
Mercury by CVAA	EPA 7471B - CVAA, digestion	18-Jul-19	19-Jul-19
PHC F1	CWS Tier 1 - P&T GC-FID	18-Jul-19	20-Jul-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	17-Jul-19	19-Jul-19
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	18-Jul-19	19-Jul-19
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	17-Jul-19	22-Jul-19
REG 153: VOCs by P&T GC/MS	EPA 8260 - P&T GC-MS	18-Jul-19	19-Jul-19
Solids, %	Gravimetric, calculation	20-Jul-19	20-Jul-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26976

Report Date: 22-Jul-2019

Order Date: 16-Jul-2019

Project Description: PE4614

	Client ID:	BH7-AU1	BH7-SS3	BH8-SS4	BH8-SS9
	Sample Date:	15-Jul-19 10:00	15-Jul-19 10:00	15-Jul-19 11:00	15-Jul-19 11:00
	Sample ID:	1929255-01	1929255-02	1929255-03	1929255-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	85.0	90.8	89.5	93.1
Metals					
Antimony	1.0 ug/g dry	1.5	-	-	-
Arsenic	1.0 ug/g dry	10.8	-	-	-
Barium	1.0 ug/g dry	293	-	-	-
Beryllium	0.5 ug/g dry	0.7	-	-	-
Boron	5.0 ug/g dry	7.8	-	-	-
Cadmium	0.5 ug/g dry	0.7	-	-	-
Chromium	5.0 ug/g dry	26.8	-	-	-
Chromium (VI)	0.2 ug/g dry	<0.2	-	-	-
Cobalt	1.0 ug/g dry	9.1	-	-	-
Copper	5.0 ug/g dry	77.6	-	-	-
Lead	1.0 ug/g dry	295	-	-	-
Mercury	0.1 ug/g dry	0.2	-	-	-
Molybdenum	1.0 ug/g dry	2.7	-	-	-
Nickel	5.0 ug/g dry	27.8	-	-	-
Selenium	1.0 ug/g dry	1.0	-	-	-
Silver	0.3 ug/g dry	0.3	-	-	-
Thallium	1.0 ug/g dry	<1.0	-	-	-
Uranium	1.0 ug/g dry	<1.0	-	-	-
Vanadium	10.0 ug/g dry	28.0	-	-	-
Zinc	20.0 ug/g dry	279	-	-	-
Volatiles					
Acetone	0.50 ug/g dry	-	<0.50	<0.50	<0.50
Benzene	0.02 ug/g dry	-	<0.02	<0.02	<0.02
Bromodichloromethane	0.05 ug/g dry	-	<0.05	<0.05	<0.05
Bromoform	0.05 ug/g dry	-	<0.05	<0.05	<0.05
Bromomethane	0.05 ug/g dry	-	<0.05	<0.05	<0.05
Carbon Tetrachloride	0.05 ug/g dry	-	<0.05	<0.05	<0.05
Chlorobenzene	0.05 ug/g dry	-	<0.05	<0.05	<0.05
Chloroform	0.05 ug/g dry	-	<0.05	<0.05	<0.05
Dibromochloromethane	0.05 ug/g dry	-	<0.05	<0.05	<0.05
Dichlorodifluoromethane	0.05 ug/g dry	-	<0.05	<0.05	<0.05
1,2-Dichlorobenzene	0.05 ug/g dry	-	<0.05	<0.05	<0.05
1,3-Dichlorobenzene	0.05 ug/g dry	-	<0.05	<0.05	<0.05

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26976

Report Date: 22-Jul-2019

Order Date: 16-Jul-2019

Project Description: PE4614

	Client ID:	BH7-AU1	BH7-SS3	BH8-SS4	BH8-SS9
	Sample Date:	15-Jul-19 10:00	15-Jul-19 10:00	15-Jul-19 11:00	15-Jul-19 11:00
	Sample ID:	1929255-01	1929255-02	1929255-03	1929255-04
	MDL/Units	Soil	Soil	Soil	Soil
1,4-Dichlorobenzene	0.05 ug/g dry	-	<0.05	<0.05	<0.05
1,1-Dichloroethane	0.05 ug/g dry	-	<0.05	<0.05	<0.05
1,2-Dichloroethane	0.05 ug/g dry	-	<0.05	<0.05	<0.05
1,1-Dichloroethylene	0.05 ug/g dry	-	<0.05	<0.05	<0.05
cis-1,2-Dichloroethylene	0.05 ug/g dry	-	<0.05	<0.05	<0.05
trans-1,2-Dichloroethylene	0.05 ug/g dry	-	<0.05	<0.05	<0.05
1,2-Dichloropropane	0.05 ug/g dry	-	<0.05	<0.05	<0.05
cis-1,3-Dichloropropylene	0.05 ug/g dry	-	<0.05	<0.05	<0.05
trans-1,3-Dichloropropylene	0.05 ug/g dry	-	<0.05	<0.05	<0.05
1,3-Dichloropropene, total	0.05 ug/g dry	-	<0.05	<0.05	<0.05
Ethylbenzene	0.05 ug/g dry	-	<0.05	<0.05	<0.05
Ethylene dibromide (dibromoethan	0.05 ug/g dry	-	<0.05	<0.05	<0.05
Hexane	0.05 ug/g dry	-	<0.05	<0.05	<0.05
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	-	<0.50	<0.50	<0.50
Methyl Isobutyl Ketone	0.50 ug/g dry	-	<0.50	<0.50	<0.50
Methyl tert-butyl ether	0.05 ug/g dry	-	<0.05	<0.05	<0.05
Methylene Chloride	0.05 ug/g dry	-	<0.05	<0.05	<0.05
Styrene	0.05 ug/g dry	-	<0.05	<0.05	<0.05
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	-	<0.05	<0.05	<0.05
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	-	<0.05	<0.05	<0.05
Tetrachloroethylene	0.05 ug/g dry	-	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	-	<0.05	<0.05	<0.05
1,1,1-Trichloroethane	0.05 ug/g dry	-	<0.05	<0.05	<0.05
1,1,2-Trichloroethane	0.05 ug/g dry	-	<0.05	<0.05	<0.05
Trichloroethylene	0.05 ug/g dry	-	<0.05	<0.05	<0.05
Trichlorofluoromethane	0.05 ug/g dry	-	<0.05	<0.05	<0.05
Vinyl chloride	0.02 ug/g dry	-	<0.02	<0.02	<0.02
m,p-Xylenes	0.05 ug/g dry	-	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	-	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	-	<0.05	<0.05	<0.05
4-Bromofluorobenzene	Surrogate	-	119%	106%	132%
Dibromofluoromethane	Surrogate	-	95.4%	74.2%	99.2%
Toluene-d8	Surrogate	-	83.9%	101%	89.9%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	-	-	60	-
F2 PHCs (C10-C16)	4 ug/g dry	-	-	2980	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26976

Report Date: 22-Jul-2019

Order Date: 16-Jul-2019

Project Description: PE4614

	Client ID:	BH7-AU1	BH7-SS3	BH8-SS4	BH8-SS9
	Sample Date:	15-Jul-19 10:00	15-Jul-19 10:00	15-Jul-19 11:00	15-Jul-19 11:00
	Sample ID:	1929255-01	1929255-02	1929255-03	1929255-04
	MDL/Units	Soil	Soil	Soil	Soil
F3 PHCs (C16-C34)	8 ug/g dry	-	-	888	-
F4 PHCs (C34-C50)	6 ug/g dry	-	-	<6	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26976

Report Date: 22-Jul-2019

Order Date: 16-Jul-2019

Project Description: PE4614

	Client ID:	BH9-AU1	BH9-SS6	BH9-SS9	BH10-SS2
	Sample Date:	15-Jul-19 12:30	15-Jul-19 12:30	15-Jul-19 12:30	15-Jul-19 13:30
	Sample ID:	1929255-05	1929255-06	1929255-07	1929255-08
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	94.2	87.8	92.5	82.3
Metals					
Antimony	1.0 ug/g dry	-	-	-	<1.0
Arsenic	1.0 ug/g dry	-	-	-	5.8
Barium	1.0 ug/g dry	-	-	-	171
Beryllium	0.5 ug/g dry	-	-	-	0.6
Boron	5.0 ug/g dry	-	-	-	6.7
Cadmium	0.5 ug/g dry	-	-	-	<0.5
Chromium	5.0 ug/g dry	-	-	-	19.7
Chromium (VI)	0.2 ug/g dry	-	-	-	<0.2
Cobalt	1.0 ug/g dry	-	-	-	8.1
Copper	5.0 ug/g dry	-	-	-	43.8
Lead	1.0 ug/g dry	-	-	-	255
Mercury	0.1 ug/g dry	-	-	-	0.3
Molybdenum	1.0 ug/g dry	-	-	-	1.5
Nickel	5.0 ug/g dry	-	-	-	21.0
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	-	-	-	23.0
Zinc	20.0 ug/g dry	-	-	-	186
Volatiles					
Acetone	0.50 ug/g dry	-	<0.50	<0.50	-
Benzene	0.02 ug/g dry	-	<0.02	<0.02	-
Bromodichloromethane	0.05 ug/g dry	-	<0.05	<0.05	-
Bromoform	0.05 ug/g dry	-	<0.05	<0.05	-
Bromomethane	0.05 ug/g dry	-	<0.05	<0.05	-
Carbon Tetrachloride	0.05 ug/g dry	-	<0.05	<0.05	-
Chlorobenzene	0.05 ug/g dry	-	<0.05	<0.05	-
Chloroform	0.05 ug/g dry	-	<0.05	<0.05	-
Dibromochloromethane	0.05 ug/g dry	-	<0.05	<0.05	-
Dichlorodifluoromethane	0.05 ug/g dry	-	<0.05	<0.05	-
1,2-Dichlorobenzene	0.05 ug/g dry	-	<0.05	<0.05	-
1,3-Dichlorobenzene	0.05 ug/g dry	-	<0.05	<0.05	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26976

Report Date: 22-Jul-2019

Order Date: 16-Jul-2019

Project Description: PE4614

	Client ID:	BH9-AU1	BH9-SS6	BH9-SS9	BH10-SS2
	Sample Date:	15-Jul-19 12:30	15-Jul-19 12:30	15-Jul-19 12:30	15-Jul-19 13:30
	Sample ID:	1929255-05	1929255-06	1929255-07	1929255-08
	MDL/Units	Soil	Soil	Soil	Soil
1,4-Dichlorobenzene	0.05 ug/g dry	-	<0.05	<0.05	-
1,1-Dichloroethane	0.05 ug/g dry	-	<0.05	<0.05	-
1,2-Dichloroethane	0.05 ug/g dry	-	<0.05	<0.05	-
1,1-Dichloroethylene	0.05 ug/g dry	-	<0.05	<0.05	-
cis-1,2-Dichloroethylene	0.05 ug/g dry	-	<0.05	<0.05	-
trans-1,2-Dichloroethylene	0.05 ug/g dry	-	<0.05	<0.05	-
1,2-Dichloropropane	0.05 ug/g dry	-	<0.05	<0.05	-
cis-1,3-Dichloropropylene	0.05 ug/g dry	-	<0.05	<0.05	-
trans-1,3-Dichloropropylene	0.05 ug/g dry	-	<0.05	<0.05	-
1,3-Dichloropropene, total	0.05 ug/g dry	-	<0.05	<0.05	-
Ethylbenzene	0.05 ug/g dry	-	<0.05	<0.05	-
Ethylene dibromide (dibromoethar	0.05 ug/g dry	-	<0.05	<0.05	-
Hexane	0.05 ug/g dry	-	<0.05	<0.05	-
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	-	<0.50	<0.50	-
Methyl Isobutyl Ketone	0.50 ug/g dry	-	<0.50	<0.50	-
Methyl tert-butyl ether	0.05 ug/g dry	-	<0.05	<0.05	-
Methylene Chloride	0.05 ug/g dry	-	<0.05	<0.05	-
Styrene	0.05 ug/g dry	-	<0.05	<0.05	-
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	-	<0.05	<0.05	-
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	-	<0.05	<0.05	-
Tetrachloroethylene	0.05 ug/g dry	-	<0.05	<0.05	-
Toluene	0.05 ug/g dry	-	<0.05	<0.05	-
1,1,1-Trichloroethane	0.05 ug/g dry	-	<0.05	<0.05	-
1,1,2-Trichloroethane	0.05 ug/g dry	-	<0.05	<0.05	-
Trichloroethylene	0.05 ug/g dry	-	<0.05	<0.05	-
Trichlorofluoromethane	0.05 ug/g dry	-	<0.05	<0.05	-
Vinyl chloride	0.02 ug/g dry	-	<0.02	<0.02	-
m,p-Xylenes	0.05 ug/g dry	-	0.61	<0.05	-
o-Xylene	0.05 ug/g dry	-	0.26	<0.05	-
Xylenes, total	0.05 ug/g dry	-	0.87	<0.05	-
4-Bromofluorobenzene	Surrogate	-	115%	135%	-
Dibromofluoromethane	Surrogate	-	66.7%	96.8%	-
Toluene-d8	Surrogate	-	114%	96.1%	-
Hydrocarbons					
F2 PHCs (C10-C16)	4 ug/g dry	<4	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26976

Report Date: 22-Jul-2019

Order Date: 16-Jul-2019

Project Description: PE4614

	Client ID:	BH9-AU1	BH9-SS6	BH9-SS9	BH10-SS2
	Sample Date:	15-Jul-19 12:30	15-Jul-19 12:30	15-Jul-19 12:30	15-Jul-19 13:30
	Sample ID:	1929255-05	1929255-06	1929255-07	1929255-08
	MDL/Units	Soil	Soil	Soil	Soil
F3 PHCs (C16-C34)	8 ug/g dry	98	-	-	-
F4 PHCs (C34-C50)	6 ug/g dry	171 [1]	-	-	-
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	-	-	-	<0.02
Acenaphthylene	0.02 ug/g dry	-	-	-	<0.02
Anthracene	0.02 ug/g dry	-	-	-	<0.02
Benzo [a] anthracene	0.02 ug/g dry	-	-	-	0.04
Benzo [a] pyrene	0.02 ug/g dry	-	-	-	0.03
Benzo [b] fluoranthene	0.02 ug/g dry	-	-	-	0.04
Benzo [g,h,i] perylene	0.02 ug/g dry	-	-	-	0.03
Benzo [k] fluoranthene	0.02 ug/g dry	-	-	-	0.03
Chrysene	0.02 ug/g dry	-	-	-	0.06
Dibenzo [a,h] anthracene	0.02 ug/g dry	-	-	-	<0.02
Fluoranthene	0.02 ug/g dry	-	-	-	0.09
Fluorene	0.02 ug/g dry	-	-	-	<0.02
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	-	-	-	<0.02
1-Methylnaphthalene	0.02 ug/g dry	-	-	-	<0.02
2-Methylnaphthalene	0.02 ug/g dry	-	-	-	<0.02
Methylnaphthalene (1&2)	0.04 ug/g dry	-	-	-	<0.04
Naphthalene	0.01 ug/g dry	-	-	-	<0.01
Phenanthrene	0.02 ug/g dry	-	-	-	0.07
Pyrene	0.02 ug/g dry	-	-	-	0.09
2-Fluorobiphenyl	Surrogate	-	-	-	69.1%
Terphenyl-d14	Surrogate	-	-	-	66.1%

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	*0.936*		*ug/g*		*70.2*	*50-140*			
Surrogate: Terphenyl-d14	*0.941*		*ug/g*		*70.6*	*50-140*			
Volatiles									
Acetone	ND	0.50	ug/g						
Benzene	ND	0.02	ug/g						
Bromodichloromethane	ND	0.05	ug/g						
Bromoform	ND	0.05	ug/g						
Bromomethane	ND	0.05	ug/g						
Carbon Tetrachloride	ND	0.05	ug/g						
Chlorobenzene	ND	0.05	ug/g						
Chloroform	ND	0.05	ug/g						
Dibromochloromethane	ND	0.05	ug/g						
Dichlorodifluoromethane	ND	0.05	ug/g						

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
1,2-Dichlorobenzene	ND	0.05	ug/g						
1,3-Dichlorobenzene	ND	0.05	ug/g						
1,4-Dichlorobenzene	ND	0.05	ug/g						
1,1-Dichloroethane	ND	0.05	ug/g						
1,2-Dichloroethane	ND	0.05	ug/g						
1,1-Dichloroethylene	ND	0.05	ug/g						
cis-1,2-Dichloroethylene	ND	0.05	ug/g						
trans-1,2-Dichloroethylene	ND	0.05	ug/g						
1,2-Dichloropropane	ND	0.05	ug/g						
cis-1,3-Dichloropropylene	ND	0.05	ug/g						
trans-1,3-Dichloropropylene	ND	0.05	ug/g						
1,3-Dichloropropene, total	ND	0.05	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Ethylene dibromide (dibromoethane	ND	0.05	ug/g						
Hexane	ND	0.05	ug/g						
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g						
Methyl Isobutyl Ketone	ND	0.50	ug/g						
Methyl tert-butyl ether	ND	0.05	ug/g						
Methylene Chloride	ND	0.05	ug/g						
Styrene	ND	0.05	ug/g						
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g						
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g						
Tetrachloroethylene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
1,1,1-Trichloroethane	ND	0.05	ug/g						
1,1,2-Trichloroethane	ND	0.05	ug/g						
Trichloroethylene	ND	0.05	ug/g						
Trichlorofluoromethane	ND	0.05	ug/g						
Vinyl chloride	ND	0.02	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: 4-Bromofluorobenzene	*3.46*		*ug/g*		*108*	*50-140*			
Surrogate: Dibromofluoromethane	*3.26*		*ug/g*		*102*	*50-140*			
Surrogate: Toluene-d8	*2.47*		*ug/g*		*77.1*	*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				40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND				30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND				30	
Metals									
Antimony	1.7	1.0	ug/g dry	1.5			14.2	30	
Arsenic	8.8	1.0	ug/g dry	8.4			5.6	30	
Barium	133	1.0	ug/g dry	137			3.5	30	
Beryllium	0.8	0.5	ug/g dry	0.8			2.1	30	
Boron	12.2	5.0	ug/g dry	11.2			9.0	30	
Cadmium	3.4	0.5	ug/g dry	3.3			1.1	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	28.1	5.0	ug/g dry	26.8			4.6	30	
Cobalt	8.7	1.0	ug/g dry	8.6			1.9	30	
Copper	61.8	5.0	ug/g dry	60.9			1.4	30	
Lead	175	1.0	ug/g dry	103			51.9	30	
Mercury	ND	0.1	ug/g dry	0.113			0.0	30	
Molybdenum	2.0	1.0	ug/g dry	1.6			20.3	30	
Nickel	25.6	5.0	ug/g dry	24.0			6.4	30	
Selenium	ND	1.0	ug/g dry	ND			0.0	30	
Silver	ND	0.3	ug/g dry	ND			0.0	30	
Thallium	ND	1.0	ug/g dry	ND			0.0	30	
Uranium	ND	1.0	ug/g dry	ND			0.0	30	
Vanadium	33.8	10.0	ug/g dry	32.2			4.9	30	
Zinc	206	20.0	ug/g dry	193			6.5	30	
Physical Characteristics									
% Solids	83.6	0.1	% by Wt.	85.0			1.6	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	ND				40	
Acenaphthylene	ND	0.02	ug/g dry	ND			0.0	40	
Anthracene	ND	0.02	ug/g dry	ND			0.0	40	
Benzo [a] anthracene	0.040	0.02	ug/g dry	0.044			9.4	40	
Benzo [a] pyrene	0.032	0.02	ug/g dry	0.034			4.5	40	
Benzo [b] fluoranthene	0.039	0.02	ug/g dry	0.042			7.3	40	
Benzo [g,h,i] perylene	0.024	0.02	ug/g dry	0.025			5.4	40	
Benzo [k] fluoranthene	ND	0.02	ug/g dry	0.026			0.0	40	
Chrysene	0.048	0.02	ug/g dry	0.056			14.7	40	
Dibenzo [a,h] anthracene	ND	0.02	ug/g dry	ND				40	
Fluoranthene	0.082	0.02	ug/g dry	0.094			13.5	40	
Fluorene	ND	0.02	ug/g dry	ND			0.0	40	
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g dry	ND			0.0	40	
1-Methylnaphthalene	ND	0.02	ug/g dry	ND				40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND				40	
Naphthalene	ND	0.01	ug/g dry	ND				40	
Phenanthrene	0.047	0.02	ug/g dry	0.071			42.2	40	QR-01
Pyrene	0.074	0.02	ug/g dry	0.088			17.8	40	
Surrogate: 2-Fluorobiphenyl	*0.868*		*ug/g dry*		*53.6*	*50-140*			
Surrogate: Terphenyl-d14	*0.840*		*ug/g dry*		*51.9*	*50-140*			
Volatiles									
Acetone	ND	0.50	ug/g dry	ND				50	
Benzene	ND	0.02	ug/g dry	ND				50	
Bromodichloromethane	ND	0.05	ug/g dry	ND				50	
Bromoform	ND	0.05	ug/g dry	ND				50	
Bromomethane	ND	0.05	ug/g dry	ND				50	
Carbon Tetrachloride	ND	0.05	ug/g dry	ND				50	
Chlorobenzene	ND	0.05	ug/g dry	ND				50	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Chloroform	ND	0.05	ug/g dry	ND				50	
Dibromochloromethane	ND	0.05	ug/g dry	ND				50	
Dichlorodifluoromethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,3-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,4-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
cis-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
trans-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
1,2-Dichloropropane	ND	0.05	ug/g dry	ND				50	
cis-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
trans-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Ethylene dibromide (dibromoethane	ND	0.05	ug/g dry	ND				50	
Hexane	ND	0.05	ug/g dry	ND				50	
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g dry	ND				50	
Methyl Isobutyl Ketone	ND	0.50	ug/g dry	ND				50	
Methyl tert-butyl ether	ND	0.05	ug/g dry	ND				50	
Methylene Chloride	ND	0.05	ug/g dry	ND				50	
Styrene	ND	0.05	ug/g dry	ND				50	
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
Tetrachloroethylene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
1,1,1-Trichloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2-Trichloroethane	ND	0.05	ug/g dry	ND				50	
Trichloroethylene	ND	0.05	ug/g dry	ND				50	
Trichlorofluoromethane	ND	0.05	ug/g dry	ND				50	
Vinyl chloride	ND	0.02	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: 4-Bromofluorobenzene	*4.34*		*ug/g dry*		*123*	*50-140*			
Surrogate: Dibromofluoromethane	*3.53*		*ug/g dry*		*100*	*50-140*			
Surrogate: Toluene-d8	*2.98*		*ug/g dry*		*84.6*	*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)	196	7	ug/g		97.9	80-120			
F2 PHCs (C10-C16)	96	4	ug/g	ND	111	60-140			
F3 PHCs (C16-C34)	282	8	ug/g	ND	133	60-140			
F4 PHCs (C34-C50)	164	6	ug/g	ND	122	60-140			
Metals									
Antimony	39.3		ug/L	ND	77.4	70-130			
Arsenic	52.3		ug/L	3.3	98.0	70-130			
Barium	105		ug/L	54.9	101	70-130			
Beryllium	47.4		ug/L	ND	94.2	70-130			
Boron	47.3		ug/L	ND	85.7	70-130			
Cadmium	47.4		ug/L	1.3	92.1	70-130			
Chromium (VI)	3.7	0.2	ug/g		74.5	70-130			
Chromium	59.8		ug/L	10.7	98.1	70-130			
Cobalt	51.1		ug/L	3.4	95.3	70-130			
Copper	72.8		ug/L	24.4	97.0	70-130			
Lead	87.4		ug/L	41.3	92.2	70-130			
Mercury	1.51	0.1	ug/g	0.113	93.2	70-130			
Molybdenum	47.4		ug/L	ND	93.5	70-130			
Nickel	56.7		ug/L	9.6	94.2	70-130			
Selenium	48.4		ug/L	ND	96.2	70-130			
Silver	39.4		ug/L	ND	78.7	70-130			
Thallium	44.3		ug/L	ND	88.4	70-130			
Uranium	46.6		ug/L	ND	92.5	70-130			
Vanadium	61.9		ug/L	12.9	98.1	70-130			
Zinc	124		ug/L	77.2	94.3	70-130			
Semi-Volatiles									
Acenaphthene	0.134	0.02	ug/g	ND	66.3	50-140			
Acenaphthylene	0.128	0.02	ug/g	ND	63.2	50-140			
Anthracene	0.150	0.02	ug/g	ND	74.1	50-140			
Benzo [a] anthracene	0.187	0.02	ug/g	0.044	70.6	50-140			
Benzo [a] pyrene	0.146	0.02	ug/g	0.034	55.2	50-140			
Benzo [b] fluoranthene	0.236	0.02	ug/g	0.042	96.3	50-140			
Benzo [g,h,i] perylene	0.130	0.02	ug/g	0.025	51.7	50-140			
Benzo [k] fluoranthene	0.182	0.02	ug/g	0.026	77.2	50-140			
Chrysene	0.236	0.02	ug/g	0.056	89.0	50-140			
Dibenzo [a,h] anthracene	0.099	0.02	ug/g		59.2	50-140			
Fluoranthene	0.247	0.02	ug/g	0.094	75.5	50-140			
Fluorene	0.125	0.02	ug/g	ND	61.8	50-140			
Indeno [1,2,3-cd] pyrene	0.125	0.02	ug/g	ND	61.8	50-140			
1-Methylnaphthalene	0.140	0.02	ug/g	ND	69.0	50-140			
2-Methylnaphthalene	0.152	0.02	ug/g	ND	75.2	50-140			
Naphthalene	0.133	0.01	ug/g	ND	65.7	50-140			
Phenanthrene	0.219	0.02	ug/g	0.071	73.1	50-140			
Pyrene	0.245	0.02	ug/g	0.088	77.6	50-140			
Surrogate: 2-Fluorobiphenyl	*0.998*		*ug/g*		*61.6*	*50-140*			
Volatiles									
Acetone	13.0	0.50	ug/g		130	50-140			
Benzene	4.13	0.02	ug/g		103	60-130			
Bromodichloromethane	4.50	0.05	ug/g		112	60-130			
Bromoform	4.08	0.05	ug/g		102	60-130			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Bromomethane	2.37	0.05	ug/g		59.2	50-140			
Carbon Tetrachloride	3.97	0.05	ug/g		99.3	60-130			
Chlorobenzene	3.78	0.05	ug/g		94.5	60-130			
Chloroform	4.73	0.05	ug/g		118	60-130			
Dibromochloromethane	4.06	0.05	ug/g		101	60-130			
Dichlorodifluoromethane	2.49	0.05	ug/g		62.2	50-140			
1,2-Dichlorobenzene	2.84	0.05	ug/g		71.0	60-130			
1,3-Dichlorobenzene	2.96	0.05	ug/g		74.1	60-130			
1,4-Dichlorobenzene	2.93	0.05	ug/g		73.2	60-130			
1,1-Dichloroethane	4.73	0.05	ug/g		118	60-130			
1,2-Dichloroethane	4.82	0.05	ug/g		120	60-130			
1,1-Dichloroethylene	3.91	0.05	ug/g		97.9	60-130			
cis-1,2-Dichloroethylene	4.16	0.05	ug/g		104	60-130			
trans-1,2-Dichloroethylene	3.70	0.05	ug/g		92.5	60-130			
1,2-Dichloropropane	4.67	0.05	ug/g		117	60-130			
cis-1,3-Dichloropropylene	2.74	0.05	ug/g		68.6	60-130			
trans-1,3-Dichloropropylene	3.17	0.05	ug/g		79.1	60-130			
Ethylbenzene	4.19	0.05	ug/g		105	60-130			
Ethylene dibromide (dibromoethane	4.01	0.05	ug/g		100	60-130			
Hexane	3.96	0.05	ug/g		99.1	60-130			
Methyl Ethyl Ketone (2-Butanone)	12.0	0.50	ug/g		120	50-140			
Methyl Isobutyl Ketone	11.4	0.50	ug/g		114	50-140			
Methyl tert-butyl ether	9.57	0.05	ug/g		95.7	50-140			
Methylene Chloride	5.12	0.05	ug/g		128	60-130			
Styrene	4.17	0.05	ug/g		104	60-130			
1,1,1,2-Tetrachloroethane	3.95	0.05	ug/g		98.9	60-130			
1,1,2,2-Tetrachloroethane	4.32	0.05	ug/g		108	60-130			
Tetrachloroethylene	3.27	0.05	ug/g		81.8	60-130			
Toluene	3.99	0.05	ug/g		99.7	60-130			
1,1,1-Trichloroethane	3.89	0.05	ug/g		97.4	60-130			
1,1,2-Trichloroethane	4.87	0.05	ug/g		122	60-130			
Trichloroethylene	3.61	0.05	ug/g		90.3	60-130			
Trichlorofluoromethane	3.61	0.05	ug/g		90.4	50-140			
Vinyl chloride	2.68	0.02	ug/g		67.1	50-140			
m,p-Xylenes	7.76	0.05	ug/g		97.1	60-130			
o-Xylene	4.48	0.05	ug/g		112	60-130			

Qualifier Notes:

Sample Qualifiers :

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

QC Qualifiers :

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

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.
- When reported, data for F4G has been processed using a silica gel cleanup.

PARACEL LABORATORIES LTD.

Paracel ID: 1929255

Head Office
300-2319 St. Laurent Blvd.
Ottawa, Ontario K1G 4J8
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Chain of Custody
(Lab Use Only)
№ 122828

Page 1 of 1

Client Name: Paterson	Project Reference: PE4614	**Turnaround Time:**
Contact Name: Mark D'Arcy	Quote #	☐ 1 Day ☐ 3 Day
Address:	PO # 26976	☐ 2 Day ☑ Regular
Telephone: 226-7381	Email Address:	Date Required:

Criteria: ☑ O. Reg. 153/04 (As Amended) Table __ ☐ 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: 1929255

	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)	PHC (F2-F4)					
1	BH7-AU1	S		1	July 15	10 am				✓	✓	✓						120 ml jar	
2	BH7-SS3	S		2	2019	10 am		✓										120 ml jar x vial	
3	BH8-SS4	S		2	"	11 am	✓	✓										"	
4	BH8-SS9	S		2	"	11 am		✓										"	
5	BH9-AU1	S		1	"	12:30pm								✓				120 ml jar x vial	
6	BH9-SS6	S		2	"	12:30pm	~~✓~~	✓										"	
7	BH9-SS9	S		2	"	12:30pm	~~✓~~	✓										"	
8	BH10-SS2	S		1	"	1:30pm			✓	✓	✓	✓						250 ml jar	
9																			
10																			

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: A. Foulie	Received at Lab: Samuel	Verified By: SD
Relinquished By (Print): Mark St.Pierre	Date/Time: 16/07/19 2:40	Date/Time: 07/16/19 15:27	Date/Time: 16/7/19 16:30
Date/Time:	Temperature: °C FA	Temperature: 9.5 °C	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 30555
Project: PE4614
Custody: 125769

Report Date: 2-Sep-2020
Order Date: 27-Aug-2020

Order #: 2035556

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

Paracel ID	Client ID
2035556-01	BH11-20-AU1
2035556-02	BH11-20-SS2
2035556-03	BH11-20-SS4
2035556-04	BH13-20-AU1
2035556-05	BH13-20-SS3
2035556-06	BH13-20-SS7
2035556-07	BH14-20-SS2

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 02-Sep-2020

Client: Paterson Group Consulting Engineers

Order Date: 27-Aug-2020

Client PO: 30555

Project Description: PE4614

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	28-Aug-20	28-Aug-20
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	28-Aug-20	29-Aug-20
Mercury by CVAA	EPA 7471B - CVAA, digestion	1-Sep-20	1-Sep-20
PHC F1	CWS Tier 1 - P&T GC-FID	28-Aug-20	28-Aug-20
PHC F4G (gravimetric)	CWS Tier 1 - Extraction Gravimetric	1-Sep-20	2-Sep-20
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	28-Aug-20	2-Sep-20
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	31-Aug-20	31-Aug-20
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	28-Aug-20	1-Sep-20
REG 153: VOCs by P&T GC/MS	EPA 8260 - P&T GC-MS	28-Aug-20	28-Aug-20
Solids, %	Gravimetric, calculation	28-Aug-20	31-Aug-20

Certificate of Analysis

Report Date: 02-Sep-2020

Client: Paterson Group Consulting Engineers

Order Date: 27-Aug-2020

Client PO: 30555

Project Description: PE4614

	Client ID:	BH11-20-AU1	BH11-20-SS2	BH11-20-SS4	BH13-20-AU1
	Sample Date:	24-Aug-20 09:00	24-Aug-20 09:00	24-Aug-20 09:00	24-Aug-20 09:00
	Sample ID:	2035556-01	2035556-02	2035556-03	2035556-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	94.8	85.3	90.8	91.6
Metals					
Antimony	1.0 ug/g dry	-	<1.0	-	-
Arsenic	1.0 ug/g dry	-	8.2	-	-
Barium	1.0 ug/g dry	-	180	-	-
Beryllium	0.5 ug/g dry	-	0.8	-	-
Boron	5.0 ug/g dry	-	9.0	-	-
Cadmium	0.5 ug/g dry	-	<0.5	-	-
Chromium	5.0 ug/g dry	-	30.4	-	-
Chromium (VI)	0.2 ug/g dry	-	<0.2	-	-
Cobalt	1.0 ug/g dry	-	9.5	-	-
Copper	5.0 ug/g dry	-	63.1	-	-
Lead	1.0 ug/g dry	-	226	-	-
Mercury	0.1 ug/g dry	-	1.4	-	-
Molybdenum	1.0 ug/g dry	-	2.2	-	-
Nickel	5.0 ug/g dry	-	34.8	-	-
Selenium	1.0 ug/g dry	-	<1.0	-	-
Silver	0.3 ug/g dry	-	1.1	-	-
Thallium	1.0 ug/g dry	-	<1.0	-	-
Uranium	1.0 ug/g dry	-	2.4	-	-
Vanadium	10.0 ug/g dry	-	30.5	-	-
Zinc	20.0 ug/g dry	-	175	-	-
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	-	-	108%	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	-	-	<7	-
F2 PHCs (C10-C16)	4 ug/g dry	<40 [1]	-	35	5
F3 PHCs (C16-C34)	8 ug/g dry	131	-	83	54
F4 PHCs (C34-C50)	6 ug/g dry	877 [2]	-	36	57

Certificate of Analysis

Report Date: 02-Sep-2020

Client: Paterson Group Consulting Engineers

Order Date: 27-Aug-2020

Client PO: 30555

Project Description: PE4614

	Client ID:	BH11-20-AU1	BH11-20-SS2	BH11-20-SS4	BH13-20-AU1
	Sample Date:	24-Aug-20 09:00	24-Aug-20 09:00	24-Aug-20 09:00	24-Aug-20 09:00
	Sample ID:	2035556-01	2035556-02	2035556-03	2035556-04
	MDL/Units	Soil	Soil	Soil	Soil
F4G PHCs (gravimetric)	50 ug/g dry	1730	-	-	-
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	-	<0.02	-	-
Acenaphthylene	0.02 ug/g dry	-	0.05	-	-
Anthracene	0.02 ug/g dry	-	0.05	-	-
Benzo [a] anthracene	0.02 ug/g dry	-	0.13	-	-
Benzo [a] pyrene	0.02 ug/g dry	-	0.14	-	-
Benzo [b] fluoranthene	0.02 ug/g dry	-	0.19	-	-
Benzo [g,h,i] perylene	0.02 ug/g dry	-	0.10	-	-
Benzo [k] fluoranthene	0.02 ug/g dry	-	0.10	-	-
Chrysene	0.02 ug/g dry	-	0.13	-	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	-	0.03	-	-
Fluoranthene	0.02 ug/g dry	-	0.27	-	-
Fluorene	0.02 ug/g dry	-	<0.02	-	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	-	0.09	-	-
1-Methylnaphthalene	0.02 ug/g dry	-	<0.02	-	-
2-Methylnaphthalene	0.02 ug/g dry	-	<0.02	-	-
Methylnaphthalene (1&2)	0.04 ug/g dry	-	<0.04	-	-
Naphthalene	0.01 ug/g dry	-	<0.01	-	-
Phenanthrene	0.02 ug/g dry	-	0.15	-	-
Pyrene	0.02 ug/g dry	-	0.24	-	-
2-Fluorobiphenyl	Surrogate	-	92.6%	-	-
Terphenyl-d14	Surrogate	-	110%	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 30555

Report Date: 02-Sep-2020

Order Date: 27-Aug-2020

Project Description: PE4614

	Client ID:	BH13-20-SS3	BH13-20-SS7	BH14-20-SS2	-
	Sample Date:	24-Aug-20 09:00	24-Aug-20 09:00	24-Aug-20 09:00	-
	Sample ID:	2035556-05	2035556-06	2035556-07	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	96.7	89.8	94.0	-
Metals					
Antimony	1.0 ug/g dry	<1.0	-	3.9	-
Arsenic	1.0 ug/g dry	2.0	-	2.3	-
Barium	1.0 ug/g dry	14.8	-	99.5	-
Beryllium	0.5 ug/g dry	<0.5	-	<0.5	-
Boron	5.0 ug/g dry	<5.0	-	7.6	-
Cadmium	0.5 ug/g dry	<0.5	-	<0.5	-
Chromium	5.0 ug/g dry	7.9	-	13.7	-
Chromium (VI)	0.2 ug/g dry	<0.2	-	0.3	-
Cobalt	1.0 ug/g dry	3.5	-	5.4	-
Copper	5.0 ug/g dry	8.0	-	18.4	-
Lead	1.0 ug/g dry	3.6	-	22.7	-
Mercury	0.1 ug/g dry	<0.1	-	0.2	-
Molybdenum	1.0 ug/g dry	<1.0	-	<1.0	-
Nickel	5.0 ug/g dry	10.1	-	11.6	-
Selenium	1.0 ug/g dry	<1.0	-	<1.0	-
Silver	0.3 ug/g dry	<0.3	-	<0.3	-
Thallium	1.0 ug/g dry	<1.0	-	<1.0	-
Uranium	1.0 ug/g dry	<1.0	-	<1.0	-
Vanadium	10.0 ug/g dry	14.6	-	16.5	-
Zinc	20.0 ug/g dry	<20.0	-	36.6	-
Volatiles					
Acetone	0.50 ug/g dry	-	<0.50	-	-
Benzene	0.02 ug/g dry	-	<0.02	-	-
Bromodichloromethane	0.05 ug/g dry	-	<0.05	-	-
Bromoform	0.05 ug/g dry	-	<0.05	-	-
Bromomethane	0.05 ug/g dry	-	<0.05	-	-
Carbon Tetrachloride	0.05 ug/g dry	-	<0.05	-	-
Chlorobenzene	0.05 ug/g dry	-	<0.05	-	-
Chloroform	0.05 ug/g dry	-	<0.05	-	-
Dibromochloromethane	0.05 ug/g dry	-	<0.05	-	-
Dichlorodifluoromethane	0.05 ug/g dry	-	<0.05	-	-
1,2-Dichlorobenzene	0.05 ug/g dry	-	<0.05	-	-
1,3-Dichlorobenzene	0.05 ug/g dry	-	<0.05	-	-

Certificate of Analysis

Report Date: 02-Sep-2020

Client: Paterson Group Consulting Engineers

Order Date: 27-Aug-2020

Client PO: 30555

Project Description: PE4614

	Client ID:	BH13-20-SS3	BH13-20-SS7	BH14-20-SS2	-
	Sample Date:	24-Aug-20 09:00	24-Aug-20 09:00	24-Aug-20 09:00	-
	Sample ID:	2035556-05	2035556-06	2035556-07	-
	MDL/Units	Soil	Soil	Soil	-
1,4-Dichlorobenzene	0.05 ug/g dry	-	<0.05	-	-
1,1-Dichloroethane	0.05 ug/g dry	-	<0.05	-	-
1,2-Dichloroethane	0.05 ug/g dry	-	<0.05	-	-
1,1-Dichloroethylene	0.05 ug/g dry	-	<0.05	-	-
cis-1,2-Dichloroethylene	0.05 ug/g dry	-	<0.05	-	-
trans-1,2-Dichloroethylene	0.05 ug/g dry	-	<0.05	-	-
1,2-Dichloropropane	0.05 ug/g dry	-	<0.05	-	-
cis-1,3-Dichloropropylene	0.05 ug/g dry	-	<0.05	-	-
trans-1,3-Dichloropropylene	0.05 ug/g dry	-	<0.05	-	-
1,3-Dichloropropene, total	0.05 ug/g dry	-	<0.05	-	-
Ethylbenzene	0.05 ug/g dry	-	<0.05	-	-
Ethylene dibromide (dibromoethane, 1	0.05 ug/g dry	-	<0.05	-	-
Hexane	0.05 ug/g dry	-	<0.05	-	-
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	-	<0.50	-	-
Methyl Isobutyl Ketone	0.50 ug/g dry	-	<0.50	-	-
Methyl tert-butyl ether	0.05 ug/g dry	-	<0.05	-	-
Methylene Chloride	0.05 ug/g dry	-	<0.05	-	-
Styrene	0.05 ug/g dry	-	<0.05	-	-
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	-	<0.05	-	-
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	-	<0.05	-	-
Tetrachloroethylene	0.05 ug/g dry	-	<0.05	-	-
Toluene	0.05 ug/g dry	-	<0.05	-	-
1,1,1-Trichloroethane	0.05 ug/g dry	-	<0.05	-	-
1,1,2-Trichloroethane	0.05 ug/g dry	-	<0.05	-	-
Trichloroethylene	0.05 ug/g dry	-	<0.05	-	-
Trichlorofluoromethane	0.05 ug/g dry	-	<0.05	-	-
Vinyl chloride	0.02 ug/g dry	-	<0.02	-	-
m,p-Xylenes	0.05 ug/g dry	-	<0.05	-	-
o-Xylene	0.05 ug/g dry	-	<0.05	-	-
Xylenes, total	0.05 ug/g dry	-	<0.05	-	-
4-Bromofluorobenzene	Surrogate	-	111%	-	-
Dibromofluoromethane	Surrogate	-	98.5%	-	-
Toluene-d8	Surrogate	-	96.2%	-	-
Hydrocarbons					
F2 PHCs (C10-C16)	4 ug/g dry	<4	-	-	-

Certificate of Analysis

Report Date: 02-Sep-2020

Client: Paterson Group Consulting Engineers

Order Date: 27-Aug-2020

Client PO: 30555

Project Description: PE4614

	Client ID:	BH13-20-SS3	BH13-20-SS7	BH14-20-SS2	-
	Sample Date:	24-Aug-20 09:00	24-Aug-20 09:00	24-Aug-20 09:00	-
	Sample ID:	2035556-05	2035556-06	2035556-07	-
	MDL/Units	Soil	Soil	Soil	-
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						
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	*1.26*		*ug/g*		*94.6*	*50-140*			
Surrogate: Terphenyl-d14	*1.57*		*ug/g*		*118*	*50-140*			
Volatiles									
Acetone	ND	0.50	ug/g						
Benzene	ND	0.02	ug/g						
Bromodichloromethane	ND	0.05	ug/g						
Bromoform	ND	0.05	ug/g						
Bromomethane	ND	0.05	ug/g						
Carbon Tetrachloride	ND	0.05	ug/g						
Chlorobenzene	ND	0.05	ug/g						
Chloroform	ND	0.05	ug/g						
Dibromochloromethane	ND	0.05	ug/g						

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Dichlorodifluoromethane	ND	0.05	ug/g						
1,2-Dichlorobenzene	ND	0.05	ug/g						
1,3-Dichlorobenzene	ND	0.05	ug/g						
1,4-Dichlorobenzene	ND	0.05	ug/g						
1,1-Dichloroethane	ND	0.05	ug/g						
1,2-Dichloroethane	ND	0.05	ug/g						
1,1-Dichloroethylene	ND	0.05	ug/g						
cis-1,2-Dichloroethylene	ND	0.05	ug/g						
trans-1,2-Dichloroethylene	ND	0.05	ug/g						
1,2-Dichloropropane	ND	0.05	ug/g						
cis-1,3-Dichloropropylene	ND	0.05	ug/g						
trans-1,3-Dichloropropylene	ND	0.05	ug/g						
1,3-Dichloropropene, total	ND	0.05	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Ethylene dibromide (dibromoethane, 1,2-	ND	0.05	ug/g						
Hexane	ND	0.05	ug/g						
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g						
Methyl Isobutyl Ketone	ND	0.50	ug/g						
Methyl tert-butyl ether	ND	0.05	ug/g						
Methylene Chloride	ND	0.05	ug/g						
Styrene	ND	0.05	ug/g						
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g						
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g						
Tetrachloroethylene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
1,1,1-Trichloroethane	ND	0.05	ug/g						
1,1,2-Trichloroethane	ND	0.05	ug/g						
Trichloroethylene	ND	0.05	ug/g						
Trichlorofluoromethane	ND	0.05	ug/g						
Vinyl chloride	ND	0.02	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: 4-Bromofluorobenzene	*3.56*		*ug/g*		*111*	*50-140*			
Surrogate: Dibromofluoromethane	*3.26*		*ug/g*		*102*	*50-140*			
Surrogate: Toluene-d8	*3.79*		*ug/g*		*118*	*50-140*			
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*3.79*		*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	1.4	1.0	ug/g dry	ND			NC	30	
Arsenic	10.0	1.0	ug/g dry	8.2			19.8	30	
Barium	198	1.0	ug/g dry	180			9.3	30	
Beryllium	0.9	0.5	ug/g dry	0.8			4.6	30	
Boron	10.7	5.0	ug/g dry	9.0			18.2	30	
Cadmium	ND	0.5	ug/g dry	ND			NC	30	
Chromium (VI)	ND	0.2	ug/g dry	ND			NC	35	
Chromium	34.2	5.0	ug/g dry	30.4			11.8	30	
Cobalt	10.7	1.0	ug/g dry	9.5			11.5	30	
Copper	69.8	5.0	ug/g dry	63.1			10.0	30	
Lead	230	1.0	ug/g dry	226			1.4	30	
Mercury	1.58	0.1	ug/g dry	1.35			15.9	30	
Molybdenum	2.8	1.0	ug/g dry	2.2			24.2	30	
Nickel	39.1	5.0	ug/g dry	34.8			11.7	30	
Selenium	1.1	1.0	ug/g dry	ND			NC	30	
Silver	1.3	0.3	ug/g dry	1.1			18.1	30	
Thallium	ND	1.0	ug/g dry	ND			NC	30	
Uranium	2.6	1.0	ug/g dry	2.4			10.5	30	
Vanadium	34.9	10.0	ug/g dry	30.5			13.5	30	
Zinc	193	20.0	ug/g dry	175			10.0	30	
Physical Characteristics									
% Solids	95.5	0.1	% by Wt.	94.8			0.7	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	ND			NC	40	
Acenaphthylene	0.044	0.02	ug/g dry	0.051			16.0	40	
Anthracene	0.034	0.02	ug/g dry	0.053			NC	40	
Benzo [a] anthracene	0.088	0.02	ug/g dry	0.130			38.9	40	
Benzo [a] pyrene	0.104	0.02	ug/g dry	0.144			32.3	40	
Benzo [b] fluoranthene	0.143	0.02	ug/g dry	0.187			27.1	40	
Benzo [g,h,i] perylene	0.082	0.02	ug/g dry	0.099			19.5	40	
Benzo [k] fluoranthene	0.063	0.02	ug/g dry	0.098			NC	40	
Chrysene	0.101	0.02	ug/g dry	0.132			26.6	40	
Dibenzo [a,h] anthracene	0.021	0.02	ug/g dry	0.027			24.3	40	
Fluoranthene	0.164	0.02	ug/g dry	0.272			NC	40	
Fluorene	ND	0.02	ug/g dry	ND			NC	40	
Indeno [1,2,3-cd] pyrene	0.067	0.02	ug/g dry	0.092			31.9	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	0.083	0.02	ug/g dry	0.150			NC	40	
Pyrene	0.151	0.02	ug/g dry	0.238			NC	40	
Surrogate: 2-Fluorobiphenyl	*1.52*		*ug/g dry*		*97.2*	*50-140*			
Surrogate: Terphenyl-d14	*1.81*		*ug/g dry*		*116*	*50-140*			
Volatiles									
Acetone	ND	0.50	ug/g dry	ND			NC	50	
Benzene	ND	0.02	ug/g dry	ND			NC	50	
Bromodichloromethane	ND	0.05	ug/g dry	ND			NC	50	
Bromoform	ND	0.05	ug/g dry	ND			NC	50	
Bromomethane	ND	0.05	ug/g dry	ND			NC	50	
Carbon Tetrachloride	ND	0.05	ug/g dry	ND			NC	50	
Chlorobenzene	ND	0.05	ug/g dry	ND			NC	50	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Chloroform	ND	0.05	ug/g dry	ND			NC	50	
Dibromochloromethane	ND	0.05	ug/g dry	ND			NC	50	
Dichlorodifluoromethane	ND	0.05	ug/g dry	ND			NC	50	
1,2-Dichlorobenzene	ND	0.05	ug/g dry	ND			NC	50	
1,3-Dichlorobenzene	ND	0.05	ug/g dry	ND			NC	50	
1,4-Dichlorobenzene	ND	0.05	ug/g dry	ND			NC	50	
1,1-Dichloroethane	ND	0.05	ug/g dry	ND			NC	50	
1,2-Dichloroethane	ND	0.05	ug/g dry	ND			NC	50	
1,1-Dichloroethylene	ND	0.05	ug/g dry	ND			NC	50	
cis-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND			NC	50	
trans-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND			NC	50	
1,2-Dichloropropane	ND	0.05	ug/g dry	ND			NC	50	
cis-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND			NC	50	
trans-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND			NC	50	
Ethylbenzene	ND	0.05	ug/g dry	ND			NC	50	
Ethylene dibromide (dibromoethane, 1,2	ND	0.05	ug/g dry	ND			NC	50	
Hexane	ND	0.05	ug/g dry	ND			NC	50	
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g dry	ND			NC	50	
Methyl Isobutyl Ketone	ND	0.50	ug/g dry	ND			NC	50	
Methyl tert-butyl ether	ND	0.05	ug/g dry	ND			NC	50	
Methylene Chloride	ND	0.05	ug/g dry	ND			NC	50	
Styrene	ND	0.05	ug/g dry	ND			NC	50	
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g dry	ND			NC	50	
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g dry	ND			NC	50	
Tetrachloroethylene	ND	0.05	ug/g dry	ND			NC	50	
Toluene	ND	0.05	ug/g dry	ND			NC	50	
1,1,1-Trichloroethane	ND	0.05	ug/g dry	ND			NC	50	
1,1,2-Trichloroethane	ND	0.05	ug/g dry	ND			NC	50	
Trichloroethylene	ND	0.05	ug/g dry	ND			NC	50	
Trichlorofluoromethane	ND	0.05	ug/g dry	ND			NC	50	
Vinyl chloride	ND	0.02	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: 4-Bromofluorobenzene	*4.04*		*ug/g dry*		*110*	*50-140*			
Surrogate: Dibromofluoromethane	*3.84*		*ug/g dry*		*105*	*50-140*			
Surrogate: Toluene-d8	*4.31*		*ug/g dry*		*118*	*50-140*			
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	*4.31*		*ug/g dry*		*118*	*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)	202	7	ug/g	ND	101	80-120			
F2 PHCs (C10-C16)	116	4	ug/g	ND	94.9	60-140			
F3 PHCs (C16-C34)	307	8	ug/g	ND	102	60-140			
F4 PHCs (C34-C50)	204	6	ug/g	ND	107	60-140			
F4G PHCs (gravimetric)	820	50	ug/g	ND	82.0	80-120			
Metals									
Antimony	45.4	1.0	ug/g	ND	90.2	70-130			
Arsenic	53.3	1.0	ug/g	3.3	100	70-130			
Barium	126	1.0	ug/g	72.0	107	70-130			
Beryllium	48.2	0.5	ug/g	ND	95.8	70-130			
Boron	46.3	5.0	ug/g	ND	85.4	70-130			
Cadmium	47.2	0.5	ug/g	ND	94.1	70-130			
Chromium (VI)	0.1	0.2	ug/g	ND	65.0	70-130			QM-05
Chromium	63.8	5.0	ug/g	12.2	103	70-130			
Cobalt	53.3	1.0	ug/g	3.8	98.9	70-130			
Copper	75.4	5.0	ug/g	25.3	100	70-130			
Lead	135	1.0	ug/g	90.6	89.7	70-130			
Mercury	3.03	0.1	ug/g	1.35	112	70-130			
Molybdenum	49.0	1.0	ug/g	ND	96.3	70-130			
Nickel	63.6	5.0	ug/g	13.9	99.3	70-130			
Selenium	46.4	1.0	ug/g	ND	92.2	70-130			
Silver	44.3	0.3	ug/g	0.4	87.7	70-130			
Thallium	46.5	1.0	ug/g	ND	92.8	70-130			
Uranium	48.4	1.0	ug/g	ND	95.0	70-130			
Vanadium	63.8	10.0	ug/g	12.2	103	70-130			
Zinc	121	20.0	ug/g	69.9	102	70-130			
Semi-Volatiles									
Acenaphthene	0.210	0.02	ug/g	ND	107	50-140			
Acenaphthylene	0.233	0.02	ug/g	0.051	93.0	50-140			
Anthracene	0.258	0.02	ug/g	0.053	105	50-140			
Benzo [a] anthracene	0.354	0.02	ug/g	0.130	115	50-140			
Benzo [a] pyrene	0.364	0.02	ug/g	0.144	113	50-140			
Benzo [b] fluoranthene	0.489	0.02	ug/g	0.187	154	50-140			QM-06
Benzo [g,h,i] perylene	0.281	0.02	ug/g	0.099	93.2	50-140			
Benzo [k] fluoranthene	0.351	0.02	ug/g	0.098	129	50-140			
Chrysene	0.405	0.02	ug/g	0.132	140	50-140			
Dibenzo [a,h] anthracene	0.202	0.02	ug/g	0.027	89.5	50-140			
Fluoranthene	0.601	0.02	ug/g	0.272	169	50-140			QM-06
Fluorene	0.199	0.02	ug/g	ND	102	50-140			
Indeno [1,2,3-cd] pyrene	0.290	0.02	ug/g	0.092	101	50-140			
1-Methylnaphthalene	0.197	0.02	ug/g	ND	101	50-140			
2-Methylnaphthalene	0.218	0.02	ug/g	ND	112	50-140			
Naphthalene	0.208	0.01	ug/g	ND	106	50-140			
Phenanthrene	0.442	0.02	ug/g	0.150	149	50-140			QM-06
Pyrene	0.539	0.02	ug/g	0.238	154	50-140			QM-06
Surrogate: 2-Fluorobiphenyl	*1.60*		*ug/g*		*103*	*50-140*			
Surrogate: Terphenyl-d14	*1.91*		*ug/g*		*122*	*50-140*			
Volatiles									

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Acetone	12.8	0.50	ug/g	ND	128	50-140			
Benzene	3.41	0.02	ug/g	ND	85.2	60-130			
Bromodichloromethane	3.39	0.05	ug/g	ND	84.8	60-130			
Bromoform	3.79	0.05	ug/g	ND	94.8	60-130			
Bromomethane	3.73	0.05	ug/g	ND	93.1	50-140			
Carbon Tetrachloride	3.19	0.05	ug/g	ND	79.8	60-130			
Chlorobenzene	4.13	0.05	ug/g	ND	103	60-130			
Chloroform	3.39	0.05	ug/g	ND	84.7	60-130			
Dibromochloromethane	4.08	0.05	ug/g	ND	102	60-130			
Dichlorodifluoromethane	3.85	0.05	ug/g	ND	96.2	50-140			
1,2-Dichlorobenzene	3.58	0.05	ug/g	ND	89.4	60-130			
1,3-Dichlorobenzene	3.48	0.05	ug/g	ND	87.1	60-130			
1,4-Dichlorobenzene	3.55	0.05	ug/g	ND	88.7	60-130			
1,1-Dichloroethane	3.47	0.05	ug/g	ND	86.6	60-130			
1,2-Dichloroethane	3.27	0.05	ug/g	ND	81.8	60-130			
1,1-Dichloroethylene	3.06	0.05	ug/g	ND	76.5	60-130			
cis-1,2-Dichloroethylene	3.16	0.05	ug/g	ND	79.1	60-130			
trans-1,2-Dichloroethylene	3.27	0.05	ug/g	ND	81.8	60-130			
1,2-Dichloropropane	3.12	0.05	ug/g	ND	78.0	60-130			
cis-1,3-Dichloropropylene	3.02	0.05	ug/g	ND	75.5	60-130			
trans-1,3-Dichloropropylene	2.74	0.05	ug/g	ND	68.5	60-130			
Ethylbenzene	4.08	0.05	ug/g	ND	102	60-130			
Ethylene dibromide (dibromoethane, 1,2-	4.01	0.05	ug/g	ND	100	60-130			
Hexane	2.86	0.05	ug/g	ND	71.5	60-130			
Methyl Ethyl Ketone (2-Butanone)	6.96	0.50	ug/g	ND	69.6	50-140			
Methyl Isobutyl Ketone	7.81	0.50	ug/g	ND	78.1	50-140			
Methyl tert-butyl ether	6.97	0.05	ug/g	ND	69.7	50-140			
Methylene Chloride	3.28	0.05	ug/g	ND	82.0	60-130			
Styrene	3.67	0.05	ug/g	ND	91.7	60-130			
1,1,1,2-Tetrachloroethane	4.05	0.05	ug/g	ND	101	60-130			
1,1,2,2-Tetrachloroethane	4.74	0.05	ug/g	ND	119	60-130			
Tetrachloroethylene	3.56	0.05	ug/g	ND	89.0	60-130			
Toluene	4.28	0.05	ug/g	ND	107	60-130			
1,1,1-Trichloroethane	3.13	0.05	ug/g	ND	78.3	60-130			
1,1,2-Trichloroethane	3.41	0.05	ug/g	ND	85.2	60-130			
Trichloroethylene	3.11	0.05	ug/g	ND	77.7	60-130			
Trichlorofluoromethane	4.11	0.05	ug/g	ND	103	50-140			
Vinyl chloride	3.32	0.02	ug/g	ND	83.1	50-140			
m,p-Xylenes	8.46	0.05	ug/g	ND	106	60-130			
o-Xylene	4.53	0.05	ug/g	ND	113	60-130			
Surrogate: 4-Bromofluorobenzene	*2.59*		*ug/g*		*80.9*	*50-140*			
Surrogate: Dibromofluoromethane	*3.57*		*ug/g*		*111*	*50-140*			
Surrogate: Toluene-d8	*2.91*		*ug/g*		*91.1*	*50-140*			
Benzene	3.41	0.02	ug/g	ND	85.2	60-130			
Ethylbenzene	4.08	0.05	ug/g	ND	102	60-130			
Toluene	4.28	0.05	ug/g	ND	107	60-130			
m,p-Xylenes	8.46	0.05	ug/g	ND	106	60-130			
o-Xylene	4.53	0.05	ug/g	ND	113	60-130			
Surrogate: Toluene-d8	*2.91*		*ug/g*		*91.1*	*50-140*			

Qualifier Notes:

Sample Qualifiers :

1 : Elevated detection limits due to the nature of the sample matrix.

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

QC Qualifiers :

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

QM-06 : Due to noted non-homogeneity of the QC sample matrix, the spike recoveries were out side the accepted range. Batch data accepted based on other QC.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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Paracel Order Number (Lab Use Only): 2035556

Chain Of Custody (Lab Use Only)

Nº 125769

Client Name: PATERSON	Project Ref: PE4614	Page 1 of 1
Contact Name: Mark D'Arcy	Quote #:	Turnaround Time
Address: 154 Colonnade Road	PO #: 30555	☐ 1 day ☐ 3 day ☐ 2 day ☑ Regular
Telephone: 613 - 226-7381	E-mail: mdarcy@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)	F2 - F4						
1	BH11-20-AU1	S		1	AUG 24/2020									✓						
2	BH11-20-SS2	↓		1	↓				✓	✓	✓	✓								
3	BH11-20-SS4	↓		2	↓		✓													
4	BH12-20-AU1	↓		1	↓				HOLD											
5	BH13-20-AU1	↓		1	↓									✓						
6	BH13-20-SS3	↓		1	↓					✓	✓	✓		✓						
7	BH13-20-SS7	↓		2	↓			✓												
8	BH14-20-SS2	↓		1	↓					✓	✓	✓								
9		▽			▽															
10																				

Comments:

Method of Delivery: PARACEL COURIER

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Relinquished By (Print): Joshua Dempsey	Date/Time: 27/08/20 3:20	Date/Time: Aug 27, 2020 17:15	Date/Time: 28 Aug 2020 08:31
Date/Time: August 26/2020	Temperature: °C FH.	Temperature: 16.8 °C	pH Verified: ☐ By:

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 26843
Project: PE4614
Custody: 122294

Report Date: 10-Jun-2019
Order Date: 4-Jun-2019

Order #: 1923235

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

Paracel ID	Client ID
1923235-01	BH2-GW1
1923235-02	BH3-GW1
1923235-03	BH4-GW1

Approved By:

Dale Robertson, BSc
Laboratory Director

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHC F1	CWS Tier 1 - P&T GC-FID	7-Jun-19	7-Jun-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	5-Jun-19	7-Jun-19
REG 153: PAHs by GC-MS	EPA 625 - GC-MS, extraction	10-Jun-19	10-Jun-19
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	7-Jun-19	7-Jun-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26843

Report Date: 10-Jun-2019

Order Date: 4-Jun-2019

Project Description: PE4614

	Client ID:	BH2-GW1	BH3-GW1	BH4-GW1	-
	Sample Date:	03-Jun-19 09:00	03-Jun-19 12:00	03-Jun-19 09:00	-
	Sample ID:	1923235-01	1923235-02	1923235-03	-
	MDL/Units	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 (dibromoethar	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
Client: Paterson Group Consulting Engineers
Client PO: 26843

Report Date: 10-Jun-2019
Order Date: 4-Jun-2019
Project Description: PE4614

	Client ID:	BH2-GW1	BH3-GW1	BH4-GW1	-
	Sample Date:	03-Jun-19 09:00	03-Jun-19 12:00	03-Jun-19 09:00	-
	Sample ID:	1923235-01	1923235-02	1923235-03	-
	MDL/Units	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	113%	107%	110%	-
Dibromofluoromethane	Surrogate	91.1%	92.9%	91.8%	-
Toluene-d8	Surrogate	109%	101%	111%	-
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	-
Semi-Volatiles					
Acenaphthene	0.05 ug/L	<0.05	<0.05	<0.05	-
Acenaphthylene	0.05 ug/L	<0.05	<0.05	<0.05	-
Anthracene	0.01 ug/L	0.05	<0.01	<0.01	-
Benzo [a] anthracene	0.01 ug/L	<0.01	<0.01	<0.01	-
Benzo [a] pyrene	0.01 ug/L	0.03	<0.01	<0.01	-
Benzo [b] fluoranthene	0.05 ug/L	<0.05	<0.05	<0.05	-
Benzo [g,h,i] perylene	0.05 ug/L	<0.05	<0.05	<0.05	-
Benzo [k] fluoranthene	0.05 ug/L	<0.05	<0.05	<0.05	-
Chrysene	0.05 ug/L	<0.05	<0.05	<0.05	-
Dibenzo [a,h] anthracene	0.05 ug/L	<0.05	<0.05	<0.05	-
Fluoranthene	0.01 ug/L	0.07	<0.01	<0.01	-
Fluorene	0.05 ug/L	<0.05	<0.05	<0.05	-
Indeno [1,2,3-cd] pyrene	0.05 ug/L	<0.05	<0.05	<0.05	-
1-Methylnaphthalene	0.05 ug/L	<0.05	<0.05	<0.05	-
2-Methylnaphthalene	0.05 ug/L	<0.05	<0.05	<0.05	-
Methylnaphthalene (1&2)	0.10 ug/L	<0.10	<0.10	<0.10	-
Naphthalene	0.05 ug/L	<0.05	<0.05	<0.05	-
Phenanthrene	0.05 ug/L	<0.05	<0.05	<0.05	-
Pyrene	0.01 ug/L	0.06	<0.01	<0.01	-
2-Fluorobiphenyl	Surrogate	88.9%	95.4%	90.4%	-
Terphenyl-d14	Surrogate	109%	121%	115%	-

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	*19.3*		*ug/L*		*96.4*	*50-140*			
Surrogate: Terphenyl-d14	*23.5*		*ug/L*		*117*	*50-140*			
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,	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						

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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	*85.8*		*ug/L*		*107*	*50-140*			
Surrogate: Dibromofluoromethane	*55.0*		*ug/L*		*68.8*	*50-140*			
Surrogate: Toluene-d8	*84.7*		*ug/L*		*106*	*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				30	
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	5.53	0.5	ug/L	4.15			28.5	30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	16.7	0.5	ug/L	14.2			16.6	30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane,	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*81.7*		*ug/L*		*102*	*50-140*			
Surrogate: Dibromofluoromethane	*79.6*		*ug/L*		*99.5*	*50-140*			
Surrogate: Toluene-d8	*80.9*		*ug/L*		*101*	*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)	1660	25	ug/L		82.8	68-117			
F2 PHCs (C10-C16)	1290	100	ug/L		80.4	60-140			
F3 PHCs (C16-C34)	3210	100	ug/L		81.8	60-140			
F4 PHCs (C34-C50)	2200	100	ug/L		88.9	60-140			
Semi-Volatiles									
Acenaphthene	3.94	0.05	ug/L		78.8	50-140			
Acenaphthylene	3.64	0.05	ug/L		72.7	50-140			
Anthracene	4.21	0.01	ug/L		84.1	50-140			
Benzo [a] anthracene	3.95	0.01	ug/L		78.9	50-140			
Benzo [a] pyrene	3.30	0.01	ug/L		66.0	50-140			
Benzo [b] fluoranthene	5.26	0.05	ug/L		105	50-140			
Benzo [g,h,i] perylene	3.15	0.05	ug/L		63.1	50-140			
Benzo [k] fluoranthene	4.96	0.05	ug/L		99.3	50-140			
Chrysene	4.49	0.05	ug/L		89.8	50-140			
Dibenzo [a,h] anthracene	3.42	0.05	ug/L		68.5	50-140			
Fluoranthene	3.95	0.01	ug/L		79.0	50-140			
Fluorene	3.87	0.05	ug/L		77.4	50-140			
Indeno [1,2,3-cd] pyrene	3.48	0.05	ug/L		69.5	50-140			
1-Methylnaphthalene	4.40	0.05	ug/L		88.0	50-140			
2-Methylnaphthalene	4.81	0.05	ug/L		96.1	50-140			
Naphthalene	3.90	0.05	ug/L		78.1	50-140			
Phenanthrene	3.88	0.05	ug/L		77.7	50-140			
Pyrene	4.04	0.01	ug/L		80.7	50-140			
Surrogate: 2-Fluorobiphenyl	*19.9*		*ug/L*		*99.7*	*50-140*			
Volatiles									
Acetone	56.6	5.0	ug/L		56.6	50-140			
Benzene	42.2	0.5	ug/L		105	60-130			
Bromodichloromethane	29.2	0.5	ug/L		73.0	60-130			
Bromoform	25.1	0.5	ug/L		62.8	60-130			
Bromomethane	33.6	0.5	ug/L		84.1	50-140			
Carbon Tetrachloride	28.4	0.2	ug/L		71.0	60-130			
Chlorobenzene	36.3	0.5	ug/L		90.8	60-130			
Chloroform	28.3	0.5	ug/L		70.7	60-130			
Dibromochloromethane	27.2	0.5	ug/L		68.0	60-130			
Dichlorodifluoromethane	24.1	1.0	ug/L		60.2	50-140			
1,2-Dichlorobenzene	44.7	0.5	ug/L		112	60-130			
1,3-Dichlorobenzene	47.2	0.5	ug/L		118	60-130			
1,4-Dichlorobenzene	39.3	0.5	ug/L		98.3	60-130			
1,1-Dichloroethane	30.0	0.5	ug/L		75.1	60-130			
1,2-Dichloroethane	28.3	0.5	ug/L		70.8	60-130			
1,1-Dichloroethylene	33.1	0.5	ug/L		82.7	60-130			
cis-1,2-Dichloroethylene	42.5	0.5	ug/L		106	60-130			
trans-1,2-Dichloroethylene	34.6	0.5	ug/L		86.6	60-130			
1,2-Dichloropropane	40.4	0.5	ug/L		101	60-130			
cis-1,3-Dichloropropylene	46.0	0.5	ug/L		115	60-130			
trans-1,3-Dichloropropylene	43.0	0.5	ug/L		107	60-130			
Ethylbenzene	40.9	0.5	ug/L		102	60-130			
Ethylene dibromide (dibromoethane,	38.1	0.2	ug/L		95.3	60-130			
Hexane	49.8	1.0	ug/L		124	60-130			
Methyl Ethyl Ketone (2-Butanone)	86.5	5.0	ug/L		86.5	50-140			
Methyl Isobutyl Ketone	88.9	5.0	ug/L		88.9	50-140			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Methyl tert-butyl ether	85.3	2.0	ug/L		85.3	50-140			
Methylene Chloride	28.5	5.0	ug/L		71.2	60-130			
Styrene	46.1	0.5	ug/L		115	60-130			
1,1,1,2-Tetrachloroethane	29.3	0.5	ug/L		73.3	60-130			
1,1,2,2-Tetrachloroethane	38.2	0.5	ug/L		95.5	60-130			
Tetrachloroethylene	38.4	0.5	ug/L		96.0	60-130			
Toluene	36.8	0.5	ug/L		92.0	60-130			
1,1,1-Trichloroethane	28.2	0.5	ug/L		70.6	60-130			
1,1,2-Trichloroethane	36.8	0.5	ug/L		92.0	60-130			
Trichloroethylene	34.6	0.5	ug/L		86.6	60-130			
Trichlorofluoromethane	26.1	1.0	ug/L		65.4	60-130			
Vinyl chloride	29.1	0.5	ug/L		72.7	50-140			
m,p-Xylenes	83.6	0.5	ug/L		105	60-130			
o-Xylene	39.0	0.5	ug/L		97.4	60-130			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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.

TR RE RE **PARACEL WO: 1923235**

Head Office
300-2319 St. Laurent Blvd.
Ottawa, Ontario K1G 4J8
p: 1-800-749-1947
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Chain of Custody
(Lab Use Only)
No 122294

Page 1 of 1

Client Name: Paterson	Project Reference: PE4614
Contact Name: Mark D'Arcy	Quote #
Address: 154 Colonnade St. S.	PO # 26843
Telephone: (613) 226-7381	Email Address: mdarcy@patersongroup.ca

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

Criteria: ☑ O. Reg. 153/04 (As Amended) Table _ ☐ 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: 1923235

	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-GW1	GW		4	Jun3/19	AM	✓	✓	✓										
2	BH3-GW1	GW		4	Jun3/19	PM	✓	✓	✓										
3	BH4-GW1	GW		4	Jun3/19	AM	✓	✓	✓										
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments:

Method of Delivery: Swift

Relinquished By (Sign):	Received by Driver/Depot: J. Claude Karenzi	Received at Lab: Jimee Porm Dokmai	Verified By: MdW/AH
Relinquished By (Print):	Date/Time:	Date/Time: Jun 04 2019 03:49	Date/Time: 06/04-19 16:09
Date/Time:	Temperature: °C	Temperature: 21.5 °C	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 27107
Project: PE4614
Custody: 122847

Report Date: 25-Jul-2019
Order Date: 19-Jul-2019

Order #: 1929690

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

Paracel ID	Client ID
1929690-01	BH3-GW2
1929690-02	BH7-GW1
1929690-03	BH9-GW1
1929690-04	BH10-GW1
1929690-05	DUP1

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27107

Report Date: 25-Jul-2019
Order Date: 19-Jul-2019
Project Description: PE4614

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHC F1	CWS Tier 1 - P&T GC-FID	23-Jul-19	24-Jul-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	24-Jul-19	25-Jul-19
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	23-Jul-19	24-Jul-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27107

Report Date: 25-Jul-2019

Order Date: 19-Jul-2019

Project Description: PE4614

	Client ID:	BH3-GW2	BH7-GW1	BH9-GW1	BH10-GW1
	Sample Date:	19-Jul-19 12:30	19-Jul-19 09:45	19-Jul-19 11:15	19-Jul-19 10:30
	Sample ID:	1929690-01	1929690-02	1929690-03	1929690-04
	MDL/Units	Water	Water	Water	Water
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Chloroform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylene dibromide (dibromoethan	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	<2.0
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27107

Report Date: 25-Jul-2019

Order Date: 19-Jul-2019

Project Description: PE4614

	Client ID:	BH3-GW2	BH7-GW1	BH9-GW1	BH10-GW1
	Sample Date:	19-Jul-19 12:30	19-Jul-19 09:45	19-Jul-19 11:15	19-Jul-19 10:30
	Sample ID:	1929690-01	1929690-02	1929690-03	1929690-04
	MDL/Units	Water	Water	Water	Water
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
4-Bromofluorobenzene	Surrogate	110%	124%	115%	114%
Dibromofluoromethane	Surrogate	78.3%	76.6%	83.3%	76.4%
Toluene-d8	Surrogate	113%	115%	108%	116%
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

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27107

Report Date: 25-Jul-2019

Order Date: 19-Jul-2019

Project Description: PE4614

	Client ID:	DUP1	-	-	-
	Sample Date:	19-Jul-19 12:30	-	-	-
	Sample ID:	1929690-05	-	-	-
	MDL/Units	Water	-	-	-
Volatiles					
Acetone	5.0 ug/L	<5.0	-	-	-
Benzene	0.5 ug/L	<0.5	-	-	-
Bromodichloromethane	0.5 ug/L	<0.5	-	-	-
Bromoform	0.5 ug/L	<0.5	-	-	-
Bromomethane	0.5 ug/L	<0.5	-	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	-	-	-
Chlorobenzene	0.5 ug/L	<0.5	-	-	-
Chloroform	0.5 ug/L	<0.5	-	-	-
Dibromochloromethane	0.5 ug/L	<0.5	-	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	-	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	-	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	-	-	-
Ethylbenzene	0.5 ug/L	<0.5	-	-	-
Ethylene dibromide (dibromoethar	0.2 ug/L	<0.2	-	-	-
Hexane	1.0 ug/L	<1.0	-	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	-	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	-	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	-	-	-
Methylene Chloride	5.0 ug/L	<5.0	-	-	-
Styrene	0.5 ug/L	<0.5	-	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	-	-	-
Toluene	0.5 ug/L	<0.5	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27107

Report Date: 25-Jul-2019

Order Date: 19-Jul-2019

Project Description: PE4614

Client ID:		DUP1	-	-	-
Sample Date:		19-Jul-19 12:30	-	-	-
Sample ID:		1929690-05	-	-	-
	MDL/Units	Water	-	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	-	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	-	-	-
Trichloroethylene	0.5 ug/L	<0.5	-	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	-	-	-
Vinyl chloride	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	-	-	-
4-Bromofluorobenzene	Surrogate	117%	-	-	-
Dibromofluoromethane	Surrogate	78.0%	-	-	-
Toluene-d8	Surrogate	110%	-	-	-

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	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	*96.4*		*ug/L*		*120*	*50-140*			
Surrogate: Dibromofluoromethane	*61.4*		*ug/L*		*76.7*	*50-140*			
Surrogate: Toluene-d8	*92.0*		*ug/L*		*115*	*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				30	
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*91.8*		*ug/L*		*115*	*50-140*			
Surrogate: Dibromofluoromethane	*61.6*		*ug/L*		*77.0*	*50-140*			
Surrogate: Toluene-d8	*91.0*		*ug/L*		*114*	*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)	2060	25	ug/L		103	68-117			
F2 PHCs (C10-C16)	1720	100	ug/L		108	60-140			
F3 PHCs (C16-C34)	3890	100	ug/L		99.3	60-140			
F4 PHCs (C34-C50)	2600	100	ug/L		105	60-140			
Volatiles									
Acetone	68.5	5.0	ug/L		68.5	50-140			
Benzene	31.4	0.5	ug/L		78.5	60-130			
Bromodichloromethane	24.3	0.5	ug/L		60.7	60-130			
Bromoform	34.6	0.5	ug/L		86.5	60-130			
Bromomethane	32.0	0.5	ug/L		80.1	50-140			
Carbon Tetrachloride	28.4	0.2	ug/L		71.0	60-130			
Chlorobenzene	37.2	0.5	ug/L		92.9	60-130			
Chloroform	26.6	0.5	ug/L		66.4	60-130			
Dibromochloromethane	39.6	0.5	ug/L		99.0	60-130			
Dichlorodifluoromethane	30.0	1.0	ug/L		74.9	50-140			
1,2-Dichlorobenzene	43.8	0.5	ug/L		110	60-130			
1,3-Dichlorobenzene	48.1	0.5	ug/L		120	60-130			
1,4-Dichlorobenzene	39.4	0.5	ug/L		98.5	60-130			
1,1-Dichloroethane	32.8	0.5	ug/L		82.0	60-130			
1,2-Dichloroethane	27.4	0.5	ug/L		68.6	60-130			
1,1-Dichloroethylene	33.2	0.5	ug/L		83.0	60-130			
cis-1,2-Dichloroethylene	28.0	0.5	ug/L		70.0	60-130			
trans-1,2-Dichloroethylene	30.7	0.5	ug/L		76.8	60-130			
1,2-Dichloropropane	26.9	0.5	ug/L		67.2	60-130			
cis-1,3-Dichloropropylene	26.8	0.5	ug/L		66.9	60-130			
trans-1,3-Dichloropropylene	28.4	0.5	ug/L		70.9	60-130			
Ethylbenzene	43.0	0.5	ug/L		107	60-130			
Ethylene dibromide (dibromoethane	40.2	0.2	ug/L		100	60-130			
Hexane	31.7	1.0	ug/L		79.3	60-130			
Methyl Ethyl Ketone (2-Butanone)	78.0	5.0	ug/L		78.0	50-140			
Methyl Isobutyl Ketone	62.8	5.0	ug/L		62.8	50-140			
Methyl tert-butyl ether	90.0	2.0	ug/L		90.0	50-140			
Methylene Chloride	32.7	5.0	ug/L		81.8	60-130			
Styrene	39.8	0.5	ug/L		99.6	60-130			
1,1,1,2-Tetrachloroethane	47.0	0.5	ug/L		117	60-130			
1,1,2,2-Tetrachloroethane	44.5	0.5	ug/L		111	60-130			
Tetrachloroethylene	43.6	0.5	ug/L		109	60-130			
Toluene	44.5	0.5	ug/L		111	60-130			
1,1,1-Trichloroethane	26.6	0.5	ug/L		66.6	60-130			
1,1,2-Trichloroethane	29.4	0.5	ug/L		73.4	60-130			
Trichloroethylene	38.0	0.5	ug/L		94.9	60-130			
Trichlorofluoromethane	29.6	1.0	ug/L		74.0	60-130			
Vinyl chloride	45.3	0.5	ug/L		113	50-140			
m,p-Xylenes	74.0	0.5	ug/L		92.4	60-130			
o-Xylene	39.1	0.5	ug/L		97.8	60-130			
Surrogate: 4-Bromofluorobenzene	*61.5*		*ug/L*		*76.9*	*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.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.
- When reported, data for F4G has been processed using a silica gel cleanup.

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Chain of Custody
(Lab Use Only)
№ 122847

Page 1 of 1

Client Name: Paterson	Project Reference: PE4614	**Turnaround Time:**
Contact Name: Mark D'Arcy	Quote #	☐ 1 Day ☐ 3 Day
Address:	PO # 27107	☐ 2 Day ☑ Regular
Telephone: 226-7381	Email Address:	Date Required:

Criteria: ☑ O. Reg. 153/04 (As Amended) Table ___ ☐ 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: 1929690

	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	BH3-GW2	GW		2	July 19/19	12:30pm		✓					
2	BH7-GW1	GW		3	"	9:45am	✓	✓					
3	BH9-GW1	GW		2	"	11:15am		✓					
4	BH10-GW1	GW		3	"	10:30am	✓	✓					
5	DUP1	GW		2	"	12:30pm		✓					
6													
7													
8													
9													
10													

Comments:

Method of Delivery: Brift

Relinquished By (Sign): N. Sullivan	Received by Driver/Depot: Ogue 19/7	Received at Lab: Scot	Verified By: Mark Scot
Relinquished By (Print): Nicky Sullivan	Date/Time:	Date/Time: July 19/19 4:00p	Date/Time: 7-19-19 16:30
Date/Time: July 19/19	Temperature: °C	Temperature: 16.9 °C	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 27660
Project: PE4614
Custody: 122874

Report Date: 1-Aug-2019
Order Date: 31-Jul-2019

Order #: 1931355

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

Paracel ID	Client ID
1931355-01	BH8B-GW1

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27660

Report Date: 01-Aug-2019
Order Date: 31-Jul-2019
Project Description: PE4614

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	1-Aug-19	1-Aug-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27660

Report Date: 01-Aug-2019

Order Date: 31-Jul-2019

Project Description: PE4614

	Client ID:	BH8B-GW1	-	-	-
	Sample Date:	31-Jul-19 10:10	-	-	-
	Sample ID:	1931355-01	-	-	-
	MDL/Units	Water	-	-	-
Volatiles					
Acetone	5.0 ug/L	<5.0	-	-	-
Benzene	0.5 ug/L	<0.5	-	-	-
Bromodichloromethane	0.5 ug/L	<0.5	-	-	-
Bromoform	0.5 ug/L	<0.5	-	-	-
Bromomethane	0.5 ug/L	<0.5	-	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	-	-	-
Chlorobenzene	0.5 ug/L	<0.5	-	-	-
Chloroform	0.5 ug/L	<0.5	-	-	-
Dibromochloromethane	0.5 ug/L	<0.5	-	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	-	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	-	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	-	-	-
Ethylbenzene	0.5 ug/L	<0.5	-	-	-
Ethylene dibromide (dibromoethan	0.2 ug/L	<0.2	-	-	-
Hexane	1.0 ug/L	<1.0	-	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	-	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	-	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	-	-	-
Methylene Chloride	5.0 ug/L	<5.0	-	-	-
Styrene	0.5 ug/L	<0.5	-	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	-	-	-
Toluene	0.5 ug/L	<0.5	-	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27660

Report Date: 01-Aug-2019

Order Date: 31-Jul-2019

Project Description: PE4614

	Client ID:	BH8B-GW1	-	-	-
	Sample Date:	31-Jul-19 10:10	-	-	-
	Sample ID:	1931355-01	-	-	-
	MDL/Units	Water	-	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	-	-	-
Trichloroethylene	0.5 ug/L	<0.5	-	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	-	-	-
Vinyl chloride	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	-	-	-
4-Bromofluorobenzene	Surrogate	108%	-	-	-
Dibromofluoromethane	Surrogate	97.8%	-	-	-
Toluene-d8	Surrogate	116%	-	-	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27660

Report Date: 01-Aug-2019
Order Date: 31-Jul-2019
Project Description: PE4614

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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	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	*83.4*		*ug/L*		*104*	*50-140*			
Surrogate: Dibromofluoromethane	*81.0*		*ug/L*		*101*	*50-140*			
Surrogate: Toluene-d8	*78.1*		*ug/L*		*97.6*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*75.6*		*ug/L*		*94.4*	*50-140*			
Surrogate: Dibromofluoromethane	*92.1*		*ug/L*		*115*	*50-140*			
Surrogate: Toluene-d8	*71.2*		*ug/L*		*89.0*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	58.6	5.0	ug/L		58.6	50-140			
Benzene	41.9	0.5	ug/L		105	60-130			
Bromodichloromethane	31.3	0.5	ug/L		78.2	60-130			
Bromoform	26.3	0.5	ug/L		65.8	60-130			
Bromomethane	26.6	0.5	ug/L		66.6	50-140			
Carbon Tetrachloride	30.6	0.2	ug/L		76.4	60-130			
Chlorobenzene	29.4	0.5	ug/L		73.5	60-130			
Chloroform	29.6	0.5	ug/L		74.0	60-130			
Dibromochloromethane	27.7	0.5	ug/L		69.2	60-130			
Dichlorodifluoromethane	27.3	1.0	ug/L		68.3	50-140			
1,2-Dichlorobenzene	38.8	0.5	ug/L		96.9	60-130			
1,3-Dichlorobenzene	38.1	0.5	ug/L		95.3	60-130			
1,4-Dichlorobenzene	32.2	0.5	ug/L		80.6	60-130			
1,1-Dichloroethane	35.5	0.5	ug/L		88.8	60-130			
1,2-Dichloroethane	32.4	0.5	ug/L		81.1	60-130			
1,1-Dichloroethylene	34.6	0.5	ug/L		86.4	60-130			
cis-1,2-Dichloroethylene	38.1	0.5	ug/L		95.2	60-130			
trans-1,2-Dichloroethylene	33.3	0.5	ug/L		83.2	60-130			
1,2-Dichloropropane	40.2	0.5	ug/L		101	60-130			
cis-1,3-Dichloropropylene	28.6	0.5	ug/L		71.5	60-130			
trans-1,3-Dichloropropylene	33.5	0.5	ug/L		83.8	60-130			
Ethylbenzene	30.9	0.5	ug/L		77.2	60-130			
Ethylene dibromide (dibromoethane	29.7	0.2	ug/L		74.3	60-130			
Hexane	40.8	1.0	ug/L		102	60-130			
Methyl Ethyl Ketone (2-Butanone)	89.0	5.0	ug/L		89.0	50-140			
Methyl Isobutyl Ketone	80.1	5.0	ug/L		80.1	50-140			
Methyl tert-butyl ether	97.6	2.0	ug/L		97.6	50-140			
Methylene Chloride	37.8	5.0	ug/L		94.4	60-130			
Styrene	29.8	0.5	ug/L		74.4	60-130			
1,1,1,2-Tetrachloroethane	36.1	0.5	ug/L		90.3	60-130			
1,1,2,2-Tetrachloroethane	28.3	0.5	ug/L		70.8	60-130			
Tetrachloroethylene	28.4	0.5	ug/L		71.1	60-130			
Toluene	31.6	0.5	ug/L		78.9	60-130			
1,1,1-Trichloroethane	31.6	0.5	ug/L		78.9	60-130			
1,1,2-Trichloroethane	31.1	0.5	ug/L		77.8	60-130			
Trichloroethylene	36.0	0.5	ug/L		90.1	60-130			
Trichlorofluoromethane	26.8	1.0	ug/L		66.9	60-130			
Vinyl chloride	53.6	0.5	ug/L		134	50-140			
m,p-Xylenes	59.7	0.5	ug/L		74.6	60-130			
o-Xylene	30.4	0.5	ug/L		76.0	60-130			
Surrogate: 4-Bromofluorobenzene	*62.2*		*ug/L*		*77.8*	*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.

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TRI
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Paracel ID: 1931355

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wa, Ontario K1G 4J8
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racel@paracellabs.com

Chain of Custody
(Lab Use Only)
Nº 122874

Page ___ of ___

Client Name: Paterson Group	Project Reference: PE4614
Contact Name: Mark D'Arcy	Quote #
Address: 154 Colonnade Rd.	PO # 27660
Telephone: 613-226-7381	Email Address: mdarcy@patersongroup.ca

Turnaround Time:
X 1 Day ☐ 3 Day
☐ 2 Day X Regular
Date Required: ___

Criteria: X O. Reg. 153/04 (As Amended) Table ___ ☐ 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: 1931355

	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	BH8B-GW1	GW		2	July 31/19	10:10AM		X												
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments: RUSH → 1 DAY

Method of Delivery: Paracol

Relinquished By (Sign): W. Sullivan	Received by Driver/Depot: M. Scouse	Received at Lab: [signature]	Verified By: [signature]
Relinquished By (Print): Nick Sullivan	Date/Time: 31/07/19 3:10 PM	Date/Time: 07/31/19 16:25	Date/Time: 07/31/19 17:10
Date/Time: July 31, 2019	Temperature:	Temperature: 16.8 °C	pH Verified [ ] By: NA

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 30732
Project: PE4641
Custody: 128122

Report Date: 11-Sep-2020
Order Date: 4-Sep-2020

Order #: 2036662

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

Paracel ID	Client ID
2036662-01	BH3-GW3
2036662-02	BH8B-GW1
2036662-03	BH11-20-GW1
2036662-04	BH13-20-GW1
2036662-05	DUP

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 30732

Report Date: 11-Sep-2020

Order Date: 4-Sep-2020

Project Description: PE4641

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHC F1	CWS Tier 1 - P&T GC-FID	8-Sep-20	9-Sep-20
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	10-Sep-20	10-Sep-20
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	8-Sep-20	9-Sep-20

Certificate of Analysis

Report Date: 11-Sep-2020

Client: Paterson Group Consulting Engineers

Order Date: 4-Sep-2020

Client PO: 30732

Project Description: PE4641

	Client ID:	BH3-GW3	BH8B-GW1	BH11-20-GW1	BH13-20-GW1
	Sample Date:	03-Sep-20 09:00	03-Sep-20 09:00	03-Sep-20 09:00	03-Sep-20 09:00
	Sample ID:	2036662-01	2036662-02	2036662-03	2036662-04
	MDL/Units	Water	Water	Water	Water
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Chloroform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5 ug/L	<0.5	<0.5	0.6	<0.5
Ethylene dibromide (dibromoethane, 1,2-)	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	<2.0
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5

Certificate of Analysis

Report Date: 11-Sep-2020

Client: Paterson Group Consulting Engineers

Order Date: 4-Sep-2020

Client PO: 30732

Project Description: PE4641

	Client ID:	BH3-GW3	BH8B-GW1	BH11-20-GW1	BH13-20-GW1
	Sample Date:	03-Sep-20 09:00	03-Sep-20 09:00	03-Sep-20 09:00	03-Sep-20 09:00
	Sample ID:	2036662-01	2036662-02	2036662-03	2036662-04
	MDL/Units	Water	Water	Water	Water
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	0.7	<0.5
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Xylenes, total	0.5 ug/L	<0.5	<0.5	0.7	<0.5
4-Bromofluorobenzene	Surrogate	103%	104%	104%	103%
Dibromofluoromethane	Surrogate	96.3%	95.9%	99.3%	98.6%
Toluene-d8	Surrogate	104%	105%	104%	104%
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

Certificate of Analysis

Report Date: 11-Sep-2020

Client: Paterson Group Consulting Engineers

Order Date: 4-Sep-2020

Client PO: 30732

Project Description: PE4641

	Client ID:	DUP	-	-	-
	Sample Date:	03-Sep-20 09:00	-	-	-
	Sample ID:	2036662-05	-	-	-
	MDL/Units	Water	-	-	-
Volatiles					
Acetone	5.0 ug/L	<5.0	-	-	-
Benzene	0.5 ug/L	<0.5	-	-	-
Bromodichloromethane	0.5 ug/L	<0.5	-	-	-
Bromoform	0.5 ug/L	<0.5	-	-	-
Bromomethane	0.5 ug/L	<0.5	-	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	-	-	-
Chlorobenzene	0.5 ug/L	<0.5	-	-	-
Chloroform	0.5 ug/L	<0.5	-	-	-
Dibromochloromethane	0.5 ug/L	<0.5	-	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	-	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	-	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	-	-	-
Ethylbenzene	0.5 ug/L	<0.5	-	-	-
Ethylene dibromide (dibromoethane, 1	0.2 ug/L	<0.2	-	-	-
Hexane	1.0 ug/L	<1.0	-	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	-	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	-	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	-	-	-
Methylene Chloride	5.0 ug/L	<5.0	-	-	-
Styrene	0.5 ug/L	<0.5	-	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	-	-	-
Toluene	0.5 ug/L	<0.5	-	-	-

Certificate of Analysis

Report Date: 11-Sep-2020

Client: Paterson Group Consulting Engineers

Order Date: 4-Sep-2020

Client PO: 30732

Project Description: PE4641

	Client ID:	DUP	-	-	-
	Sample Date:	03-Sep-20 09:00	-	-	-
	Sample ID:	2036662-05	-	-	-
	MDL/Units	Water	-	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	-	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	-	-	-
Trichloroethylene	0.5 ug/L	<0.5	-	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	-	-	-
Vinyl chloride	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	-	-	-
4-Bromofluorobenzene	Surrogate	104%	-	-	-
Dibromofluoromethane	Surrogate	98.2%	-	-	-
Toluene-d8	Surrogate	104%	-	-	-

Certificate of Analysis

Report Date: 11-Sep-2020

Client: Paterson Group Consulting Engineers

Order Date: 4-Sep-2020

Client PO: 30732

Project Description: PE4641

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	*79.4*		*ug/L*		*99.2*	*50-140*			
Surrogate: Dibromofluoromethane	*67.4*		*ug/L*		*84.2*	*50-140*			
Surrogate: Toluene-d8	*84.6*		*ug/L*		*106*	*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	2.01	0.5	ug/L	2.00			0.5	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	*81.1*		*ug/L*		*101*	*50-140*			
Surrogate: Dibromofluoromethane	*75.8*		*ug/L*		*94.8*	*50-140*			
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)	1780	25	ug/L	ND	89.1	68-117			
F2 PHCs (C10-C16)	1660	100	ug/L	ND	104	60-140			
F3 PHCs (C16-C34)	4100	100	ug/L	ND	105	60-140			
F4 PHCs (C34-C50)	2700	100	ug/L	ND	109	60-140			
Volatiles									
Acetone	91.0	5.0	ug/L	ND	91.0	50-140			
Benzene	32.3	0.5	ug/L	ND	80.7	60-130			
Bromodichloromethane	28.2	0.5	ug/L	ND	70.6	60-130			
Bromoform	29.1	0.5	ug/L	ND	72.8	60-130			
Bromomethane	31.8	0.5	ug/L	ND	79.5	50-140			
Carbon Tetrachloride	30.4	0.2	ug/L	ND	76.0	60-130			
Chlorobenzene	34.2	0.5	ug/L	ND	85.5	60-130			
Chloroform	31.6	0.5	ug/L	ND	79.0	60-130			
Dibromochloromethane	30.6	0.5	ug/L	ND	76.5	60-130			
Dichlorodifluoromethane	30.4	1.0	ug/L	ND	76.0	50-140			
1,2-Dichlorobenzene	33.3	0.5	ug/L	ND	83.2	60-130			
1,3-Dichlorobenzene	34.9	0.5	ug/L	ND	87.2	60-130			
1,4-Dichlorobenzene	34.4	0.5	ug/L	ND	85.9	60-130			
1,1-Dichloroethane	32.4	0.5	ug/L	ND	80.9	60-130			
1,2-Dichloroethane	30.6	0.5	ug/L	ND	76.5	60-130			
1,1-Dichloroethylene	31.0	0.5	ug/L	ND	77.4	60-130			
cis-1,2-Dichloroethylene	34.4	0.5	ug/L	ND	86.1	60-130			
trans-1,2-Dichloroethylene	31.5	0.5	ug/L	ND	78.8	60-130			
1,2-Dichloropropane	31.6	0.5	ug/L	ND	79.1	60-130			
cis-1,3-Dichloropropylene	27.8	0.5	ug/L	ND	69.6	60-130			
trans-1,3-Dichloropropylene	27.2	0.5	ug/L	ND	68.0	60-130			
Ethylbenzene	34.2	0.5	ug/L	ND	85.6	60-130			
Ethylene dibromide (dibromoethane, 1,2-	28.8	0.2	ug/L	ND	71.9	60-130			
Hexane	39.8	1.0	ug/L	ND	99.4	60-130			
Methyl Ethyl Ketone (2-Butanone)	68.2	5.0	ug/L	ND	68.2	50-140			
Methyl Isobutyl Ketone	69.5	5.0	ug/L	ND	69.5	50-140			
Methyl tert-butyl ether	72.7	2.0	ug/L	ND	72.7	50-140			
Methylene Chloride	34.0	5.0	ug/L	ND	85.0	60-130			
Styrene	32.5	0.5	ug/L	ND	81.3	60-130			
1,1,1,2-Tetrachloroethane	33.0	0.5	ug/L	ND	82.6	60-130			
1,1,2,2-Tetrachloroethane	28.6	0.5	ug/L	ND	71.6	60-130			
Tetrachloroethylene	33.2	0.5	ug/L	ND	82.9	60-130			
Toluene	33.8	0.5	ug/L	ND	84.6	60-130			
1,1,1-Trichloroethane	30.1	0.5	ug/L	ND	75.3	60-130			
1,1,2-Trichloroethane	28.4	0.5	ug/L	ND	71.0	60-130			
Trichloroethylene	31.3	0.5	ug/L	ND	78.3	60-130			
Trichlorofluoromethane	32.8	1.0	ug/L	ND	82.1	60-130			
Vinyl chloride	30.8	0.5	ug/L	ND	77.1	50-140			
m,p-Xylenes	69.4	0.5	ug/L	ND	86.8	60-130			
o-Xylene	34.6	0.5	ug/L	ND	86.4	60-130			
Surrogate: 4-Bromofluorobenzene	*82.6*		*ug/L*		*103*	*50-140*			
Surrogate: Dibromofluoromethane	*77.0*		*ug/L*		*96.3*	*50-140*			
Surrogate: Toluene-d8	*83.6*		*ug/L*		*104*	*50-140*			

Qualifier Notes:

Login Qualifiers :

Container(s) - Bottle and COC sample ID don't match - reads GW2 instead of GW1

Applies to samples: BH8B-GW1

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: 2036662

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2036662	Nº 128122

Client Name: PATERSON	Project Ref: PE4641	Page 1 of 1
Contact Name: MARK D'ARCY	Quote #:	Turnaround Time: ☐ 1 day ☐ 3 day ☐ 2 day ☑ Regular
Address: 154 COLONNADE Rd. S OTTAWA, ONT.	PO #: 30732	
Telephone: (613) 226-7381	E-mail: mdarcy@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	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)
1	BH3-GW3	GW		2	SEPT 03/20			✓					
2	BH8B-GW1	GW		2	SEPT 03/20			✓					
3	BH11-20-GW1	GW		3	SEPT 03/20		✓	✓					
4	BH13-20-GW1	GW		3	SEPT 03/20		✓	✓					
5	DUP.	GW		2	SEPT 03/20			✓					
6													
7													
8													
9													
10													

Comments:

Method of Delivery: Drop Box

Relinquished By (Sign):	Received By Driver/Depot:	Received at Lab: Suneeporn Dokmai Sep 04, 2020 04.55	Verified By: BCm
Relinquished By (Print): DOMINIC LANDRY	Date/Time:	Date/Time:	Date/Time: Sept 5, 2020 13:54
Date/Time: SEPTEMBER 03/2020	Temperature: °C	Temperature: 14.9 °C	pH Verified: ☐ By: NA