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Phase II Environmental Site Assessment

Northern Part of 5123 Hawthorne Road (formerly)
And now readdressed
301 Somme Street
Ottawa, Ontario

Prepared For

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Report: PE5100-2

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EXECUTIVE SUMMARY

Assessment

A Phase II ESA was conducted for the property now addressed, 301 Somme Street, formerly the northern portion of the 5123 Hawthorne Road, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address the area of potential environmental concern (APEC) that was identified on the Phase II Property during the Phase I ESA.

The Phase II ESA consisted of drilling three (3) boreholes on the Phase II Property, two (2) of which were constructed with groundwater monitoring well installations.

The soil profile generally consisted of a layer of fill, overlying native clayey silt/silty clay and/or a silty fine sand with traces of gravel. Practical refusal was reached at depths ranging from 5.28 to 10.67 m below the existing grade on inferred bedrock. The fill material consisted of a mix of clay, silt, sand and gravel with varying amounts of asphaltic concrete and concrete. Soil samples were obtained from the boreholes and screened using vapour measurements along with visual and olfactory observations. No staining or unusual odour was noted during the subsurface investigation.

Six (6) soil samples and two (2) grab samples were submitted for BTEX, PHCs (F1-F4), metals and/or PAH analysis, as well as for electrical conductivity (EC) and sodium absorption ratio (SAR). All soil samples complied with the selected MECP Table 2 Standards. A comparison of the soil data to the MECP Table 1 Standards, indicated that the petroleum hydrocarbon fraction 4 concentrations in several soil samples exceeded the Table 1 Standards, as well as molybdenum and chromium concentrations.

Groundwater samples were recovered from the monitoring wells BH1, BH2 and MW7-8 on May 28, June 7, 2019 and November 10, 2020. No visual or olfactory signs of contamination were noted in the groundwater. The groundwater samples were submitted for PHC (F1-F4), PAH, VOC and sodium and chloride analysis. No PHC or VOC concentrations above the laboratory method detection limits were identified in the groundwater samples analyzed. VOC and PHC test results are in compliance with the MECP Table 2 Standards.

Detectable PAH parameters were identified in all of the groundwater samples analyzed for the May 28, 2019 sampling event. All PAH parameters in groundwater at location MW7-08 were in compliance with the MECP Table 2 Standards.

Benzo[a]pyrene concentrations in BH1 and BH2 were in excess of the applicable standards. Benzo[b]fluoranthene and chrysene concentrations in BH2 were also in excess of the applicable MECP standards.

Since it was considered possible that sediment had resulted in the elevated PAH concentrations, BH1 and BH2 were resampled on June 7, 2019 and November 10, 2020. The most recent sample results for those 2 wells were all in compliance with the MECP Table 2 Standards. It is expected that the apparent discrepancies between these analytical results, are a result of sediment present in the first groundwater samples analyzed.

Recommendations

The investigation confirms that the fill is composed of waste road building materials, generally consisting of various soils, road based granular materials concrete and asphaltic concrete. No other deleterious materials or otherwise contaminated soils were identified. The analytical testing indicates that the fill complies with the MECP standards.

Based on the intended use of the site and our findings, no remediation of the soil is considered necessary, however, given the Table 1 exceedances for PHC fraction 4, molybdenum and chromium, and the presence of asphalt in the majority of the samples, it is our opinion that the fill is not clean for off-site disposal if it has to be removed from the property for construction purposes. It is recommended that any excess soil generated during the future site development be analyzed to confirm its quality and determine an appropriate disposal methodology.

If the monitoring wells installed on the subject site are not going to be used in the future, or will be destroyed during site redevelopment, they should be abandoned according to Ontario Regulation 903. In the meantime, the wells will be registered with the MECP under this regulation.

1.0 INTRODUCTION

At the request of Fastfrate (Ottawa) Holdings Inc., Paterson Group (Paterson) conducted a Phase II Environmental Site Assessment for a northern portion of the property addressed 5123 Hawthorne Road, in the City of Ottawa, Ontario, herein referred to as the Phase II Property. The purpose of this Phase II ESA was to address an area of potential environmental concern (APEC) identified on the Phase II Property, during the Phase I ESA conducted by Paterson.

1.1 Site Description

Address:	301 Somme Street, formerly Part of 5123 Hawthorne Road, in Ottawa Ontario.
Location:	The Phase II Property is located on the northeast side of Rideau Road at Somme Street intersection, in the City of Ottawa, Ontario. Refer to Figure 1 - Key Plan in the Figures section following the text.
Legal Description:	Part of Lots 26 and 27, Concession 6 Rideau Front, Township of Gloucester, now in the City of Ottawa, Ontario.
Latitude and Longitude:	45° 18' 26" N, 75° 33' 14.2" W
Zoning:	DR – Development Reserve Zone
Configuration:	Irregular
Site Area:	4.8 hectares (approximate)

1.2 Property Ownership

Paterson was retained to complete the Phase II-ESA by Mr. Pierre Courteau, acting on behalf of Fastfrate (Ottawa) Holdings Inc. The head office of Fastfrate (Ottawa) Holdings Inc. is located at 55 Commerce Valley Drive West, Thornhill, Ontario. Mr. Courteau can be reached by telephone at 613-295-8570.

1.3 Current and Proposed Future Uses

The Phase II Property is a vacant parcel of land. It is our understanding that the proposed site redevelopment for the Phase II Property consists of a commercial development.

The footprint of the development will cover the majority of the central portion of the site and it will rely upon private services (septic system and potable groundwater).

1.4 Applicable Site Condition Standard

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

- ☐ Coarse-grained soil conditions
- ☐ Full depth generic site condition
- ☐ Potable groundwater conditions
- ☐ Commercial land use

Section 38 of O.Reg. 153/04 does apply to the Phase II Property in that the property relies upon potable groundwater.

Section 41 of O.Reg. 153/04 does not apply to the Phase II Property, as the property is not within 30m of an environmentally sensitive area.

Section 43.1 of O.Reg. 153/04 does not apply to the Phase II Property as it is a shallow soil property.

The proposed use of the Phase II ESA property is commercial; therefore, the Commercial/Industrial Standards are selected for the purpose of this Phase II ESA.

A comparison of the soil test data to the MECP Table 1 Standards was also conducted. The Table 1 standards are considered to be indicative of typical Ontario background concentrations and are commonly used to assess whether soil is clean for off-site disposal purposes.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The Phase II Property is situated in an industrial area. Adjacent and neighbouring properties primarily consist of vacant undeveloped lands with some commercial to light industrial land use further west.

The Phase II Property is an undeveloped vacant lot that was previously used to handle fill material from 2002 to 2014. The land itself is grassed with evidence of imported fill material on-site.

Drainage on the Phase II Property consists primarily of surface infiltration throughout the property. The site is relatively at the grade of the surrounding lands with the regional topography sloping downwards in a south-easterly direction.

2.2 Past Investigations

The Phase I ESA report, entitled *“Phase I-Environmental Site Assessment, Part Lot 26 & 27 Concession 6, Ottawa, Ontario,”* prepared by CRA, dated July 2008, was reviewed as part of this assessment.

The Phase I ESA indicated that a former waste disposal site was documented on the northern portion of the lands that they were assessing, however, they found no evidence through a review of aerial photographs or on-site observations including tests pits. CRA concluded that the designation of part of the lands as a waste disposal site was an error.

Aside from the aforementioned item, CRA noted the presence of the waste road building materials on site as a potential environmental impairment to the land. Paterson was subsequently commissioned to complete a Phase II-ESA to assess the quality of the fill material and groundwater in light of a potential land transaction and proposed site development.

The Phase II ESA Report, entitled *“Phase II Environmental Site Assessment, 5123 Hawthorne Road, Part 1, Ottawa, Ontario,”* prepared by Paterson Group Inc. (Paterson), dated July 14, 2019 was reviewed as part of this assessment.

The Phase II – ESA was completed to assess the quality of the fill material that had been placed on site by R.W. Tomlinson, the owners of the land.

The Ontario Ministry of Environment (MOE) approved the placement of non-recyclable asphalt and waste road building materials (MOE letter, 1990). In summary, the letter of approval authorized the placement of waste road building materials (granular materials, non-recyclable asphalt and presumably concrete) on-site, provided that no deleterious substances, demolition building materials or contaminated materials are deposited, and that there is no negative environmental impact on the land or groundwater.

The field program consisted of placing three (3) boreholes on the subject site. The boreholes were placed to obtain a general coverage of the area to address the unknown quality of the fill material on-site.

The soil profile generally consisted of a layer of fill, overlying native clayey silt/silty clay and/or a silty fine sand with traces of gravel. Practical refusal was reached at depths ranging from 5.28 to 10.67 m below the existing grade on inferred bedrock. It should be noted that refusal was initially encountered during the drilling of BH1 and BH3 on inferred concrete in the fill.

The fill material consisted of a mix of clay, silt, sand and gravel with varying amounts of asphaltic concrete and concrete. The fill varied in thickness from 2.3 to 5.8 m.

Six (6) soil samples were submitted for metals, PHC (fractions 2 to 4), PAH, electrical conductivity (EC), sodium absorption ratio (SAR) and pH analysis. All soil samples complied with the MECP Table 2 Commercial Standards.

Groundwater samples were recovered from the monitoring wells on May 28 and June 7, 2019. No visual or olfactory signs of contamination were noted in the groundwater. The groundwater samples were submitted for PHC (F1-F4), PAH, VOC and sodium and chloride analysis. No PHC or VOC concentrations above the laboratory method detection limits were identified in the groundwater samples analyzed. VOC and PHC test results are in compliance with the MECP Table 2 Standards.

Detectable PAH parameters were identified in all of the groundwater samples analyzed for the May 28, 2019 sampling event. All PAH parameters in the groundwater at location MW7-08 were in compliance with the MECP Table 2 Standards. Benzo[a]pyrene concentrations in BH1 and BH2 were in excess of the applicable standards. Benzo[b]fluoranthene and chrysene concentrations in BH2 were also in excess of the applicable MECP Standards.

Since it was considered possible that sediment had resulted in the elevated PAH concentrations, BH1 and BH2 were resampled on June 7, 2019. No detectable PAH parameters were identified in BH2-GW2, while PAH concentrations were identified in the second groundwater sample analyzed for BH1 (BH1-GW2) in excess of the selected MECP Standards.

It is expected that the apparent discrepancies between the two (2) analytical results for BH2, are a result of sediment present in the first groundwater sample analyzed.

A Phase I-ESA was conducted by Paterson in September of 2020 in general accordance with the Ontario Regulation (O.Reg.) 153/04, as amended. The Phase I ESA identified the following on-site PCA that generated an APEC on the Phase I Property:

- ☐ PCA 30 – “*Importation of Fill Material of Unknown Quality*” associated with handling and placement of fill material across the majority of the Phase I Property (APEC 1).

A Phase II ESA was recommended to address the aforementioned APEC on the Phase I Property.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The initial subsurface investigation was conducted on May 14, 2019 in conjunction with a Geotechnical Investigation. The field program consisted of drilling three (3) boreholes, two (2) of which were instrumented with groundwater monitoring wells for environmental purposes. Boreholes were drilled to depths ranging from 5.30 to 10.67 m below the ground surface (mbgs). It should be noted that a previously drilled well from 2008 (MW7-08) was sampled as part of this program. More recent investigation and testing was completed on November 10, 2020.

3.2 Media Investigated

During the subsurface investigation, soil samples and groundwater samples were obtained and submitted for laboratory analysis. The rationale for sampling and analyzing this media is based on the Contaminants of Potential Concern (CPCs) identified in the Phase I ESA.

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

According to the Geological Survey of Canada website, the bedrock in the area of the Phase I Property is reported to consist of dolomite of the Oxford Formation. The overburden is reported to consist of exposed bedrock thickness of 0 to 2 m across the site; however, the June 2019 subsurface investigation encountered the bedrock surface at depths ranging from 5.28 to 10.67 mbgs, in which the latter was inferred from practical refusal. Groundwater beneath the site was determined to flow in a north-westerly direction.

Fill Placement

Based on the historical review in combination with the site visit, the majority of the subject land has been used for fill placement during 2002 to 2014. The unknown quality of the fill material imported on-site represents an APEC on the Phase I Property.

Existing Buildings and Structures

No buildings or structures are present on the Phase I Property.

Drinking Water Wells

There are no domestic wells on-site. It is expected that the site will be serviced by a private well and septic system.

Subsurface Structures and Utilities

The Phase I Property is not expected to have any subsurface structures or utilities on-site.

Areas of Natural Significance and Water Bodies

No areas of natural significance were identified within the Phase I Study Area. A tributary of Findley Creek is present approximately 245 m southeast of the Phase I Property and discharges into the North Caster River

Neighbouring Land Use

Neighbouring land use in the Phase I Study Area consists primarily of vacant and/or undeveloped lands to the north, south and west, and farmland to the east.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

As per Section 7.1 of the Phase I ESA report, one PCA was considered to result in an APEC on the Phase I Property. This APEC has been summarized in Table 1, along with its respective location and contaminants of potential concern (CPCs) on the Phase I Property.

Table 1: Areas of Potential Environmental Concern					
Area of Potential Environmental Concern	Location of Area of Potential Environmental Concern	Potentially Contaminating Activity	Location of PCA (on-site or off-site)	Contaminants of Potential Concern	Media Potentially Impacted (Groundwater, Soil, and/or Sediment)
APEC 1: Resulting from fill material of unknown quality	Across the Phase I Property	PCA 30 – <i>“Importation of Fill Material of Unknown Quality.”</i>	On-site	PHCs PAHs Metals (including Hg, CrVI) VOCs Sodium Chloride EC and SAR	Soil and/or Groundwater

Contaminants of Potential Concern

As per the APEC identified in Table 1, the contaminants of potential concern (CPCs) in soil and/or groundwater include:

- ☐ Petroleum hydrocarbons (PHCs, Fractions F₂-F₄).
- ☐ Polycyclic Aromatic Hydrocarbons (PAHs).
- ☐ Metals (Hg and CrVI).
- ☐ Volatile Organic Compounds (VOCs).
- ☐ Sodium and Chloride.
- ☐ Sodium Adsorption Ratio (SAR) and Electrical Conductivity (EC).

The CPCs are expected to be present in the soil and/or groundwater of the Phase I Property.

Assessment of Uncertainty and/or Absence of Information

The information available for review as part of the preparation of this Phase I-ESA is considered to be sufficient to conclude that there is an on-site PCA that has resulted in an APEC on the Phase I Property.

A variety of independent sources were consulted as part of this assessment, 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.

3.5 Impediments

No physical impediments were encountered during the Phase II ESA program.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation was conducted on May 15, 2019 and November 10, 2020. The field program consisted of drilling three (3) boreholes across the Phase II Property.

The boreholes were drilled to a maximum depth of 10.67 mbgs. Two (2) of the three (3) boreholes were completed as groundwater monitoring wells to access the groundwater table. All boreholes were completed using a track mounted drill rig provided by Marathon Drilling Ltd. of Ottawa, Ontario, under the full-time supervision of Paterson personnel. The borehole locations are indicated on the attached Drawing PE5100-3 – Test Hole Location Plan, appended to this report.

4.2 Soil Sampling

A total of 28 soil samples were obtained from the boreholes by means of grab sampling from auger flights and split spoon sampling. Split spoon samples were taken at approximate 0.76 m intervals. The depths at which grab samples and split spoon samples were obtained from the boreholes are shown as “G” and “SS” on the Soil Profile and Test Data Sheets appended to this report.

The soil profile encountered generally consisted of a layer of fill, overlying native clayey silt/silty clay and/or a silty fine sand with traces of gravel. Practical refusal was reached at depths ranging from 5.28 to 10.67 m below the existing grade on inferred bedrock. It should be noted that refusal was initially encountered during the drilling of BH1 and BH3 on inferred concrete in the fill.

The fill material consisted of a mix of clay, silt, sand and gravel with varying amounts of asphaltic concrete and concrete.

4.3 Field Screening Measurements

All soil samples collected were subjected to a preliminary screening procedure, which included visual screening for colour and evidence of metals, as well as soil vapour screening with a MiniRAE 2000 Portable VOC Monitor.

The technical protocol was obtained from Appendix C of the MECP document entitled “Interim Guidelines for the Remediation of Petroleum Contamination at Operating Retail and Private Fuel Outlets in Ontario”, dated March 1992.

Soil samples recovered at the time of sampling were placed immediately into airtight plastic bags with nominal headspace. All lumps of soil inside the bags were broken by hand, and the soil was allowed to come to ambient temperature prior to conducting the vapour survey. Allowing the samples to stabilize to ambient temperature ensures consistency of readings between samples.

The soil vapours were measured by inserting the analyzer probe into the nominal headspace above the soil sample. Samples were then agitated/manipulated gently as the measurements were taken. The peak reading registered within the first 15 seconds was recorded as the vapour measurement.

The vapours readings were found to be negligible in all of the soil samples. No obvious visual or olfactory indications of potential environmental contaminants were identified in the soil samples aside from some asphaltic and concrete fragments. Vapour readings are noted on the Soil Profile and Test Data Sheets in Appendix 1.

Soil samples were selected based on a combination of the results of the vapour screening, visual and olfactory screening, sample depth and/or sample location.

4.4 Groundwater Monitoring Well Installation

Two (2) groundwater monitoring wells were installed on the Phase II Property as part of the subsurface investigation in 2019. The monitoring wells consisted of 35 mm diameter, Schedule 40 threaded PVC risers and screens. Monitoring well construction details are listed below in Table 2 and are also presented on the Soil Profile and Test Data Sheets provided in Appendix 1. A summary of the monitoring well construction details is provided below in Table 2.

TABLE 2: 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
BH1	91.80	8.35	5.35-8.35	5.03-8.38	0.15-5.03	Stick-up
BH2	92.38	5.30	2.30-5.30	1.98-5.30	0.15-1.92	Stick-up

4.5 Field Measurement of Water Quality Parameters

Groundwater samples were collected on May 28 and June 8, 2019 and more recently on November 10, 2020. The water levels were the only parameter measured in the field during the sampling event.

4.6 Groundwater Sampling

Groundwater sampling protocols were followed using the MECP document entitled "Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario", dated May 1996. 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.

4.7 Analytical Testing

Based on the guidelines outlined in the Sampling and Analysis Plan in Appendix 1, the soil and groundwater samples submitted for analytical testing are presented in Tables 3 and 4.

TABLE 3: Soil Samples Submitted and Analyzed Parameters								
Sample ID	Sample Depth (m) and Stratigraphic Unit	Parameters Analyzed						Rationale
		SAR/EC	pH	BTEX	Metals	PHCs (F2-F4)	PAHs	
May 15, 2019								
BH1-AU1	0-0.74 Fill	X			X	X	X	Assess the quality of fill material on-site.
BH1-SS3	2.44-3.05 Fill	X	X		X	X	X	Assess the quality of fill material on-site.
BH2-AU1	0-0.74 Fill	X			X	X	X	Assess the quality of fill material on-site.
BH2-SS1	0.74-1.52 Fill				X	X	X	Assess the quality of fill material on-site.
BH3-SS2	1.52-2.26 Fill				X			Assess the quality of fill material on-site.
BH3-SS3	2.26-3.05 Fill					X	X	Assess the quality of fill material on-site.
BH3-SS5	3.78-4.57 Fill	X	X		X	X	X	Assess the quality of fill material on-site.
November 10, 2020								
G1*	0-0.5 Fill			X		X		Assess the quality of fill material on-site.
G2*	0-0.5 Fill			X		X		Duplicate sample of G1 for QA/QC purposes.
Note: * Grab samples were tested for PHCs (F1 – F4)								

TABLE 4: Groundwater Samples Submitted and Analyzed Parameters						
Sample ID	Screened Interval (m) and Stratigraphy Unit	Parameters Analyzed				Rationale
		PHCs	PAHs	VOCs	Sodium Chloride	
May 28, 2019						
BH1-GW1	5.35-8.35 Native	X	X	X		Assess the potential groundwater impact.
BH2-GW1	2.30-5.30 Native	X	X	X		Assess the potential groundwater impact.
MW07-08	3.0-6.0 Fill	X	X	X		Assess the potential groundwater impact.
June 7, 2019						
BH1-GW2	5.35-8.35 Native		X		X	Assess the potential groundwater impact.
BH2-GW2	2.30-5.30 Native		X		X	Assess the potential groundwater impact.
November 10, 2020						
BH1-GW3	5.35-8.35 Native		X			Assess the potential groundwater impact.
MW11-GW1 (DUP)	5.35-8.35 Native		X			Duplicate sample for QA/QC purposes.

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

4.8 Residue Management

All soil cuttings, purge water and fluids from equipment cleaning were retained on-site.

4.9 Elevation Surveying

The borehole locations were selected by Paterson for coverage to assess the potential impact on-site. Boreholes were located and surveyed in the field by R.W. Tomlinson.

The locations and elevations of the boreholes are presented on Drawing PE5100-3 – Test Hole Location Plan, appended to this report.

4.10 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 soils generally consisted of a layer of fill, overlying native clayey silt/silty clay and/or a silty fine sand with traces of gravel. Practical refusal was reached at depths ranging from 5.28 to 10.67 m below the existing grade on inferred bedrock. It should be noted that refusal was initially encountered during the drilling of BH1 and BH3 on inferred concrete in the fill.

The fill material consisted of a mix of clay, silt, sand and gravel with varying amounts of asphaltic concrete and concrete.

Groundwater was encountered within either the fill or native soil at depths ranging from approximately of 2.92 to 3.82 m, below the existing grade. It should be noted that groundwater levels are expected to fluctuate throughout the year with seasonal variations. Site geology details are provided in the Soil Profile and Test Data Sheets provided in Appendix 1.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured during the groundwater sampling events on May 28, 2019 and November 10, 2020 using an electronic water level meter. Groundwater levels are summarized below in Table 5.

TABLE 5: Groundwater Level Measurements				
Borehole Location	Ground Surface Elevation (m)	Water Level Depth (m below grade)	Water Level Elevation (m ASL)	Date of Measurement
BH1	91.80	2.92	88.88	May 28, 2019
BH2	92.38	3.82	88.56	May 28, 2019
MW7-08	92.85	--	--	May 28, 2019
BH1	91.80	3.09	88.71	November 10, 2020
BH2	92.38	3.17	89.21	November 10, 2020
MW7-08	92.85	2.95	89.90	November 10, 2020

Based on the most recent groundwater sampling event, a groundwater contour plan was completed. The groundwater contour mapping is shown on Drawing PE5100-3 – Groundwater Contour Plan. Based on the contour mapping, groundwater flow beneath the Phase II Property is in a westerly direction. A horizontal hydraulic gradient of approximately 0.015 m/m was calculated.

5.3 Fine-Course Soil Texture

No grain size analysis was completed for the subject site. Coarse grained standards were chosen as a conservative approach.

5.4 Soil: Field Screening

Field screening of the soil samples collected resulted in negligible vapour readings.

No staining or unusual odours were noted during the field program. Soil samples were selected based on a combination of the results of the vapour screening, visual and olfactory screening, sample depth and/or sample location.

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

5.5 Soil Quality

Seven (7) soil samples were submitted for metals, PHC (fractions 2 to 4) and/or PAH analysis, as well as for electrical conductivity (EC) and sodium absorption ratio (SAR) during the May 2019 sampling event. Two (2) additional grab samples (one was a duplicate of the first one) were obtained during the current sampling event, which were submitted for laboratory testing of BTEX and PHCs (F1-F4). The results of the analytical testing are summarized in Tables 6, 7, 8, 9 and 10 along with the selected MECP Table 2 Standards. The laboratory certificate of analysis is included in Appendix 1 of this report.

TABLE 6: Analytical Test Results – Soil – PHC (F2 to F4)					
Parameter	MDL (µg/g)	Soil Samples (ug/g)			MECP Table 2 Standards (µg/g)
		May 15, 2019			
		BH1-AU1	BH1-SS3	BH2-AU1	
PHCs - F2	4	4	6	7	230
PHCs - F3	8	160	189	39	1700
PHCs - F4	6	(852)	(983)	(228)	3300
PHCs - F4 (gravimetric)	50	(696)	(628)	(441)	3300
Notes:					
☐ MDL - Method Detection Limit					
☐ (-) – Result exceeds the MECP Table 1 Standards					

TABLE 6 Continued: Analytical Test Results – Soil – PHC (F2 to F4)					
Parameter	MDL (µg/g)	Soil Samples (ug/g)			MECP Table 2 Standards (µg/g)
		May 15, 2019	May 14, 2019		
		BH2-SS1	BH3-SS3	BH3-SS5	
PHCs - F2	4	nd	nd	6	230
PHCs - F3	8	19	174	239	1700
PHCs – F4	6	114	(413)	(1410)	3300
PHCs - F4 (gravimetric)	50	(270)	NA	(247)	3300
Notes:					
☐ MDL - Method Detection Limit					
☐ nd - Not Detected (i.e <MDL)					
☐ (-) – Results exceeds the MECP Table 1 Standards					

TABLE 7: Analytical Test Results – Soil – BTEX and PHC (F1 to F4)				
Parameter	MDL (µg/g)	Soil Samples (ug/g)		MECP Table 2 Standards (µg/g)
		November 10, 2020		
		G1	G2	
Benzene	0.02	nd	nd	0.32
Ethylbenzene	0.05	nd	nd	1.1
Toluene	0.05	nd	nd	6.4
Xylenes	0.05	nd	nd	26
PHCs - F1	7	nd	nd	55
PHCs - F2	4	nd	nd	230
PHCs - F3	8	27	20	1700
PHCs – F4	6	28	24	3300
Notes:				
☐ MDL - Method Detection Limit				
☐ nd - Not Detected (i.e <MDL)				
☐ (-) – Results exceeds the MECP Table 1 Standards				

Detectable PHC concentrations were identified in all of the soil samples analyzed. All PHC parameters are in compliance with the MECP Table 2 Standards.

All of the F4 concentrations exceed the MECP Table 1 (Background) Standards.

TABLE 8: Analytical Test Results – Soils – Metals					
Parameter	MDL (µg/g)	Soil Samples (µg/g)			MECP Table 2 Standards (µg/g)
		May 15, 2019			
		BH1-AU1	BH1-SS3	BH2-AU1	
Antimony	1.0	nd	nd	nd	40
Arsenic	1.0	5.7	4.9	4.4	18
Barium	1.0	163	65.7	71.5	670
Beryllium	0.5	0.6	nd	0.5	8
Boron	5.0	8.3	8.5	9.8	120
Cadmium	0.5	nd	nd	nd	1.9
Chromium	5.0	53.5	19.4	23.4	160
Chromium (VI)	0.2	nd	nd	nd	8
Cobalt	1.0	11.5	7.0	8.1	80
Copper	5.0	27.8	14.3	21.0	230
Lead	1.0	25.9	19.6	14.5	120
Mercury	0.1	nd	nd	nd	3.9
Molybdenum	1.0	1.1	(2.3)	nd	40
Nickel	5.0	31.1	16.1	18	270
Selenium	1.0	nd	nd	nd	5.5
Silver	0.3	nd	nd	nd	40
Thallium	1.0	nd	nd	nd	3.3
Uranium	1.0	nd	nd	nd	33
Vanadium	10.0	64.9	29.6	35.2	86
Zinc	20.0	97.3	36.4	37	340

TABLE 8: Analytical Test Results – Soils – Metals					
Parameter	MDL (µg/g)	Soil Samples (µg/g)			MECP Table 2 Standards (µg/g)
		May 15, 2019			
		BH1-AU1	BH1-SS3	BH2-AU1	
Notes: ☐ MDL – Method Detection Limit ☐ nd – not detected above the MDL ☐ (-) – Results exceeds the MECP Table 1 Standards					

TABLE 8 Continued: Analytical Test Results – Soils – Metals					
Parameter	MDL (µg/g)	Soil Samples (µg/g)			MECP Table 2 Standards (µg/g)
		May 15, 2019		May 14, 2019	
		BH2-SS1	BH3-SS2	BH3-SS5	
Antimony	1.0	nd	nd	nd	40
Arsenic	1.0	7.3	5.9	6.2	18
Barium	1.0	188	191	137	670
Beryllium	0.5	1	1	0.5	8
Boron	5.0	17	15.9	9.7	120
Cadmium	0.5	nd	nd	nd	1.9
Chromium	5.0	44.3	(73.4)	33	160
Chromium (VI)	0.2	nd	nd	nd	8
Cobalt	1.0	15.7	14.7	9	80
Copper	5.0	41.6	37.4	19.6	230
Lead	1.0	35.2	29.3	65.1	120
Mercury	0.1	nd	nd	nd	3.9
Molybdenum	1.0	1.9	2	(2.8)	40
Nickel	5.0	39.2	44.7	22.2	270
Selenium	1.0	nd	nd	nd	5.5
Silver	0.3	nd	nd	nd	40
Thallium	1.0	nd	nd	nd	3.3
Uranium	1.0	1.1	1.2	nd	33
Vanadium	10.0	53.2	69.1	37.7	86
Zinc	20.0	93	98.4	55.7	340
Notes: ☐ MDL – Method Detection Limit ☐ nd – not detected above the MDL ☐ (-) – Results exceeds the MECP Table 1 Standards					

Detectable metal concentrations were identified in all of the soil samples analyzed. All metal parameters are in compliance with MECP Table 2 Standards.

Molybdenum in two (2) of the samples (BH1-SS3 and BH3-SS5) and chromium in one of the samples (BH3-SS2) exceeded Table 1 Standards. It should be noted that molybdenum and chromium may possibly be naturally occurring in this area.

TABLE 9: Analytical Test Results – Soil – PAH					
Parameter	MDL (µg/g)	Soil Samples (ug/g)			MECP Table 2 Standards (µg/g)
		May 15, 2019			
		BH1-AU1	BH1-SS3	BH2-AU1	
Acenaphthene	0.02	nd	0.04	nd	21
Acenaphthylene	0.02	nd	nd	nd	0.15
Anthracene	0.02	nd	0.11	nd	0.67
Benzo[a]anthracene	0.02	0.03	0.18	nd	0.96
Benzo[a]pyrene	0.02	0.05	0.16	nd	0.3
Benzo[b]fluoranthene	0.02	0.05	0.16	nd	0.96
Benzo[g,h,i]perylene	0.02	0.05	0.08	nd	9.6
Benzo[k]fluoranthene	0.02	0.04	0.14	nd	0.96
Chrysene	0.02	0.06	0.21	nd	9.6
Dibenzo[a,h]anthracene	0.02	nd	0.02	nd	0.1
Fluoranthene	0.02	0.05	0.46	nd	9.6
Fluorene	0.02	nd	0.04	nd	62
Indeno[1,2,3-cd]pyrene	0.02	0.02	0.04	nd	0.76
1-Methylnaphthalene	0.02	nd	nd	nd	30
2-Methylnaphthalene	0.02	nd	nd	nd	30
Methylnaphthalene (1&2)	0.02	nd	nd	nd	30
Naphthalene	0.01	nd	nd	nd	9.6
Phenanthrene	0.02	0.03	0.3	nd	12
Pyrene	0.02	0.05	0.36	nd	9.6
Notes:					
☐ MDL - Method Detection Limit					
☐ nd - Not Detected (i.e <MDL)					

TABLE 9 Continued: Analytical Test Results – Soil – PAH					
Parameter	MDL (µg/g)	Soil Samples (ug/g)			MECP Table 2 Standards (µg/g)
		May 15, 2019	May 14, 2019		
		BH2-SS1	BH3-SS3	BH3-SS5	
Acenaphthene	0.02	nd	nd	nd	21
Acenaphthylene	0.02	nd	nd	nd	0.15
Anthracene	0.02	nd	nd	0.03	0.67
Benzo[a]anthracene	0.02	nd	0.05	0.07	0.96
Benzo[a]pyrene	0.02	nd	0.08	0.06	0.3
Benzo[b]fluoranthene	0.02	nd	0.09	0.09	0.96
Benzo[g,h,i]perylene	0.02	nd	0.07	0.05	9.6
Benzo[k]fluoranthene	0.02	nd	0.1	0.07	0.96
Chrysene	0.02	nd	0.1	0.09	9.6
Dibenzo[a,h]anthracene	0.02	nd	nd	nd	0.1
Fluoranthene	0.02	0.03	0.15	0.18	9.6
Fluorene	0.02	nd	nd	nd	62
Indeno[1,2,3-cd]pyrene	0.02	nd	0.03	0.03	0.76
1-Methylnaphthalene	0.02	nd	nd	nd	30
2-Methylnaphthalene	0.02	nd	nd	nd	30
Methylnaphthalene (1&2)	0.02	nd	nd	nd	30
Naphthalene	0.01	nd	nd	nd	9.6
Phenanthrene	0.02	nd	0.06	0.12	12
Pyrene	0.02	0.03	0.13	0.14	9.6
Notes:					
☐ MDL - Method Detection Limit					
☐ nd - Not Detected (i.e <MDL)					

Detectable PAH concentrations were identified in all of the soil samples analyzed. All PAH parameters are in compliance with MECP Table 2 Standards, as well as Table 1 Standards.

TABLE 10: Analytical Test Results – Soil –Conductivity (EC), SAR and pH					
Parameter	MDL	Soil Samples (ug/g)			MECP Table 2 Standards
		May 15, 2019		May 14, 2019	
		BH1-SS3	BH2-AU1	BH3-SS5	
SAR	0.01	0.26	0.25	0.69	12
Conductivity (µS/cm)	5	272	282	472	1400
pH	0.05	7.65	NA	7.86	5-9
Notes:					
☐ MDL - Method Detection Limit ☐ NA – Parameter not analyzed					

The conductivity, SAR and pH in all of the soil samples analyzed are in compliance with the MECP Table 2 and Table 1 Standards.

The analytical results in the soil samples analyzed with respect to borehole locations are shown on Drawing PE5100-4- Analytical Testing Plan – Soil.

The maximum concentrations of analyzed parameters in the soil at the site are summarized in Table 11.

TABLE 11: Maximum Concentrations – Soil			
Parameter	Maximum Concentration (µg/g)	Soil Sample	Depth Interval (m BGS)
PHC F ₂	7	BH2-AU1	0-0.74
PHC F ₃	239	BH3-SS5	3.78-4.57
PHC F ₄	(1410)	BH3-SS5	3.78-4.57
PHCs - F ₄ (gravimetric)	(696)	BH1-AU1	0-0.74
Arsenic	7.3	BH2-SS1	0.74-1.52
Barium	191	BH3-SS2	1.52-2.26
Beryllium	1	BH3-SS2	1.52-2.26
Boron	17	BH2-SS1	0.74-1.52
Chromium	(73.4)	BH3-SS2	1.52-2.26
Cobalt	15.7	BH2-SS1	0.74-1.52
Copper	41.6	BH2-SS1	0.74-1.52
Lead	65.1	BH3-SS5	3.78-4.57
Molybdenum	(2.8)	BH3-SS5	3.78-4.57
Nickel	44.7	BH3-SS2	1.52-2.26
Uranium	1.2	BH3-SS2	1.52-2.26
Vanadium	69.1	BH3-SS2	1.52-2.26
Zinc	98.4	BH3-SS2	1.52-2.26
Acenaphthene	0.04	BH1-SS3	2.44-3.05
Anthracene	0.11	BH1-SS3	2.44-3.05
Benzo[a]anthracene	0.18	BH1-SS3	2.44-3.05

TABLE 11: Maximum Concentrations – Soil			
Parameter	Maximum Concentration (µg/g)	Soil Sample	Depth Interval (m BGS)
Benzo[a]pyrene	0.16	BH1-SS3	2.44-3.05
Benzo[b]fluoranthene	0.16	BH1-SS3	2.44-3.05
Benzo[g,h,i]perylene	0.08	BH1-SS3	2.44-3.05
Benzo[k]fluoranthene	0.14	BH1-SS3	2.44-3.05
Chrysene	0.21	BH1-SS3	2.44-3.05
Dibenzo[a,h]anthracene	0.02	BH1-SS3	2.44-3.05
Fluoranthene	0.46	BH1-SS3	2.44-3.05
Fluorene	0.04	BH1-SS3	2.44-3.05
Indeno[1,2,3-cd]pyrene	0.04	BH1-SS3	2.44-3.05
Phenanthrene	0.3	BH1-SS3	2.44-3.05
Pyrene	0.36	BH1-SS3	2.44-3.05
Notes: ☐ (-) – Results exceed the MECP Table 1 Background Standards			

The remaining parameters were not detected above the laboratory method detection limits.

5.6 Groundwater Quality

Groundwater samples were recovered from each of the monitoring well installed at BH1, BH2 and MW7-08 and submitted for PHC (F1-F4), PAH, VOC and sodium and chloride analysis. For confirmatory and quality assurance purposes, a second groundwater sample was collected from BH1 and BH2 and submitted for PAH analysis on June 7, 2019. An additional groundwater sample from BH1 as well as a duplicate was collected during the more recent sampling event and submitted for PAH analysis for verification purposes. The results of the analytical testing are presented in Tables 12, 13, 14 and 15 along with the MECP Table 2 Standards. The laboratory certificates of analysis are included in Appendix 1 of this report.

TABLE 12: Analytical Test Results – Groundwater – PHC (F1 – F4)					
Parameter	MDL (µg/L)	Groundwater Samples (µg/L)			MECP Table 2 Standards (µg/L)
		May 28, 2019			
		BH1	BH2	MW7-08	
PHC F1	25	nd	nd	nd	750
PHC F2	100	nd	nd	nd	150
PHC F3	100	nd	nd	nd	500
PHC F4	100	nd	nd	nd	500
Notes: ☐ MDL - Method Detection Limit ☐ nd - Not Detected (i.e <MDL)					

No detectable PHC concentrations were identified in any of the groundwater samples analyzed. All PHC parameters were in compliance with the MECP Table 2 Standards.

TABLE 13: Analytical Test Results – Groundwater – PAH							
Parameter	MDL (µg/L)	Groundwater Samples (µg/L)					MECP Table 2 Standards (µg/L)
		May 28, 2019			June 7, 2019		
		BH1	BH2	MW7-08	BH1-GW2	BH2-GW2	
Acenaphthene	0.05	0.75	nd	0.11	0.69	nd	4.1
Acenaphthylene	0.05	nd	nd	0.08	0.06	nd	1
Anthracene	0.01	0.06	0.07	nd	0.42	nd	2.4
Benzo[a]anthracene	0.01	0.07	0.16	nd	1.02	nd	1
Benzo[a]pyrene	0.01	0.05	0.12	nd	0.75	nd	0.01
Benzo[b]fluoranthene	0.05	nd	0.15	nd	1.41	nd	0.1
Benzo[g,h,i]perylene	0.05	nd	0.09	nd	0.41	nd	0.2
Benzo[k]fluoranthene	0.05	nd	0.07	nd	0.81	nd	0.1
Chrysene	0.05	0.06	0.15	nd	0.88	nd	0.1
Dibenzo[a,h]anthracene	0.05	nd	nd	nd	0.15	nd	0.2
Fluoranthene	0.01	0.29	0.35	0.03	2.28	nd	0.41
Fluorene	0.05	0.58	0.05	0.11	0.49	nd	120
Indeno[1,2,3-cd]pyrene	0.05	0.06	0.08	nd	0.40	nd	0.2
1-Methylnaphthalene	0.05	nd	nd	0.05	nd	nd	3.2
2-Methylnaphthalene	0.05	nd	0.05	nd	nd	nd	3.2
Methylnaphthalene (1&2)	0.1	nd	nd	nd	nd	nd	3.2
Naphthalene	0.05	nd	nd	0.22	nd	nd	11
Phenanthrene	0.05	0.12	0.26	nd	1.12	nd	1
Pyrene	0.01	0.21	0.29	0.03	1.82	nd	4.1
Notes:							
☐ MDL - Method Detection Limit							
☐ nd - Not Detected (i.e <MDL)							
☐ Bold and underlined – Results exceed selected MECP standard							

Detectable PAH parameters were identified in all of the groundwater samples analyzed for the May 28, 2019 sampling event. All PAH parameters in the groundwater at location MW7-08 were in compliance with the MECP Table 2 Standards. Benzo[a]pyrene concentrations in BH1 and BH2 were in excess of the applicable standards. Benzo[b]fluoranthene and chrysene concentrations in BH2 were also in excess of the applicable MECP standards.

Since it was considered possible that sediment had resulted in the elevated PAH concentrations, BH1 and BH2 were resampled on June 7, 2019. No detectable PAH parameters were identified in BH2-GW2. It is expected that the apparent discrepancies between the two (2) analytical results for BH2, are a result of sediment present in the first groundwater sample analyzed.

TABLE 13 Continued: Analytical Test Results – Groundwater – PAH				
Parameter	MDL (µg/L)	Groundwater Samples (µg/L)		MECP Table 2 Standards (µg/L)
		November 10, 2020		
		BH1-GW3	MW11-GW1 (Duplicate of BH1-GW3)	
Acenaphthene	0.05	0.79	0.73	4.1
Acenaphthylene	0.05	nd	nd	1
Anthracene	0.01	nd	nd	2.4
Benzo[a]anthracene	0.01	nd	nd	1
Benzo[a]pyrene	0.01	nd	nd	0.01
Benzo[b]fluoranthene	0.05	nd	nd	0.1
Benzo[g,h,i]perylene	0.05	nd	nd	0.2
Benzo[k]fluoranthene	0.05	nd	nd	0.1
Chrysene	0.05	nd	nd	0.1
Dibenzo[a,h]anthracene	0.05	nd	nd	0.2
Fluoranthene	0.01	0.27	0.26	0.41
Fluorene	0.05	0.47	0.44	120
Indeno[1,2,3-cd]pyrene	0.05	nd	nd	0.2
1-Methylnaphthalene	0.05	nd	nd	3.2
2-Methylnaphthalene	0.05	nd	nd	3.2
Methylnaphthalene (1&2)	0.1	nd	nd	3.2
Naphthalene	0.05	nd	nd	11
Phenanthrene	0.05	nd	nd	1
Pyrene	0.01	0.15	0.15	4.1
Notes: ☐ MDL - Method Detection Limit ☐ nd - Not Detected (i.e <MDL) ☐ <u>Bold and underlined</u> – Results exceed selected MECP standard				

The PAH concentrations in the most recent groundwater samples (BH1-GW3 and duplicate), were in compliance of the selected MECP Table 2 Standards.

TABLE 14: Analytical Test Results – Groundwater – VOC					
Parameter	MDL (µg/L)	Groundwater Samples (µg/L)			MECP Table 2 Standards (µg/L)
		May 28, 2019			
		BH1	BH2	MW7-08	
Acetone	5	nd	nd	nd	2700
Benzene	0.5	nd	nd	nd	5
Bromodichloromethane	0.5	nd	nd	nd	16
Bromoform	0.5	nd	nd	nd	25
Bromomethane	0.5	nd	nd	nd	0.89
Carbon Tetrachloride	0.2	nd	nd	nd	0.79
Chlorobenzene	0.5	nd	nd	nd	30
Chloroform	0.5	nd	nd	nd	2.4
Dibromochloromethane	0.5	nd	nd	nd	25
Dichlorodifluoromethane	1	nd	nd	nd	590
1,2-Dichlorobenzene	0.5	nd	nd	nd	3
1,3-Dichlorobenzene	0.5	nd	nd	nd	59
1,4-Dichlorobenzene	0.5	nd	nd	nd	1
1,1-Dichloroethane	0.5	nd	nd	nd	5
1,2-Dichloroethane	0.5	nd	nd	nd	1.6
1,1-Dichloroethylene	0.5	nd	nd	nd	1.6

TABLE 14: Analytical Test Results – Groundwater – VOC

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)			MECP Table 2 Standards (µg/L)
		May 28, 2019			
		BH1	BH2	MW7-08	
cis-1,2-Dichloroethylene	0.5	nd	nd	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	nd	1.6
1,2-Dichloropropane	0.5	nd	nd	nd	5
1,3-Dichloropropene, total	0.5	nd	nd	nd	0.5
Ethylbenzene	0.5	nd	nd	nd	2.4
Ethylene dibromide	0.2	nd	nd	nd	0.2
Hexane	1	nd	nd	nd	51
Methyl Ethyl Ketone	5	nd	nd	nd	1800
Methyl Isobutyl Ketone	5	nd	nd	nd	640
Methyl tert-butyl ether	2	nd	nd	nd	15
Methylene Chloride	5	nd	nd	nd	50
Styrene	0.5	nd	nd	nd	5.4
1,1,1,2-Tetrachloroethane	0.5	nd	nd	nd	1.1
1,1,2,2-Tetrachloroethane	0.5	nd	nd	nd	1
Tetrachloroethylene	0.5	nd	nd	nd	1.6
Toluene	0.5	nd	nd	nd	24
1,1,1-Trichloroethane	0.5	nd	nd	nd	200
1,1,2-Trichloroethane	0.5	nd	nd	nd	4.7
Trichloroethylene	0.5	nd	nd	nd	1.6
Trichlorofluoromethane	1	nd	nd	nd	150
Vinyl Chloride	0.5	nd	nd	nd	0.5
Xylenes, total	0.5	nd	nd	nd	300
Notes:					
☐ MDL - Method Detection Limit					
☐ nd - Not Detected (i.e <MDL)					

No detectable VOC concentrations were identified in any of the groundwater samples analyzed. All VOC parameters are in compliance with the MECP Table 2 Standards.

TABLE 15: Analytical Test Results – Groundwater – Salt (Sodium and Chloride)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)		MECP Table 2 Standards (µg/L)
		June 7, 2019		
		BH1-GW2	BH2-GW2	
Chloride	1000	113,000	65,000	790,000
Sodium	200	109,000	94,200	490,000
Notes:				
☐ MDL - Method Detection Limit				
☐ nd - Not Detected (i.e <MDL)				

Detectable chloride and sodium concentrations were identified in all of the groundwater samples analyzed. Chloride and sodium concentrations are in compliance of the MECP Table 2 Standards.

The analytical results in the groundwater with respect to borehole locations are shown on Drawing PE5100-5- Analytical Testing Plan – Groundwater.

The maximum concentrations of analyzed parameters in the groundwater beneath the site are summarized in Table 16.

TABLE 16: Maximum Concentrations – Groundwater			
Parameter	Maximum Concentration (µg/L)	Groundwater Sample	Screened Interval (m BGS)
Acenaphthene	0.79	BH1-GW3	5.35-8.35
Acenaphthylene	0.08	MW7-08	3.0-6.0
Anthracene	0.42	BH1-GW2	5.35-8.35
Benzo[a]anthracene	<u>1.02</u>	BH1-GW2	5.35-8.35
Benzo[a]pyrene	<u>0.75</u>	BH1-GW2	5.35-8.35
Benzo[b]fluoranthene	<u>1.41</u>	BH1-GW2	5.35-8.35
Benzo[g,h,i]perylene	<u>0.41</u>	BH1-GW2	5.35-8.35
Benzo[k]fluoranthene	<u>0.81</u>	BH1-GW2	5.35-8.35
Chrysene	<u>0.88</u>	BH1-GW2	5.35-8.35
Dibenzo[a,h]anthracene	0.15	BH1-GW2	5.35-8.35
Fluoranthene	<u>2.28</u>	BH1-GW2	5.35-8.35
Fluorene	0.58	BH1	5.35-8.35
Indeno[1,2,3-cd]pyrene	<u>0.40</u>	BH1-GW2	5.35-8.35
1-Methylnaphthalene	0.05	MW7-08	3.0-6.0
2-Methylnaphthalene	0.05	BH2	2.3-5.3
Naphthalene	0.22	MW7-08	3.0-6.0
Phenanthrene	<u>1.12</u>	BH1-GW2	5.35-8.35
Pyrene	1.82	BH1-GW2	5.35-8.35
Chloride	130,000	BH1-GW1	5.35-8.35
Sodium	69,700	BH1-GW1	5.35-8.35

The remaining parameters were not detected above the laboratory method detection limits.

5.7 Quality Assurance and Quality Control Results

All samples submitted as part of the 2019 and 2020 sampling events were handled in accordance with the Analytical Protocol with respect to preservation method, storage requirement, and container type.

A duplicate soil (G2) and groundwater samples (MW11-GW1) were obtained from samples G1 and BH1-GW3 and analyzed for PHCs and PAHs, respectively. Test results for the duplicate soil and groundwater samples and RPD calculations are provided below in Tables 17 and 18.

TABLE 17: QA/QC Results – Soil (PHCs)				
Parameter	G1	G2 (DUP)	RPD (%)	QA/QC Results
PHC F3	27	20	29	Outside the acceptable range
PHC F4	28	24	15	Within the acceptable range

TABLE 18: QA/QC Results – Groundwater (Metals)				
Parameter	BH1-GW3	MW11-GW1 (DUP)	RPD (%)	QA/QC Results
Acenaphthene	0.79	0.73	7.90	Within the acceptable range
Fluoranthene	0.27	0.26	3.80	Within the acceptable range
Fluorene	0.47	0.44	6.60	Within the acceptable range
Pyrene	0.15	0.15	0	Within the acceptable range

The majority of the RPD results are within the acceptable range, with the exception of a few parameters. It is not uncommon that very small or very high concentrations or values will yield higher RPD values, and as such, the RPD value is not an accurate measure in these cases.

Overall, the quality of the field data collected during this Phase II-ESA is considered to be sufficient to meet the overall objectives of this assessment.

5.8 Phase II Conceptual Site Model

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

Site Description

Potentially Contaminating Activity and Areas of Potential Environmental Concern

As indicated in Section 2.2 of this report, PCA 30 was identified on the subject land, which resulted in an APEC on the Phase II Property.

Table 19: Areas of Potential Environmental Concern

Area of Potential Environmental Concern	Location of Area of Potential Environmental Concern	Potentially Contaminating Activity	Location of PCA (on-site or off-site)	Contaminants of Potential Concern	Media Potentially Impacted (Groundwater, Soil, and/or Sediment)
APEC 1: Resulting from fill material of unknown quality	Across the Phase II Property	PCA 30 – “Importation of Fill Material of Unknown Quality.”	On-site	PHCs PAHs Metals (including Hg, CrVI) VOCs Sodium Chloride EC and SAR	Soil and/or Groundwater

Contaminants of Potential Concern

Based on the APECs identified on the Phase II Property, the contaminants of potential concern (CPCs) are:

- ☐ Petroleum hydrocarbons (PHCs, Fractions F₁-F₄).
- ☐ Polycyclic Aromatic Hydrocarbons (PAHs).
- ☐ Metals (Hg and CrVI).
- ☐ Volatile Organic Compounds (VOCs).
- ☐ Sodium and Chloride.
- ☐ Sodium Adsorption Ratio (SAR) and Electrical Conductivity (EC).

Subsurface Structures and Utilities

The Phase II Property is not expected to have any subsurface structures or utilities on it. Upon development, the Phase II Property will be serviced by a private septic system and a potable groundwater well.

Physical Setting

Site Stratigraphy

The site stratigraphy consists of:

- ☐ Fill material consisting of silt, sand, gravel with some cobbles, shale and road construction materials (i.e. asphalt and concrete), extending to depths ranging from 2.30 to 5.79 mbgs. Groundwater was encountered in this layer at BH1.

- ☐ Clayey silt or silty clay was encountered in BH1 and BH2 beneath the fill material, extending to depths ranging from 6.0 to 5.30 mbgs, respectively. Groundwater was encountered in this layer at BH2.
- ☐ Silty sand was encountered in BH1 and BH3, extending to depths of 8.35 and 9.45 mbgs, respectively. BH1 was terminated in this layer.
- ☐ Sandy silt was encountered in BH3. This borehole was terminated in this layer at a depth of 10.67 mbgs.

Hydrogeological Characteristics

Groundwater at the Phase II Property was generally encountered in the fill ranging at depths of approximately 2.92 to 3.82 mbgs. Groundwater flow was measured in a westerly direction with a hydraulic gradient of 0.015 m/m. Groundwater contours are shown on Drawing PE5100-3—Test Hole Location Plan.

Approximate Depth to Water Table

Depth to the water table at the subject site varies between approximately 2.92 to 3.82 mbgs.

Approximate Depth to Bedrock

Bedrock was not confirmed during the drilling program. All boreholes were completed in native soil. Practical refusal was reached at depths ranging from 5.28 to 10.67 m below the existing grade on inferred bedrock. It should be noted that refusal was initially encountered during the drilling of BH1 and BH3 on inferred concrete in the fill.

Sections 41 and 43.1 of the Regulation

Section 41 of the Regulation does not apply to the Phase II Property, in that the subject property is not within 30m of an environmentally sensitive area.

Section 43.1 of the Regulation does not apply to the Phase II Property as it is not a shallow soil property.

Fill Placement

Based on the findings of the subsurface investigation, the fill material consisted of a mix of clay, silt, sand and gravel with varying amounts of asphaltic concrete and concrete. The fill varied in thickness from 2.3 to 5.8 m.

Existing Buildings and Structures

No buildings or structures are present on the Phase II Property.

Proposed Buildings and Other Structures

The proposed development for the Phase II Property includes a commercial development that will consist of a large warehouse attached with a cross-dock which leads to an office. The footprint of the development will cover the majority of the central portion of the site and it will be privately serviced (i.e. septic system and potable groundwater well).

Drinking Water Wells

No potable water wells are present on the Phase II Property; however, upon development, the subject land will be serviced by a potable water well.

Water Bodies and Areas of Natural Significance

No areas of natural significance were identified within the study area. A tributary of Findley Creek is present approximately 245 m southeast of the Phase I Property and discharges into the North Caster River.

Environmental Condition

Areas Where Contaminants are Present

Based on the analytical results, all of the soil and groundwater results comply with the selected MECP Table 2 Commercial Standards, as shown on Drawings PE5100-4 – Analytical Testing Plan – Soil and Drawing PE5100-5 – Analytical Testing Plan - Groundwater.

Types of Contaminants

Based on the analytical results, there are no contaminants of concern on the Phase II Property.

Contaminated Media

Based on the findings of the Phase II ESA, there is no contaminated soil or groundwater on the Phase II Property.

What Is Known About Areas Where Contaminants Are Present

Based on the findings of the Phase II ESA, there is no contaminants present on the Phase II Property.

Distribution and Migration of Contaminants

Based on the findings of the Phase II ESA, no distribution or migration of potential contaminants is considered to have occurred.

Discharge of Contaminants

Based on the findings of the Phase II ESA, no discharge of potential contaminants is considered to have occurred.

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 by means of the infiltration of precipitation, and the migration of contaminants via groundwater levels and/or flow, which may fluctuate seasonally.

Since no contaminants were identified in the soil or groundwater, climatic and meteorological conditions do not apply in this Phase II ESA.

Potential for Vapour Intrusion

There is no potential for vapour intrusion on the Phase II Property.

6.0 CONCLUSIONS

Assessment

A Phase II ESA was conducted for the property now addressed, 301 Somme Street, formerly the northern portion of the 5123 Hawthorne Road, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address the area of potential environmental concern (APEC) that was identified on the Phase II Property during the Phase I ESA.

The Phase II ESA consisted of drilling three (3) boreholes on the Phase II Property, two (2) of which were constructed with groundwater monitoring well installations.

The soil profile generally consisted of a layer of fill, overlying native clayey silt/silty clay and/or a silty fine sand with traces of gravel. Practical refusal was reached at depths ranging from 5.28 to 10.67 m below the existing grade on inferred bedrock. The fill material consisted of a mix of clay, silt, sand and gravel with varying amounts of asphaltic concrete and concrete. Soil samples were obtained from the boreholes and screened using vapour measurements along with visual and olfactory observations. No staining or unusual odour was noted during the subsurface investigation.

Six (6) soil samples and two (2) grab samples were submitted for BTEX, PHCs (F1-F4), metals and/or PAH analysis, as well as for electrical conductivity (EC) and sodium absorption ratio (SAR). All soil samples complied with the selected MECP Table 2 Standards. A comparison of the soil data to the MECP Table 1 Standards, indicated that the petroleum hydrocarbon fraction 4 concentrations in several soil samples exceeded the Table 1 Standards, as well as molybdenum and chromium concentrations.

Groundwater samples were recovered from the monitoring wells BH1, BH2 and MW7-8 on May 28, June 7, 2019 and November 10, 2020. No visual or olfactory signs of contamination were noted in the groundwater. The groundwater samples were submitted for PHC (F1-F4), PAH, VOC and sodium and chloride analysis. No PHC or VOC concentrations above the laboratory method detection limits were identified in the groundwater samples analyzed. VOC and PHC test results are in compliance with the MECP Table 2 Standards.

Detectable PAH parameters were identified in all of the groundwater samples analyzed for the May 28, 2019 sampling event. All PAH parameters in groundwater at location MW7-08 were in compliance with the MECP Table 2 Standards. Benzo[a]pyrene concentrations in BH1 and BH2 were in excess of the applicable standards. Benzo[b]fluoranthene and chrysene concentrations in BH2 were also in excess of the applicable MECP standards.

Since it was considered possible that sediment had resulted in the elevated PAH concentrations, BH1 and BH2 were resampled on June 7, 2019 and November 10, 2020. The most recent sample results for those 2 wells were all in compliance with the MECP Table 2 Standards. It is expected that the apparent discrepancies between these analytical results, are a result of sediment present in the first groundwater samples analyzed.

Recommendations

The investigation confirms that the fill is composed of waste road building materials, generally consisting of various soils, road based granular materials concrete and asphaltic concrete. No other deleterious materials or otherwise contaminated soils were identified. The analytical testing indicates that the fill complies with the MECP standards.

Based on the intended use of the site and our findings, no remediation of the soil is considered necessary, however, given the Table 1 exceedances for PHC fraction 4, molybdenum and chromium, and the presence of asphalt in the majority of the samples, it is our opinion that the fill is not clean for off-site disposal if it has to be removed from the property for construction purposes. It is recommended that any excess soil generated during the future site development be analyzed to confirm its quality and determine an appropriate disposal methodology.

If the monitoring wells installed on the subject site are not going to be used in the future, or will be destroyed during site redevelopment, they should be abandoned according to Ontario Regulation 903. In the meantime, the wells will be registered with the MECP under this regulation.

7.0 STATEMENT OF LIMITATIONS

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

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

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

This report was prepared for the sole use of Fastfrate (Ottawa) Holdings Inc. Notification from Fastfrate (Ottawa) Holdings Inc. and Paterson Group will be required to release this report to any other party.

Paterson Group Inc.



Mandy Witteman, B.Eng., M.A.Sc.



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



Report Distribution:

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FIGURES

Figure 1 - Key Plan

**Drawing PE5100-3 – Test Hole Location Plan and Groundwater
Contour Plan**

Drawing PE5100-4 – Analytical Testing Plan – Soil

Drawing PE5100-5 – Analytical Testing Plan – Groundwater

Drawing PE5100-6 –Cross-Section A-A'– Soil and Groundwater

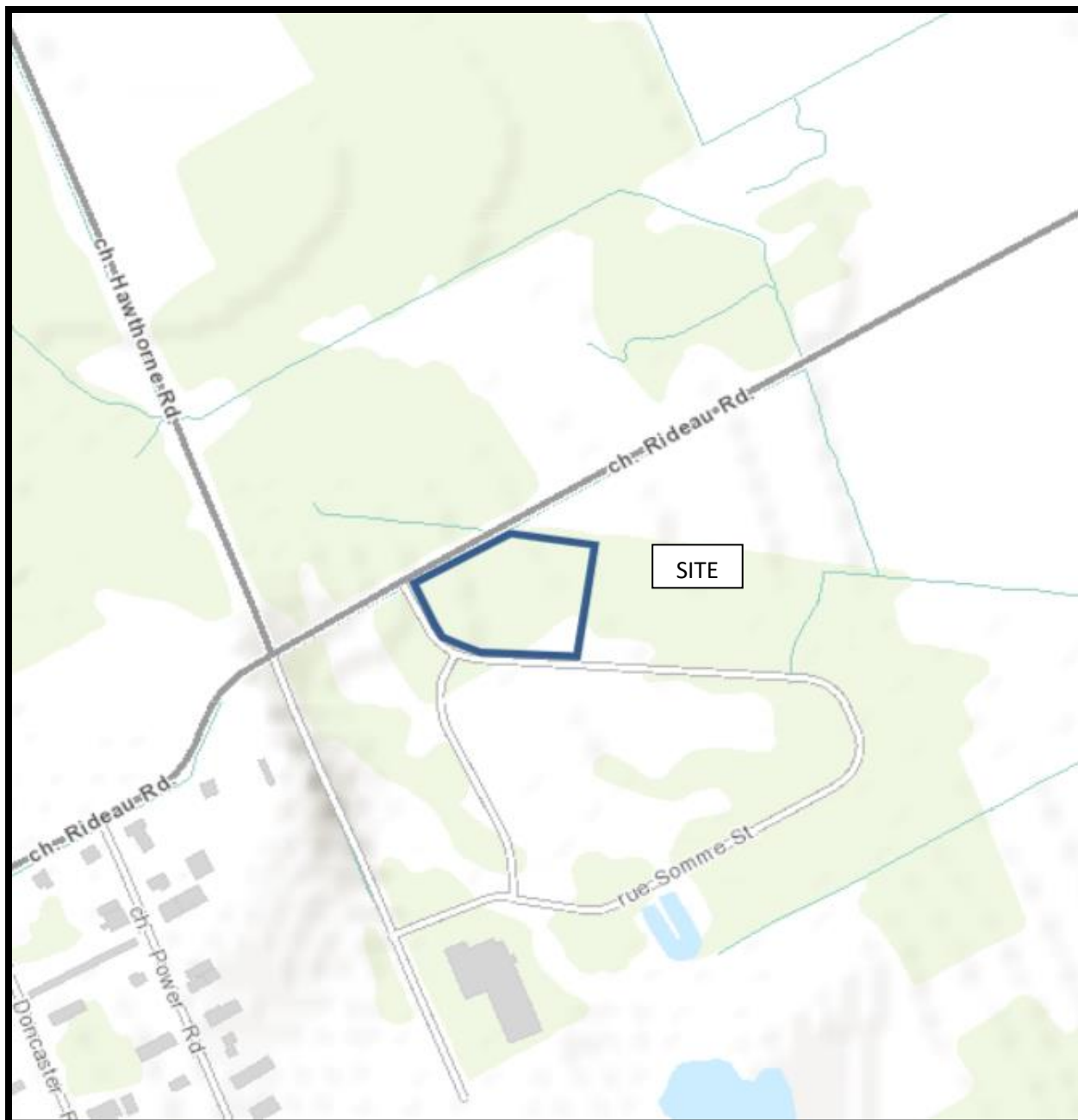
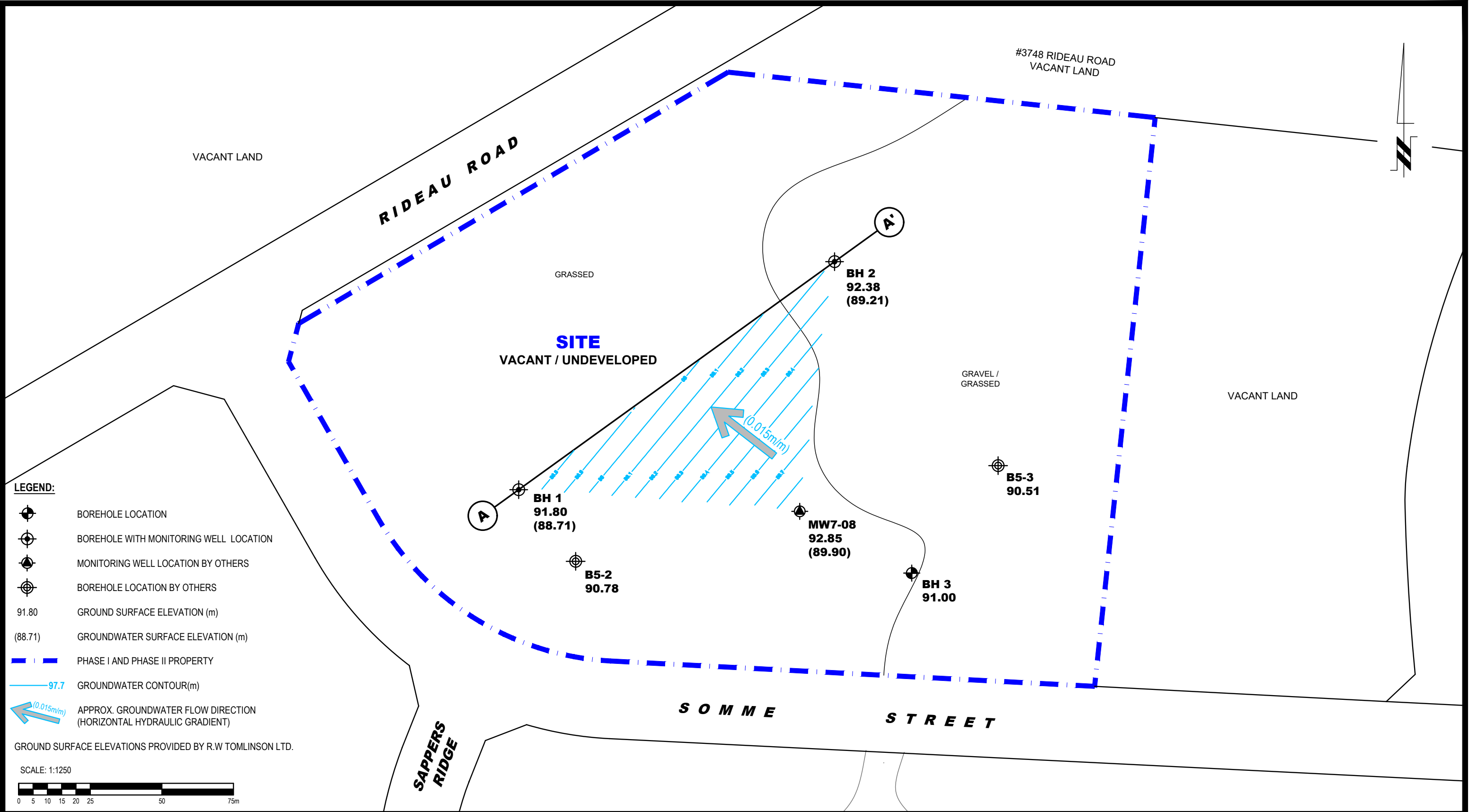


FIGURE 1
KEY PLAN



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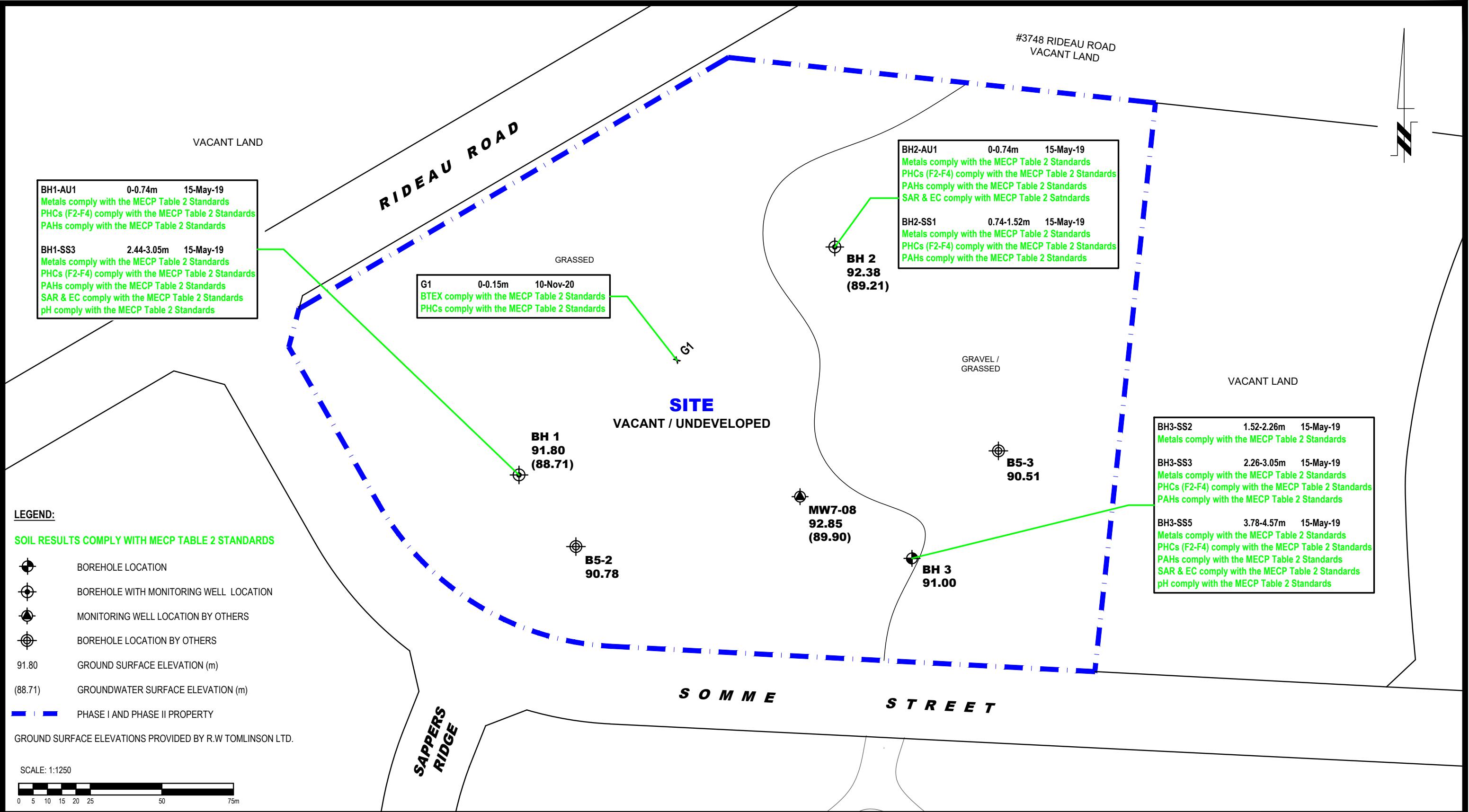
FASTFRATE (OTTAWA) HOLDINGS INC.
PHASE II - ENVIRONMENTAL SITE ASSESSMENT
NORTHERN PART OF 5123 HAWTHORNE ROAD

OTTAWA,
Title:

ONTARIO

TEST HOLE LOCATION PLAN

Scale:	1:1250	Date:	11/2020
Drawn by:	MPG	Report No.:	PE5100-2
Checked by:	MW	Dwg. No.:	PE5100-3
Approved by:	MSD	Revision No.:	



LEGEND:

SOIL RESULTS COMPLY WITH MECP TABLE 2 STANDARDS

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- MONITORING WELL LOCATION BY OTHERS
- BOREHOLE LOCATION BY OTHERS
- 91.80 GROUND SURFACE ELEVATION (m)
- (88.71) GROUNDWATER SURFACE ELEVATION (m)
- PHASE I AND PHASE II PROPERTY

GROUND SURFACE ELEVATIONS PROVIDED BY R.W TOMLINSON LTD.



patersongroup consulting engineers 154 Colonnade Road South Ottawa, Ontario K2E 7J5 Tel: (613) 226-7381 Fax: (613) 226-6344					FASTRATE (OTTAWA) HOLDINGS INC. PHASE II - ENVIRONMENTAL SITE ASSESSMENT NORTHERN PART OF 5123 HAWTHORNE ROAD	OTTAWA, ONTARIO	Scale:	1:1250	Date:	11/2020
							Drawn by:	MPG	Report No.:	PE5100-2
							Checked by:	MW	Dwg. No.:	PE5100-4
							Approved by:	MSD	Revision No.:	
	0						ANALYTICAL TESTING PLAN - SOIL			
	NO.	REVISIONS	DATE	INITIAL						

BH1-GW1	5.35-8.35m	28-May19
Parameter	Results	Table 2 (ug/L)
Benzo(a)pyrene	0.05	0.01
All other PAHs comply with the MECP Table 2		
PHCs comply with the MECP Table 2 Standards		
VOCs comply with the MECP Table 2 Standards		
BH1-GW2	5.35-8.35m	7-Jun-19
Parameter	Results	Table 2 (ug/L)
Benzo(a)anthracene	1.02	1.0
Benzo(a)pyrene	0.75	0.01
Benzo(b)fluoranthene	1.41	0.1
Benzo(g,h,i)perylene	0.41	0.2
Benzo(k)fluoranthene	0.81	0.1
Chrysene	0.88	0.1
Fluoranthene	2.28	0.41
Indenol(1,2,3-cd)pyrene	0.4	0.05
Phenanthrene	1012	1.0
All other PAHs comply with the MECP Table 2 Standards		
Sodium and Chloride comply with the MECP Table 2		
BH1-GW3	5.35-8.35m	10-Nov-20
PAHs comply with the MECP Table 2 Standards		

BH2-GW1	2.30-5.30m	28-May19
Parameter	Results	Table 2 (ug/L)
Benzo(a)pyrene	0.05	0.01
Benzo(b)fluoranthene	0.15	0.1
Chrysene	0.15	0.1
All other PAHs comply with the MECP Table 2		
PHCs comply with the MECP Table 2 Standards		
VOCs comply with the MECP Table 2 Standards		
BH2-GW2	2.30-5.30	7-Jun-19
PAHs comply with MECP Table 2 Standards		

MW7-8	3.0-6.0m	28-May-19
PAHs comply with the MECP Table 2 Standards		
PHCs comply with the MECP Table 2 Standards		
VOCs comply with the MECP Table 2 Standards		

LEGEND:

GROUNDWATER RESULTS COMPLY WITH MECP TABLE 2 STANDARDS

GROUNDWATER RESULTS EXCEED MECP TABLE 2 STANDARDS

-  BOREHOLE LOCATION
-  BOREHOLE WITH MONITORING WELL LOCATION
-  MONITORING WELL LOCATION BY OTHERS
-  BOREHOLE LOCATION BY OTHERS
-  91.80 GROUND SURFACE ELEVATION (m)
-  (88.71) GROUNDWATER SURFACE ELEVATION (m)
-  PHASE I AND PHASE II PROPERTY

GROUND SURFACE ELEVATIONS PROVIDED BY R.W TOMLINSON LTD.





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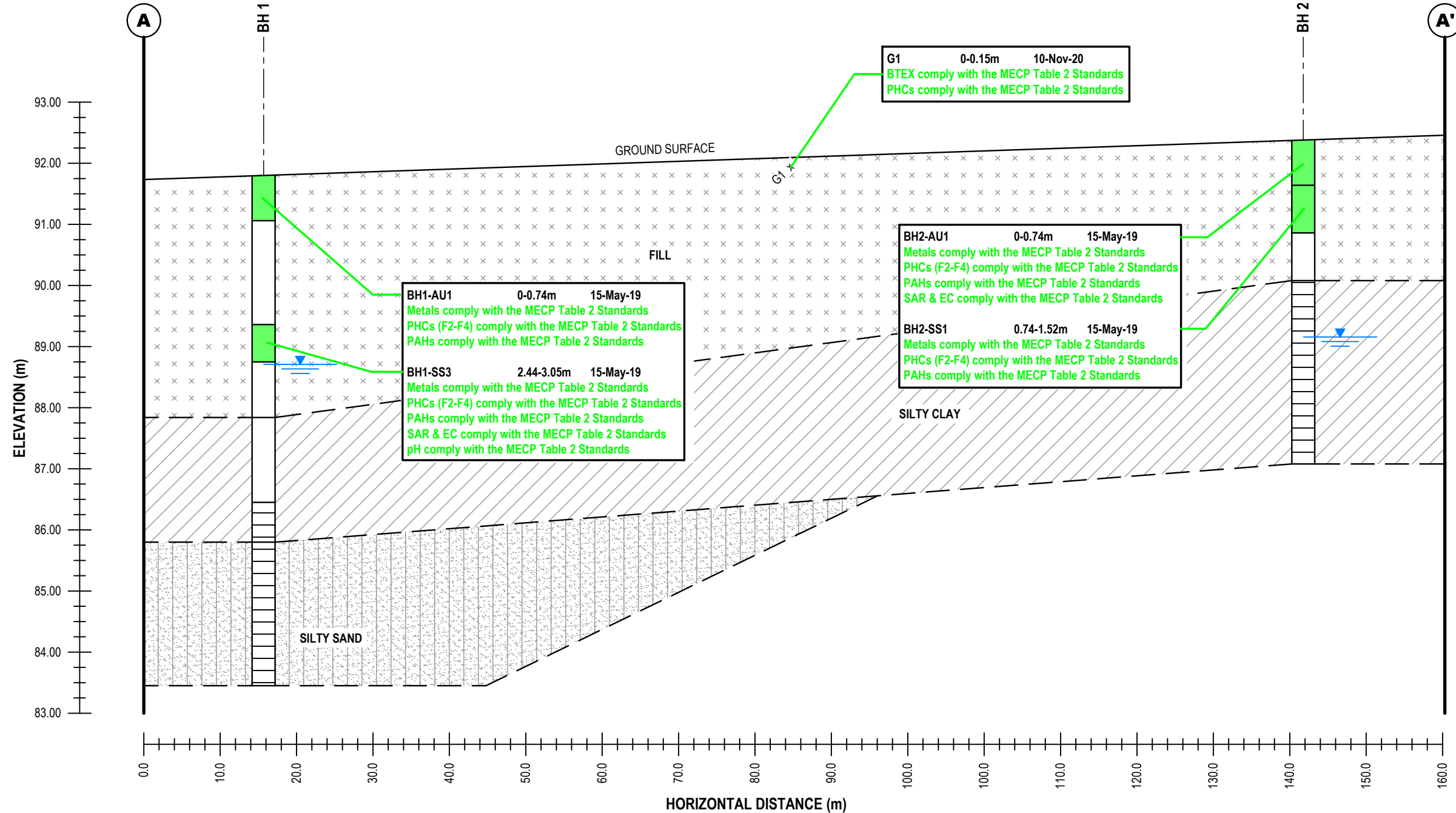
PHASE II - ENVIRONMENTAL SITE ASSESSMENT

NORTHERN PART OF 5123 HAWTHORNE ROAD

OTTAWA, ONTARIO

ANALYTICAL TESTING PLAN - GROUNDWATER

Scale:	1:1250	Date:	11/2020
Drawn by:	MPG	Report No.:	PE5100-2
Checked by:	MW	Dwg. No.:	PE5100-5
Approved by:	MSD	Revision No.:	



SOIL RESULTS COMPLY WITH MECP TABLE 2 STANDARDS

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FASTRATE (OTTAWA) HOLDINGS INC.	
PHASE II - ENVIRONMENTAL SITE ASSESSMENT	
NORTHERN PART OF 5123 HAWTHORNE ROAD	
OTTAWA,	ONTARIO
Title: CROSS-SECTION A'A' - SOIL	

Scale:	AS SHOWN	Date:	11/2020
Drawn by:	MPG	Report No.:	PE5100-2
Checked by:	MW	Dwg. No.:	PE5100-6
Approved by:	MSD	Revision No.:	

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
Northern Part of 5123 Hawthorn Road
Ottawa, Ontario

Prepared For

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May 2019

Report: PE5100-SAP

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1.0 SAMPLING PROGRAM

Paterson was retained by Mr. Pierre Cadeau, acting on behalf of Fastfrate (Ottawa) Holdings Inc., to conduct a Phase II Environmental Site Assessment (ESA) for the northern portion of the property addressed 5123 Hawthorne Road, in the City of Ottawa, Ontario.

The Phase II ESA was carried out to address the areas of potential environmental concern on the Phase II Property. The following subsurface investigation program was developed.

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1	Place on the western side of the Phase II Property to assess the potential impact due to APEC 1.	Borehole to be advanced to approximately 8 mbgs to install monitoring well.
BH2	Place on the northeastern side of the Phase II Property to assess the potential impact due to APEC 1.	Borehole to be advanced to approximately 5 mbgs to install monitoring well.
BH3	Place on the southeastern side of the Phase II Property to assess the potential impact due to APEC 1.	Borehole to be advanced to approximately 10 mbgs.

At each borehole, split-spoon samples of 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 borehole drilling, monitoring wells will be installed in selected boreholes (as above) for the measurement of water levels and the collection of groundwater samples. Borehole locations are shown on the Test Hole Location Plan appended to the main report.

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 MOECC 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 groundwater at the subject site is based on the following general considerations:

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

3.0 STANDARD OPERATING PROCEDURES

3.1 Environmental Drilling Procedure

Purpose

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

Equipment

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

- ☐ glass soil sample jars
- ☐ two buckets
- ☐ cleaning brush (toilet brush works well)
- ☐ dish detergent
- ☐ methyl hydrate
- ☐ water (if not available on site - water jugs available in trailer)
- ☐ latex or nitrile gloves (depending on suspected contaminant)
- ☐ Rkl 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 should be measured using a measuring tape or wheel rather than paced off. Boreholes were located and surveyed in the field by Paterson. All borehole and test pit locations were measured at geodetic elevations.

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 F1, 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" [1.52 m x 50 mm] threaded sections of Schedule 40 PVC slotted well screen (5' x 1 1/4" [1.52 m x 32 mm] if installing in cored hole in bedrock)
- ☐ 5' x 2" [1.52 m x 50 mm] threaded sections of Schedule 40 PVC riser pipe (5' x 1 1/4" [1.52 m x 32 mm] 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 (0.5 x) 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 MECP 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 TO SAMPLING & ANALYSIS PLAN

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.

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Northern Part of 5123 Hawthorne Road
Ottawa, Ontario

DATUM Ground surface elevations provided R. W. Tomlinson Limited.

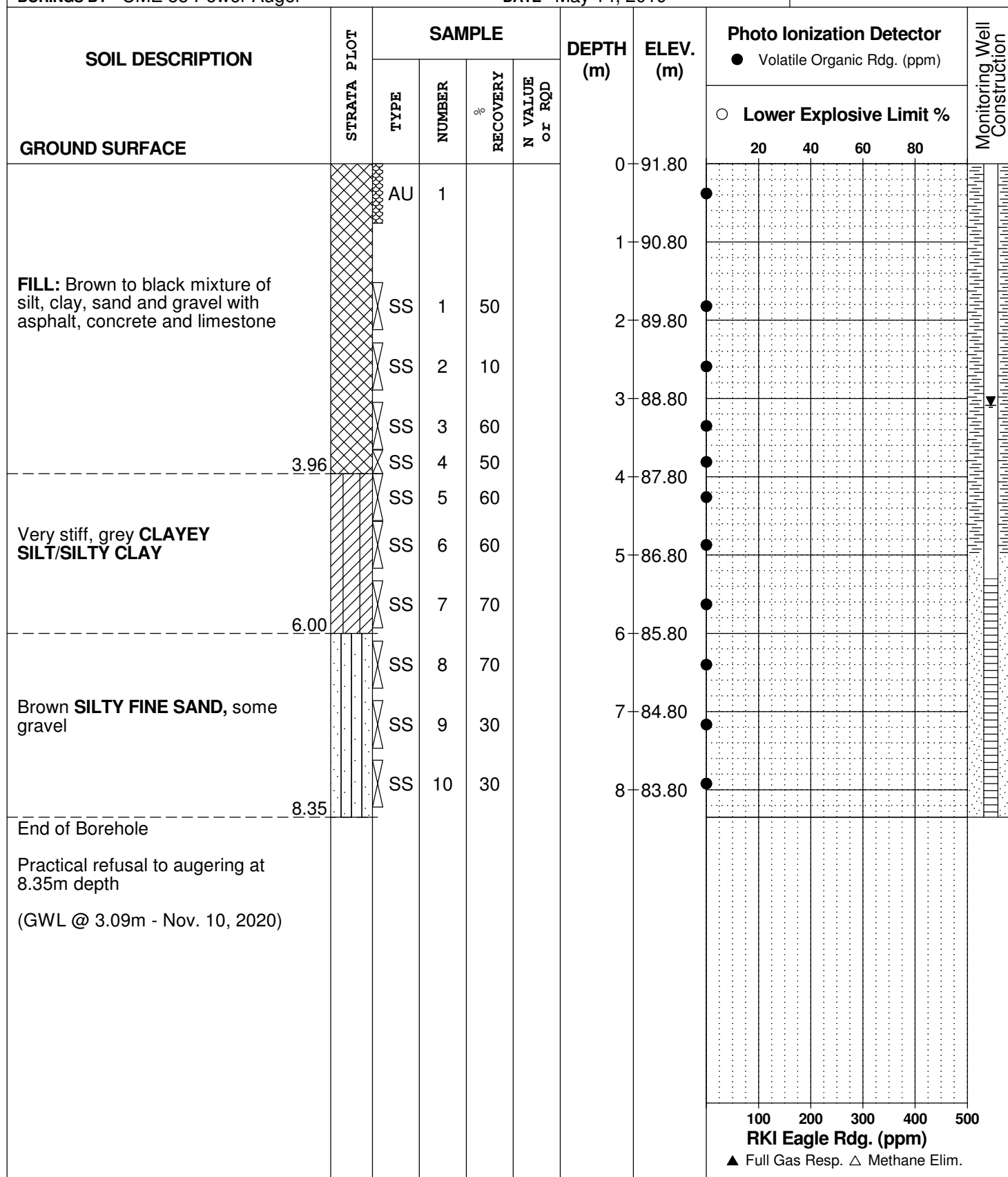
FILE NO.
PE5100

REMARKS

HOLE NO.
BH 1

BORINGS BY CME 55 Power Auger

DATE May 14, 2019



SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Northern Part of 5123 Hawthorne Road
Ottawa, Ontario

DATUM Ground surface elevations provided R. W. Tomlinson Limited.

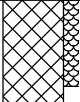
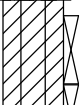
FILE NO.
PE5100

REMARKS

HOLE NO.
BH 2

BORINGS BY CME 55 Power Auger

DATE May 15, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rdg. (ppm)	○ Lower Explosive Limit %			
GROUND SURFACE								20	40	60	80	
FILL: Dark brown clayey sand		AU	1			0	92.38	●				
0.91												
FILL: Dark grey gravelly clay, some shale		SS	1	70		1	91.38	●				
1.52												
FILL: Dark grey gravelly silty sandy clay with shale and cobbles		SS	2	70		2	90.38	●				
2.30												
Stiff to firm, grey SILTY CLAY		SS	3	90		3	89.38	●				
		SS	4	90		4	88.38	●				
		SS	5			5	87.38	●				
		SS	6			6						
5.30												
End of Borehole												
Practical refusal to augering at 5.30m depth												
(GWL @ 3.17m - Nov. 10, 2020)												
						</						

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Northern Part of 5123 Hawthorne Road
Ottawa, Ontario

DATUM Ground surface elevations provided R. W. Tomlinson Limited.

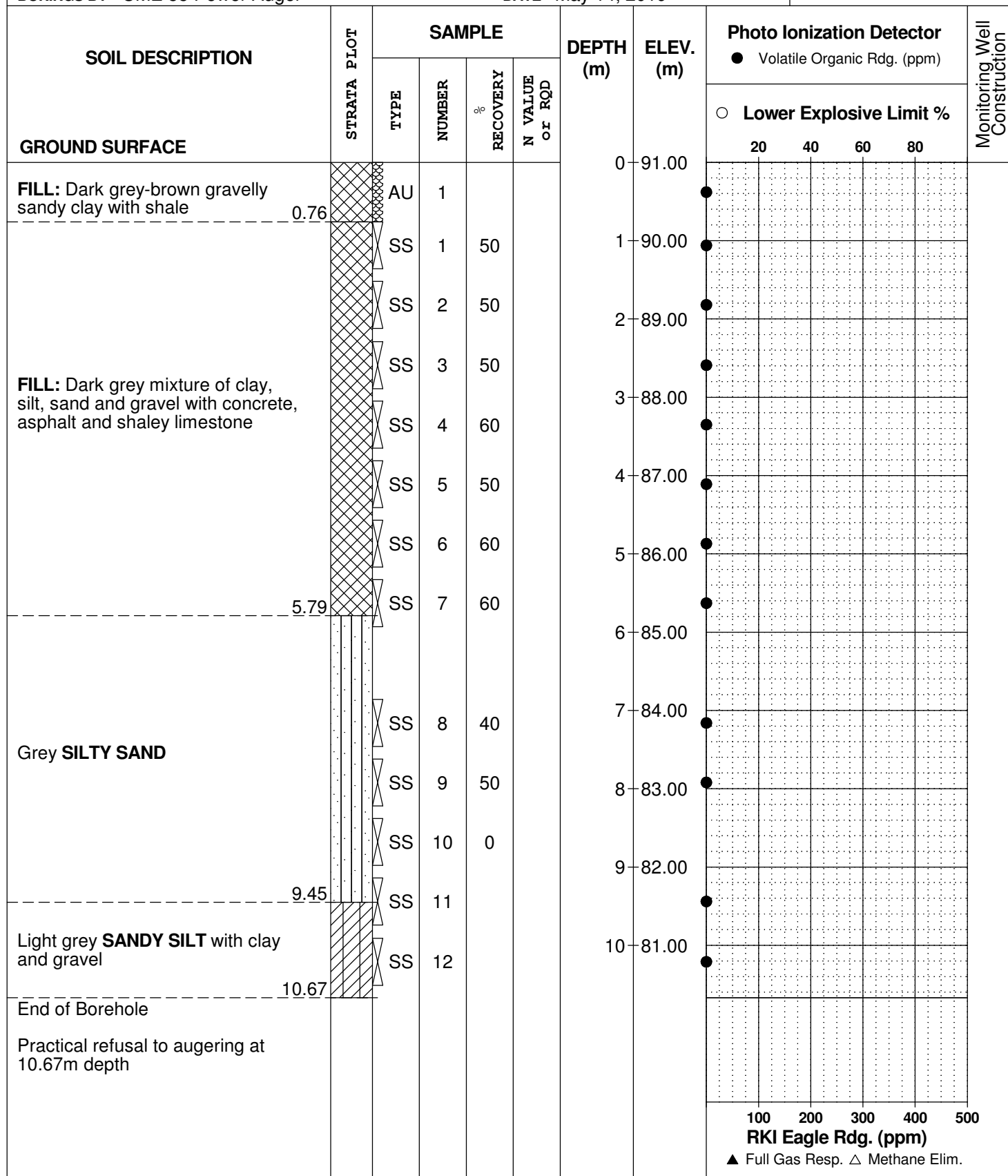
FILE NO.
PE5100

REMARKS

HOLE NO.
BH 3

BORINGS BY CME 55 Power Auger

DATE May 14, 2019



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)
D _{xx}	-	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
D ₁₀	-	Grain size at which 10% of the soil is finer (effective grain size)
D ₆₀	-	Grain size at which 60% of the soil is finer
C _c	-	Concavity coefficient = $(D_{30})^2 / (D_{10} \times D_{60})$
C _u	-	Uniformity coefficient = D_{60} / D_{10}

C_c and C_u are used to assess the grading of sands and gravels:

Well-graded gravels have: $1 < C_c < 3$ and $C_u > 4$

Well-graded sands have: $1 < C_c < 3$ and $C_u > 6$

Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.

C_c and C_u 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

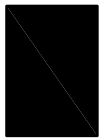
p' _o	-	Present effective overburden pressure at sample depth
p' _c	-	Preconsolidation pressure of (maximum past pressure on) sample
C _{cr}	-	Recompression index (in effect at pressures below p' _c)
C _c	-	Compression index (in effect at pressures above p' _c)
OC Ratio		Overconsolidation ratio = p'_c / p'_o
Void Ratio		Initial sample void ratio = volume of voids / volume of solids
W _o	-	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.
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SYMBOLS AND TERMS (continued)

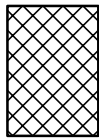
STRATA PLOT



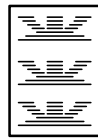
Topsoil



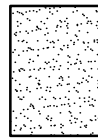
Asphalt



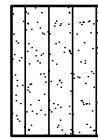
Fill



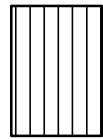
Peat



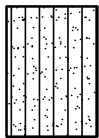
Sand



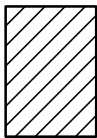
Silty Sand



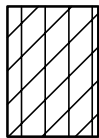
Silt



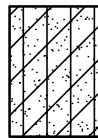
Sandy Silt



Clay



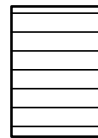
Silty Clay



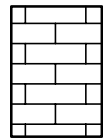
Clayey Silty Sand



Glacial Till



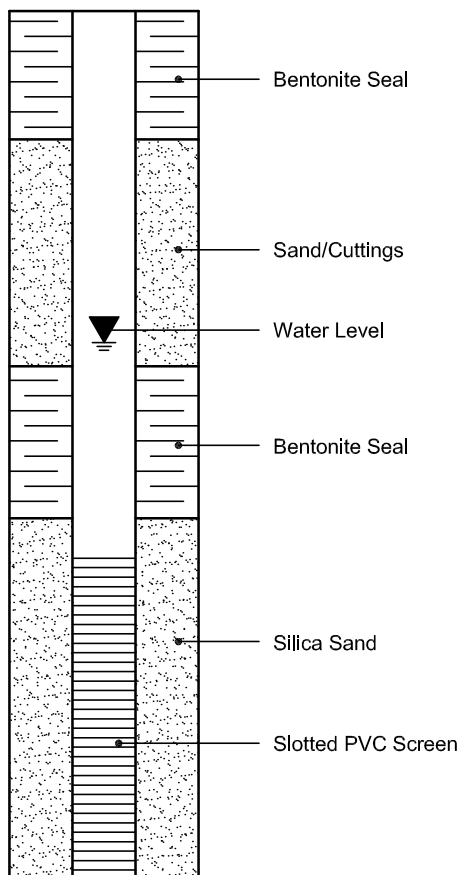
Shale



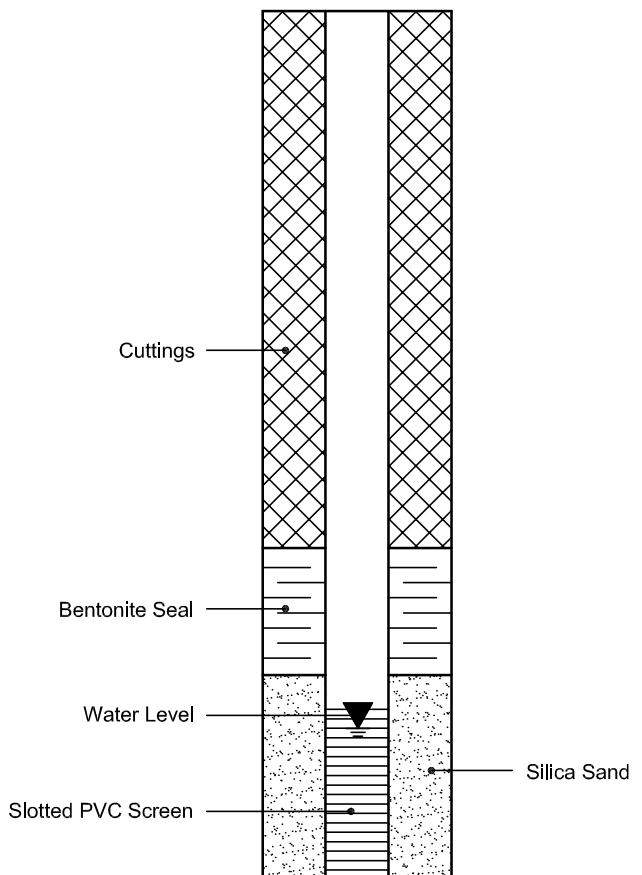
Bedrock

MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 26732
Project: PE4621
Custody: 122130

Report Date: 27-May-2019
Order Date: 21-May-2019

Order #: 1921134

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

Paracel ID	Client ID
1921134-01	BH1-AU1
1921134-02	BH1-SS3
1921134-03	BH2-AU1
1921134-04	BH2-SS1
1921134-05	BH3-SS2
1921134-06	BH3-SS3
1921134-07	BH3-SS5

Approved By:



Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26732

Report Date: 27-May-2019
 Order Date: 21-May-2019
Project Description: PE4621

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	21-May-19	23-May-19
Mercury by CVAA	EPA 7471B - CVAA, digestion	23-May-19	23-May-19
PHC F4G (gravimetric)	CWS Tier 1 - Extraction Gravimetric	27-May-19	27-May-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	21-May-19	23-May-19
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	23-May-19	23-May-19
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	22-May-19	23-May-19
Solids, %	Gravimetric, calculation	23-May-19	23-May-19

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26732

Report Date: 27-May-2019

Order Date: 21-May-2019

Project Description: PE4621

	Client ID:	BH1-AU1	BH1-SS3	BH2-AU1	BH2-SS1
	Sample Date:	15-May-19 09:00	15-May-19 09:00	15-May-19 09:00	15-May-19 09:00
	Sample ID:	1921134-01	1921134-02	1921134-03	1921134-04
	MDL/Units	Soil	Soil	Soil	Soil

Physical Characteristics

% Solids	0.1 % by Wt.	89.0	92.4	88.4	92.6
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Metals

Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	5.7	4.9	4.4	7.3
Barium	1.0 ug/g dry	163	65.7	71.5	188
Beryllium	0.5 ug/g dry	0.6	<0.5	0.5	1.0
Boron	5.0 ug/g dry	8.3	8.5	9.8	17.0
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5.0 ug/g dry	53.5	19.4	23.4	44.3
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	<0.2
Cobalt	1.0 ug/g dry	11.5	7.0	8.1	15.7
Copper	5.0 ug/g dry	27.8	14.3	21.0	41.6
Lead	1.0 ug/g dry	25.9	19.6	14.5	35.2
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1.0 ug/g dry	1.1	2.3	<1.0	1.9
Nickel	5.0 ug/g dry	31.1	16.1	18.0	39.2
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	1.1
Vanadium	10.0 ug/g dry	64.9	29.6	35.2	53.2
Zinc	20.0 ug/g dry	97.3	36.4	37.0	93.0

Hydrocarbons

F2 PHCs (C10-C16)	4 ug/g dry	4	6	7	<4
F3 PHCs (C16-C34)	8 ug/g dry	160	189	39	19
F4 PHCs (C34-C50)	6 ug/g dry	852 [1]	983 [1]	228 [1]	114 [1]
F4G PHCs (gravimetric)	50 ug/g dry	696	628	441	270

Semi-Volatiles

Acenaphthene	0.02 ug/g dry	<0.02	0.04	<0.02	<0.02
Acenaphthylene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Anthracene	0.02 ug/g dry	<0.02	0.11	<0.02	<0.02
Benzo [a] anthracene	0.02 ug/g dry	0.03	0.18	<0.02	<0.02
Benzo [a] pyrene	0.02 ug/g dry	0.05	0.16	<0.02	<0.02
Benzo [b] fluoranthene	0.02 ug/g dry	0.05	0.16	<0.02	<0.02
Benzo [g,h,i] perylene	0.02 ug/g dry	0.05	0.08	<0.02	<0.02

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26732

Report Date: 27-May-2019

Order Date: 21-May-2019

Project Description: PE4621

	Client ID: Sample Date: Sample ID:	BH1-AU1 15-May-19 09:00 1921134-01 Soil	BH1-SS3 15-May-19 09:00 1921134-02 Soil	BH2-AU1 15-May-19 09:00 1921134-03 Soil	BH2-SS1 15-May-19 09:00 1921134-04 Soil
	MDL/Units				
Benzo [k] fluoranthene	0.02 ug/g dry	0.04	0.14	<0.02	<0.02
Chrysene	0.02 ug/g dry	0.06	0.21	<0.02	<0.02
Dibenzo [a,h] anthracene	0.02 ug/g dry	<0.02	0.02	<0.02	<0.02
Fluoranthene	0.02 ug/g dry	0.05	0.46	<0.02	0.03
Fluorene	0.02 ug/g dry	<0.02	0.04	<0.02	<0.02
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	0.02	0.04	<0.02	<0.02
1-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
2-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Methylnaphthalene (1&2)	0.04 ug/g dry	<0.04	<0.04	<0.04	<0.04
Naphthalene	0.01 ug/g dry	<0.01	<0.01	<0.01	<0.01
Phenanthrene	0.02 ug/g dry	0.03	0.30	<0.02	<0.02
Pyrene	0.02 ug/g dry	0.05	0.36	<0.02	0.03
2-Fluorobiphenyl	Surrogate	82.9%	86.7%	83.8%	75.5%
Terphenyl-d14	Surrogate	95.7%	101%	99.2%	110%

Certificate of Analysis
Client: **Paterson Group Consulting Engineers**
Client PO: **26732**

Report Date: 27-May-2019

Order Date: 21-May-2019

Project Description: **PE4621**

Client ID:	BH3-SS2	BH3-SS3	BH3-SS5	-
Sample Date:	14-May-19 09:00	14-May-19 09:00	14-May-19 09:00	-
Sample ID:	1921134-05	1921134-06	1921134-07	-
MDL/Units	Soil	Soil	Soil	-

Physical Characteristics

% Solids	0.1 % by Wt.	81.0	90.1	89.2	-
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Metals

Antimony	1.0 ug/g dry	<1.0	-	<1.0	-
Arsenic	1.0 ug/g dry	5.9	-	6.2	-
Barium	1.0 ug/g dry	191	-	137	-
Beryllium	0.5 ug/g dry	1.0	-	0.5	-
Boron	5.0 ug/g dry	15.9	-	9.7	-
Cadmium	0.5 ug/g dry	<0.5	-	<0.5	-
Chromium	5.0 ug/g dry	73.4	-	33.0	-
Chromium (VI)	0.2 ug/g dry	<0.2	-	<0.2	-
Cobalt	1.0 ug/g dry	14.7	-	9.0	-
Copper	5.0 ug/g dry	37.4	-	19.6	-
Lead	1.0 ug/g dry	29.3	-	65.1	-
Mercury	0.1 ug/g dry	<0.1	-	<0.1	-
Molybdenum	1.0 ug/g dry	2.0	-	2.8	-
Nickel	5.0 ug/g dry	44.7	-	22.2	-
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	1.2	-	<1.0	-
Vanadium	10.0 ug/g dry	69.1	-	37.7	-
Zinc	20.0 ug/g dry	98.4	-	55.7	-

Hydrocarbons

F2 PHCs (C10-C16)	4 ug/g dry	-	<4	6	-
F3 PHCs (C16-C34)	8 ug/g dry	-	174	239	-
F4 PHCs (C34-C50)	6 ug/g dry	-	413 [1]	1410 [1]	-
F4G PHCs (gravimetric)	50 ug/g dry	-	-	247	-

Semi-Volatiles

Acenaphthene	0.02 ug/g dry	-	<0.02	<0.02	-
Acenaphthylene	0.02 ug/g dry	-	<0.02	<0.02	-
Anthracene	0.02 ug/g dry	-	<0.02	0.03	-
Benzo [a] anthracene	0.02 ug/g dry	-	0.05	0.07	-
Benzo [a] pyrene	0.02 ug/g dry	-	0.08	0.06	-
Benzo [b] fluoranthene	0.02 ug/g dry	-	0.09	0.09	-
Benzo [g,h,i] perylene	0.02 ug/g dry	-	0.07	0.05	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26732

Report Date: 27-May-2019

Order Date: 21-May-2019

Project Description: PE4621

	MDL/Units	Client ID:	BH3-SS2	BH3-SS3	BH3-SS5	
		Sample Date:	14-May-19 09:00	14-May-19 09:00	14-May-19 09:00	-
		Sample ID:	1921134-05	1921134-06	1921134-07	-
			Soil	Soil	Soil	-
Benzo [k] fluoranthene	0.02 ug/g dry		-	0.10	0.07	-
Chrysene	0.02 ug/g dry		-	0.10	0.09	-
Dibenzo [a,h] anthracene	0.02 ug/g dry		-	<0.02	<0.02	-
Fluoranthene	0.02 ug/g dry		-	0.15	0.18	-
Fluorene	0.02 ug/g dry		-	<0.02	<0.02	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry		-	0.03	0.03	-
1-Methylnaphthalene	0.02 ug/g dry		-	<0.02	<0.02	-
2-Methylnaphthalene	0.02 ug/g dry		-	<0.02	<0.02	-
Methylnaphthalene (1&2)	0.04 ug/g dry		-	<0.04	<0.04	-
Naphthalene	0.01 ug/g dry		-	<0.01	<0.01	-
Phenanthrene	0.02 ug/g dry		-	0.06	0.12	-
Pyrene	0.02 ug/g dry		-	0.13	0.14	-
2-Fluorobiphenyl	Surrogate		-	85.7%	83.1%	-
Terphenyl-d14	Surrogate		-	98.5%	95.8%	-

Certificate of Analysis

Report Date: 27-May-2019

Client: Paterson Group Consulting Engineers

Order Date: 21-May-2019

Client PO: 26732

Project Description: PE4621

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
F4G PHCs (gravimetric)	ND	50	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	0.869		ug/g		65.2	50-140			
Surrogate: Terphenyl-d14	1.16		ug/g		86.9	50-140			

Certificate of Analysis

Report Date: 27-May-2019

Client: Paterson Group Consulting Engineers

Order Date: 21-May-2019

Client PO: 26732

Project Description: PE4621

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	14	8	ug/g dry	ND			0.0	30	
F4 PHCs (C34-C50)	15	6	ug/g dry	7			71.2	30	QR-01
Metals									
Antimony	1.1	1.0	ug/g dry	ND			0.0	30	
Arsenic	5.9	1.0	ug/g dry	5.7			2.2	30	
Barium	91.9	1.0	ug/g dry	90.5			1.5	30	
Beryllium	0.8	0.5	ug/g dry	0.8			5.8	30	
Boron	12.0	5.0	ug/g dry	11.3			5.9	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	28.7	5.0	ug/g dry	28.1			2.1	30	
Cobalt	10.0	1.0	ug/g dry	9.6			4.0	30	
Copper	26.4	5.0	ug/g dry	25.7			2.5	30	
Lead	22.0	1.0	ug/g dry	20.5			6.7	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	30	
Molybdenum	ND	1.0	ug/g dry	ND			0.0	30	
Nickel	22.6	5.0	ug/g dry	22.0			2.4	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	41.4	10.0	ug/g dry	39.1			5.6	30	
Zinc	83.1	20.0	ug/g dry	78.9			5.2	30	
Physical Characteristics									
% Solids	79.2	0.1	% by Wt.	79.8			0.8	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	ND			0.0	40	
Acenaphthylene	ND	0.02	ug/g dry	ND			0.0	40	
Anthracene	0.021	0.02	ug/g dry	0.030			36.1	40	
Benzo [a] anthracene	0.049	0.02	ug/g dry	0.067			31.6	40	
Benzo [a] pyrene	0.036	0.02	ug/g dry	0.049			31.1	40	
Benzo [b] fluoranthene	0.051	0.02	ug/g dry	0.066			26.9	40	
Benzo [g,h,i] perylene	0.033	0.02	ug/g dry	0.038			13.9	40	
Benzo [k] fluoranthene	0.027	0.02	ug/g dry	0.039			37.6	40	
Chrysene	0.051	0.02	ug/g dry	0.073			36.6	40	
Dibenzo [a,h] anthracene	ND	0.02	ug/g dry	ND				40	
Fluoranthene	0.085	0.02	ug/g dry	0.124			37.5	40	
Fluorene	ND	0.02	ug/g dry	ND			0.0	40	
Indeno [1,2,3-cd] pyrene	0.023	0.02	ug/g dry	0.028			22.3	40	
1-Methylnaphthalene	ND	0.02	ug/g dry	ND				40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND			0.0	40	
Naphthalene	0.017	0.01	ug/g dry	0.017			1.6	40	
Phenanthrene	0.048	0.02	ug/g dry	0.084			53.5	40	QR-01
Pyrene	0.094	0.02	ug/g dry	0.132			34.0	40	
Surrogate: 2-Fluorobiphenyl	1.20		ug/g dry		72.0	50-140			
Surrogate: Terphenyl-d14	1.67		ug/g dry		100	50-140			

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26732

Report Date: 27-May-2019

Order Date: 21-May-2019

Project Description: PE4621

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F2 PHCs (C10-C16)	96	4	ug/g	ND	90.8	60-140			
F3 PHCs (C16-C34)	265	8	ug/g	ND	102	60-140			
F4 PHCs (C34-C50)	169	6	ug/g	7	98.7	60-140			
F4G PHCs (gravimetric)	880	50	ug/g		88.0	80-120			
Metals									
Antimony	41.5		ug/L	ND	82.5	70-130			
Arsenic	52.0		ug/L	2.3	99.5	70-130			
Barium	82.7		ug/L	36.2	92.9	70-130			
Beryllium	48.2		ug/L	ND	95.8	70-130			
Boron	45.8		ug/L	ND	82.5	70-130			
Cadmium	47.0		ug/L	ND	93.7	70-130			
Chromium (VI)	0.09		mg/L	ND	44.5	70-130			QM-01
Chromium	60.3		ug/L	11.2	98.1	70-130			
Cobalt	51.6		ug/L	3.8	95.5	70-130			
Copper	58.8		ug/L	10.3	97.1	70-130			
Lead	53.0		ug/L	8.2	89.5	70-130			
Mercury	1.64	0.1	ug/g	ND	109	70-130			
Molybdenum	49.2		ug/L	ND	98.1	70-130			
Nickel	57.9		ug/L	8.8	98.1	70-130			
Selenium	48.4		ug/L	ND	96.3	70-130			
Silver	44.6		ug/L	ND	89.1	70-130			
Thallium	45.4		ug/L	ND	90.6	70-130			
Uranium	48.0		ug/L	ND	95.5	70-130			
Vanadium	69.5		ug/L	15.7	108	70-130			
Zinc	78.5		ug/L	31.6	93.8	70-130			
Semi-Volatiles									
Acenaphthene	0.244	0.02	ug/g	ND	117	50-140			
Acenaphthylene	0.222	0.02	ug/g	ND	106	50-140			
Anthracene	0.217	0.02	ug/g	0.030	89.3	50-140			
Benzo [a] anthracene	0.269	0.02	ug/g	0.067	96.8	50-140			
Benzo [a] pyrene	0.221	0.02	ug/g	0.049	82.4	50-140			
Benzo [b] fluoranthene	0.353	0.02	ug/g	0.066	137	50-140			
Benzo [g,h,i] perylene	0.221	0.02	ug/g	0.038	87.4	50-140			
Benzo [k] fluoranthene	0.315	0.02	ug/g	0.039	132	50-140			
Chrysene	0.308	0.02	ug/g	0.073	112	50-140			
Dibenzo [a,h] anthracene	0.210	0.02	ug/g	ND	101	50-140			
Fluoranthene	0.325	0.02	ug/g	0.124	96.3	50-140			
Fluorene	0.215	0.02	ug/g	ND	103	50-140			
Indeno [1,2,3-cd] pyrene	0.232	0.02	ug/g	0.028	97.6	50-140			
1-Methylnaphthalene	0.155	0.02	ug/g	ND	74.4	50-140			
2-Methylnaphthalene	0.184	0.02	ug/g	ND	88.3	50-140			
Naphthalene	0.223	0.01	ug/g	0.017	98.8	50-140			
Phenanthrene	0.260	0.02	ug/g	0.084	84.6	50-140			
Pyrene	0.326	0.02	ug/g	0.132	93.0	50-140			
Surrogate: 2-Fluorobiphenyl	1.16		ug/g		69.6	50-140			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26732

Report Date: 27-May-2019
Order Date: 21-May-2019
Project Description: PE4621

Qualifier Notes:

Sample Qualifiers :

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

QC Qualifiers :

QM-01 : The spike recovery for this QC sample is outside of established control limits due to sample matrix interference.

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

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

Soil results are reported on a dry weight basis when the units are denoted with 'dry'.

Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

CCME PHC additional information:

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

Client Name: <u>Paterson Group</u>	Project Reference: <u>PE4621</u>	Turnaround Time: ☐ 1 Day ☐ 3 Day ☐ 2 Day ☒ Regular Date Required: _____
Contact Name: <u>Mark D'Arcy</u>	Quote #	
Address: <u>154 Colonnade Rd. S.</u>	PO # <u>26732</u>	
Telephone: <u>613-226-7381</u>	Email Address: <u>mdarcy@patersongroup.ca</u>	
Criteria: ☒ O. Reg. 153/04 (As Amended) Table 3 ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) Municipality: _____ ☐ Other: _____		

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

Required Analyses

Paracel Order Number:		Matrix	Air Volume	# of Containers	Sample Taken		PHCs F1-F4+BTX	VOCs	PAHs	Metals by ICP	Hg	Cd+Pb	B (HWS)	PHCs F2-F4						
Sample ID/Location Name					Date	Time														
1	BH1-AU1	S		1	May 15/19			X	X	X	X			X						
2	BH1-SS3	S		1	↓			X	X	X	X			X						
3	BH2-AU1	S		1	↓			X	X	X	X			X						
4	BH2-SS1	S		1	↓			X	X	X	X			X						
5	BH3-SS5	S		1	May 14/19			X	X	X	X			X						
6	BH3-SS2	S		1	↓				X	X	X									
7	BH3-SS3	S		1	↓			X						X						
8																				
9																				
10																				

Comments: please report these in numerical order - i.e. - more
"BH3-SS5" to bottom

Method of Delivery:

Swift

Relinquished By (Sign): <u>N. Sullivan</u>	Received by Driver/Depot: <u>927</u>	Received at Lab: <u>Sinegorn Bokmal</u>	Verified By: <u>D. G...</u>
Relinquished By (Print): <u>Nick Sullivan</u>	Date/Time: _____	Date/Time: <u>May 21, 2019 06:16</u>	Date/Time: <u>22 May 19 05</u>
Date/Time: <u>May 21 / 2019</u>	Temperature: <u>°C</u>	Temperature: <u>20.0 °C</u>	pH Verified [] By: _____

Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 26732
Project: PE4621
Custody: 122130

Report Date: 3-Jun-2019
Order Date: 21-May-2019

Revised Report

Order #: 1921134

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

Paracel ID	Client ID
1921134-01	BH1-AU1
1921134-02	BH1-SS3
1921134-03	BH2-AU1
1921134-04	BH2-SS1
1921134-05	BH3-SS2
1921134-06	BH3-SS3
1921134-07	BH3-SS5

Approved By:



Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26732

Report Date: 03-Jun-2019
 Order Date: 21-May-2019
Project Description: PE4621

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	21-May-19	23-May-19
Mercury by CVAA	EPA 7471B - CVAA, digestion	23-May-19	23-May-19
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	3-Jun-19	3-Jun-19
PHC F4G (gravimetric)	CWS Tier 1 - Extraction Gravimetric	27-May-19	27-May-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	21-May-19	23-May-19
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	23-May-19	23-May-19
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	22-May-19	24-May-19
Solids, %	Gravimetric, calculation	23-May-19	23-May-19

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26732

Report Date: 03-Jun-2019
 Order Date: 21-May-2019
 Project Description: PE4621

	Client ID:	BH1-AU1	BH1-SS3	BH2-AU1	BH2-SS1
	Sample Date:	15-May-19 09:00	15-May-19 09:00	15-May-19 09:00	15-May-19 09:00
	Sample ID:	1921134-01	1921134-02	1921134-03	1921134-04
	MDL/Units	Soil	Soil	Soil	Soil

Physical Characteristics

% Solids	0.1 % by Wt.	89.0	92.4	88.4	92.6
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General Inorganics

pH	0.05 pH Units	-	7.65	-	-
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Metals

Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	5.7	4.9	4.4	7.3
Barium	1.0 ug/g dry	163	65.7	71.5	188
Beryllium	0.5 ug/g dry	0.6	<0.5	0.5	1.0
Boron	5.0 ug/g dry	8.3	8.5	9.8	17.0
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5.0 ug/g dry	53.5	19.4	23.4	44.3
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	<0.2
Cobalt	1.0 ug/g dry	11.5	7.0	8.1	15.7
Copper	5.0 ug/g dry	27.8	14.3	21.0	41.6
Lead	1.0 ug/g dry	25.9	19.6	14.5	35.2
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1.0 ug/g dry	1.1	2.3	<1.0	1.9
Nickel	5.0 ug/g dry	31.1	16.1	18.0	39.2
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	1.1
Vanadium	10.0 ug/g dry	64.9	29.6	35.2	53.2
Zinc	20.0 ug/g dry	97.3	36.4	37.0	93.0

Hydrocarbons

F2 PHCs (C10-C16)	4 ug/g dry	4	6	7	<4
F3 PHCs (C16-C34)	8 ug/g dry	160	189	39	19
F4 PHCs (C34-C50)	6 ug/g dry	852 [1]	983 [1]	228 [1]	114 [1]
F4G PHCs (gravimetric)	50 ug/g dry	696	628	441	270

Semi-Volatiles

Acenaphthene	0.02 ug/g dry	<0.02	0.04	<0.02	<0.02
Acenaphthylene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Anthracene	0.02 ug/g dry	<0.02	0.11	<0.02	<0.02
Benzo [a] anthracene	0.02 ug/g dry	0.03	0.18	<0.02	<0.02
Benzo [a] pyrene	0.02 ug/g dry	0.05	0.16	<0.02	<0.02

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26732

Report Date: 03-Jun-2019

Order Date: 21-May-2019

Project Description: PE4621

	Client ID:	BH1-AU1	BH1-SS3	BH2-AU1	BH2-SS1
	Sample Date:	15-May-19 09:00	15-May-19 09:00	15-May-19 09:00	15-May-19 09:00
	Sample ID:	1921134-01	1921134-02	1921134-03	1921134-04
	MDL/Units	Soil	Soil	Soil	Soil
Benzo [b] fluoranthene	0.02 ug/g dry	0.05	0.16	<0.02	<0.02
Benzo [g,h,i] perylene	0.02 ug/g dry	0.05	0.08	<0.02	<0.02
Benzo [k] fluoranthene	0.02 ug/g dry	0.04	0.14	<0.02	<0.02
Chrysene	0.02 ug/g dry	0.06	0.21	<0.02	<0.02
Dibenzo [a,h] anthracene	0.02 ug/g dry	<0.02	0.02	<0.02	<0.02
Fluoranthene	0.02 ug/g dry	0.05	0.46	<0.02	0.03
Fluorene	0.02 ug/g dry	<0.02	0.04	<0.02	<0.02
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	0.02	0.04	<0.02	<0.02
1-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
2-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Methylnaphthalene (1&2)	0.04 ug/g dry	<0.04	<0.04	<0.04	<0.04
Naphthalene	0.01 ug/g dry	<0.01	<0.01	<0.01	<0.01
Phenanthrene	0.02 ug/g dry	0.03	0.30	<0.02	<0.02
Pyrene	0.02 ug/g dry	0.05	0.36	<0.02	0.03
2-Fluorobiphenyl	Surrogate	82.9%	86.7%	83.8%	75.5%
Terphenyl-d14	Surrogate	95.7%	101%	99.2%	110%

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26732

Report Date: 03-Jun-2019
Order Date: 21-May-2019
Project Description: PE4621

Client ID:	BH3-SS2	BH3-SS3	BH3-SS5	-
Sample Date:	14-May-19 09:00	14-May-19 09:00	14-May-19 09:00	-
Sample ID:	1921134-05	1921134-06	1921134-07	-
MDL/Units	Soil	Soil	Soil	-

Physical Characteristics

% Solids	0.1 % by Wt.	81.0	90.1	89.2	-
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General Inorganics

pH	0.05 pH Units	-	-	7.86	-
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Metals

Antimony	1.0 ug/g dry	<1.0	-	<1.0	-
Arsenic	1.0 ug/g dry	5.9	-	6.2	-
Barium	1.0 ug/g dry	191	-	137	-
Beryllium	0.5 ug/g dry	1.0	-	0.5	-
Boron	5.0 ug/g dry	15.9	-	9.7	-
Cadmium	0.5 ug/g dry	<0.5	-	<0.5	-
Chromium	5.0 ug/g dry	73.4	-	33.0	-
Chromium (VI)	0.2 ug/g dry	<0.2	-	<0.2	-
Cobalt	1.0 ug/g dry	14.7	-	9.0	-
Copper	5.0 ug/g dry	37.4	-	19.6	-
Lead	1.0 ug/g dry	29.3	-	65.1	-
Mercury	0.1 ug/g dry	<0.1	-	<0.1	-
Molybdenum	1.0 ug/g dry	2.0	-	2.8	-
Nickel	5.0 ug/g dry	44.7	-	22.2	-
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	1.2	-	<1.0	-
Vanadium	10.0 ug/g dry	69.1	-	37.7	-
Zinc	20.0 ug/g dry	98.4	-	55.7	-

Hydrocarbons

F2 PHCs (C10-C16)	4 ug/g dry	-	<4	6	-
F3 PHCs (C16-C34)	8 ug/g dry	-	174	239	-
F4 PHCs (C34-C50)	6 ug/g dry	-	413 [1]	1410 [1]	-
F4G PHCs (gravimetric)	50 ug/g dry	-	-	247	-

Semi-Volatiles

Acenaphthene	0.02 ug/g dry	-	<0.02	<0.02	-
Acenaphthylene	0.02 ug/g dry	-	<0.02	<0.02	-
Anthracene	0.02 ug/g dry	-	<0.02	0.03	-
Benzo [a] anthracene	0.02 ug/g dry	-	0.05	0.07	-
Benzo [a] pyrene	0.02 ug/g dry	-	0.08	0.06	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26732

Report Date: 03-Jun-2019

Order Date: 21-May-2019

Project Description: PE4621

	Client ID:	BH3-SS2	BH3-SS3	BH3-SS5	-
	Sample Date:	14-May-19 09:00	14-May-19 09:00	14-May-19 09:00	-
	Sample ID:	1921134-05	1921134-06	1921134-07	-
	MDL/Units	Soil	Soil	Soil	-
Benzo [b] fluoranthene	0.02 ug/g dry	-	0.09	0.09	-
Benzo [g,h,i] perylene	0.02 ug/g dry	-	0.07	0.05	-
Benzo [k] fluoranthene	0.02 ug/g dry	-	0.10	0.07	-
Chrysene	0.02 ug/g dry	-	0.10	0.09	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	-	<0.02	<0.02	-
Fluoranthene	0.02 ug/g dry	-	0.15	0.18	-
Fluorene	0.02 ug/g dry	-	<0.02	<0.02	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	-	0.03	0.03	-
1-Methylnaphthalene	0.02 ug/g dry	-	<0.02	<0.02	-
2-Methylnaphthalene	0.02 ug/g dry	-	<0.02	<0.02	-
Methylnaphthalene (1&2)	0.04 ug/g dry	-	<0.04	<0.04	-
Naphthalene	0.01 ug/g dry	-	<0.01	<0.01	-
Phenanthrene	0.02 ug/g dry	-	0.06	0.12	-
Pyrene	0.02 ug/g dry	-	0.13	0.14	-
2-Fluorobiphenyl	Surrogate	-	85.7%	83.1%	-
Terphenyl-d14	Surrogate	-	98.5%	95.8%	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26732

Report Date: 03-Jun-2019
Order Date: 21-May-2019
Project Description: PE4621

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
F4G PHCs (gravimetric)	ND	50	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	0.869		ug/g		65.2	50-140			
Surrogate: Terphenyl-d14	1.16		ug/g		86.9	50-140			

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26732

Report Date: 03-Jun-2019
 Order Date: 21-May-2019
 Project Description: PE4621

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
pH	7.72	0.05	pH Units	7.65			0.9	10	
Hydrocarbons									
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	14	8	ug/g dry	ND			0.0	30	
F4 PHCs (C34-C50)	15	6	ug/g dry	7			71.2	30	QR-01
Metals									
Antimony	1.1	1.0	ug/g dry	ND			0.0	30	
Arsenic	5.9	1.0	ug/g dry	5.7			2.2	30	
Barium	91.9	1.0	ug/g dry	90.5			1.5	30	
Beryllium	0.8	0.5	ug/g dry	0.8			5.8	30	
Boron	12.0	5.0	ug/g dry	11.3			5.9	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	28.7	5.0	ug/g dry	28.1			2.1	30	
Cobalt	10.0	1.0	ug/g dry	9.6			4.0	30	
Copper	26.4	5.0	ug/g dry	25.7			2.5	30	
Lead	22.0	1.0	ug/g dry	20.5			6.7	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	30	
Molybdenum	ND	1.0	ug/g dry	ND			0.0	30	
Nickel	22.6	5.0	ug/g dry	22.0			2.4	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	41.4	10.0	ug/g dry	39.1			5.6	30	
Zinc	83.1	20.0	ug/g dry	78.9			5.2	30	
Physical Characteristics									
% Solids	79.2	0.1	% by Wt.	79.8			0.8	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	ND			0.0	40	
Acenaphthylene	ND	0.02	ug/g dry	ND			0.0	40	
Anthracene	0.021	0.02	ug/g dry	0.030			36.1	40	
Benzo [a] anthracene	0.049	0.02	ug/g dry	0.067			31.6	40	
Benzo [a] pyrene	0.036	0.02	ug/g dry	0.049			31.1	40	
Benzo [b] fluoranthene	0.051	0.02	ug/g dry	0.066			26.9	40	
Benzo [g,h,i] perylene	0.033	0.02	ug/g dry	0.038			13.9	40	
Benzo [k] fluoranthene	0.027	0.02	ug/g dry	0.039			37.6	40	
Chrysene	0.051	0.02	ug/g dry	0.073			36.6	40	
Dibenzo [a,h] anthracene	ND	0.02	ug/g dry	ND				40	
Fluoranthene	0.085	0.02	ug/g dry	0.124			37.5	40	
Fluorene	ND	0.02	ug/g dry	ND			0.0	40	
Indeno [1,2,3-cd] pyrene	0.023	0.02	ug/g dry	0.028			22.3	40	
1-Methylnaphthalene	ND	0.02	ug/g dry	ND				40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND			0.0	40	
Naphthalene	0.017	0.01	ug/g dry	0.017			1.6	40	
Phenanthrene	0.048	0.02	ug/g dry	0.084			53.5	40	QR-01
Pyrene	0.094	0.02	ug/g dry	0.132			34.0	40	
Surrogate: 2-Fluorobiphenyl	1.20		ug/g dry		72.0	50-140			
Surrogate: Terphenyl-d14	1.67		ug/g dry		100	50-140			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26732

Report Date: 03-Jun-2019
Order Date: 21-May-2019
Project Description: PE4621

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F2 PHCs (C10-C16)	96	4	ug/g	ND	90.8	60-140			
F3 PHCs (C16-C34)	265	8	ug/g	ND	102	60-140			
F4 PHCs (C34-C50)	169	6	ug/g	7	98.7	60-140			
F4G PHCs (gravimetric)	880	50	ug/g		88.0	80-120			
Metals									
Antimony	41.5		ug/L	ND	82.5	70-130			
Arsenic	52.0		ug/L	2.3	99.5	70-130			
Barium	82.7		ug/L	36.2	92.9	70-130			
Beryllium	48.2		ug/L	ND	95.8	70-130			
Boron	45.8		ug/L	ND	82.5	70-130			
Cadmium	47.0		ug/L	ND	93.7	70-130			
Chromium (VI)	0.09		mg/L	ND	44.5	70-130			QM-01
Chromium	60.3		ug/L	11.2	98.1	70-130			
Cobalt	51.6		ug/L	3.8	95.5	70-130			
Copper	58.8		ug/L	10.3	97.1	70-130			
Lead	53.0		ug/L	8.2	89.5	70-130			
Mercury	1.64	0.1	ug/g	ND	109	70-130			
Molybdenum	49.2		ug/L	ND	98.1	70-130			
Nickel	57.9		ug/L	8.8	98.1	70-130			
Selenium	48.4		ug/L	ND	96.3	70-130			
Silver	44.6		ug/L	ND	89.1	70-130			
Thallium	45.4		ug/L	ND	90.6	70-130			
Uranium	48.0		ug/L	ND	95.5	70-130			
Vanadium	69.5		ug/L	15.7	108	70-130			
Zinc	78.5		ug/L	31.6	93.8	70-130			
Semi-Volatiles									
Acenaphthene	0.244	0.02	ug/g	ND	117	50-140			
Acenaphthylene	0.222	0.02	ug/g	ND	106	50-140			
Anthracene	0.217	0.02	ug/g	0.030	89.3	50-140			
Benzo [a] anthracene	0.269	0.02	ug/g	0.067	96.8	50-140			
Benzo [a] pyrene	0.221	0.02	ug/g	0.049	82.4	50-140			
Benzo [b] fluoranthene	0.353	0.02	ug/g	0.066	137	50-140			
Benzo [g,h,i] perylene	0.221	0.02	ug/g	0.038	87.4	50-140			
Benzo [k] fluoranthene	0.315	0.02	ug/g	0.039	132	50-140			
Chrysene	0.308	0.02	ug/g	0.073	112	50-140			
Dibenzo [a,h] anthracene	0.210	0.02	ug/g	ND	101	50-140			
Fluoranthene	0.325	0.02	ug/g	0.124	96.3	50-140			
Fluorene	0.215	0.02	ug/g	ND	103	50-140			
Indeno [1,2,3-cd] pyrene	0.232	0.02	ug/g	0.028	97.6	50-140			
1-Methylnaphthalene	0.155	0.02	ug/g	ND	74.4	50-140			
2-Methylnaphthalene	0.184	0.02	ug/g	ND	88.3	50-140			
Naphthalene	0.223	0.01	ug/g	0.017	98.8	50-140			
Phenanthrene	0.260	0.02	ug/g	0.084	84.6	50-140			
Pyrene	0.326	0.02	ug/g	0.132	93.0	50-140			
Surrogate: 2-Fluorobiphenyl	1.16		ug/g		69.6	50-140			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26732

Report Date: 03-Jun-2019
Order Date: 21-May-2019
Project Description: PE4621

Qualifier Notes:

Sample Qualifiers :

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

QC Qualifiers :

QM-01 : The spike recovery for this QC sample is outside of established control limits due to sample matrix interference.

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

Sample Data Revisions

None

Work Order Revisions / Comments:

Revision 1 - This report includes additional pH data.

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.

Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 26732
Project: PE4621
Custody: 122130

Report Date: 10-Jun-2019
Order Date: 21-May-2019

Revised Report

Order #: 1921134

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

Paracel ID	Client ID
1921134-01	BH1-AU1
1921134-02	BH1-SS3
1921134-03	BH2-AU1
1921134-04	BH2-SS1
1921134-05	BH3-SS2
1921134-06	BH3-SS3
1921134-07	BH3-SS5

Approved By:



Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26732

Report Date: 10-Jun-2019
Order Date: 21-May-2019
Project Description: PE4621

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	21-May-19	23-May-19
Conductivity	MOE E3138 - probe @25 °C, water ext	8-Jun-19	8-Jun-19
Mercury by CVAA	EPA 7471B - CVAA, digestion	23-May-19	23-May-19
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	3-Jun-19	3-Jun-19
PHC F4G (gravimetric)	CWS Tier 1 - Extraction Gravimetric	27-May-19	27-May-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	21-May-19	23-May-19
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	23-May-19	23-May-19
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	22-May-19	23-May-19
SAR	Calculated	7-Jun-19	7-Jun-19
Solids, %	Gravimetric, calculation	23-May-19	23-May-19

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26732

Report Date: 10-Jun-2019
 Order Date: 21-May-2019
 Project Description: PE4621

	Client ID:	BH1-AU1	BH1-SS3	BH2-AU1	BH2-SS1
	Sample Date:	15-May-19 09:00	15-May-19 09:00	15-May-19 09:00	15-May-19 09:00
	Sample ID:	1921134-01	1921134-02	1921134-03	1921134-04
	MDL/Units	Soil	Soil	Soil	Soil

Physical Characteristics

% Solids	0.1 % by Wt.	89.0	92.4	88.4	92.6
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General Inorganics

SAR	0.01 N/A	-	0.26	0.25	-
Conductivity	5 uS/cm	-	272	282	-
pH	0.05 pH Units	-	7.65	-	-

Metals

Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	5.7	4.9	4.4	7.3
Barium	1.0 ug/g dry	163	65.7	71.5	188
Beryllium	0.5 ug/g dry	0.6	<0.5	0.5	1.0
Boron	5.0 ug/g dry	8.3	8.5	9.8	17.0
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5.0 ug/g dry	53.5	19.4	23.4	44.3
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	<0.2
Cobalt	1.0 ug/g dry	11.5	7.0	8.1	15.7
Copper	5.0 ug/g dry	27.8	14.3	21.0	41.6
Lead	1.0 ug/g dry	25.9	19.6	14.5	35.2
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1.0 ug/g dry	1.1	2.3	<1.0	1.9
Nickel	5.0 ug/g dry	31.1	16.1	18.0	39.2
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	1.1
Vanadium	10.0 ug/g dry	64.9	29.6	35.2	53.2
Zinc	20.0 ug/g dry	97.3	36.4	37.0	93.0

Hydrocarbons

F2 PHCs (C10-C16)	4 ug/g dry	4	6	7	<4
F3 PHCs (C16-C34)	8 ug/g dry	160	189	39	19
F4 PHCs (C34-C50)	6 ug/g dry	852 [1]	983 [1]	228 [1]	114 [1]
F4G PHCs (gravimetric)	50 ug/g dry	696	628	441	270

Semi-Volatiles

Acenaphthene	0.02 ug/g dry	<0.02	0.04	<0.02	<0.02
Acenaphthylene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Anthracene	0.02 ug/g dry	<0.02	0.11	<0.02	<0.02

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26732

Report Date: 10-Jun-2019

Order Date: 21-May-2019

Project Description: PE4621

	Client ID: Sample Date: Sample ID:	BH1-AU1 15-May-19 09:00 1921134-01 Soil	BH1-SS3 15-May-19 09:00 1921134-02 Soil	BH2-AU1 15-May-19 09:00 1921134-03 Soil	BH2-SS1 15-May-19 09:00 1921134-04 Soil
	MDL/Units				
Benzo [a] anthracene	0.02 ug/g dry	0.03	0.18	<0.02	<0.02
Benzo [a] pyrene	0.02 ug/g dry	0.05	0.16	<0.02	<0.02
Benzo [b] fluoranthene	0.02 ug/g dry	0.05	0.16	<0.02	<0.02
Benzo [g,h,i] perylene	0.02 ug/g dry	0.05	0.08	<0.02	<0.02
Benzo [k] fluoranthene	0.02 ug/g dry	0.04	0.14	<0.02	<0.02
Chrysene	0.02 ug/g dry	0.06	0.21	<0.02	<0.02
Dibenzo [a,h] anthracene	0.02 ug/g dry	<0.02	0.02	<0.02	<0.02
Fluoranthene	0.02 ug/g dry	0.05	0.46	<0.02	0.03
Fluorene	0.02 ug/g dry	<0.02	0.04	<0.02	<0.02
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	0.02	0.04	<0.02	<0.02
1-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
2-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Methylnaphthalene (1&2)	0.04 ug/g dry	<0.04	<0.04	<0.04	<0.04
Naphthalene	0.01 ug/g dry	<0.01	<0.01	<0.01	<0.01
Phenanthrene	0.02 ug/g dry	0.03	0.30	<0.02	<0.02
Pyrene	0.02 ug/g dry	0.05	0.36	<0.02	0.03
2-Fluorobiphenyl	Surrogate	82.9%	86.7%	83.8%	75.5%
Terphenyl-d14	Surrogate	95.7%	101%	99.2%	110%

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26732

Report Date: 10-Jun-2019
 Order Date: 21-May-2019
 Project Description: PE4621

Client ID:	BH3-SS2	BH3-SS3	BH3-SS5	-
Sample Date:	14-May-19 09:00	14-May-19 09:00	14-May-19 09:00	-
Sample ID:	1921134-05	1921134-06	1921134-07	-
MDL/Units	Soil	Soil	Soil	-

Physical Characteristics

% Solids	0.1 % by Wt.	81.0	90.1	89.2	-
----------	--------------	------	------	------	---

General Inorganics

SAR	0.01 N/A	-	-	0.69	-
Conductivity	5 uS/cm	-	-	472	-
pH	0.05 pH Units	-	-	7.86	-

Metals

Antimony	1.0 ug/g dry	<1.0	-	<1.0	-
Arsenic	1.0 ug/g dry	5.9	-	6.2	-
Barium	1.0 ug/g dry	191	-	137	-
Beryllium	0.5 ug/g dry	1.0	-	0.5	-
Boron	5.0 ug/g dry	15.9	-	9.7	-
Cadmium	0.5 ug/g dry	<0.5	-	<0.5	-
Chromium	5.0 ug/g dry	73.4	-	33.0	-
Chromium (VI)	0.2 ug/g dry	<0.2	-	<0.2	-
Cobalt	1.0 ug/g dry	14.7	-	9.0	-
Copper	5.0 ug/g dry	37.4	-	19.6	-
Lead	1.0 ug/g dry	29.3	-	65.1	-
Mercury	0.1 ug/g dry	<0.1	-	<0.1	-
Molybdenum	1.0 ug/g dry	2.0	-	2.8	-
Nickel	5.0 ug/g dry	44.7	-	22.2	-
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	1.2	-	<1.0	-
Vanadium	10.0 ug/g dry	69.1	-	37.7	-
Zinc	20.0 ug/g dry	98.4	-	55.7	-

Hydrocarbons

F2 PHCs (C10-C16)	4 ug/g dry	-	<4	6	-
F3 PHCs (C16-C34)	8 ug/g dry	-	174	239	-
F4 PHCs (C34-C50)	6 ug/g dry	-	413 [1]	1410 [1]	-
F4G PHCs (gravimetric)	50 ug/g dry	-	-	247	-

Semi-Volatiles

Acenaphthene	0.02 ug/g dry	-	<0.02	<0.02	-
Acenaphthylene	0.02 ug/g dry	-	<0.02	<0.02	-
Anthracene	0.02 ug/g dry	-	<0.02	0.03	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26732

Report Date: 10-Jun-2019
Order Date: 21-May-2019
Project Description: PE4621

	Client ID: Sample Date: Sample ID:	BH3-SS2 14-May-19 09:00 1921134-05 Soil	BH3-SS3 14-May-19 09:00 1921134-06 Soil	BH3-SS5 14-May-19 09:00 1921134-07 Soil	- - - -
	MDL/Units				
Benzo [a] anthracene	0.02 ug/g dry	-	0.05	0.07	-
Benzo [a] pyrene	0.02 ug/g dry	-	0.08	0.06	-
Benzo [b] fluoranthene	0.02 ug/g dry	-	0.09	0.09	-
Benzo [g,h,i] perylene	0.02 ug/g dry	-	0.07	0.05	-
Benzo [k] fluoranthene	0.02 ug/g dry	-	0.10	0.07	-
Chrysene	0.02 ug/g dry	-	0.10	0.09	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	-	<0.02	<0.02	-
Fluoranthene	0.02 ug/g dry	-	0.15	0.18	-
Fluorene	0.02 ug/g dry	-	<0.02	<0.02	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	-	0.03	0.03	-
1-Methylnaphthalene	0.02 ug/g dry	-	<0.02	<0.02	-
2-Methylnaphthalene	0.02 ug/g dry	-	<0.02	<0.02	-
Methylnaphthalene (1&2)	0.04 ug/g dry	-	<0.04	<0.04	-
Naphthalene	0.01 ug/g dry	-	<0.01	<0.01	-
Phenanthrene	0.02 ug/g dry	-	0.06	0.12	-
Pyrene	0.02 ug/g dry	-	0.13	0.14	-
2-Fluorobiphenyl	Surrogate	-	85.7%	83.1%	-
Terphenyl-d14	Surrogate	-	98.5%	95.8%	-

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26732

Report Date: 10-Jun-2019
 Order Date: 21-May-2019
 Project Description: PE4621

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
Conductivity	ND	5	uS/cm						
Hydrocarbons									
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
F4G PHCs (gravimetric)	ND	50	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	0.869		ug/g		65.2	50-140			
Surrogate: Terphenyl-d14	1.16		ug/g		86.9	50-140			

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26732

Report Date: 10-Jun-2019
 Order Date: 21-May-2019
 Project Description: PE4621

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
SAR	0.05	0.01	N/A	0.05			0.0	200	
Conductivity	96.6	5	uS/cm	96.4			0.2	5	
pH	7.72	0.05	pH Units	7.65			0.9	10	
Hydrocarbons									
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	14	8	ug/g dry	ND			0.0	30	
F4 PHCs (C34-C50)	15	6	ug/g dry	7			71.2	30	QR-01
Metals									
Antimony	1.1	1.0	ug/g dry	ND			0.0	30	
Arsenic	5.9	1.0	ug/g dry	5.7			2.2	30	
Barium	91.9	1.0	ug/g dry	90.5			1.5	30	
Beryllium	0.8	0.5	ug/g dry	0.8			5.8	30	
Boron	12.0	5.0	ug/g dry	11.3			5.9	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	28.7	5.0	ug/g dry	28.1			2.1	30	
Cobalt	10.0	1.0	ug/g dry	9.6			4.0	30	
Copper	26.4	5.0	ug/g dry	25.7			2.5	30	
Lead	22.0	1.0	ug/g dry	20.5			6.7	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	30	
Molybdenum	ND	1.0	ug/g dry	ND			0.0	30	
Nickel	22.6	5.0	ug/g dry	22.0			2.4	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	41.4	10.0	ug/g dry	39.1			5.6	30	
Zinc	83.1	20.0	ug/g dry	78.9			5.2	30	
Physical Characteristics									
% Solids	79.2	0.1	% by Wt.	79.8			0.8	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	ND			0.0	40	
Acenaphthylene	ND	0.02	ug/g dry	ND			0.0	40	
Anthracene	0.021	0.02	ug/g dry	0.030			36.1	40	
Benzo [a] anthracene	0.049	0.02	ug/g dry	0.067			31.6	40	
Benzo [a] pyrene	0.036	0.02	ug/g dry	0.049			31.1	40	
Benzo [b] fluoranthene	0.051	0.02	ug/g dry	0.066			26.9	40	
Benzo [g,h,i] perylene	0.033	0.02	ug/g dry	0.038			13.9	40	
Benzo [k] fluoranthene	0.027	0.02	ug/g dry	0.039			37.6	40	
Chrysene	0.051	0.02	ug/g dry	0.073			36.6	40	
Dibenzo [a,h] anthracene	ND	0.02	ug/g dry	ND				40	
Fluoranthene	0.085	0.02	ug/g dry	0.124			37.5	40	
Fluorene	ND	0.02	ug/g dry	ND			0.0	40	
Indeno [1,2,3-cd] pyrene	0.023	0.02	ug/g dry	0.028			22.3	40	
1-Methylnaphthalene	ND	0.02	ug/g dry	ND				40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND			0.0	40	
Naphthalene	0.017	0.01	ug/g dry	0.017			1.6	40	
Phenanthrene	0.048	0.02	ug/g dry	0.084			53.5	40	QR-01
Pyrene	0.094	0.02	ug/g dry	0.132			34.0	40	
Surrogate: 2-Fluorobiphenyl	1.20		ug/g dry		72.0	50-140			
Surrogate: Terphenyl-d14	1.67		ug/g dry		100	50-140			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26732

Report Date: 10-Jun-2019
Order Date: 21-May-2019
Project Description: PE4621

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F2 PHCs (C10-C16)	96	4	ug/g	ND	90.8	60-140			
F3 PHCs (C16-C34)	265	8	ug/g	ND	102	60-140			
F4 PHCs (C34-C50)	169	6	ug/g	7	98.7	60-140			
F4G PHCs (gravimetric)	880	50	ug/g		88.0	80-120			
Metals									
Antimony	41.5		ug/L	ND	82.5	70-130			
Arsenic	52.0		ug/L	2.3	99.5	70-130			
Barium	82.7		ug/L	36.2	92.9	70-130			
Beryllium	48.2		ug/L	ND	95.8	70-130			
Boron	45.8		ug/L	ND	82.5	70-130			
Cadmium	47.0		ug/L	ND	93.7	70-130			
Chromium (VI)	0.09		mg/L	ND	44.5	70-130			QM-01
Chromium	60.3		ug/L	11.2	98.1	70-130			
Cobalt	51.6		ug/L	3.8	95.5	70-130			
Copper	58.8		ug/L	10.3	97.1	70-130			
Lead	53.0		ug/L	8.2	89.5	70-130			
Mercury	1.64	0.1	ug/g	ND	109	70-130			
Molybdenum	49.2		ug/L	ND	98.1	70-130			
Nickel	57.9		ug/L	8.8	98.1	70-130			
Selenium	48.4		ug/L	ND	96.3	70-130			
Silver	44.6		ug/L	ND	89.1	70-130			
Thallium	45.4		ug/L	ND	90.6	70-130			
Uranium	48.0		ug/L	ND	95.5	70-130			
Vanadium	69.5		ug/L	15.7	108	70-130			
Zinc	78.5		ug/L	31.6	93.8	70-130			
Semi-Volatiles									
Acenaphthene	0.244	0.02	ug/g	ND	117	50-140			
Acenaphthylene	0.222	0.02	ug/g	ND	106	50-140			
Anthracene	0.217	0.02	ug/g	0.030	89.3	50-140			
Benzo [a] anthracene	0.269	0.02	ug/g	0.067	96.8	50-140			
Benzo [a] pyrene	0.221	0.02	ug/g	0.049	82.4	50-140			
Benzo [b] fluoranthene	0.353	0.02	ug/g	0.066	137	50-140			
Benzo [g,h,i] perylene	0.221	0.02	ug/g	0.038	87.4	50-140			
Benzo [k] fluoranthene	0.315	0.02	ug/g	0.039	132	50-140			
Chrysene	0.308	0.02	ug/g	0.073	112	50-140			
Dibenzo [a,h] anthracene	0.210	0.02	ug/g	ND	101	50-140			
Fluoranthene	0.325	0.02	ug/g	0.124	96.3	50-140			
Fluorene	0.215	0.02	ug/g	ND	103	50-140			
Indeno [1,2,3-cd] pyrene	0.232	0.02	ug/g	0.028	97.6	50-140			
1-Methylnaphthalene	0.155	0.02	ug/g	ND	74.4	50-140			
2-Methylnaphthalene	0.184	0.02	ug/g	ND	88.3	50-140			
Naphthalene	0.223	0.01	ug/g	0.017	98.8	50-140			
Phenanthrene	0.260	0.02	ug/g	0.084	84.6	50-140			
Pyrene	0.326	0.02	ug/g	0.132	93.0	50-140			
Surrogate: 2-Fluorobiphenyl	1.16		ug/g		69.6	50-140			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26732

Report Date: 10-Jun-2019
Order Date: 21-May-2019
Project Description: PE4621

Qualifier Notes:

Sample Qualifiers :

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

QC Qualifiers :

QM-01 : The spike recovery for this QC sample is outside of established control limits due to sample matrix interference.

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

Sample Data Revisions

None

Work Order Revisions / Comments:

Revision 1 - This report includes additional pH data.

Revision 2 - this report includes additional Sample Data.

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.

Client Name: <u>Paterson Group</u>	Project Reference: <u>PE4621</u>	Turnaround Time: ☐ 1 Day ☐ 3 Day ☐ 2 Day ☒ Regular Date Required: _____
Contact Name: <u>Mark D'Arcy</u>	Quote #	
Address: <u>154 Colonnade Rd. S.</u>	PO # <u>26732</u>	
Telephone: <u>613-226-7381</u>	Email Address: <u>mdarcy@patersongroup.ca</u>	
Criteria: ☒ O. Reg. 153/04 (As Amended) Table 3 ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) Municipality: _____ ☐ Other: _____		

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)						Required Analyses									
Paracel Order Number: <u>1921134</u>															
Sample ID/Location Name		Matrix	Air Volume	# of Containers	Sample Taken		PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	PHCs E2-E4	
					Date	Time									
1	BH1-AU1	S		1	May 15/19				X	X	X	X		X	
2	BH1-SS3	S		1	↓				X	X	X	X		X	
3	BH2-AU1	S		1	↓				X	X	X	X		X	
4	BH2-SS1	S		1	↓				X	X	X	X		X	
5	BH3-SS5	S		1	May 14/19				X	X	X	X		X	
6	BH3-SS2	S		1	↓				X	X	X				
7	BH3-SS3	S		1	↓				X					X	
8															
9															
10															

Comments: please report these in numerical order - i.e. - move "BH3-SS5" to bottom

Method of Delivery: Swift

Relinquished By (Sign): <u>N. Sullivan</u>	Received by Driver/Depot: <u>927</u>	Received at Lab: <u>Shreeborn Dokma</u>	Verified By: <u>D. G...</u>
Relinquished By (Print): <u>Nick Sullivan</u>	Date/Time: _____	Date/Time: <u>May 21, 2019 06:16</u>	Date/Time: <u>22 May 19 05</u>
Date/Time: <u>May 21/2019</u>	Temperature: _____ °C	Temperature: <u>20.0</u> °C	pH Verified [] By: _____

Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 30896
Project: PE5100
Custody: 55084

Report Date: 13-Nov-2020
Order Date: 10-Nov-2020

Order #: 2046230

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

Paracel ID	Client ID
2046230-01	G1
2046230-02	G2

Approved By:



Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 13-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 10-Nov-2020

Client PO: 30896

Project Description: PE5100

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	12-Nov-20	13-Nov-20
PHC F1	CWS Tier 1 - P&T GC-FID	12-Nov-20	13-Nov-20
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	11-Nov-20	13-Nov-20
Solids, %	Gravimetric, calculation	11-Nov-20	12-Nov-20

Certificate of Analysis

Report Date: 13-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 10-Nov-2020

Client PO: 30896

Project Description: PE5100

Client ID:	G1	G2	-	-
Sample Date:	10-Nov-20 09:00	10-Nov-20 09:00	-	-
Sample ID:	2046230-01	2046230-02	-	-
MDL/Units	Soil	Soil	-	-

Physical Characteristics

% Solids	0.1 % by Wt.	89.1	89.1	-	-
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Volatiles

Benzene	0.02 ug/g dry	<0.02	<0.02	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	-	-
Toluene	0.05 ug/g dry	<0.05	<0.05	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	-	-
o-Xylene	0.05 ug/g dry	<0.05	<0.05	-	-
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	-	-
Toluene-d8	Surrogate	116%	119%	-	-

Hydrocarbons

F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	-	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	-	-
F3 PHCs (C16-C34)	8 ug/g dry	27	20	-	-
F4 PHCs (C34-C50)	6 ug/g dry	28	24	-	-

Certificate of Analysis

Report Date: 13-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 10-Nov-2020

Client PO: 30896

Project Description: PE5100

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						
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	9.47		ug/g		118	50-140			

Certificate of Analysis

Report Date: 13-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 10-Nov-2020

Client PO: 30896

Project Description: PE5100

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	
Physical Characteristics									
% Solids	91.5	0.1	% by Wt.	91.2			0.3	25	
Volatiles									
Benzene	ND	0.02	ug/g dry	ND			NC	50	
Ethylbenzene	ND	0.05	ug/g dry	ND			NC	50	
Toluene	ND	0.05	ug/g dry	ND			NC	50	
m,p-Xylenes	ND	0.05	ug/g dry	ND			NC	50	
o-Xylene	ND	0.05	ug/g dry	ND			NC	50	
Surrogate: Toluene-d8	10.9		ug/g dry		119	50-140			

Certificate of Analysis

Report Date: 13-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 10-Nov-2020

Client PO: 30896

Project Description: PE5100

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	163	7	ug/g	ND	81.5	80-120			
F2 PHCs (C10-C16)	93	4	ug/g	ND	91.3	60-140			
F3 PHCs (C16-C34)	226	8	ug/g	ND	90.6	60-140			
F4 PHCs (C34-C50)	140	6	ug/g	ND	88.9	60-140			
Volatiles									
Benzene	3.55	0.02	ug/g	ND	88.7	60-130			
Ethylbenzene	3.97	0.05	ug/g	ND	99.3	60-130			
Toluene	4.21	0.05	ug/g	ND	105	60-130			
m,p-Xylenes	8.32	0.05	ug/g	ND	104	60-130			
o-Xylene	3.89	0.05	ug/g	ND	97.2	60-130			
Surrogate: Toluene-d8	8.32		ug/g		104	50-140			

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 30896

Report Date: 13-Nov-2020

Order Date: 10-Nov-2020

Project Description: PE5100

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

Soil results are reported on a dry weight basis when the units are denoted with 'dry'.

Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

CCME PHC additional information:

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



Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 26787
Project: PE4621
Custody: 122161

Report Date: 31-May-2019
Order Date: 29-May-2019

Order #: 1922388

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

Paracel ID	Client ID
1922388-01	BH1
1922388-02	BH2
1922388-03	MW07-8

Approved By:



Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26787

Report Date: 31-May-2019

Order Date: 29-May-2019

Project Description: PE4621

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHC F1	CWS Tier 1 - P&T GC-FID	29-May-19	30-May-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	29-May-19	30-May-19
REG 153: PAHs by GC-MS	EPA 625 - GC-MS, extraction	29-May-19	31-May-19
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	29-May-19	30-May-19

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26787

Report Date: 31-May-2019

Order Date: 29-May-2019

Project Description: PE4621

Client ID:	BH1	BH2	MW07-8	-
Sample Date:	28-May-19 12:00	28-May-19 12:00	28-May-19 12:00	-
Sample ID:	1922388-01	1922388-02	1922388-03	-
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 (dibromoethane)	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: 26787

Report Date: 31-May-2019

Order Date: 29-May-2019

Project Description: PE4621

	Client ID: Sample Date: Sample ID:	BH1 28-May-19 12:00 1922388-01 Water	BH2 28-May-19 12:00 1922388-02 Water	MW07-8 28-May-19 12:00 1922388-03 Water	- - - -
	MDL/Units				
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	99.1%	101%	103%	-
Dibromofluoromethane	Surrogate	106%	106%	105%	-
Toluene-d8	Surrogate	100%	103%	103%	-

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	0.75	<0.05	0.11	-
Acenaphthylene	0.05 ug/L	<0.05	<0.05	0.08	-
Anthracene	0.01 ug/L	0.06	0.07	<0.01	-
Benzo [a] anthracene	0.01 ug/L	0.07	0.16	<0.01	-
Benzo [a] pyrene	0.01 ug/L	0.05	0.12	<0.01	-
Benzo [b] fluoranthene	0.05 ug/L	<0.05	0.15	<0.05	-
Benzo [g,h,i] perylene	0.05 ug/L	<0.05	0.09	<0.05	-
Benzo [k] fluoranthene	0.05 ug/L	<0.05	0.07	<0.05	-
Chrysene	0.05 ug/L	0.06	0.15	<0.05	-
Dibenzo [a,h] anthracene	0.05 ug/L	<0.05	<0.05	<0.05	-
Fluoranthene	0.01 ug/L	0.29	0.35	0.03	-
Fluorene	0.05 ug/L	0.58	0.05	0.11	-
Indeno [1,2,3-cd] pyrene	0.05 ug/L	0.06	0.08	<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	0.22	-
Phenanthrene	0.05 ug/L	0.12	0.26	<0.05	-
Pyrene	0.01 ug/L	0.21	0.29	0.03	-
2-Fluorobiphenyl	Surrogate	88.7%	65.6%	98.8%	-
Terphenyl-d14	Surrogate	108%	69.1%	116%	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26787

Report Date: 31-May-2019
Order Date: 29-May-2019
Project Description: PE4621

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	17.9		ug/L		89.4	50-140			
Surrogate: Terphenyl-d14	21.1		ug/L		105	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						

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26787
Report Date: 31-May-2019
Order Date: 29-May-2019
Project Description: PE4621
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	83.9		ug/L		105	50-140			
Surrogate: Dibromofluoromethane	75.3		ug/L		94.1	50-140			
Surrogate: Toluene-d8	84.7		ug/L		106	50-140			

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26787

Report Date: 31-May-2019
 Order Date: 29-May-2019
 Project Description: PE4621

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	82.8		ug/L		104	50-140			
Surrogate: Dibromofluoromethane	80.6		ug/L		101	50-140			
Surrogate: Toluene-d8	81.5		ug/L		102	50-140			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26787

Report Date: 31-May-2019
Order Date: 29-May-2019
Project Description: PE4621

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)	1440	100	ug/L		90.1	60-140			
F3 PHCs (C16-C34)	3860	100	ug/L		98.5	60-140			
F4 PHCs (C34-C50)	1960	100	ug/L		79.2	60-140			
Semi-Volatiles									
Acenaphthene	5.31	0.05	ug/L		106	50-140			
Acenaphthylene	5.20	0.05	ug/L		104	50-140			
Anthracene	4.28	0.01	ug/L		85.6	50-140			
Benzo [a] anthracene	4.93	0.01	ug/L		98.5	50-140			
Benzo [a] pyrene	4.44	0.01	ug/L		88.8	50-140			
Benzo [b] fluoranthene	5.35	0.05	ug/L		107	50-140			
Benzo [g,h,i] perylene	3.87	0.05	ug/L		77.4	50-140			
Benzo [k] fluoranthene	4.85	0.05	ug/L		96.9	50-140			
Chrysene	5.12	0.05	ug/L		102	50-140			
Dibenzo [a,h] anthracene	4.32	0.05	ug/L		86.3	50-140			
Fluoranthene	4.53	0.01	ug/L		90.7	50-140			
Fluorene	4.68	0.05	ug/L		93.5	50-140			
Indeno [1,2,3-cd] pyrene	4.28	0.05	ug/L		85.6	50-140			
1-Methylnaphthalene	6.09	0.05	ug/L		122	50-140			
2-Methylnaphthalene	5.86	0.05	ug/L		117	50-140			
Naphthalene	5.75	0.05	ug/L		115	50-140			
Phenanthrene	4.13	0.05	ug/L		82.7	50-140			
Pyrene	4.70	0.01	ug/L		94.0	50-140			
Surrogate: 2-Fluorobiphenyl	23.0		ug/L		115	50-140			
Volatiles									
Acetone	64.5	5.0	ug/L		64.5	50-140			
Benzene	38.5	0.5	ug/L		96.2	60-130			
Bromodichloromethane	35.8	0.5	ug/L		89.5	60-130			
Bromoform	36.1	0.5	ug/L		90.4	60-130			
Bromomethane	27.6	0.5	ug/L		69.0	50-140			
Carbon Tetrachloride	33.4	0.2	ug/L		83.4	60-130			
Chlorobenzene	35.8	0.5	ug/L		89.4	60-130			
Chloroform	34.0	0.5	ug/L		85.1	60-130			
Dibromochloromethane	35.0	0.5	ug/L		87.5	60-130			
Dichlorodifluoromethane	25.8	1.0	ug/L		64.5	50-140			
1,2-Dichlorobenzene	42.3	0.5	ug/L		106	60-130			
1,3-Dichlorobenzene	40.9	0.5	ug/L		102	60-130			
1,4-Dichlorobenzene	41.4	0.5	ug/L		103	60-130			
1,1-Dichloroethane	33.3	0.5	ug/L		83.3	60-130			
1,2-Dichloroethane	34.7	0.5	ug/L		86.8	60-130			
1,1-Dichloroethylene	33.7	0.5	ug/L		84.2	60-130			
cis-1,2-Dichloroethylene	39.6	0.5	ug/L		99.0	60-130			
trans-1,2-Dichloroethylene	33.1	0.5	ug/L		82.8	60-130			
1,2-Dichloropropane	38.1	0.5	ug/L		95.2	60-130			
cis-1,3-Dichloropropylene	38.2	0.5	ug/L		95.4	60-130			
trans-1,3-Dichloropropylene	38.6	0.5	ug/L		96.4	60-130			
Ethylbenzene	36.9	0.5	ug/L		92.3	60-130			
Ethylene dibromide (dibromoethane)	39.0	0.2	ug/L		97.5	60-130			
Hexane	35.7	1.0	ug/L		89.2	60-130			
Methyl Ethyl Ketone (2-Butanone)	89.3	5.0	ug/L		89.3	50-140			
Methyl Isobutyl Ketone	112	5.0	ug/L		112	50-140			

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26787

Report Date: 31-May-2019

Order Date: 29-May-2019

Project Description: PE4621

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Methyl tert-butyl ether	88.1	2.0	ug/L		88.1	50-140			
Methylene Chloride	29.2	5.0	ug/L		72.9	60-130			
Styrene	37.7	0.5	ug/L		94.3	60-130			
1,1,1,2-Tetrachloroethane	35.3	0.5	ug/L		88.2	60-130			
1,1,2,2-Tetrachloroethane	44.3	0.5	ug/L		111	60-130			
Tetrachloroethylene	35.0	0.5	ug/L		87.6	60-130			
Toluene	37.0	0.5	ug/L		92.4	60-130			
1,1,1-Trichloroethane	34.0	0.5	ug/L		85.1	60-130			
1,1,2-Trichloroethane	39.9	0.5	ug/L		99.8	60-130			
Trichloroethylene	35.7	0.5	ug/L		89.2	60-130			
Trichlorofluoromethane	31.0	1.0	ug/L		77.5	60-130			
Vinyl chloride	25.3	0.5	ug/L		63.3	50-140			
m,p-Xylenes	79.9	0.5	ug/L		99.9	60-130			
o-Xylene	42.1	0.5	ug/L		105	60-130			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26787

Report Date: 31-May-2019
Order Date: 29-May-2019
Project Description: PE4621

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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PARACEL WO: 1922388



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Toronto, Ontario K1G 4J8
416-749-1947
rachel@paracellabs.com

Chain of Custody

(Lab Use Only)

.N₀ 122161

Page 1 of 1

Turnaround Time:

☐ 1 Day ☐ 3 Day☒ 2 Day ☒ Regular

Date Required: _____

Client Name: Paterson
Contact Name: Mark D'Arcy
Address: 154 Colonnade St. S.
Telephone: (412) 276-7381

Project Reference	PE4621
Quote #	
PO #	26787
Email Address:	mdarcy@patersongroup.ca

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:

1922388

Matrix	Air Volume	# of Containers	Sample Taken	
			Date	Time

PHCs F1-F4+BTEN
VOCs
PAHs
Metals by ICP
Hg
CrVI
B (HWS)

1	BH1	GIN	3	MON/28/A	AM	✓	✓	✓
2	BH2	↓	↓	↓	↓	✓	✓	✓
3	BH3	↓	↓	↓	↓	✓	✓	✓
4								
5								
6								
7								
8								
9								
10								

Comments:	%-Received Extra Sample, Sample 50 on 2 vials read = 0144 (# PE 4691) May 25, 2017 Cancel per Mark O'Brien	Method of Delivery:	Parcel
-----------	---	---------------------	--------

Relinquished By (Sign): 	Received by Driver/Depot: 	Received at Lab: Sunegorn Bohmai	Verified By: 
Relinquished By (Print): Mandy Witterman	Date/Time: 29/05/19 1:20	Date/Time: May 29, 2019 04:48	Date/Time: May 29, 2019
Date/Time: May 29, 2019 ; 1:30 pm	Temperature: °C 71	Temperature: 15.8 °C	pH Verified By: _____

Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 26892
Project: PE4621
Custody: 122384

Report Date: 13-Jun-2019
Order Date: 11-Jun-2019

Order #: 1924244

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

Paracel ID	Client ID
1924244-01	BH1-GW2
1924244-02	BH2-GW2

Approved By:



Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26892

Report Date: 13-Jun-2019

Order Date: 11-Jun-2019

Project Description: PE4621

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Anions	EPA 300.1 - IC	12-Jun-19	12-Jun-19
Metals, ICP-MS	EPA 200.8 - ICP-MS	12-Jun-19	13-Jun-19
REG 153: PAHs by GC-MS	EPA 625 - GC-MS, extraction	12-Jun-19	13-Jun-19

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26892

Report Date: 13-Jun-2019
Order Date: 11-Jun-2019
Project Description: PE4621

Client ID:	BH1-GW2	BH2-GW2	-	-
Sample Date:	07-Jun-19 09:00	07-Jun-19 09:00	-	-
Sample ID:	1924244-01	1924244-02	-	-
MDL/Units	Water	Water	-	-

Anions

Chloride	1 mg/L	113	65	-	-
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Metals

Sodium	200 ug/L	109000	94200	-	-
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Semi-Volatiles

Acenaphthene	0.05 ug/L	0.69	<0.05	-	-
Acenaphthylene	0.05 ug/L	0.06	<0.05	-	-
Anthracene	0.01 ug/L	0.42	<0.01	-	-
Benzo [a] anthracene	0.01 ug/L	1.02	<0.01	-	-
Benzo [a] pyrene	0.01 ug/L	0.75	<0.01	-	-
Benzo [b] fluoranthene	0.05 ug/L	1.41	<0.05	-	-
Benzo [g,h,i] perylene	0.05 ug/L	0.41	<0.05	-	-
Benzo [k] fluoranthene	0.05 ug/L	0.81	<0.05	-	-
Chrysene	0.05 ug/L	0.88	<0.05	-	-
Dibenzo [a,h] anthracene	0.05 ug/L	0.15	<0.05	-	-
Fluoranthene	0.01 ug/L	2.28	<0.01	-	-
Fluorene	0.05 ug/L	0.49	<0.05	-	-
Indeno [1,2,3-cd] pyrene	0.05 ug/L	0.40	<0.05	-	-
1-Methylnaphthalene	0.05 ug/L	<0.05	<0.05	-	-
2-Methylnaphthalene	0.05 ug/L	<0.05	<0.05	-	-
Methylnaphthalene (1&2)	0.10 ug/L	<0.10	<0.10	-	-
Naphthalene	0.05 ug/L	<0.05	<0.05	-	-
Phenanthrene	0.05 ug/L	1.12	<0.05	-	-
Pyrene	0.01 ug/L	1.82	<0.01	-	-
2-Fluorobiphenyl	Surrogate	91.8%	69.4%	-	-
Terphenyl-d14	Surrogate	111%	113%	-	-

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26892

Report Date: 13-Jun-2019
 Order Date: 11-Jun-2019
 Project Description: PE4621

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L						
Metals									
Sodium	ND	200	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	21.7		ug/L		108	50-140			
Surrogate: Terphenyl-d14	24.7		ug/L		124	50-140			

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26892

Report Date: 13-Jun-2019
 Order Date: 11-Jun-2019
 Project Description: PE4621

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	29.2	1	mg/L	29.3			0.5	10	
Metals									
Sodium	15200	200	ug/L	14900			1.9	20	

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26892

Report Date: 13-Jun-2019
 Order Date: 11-Jun-2019
 Project Description: PE4621

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	38.8	1	mg/L	29.3	94.7	77-123			
Metals									
Sodium	24600		ug/L	14900	96.5	80-120			
Semi-Volatiles									
Acenaphthene	4.82	0.05	ug/L		96.4	50-140			
Acenaphthylene	4.49	0.05	ug/L		89.8	50-140			
Anthracene	4.52	0.01	ug/L		90.4	50-140			
Benzo [a] anthracene	4.83	0.01	ug/L		96.7	50-140			
Benzo [a] pyrene	4.12	0.01	ug/L		82.5	50-140			
Benzo [b] fluoranthene	5.78	0.05	ug/L		116	50-140			
Benzo [g,h,i] perylene	3.88	0.05	ug/L		77.5	50-140			
Benzo [k] fluoranthene	5.83	0.05	ug/L		117	50-140			
Chrysene	5.46	0.05	ug/L		109	50-140			
Dibenzo [a,h] anthracene	4.14	0.05	ug/L		82.8	50-140			
Fluoranthene	4.73	0.01	ug/L		94.7	50-140			
Fluorene	4.58	0.05	ug/L		91.5	50-140			
Indeno [1,2,3-cd] pyrene	4.21	0.05	ug/L		84.2	50-140			
1-Methylnaphthalene	5.45	0.05	ug/L		109	50-140			
2-Methylnaphthalene	5.97	0.05	ug/L		119	50-140			
Naphthalene	5.02	0.05	ug/L		100	50-140			
Phenanthrene	4.61	0.05	ug/L		92.1	50-140			
Pyrene	4.78	0.01	ug/L		95.7	50-140			
Surrogate: 2-Fluorobiphenyl	22.8		ug/L		114	50-140			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26892

Report Date: 13-Jun-2019
Order Date: 11-Jun-2019
Project Description: PE4621

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.

Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 30896
Project: PE5100
Custody: 55084

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

Order #: 2046207

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

Paracel ID	Client ID
2046207-01	MW1-GW3
2046207-02	MW11-GW1

Approved By:



Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 16-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 10-Nov-2020

Client PO: 30896

Project Description: PE5100

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
REG 153: PAHs by GC-MS	EPA 625 - GC-MS, extraction	16-Nov-20	16-Nov-20

Certificate of Analysis

Report Date: 16-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 10-Nov-2020

Client PO: 30896

Project Description: PE5100

Client ID:	MW1-GW3	MW11-GW1	-	-
Sample Date:	10-Nov-20 09:00	10-Nov-20 09:00	-	-
Sample ID:	2046207-01	2046207-02	-	-
MDL/Units	Water	Water	-	-

Semi-Volatiles

Acenaphthene	0.05 ug/L	0.79	0.73	-	-
Acenaphthylene	0.05 ug/L	<0.05	<0.05	-	-
Anthracene	0.01 ug/L	<0.01	<0.01	-	-
Benzo [a] anthracene	0.01 ug/L	<0.01	<0.01	-	-
Benzo [a] pyrene	0.01 ug/L	<0.01	<0.01	-	-
Benzo [b] fluoranthene	0.05 ug/L	<0.05	<0.05	-	-
Benzo [g,h,i] perylene	0.05 ug/L	<0.05	<0.05	-	-
Benzo [k] fluoranthene	0.05 ug/L	<0.05	<0.05	-	-
Chrysene	0.05 ug/L	<0.05	<0.05	-	-
Dibenzo [a,h] anthracene	0.05 ug/L	<0.05	<0.05	-	-
Fluoranthene	0.01 ug/L	0.27	0.26	-	-
Fluorene	0.05 ug/L	0.47	0.44	-	-
Indeno [1,2,3-cd] pyrene	0.05 ug/L	<0.05	<0.05	-	-
1-Methylnaphthalene	0.05 ug/L	<0.05	<0.05	-	-
2-Methylnaphthalene	0.05 ug/L	<0.05	<0.05	-	-
Methylnaphthalene (1&2)	0.10 ug/L	<0.10	<0.10	-	-
Naphthalene	0.05 ug/L	<0.05	<0.05	-	-
Phenanthrene	0.05 ug/L	<0.05	<0.05	-	-
Pyrene	0.01 ug/L	0.15	0.15	-	-
2-Fluorobiphenyl	Surrogate	78.0%	65.9%	-	-
Terphenyl-d14	Surrogate	86.4%	88.1%	-	-

Certificate of Analysis

Report Date: 16-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 10-Nov-2020

Client PO: 30896

Project Description: PE5100

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Semi-Volatiles									
Acenaphthene	ND	0.05	ug/L						
Acenaphthylene	ND	0.05	ug/L						
Anthracene	ND	0.01	ug/L						
Benzo [a] anthracene	ND	0.01	ug/L						
Benzo [a] pyrene	ND	0.01	ug/L						
Benzo [b] fluoranthene	ND	0.05	ug/L						
Benzo [g,h,i] perylene	ND	0.05	ug/L						
Benzo [k] fluoranthene	ND	0.05	ug/L						
Chrysene	ND	0.05	ug/L						
Dibenzo [a,h] anthracene	ND	0.05	ug/L						
Fluoranthene	ND	0.01	ug/L						
Fluorene	ND	0.05	ug/L						
Indeno [1,2,3-cd] pyrene	ND	0.05	ug/L						
1-Methylnaphthalene	ND	0.05	ug/L						
2-Methylnaphthalene	ND	0.05	ug/L						
Methylnaphthalene (1&2)	ND	0.10	ug/L						
Naphthalene	ND	0.05	ug/L						
Phenanthrene	ND	0.05	ug/L						
Pyrene	ND	0.01	ug/L						
Surrogate: 2-Fluorobiphenyl	15.9		ug/L		79.7	50-140			
Surrogate: Terphenyl-d14	21.4		ug/L		107	50-140			

Certificate of Analysis

Report Date: 16-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 10-Nov-2020

Client PO: 30896

Project Description: PE5100

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Semi-Volatiles									
Acenaphthene	4.72	0.05	ug/L	ND	94.3	50-140			
Acenaphthylene	3.79	0.05	ug/L	ND	75.8	50-140			
Anthracene	5.30	0.01	ug/L	ND	106	50-140			
Benzo [a] anthracene	4.68	0.01	ug/L	ND	93.5	50-140			
Benzo [a] pyrene	4.66	0.01	ug/L	ND	93.1	50-140			
Benzo [b] fluoranthene	6.47	0.05	ug/L	ND	129	50-140			
Benzo [g,h,i] perylene	5.50	0.05	ug/L	ND	110	50-140			
Benzo [k] fluoranthene	5.63	0.05	ug/L	ND	113	50-140			
Chrysene	5.01	0.05	ug/L	ND	100	50-140			
Dibenzo [a,h] anthracene	5.69	0.05	ug/L	ND	114	50-140			
Fluoranthene	5.11	0.01	ug/L	ND	102	50-140			
Fluorene	4.50	0.05	ug/L	ND	90.0	50-140			
Indeno [1,2,3-cd] pyrene	5.57	0.05	ug/L	ND	111	50-140			
1-Methylnaphthalene	4.33	0.05	ug/L	ND	86.6	50-140			
2-Methylnaphthalene	3.47	0.05	ug/L	ND	69.3	50-140			
Naphthalene	4.80	0.05	ug/L	ND	96.0	50-140			
Phenanthrene	4.38	0.05	ug/L	ND	87.6	50-140			
Pyrene	5.25	0.01	ug/L	ND	105	50-140			
Surrogate: 2-Fluorobiphenyl	12.1		ug/L		60.5	50-140			
Surrogate: Terphenyl-d14	21.1		ug/L		106	50-140			

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 30896

Report Date: 16-Nov-2020

Order Date: 10-Nov-2020

Project Description: PE5100

Qualifier Notes:

Login Qualifiers :

Container and COC sample IDs don't match - Labelled BH11-GW1

Applies to samples: MW11-GW1

Container and COC sample IDs don't match - Labelled BH1-GW3

Applies to samples: MW1-GW3

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

