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Phase II Environmental Site Assessment

3713 Borrisokane Road
Ottawa, Ontario

Prepared For

Caivan Communities

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Report: PE4810-2

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EXECUTIVE SUMMARY

Assessment

A Phase II ESA was conducted for the property addressed 3713 Borrisokane Road, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to assess a potential area of environmental concern (APEC) on the Phase II Property, resulting from the historical infilling of the former aggregate pit with fill material of unknown quality. The Phase II ESA consisted of drilling eight (8) boreholes across the Phase II Property, six (6) of which were constructed with groundwater monitoring well installations. In addition to the boreholes, 31 test pits were excavated across the Phase II Property.

Soil samples were obtained from the test holes and screened using visual observations and/or combustible vapour measurements. Based on the screening results, a total of seventeen (17) soil samples were submitted for laboratory analysis of benzene, toluene, ethylbenzene and xylenes (BTEX), petroleum hydrocarbons (PHCs), polynuclear aromatic hydrocarbons (PAHs), metals (including As, Sb, Se), Hg and CrVI.

No BTEX or PHC F_1 parameters were identified in the soil samples submitted for testing. Petroleum hydrocarbons F_2, F_3 and F_4 fractions were identified, as well as various PAH and metal parameters. All identified parameter concentrations were in compliance with the MECP Table 3 residential standards with one exception. An arsenic concentration (48.1 µg/g) identified in TP13, situated on the northwestern portion of the site, in the area of future commercial development, exceeds both the MECP Table 3 residential and commercial standard of18 µg/g.

Groundwater samples recovered from the monitoring wells installed in BH1, BH2, BH3, BH4, BH6 and BH7, were submitted for analytical testing of a combination of BTEX, PHCs, PAHs, metals (including As, Sb, Se), Hg and CrVI. Based on the results of the analytical testing no BTEX, PHC, Hg or CrVI parameters were identified in any of the groundwater samples analysed. All PAH and metal parameters identified in the groundwater samples were in compliance with the MECP Table 3 standards.

Conclusion

Based the findings of the Phase II ESA, it is our opinion that the fill used to infill the aggregate pit has not been significantly impacted. However, soil impacted with arsenic should be remediated by means of removal from the site and disposal at an approved waste disposal facility. Further investigation of the near surface soil conditions in this area of the site should also be considered.

Based on the findings of the Phase II ESA, the groundwater beneath the Phase II Property is in compliance with the MECP Table 3 standards.

It is recommended that efforts be made to maintain the integrity of the monitoring wells for possible future groundwater monitoring. It is expected that the monitoring wells will be abandoned in accordance with Ontario Regulation 903 at the time of construction excavation.

1.0 INTRODUCTION

At the request of Caivan Communities, Paterson Group (Paterson) conducted a Phase II Environmental Site Assessment (ESA) for the property addressed 3713 Borrisokane Road in the City of Ottawa, Ontario. The purpose of this Phase II ESA was to address an area of potential environmental concern (APEC) associated with the infilling of the former aggregate pit on the Phase II Property.

1.1 Site Description

Address:	3713 Borrisokane Road, Ottawa, Ontario
Legal Description:	Part of Lot 9, Concession 3 (Rideau Front), Registered Plan 5R-6254, Geographic Township of Nepean, in the City of Ottawa, Ontario.
Property Identification Number:	04592-0035
Location:	The Phase II Property is located on the east side of Borrisokane Road, approximately 515 m southeast of Cambrian Road, in the City of Ottawa, Ontario. The location of the Phase II Property is shown on Figure 1 - Key Plan following the body of this report.
Latitude and Longitude:	45° 14' 27" N, 75° 45' 00" W
Configuration:	Irregular
Site Area:	32.2 ha (approximate)

1.2 Property Ownership

The subject property is currently owned by Caivan Communities. Paterson was retained to complete this Phase II ESA by Mr. Hugo Lalonde of Caivan Communities. Mr. Lalonde can be reached by telephone at (613) 295-5082.

1.3 Current and Proposed Future Uses

The Phase II Property, is currently vacant, undeveloped land, previously used for aggregate operations. It is our understanding that the eastern portion of the Phase II Property will be developed with part of a larger residential subdivision, while the western third of the property will be developed for commercial purposes.

1.4 Applicable Site Condition Standard

The site condition standards for the property were obtained from Table 3 of the document entitled "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", prepared by the Ontario Ministry of the Environment, Conservation and Parks (MECP), April 2011. The selected MECP Table 3 Standards are based on the following considerations:

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

While the property is not currently serviced, neighbouring lands to the east are provided with municipal water and sewer; the proposed development will also be provided with municipal services. As such, non-potable groundwater conditions were selected.

The western portion of the property will be developed as a separate parcel, to which commercial land use standards will apply. However, for the purposes of this report, the data obtained for the entire property has been compared to the more stringent residential standards.

A comparison of the soil test data to the MECP Table 1 standards was also conducted, since some of the fill may be removed from this property for redevelopment. The Table 1 standards are considered to be indicative of typical Ontario background concentrations.

Sections 41 and 43.1 of O.Reg. 153/04 do not apply to the Phase II Property, as the property is not within 30m of an area of natural significance or a body of water, the pH is between 5 and 9, and there is more than 2m of overburden across the site.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The Phase II Property is surrounded by a residential subdivision under construction to the north, a former aggregate pit to the south, partially treed land and/or residential to the east and Borrisokane Road followed by Highway No. 416 and the Trail Road landfill site to the west.

At the time of the Phase I ESA, the western portion of the subject property was occupied by a small weigh-scale office and several small wood barns, used for storing soil. There are currently no permanent buildings or structures present on the subject land.

The Phase II Property currently exists as vacant, partially tree-covered land with some brush or grassed areas. The area of the former extraction operation was noted to have been backfilled in with imported fill material which appeared to consist of a mixture of silty sand and gravel with some clay and occasional boulders.

The topography of the eastern portion of the Phase II Property slopes down to the northeast, while the western portion of the site slopes down to the west. The regional topography in the general area of the site slopes downward to the north, towards the Jock River.

The residential subdivision further to the east of the Phase II Property is provided with municipal services. The Phase II Property and adjacent properties to the west, north and south are not currently provided with municipal services and do not have private wells or septic systems.

2.2 Past Investigation

Phase I Environmental Site Assessment, 2019

In November of 2019, Paterson conducted a Phase I ESA for the subject land. Based on the findings of the Phase I ESA, the importation of fill material of unknown quality was identified as an on-site potentially contaminating activity (PCA) resulting in an area of potential environmental concern (APEC) on the subject property as shown in Table 1 below. A Phase II ESA was recommended to support the filing of a Record of Site Condition for the eastern portion of the Phase II Property, prior to residential development.

Table 1: Areas of Potential Environmental Concern					
Area of Potential Environmental Concern	**Location of Area of Potential Environmental Concern with respect to Phase I Property**	**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	Across the Phase I Property	PCA: Item 30 – Importation of fill material of unknown quality	On-site	PHC F_1-F_4 BTEX PAHs Metals As, Sb, Se Hg, CrVI	Soil and groundwater

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation was conducted during the interim of July 22 through September 19, 2019. The field program consisted of drilling 8 boreholes to depths ranging from approximately 6.7 to 11.3m below grade. All boreholes were completed with monitoring well installations, with the exception of BH5 and BH8. The drilling program was followed by the excavation of 31 test pits to depths ranging from approximately 2.0 to 8.5m below grade. Bedrock was not confirmed during the field program, however practical refusal to DCPT was encountered at 11.6 m below existing ground surface at BH 5.

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 these media is based on the Contaminants of Potential Concern (CPCs) identified in the Phase I ESA. As noted in Table 1 above, CPCs for soil and groundwater include benzene, toluene, ethylbenzene and xylenes (BTEX), petroleum hydrocarbons (PHCs, fractions F_1-F_4),), polynuclear aromatic hydrocarbons (PAHs), metals (including hydride forming compounds: arsenic (As), antimony (Sb) and selenium (Se)), mercury (Hg) and hexavalent chromium (CrVI). The CPCs were selected based on the importation of fill material of unknown quality associated with the backfilling of the former aggregate pit.

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

Based on information from the Geological Survey of Canada, the subject property is located in an area of dolomite bedrock, with an overburden ranging from 15 m to 25 m in thickness and consisting of glaciofluvial deposits. Groundwater is anticipated to be encountered within the overburden unit and flow in a northerly direction towards the Jock River.

Existing Buildings and Structures

At the time of the Phase I ESA, the western portion of the subject property was occupied by a small weigh-scale office and several small wood barns, used for storing soil. There are currently no permanent buildings or structures present on the subject land.

Areas of Natural Significance

No areas of natural significance were identified on the subject property or within the Phase I study area.

Water Bodies

No water bodies are present on the subject property or within the Phase I study area. The closest significant body of water is the Jock River, located approximately 1.5 km to the north of the subject land.

Water Wells

A search of the MECPs website for all drilled well records within 250 m of the subject site was conducted as part of this assessment. No potable well records were identified for the subject property or for properties within the 250m study area.

The search identified four (4) records of monitoring wells for properties within the study area, drilled between 2004 and 2016. No monitoring well records were identified for the subject land. According to the well records, the overburden stratigraphy in the general area of the subject property generally consists of brown sand and silt.

Neighbouring Land Use

Neighbouring land use within the Phase I study area consists mainly of vacant land and residential dwellings under construction. No environmental concerns were identified with respect to the current use of the neighbouring properties.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

As per Table 1 in Section 2.2, the following Potentially Contaminating Activities were identified on the subject property:

- Item 30: Importation of fill material of unknown quality – this PCA was identified based on the infilling of the former aggregate pit and was considered to result in APEC 1 on the Phase I Property.

The following off-site PCA was identified within the Phase I study area:

- Item 58: Waste disposal and waste management, including thermal treatment, landfilling and transfer of waste, other than use of biosoils as soil conditioners – this PCA was identified based on the presence of an active landfill site (Trail Road Landfill) approximately 150m west of the subject property, across Borrisokane Road and Highway No. 416.

  Based on its separation distance and cross-gradient orientation relative to the subject land, in combination with our knowledge of the landfill (2015 through 2018 operating and monitoring reports) the active landfill site is not considered to represent an APEC on the Phase I Property.

Contaminants of Potential Concern (CPCs)

The CPCs identified with respect to the Phase I Property are considered to be metals (including As, Sb, Se, Hg and CrVI), polynuclear aromatic hydrocarbons (PAHs), petroleum hydrocarbons (PHCs F1-F4), as well as benzene, toluene, ethylbenzene, and xylenes (BTEX). The CPCs are expected to be limited to the fill material, as opposed to the native soils or groundwater.

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 the PCA identified on the subject property represents an on-site APEC, whereas the PCA identified off of the subject site, yet within the Phase I Study area, does not represent an APEC with respect to the subject property.

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

3.4 Deviations from Sampling and Analysis Plan

The Sampling and Analysis Plan for this project is included in Appendix 1 of this report. Field measurement of water quality parameters was not conducted at the time of the groundwater sampling event due to equipment failure in the field. The depth of test pit excavation was limited by infiltrating groundwater.

Duplicate soil and groundwater samples were not recovered during the initial Phase II field work; duplicate sampling will be conducted in conjunction with additional investigation as required. Otherwise, there were no deviations from the Sampling and Analysis Plan.

3.5 Impediments

The infiltration of groundwater within the test pit excavations limited excavation depth. Otherwise no physical impediments were encountered during the field portion of the Phase II ESA.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation was conducted during the interim of July 22 through September 19, 2019. The field program consisted of drilling 8 boreholes to depths ranging from approximately 6.7 to 11.3m below grade. All boreholes were completed with monitoring well installations, with the exception of BH5 and BH8. The drilling program was followed by the excavation of 31 test pits to depths ranging from approximately 2.0 to 8.5m below grade.

All boreholes were drilled with a track-mounted CME 55 power auger drill rig, provided by George Downing Estate Drilling of Hawkesbury, Ontario, under the full-time supervision of Paterson personnel. Test pits were excavated using a track-mounted hydraulic excavator provided by Taggart Construction Limited of Ottawa, Ontario, under the full-time supervision of Paterson personnel. All test hole locations are shown on Drawing PE4810-3 – Test Hole Location Plan, appended to this report.

4.2 Soil Sampling

A total of eighty-nine (89) soil samples were obtained from the boreholes by means of sampling directly from auger flights and split spoon sampling. A total of ninety-two (92) soil samples were obtained from the test pits by means of grab sampling. The depths at which auger samples, split spoon samples and grab samples were obtained from the test holes are shown as "**AU**", "**SS**" and "**G**" on the Soil Profile and Test Data Sheets, appended to this report.

Generally, the subsurface profile encountered at the test hole locations consists of a fill layer overlying a deep deposit of brown silty sand and/or brown sand with varying amounts of gravel, cobbles and boulders. Stiff to very stiff brown to grey silty clay was encountered below the silty sand layer and/or fill layer at BH 5, BH 6, BH 8, TP 7, TP 14, TP 23 and TP 25. Practical refusal to DCPT was encountered at 11.6 m below existing ground surface at BH 5.

4.3 Field Screening Measurements

All soil samples collected were subjected to a preliminary screening procedure, which included visual screening for colour/staining and evidence of fill material/ metal impacts. Soil vapour screening with an RKI Eagle gas detector with methane elimination and calibrated to hexane, was conducted on samples recovered from the borehole locations.

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 parts per million (ppm) scale is used to measure concentrations of hydrocarbon vapours that are too low to register on the Lower Explosive Limit (LEL) scale. The explosive point, 100% LEL, represents the leanest mixture which will burn (or explode) if ignited.

The combustible vapour readings generally ranged from 5 to 50ppm and were not considered to be indicative of petroleum hydrocarbon compounds. Vapour readings are noted on the Soil Profile and Test Data Sheets in Appendix 1.

No visual or olfactory indications of potential hydrocarbons were noted in any of the samples during the field programs. Fill material was noted at all test hole locations. Fill material generally consisted of a mixture of silt, sand, clay, gravel and cobbles, with occasional fragments of brick and will be discussed further in the Phase II CSM (Section 5.8). No deleterious materials or obvious signs of contamination were identified. Soil samples were selected based on the results of the vapour screening, in combination with visual observations and sample depth.

4.4 Groundwater Monitoring Well Installation

Six (6) groundwater monitoring wells were installed on the Phase II Property, at boreholes BH1, BH2, BH3, BH4, BH6 and BH7. The monitoring wells consisted of 51mm 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.

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	102.51	9.14	6.10-9.14	5.79-9.14	0.3-5.79	Stick-up
BH2	101.22	6.86	3.81-6.86	3.51-6.86	0.3-3.51	Stick-up
BH3	104.73	10.67	7.62-10.67	7.31-10.67	0.3-7.31	Stick-up
BH4	104.42	10.67	7.62-10.67	7.31-10.67	0.3-7.31	Stick-up
BH6	103.89	6.10	3.05-6.10	2.74-6.10	0.3-2.74	Stick-up
BH7	103.77	6.10	3.05-6.10	2.74-6.10	0.3-2.74	Stick-up

4.5 Groundwater Sampling

Groundwater sampling protocols were followed using the MECP document entitled “Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario”, dated May 1996. Groundwater samples were obtained from each monitoring well, using dedicated sampling equipment. Standing water was purged from each well prior to sampling. Samples were stored in coolers to reduce analyte volatilization during transportation. Details of our standard operating procedure for groundwater sampling are provided in the Sampling and Analysis Plan in Appendix 1.

4.6 Analytical Testing

Based on the guidelines outlined in the Sampling and Analysis Plan appended to this report, the soil and groundwater samples submitted for analytical testing are outlined in Tables 3 and 4.

Table 3: Soil Samples Submitted for Analytical Testing

Sample ID	Sample Depth/ Stratigraphic Unit	Parameters Analyzed						Rationale
		BTEX	PHCs (F_1-F_4)	PAHs	Metals	As, Sb, Se	Hg, CrVI	
BH3-SS2	0.76-1.37; Fill material	X	X	X	X	X	X	Sample selected based on visual screening of fill material.
BH4-SS3	1.52-2.13m; Fill material				X	X	X	Sample selected based on visual screening of fill material.
BH4-SS5	6.10-6.70m; Fill material			X				Sample selected based on visual and vapour screening of fill material.
BH4-SS8	8.38-8.99m; Glacial Till	X	X					Sample selected based on slightly elevated vapour screening result.
BH6-SS2	0.67-1.37m; Fill material	X	X	X	X	X	X	Sample selected based on visual screening of the fill material.
BH6-SS12	7.62-8.23m; Silty sand to sandy silt	X	X	X	X	X	X	Sample selected based on vapour screening result.
BH7-AU1	0-0.61m; Fill material	X	X		X	X	X	Sample selected based on visual screening of fill material.
BH8-AU1	0-0.61m; Fill material	X	X					Sample selected based on visual screening of fill material.
TP1-G4	4.0-4.2m; Fill material	X	X	X	X	X	X	Samples selected based on visual screening of fill material.
TP4-G4	2.8-2.9m; Fill material	X	X	X	X	X	X	
TP6-G2	3.1-3.3m; Fill material	X	X	X	X	X	X	
TP9-G1	0.3-0.6m; Fill material	X	X	X	X	X	X	
TP10-G2	2.3-2.5m; Fill material	X	X	X	X	X	X	
TP13-G1	0.3-0.4m; Fill material	X	X	X	X	X	X	
TP24-G1	3.6-3.7m; Fill material	X	X	X	X	X	X	
TP25-G1	5.3-5.4m; Fill material	X	X	X	X	X	X	

Table 4: Groundwater Samples Submitted for Analytical Testing								
Sample ID	Sample Depth/ Stratigraphic Unit	Parameters Analyzed						Rationale
		BTEX	PHCs (F_1-F_4)	PAHs	Metals	As, Sb, Se	Hg, CrVI	
BH1-GW1	6.10-9.14m; Fill material, native silty sand	X	X	X	X	X	X	Parameters selected based on observations made during screening of soils recovered from boreholes with monitoring well installations.
BH2-GW1	3.81-6.86m; Fill material, native silty sand	X	X					
BH3-GW1	7.62-10.67m; Fill material, native silty sand	X	X					
BH4-GW1	7.62-10.67m; Fill material, glacial till	X	X	X	X	X	X	
BH6-GW1	3.05-6.10m; Fill material, native silty sand	X	X	X	X	X	X	
BH7-GW1	3.05-6.10m; Native silty sand	X	X	X				

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.

4.7 Residue Management

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

4.8 Elevation Surveying

The test holes locations selected by Paterson were located and surveyed in the field by J.D. Barnes Limited. The ground surface elevations at the test hole locations are referenced to a geodetic datum and are presented on Drawing PE4810-3 - Test Hole Location Plan appended to this report.

4.9 Quality Assurance and Quality Control Measures

A summary of quality assurance and quality control (QA/QC) measures, including sampling containers, preservation, labelling, handling, 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

Based on the information obtained during the current subsurface investigation, site soils generally consist of fill material over native silty sand to sandy silt, silty sand with gravel, silty clay and/or glacial till.

Groundwater was encountered within the overburden at depths ranging from approximately 3.66 to 9.08m below ground surface.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured during the groundwater sampling event on July 24, 2019, using an electronic water level meter. Groundwater levels are summarized below in Table 5 below.

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	102.51	6.67	95.84	July 24, 2019
BH2	101.22	5.65	95.57	July 24, 2019
BH3	104.73	9.08	95.65	July 24, 2019
BH4	104.42	6.69	97.73	July 24, 2019
BH6	103.89	3.80	100.09	July 24, 2019
BH7	103.77	3.66	100.11	July 24, 2019

Based on the groundwater elevations measured at the aforementioned borehole locations, contour mapping was completed. Groundwater contours as shown on Drawing PE4810-4 – Groundwater Contour Plan, indicate that the groundwater beneath the Phase II Property flows towards the east. A hydraulic gradient of 0.01m/m was calculated.

Based on the regional topography and proximity of the Jock River, in combination with work previously conducted in the immediate vicinity of the Phase II Property, the regional groundwater flow is in a northerly direction.

5.3 Fine-Coarse Soil Texture

Based on field soil observations, fine-grained soil standards are not applicable to the Phase II Property.

5.4 Soil: Field Screening

Field screening of the soil samples collected during drilling resulted in combustible vapour readings generally ranging from 5 to 50ppm. 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

A total of sixteen (16) soil samples were submitted for analysis of BTEX, PHCs (F_1-F_4), PAHs, metals (including arsenic (As), antimony (Sb) and selenium (Se)), mercury (Hg) and hexavalent chromium (CrVI). The results of the analytical testing are presented below in Tables 6 through 8. The laboratory certificates of analysis are provided in Appendix 1.

Table 6A: Analytical Test Results – Soil
BTEX and PHCs (F_1-F_4)

Parameter	MDL (µg/g)	Soil Samples (µg/g) Borehole Samples			MECP Table 3 Residential Standards (µg/g)
		Jul.19/19	Jul.19/19	Jul.24/19	
		BH3-SS2 (0.67-1.37m)	BH4-SS8 (8.38-8.99m)	BH6-SS2 (0.76-1.37m)	
Benzene	0.02	nd	nd	nd	0.21
Ethylbenzene	0.05	nd	nd	nd	2
Toluene	0.05	nd	nd	nd	2.3
Xylenes	0.05	nd	nd	nd	3.1
PHC F1	7	nd	nd	nd	55
PHC F2	4	nd	nd	nd	98
PHC F3	8	20	30	44	300
PHC F4	6	30	57	12	2,800

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL

Table 6A Continued: Analytical Test Results – Soil
BTEX and PHCs (F1-F4)

Parameter	MDL (µg/g)	Soil Samples (µg/g) Borehole Samples			MECP Table 3 Residential Standards (µg/g)
		Jul.24/19			
		BH6-SS12 (7.62-8.23m)	BH7-AU1 (0-0.61m)	BH8-AU1 (0-0.61m)	
Benzene	0.02	nd	nd	nd	0.21
Ethylbenzene	0.05	nd	nd	nd	2
Toluene	0.05	nd	nd	nd	2.3
Xylenes	0.05	nd	nd	nd	3.1
PHC F1	7	nd	nd	nd	55
PHC F2	4	nd	nd	nd	98
PHC F3	8	99	40	36	300
PHC F4	6	55	45	37	2,800

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL

All BTEX and PHC concentrations comply with the MECP Table 3 standards, as well as, the MECP Table 1 Standards.

Table 6B: Analytical Test Results – Soil
BTEX and PHCs (F_1-F_4)

Parameter	MDL (µg/g)	Soil Samples (µg/g) Test Pit Samples				MECP Table 3 Residential Standards (µg/g)
		Jul.25/19			Jul.26/19	
		TP1-G4 (4.0-4.2m)	TP4-G4 (2.8-2.9m)	TP6-G2 (3.1-3.3m)	TP9-G1 (0.3-0.6m)	
Benzene	0.02	nd	nd	nd	nd	0.21
Ethylbenzene	0.05	nd	nd	nd	nd	2
Toluene	0.05	nd	nd	nd	nd	2.3
Xylenes	0.05	nd	nd	nd	nd	3.1
PHC F1	7	nd	nd	nd	nd	55
PHC F2	4	nd	5	nd	nd	98
PHC F3	8	45	236	22	31	300
PHC F4	6	22	96	28	34	2,800

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- na – not analysed for this parameter

Table 6B Continued: Analytical Test Results – Soil
BTEX and PHCs (F_1-F_4)

Parameter	MDL (µg/g)	Soil Samples (µg/g) Test Pit Samples				MECP Table 3 Residential Standards (µg/g)
		Jul.26/19		Sept.17/19		
		TP10-G2 (2.3-2.5m)	TP13-G1 (0.3-0.4m)	TP24-G1 (3.6-3.7m)	TP25-G2 (5.3-5.4m)	
Benzene	0.02	nd	nd	nd	nd	0.21
Ethylbenzene	0.05	nd	nd	nd	nd	2
Toluene	0.05	nd	nd	nd	nd	2.3
Xylenes	0.05	nd	nd	nd	nd	3.1
PHC F1	7	nd	nd	nd	nd	55
PHC F2	4	nd	nd	nd	nd	98
PHC F3	8	33	77	15	16	300
PHC F4	6	33	<u>140</u>	24	22	2,800

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- na – not analysed for this parameter
- ___ - underlined value exceeds MECP Table 1 standards

All BTEX and PHC concentrations comply with the MECP Table 3 standards, as well as the MECP Table 1 Standards, with the exception of the PHC fraction F4 concentration in Sample TP13-G1.

Table 7A
Analytical Test Results – Soil
Polynuclear Aromatic Hydrocarbons (PAHs)

Parameter	MDL (µg/g)	Soil Samples (µg/g) Borehole Samples				MECP Table 3 Standards Residential (µg/g)
		Jul.19/19		Jul.24/19		
		BH3-SS2 (0.67-1.37m)	BH4-SS5 (6.10-6.70m)	BH6-SS2 (0.76-1.37m)	BH6-SS12 (7.62-8.23m)	
Acenaphthene	0.02	nd	nd	nd	nd	7.9
Acenaphthylene	0.02	nd	nd	nd	nd	0.15
Anthracene	0.02	nd	nd	nd	nd	0.67
Benzo[a]anthracene	0.02	0.02	0.03	nd	nd	0.5
Benzo[a]pyrene	0.02	0.02	0.02	nd	nd	0.3
Benzo[b]fluoranthene	0.02	0.03	0.03	nd	nd	0.78
Benzo[g,h,i]perylene	0.02	nd	nd	nd	nd	6.6
Benzo[k]fluoranthene	0.02	nd	nd	nd	nd	0.78
Chrysene	0.02	0.02	0.02	nd	nd	7
Dibenzo[a,h]anthracene	0.02	nd	nd	nd	nd	0.1
Fluoranthene	0.02	0.04	0.05	nd	nd	0.69
Fluorene	0.02	nd	nd	nd	nd	62
Indeno[1,2,3-cd]pyrene	0.02	nd	nd	nd	nd	0.38
Methylnapthalene (1&2)	0.04	nd	nd	nd	0.09	0.99
Naphthalene	0.01	nd	nd	nd	nd	0.6
Phenanthrene	0.02	nd	0.03	nd	nd	6.2
Pyrene	0.02	0.04	0.04	nd	nd	78

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL

All PAH concentrations comply with the MECP Table 3 standards, as well as, the MECP Table 1 standards.

Table 7B
Analytical Test Results – Soil
Polynuclear Aromatic Hydrocarbons (PAHs)

Parameter	MDL (µg/g)	Soil Samples (µg/g) Test Pit Samples				MECP Table 3 Standards Residential (µg/g)
		Jul.25/19			Jul.26/19	
		TP1-G4 (4.0-4.2m)	TP4-G4 (2.8-2.9m)	TP6-G2 (3.1-3.3m)	TP9-G1 (0.3-0.6m)	
Acenaphthene	0.02	nd	nd	nd	nd	7.9
Acenaphthylene	0.02	nd	nd	nd	nd	0.15
Anthracene	0.02	0.06	nd	nd	nd	0.67
Benzo[a]anthracene	0.02	0.11	nd	nd	nd	0.5
Benzo[a]pyrene	0.02	0.09	nd	nd	0.05	0.3
Benzo[b]fluoranthene	0.02	0.13	nd	nd	nd	0.78
Benzo[g,h,i]perylene	0.02	0.06	nd	nd	nd	6.6
Benzo[k]fluoranthene	0.02	0.06	nd	nd	nd	0.78
Chrysene	0.02	0.11	nd	nd	nd	7
Dibenzo[a,h]anthracene	0.02	nd	nd	nd	nd	0.1
Fluoranthene	0.02	0.27	0.04	0.04	0.05	0.69
Fluorene	0.02	nd	nd	nd	nd	62
Indeno[1,2,3-cd]pyrene	0.02	0.06	nd	nd	nd	0.38
Methylnapthalene (1&2)	0.04	nd	nd	nd	nd	0.99
Naphthalene	0.01	nd	nd	nd	nd	0.6
Phenanthrene	0.02	0.18	nd	nd	nd	6.2
Pyrene	0.02	0.21	0.04	0.04	nd	78

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL

Table 7B Continued
Analytical Test Results – Soil
Polynuclear Aromatic Hydrocarbons (PAHs)

Parameter	MDL (µg/g)	Soil Samples (µg/g) Test Pit Samples				MECP Table 3 Standards Residential (µg/g)
		Jul.26/19		Sept.17/19		
		TP10-G2 (2.3-2.5m)	TP13-G1 (0.3-0.4m)	TP24-G1 (3.6-3.7m)	TP25-G2 (5.3-5.4m)	
Acenaphthene	0.02	nd	nd	nd	nd	7.9
Acenaphthylene	0.02	nd	nd	nd	0.05	0.15
Anthracene	0.02	0.15	nd	nd	0.05	0.67
Benzo[a]anthracene	0.02	0.12	nd	0.03	0.09	0.5
Benzo[a]pyrene	0.02	0.11	nd	0.02	0.10	0.3
Benzo[b]fluoranthene	0.02	0.06	nd	0.04	0.13	0.78
Benzo[g,h,i]perylene	0.02	nd	nd	nd	0.05	6.6
Benzo[k]fluoranthene	0.02	0.06	nd	nd	0.06	0.78
Chrysene	0.02	0.13	nd	0.03	0.10	7
Dibenzo[a,h]anthracene	0.02	nd	nd	nd	nd	0.1
Fluoranthene	0.02	0.26	nd	0.05	0.17	0.69
Fluorene	0.02	nd	nd	nd	nd	62
Indeno[1,2,3-cd]pyrene	0.02	0.05	nd	nd	0.05	0.38
Methylnapthalene (1&2)	0.04	nd	nd	0.07	nd	0.99
Naphthalene	0.01	nd	nd	0.05	0.01	0.6
Phenanthrene	0.02	0.15	nd	0.04	0.09	6.2
Pyrene	0.02	0.20	nd	0.06	0.15	78

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL

The PAH concentrations identified comply with the MECP Table 3 and MECP Table 1 standards.

Table 8A: Analytical Test Results – Soil
Metals (including As, Sb, Se), Hg, CrVI

Parameter	MDL (µg/g)	Soil Samples (µg/g) Borehole Samples			MECP Table 3 Residential Standards (µg/g)
		Jul.19/19		Jul.24/19	
		BH3-SS2 (0.67-1.37m)	BH4-SS3 (1.52-2.13m)	BH6-SS2 (0.76-1.37m)	
Antimony	1.0	nd	nd	nd	7.5
Arsenic	1.0	2.7	2.4	2.0	18
Barium	1.0	88.4	172	129	390
Beryllium	0.5	nd	0.5	nd	4
Boron	5.0	8.2	nd	5.2	120
Cadmium	0.5	nd	nd	nd	1.2
Chromium	5.0	19.8	32.4	33.2	160
Chromium (VI)	0.2	nd	nd	nd	8
Cobalt	1.0	6.5	8.9	7.7	22
Copper	5.0	15.4	20.9	14.0	140
Lead	1.0	10.5	8.6	8.8	120
Mercury	0.1	nd	nd	nd	0.27
Molybdenum	1.0	nd	nd	nd	6.9
Nickel	5.0	13.2	18.9	16.5	100
Selenium	1.0	nd	nd	nd	2.4
Silver	0.3	nd	nd	nd	20
Thallium	1.0	nd	nd	nd	1
Uranium	1.0	nd	nd	nd	23
Vanadium	10.0	25.2	43.1	39.0	86
Zinc	20.0	34.5	52.0	55.4	340

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- nt – not tested for this parameter

Table 8A Continued: Analytical Test Results – Soil
Metals (including As, Sb, Se), Hg, CrVI

Parameter	MDL (µg/g)	Soil Samples (µg/g) Borehole Samples		MECP Table 3 Residential Standards (µg/g)
		Jul.24/19		
		BH6-SS12 (7.62-8.23m)	BH7-AU1 (0-0.61m)	
Antimony	1.0	nd	nd	7.5
Arsenic	1.0	2.8	2.1	18
Barium	1.0	171	58.5	390
Beryllium	0.5	nd	nd	4
Boron	5.0	7.7	10.2	120
Cadmium	0.5	nd	nd	1.2
Chromium	5.0	25.6	16.6	160
Chromium (VI)	0.2	nd	nd	8
Cobalt	1.0	8.1	4.5	22
Copper	5.0	20.2	9.4	140
Lead	1.0	3.9	4.8	120
Mercury	0.1	nd	nd	0.27
Molybdenum	1.0	3.7	nd	6.9
Nickel	5.0	18.1	9.2	100
Selenium	1.0	nd	nd	2.4
Silver	0.3	nd	nd	20
Thallium	1.0	nd	nd	1
Uranium	1.0	1.1	nd	23
Vanadium	10.0	38.7	21.8	86
Zinc	20.0	43.9	21.8	340

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- nt – not tested for this parameter
- ___ - underlined value exceeds MECP Table 1 standards

All metals concentrations comply with the MECP Table 3 standards. Molybdenum in Sample BH6-SS12 exceeds the Table 1 standard.

Table 8B: Analytical Test Results – Soil
Metals (including As, Sb, Se), Hg, CrVI

Parameter	MDL (µg/g)	Soil Samples (µg/g) Test Pit Samples				MECP Table 3 Residential Standards (µg/g)
		Jul.25/19			Jul.26/19	
		TP1-G4 (4.0-4.2m)	TP4-G4 (2.8-2.9m)	TP6-G2 (3.1-3.3m)	TP9-G1 (0.3-0.6m)	
Antimony	1.0	nd	nd	nd	nd	7.5
Arsenic	1.0	2.2	2.5	2.7	2.5	18
Barium	1.0	94.4	186	185	107	390
Beryllium	0.5	nd	0.5	nd	nd	4
Boron	5.0	8.2	8.4	6.9	5.9	120
Cadmium	0.5	nd	nd	nd	nd	1.2
Chromium	5.0	19.1	37.6	29.6	28.1	160
Chromium (VI)	0.2	nd	nd	nd	nd	8
Cobalt	1.0	5.9	9.0	7.9	7.2	22
Copper	5.0	12.4	20.9	16.3	14.8	140
Lead	1.0	7.0	14.2	11.7	11.1	120
Mercury	0.1	nd	nd	nd	nd	0.27
Molybdenum	1.0	nd	nd	nd	nd	6.9
Nickel	5.0	12.4	21.4	17.4	15.8	100
Selenium	1.0	nd	nd	nd	nd	2.4
Silver	0.3	nd	nd	nd	nd	20
Thallium	1.0	nd	nd	nd	nd	1
Uranium	1.0	nd	nd	nd	nd	23
Vanadium	10.0	28.1	40.7	36.6	34.2	86
Zinc	20.0	32.0	64.0	45.1	55.3	340

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- nt – not tested for this parameter

Table 8B Continued: Analytical Test Results – Soil
Metals (including As, Sb, Se), Hg, CrVI

Parameter	MDL (µg/g)	Soil Samples (µg/g) Test Pit Samples				MECP Table 3 Residential Standards (µg/g)
		Jul.26/19		Sept.17/19		
		TP10-G2 (2.3-2.5m)	TP13-G1 (0.3-0.4m)	TP24-G1 (3.6-3.7m)	TP25-G2 (5.3-5.4m)	
Antimony	1.0	nd	nd	nd	nd	7.5
Arsenic	1.0	2.6	**46.8**	2.1	1.8	18
Barium	1.0	95.7	90.3	117	118	390
Beryllium	0.5	nd	nd	nd	nd	4
Boron	5.0	6.4	10.8	5.9	5.1	120
Cadmium	0.5	nd	nd	nd	nd	1.2
Chromium	5.0	22.1	49.6	25.4	32.0	160
Chromium (VI)	0.2	nd	nd	nd	nd	8
Cobalt	1.0	5.6	5.9	8.0	7.6	22
Copper	5.0	14.8	81.9	21.0	17.9	140
Lead	1.0	20.8	33.5	13.9	11.5	120
Mercury	0.1	nd	nd	nd	nd	0.27
Molybdenum	1.0	nd	nd	nd	nd	6.9
Nickel	5.0	13.7	13.7	17.5	18.7	100
Selenium	1.0	nd	nd	nd	nd	2.4
Silver	0.3	nd	nd	nd	nd	20
Thallium	1.0	nd	nd	nd	nd	1
Uranium	1.0	nd	nd	nd	nd	23
Vanadium	10.0	26.3	28.3	31.5	33.7	86
Zinc	20.0	54.8	244	51.8	42.2	340

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- nt – not tested for this parameter
- **Bold** - value exceeds MECP Table 3 standards

All metals concentrations comply with the MECP Table 3 and Table 1 standards, with the exception of the arsenic concentration identified in Sample TP13-G1. It should be noted that TP13 is situated on the western portion of the Phase II Property, to be developed for commercial purposes; this parameter also fails the MECP Table 3 commercial standard (18µg/g) for arsenic.

Maximum soil concentrations identified on-site are presented in Table 9 below. All other parameters were below laboratory detection limits.

Table 9: Maximum Soil Concentrations			
Parameter	**Maximum Concentration (µg/g)**	**Borehole**	**Depth Interval (m BGS)**
Petroleum Hydrocarbons			
PHC F_2	5	TP4-G4	2.8-2.9
PHC F_3	236	TP4-G4	2.8-2.9
PHC F_4	140	TP13-G1	0.3-0.4
Polynuclear Aromatic Hydrocarbons			
Acenaphthylene	0.05	TP25-G2	5.3-5.4
Anthracene	0.15	TP10-G2	2.3-2.5
Benzo[a]anthracene	0.12	TP10-G2	2.3-2.5
Benzo[a]pyrene	0.11	TP10-G2	2.3-2.5
Benzo[b]fluoranthene	0.13	TP1-G4	4.0-4.2
Benzo[g,h,i]perylene	0.06	TP1-G4	4.0-4.2
Benzo[k]fluoranthene	0.11	TP1-G4	4.0-4.2
Chrysene	0.13	TP10-G2	2.3-2.5
Fluoranthene	0.27	TP1-G4	4.0-4.2
Indeno[1,2,3-cd]pyrene	0.06	TP1-G4	4.0-4.2
Methylnapthalene (1&2)	0.09	BH6-SS12	7.62-8.23
Naphthalene	0.05	TP24-G1	3.6-3.7
Phenanthrene	0.18	TP1-G4	4.0-4.2
Pyrene	0.21	TP1-G4	4.0-4.2
Metals (including, As, Sb, Se), Hg and CrVI			
Arsenic	**46.8**	TP13-G1	0.3-0.4
Barium	186	TP4-G4	2.8-2.9
Beryllium	0.5	BH4-SS3 TP4-G4	1.52-2.13 22.8-2.9
Boron	10.8	TP13-G1	0.3-0.4
Chromium	49.6	TP13-G1	0.3-0.4
Cobalt	9.0	TP4-G4	2.8-2.9
Copper	81.9	TP13-G1	0.3-0.4
Lead	33.5	TP13-G1	0.3-0.4
Molybdenum	3.7	BH6-SS12	6.2-8.23
Nickel	21.4	TP4-G4	2.8-2.9
Uranium	1.1	BH6-SS12	6.2-8.23
Vanadium	43.1	BH4-SS3	1.52-2.13
Zinc	244	TP13-G1	0.3-0.4

Notes:
- **Bold** - value exceeds MECP Table 3 standards

5.6 Groundwater Quality

Groundwater samples from monitoring wells installed in BH1, BH2, BH3, BH4, BH6 and BH7 were submitted for a combination of analyses including BTEX, PHC (F_1-F_4), PAH and metal parameters (including As, Sb, Se, Hg and CrVI). The groundwater samples were obtained from the screened intervals noted on Table 2. No visual or olfactory evidence of petroleum hydrocarbons was noted on the groundwater at any of the borehole locations.

The results of the analytical testing are presented below in Tables 10 through 12. The laboratory certificates of analysis are provided in Appendix 1.

Table 10: Analytical Test Results - Groundwater
BTEX and PHCs (F_1-F_4)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L) July 24, 2019						MECP Table 3 Standards (µg/L)
		BH1-GW1	BH2-GW1	BH3-GW1	BH4-GW1	BH6-GW1	BH7-GW1	
Benzene	0.5	nd	nd	nd	nd	nd	nd	44
Ethylbenzene	0.5	nd	nd	nd	nd	nd	nd	2,300
Toluene	0.5	nd	nd	nd	nd	nd	nd	18,000
Xylenes	0.5	nd	nd	nd	nd	nd	nd	4,200
PHC F1	25	nd	nd	nd	nd	nd	nd	750
PHC F2	100	nd	nd	nd	nd	nd	nd	150
PHC F3	100	nd	nd	nd	nd	nd	nd	500
PHC F4	100	nd	nd	nd	nd	nd	nd	500

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL

No BTEX or PHC parameters were detected above the laboratory method detection limits in any of the groundwater samples submitted for analytical testing. The results are in compliance with the MECP Table 3 standards.

It is our interpretation that the analyzed parameter concentrations do not indicate the potential presence of light non-aqueous phase liquids (LNAPLs). As previously noted, no free phase hydrocarbons were noted in the wells at the time of groundwater sampling event.

Table 11: Analytical Test Results – Groundwater
Polynuclear Aromatic Hydrocarbons (PAHs)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L) July 24, 2019				MECP Table 3 Standards Residential (µg/L)
		BH1-GW1	BH4-GW1	BH6-GW1	BH7-GW1	
Acenaphthene	0.05	nd	3.2	nd	nd	600
Acenaphthylene	0.05	nd	1.37	nd	nd	1.8
Anthracene	0.01	0.12	0.83	nd	nd	2.4
Benzo[a]anthracene	0.01	0.23	0.04	nd	nd	4.7
Benzo[a]pyrene	0.01	0.19	nd	nd	nd	0.81
Benzo[b]fluoranthene	0.05	0.24	nd	nd	nd	0.75
Benzo[g,h,i]perylene	0.05	0.12	nd	nd	nd	0.2
Benzo[k]fluoranthene	0.05	0.11	nd	nd	nd	0.4
Chrysene	0.05	0.24	nd	nd	nd	1
Dibenzo[a,h]anthracene	0.05	nd	nd	nd	nd	0.52
Fluoranthene	0.01	0.49	0.51	nd	nd	130
Fluorene	0.05	nd	3.66	nd	nd	400
Indeno[1,2,3-cd]pyrene	0.05	0.09	nd	nd	nd	0.2
Methylnapthalene (1&2)	0.01	nd	9.78	nd	nd	1,800
Naphthalene	0.05	nd	40.2	nd	nd	1,400
Phenanthrene	0.05	0.3	3.99	nd	nd	580
Pyrene	0.01	0.41	0.30	nd	nd	68

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL

The PAH results were non-detect, with several exceptions, however, all test results comply with the MECP Table 3 standards.

Table 12: Analytical Test Results – Groundwater
Metals (including As, Sb, Se, CrVI and Hg)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L) July 24, 2019			MECP Table 3 Residential Standards (µg/L)
		BH1-GW1	BH4-GW1	BH6-GW1	
Antimony	0.5	nd	nd	nd	2,000
Arsenic	1	nd	4	1	1,900
Barium	1	112	361	111	29,000
Beryllium	0.5	nd	nd	nd	67
Boron	10	133	67	17	45,000
Cadmium	0.1	nd	nd	nd	2.7
Chromium	1	nd	nd	nd	810
Chromium (VI)	10	nd	nd	nd	140
Cobalt	0.5	17.2	0.8	0.9	66
Copper	0.5	nd	nd	2.8	87
Lead	0.1	nd	nd	nd	25
Mercury	0.1	nd	nd	nd	0.29
Molybdenum	0.5	60.4	4.9	14.7	9,200
Nickel	1	9	3	nd	490
Selenium	1	nd	nd	nd	63
Silver	0.1	nd	nd	nd	1.5
Sodium	200	1,300,000	1,290,000	101,000	2,300,000
Thallium	0.1	nd	nd	nd	510
Uranium	0.1	11.4	1.3	0.7	420
Vanadium	0.5	nd	3.3	0.9	250
Zinc	5	nd	nd	nd	1,100

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL

Metal concentrations identified in the groundwater samples analysed are in compliance with the MECP Table 3 standards.

Maximum groundwater concentrations identified on-site are presented in Table 13 below. All other parameters were below laboratory detection limits.

Table 13: Maximum Groundwater Concentrations			
Parameter	**Maximum Concentration (µg/L)**	**Borehole**	**Depth Interval (m BGS)**
Polynuclear Aromatic Hydrocarbons			
Acenapthene	3.2	BH4-GW1	7.62-10.67
Acenaphthylene	1.37	BH4-GW1	7.62-10.67
Anthracene	0.83	BH4-GW1	7.62-10.67
Benzo[a]anthracene	0.23	BH1-GW1	6.10-9.14
Benzo[a]pyrene	0.19	BH1-GW1	6.10-9.14
Benzo[b]fluoranthene	0.24	BH1-GW1	6.10-9.14
Benzo[g,h,i]perylene	0.12	BH1-GW1	6.10-9.14
Benzo[k]fluoranthene	0.11	BH1-GW1	6.10-9.14
Chrysene	0.24	BH1-GW1	6.10-9.14
Fluoranthene	0.51	BH4-GW1	7.62-10.67
Fluorene	3.66	BH4-GW1	7.62-10.67
Indeno[1,2,3-cd]pyrene	0.09	BH1-GW1	6.10-9.14
Methylnapthalene (1&2)	9.78	BH4-GW1	7.62-10.67
Naphthalene	40.2	BH4-GW1	7.62-10.67
Phenanthrene	3.99	BH4-GW1	7.62-10.67
Pyrene	0.41	BH1-GW1	6.10-9.14
Metals (including, As, Sb, Se), Hg and CrVI			
Arsenic	4	BH4-GW1	7.62-10.67
Barium	361	BH4-GW1	7.62-10.67
Boron	133	BH1-GW1	6.10-9.14
Cobalt	17.2	BH1-GW1	6.10-9.14
Copper	2.8	BH6-GW1	3.05-6.10
Molybdenum	60.4	BH1-GW1	6.10-9.14
Nickel	9	BH1-GW1	6.10-9.14
Uranium	11.4	BH1-GW1	6.10-9.14
Vanadium	0.9	BH6-GW1	3.05-6.10

5.7 Quality Assurance and Quality Control Results

All soil and groundwater samples were handled in accordance with the Analytical Protocol with respect to holding time, preservation method, storage requirement, and container type.

As per Subsection 47(3) of O.Reg. 153/04 as amended by O.Reg. 269/11, a Certificate of Analysis has been received for each sample submitted for analysis and all Certificates of Analysis are appended to this report.

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 accordance with the requirements of the MECP Record of Site Condition Regulation, O.Reg. 153/04, as amended, made under the Environmental Protection Act. Conclusions and recommendations are discussed in a subsequent section.

Site Description

The Phase II Property is located on the east side of Borrisokane Road, approximately 515 m southeast of Cambrian Road, in the City of Ottawa, Ontario.

The Phase II Property has an approximate area of 32.2 hectares. The Phase II Property is not developed with any permanent building structures and currently exists as vacant, partially tree-covered land with some brush or grassed areas. The area of the former extraction operation has been backfilled in with imported fill material consisting of a mixture of sand and gravel at ground surface.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

As per Table 1 in Section 2.2, the following Potentially Contaminating Activities were identified on the subject property:

- Item 30: Importation of fill material of unknown quality – this PCA was identified based on the infilling of the former aggregate pit and was considered to result in APEC 1 on the Phase I Property.

As shown on Drawing PE4810-2, appended to the Phase I ESA, the following off-site PCA was identified within the Phase I study area:

- Item 58, Table 2, O.Reg.153/04 as amended ("Waste Disposal and Waste Management, including thermal treatment, landfilling and transfer of waste other than use of biosoils as soil conditioners"); this PCA refers to the Trail Road Landfill property situated approximately 150m west of the RSC Property.

Based on its separation distance and cross-gradient orientation relative to the subject land, in combination with our knowledge of the landfill (2015 through 2018 operating and monitoring reports) the active landfill site is not considered to represent an APEC on the Phase I Property.

The rationale for identifying the above PCAs is based on a review of aerial photographs as well as field observations and personal interviews.

Contaminants of Potential Concern and Impacted Media

The following Contaminants of Potential Concern (CPC) were identified with respect to the soil and groundwater beneath the Phase II Property:

- Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX);
- Petroleum Hydrocarbons fractions 1 through 4 (PHCs F_1-F_4);
- Polynuclear Aromatic Hydrocarbons (PAHs);
- Metals, including arsenic (As), antimony (Sb) and selenium (Se);
- Mercury (Hg); and
- Hexavalent Chromium (CrVI).

Subsurface Structures and Utilities

There are no subsurface structures or utilities on the Phase II Property.

Physical Setting

Site Stratigraphy

The site stratigraphy, as presented on Drawings PE4810-5B, 6B and 7B – Cross-Sections A-A' generally consists of the following:

- Fill material consisting of a combination of silt, sand and/or clay. Occasional fragments of brick were identified in the fill material at TP4 and TP27, while traces of organics were identified at TP26. The fill material extended from ground surface to depths ranging from approximately 3.7 to 8.2m below ground surface. Test pits TP27 and TP28 were terminated in this layer. Groundwater was encountered within this stratigraphic unit.

- Native silty sand to sandy silt was identified beneath the fill material at BH6, TP13, TP27 and BH2. Borehole BH2 was terminated in this layer. Groundwater was encountered within this stratigraphic unit.

- A silty clay/clayey silty with some gravel was identified beneath the sandy silt/silty sand at BH6 and beneath the fill layer. This is the deepest unit investigated.

Hydrogeological Characteristics

Contour mapping was completed based on the groundwater elevations measured at the monitoring wells during the July 2019 groundwater sampling event. Groundwater contours as shown on Drawing PE4810-4 – Groundwater Contour Plan, indicate that the groundwater beneath the Phase II Property flows in an easterly direction. A hydraulic gradient of 0.01m/m was calculated.

Based on the regional topography and proximity of the Jock River, in combination with work previously conducted in the immediate vicinity of the Phase II Property, the regional groundwater flow is in a northerly direction.

Approximate Depth to Bedrock

Bedrock was not confirmed during the field drilling program. Practical refusal to DCPT was encountered at 11.6 m below existing ground surface at BH 5. According to the Geological Survey of Canada website on the Urban Geology of the National Capital Area, consulted as part of this assessment, bedrock in the area of the site consists of dolomite of the Oxford Formation at depths ranging from approximately 15 to 25m across the Phase II Property.

Approximate Depth to Water Table

Depth to the water table at the subject site varies between approximately 3.7m and 9.1m below existing grade.

Sections 41 and 43.1 of the Regulation

Section 41 of the Regulation does not apply to the Phase II Property, in that the Phase II Property is not within 30m of an environmentally sensitive area, and the pH of surface soil is between 5 and 9, while the pH of subsurface soil is between 5 and 11.

Section 43.1 of the Regulation does not apply to the subject site as bedrock is not located less than 2 m below ground surface.

Soil Brought to the Phase II Property

Fill material was encountered across the Phase II Property, within the area of the former aggregate pit, extending to depths ranging from approximately 3.3 to 9.1m below grade. The fill material generally consisted of silty sand and gravel with some silty clay and occasional boulders.

Traces of brick and/or concrete fragments were identified in the fill material at BH4, TP1, TP3, TP4, TP5, TP17, TP18, TP22, TP25, TP27 and TP28. A piece of plastic was identified in TP4, while a steel pipe and a piece of metal were identified in TP6 and TP9.

Proposed Buildings and Other Structures

It is our understanding that the eastern portion of the Phase II Property will be developed with part of a larger residential subdivision, while the western third of the property will be developed for commercial purposes.

Existing Buildings and Structures

No permanent buildings or structures exist on the Phase II Property.

Water Bodies

No water bodies are situated on or within 30m of the Phase II Property. The closest major water body is the Jock River, located approximately 1.12 km to the north of the site.

Areas of Natural Significance

No areas of natural significance are present on or within 250m of the Phase II Property.

Environmental Condition

Areas Where Contaminants are Present

Based on the findings of the Phase II ESA, a concentration of arsenic exceeding the MECP Table 3 standards was identified in the fill material on the northwestern portion of the Phase II Property (future commercial lands).

Types of Contaminants

As noted above, a concentration of arsenic exceeding the MECP Table 3 standards was identified in the fill material on the northwestern portion of the Phase II Property (future commercial lands).

Contaminated Media

A concentration of arsenic exceeding the MECP Table 3 standards was identified in the fill material on the northwestern portion of the Phase II Property (future commercial lands).

Groundwater across the Phase II Property was determined to be in compliance with the MECP Table 3 standards.

What Is Known About Areas Where Contaminants Are Present

An arsenic concentration exceeding the MECP Table 3 standard was identified in the fill material at TP13 on the northwestern portion of the Phase II Property, in the vicinity of former equipment storage. The impacted concentration was identified near surface, at a depth of approximately 0.3 to 0.4m below grade. Based on the findings of the Phase II ESA, the contamination is expected to be confined to the fill material and localized in the vicinity of TP13.

Distribution of Contaminants

Based on the low solubility of metal parameters, in combination with its location above the water table, the arsenic impact is considered to be confined to the fill layer. Based on analytical testing of the fill material across the Phase II Property, the arsenic concentration is considered to be anomalous and localized to the immediate vicinity of TP13.

Discharge of Contaminants

The concentration of arsenic identified in a near surface sample collected from TP13, is considered to be associated with the former equipment storage on the northwestern portion of the Phase II Property.

Migration of Contaminants

Based on the findings of the Phase II ESA, physical transport of contaminated soil does not appear to have occurred. Given the low solubility of metals and the location of the arsenic impact well above the water table, in combination with clean groundwater results, migration of arsenic is considered to be negligible. The arsenic concentration is expected to be confined to the fill layer and localized to the immediate vicinity of TP13.

Climatic and Meteorological Conditions

In general, climatic and meteorological conditions have the potential to affect contaminant distribution. Two 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.

Given the low solubility of metals and the location of the arsenic impact well above the water table, in combination with clean groundwater results, climatic and meteorological conditions are not expected to have affected contaminant distribution.

6.0 CONCLUSIONS

Assessment

A Phase II ESA was conducted for the property addressed 3713 Borrisokane Road, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to assess a potential area of environmental concern (APEC) on the Phase II Property, resulting from the historical infilling of the former aggregate pit with fill material of unknown quality. The Phase II ESA consisted of drilling eight (8) boreholes across the Phase II Property, six (6) of which were constructed with groundwater monitoring well installations. In addition to the boreholes, 31 test pits were excavated across the Phase II Property.

Soil samples were obtained from the test holes and screened using visual observations and/or combustible vapour measurements. Based on the screening results, a total of seventeen (17) soil samples were submitted for laboratory analysis of benzene, toluene, ethylbenzene and xylenes (BTEX), petroleum hydrocarbons (PHCs), polynuclear aromatic hydrocarbons (PAHs), metals (including arsenic (As), antimony (Sb) and selenium (Se)), mercury (Hg) and hexavalent chromium (CrVI).

No BTEX or PHC F1 parameters were identified in the soil samples submitted for testing. Petroleum hydrocarbons F2, F3 and F4 fractions were identified, as well as various PAH and metal parameters. All identified parameter concentrations were in compliance with the MECP Table 3 residential standards with one exception. An arsenic concentration (48.1 µg/g) identified in TP13, situated on the northwestern portion of the site, in the area of future commercial development, exceeds both the MECP Table residential and commercial standard (18 µg/g).

Groundwater samples recovered from the monitoring wells installed in BH1, BH2, BH3, BH4, BH6 and BH7, were submitted for analytical testing of a combination of BTEX, PHCs, PAHs, metals (including As, Sb, Se), Hg and CrVI. Based on the results of the analytical testing no BTEX, PHC, Hg or CrVI parameters were identified in any of the groundwater samples analysed. All PAH and metal parameters identified in the groundwater samples were in compliance with the MECP Table 3 standards.

Conclusion

Based the findings of the Phase II ESA, it is our opinion that the fill used to infill the aggregate pit has not been significantly impacted. However, soil impacted with arsenic should be remediated by means of removal from the site and disposal at an approved waste disposal facility. Further investigation of the near surface soil conditions in this area of the site should also be considered.

Based on the findings of the Phase II ESA, the groundwater beneath the Phase II Property is in compliance with the MECP Table 3 standards.

It is recommended that efforts be made to maintain the integrity of the monitoring wells for possible future groundwater monitoring. It is expected that the monitoring wells will be abandoned in accordance with Ontario Regulation 903 at the time of construction excavation.

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.

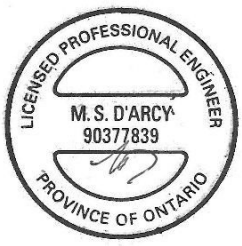
The client should be aware that any information pertaining to soils and all test hole logs are furnished as a matter of general information only and test hole descriptions or logs are not to be interpreted as descriptive of conditions at locations other than those of the test holes themselves.

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 Caivan Communities. Notification from Caivan Communities and Paterson Group will be required to release this report to any other party.

Paterson Group Inc.

Karyn Munch, P.Eng., QP$_{ESA}$



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

Report Distribution:

- ❒ Caivan Communities
- ❒ Paterson Group Inc.

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE4810-3 – TEST HOLE LOCATION PLAN

DRAWING PE4810-4 – GROUNDWATER CONTOUR PLAN

DRAWING PE4810-5A – ANALYTICAL TESTING PLAN – SOIL (BTEX, PHCs, PAHs, METALS, HG AND CRVI)

DRAWING PE4810-5B – CROSS-SECTION A-A' – SOIL (BTEX, PHCs, PAHs, METALS, HG AND CRVI)

DRAWING PE4810-6A – ANALYTICAL TESTING PLAN – SOIL (AS, SB, SE)

DRAWING PE4810-6B – CROSS-SECTION 1-1' – SOIL (AS, SB, SE)

DRAWING PE4810-7A – ANALYTICAL TESTING PLAN – GROUNDWATER

DRAWING PE4810-7B – CROSS-SECTION A-A' - GROUNDWATER

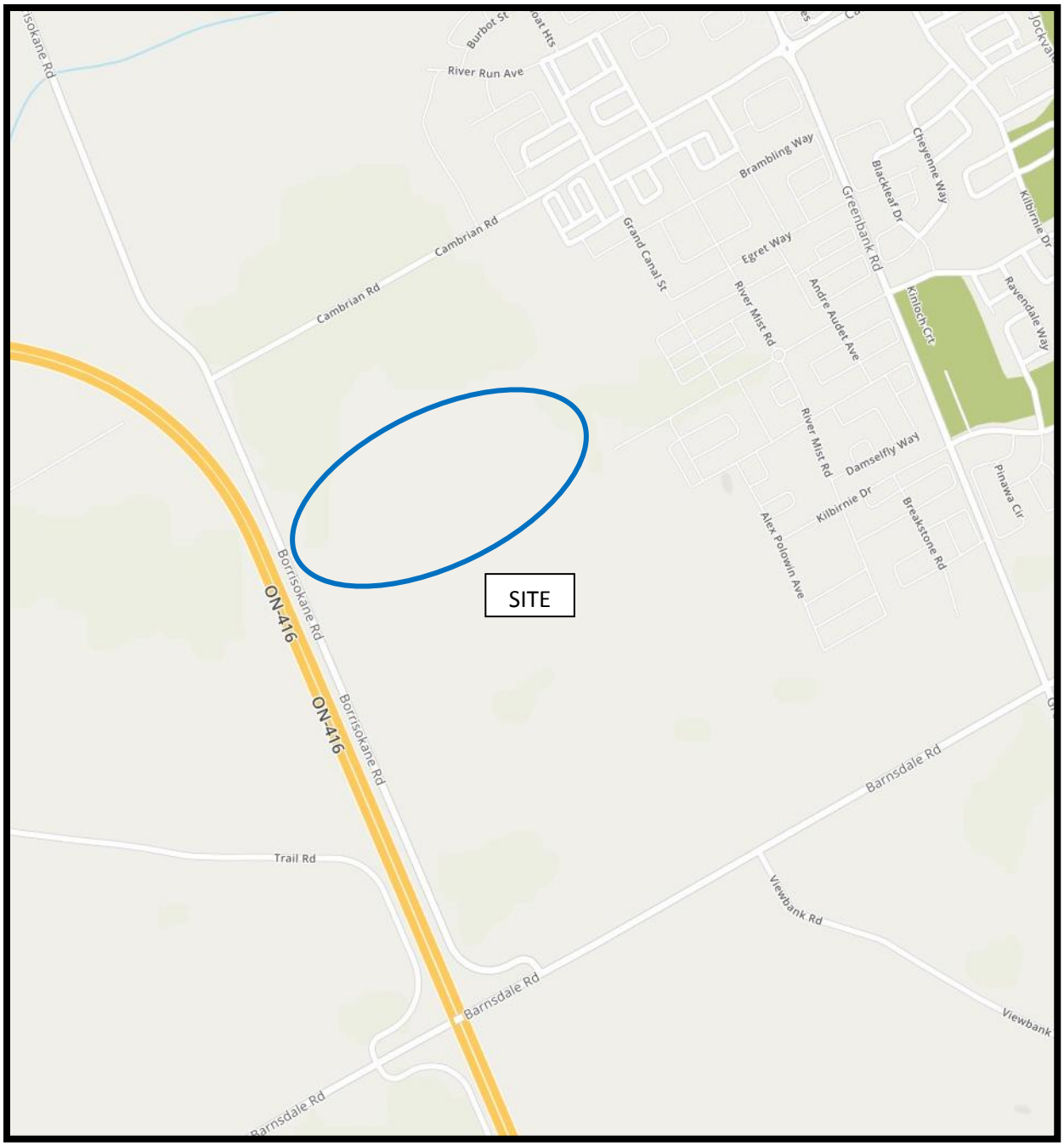


FIGURE 1

KEY PLAN

FUTURE COMMERCIAL LAND

FUTURE RESIDENTIAL SUBDIVISION

BORRISOKANE ROAD

NEW GREENBANK ROAD

3713 BORRISOKANE ROAD
VACANT LAND

GRASSED

TP 28 104.75
TP 29 104.41
TP 13 104.50
TP 27 105.62
A
BH 6 103.89 (100.09)
TP 10 106.58
TP 26 105.54
TP 25 106.40
TP 24 106.36
TP 14 100.63
TP 12 103.85
BH 8 100.95
TP 7 106.70
TP 23 105.53
TP 22 106.64
TP 11 105.18
TP 8 106.58
BH 5 106.40
TP 21 106.39
TP 20 107.02
TP 16 105.71
TP 18 105.36
TP 9 104.06
BH 7 103.77 (100.11)
TP 19 106.71
TP 15 103.42
TP 17 101.66
TP 5 105.03
BH 3 104.73 (95.65)
BH 4 104.42 (97.73)
TP 6 105.04
TP 3 101.63
TP 31 100.59
BH 2 101.22 (95.57)
A'
TP 30 101.71
TP 1 101.80
TP 2 102.15
BH 1 102.51 (95.84)

LEGEND:

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- TEST PIT LOCATION
- TEST PIT LOCATION (SEPTEMBER 2019)
- 102.51 GROUND SURFACE ELEVATION (m)
- (95.84) GROUNDWATER SURFACE ELEVATION (m)
- A—A' CROSS SECTION LOCATION

TEST HOLE LOCATIONS AND ELEVATIONS AT TEST HOLES PROVIDED BY J.D BARNES LTD. (21/08/2019)

BASEPLAN PROVIDED BY DAVID SHAEFFER ENGINEERING LTD.

SCALE: 1:3000

0 25 50 75 100 125 150 200m

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consulting engineers

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NO.	REVISIONS	DATE	INITIAL

CAIVAN COMMUNITIES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
3713 BORRISOKANE ROAD

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:3000	Date: 02/2020
Drawn by: YA	Report No.: PE4810-2
Checked by: KM	Dwg. No.: PE4810-3
Approved by: MSD	Revision No.:

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11x17

FUTURE COMMERCIAL LAND

FUTURE RESIDENTIAL SUBDIVISION

BORRISOKANE ROAD

NEW GREENBANK ROAD

A

A'

TP 13
104.50

BH 6
103.89
(100.09)

TP 28
104.75

TP 29
104.41

TP 27
105.62

TP 26
105.54

TP 10
106.58

TP 25
106.40

TP 24
106.36

TP 7
106.70

TP 22
106.64

TP 23
105.53

TP 14
100.63

TP 12
103.85

BH 8
100.95

TP 11
105.18

TP 6
105.04

BH 4
104.42
(97.73)

TP 3
101.63

TP 31
100.59

BH 2
101.22
(95.57)

TP 30
101.71

TP 4
105.93

TP 1
101.80

TP 2
102.15

99.8
99.4
99
98.6
98.2
97.8
97.4
97
96.6
96.2
95.8

(0.01m/m)

TP 8
106.58

TP 9
104.06

BH 5
106.40

TP 21
106.39

TP 20
107.02

TP 16
105.71

TP 18
105.36

TP 5
105.03

BH 3
104.73
(95.65)

TP 17
101.66

BH 1
102.51
(95.84)

BH 7
103.77
(100.11)

TP 19
106.71

TP 15
103.42

LEGEND:

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- TEST PIT LOCATION
- TEST PIT LOCATION (SEPTEMBER 2019)
- 102.51 GROUND SURFACE ELEVATION (m)
- (95.84) GROUNDWATER SURFACE ELEVATION (m)
- A—A' CROSS SECTION LOCATION
- 97.7 GROUNDWATER CONTOUR(m)
- (0.06m/m) APPROX. GROUNDWATER FLOW DIRECTION (HORIZONTAL HYDRAULIC GRADIENT)

TEST HOLE LOCATIONS AND ELEVATIONS AT TEST HOLES PROVIDED BY J.D BARNES LTD. (21/08/2019)

BASEPLAN PROVIDED BY DAVID SHAEFFER ENGINEERING LTD.

0 25 50 75 100 125 150 200m

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NO.	REVISIONS	DATE	INITIAL

CAIVAN COMMUNITIES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
3713 BORRISOKANE ROAD

OTTAWA, ONTARIO

Title:

GROUNDWATER CONTOUR PLAN

Scale: 1:3000	Date: 02/2020
Drawn by: YA	Report No.: PE4810-2
Checked by: KM	Dwg. No.: PE4810-4
Approved by: MSD	Revision No.:

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11x17

TP10-G2 2.3-2.5m Jul.26, 2019
BTEX, PHCs (F1-F4), PAHs, Metals, Hg and CrVI comply with MECP Table 3

TP13-G1 0.3-0.4m Jul.26, 2019
BTEX, PHCs (F1-F4), PAHs, Metals, Hg and CrVI comply with MECP Table 3

BH6-SS2 0.76-1.37m Jul.23, 2019
BTEX, PHCs (F1-F4), PAHs, Metals, Hg and CrVI comply with MECP Table 3

BH6-SS12 7.62-8.23m Jul.23, 2019
BTEX, PHCs (F1-F4), PAHs, Metals, Hg and CrVI comply with MECP Table 3

TP25-G2 5.3-5.4m Sept.17, 2019
BTEX, PHCs (F1-F4), PAHs, Metals, Hg and CrVI comply with MECP Table 3

TP24-G1 3.6-3.7m Sept.17, 2019
BTEX, PHCs (F1-F4), PAHs, Metals, Hg and CrVI comply with MECP Table 3

TP6-G2 3.1-3.3m Jul.25, 2019
BTEX, PHCs (F1-F4), PAHs, Metals, Hg and CrVI comply with MECP Table 3

BH4-SS3 1.52-2.13m Jul.19, 2019
Metals, Hg and CrVI comply with MECP Table 3

BH4-SS5 6.10-6.70m Jul.19, 2019
PAHS comply with MECP Table 3

BH4-SS8 8.38-8.99m Jul.19, 2019
BTEX and PHCs (F1-F4) comply with MECP Table 3

TP4-G4 2.8-2.9m Jul.25, 2019
BTEX, PHCs (F1-F4), PAHs, Metals, Hg and CrVI comply with MECP Table 3

FUTURE COMMERCIAL LAND

FUTURE RESIDENTIAL SUBDIVISION

BORRISOKANE ROAD

NEW GREENBANK ROAD

A

A'

TP 13 104.50

BH 6 103.89 (100.09)

TP 28 104.75

TP 29 104.41

TP 27 105.62

TP 26 105.54

TP 10 106.58

TP 25 106.40

TP 24 106.36

TP 7 106.70

TP 23 105.53

TP 22 106.64

TP 14 100.63

TP 12 103.85

BH 8 100.95

TP 11 105.18

TP 9 104.06

BH 5 106.40

TP 21 106.39

TP 20 107.02

TP 16 105.71

TP 8 106.58

TP 18 105.36

TP 5 105.03

TP 17 101.66

BH 3 104.73 (95.65)

TP 19 106.71

TP 15 103.42

TP 6 105.04

BH 4 104.42 (97.73)

TP 4 105.93

TP 3 101.63

TP 31 100.59

BH 2 101.22 (95.57)

TP 30 101.71

TP 1 101.80

TP 2 102.15

BH 1 102.51 (95.84)

BH8-AU1 0-0.61m Jul.23,2019
BTEX and PHCs (F1-F4)comply with MECP Table 3

BH7-AU1 0-0.61m Jul.23,2019
BTEX, PHCs (F1-F4), Metals, Hg and CrVI comply with MECP Table 3

BH3-SS2 0.76-1.37m Jul.22, 2019
BTEX, PHCs (F1-F4), PAHs, Metals, Hg and CrVI comply with MECP Table 3

TP1-G4 4.0-4.2m Jul.25, 2019
BTEX, PHCs (F1-F4), PAHs, Metals, Hg and CrVI comply with MECP Table 3

TP9-G1 0.3-0.6m Jul.26, 2019
BTEX, PHCs (F1-F4), PAHs, Metals, Hg and CrVI comply with MECP Table 3

SOIL RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 3 STANDARDS

LEGEND:

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- TEST PIT LOCATION
- TEST PIT LOCATION (SEPTEMBER 2019)
- 102.51 GROUND SURFACE ELEVATION (m)
- (95.84) GROUNDWATER SURFACE ELEVATION (m)
- A—A' CROSS SECTION LOCATION

TEST HOLE LOCATIONS AND ELEVATIONS AT TEST HOLES PROVIDED BY J.D BARNES LTD. (21/08/2019)

BASEPLAN PROVIDED BY DAVID SHAEFFER ENGINEERING LTD.

SCALE: 1:3000

0 25 50 75 100 125 150 200m

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NO.	REVISIONS	DATE	INITIAL

CAIVAN COMMUNITIES

PHASE I - ENVIRONMENTAL SITE ASSESSMENT
3713 BORRISOKANE ROAD

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL (BTEX, PHC, METALS, PAH, Hg, CrVI)

Scale: 1:3000	Date: 02/2020
Drawn by: YA	Report No.: PE4810-1
Checked by: KM	Dwg. No.: PE4810-5A
Approved by: MSD	Revision No.:

11x17

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TP13-G1 0.3-0.4m Jul.26, 2019
BTEX, PHCs (F1-F4), PAHs, Metals,
Hg and CrVI comply with MECP Table 3

BH6-SS2 0.76-1.37m Jul.23, 2019
BTEX, PHCs (F1-F4), PAHs, Metals,
Hg and CrVI comply with MECP Table 3

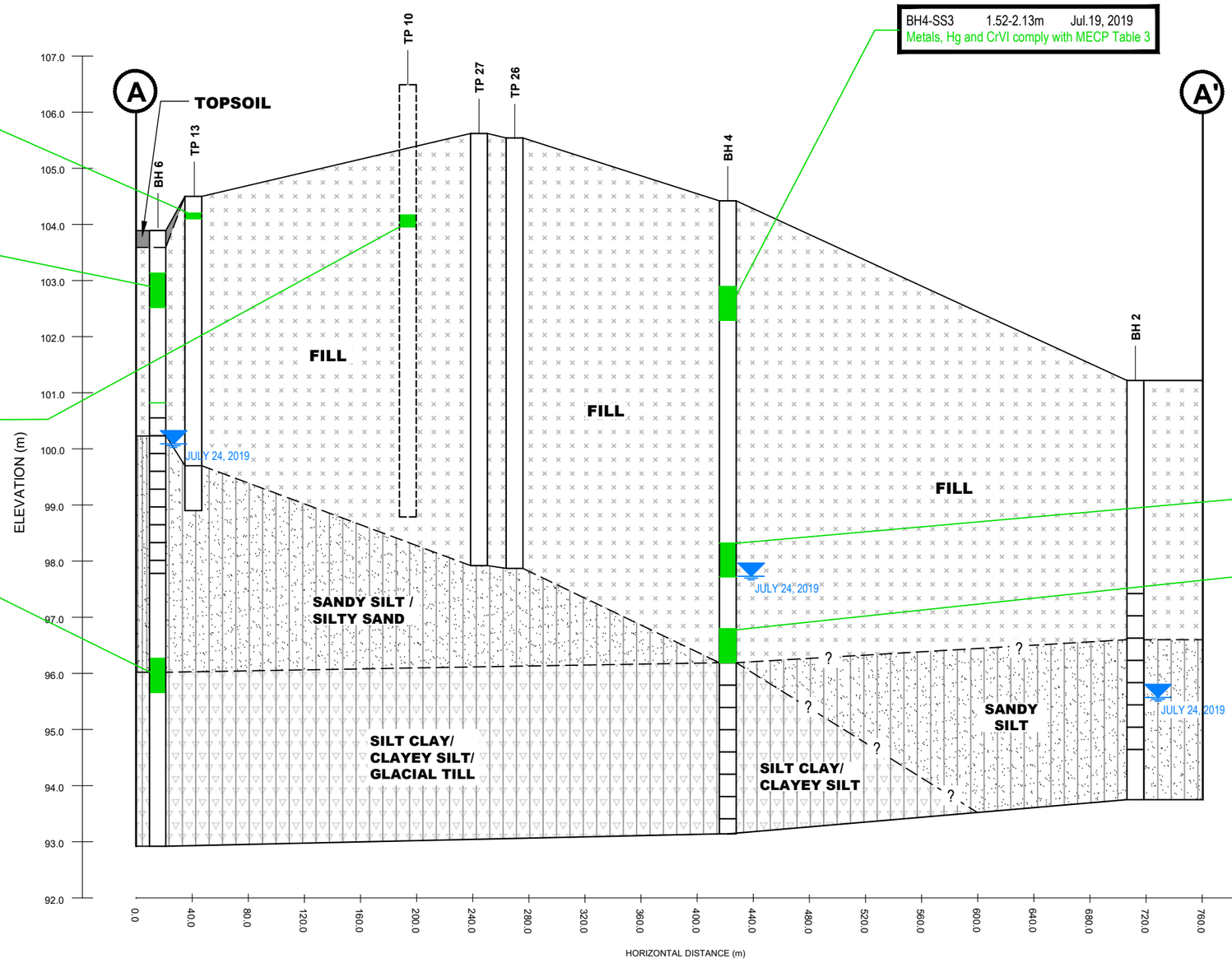
TP10-G2 2.3-2.5m Jul.26, 2019
BTEX, PHCs (F1-F4), PAHs, Metals,
Hg and CrVI comply with MECP Table 3

BH6-SS12 7.62-8.23m Jul.23, 2019
BTEX, PHCs (F1-F4), PAHs, Metals,
Hg and CrVI comply with MECP Table 3

BH4-SS3 1.52-2.13m Jul.19, 2019
Metals, Hg and CrVI comply with MECP Table 3

BH4-SS5 6.10-6.70m Jul.19, 2019
PAHS comply with MECP Table 3

BH4-SS8 8.38-8.99m Jul.19, 2019
BTEX and PHCs (F1-F4) comply with MECP Table 3



SOIL SAMPLES COMPLY WITH MECP TABLE 3 STANDARDS

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NO.	REVISIONS	DATE	INITIAL

CAIVAN COMMUNITIES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
3713 BORRISOKANE ROAD

OTTAWA, ONTARIO

Title:
CROSS SECTION A - A'-SOIL (BTEX, PHC, PAH, METALS, Hg, CrVI)

Scale: AS SHOWN	Date: 02/2020
Drawn by: NFRV	Report No.: PE4810-2
Checked by: KM	Dwg. No.: PE4810-5B
Approved by: MSD	Revision No.:

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11x17

TP25-G2 5.3-5.4m Sept.17, 2019
As, Sb, Se comply with MECP Table 3

TP10-G2 2.3-2.5m Jul.26, 2019
As, Sb, Se comply with MECP Table 3

TP13-G1 0.3-0.4m Jul.26, 2019

PARAMETER	RESULT (µg/g)	STANDARD (µg/g)
Arsenic	46.8	18

Sb and Se comply with MECP Table 3

BH6-SS2 0.76-1.37m Jul.23, 2019
As, Sb, Se comply with MECP Table 3

BH6-SS12 7.62-8.23m Jul.23, 2019
As, Sb, Se comply with MECP Table 3

TP24-G1 3.6-3.7m Sept.17, 2019
As, Sb, Se comply with MECP Table 3

TP6-G2 3.1-3.3m Jul.25, 2019
As, Sb, Se comply with MECP Table 3

BH4-SS3 1.52-2.13m Jul.19, 2019
As, Sb, Se comply with MECP Table 3

TP4-G4 2.8-2.9m Jul.25, 2019
As, Sb, Se comply with MECP Table 3

FUTURE COMMERCIAL LAND

FUTURE RESIDENTIAL SUBDIVISION

BORRISOKANE ROAD

NEW GREENBANK ROAD

A

A'

BH 6
103.89
(100.09)

TP 13
104.50

TP 28
104.75

TP 29
104.41

TP 27
105.62

TP 10
106.58

TP 26
105.54

TP 25
106.40

TP 24
106.36

TP 23
105.53

TP 22
106.64

TP 7
106.70

TP 11
105.18

TP 14
100.63

TP 12
103.85

BH 8
100.95

BH 4
104.42
(97.73)

TP 6
105.04

TP 4
105.93

TP 3
101.63

TP 31
100.59

BH 2
101.22
(95.57)

TP 30
101.71

TP 1
101.80

TP 2
102.15

BH 1
102.51
(95.84)

TP 8
106.58

TP 9
104.06

BH 5
106.40

TP 21
106.39

TP 20
107.02

TP 16
105.71

TP 18
105.36

TP 5
105.03

BH 3
104.73
(95.65)

TP 17
101.66

BH 7
103.77
(100.11)

TP 19
106.71

TP 15
103.42

BH3-SS2 0.76-1.37m Jul.22, 2019
As, Sb, Se comply with MECP Table 3

TP1-G4 4.0-4.2m Jul.25, 2019
As, Sb, Se comply with MECP Table 3

BH7-AU1 0-0.61m Jul.23,2019
As, Sb, Se comply with MECP Table 3

TP9-G1 0.3-0.6m Jul.26, 2019
As, Sb, Se comply with MECP Table 3

SOIL RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 3 STANDARDS

LEGEND:

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- TEST PIT LOCATION
- TEST PIT LOCATION (SEPTEMBER 2019)
- 102.51 GROUND SURFACE ELEVATION (m)
- (95.84) GROUNDWATER SURFACE ELEVATION (m)
- (A)—(A') CROSS SECTION LOCATION

TEST HOLE LOCATIONS AND ELEVATIONS AT TEST HOLES PROVIDED BY J.D BARNES LTD. (21/08/2019)

BASEPLAN PROVIDED BY DAVID SHAEFFER ENGINEERING LTD.

SCALE: 1:3000

0 25 50 75 100 125 150 200m

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL

CAIVAN COMMUNITIES

PHASE I - ENVIRONMENTAL SITE ASSESSMENT
3713 BORRISOKANE ROAD

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL (As, Sb, Se)

Scale: 1:3000	Date: 02/2020
Drawn by: YA	Report No.: PE4810-1
Checked by: KM	Dwg. No.: PE4810-6A
Approved by: MSD	Revision No.:

11x17

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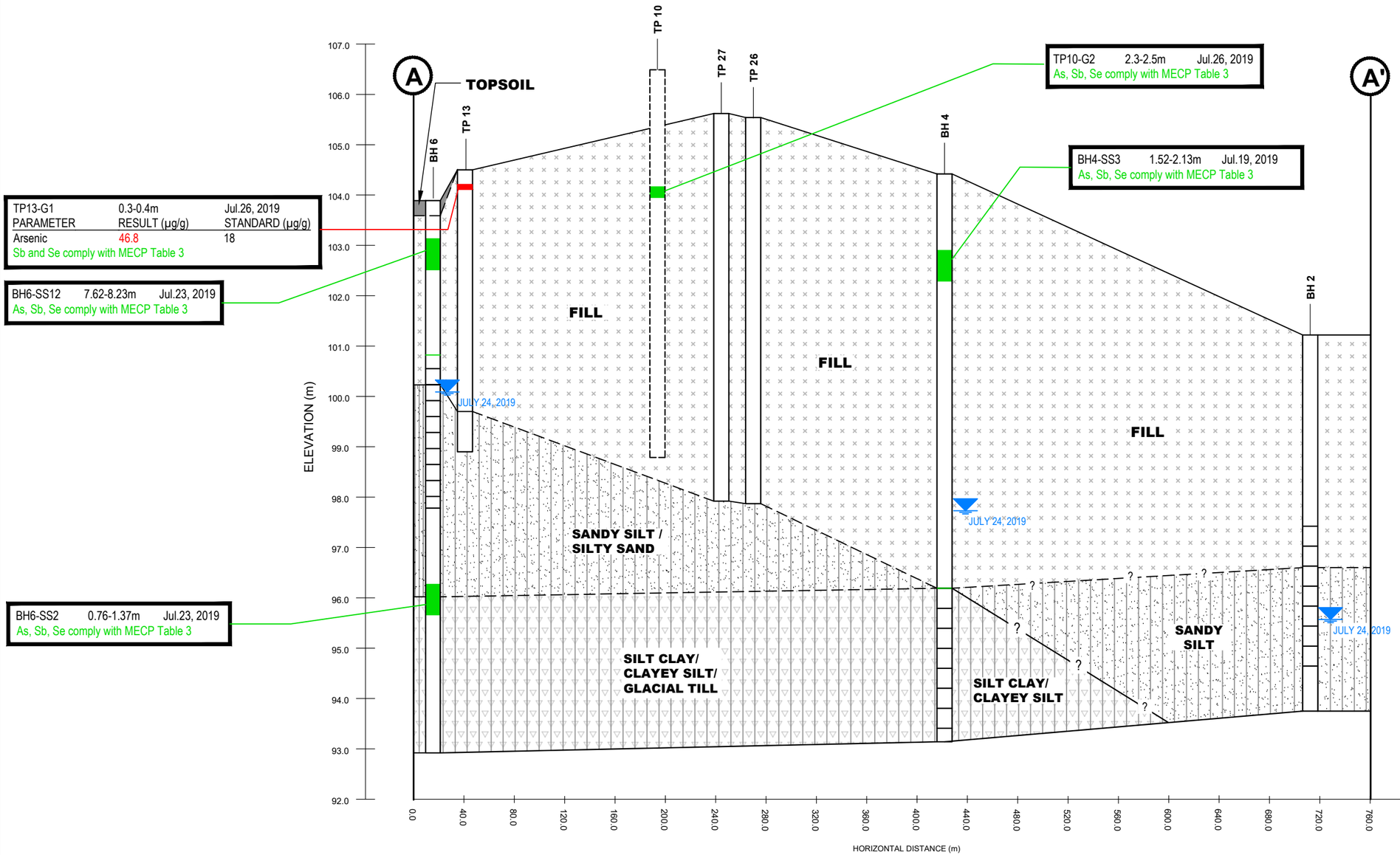

SOIL SAMPLES COMPIES WITH MECP TABLE 3 STANDARDS

SOIL SAMPLE EXCEEDS MECP TABLE 3 STANDARDS

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NO.	REVISIONS	DATE	INITIAL

CAIVAN COMMUNITIES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
3713 BORRISOKANE ROAD

OTTAWA, ONTARIO

Title:

CROSS SECTION A - A' (As, Sb, Se)

Scale: AS SHOWN	Date: 02/2020
Drawn by: NFRV	Report No.: PE4810-2
Checked by: KM	Dwg. No.: PE4810-6B
Approved by: MSD	Revision No.:

11x17

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BH6-GW1 6.10-9.14m Jul.24-2019
BTEX, PHCs (F1-F4), PAHs, Metals, As, Se, Sb, Hg and CrVI comply with MECP Table 3

BH4-GW1 7.62-10.67m Jul.24-2019
BTEX, PHCs (F1-F4), PAHs, Metals, As, Se, Sb, Hg and CrVI comply with MECP Table 3

BH2-GW1 3.81-6.86m Jul.24, 2019
BTEX and PHCs (F1-F4) comply with MECP Table 3

FUTURE COMMERCIAL LAND

FUTURE RESIDENTIAL SUBDIVISION

BORRISOKANE ROAD

NEW GREENBANK ROAD

A

A'

BH 6
103.89
(100.09)

BH 4
104.42
(97.73)

BH 2
101.22
(95.57)

BH 1
102.51
(95.84)

BH 3
104.73
(95.65)

BH 7
103.77
(100.11)

TP 13 104.50
TP 14 100.63
TP 12 103.85
BH 8 100.95
TP 11 105.18
TP 9 104.06
BH 5 106.40
TP 21 106.39
TP 20 107.02
TP 16 105.71
TP 19 106.71
TP 15 103.42
TP 17 101.66
TP 18 105.36
TP 8 106.58
TP 5 105.03
TP 28 104.75
TP 29 104.41
TP 27 105.62
TP 10 106.58
TP 26 105.54
TP 25 106.40
TP 24 106.36
TP 23 105.53
TP 7 106.70
TP 22 106.64
TP 6 105.04
TP 3 101.63
TP 31 100.59
TP 4 105.93
TP 30 101.71
TP 1 101.80
TP 2 102.15

BH7-GW1 6.10-9.14m Jul.24-2019
BTEX, PHCs (F1-F4) and PAHs comply with MECP Table 3

BH3-GW1 7.62-10.67m Jul.24, 2019
BTEX and PHCs comply with MECP Table 3

BH1-GW1 6.10-9.14m Jul.24-2019
BTEX, PHCs (F1-F4), PAHs, Metals, As, Se, Sb, Hg and CrVI comply with MECP Table 3

ALL GROUNDWATER RESULTS COMPLY WITH MECP TABLE 3 STANDARDS

LEGEND:

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- TEST PIT LOCATION
- TEST PIT LOCATION (SEPTEMBER 2019)
- 102.51 GROUND SURFACE ELEVATION (m)
- (95.84) GROUNDWATER SURFACE ELEVATION (m)
- A—A' CROSS SECTION LOCATION

TEST HOLE LOCATIONS AND ELEVATIONS AT TEST HOLES PROVIDED BY J.D BARNES LTD. (21/08/2019)

BASEPLAN PROVIDED BY DAVID SHAEFFER ENGINEERING LTD.

SCALE: 1:3000

0 25 50 75 100 125 150 200m

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NO.	REVISIONS	DATE	INITIAL

CAIVAN COMMUNITIES

PHASE I - ENVIRONMENTAL SITE ASSESSMENT
3713 BORRISOKANE ROAD

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN-GROUNDWATER

Scale: 1:3000	Date: 02/20120
Drawn by: YA	Report No.: PE4810-1
Checked by: KM	Dwg. No.: PE4810-7A
Approved by: MSD	Revision No.:

11x17

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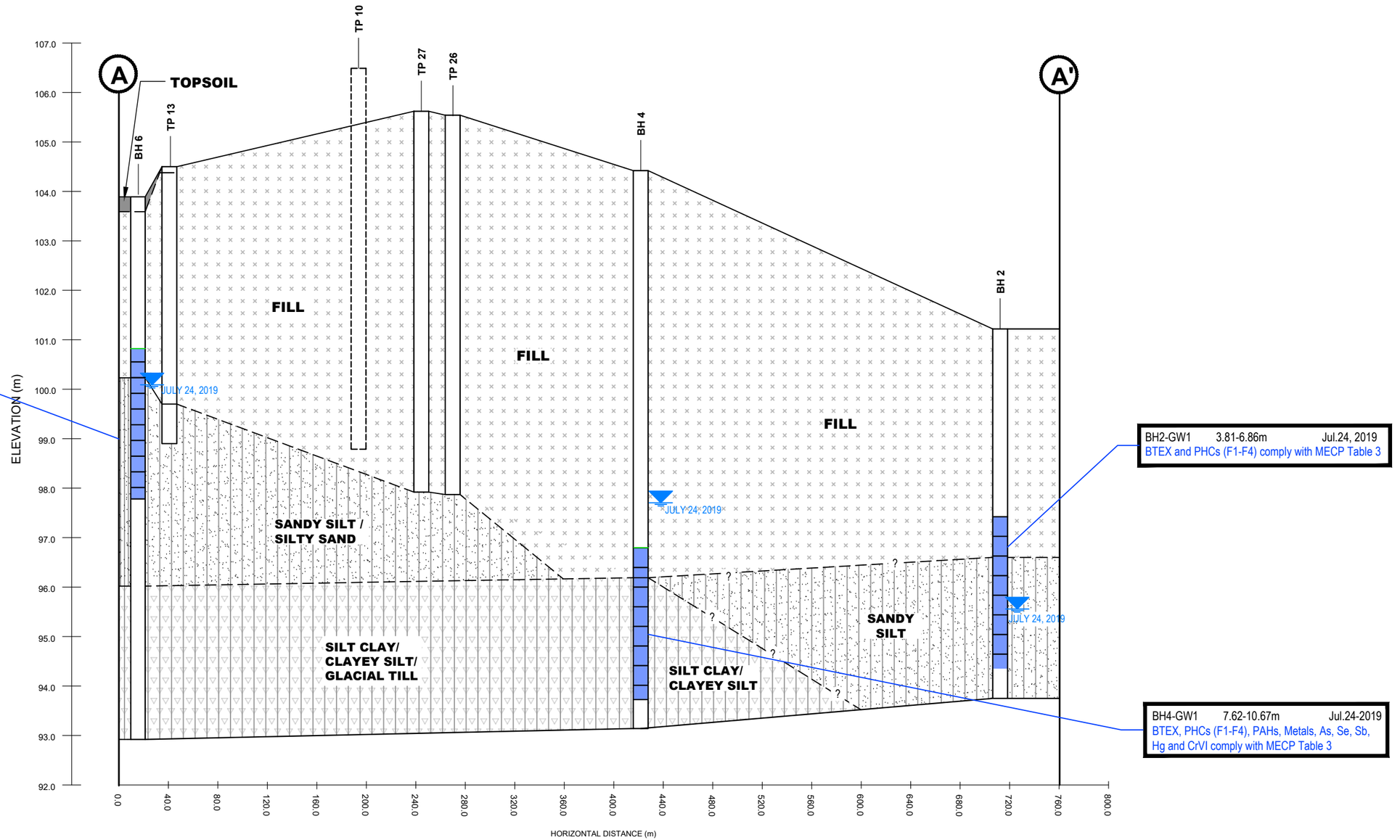

BH6-GW1 3.05-6.10m Jul.24-2019
BTEX, PHCs (F1-F4), PAHs, Metals, As, Se, Sb, Hg and CrVI comply with MECP Table 3

BH2-GW1 3.81-6.86m Jul.24, 2019
BTEX and PHCs (F1-F4) comply with MECP Table 3

BH4-GW1 7.62-10.67m Jul.24-2019
BTEX, PHCs (F1-F4), PAHs, Metals, As, Se, Sb, Hg and CrVI comply with MECP Table 3

GROUNDWATER SAMPLES COMPLY WITH MECP TABLE 3 STANDARDS

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NO.	REVISIONS	DATE	INITIAL

CAIVAN COMMUNITIES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
3713 BORRISOKANE ROAD

OTTAWA, ONTARIO

Title: CROSS SECTION A - A' (GROUNDWATER)

Scale: AS SHOWN	Date: 02/2020
Drawn by: NFRV	Report No.: PE4810-2
Checked by: KM	Dwg. No.: PE4810-7B
Approved by: MSD	Revision No.:

11x17

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APPENDIX 1

SAMPLING AND ANALYSIS PLAN

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

LABORATORY CERTIFICATES OF ANALYSIS

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Services

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patersongroup

Sampling & Analysis Plan

Phase II Environmental Site Assessment
3713 Borrisokane Road
Ottawa, Ontario

Prepared For

Caivan Communities

July 2019

Report: PE4810-SAP

TABLE OF CONTENTS

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Caivan Communities to conduct a Phase II Environmental Site Assessment (ESA) for 3713 Borrisokane Road, in the City of Ottawa, Ontario. A subsurface investigation program consisting of borehole drilling and the excavation of test pits, was developed for the property to assess potential soil and groundwater impacts resulting from the importation of fill material of unknown quality in the area of the former aggregate extraction Pit. The subsurface investigation was carried out in conjunction with a Geotechnical Investigation.

Note that a Phase I ESA conducted by Paterson in November of 2019 confirmed that no other on or off-site PCAs were considered to result in APECs on the subject property.

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1	Boreholes placed to provide general coverage of the former aggregate pit operations across the Phase II Property. Boreholes also placed for geotechnical purposes.	Sample overburden to at least 1.5m below the water table for monitoring well installation.
BH2		
BH3		
BH4		
BH5		Sample overburden to a depth of at least 1.5m below the water table and/or 9m below grade. Determine practical refusal to DCPT (for geotechnical purposes).
BH6		Sample overburden to at least 1.5m below the water table for monitoring well installation.
BH7		
BH8		Sample overburden to depth of at least 1.5m below the water table and/or 8m below grade (for geotechnical purposes).
TP1-TP31	Test pits placed to provide general coverage of the former aggregate pit and to further investigate depth/quality of the fill material.	Place test pits through the fill material to the native soil.

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.

At each test pit location, grab samples of fill material will be obtained from different matrix or where there is visual or olfactory evidence of contamination.

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 test hole 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 test hole where there is visual or olfactory evidence of contamination, or where organic vapour meter or photoionization detector readings indicate the presence of contamination, the 'worst-case' sample from each borehole should be submitted for comparison with MECP site condition standards.
- ❒ In test hole 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 Potential 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 Standard Operating Procedure (SOP):

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

Determining Borehole Locations

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

After drilling/excavation is completed a plan with the test hole locations must be provided. Distances and orientations of boreholes with respect to site features (buildings, roadways, etc.) must be provided. Distances should be measured using a measuring tape or wheel rather than paced off. Ground surface elevations at each borehole should be surveyed relative to a geodetic benchmark.

Drilling Procedure

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

- ❒ Continuous split spoon samples (every 0.6 m or 2') or semi-continuous (every 0.76 m or 2'6") are required.
- ❒ Make sure samples are well sealed in plastic bags with no holes prior to screening and are kept cool but unfrozen.
- ❒ If sampling for VOCs, BTEX, or PHCs F_1, a soil core from each soil sample which may be analyzed must be taken and placed in the laboratory-provided methanol vial.
- ❒ Note all and any odours or discolouration of samples.
- ❒ Split spoon samplers or hand held sampling equipment (shovel or trowel) 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 and 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 ¼" [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 ¼" [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 MOE site remediation standards by a large margin, the decision-making usefulness of the sample may not be considered to be impaired. The proximity of other samples which meet the DQOs must also be considered in developing the Phase II Conceptual Site Model; often there are enough data available to produce a reliable Phase II Conceptual Site Model even if DQOs are not met for certain individual samples.

These considerations are discussed in the body of the report.

6.0 PHYSICAL IMPEDIMENTS 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.

patersongroup Consulting Engineers

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SOIL PROFILE AND TEST DATA

Phase II ESA
3713 Borrisokane Road
Ottawa, Ontario

DATUM Ground surface elevations provided by J.D. Barnes Limited.

FILE NO. **PE4810**

REMARKS

HOLE NO. **BH 1**

BORINGS BY CME 55 Power Auger **DATE** 2019 July 22

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	102.51
FILL: Brown silty fine sand, trace gravel		AU	1				
0.91		SS	2	8	22	1	101.51
FILL: Brown silt, some sand and gravel		SS	3	54	18	2	100.51
		SS	4	25	5		
3.20		SS	5	54	8	3	99.51
		SS	6	88	58	4	98.51
FILL: Brown silty clay, some sand		SS	7	62	8	5	97.51
- with gravel and trace cobbles, boulders by 5.5m depth		SS	8	50	5	6	96.51
		SS	9	46	8		
		SS	10	17	9	7	95.51
7.72		SS	11	50	7	8	94.51
Loose to compact, brown **SILTY SAND,** some gravel		SS	12	58	14		
9.10						9	93.51
Very dense, brown **SILTY SAND** with gravel, cobbles and boulders		SS	13		50+		
9.75							
End of Borehole							
(GWL @ 6.67m - July 24, 2019)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II ESA
3713 Borrisokane Road
Ottawa, Ontario

DATUM Ground surface elevations provided by J.D. Barnes Limited.

FILE NO. PE4810

REMARKS

HOLE NO. BH 2

BORINGS BY CME 55 Power Auger **DATE** 2019 July 22

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	101.22
		AU	1				
		SS	2	62	12	1	100.22
FILL: Brown silty fine sand, trace gravel, cobbles and boulders		SS	3	38	5	2	99.22
		SS	4	46	5		
		SS	5	38	9	3	98.22
		SS	6	6	50+	4	97.22
4.62							
Compact, brown **SILTY FINE SAND** to **SAND,** some silt		SS	7	79	23	5	96.22
		SS	8	58	22		
6.00						6	95.22
Compact, brown **SILTY SAND** with gravel, cobbles and boulders		SS	9	67	24		
		SS	10	50	29	7	94.22
7.47							
End of Borehole							
(GWL @ 5.65m - July 24, 2019)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II ESA
3713 Borrisokane Road
Ottawa, Ontario

DATUM Ground surface elevations provided by J.D. Barnes Limited.

FILE NO. PE4810

REMARKS

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** 2019 July 19

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	104.73
		AU	1				
		SS	2	54	8	1	103.73
		SS	3	62	26	2	102.73
FILL: Brown silty sand, some gravel		SS	4	58	43		
		SS	5	4	29	3	101.73
		AU	6				
		SS	7	100	89	4	100.73
		SS	8	75	43	5	99.73
		SS	9	79	33		
6.10						6	98.73
FILL: Brown sand, some gravel		SS	10	75	55		
6.86						7	97.73
FILL: Brow sand with gravel, trace cobbles and boulders		SS	11	71	76		
		SS	12	54	65	8	96.73
		SS	13	62	52		
9.10						9	95.73
		SS	14	58	36		
Dense, brown **SILTY SAND** with gravel, cobbles and boulders		SS	15	46	25	10	94.73
		SS	16	54	44	11	93.73
11.28							
End of Borehole							
(GWL @ 9.08m - July 24, 2019)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

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SOIL PROFILE AND TEST DATA

Phase II ESA
3713 Borrisokane Road
Ottawa, Ontario

DATUM Ground surface elevations provided by J.D. Barnes Limited.

FILE NO. PE4810

REMARKS

HOLE NO. BH 4

BORINGS BY CME 55 Power Auger **DATE** 2019 July 19

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	104.52
FILL: Brown sand with silt and organics		AU	1				
0.46							
FILL: Grey silty sand with gravel		SS	2	38	8	1	103.52
1.58							
		SS	3	38	7	2	102.52
		SS	4	67	4		
FILL: Grey silty clay/clayey silt with sand and gravel, trace brick						3	101.52
						4	100.52
						5	99.52
		SS	5	71	7	6	98.52
- trace cobbles and boulders by 6.7m depth		SS	6	79	18	7	97.52
		SS	7	33	25		
8.23						8	96.52
		SS	8	46	14		
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles and boulders		SS	9	62	16	9	95.52
		SS	10	79	7	10	94.52
		SS	11	67	9	11	93.52
11.28							
End of Borehole							
(GWL @ 6.69m - July 24, 2019)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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Phase II ESA
3713 Borrisokane Road
Ottawa, Ontario

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FILE NO. PE4810

REMARKS

HOLE NO. BH 5

BORINGS BY CME 55 Power Auger **DATE** 2019 July 22

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	106.40
FILL: Brown to dark brown sand with gravel, some cobbles and boulders		AU	1				
		SS	2	58	14	1	105.40
		SS	3	8	7	2	104.40
2.30							
		SS	4	54	7	3	103.40
FILL: Dark grey silty clay, trace organics, sand and gravel		SS	5	83	9		
		SS	6	54	8	4	102.40
		SS	7	50	13	5	101.40
5.50		SS	8	100	50+		
FILL: Brown sand, some gravel, trace cobbles and boulders						6	100.40
6.60		SS	9	58	32		
		SS	10		3	7	99.40
Stiff to very stiff, grey **SILTY CLAY/CLAYEY SILT,** trace sand						8	98.40
9.45						9	97.40
Dynamic Cone Penetration Test commenced at 9.45m depth.						10	96.40
11.56						11	95.40
End of Borehole							
Practical DCPT refusal at 11.56m depth							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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FILE NO. **PE4810**

REMARKS

HOLE NO. **BH 6**

BORINGS BY CME 55 Power Auger **DATE** 2019 July 23

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
TOPSOIL 0.30		AU	1			0	103.89
FILL: Brown silty clay, some sand and gravel		SS	2	71	12	1	102.89
		SS	3	38	10	2	101.89
2.30							
FILL: Brown sand, some gravel, trace cobbles and boulders		SS	4	29	6	3	100.89
		SS	6	12	12		
3.66						4	99.89
Compact to loose, brown **SILTY SAND,** some gravel		SS	7	71	22		
		SS	8	100	10	5	98.89
		SS	9	100	12		
		SS	10	100	5	6	97.89
		SS	11	33	3	7	96.89
7.87							
Stiff to very stiff, grey **SILTY CLAY/CLAYEY SILT,** some sand, trace gravel		SS	12	100	1	8	95.89
		SS	13	100	1	9	94.89
		SS	14	100	1	10	93.89
10.97							
End of Borehole							
(GWL @ 3.80m - July 24, 2019)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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FILE NO. PE4810

REMARKS

HOLE NO. BH 7

BORINGS BY CME 55 Power Auger **DATE** 2019 July 23

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	103.77
FILL: Brown silty sand and gravel		AU	1				
1.07		SS	2	0	9	1	102.77
		SS	3	62	13	2	101.77
		SS	4	62	14		
Compact to dense, brown **SILTY SAND**		SS	5	54	22	3	100.77
		SS	6	96	23	4	99.77
		SS	7	71	24	5	98.77
		SS	8	100	27		
		SS	9	100	38	6	97.77
6.70							
End of Borehole							
(GWL @ 3.66m - July 24, 2019)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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FILE NO. **PE4810**

REMARKS

HOLE NO. **BH 8**

BORINGS BY CME 55 Power Auger **DATE** 2019 July 23

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	100.95		
FILL: Brown sand, some gravel		AU	1						
		SS	2	62	15	1	99.95		
1.93		SS	3	100	3	2	98.95		
Brown **SANDY SILT/SILT,** trace clay									
2.49		SS	4	100	2	3	97.95		
Stiff, grey **SILTY CLAY/CLAYEY SILT,** trace sand						4	96.95		
						5	95.95		
6.10						6	94.95		
		SS	5	100	5				
Loose to compact, brown **SILTY SAND**						7	93.95		
		SS	6	100	11	8	92.95		
8.23									
End of Borehole									

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

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

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FILE NO. PE4810

REMARKS

HOLE NO. TP 1

BORINGS BY Excavator **DATE** 2019 July 25

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: ● Volatile Organic Rdg. (ppm) / ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	101.80		
FILL: Brown sand with gravel, cobbles and boulders, some brick pieces		G	1			1	100.80		
- grey by 1.2m depth		G	2			2	99.80		
		G	3			3	98.80		
		G	4			4	97.80		
						5	96.80		
6.00						6	95.80		
GLACIAL TILL: Grey-brown sand with gravel, cobbles and boulders		G	5						
6.60									
End of Test Pit									
(Groundwater infiltration at 6.0m depth)									

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

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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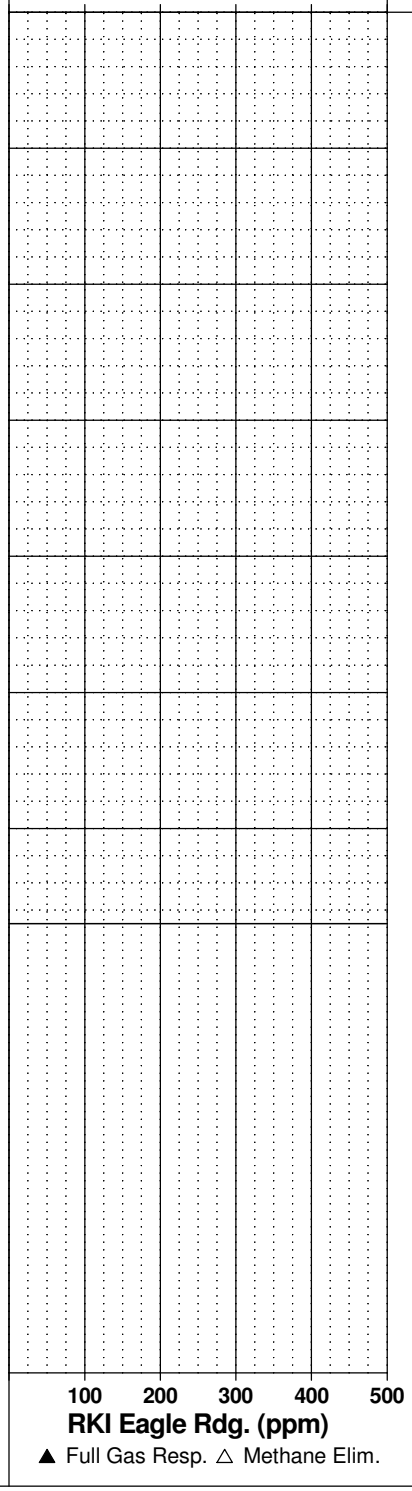
FILE NO. PE4810

REMARKS

HOLE NO. TP 2

BORINGS BY Excavator **DATE** 2019 July 25

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	102.15		
FILL: Brown silty sand with gravel, some clay, cobbles and boulders		G	1			1	101.15		
						2	100.15		
3.00		G	2			3	99.15		
FILL: Brown silty clay with sand and gravel, trace cobbles and boulders		G	3			4	98.15		
						5	97.15		
		G	4			6	96.15		
6.70									
End of Test Pit (Groundwater infiltration at 3.0m depth)									



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FILE NO. PE4810

REMARKS

HOLE NO. TP 3

BORINGS BY Excavator **DATE** 2019 July 25

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	101.63		
FILL: Brown silty sand with gravel, some clay, cobbles, boulders, brick and concrete pieces									
0.50						1	100.63		
		G	1						
FILL: Brown silty clay with sand and gravel, some cobbles, boulders, brick and concrete pieces						2	99.63		
						3	98.63		
		G	2			4	97.63		
5.00						5	96.63		
GLACIAL TILL: Brown silty clay with sand, gravel, cobbles, boulders									
5.60		G	3						
End of Test Pit									
(Groundwater infiltration at 5.3m depth)									

Photo Ionization Detector: ○ Lower Explosive Limit % (20, 40, 60, 80)

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

▲ Full Gas Resp. △ Methane Elim.

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FILE NO. PE4810

REMARKS

HOLE NO. TP 4

BORINGS BY Excavator **DATE** 2019 July 25

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	105.93		
FILL: Brown sand with gravel, cobbles, boulders, brick and plastic pieces		G	1						
0.50						1	104.93		
FILL: Dark brown silty sand with gravel, organics, brick and plastic pieces		G	2						
1.90						2	103.93		
FILL: Brown silty sand, some gravel and clay		G	3						
2.50		G	4			3	102.93		
						4	101.93		
FILL: Dark brown islty clay with sand and gravel, trace cobbles and boulders		G	5			5	100.93		
						6	99.93		
						7	98.93		
7.40									
End of Test Pit									
(TP dry upon completion)									

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

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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FILE NO. PE4810

REMARKS

HOLE NO. TP 5

BORINGS BY Excavator **DATE** 2019 July 25

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	105.03		
FILL: Brown sand with gravel, some organics, cobbles, boulders and brick pieces		G	1			1	104.03		
1.10									
FILL: Dark brown silty sand, some gravel, trace cobbles and boulders		G	2			2	103.03		
						3	102.03		
						4	101.03		
4.50									
GLACIAL TILL: Brown sand with gravel, cobbles and boulders		G	3			5	100.03		
						6	99.03		
6.30		G	4						
End of Test Pit									
(TP dry upon completion)									

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

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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FILE NO. PE4810

REMARKS

HOLE NO. TP 6

BORINGS BY Excavator **DATE** 2019 July 25

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	105.04		
FILL: Brown sand with gravel, cobbles and boulders		G	1						
0.70						1	104.04		
FILL: Brown silty sand, some clay, gravel, trace cobbles and boulders - steel pipe encountered at 1.0m depth		G	2			2	103.04		
						3	102.04		
4.20						4	101.04		
FILL: Brown clayey silty sand with gravel, some cobbles and boulders		G	3			5	100.04		
6.10						6	99.04		
FILL: Brown silty clay, some sand, gravel, cobbles and boulders		G	4						
6.70									
End of Test Pit (Groundwater infiltration at 6.1m depth)									

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

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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REMARKS

HOLE NO. TP 7

BORINGS BY Excavator **DATE** 2019 July 25

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	106.70		
FILL: Brown sand with gravel, cobbles and boulders		G	1			1	105.70		
2.00						2	104.70		
FILL: Brown silty clay with sand, gravel, cobbles and boulders		G	2			3	103.70		
		G	3			4	102.70		
						5	101.70		
6.50						6	100.70		
Brown **SILTY CLAY**		G	4						
6.90									
End of Test Pit									
(Groundwater infiltration at 5.8m depth)									

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

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FILE NO. PE4810

REMARKS

HOLE NO. TP 8

BORINGS BY Excavator **DATE** 2019 July 26

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	106.58		
FILL: Brown sand with gravel, cobbles and boulders		G	1			1	105.58		
1.20									
FILL: Brown sand, some gravel and clay		G	2			2	104.58		
2.20									
FILL: Brown silty clay with sand, gravel, cobbles and boulders		G	3			3	103.58		
						4	102.58		
						5	101.58		
		G	4			6	100.58		
6.60									
End of Test Pit									
(Groundwater infiltration at 5.9m depth)									

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

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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FILE NO. PE4810

REMARKS

HOLE NO. TP 9

BORINGS BY Excavator **DATE** 2019 July 26

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	104.06		
FILL: Brown silty sand, some gravel, organics, trace cobbles, boulders, metal pieces		G	1			1	103.06		
1.40						2	102.06		
FILL: Brown silty clay with sand, gravel, some cobbles, boulders		G	2			3	101.06		
4.80						4	100.06		
Brown **SAND,** some gravel		G	3			5	99.06		
5.20									
End of Test Pit									
(Groundwater infiltration at 2.9m depth)									

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

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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REMARKS

BORINGS BY Excavator

DATE 2019 July 26

FILE NO. PE4810

HOLE NO. TP10

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	106.58
FILL: Brown sand with gravel, cobbles and boulders (to 0.70)		G	1				
						1	105.58
FILL: Brown silty sand with gravel, trace cobbles and boulders (0.70 to 3.30)						2	104.58
		G	2				
						3	103.58
FILL: Brown silty clay, trace sand and gravel (3.30 to 6.20)		G	3				
						4	102.58
						5	101.58
						6	100.58
FILL: Brown sand, some gravel, trace cobbles and boulders (6.20 to 7.10)		G	4				
						7	99.58
End of Test Pit (7.10)							
(TP dry upon completion)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

Monitoring Well Construction

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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FILE NO. PE4810

REMARKS

HOLE NO. TP11

BORINGS BY Excavator **DATE** 2019 July 26

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	105.18		
FILL: Brown sand with gravel, trace cobbles and boulders		G	1						
0.60						1	104.18		
FILL: Brown sand with gravel		G	2			2	103.18		
						3	102.18		
4.40		G	3			4	101.18		
Brown **SAND,** some gravel						5	100.18		
						6	99.18		
6.30		G	4						
End of Test Pit									
(TP dry upon completion)									

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

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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FILE NO. PE4810

REMARKS

HOLE NO. TP12

BORINGS BY Excavator **DATE** 2019 July 26

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	103.85		
Brown **SAND** some gravel, trace to some cobbles and boulders		G	1			1	102.85		
						2	101.85		
		G	2			3	100.85		
						4	99.85		
5.00		G	3			5	98.85		
GLACIAL TILL: Brown clayey silt with sand and gravel 5.20									
End of Test Pit									
(Groundwater infiltration at 4.7m depth)									

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

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II ESA
3713 Borrisokane Road
Ottawa, Ontario

DATUM Ground surface elevations provided by J.D. Barnes Limited.

FILE NO. PE4810

REMARKS

HOLE NO. TP13

BORINGS BY Excavator **DATE** 2019 July 26

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	104.50		
		G	1			1	103.50		
FILL: Dark brown to brown sand with gravel, some cobbles and boulders		G	2			2	102.50		
		G	3			3	101.50		
4.80						4	100.50		
Brown **SAND,** trace gravel		G	4			5	99.50		
5.60									
End of Test Pit									
(Groundwater infiltration at 4.8m depth)									

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

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II ESA
3713 Borrisokane Road
Ottawa, Ontario

DATUM Ground surface elevations provided by J.D. Barnes Limited.

FILE NO. PE4810

REMARKS

HOLE NO. TP14

BORINGS BY Excavator **DATE** 2019 July 26

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	100.63		
FILL: Brown sand		G	1						
0.50									
FILL: Brown silty sand, some clay and gravel, trace cobbles and boulders		G	2			1	99.63		
1.60									
Brown **SAND,** trace gravel		G	3			2	98.63		
2.80									
Grey **SILTY CLAY**		G	4			3	97.63		
4.60						4	96.63		
End of Test Pit									
(Groundwater infiltration at 1.8m depth)									

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

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II ESA
3713 Borrisokane Road
Ottawa, Ontario

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FILE NO. PE4810

REMARKS

HOLE NO. TP15

BORINGS BY Excavator **DATE** 2019 September 16

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	103.42		
FILL: Brown silty sand with gravel 0.23		G	1			1	102.42		
FILL: Grey silty clay with gravel		G	2			2	101.42		
4.09						3	100.42		
FILL: Brown sand with boulders		G	3			4	99.42		
7.14						5	98.42		
End of Test Pit						6	97.42		
(TP dry upon completion)						7	96.42		

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

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II ESA
3713 Borrisokane Road
Ottawa, Ontario

DATUM Ground surface elevations provided by J.D. Barnes Limited.

FILE NO. PE4810

REMARKS

HOLE NO. TP16

BORINGS BY Excavator **DATE** 2019 September 16

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	105.71		
FILL: Brown silty sand with clay, gravel, cobbles and boulders		G	1			1	104.71		
						2	103.71		
						3	102.71		
5.26						4	101.71		
FILL: Grey silty sand with gravel, cobbles and boulders, some clay		G	2			5	100.71		
						6	99.71		
7.26						7	98.71		
End of Test Pit (TP dry upon completion)									

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

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

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SOIL PROFILE AND TEST DATA

Phase II ESA
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Ottawa, Ontario

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FILE NO. PE4810

REMARKS

HOLE NO. TP17

BORINGS BY Excavator **DATE** 2019 September 16

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: ● Volatile Organic Rdg. (ppm) / ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE									
FILL: Brown silty sand with gravel, concrete, trace organics		G	1			0	101.66		
0.46									
FILL: Brown silty sand with concrete		G	2			1	100.66		
						2	99.66		
						3	98.66		
3.30									
End of Test Pit									
(TP dry upon completion)									

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

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SOIL PROFILE AND TEST DATA

Phase II ESA
3713 Borrisokane Road
Ottawa, Ontario

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FILE NO. **PE4810**

REMARKS

HOLE NO. **TP18**

BORINGS BY Excavator **DATE** 2019 September 16

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	105.36		
FILL: Brown silty sand with gravel and cobbles		G	1			1	104.36		
1.24						2	103.36		
FILL: Brown silty sand with concrete, boulders, trace organics		G	2			3	102.36		
						4	101.36		
						5	100.36		
						6	99.36		
7.03						7	98.36		
End of Test Pit									
(TP dry upon completion)									

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

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II ESA
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Ottawa, Ontario

DATUM Ground surface elevations provided by J.D. Barnes Limited.

FILE NO. **PE4810**

REMARKS

HOLE NO. **TP19**

BORINGS BY Excavator **DATE** 2019 September 16

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	106.71		
FILL: Brown silty sand with gravel and cobbles		G	1			1	105.71		
1.36						2	104.71		
FILL: Brown silty sand with gravel, clay, trace organics		G	2			3	103.71		
						4	102.71		
						5	101.71		
6.83						6	100.71		
Brown **SILTY SAND**		G	3			7	99.71		
7.92									
End of Test Pit									
(TP dry upon completion)									

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

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II ESA
3713 Borrisokane Road
Ottawa, Ontario

DATUM Ground surface elevations provided by J.D. Barnes Limited.

FILE NO. PE4810

REMARKS

HOLE NO. TP20

BORINGS BY Excavator **DATE** 2019 September 16

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	107.02		
FILL: Brown silty sand with gravel, cobbles and boulders, trace organics		G	1			1	106.02		
1.65						2	105.02		
FILL: Brown silty sand with boulders						3	104.02		
						4	103.02		
5.33		G	2			5	102.02		
End of Test Pit									
(TP dry upon completion)									

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

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SOIL PROFILE AND TEST DATA

Phase II ESA
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Ottawa, Ontario

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FILE NO. PE4810

REMARKS

HOLE NO. TP21

BORINGS BY Excavator **DATE** 2019 September 17

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: ● Volatile Organic Rdg. (ppm) / ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	106.39		
FILL: Brown silty sand with gravel, clay, trace organics and cobbles						1	105.39		
1.98		G	1			2	104.39		
FILL: Brown silty sand, trace cobbles and boulders						3	103.39		
						4	102.39		
						5	101.39		
		G	2			6	100.39		
6.61									
End of Test Pit									
(TP dry upon completion)									

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

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II ESA
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FILE NO. PE4810

REMARKS

HOLE NO. TP22

BORINGS BY Excavator **DATE** 2019 September 17

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	106.64		
						1	105.64		
						2	104.64		
		G	1			3	103.64		
FILL: Brown sand, some clay, cobbles, brick and concrete						4	102.64		
						5	101.64		
		G	2			6	100.64		
						7	99.64		
						8	98.64		
8.25									
End of Test Pit									
(TP dry upon completion)									

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

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II ESA
3713 Borrisokane Road
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FILE NO. PE4810

REMARKS

HOLE NO. TP23

BORINGS BY Excavator **DATE** 2019 September 17

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	105.53		
						1	104.53		
						2	103.53		
FILL: Brown silty sand with clay, trace cobbles and boulders						3	102.53		
						4	101.53		
		G	1			5	100.53		
						6	99.53		
6.48									
Grey **SILTY CLAY**						7	98.53		▽
7.34		G	2						
End of Test Pit									
(GWL @ 7.0m depth based on field observations)									

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

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II ESA
3713 Borrisokane Road
Ottawa, Ontario

DATUM Ground surface elevations provided by J.D. Barnes Limited.

FILE NO. PE4810

REMARKS

HOLE NO. TP24

BORINGS BY Excavator **DATE** 2019 September 17

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	106.36		
						1	105.36		
						2	104.36		
						3	103.36		
FILL: Grey silty clay, trace cobbles and boulders		G	1						
		G	2			4	102.36		
						5	101.36		
						6	100.36		
						7	99.36		
						8	98.36		
8.48									
End of Test Pit									
(TP dry upon completion)									

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

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II ESA
3713 Borrisokane Road
Ottawa, Ontario

DATUM Ground surface elevations provided by J.D. Barnes Limited.

FILE NO. PE4810

REMARKS

HOLE NO. TP25

BORINGS BY Excavator **DATE** 2019 September 17

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	106.40		
FILL: Brown silty sand, trace organics, concrete and building mat						1	105.40		
						2	104.40		
		G	1			3	103.40		
3.81									
FILL: Brown silty sand with clay, cobbles and boulders						4	102.40		
		G	2			5	101.40		
						6	100.40		
						7	99.40		
8.18						8	98.40		
Stiff, grey **SILTY CLAY** 8.38		G	3						▽
End of Test Pit									
(GWL @ 8.2m depth based on field observations)									

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

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II ESA
3713 Borrisokane Road
Ottawa, Ontario

DATUM Ground surface elevations provided by J.D. Barnes Limited.

FILE NO. PE4810

REMARKS

HOLE NO. TP26

BORINGS BY Excavator **DATE** 2019 September 18

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	105.54		
FILL: Brown silty sand with clay, trace organics and cobbles		G	1			1	104.54		
						2	103.54		
						3	102.54		
4.09						4	101.54		
FILL: Brown silty clay with concrete and boulders		G	2			5	100.54		
						6	99.54		
						7	98.54		
7.67									
End of Test Pit									
(TP dry upon completion)									

Lower Explosive Limit % scale: 20 40 60 80

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

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II ESA
3713 Borrisokane Road
Ottawa, Ontario

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FILE NO. PE4810

REMARKS

HOLE NO. TP27

BORINGS BY Excavator **DATE** 2019 September 18

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	105.62		
						1	104.62		
						2	103.62		
						3	102.62		
FILL: Brown silty sand with clay, trace concrete, boulders and construction materials		G	1			4	101.62		
						5	100.62		
						6	99.62		
						7	98.62		
7.70		G	2						
End of Test Pit									
(TP dry upon completion)									

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

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SOIL PROFILE AND TEST DATA

Phase II ESA
3713 Borrisokane Road
Ottawa, Ontario

DATUM Ground surface elevations provided by J.D. Barnes Limited.

FILE NO. PE4810

REMARKS

HOLE NO. TP28

BORINGS BY Excavator **DATE** 2019 September 18

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	104.75		
						1	103.75		
		G	1			2	102.75		
FILL: Brown silty sand with gravel, clay, boulders, concrete and construction materials						3	101.75		
						4	100.75		
						5	99.75		
						6	98.75		
		G	2			7	97.75		
7.03									
End of Test Pit									
(TP dry upon completion)									

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

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II ESA
3713 Borrisokane Road
Ottawa, Ontario

DATUM Ground surface elevations provided by J.D. Barnes Limited.

FILE NO. PE4810

REMARKS

HOLE NO. TP29

BORINGS BY Excavator **DATE** 2019 September 18

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: ● Volatile Organic Rdg. (ppm) / ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	104.41		
FILL: Brown silty sand with boulders, trace organics		G	1			1	103.41		
1.27									
Brown **SILTY SAND**		G	2			2	102.41		
2.13									
End of Test Pit									
(TP dry upon completion)									

Photo Ionization Detector scale: 20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II ESA
3713 Borrisokane Road
Ottawa, Ontario

DATUM Ground surface elevations provided by J.D. Barnes Limited.

FILE NO. PE4810

REMARKS

HOLE NO. TP30

BORINGS BY Excavator **DATE** 2019 September 18

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	101.71		
FILL: Brown silty sand, some gravel		G	1						
0.97						1	100.71		
Brown **SILTY SAND**		G	2						
2.01						2	99.71		
End of Test Pit									
(TP dry upon completion)									

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

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SOIL PROFILE AND TEST DATA

Phase II ESA
3713 Borrisokane Road
Ottawa, Ontario

DATUM Ground surface elevations provided by J.D. Barnes Limited.

FILE NO. PE4810

REMARKS

HOLE NO. TP31

BORINGS BY Excavator **DATE** 2019 September 18

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: ● Volatile Organic Rdg. (ppm) / ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	100.59		
FILL: Brown silty sand, trace organics and boulders		G	1						
1.04						1	99.59		
Brown **SILTY SAND**		G	2						
1.98									
End of Test Pit									
(TP dry upon completion)									

Photo Ionization Detector scale: 20, 40, 60, 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

The standard terminology to describe the strength of cohesionless soils is the relative density, 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.

Relative Density	'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 vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

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 is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil.

Terminology used for describing soil strata based upon texture, or the proportion of individual particle sizes present is provided on the Textural Soil Classification Chart at the end of this information package.

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 NXL size core. However, it can be used on smaller core sizes, such as BX, 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
PS	-	Piston sample
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size AXT, BXL, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

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

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

CONSOLIDATION TEST

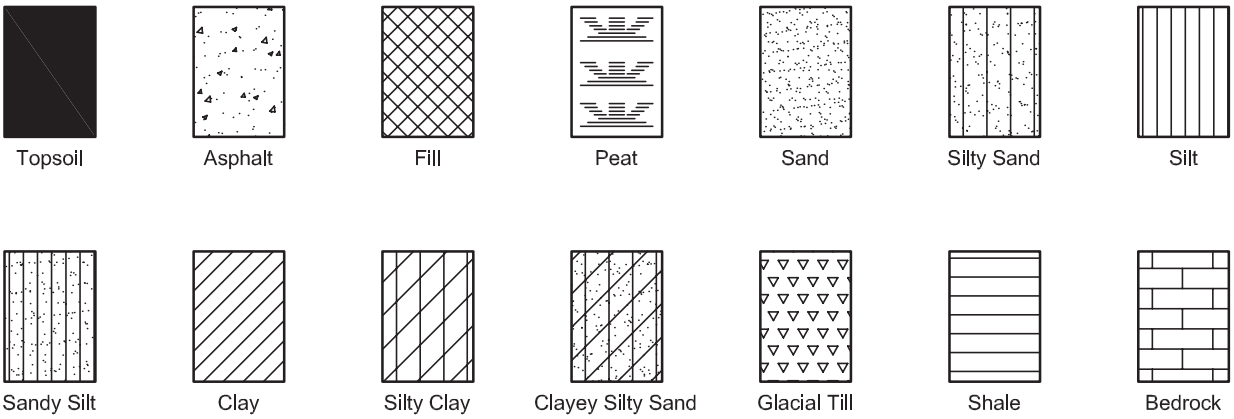
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

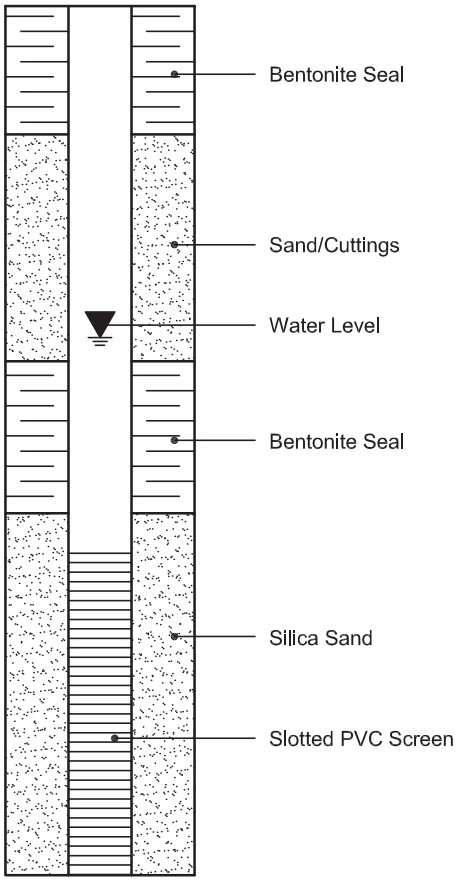
SYMBOLS AND TERMS (continued)

STRATA PLOT

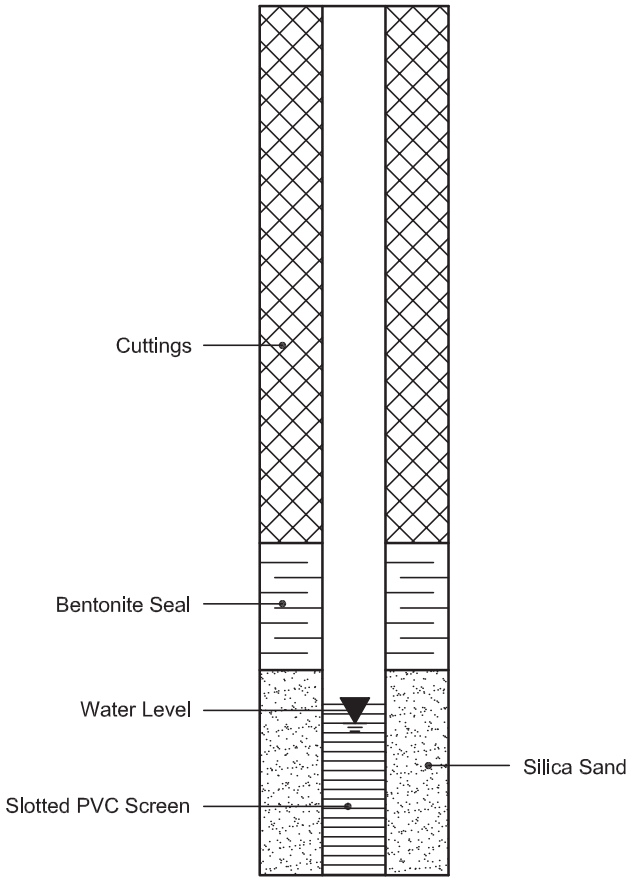


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 27090
Project: PE4689
Custody: 122851

Report Date: 26-Jul-2019
Order Date: 22-Jul-2019

Order #: 1930140

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

Paracel ID	Client ID
1930140-01	BH3-SS2
1930140-02	BH4-SS3
1930140-03	BH4-SS5
1930140-04	BH4-SS8

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27090

Report Date: 26-Jul-2019
Order Date: 22-Jul-2019
Project Description: PE4689

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	25-Jul-19	25-Jul-19
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	22-Jul-19	24-Jul-19
Mercury by CVAA	EPA 7471B - CVAA, digestion	24-Jul-19	25-Jul-19
PHC F1	CWS Tier 1 - P&T GC-FID	25-Jul-19	25-Jul-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	22-Jul-19	25-Jul-19
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	24-Jul-19	24-Jul-19
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	23-Jul-19	24-Jul-19
Solids, %	Gravimetric, calculation	25-Jul-19	25-Jul-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27090

Report Date: 26-Jul-2019

Order Date: 22-Jul-2019

Project Description: PE4689

	Client ID:	BH3-SS2	BH4-SS3	BH4-SS5	BH4-SS8
	Sample Date:	19-Jul-19 09:00	19-Jul-19 09:00	19-Jul-19 09:00	19-Jul-19 09:00
	Sample ID:	1930140-01	1930140-02	1930140-03	1930140-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	91.1	85.7	81.5	85.3
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	-	-
Arsenic	1.0 ug/g dry	2.7	2.4	-	-
Barium	1.0 ug/g dry	88.4	172	-	-
Beryllium	0.5 ug/g dry	<0.5	0.5	-	-
Boron	5.0 ug/g dry	8.2	<5.0	-	-
Cadmium	0.5 ug/g dry	<0.5	<0.5	-	-
Chromium	5.0 ug/g dry	19.8	32.4	-	-
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	-	-
Cobalt	1.0 ug/g dry	6.5	8.9	-	-
Copper	5.0 ug/g dry	15.4	20.9	-	-
Lead	1.0 ug/g dry	10.5	8.6	-	-
Mercury	0.1 ug/g dry	<0.1	<0.1	-	-
Molybdenum	1.0 ug/g dry	<1.0	<1.0	-	-
Nickel	5.0 ug/g dry	13.2	18.9	-	-
Selenium	1.0 ug/g dry	<1.0	<1.0	-	-
Silver	0.3 ug/g dry	<0.3	<0.3	-	-
Thallium	1.0 ug/g dry	<1.0	<1.0	-	-
Uranium	1.0 ug/g dry	<1.0	<1.0	-	-
Vanadium	10.0 ug/g dry	25.2	43.1	-	-
Zinc	20.0 ug/g dry	34.5	52.0	-	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	-	-	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	-	-	<0.05
Toluene	0.05 ug/g dry	<0.05	-	-	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	-	-	<0.05
o-Xylene	0.05 ug/g dry	<0.05	-	-	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	-	-	<0.05
Toluene-d8	Surrogate	92.3%	-	-	93.6%
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	20	-	-	30
F4 PHCs (C34-C50)	6 ug/g dry	30	-	-	57

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27090

Report Date: 26-Jul-2019

Order Date: 22-Jul-2019

Project Description: PE4689

	Client ID:	BH3-SS2	BH4-SS3	BH4-SS5	BH4-SS8
	Sample Date:	19-Jul-19 09:00	19-Jul-19 09:00	19-Jul-19 09:00	19-Jul-19 09:00
	Sample ID:	1930140-01	1930140-02	1930140-03	1930140-04
	MDL/Units	Soil	Soil	Soil	Soil
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	<0.02	-	<0.02	-
Acenaphthylene	0.02 ug/g dry	<0.02	-	<0.02	-
Anthracene	0.02 ug/g dry	<0.02	-	<0.02	-
Benzo [a] anthracene	0.02 ug/g dry	0.02	-	0.03	-
Benzo [a] pyrene	0.02 ug/g dry	0.02	-	0.02	-
Benzo [b] fluoranthene	0.02 ug/g dry	0.03	-	0.03	-
Benzo [g,h,i] perylene	0.02 ug/g dry	<0.02	-	<0.02	-
Benzo [k] fluoranthene	0.02 ug/g dry	<0.02	-	<0.02	-
Chrysene	0.02 ug/g dry	0.02	-	0.02	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	<0.02	-	<0.02	-
Fluoranthene	0.02 ug/g dry	0.04	-	0.05	-
Fluorene	0.02 ug/g dry	<0.02	-	<0.02	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	<0.02	-	<0.02	-
1-Methylnaphthalene	0.02 ug/g dry	<0.02	-	<0.02	-
2-Methylnaphthalene	0.02 ug/g dry	<0.02	-	<0.02	-
Methylnaphthalene (1&2)	0.04 ug/g dry	<0.04	-	<0.04	-
Naphthalene	0.01 ug/g dry	<0.01	-	<0.01	-
Phenanthrene	0.02 ug/g dry	<0.02	-	0.03	-
Pyrene	0.02 ug/g dry	0.04	-	0.04	-
2-Fluorobiphenyl	Surrogate	93.9%	-	115%	-
Terphenyl-d14	Surrogate	84.2%	-	103%	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	*1.49*		*ug/g*		*112*	*50-140*			
Surrogate: Terphenyl-d14	*1.38*		*ug/g*		*103*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*2.69*		*ug/g*		*84.1*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	165	4	ug/g dry	92			56.4	30	QR-04
F3 PHCs (C16-C34)	363	8	ug/g dry	172			71.4	30	QR-04
F4 PHCs (C34-C50)	73	6	ug/g dry	73			1.0	30	
Metals									
Antimony	1.1	1.0	ug/g dry	ND			0.0	30	
Arsenic	2.7	1.0	ug/g dry	2.7			2.2	30	
Barium	89.2	1.0	ug/g dry	88.4			0.9	30	
Beryllium	ND	0.5	ug/g dry	ND			0.0	30	
Boron	9.4	5.0	ug/g dry	8.2			13.1	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	20.3	5.0	ug/g dry	19.8			2.4	30	
Cobalt	6.7	1.0	ug/g dry	6.5			3.2	30	
Copper	15.5	5.0	ug/g dry	15.4			0.5	30	
Lead	10.7	1.0	ug/g dry	10.5			2.2	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	30	
Molybdenum	ND	1.0	ug/g dry	ND			0.0	30	
Nickel	13.5	5.0	ug/g dry	13.2			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	25.4	10.0	ug/g dry	25.2			0.8	30	
Zinc	35.0	20.0	ug/g dry	34.5			1.3	30	
Physical Characteristics									
% Solids	95.1	0.1	% by Wt.	77.2			20.8	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	ND				40	
Acenaphthylene	ND	0.02	ug/g dry	ND				40	
Anthracene	ND	0.02	ug/g dry	0.025			0.0	40	
Benzo [a] anthracene	0.063	0.02	ug/g dry	0.093			38.6	40	
Benzo [a] pyrene	0.054	0.02	ug/g dry	0.073			29.4	40	
Benzo [b] fluoranthene	0.056	0.02	ug/g dry	0.083			39.4	40	
Benzo [g,h,i] perylene	0.040	0.02	ug/g dry	0.041			2.6	40	
Benzo [k] fluoranthene	0.039	0.02	ug/g dry	0.053			30.1	40	
Chrysene	0.068	0.02	ug/g dry	0.116			51.7	40	QR-01
Dibenzo [a,h] anthracene	ND	0.02	ug/g dry	ND				40	
Fluoranthene	0.137	0.02	ug/g dry	0.217			45.2	40	QR-01
Fluorene	ND	0.02	ug/g dry	ND				40	
Indeno [1,2,3-cd] pyrene	0.033	0.02	ug/g dry	0.039			16.9	40	
1-Methylnaphthalene	ND	0.02	ug/g dry	ND			0.0	40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND			0.0	40	
Naphthalene	ND	0.01	ug/g dry	ND				40	
Phenanthrene	0.088	0.02	ug/g dry	0.163			59.8	40	QR-01
Pyrene	0.109	0.02	ug/g dry	0.163			40.1	40	QR-01
Surrogate: 2-Fluorobiphenyl	*1.86*		*ug/g dry*		*118*	*50-140*			
Surrogate: Terphenyl-d14	*1.67*		*ug/g dry*		*106*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*3.56*		*ug/g dry*		*93.4*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	201	7	ug/g		101	80-120			
F2 PHCs (C10-C16)	85	4	ug/g		106	80-120			
F3 PHCs (C16-C34)	173	8	ug/g		88.3	80-120			
F4 PHCs (C34-C50)	275	6	ug/g	73	114	60-140			
Metals									
Antimony	40.9		ug/L	ND	81.6	70-130			
Arsenic	49.7		ug/L	1.1	97.2	70-130			
Barium	82.8		ug/L	35.4	94.8	70-130			
Beryllium	47.4		ug/L	ND	94.5	70-130			
Boron	47.4		ug/L	ND	88.3	70-130			
Cadmium	45.9		ug/L	ND	91.8	70-130			
Chromium (VI)	4.5	0.2	ug/g		90.5	70-130			
Chromium	57.1		ug/L	7.9	98.4	70-130			
Cobalt	48.8		ug/L	2.6	92.5	70-130			
Copper	53.6		ug/L	6.2	94.9	70-130			
Lead	53.3		ug/L	4.2	98.3	70-130			
Mercury	1.59	0.1	ug/g	ND	106	70-130			
Molybdenum	47.6		ug/L	ND	94.6	70-130			
Nickel	51.8		ug/L	5.3	93.0	70-130			
Selenium	47.9		ug/L	ND	95.5	70-130			
Silver	44.1		ug/L	ND	88.2	70-130			
Thallium	44.6		ug/L	ND	89.0	70-130			
Uranium	51.1		ug/L	ND	102	70-130			
Vanadium	58.5		ug/L	10.1	96.8	70-130			
Zinc	59.5		ug/L	ND	91.3	70-130			
Semi-Volatiles									
Acenaphthene	0.197	0.02	ug/g	ND	99.6	50-140			
Acenaphthylene	0.178	0.02	ug/g	ND	89.8	50-140			
Anthracene	0.187	0.02	ug/g	0.025	81.9	50-140			
Benzo [a] anthracene	0.204	0.02	ug/g	0.093	56.0	50-140			
Benzo [a] pyrene	0.168	0.02	ug/g	0.073	48.2	50-140			QM-06
Benzo [b] fluoranthene	0.267	0.02	ug/g	0.083	93.1	50-140			
Benzo [g,h,i] perylene	0.172	0.02	ug/g	0.041	66.1	50-140			
Benzo [k] fluoranthene	0.233	0.02	ug/g	0.053	90.7	50-140			
Chrysene	0.229	0.02	ug/g	0.116	57.4	50-140			
Dibenzo [a,h] anthracene	0.152	0.02	ug/g	ND	76.6	50-140			
Fluoranthene	0.212	0.02	ug/g	0.217	-2.62	50-140			QM-06
Fluorene	0.179	0.02	ug/g	ND	90.6	50-140			
Indeno [1,2,3-cd] pyrene	0.170	0.02	ug/g	0.039	66.2	50-140			
1-Methylnaphthalene	0.215	0.02	ug/g	ND	108	50-140			
2-Methylnaphthalene	0.229	0.02	ug/g	ND	116	50-140			
Naphthalene	0.190	0.01	ug/g	ND	96.1	50-140			
Phenanthrene	0.203	0.02	ug/g	0.163	20.4	50-140			QM-06
Pyrene	0.217	0.02	ug/g	0.163	27.0	50-140			QM-06
Surrogate: 2-Fluorobiphenyl	*1.61*		*ug/g*		*102*	*50-140*			
Volatiles									
Benzene	3.06	0.02	ug/g		76.6	60-130			
Ethylbenzene	5.00	0.05	ug/g		125	60-130			
Toluene	5.01	0.05	ug/g		125	60-130			
m,p-Xylenes	9.25	0.05	ug/g		116	60-130			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
o-Xylene	5.04	0.05	ug/g		126	60-130			

Qualifier Notes:

QC Qualifiers :

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

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

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

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

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Paracel ID: 1930140

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800-749-1947
racel@paracellabs.com

Chain of Custody
(Lab Use Only)
№ 122851

Page 1 of 1

Client Name: Paterson	Project Reference: PE4689	**Turnaround Time:**
Contact Name: Mark D'Arcy	Quote #	☐ 1 Day ☐ 3 Day
Address: 154 Colonade Rd	PO # 27090	☐ 2 Day ☑ Regular
Telephone: 613 226 7381	Email Address:	Date Required:

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

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

Required Analyses

Paracel Order Number: 1930140

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)						
1	BH3-SS2	S		3	19 July '19	-	/		/	/	/	/		(2)	250 ml	Jars	X	Vials	(1)
2	BH4-SS3	S		1	↓	-				/	/	/			250 ml	Jar			
3	BH4-SS5	S		1		-			/						1l				
4	BH4-SS8	S		2	↓	-	/								120 ml	Jar	X	Vials	
5																			
6																			
7																			
8																			
9																			
10																			

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: T. Louise	Received at Lab: Samuel	Verified By: MAV
Relinquished By (Print): Philip Price	Date/Time: 22/07/19 320 PM	Date/Time: 07/22/19 16:06	Date/Time: 7-22-19 18:59
Date/Time:	Temperature: °C	Temperature: 15.9 °C	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 27040
Project: PE4689
Custody: 122859

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

Order #: 1930443

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

Paracel ID	Client ID
1930443-01	BH6-SS2
1930443-02	BH6-SS12
1930443-03	BH7-AU1
1930443-04	BH8-AU1

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27040

Report Date: 30-Jul-2019
Order Date: 24-Jul-2019
Project Description: PE4689

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	26-Jul-19	27-Jul-19
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	25-Jul-19	29-Jul-19
Mercury by CVAA	EPA 7471B - CVAA, digestion	29-Jul-19	29-Jul-19
PHC F1	CWS Tier 1 - P&T GC-FID	26-Jul-19	27-Jul-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	25-Jul-19	28-Jul-19
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	26-Jul-19	29-Jul-19
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	25-Jul-19	30-Jul-19
Solids, %	Gravimetric, calculation	29-Jul-19	29-Jul-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27040

Report Date: 30-Jul-2019

Order Date: 24-Jul-2019

Project Description: PE4689

	Client ID:	BH6-SS2	BH6-SS12	BH7-AU1	BH8-AU1
	Sample Date:	24-Jul-19 09:00	24-Jul-19 09:00	24-Jul-19 09:00	24-Jul-19 09:00
	Sample ID:	1930443-01	1930443-02	1930443-03	1930443-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	84.7	71.7	93.7	90.2
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Arsenic	1.0 ug/g dry	2.0	2.8	2.1	-
Barium	1.0 ug/g dry	129	171	58.5	-
Beryllium	0.5 ug/g dry	<0.5	<0.5	<0.5	-
Boron	5.0 ug/g dry	5.2	7.7	10.2	-
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	-
Chromium	5.0 ug/g dry	33.2	25.6	16.6	-
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	-
Cobalt	1.0 ug/g dry	7.7	8.1	4.5	-
Copper	5.0 ug/g dry	14.0	20.2	9.4	-
Lead	1.0 ug/g dry	8.8	3.9	4.8	-
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	-
Molybdenum	1.0 ug/g dry	<1.0	3.7	<1.0	-
Nickel	5.0 ug/g dry	16.5	18.1	9.2	-
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	-
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Uranium	1.0 ug/g dry	<1.0	1.1	<1.0	-
Vanadium	10.0 ug/g dry	39.0	38.7	21.8	-
Zinc	20.0 ug/g dry	55.4	43.9	21.8	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene-d8	Surrogate	83.5%	82.1%	69.4%	78.1%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	44	99 [1]	40	36
F4 PHCs (C34-C50)	6 ug/g dry	12	55	45	37

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27040

Report Date: 30-Jul-2019

Order Date: 24-Jul-2019

Project Description: PE4689

	Client ID:	BH6-SS2	BH6-SS12	BH7-AU1	BH8-AU1
	Sample Date:	24-Jul-19 09:00	24-Jul-19 09:00	24-Jul-19 09:00	24-Jul-19 09:00
	Sample ID:	1930443-01	1930443-02	1930443-03	1930443-04
	MDL/Units	Soil	Soil	Soil	Soil
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	<0.02	<0.02	-	-
Acenaphthylene	0.02 ug/g dry	<0.02	<0.02	-	-
Anthracene	0.02 ug/g dry	<0.02	<0.02	-	-
Benzo [a] anthracene	0.02 ug/g dry	<0.02	<0.02	-	-
Benzo [a] pyrene	0.02 ug/g dry	<0.02	<0.02	-	-
Benzo [b] fluoranthene	0.02 ug/g dry	<0.02	<0.02	-	-
Benzo [g,h,i] perylene	0.02 ug/g dry	<0.02	<0.02	-	-
Benzo [k] fluoranthene	0.02 ug/g dry	<0.02	<0.02	-	-
Chrysene	0.02 ug/g dry	<0.02	<0.02	-	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	<0.02	<0.02	-	-
Fluoranthene	0.02 ug/g dry	<0.02	<0.02	-	-
Fluorene	0.02 ug/g dry	<0.02	<0.02	-	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	<0.02	<0.02	-	-
1-Methylnaphthalene	0.02 ug/g dry	<0.02	0.09	-	-
2-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	-	-
Methylnaphthalene (1&2)	0.04 ug/g dry	<0.04	0.09	-	-
Naphthalene	0.01 ug/g dry	<0.01	<0.01	-	-
Phenanthrene	0.02 ug/g dry	<0.02	<0.02	-	-
Pyrene	0.02 ug/g dry	<0.02	<0.02	-	-
2-Fluorobiphenyl	Surrogate	81.8%	88.0%	-	-
Terphenyl-d14	Surrogate	76.7%	113%	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	*1.34*		*ug/g*		*100*	*50-140*			
Surrogate: Terphenyl-d14	*0.861*		*ug/g*		*64.6*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*2.75*		*ug/g*		*86.1*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	30	8	ug/g dry	40			27.9	30	
F4 PHCs (C34-C50)	21	6	ug/g dry	32			41.9	30	QR-04
Metals									
Antimony	1.3	1.0	ug/g dry	1.2			6.4	30	
Arsenic	5.4	1.0	ug/g dry	5.1			5.7	30	
Barium	97.4	1.0	ug/g dry	100			2.7	30	
Beryllium	0.8	0.5	ug/g dry	0.7			5.3	30	
Boron	9.6	5.0	ug/g dry	8.4			13.8	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	20.5	5.0	ug/g dry	20.0			2.4	30	
Cobalt	10.3	1.0	ug/g dry	10.2			0.6	30	
Copper	13.3	5.0	ug/g dry	13.0			1.7	30	
Lead	12.0	1.0	ug/g dry	11.9			1.4	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	30	
Molybdenum	ND	1.0	ug/g dry	ND			0.0	30	
Nickel	18.2	5.0	ug/g dry	18.1			0.4	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	30.6	10.0	ug/g dry	29.9			2.3	30	
Zinc	64.9	20.0	ug/g dry	64.4			0.8	30	
Physical Characteristics									
% Solids	89.2	0.1	% by Wt.	88.7			0.5	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	ND			0.0	40	
Acenaphthylene	0.038	0.02	ug/g dry	0.032			16.8	40	
Anthracene	0.022	0.02	ug/g dry	ND			0.0	40	
Benzo [a] anthracene	0.024	0.02	ug/g dry	0.034			35.4	40	
Benzo [a] pyrene	0.037	0.02	ug/g dry	0.040			8.7	40	
Benzo [b] fluoranthene	0.046	0.02	ug/g dry	0.057			21.5	40	
Benzo [g,h,i] perylene	0.037	0.02	ug/g dry	0.055			40.8	40	QR-01
Benzo [k] fluoranthene	0.024	0.02	ug/g dry	ND			0.0	40	
Chrysene	0.027	0.02	ug/g dry	0.040			39.6	40	
Dibenzo [a,h] anthracene	ND	0.02	ug/g dry	ND				40	
Fluoranthene	0.048	0.02	ug/g dry	0.068			33.7	40	
Fluorene	ND	0.02	ug/g dry	ND				40	
Indeno [1,2,3-cd] pyrene	0.040	0.02	ug/g dry	0.044			9.6	40	
1-Methylnaphthalene	ND	0.02	ug/g dry	ND				40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND			0.0	40	
Naphthalene	ND	0.01	ug/g dry	ND				40	
Phenanthrene	0.029	0.02	ug/g dry	0.047			46.5	40	QR-01
Pyrene	0.041	0.02	ug/g dry	0.055			29.2	40	
Surrogate: 2-Fluorobiphenyl	*1.26*		*ug/g dry*		*92.9*	*50-140*			
Surrogate: Terphenyl-d14	*1.01*		*ug/g dry*		*74.3*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*2.33*		*ug/g dry*		*71.8*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	205	7	ug/g		103	80-120			
F2 PHCs (C10-C16)	134	4	ug/g	ND	136	60-140			
F3 PHCs (C16-C34)	371	8	ug/g	40	137	60-140			
F4 PHCs (C34-C50)	226	6	ug/g	32	127	60-140			
Metals									
Antimony	40.3		ug/L	ND	79.7	70-130			
Arsenic	48.3		ug/L	2.0	92.5	70-130			
Barium	86.0		ug/L	40.0	92.0	70-130			
Beryllium	47.0		ug/L	ND	93.5	70-130			
Boron	45.0		ug/L	ND	83.3	70-130			
Cadmium	45.0		ug/L	ND	89.8	70-130			
Chromium (VI)	4.2	0.2	ug/g		84.5	70-130			
Chromium	53.7		ug/L	8.0	91.3	70-130			
Cobalt	49.0		ug/L	4.1	89.8	70-130			
Copper	50.3		ug/L	5.2	90.2	70-130			
Lead	47.8		ug/L	4.7	86.2	70-130			
Mercury	1.43	0.1	ug/g	ND	95.2	70-130			
Molybdenum	45.3		ug/L	ND	89.9	70-130			
Nickel	51.6		ug/L	7.3	88.7	70-130			
Selenium	46.4		ug/L	ND	92.4	70-130			
Silver	44.3		ug/L	ND	88.6	70-130			
Thallium	46.8		ug/L	ND	93.5	70-130			
Uranium	46.3		ug/L	ND	92.1	70-130			
Vanadium	57.7		ug/L	12.0	91.4	70-130			
Zinc	69.8		ug/L	25.8	88.2	70-130			
Semi-Volatiles									
Acenaphthene	0.205	0.02	ug/g	ND	121	50-140			
Acenaphthylene	0.210	0.02	ug/g	0.032	105	50-140			
Anthracene	0.176	0.02	ug/g	ND	104	50-140			
Benzo [a] anthracene	0.190	0.02	ug/g	0.034	92.6	50-140			
Benzo [a] pyrene	0.188	0.02	ug/g	0.040	87.0	50-140			
Benzo [b] fluoranthene	0.251	0.02	ug/g	0.057	115	50-140			
Benzo [g,h,i] perylene	0.152	0.02	ug/g	0.055	57.3	50-140			
Benzo [k] fluoranthene	0.170	0.02	ug/g	ND	100	50-140			
Chrysene	0.262	0.02	ug/g	0.040	131	50-140			
Dibenzo [a,h] anthracene	0.117	0.02	ug/g	ND	69.1	50-140			
Fluoranthene	0.241	0.02	ug/g	0.068	102	50-140			
Fluorene	0.182	0.02	ug/g	ND	108	50-140			
Indeno [1,2,3-cd] pyrene	0.155	0.02	ug/g	0.044	65.9	50-140			
1-Methylnaphthalene	0.164	0.02	ug/g	ND	96.7	50-140			
2-Methylnaphthalene	0.182	0.02	ug/g	ND	107	50-140			
Naphthalene	0.178	0.01	ug/g	ND	105	50-140			
Phenanthrene	0.212	0.02	ug/g	0.047	97.4	50-140			
Pyrene	0.253	0.02	ug/g	0.055	117	50-140			
Surrogate: 2-Fluorobiphenyl	*1.15*		*ug/g*		*84.8*	*50-140*			
Volatiles									
Benzene	2.72	0.02	ug/g		68.0	60-130			
Ethylbenzene	3.81	0.05	ug/g		95.2	60-130			
Toluene	3.43	0.05	ug/g		85.8	60-130			
m,p-Xylenes	7.60	0.05	ug/g		95.0	60-130			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
o-Xylene	4.02	0.05	ug/g		101	60-130			

Qualifier Notes:

Sample Qualifiers :

1 : Peak(s) in the GC-FID Chromatogram are not typical of petroleum hydrocarbon distillates. May be the result of high concentrations of non-mineral based compounds not completely removed by the method cleanup.

QC Qualifiers :

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

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

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

Paracel ID: 1930443

PARAC

LABORATORIES LTD.

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

Chain of Custody
(Lab Use Only)
№ 122859

Page ___ of ___

Client Name: Paterson	Project Reference: PE4689	**Turnaround Time:**	
Contact Name: Mark D'Arcy	Quote #	☐ 1 Day	☐ 3 Day
Address:	PO # 27040	☐ 2 Day	☒ Regular
Telephone: 613-226-7381	Email Address: mdarcy@patersongroup.ca	Date Required:	

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

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

Required Analyses

Paracel Order Number: 1930443

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)							
1	BH6-SS2	S			July 24/19		✓		✓	✓	✓	✓					250mL	x	VIAL	
2	BH6-SS12	S			July 24/19		✓		✓	✓	✓	✓					"			
3	BH7-AU1	S			July 24/19		✓			✓	✓	✓					"			
4	BH8-AU1	S			July 24/19		✓										120mL	x	VIAL	
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Swift

Relinquished By (Sign):	Received by Driver/Depot:	Received at Lab:	Verified By:
Relinquished By (Print):	Date/Time:	Date/Time: 07/24/19 17:27	Date/Time: 7-24-19 17:54
Date/Time:	Temperature: °C	Temperature: 12.8 °C	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 27053
Project: PE4689
Custody: 122870

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

Order #: 1931109

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

Paracel ID	Client ID
1931109-01	TP1-G4
1931109-02	TP4-G4
1931109-03	TP6-G2

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27053

Report Date: 31-Jul-2019
Order Date: 29-Jul-2019
Project Description: PE4689

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	31-Jul-19	31-Jul-19
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	30-Jul-19	30-Jul-19
Mercury by CVAA	EPA 7471B - CVAA, digestion	31-Jul-19	31-Jul-19
PHC F1	CWS Tier 1 - P&T GC-FID	31-Jul-19	31-Jul-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	30-Jul-19	31-Jul-19
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	31-Jul-19	31-Jul-19
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	30-Jul-19	31-Jul-19
Solids, %	Gravimetric, calculation	30-Jul-19	30-Jul-19

PARACEL LABORATORIES LTD.

Order #: 1931109

Certificate of Analysis

Report Date: 31-Jul-2019

Client: Paterson Group Consulting Engineers

Order Date: 29-Jul-2019

Client PO: 27053

Project Description: PE4689

	Client ID:	TP1-G4	TP4-G4	TP6-G2	-
	Sample Date:	25-Jul-19 09:00	25-Jul-19 09:00	25-Jul-19 09:00	-
	Sample ID:	1931109-01	1931109-02	1931109-03	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	89.8	85.7	87.1	-
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Arsenic	1.0 ug/g dry	2.2	2.5	2.7	-
Barium	1.0 ug/g dry	94.4	186	185	-
Beryllium	0.5 ug/g dry	<0.5	0.5	<0.5	-
Boron	5.0 ug/g dry	8.2	8.4	6.9	-
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	-
Chromium	5.0 ug/g dry	19.1	37.6	29.6	-
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	-
Cobalt	1.0 ug/g dry	5.9	9.0	7.9	-
Copper	5.0 ug/g dry	12.4	20.9	16.3	-
Lead	1.0 ug/g dry	7.0	14.2	11.7	-
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	-
Molybdenum	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Nickel	5.0 ug/g dry	12.4	21.4	17.4	-
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	-
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Vanadium	10.0 ug/g dry	28.1	40.7	36.6	-
Zinc	20.0 ug/g dry	32.0	64.0	45.1	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	-
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Toluene-d8	Surrogate	112%	108%	108%	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	5	<4	-
F3 PHCs (C16-C34)	8 ug/g dry	45	236	22	-
F4 PHCs (C34-C50)	6 ug/g dry	22	96	28	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27053

Report Date: 31-Jul-2019

Order Date: 29-Jul-2019

Project Description: PE4689

	Client ID:	TP1-G4	TP4-G4	TP6-G2	-
	Sample Date:	25-Jul-19 09:00	25-Jul-19 09:00	25-Jul-19 09:00	-
	Sample ID:	1931109-01	1931109-02	1931109-03	-
	MDL/Units	Soil	Soil	Soil	-
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Acenaphthylene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Anthracene	0.02 ug/g dry	0.06	<0.02	<0.02	-
Benzo [a] anthracene	0.02 ug/g dry	0.11	<0.02	<0.02	-
Benzo [a] pyrene	0.02 ug/g dry	0.09	<0.02	<0.02	-
Benzo [b] fluoranthene	0.02 ug/g dry	0.13	<0.02	<0.02	-
Benzo [g,h,i] perylene	0.02 ug/g dry	0.06	<0.02	<0.02	-
Benzo [k] fluoranthene	0.02 ug/g dry	0.06	<0.02	<0.02	-
Chrysene	0.02 ug/g dry	0.11	<0.02	<0.02	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Fluoranthene	0.02 ug/g dry	0.27	0.04	0.04	-
Fluorene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	0.06	<0.02	<0.02	-
1-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
2-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Methylnaphthalene (1&2)	0.04 ug/g dry	<0.04	<0.04	<0.04	-
Naphthalene	0.01 ug/g dry	<0.01	<0.01	<0.01	-
Phenanthrene	0.02 ug/g dry	0.18	<0.02	<0.02	-
Pyrene	0.02 ug/g dry	0.21	0.04	0.04	-
2-Fluorobiphenyl	Surrogate	98.3%	97.0%	85.0%	-
Terphenyl-d14	Surrogate	98.0%	104%	96.2%	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	*1.42*		*ug/g*		*106*	*50-140*			
Surrogate: Terphenyl-d14	*1.26*		*ug/g*		*94.8*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*3.47*		*ug/g*		*108*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	9	8	ug/g dry	11			21.0	30	
F4 PHCs (C34-C50)	36	6	ug/g dry	36			1.1	30	
Metals									
Antimony	1.6	1.0	ug/g dry	ND			0.0	30	
Arsenic	7.6	1.0	ug/g dry	7.3			3.7	30	
Barium	87.6	1.0	ug/g dry	84.9			3.1	30	
Beryllium	0.8	0.5	ug/g dry	0.7			18.1	30	
Boron	21.4	5.0	ug/g dry	19.4			9.9	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	25.2	5.0	ug/g dry	24.3			3.7	30	
Cobalt	7.9	1.0	ug/g dry	7.6			3.7	30	
Copper	20.8	5.0	ug/g dry	20.3			2.6	30	
Lead	15.6	1.0	ug/g dry	14.5			7.0	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	30	
Molybdenum	2.4	1.0	ug/g dry	2.0			15.0	30	
Nickel	23.4	5.0	ug/g dry	22.8			2.9	30	
Selenium	ND	1.0	ug/g dry	ND			0.0	30	
Silver	ND	0.3	ug/g dry	ND			0.0	30	
Thallium	ND	1.0	ug/g dry	ND			0.0	30	
Uranium	1.1	1.0	ug/g dry	ND			0.0	30	
Vanadium	38.8	10.0	ug/g dry	37.9			2.5	30	
Zinc	70.9	20.0	ug/g dry	68.2			3.9	30	
Physical Characteristics									
% Solids	81.4	0.1	% by Wt.	81.4			0.1	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	ND				40	
Acenaphthylene	ND	0.02	ug/g dry	ND				40	
Anthracene	ND	0.02	ug/g dry	ND				40	
Benzo [a] anthracene	ND	0.02	ug/g dry	ND				40	
Benzo [a] pyrene	ND	0.02	ug/g dry	ND				40	
Benzo [b] fluoranthene	ND	0.02	ug/g dry	ND				40	
Benzo [g,h,i] perylene	ND	0.02	ug/g dry	ND			0.0	40	
Benzo [k] fluoranthene	ND	0.02	ug/g dry	ND				40	
Chrysene	ND	0.02	ug/g dry	ND			0.0	40	
Dibenzo [a,h] anthracene	ND	0.02	ug/g dry	ND				40	
Fluoranthene	ND	0.02	ug/g dry	ND				40	
Fluorene	ND	0.02	ug/g dry	ND				40	
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g dry	ND				40	
1-Methylnaphthalene	ND	0.02	ug/g dry	ND				40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND				40	
Naphthalene	ND	0.01	ug/g dry	ND				40	
Phenanthrene	ND	0.02	ug/g dry	ND				40	
Pyrene	ND	0.02	ug/g dry	ND			0.0	40	
Surrogate: 2-Fluorobiphenyl	*1.28*		*ug/g dry*		*90.8*	*50-140*			
Surrogate: Terphenyl-d14	*1.42*		*ug/g dry*		*100*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*4.09*		*ug/g dry*		*110*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	189	7	ug/g		94.7	80-120			
F2 PHCs (C10-C16)	103	4	ug/g	ND	125	60-140			
F3 PHCs (C16-C34)	254	8	ug/g	11	120	60-140			
F4 PHCs (C34-C50)	183	6	ug/g	36	115	60-140			
Metals									
Antimony	39.3		ug/L	ND	78.5	70-130			
Arsenic	51.7		ug/L	2.9	97.5	70-130			
Barium	83.2		ug/L	34.0	98.5	70-130			
Beryllium	46.5		ug/L	ND	92.5	70-130			
Boron	49.1		ug/L	7.7	82.7	70-130			
Cadmium	47.8		ug/L	ND	95.3	70-130			
Chromium (VI)	0.1		mg/L	ND	55.0	70-130			QM-05
Chromium	59.4		ug/L	9.7	99.4	70-130			
Cobalt	50.1		ug/L	3.1	94.1	70-130			
Copper	55.4		ug/L	8.1	94.5	70-130			
Lead	51.3		ug/L	5.8	91.1	70-130			
Mercury	1.43	0.1	ug/g	ND	95.4	70-130			
Molybdenum	47.7		ug/L	ND	93.9	70-130			
Nickel	56.3		ug/L	9.1	94.3	70-130			
Selenium	46.6		ug/L	ND	92.9	70-130			
Silver	43.9		ug/L	ND	87.7	70-130			
Thallium	46.2		ug/L	ND	92.1	70-130			
Uranium	48.0		ug/L	ND	95.2	70-130			
Vanadium	64.6		ug/L	15.1	98.9	70-130			
Zinc	72.9		ug/L	27.3	91.2	70-130			
Semi-Volatiles									
Acenaphthene	0.169	0.02	ug/g	ND	95.7	50-140			
Acenaphthylene	0.141	0.02	ug/g	ND	80.0	50-140			
Anthracene	0.146	0.02	ug/g	ND	82.8	50-140			
Benzo [a] anthracene	0.137	0.02	ug/g	ND	77.8	50-140			
Benzo [a] pyrene	0.131	0.02	ug/g	ND	74.2	50-140			
Benzo [b] fluoranthene	0.212	0.02	ug/g	ND	120	50-140			
Benzo [g,h,i] perylene	0.154	0.02	ug/g	ND	87.1	50-140			
Benzo [k] fluoranthene	0.188	0.02	ug/g	ND	107	50-140			
Chrysene	0.166	0.02	ug/g	ND	94.1	50-140			
Dibenzo [a,h] anthracene	0.153	0.02	ug/g	ND	86.5	50-140			
Fluoranthene	0.167	0.02	ug/g	ND	94.5	50-140			
Fluorene	0.163	0.02	ug/g	ND	92.3	50-140			
Indeno [1,2,3-cd] pyrene	0.157	0.02	ug/g	ND	88.8	50-140			
1-Methylnaphthalene	0.166	0.02	ug/g	ND	94.1	50-140			
2-Methylnaphthalene	0.183	0.02	ug/g	ND	104	50-140			
Naphthalene	0.152	0.01	ug/g	ND	86.3	50-140			
Phenanthrene	0.156	0.02	ug/g	ND	88.3	50-140			
Pyrene	0.173	0.02	ug/g	ND	98.0	50-140			
Surrogate: 2-Fluorobiphenyl	*1.41*		*ug/g*		*99.9*	*50-140*			
Volatiles									
Benzene	3.33	0.02	ug/g		83.3	60-130			
Ethylbenzene	3.68	0.05	ug/g		91.9	60-130			
Toluene	3.84	0.05	ug/g		96.1	60-130			
m,p-Xylenes	8.33	0.05	ug/g		104	60-130			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
o-Xylene	4.01	0.05	ug/g		100	60-130			

Qualifier Notes:

QC Qualifiers :

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

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

Paracel ID: 1931109

PARACEL LABORATORIES LTD. | TR RE RE

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awa, Ontario K1G 4J8
-800-749-1947
aracel@paracellabs.com

Chain of Custody (Lab Use Only) № 122870

Page 1 of 1

Client Name: Paterson	Project Reference: PE 4689
Contact Name: Mark D'Arcy	Quote #
Address:	PO # 27053
Telephone: 613 -	Email Address: mdarcy@patersongroup.ca

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

Date Required:

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

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

Paracel Order Number: 1931109

Required Analyses

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)							
1	TP1 - G4	S		2	July 25/19		✓		✓	✓	✓	✓				250ml + 1 vial				
2	TP4 - G4	S		2	July 25/19		✓		✓	✓	✓	✓				↓				
3	TP6 - G2	S		2	July 25/19		✓		✓	✓	✓	✓								
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Paracel

Relinquished By (Sign): [signature]	Received by Driver/Depot: M. Trouse	Received at Lab: Suneeporn Dokmai	Verified By: Samuel
Relinquished By (Print): Samuel Berube	Date/Time: 29/07/19 3:10	Date/Time: July 29, 2019 04:30	Date/Time: 07/29/19 17:51
Date/Time: July 29/2019 3:18 PM	Temperature: °C AH	Temperature: 17.9 °C	pH Verified [ ] By: NA

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 27054
Project: PE4689
Custody: 122871

Report Date: 2-Aug-2019
Order Date: 30-Jul-2019

Revised Report

Order #: 1931173

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

Paracel ID	Client ID
1931173-01	TP9-G1
1931173-02	TP10-G2
1931173-03	TP13-G1

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 02-Aug-2019

Client: Paterson Group Consulting Engineers

Order Date: 30-Jul-2019

Client PO: 27054

Project Description: PE4689

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Boron, available	MOE (HWE), EPA 200.7 - ICP-OES	31-Jul-19	31-Jul-19
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	31-Jul-19	1-Aug-19
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	30-Jul-19	1-Aug-19
Mercury by CVAA	EPA 7471B - CVAA, digestion	31-Jul-19	31-Jul-19
PHC F1	CWS Tier 1 - P&T GC-FID	31-Jul-19	1-Aug-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	30-Jul-19	1-Aug-19
REG 153: ABNs + PAHs, soil	based on SW-846 8270	30-Jul-19	1-Aug-19
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	1-Aug-19	1-Aug-19
Solids, %	Gravimetric, calculation	31-Jul-19	31-Jul-19

Certificate of Analysis

Report Date: 02-Aug-2019

Client: **Paterson Group Consulting Engineers**

Order Date: 30-Jul-2019

Client PO: **27054**

Project Description: **PE4689**

	Client ID:	TP9-G1	TP10-G2	TP13-G1	-
	Sample Date:	26-Jul-19 09:00	26-Jul-19 09:00	26-Jul-19 09:00	-
	Sample ID:	1931173-01	1931173-02	1931173-03	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	84.6	87.1	93.5	-
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Arsenic	1.0 ug/g dry	2.5	2.6	46.8	-
Barium	1.0 ug/g dry	107	95.7	90.3	-
Beryllium	0.5 ug/g dry	<0.5	<0.5	<0.5	-
Boron	5.0 ug/g dry	5.9	6.4	10.8	-
Boron, available	0.5 ug/g dry	<0.5	0.5	<0.5	-
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	-
Chromium	5.0 ug/g dry	28.1	22.1	49.6	-
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	-
Cobalt	1.0 ug/g dry	7.2	5.6	5.9	-
Copper	5.0 ug/g dry	14.8	14.8	81.9	-
Lead	1.0 ug/g dry	11.1	20.8	33.5	-
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	-
Molybdenum	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Nickel	5.0 ug/g dry	15.8	13.7	13.7	-
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	-
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Vanadium	10.0 ug/g dry	34.2	26.3	28.3	-
Zinc	20.0 ug/g dry	55.3	54.8	244	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	-
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Toluene-d8	Surrogate	103%	103%	103%	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	-
F3 PHCs (C16-C34)	8 ug/g dry	31	33	77	-

Certificate of Analysis

Report Date: 02-Aug-2019

Client: **Paterson Group Consulting Engineers**

Order Date: 30-Jul-2019

Client PO: 27054

Project Description: PE4689

	Client ID:	TP9-G1	TP10-G2	TP13-G1	-
	Sample Date:	26-Jul-19 09:00	26-Jul-19 09:00	26-Jul-19 09:00	-
	Sample ID:	1931173-01	1931173-02	1931173-03	-
	MDL/Units	Soil	Soil	Soil	-
F4 PHCs (C34-C50)	6 ug/g dry	34	33	140	-
Semi-Volatiles					
1-Methylnaphthalene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
2-Methylnaphthalene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Methylnaphthalene (1&2)	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Acenaphthene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Acenaphthylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Anthracene	0.05 ug/g dry	<0.05	0.15	<0.05	-
Benzo [a] anthracene	0.05 ug/g dry	<0.05	0.12	<0.05	-
Benzo [a] pyrene	0.05 ug/g dry	0.05	0.11	<0.05	-
Benzo [b] fluoranthene	0.05 ug/g dry	<0.05	0.06	<0.05	-
Benzo [g,h,i] perylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Benzo [k] fluoranthene	0.05 ug/g dry	<0.05	0.06	<0.05	-
Chrysene	0.05 ug/g dry	<0.05	0.13	<0.05	-
Dibenzo [a,h] anthracene	0.10 ug/g dry	<0.10	<0.10	<0.10	-
Fluoranthene	0.05 ug/g dry	0.05	0.26	<0.05	-
Fluorene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Indeno [1,2,3-cd] pyrene	0.05 ug/g dry	<0.05	0.05	<0.05	-
Naphthalene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Phenanthrene	0.05 ug/g dry	<0.05	0.15	<0.05	-
Pyrene	0.05 ug/g dry	<0.05	0.20	<0.05	-
2-Fluorobiphenyl	Surrogate	51.6%	53.2%	45.5%	-
Terphenyl-d14	Surrogate	61.4%	59.0%	55.9%	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron, available	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									
1,2,4-Trichlorobenzene	ND	0.05	ug/g						
1-Methylnaphthalene	ND	0.05	ug/g						
2-Methylnaphthalene	ND	0.05	ug/g						
Methylnaphthalene (1&2)	ND	0.05	ug/g						
2,4-Dinitrotoluene	ND	0.10	ug/g						
2,6-Dinitrotoluene	ND	0.10	ug/g						
Dinitrotoluene (2,4 & 2,6)	ND	0.20	ug/g						
3,3-Dichlorobenzidine	ND	0.10	ug/g						
4-Chloroaniline	ND	0.10	ug/g						
Acenaphthene	ND	0.05	ug/g						
Acenaphthylene	ND	0.05	ug/g						
Anthracene	ND	0.05	ug/g						
Benzo [a] anthracene	ND	0.05	ug/g						
Benzo [a] pyrene	ND	0.05	ug/g						
Benzo [b] fluoranthene	ND	0.05	ug/g						
Benzo [g,h,i] perylene	ND	0.05	ug/g						
Benzo [k] fluoranthene	ND	0.05	ug/g						
Biphenyl	ND	0.05	ug/g						
Bis(2-chloroethyl)ether	ND	0.10	ug/g						
Bis(2-chloroisopropyl)ether	ND	0.10	ug/g						
Bis(2-ethylhexyl)phthalate	ND	0.10	ug/g						
Chrysene	ND	0.05	ug/g						
Diethylphthalate	ND	0.10	ug/g						
Dimethylphthalate	ND	0.10	ug/g						
Dibenzo [a,h] anthracene	ND	0.10	ug/g						
Fluoranthene	ND	0.05	ug/g						
Fluorene	ND	0.05	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.05	ug/g						
Naphthalene	ND	0.05	ug/g						
Phenanthrene	ND	0.05	ug/g						
Pyrene	ND	0.05	ug/g						
2,4,5-Trichlorophenol	ND	0.10	ug/g						

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
2,4,6-Trichlorophenol	ND	0.10	ug/g						
2,4-Dichlorophenol	ND	0.10	ug/g						
2,4-Dimethylphenol	ND	0.10	ug/g						
2,4-Dinitrophenol	ND	0.10	ug/g						
2-Chlorophenol	ND	0.10	ug/g						
Pentachlorophenol	ND	0.10	ug/g						
Phenol	ND	0.10	ug/g						
Surrogate: 2-Fluorobiphenyl	*0.402*		*ug/g*		*60.3*	*50-140*			
Surrogate: Nitrobenzene-d5	*0.734*		*ug/g*		*110*	*50-140*			
Surrogate: Terphenyl-d14	*0.514*		*ug/g*		*77.1*	*50-140*			
Surrogate: 2,4,6-Tribromophenol	*0.909*		*ug/g*		*68.2*	*50-140*			
Surrogate: 2-Fluorophenol	*0.761*		*ug/g*		*57.1*	*50-140*			
Surrogate: Phenol-d6	*1.20*		*ug/g*		*89.6*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*8.15*		*ug/g*		*102*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	484	4	ug/g dry	406			17.7	30	
F3 PHCs (C16-C34)	5730	8	ug/g dry	3620			45.2	30	QR-04
F4 PHCs (C34-C50)	302	6	ug/g dry	239			23.4	30	
Metals									
Antimony	1.9	1.0	ug/g dry	ND			0.0	30	
Arsenic	6.4	1.0	ug/g dry	6.3			0.5	30	
Barium	73.3	1.0	ug/g dry	73.2			0.2	30	
Beryllium	0.7	0.5	ug/g dry	0.6			10.4	30	
Boron, available	ND	0.5	ug/g dry	ND			0.0	35	
Boron	12.3	5.0	ug/g dry	11.6			6.6	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	22.7	5.0	ug/g dry	23.6			3.6	30	
Cobalt	7.9	1.0	ug/g dry	8.1			2.3	30	
Copper	20.0	5.0	ug/g dry	20.2			1.0	30	
Lead	10.3	1.0	ug/g dry	10.5			1.5	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	30	
Molybdenum	2.4	1.0	ug/g dry	2.2			11.6	30	
Nickel	25.2	5.0	ug/g dry	26.4			4.4	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	1.6	1.0	ug/g dry	1.5			3.1	30	
Vanadium	29.8	10.0	ug/g dry	31.3			4.7	30	
Zinc	84.6	20.0	ug/g dry	86.1			1.8	30	
Physical Characteristics									
% Solids	68.6	0.1	% by Wt.	67.7			1.3	25	
Semi-Volatiles									
1,2,4-Trichlorobenzene	ND	0.05	ug/g dry	ND				40	
1-Methylnaphthalene	ND	0.05	ug/g dry	ND			0.0	40	
2-Methylnaphthalene	ND	0.05	ug/g dry	ND			0.0	40	
2,4-Dinitrotoluene	ND	0.10	ug/g dry	ND			0.0	40	
2,6-Dinitrotoluene	ND	0.10	ug/g dry	ND			0.0	40	
3,3-Dichlorobenzidine	ND	0.10	ug/g dry	ND			0.0	40	
Acenaphthene	ND	0.05	ug/g dry	ND			0.0	40	
Acenaphthylene	ND	0.05	ug/g dry	ND			0.0	40	
Anthracene	ND	0.05	ug/g dry	ND			0.0	40	
Benzo [a] anthracene	0.22	0.05	ug/g dry	0.17			25.4	40	
Benzo [a] pyrene	0.27	0.05	ug/g dry	0.21			25.1	40	
Benzo [b] fluoranthene	0.40	0.05	ug/g dry	0.34			16.7	40	
Benzo [g,h,i] perylene	0.19	0.05	ug/g dry	0.15			20.9	40	
Benzo [k] fluoranthene	0.17	0.05	ug/g dry	0.10			51.5	40	QR-01
Biphenyl	ND	0.05	ug/g dry	ND			0.0	40	
Bis(2-chloroethyl)ether	ND	0.10	ug/g dry	ND				40	
Bis(2-chloroisopropyl)ether	ND	0.10	ug/g dry	ND			0.0	40	
Bis(2-ethylhexyl)phthalate	ND	0.10	ug/g dry	ND			0.0	40	
Chrysene	0.24	0.05	ug/g dry	0.19			19.9	40	
Diethylphthalate	ND	0.10	ug/g dry	ND			0.0	40	
Dimethylphthalate	ND	0.10	ug/g dry	ND			0.0	40	
Dibenzo [a,h] anthracene	ND	0.10	ug/g dry	ND			0.0	40	
Fluoranthene	0.33	0.05	ug/g dry	0.25			27.5	40	
Fluorene	ND	0.05	ug/g dry	ND			0.0	40	
Indeno [1,2,3-cd] pyrene	ND	0.05	ug/g dry	0.14			0.0	40	
Naphthalene	ND	0.05	ug/g dry	ND			0.0	40	
Phenanthrene	0.17	0.05	ug/g dry	0.13			28.4	40	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Pyrene	0.32	0.05	ug/g dry	0.27			17.5	40	
2,4,5-Trichlorophenol	ND	0.10	ug/g dry	ND			0.0	40	
2,4,6-Trichlorophenol	ND	0.10	ug/g dry	ND			0.0	40	
2,4-Dichlorophenol	ND	0.10	ug/g dry	ND			0.0	40	
2,4-Dimethylphenol	ND	0.10	ug/g dry	ND			0.0	40	
2,4-Dinitrophenol	ND	0.10	ug/g dry	ND				40	
2-Chlorophenol	0.15	0.10	ug/g dry	ND			0.0	40	
Pentachlorophenol	ND	0.10	ug/g dry	ND			0.0	40	
Phenol	0.12	0.10	ug/g dry	ND			0.0	40	
Surrogate: 2-Fluorobiphenyl	*0.342*		*ug/g dry*		*48.0*	*50-140*			*S-04*
Surrogate: Nitrobenzene-d5	*0.778*		*ug/g dry*		*109*	*50-140*			
Surrogate: Terphenyl-d14	*0.415*		*ug/g dry*		*58.3*	*50-140*			
Surrogate: 2,4,6-Tribromophenol	*0.830*		*ug/g dry*		*58.2*	*50-140*			
Surrogate: 2-Fluorophenol	*0.384*		*ug/g dry*		*27.0*	*50-140*			*S-04*
Surrogate: Phenol-d6	*1.13*		*ug/g dry*		*79.0*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*8.94*		*ug/g dry*		*99.4*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	196	7	ug/g		98.2	80-120			
F2 PHCs (C10-C16)	87	4	ug/g		109	80-120			
F3 PHCs (C16-C34)	226	8	ug/g		115	80-120			
F4 PHCs (C34-C50)	384	6	ug/g	239	110	60-140			
Metals									
Antimony	39.1		ug/L	ND	77.9	70-130			
Arsenic	51.5		ug/L	2.5	98.0	70-130			
Barium	75.5		ug/L	29.3	92.5	70-130			
Beryllium	47.6		ug/L	ND	94.8	70-130			
Boron, available	3.58	0.5	ug/g	ND	71.7	70-122			
Boron	46.8		ug/L	ND	84.4	70-130			
Cadmium	47.8		ug/L	ND	95.4	70-130			
Chromium (VI)	0.2		mg/L	ND	86.0	70-130			
Chromium	59.0		ug/L	9.4	99.1	70-130			
Cobalt	50.2		ug/L	3.2	94.0	70-130			
Copper	56.1		ug/L	8.1	96.1	70-130			
Lead	48.2		ug/L	4.2	87.9	70-130			
Mercury	1.43	0.1	ug/g	ND	95.4	70-130			
Molybdenum	48.9		ug/L	ND	96.0	70-130			
Nickel	57.9		ug/L	10.5	94.8	70-130			
Selenium	47.4		ug/L	ND	94.3	70-130			
Silver	44.3		ug/L	ND	88.7	70-130			
Thallium	45.7		ug/L	ND	91.1	70-130			
Uranium	48.4		ug/L	ND	95.5	70-130			
Vanadium	60.9		ug/L	12.5	96.9	70-130			
Zinc	79.6		ug/L	34.4	90.2	70-130			
Semi-Volatiles									
1,2,4-Trichlorobenzene	0.35	0.05	ug/g	ND	98.2	50-140			
1-Methylnaphthalene	0.24	0.05	ug/g	ND	66.2	50-140			
2-Methylnaphthalene	0.25	0.05	ug/g	ND	69.4	50-140			
2,4-Dinitrotoluene	0.26	0.10	ug/g	ND	71.8	50-140			
2,6-Dinitrotoluene	0.35	0.10	ug/g	ND	99.0	50-140			
Acenaphthene	0.27	0.05	ug/g	ND	75.4	50-140			
Acenaphthylene	0.31	0.05	ug/g	ND	88.0	50-140			
Anthracene	0.48	0.05	ug/g	ND	136	50-140			
Benzo [a] anthracene	0.50	0.05	ug/g	0.17	90.2	50-140			
Benzo [a] pyrene	0.46	0.05	ug/g	0.21	69.6	50-140			
Benzo [b] fluoranthene	0.53	0.05	ug/g	0.34	54.3	50-140			
Benzo [g,h,i] perylene	0.39	0.05	ug/g	0.15	67.9	50-140			
Benzo [k] fluoranthene	0.44	0.05	ug/g	0.10	96.6	50-140			
Bis(2-chloroethyl)ether	0.50	0.10	ug/g	ND	140	50-140			
Bis(2-chloroisopropyl)ether	0.26	0.10	ug/g	ND	72.5	50-140			
Bis(2-ethylhexyl)phthalate	0.44	0.10	ug/g	ND	123	50-140			
Chrysene	0.49	0.05	ug/g	0.19	83.4	50-140			
Diethylphthalate	0.43	0.10	ug/g	ND	120	50-140			
Dimethylphthalate	0.28	0.10	ug/g	ND	77.2	50-140			
Dibenzo [a,h] anthracene	0.28	0.10	ug/g	ND	79.4	50-140			
Fluoranthene	0.57	0.05	ug/g	0.25	90.4	50-140			
Fluorene	0.33	0.05	ug/g	ND	91.3	50-140			
Indeno [1,2,3-cd] pyrene	0.36	0.05	ug/g	0.14	60.8	50-140			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Naphthalene	0.27	0.05	ug/g	ND	76.9	50-140			
Phenanthrene	0.46	0.05	ug/g	0.13	91.4	50-140			
Pyrene	0.59	0.05	ug/g	0.27	88.6	50-140			
2,4,5-Trichlorophenol	0.27	0.10	ug/g	ND	76.6	50-140			
2,4,6-Trichlorophenol	0.25	0.10	ug/g	ND	69.5	50-140			
2,4-Dimethylphenol	0.37	0.10	ug/g	ND	103	30-130			
2-Chlorophenol	0.35	0.10	ug/g	ND	99.4	50-140			
Pentachlorophenol	0.37	0.10	ug/g	ND	103	50-140			
Phenol	0.17	0.10	ug/g	ND	48.4	30-130			
Surrogate: 2-Fluorobiphenyl	*0.348*		*ug/g*		*48.8*	*50-140*			*S-04*
Volatiles									
Benzene	4.43	0.02	ug/g		111	60-130			
Ethylbenzene	4.54	0.05	ug/g		114	60-130			
Toluene	4.41	0.05	ug/g		110	60-130			
m,p-Xylenes	8.45	0.05	ug/g		106	60-130			
o-Xylene	4.56	0.05	ug/g		114	60-130			

Qualifier Notes:

QC Qualifiers :

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

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

S-04 : The surrogate recovery for this sample is outside of established control limits due to a sample matrix effect.

S-GC : Surrogate recovery outside of control limits. The data was accepted based on valid recovery of the remaining surrogate.

Sample Data Revisions

None

Work Order Revisions / Comments:

Revision 1 This report includes an updated parameter list.

Other Report Notes:

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

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

CCME PHC additional information:

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

Paracel ID: 1931173

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TRR

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Chain of Custody (Lab Use Only) № 122871

Page 1 of 1

Client Name: Paterson	Project Reference: PE4689	**Turnaround Time:**	
Contact Name: Mark D'Arcy	Quote #	☐ 1 Day	☐ 3 Day
Address:	PO # 27054	☑ 2 Day	☐ Regular
Telephone: 613-226-7381	Email Address: mdarcy@patersongroup.ca	Date Required:	

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

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

Paracel Order Number: 1931173

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Date	Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)							
1	TP9 - G1	S		2	July 26/19		✓		✓	✓	✓	✓				250ml + 1 vial				
2	TP10 - G2	S		2	July 26/19		✓		✓	✓	✓	✓								
3	TP13 - G1	S		2	July 26/19		✓		✓	✓	✓	✓				↓				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Paracel

Relinquished By (Sign): [signature]	Received by Driver/Depot: M. Krouse	Received at Lab: Suneeporn Dohmai	Verified By: D. Gam
Relinquished By (Print): Samuel Berube	Date/Time: 30/07/19 10:10 AM	Date/Time: Jul 30, 2019 12:50	Date/Time: 30 July/19 3:53
Date/Time:	Temperature: °C	Temperature: 19.9 °C	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 28264
Project: PE4689
Custody: 123237

Report Date: 24-Sep-2019
Order Date: 18-Sep-2019

Order #: 1938431

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

Paracel ID	Client ID
1938431-01	TP24-G1
1938431-02	TP25-G2

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 28264

Report Date: 24-Sep-2019
Order Date: 18-Sep-2019
Project Description: PE4689

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	23-Sep-19	24-Sep-19
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	20-Sep-19	24-Sep-19
Mercury by CVAA	EPA 7471B - CVAA, digestion	24-Sep-19	24-Sep-19
PHC F1	CWS Tier 1 - P&T GC-FID	23-Sep-19	24-Sep-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	19-Sep-19	23-Sep-19
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	24-Sep-19	24-Sep-19
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	19-Sep-19	24-Sep-19
Solids, %	Gravimetric, calculation	19-Sep-19	19-Sep-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 28264

Report Date: 24-Sep-2019

Order Date: 18-Sep-2019

Project Description: PE4689

	Client ID:	TP24-G1	TP25-G2	-	-
	Sample Date:	17-Sep-19 09:00	17-Sep-19 09:00	-	-
	Sample ID:	1938431-01	1938431-02	-	-
	MDL/Units	Soil	Soil	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	88.7	86.0	-	-
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	-	-
Arsenic	1.0 ug/g dry	2.1	1.8	-	-
Barium	1.0 ug/g dry	117	118	-	-
Beryllium	0.5 ug/g dry	<0.5	<0.5	-	-
Boron	5.0 ug/g dry	5.9	5.1	-	-
Cadmium	0.5 ug/g dry	<0.5	<0.5	-	-
Chromium	5.0 ug/g dry	25.4	32.0	-	-
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	-	-
Cobalt	1.0 ug/g dry	8.0	7.6	-	-
Copper	5.0 ug/g dry	21.0	17.9	-	-
Lead	1.0 ug/g dry	13.9	11.5	-	-
Mercury	0.1 ug/g dry	<0.1	<0.1	-	-
Molybdenum	1.0 ug/g dry	<1.0	<1.0	-	-
Nickel	5.0 ug/g dry	17.5	18.7	-	-
Selenium	1.0 ug/g dry	<1.0	<1.0	-	-
Silver	0.3 ug/g dry	<0.3	<0.3	-	-
Thallium	1.0 ug/g dry	<1.0	<1.0	-	-
Uranium	1.0 ug/g dry	<1.0	<1.0	-	-
Vanadium	10.0 ug/g dry	31.5	33.7	-	-
Zinc	20.0 ug/g dry	51.8	42.2	-	-
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	107%	107%	-	-
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	15	16	-	-
F4 PHCs (C34-C50)	6 ug/g dry	24	22	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 28264

Report Date: 24-Sep-2019

Order Date: 18-Sep-2019

Project Description: PE4689

	Client ID:	TP24-G1	TP25-G2	-	-
	Sample Date:	17-Sep-19 09:00	17-Sep-19 09:00	-	-
	Sample ID:	1938431-01	1938431-02	-	-
	MDL/Units	Soil	Soil	-	-
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	<0.02	<0.02	-	-
Acenaphthylene	0.02 ug/g dry	<0.02	0.05	-	-
Anthracene	0.02 ug/g dry	<0.02	0.05	-	-
Benzo [a] anthracene	0.02 ug/g dry	0.03	0.09	-	-
Benzo [a] pyrene	0.02 ug/g dry	0.02	0.10	-	-
Benzo [b] fluoranthene	0.02 ug/g dry	0.04	0.13	-	-
Benzo [g,h,i] perylene	0.02 ug/g dry	<0.02	0.05	-	-
Benzo [k] fluoranthene	0.02 ug/g dry	<0.02	0.06	-	-
Chrysene	0.02 ug/g dry	0.03	0.10	-	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	<0.02	<0.02	-	-
Fluoranthene	0.02 ug/g dry	0.05	0.17	-	-
Fluorene	0.02 ug/g dry	<0.02	<0.02	-	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	<0.02	0.05	-	-
1-Methylnaphthalene	0.02 ug/g dry	0.03	<0.02	-	-
2-Methylnaphthalene	0.02 ug/g dry	0.04	<0.02	-	-
Methylnaphthalene (1&2)	0.04 ug/g dry	0.07	<0.04	-	-
Naphthalene	0.01 ug/g dry	0.05	0.01	-	-
Phenanthrene	0.02 ug/g dry	0.04	0.09	-	-
Pyrene	0.02 ug/g dry	0.06	0.15	-	-
2-Fluorobiphenyl	Surrogate	105%	86.6%	-	-
Terphenyl-d14	Surrogate	93.1%	87.8%	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	*1.19*		*ug/g*		*88.9*	*50-140*			
Surrogate: Terphenyl-d14	*1.42*		*ug/g*		*106*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*2.58*		*ug/g*		*80.5*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	14	4	ug/g dry	17			21.7	30	
F3 PHCs (C16-C34)	49	8	ug/g dry	140			96.0	30	QR-04
F4 PHCs (C34-C50)	57	6	ug/g dry	370			147.0	30	QR-04
Metals									
Antimony	ND	1.0	ug/g dry	ND			0.0	30	
Arsenic	7.8	1.0	ug/g dry	8.0			2.3	30	
Barium	96.7	1.0	ug/g dry	96.2			0.5	30	
Beryllium	0.8	0.5	ug/g dry	0.8			7.2	30	
Boron	11.4	5.0	ug/g dry	9.5			18.1	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	22.5	5.0	ug/g dry	22.7			0.8	30	
Cobalt	12.6	1.0	ug/g dry	12.8			1.4	30	
Copper	16.1	5.0	ug/g dry	16.4			1.8	30	
Lead	17.4	1.0	ug/g dry	17.3			0.4	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	30	
Molybdenum	3.1	1.0	ug/g dry	2.8			11.1	30	
Nickel	22.3	5.0	ug/g dry	22.5			1.1	30	
Selenium	ND	1.0	ug/g dry	ND			0.0	30	
Silver	0.3	0.3	ug/g dry	ND			0.0	30	
Thallium	ND	1.0	ug/g dry	ND			0.0	30	
Uranium	1.4	1.0	ug/g dry	1.4			2.3	30	
Vanadium	38.2	10.0	ug/g dry	38.9			1.8	30	
Zinc	72.0	20.0	ug/g dry	73.7			2.3	30	
Physical Characteristics									
% Solids	91.7	0.1	% by Wt.	91.4			0.3	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	ND				40	
Acenaphthylene	ND	0.02	ug/g dry	ND			0.0	40	
Anthracene	ND	0.02	ug/g dry	ND			0.0	40	
Benzo [a] anthracene	ND	0.02	ug/g dry	ND			0.0	40	
Benzo [a] pyrene	ND	0.02	ug/g dry	ND			0.0	40	
Benzo [b] fluoranthene	0.022	0.02	ug/g dry	0.022			0.2	40	
Benzo [g,h,i] perylene	ND	0.02	ug/g dry	ND			0.0	40	
Benzo [k] fluoranthene	ND	0.02	ug/g dry	ND			0.0	40	
Chrysene	0.022	0.02	ug/g dry	0.022			1.9	40	
Dibenzo [a,h] anthracene	ND	0.02	ug/g dry	ND				40	
Fluoranthene	0.031	0.02	ug/g dry	0.033			8.3	40	
Fluorene	ND	0.02	ug/g dry	ND				40	
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g dry	ND			0.0	40	
1-Methylnaphthalene	ND	0.02	ug/g dry	ND			0.0	40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND			0.0	40	
Naphthalene	0.011	0.01	ug/g dry	ND			0.0	40	
Phenanthrene	0.022	0.02	ug/g dry	0.024			8.8	40	
Pyrene	0.030	0.02	ug/g dry	0.033			7.3	40	
Surrogate: 2-Fluorobiphenyl	*1.24*		*ug/g dry*		*82.5*	*50-140*			
Surrogate: Terphenyl-d14	*1.29*		*ug/g dry*		*86.0*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*3.80*		*ug/g dry*		*106*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	191	7	ug/g		95.5	80-120			
F2 PHCs (C10-C16)	84	4	ug/g		105	80-120			
F3 PHCs (C16-C34)	226	8	ug/g		115	80-120			
F4 PHCs (C34-C50)	148	6	ug/g		119	80-120			
Metals									
Antimony	100	1.0	ug/g	ND	80.3	70-130			
Arsenic	137	1.0	ug/g	8.0	103	70-130			
Barium	224	1.0	ug/g	96.2	102	70-130			
Beryllium	120	0.5	ug/g	0.8	95.3	70-130			
Boron	126	5.0	ug/g	9.5	93.2	70-130			
Cadmium	126	0.5	ug/g	ND	101	70-130			
Chromium (VI)	5.9	0.2	ug/g	ND	97.5	70-130			
Chromium	144	5.0	ug/g	22.7	96.8	70-130			
Cobalt	133	1.0	ug/g	12.8	96.2	70-130			
Copper	138	5.0	ug/g	16.4	97.2	70-130			
Lead	141	1.0	ug/g	17.3	99.0	70-130			
Mercury	1.28	0.1	ug/g	ND	85.0	70-130			
Molybdenum	128	1.0	ug/g	2.8	100	70-130			
Nickel	146	5.0	ug/g	22.5	98.8	70-130			
Selenium	131	1.0	ug/g	ND	105	70-130			
Silver	111	0.3	ug/g	ND	89.0	70-130			
Thallium	122	1.0	ug/g	ND	97.8	70-130			
Uranium	131	1.0	ug/g	1.4	103	70-130			
Vanadium	160	10.0	ug/g	38.9	97.3	70-130			
Zinc	197	20.0	ug/g	73.7	98.7	70-130			
Semi-Volatiles									
Acenaphthene	0.151	0.02	ug/g	ND	80.3	50-140			
Acenaphthylene	0.160	0.02	ug/g	ND	85.3	50-140			
Anthracene	0.163	0.02	ug/g	ND	86.9	50-140			
Benzo [a] anthracene	0.186	0.02	ug/g	ND	99.1	50-140			
Benzo [a] pyrene	0.175	0.02	ug/g	ND	93.1	50-140			
Benzo [b] fluoranthene	0.210	0.02	ug/g	0.022	99.9	50-140			
Benzo [g,h,i] perylene	0.162	0.02	ug/g	ND	86.6	50-140			
Benzo [k] fluoranthene	0.215	0.02	ug/g	ND	115	50-140			
Chrysene	0.235	0.02	ug/g	0.022	114	50-140			
Dibenzo [a,h] anthracene	0.148	0.02	ug/g	ND	79.0	50-140			
Fluoranthene	0.189	0.02	ug/g	0.033	83.3	50-140			
Fluorene	0.167	0.02	ug/g	ND	89.1	50-140			
Indeno [1,2,3-cd] pyrene	0.118	0.02	ug/g	ND	63.1	50-140			
1-Methylnaphthalene	0.175	0.02	ug/g	ND	93.1	50-140			
2-Methylnaphthalene	0.188	0.02	ug/g	ND	100	50-140			
Naphthalene	0.166	0.01	ug/g	ND	88.4	50-140			
Phenanthrene	0.177	0.02	ug/g	0.024	81.5	50-140			
Pyrene	0.208	0.02	ug/g	0.033	93.3	50-140			
Surrogate: 2-Fluorobiphenyl	*1.14*		*ug/g*		*76.2*	*50-140*			
Volatiles									
Benzene	3.48	0.02	ug/g		87.1	60-130			
Ethylbenzene	4.48	0.05	ug/g		112	60-130			
Toluene	4.67	0.05	ug/g		117	60-130			
m,p-Xylenes	8.74	0.05	ug/g		109	60-130			

Method Quality Control: Spike

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

Qualifier Notes:

QC Qualifiers :

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

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

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Chain of Custody
(Lab Use Only)
№ 123237

Page 1 of 1

Client Name: Paterson	Project Reference: PE 4689
Contact Name: Mark D'Arcy	Quote #
Address: 154 Colonnade Rd S	PO # 28264
	Email Address: mdarcy@patersongroup.ca
Telephone: 613-226-7381	

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

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

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

Paracel Order Number: 1938431

Required Analyses

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)							
1	TP24 - G1	S		3	Sep 17/2019		✓		✓	✓	✓	✓								/
2	TP25 - G2	S		3	Sep 17/2019		✓		✓	✓	✓	✓								/
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Paracel

Relinquished By (Sign): [signature]	Received by Driver/Depot: [signature]	Received at Lab: Sunnaparm Dohmai	Verified By: [signature]
Relinquished By (Print): Samuel Berubé	Date/Time: 18/09/19 4:30 PM	Date/Time: Sep 18, 2019 05:40	Date/Time: 09-19-19 10:55
Date/Time:	Temperature: °C	Temperature: 12.2 °C	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 27045
Project: PE4689
Custody: 122862

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

Order #: 1930600

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

Paracel ID	Client ID
1930600-01	BH1 - GW1
1930600-02	BH2 - GW1
1930600-03	BH3 - GW1
1930600-04	BH4 - GW1
1930600-05	BH6 - GW1
1930600-06	BH7 - GW1

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27045

Report Date: 31-Jul-2019

Order Date: 25-Jul-2019

Project Description: PE4689

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	29-Jul-19	29-Jul-19
Chromium, hexavalent - water	MOE E3056 - colourimetric	29-Jul-19	29-Jul-19
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	26-Jul-19	31-Jul-19
Metals, ICP-MS	EPA 200.8 - ICP-MS	29-Jul-19	29-Jul-19
PHC F1	CWS Tier 1 - P&T GC-FID	27-Jul-19	29-Jul-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	26-Jul-19	27-Jul-19
REG 153: PAHs by GC-MS	EPA 625 - GC-MS, extraction	26-Jul-19	26-Jul-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27045

Report Date: 31-Jul-2019

Order Date: 25-Jul-2019

Project Description: PE4689

	Client ID:	BH1 - GW1	BH2 - GW1	BH3 - GW1	BH4 - GW1
	Sample Date:	24-Jul-19 09:00	24-Jul-19 15:00	24-Jul-19 15:00	24-Jul-19 09:00
	Sample ID:	1930600-01	1930600-02	1930600-03	1930600-04
	MDL/Units	Water	Water	Water	Water
Metals					
Mercury	0.1 ug/L	<0.1	-	-	<0.1
Antimony	0.5 ug/L	<0.5	-	-	<0.5
Arsenic	1 ug/L	<1	-	-	4
Barium	1 ug/L	112	-	-	361
Beryllium	0.5 ug/L	<0.5	-	-	<0.5
Boron	10 ug/L	133	-	-	67
Cadmium	0.1 ug/L	<0.1	-	-	<0.1
Chromium	1 ug/L	<1	-	-	<1
Chromium (VI)	10 ug/L	<10	-	-	<10
Cobalt	0.5 ug/L	17.2	-	-	0.8
Copper	0.5 ug/L	<0.5	-	-	<0.5
Lead	0.1 ug/L	<0.1	-	-	<0.1
Molybdenum	0.5 ug/L	60.4	-	-	4.9
Nickel	1 ug/L	9	-	-	3
Selenium	1 ug/L	<1	-	-	<1
Silver	0.1 ug/L	<0.1	-	-	<0.1
Sodium	200 ug/L	1300000	-	-	1290000
Thallium	0.1 ug/L	<0.1	-	-	<0.1
Uranium	0.1 ug/L	11.4	-	-	1.3
Vanadium	0.5 ug/L	<0.5	-	-	3.3
Zinc	5 ug/L	<5	-	-	<5
Volatiles					
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Toluene-d8	Surrogate	94.0%	93.7%	91.6%	93.9%
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	<25	<25
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	<100
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	<100
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	<100
Semi-Volatiles					

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27045

Report Date: 31-Jul-2019

Order Date: 25-Jul-2019

Project Description: PE4689

	Client ID:	BH1 - GW1	BH2 - GW1	BH3 - GW1	BH4 - GW1
	Sample Date:	24-Jul-19 09:00	24-Jul-19 15:00	24-Jul-19 15:00	24-Jul-19 09:00
	Sample ID:	1930600-01	1930600-02	1930600-03	1930600-04
	MDL/Units	Water	Water	Water	Water
Acenaphthene	0.05 ug/L	<0.05	-	-	3.20
Acenaphthylene	0.05 ug/L	<0.05	-	-	1.37
Anthracene	0.01 ug/L	0.12	-	-	0.83
Benzo [a] anthracene	0.01 ug/L	0.23	-	-	0.04
Benzo [a] pyrene	0.01 ug/L	0.19	-	-	<0.01
Benzo [b] fluoranthene	0.05 ug/L	0.24	-	-	<0.05
Benzo [g,h,i] perylene	0.05 ug/L	0.12	-	-	<0.05
Benzo [k] fluoranthene	0.05 ug/L	0.11	-	-	<0.05
Chrysene	0.05 ug/L	0.24	-	-	<0.05
Dibenzo [a,h] anthracene	0.05 ug/L	<0.05	-	-	<0.05
Fluoranthene	0.01 ug/L	0.49	-	-	0.51
Fluorene	0.05 ug/L	<0.05	-	-	3.66
Indeno [1,2,3-cd] pyrene	0.05 ug/L	0.09	-	-	<0.05
1-Methylnaphthalene	0.05 ug/L	<0.05	-	-	3.83
2-Methylnaphthalene	0.05 ug/L	<0.05	-	-	5.95
Methylnaphthalene (1&2)	0.10 ug/L	<0.10	-	-	9.78
Naphthalene	0.05 ug/L	<0.05	-	-	40.2
Phenanthrene	0.05 ug/L	0.30	-	-	3.99
Pyrene	0.01 ug/L	0.41	-	-	0.30
2-Fluorobiphenyl	Surrogate	101%	-	-	87.7%
Terphenyl-d14	Surrogate	113%	-	-	93.6%

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27045

Report Date: 31-Jul-2019

Order Date: 25-Jul-2019

Project Description: PE4689

	Client ID:	BH6 - GW1	BH7 - GW1	-	-
	Sample Date:	24-Jul-19 12:00	24-Jul-19 11:00	-	-
	Sample ID:	1930600-05	1930600-06	-	-
	MDL/Units	Water	Water	-	-
Metals					
Mercury	0.1 ug/L	<0.1	-	-	-
Antimony	0.5 ug/L	<0.5	-	-	-
Arsenic	1 ug/L	1	-	-	-
Barium	1 ug/L	111	-	-	-
Beryllium	0.5 ug/L	<0.5	-	-	-
Boron	10 ug/L	17	-	-	-
Cadmium	0.1 ug/L	<0.1	-	-	-
Chromium	1 ug/L	<1	-	-	-
Chromium (VI)	10 ug/L	<10	-	-	-
Cobalt	0.5 ug/L	0.9	-	-	-
Copper	0.5 ug/L	2.8	-	-	-
Lead	0.1 ug/L	<0.1	-	-	-
Molybdenum	0.5 ug/L	14.7	-	-	-
Nickel	1 ug/L	<1	-	-	-
Selenium	1 ug/L	<1	-	-	-
Silver	0.1 ug/L	<0.1	-	-	-
Sodium	200 ug/L	101000	-	-	-
Thallium	0.1 ug/L	<0.1	-	-	-
Uranium	0.1 ug/L	0.7	-	-	-
Vanadium	0.5 ug/L	0.9	-	-	-
Zinc	5 ug/L	<5	-	-	-
Volatiles					
Benzene	0.5 ug/L	<0.5	<0.5	-	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	-	-
Toluene	0.5 ug/L	<0.5	<0.5	-	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	-	-
o-Xylene	0.5 ug/L	<0.5	<0.5	-	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	-	-
Toluene-d8	Surrogate	94.5%	92.3%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	-	-
F2 PHCs (C10-C16)	100 ug/L	<100	<100	-	-
F3 PHCs (C16-C34)	100 ug/L	<100	<100	-	-
F4 PHCs (C34-C50)	100 ug/L	<100	<100	-	-
Semi-Volatiles					

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27045

Report Date: 31-Jul-2019

Order Date: 25-Jul-2019

Project Description: PE4689

	Client ID:	BH6 - GW1	BH7 - GW1	-	-
	Sample Date:	24-Jul-19 12:00	24-Jul-19 11:00	-	-
	Sample ID:	1930600-05	1930600-06	-	-
	MDL/Units	Water	Water	-	-
Acenaphthene	0.05 ug/L	<0.05	<0.05	-	-
Acenaphthylene	0.05 ug/L	<0.05	<0.05	-	-
Anthracene	0.01 ug/L	<0.01	<0.01	-	-
Benzo [a] anthracene	0.01 ug/L	<0.01	<0.01	-	-
Benzo [a] pyrene	0.01 ug/L	<0.01	<0.01	-	-
Benzo [b] fluoranthene	0.05 ug/L	<0.05	<0.05	-	-
Benzo [g,h,i] perylene	0.05 ug/L	<0.05	<0.05	-	-
Benzo [k] fluoranthene	0.05 ug/L	<0.05	<0.05	-	-
Chrysene	0.05 ug/L	<0.05	<0.05	-	-
Dibenzo [a,h] anthracene	0.05 ug/L	<0.05	<0.05	-	-
Fluoranthene	0.01 ug/L	<0.01	<0.01	-	-
Fluorene	0.05 ug/L	<0.05	<0.05	-	-
Indeno [1,2,3-cd] pyrene	0.05 ug/L	<0.05	<0.05	-	-
1-Methylnaphthalene	0.05 ug/L	<0.05	<0.05	-	-
2-Methylnaphthalene	0.05 ug/L	<0.05	<0.05	-	-
Methylnaphthalene (1&2)	0.10 ug/L	<0.10	<0.10	-	-
Naphthalene	0.05 ug/L	<0.05	<0.05	-	-
Phenanthrene	0.05 ug/L	<0.05	<0.05	-	-
Pyrene	0.01 ug/L	<0.01	<0.01	-	-
2-Fluorobiphenyl	Surrogate	96.4%	74.7%	-	-
Terphenyl-d14	Surrogate	107%	103%	-	-

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						
Metals									
Mercury	ND	0.1	ug/L						
Antimony	ND	0.5	ug/L						
Arsenic	ND	1	ug/L						
Barium	ND	1	ug/L						
Beryllium	ND	0.5	ug/L						
Boron	ND	10	ug/L						
Cadmium	ND	0.1	ug/L						
Chromium (VI)	ND	10	ug/L						
Chromium	ND	1	ug/L						
Cobalt	ND	0.5	ug/L						
Copper	ND	0.5	ug/L						
Lead	ND	0.1	ug/L						
Molybdenum	ND	0.5	ug/L						
Nickel	ND	1	ug/L						
Selenium	ND	1	ug/L						
Silver	ND	0.1	ug/L						
Sodium	ND	200	ug/L						
Thallium	ND	0.1	ug/L						
Uranium	ND	0.1	ug/L						
Vanadium	ND	0.5	ug/L						
Zinc	ND	5	ug/L						
Semi-Volatiles									
Acenaphthene	ND	0.05	ug/L						
Acenaphthylene	ND	0.05	ug/L						
Anthracene	ND	0.01	ug/L						
Benzo [a] anthracene	ND	0.01	ug/L						
Benzo [a] pyrene	ND	0.01	ug/L						
Benzo [b] fluoranthene	ND	0.05	ug/L						
Benzo [g,h,i] perylene	ND	0.05	ug/L						
Benzo [k] fluoranthene	ND	0.05	ug/L						
Chrysene	ND	0.05	ug/L						
Dibenzo [a,h] anthracene	ND	0.05	ug/L						
Fluoranthene	ND	0.01	ug/L						
Fluorene	ND	0.05	ug/L						
Indeno [1,2,3-cd] pyrene	ND	0.05	ug/L						
1-Methylnaphthalene	ND	0.05	ug/L						
2-Methylnaphthalene	ND	0.05	ug/L						
Methylnaphthalene (1&2)	ND	0.10	ug/L						
Naphthalene	ND	0.05	ug/L						
Phenanthrene	ND	0.05	ug/L						
Pyrene	ND	0.01	ug/L						
Surrogate: 2-Fluorobiphenyl	*19.6*		*ug/L*		*97.9*	*50-140*			
Surrogate: Terphenyl-d14	*22.8*		*ug/L*		*114*	*50-140*			
Volatiles									
Benzene	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: Toluene-d8	*76.8*		*ug/L*		*96.0*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Metals									
Mercury	0.65	0.1	ug/L	0.80			21.4	20	QR-01
Antimony	ND	0.5	ug/L	ND			0.0	20	
Arsenic	ND	1	ug/L	ND			0.0	20	
Barium	106	1	ug/L	112			6.2	20	
Beryllium	ND	0.5	ug/L	ND			0.0	20	
Boron	137	10	ug/L	133			3.2	20	
Cadmium	ND	0.1	ug/L	ND			0.0	20	
Chromium (VI)	ND	10	ug/L	ND			0.0	20	
Chromium	ND	1	ug/L	ND			0.0	20	
Cobalt	16.9	0.5	ug/L	17.2			1.3	20	
Copper	ND	0.5	ug/L	ND			0.0	20	
Lead	ND	0.1	ug/L	ND			0.0	20	
Molybdenum	60.9	0.5	ug/L	60.4			0.8	20	
Nickel	9.3	1	ug/L	9.4			1.1	20	
Selenium	ND	1	ug/L	ND			0.0	20	
Silver	ND	0.1	ug/L	ND			0.0	20	
Thallium	ND	0.1	ug/L	ND			0.0	20	
Uranium	11.3	0.1	ug/L	11.4			0.8	20	
Vanadium	ND	0.5	ug/L	ND			0.0	20	
Zinc	ND	5	ug/L	ND			0.0	20	
Volatiles									
Benzene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: Toluene-d8	*80.3*		*ug/L*		*100*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	2070	25	ug/L		104	68-117			
F2 PHCs (C10-C16)	1900	100	ug/L		119	60-140			
F3 PHCs (C16-C34)	4690	100	ug/L		120	60-140			
F4 PHCs (C34-C50)	2690	100	ug/L		109	60-140			
Metals									
Mercury	4.53	0.1	ug/L	0.80	124	70-130			
Antimony	41.2		ug/L	ND	82.0	80-120			
Arsenic	49.5		ug/L	ND	98.4	80-120			
Barium	148		ug/L	112	71.7	80-120			QM-07
Beryllium	38.2		ug/L	ND	76.3	80-120			QM-07
Boron	164		ug/L	133	61.1	80-120			QM-07
Cadmium	43.0		ug/L	ND	85.9	80-120			
Chromium (VI)	153	10	ug/L	ND	76.5	70-130			
Chromium	53.5		ug/L	ND	107	80-120			
Cobalt	65.8		ug/L	17.2	97.3	80-120			
Copper	45.1		ug/L	ND	89.5	80-120			
Lead	29.6		ug/L	ND	59.2	80-120			QM-07
Molybdenum	107		ug/L	60.4	93.3	80-120			
Nickel	55.1		ug/L	9.4	91.3	80-120			
Selenium	43.3		ug/L	ND	86.4	80-120			
Silver	38.5		ug/L	ND	76.9	80-120			QM-07
Thallium	44.7		ug/L	ND	89.4	80-120			
Uranium	48.1		ug/L	11.4	73.4	80-120			QM-07
Vanadium	54.3		ug/L	ND	108	80-120			
Zinc	39		ug/L	ND	73.7	80-120			QM-07
Semi-Volatiles									
Acenaphthene	4.68	0.05	ug/L		93.6	50-140			
Acenaphthylene	4.18	0.05	ug/L		83.7	50-140			
Anthracene	4.93	0.01	ug/L		98.7	50-140			
Benzo [a] anthracene	5.14	0.01	ug/L		103	50-140			
Benzo [a] pyrene	4.11	0.01	ug/L		82.2	50-140			
Benzo [b] fluoranthene	6.57	0.05	ug/L		131	50-140			
Benzo [g,h,i] perylene	4.15	0.05	ug/L		82.9	50-140			
Benzo [k] fluoranthene	5.96	0.05	ug/L		119	50-140			
Chrysene	5.29	0.05	ug/L		106	50-140			
Dibenzo [a,h] anthracene	3.97	0.05	ug/L		79.5	50-140			
Fluoranthene	4.45	0.01	ug/L		88.9	50-140			
Fluorene	3.99	0.05	ug/L		79.7	50-140			
Indeno [1,2,3-cd] pyrene	4.29	0.05	ug/L		85.9	50-140			
1-Methylnaphthalene	5.83	0.05	ug/L		117	50-140			
2-Methylnaphthalene	6.38	0.05	ug/L		128	50-140			
Naphthalene	4.97	0.05	ug/L		99.4	50-140			
Phenanthrene	4.93	0.05	ug/L		98.6	50-140			
Pyrene	5.22	0.01	ug/L		104	50-140			
Surrogate: 2-Fluorobiphenyl	*23.2*		*ug/L*		*116*	*50-140*			
Volatiles									
Benzene	41.4	0.5	ug/L		103	60-130			
Ethylbenzene	29.1	0.5	ug/L		72.7	60-130			
Toluene	46.6	0.5	ug/L		116	60-130			
m,p-Xylenes	59.8	0.5	ug/L		74.8	60-130			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
o-Xylene	33.8	0.5	ug/L		84.4	60-130			

Qualifier Notes:

QC Qualifiers :

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

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

QS-02 : Spike level outside of control limits. Analysis batch accepted based on other QC included in the batch.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

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

Paracel ID: 1930600

PARACEL LABORATORIES LTD.

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Chain of Custody
(Lab Use Only)
№ 122862

Page 1 of 1

Client Name: Paterson Group	Project Reference: PE4689
Contact Name: Mark D'Arcy	Quote #
Address: 154 Colonnade Rd.	PO # 27045
Telephone: 613-226-7381	Email Address: nsullivan@patersongroup.ca mdarcy@patersongroup.ca

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

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

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

Required Analyses

Paracel Order Number: 1930600

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)
1	BH1-GW1	GW		7	July 24/19		X		X	X	X	X	
2	BH2-GW1	↓		3	↓	3:00 PM	X						
3	BH3-GW1	↓		3	↓	↓	X						
4	BH4-GW1	↓		7	↓	↓	X		X	X	X	X	
5	BH6-GW1	↓		7	↓	12:00 AM	X		X	X	X	X	
6	BH7-GW1	↓		4	↓	11:00 AM	X		X				
7													
8													
9													
10													

Comments:

Method of Delivery: Swift ~~Walk-in~~

Relinquished By (Sign): N. Sullivan	Received by Driver/Depot:	Received at Lab: Samuel	Verified By:
Relinquished By (Print): Nick Sullivan	Date/Time:	Date/Time: 07/25/19 17:32	Date/Time: July 26/19 10:00a
Date/Time: July 25/19	Temperature: °C	Temperature: 23.6 °C	pH Verified [ ] By: