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Phase II-Environmental Site Assessment

443 and 447 Kent Street
423 and 425 McLeod Street
Ottawa, Ontario

Prepared For

CHSS International Investments and Management Inc.

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Paterson Group Inc.

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

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

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Assessment

A Phase II-ESA was conducted for 443 and 447 Kent Street and 423 and 425 McLeod Street in Ottawa, Ontario. The focus of the Phase II-ESA was to assess APECs identified in the Phase I-ESA and to confirm the soil and groundwater quality.

The Phase II-ESA consisted of the drilling of three (3) boreholes and the installation of three (3) groundwater monitoring wells to assess soil and groundwater quality at the subject site. Two additional boreholes, each instrumented with a groundwater monitoring well were drilled in January 2019 to reassess the groundwater conditions at the subject site.

Soil samples obtained from the boreholes were screened using visual observations and organic vapour measurements. Based on the screening results, samples were selected for analysis of petroleum hydrocarbons, fractions 1 through 4 (PHCs F1-F4) and/or volatile organic compounds (VOC). No parameters were detected above the method detection limit for PHCs or VOCs. The analytical results indicated that all detected concentrations were in compliance with the selected MECP Table 3 standards.

Groundwater samples obtained from BH1, BH2, and BH3 were submitted for analytical testing for a combination of VOCs and PHCs (F1-F4). There were no detectable concentrations of VOCs or PHCs in the samples submitted from BH1 and BH2. All the tested parameters in the groundwater samples from BH1 and BH2 were in compliance with the selected MECP Table 3 standards. Tetrachloroethylene was identified in both groundwater samples collected from BH3, although additional analysis in November 2018 identified concentrations in compliance with the selected MECP Standards. No other VOC or PHC parameters were detected, however, some of the laboratory detection limits had to be revised above the standards as a result of sample dilution. Additional groundwater samples were collected from BH3 in November 2018 to confirm the groundwater quality at the subject site. Both samples from November 2018 were incompliance with the selected MECP Standards.

Groundwater was collected from BH4 and BH5 in January 2019 to reassess the groundwater conditions at the subject site. No VOC concentrations were identified in the groundwater samples collected. The groundwater throughout the subject site is considered to be in compliance with the selected MECP standards.

Recommendations

Groundwater

If the groundwater monitoring wells will no longer be used, they should be decommissioned by a licensed contractor in accordance with Ontario Regulation 903, however it is recommended these wells remain intact for future groundwater monitoring purposes.

1.0 INTRODUCTION

At the request of CHSS International Investments and Management Inc. (CHSS), Paterson Group conducted a Phase II Environmental Site Assessment of the properties at 443 and 447 Kent Street, 423 and 425 McLeod Street, in the City of Ottawa, Ontario. The purpose of this Phase II ESA has been to investigate the Areas of Potential Environmental Concern identified in a Phase I ESA prepared by Paterson.

1.1 Site Description

Address:	443 and 447 Kent Street, 423 and 425 McLeod Street, City of Ottawa, Ontario.
Legal Description:	North and South Parts of Lot 2, Plan 30; Lot 3, Plan 30; WPT Kent East, City of Ottawa.
Property Identification Numbers:	04119-0261; 04119-0259; 04119-0258.
Location:	The subject site is located at the northeast corner of the intersection of Kent Street and McLeod Street. The subject site is shown on Figure 1 - Key Plan following the body of this report.
Latitude and Longitude:	45° 24' 39" N, 75° 41' 43" W.
Configuration:	Irregular.
Site Area:	885 m^2 (approximate).

1.2 Property Ownership

The property is currently owned by Seun and Wendy Kan, represented by CHSS.

1.3 Current and Proposed Future Uses

The subject site is currently occupied by three different residential buildings.

It is understood that the subject site is to be redeveloped with a multi-storey residential building.

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 MECP Table 3 Standards are based on the following considerations:

- Full depth soil condition
- Fine-grained soil conditions
- Non-potable groundwater conditions
- Residential land use

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The subject site is located on the northeast corner of the Kent Street and McLeod Street intersection, in the City of Ottawa. At the time of the Phase I ESA, the subject site was occupied by three residential dwellings. The ground surface at the subject site consisted primarily of asphalt, grass and landscaped (trees and bushes) areas about the edges of the property. The site was snow covered at the time of the assessment. The asphaltic parking lot is graded to direct surficial sheet flow to catch basins along Kent Street and McLeod Street.

2.2 Past Investigations

The following reports were available for review:

- ”Phase I-Environmental Site Assessment, 443 and 447 Kent Street, 423 and 425 McLeod Street, Ottawa, Ontario”, prepared by Paterson, dated December 14, 2017.

The 2017 Phase I-ESA report identified the following potentially contaminating activities (PCAs) that are considered to generate areas of potential environmental concern (APEC) for the subject site:

- Former automotive service garage and printers, located at 430 Gladstone Avenue, adjacent to the northeast of the subject site, is considered to represent an APEC on the northeastern portion of the subject site.

- Automotive service garage, located at 426 Gladstone Avenue, approximately 20m northeast of the subject site, is considered to represent an APEC on the northeastern portion of the subject site.

The report recommended that a Phase II-ESA be conducted to address the above concerns.

Several other PCAs were identified in the area of the subject site, however none were considered to represent an APEC on the property based on separation distance or the inferred groundwater flow direction.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation, conducted as a component of this Phase II ESA, consisted of the drilling of three boreholes at the subject site in conjunction with a geotechnical investigation. Boreholes were drilled to depths ranging 8.99m to 9.60m below ground surface. Groundwater monitoring wells were installed in all three boreholes. The focus of the Phase II-ESA was to assess the area of potential environmental concern identified during the Phase I-ESA assessment.

An additional subsurface investigation was carried out on January 7, 2019 to delineate the groundwater impacts identified in BH3 during the original Phase II ESA. Two boreholes, each instrumented with groundwater monitoring wells, were drilled to a maximum depth of 9.75m below the existing ground surface.

3.2 Media Investigated

During the initial 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 identified in the Phase I ESA. Contaminants of concern for soil and groundwater are volatile organic compounds (VOCs) and petroleum hydrocarbon fractions 1 through 4 (PHCs F1-F4). As part of the additional subsurface investigation carried out in January 2019 soil and groundwater samples were tested for VOCs.

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

Based on information from the Geological Survey of Canada and subsurface investigations at the subject site and nearby properties, drift thickness in the area of the subject site is estimated to be on the order of 5 to 10 m. Overburden soils consist of alluvial sediment and bedrock is identified as shale of the Billings Formation.

Actual subsurface conditions encountered during the Phase II-ESA are discussed in Section 5.1.

Contaminants of Potential Concern

Based on the areas of potential environmental concern on the subject site, the following Contaminants of Potential Concern (CPCs) were targeted:

- Volatile Organic Compounds (VOCs) – this suite of parameters includes Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX), associated with fuel

oil, as well as chemicals used in typical printing operations. These parameters were selected as CPCs for the subject site due to the former printers and automotive service garages located to the northeast of the subject site. VOCs/BTEX may be present in the soil matrix as well as in the dissolved phase in the groundwater system.

- Petroleum Hydrocarbons Fractions 1 through 4 (PHCs F1-F4) – this suite of parameters encompasses gasoline (Fraction 1), diesel and fuel oil (Fraction 2), and heavy oils (Fractions 3 and 4). These parameters were selected as CPCs for the Phase I study area based on the offsite garages. PHCs may be present in the soil matrix, sorbed to soil particles, as well as in free or dissolved phase in the groundwater system. PHCs are generally considered to be LNAPLs – light non-aqueous phase liquids, indicating that when present in sufficient concentrations above the solubility limit, they will partition into a separate phase above the water table, due to their lower density.

The mechanisms of contaminant transport within the site soils include physical transportation and leaching. Physical transportation is not anticipated to be an issue at the subject site, given the developed nature of the site. Leaching is anticipated to be limited in areas of low permeability such as the asphalt pavement.

The mechanisms of contaminant transport within the groundwater system include advection, dispersion, and diffusion. Advection and dispersion will be the dominant mechanisms of contaminant transport in soils with higher hydraulic conductivities, such as sands, gravels, silts, and some glacial till soils, whereas diffusion will dominate in soils with lower hydraulic conductivity, such as clays.

Buildings and Structures

The subject site is occupied by three two-storey residential buildings with one basement level each.

Water Bodies

There are no water bodies on the subject site or within the Phase I study area.

Areas of Natural Significance

No areas of natural significance were identified on the site or in the Phase I study area.

Drinking Water Wells

The search of the water well database did not identify any drinking water wells on the subject site or within the Phase I study area.

Neighbouring Land Use

Neighbouring land use in the Phase I study area is primarily residential with retail-commercial to the north. Land use is shown on Drawing PE4194-2 - Surrounding Land Use Plan in the Phase I-ESA.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

The PCAs that are considered to generate APECs on the northern part of the site (443 Kent Street) are Mike's Gladstone Auto Repair currently at 426 Gladstone Avenue, and the former Progressive Printers, John Fern's Garage, and various other garages located at 430 Gladstone Avenue. Other potentially contaminating activities in the area are not considered to have created APECs on the subject site, based on their separation distances, downgradient location with respect to groundwater flow direction, and/or available documentation regarding those concerns.

Assessment of Uncertainty and/or Absence of Information

The information available for review as part of the preparation of the Phase I ESA is considered to be sufficient to conclude that there are areas of potential environmental concern on the subject site and neighbouring properties which have the potential to have impacted the subject site. The presence of potentially contaminating activities was confirmed by a variety of independent sources, including, in some cases, observations made during the Phase I site visit. 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 parameters for groundwater stabilization were not measured during the groundwater purging and sampling events on February 22, 2018 and March 7, 2018. A sufficient volume of groundwater was purged to suggest the well development was adequate. No other deviations from the Sampling and Analysis Plan were noted.

Trip Blanks and duplicate samples were not analysed as part of this program. Based on the groundwater results there appears to be no evidence of cross contamination during the groundwater sampling procedure. The results of the groundwater sampling program indicate that the trip blanks and duplicate sampling are not necessary at this time.

3.5 Impediments

During the supplemental Phase II ESA work carried out in January 2019 two minor impediments were identified. An old shed structure and significant tree cover were present in the southeast corner of 447 Kent Street, which did not permit the borehole to be placed directly in the southeast corner of the property. The borehole was placed as far into the corner as the shed and tree cover allowed. The impediments are not considered to have significantly impacted the results of the supplemental Phase II ESA work.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The initial subsurface investigation was carried out on February 13 and 16, 2018, and consisted of the drilling of three boreholes, each instrumented with a groundwater monitoring well on the subject site. The boreholes were placed to address the Areas of Potential Environmental Concern identified in the Phase I-ESA and for general coverage for geotechnical purposes. The boreholes were drilled using a track- or truck-mounted CME 55 power auger drill rig.

Supplemental Phase II ESA work was carried out on January 7, 2019, and consisted of drilling two boreholes each instrumented with a groundwater monitoring well on the subject site. The boreholes were placed to delineate the groundwater results identified in BH3 during the initial Phase II ESA.

Drilling occurred under full-time supervision of Paterson personnel. Borehole locations are shown on Drawing PE4194-3 - Test Hole Location Plan, appended to this report.

4.2 Soil Sampling

As part of the subsurface investigation a total of fifty-seven soil samples were obtained from the boreholes by means of split spoon sampling and direct sampling from auger flights.

The depths at which split spoon and auger samples were obtained from the boreholes are shown as "**SS**" and "**AU**" respectively on the Soil Profile and Test Data Sheets, appended to this report.

Site soils consist of a layer of topsoil in the landscaped areas or asphaltic concrete pavement structure in the parking areas, underlain by brown silty sand and grey silty clay. Based on available mapping, bedrock at the subject site is interpreted to be shale of the Billings Formation.

4.3 Field Screening Measurements

All soil samples collected were submitted to a preliminary screening procedure, which included visual screening for colour and evidence of metals, as well as screening with a photo ionization detector (PID). The device's detection limit is 0.1 ppm, with a precision of +/- 0.1 ppm.

The soil vapours were measured by inserting the analyzer probe into the nominal headspace above the soil sample. Samples were then agitated and the peak readings recorded. Vapour readings were largely negligible and varied from 0.1 ppm to 2.9 ppm. Vapour readings are noted on the Soil Profile and Test Data Sheets in Appendix 1.

Soil samples were selected for analysis based on visual appearance, location, and vapour readings.

4.4 Groundwater Monitoring Well Installation

Five groundwater monitoring wells were installed during the drilling program by George Downing Estate Drilling of Hawkesbury, Ontario, under full-time supervision by Paterson personnel. The monitoring wells consisted of 51 mm diameter Schedule 40 threaded PVC riser and screen. The monitoring wells installed during the supplemental Phase II ESA consisted of 32mm diameter Schedule 40 threaded PVC riser and screen. A sand pack consisting of silica sand was placed around the screen, and a bentonite seal was placed above the screen to minimize cross-contamination. Monitoring well construction details are provided on the Soil Profile and Test Data Sheets in Appendix 1.

A summary of the monitoring well construction details is provided below in Table 1. The monitoring wells were surveyed to an arbitrary benchmark assigned an elevation of 100m.

Table 1: Monitoring Well Construction Details

Well ID	Ground Surface Elevation	Total Depth (m BGS)	Screened Interval (m BGS)	Sand Pack (m BGS)	Bentonite Seal (m BGS)	Casing Type
BH1	100.35	6.85	3.85-6.85	3.35-6.85	0-3.35	Flushmount
BH2	99.77	6.85	3.85-6.85	3.35-6.85	0-3.35	Flushmount
BH3	99.49	9.14	4.57-9.14	4.09-9.14	0-4.57	Flushmount
BH4	99.88	9.14	6.14-9.14	5.84-9.14	0-5.84	Flushmount
BH5	100.19	9.75	6.75-9.75	6.45-9.75	0-5.84	Stickup

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.

Trip Blanks and duplicate samples were not analysed as part of this program. Based on the groundwater results there appears to be no evidence of cross contamination during the groundwater sampling procedure. The results of the groundwater sampling program indicate that the trip blanks and duplicate sampling are not considered to be necessary at this time.

4.6 Analytical Testing

Based on the guidelines outlined in the Sampling and Analysis Plan appended to this report, the following soil and groundwater samples were submitted for analysis:

Table 2: Soil Samples Submitted

Sample ID	Sample Depth/ Stratigraphic Unit	Parameters Analysed		Rationale
		VOCs	PHCs (F_1-F_4)	
February 13, 2018				
BH1-SS6	3.81-4.42 m; Native Silty Clay	X	X	Assessment of the current and former automotive service garages and former printers adjacent to the northeast.
BH2-SS6	3.81-4.42 m; Native Silty Clay	X	X	General coverage
February 16, 2018				
BH3-SS8	7.62-8.23m; Native Silty Clay	X		General coverage
January 7, 2019				
BH4-SS8	4.89-5.49m, Native Silty Clay	X		General Coverage
BH5-SS5	3.05-3.66m, Native Silty Clay	X		General Coverage

Table 3: Groundwater Samples Submitted				
Sample ID	**Screened Interval/ Stratigraphic Unit**	**Parameters Analysed**		**Rationale**
		PHCs (F_1-F_4)	**VOCs**	
February 22, 2018				
BH1-GW1	3.85-6.85, Native Silty Clay	X	X	Assessment of the current and former automotive service garages and former printers adjacent to the northeast.
BH2-GW1	3.85-6.85, Native Silty Clay	X	X	General coverage
BH3-GW1	4.57-9.14, Native Silty Clay	X	X	General coverage
March 7, 2018				
BH3-GW2	4.57-9.14, Native Silty Clay		X	Confirm sample result of BH3-GW1
November 2, 2018				
BH3-GW3	4.57-9.14, Native Silty Clay		X	Update BH3 groundwater quality
November 21, 2018				
BH3-GW	4.57-9.14, Native Silty Clay		X	Confirm sample result of BH3-GW3
January 14, 2019				
BH4-GW1	6.41-9.41, Native Silty Clay		X	Delineate groundwater results of BH3
BH5-GW1	6.75-9.75, Native Silty Clay		X	Delineate groundwater results of BH3

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

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

4.8 Elevation Surveying

The monitoring well elevations were surveyed relative to the top spindle of a fire hydrant, located at the intersection of Kent and McLeod Streets, adjacent to the southwest corner of the subject site with an arbitrary elevation of 100 m. Elevations of the monitoring wells are illustrated on Drawing 4194-3 – Test Hole Location Plan.

4.9 Quality Assurance and Quality Control Measures

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

Trip Blanks and duplicate samples were not analysed as part of this program. Based on the groundwater results there appears to be no evidence of cross contamination during the groundwater sampling procedure. The results of the groundwater sampling program indicate that the trip blanks and duplicate sampling are not considered to be necessary at this time. No other deviations from the QA/QC procedures in the Sampling & Analysis Plan were noted.

5.0 REVIEW AND EVALUATION

5.1 Geology

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

- Asphaltic pavement and the associated engineered fill material was identified in BH2 and BH3, all of which were advanced through parking areas on the subject site.
- A layer of native silty sand covered the site to a depth of approximately of 3m. This silty sand was encountered in all three boreholes.
- Silty clay was encountered in all boreholes. All boreholes were terminated in the silty clay unit. Groundwater was also encountered in this unit.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured using an electronic water level meter. Groundwater levels are summarized below in Table 4. All elevations are relative to the temporary benchmark.

Table 4: Groundwater Level Measurements

Borehole Location	Ground Surface Elevation (m)	Water Level Depth (m below grade)	Water Level Elevation (Relative to TBM)	Date of Measurement
BH1	100.35	3.05	97.30	February 22, 2018
BH1	100.35	4.38	95.97	November 21, 2018
BH1	100.35	4.53	95.82	January 14, 2019
BH2	99.77	3.72	96.05	February 22, 2018
BH2	99.77	4.20	95.57	November 21, 2018
BH2	99.77	4.03	95.74	January 14, 2019
BH3	99.49	8.50	90.99	February 22, 2018
BH3	99.49	7.01	90.99	March 7, 2018
BH3	99.49	3.71	95.78	November 21, 2018
BH3	99.49	3.58	95.91	January 14, 2019
BH4	99.88	5.97	93.91	January 14, 2019
BH5	100.19	6.34	93.85	January 14, 2019

Based on the groundwater elevations from the November 21, 2018 sampling event, groundwater contours were calculated. Based on the contour calculations, groundwater flow at the subject site appears to be in a westerly direction. A horizontal hydraulic gradient of approximately 0.012 m/m was calculated.

The groundwater levels from the January 2019 sampling event were not used to calculate the groundwater contours as the groundwater levels in BH4 and BH5 had not fully stabilized at the time of sampling. Stabilized groundwater levels on the subject site appear to be at an elevation between 95m and 96m relative to the TBM.

No free product was observed in the monitoring wells at the subject site. No visual or olfactory indications of contamination were noted during the groundwater monitoring events.

5.3 Fine-Medium Soil Texture

No grain size analysis was carried out at the subject site, however a review of the soil profile data indicates that fine grained standards can be used for the subject site, as the silty clay deposit, which is fine grained material, is the predominant deposit.

Table 5: Fine-Medium Soil Texture

Borehole ID	Depth of Coarse-Grained Material (m)	Maximum Depth Investigated[1] (m)	% of Material Considered Fine-Grained
BH1	3.05	9.75	69
BH2	2.90	9.75	70
BH3	3.05	9.75	69
BH4	2.95	9.75	70
BH5	3.15	9.75	68

1 – Maximum depth is considered to be the maximum depth that Fine-Grained material was observed in any borehole on the property (BH5)

Based on the amount of fine-grained material the subject site (>66%) the fine-medium soil condition is applicable to the subject site.

5.4 Soil: Field Screening

Field screening of the soil samples collected during drilling resulted in soil vapour readings of 0 ppm to 2.9 ppm. Field screening results of each individual soil sample are provided on the Soil Profile and Test Data Sheets appended to this report. The field screening results were generally negligible. As a result, soil samples were selected for analytical testing based on visual observations and soil stratigraphy.

5.5 Soil Quality

Five soil samples from the subsurface investigation were submitted for analysis of VOCs and/or PHCs as presented below. The laboratory certificates of analysis are provided in Appendix 1.

Table 6:
Analytical Test Results – Soil
VOCs

Parameter	MDL (µg/g)	Soil Samples (µg/g)					MECP Table 3 Residential Standards
		BH1-SS6	BH2-SS6	BH3-SS8	BH4-SS8	BH5-SS5	
Acetone	0.5	nd	nd	nd	nd	nd	28
Benzene	0.02	nd	nd	nd	nd	nd	0.17
Bromodichlorormethane	0.05	nd	nd	nd	nd	nd	13
Bromoform	0.05	nd	nd	nd	nd	nd	0.26
Bromomethane	0.05	nd	nd	nd	nd	nd	0.05
Carbon Tetrachloride	0.05	nd	nd	nd	nd	nd	0.12
Chlorobenzene	0.05	nd	nd	nd	nd	nd	2.7
Chloroform	0.05	nd	nd	nd	nd	nd	0.18
Dibromochloromethane	0.05	nd	nd	nd	nd	nd	9.4
Dichlorodifluoromethane	0.05	nd	nd	nd	nd	nd	25
1,2-Dichlorobenzene	0.05	nd	nd	nd	nd	nd	4.3
1,3-Dichlorobenzene	0.05	nd	nd	nd	nd	nd	6
1,4-Dichlorobenzene	0.05	nd	nd	nd	nd	nd	0.097
1,1-Dichloroethane	0.05	nd	nd	nd	nd	nd	11
1,2-Dichloroethane	0.05	nd	nd	nd	nd	nd	0.05
1,1-Dichloroethylene	0.05	nd	nd	nd	nd	nd	0.05
cis-1,2-Dichloroethylene	0.05	nd	nd	nd	nd	nd	30
trans-1,2-Dichloroethylene	0.05	nd	nd	nd	nd	nd	0.75
1,2-Dichloropropane	0.05	nd	nd	nd	nd	nd	0.085
1,3-Dichloropropene	0.05	nd	nd	nd	nd	nd	0.083
Ethylbenzene	0.05	nd	nd	nd	nd	nd	15
Ethylene dibromide	0.05	nd	nd	nd	nd	nd	0.05
Hexane	0.05	nd	nd	nd	nd	nd	34
Methyl Ethyl Ketone	0.05	nd	nd	nd	nd	nd	44
Methyl Isobutyl Ketone	0.05	nd	nd	nd	nd	nd	4.3
Methyl tert-butyl Ether	0.05	nd	nd	nd	nd	nd	1.4
Methylene Chloride	0.05	nd	nd	nd	nd	nd	0.96
Styrene	0.05	nd	nd	nd	nd	nd	2.2
1,1,1,2-Tetrachloroethane	0.05	nd	nd	nd	nd	nd	0.05
1,1,2,2,-Tetrachloroethane	0.05	nd	nd	nd	nd	nd	0.05
Tetrachloroethylene	0.05	nd	nd	nd	nd	nd	2.3
Toluene	0.05	nd	nd	nd	nd	nd	6
1,1,1-Trichloroethane	0.05	nd	nd	nd	nd	nd	3.4
1,1,2-Trichlotoethane	0.05	nd	nd	nd	nd	nd	0.05
Trichloroethylene	0.05	nd	nd	nd	nd	nd	0.52
Trichlorofluoromethane	0.05	nd	nd	nd	nd	nd	5.8
Vinyl Chloride	0.02	nd	nd	nd	nd	nd	0.022
Xylenes	0.05	nd	nd	nd	nd	nd	25

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

All VOC concentrations are in compliance with the selected MECP Table 3 standards. All parameter concentrations were below laboratory detection limits.

Table 7:
Analytical Test Results – Soil
PHCs

Parameter	MDL (µg/g)	Soil Samples (µg/g)		MECP Table 3 Residential Standards
		BH1-SS6	BH2-SS6	
PHCs F1	7	nd	nd	65
PHCs F2	4	nd	nd	150
PHCs F3	8	nd	nd	1300
PHCs F4	6	nd	nd	5600

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

All PHC concentrations are in compliance with the selected MECP Table 3 standards. All parameter concentrations were below laboratory detection limits.

5.6 Groundwater Quality

Groundwater samples from BH1, BH2, BH3, BH4 and BH5 were submitted for a combination of VOC and/or PHC analysis. The groundwater samples were obtained from the screened intervals noted on Table 1. The results of the analytical testing are presented below.

Table 8A: Analytical Test Results – Groundwater – VOCs						
Parameter	MDL (µg/L)	Groundwater Samples (µg/L				MECP Table 3 Standards
		BH1-GW1	BH1-GW	BH2-GW1	BH2-GW	
Acetone	5.0	nd	nd	nd	nd	130,000
Benzene	0.5	nd	nd	nd	nd	430
Bromodichloromethane	0.5	nd	nd	nd	nd	85,000
Bromoform	0.5	nd	nd	nd	nd	770
Bromomethane	0.5	nd	nd	nd	nd	56
Carbon Tetrachloride	0.2	nd	nd	nd	nd	8.4
Chlorobenzene	0.5	nd	nd	nd	nd	630
Chloroform	0.5	nd	nd	nd	nd	22
Dibromochloromethane	0.5	nd	nd	nd	nd	82,000
Dichlorodifluoromethane	1.0	nd	nd	nd	nd	4,400
1,2-Dichlorobenzene	0.5	nd	nd	nd	nd	9,600
1,3-Dichlorobenzene	0.5	nd	nd	nd	nd	9,600
1,4-Dichlorobenzene	0.5	nd	nd	nd	nd	67
1,1-Dichloroethane	0.5	nd	nd	nd	nd	3,100
1,2-Dichloroethane	0.5	nd	nd	nd	nd	12
1,1-Dichloroethylene	0.5	nd	nd	nd	nd	17
cis-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	17
trans-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	17
1,2-Dichloropropane	0.5	nd	nd	nd	nd	140
1,3-Dichloropropene	0.5	nd	nd	nd	nd	45
Ethylbenzene	0.5	nd	nd	nd	nd	2,300
Ethylene dibromide	0.2	nd	nd	nd	nd	0.83
Hexane	1.0	nd	nd	nd	nd	520
Methyl Ethyl Ketone	5.0	nd	nd	nd	nd	1,500,000
Methyl Isobutyl Ketone	5.0	nd	nd	nd	nd	580,000
Methyl tert-butyl Ether	2.0	nd	nd	nd	nd	1,400
Methylene Chloride	5.0	nd	nd	nd	nd	5,500
Styrene	0.5	nd	nd	nd	nd	9,100
1,1,1,2-Tetrachloroethane	0.5	nd	nd	nd	nd	28
1,1,2,2-Tetrachloroethane	0.5	nd	nd	nd	nd	15
Tetrachloroethylene	0.5	nd	nd	nd	nd	17
Toluene	0.5	nd	nd	nd	nd	18,000
1,1,1-Trichloroethane	0.5	nd	nd	nd	nd	6,700
1,1,2-Trichloroethane	0.5	nd	nd	nd	nd	30
Trichloroethylene	0.5	nd	nd	nd	nd	17
Trichlorofluromethane	1.0	nd	nd	nd	nd	2,500
Vinyl Chloride	0.5	nd	nd	nd	nd	1.7
Xylene	0.5	nd	nd	nd	nd	4,200

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

Table 8B: Analytical Test Results – Groundwater – VOCs						
Parameter	**MDL (µg/L)**	**Groundwater Samples (µg/L**				**MECP Table 3 Standards**
		BH3-GW1	**BH3-GW2**	**BH3-GW3**	**BH3-GW**	
Acetone	5.0	nd(250)	nd(250)	nd	nd	130,000
Benzene	0.5	nd(25)	nd(25)	nd	nd	430
Bromodichloromethane	0.5	nd(25)	nd(25)	nd	nd	85,000
Bromoform	0.5	nd(25)	nd(25)	nd	nd	770
Bromomethane	0.5	nd(25)	nd(25)	nd	nd	56
Carbon Tetrachloride	0.2	**nd(10)**	**nd(10)**	nd	nd	8.4
Chlorobenzene	0.5	nd(25)	nd(25)	nd	nd	630
Chloroform	0.5	**nd(25)**	**nd(25)**	1.2	0.9	22
Dibromochloromethane	0.5	nd(25)	nd(25)	nd	nd	82,000
Dichlorodifluoromethane	1.0	nd(25)	nd(25)	nd	nd	4,400
1,2-Dichlorobenzene	0.5	nd(25)	nd(25)	nd	nd	9,600
1,3-Dichlorobenzene	0.5	nd(25)	nd(25)	nd	nd	9,600
1,4-Dichlorobenzene	0.5	nd(25)	nd(25)	nd	nd	67
1,1-Dichloroethane	0.5	nd(25)	nd(25)	nd	nd	3,100
1,2-Dichloroethane	0.5	**nd(25)**	**nd(25)**	nd	nd	12
1,1-Dichloroethylene	0.5	**nd(25)**	**nd(25)**	nd	nd	17
cis-1,2-Dichloroethylene	0.5	**nd(25)**	**nd(25)**	nd	nd	17
trans-1,2-Dichloroethylene	0.5	**nd(25)**	**nd(25)**	nd	nd	17
1,2-Dichloropropane	0.5	nd(25)	nd(25)	nd	nd	140
1,3-Dichloropropene	0.5	nd(25)	nd(25)	nd	nd	45
Ethylbenzene	0.5	nd(25)	nd(25)	nd	nd	2,300
Ethylene dibromide	0.2	**nd(10)**	**nd(10)**	nd	nd	0.83
Hexane	1.0	nd(50)	nd(50)	nd	nd	520
Methyl Ethyl Ketone	5.0	nd(250)	nd(250)	nd	nd	1,500,000
Methyl Isobutyl Ketone	5.0	nd(250)	nd(250)	nd	nd	580,000
Methyl tert-butyl Ether	2.0	nd(100)	nd(100)	nd	nd	1,400
Methylene Chloride	5.0	nd(250)	nd(250)	nd	nd	5,500
Styrene	0.5	nd(25)	nd(25)	nd	nd	9,100
1,1,1,2-Tetrachloroethane	0.5	**nd(25)**	**nd(25)**	nd	nd	28
1,1,2,2-Tetrachloroethane	0.5	**nd(25)**	**nd(25)**	nd	nd	15
Tetrachloroethylene	0.5	**1150**	**456**	6.2	11.8	17
Toluene	0.5	nd(25)	nd(25)	nd	nd	18,000
1,1,1-Trichloroethane	0.5	nd(25)	nd(25)	nd	nd	6,700
1,1,2-Trichloroethane	0.5	nd(25)	nd(25)	nd	nd	30
Trichloroethylene	0.5	**nd(25)**	**nd(25)**	nd	nd	17
Trichlorofluromethane	1.0	nd(25)	nd(25)	nd	nd	2,500
Vinyl Chloride	0.5	**nd(50)**	**nd(50)**	nd	nd	1.7
Xylene	0.5	nd(25)	nd(25)	nd	nd	4,200

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold(25) –** Elevated detection limit above the MECP Table 3 Standards
- **Bold** – Sample concentration detected above the MECP Table 3 Standards

Table 8C: Analytical Test Results – Groundwater – VOCs				
Parameter	MDL (µg/L)	Groundwater Samples (µg/L		MECP Table 3 Standards
		BH4-GW1	BH5-GW1	
Acetone	5.0	nd	nd	130,000
Benzene	0.5	nd	nd	430
Bromodichloromethane	0.5	nd	nd	85,000
Bromoform	0.5	nd	nd	770
Bromomethane	0.5	nd	nd	56
Carbon Tetrachloride	0.2	nd	nd	8.4
Chlorobenzene	0.5	nd	nd	630
Chloroform	0.5	nd	nd	22
Dibromochloromethane	0.5	nd	nd	82,000
Dichlorodifluoromethane	1.0	nd	nd	4,400
1,2-Dichlorobenzene	0.5	nd	nd	9,600
1,3-Dichlorobenzene	0.5	nd	nd	9,600
1,4-Dichlorobenzene	0.5	nd	nd	67
1,1-Dichloroethane	0.5	nd	nd	3,100
1,2-Dichloroethane	0.5	nd	nd	12
1,1-Dichloroethylene	0.5	nd	nd	17
cis-1,2-Dichloroethylene	0.5	nd	nd	17
trans-1,2-Dichloroethylene	0.5	nd	nd	17
1,2-Dichloropropane	0.5	nd	nd	140
1,3-Dichloropropene	0.5	nd	nd	45
Ethylbenzene	0.5	nd	nd	2,300
Ethylene dibromide	0.2	nd	nd	0.83
Hexane	1.0	nd	nd	520
Methyl Ethyl Ketone	5.0	nd	nd	1,500,000
Methyl Isobutyl Ketone	5.0	nd	nd	580,000
Methyl tert-butyl Ether	2.0	nd	nd	1,400
Methylene Chloride	5.0	nd	nd	5,500
Styrene	0.5	nd	nd	9,100
1,1,1,2-Tetrachloroethane	0.5	nd	nd	28
1,1,2,2-Tetrachloroethane	0.5	nd	nd	15
Tetrachloroethylene	0.5	nd	nd	17
Toluene	0.5	nd	nd	18,000
1,1,1-Trichloroethane	0.5	nd	nd	6,700
1,1,2-Trichloroethane	0.5	nd	nd	30
Trichloroethylene	0.5	nd	nd	17
Trichlorofluromethane	1.0	nd	nd	2,500
Vinyl Chloride	0.5	nd	nd	1.7
Xylene	0.5	nd	nd	4,200

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

Elevated levels of Tetrachloroethylene were detected in BH3-GW1 and BH3-GW2 which exceed the MECP Table 3 Standard. BH3 was retested due to the elevated level of Tetrachloroethylene in the original groundwater sample. The Tetrachloroethylene result caused several of the detection limits for the VOCs to exceed the MECP Table 3 Standards as well. BH3 was retested in November

2018 to confirm the groundwater quality. The groundwater in BH3 during the two sampling events in November are both in compliance with the selected MECP Standards. No VOC parameters were identified in BH1 or BH2 during any of the groundwater sampling events.

Paterson drilled two additional boreholes in January 2019 in an to attempt to identify the source of the impacted groundwater. No VOC parameters were identified above the method detection limit in BH4 or BH5 during the groundwater sampling event.

Table 9: Analytical Test Results – Groundwater – PHCs

Parameter	MDL (µg/L)	Groundwater Samples (µg/L) February 22, 2018			MECP Table 3 Standards
		BH1-GW1	BH2-GW1	BH3-GW1	
PHCs F1	25	nd	nd	**nd(1250)**	750
PHCs F2	100	nd	nd	nd	150
PHCs F3	100	nd	nd	nd	500
PHCs F4	100	nd	nd	nd	500

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold(1250) –** Elevated detection limit above the MECP Table 3 Standards

No PHC parameters were detected in the groundwater samples collected. The groundwater sample BH3-GW1 detection limit for the PHC F1 parameter exceeded the MECP Table 3 Standards due to an elevated VOC concentration.

Sample locations and analytical results are shown on Drawing PE4194-3 – Test Hole Location Plan and PE4194-4 – Cross-Section A-A'.

5.7 Quality Assurance and Quality Control Results

All samples submitted as part of this Phase II ESA were handled in accordance with the Analytical 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 O.Reg. 153/04 as amended by O.Reg. 269/11 - Record of Site Condition regulation, made under the Environmental Protection Act. Conclusions and recommendations are discussed in a subsequent section.

Site Description

Potentially Contaminating Activities

Based on the results of the Phase I ESA completed for the subject site, several PCAs have been identified within the Phase I study area. The rationale for identifying these PCAs is based on city directories, aerial photographs, previous reports, field observations, and personal interviews. These PCAs are shown on Drawing PE4194-2 in the Phase I ESA. Two of these PCAs are considered to represent APECs with respect to the subject site, and are discussed in the following section.

Areas of Potential Environmental Concern

Based on the results of the Phase I ESA completed for the subject site, two APECs were identified on the subject site due to offsite PCAs. The PCAs considered to represent APECs on the subject site are summarized below:

- Former Progressive Printers, Former John Fern's Garage, located to the north of the subject site, 430 Gladstone Avenue.
- Former automotive repair garages, former Edward Watt Coal and Oil, located to the north of the subject site, 426 Gladstone Avenue.

Other PCAs within the Phase I study area are not considered to pose an area of potential environmental concern to the subject site due to their separation distance and/or location down- or cross-gradient of the subject site.

Contaminants of Potential Concern

PHCs and VOCs in the soil and groundwater were identified as Contaminants of Potential Concern with respect to the subject site.

Subsurface Structures and Utilities

All utility services on the subject site were located prior to the subsurface investigation. The existing buildings are serviced by underground natural gas, water and sewer connections. Single basement levels were observed on the subject site and the adjacent properties.

Physical Setting

Site Stratigraphy

The site stratigraphy, from ground surface to the deepest aquifer or aquitard investigated, is provided in the Soil Profile and Test Data Sheets provided in Appendix 1 and illustrated on Drawings PE4194-4. Stratigraphy consists of:

- Asphaltic pavement and the associated engineered fill material was identified in BH2 and BH3, both of which were advanced through parking areas on the subject site.
- A layer of native silty sand covered the site to a depth of approximately of 3m. This silty sand was encountered in all three boreholes.
- Silty clay was encountered in all boreholes. All boreholes were terminated in the silty clay unit at a maximum depth of 9.75m below the existing ground surface. Groundwater was also encountered in this unit.

Hydrogeological Characteristics

Groundwater was encountered in the silty clay on the subject site. The most recent groundwater levels show groundwater to be present between 3.58 and 4.53m below grade in the monitoring wells installed during the February 2018 field program. January 2019 water levels from these monitoring wells are used to calculate the groundwater flow direction on the subject site.

The most recent groundwater levels indicate that the local groundwater flow is in a westerly direction. A hydraulic gradient of approximately 0.012 m/m was calculated. Groundwater levels from BH4 and BH5 were not used to calculate the groundwater flow direction at this time. The groundwater wells were not considered to be fully stabilized to static groundwater levels at the time of sampling.

Approximate Depth to Bedrock

Bedrock was not encountered in any of the boreholes. According to the geological mapping the drift thickness in the area of the subject site is expected to be in excess of 10m.

Approximate Depth to Water Table

Depth to the water table at the subject site varies between approximately 3.58 m and 4.53m below existing grade. The groundwater levels in BH4 and BH5 were recorded to be 5.97m and 6.34m below the existing grade. Based on previous groundwater level information these groundwater levels are not considered to have fully stabilized and are the groundwater elevation data is not representative of the stabilized groundwater levels.

Sections 41 and 43.1 of the Regulation

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

Section 43.1 of the Regulation does not apply to the subject site as bedrock is located more than 2 m below ground surface and thus the site is not considered to have shallow soils.

Fill Placement

Fill on site is considered to have been brought on-site or generated during grading below the laneways and backfilling around the building footprints. This fill material is considered to be engineered fill and/or reworked native material. This engineered fill material is not considered to be soil and therefore is not considered to represent an APEC on the subject site. Reworked native material is not considered to represent an APEC on the subject site. No concerns were identified regarding the fill material on the subject site.

Proposed Buildings and Other Structures

It is our understanding that the subject site will be redeveloped with a multi-storey residential building with at least one underground parking level.

Existing Buildings and Structures

The subject site is occupied by three two-storey residential buildings with one basement level each.

Water Bodies

No water bodies are present on the subject site or within 250 m of the subject site. The closest body of water is the Rideau Canal located approximately 890 m east of the subject site.

Areas of Natural Significance

No areas of natural significance are present on the subject site or within 250 m of the subject site.

Environmental Condition

Areas Where Contaminants are Present

No impacted soil exceeding the selected MECP Table 3 standards was encountered on the subject site. Impacted groundwater was identified in the southeast corner of the subject site, on the 423 McLeod Street property. The analytical results are shown on Drawings PE4194-3, and PE4194-4.

Types of Contaminants

The Phase II ESA identified elevated concentrations of Tetrachloroethylene on the subject site in February and March 2018. Retesting of the groundwater in November 2018 identified groundwater concentrations in compliance with the selected MECP standards.

Contaminated Media

The groundwater was identified as impacted on the subject site in February and March 2018. Retesting the November 2018 did not identify any impacted groundwater on the subject site. No impacted soils were identified.

What Is Known About Areas Where Contaminants Are Present

The source of the impacts is unknown at this time, but is considered to be offsite to the east.

Distribution of Contaminants

Impacted groundwater was identified in BH3 on the subject site during testing in Spring 2018. All subsequent results are in compliance with the applicable site condition standards. Impacted groundwater is no longer considered to be present.

Discharge of Contaminants

There is no ongoing discharge of contaminants on the subject site.

Migration of Contaminants

The migration of contaminants is not expected on the subject site by anthropogenic means. Any migration on the site is expected to be limited to natural advection and diffusion.

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. Based on the results of the Phase II ESA the fluctuation of the groundwater table was considered to have a limited effect on the distribution of contaminants at the subject site.

Potential for Vapour Intrusion

The potential for vapour intrusion at the subject site is considered to be negligible at this time since the groundwater is in compliance with the applicable standards.

6.0 CONCLUSIONS

Assessment

A Phase II-ESA was conducted for 443 and 447 Kent Street and 423 and 425 McLeod Street in Ottawa, Ontario. The focus of the Phase II-ESA was to assess APECs identified in the Phase I-ESA and to confirm the soil and groundwater quality.

The Phase II-ESA consisted of the drilling of three (3) boreholes and the installation of three (3) groundwater monitoring wells to assess soil and groundwater quality at the subject site. Two additional boreholes, each instrumented with a groundwater monitoring well were drilled in January 2019 to reassess the groundwater conditions at the subject site.

Soil samples obtained from the boreholes were screened using visual observations and organic vapour measurements. Based on the screening results, samples were selected for analysis of petroleum hydrocarbons, fractions 1 through 4 (PHCs F1-F4) and/or volatile organic compounds (VOC). No parameters were detected above the method detection limit for PHCs or VOCs. The analytical results indicated that all detected concentrations were in compliance with the selected MECP Table 3 standards.

Groundwater samples obtained from BH1, BH2, and BH3 were submitted for analytical testing for a combination of VOCs and PHCs (F1-F4). There were no detectable concentrations of VOCs or PHCs in the samples submitted from BH1 and BH2. All the tested parameters in the groundwater samples from BH1 and BH2 were in compliance with the selected MECP Table 3 standards. Tetrachloroethylene was identified in both groundwater samples collected from BH3, although additional analysis in November 2018 identified concentrations in compliance with the selected MECP Standards. No other VOC or PHC parameters were detected, however, some of the laboratory detection limits had to be revised above the standards as a result of sample dilution. Additional groundwater samples were collected from BH3 in November 2018 to confirm the groundwater quality at the subject site. Both samples from November 2018 were incompliance with the selected MECP Standards.

Groundwater was collected from BH4 and BH5 in January 2019 to reassess the groundwater conditions at the subject site. No VOC concentrations were identified in the groundwater samples collected. The groundwater throughout the subject site is considered to be in compliance with the selected MECP standards.

Recommendations

Groundwater

If the groundwater monitoring wells will no longer be used, they should be decommissioned by a licensed contractor in accordance with Ontario Regulation 903, however it is recommended these wells remain intact for future groundwater monitoring purposes.

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 by O.Reg. 269/11, and meets the requirements of CSA Z769-00. The conclusions presented herein are based on information gathered from a limited sampling and testing program. The test results represent conditions at specific test locations at the time of the field program.

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

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

This report was prepared for the sole use of CHSS International Investments and Management Inc. Permission and notification from CHSS International Investments and Management Inc. and Paterson will be required to release this report to any other party.

Paterson Group Inc.

Michael Beaudoin, P.Eng.,

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

Report Distribution:

- CHSS International Investments and Management Inc.
- Paterson Group

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE4194-3 – TEST HOLE LOCATION PLAN

DRAWING PE4194-4 – CROSS-SECTION A-A’

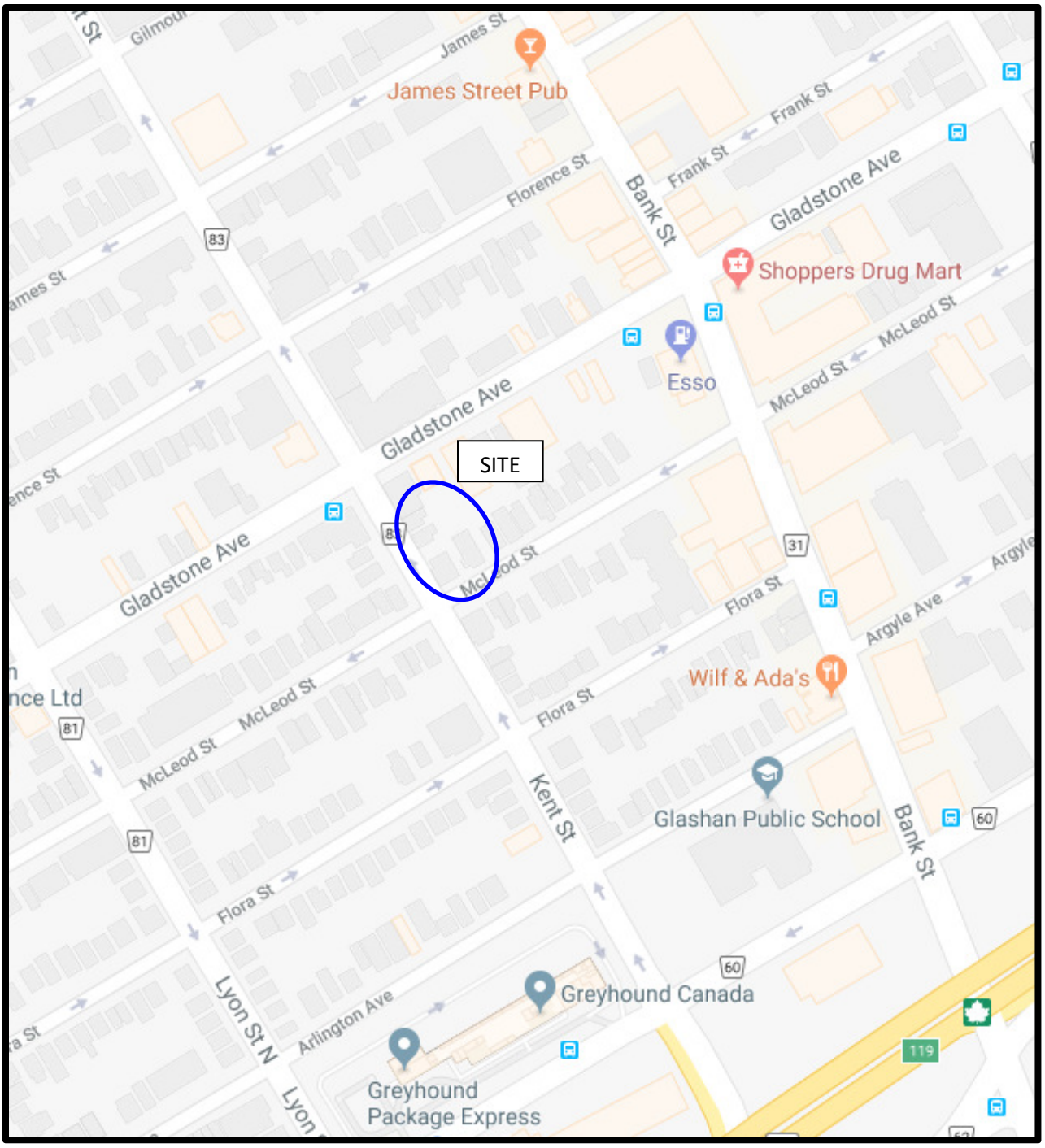

FIGURE 1

KEY PLAN

#444 GLADSTONE AVENUE
RESIDENTIAL ROW HOUSE
APARTMENTS

#435 TO 441 KENT STREET
RESIDENTIAL

#430 GLADSTONE AVENUE
COUVRETTE STUDIO
PHOTOGRAPHERS

#426 GLADSTONE AVENUE MIKE'S
GLADSTONE AUTO REPAIR

#431 MCLEOD STREET
RESIDENTIAL

#429 MCLEOD STREET
RESIDENTIAL

#427 MCLEOD STREET
RESIDENTIAL

KENT STREET

#443 KENT STREET
RESIDENTIAL
(1 UNIT)

#447 KENT STREET
RESIDENTIAL
(2 UNITS)

#423 AND 425
MCLEOD STREET
RESIDENTIAL
(4 UNITS)

SHED

BH 1
100.35
(95.82)

BH 2
99.77
(95.74)

BH 3
99.49
(95.91)

BH 4
99.88
(93.91)

BH 5
100.19
(93.85)

FH-TBM

BH A

A

A'

BH1-SS6 (3.81-4.42m) Feb. 13, 2018
PHCs and VOCs comply with MECP Table 3 Standards

BH1-GW1 (3.85-6.85m) Feb. 22, 2018
PHCs and VOCs comply with MECP Table 3 Standards

BH1-GW (3.85-6.85m) November 21, 2018
VOCs comply with MECP Table 3 Standards

BH5-SS5 (3.05-3.66m) January 7, 2019
VOCs comply with MECP Table 3 Standards

BH5-GW1 (6.75-9.75m) January 14, 2019
VOCs comply with MECP Table 3 Standards

BH2-SS6 (3.81-4.42m) Feb. 13, 2018
PHCs and VOCs comply with MECP Table 3 Standards

BH2-GW1 (3.85-6.85m) Feb. 22, 2018
PHCs and VOCs comply with MECP Table 3 Standards

BH2-GW (3.85-6.85m) November 21, 2018
VOCs comply with MECP Table 3 Standards

BH4-SS8 (4.87-5.49m) January 7, 2019
VOCs comply with MECP Table 3 Standards

BH4-GW1 (6.14-9.14m) January 14, 2019
VOCs comply with MECP Table 3 Standards

BH3-SS8 (7.26-8.23m) Feb. 16, 2018
VOCs comply with MECP Table 3 Standards

BH3-GW1 (4.57-9.14m) Feb. 22, 2018

Parameter	Concentration	Standard
Tetrachloroethylene	1150	17

Several detection limits exceed the MECP Table 3 Standard

BH3-GW2 (4.57-9.14m) March 7, 2018

Parameter	Concentration	Standard
Tetrachloroethylene	456	17

Several detection limits exceed the MECP Table 3 Standard

BH3-GW3 (4.57-9.14m) November 2, 2018
VOCs comply with MECP Table 3 Standards

BH3-GW (4.57-9.14m) November 21, 2018
VOCs comply with MECP Table 3 Standards

MCLEOD STREET

LEGEND:

SOIL PARAMETERS MEET MECP TABLE 3 STANDARDS

GROUNDWATER PARAMETERS MEET MECP TABLE 3 STANDARDS

GROUNDWATER PARAMETERS EXCEED MECP TABLE 3 STANDARDS

- BOREHOLE WITH MONITORING WELL LOCATION
- MONITORING WELL LOCATION BY OTHERS
- 100.35 GROUND SURFACE ELEVATION (m)
- (95.82) GROUNDWATER SURFACE ELEVATION (m) (JANUARY 14, 2019)

TBM - TOP SPINDLE OF FIRE HYDRANT. ASSUMED ELEVATION = 100.00m.

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL
2	BH 4 & BH 5 ADDED; GROUNDWATER SURFACE ELEVATIONS UPDATED	25/01/2019	MB
1	ANALYTICAL RESULTS ADDED	10/12/2018	MB

CHSS INTERNATIONAL INVESTMENTS AND MANAGEMENT INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
443 & 447 KENT STREET AND 423 & 425 MCLEOD STREET

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:250	Date: 01/2019
Drawn by: MPG	Report No.: PE4194-2R
Checked by: MB	Dwg. No.: PE4194-3
Approved by: MSD	Revision No.: 2

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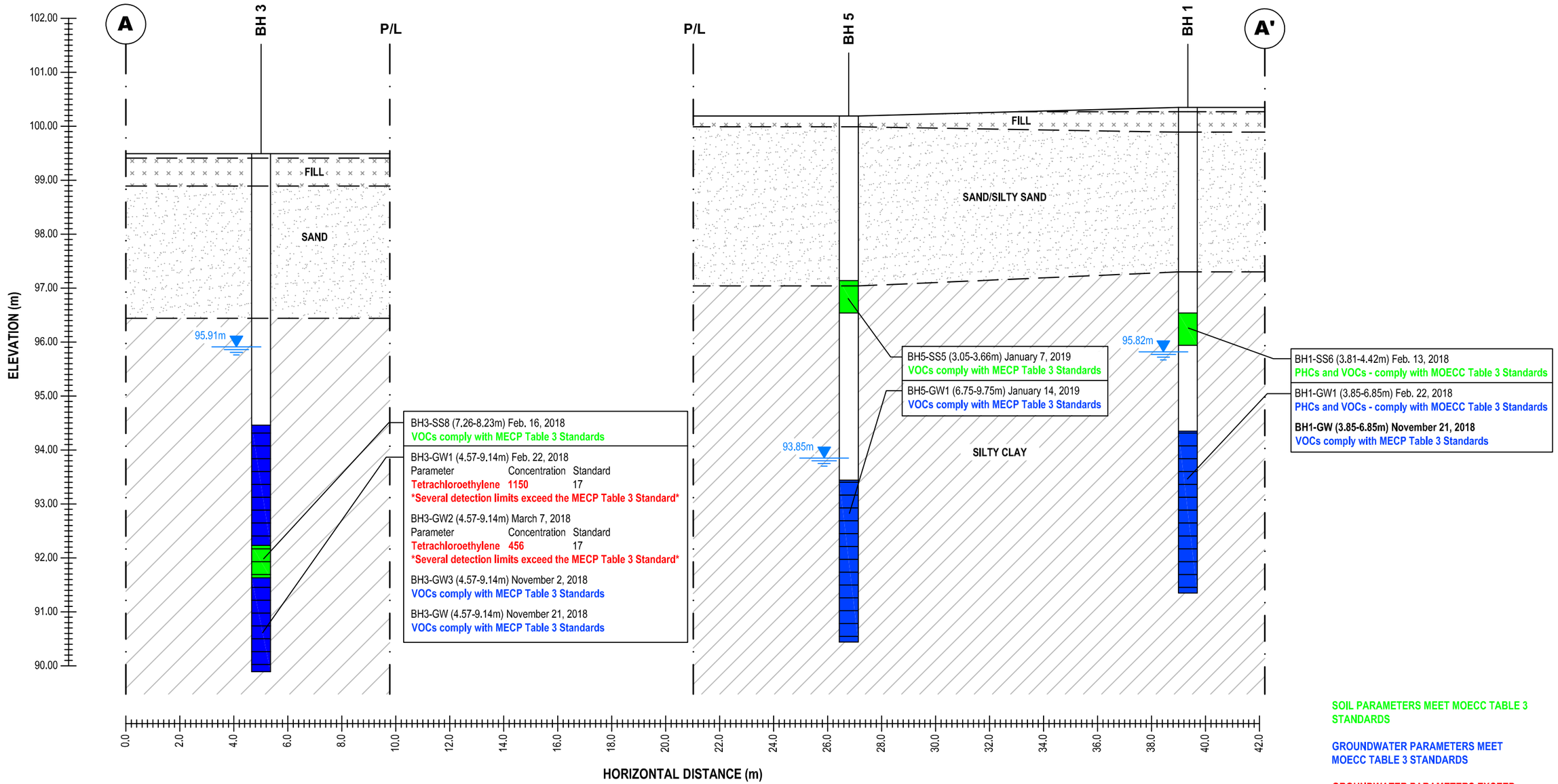

SOIL PARAMETERS MEET MOECC TABLE 3 STANDARDS

GROUNDWATER PARAMETERS MEET MOECC TABLE 3 STANDARDS

GROUNDWATER PARAMETERS EXCEED MOECC TABLE 3 STANDARDS

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL
0			

CHSS INTERNATIONAL INVESTMENTS AND MANAGEMENT INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
443 & 447 KENT STREET AND 423 & 425 McLEOD STREET

OTTAWA, ONTARIO

Title:

CROSS-SECTION A-A'

Scale: AS SHOWN	Date: 01/2019
Drawn by: MPG	Report No.: PE4194-2R
Checked by: MB	Dwg. No.: PE4194-4
Approved by: MSD	Revision No.: 0

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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 Studies

Paterson Group Inc.

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

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

patersongroup

Sampling & Analysis Plan

443 and 447 Kent Street
423 and 425 McLeod Street
Ottawa, Ontario

Prepared For

CHSS International Investments and Management Inc.

January, 2018
Revised: January 2019
Report: PE4194-SAP

Table of Contents

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by CHSS International Investments and Management Inc. to carry out a Phase II-Environmental Site Assessment (ESA) for the property at 443 and 447 Kent Street and 423 and 425 McLeod Street, in the City of Ottawa, Ontario. The Phase II was completed in conjunction with a geotechnical investigation. Based on the Phase I-ESA completed by Paterson for the subject property, the following subsurface investigation program was developed:

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1	Northeast corner of the subject site to address APEC 1 and APEC 2	Within the overburden soils to intercept the groundwater table and install a monitoring well.
BH2	Central part of site to address APEC 1 and APEC2, provide general coverage	Within the overburden soils to intercept the groundwater table and install a monitoring well.
BH3	Southern portion of the site to provide general coverage.	Within the overburden soils to intercept the groundwater table and install a monitoring well.
BH4	Northeast corner of 423/425 McLeod Street to delineate BH3 results	Similar depth as BH3, as requested by the City of Ottawa
BH5	Southeast corner of 447 Kent Street to delineate BH3 results.	Similar depth as BH3, as requested by the City of Ottawa

Test hole locations are shown on the Test Hole Location Plan appended to the main report.

At each borehole, split-spoon samples of overburden soils will be obtained at 0.76 m (2'6") intervals until five feet below the water table. All soil samples will be retained, and samples will be selected for submission following a preliminary screening analysis.

If it is considered necessary to drill into bedrock to intercept the groundwater table, boreholes will be advanced into bedrock as required using diamond coring equipment. Rock core samples will be retained for review, but not submitted for analysis.

Following borehole drilling, monitoring wells will be installed in selected boreholes for the measurement of water levels and the collection of groundwater samples.

2.0 ANALYTICAL TESTING PROGRAM

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

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

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

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

3.0 STANDARD OPERATING PROCEDURES

3.1 Environmental Drilling Procedure

Purpose

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

Equipment

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

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

Determining Borehole Locations

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

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

Drilling Procedure

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

- Continuous split spoon samples (every 0.6 m or 2') or semi-continuous (every 0.76 m or 2'6") are required.
- Make sure samples are well sealed in plastic bags with no holes prior to screening and are kept cool but unfrozen.
- If sampling for VOCs, BTEX, or PHCs F1, a soil core from each soil sample which may be analyzed must be taken and placed in the laboratory-provided methanol vial.
- Note all and any odours or discolouration of samples.
- Split spoon samplers must be washed between samples.
- If obvious contamination is encountered, continue sampling until vertical extent of contamination is delineated.
- As a general rule, environmental boreholes should be deep enough to intercept the groundwater table (unless this is impossible/impractical - call project manager to discuss).
- If at all possible, soil samples should be submitted to a preliminary screening procedure on site, either using a RKI Eagle, PID, visual observations, etc. depending on type of suspected contamination.

Spoon Washing Procedure

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

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

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

Screening Procedure

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

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

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

3.2 Monitoring Well Installation Procedure

Equipment

- 1.5 m x 5 cm threaded sections of Schedule 40 PVC slotted well screen (1.5 m x 3.2 cm if installing in cored hole in bedrock)
- 1.5 m x 5 cm threaded sections of Schedule 40 PVC riser pipe (1.5 m x 3.2 cm 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
- Portable pH/Temperature/Conductivity analyzer
- 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 possible.
- Where multi-parameter analyzers 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 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

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
443 & 447 Kent Street and 423 & 425 Mcleod Street
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant. An arbitrary elevation of 100.00m was assigned to the TBM.

FILE NO. **PE4194**

REMARKS

HOLE NO. **BH 1**

BORINGS BY CME-55 Low Clearance Drill **DATE** February 13, 2018

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							0	100.35
TOPSOIL	0.08		AU	1				
FILL: Brown sand, silt and clay	0.46							
Very loose, brown **SAND,** trace silt			SS	2	75	3	1	99.35
	1.50		SS	3	83	14	2	98.35
Compact to loose, brown **SAND**			SS	4	75	7		
	3.05		SS	5	100	2	3	97.35
			SS	6	100	P	4	96.35
			SS	7	100	P	5	95.35
Stiff, brown to grey **SILTY CLAY**			SS	8	100	P	6	94.35
			SS	9	100	3		
			SS	10	100	P	7	93.35
			AU	11			8	92.35
	8.99							
End of Borehole								
(GWL @ 4.53m - Jan. 14, 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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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
443 & 447 Kent Street and 423 & 425 Mcleod Street
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant. An arbitrary elevation of 100.00m was assigned to the TBM.

FILE NO. PE4194

REMARKS

HOLE NO. BH 2

BORINGS BY CME-55 Low Clearance Drill **DATE** February 13, 2018

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							0	99.77
Asphaltic concrete	0.05							
FILL: Brown silt, sand, clay and gravel	0.60		AU	1				
			SS	2	67	13	1	98.77
Compact, brown **SAND**			SS	3	67	14	2	97.77
	2.59		SS	4	50	11		
Compact, brown **SAND,** some silt and gravel	2.90		SS	5	100	1	3	96.77
			SS	6	100	P	4	95.77
			SS	7	100	P	5	94.77
Stiff, grey **SILTY CLAY**			SS	8	100	P	6	93.77
							7	92.77
			SS	9	100	P	8	91.77
							9	90.77
	9.30							
End of Borehole								
(GWL @ 4.03m - Jan. 14, 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 - Environmental Site Assessment
443 & 447 Kent Street and 423 & 425 Mcleod Street
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant. An arbitrary elevation of 100.00m was assigned to the TBM.

FILE NO. PE4194

REMARKS

HOLE NO. BH 3

BORINGS BY CME-55 Low Clearance Drill **DATE** February 16, 2018

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							0	99.49
Asphaltic concrete	0.08							
FILL: Brown sand, silt, clay and gravel	0.60		AU	1				
			SS	2	75	14	1	98.49
Compact, brown **SAND**			SS	3		16	2	97.49
	2.74		SS	4		37		
Grey **SAND** with gravel	3.05		SS	5		2	3	96.49
			SS	6	100	P	4	95.49
							5	94.49
Very stiff to stiff, grey **SILTY CLAY**			SS	7	100	P	6	93.49
							7	92.49
			SS	8	100	P	8	91.49
							9	90.49
	9.60							
End of Borehole								
(GWL @ 3.58m - Jan. 14, 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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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
443 & 447 Kent Street and 423 & 425 Mcleod Street
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant. An arbitrary elevation of 100.00m was assigned to the TBM.

FILE NO. PE4194

REMARKS

HOLE NO. BH 4

BORINGS BY Geoprobe **DATE** January 7, 2019

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							0	99.88
Concrete	0.10							
FILL: Brown sand, silt, clay and gravel	0.56							
			SS	1			1	98.88
Brown **SAND,** trace silt			SS	2				
			SS	3			2	97.88
	2.74		SS	4				
Brown **SAND**	2.95						3	96.88
			SS	5				
			SS	6			4	95.88
			SS	7				
			SS	8			5	94.88
Brown to grey **SILTY CLAY**								
			SS	9			6	93.88
			SS	10				
			SS	11			7	92.88
			SS	12				
			SS	13			8	91.88
			SS	14				
	9.14						9	90.88
End of Borehole								
(GWL @ 5.97m - Jan. 14, 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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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
443 & 447 Kent Street and 423 & 425 Mcleod Street
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant. An arbitrary elevation of 100.00m was assigned to the TBM.

FILE NO. PE4194

REMARKS

HOLE NO. BH 5

BORINGS BY Geoprobe **DATE** January 7, 2019

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							0	100.19
Crushed stone	0.20							
Brown **SILTY SAND**			SS	1			1	99.19
	1.22		SS	2				
Brown **SAND,** some silt			SS	3			2	98.19
			SS	4				
	3.15		SS	5			3	97.19
			SS	6				
			SS	7			4	96.19
			SS	8				
			SS	9			5	95.19
Brown to grey **SILTY CLAY**			SS	10				
			SS	11			6	94.19
			SS	12				
			SS	13			7	93.19
			SS	14				
			SS	15			8	92.19
	9.75							
End of Borehole							9	91.19
(GWL @ 6.34m - Jan. 14, 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

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

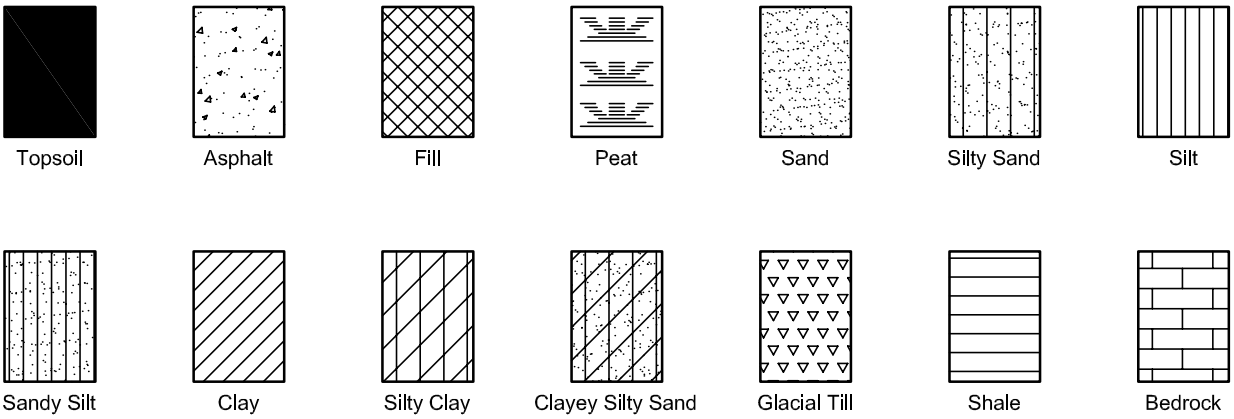
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

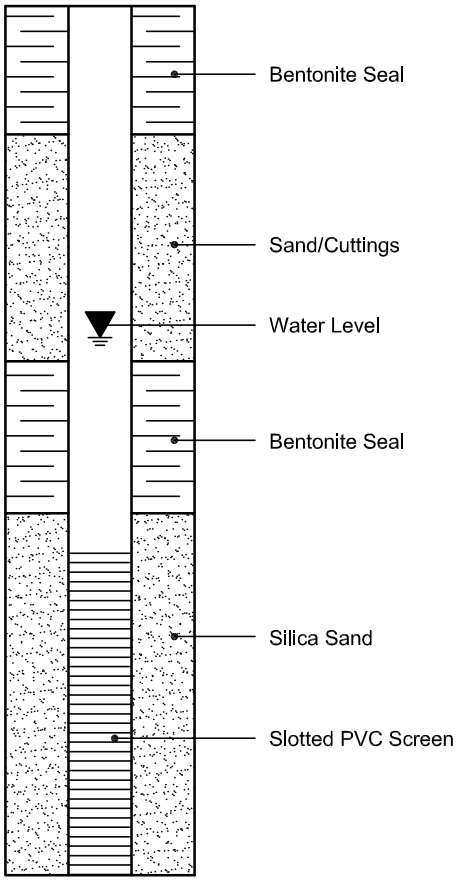
SYMBOLS AND TERMS (continued)

STRATA PLOT

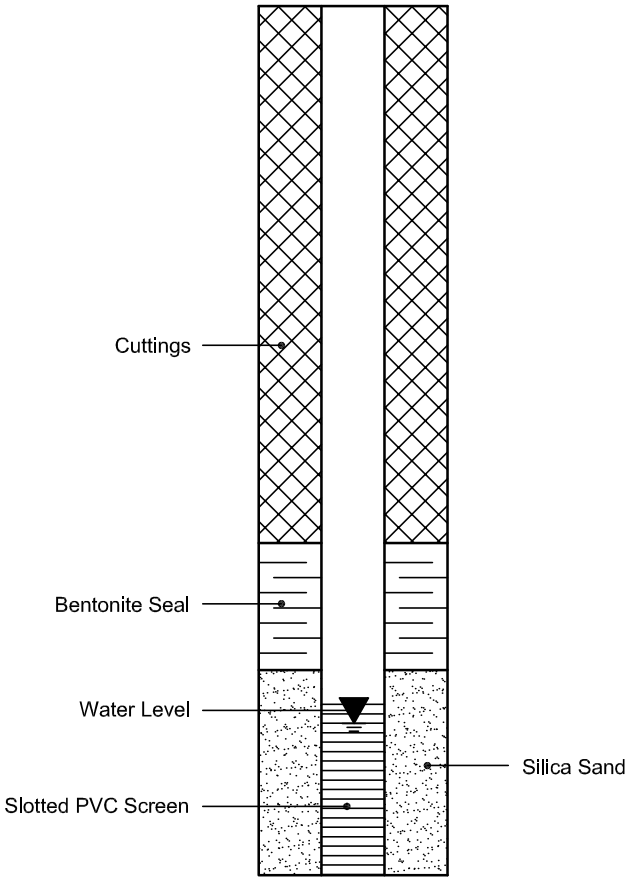


MONITORING WELL AND PIEZOMETER CONSTRUCTION

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: Mike Beaudoin

Client PO: 25656
Project: PE4194
Custody: 118596

Report Date: 14-Jan-2019
Order Date: 8-Jan-2019

Order #: 1902156

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

Paracel ID	Client ID
1902156-01	BH4-SS8
1902156-02	BH5-SS5

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25656

Report Date: 14-Jan-2019
Order Date: 8-Jan-2019
Project Description: PE4194

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
REG 153: VOCs by P&T GC/MS	EPA 8260 - P&T GC-MS	9-Jan-19	11-Jan-19
Solids, %	Gravimetric, calculation	9-Jan-19	9-Jan-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 25656

Report Date: 14-Jan-2019

Order Date: 8-Jan-2019

Project Description: PE4194

	Client ID:	BH4-SS8	BH5-SS5	-	-
	Sample Date:	01/07/2019 09:00	01/07/2019 09:00	-	-
	Sample ID:	1902156-01	1902156-02	-	-
	MDL/Units	Soil	Soil	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	58.0	70.3	-	-
Volatiles					
Acetone	0.50 ug/g dry	<0.50	<0.50	-	-
Benzene	0.02 ug/g dry	<0.02	<0.02	-	-
Bromodichloromethane	0.05 ug/g dry	<0.05	<0.05	-	-
Bromoform	0.05 ug/g dry	<0.05	<0.05	-	-
Bromomethane	0.05 ug/g dry	<0.05	<0.05	-	-
Carbon Tetrachloride	0.05 ug/g dry	<0.05	<0.05	-	-
Chlorobenzene	0.05 ug/g dry	<0.05	<0.05	-	-
Chloroform	0.05 ug/g dry	<0.05	<0.05	-	-
Dibromochloromethane	0.05 ug/g dry	<0.05	<0.05	-	-
Dichlorodifluoromethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,2-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	-	-
1,3-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	-	-
1,4-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	-	-
1,1-Dichloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,2-Dichloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,1-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	-	-
cis-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	-	-
trans-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	-	-
1,2-Dichloropropane	0.05 ug/g dry	<0.05	<0.05	-	-
cis-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	<0.05	-	-
trans-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	<0.05	-	-
1,3-Dichloropropene, total	0.05 ug/g dry	<0.05	<0.05	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	-	-
Ethylene dibromide (dibromoethan	0.05 ug/g dry	<0.05	<0.05	-	-
Hexane	0.05 ug/g dry	<0.05	<0.05	-	-
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	<0.50	<0.50	-	-
Methyl Isobutyl Ketone	0.50 ug/g dry	<0.50	<0.50	-	-
Methyl tert-butyl ether	0.05 ug/g dry	<0.05	<0.05	-	-
Methylene Chloride	0.05 ug/g dry	<0.05	<0.05	-	-
Styrene	0.05 ug/g dry	<0.05	<0.05	-	-
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
Tetrachloroethylene	0.05 ug/g dry	<0.05	<0.05	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 25656

Report Date: 14-Jan-2019

Order Date: 8-Jan-2019

Project Description: PE4194

	Client ID:	BH4-SS8	BH5-SS5	-	-
	Sample Date:	01/07/2019 09:00	01/07/2019 09:00	-	-
	Sample ID:	1902156-01	1902156-02	-	-
	MDL/Units	Soil	Soil	-	-
Toluene	0.05 ug/g dry	<0.05	<0.05	-	-
1,1,1-Trichloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,1,2-Trichloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
Trichloroethylene	0.05 ug/g dry	<0.05	<0.05	-	-
Trichlorofluoromethane	0.05 ug/g dry	<0.05	<0.05	-	-
Vinyl chloride	0.02 ug/g dry	<0.02	<0.02	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	-	-
o-Xylene	0.05 ug/g dry	<0.05	<0.05	-	-
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	-	-
4-Bromofluorobenzene	Surrogate	103%	100%	-	-
Dibromofluoromethane	Surrogate	93.7%	93.3%	-	-
Toluene-d8	Surrogate	101%	100%	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	ND	0.50	ug/g						
Benzene	ND	0.02	ug/g						
Bromodichloromethane	ND	0.05	ug/g						
Bromoform	ND	0.05	ug/g						
Bromomethane	ND	0.05	ug/g						
Carbon Tetrachloride	ND	0.05	ug/g						
Chlorobenzene	ND	0.05	ug/g						
Chloroform	ND	0.05	ug/g						
Dibromochloromethane	ND	0.05	ug/g						
Dichlorodifluoromethane	ND	0.05	ug/g						
1,2-Dichlorobenzene	ND	0.05	ug/g						
1,3-Dichlorobenzene	ND	0.05	ug/g						
1,4-Dichlorobenzene	ND	0.05	ug/g						
1,1-Dichloroethane	ND	0.05	ug/g						
1,2-Dichloroethane	ND	0.05	ug/g						
1,1-Dichloroethylene	ND	0.05	ug/g						
cis-1,2-Dichloroethylene	ND	0.05	ug/g						
trans-1,2-Dichloroethylene	ND	0.05	ug/g						
1,2-Dichloropropane	ND	0.05	ug/g						
cis-1,3-Dichloropropylene	ND	0.05	ug/g						
trans-1,3-Dichloropropylene	ND	0.05	ug/g						
1,3-Dichloropropene, total	ND	0.05	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Ethylene dibromide (dibromoethane	ND	0.05	ug/g						
Hexane	ND	0.05	ug/g						
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g						
Methyl Isobutyl Ketone	ND	0.50	ug/g						
Methyl tert-butyl ether	ND	0.05	ug/g						
Methylene Chloride	ND	0.05	ug/g						
Styrene	ND	0.05	ug/g						
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g						
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g						
Tetrachloroethylene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
1,1,1-Trichloroethane	ND	0.05	ug/g						
1,1,2-Trichloroethane	ND	0.05	ug/g						
Trichloroethylene	ND	0.05	ug/g						
Trichlorofluoromethane	ND	0.05	ug/g						
Vinyl chloride	ND	0.02	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: 4-Bromofluorobenzene	*8.82*		*ug/g*		*110*	*50-140*			
Surrogate: Dibromofluoromethane	*7.61*		*ug/g*		*95.1*	*50-140*			
Surrogate: Toluene-d8	*7.64*		*ug/g*		*95.5*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Physical Characteristics									
% Solids	88.6	0.1	% by Wt.	88.2			0.4	25	
Volatiles									
Acetone	ND	0.50	ug/g dry	ND				50	
Benzene	ND	0.02	ug/g dry	ND				50	
Bromodichloromethane	ND	0.05	ug/g dry	ND				50	
Bromoform	ND	0.05	ug/g dry	ND				50	
Bromomethane	ND	0.05	ug/g dry	ND				50	
Carbon Tetrachloride	ND	0.05	ug/g dry	ND				50	
Chlorobenzene	ND	0.05	ug/g dry	ND				50	
Chloroform	ND	0.05	ug/g dry	ND				50	
Dibromochloromethane	ND	0.05	ug/g dry	ND				50	
Dichlorodifluoromethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,3-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,4-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
cis-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
trans-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
1,2-Dichloropropane	ND	0.05	ug/g dry	ND				50	
cis-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
trans-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Ethylene dibromide (dibromoethane	ND	0.05	ug/g dry	ND				50	
Hexane	ND	0.05	ug/g dry	ND				50	
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g dry	ND				50	
Methyl Isobutyl Ketone	ND	0.50	ug/g dry	ND				50	
Methyl tert-butyl ether	ND	0.05	ug/g dry	ND				50	
Methylene Chloride	ND	0.05	ug/g dry	ND				50	
Styrene	ND	0.05	ug/g dry	ND				50	
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
Tetrachloroethylene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
1,1,1-Trichloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2-Trichloroethane	ND	0.05	ug/g dry	ND				50	
Trichloroethylene	ND	0.05	ug/g dry	ND				50	
Trichlorofluoromethane	ND	0.05	ug/g dry	ND				50	
Vinyl chloride	ND	0.02	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: 4-Bromofluorobenzene	*9.62*		*ug/g dry*		*99.7*	*50-140*			
Surrogate: Dibromofluoromethane	*8.82*		*ug/g dry*		*91.4*	*50-140*			
Surrogate: Toluene-d8	*9.85*		*ug/g dry*		*102*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	8.96	0.50	ug/g		89.6	50-140			
Benzene	3.49	0.02	ug/g		87.3	60-130			
Bromodichloromethane	3.53	0.05	ug/g		88.3	60-130			
Bromoform	4.61	0.05	ug/g		115	60-130			
Bromomethane	3.10	0.05	ug/g		77.6	50-140			
Carbon Tetrachloride	3.81	0.05	ug/g		95.2	60-130			
Chlorobenzene	3.80	0.05	ug/g		95.1	60-130			
Chloroform	3.57	0.05	ug/g		89.4	60-130			
Dibromochloromethane	4.26	0.05	ug/g		106	60-130			
Dichlorodifluoromethane	3.57	0.05	ug/g		89.2	50-140			
1,2-Dichlorobenzene	3.43	0.05	ug/g		85.7	60-130			
1,3-Dichlorobenzene	3.65	0.05	ug/g		91.3	60-130			
1,4-Dichlorobenzene	3.60	0.05	ug/g		90.0	60-130			
1,1-Dichloroethane	4.31	0.05	ug/g		108	60-130			
1,2-Dichloroethane	4.35	0.05	ug/g		109	60-130			
1,1-Dichloroethylene	4.31	0.05	ug/g		108	60-130			
cis-1,2-Dichloroethylene	3.90	0.05	ug/g		97.4	60-130			
trans-1,2-Dichloroethylene	3.83	0.05	ug/g		95.7	60-130			
1,2-Dichloropropane	4.04	0.05	ug/g		101	60-130			
cis-1,3-Dichloropropylene	4.33	0.05	ug/g		108	60-130			
trans-1,3-Dichloropropylene	2.82	0.05	ug/g		70.4	60-130			
Ethylbenzene	3.95	0.05	ug/g		98.7	60-130			
Ethylene dibromide (dibromoethane	4.87	0.05	ug/g		122	60-130			
Hexane	2.84	0.05	ug/g		71.1	60-130			
Methyl Ethyl Ketone (2-Butanone)	7.64	0.50	ug/g		76.4	50-140			
Methyl Isobutyl Ketone	10.7	0.50	ug/g		107	50-140			
Methyl tert-butyl ether	6.54	0.05	ug/g		65.4	50-140			
Methylene Chloride	3.94	0.05	ug/g		98.4	60-130			
Styrene	3.91	0.05	ug/g		97.6	60-130			
1,1,1,2-Tetrachloroethane	4.93	0.05	ug/g		123	60-130			
1,1,2,2-Tetrachloroethane	4.43	0.05	ug/g		111	60-130			
Tetrachloroethylene	4.04	0.05	ug/g		101	60-130			
Toluene	3.71	0.05	ug/g		92.7	60-130			
1,1,1-Trichloroethane	3.81	0.05	ug/g		95.3	60-130			
1,1,2-Trichloroethane	3.81	0.05	ug/g		95.3	60-130			
Trichloroethylene	3.90	0.05	ug/g		97.5	60-130			
Trichlorofluoromethane	3.33	0.05	ug/g		83.4	50-140			
Vinyl chloride	2.50	0.02	ug/g		62.6	50-140			
m,p-Xylenes	7.68	0.05	ug/g		96.1	60-130			
o-Xylene	4.13	0.05	ug/g		103	60-130			
Surrogate: 4-Bromofluorobenzene	*7.25*		*ug/g*		*90.6*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

PARACE LABORATORIES

Paracel ID: 1902156

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

Chain of Custody
(Lab Use Only)
№ 118596

Page 1 of 1

Client Name: PATERSON	Project Reference: PE4194
Contact Name: MIKE BEAUDOIN	Quote #
Address: 154 Colonnade Rd S.	PO # 25656
Telephone: 613-226-7381	Email Address: mdarcy@patersongroup.ca mbeaudoin@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: 1902156

	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	BH4-SS8	S		2	JAN 7/19			X											120hr TAT	
2	BH5-SS5	S		2	↓			X											↓	
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Paracel

Relinquished By (Sign): Mike B.	Received by Driver/Depot: T. Scouse	Received at Lab:
Relinquished By (Print): Mike B.	Date/Time: 08/01/19 3:40 PM	Date/Time: 08/01/19 4:15pm
Date/Time:	Temperature: °C	Temperature: 16.1°C

Verified By:
Date/Time: Jan 8, 19 4:37
pH Verified [ ] By: NA

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mike Beaudoin

Client PO: 25769
Project: PE4194
Custody: 118598

Report Date: 21-Jan-2019
Order Date: 15-Jan-2019

Order #: 1903268

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

Paracel ID	Client ID
1903268-01	BH4-GW1
1903268-02	BH5-GW1

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25769

Report Date: 21-Jan-2019
Order Date: 15-Jan-2019
Project Description: PE4194

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	17-Jan-19	17-Jan-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 25769

Report Date: 21-Jan-2019

Order Date: 15-Jan-2019

Project Description: PE4194

	Client ID:	BH4-GW1	BH5-GW1	-	-
	Sample Date:	01/14/2019 09:00	01/14/2019 09:00	-	-
	Sample ID:	1903268-01	1903268-02	-	-
	MDL/Units	Water	Water	-	-
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	-	-
Benzene	0.5 ug/L	<0.5	<0.5	-	-
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	-	-
Bromoform	0.5 ug/L	<0.5	<0.5	-	-
Bromomethane	0.5 ug/L	<0.5	<0.5	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	-	-
Chlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
Chloroform	0.5 ug/L	<0.5	<0.5	-	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	-	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	-	-
Ethylene dibromide (dibromoethan	0.2 ug/L	<0.2	<0.2	-	-
Hexane	1.0 ug/L	<1.0	<1.0	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	-	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	-	-
Styrene	0.5 ug/L	<0.5	<0.5	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	-	-
Toluene	0.5 ug/L	<0.5	<0.5	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 25769

Report Date: 21-Jan-2019

Order Date: 15-Jan-2019

Project Description: PE4194

	Client ID:	BH4-GW1	BH5-GW1	-	-
	Sample Date:	01/14/2019 09:00	01/14/2019 09:00	-	-
	Sample ID:	1903268-01	1903268-02	-	-
	MDL/Units	Water	Water	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	-
Trichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	-	-
Vinyl chloride	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	-	-
4-Bromofluorobenzene	Surrogate	110%	107%	-	-
Dibromofluoromethane	Surrogate	118%	114%	-	-
Toluene-d8	Surrogate	106%	110%	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*89.4*		*ug/L*		*112*	*50-140*			
Surrogate: Dibromofluoromethane	*96.7*		*ug/L*		*121*	*50-140*			
Surrogate: Toluene-d8	*87.1*		*ug/L*		*109*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	22.2	0.5	ug/L	18.1			20.4	30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	61.5	0.5	ug/L	61.0			0.9	30	
Chloroform	ND	0.5	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	6.32	0.5	ug/L	6.85			8.1	30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*71.6*		*ug/L*		*89.5*	*50-140*			
Surrogate: Dibromofluoromethane	*79.3*		*ug/L*		*99.2*	*50-140*			
Surrogate: Toluene-d8	*78.2*		*ug/L*		*97.8*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	74.3	5.0	ug/L		74.3	50-140			
Benzene	39.0	0.5	ug/L		97.6	60-130			
Bromodichloromethane	38.9	0.5	ug/L		97.2	60-130			
Bromoform	30.5	0.5	ug/L		76.2	60-130			
Bromomethane	25.5	0.5	ug/L		63.8	50-140			
Carbon Tetrachloride	33.3	0.2	ug/L		83.2	60-130			
Chlorobenzene	33.6	0.5	ug/L		84.0	60-130			
Chloroform	35.3	0.5	ug/L		88.2	60-130			
Dibromochloromethane	34.7	0.5	ug/L		86.7	60-130			
Dichlorodifluoromethane	29.5	1.0	ug/L		73.8	50-140			
1,2-Dichlorobenzene	35.2	0.5	ug/L		87.9	60-130			
1,3-Dichlorobenzene	34.4	0.5	ug/L		86.0	60-130			
1,4-Dichlorobenzene	32.6	0.5	ug/L		81.4	60-130			
1,1-Dichloroethane	33.9	0.5	ug/L		84.8	60-130			
1,2-Dichloroethane	33.1	0.5	ug/L		82.7	60-130			
1,1-Dichloroethylene	29.7	0.5	ug/L		74.3	60-130			
cis-1,2-Dichloroethylene	35.1	0.5	ug/L		87.8	60-130			
trans-1,2-Dichloroethylene	29.8	0.5	ug/L		74.4	60-130			
1,2-Dichloropropane	39.2	0.5	ug/L		98.0	60-130			
cis-1,3-Dichloropropylene	41.1	0.5	ug/L		103	60-130			
trans-1,3-Dichloropropylene	35.1	0.5	ug/L		87.8	60-130			
Ethylbenzene	41.8	0.5	ug/L		105	60-130			
Ethylene dibromide (dibromoethane	31.6	0.2	ug/L		78.9	60-130			
Hexane	83.2	1.0	ug/L		208	60-130			
Methyl Ethyl Ketone (2-Butanone)	87.7	5.0	ug/L		87.7	50-140			
Methyl Isobutyl Ketone	99.2	5.0	ug/L		99.2	50-140			
Methyl tert-butyl ether	85.5	2.0	ug/L		85.5	50-140			
Methylene Chloride	31.3	5.0	ug/L		78.3	60-130			
Styrene	41.8	0.5	ug/L		105	60-130			
1,1,1,2-Tetrachloroethane	32.6	0.5	ug/L		81.4	60-130			
1,1,2,2-Tetrachloroethane	33.6	0.5	ug/L		83.9	60-130			
Tetrachloroethylene	30.6	0.5	ug/L		76.4	60-130			
Toluene	35.4	0.5	ug/L		88.4	60-130			
1,1,1-Trichloroethane	31.7	0.5	ug/L		79.2	60-130			
1,1,2-Trichloroethane	38.6	0.5	ug/L		96.5	60-130			
Trichloroethylene	38.0	0.5	ug/L		95.0	60-130			
Trichlorofluoromethane	33.3	1.0	ug/L		83.2	60-130			
Vinyl chloride	31.2	0.5	ug/L		78.0	50-140			
m,p-Xylenes	83.2	0.5	ug/L		104	60-130			
o-Xylene	41.9	0.5	ug/L		105	60-130			
Surrogate: 4-Bromofluorobenzene	*69.8*		*ug/L*		*87.3*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

PARACEL LABORATORIES LTD.

Paracel ID: 1903268

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

Chain of Custody
(Lab Use Only)
№ 118598

Page 1 of 1

Client Name: PATERSON	Project Reference: PE4194
Contact Name: MIKE BEAUDOIN	Quote #
Address: 154 Colonnade Rd S.	PO # 25769
Telephone: 613-226-7381	Email Address: mbeaudoin@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: 1903268																						
	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	BH4-GW1	GW		2	Jan 14/19			X														
2	BH5-GW1	GW		2	↓			X														
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						

Comments:

Method of Delivery: Picked

Relinquished By (Sign): L. C. B.	Received by Driver/Depot: T. Sloutsis	Received at Lab:	Verified By:
Relinquished By (Print): MIKE B.	Date/Time: 15/01/19 4:20 pm	Date/Time: 15/1/19 5:39 am	Date/Time:
Date/Time:	Temperature: °C	Temperature: 15 °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: 23465
Project: PE4194
Custody: 115619

Report Date: 21-Feb-2018
Order Date: 14-Feb-2018

Order #: 1807312

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

Paracel ID	Client ID
1807312-01	BH1-SS6
1807312-02	BH2-SS6

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23465

Report Date: 21-Feb-2018
Order Date: 14-Feb-2018
Project Description: PE4194

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHC F1	CWS Tier 1 - P&T GC-FID	15-Feb-18	17-Feb-18
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	15-Feb-18	17-Feb-18
REG 153: VOCs by P&T GC/MS	EPA 8260 - P&T GC-MS	15-Feb-18	21-Feb-18
Solids, %	Gravimetric, calculation	16-Feb-18	16-Feb-18

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 23465

Report Date: 21-Feb-2018

Order Date: 14-Feb-2018

Project Description: PE4194

	Client ID:	BH1-SS6	BH2-SS6	-	-
	Sample Date:	13-Feb-18	13-Feb-18	-	-
	Sample ID:	1807312-01	1807312-02	-	-
	MDL/Units	Soil	Soil	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	57.9	56.3	-	-
Volatiles					
Acetone	0.50 ug/g dry	<0.50	<0.50	-	-
Benzene	0.02 ug/g dry	<0.02	<0.02	-	-
Bromodichloromethane	0.05 ug/g dry	<0.05	<0.05	-	-
Bromoform	0.05 ug/g dry	<0.05	<0.05	-	-
Bromomethane	0.05 ug/g dry	<0.05	<0.05	-	-
Carbon Tetrachloride	0.05 ug/g dry	<0.05	<0.05	-	-
Chlorobenzene	0.05 ug/g dry	<0.05	<0.05	-	-
Chloroform	0.05 ug/g dry	<0.05	<0.05	-	-
Dibromochloromethane	0.05 ug/g dry	<0.05	<0.05	-	-
Dichlorodifluoromethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,2-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	-	-
1,3-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	-	-
1,4-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	-	-
1,1-Dichloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,2-Dichloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,1-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	-	-
cis-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	-	-
trans-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	-	-
1,2-Dichloropropane	0.05 ug/g dry	<0.05	<0.05	-	-
cis-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	<0.05	-	-
trans-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	<0.05	-	-
1,3-Dichloropropene, total	0.05 ug/g dry	<0.05	<0.05	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	-	-
Ethylene dibromide (dibromoethan	0.05 ug/g dry	<0.05	<0.05	-	-
Hexane	0.05 ug/g dry	<0.05	<0.05	-	-
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	<0.50	<0.50	-	-
Methyl Isobutyl Ketone	0.50 ug/g dry	<0.50	<0.50	-	-
Methyl tert-butyl ether	0.05 ug/g dry	<0.05	<0.05	-	-
Methylene Chloride	0.05 ug/g dry	<0.05	<0.05	-	-
Styrene	0.05 ug/g dry	<0.05	<0.05	-	-
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
Tetrachloroethylene	0.05 ug/g dry	<0.05	<0.05	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 23465

Report Date: 21-Feb-2018

Order Date: 14-Feb-2018

Project Description: PE4194

	Client ID:	BH1-SS6	BH2-SS6	-	-
	Sample Date:	13-Feb-18	13-Feb-18	-	-
	Sample ID:	1807312-01	1807312-02	-	-
	MDL/Units	Soil	Soil	-	-
Toluene	0.05 ug/g dry	<0.05	<0.05	-	-
1,1,1-Trichloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,1,2-Trichloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
Trichloroethylene	0.05 ug/g dry	<0.05	<0.05	-	-
Trichlorofluoromethane	0.05 ug/g dry	<0.05	<0.05	-	-
Vinyl chloride	0.02 ug/g dry	<0.02	<0.02	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	-	-
o-Xylene	0.05 ug/g dry	<0.05	<0.05	-	-
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	-	-
4-Bromofluorobenzene	Surrogate	106%	106%	-	-
Dibromofluoromethane	Surrogate	97.3%	81.9%	-	-
Toluene-d8	Surrogate	103%	113%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	-	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	-	-
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	-	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Volatiles									
Acetone	ND	0.50	ug/g						
Benzene	ND	0.02	ug/g						
Bromodichloromethane	ND	0.05	ug/g						
Bromoform	ND	0.05	ug/g						
Bromomethane	ND	0.05	ug/g						
Carbon Tetrachloride	ND	0.05	ug/g						
Chlorobenzene	ND	0.05	ug/g						
Chloroform	ND	0.05	ug/g						
Dibromochloromethane	ND	0.05	ug/g						
Dichlorodifluoromethane	ND	0.05	ug/g						
1,2-Dichlorobenzene	ND	0.05	ug/g						
1,3-Dichlorobenzene	ND	0.05	ug/g						
1,4-Dichlorobenzene	ND	0.05	ug/g						
1,1-Dichloroethane	ND	0.05	ug/g						
1,2-Dichloroethane	ND	0.05	ug/g						
1,1-Dichloroethylene	ND	0.05	ug/g						
cis-1,2-Dichloroethylene	ND	0.05	ug/g						
trans-1,2-Dichloroethylene	ND	0.05	ug/g						
1,2-Dichloropropane	ND	0.05	ug/g						
cis-1,3-Dichloropropylene	ND	0.05	ug/g						
trans-1,3-Dichloropropylene	ND	0.05	ug/g						
1,3-Dichloropropene, total	ND	0.05	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Ethylene dibromide (dibromoethane	ND	0.05	ug/g						
Hexane	ND	0.05	ug/g						
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g						
Methyl Isobutyl Ketone	ND	0.50	ug/g						
Methyl tert-butyl ether	ND	0.05	ug/g						
Methylene Chloride	ND	0.05	ug/g						
Styrene	ND	0.05	ug/g						
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g						
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g						
Tetrachloroethylene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
1,1,1-Trichloroethane	ND	0.05	ug/g						
1,1,2-Trichloroethane	ND	0.05	ug/g						
Trichloroethylene	ND	0.05	ug/g						
Trichlorofluoromethane	ND	0.05	ug/g						
Vinyl chloride	ND	0.02	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: 4-Bromofluorobenzene	*3.10*		*ug/g*		*96.9*	*50-140*			
Surrogate: Dibromofluoromethane	*2.78*		*ug/g*		*86.8*	*50-140*			
Surrogate: Toluene-d8	*2.35*		*ug/g*		*73.5*	*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)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND				30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND				30	
Physical Characteristics									
% Solids	83.7	0.1	% by Wt.	84.5			0.9	25	
Volatiles									
Acetone	ND	0.50	ug/g dry	ND				50	
Benzene	ND	0.02	ug/g dry	ND				50	
Bromodichloromethane	ND	0.05	ug/g dry	ND				50	
Bromoform	ND	0.05	ug/g dry	ND				50	
Bromomethane	ND	0.05	ug/g dry	ND				50	
Carbon Tetrachloride	ND	0.05	ug/g dry	ND				50	
Chlorobenzene	ND	0.05	ug/g dry	ND				50	
Chloroform	ND	0.05	ug/g dry	ND				50	
Dibromochloromethane	ND	0.05	ug/g dry	ND				50	
Dichlorodifluoromethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,3-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,4-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
cis-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
trans-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
1,2-Dichloropropane	ND	0.05	ug/g dry	ND				50	
cis-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
trans-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Ethylene dibromide (dibromoethane	ND	0.05	ug/g dry	ND				50	
Hexane	ND	0.05	ug/g dry	ND				50	
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g dry	ND				50	
Methyl Isobutyl Ketone	ND	0.50	ug/g dry	ND				50	
Methyl tert-butyl ether	ND	0.05	ug/g dry	ND				50	
Methylene Chloride	ND	0.05	ug/g dry	ND				50	
Styrene	ND	0.05	ug/g dry	ND				50	
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
Tetrachloroethylene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
1,1,1-Trichloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2-Trichloroethane	ND	0.05	ug/g dry	ND				50	
Trichloroethylene	ND	0.05	ug/g dry	ND				50	
Trichlorofluoromethane	ND	0.05	ug/g dry	ND				50	
Vinyl chloride	ND	0.02	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: 4-Bromofluorobenzene	*3.17*		*ug/g dry*		*86.4*	*50-140*			
Surrogate: Dibromofluoromethane	*2.52*		*ug/g dry*		*68.9*	*50-140*			
Surrogate: Toluene-d8	*3.61*		*ug/g dry*		*98.5*	*50-140*			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23465

Report Date: 21-Feb-2018
Order Date: 14-Feb-2018
Project Description: PE4194

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	203	7	ug/g		101	80-120			
F2 PHCs (C10-C16)	105	4	ug/g	ND	97.7	60-140			
F3 PHCs (C16-C34)	209	8	ug/g	ND	94.4	60-140			
F4 PHCs (C34-C50)	181	6	ug/g	ND	123	60-140			
Volatiles									
Acetone	7.02	0.50	ug/g		70.2	50-140			
Benzene	2.75	0.02	ug/g		68.7	60-130			
Bromodichloromethane	2.58	0.05	ug/g		64.5	60-130			
Bromoform	3.25	0.05	ug/g		81.3	60-130			
Bromomethane	2.47	0.05	ug/g		61.8	50-140			
Carbon Tetrachloride	2.51	0.05	ug/g		62.9	60-130			
Chlorobenzene	4.01	0.05	ug/g		100	60-130			
Chloroform	2.82	0.05	ug/g		70.5	60-130			
Dibromochloromethane	4.15	0.05	ug/g		104	60-130			
Dichlorodifluoromethane	2.50	0.05	ug/g		62.5	50-140			
1,2-Dichlorobenzene	3.80	0.05	ug/g		95.0	60-130			
1,3-Dichlorobenzene	3.88	0.05	ug/g		97.0	60-130			
1,4-Dichlorobenzene	3.90	0.05	ug/g		97.5	60-130			
1,1-Dichloroethane	2.59	0.05	ug/g		64.7	60-130			
1,2-Dichloroethane	2.91	0.05	ug/g		72.7	60-130			
1,1-Dichloroethylene	3.20	0.05	ug/g		80.1	60-130			
cis-1,2-Dichloroethylene	2.50	0.05	ug/g		62.6	60-130			
trans-1,2-Dichloroethylene	3.17	0.05	ug/g		79.3	60-130			
1,2-Dichloropropane	2.67	0.05	ug/g		66.7	60-130			
cis-1,3-Dichloropropylene	2.74	0.05	ug/g		68.6	60-130			
trans-1,3-Dichloropropylene	3.56	0.05	ug/g		89.1	60-130			
Ethylbenzene	3.85	0.05	ug/g		96.2	60-130			
Ethylene dibromide (dibromoethane	3.62	0.05	ug/g		90.5	60-130			
Hexane	2.42	0.05	ug/g		60.5	60-130			
Methyl Ethyl Ketone (2-Butanone)	7.77	0.50	ug/g		77.7	50-140			
Methyl Isobutyl Ketone	9.51	0.50	ug/g		95.1	50-140			
Methyl tert-butyl ether	5.42	0.05	ug/g		54.2	50-140			
Methylene Chloride	2.75	0.05	ug/g		68.8	60-130			
Styrene	3.65	0.05	ug/g		91.3	60-130			
1,1,1,2-Tetrachloroethane	3.60	0.05	ug/g		89.9	60-130			
1,1,2,2-Tetrachloroethane	3.40	0.05	ug/g		85.1	60-130			
Tetrachloroethylene	4.15	0.05	ug/g		104	60-130			
Toluene	3.79	0.05	ug/g		94.9	60-130			
1,1,1-Trichloroethane	2.75	0.05	ug/g		68.7	60-130			
1,1,2-Trichloroethane	2.69	0.05	ug/g		67.3	60-130			
Trichloroethylene	2.68	0.05	ug/g		67.1	60-130			
Trichlorofluoromethane	3.46	0.05	ug/g		86.5	50-140			
Vinyl chloride	2.82	0.02	ug/g		70.5	50-140			
m,p-Xylenes	7.98	0.05	ug/g		99.7	60-130			
o-Xylene	4.16	0.05	ug/g		104	60-130			
Surrogate: 4-Bromofluorobenzene	*2.20*		*ug/g*		*68.7*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

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

Paracel ID: 1807312

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№ 115619

Page 1 of 1

Client Name: Paterson Group	Project Reference: PE4194	**Turnaround Time:**	
Contact Name: Mark D'Arcy	Quote #	☐ 1 Day	☐ 3 Day
Address: 154 Colonnade Rd S Ottawa, ON	PO # 23465	☐ 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: 1807312

	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-S56	S		2	FEB 13/18	PM	✓	✓										120 trivial		
2	BH2-S56	S		2	↓	PM	✓	✓										"		
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: A. Seguin	Received at Lab:
Relinquished By (Print): Greg vL	Date/Time: 14/02/18 3:10 pm	Date/Time: 02/14/18 9:13
Date/Time:	Temperature: °C	Temperature: 13.1 °C
		Verified By:
		Date/Time: 02/14/18 5:30
		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: 25574
Project: PE4194
Custody: 46404

Report Date: 28-Nov-2018
Order Date: 22-Nov-2018

Order #: 1847486

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

Paracel ID	Client ID
1847486-01	BH1-GW
1847486-02	BH2-GW
1847486-03	BH3-GW

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25574

Report Date: 28-Nov-2018
Order Date: 22-Nov-2018
Project Description: PE4194

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	23-Nov-18	27-Nov-18

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 25574

Report Date: 28-Nov-2018

Order Date: 22-Nov-2018

Project Description: PE4194

	Client ID:	BH1-GW	BH2-GW	BH3-GW	-
	Sample Date:	11/21/2018 12:45	11/21/2018 13:45	11/21/2018 11:45	-
	Sample ID:	1847486-01	1847486-02	1847486-03	-
	MDL/Units	Water	Water	Water	-
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	<5.0	-
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	-
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Chloroform	0.5 ug/L	<0.5	<0.5	0.9	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Ethylene dibromide (dibromoethan	0.2 ug/L	<0.2	<0.2	<0.2	-
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	-
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	11.8	-
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 25574

Report Date: 28-Nov-2018

Order Date: 22-Nov-2018

Project Description: PE4194

	Client ID:	BH1-GW	BH2-GW	BH3-GW	-
	Sample Date:	11/21/2018 12:45	11/21/2018 13:45	11/21/2018 11:45	-
	Sample ID:	1847486-01	1847486-02	1847486-03	-
	MDL/Units	Water	Water	Water	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	-
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	-
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	-
4-Bromofluorobenzene	Surrogate	116%	124%	115%	-
Dibromofluoromethane	Surrogate	123%	130%	133%	-
Toluene-d8	Surrogate	76.6%	78.8%	79.0%	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*86.8*		*ug/L*		*108*	*50-140*			
Surrogate: Dibromofluoromethane	*79.9*		*ug/L*		*99.9*	*50-140*			
Surrogate: Toluene-d8	*84.2*		*ug/L*		*105*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*78.7*		*ug/L*		*98.4*	*50-140*			
Surrogate: Dibromofluoromethane	*91.2*		*ug/L*		*114*	*50-140*			
Surrogate: Toluene-d8	*85.9*		*ug/L*		*107*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	84.2	5.0	ug/L		84.2	50-140			
Benzene	27.4	0.5	ug/L		68.6	60-130			
Bromodichloromethane	27.9	0.5	ug/L		69.8	60-130			
Bromoform	32.1	0.5	ug/L		80.2	60-130			
Bromomethane	30.5	0.5	ug/L		76.2	50-140			
Carbon Tetrachloride	30.4	0.2	ug/L		75.9	60-130			
Chlorobenzene	32.4	0.5	ug/L		81.1	60-130			
Chloroform	30.3	0.5	ug/L		75.7	60-130			
Dibromochloromethane	27.4	0.5	ug/L		68.4	60-130			
Dichlorodifluoromethane	26.0	1.0	ug/L		65.1	50-140			
1,2-Dichlorobenzene	27.2	0.5	ug/L		68.1	60-130			
1,3-Dichlorobenzene	29.2	0.5	ug/L		73.0	60-130			
1,4-Dichlorobenzene	30.1	0.5	ug/L		75.2	60-130			
1,1-Dichloroethane	28.8	0.5	ug/L		71.9	60-130			
1,2-Dichloroethane	30.0	0.5	ug/L		75.1	60-130			
1,1-Dichloroethylene	29.2	0.5	ug/L		73.0	60-130			
cis-1,2-Dichloroethylene	28.2	0.5	ug/L		70.5	60-130			
trans-1,2-Dichloroethylene	29.0	0.5	ug/L		72.6	60-130			
1,2-Dichloropropane	28.8	0.5	ug/L		72.1	60-130			
cis-1,3-Dichloropropylene	32.2	0.5	ug/L		80.5	60-130			
trans-1,3-Dichloropropylene	37.7	0.5	ug/L		94.3	60-130			
Ethylbenzene	34.9	0.5	ug/L		87.2	60-130			
Ethylene dibromide (dibromoethane	31.0	0.2	ug/L		77.4	60-130			
Hexane	34.7	1.0	ug/L		86.8	60-130			
Methyl Ethyl Ketone (2-Butanone)	69.9	5.0	ug/L		69.9	50-140			
Methyl Isobutyl Ketone	55.8	5.0	ug/L		55.8	50-140			
Methyl tert-butyl ether	56.6	2.0	ug/L		56.6	50-140			
Methylene Chloride	28.4	5.0	ug/L		71.0	60-130			
Styrene	30.3	0.5	ug/L		75.8	60-130			
1,1,1,2-Tetrachloroethane	30.2	0.5	ug/L		75.6	60-130			
1,1,2,2-Tetrachloroethane	27.0	0.5	ug/L		67.6	60-130			
Tetrachloroethylene	32.4	0.5	ug/L		81.1	60-130			
Toluene	35.2	0.5	ug/L		87.9	60-130			
1,1,1-Trichloroethane	32.6	0.5	ug/L		81.4	60-130			
1,1,2-Trichloroethane	26.7	0.5	ug/L		66.7	60-130			
Trichloroethylene	36.3	0.5	ug/L		90.8	60-130			
Trichlorofluoromethane	33.0	1.0	ug/L		82.5	60-130			
Vinyl chloride	32.6	0.5	ug/L		81.6	50-140			
m,p-Xylenes	73.9	0.5	ug/L		92.3	60-130			
o-Xylene	40.2	0.5	ug/L		101	60-130			
Surrogate: 4-Bromofluorobenzene	*72.0*		*ug/L*		*90.0*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

PARACEL LABORATORIES LTD.

Paracel ID: 1847486

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Ottawa, Ontario K1G 4J8
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Chain of Custody
(Lab Use Only)
№ 46404

Page 1 of 1

Client Name: Paterson	Project Reference: PE4164
Contact Name:	Quote #
Address: 154 Colonnade	PO # AP 25574
Telephone: 613 226 7381	Email Address: mdarcy@patersongrp.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: 1847486 / Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	VOC	Required Analyses
1	BH1-GW	W		2	21 Nov	12.45	✓	
2	BH2-GW	W		2	↓	1.45	✓	
3	BH3-GW	W		2	↓	11.45	✓	
4								
5								
6								
7								
8								
9								
10								

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: T. Feduke	Received at Lab:	Verified By:
Relinquished By (Print): PHILIP PRICE	Date/Time: 22/11/18 4:30 PM	Date/Time: Nov 22, 18 5:11	Date/Time: NOV 22/18 6:20p
Date/Time:	Temperature: ___ °C	Temperature: 15.0 °C	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mike Beaudoin

Client PO: 23533
Project: PE4194
Custody: 33453

Report Date: 5-Mar-2018
Order Date: 1-Mar-2018

Order #: 1809403

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

Paracel ID	Client ID
1809403-01	BH1-GW1

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23533

Report Date: 05-Mar-2018
Order Date: 1-Mar-2018
Project Description: PE4194

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHC F1	CWS Tier 1 - P&T GC-FID	2-Mar-18	3-Mar-18
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	2-Mar-18	5-Mar-18
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	2-Mar-18	3-Mar-18

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 23533

Report Date: 05-Mar-2018

Order Date: 1-Mar-2018

Project Description: PE4194

	Client ID:	BH1-GW1	-	-	-
	Sample Date:	22-Feb-18	-	-	-
	Sample ID:	1809403-01	-	-	-
	MDL/Units	Water	-	-	-
Volatiles					
Acetone	5.0 ug/L	<5.0 [1]	-	-	-
Benzene	0.5 ug/L	<0.5 [1]	-	-	-
Bromodichloromethane	0.5 ug/L	<0.5 [1]	-	-	-
Bromoform	0.5 ug/L	<0.5 [1]	-	-	-
Bromomethane	0.5 ug/L	<0.5 [1]	-	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2 [1]	-	-	-
Chlorobenzene	0.5 ug/L	<0.5 [1]	-	-	-
Chloroform	0.5 ug/L	<0.5 [1]	-	-	-
Dibromochloromethane	0.5 ug/L	<0.5 [1]	-	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0 [1]	-	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5 [1]	-	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5 [1]	-	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5 [1]	-	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5 [1]	-	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5 [1]	-	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5 [1]	-	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5 [1]	-	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5 [1]	-	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5 [1]	-	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5 [1]	-	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5 [1]	-	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5 [1]	-	-	-
Ethylbenzene	0.5 ug/L	<0.5 [1]	-	-	-
Ethylene dibromide (dibromoethan	0.2 ug/L	<0.2 [1]	-	-	-
Hexane	1.0 ug/L	<1.0 [1]	-	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0 [1]	-	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0 [1]	-	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0 [1]	-	-	-
Methylene Chloride	5.0 ug/L	<5.0 [1]	-	-	-
Styrene	0.5 ug/L	<0.5 [1]	-	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5 [1]	-	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5 [1]	-	-	-
Tetrachloroethylene	0.5 ug/L	<0.5 [1]	-	-	-
Toluene	0.5 ug/L	<0.5 [1]	-	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5 [1]	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 23533

Report Date: 05-Mar-2018

Order Date: 1-Mar-2018

Project Description: PE4194

	Client ID:	BH1-GW1	-	-	-
	Sample Date:	22-Feb-18	-	-	-
	Sample ID:	1809403-01	-	-	-
	MDL/Units	Water	-	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5 [1]	-	-	-
Trichloroethylene	0.5 ug/L	<0.5 [1]	-	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0 [1]	-	-	-
Vinyl chloride	0.5 ug/L	<0.5 [1]	-	-	-
m,p-Xylenes	0.5 ug/L	<0.5 [1]	-	-	-
o-Xylene	0.5 ug/L	<0.5 [1]	-	-	-
Xylenes, total	0.5 ug/L	<0.5 [1]	-	-	-
4-Bromofluorobenzene	Surrogate	90.0% [1]	-	-	-
Dibromofluoromethane	Surrogate	101% [1]	-	-	-
Toluene-d8	Surrogate	100% [1]	-	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25 [1]	-	-	-
F2 PHCs (C10-C16)	100 ug/L	<100	-	-	-
F3 PHCs (C16-C34)	100 ug/L	<100	-	-	-
F4 PHCs (C34-C50)	100 ug/L	<100	-	-	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23533

Report Date: 05-Mar-2018
Order Date: 1-Mar-2018
Project Description: PE4194

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*72.4*		*ug/L*		*90.5*	*50-140*			
Surrogate: Dibromofluoromethane	*81.0*		*ug/L*		*101*	*50-140*			
Surrogate: Toluene-d8	*82.8*		*ug/L*		*104*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	4.52	0.5	ug/L	4.51			0.2	30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	5.51	0.5	ug/L	5.17			6.4	30	
Dibromochloromethane	3.17	0.5	ug/L	4.03			23.9	30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*70.9*		*ug/L*		*88.6*	*50-140*			
Surrogate: Dibromofluoromethane	*82.2*		*ug/L*		*103*	*50-140*			
Surrogate: Toluene-d8	*81.9*		*ug/L*		*102*	*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)	1830	25	ug/L		91.6	68-117			
F2 PHCs (C10-C16)	1770	100	ug/L		98.5	60-140			
F3 PHCs (C16-C34)	3460	100	ug/L		93.0	60-140			
F4 PHCs (C34-C50)	2520	100	ug/L		101	60-140			
Volatiles									
Acetone	110	5.0	ug/L		110	50-140			
Benzene	35.7	0.5	ug/L		89.3	60-130			
Bromodichloromethane	39.4	0.5	ug/L		98.5	60-130			
Bromoform	37.7	0.5	ug/L		94.2	60-130			
Bromomethane	33.6	0.5	ug/L		84.0	50-140			
Carbon Tetrachloride	41.2	0.2	ug/L		103	60-130			
Chlorobenzene	33.8	0.5	ug/L		84.4	60-130			
Chloroform	37.8	0.5	ug/L		94.5	60-130			
Dibromochloromethane	38.8	0.5	ug/L		97.0	60-130			
Dichlorodifluoromethane	31.6	1.0	ug/L		79.0	50-140			
1,2-Dichlorobenzene	28.4	0.5	ug/L		71.1	60-130			
1,3-Dichlorobenzene	28.6	0.5	ug/L		71.6	60-130			
1,4-Dichlorobenzene	28.9	0.5	ug/L		72.3	60-130			
1,1-Dichloroethane	41.8	0.5	ug/L		104	60-130			
1,2-Dichloroethane	40.6	0.5	ug/L		101	60-130			
1,1-Dichloroethylene	36.2	0.5	ug/L		90.6	60-130			
cis-1,2-Dichloroethylene	32.2	0.5	ug/L		80.6	60-130			
trans-1,2-Dichloroethylene	38.8	0.5	ug/L		97.1	60-130			
1,2-Dichloropropane	38.8	0.5	ug/L		97.0	60-130			
cis-1,3-Dichloropropylene	36.5	0.5	ug/L		91.2	60-130			
trans-1,3-Dichloropropylene	46.0	0.5	ug/L		115	60-130			
Ethylbenzene	34.2	0.5	ug/L		85.5	60-130			
Ethylene dibromide (dibromoethane	34.6	0.2	ug/L		86.6	60-130			
Hexane	33.2	1.0	ug/L		83.0	60-130			
Methyl Ethyl Ketone (2-Butanone)	112	5.0	ug/L		112	50-140			
Methyl Isobutyl Ketone	113	5.0	ug/L		113	50-140			
Methyl tert-butyl ether	76.0	2.0	ug/L		76.0	50-140			
Methylene Chloride	36.8	5.0	ug/L		92.1	60-130			
Styrene	38.9	0.5	ug/L		97.3	60-130			
1,1,1,2-Tetrachloroethane	41.1	0.5	ug/L		103	60-130			
1,1,2,2-Tetrachloroethane	34.8	0.5	ug/L		87.1	60-130			
Tetrachloroethylene	29.3	0.5	ug/L		73.2	60-130			
Toluene	34.6	0.5	ug/L		86.4	60-130			
1,1,1-Trichloroethane	34.6	0.5	ug/L		86.4	60-130			
1,1,2-Trichloroethane	37.5	0.5	ug/L		93.8	60-130			
Trichloroethylene	35.0	0.5	ug/L		87.4	60-130			
Trichlorofluoromethane	36.3	1.0	ug/L		90.8	60-130			
Vinyl chloride	32.5	0.5	ug/L		81.3	50-140			
m,p-Xylenes	70.6	0.5	ug/L		88.2	60-130			
o-Xylene	37.2	0.5	ug/L		93.0	60-130			
Surrogate: 4-Bromofluorobenzene	*66.3*		*ug/L*		*82.9*	*50-140*			

Qualifier Notes:

Sample Qualifiers :

1 : Sample decanted prior to analysis due to sediments.

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.

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Paracel ID: 1809403

Chain of Custody (Lab Use Only)
№ 33453

Page 1 of 1

Client Name: PATERSON	Project Reference: PE4194	**Turnaround Time:**	
Contact Name: MIKE BEAUDOIN	Quote #	☐ 1 Day	☐ 3 Day
Address: 154 Colonnade Rd	PO # 23533	☒ 2 Day MS	☒ Regular
Telephone: 613-226-7381	Email Address: mbeaudoin@petersongroup.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: 1809403 / Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PAH VOC F1-F4	VOC									
1	BH1-GW	GW		3	Feb 22/18		X	X									✓
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: T. Teare	Received at Lab:	Verified By:
Relinquished By (Print): MIKE B	Date/Time: 01/03/18 9:30 AM	Date/Time: 03/01/18 12:8pm	Date/Time: 03/01/18 1:25pm
Date/Time:	Temperature: °C	Temperature: 5.9 °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: 23521
Project: PE4194
Custody: 115546

Report Date: 1-Mar-2018
Order Date: 23-Feb-2018

Order #: 1808494

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

Paracel ID	Client ID
1808494-01	BH2-GW1
1808494-02	BH3-GW1

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23521

Report Date: 01-Mar-2018
Order Date: 23-Feb-2018
Project Description: PE4194

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHC F1	CWS Tier 1 - P&T GC-FID	23-Feb-18	1-Mar-18
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	27-Feb-18	1-Mar-18
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	23-Feb-18	1-Mar-18

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 23521

Report Date: 01-Mar-2018

Order Date: 23-Feb-2018

Project Description: PE4194

	Client ID:	BH2-GW1	BH3-GW1	-	-
	Sample Date:	22-Feb-18	22-Feb-18	-	-
	Sample ID:	1808494-01	1808494-02	-	-
	MDL/Units	Water	Water	-	-
Volatiles					
Acetone	5.0 ug/L	<5.0	<250 [1]	-	-
Benzene	0.5 ug/L	<0.5	<25.0 [1]	-	-
Bromodichloromethane	0.5 ug/L	<0.5	<25.0 [1]	-	-
Bromoform	0.5 ug/L	<0.5	<25.0 [1]	-	-
Bromomethane	0.5 ug/L	<0.5	<25.0 [1]	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<10.0 [1]	-	-
Chlorobenzene	0.5 ug/L	<0.5	<25.0 [1]	-	-
Chloroform	0.5 ug/L	<0.5	<25.0 [1]	-	-
Dibromochloromethane	0.5 ug/L	<0.5	<25.0 [1]	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<50.0 [1]	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<25.0 [1]	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<25.0 [1]	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<25.0 [1]	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	<25.0 [1]	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<25.0 [1]	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	<25.0 [1]	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<25.0 [1]	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<25.0 [1]	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<25.0 [1]	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<25.0 [1]	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<25.0 [1]	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<25.0 [1]	-	-
Ethylbenzene	0.5 ug/L	<0.5	<25.0 [1]	-	-
Ethylene dibromide (dibromoethan	0.2 ug/L	<0.2	<10.0 [1]	-	-
Hexane	1.0 ug/L	<1.0	<50.0 [1]	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<250 [1]	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<250 [1]	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<100 [1]	-	-
Methylene Chloride	5.0 ug/L	<5.0	<250 [1]	-	-
Styrene	0.5 ug/L	<0.5	<25.0 [1]	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<25.0 [1]	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<25.0 [1]	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	1150	-	-
Toluene	0.5 ug/L	<0.5	<25.0 [1]	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<25.0 [1]	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 23521

Report Date: 01-Mar-2018

Order Date: 23-Feb-2018

Project Description: PE4194

	Client ID:	BH2-GW1	BH3-GW1	-	-
	Sample Date:	22-Feb-18	22-Feb-18	-	-
	Sample ID:	1808494-01	1808494-02	-	-
	MDL/Units	Water	Water	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<25.0 [1]	-	-
Trichloroethylene	0.5 ug/L	<0.5	<25.0 [1]	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	<50.0 [1]	-	-
Vinyl chloride	0.5 ug/L	<0.5	<25.0 [1]	-	-
m,p-Xylenes	0.5 ug/L	<0.5	<25.0 [1]	-	-
o-Xylene	0.5 ug/L	<0.5	<25.0 [1]	-	-
Xylenes, total	0.5 ug/L	<0.5	<25.0 [1]	-	-
4-Bromofluorobenzene	Surrogate	96.7%	96.2%	-	-
Dibromofluoromethane	Surrogate	107%	112%	-	-
Toluene-d8	Surrogate	108%	109%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<1250 [1]	-	-
F2 PHCs (C10-C16)	100 ug/L	<100	<100	-	-
F3 PHCs (C16-C34)	100 ug/L	<100	<100	-	-
F4 PHCs (C34-C50)	100 ug/L	<100	<100	-	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23521

Report Date: 01-Mar-2018
Order Date: 23-Feb-2018
Project Description: PE4194

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*36.0*		*ug/L*		*112*	*50-140*			
Surrogate: Dibromofluoromethane	*28.7*		*ug/L*		*89.8*	*50-140*			
Surrogate: Toluene-d8	*36.4*		*ug/L*		*114*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	0.60	0.5	ug/L	0.60			0.0	30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*28.6*		*ug/L*		*89.5*	*50-140*			
Surrogate: Dibromofluoromethane	*30.2*		*ug/L*		*94.2*	*50-140*			
Surrogate: Toluene-d8	*35.7*		*ug/L*		*112*	*50-140*			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23521

Report Date: 01-Mar-2018
Order Date: 23-Feb-2018
Project Description: PE4194

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1810	25	ug/L		90.6	68-117			
F2 PHCs (C10-C16)	1780	100	ug/L		99.0	60-140			
F3 PHCs (C16-C34)	3250	100	ug/L		87.3	60-140			
F4 PHCs (C34-C50)	2580	100	ug/L		104	60-140			
Volatiles									
Acetone	132	5.0	ug/L		132	50-140			
Benzene	29.9	0.5	ug/L		74.8	60-130			
Bromodichloromethane	28.5	0.5	ug/L		71.2	60-130			
Bromoform	29.7	0.5	ug/L		74.3	60-130			
Bromomethane	28.5	0.5	ug/L		71.3	50-140			
Carbon Tetrachloride	26.7	0.2	ug/L		66.8	60-130			
Chlorobenzene	30.6	0.5	ug/L		76.5	60-130			
Chloroform	26.6	0.5	ug/L		66.5	60-130			
Dibromochloromethane	24.4	0.5	ug/L		61.0	60-130			
Dichlorodifluoromethane	31.7	1.0	ug/L		79.2	50-140			
1,2-Dichlorobenzene	37.8	0.5	ug/L		94.5	60-130			
1,3-Dichlorobenzene	38.7	0.5	ug/L		96.8	60-130			
1,4-Dichlorobenzene	33.3	0.5	ug/L		83.2	60-130			
1,1-Dichloroethane	37.0	0.5	ug/L		92.4	60-130			
1,2-Dichloroethane	29.5	0.5	ug/L		73.8	60-130			
1,1-Dichloroethylene	28.0	0.5	ug/L		70.0	60-130			
cis-1,2-Dichloroethylene	31.9	0.5	ug/L		79.7	60-130			
trans-1,2-Dichloroethylene	30.9	0.5	ug/L		77.2	60-130			
1,2-Dichloropropane	30.9	0.5	ug/L		77.3	60-130			
cis-1,3-Dichloropropylene	44.0	0.5	ug/L		110	60-130			
trans-1,3-Dichloropropylene	44.2	0.5	ug/L		110	60-130			
Ethylbenzene	41.0	0.5	ug/L		103	60-130			
Ethylene dibromide (dibromoethane	40.5	0.2	ug/L		101	60-130			
Hexane	44.4	1.0	ug/L		111	60-130			
Methyl Ethyl Ketone (2-Butanone)	140	5.0	ug/L		140	50-140			
Methyl Isobutyl Ketone	108	5.0	ug/L		108	50-140			
Methyl tert-butyl ether	116	2.0	ug/L		116	50-140			
Methylene Chloride	29.7	5.0	ug/L		74.3	60-130			
Styrene	45.7	0.5	ug/L		114	60-130			
1,1,1,2-Tetrachloroethane	31.4	0.5	ug/L		78.4	60-130			
1,1,2,2-Tetrachloroethane	49.3	0.5	ug/L		123	60-130			
Tetrachloroethylene	31.5	0.5	ug/L		78.7	60-130			
Toluene	31.4	0.5	ug/L		78.5	60-130			
1,1,1-Trichloroethane	29.1	0.5	ug/L		72.8	60-130			
1,1,2-Trichloroethane	30.0	0.5	ug/L		75.1	60-130			
Trichloroethylene	28.6	0.5	ug/L		71.4	60-130			
Trichlorofluoromethane	27.4	1.0	ug/L		68.4	60-130			
Vinyl chloride	26.9	0.5	ug/L		67.2	50-140			
m,p-Xylenes	72.2	0.5	ug/L		90.2	60-130			
o-Xylene	36.7	0.5	ug/L		91.7	60-130			
Surrogate: 4-Bromofluorobenzene	*41.3*		*ug/L*		*129*	*50-140*			

Qualifier Notes:

Sample Qualifiers :

1 : Elevated detection limit due to dilution required because of high target analyte concentration.

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.

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Page 1 of 1

Client Name: Peterson Group	Project Reference: PE4194	**Turnaround Time:**
Contact Name: Mark D'Arcy / Mike Beaudoin	Quote #	☐ 1 Day ☐ 3 Day
Address: 154 Colonnade Rd S, Ottawa, ON	PO # 23521	☐ 2 Day ☒ Regular
Telephone: 613 226 7381	Email Address: mbeaudoin@petersongroup.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: 1808494

	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		3	2018-02-22	12p	X	X					
2	BH2 - GW1	GW		3	"	11a	X	X					
3	BH3 - GW1	GW		3	"	10a	X	X					
4													
5													
6													
7													
8													
9													
10													

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: T. Jeanse	Received at Lab: Rachel Subcot	Verified By:
Relinquished By (Print): Marek Mroz	Date/Time: 23/02/18 3:10	Date/Time: Feb 23/18 4:36	Date/Time: 02/23/18 5:01
Date/Time: 2018-02-22	Temperature: °C	Temperature: 13.9 °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: 25223
Project: PE4194
Custody: 116736

Report Date: 7-Nov-2018
Order Date: 5-Nov-2018

Order #: 1845142

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

Paracel ID	Client ID
1845142-01	BH3-GW3

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25223

Report Date: 07-Nov-2018
Order Date: 5-Nov-2018
Project Description: PE4194

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	6-Nov-18	7-Nov-18

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 25223

Report Date: 07-Nov-2018

Order Date: 5-Nov-2018

Project Description: PE4194

	Client ID:	BH3-GW3	-	-	-
	Sample Date:	11/02/2018 15:00	-	-	-
	Sample ID:	1845142-01	-	-	-
	MDL/Units	Water	-	-	-
Volatiles					
Acetone	5.0 ug/L	<5.0	-	-	-
Benzene	0.5 ug/L	<0.5	-	-	-
Bromodichloromethane	0.5 ug/L	<0.5	-	-	-
Bromoform	0.5 ug/L	<0.5	-	-	-
Bromomethane	0.5 ug/L	<0.5	-	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	-	-	-
Chlorobenzene	0.5 ug/L	<0.5	-	-	-
Chloroform	0.5 ug/L	1.2	-	-	-
Dibromochloromethane	0.5 ug/L	<0.5	-	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	-	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	-	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	-	-	-
Ethylbenzene	0.5 ug/L	<0.5	-	-	-
Ethylene dibromide (dibromoethan	0.2 ug/L	<0.2	-	-	-
Hexane	1.0 ug/L	<1.0	-	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	-	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	-	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	-	-	-
Methylene Chloride	5.0 ug/L	<5.0	-	-	-
Styrene	0.5 ug/L	<0.5	-	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
Tetrachloroethylene	0.5 ug/L	6.2	-	-	-
Toluene	0.5 ug/L	<0.5	-	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 25223

Report Date: 07-Nov-2018

Order Date: 5-Nov-2018

Project Description: PE4194

	Client ID:	BH3-GW3	-	-	-
	Sample Date:	11/02/2018 15:00	-	-	-
	Sample ID:	1845142-01	-	-	-
	MDL/Units	Water	-	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	-	-	-
Trichloroethylene	0.5 ug/L	<0.5	-	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	-	-	-
Vinyl chloride	0.5 ug/L	<0.5	-	-	-
m,p-Xylenes	0.5 ug/L	<0.5	-	-	-
o-Xylene	0.5 ug/L	<0.5	-	-	-
Xylenes, total	0.5 ug/L	<0.5	-	-	-
4-Bromofluorobenzene	Surrogate	114%	-	-	-
Dibromofluoromethane	Surrogate	97.8%	-	-	-
Toluene-d8	Surrogate	109%	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*34.6*		*ug/L*		*108*	*50-140*			
Surrogate: Dibromofluoromethane	*33.3*		*ug/L*		*104*	*50-140*			
Surrogate: Toluene-d8	*34.9*		*ug/L*		*109*	*50-140*			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25223

Report Date: 07-Nov-2018
Order Date: 5-Nov-2018
Project Description: PE4194

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*29.8*		*ug/L*		*93.2*	*50-140*			
Surrogate: Dibromofluoromethane	*28.9*		*ug/L*		*90.4*	*50-140*			
Surrogate: Toluene-d8	*32.1*		*ug/L*		*100*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	81.8	5.0	ug/L		81.8	50-140			
Benzene	27.4	0.5	ug/L		68.4	60-130			
Bromodichloromethane	29.1	0.5	ug/L		72.7	60-130			
Bromoform	37.1	0.5	ug/L		92.8	60-130			
Bromomethane	27.5	0.5	ug/L		68.7	50-140			
Carbon Tetrachloride	32.1	0.2	ug/L		80.3	60-130			
Chlorobenzene	33.4	0.5	ug/L		83.5	60-130			
Chloroform	27.2	0.5	ug/L		68.1	60-130			
Dibromochloromethane	36.0	0.5	ug/L		89.9	60-130			
Dichlorodifluoromethane	35.2	1.0	ug/L		88.1	50-140			
1,2-Dichlorobenzene	35.0	0.5	ug/L		87.4	60-130			
1,3-Dichlorobenzene	35.8	0.5	ug/L		89.4	60-130			
1,4-Dichlorobenzene	31.6	0.5	ug/L		78.9	60-130			
1,1-Dichloroethane	29.7	0.5	ug/L		74.2	60-130			
1,2-Dichloroethane	25.3	0.5	ug/L		63.2	60-130			
1,1-Dichloroethylene	38.2	0.5	ug/L		95.6	60-130			
cis-1,2-Dichloroethylene	24.7	0.5	ug/L		61.7	60-130			
trans-1,2-Dichloroethylene	34.3	0.5	ug/L		85.8	60-130			
1,2-Dichloropropane	34.8	0.5	ug/L		86.9	60-130			
cis-1,3-Dichloropropylene	30.6	0.5	ug/L		76.5	60-130			
trans-1,3-Dichloropropylene	31.8	0.5	ug/L		79.4	60-130			
Ethylbenzene	37.0	0.5	ug/L		92.6	60-130			
Ethylene dibromide (dibromoethane	31.3	0.2	ug/L		78.2	60-130			
Hexane	27.3	1.0	ug/L		68.2	60-130			
Methyl Ethyl Ketone (2-Butanone)	71.8	5.0	ug/L		71.8	50-140			
Methyl Isobutyl Ketone	72.0	5.0	ug/L		72.0	50-140			
Methyl tert-butyl ether	70.4	2.0	ug/L		70.4	50-140			
Methylene Chloride	35.4	5.0	ug/L		88.6	60-130			
Styrene	39.7	0.5	ug/L		99.4	60-130			
1,1,1,2-Tetrachloroethane	34.7	0.5	ug/L		86.7	60-130			
1,1,2,2-Tetrachloroethane	37.6	0.5	ug/L		94.0	60-130			
Tetrachloroethylene	35.4	0.5	ug/L		88.6	60-130			
Toluene	31.3	0.5	ug/L		78.2	60-130			
1,1,1-Trichloroethane	28.7	0.5	ug/L		71.8	60-130			
1,1,2-Trichloroethane	28.4	0.5	ug/L		71.0	60-130			
Trichloroethylene	27.5	0.5	ug/L		68.8	60-130			
Trichlorofluoromethane	39.3	1.0	ug/L		98.2	60-130			
Vinyl chloride	29.6	0.5	ug/L		73.9	50-140			
m,p-Xylenes	76.7	0.5	ug/L		95.9	60-130			
o-Xylene	38.0	0.5	ug/L		95.1	60-130			
Surrogate: 4-Bromofluorobenzene	*27.4*		*ug/L*		*85.8*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

PARACEL LABORATORIES LTD

Paracel ID: 1845142

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

Chain of Custody
(Lab Use Only)
№ 116736

Page 1 of 1

Client Name: Paterson	Project Reference: PE4144	**Turnaround Time:**	
Contact Name:	Quote #	☐ 1 Day	☐ 3 Day
Address: 154 Colonnade Rd	PO # 25223	☑ 2 Day	☐ Regular
Telephone: 613 226 7381	Email Address: mdarye@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: 1845142

	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-GW3	GW		2	2 Nov	3pm		✓												
2	MW1-GW1	GW		2	2 Nov	3pm		✓		HOLD -										
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments: please hold on MW1-GW1.

Method of Delivery: Picked -

Relinquished By (Sign):	Received by Driver/Depot: A. Jeanne	Received at Lab:	Verified By:
Relinquished By (Print): PHILIP PRICE	Date/Time: 05/11/18 3:20 PM	Date/Time: NOV 5/18 5:48	Date/Time: NOV 5/18 6:38
Date/Time:	Temperature: °C	Temperature: 13 °C	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mike Beaudoin

Client PO: 23539
Project: PE4194
Custody: 33452

Report Date: 9-Mar-2018
Order Date: 7-Mar-2018

Order #: 1810310

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

Paracel ID	Client ID
1810310-01	BH3-GW2

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23539

Report Date: 09-Mar-2018
Order Date: 7-Mar-2018
Project Description: PE4194

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	8-Mar-18	9-Mar-18

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 23539

Report Date: 09-Mar-2018

Order Date: 7-Mar-2018

Project Description: PE4194

	Client ID:	BH3-GW2	-	-	-
	Sample Date:	07-Mar-18	-	-	-
	Sample ID:	1810310-01	-	-	-
	MDL/Units	Water	-	-	-
Volatiles					
Acetone	5.0 ug/L	<250 [1]	-	-	-
Benzene	0.5 ug/L	<25.0 [1]	-	-	-
Bromodichloromethane	0.5 ug/L	<25.0 [1]	-	-	-
Bromoform	0.5 ug/L	<25.0 [1]	-	-	-
Bromomethane	0.5 ug/L	<25.0 [1]	-	-	-
Carbon Tetrachloride	0.2 ug/L	<10.0 [1]	-	-	-
Chlorobenzene	0.5 ug/L	<25.0 [1]	-	-	-
Chloroform	0.5 ug/L	<25.0 [1]	-	-	-
Dibromochloromethane	0.5 ug/L	<25.0 [1]	-	-	-
Dichlorodifluoromethane	1.0 ug/L	<50.0 [1]	-	-	-
1,2-Dichlorobenzene	0.5 ug/L	<25.0 [1]	-	-	-
1,3-Dichlorobenzene	0.5 ug/L	<25.0 [1]	-	-	-
1,4-Dichlorobenzene	0.5 ug/L	<25.0 [1]	-	-	-
1,1-Dichloroethane	0.5 ug/L	<25.0 [1]	-	-	-
1,2-Dichloroethane	0.5 ug/L	<25.0 [1]	-	-	-
1,1-Dichloroethylene	0.5 ug/L	<25.0 [1]	-	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<25.0 [1]	-	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<25.0 [1]	-	-	-
1,2-Dichloropropane	0.5 ug/L	<25.0 [1]	-	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<25.0 [1]	-	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<25.0 [1]	-	-	-
1,3-Dichloropropene, total	0.5 ug/L	<25.0 [1]	-	-	-
Ethylbenzene	0.5 ug/L	<25.0 [1]	-	-	-
Ethylene dibromide (dibromoethan	0.2 ug/L	<10.0 [1]	-	-	-
Hexane	1.0 ug/L	<50.0 [1]	-	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<250 [1]	-	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<250 [1]	-	-	-
Methyl tert-butyl ether	2.0 ug/L	<100 [1]	-	-	-
Methylene Chloride	5.0 ug/L	<250 [1]	-	-	-
Styrene	0.5 ug/L	<25.0 [1]	-	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<25.0 [1]	-	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<25.0 [1]	-	-	-
Tetrachloroethylene	0.5 ug/L	456 [1]	-	-	-
Toluene	0.5 ug/L	<25.0 [1]	-	-	-
1,1,1-Trichloroethane	0.5 ug/L	<25.0 [1]	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 23539

Report Date: 09-Mar-2018

Order Date: 7-Mar-2018

Project Description: PE4194

	Client ID:	BH3-GW2	-	-	-
	Sample Date:	07-Mar-18	-	-	-
	Sample ID:	1810310-01	-	-	-
	MDL/Units	Water	-	-	-
1,1,2-Trichloroethane	0.5 ug/L	<25.0 [1]	-	-	-
Trichloroethylene	0.5 ug/L	<25.0 [1]	-	-	-
Trichlorofluoromethane	1.0 ug/L	<50.0 [1]	-	-	-
Vinyl chloride	0.5 ug/L	<25.0 [1]	-	-	-
m,p-Xylenes	0.5 ug/L	<25.0 [1]	-	-	-
o-Xylene	0.5 ug/L	<25.0 [1]	-	-	-
Xylenes, total	0.5 ug/L	<25.0 [1]	-	-	-
4-Bromofluorobenzene	Surrogate	78.9% [1]	-	-	-
Dibromofluoromethane	Surrogate	114% [1]	-	-	-
Toluene-d8	Surrogate	95.1% [1]	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane,	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*101*		*ug/L*		*126*	*50-140*			
Surrogate: Dibromofluoromethane	*75.9*		*ug/L*		*94.9*	*50-140*			
Surrogate: Toluene-d8	*68.2*		*ug/L*		*85.3*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane,	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*71.7*		*ug/L*		*89.7*	*50-140*			
Surrogate: Dibromofluoromethane	*68.0*		*ug/L*		*85.0*	*50-140*			
Surrogate: Toluene-d8	*69.0*		*ug/L*		*86.3*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	40.6	5.0	ug/L		81.2	50-140			
Benzene	17.9	0.5	ug/L		89.7	60-130			
Bromodichloromethane	14.1	0.5	ug/L		70.4	60-130			
Bromoform	15.1	0.5	ug/L		75.4	60-130			
Bromomethane	23.1	0.5	ug/L		116	50-140			
Carbon Tetrachloride	24.2	0.2	ug/L		121	60-130			
Chlorobenzene	18.9	0.5	ug/L		94.7	60-130			
Chloroform	17.5	0.5	ug/L		87.7	60-130			
Dibromochloromethane	16.8	0.5	ug/L		84.0	60-130			
Dichlorodifluoromethane	18.9	1.0	ug/L		94.4	50-140			
1,2-Dichlorobenzene	15.3	0.5	ug/L		76.4	60-130			
1,3-Dichlorobenzene	16.6	0.5	ug/L		83.0	60-130			
1,4-Dichlorobenzene	16.7	0.5	ug/L		83.4	60-130			
1,1-Dichloroethane	18.1	0.5	ug/L		90.7	60-130			
1,2-Dichloroethane	15.6	0.5	ug/L		77.8	60-130			
1,1-Dichloroethylene	19.4	0.5	ug/L		97.1	60-130			
cis-1,2-Dichloroethylene	16.7	0.5	ug/L		83.6	60-130			
trans-1,2-Dichloroethylene	20.0	0.5	ug/L		99.9	60-130			
1,2-Dichloropropane	14.6	0.5	ug/L		73.0	60-130			
cis-1,3-Dichloropropylene	12.2	0.5	ug/L		61.0	60-130			
trans-1,3-Dichloropropylene	12.7	0.5	ug/L		63.7	60-130			
Ethylbenzene	13.8	0.5	ug/L		69.2	60-130			
Ethylene dibromide (dibromoethane,	16.6	0.2	ug/L		83.2	60-130			
Hexane	22.9	1.0	ug/L		115	60-130			
Methyl Ethyl Ketone (2-Butanone)	41.0	5.0	ug/L		82.0	50-140			
Methyl Isobutyl Ketone	32.3	5.0	ug/L		64.6	50-140			
Methyl tert-butyl ether	40.2	2.0	ug/L		80.5	50-140			
Methylene Chloride	17.4	5.0	ug/L		86.8	60-130			
Styrene	12.2	0.5	ug/L		61.2	60-130			
1,1,1,2-Tetrachloroethane	20.5	0.5	ug/L		102	60-130			
1,1,2,2-Tetrachloroethane	17.2	0.5	ug/L		85.8	60-130			
Tetrachloroethylene	19.1	0.5	ug/L		95.7	60-130			
Toluene	18.4	0.5	ug/L		92.2	60-130			
1,1,1-Trichloroethane	19.7	0.5	ug/L		98.5	60-130			
1,1,2-Trichloroethane	13.8	0.5	ug/L		68.9	60-130			
Trichloroethylene	16.1	0.5	ug/L		80.5	60-130			
Trichlorofluoromethane	21.0	1.0	ug/L		105	60-130			
Vinyl chloride	22.2	0.5	ug/L		111	50-140			
m,p-Xylenes	29.8	0.5	ug/L		74.4	60-130			
o-Xylene	14.9	0.5	ug/L		74.4	60-130			
Surrogate: 4-Bromofluorobenzene	*76.5*		*ug/L*		*95.6*	*50-140*			

Qualifier Notes:

Sample Qualifiers :

1 : Elevated detection limit due to dilution required because of high target analyte concentration.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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Paracel ID: 1810310

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№ 33452

Page 1 of 1

Client Name: PATERSON	Project Reference: PE4194
Contact Name: MIKE BEAUDOIN	Quote #
Address: 154 Colonnade Rd	PO # 23539
Telephone: 613-226-7381	Email Address: mdarcy@patersongroup.ca mbeaudoin@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: 1810310

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	VOC										
1	BH5-GW2	GW		2	MAR 7/18		X										
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Comments:

Method of Delivery: Paracel

Relinquished By (Sign): Mike Beaudoin	Received by Driver/Depot: A Stouse	Received at Lab: SUNEEPORN DOKMAI	Verified By:
Relinquished By (Print):	Date/Time: 07/03/18 4:20 pm	Date/Time: MAR 07 2018 05:00	Date/Time: 030218 5:11pm
Date/Time:	Temperature: ____ °C	Temperature: 13.4 °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: 22059
Project: PE4194
Custody: 112432

Report Date: 26-Feb-2018
Order Date: 20-Feb-2018

Order #: 1808110

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

Paracel ID	Client ID
1808110-01	BH3-SS8

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 22059

Report Date: 26-Feb-2018
Order Date: 20-Feb-2018
Project Description: PE4194

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
REG 153: VOCs by P&T GC/MS	EPA 8260 - P&T GC-MS	21-Feb-18	23-Feb-18
Solids, %	Gravimetric, calculation	22-Feb-18	22-Feb-18

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 22059

Report Date: 26-Feb-2018

Order Date: 20-Feb-2018

Project Description: PE4194

	Client ID:	BH3-SS8	-	-	-
	Sample Date:	16-Feb-18	-	-	-
	Sample ID:	1808110-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	71.4	-	-	-
Volatiles					
Acetone	0.50 ug/g dry	<0.50	-	-	-
Benzene	0.02 ug/g dry	<0.02	-	-	-
Bromodichloromethane	0.05 ug/g dry	<0.05	-	-	-
Bromoform	0.05 ug/g dry	<0.05	-	-	-
Bromomethane	0.05 ug/g dry	<0.05	-	-	-
Carbon Tetrachloride	0.05 ug/g dry	<0.05	-	-	-
Chlorobenzene	0.05 ug/g dry	<0.05	-	-	-
Chloroform	0.05 ug/g dry	<0.05	-	-	-
Dibromochloromethane	0.05 ug/g dry	<0.05	-	-	-
Dichlorodifluoromethane	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-
1,3-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-
1,4-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-
1,1-Dichloroethane	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichloroethane	0.05 ug/g dry	<0.05	-	-	-
1,1-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
cis-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
trans-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichloropropane	0.05 ug/g dry	<0.05	-	-	-
cis-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	-	-	-
trans-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	-	-	-
1,3-Dichloropropene, total	0.05 ug/g dry	<0.05	-	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	-	-	-
Ethylene dibromide (dibromoethan	0.05 ug/g dry	<0.05	-	-	-
Hexane	0.05 ug/g dry	<0.05	-	-	-
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	<0.50	-	-	-
Methyl Isobutyl Ketone	0.50 ug/g dry	<0.50	-	-	-
Methyl tert-butyl ether	0.05 ug/g dry	<0.05	-	-	-
Methylene Chloride	0.05 ug/g dry	<0.05	-	-	-
Styrene	0.05 ug/g dry	<0.05	-	-	-
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	<0.05	-	-	-
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	<0.05	-	-	-
Tetrachloroethylene	0.05 ug/g dry	<0.05	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 22059

Report Date: 26-Feb-2018

Order Date: 20-Feb-2018

Project Description: PE4194

	Client ID:	BH3-SS8	-	-	-
	Sample Date:	16-Feb-18	-	-	-
	Sample ID:	1808110-01	-	-	-
	MDL/Units	Soil	-	-	-
Toluene	0.05 ug/g dry	<0.05	-	-	-
1,1,1-Trichloroethane	0.05 ug/g dry	<0.05	-	-	-
1,1,2-Trichloroethane	0.05 ug/g dry	<0.05	-	-	-
Trichloroethylene	0.05 ug/g dry	<0.05	-	-	-
Trichlorofluoromethane	0.05 ug/g dry	<0.05	-	-	-
Vinyl chloride	0.02 ug/g dry	<0.02	-	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	-	-	-
o-Xylene	0.05 ug/g dry	<0.05	-	-	-
Xylenes, total	0.05 ug/g dry	<0.05	-	-	-
4-Bromofluorobenzene	Surrogate	106%	-	-	-
Dibromofluoromethane	Surrogate	102%	-	-	-
Toluene-d8	Surrogate	114%	-	-	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 22059

Report Date: 26-Feb-2018
Order Date: 20-Feb-2018
Project Description: PE4194

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	ND	0.50	ug/g						
Benzene	ND	0.02	ug/g						
Bromodichloromethane	ND	0.05	ug/g						
Bromoform	ND	0.05	ug/g						
Bromomethane	ND	0.05	ug/g						
Carbon Tetrachloride	ND	0.05	ug/g						
Chlorobenzene	ND	0.05	ug/g						
Chloroform	ND	0.05	ug/g						
Dibromochloromethane	ND	0.05	ug/g						
Dichlorodifluoromethane	ND	0.05	ug/g						
1,2-Dichlorobenzene	ND	0.05	ug/g						
1,3-Dichlorobenzene	ND	0.05	ug/g						
1,4-Dichlorobenzene	ND	0.05	ug/g						
1,1-Dichloroethane	ND	0.05	ug/g						
1,2-Dichloroethane	ND	0.05	ug/g						
1,1-Dichloroethylene	ND	0.05	ug/g						
cis-1,2-Dichloroethylene	ND	0.05	ug/g						
trans-1,2-Dichloroethylene	ND	0.05	ug/g						
1,2-Dichloropropane	ND	0.05	ug/g						
cis-1,3-Dichloropropylene	ND	0.05	ug/g						
trans-1,3-Dichloropropylene	ND	0.05	ug/g						
1,3-Dichloropropene, total	ND	0.05	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Ethylene dibromide (dibromoethane	ND	0.05	ug/g						
Hexane	ND	0.05	ug/g						
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g						
Methyl Isobutyl Ketone	ND	0.50	ug/g						
Methyl tert-butyl ether	ND	0.05	ug/g						
Methylene Chloride	ND	0.05	ug/g						
Styrene	ND	0.05	ug/g						
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g						
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g						
Tetrachloroethylene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
1,1,1-Trichloroethane	ND	0.05	ug/g						
1,1,2-Trichloroethane	ND	0.05	ug/g						
Trichloroethylene	ND	0.05	ug/g						
Trichlorofluoromethane	ND	0.05	ug/g						
Vinyl chloride	ND	0.02	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: 4-Bromofluorobenzene	*3.00*		*ug/g*		*93.7*	*50-140*			
Surrogate: Dibromofluoromethane	*3.52*		*ug/g*		*110*	*50-140*			
Surrogate: Toluene-d8	*2.95*		*ug/g*		*92.3*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Physical Characteristics									
% Solids	79.3	0.1	% by Wt.	80.7			1.8	25	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	3.27	0.50	ug/g		65.4	50-140			
Benzene	1.61	0.02	ug/g		80.4	60-130			
Bromodichloromethane	1.55	0.05	ug/g		77.4	60-130			
Bromoform	1.92	0.05	ug/g		95.8	60-130			
Bromomethane	1.45	0.05	ug/g		72.4	50-140			
Carbon Tetrachloride	1.67	0.05	ug/g		83.3	60-130			
Chlorobenzene	2.16	0.05	ug/g		108	60-130			
Chloroform	1.66	0.05	ug/g		82.8	60-130			
Dibromochloromethane	2.30	0.05	ug/g		115	60-130			
Dichlorodifluoromethane	1.70	0.05	ug/g		84.8	50-140			
1,2-Dichlorobenzene	1.89	0.05	ug/g		94.4	60-130			
1,3-Dichlorobenzene	2.08	0.05	ug/g		104	60-130			
1,4-Dichlorobenzene	1.99	0.05	ug/g		99.7	60-130			
1,1-Dichloroethane	1.55	0.05	ug/g		77.4	60-130			
1,2-Dichloroethane	1.68	0.05	ug/g		84.2	60-130			
1,1-Dichloroethylene	1.85	0.05	ug/g		92.7	60-130			
cis-1,2-Dichloroethylene	1.55	0.05	ug/g		77.6	60-130			
trans-1,2-Dichloroethylene	1.82	0.05	ug/g		90.9	60-130			
1,2-Dichloropropane	1.57	0.05	ug/g		78.6	60-130			
cis-1,3-Dichloropropylene	1.60	0.05	ug/g		80.1	60-130			
trans-1,3-Dichloropropylene	2.49	0.05	ug/g		125	60-130			
Ethylbenzene	2.14	0.05	ug/g		107	60-130			
Hexane	1.73	0.05	ug/g		86.4	60-130			
Methyl Ethyl Ketone (2-Butanone)	3.37	0.50	ug/g		67.5	50-140			
Methyl Isobutyl Ketone	3.09	0.50	ug/g		61.7	50-140			
Methyl tert-butyl ether	3.52	0.05	ug/g		70.5	50-140			
Methylene Chloride	1.49	0.05	ug/g		74.6	60-130			
Styrene	2.06	0.05	ug/g		103	60-130			
1,1,1,2-Tetrachloroethane	1.98	0.05	ug/g		98.8	60-130			
1,1,2,2-Tetrachloroethane	2.27	0.05	ug/g		114	60-130			
Tetrachloroethylene	2.31	0.05	ug/g		116	60-130			
Toluene	2.06	0.05	ug/g		103	60-130			
1,1,1-Trichloroethane	1.69	0.05	ug/g		84.3	60-130			
1,1,2-Trichloroethane	1.57	0.05	ug/g		78.3	60-130			
Trichloroethylene	1.55	0.05	ug/g		77.5	60-130			
Trichlorofluoromethane	1.86	0.05	ug/g		92.9	50-140			
Vinyl chloride	1.48	0.02	ug/g		74.2	50-140			
m,p-Xylenes	4.35	0.05	ug/g		109	60-130			
o-Xylene	2.23	0.05	ug/g		111	60-130			
Surrogate: 4-Bromofluorobenzene	*2.48*		*ug/g*		*77.5*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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Page 1 of 1

Client Name: Paterson Group	Project Reference: PE 4194	**Turnaround Time:**	
Contact Name: Mark D'Arcy	Quote #	☐ 1 Day	☐ 3 Day
Address:	PO # # 22059	☐ 2 Day	☑ Regular
Telephone: 226-7381	Email Address:	Date Required:	

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

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

Required Analyses

Paracel Order Number: 1808110

	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-SS8	S	-	2	Feb 16/18	2pm		✓						250 mL.						
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Paracel.

Relinquished By (Sign):	Received by Driver/Depot: T. Jeause	Received at Lab: Rachel - subject	Verified By:
Relinquished By (Print): Marek Moroz	Date/Time: 20/02/18 3:30 PM	Date/Time: Feb 20 18	Date/Time: 20Feb18 4:57pm
Date/Time: 2018-02-20	Temperature: °C	Temperature: 15.8 °C 4:45	pH Verified [ ] By: