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Phase II-Environmental Site Assessment

1705 Carling Avenue
Ottawa, Ontario

Prepared For

Claridge Homes

November 14, 2019
Report: PE4192-2R

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Assessment

A Phase II-ESA was conducted for 1705 Carling Avenue, Ottawa, Ontario. The focus of the Phase II-ESA was to assess APECs identified in the Phase I-ESA and to confirm general soil and groundwater quality at the APEC locations.

The Phase II-ESA consisted of the drilling of seven (7) boreholes, and the installation of five (5) groundwater monitoring wells to assess soil and groundwater quality 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), benzene, toluene, ethylbenzene and xylene (BTEX). The analytical results indicated that all detected concentrations were in compliance with the selected MOECC Table 7 standards.

Groundwater samples obtained from BH1, BH2, BH3, BH6 and BH7 were submitted for analytical testing for a combination of VOCs and PHCs (F1-F4) in January 2018. All the tested parameters in the groundwater samples were in compliance with the selected MOECC Table 7 standards with the exception of chloroform in samples from BH2, BH3 and BH7. A second sampling event was conducted in March 2018 to address the chloroform in these wells. Since municipally treated potable water was used during in the bedrock coring process while drilling the boreholes, and municipal water is known to contain chloroform as a by-product of the water treatment process, it was considered possible that the chloroform identified during the first sampling event was a result of potable coring water.

The analytical results of the second sampling event identified slightly more elevated concentrations of chloroform in the same three wells. Since the wells were well purged prior to sampling, it is now considered more likely that the chloroform is a result of nearby leaking water services. The chloroform concentrations are on the same order of magnitude as the published chloroform value from Britannia water purification plant in the City of Ottawa (26.9 ug/L, 2016 Drinking Water Quality) as well as from personally tested municipal water samples. No other potential sources of chloroform were noted during the Phase I-ESA or Phase II-ESA.

It is our opinion that although chloroform concentrations were found to exceed the MOECC Table 7 site standard during the Phase II-ESA, the chloroform is not considered to be a contaminant in the groundwater, and is not considered to pose a concern to the soil and groundwater at the subject site, nor to the tenants of the property.

It should be noted that all water services on site will be decommissioned during redevelopment, as a result, any sources (leaking water services) will be eliminated as a result of the property redevelopment.

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.

1.0 INTRODUCTION

At the request of Claridge Homes, Paterson Group conducted a Phase II Environmental Site Assessment of the property located at 1705 Carling Avenue, in the City of Ottawa, Ontario.

1.1 Site Description

Address:	1705 Carling Avenue.
Legal Description:	Part of Lot 30, Concession 1, Township of Nepean, now in the City of Ottawa.
Property Identification Number:	04006-0002.
Location:	The subject site is located on the north side of Carling Avenue, between Highland Avenue and Cole Avenue, in Ottawa, Ontario.
Latitude and Longitude:	45° 22' 43.37" N, 75° 45' 6.30" W
Configuration:	Rectangular
Site Area:	9,000 m^2

1.2 Property Ownership

The property is currently owned by Claridge Homes.

1.3 Current and Proposed Future Uses

The subject site is currently occupied by a motel with three separate motel buildings, a restaurant and a residential dwelling. It is Paterson's understanding that part of the subject property will be redeveloped with a senior's home.

1.4 Applicable Site Condition Standard

The site condition standards for the property were obtained from Table 7 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 and Climate Change (MOECC), April 2011. The MOECC Table 3 Standards are based on the following considerations:

- Coarse-grained soil conditions
- Non-potable groundwater conditions
- Shallow bedrock conditions
- Residential land use

Soil results were also compared to Table 1 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 and Climate Change (MOECC), April 2011. The Table 1 standards represent typical background condition in Ontario.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The subject site is located on the north side of Carling Avenue, between Broadview Avenue to the west and Cole Avenue to the east, in the City of Ottawa. The property is occupied by five buildings; three buildings operating under Webb's Motel, one building operating as the Rose Bowl restaurant and residential dwelling. The remainder of the property is covered in asphaltic concrete.

2.2 Past Investigations

Paterson prepared a Phase I-ESA on the subject property in December 2017. Based on a review of historical information and a visit of the property, it was determined that a Phase II-ESA would be required for the property in order to address concerns associated with the above ground heating oil tanks used in the past to heat the buildings on the property.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation consisted of the drilling up to seven (7) boreholes on the subject site. Boreholes were drilled to depths of 6.25 m below ground

surface. Limestone bedrock was encountered between 0.2 and 1.58 m below grade. The focus of the Phase II-ESA was to assess areas of potential environmental concern identified during the Phase I-ESA assessment.

3.2 Media Investigated

During the subsurface investigation, soil samples and groundwater samples were obtained and submitted for laboratory analysis. The rationale for sampling and analyzing these media is based on the Contaminants of Potential Concern identified in the Phase I ESA. Contaminants of concern for soil and groundwater are petroleum hydrocarbons (PHCs) in soil and groundwater, benzene, toluene, ethylbenzene and xylenes (BTEX) in soil and groundwater. The BTEX parameters fall within a greater set of volatile organic compounds (VOCs), all of which were analysed in the groundwater samples. Note that the entire list of VOCs are not considered to be Contaminants of Potential Concern, only the BTEX subset, however VOCs were analysed in the groundwater in order to verify if municipal drinking water is present in the groundwater monitoring wells. Chloroform, a VOC, is found in municipal water, which is also the water used to core the boreholes on-site.

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

The Geological Survey of Canada website on the Urban Geology of the National Capital Area were consulted as part of this assessment. Based on this information, bedrock in the area of the site consists of interbedded limestone and dolostone of the Gull River Formation. Based on the maps, the thickness of overburden ranges from 3 to 10 m. Overburden consists of glacial till deposits.

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:

- BTEX – this suite of parameters includes Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX), associated with fuel oil. These parameters were selected as CPCs for the subject site due to the former presence of aboveground heating oil storage tanks on the subject property. BTEX are considered to be present in both the soil and groundwater.

- 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 presence of aboveground heading oil storage tanks on the subject property. 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.

Buildings and Structures

The subject site is occupied by the Webb Motel, which consists of three separate buildings, one restaurant, and one private residence.

Water Bodies

There are no water bodies on the subject site or in the study area.

Areas of Natural Significance

There are no areas of natural significance in the study area.

Drinking Water Wells

The search returned ten (10) drinking water well records within the Phase I study area, drilled between 1950 and 1952. Based on the availability of municipal water, it is assumed that these wells have been decommissioned.

Neighbouring Land Use

Neighbouring land use in the Phase I study area is primarily residential to the north and east, and commercial to the west and south. Land use is shown on Drawing PE4192-2 - Surrounding Land Use Plan in the Phase I-ESA.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

The aboveground heating oil storage tanks formerly located on the subject property are considered to be have created areas of potential environmental concern. Off-site potentially contaminating activities were identified within the study area, however they were located at significant distances from the subject site and are considered to have created APECs on the property.

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 potentially contaminating activities 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. No deviations from the Sampling and Analysis Plan were noted.

3.5 Impediments

No physical impediments or denial of access were encountered during the Phase II Environmental Site Assessment with the exception of the utilities in the area of borehole BH1, which presented an impediment to drill any closer to the building and the former aboveground oil tank. Borehole BH1 was placed as close as safely possible to the former tank location.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation was carried out on January 22 and 25, 2018, and consisted of the drilling of seven boreholes on the subject site. The boreholes were placed to address the Areas of Potential Environmental Concern created by the former aboveground heating oil tanks identified in the Phase I-ESA, as well as for general coverage purposes. Boreholes BH1 to BH5 were drilled using a truck-mounted CME 55 power auger drill rig and boreholes BH6 and BH7, which were located inside buildings, were drilled using portable drilling equipment. All drilling occurred under full-time supervision of Paterson personnel. Borehole locations are shown on Drawing PE4192-3 - Test Hole Location Plan, appended to this report.

4.2 Soil Sampling

As part of the subsurface investigation a total of 13 soil samples were obtained from the boreholes by means of split spoon sampling and direct sampling from auger flights. An additional 19 rock core samples were collected from the boreholes.

Split spoon and rock core samples were taken continuously from ground surface up to 6.25 m below grade, within the upper water table.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 fill material (predominantly crushed stone, with some silt, sand), and till, over grey limestone. The upper layer of limestone in most boreholes was found to be weathered, becoming solid beyond approximately 1.5 m in depth.

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 ppm to 1.5 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 (5) groundwater monitoring wells were installed during the drilling program carried out on January 22 and 25, 2018 by George Downing Estate Drilling of Hawkesbury, Ontario, under full-time supervision by Paterson personnel. The monitoring wells consisted of 30 mm 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. Borehole elevations were provided by Annis, O'Sullivan, Vollebekk, as part of a 2018 survey.

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	78.35	6.25	3.20 – 6.25	2.96 – 6.25	0 – 2.96	Flushmount
BH2	79.20	6.20	3.24 – 6.20	2.96 – 6.20	0 – 2.96	Flushmount
BH3	79.49	6.20	3.24 – 6.20	2.84 – 6.20	0 – 2.84	Flushmount
BH6	77.10	5.05	2.04 – 5.05	1.72 – 5.05	0 – 1.72	Flushmount
BH7	76.85	4.34	1.32 – 4.34	1.00 – 4.34	0 – 1.00	Flushmount

4.5 Groundwater Sampling

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

4.6 Analytical Testing

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

Table 2: Soil Samples Submitted

Sample ID	Sample Depth/ Stratigraphic Unit	Parameters Analysed		Rationale
		PHC F1-F4	BTEX	
January 22, 2018				
BH1-AU2	0.1 – 0.36 m, Fill	X	X	Analysis of soil in vicinity of former heating oil storage tank.
BH2-SS2	0.76 – 1.36 m, Weathered bedrock (fine)	X	X	Analysis of soil in vicinity of former heating oil storage tank.
BH3-SS2	0.76 – 1.36 m, Weathered bedrock (fine)	X	X	Analysis of soil in vicinity of former heating oil storage tank.
BH5-AU2	0.28 – 0.53 m, Fill	X	X	Analysis of soil in vicinity of former heating oil storage tank.
January 25, 2018				
BH6-G2	0.41 – 0.53 m, Fill	X	X	Analysis of soil in vicinity of former heating oil storage tank.

Table 3: Groundwater Samples Submitted				
Sample ID	Screened Interval/ Stratigraphic Unit	Parameters Analysed		Rationale
		PHC F_1-F_4	VOC	
January 29, 2018				
BH1-GW1	3.20 – 6.25 m, bedrock	X	X	Analysis of groundwater in vicinity of former heating oil tank
BH2-GW1	3.24 - 6.20 m, bedrock	X	X	Analysis of groundwater in vicinity of former heating oil tank
BH3-GW1	3.24 – 6.20 m, Bedrock	X	X	Analysis of groundwater in vicinity of former heating oil tank
BH6-GW1	2.04 – 5.05 m, Bedrock	X	X	Analysis of groundwater in vicinity of former heating oil tank
BH7-GW1	1.32 – 4.34 m, Bedrock	X	X	Analysis of groundwater in vicinity of former heating oil tank
BH2-GW2	3.24 - 6.20 m, bedrock		X	Analysis of groundwater in vicinity of former heating oil tank and assessment of chloroform
BH3-GW2	3.24 – 6.20 m, Bedrock		X	Analysis of groundwater in vicinity of former heating oil tank and assessment of chloroform
BH7-GW2	1.32 – 4.34 m, Bedrock		X	Analysis of groundwater in vicinity of former heating oil tank
DUP (BH3)	1.32 – 4.34 m, Bedrock		X	Analysis of groundwater in vicinity of former heating oil tank and assessment of chloroform

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

Geodetic borehole elevations were provided by surveyors Annis, O'Sullivan, Vollebekk Ltd. as part of a property survey conducted in February 2018.

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. No 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 concrete was encountered at surface in each of the exterior boreholes, while concrete was encountered at the interior borehole locations (BH6 and BH7)
- Fill material was encountered below the asphaltic concrete/concrete to depths ranging from 0.3 to 0.6 m below grade. The fill consisted primarily of crushed stone with trace of silt and sand
- Till was encountered in certain boreholes, below the fill material.
- Below the fill/till was weathered limestone bedrock, followed by solid bedrock.

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 Tables 4A and 4B. All elevations are relative to the temporary benchmark.

Table 4A: Groundwater Level Measurements – January 2018

Borehole Location	Ground Surface Elevation (m)	Water Level Depth (m below grade)	Water Level Elevation (m ASL)	Date of Measurement
BH1	79.35	1.74	76.61	January 29, 2018
BH2	79.20	2.76	76.44	January 29, 2018
BH3	79.49	1.79	77.70	January 29, 2018
BH6	77.10	3.88	73.22	January 29, 2018
BH7	76.85	1.92	74.93	January 29, 2018

Table 4B: Groundwater Level Measurements – March 2018

Borehole Location	Ground Surface Elevation (m)	Water Level Depth (m below grade)	Water Level Elevation (m ASL)	Date of Measurement
BH1	79.35	1.71	76.64	March 9, 2018
BH2	79.20	2.71	76.49	March 9, 2018
BH3	79.49	2.74	76.75	March 9, 2018
BH6	77.10	3.86	73.24	March 9, 2018
BH7	76.85	1.85	75.00	March 9, 2018

Based on the groundwater elevations from the most recent sampling event (March 2018), groundwater contour mapping was completed for the bedrock aquifer unit. Groundwater contours are shown on Drawing PE4192-4 - Groundwater Contour Plan. Based on the contour mapping, groundwater flow at the subject site appears to be in a western direction. A horizontal hydraulic gradient of approximately 0.08 m/m was calculated. 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

Based on the observed soil conditions at the subject site, fine-medium textured soil standards are not considered to apply 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 1.5 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 (5) soil samples from the subsurface investigation were submitted for analysis of PHCs and BTEX as presented below in Tables 5a and 5b.

Table 5a:
Analytical Test Results – Soil
BTEX/PHCs

Parameter	MDL (µg/g)	Soil Samples (µg/g) January 22, 2018				MOECC Table 1 Residential Standards	MOECC Table 7 Residential Standards
		BH1-AU2	BH2-SS2	BH3-SS2	BH5-AU2		
Benzene	0.02	nd	nd	nd	nd	0.02	0.21
Ethylbenzene	0.05	nd	nd	nd	nd	0.05	2
Toluene	0.05	nd	nd	nd	nd	0.2	2.3
Xylenes	0.05	nd	nd	nd	nd	0.05	3.1
PHCs F1	7	nd	nd	nd	nd	25	55
PHCs F2	4	nd	nd	nd	nd	10	98
PHCs F3	8	21	nd	nd	nd	240	300
PHCs F4	6	**162**	nd	nd	58	120	2,800

Notes:
- **Bold and underlined** – Value exceeds selected MOECC standard
- **Bold** – Value exceeds MOECC Table 1
- MDL – Method Detection Limit
- nd – not detected above the MDL

Table 5b:
Analytical Test Results – Soil
BTEX/PHCs

Parameter	MDL (µg/g)	Soil Samples (µg/g) January 25 2018	MOECC Table 1 Residential Standards	MOECC Table 7 Residential Standards
		BH6-AU2		
Benzene	0.02	nd	0.02	0.21
Ethylbenzene	0.05	nd	0.05	2
Toluene	0.05	nd	0.2	2.3
Xylenes	0.05	nd	0.05	3.1
PHCs F1	7	nd	25	55
PHCs F2	4	nd	10	98
PHCs F3	8	nd	240	300
PHCs F4	6	nd	120	2,800

Notes:
- **Bold and underlined** – Value exceeds selected MOECC standard
- **Bold** – Value exceeds MOECC Table 1
- MDL – Method Detection Limit
- nd – not detected above the MDL

All BTEX and PHC concentrations are in compliance with the selected MOECC Table 7 standards.

Table 6: Maximum Concentrations – Soil

Parameter	Maximum Concentration (µg/g)	Borehole	Depth Interval (m BGS)
PHC F3	21	BH1-AU2	0.1 – 0.36 m
PHC F4	162	BH1-AU2	0.1 – 0.36 m

5.6 Groundwater Quality

Groundwater samples from BH1, BH2, BH3, BH6 and BH7 were submitted for a combination of VOC and PHC analysis. The groundwater samples were obtained from the screened intervals noted on Table 1. The results of the analytical testing are presented in Tables 7, and 8.

Table 7a: Analytical Test Results – Groundwater – VOCs

Parameter	MDL (µg/L)	Groundwater Sample (µg/L) January 29, 2018					MOECC Table 7 Standards
		BH1-GW1	BH2-GW1	BH3-GW1	BH6-GW1	BH7-GW1	
Acetone	5.0	nd	nd	nd	nd	nd	100,000
Benzene	0.5	nd	nd	nd	nd	nd	0.5
Bromodichloromethane	0.5	nd	1.6	1.8	nd	nd	67,000
Bromoform	0.5	nd	nd	nd	nd	nd	5
Bromomethane	0.5	nd	nd	nd	nd	nd	0.89
Carbon Tetrachloride	0.2	nd	nd	nd	nd	nd	0.2
Chlorobenzene	0.5	nd	nd	nd	nd	nd	140
Chloroform	0.5	nd	**14.3**	**14.4**	nd	**4.8**	2
Dibromochloromethane	0.5	nd	nd	nd	nd	nd	65,000
Dichlorodifluoromethane	1.0	nd	nd	nd	nd	nd	3,500
1,2-Dichlorobenzene	0.5	nd	nd	nd	nd	nd	150
1,3-Dichlorobenzene	0.5	nd	nd	nd	nd	nd	7,600
1,4-Dichlorobenzene	0.5	nd	nd	nd	nd	nd	0.5
1,1-Dichloroethane	0.5	nd	nd	nd	nd	nd	11
1,2-Dichloroethane	0.5	nd	nd	nd	nd	nd	0.5
1,1-Dichloroethylene	0.5	nd	nd	nd	nd	nd	0.5
cis-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	nd	1.6
1,2-Dichloropropane	0.5	nd	nd	nd	nd	nd	0.58
1,3-Dichloropropene	0.5	nd	nd	nd	nd	nd	0.5
Ethylbenzene	0.5	nd	nd	nd	nd	nd	54
Ethylene dibromide	0.2	nd	nd	nd	nd	nd	nv
Hexane	1.0	nd	nd	nd	nd	nd	5
Methyl Ethyl Ketone	5.0	nd	nd	nd	nd	nd	21,000
Methyl Isobutyl Ketone	5.0	nd	nd	nd	nd	nd	5,200
Methyl tert-butyl Ether	2.0	nd	nd	nd	nd	nd	15
Methylene Chloride	5.0	nd	nd	nd	nd	nd	26
Styrene	0.5	nd	nd	nd	nd	nd	43
1,1,1,2-Tetrachloroethane	0.5	nd	nd	nd	nd	nd	1.1
1,1,2,2-Tetrachloroethane	0.5	nd	nd	nd	nd	nd	0.5
Tetrachloroethylene	0.5	nd	nd	nd	nd	nd	0.5
Toluene	0.5	45.1	nd	nd	nd	nd	320
1,1,1-Trichloroethane	0.5	nd	nd	nd	nd	nd	23
1,1,2-Trichloroethane	0.5	nd	nd	nd	nd	nd	0.5
Trichloroethylene	0.5	nd	nd	nd	nd	nd	0.5
Trichlorofluromethane	1.0	nd	nd	nd	nd	nd	2,000
Vinyl Chloride	0.5	nd	nd	nd	nd	nd	0.5
Xylene	0.5	nd	nd	nd	nd	nd	72

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold and underlined** – Value exceeds selected MOECC standards
- nv – No value for standard

All VOC parameters were found to be in compliance with the selected MOECC Table 7 standards, with the exception of chloroform in Samples BH2-GW1, BH3-GW1 and BH7-GW1.

The chloroform in these samples is considered to be a result of the use of municipally treated drinking water during the rock coring process as municipal drinking water has been known to contain chloroform.

A second analytical sampling event was conducted later in March, to re-assess the chloroform identified in the January sample. Results are present in Table 7B.

Table 7b: Analytical Test Results – Groundwater – VOCs

Parameter	MDL (µg/L)	Groundwater Sample (µg/L) March 9, 2018				MOECC Table 7 Standards
		BH2-GW2	BH3-GW2	BH7-GW2	DUP	
Acetone	5.0	nd	nd	nd	nd	100,000
Benzene	0.5	nd	nd	nd	nd	0.5
Bromodichloromethane	0.5	nd	nd	nd	nd	67,000
Bromoform	0.5	nd	nd	nd	nd	5
Bromomethane	0.5	nd	nd	nd	nd	0.89
Carbon Tetrachloride	0.2	nd	nd	nd	nd	0.2
Chlorobenzene	0.5	nd	nd	nd	nd	140
Chloroform	0.5	**18.8**	**29.0**	**10.3**	**26.2**	2
Dibromochloromethane	0.5	nd	nd	nd	nd	65,000
Dichlorodifluoromethane	1.0	nd	nd	nd	nd	3,500
1,2-Dichlorobenzene	0.5	nd	nd	nd	nd	150
1,3-Dichlorobenzene	0.5	nd	nd	nd	nd	7,600
1,4-Dichlorobenzene	0.5	nd	nd	nd	nd	0.5
1,1-Dichloroethane	0.5	nd	nd	nd	nd	11
1,2-Dichloroethane	0.5	nd	nd	nd	nd	0.5
1,1-Dichloroethylene	0.5	nd	nd	nd	nd	0.5
cis-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	1.6
1,2-Dichloropropane	0.5	nd	nd	nd	nd	0.58
1,3-Dichloropropene	0.5	nd	nd	nd	nd	0.5
Ethylbenzene	0.5	nd	nd	nd	nd	54
Ethylene dibromide	0.2	nd	nd	nd	nd	nv
Hexane	1.0	nd	nd	nd	nd	5
Methyl Ethyl Ketone	5.0	nd	nd	nd	nd	21,000
Methyl Isobutyl Ketone	5.0	nd	nd	nd	nd	5,200
Methyl tert-butyl Ether	2.0	nd	nd	nd	nd	15
Methylene Chloride	5.0	nd	nd	nd	nd	26
Styrene	0.5	nd	nd	nd	nd	43
1,1,1,2-Tetrachloroethane	0.5	nd	nd	nd	nd	1.1
1,1,2,2-Tetrachloroethane	0.5	nd	nd	nd	nd	0.5
Tetrachloroethylene	0.5	nd	nd	nd	nd	0.5
Toluene	0.5	nd	nd	nd	nd	320
1,1,1-Trichloroethane	0.5	nd	nd	nd	nd	23
1,1,2-Trichloroethane	0.5	nd	nd	nd	nd	0.5
Trichloroethylene	0.5	nd	nd	nd	nd	0.5

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold and underlined** – Value exceeds selected MOECC standards
- nv – No value for standard

Table 7b: Analytical Test Results – Groundwater – VOCs

Parameter	MDL (µg/L)	Groundwater Sample (µg/L) March 9, 2018				MOECC Table 7 Standards
		BH2-GW2	BH3-GW2	BH7-GW2	DUP	
Trichlorofluromethane	1.0	nd	nd	nd	nd	2,000
Vinyl Chloride	0.5	nd	nd	nd	nd	0.5
Xylene	0.5	nd	nd	nd	nd	72

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold and underlined** – Value exceeds selected MOECC standards
- nv – No value for standard

None of the VOC parameters were detected above the laboratory detection limits with the exception of chloroform in all four samples. Chloroform was detected in concentrations higher than during the first sampling event. Since a representative volume of was purged from the well prior to sampling, this may indicate that the groundwater samples were influenced by a secondary potential source of chloroform, potentially a leaking water main, however the source of chloroform may still be a result of the use of municipal water during the rock coring process.

Table 8: Analytical Test Results – Groundwater – PHCs

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)					MOECC Table 7 Standards
		BH1-GW1	BH2-GW1	BH3-GW1	BH6-GW1	BH7-GW1	
PHCs F1	25	nd	nd	nd	nd	nd	420
PHCs F2	100	nd	nd	nd	nd	nd	150
PHCs F3	100	nd	nd	nd	nd	nd	500
PHCs F4	100	nd	nd	nd	nd	nd	500

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold and underlined** – Value exceeds selected MOECC standard
- nv – No value for standard

No PHC parameters were detected in the groundwater samples.

The laboratory certificates of analysis are provided in Appendix 1.

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.

A duplicate groundwater sample was collected from Borehole BH3, and was labelled “DUP”.

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 at the study site and 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 PE4192-2 in the Phase I ESA. Five (5) of these PCAs were located on the subject property and are considered to have created Areas of Potential Environmental Concern (APECs). The remaining PCAs are located at distances far enough away from the subject property such that they are not considered to have created APECs on site.

Areas of Potential Environmental Concern

Based on the results of the Phase I ESA completed for the subject site, five (5) APECs were identified at the subject site. The PCAs considered to represent APECs on the subject site are summarized below:

- The former on-site storage of heating oil in an aboveground storage tank (south end of east motel building); Item 28, Table 2, O.Reg. 153/04 as amended by O.Reg. 269/11 (“Gasoline and Associated Products Storage in Fixed Tanks”).
- The former on-site storage of heating oil in an aboveground storage tank (rear exterior of restaurant building); Item 28, Table 2, O.Reg. 153/04 as amended by O.Reg. 269/11 (“Gasoline and Associated Products Storage in Fixed Tanks”).
- The former on-site storage of heating oil in an aboveground storage tank (basement of residential dwelling); Item 28, Table 2, O.Reg. 153/04 as amended by O.Reg. 269/11 (“Gasoline and Associated Products Storage in Fixed Tanks”).

- The former on-site storage of heating oil in an aboveground storage tank (central area of central motel building); Item 28, Table 2, O.Reg. 153/04 as amended by O.Reg. 269/11 (“Gasoline and Associated Products Storage in Fixed Tanks”).
- The former on-site storage of heating oil in an aboveground storage tank central area of west motel building); Item 28, Table 2, O.Reg. 153/04 as amended by O.Reg. 269/11 (“Gasoline and Associated Products Storage in Fixed Tanks”).

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.

Contaminants of Potential Concern

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

Subsurface Structures and Utilities

Subsurface utilities on the subject property include electrical utilities, natural gas lines, telephone, cable lines, sewer lines, and water lines. No other subsurface structures were identified.

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 PE4192-7A, B, C and PE4192-8A, B, C. Stratigraphy consists of:

- A layer of fill material was encountered at all borehole locations. The fill was encountered below asphalt (Boreholes BH1 through BH5) or concrete (BH6 and BH7). The fill ranged in thickness from 0.25 m to 0.52 m and consisted primarily of crushed stone, silt, and sand. Groundwater was not encountered in this layer.
- Glacial till material was encountered at some boreholes beneath the layer of fill, up to a depth of 1.58 m below grade.
- Grey limestone was encountered below the fill. Groundwater was encountered between 1.74 m to 3.88 m below ground surface within the bedrock layer.

Hydrogeological Characteristics

Groundwater was encountered in the bedrock unit on the subject site. Groundwater levels from the five (5) monitoring wells were measured at the subject site on January 29 and March 9, 2018. The most recent groundwater levels indicate that the local groundwater flow is in a western direction with a hydraulic gradient of 0.08 m/m. Groundwater contours are shown on Drawing PE4192-4.

Approximate Depth to Bedrock

Bedrock was encountered at depths ranging from 1.74 m to 3.88 m below ground surface.

Approximate Depth to Water Table

Depth to the water table at the subject site varies between approximately 1.71 m and 3.86 m below existing grade.

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 applies to the subject site as bedrock is located less than 2 m below ground surface and thus the site is considered to have shallow soils.

Fill Placement

Crushed stone has been brought on-site for grading below the parking lot and buildings.

Proposed Buildings and Other Structures

The proposed development for the subject site includes the demolition of all buildings and the construction of a mixed-use development, with a residential care facility and apartment dwelling occupancies.

Existing Buildings and Structures

The subject site is occupied by five buildings; three buildings are used by the motel (the central-most building contains the motel's reception desk), the 4th is a restaurant, and a residential dwelling is present at the back of the lot.

Water Bodies

No water bodies are present on the subject site or within 250 m 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 was encountered at the subject property. Over the course of two groundwater sampling events, all groundwater samples were found to be in compliance with the site standards with the exception of chloroform in the groundwater at BH2, BH3 and BH7 (during both events). Although the chloroform was detected above the site standard, it is not considered to be a contaminant. Chloroform may have been introduced into the wells through the use of municipally treated groundwater during the rock coring process (municipal drinking water is known to contain chloroform) or from a leaking water main.

Types of Contaminants

Based on the potentially contaminating activities representing APECs on the subject property, the contaminants of concern (COCs) at the subject site were considered to be PHCs and BTEX, however, the Phase II ESA did not identify any contaminants in excess of the selected MOECC standards with the exception of chloroform in the groundwater. The chloroform is not considered to be a contaminant however, due to it's widespread presence in municipal drinking water. Chloroform may have been introduced into the wells through the use of municipally treated groundwater during the rock coring process (municipal drinking water is known to contain chloroform) or from a leaking water main

Contaminated Media

No soil or groundwater were found to be contaminated with any COCs. One exception to this is the presence of chloroform in the groundwater at BH2, BH3 and BH7. As mentioned earlier, the chloroform is not considered to represent contamination on the property, as it may be originating from municipally treated water sources. No other possible source of chloroform has been identified on site on in the vicinity of the property.

What Is Known About Areas Where Contaminants Are Present

The source of chloroform was suspected to be resulting from either the use of municipal drinking water in the rock coring operation, as the City of Ottawa's

municipal drinking water is a known source of chloroform, or it is possible that leaking water mains in the area have contributed to the elevated chloroform concentrations.

Distribution of Contaminants

Contaminants are not considered to have been dispersed on the subject site. Chloroform, identified in three groundwater samples, may have been dispersed into the fractured bedrock from leaking water mains. Chloroform may have also been distributed at the borehole locations only, through the use of municipal drinking water in the rock coring process.

Discharge of Contaminants

Chloroform in the groundwater may have been discharged through the use of municipal drinking water in the rock coring process, or, by a leaking water main. No other potential sources of chloroform were identified.

Migration of Contaminants

No soil or groundwater exceedances were identified during the analytical testing.

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, downward leaching has not affected contaminant distribution at the subject site.

Potential for Vapour Intrusion

There is no potential for vapour intrusion at the subject site.

6.0 CONCLUSIONS

Assessment

A Phase II-ESA was conducted for 1705 Carling Avenue, Ottawa, Ontario. The focus of the Phase II-ESA was to assess APECs identified in the Phase I-ESA and to confirm general soil and groundwater quality at the APEC locations.

The Phase II-ESA consisted of the drilling of seven (7) boreholes, and the installation of five (5) groundwater monitoring wells to assess soil and groundwater quality 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), benzene, toluene, ethylbenzene and xylene (BTEX). The analytical results indicated that all detected concentrations were in compliance with the selected MOECC Table 7 standards.

Groundwater samples obtained from BH1, BH2, BH3, BH6 and BH7 were submitted for analytical testing for a combination of VOCs and PHCs (F1-F4) in January 2018. All the tested parameters in the groundwater samples were in compliance with the selected MOECC Table 7 standards with the exception of chloroform in samples from BH2, BH3 and BH7. A second sampling event was conducted in March 2018 to address the chloroform in these wells. Since municipally treated potable water was used during in the bedrock coring process while drilling the boreholes, and municipal water is known to contain chloroform as a by-product of the water treatment process, it was considered possible that the chloroform identified during the first sampling event was a result of potable coring water.

The analytical results of the second sampling event identified slightly more elevated concentrations of chloroform in the same three wells. Since the wells were well purged prior to sampling, it is now considered more likely that the chloroform is a result of nearby leaking water services. The chloroform concentrations are on the same order of magnitude as the published chloroform value from Britannia water purification plant in the City of Ottawa (26.9 ug/L, 2016 Drinking Water Quality) as well as from personally tested municipal water samples. No other potential sources of chloroform were noted during the Phase I-ESA or Phase II-ESA.

It is our opinion that although chloroform concentrations were found to exceed the MOECC Table 7 site standard during the Phase II-ESA, the chloroform is not considered to be a contaminant in the groundwater, and is not considered to pose a concern to the soil and groundwater at the subject site, nor to the tenants of the property.

It should be noted that all water services on site will be decommissioned during redevelopment, as a result, any sources (leaking water services) will be eliminated as a result of the property redevelopment.

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.

7.0 STATEMENT OF LIMITATIONS

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

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

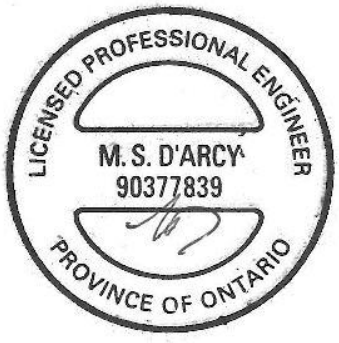
Should any conditions be encountered at the subject site and/or historical information that differ from our findings, we request that we be notified immediately in order to allow for a reassessment.

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

Paterson Group Inc.

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

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



Report Distribution:

- Claridge Homes
- Paterson Group

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE4192-3 – TEST HOLE LOCATION PLAN

DRAWING PE4192-4 – GROUNDWATER CONTOUR PLAN

DRAWING PE4192-5 – SOIL ANALYTICAL TESTING PLAN

DRAWING PE4192-6A – GROUNDWATER ANALYTICAL TESTING PLAN – PHC

DRAWING PE4192-6B – GROUNDWATER ANALYTICAL TESTING PLAN – VOC

DRAWING PE4192-7A – CROSS-SECTION A-A' – SOIL

DRAWING PE4192-7B – CROSS-SECTION A-A' – GROUNDWATER – VOC

DRAWING PE4192-7C – CROSS-SECTION A-A' – GROUNDWATER – PHC

DRAWING PE4192-8A – CROSS-SECTION B-B' – SOIL

DRAWING PE4192-8B – CROSS-SECTION A-A' – GROUNDWATER – VOC

DRAWING PE4192-8C – CROSS-SECTION A-A' – GROUNDWATER – PHC

APPENDIX 1

SAMPLING AND ANALYSIS PLAN

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

LABORATORY CERTIFICATES OF ANALYSIS

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE4192-3 – TEST HOLE LOCATION PLAN

DRAWING PE4192-4 – GROUNDWATER CONTOUR PLAN

DRAWING PE4192-5 – SOIL ANALYTICAL TESTING PLAN

DRAWING PE4192-6A – GROUNDWATER ANALYTICAL TESTING PLAN – PHC

DRAWING PE4192-6B – GROUNDWATER ANALYTICAL TESTING PLAN – VOC

DRAWING PE4192-7A – CROSS-SECTION A-A' – SOIL

DRAWING PE4192-7B – CROSS-SECTION A-A' – GROUNDWATER – VOC

DRAWING PE4192-7C – CROSS-SECTION A-A' – GROUNDWATER – PHC

DRAWING PE4192-8A – CROSS-SECTION B-B' – SOIL

DRAWING PE4192-8B – CROSS-SECTION A-A' – GROUNDWATER – VOC

DRAWING PE4192-8C – CROSS-SECTION A-A' – GROUNDWATER – PHC

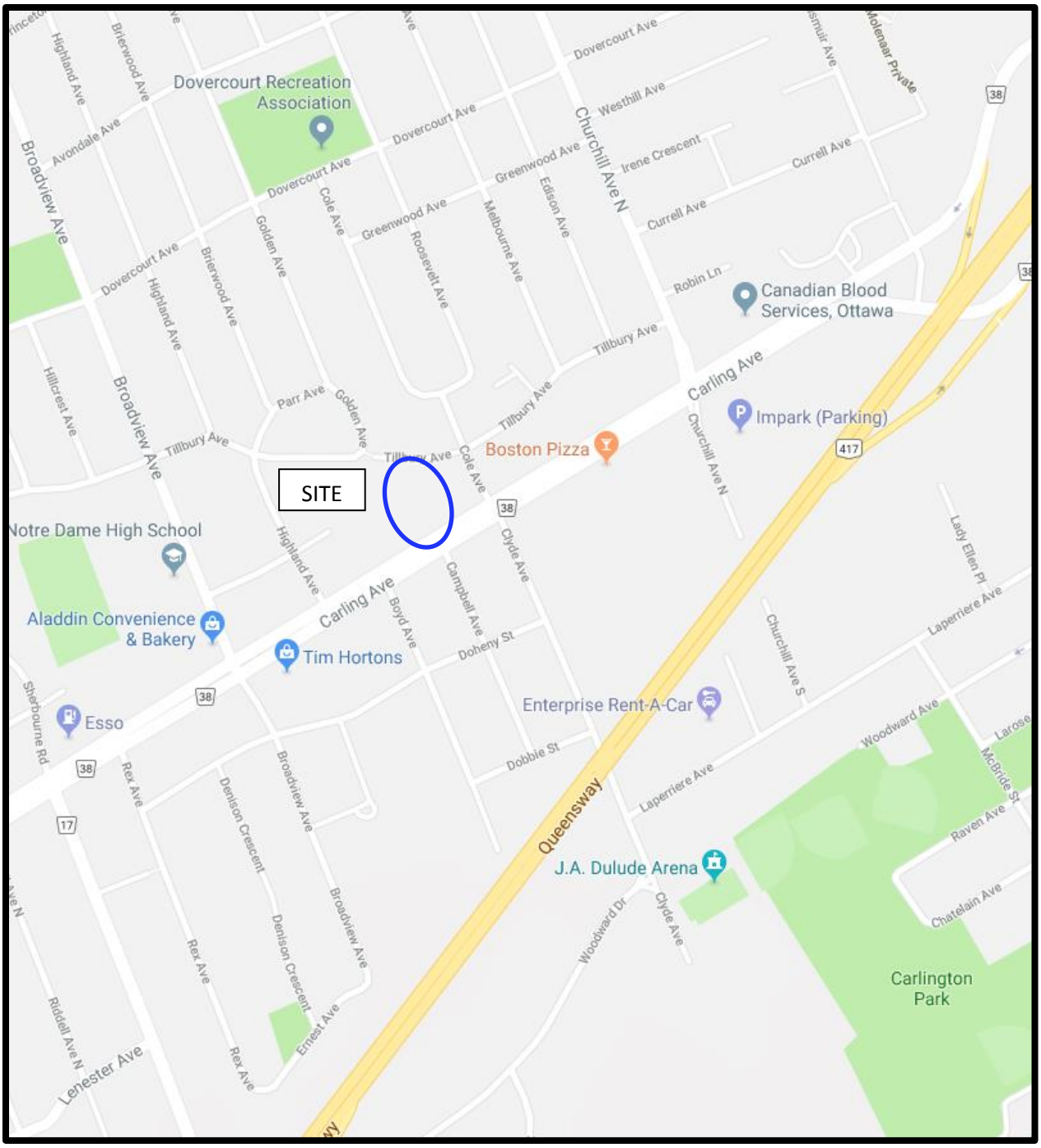


FIGURE 1

KEY PLAN

LEGEND:

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- 78.35 GROUND SURFACE ELEVATION (m)
- [77.99] BEDROCK SURFACE ELEVATION (m)
- (77.17) PRACTICAL REFUSAL TO AUGERING ELEVATION (m)
- {76.61} GROUNDWATER SURFACE ELEVATION (m)
- A — A' CROSS-SECTION LOCATION
- H — HYDRO LINE
- W — WATER LINE
- SAN — SANITARY SEWER
- GS — GAS LINE
- ST — STORM SEWER
- B — BELL LINE
- CABLE TV LINE

BM - TOP SPINDLE OF FIRE HYDRANT. GEODETIC ELEVATION = 80.56m, AS PER ANNIS, O'SULLIVAN, VOLLEBEKK LIMITED SURVEY PLAN, FEB. 2018.

CAMPBELL AVENUE

CARLING AVENUE

TILLBURY AVENUE

BOYD AVENUE

FH - BM

GRASSED

#1705 CARLING AVENUE 1-STOREY MOTEL

2-STOREY

2-STOREY RESIDENCE

ASPHALTIC CONCRETE PARKING AREA

BH 2
79.20
[77.62]
{76.49}

BH 3
79.49
[77.91]
{76.75}

BH 4
77.96
(77.17)

BH 7
76.85
[76.62]
{75.00}

#1705 CARLING AVENUE 1-STOREY MOTEL

2-STOREY

#1717 CARLING AVE. THE ROSE BOWL STEAKHOUSE

BH 1
78.35
[77.99]
{76.64}

#1705 CARLING AVENUE 2-STOREY MOTEL

BH 6
77.10
[76.57]
{73.24}

BH 5
79.13
(78.60)

75.59

A

A'

B

B'

0			
NO.	REVISIONS	DATE	INITIAL

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TRADITIONS SENIORS HOUSING

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1705-1715 CARLING AVENUE

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:500	Date: 03/2018
Drawn by: RCG	Report No.: PE4192-2
Checked by: AM	Dwg. No.: PE4192-3
Approved by: MSD	Revision No.: 0

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LEGEND:

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- 78.35 GROUND SURFACE ELEVATION (m)
- [77.99] BEDROCK SURFACE ELEVATION (m)
- (77.17) PRACTICAL REFUSAL TO AUGERING ELEVATION (m)
- {76.61} GROUNDWATER SURFACE ELEVATION (m)
- 75.2 GROUNDWATER CONTOUR
- (0.08m/m) APPROX. GROUNDWATER FLOW DIRECTION (HORIZONTAL HYDRAULIC GRADIENT)

BM - TOP SPINDLE OF FIRE HYDRANT. GEODETIC ELEVATION = 80.56m, AS PER ANNIS, O'SULLIVAN, VOLLEBEKK LIMITED SURVEY PLAN, FEB. 2018.

#432 TILLBURY AVENUE RESIDENTIAL

#1706 CARLING AVENUE RESIDENTIAL

CAMPBELL AVENUE

FH - BM

GRASSED

#1705 CARLING AVENUE 1-STOREY MOTEL

2-STOREY

GRASSED

BH 3
79.49
[77.91]
{76.75}

CABLE TV

2-STOREY RESIDENCE

BH 7
76.85
[76.62]
{75.00}

GRASSED

ASPHALTIC CONCRETE PARKING AREA

BH 2
79.20
[77.62]
{76.49}

BH 4
77.96
(77.17)

#1705 CARLING AVENUE 1-STOREY MOTEL

2-STOREY

#1717 CARLINE AVE. THE ROSE BOWL STEAKHOUSE

(0.08m/m)

75.6
76.0
76.2
76.4
76.6
75.8
75.4
75.2
75.0
74.8
74.6
74.4
74.2
74.0
73.8

BH 1
78.35
[77.99]
{76.64}

ASPHALTIC CONCRETE PARKING AREA

75.59

BH 6
77.10
[76.57]
{73.24}

#1705 CARLING AVENUE 2-STOREY MOTEL

BH 5
79.13
(78.60)

ASPHALTIC CONCRETE PARKING AREA

GRASSED

TILLBURY AVENUE

CARLING AVENUE

BOYD AVENUE

#454 TILLBURY AVENUE RESIDENTIAL

#463 WELLESLEA AVENUE RESIDENTIAL

#461 WELLESLEA AVENUE RESIDENTIAL

#1723 CARLING AVENUE VACANT COMMERCIAL BUILDING

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NO.	REVISIONS	DATE	INITIAL
0			

TRADITIONS SENIORS HOUSING

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1705-1715 CARLING AVENUE

OTTAWA, ONTARIO

Title:

GROUNDWATER CONTOUR PLAN

Scale: 1:500	Date: 03/2018
Drawn by: RCG	Report No.: PE4192-2
Checked by: MM	Dwg. No.: PE4192-4
Approved by: MSD	Revision No.: 0

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LEGEND:

SOIL RESULTS IN COMPLIANCE WITH MOECC TABLE 7 STANDARDS

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- 78.35 GROUND SURFACE ELEVATION (m)
- [77.99] BEDROCK SURFACE ELEVATION (m)
- (77.17) PRACTICAL REFUSAL TO AUGERING ELEVATION (m)
- {76.61} GROUNDWATER SURFACE ELEVATION (m)
- —H—H— HYDRO LINE
- —W— WATER LINE
- —SAN— SANITARY SEWER
- —GS— GAS LINE
- —ST— STORM SEWER
- —B—B— BELL LINE
- — — CABLE TV LINE

BM - TOP SPINDLE OF FIRE HYDRANT. GEODETIC ELEVATION = 80.56m, AS PER ANNIS, O'SULLIVAN, VOLLEBEKK LIMITED SURVEY PLAN, FEB. 2018.

BH2 - SS2 (0.76-1.36m) January 22, 2018
All PHC F1-F4 and BTEX in compliance with MOECC Table 7 Standards

BH3 - SS2 (0.76-1.36m) January 22, 2018
All PHC F1-F4 and BTEX in compliance with MOECC Table 7 Standards

BH6 - G2 (0.41-0.53m) January 25, 2018
All PHC F1-F4 and BTEX in compliance with MOECC Table 7 Standards

BH1 - AU2 (0.10-0.36m) January 22, 2018
All PHC F1-F4 and BTEX in compliance with MOECC Table 7 Standards

BH5 - AU2 (0.28-0.58m) January 22, 2018
All PHC F1-F4 and BTEX in compliance with MOECC Table 7 Standards

CAMPBELL AVENUE

CARLING AVENUE

TILLBURY AVENUE

BOYD AVENUE

FH - BM

#1705 CARLING AVENUE 1-STOREY MOTEL

2-STOREY

GRASSED

2-STOREY RESIDENCE

BH 7
76.85
[76.62]
{75.00}

BH 4
77.96
(77.17)

ASPHALTIC CONCRETE PARKING AREA

BH 3
79.49
[77.91]
{76.75}

BH 2
79.20
[77.62]
{76.49}

#1705 CARLING AVENUE 1-STOREY MOTEL

#1717 CARLING AVE. THE ROSE BOWL STEAKHOUSE

BH 1
78.35
[77.99]
{76.64}

75.59

#1705 CARLING AVENUE 2-STOREY MOTEL

BH 6
77.10
[76.57]
{73.24}

BH 5
79.13
(78.60)

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NO.	REVISIONS	DATE	INITIAL
0			

TRADITIONS SENIORS HOUSING

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1705-1715 CARLING AVENUE

OTTAWA, ONTARIO

Title:

SOIL ANALYTICAL TESTING PLAN

Scale: 1:500	Date: 03/2018
Drawn by: RCG	Report No.: PE4192-2
Checked by: AM	Dwg. No.: PE4192-5
Approved by: MSD	Revision No.: 0

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LEGEND:

GROUNDWATER RESULTS IN COMPLIANCE WITH MOECC TABLE 7 STANDARDS

GROUNDWATER RESULTS EXCEED MOECC TABLE 7 STANDARDS

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- 78.35 GROUND SURFACE ELEVATION (m)
- [77.99] BEDROCK SURFACE ELEVATION (m)
- (77.17) PRACTICAL REFUSAL TO AUGERING ELEVATION (m)
- {76.61} GROUNDWATER SURFACE ELEVATION (m)
- —H——H— HYDRO LINE
- ——W—— WATER LINE
- ——SAN—— SANITARY SEWER
- ——GS—— GAS LINE
- ——ST—— STORM SEWER
- —B——B— BELL LINE
- ——–——– CABLE TV LINE

BM - TOP SPINDLE OF FIRE HYDRANT. GEODETIC ELEVATION = 80.56m, AS PER ANNIS, O'SULLIVAN, VOLLEBEKK LIMITED SURVEY PLAN, FEB. 2018.

BH2 - GW1 (3.24-6.20m, limestone bedrock) - January 29, 2018
PHC F1-F4 - Complies with MOECC Table 7 Standards

BH3 - GW1 (3.24-6.20m, limestone bedrock) - January 29, 2018
PHC F1-F4 - Complies with MOECC Table 7 Standards

BH7 - GW1 (1.32-4.34m, limestone bedrock) - January 29, 2018
PHC F1-F4 - Complies with MOECC Table 7 Standards

BH6 - GW1 (2.04-5.05m, limestone bedrock) - January 29, 2018
PHC F1-F4 - Complies with MOECC Table 7 Standards

BH1 - GW1 (3.20-6.25m, limestone bedrock) - January 29, 2018
PHC F1-F4 - Complies with MOECC Table 7 Standards

CAMPBELL AVENUE

CARLING AVENUE

TILLBURY AVENUE

BOYD AVENUE

FH - BM

#1705 CARLING AVENUE 1-STOREY MOTEL

2-STOREY

GRASSED

2-STOREY RESIDENCE

BH 7
76.85
[76.62]
{75.00}

BH 4
77.96
(77.17)

ASPHALTIC CONCRETE PARKING AREA

BH 2
79.20
[77.62]
{76.49}

BH 3
79.49
[77.91]
{76.75}

CABLE TV

#1705 CARLING AVENUE 1-STOREY MOTEL

2-STOREY

#1717 CARLING AVE. THE ROSE BOWL STEAKHOUSE

BH 1
78.35
[77.99]
{76.64}

75.59

#1705 CARLING AVENUE 2-STOREY MOTEL

BH 6
77.10
[76.57]
{73.24}

BH 5
79.13
(78.60)

ASPHALTIC CONCRETE PARKING AREA

GRASSED

patersongroup
consulting engineers

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0			

TRADITIONS SENIORS HOUSING

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1705-1715 CARLING AVENUE

OTTAWA, ONTARIO

Title:

GROUNDWATER ANALYTICAL TESTING PLAN - PHC

Scale: 1:500	Date: 03/2018
Drawn by: RCG	Report No.: PE4192-2
Checked by: AM	Dwg. No.: PE4192-6A
Approved by: MSD	Revision No.: 0

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LEGEND:

GROUNDWATER RESULTS IN COMPLIANCE WITH MOECC TABLE 7 STANDARDS

GROUNDWATER RESULTS EXCEED MOECC TABLE 7 STANDARDS

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- 78.35 GROUND SURFACE ELEVATION (m)
- [77.99] BEDROCK SURFACE ELEVATION (m)
- (77.17) PRACTICAL REFUSAL TO AUGERING ELEVATION (m)
- {76.61} GROUNDWATER SURFACE ELEVATION (m)
- H — H — HYDRO LINE
- W — WATER LINE
- SAN — SANITARY SEWER
- GS — GAS LINE
- ST — STORM SEWER
- B — B — BELL LINE
- – – CABLE TV LINE

BM - TOP SPINDLE CF FIRE HYDRANT. GEODETIC ELEVATION = 80.56m, AS PER ANNIS, O'SULLIVAN, VCLLEBEKK LIMITED SURVEY PLAN, FEB. 2018.

BH2 - GW1 (3.24-6.20m, limestone bedrock) - January 29, 2018

Parameter	Concentrations (ug/L)	MOECC Standard (ug/L)
Chloroform	14.3	2

All other VOC parameters complies With MOECC Table 7 Standards

BH2 - GW2 (3.24-6.20m, limestone bedrock) - March 9, 2018

Parameter	Concentration (ug/L)	MOECC Standard (ug/L)
Chloroform	18.8	2

All other VOC parameters complies with MOECC Table 7 Standards

BH3 - GW1 (3.24-6.20m, limestone bedrock) - January 29, 2018

Parameter	Concentrations (ug/L)	MOECC Standard (ug/L)
Chloroform	14.4	2

All other VOC parameters complies With MOECC Table 7 Standards

BH3 - GW2 (3.24-6.20m, limestone bedrock) - March 9, 2018

Parameter	Concentration (ug/L)	MOECC Standard (ug/L)
Chloroform	29.0	2

All other VOC parameters compkies with MOECC Table 7 Standards

BH7 - GW1 (1.32-4.34m, limestone bedrock) - January 29, 2018

Parameter	Concentrations (ug/L)	MOECC Standard (ug/L)
Chloroform	4.8	2

All other VOC parameters complies With MOECC Table 7 Standards

BH7 - GW2 (1.32-4.34m, limestone bedrock) - March 9, 2018

Parameter	Concentration (ug/L)	MOECC Standard (ug/L)
Chloroform	10.3	2

All other VOC parameters complies with MOECC Table 7 Standards

DUP (1.32-4.34m, limestone bedrock) - March 9, 2018

Parameter	Concentration (ug/L)	MOECC Standard (ug/L)
Chloroform	26.2	2

All other VOC parameters complies with MOECC Table 7 Standards

BH6 - GW1 (2.04-5.05m, limestone bedrock) - January 29, 2018
VOCs - Complies With MOECC Table 7 Standards

BH1 - GW1 (3.20-6.25m, limestone bedrock) - January 29, 2018
VOCs - Complies With MOECC Table 7 Standards

TILLBURY AVENUE

CAMPBELL AVENUE

CARLING AVENUE

BOYD AVENUE

FH - BM

#1705 CARLING AVENUE 1-STOREY MOTEL

2-STOREY

GRASSED

2-STOREY RESIDENCE

BH 7
76.85
[76.62]
{75.00}

BH 4
77.96
(77.17)

ASPHALTIC CONCRETE PARKING AREA

BH 2
79.20
[77.62]
{76.49}

BH 3
79.49
[77.91]
{76.75}

CABLE TV

#1705 CARLING AVENUE 1-STOREY MOTEL

2-STOREY

#1717 CARLING AVE. THE ROSE BOWL STEAKHOUSE

BH 1
78.35
[77.99]
{76.64}

#1705 CARLING AVENUE 2-STOREY MOTEL

BH 6
77.10
[76.57]
{73.24}

BH 5
79.13
(78.60)

ASPHALTIC CONCRETE PARKING AREA

GRASSED

ST

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consulting engineers

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NO.	REVISIONS	DATE	INITIAL
0			

TRADITIONS SENIORS HOUSING

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1705-1715 CARLING AVENUE

OTTAWA, ONTARIO

Title:

GROUNDWATER ANALYTICAL TESTING PLAN - VOC

Scale: 1:500	Date: 03/2018
Drawn by: RCG	Report No.: PE4192-2
Checked by: AM	Dwg. No.: PE4192-6B
Approved by: MSD	Revision No.: 0

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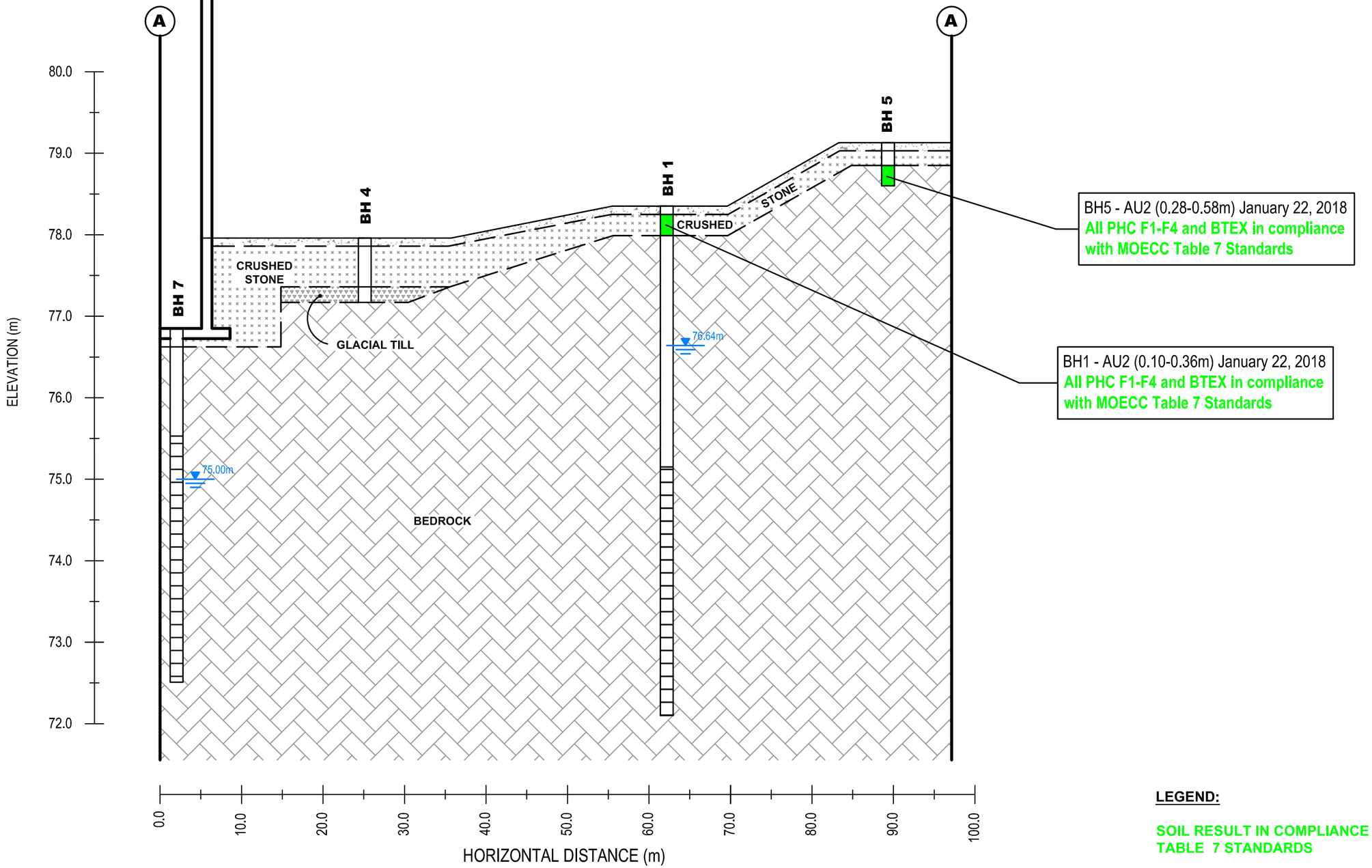

BH5 - AU2 (0.28-0.58m) January 22, 2018
All PHC F1-F4 and BTEX in compliance with MOECC Table 7 Standards

BH1 - AU2 (0.10-0.36m) January 22, 2018
All PHC F1-F4 and BTEX in compliance with MOECC Table 7 Standards

LEGEND:

SOIL RESULT IN COMPLIANCE WITH MOECC TABLE 7 STANDARDS

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TRADITIONS SENIORS HOUSING

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1705-1715 CARLING AVENUE

OTTAWA, ONTARIO

Title:

CROSS SECTION A-A - SOIL

Scale: AS SHOWN	Date: 04/2018
Drawn by: RCG	Report No.: PE4192-2
Checked by: AM	Dwg. No.: PE4192-7A
Approved by: MSD	Revision No.: 0

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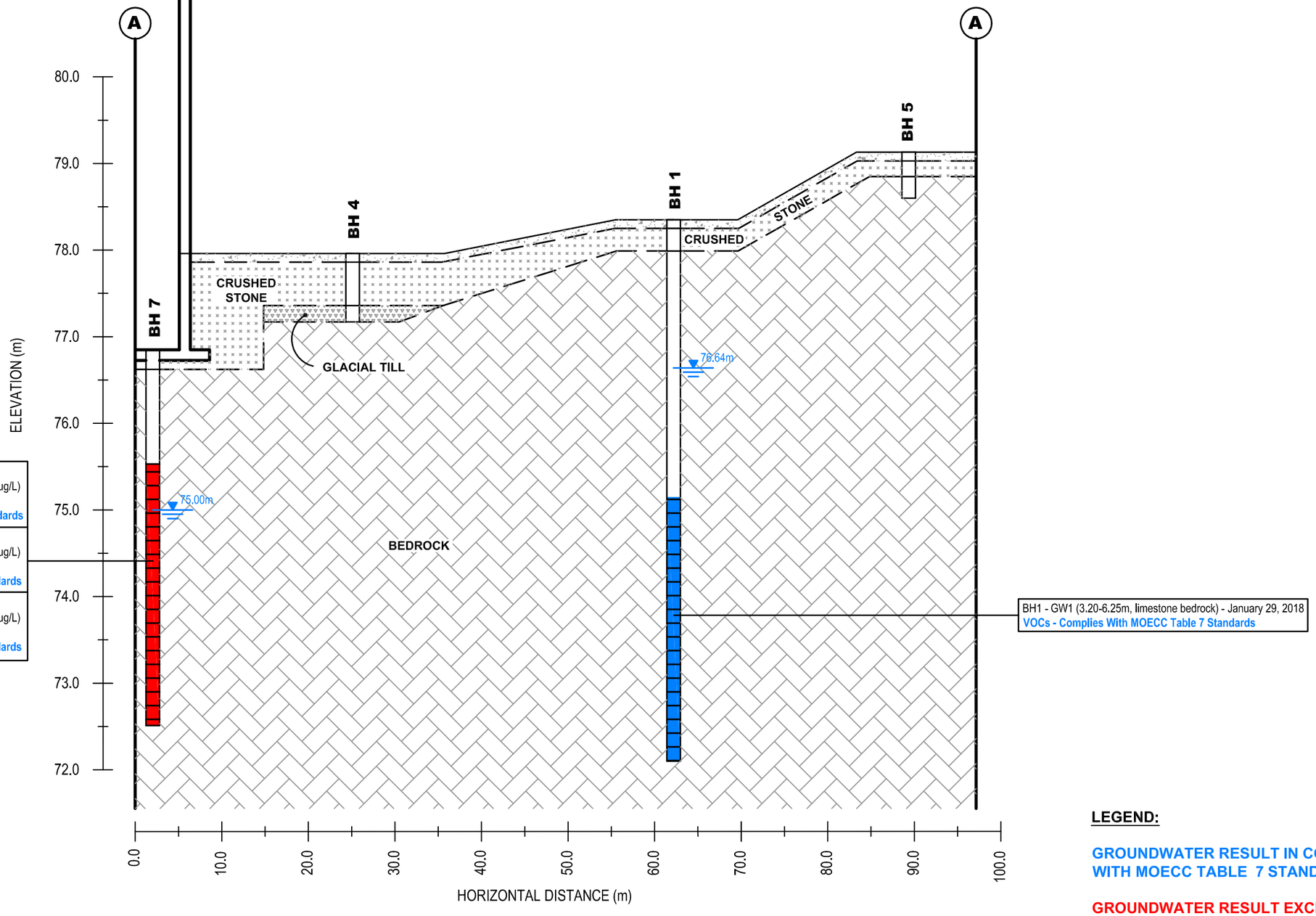

BH7 - GW1 (1.32-4.34m, limestone bedrock) - January 29, 2018

Parameter	Concentrations (ug/L)	MOECC Standard (ug/L)
Chloroform	4.8	2

All other VOC parameters complies With MOECC Table 7 Standards

BH7 - GW2 (1.32-4.34m, limestone bedrock) - March 9, 2018

Parameter	Concentration (ug/L)	MOECC Standard (ug/L)
Chloroform	10.3	2

All other VOC parameters complies with MOECC Table 7 Standards

DUP (1.32-4.34m, limestone bedrock) - March 9, 2018

Parameter	Concentration (ug/L)	MOECC Standard (ug/L)
Chloroform	26.2	2

All other VOC parameters complies with MOECC Table 7 Standards

BH1 - GW1 (3.20-6.25m, limestone bedrock) - January 29, 2018
VOCs - Complies With MOECC Table 7 Standards

LEGEND:

GROUNDWATER RESULT IN COMPLIANCE WITH MOECC TABLE 7 STANDARDS

GROUNDWATER RESULT EXCEEDS MOECC TABLE 7 STANDARDS

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TRADITIONS SENIORS HOUSING

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1705-1715 CARLING AVENUE
OTTAWA, ONTARIO

Title:
CROSS SECTION A-A - GROUNDWATER - VOC

Scale: AS SHOWN	Date: 04/2018
Drawn by: RCG	Report No.: PE4192-2
Checked by: AM	Dwg. No.: PE4192-7B
Approved by: MSD	Revision No.: 0

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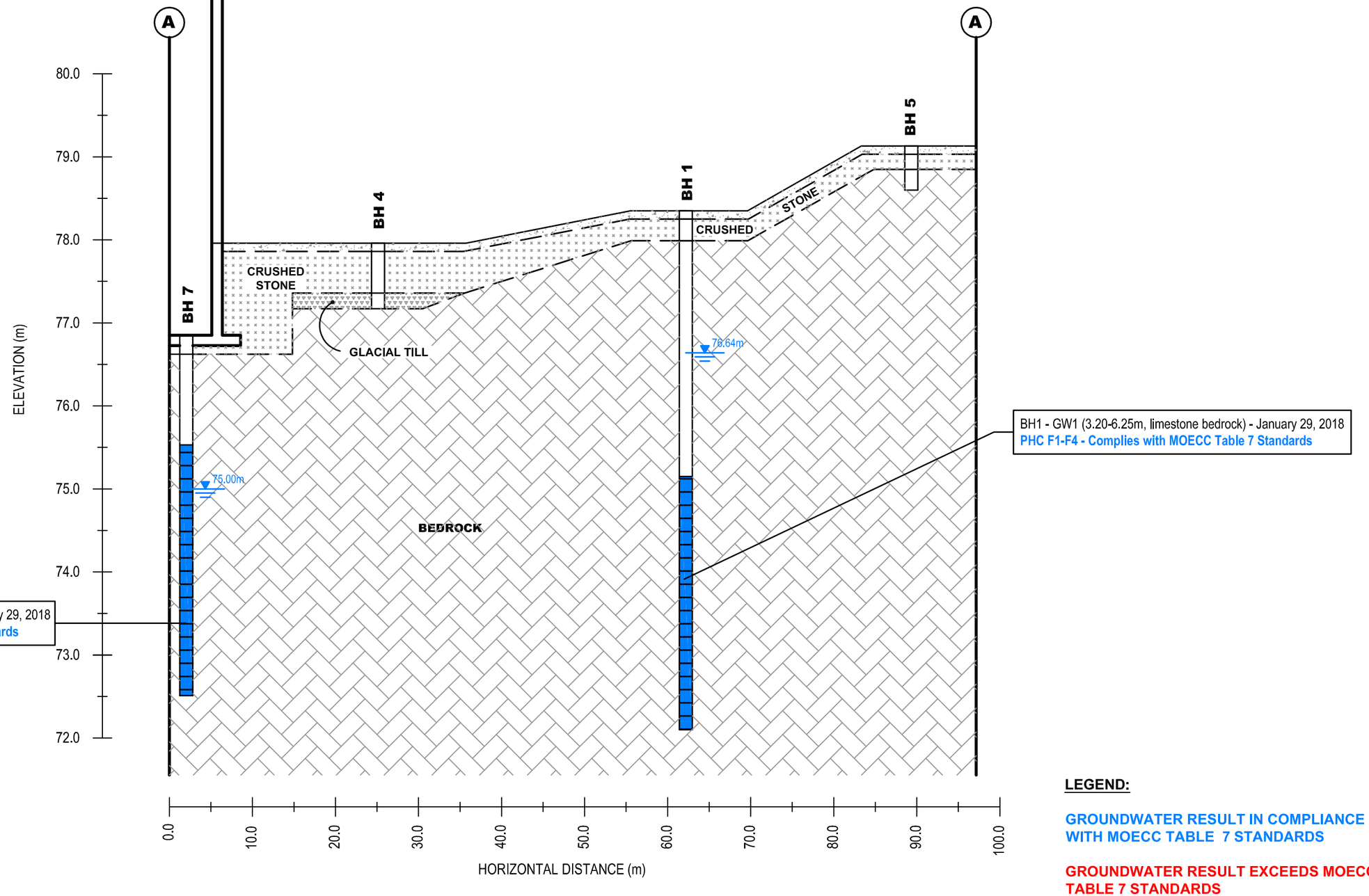

LEGEND:

GROUNDWATER RESULT IN COMPLIANCE WITH MOECC TABLE 7 STANDARDS

GROUNDWATER RESULT EXCEEDS MOECC TABLE 7 STANDARDS

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NO.	REVISIONS	DATE	INITIAL
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TRADITIONS SENIORS HOUSING

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1705-1715 CARLING AVENUE
OTTAWA, ONTARIO

Title:
CROSS SECTION A-A - GROUNDWATER - PHC

Scale: AS SHOWN	Date: 04/2018
Drawn by: RCG	Report No.: PE4192-2
Checked by: AM	Dwg. No.: PE4192-7C
Approved by: MSD	Revision No.: 0

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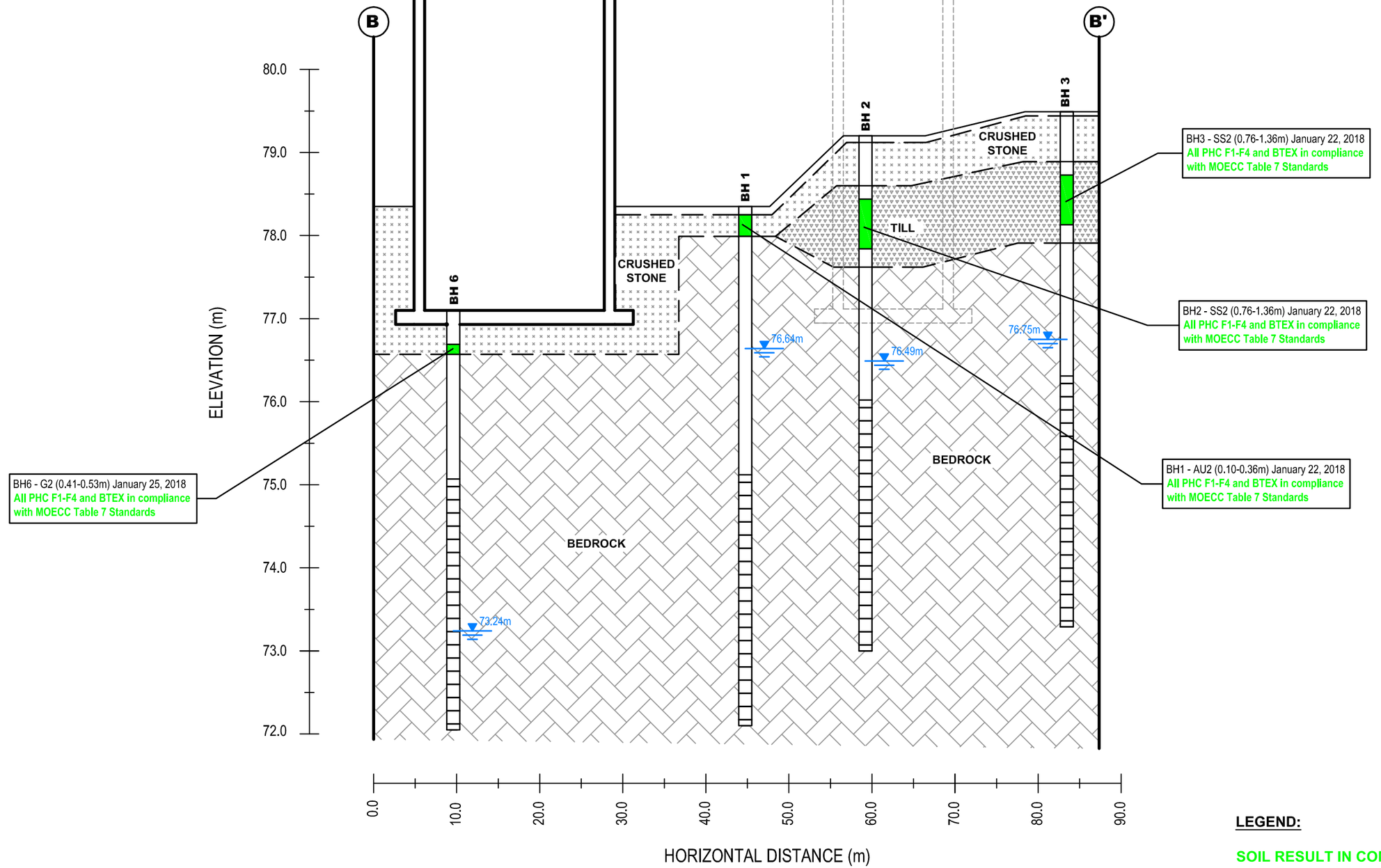

LEGEND:

SOIL RESULT IN COMPLIANCE WITH MOECC TABLE 7 STANDARDS

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TRADITIONS SENIORS HOUSING

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1705-1715 CARLING AVENUE

OTTAWA, ONTARIO

Title:

CROSS SECTION B-B - SOIL

Scale: AS SHOWN	Date: 04/2018
Drawn by: RCG	Report No.: PE4192-2
Checked by: AM	Dwg. No.: PE4192-8A
Approved by: MSD	Revision No.: 0

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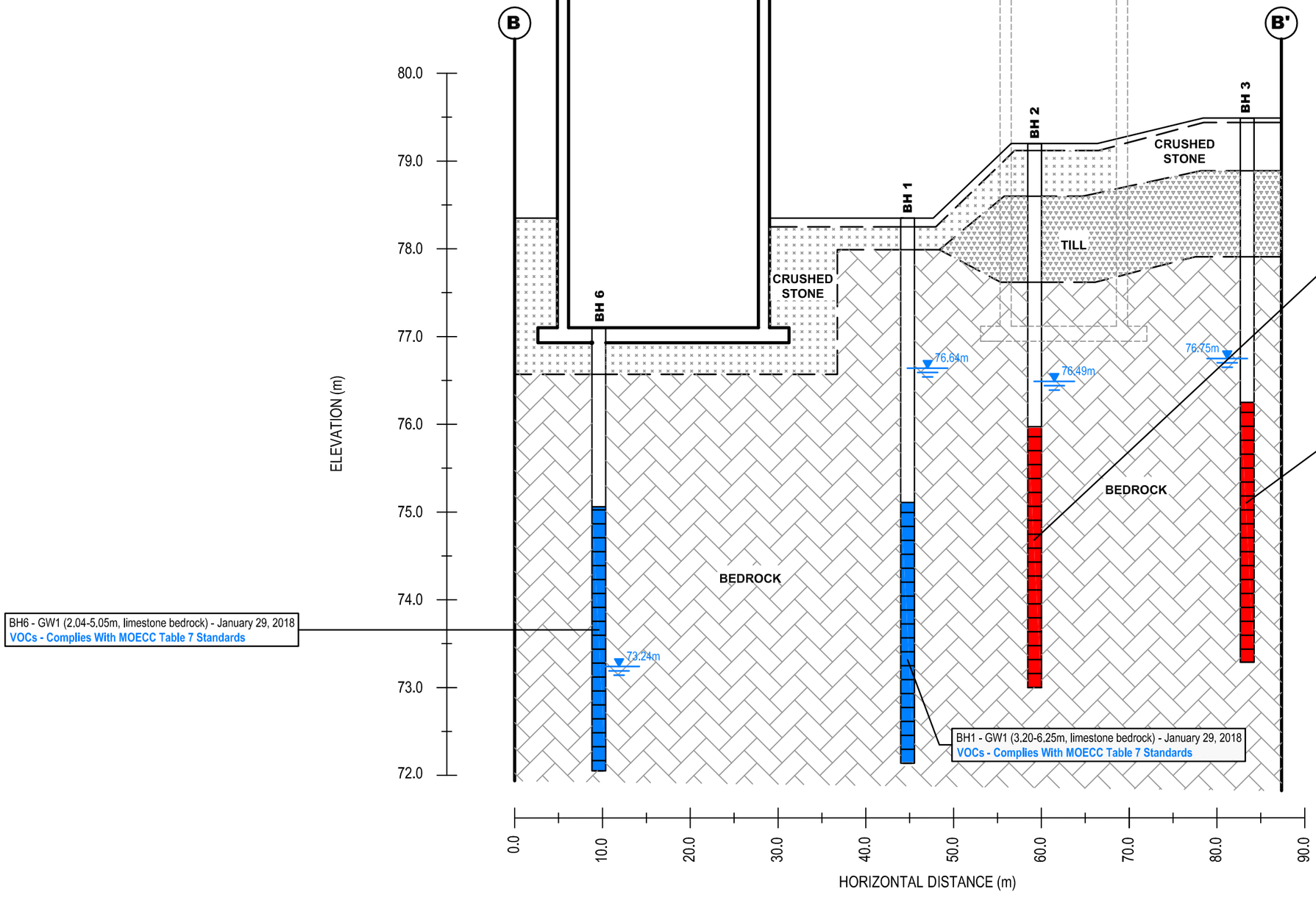

LEGEND:

GROUNDWATER RESULTS IN COMPLIANCE WITH MOECC TABLE 7 STANDARDS

GROUNDWATER RESULTS EXCEEDS MOECC TABLE 7 STANDARDS

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TRADITIONS SENIORS HOUSING

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1705-1715 CARLING AVENUE
OTTAWA, ONTARIO

Title:
CROSS SECTION B-B - GROUNDWATER - VOC

Scale: AS SHOWN	Date: 04/2018
Drawn by: RCG	Report No.: PE4192-2
Checked by: AM	Dwg. No.: PE4192-8B
Approved by: MSD	Revision No.: 0

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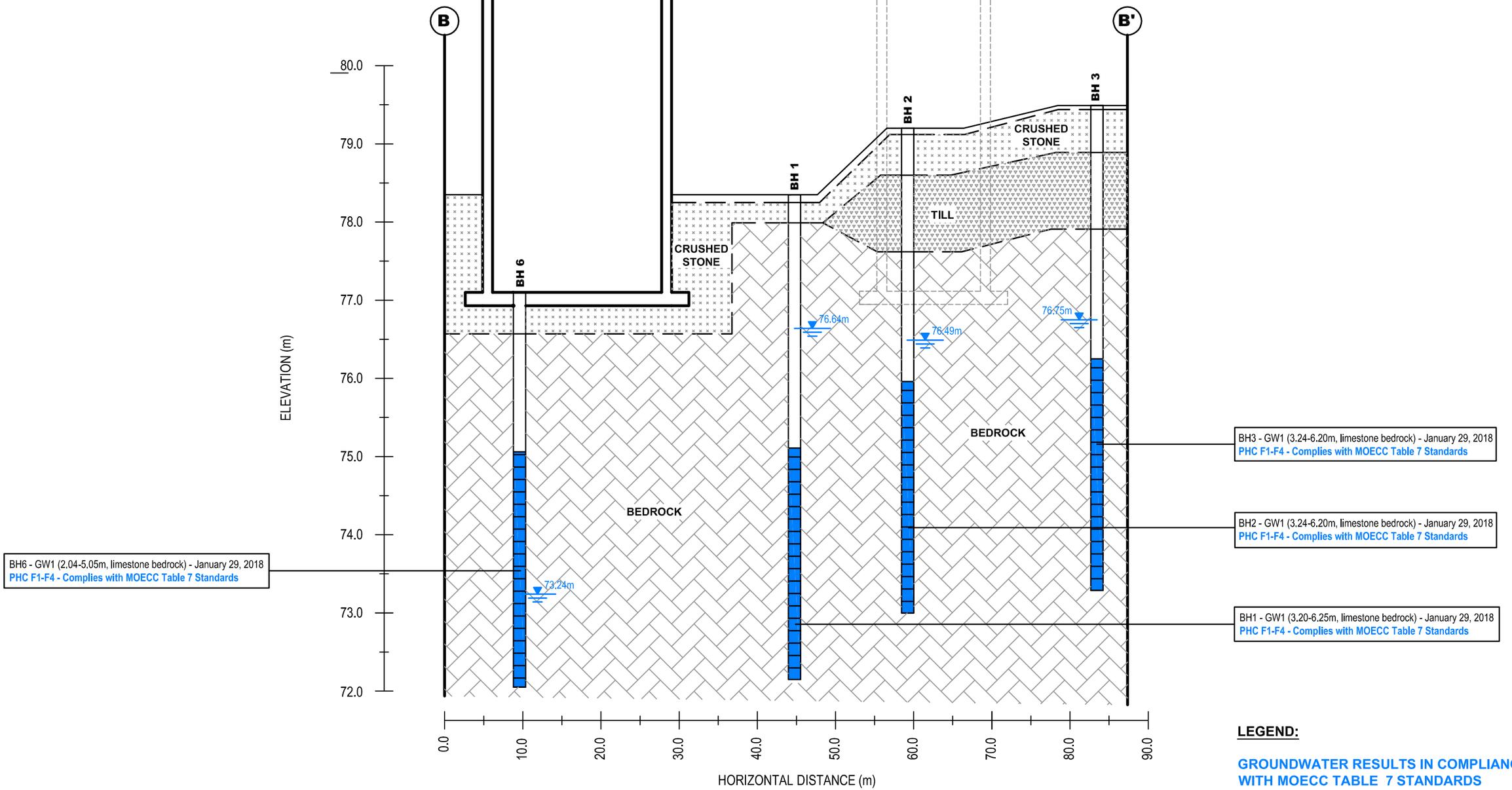

LEGEND:

GROUNDWATER RESULTS IN COMPLIANCE WITH MOECC TABLE 7 STANDARDS

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TRADITIONS SENIORS HOUSING

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1705-1715 CARLING AVENUE

OTTAWA, ONTARIO

Title:

CROSS SECTION B-B - GROUNDWATER (PHC)

Scale: AS SHOWN	Date: 04/2018
Drawn by: RCG	Report No.: PE4192-2
Checked by: AM	Dwg. No.: PE4192-8C
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 Services

Paterson Group Inc.

Consulting Engineers
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Canada K2E 7J5

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patersongroup

Sampling & Analysis Plan

1705 Carling Avenue
Ottawa, Ontario

Prepared For

Founders Residences Limited Partnership

January 21, 2018
Report: PE4192-SAP

Table of Contents

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Founders Residences Limited Partnership to prepare a Phase II-Environmental Site Assessment (ESA) for the property at 1705-1715 Carling Avenue, in the City of Ottawa, Ontario. 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	Located to assess former aboveground fuel storage tank associated with restaurant	Drill and core to reach groundwater table and install groundwater monitoring well
BH2	Located to assess former aboveground fuel storage tank associated with central motel building	Drill and core to reach groundwater table and install groundwater monitoring well
BH3	Located to assess former aboveground fuel storage tank associated with eastern motel building	Drill and core to reach groundwater table and install groundwater monitoring well
BH4	Located for general coverage purposes	Drill to bedrock refusal
BH5	Located for general coverage purposes	Drill to bedrock refusal
BH6	Located within basement of western motel building to assess present but unused aboveground fuel storage tank	Drill and core to reach groundwater table and install groundwater monitoring well
BH7	Located within basement of residential dwelling to assess former aboveground fuel storage tank	Drill and core to reach groundwater table and install groundwater monitoring well

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.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
1705 - 1715 Carling Avenue
Ottawa, Ontario

DATUM BM - Top spindle of fire hydrant located near the southeast corner of subject site. Geodetic elevation = 80.56m, as per Annis, O'Sullivan, Vollebekk Ltd. survey plan, February 2018.

REMARKS

FILE NO. PE4192

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** January 22, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
Asphaltic concrete 0.10						0	78.35
FILL: Crushed stone with silt and sand 0.36		AU	1				
		AU	2				
		RC	1	86	36	1	77.35
		RC	2	100	75	2	76.35
BEDROCK: Grey limestone		RC	3	100	98	3	75.35
		RC	4	98	89	4	74.35
		RC	5	100	100	5	73.35
6.25						6	72.35
End of Borehole							
(GWL @ 1.74m - Jan. 29, 2018)							
(GWL @ 1.71m - March 9, 2018)							

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
1705 - 1715 Carling Avenue
Ottawa, Ontario

DATUM BM - Top spindle of fire hydrant located near the southeast corner of subject site. Geodetic elevation = 80.56m, as per Annis, O'Sullivan, Vollebekk Ltd. survey plan, February 2018.

REMARKS

FILE NO. PE4192

HOLE NO. BH 2

BORINGS BY CME 55 Power Auger **DATE** January 22, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	79.20
Asphaltic concrete 0.08							
FILL: Crushed stone with silt and sand, trace clay 0.60		AU	1				
GLACIAL TILL: Very dense, brown silty sand with gravel and cobbles		SS	2	48	50+	1	78.20
1.58							
		RC	1	100	59	2	77.20
						3	76.20
BEDROCK: Grey limestone		RC	2	97	88	4	75.20
		RC	3	100	100	5	74.20
		RC	4	95	70	6	73.20
6.20							
End of Borehole							
(GWL @ 2.76m - Jan. 29, 2018)							
(GWL @ 2.71m - March 9, 2018)							

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
1705 - 1715 Carling Avenue
Ottawa, Ontario

DATUM BM - Top spindle of fire hydrant located near the southeast corner of subject site. Geodetic elevation = 80.56m, as per Annis, O'Sullivan, Vollebekk Ltd. survey plan, February 2018.

REMARKS

FILE NO. PE4192

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** January 22, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
Asphaltic concrete 0.13						0	79.49
FILL: Crushed stone with silt and sand 0.60		AU	1				
GLACIAL TILL: Very dense, brown silty sand with gravel and cobbles 1.58		SS	2	33	50+	1	78.49
		RC	1	95	67	2	77.49
BEDROCK: Grey limestone		RC	2	100	93	3	76.49
		RC	3	100	95	4	75.49
		RC	4	100	100	5	74.49
6.20						6	73.49
End of Borehole							
(GWL @ 1.79m - Jan. 29, 2018)							
(GWL @ 2.74m - March 9, 2018)							

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
1705 - 1715 Carling Avenue
Ottawa, Ontario

DATUM BM - Top spindle of fire hydrant located near the southeast corner of subject site. Geodetic elevation = 80.56m, as per Annis, O'Sullivan, Vollebekk Ltd. survey plan, February 2018.

REMARKS

FILE NO. PE4192

HOLE NO. BH 4

BORINGS BY CME 55 Power Auger **DATE** January 22, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	77.96		
Asphaltic concrete 0.10									
FILL: Crushed stone with silt and sand 0.60		AU	1						
GLACIAL TILL: Very dense, brown silty sand with gravel and cobbles 0.79		AU	2						
End of Borehole									
Practical refusal to augering at 0.79m depth									

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

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
1705 - 1715 Carling Avenue
Ottawa, Ontario

DATUM BM - Top spindle of fire hydrant located near the southeast corner of subject site. Geodetic elevation = 80.56m, as per Annis, O'Sullivan, Vollebekk Ltd. survey plan, February 2018.

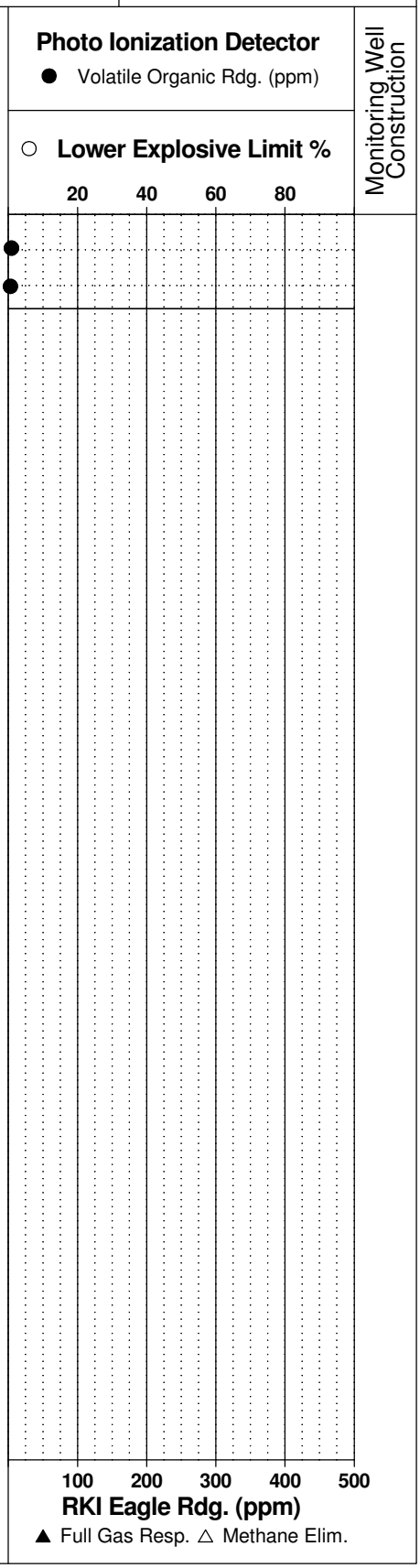
REMARKS

FILE NO. PE4192

HOLE NO. BH 5

BORINGS BY CME 55 Power Auger **DATE** January 22, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector / Monitoring Well Construction
GROUND SURFACE						0	79.13	
Asphaltic concrete 0.10								
FILL: Crushed stone with silt and sand 0.28		AU	1					
0.53		AU	2					
GLACIAL TILL: Very dense, brown silty sand with gravel and cobbles								
End of Borehole								
Practical refusal to augering at 0.53m depth								



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
1705 - 1715 Carling Avenue
Ottawa, Ontario

DATUM BM - Top spindle of fire hydrant located near the southeast corner of subject site. Geodetic elevation = 80.56m, as per Annis, O'Sullivan, Vollebekk Ltd. survey plan, February 2018.

REMARKS

FILE NO. PE4192

HOLE NO. BH 6

BORINGS BY CME 55 Power Auger **DATE** January 25, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	77.10
Concrete 0.13							
FILL: Crushed stone 0.41		AU	1				
FILL: Brown silty sand, trace organics 0.53		AU	2				
		RC	1	75	0		
		RC	2	84	84	1	76.10
		RC	3	100	79	2	75.10
BEDROCK: Grey limestone		RC	4	97	97	3	74.10
		RC	5	100	92	4	73.10
		RC	6	97	73		
5.05						5	72.10
End of Borehole							
(GWL @ 3.88m - Jan. 29, 2018)							
(GWL @ 3.86m - March 9, 2018)							

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
1705 - 1715 Carling Avenue
Ottawa, Ontario

DATUM BM - Top spindle of fire hydrant located near the southeast corner of subject site. Geodetic elevation = 80.56m, as per Annis, O'Sullivan, Vollebekk Ltd. survey plan, February 2018.

REMARKS

FILE NO. PE4192

HOLE NO. BH 7

BORINGS BY CME 55 Power Auger **DATE** January 25, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
Concrete 0.13						0	76.85
FILL: Crushed stone, some cobbles 0.23		AU	1				
		RC	1	100	0	1	75.85
		RC	2	98	85		
BEDROCK: Grey limestone						2	74.85
		RC	3	97	97		
- upper 200mm of bedrock noted to be heavily fractured						3	73.85
		RC	4	100	95		
		RC	5	100	90	4	72.85
4.34 End of Borehole							
(GWL @ 1.92m - Jan. 29, 2018)							
(GWL @ 1.85m - March 9, 2018)							

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

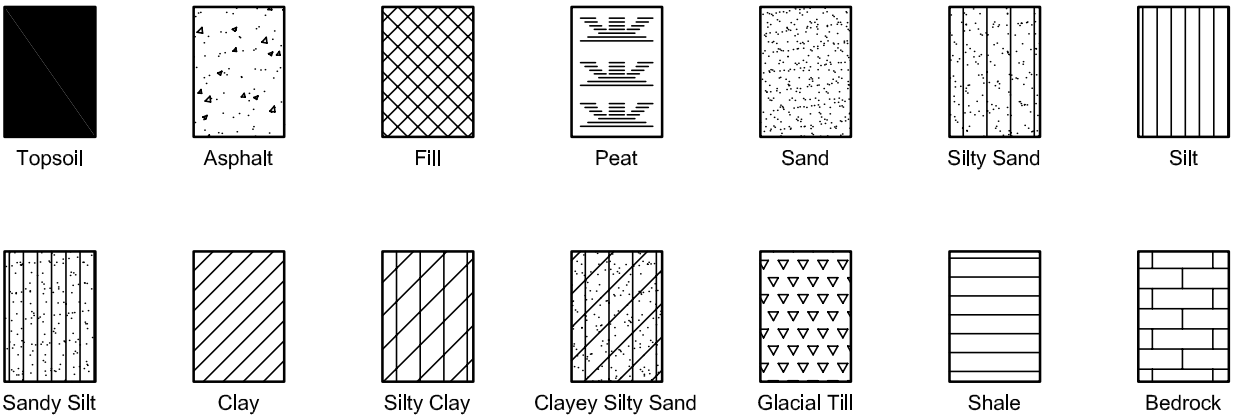
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

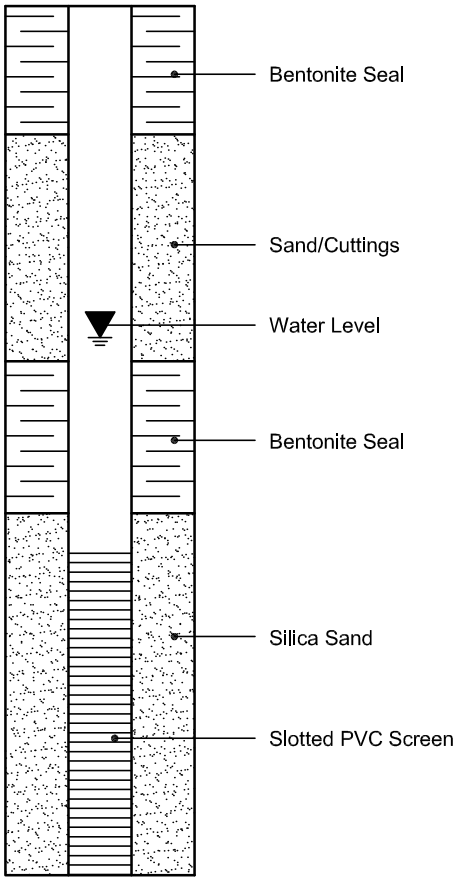
SYMBOLS AND TERMS (continued)

STRATA PLOT

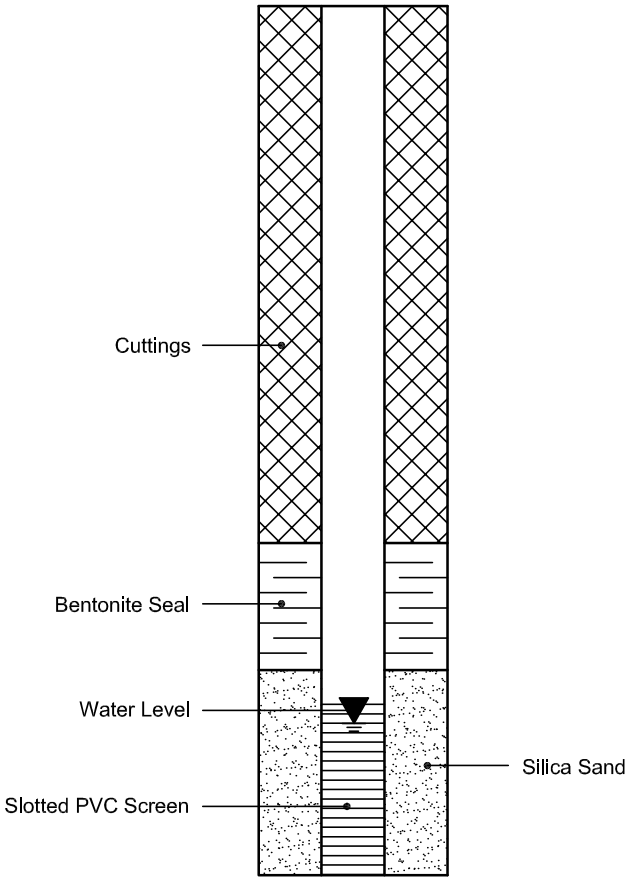


MONITORING WELL AND PIEZOMETER CONSTRUCTION

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: Mark D'Arcy

Client PO: 23199
Project: PE4192
Custody: 114244

Report Date: 29-Jan-2018
Order Date: 23-Jan-2018

Order #: 1804167

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

Paracel ID	Client ID
1804167-01	BH1-AU2
1804167-02	BH2-SS2
1804167-03	BH3-SS2
1804167-04	BH5-AU2

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23199

Report Date: 29-Jan-2018
Order Date: 23-Jan-2018
Project Description: PE4192

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	26-Jan-18	26-Jan-18
PHC F1	CWS Tier 1 - P&T GC-FID	26-Jan-18	26-Jan-18
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	24-Jan-18	24-Jan-18
Solids, %	Gravimetric, calculation	26-Jan-18	29-Jan-18

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 23199

Report Date: 29-Jan-2018

Order Date: 23-Jan-2018

Project Description: PE4192

	Client ID:	BH1-AU2	BH2-SS2	BH3-SS2	BH5-AU2
	Sample Date:	22-Jan-18	22-Jan-18	22-Jan-18	22-Jan-18
	Sample ID:	1804167-01	1804167-02	1804167-03	1804167-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	93.9	90.5	88.8	93.4
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene-d8	Surrogate	105%	107%	107%	106%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	21	<8	<8	<8
F4 PHCs (C34-C50)	6 ug/g dry	162	<6	<6	58

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23199

Report Date: 29-Jan-2018
Order Date: 23-Jan-2018
Project Description: PE4192

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*8.01*		*ug/g*		*100*	*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)	32	4	ug/g dry	34			7.1	30	
F3 PHCs (C16-C34)	114	8	ug/g dry	79			36.7	30	QR-04
F4 PHCs (C34-C50)	96	6	ug/g dry	74			26.0	30	
Physical Characteristics									
% Solids	83.2	0.1	% by Wt.	83.4			0.3	25	
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*7.33*		*ug/g dry*		*107*	*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)	194	7	ug/g		96.9	80-120			
F2 PHCs (C10-C16)	172	4	ug/g	34	122	60-140			
F3 PHCs (C16-C34)	354	8	ug/g	79	119	60-140			
F4 PHCs (C34-C50)	285	6	ug/g	74	137	60-140			
Volatiles									
Benzene	4.23	0.02	ug/g		106	60-130			
Ethylbenzene	3.97	0.05	ug/g		99.3	60-130			
Toluene	3.79	0.05	ug/g		94.8	60-130			
m,p-Xylenes	8.33	0.05	ug/g		104	60-130			
o-Xylene	4.31	0.05	ug/g		108	60-130			
Surrogate: Toluene-d8	*8.59*		*ug/g*		*107*	*50-140*			

Qualifier Notes:

QC Qualifiers :

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

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

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Paracel ID: 1804167

Chain of Custody (Lab Use Only)

№ 114244

Page 1 of 1

Client Name: Paterson Group	Project Reference: PE4192	**Turnaround Time:**
Contact Name: Mark Darcy	Quote #	☐ 1 Day ☐ 3 Day
Address: 154 Colonade Rd S.	PO # 23199	☐ 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: 1804167

	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 - AU2	S		2	Jan 22, 2018		X											120 + Vial		
2	BH2 - SS2	S		2			X													
3	BH3 - SS2	S		2			X													
4	BH4 - AU2 (Hold)	S		2			X	HOLD												
5	BH5 - AU2	S		2			X													
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: A. Vaisse	Received at Lab: Rachel Sibert	Verified By:
Relinquished By (Print): ERIK ARDLEY	Date/Time: 23/01/18 3:10 PM	Date/Time: Jan 23 18	Date/Time: 01/23/18 4:27 pm
Date/Time: Jan 23, 2018	Temperature: °C	Temperature: 18.4 °C 4:14	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Adrian Menyhart

Client PO: 23341
Project: PE4192
Custody: 115540

Report Date: 1-Feb-2018
Order Date: 26-Jan-2018

Order #: 1804463

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

Paracel ID	Client ID
1804463-01	BH6-G2

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23341

Report Date: 01-Feb-2018
Order Date: 26-Jan-2018
Project Description: PE4192

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	31-Jan-18	1-Feb-18
PHC F1	CWS Tier 1 - P&T GC-FID	31-Jan-18	1-Feb-18
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	27-Jan-18	27-Jan-18
Solids, %	Gravimetric, calculation	29-Jan-18	29-Jan-18

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 23341

Report Date: 01-Feb-2018

Order Date: 26-Jan-2018

Project Description: PE4192

	Client ID:	BH6-G2	-	-	-
	Sample Date:	25-Jan-18	-	-	-
	Sample ID:	1804463-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	95.5	-	-	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	-	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	-	-	-
Toluene	0.05 ug/g dry	<0.05	-	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	-	-	-
o-Xylene	0.05 ug/g dry	<0.05	-	-	-
Xylenes, total	0.05 ug/g dry	<0.05	-	-	-
Toluene-d8	Surrogate	91.4%	-	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	-	-	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	-	-	-
F3 PHCs (C16-C34)	8 ug/g dry	<8	-	-	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	-	-	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23341

Report Date: 01-Feb-2018
Order Date: 26-Jan-2018
Project Description: PE4192

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*3.18*		*ug/g*		*99.3*	*50-140*			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23341

Report Date: 01-Feb-2018
Order Date: 26-Jan-2018
Project Description: PE4192

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	87.9	0.1	% by Wt.	97.6			10.4	25	
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*2.24*		*ug/g dry*		*93.0*	*50-140*			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23341

Report Date: 01-Feb-2018
Order Date: 26-Jan-2018
Project Description: PE4192

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	189	7	ug/g		94.5	80-120			
F2 PHCs (C10-C16)	92	4	ug/g	ND	86.0	60-140			
F3 PHCs (C16-C34)	229	8	ug/g	ND	103	60-140			
F4 PHCs (C34-C50)	162	6	ug/g	ND	109	60-140			
Volatiles									
Benzene	3.75	0.02	ug/g		93.8	60-130			
Ethylbenzene	4.50	0.05	ug/g		113	60-130			
Toluene	4.06	0.05	ug/g		102	60-130			
m,p-Xylenes	9.01	0.05	ug/g		113	60-130			
o-Xylene	4.31	0.05	ug/g		108	60-130			
Surrogate: Toluene-d8	*2.35*		*ug/g*		*73.6*	*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.

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: 1804463

Chain of Custody
(Lab Use Only)
№ 115540

Page 1 of 1

Client Name: PATERSON GROUP	Project Reference: PE4192	**Turnaround Time:**	
Contact Name: ADRIAN MENYHART	Quote #	☐ 1 Day	☐ 3 Day
Address: 154 COLONNADE RD S.	PO # 23341	☐ 2 Day	☑ Regular
Telephone: 613-226-7381	Email Address: amenyhart@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: 1804463 / Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)							
1	BH6-G2	S		2	JAN 25 '18	PM	X								250 trial.					
2							↑													
3																				
4						Analysis as per Adrian. KW														
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: M Veaute	Received at Lab: Rachel Subject	Verified By:
Relinquished By (Print): ADRIAN	Date/Time: Jan 26/18 2:50 pm	Date/Time: Jan 26/18	Date/Time: Jan 26/18 4:22pm
Date/Time: JAN 26 2018	Temperature: °C	Temperature: 12.1 °C 4:18	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: 23407
Project: PE4192
Custody: 33477

Report Date: 1-Feb-2018
Order Date: 29-Jan-2018

Order #: 1805120

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

Paracel ID	Client ID
1805120-01	BH1-GW1
1805120-02	BH2-GW1
1805120-03	BH3-GW1
1805120-04	BH6-GW1
1805120-05	BH7-GW1

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23407

Report Date: 01-Feb-2018
Order Date: 29-Jan-2018
Project Description: PE4192

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHC F1	CWS Tier 1 - P&T GC-FID	30-Jan-18	31-Jan-18
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	30-Jan-18	31-Jan-18
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	30-Jan-18	31-Jan-18

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 23407

Report Date: 01-Feb-2018

Order Date: 29-Jan-2018

Project Description: PE4192

	Client ID:	BH1-GW1	BH2-GW1	BH3-GW1	BH6-GW1
	Sample Date:	29-Jan-18	29-Jan-18	29-Jan-18	29-Jan-18
	Sample ID:	1805120-01	1805120-02	1805120-03	1805120-04
	MDL/Units	Water	Water	Water	Water
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromodichloromethane	0.5 ug/L	<0.5	1.6	1.8	<0.5
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Chloroform	0.5 ug/L	<0.5	14.3	14.4	<0.5
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylene dibromide (dibromoethan	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	<2.0
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Toluene	0.5 ug/L	45.1	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 23407

Report Date: 01-Feb-2018

Order Date: 29-Jan-2018

Project Description: PE4192

	Client ID:	BH1-GW1	BH2-GW1	BH3-GW1	BH6-GW1
	Sample Date:	29-Jan-18	29-Jan-18	29-Jan-18	29-Jan-18
	Sample ID:	1805120-01	1805120-02	1805120-03	1805120-04
	MDL/Units	Water	Water	Water	Water
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
4-Bromofluorobenzene	Surrogate	109%	108%	108%	111%
Dibromofluoromethane	Surrogate	105%	110%	109%	108%
Toluene-d8	Surrogate	109%	108%	109%	110%
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	<25	<25
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	<100
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	<100
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	<100

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 23407

Report Date: 01-Feb-2018

Order Date: 29-Jan-2018

Project Description: PE4192

	Client ID:	BH7-GW1	-	-	-
	Sample Date:	29-Jan-18	-	-	-
	Sample ID:	1805120-05	-	-	-
	MDL/Units	Water	-	-	-
Volatiles					
Acetone	5.0 ug/L	<5.0	-	-	-
Benzene	0.5 ug/L	<0.5	-	-	-
Bromodichloromethane	0.5 ug/L	<0.5	-	-	-
Bromoform	0.5 ug/L	<0.5	-	-	-
Bromomethane	0.5 ug/L	<0.5	-	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	-	-	-
Chlorobenzene	0.5 ug/L	<0.5	-	-	-
Chloroform	0.5 ug/L	4.8	-	-	-
Dibromochloromethane	0.5 ug/L	<0.5	-	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	-	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	-	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	-	-	-
Ethylbenzene	0.5 ug/L	<0.5	-	-	-
Ethylene dibromide (dibromoethar	0.2 ug/L	<0.2	-	-	-
Hexane	1.0 ug/L	<1.0	-	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	-	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	-	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	-	-	-
Methylene Chloride	5.0 ug/L	<5.0	-	-	-
Styrene	0.5 ug/L	<0.5	-	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	-	-	-
Toluene	0.5 ug/L	<0.5	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 23407

Report Date: 01-Feb-2018

Order Date: 29-Jan-2018

Project Description: PE4192

	Client ID:	BH7-GW1	-	-	-
	Sample Date:	29-Jan-18	-	-	-
	Sample ID:	1805120-05	-	-	-
	MDL/Units	Water	-	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	-	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	-	-	-
Trichloroethylene	0.5 ug/L	<0.5	-	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	-	-	-
Vinyl chloride	0.5 ug/L	<0.5	-	-	-
m,p-Xylenes	0.5 ug/L	<0.5	-	-	-
o-Xylene	0.5 ug/L	<0.5	-	-	-
Xylenes, total	0.5 ug/L	<0.5	-	-	-
4-Bromofluorobenzene	Surrogate	106%	-	-	-
Dibromofluoromethane	Surrogate	110%	-	-	-
Toluene-d8	Surrogate	108%	-	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	-	-	-
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: 23407

Report Date: 01-Feb-2018
Order Date: 29-Jan-2018
Project Description: PE4192

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	*91.1*		*ug/L*		*114*	*50-140*			
Surrogate: Dibromofluoromethane	*79.7*		*ug/L*		*99.7*	*50-140*			
Surrogate: Toluene-d8	*89.4*		*ug/L*		*112*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	6.30	0.5	ug/L	6.13			2.7	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	4.13	0.5	ug/L	4.13			0.0	30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*85.6*		*ug/L*		*107*	*50-140*			
Surrogate: Dibromofluoromethane	*79.4*		*ug/L*		*99.3*	*50-140*			
Surrogate: Toluene-d8	*87.3*		*ug/L*		*109*	*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)	1940	25	ug/L		96.9	68-117			
F2 PHCs (C10-C16)	1590	100	ug/L		88.5	60-140			
F3 PHCs (C16-C34)	3550	100	ug/L		95.5	60-140			
F4 PHCs (C34-C50)	3000	100	ug/L		121	60-140			
Volatiles									
Acetone	73.6	5.0	ug/L		73.6	50-140			
Benzene	34.4	0.5	ug/L		86.1	60-130			
Bromodichloromethane	37.3	0.5	ug/L		93.3	60-130			
Bromoform	44.2	0.5	ug/L		111	60-130			
Bromomethane	36.7	0.5	ug/L		91.8	50-140			
Carbon Tetrachloride	42.8	0.2	ug/L		107	60-130			
Chlorobenzene	36.0	0.5	ug/L		90.0	60-130			
Chloroform	35.5	0.5	ug/L		88.7	60-130			
Dibromochloromethane	42.1	0.5	ug/L		105	60-130			
Dichlorodifluoromethane	29.4	1.0	ug/L		73.6	50-140			
1,2-Dichlorobenzene	36.8	0.5	ug/L		92.0	60-130			
1,3-Dichlorobenzene	38.2	0.5	ug/L		95.5	60-130			
1,4-Dichlorobenzene	30.8	0.5	ug/L		77.1	60-130			
1,1-Dichloroethane	34.1	0.5	ug/L		85.3	60-130			
1,2-Dichloroethane	33.7	0.5	ug/L		84.2	60-130			
1,1-Dichloroethylene	37.0	0.5	ug/L		92.4	60-130			
cis-1,2-Dichloroethylene	33.8	0.5	ug/L		84.4	60-130			
trans-1,2-Dichloroethylene	40.1	0.5	ug/L		100	60-130			
1,2-Dichloropropane	36.7	0.5	ug/L		91.7	60-130			
cis-1,3-Dichloropropylene	37.2	0.5	ug/L		93.1	60-130			
trans-1,3-Dichloropropylene	42.0	0.5	ug/L		105	60-130			
Ethylbenzene	38.0	0.5	ug/L		94.9	60-130			
Ethylene dibromide (dibromoethane	38.0	0.2	ug/L		94.9	60-130			
Hexane	32.5	1.0	ug/L		81.3	60-130			
Methyl Ethyl Ketone (2-Butanone)	89.1	5.0	ug/L		89.1	50-140			
Methyl Isobutyl Ketone	100	5.0	ug/L		100	50-140			
Methyl tert-butyl ether	84.7	2.0	ug/L		84.7	50-140			
Methylene Chloride	35.7	5.0	ug/L		89.2	60-130			
Styrene	39.8	0.5	ug/L		99.5	60-130			
1,1,1,2-Tetrachloroethane	42.4	0.5	ug/L		106	60-130			
1,1,2,2-Tetrachloroethane	35.2	0.5	ug/L		88.0	60-130			
Tetrachloroethylene	39.3	0.5	ug/L		98.2	60-130			
Toluene	34.6	0.5	ug/L		86.4	60-130			
1,1,1-Trichloroethane	38.8	0.5	ug/L		97.0	60-130			
1,1,2-Trichloroethane	36.7	0.5	ug/L		91.8	60-130			
Trichloroethylene	35.4	0.5	ug/L		88.6	60-130			
Trichlorofluoromethane	39.3	1.0	ug/L		98.2	60-130			
Vinyl chloride	32.9	0.5	ug/L		82.2	50-140			
m,p-Xylenes	75.8	0.5	ug/L		94.8	60-130			
o-Xylene	38.4	0.5	ug/L		96.0	60-130			
Surrogate: 4-Bromofluorobenzene	*78.8*		*ug/L*		*98.6*	*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.

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: 1805120

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Page ___ of ___

Client Name: PATERSON GROUP	Project Reference: PE4192	**Turnaround Time:**
Contact Name: MARK D'ARCY	Quote #	☐ 1 Day ☐ 3 Day
Address: 154 COLONNADE RD S OTTAWA	PO # 23407	☐ 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: 1805120

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHC's (F1-F4)	VOC's									
1	BH1-GW1	GW		3	29/1/18	AM	✓	✓									✓
2	BH2-GW1	↓		↓	↓	↓	✓	✓									✓
3	BH3-GW1						✓	✓									✓
4	BH6-GW1						✓	✓									✓
5	BH7-GW1						✓	✓									✓
6																	
7																	
8																	
9																	
10																	

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: M. Tasse	Received at Lab:	Verified By:
Relinquished By (Print): JAMES SULLIVAN	Date/Time: 29/01/18 3:15	Date/Time: 01/29/18 4:38 pm	Date/Time: 01/29/18 4:49 pm
Date/Time: 29/1/18 2:06 pm	Temperature: ___ °C	Temperature: 7.9 °C	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Adrian Menyhart

Client PO: 23591
Project: PE4192
Custody: 115559

Report Date: 12-Mar-2018
Order Date: 9-Mar-2018

Order #: 1810508

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

Paracel ID	Client ID
1810508-01	BH2-GW2
1810508-02	BH3-GW2
1810508-03	BH7-GW2
1810508-04	DUP

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23591

Report Date: 12-Mar-2018
Order Date: 9-Mar-2018
Project Description: PE4192

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	9-Mar-18	11-Mar-18

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 23591

Report Date: 12-Mar-2018

Order Date: 9-Mar-2018

Project Description: PE4192

	Client ID:	BH2-GW2	BH3-GW2	BH7-GW2	DUP
	Sample Date:	09-Mar-18	09-Mar-18	09-Mar-18	09-Mar-18
	Sample ID:	1810508-01	1810508-02	1810508-03	1810508-04
	MDL/Units	Water	Water	Water	Water
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Chloroform	0.5 ug/L	18.8	29.0	10.3	26.2
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylene dibromide (dibromoethan	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	<2.0
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 23591

Report Date: 12-Mar-2018

Order Date: 9-Mar-2018

Project Description: PE4192

	Client ID:	BH2-GW2	BH3-GW2	BH7-GW2	DUP
	Sample Date:	09-Mar-18	09-Mar-18	09-Mar-18	09-Mar-18
	Sample ID:	1810508-01	1810508-02	1810508-03	1810508-04
	MDL/Units	Water	Water	Water	Water
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
4-Bromofluorobenzene	Surrogate	89.0%	98.1%	98.4%	96.2%
Dibromofluoromethane	Surrogate	77.7%	97.2%	80.3%	91.1%
Toluene-d8	Surrogate	61.4%	61.4%	60.1%	58.3%

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23591

Report Date: 12-Mar-2018
Order Date: 9-Mar-2018
Project Description: PE4192

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	*26.6*		*ug/L*		*83.0*	*50-140*			
Surrogate: Dibromofluoromethane	*26.8*		*ug/L*		*83.6*	*50-140*			
Surrogate: Toluene-d8	*29.0*		*ug/L*		*90.6*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*26.6*		*ug/L*		*83.1*	*50-140*			
Surrogate: Dibromofluoromethane	*31.7*		*ug/L*		*99.2*	*50-140*			
Surrogate: Toluene-d8	*27.8*		*ug/L*		*86.9*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	128	5.0	ug/L		128	50-140			
Benzene	35.4	0.5	ug/L		88.5	60-130			
Bromodichloromethane	32.6	0.5	ug/L		81.5	60-130			
Bromoform	35.1	0.5	ug/L		87.7	60-130			
Bromomethane	28.3	0.5	ug/L		70.7	50-140			
Carbon Tetrachloride	45.5	0.2	ug/L		114	60-130			
Chlorobenzene	32.0	0.5	ug/L		80.0	60-130			
Chloroform	32.7	0.5	ug/L		81.6	60-130			
Dibromochloromethane	34.4	0.5	ug/L		86.0	60-130			
Dichlorodifluoromethane	44.4	1.0	ug/L		111	50-140			
1,2-Dichlorobenzene	37.3	0.5	ug/L		93.2	60-130			
1,3-Dichlorobenzene	37.9	0.5	ug/L		94.8	60-130			
1,4-Dichlorobenzene	32.3	0.5	ug/L		80.8	60-130			
1,1-Dichloroethane	47.4	0.5	ug/L		119	60-130			
1,2-Dichloroethane	40.2	0.5	ug/L		100	60-130			
1,1-Dichloroethylene	28.7	0.5	ug/L		71.6	60-130			
cis-1,2-Dichloroethylene	35.2	0.5	ug/L		88.1	60-130			
trans-1,2-Dichloroethylene	33.9	0.5	ug/L		84.8	60-130			
1,2-Dichloropropane	37.3	0.5	ug/L		93.3	60-130			
cis-1,3-Dichloropropylene	46.2	0.5	ug/L		115	60-130			
trans-1,3-Dichloropropylene	31.1	0.5	ug/L		77.7	60-130			
Ethylbenzene	41.3	0.5	ug/L		103	60-130			
Ethylene dibromide (dibromoethane	48.9	0.2	ug/L		122	60-130			
Hexane	47.8	1.0	ug/L		120	60-130			
Methyl Ethyl Ketone (2-Butanone)	132	5.0	ug/L		132	50-140			
Methyl Isobutyl Ketone	125	5.0	ug/L		125	50-140			
Methyl tert-butyl ether	111	2.0	ug/L		111	50-140			
Methylene Chloride	37.4	5.0	ug/L		93.6	60-130			
Styrene	45.6	0.5	ug/L		114	60-130			
1,1,1,2-Tetrachloroethane	34.1	0.5	ug/L		85.2	60-130			
1,1,2,2-Tetrachloroethane	26.8	0.5	ug/L		67.0	60-130			
Tetrachloroethylene	30.9	0.5	ug/L		77.3	60-130			
Toluene	32.9	0.5	ug/L		82.3	60-130			
1,1,1-Trichloroethane	35.7	0.5	ug/L		89.3	60-130			
1,1,2-Trichloroethane	38.7	0.5	ug/L		96.8	60-130			
Trichloroethylene	39.9	0.5	ug/L		99.8	60-130			
Trichlorofluoromethane	36.0	1.0	ug/L		90.0	60-130			
Vinyl chloride	36.7	0.5	ug/L		91.7	50-140			
m,p-Xylenes	76.6	0.5	ug/L		95.7	60-130			
o-Xylene	39.5	0.5	ug/L		98.7	60-130			
Surrogate: 4-Bromofluorobenzene	*19.6*		*ug/L*		*61.2*	*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 ID: 1810508

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Chain of Custody
(Lab Use Only)
№ 115559

Page 1 of 1

Client Name: PATERSON GROUP	Project Reference: PE4192	**Turnaround Time:**	
Contact Name: ADRIAN MENYHART	Quote #	☐ 1 Day	☐ 3 Day
Address: 154 COLONNADE RD S	PO # 23591	☐ 2 Day	☑ Regular
Telephone: 613-226-7381	Email Address: amenyhart@patersongroup.ca	Date Required:	

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

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

Required Analyses

Paracel Order Number: 1810508.

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)							
1	BH2-GW2	GW		2	MAR 9 18			1												
2	BH3-GW2	GW		2	"			1												
3	BH7-GW2	GW		2	"			1												
4	DUP	GW		2	"			1												
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: T. Keane	Received at Lab: SUMEPORN DPM MAR	Verified By: Rachel subject
Relinquished By (Print): ADRIAN M.	Date/Time: 09/03/18 4:15 PM	Date/Time: MAR 09, 2018 04:50	Date/Time: MAR 9/18
Date/Time: MAR 9 2018.	Temperature: °C	Temperature: 20.3 °C	pH Verified ☐ By: N/A 4:57