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Phase II - Environmental Site Assessment

178, 180, 182 and 200 Isabella Street and
205 Pretoria Avenue
Ottawa, Ontario

Prepared For

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EXECUTIVE SUMMARY

Assessment

A Phase II-Environmental Site Assessment (ESA) was conducted for the properties at 178, 180, 182 and 200 Isabella Street and 205 Pretoria Avenue, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address the Areas of Potential Environmental Concern identified during the Phase I ESA. The Phase II-ESA consisted of the drilling of five (5) boreholes and installation of two groundwater monitoring wells to assess the soil and groundwater quality at the subject site.

Soil samples obtained from the boreholes were screened using visual observations and vapour measurements. Site soils consist of a layer of fill material, including demolition debris in former building locations, which is underlain by native silty clay. Based on the screening results, samples were selected for testing of BTEX/PHC, metals, PAHs, sodium absorption ratio, electrical conductivity, and pH parameters. Based on the analytical results, some of the soil on the subject site is not in compliance with the MECP Table 3 standards. Exceedances of lead and multiple PAH parameters were identified in BH3-19, and SAR and electrical conductivity were in excess at BH1-19.

Groundwater samples were collected from the monitoring wells installed in BH2-19 and BH3-19, as well as BH1 and BH2 installed during the previous Phase II ESA, and analyzed for various parameters including BTEX/PHCs, PAHs, metals, sodium, and chloride. Based on the analytical groundwater results the groundwater on the subject site has not been impacted by the past activities of the subject site.

Recommendations

Fill and Building Demolition Debris

Based on the results of the Phase II ESA, contaminated material is considered to be confined to the upper fill layer. It is our understanding that the impacted fill and building demolition debris identified during the field program will be removed as part of the site redevelopment. This fill material should be disposed of at an approved waste disposal facility. The removal of this material should be monitored to ensure that proper segregation occurs, and that the removal of this material is effective in remediating the property.

Monitoring Wells

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

1.0 INTRODUCTION

At the request of Minto Communities Inc. (Minto), Paterson Group (Paterson) conducted a Phase II-Environmental Site Assessment (ESA) of the properties addressed 178, 180, 182 and 200 Isabella Street and 205 Pretoria Avenue, in the City of Ottawa, Ontario. The purpose of this Phase II-ESA was to address concerns identified during the Phase I-ESA.

1.1 Site Description

Address:	178, 180, 182 and 200 Isabella Street and 205 Pretoria Avenue, City of Ottawa, Ontario
Legal Description:	Lots 11 to 17, Plan 34325 and Lot 3, Plan 44376 City of Ottawa.
Property Identification Numbers:	04123-0098, 04123-0100, 04123-0101, 04123-0102, 04123-0108
Location:	The Phase I Property is located on the south side of Isabella Street and the north side of Pretoria Avenue, between Bank Street and O'Connor Street, in Ottawa, Ontario. The subject site is shown on Figure 1 - Key Plan following the body of this report.
Latitude and Longitude:	45° 24' 32" N, 75° 41' 26" W
Configuration:	Irregular
Site Area:	0.28 ha (approximate)

1.2 Property Ownership

Paterson was engaged to conduct this Phase II – ESA by Mr. Kevin Harper of Minto Communities Inc. (Minto). Minto's offices are located at 180 Kent Street, Ottawa, Ontario. Mr. Harper can be reached by telephone at (613) 751-2857.

1.3 Current and Proposed Future Uses

The subject site is currently vacant at the Isabella Street properties and occupied by a residential dwelling (used as an office space) at 205 Pretoria Avenue. It is our

understanding that the subject site will be redeveloped with a residential high-rise structure.

1.4 Applicable Site Condition Standard

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

- Coarse-grained soil conditions
- Surface soil and groundwater conditions
- Non-potable groundwater conditions
- Residential land use

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The subject site is located on the south side of Isabella Street, approximately 50 m east of Bank Street, in the City of Ottawa, Ontario. The ground surface on the subject site consists of asphaltic concrete, landscaped/grass areas at 205 Pretoria Avenue and vegetated areas (where the former buildings were located on Isabella Street).

2.2 Past Investigations

A Phase I Environmental Site Assessment was originally completed for the Isabella Street properties in 2016. The report identified the tinsmith, railway line to the north, former heating contractor, and former oil and coal business as APECs, and recommended a Phase II ESA. The Phase II ESA, also completed in 2016, included the placement of three (3) boreholes instrumented with groundwater monitoring wells (BH1, BH2, and BH3). PHC F1-4, BTEX, and metals parameters in the soil were found to be in compliance with the MECP Table 3 standards, and PAHs, PHCs and BTEX were in compliance with the standards in the groundwater samples analysed.

Fill material including building debris in the footprint of the former structure on the property was identified during the Phase II ESA. This fill material is considered to be an Area of Potential Environmental Concern.

A Phase I ESA Update was completed by Paterson in 2019 for the subject property, including the addition of 205 Pretoria Avenue. PCAs and APECs were identified in the Phase I Update that were not addressed by the previous Phase II ESA in 2016.

Based on a review of historical uses of the subject site and adjacent properties, Paterson identified five (5) Areas of Potential Environmental Concern (APECs) for the subject property. The APECs are discussed further below in Section 3.3 Phase I Conceptual Site Model.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation conducted as a component of this Phase II ESA consisted of drilling five (5) boreholes at the subject site. Boreholes were drilled into overburden soils to a maximum depth of 5.18 m below ground surface (bgs). Groundwater monitoring wells were installed in two of the five boreholes. Monitoring wells placed during the previous Phase II ESA investigation were observed to still be present during the Phase I Update site visit, and several of these wells were also sampled as part of the current Phase II ESA.

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 with regards to the historic land use of the subject site and adjacent properties. Contaminants of concern for soil and/or groundwater are polycyclic aromatic hydrocarbons (PAHs), petroleum hydrocarbons, fractions 1 through 4 (PHCs F1-F4), benzene, toluene, ethylbenzene and xylenes (BTEX), and metals, and the physical parameters of concern include the sodium absorption ratio (SAR), pH, and electrical conductivity.

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 was consulted as part of this assessment. Based on this information, bedrock in the area of the site consists of shale of the Billings Formation. Overburden soils are shown as offshore marine sediments with a drift thickness of 15 to 25 meters.

Subsurface conditions encountered during the Phase II-ESA are discussed in greater detail in Section 5.1.

Contaminants of Potential Concern

Based on the past and current uses of the subject site, the following Contaminants of Potential Concern (CPCs) have been identified:

- 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). PHCs F1-F4 was selected as a CPC for the Phase I property based on the presence of George P. Harris Ltd. And Gulf Oil Canada Limited (heating contractor's office/shop).

- Volatile Organic Compounds (VOCs) – this suite of parameters includes Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX), associated with oil and gasoline, as well as solvents associated with de-greasing. These parameters were selected as CPCs for the subject property based on the former tinsmith on the subject site.

- Metals – this suite of parameters encompasses various metals for which MECP standards exist. Metals are expected to only be present in the soil matrix. Metals were selected as CPCs for the Phase II property based on the identification of a tinsmith at the back of 186 Isabella Street.

- Polycyclic Aromatic Hydrocarbons (PAHs) – this suite of parameters encompasses various complex hydrocarbons, commonly associated with coal and/or combustion. PAHs were selected as a CPC for the site based on the historical presence of a heating contractor on the Phase I Property.

- Sodium absorption ratio and electrical conductivity – these parameters are associated with the application of de-icing agents (mostly sodium chloride) during the winter season.

Buildings and Structures

The subject site is currently vacant, with the exception of an office space (former residential dwelling) at 205 Pretoria Avenue. The site layout is shown on Drawing PE4710-3 – Test Hole Location Plan.

Water Bodies

There are no water bodies on the subject site or within the Phase I study area. The closest water body is Patterson Creek, located approximately 300 m to the southeast of the site.

Areas of Natural Significance

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

Drinking Water Wells

No drinking water wells are currently located on the subject site. Any water well records identified within the Phase I study area were for monitoring wells.

Neighbouring Land Use

Neighbouring land use in the Phase I study area is currently commercial and residential.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

The historical presence of a tinsmith, the former George P. Harris Limited and Gulf Oil Canada Limited commercial operations, fill material of unknown quality, and the potential use of de-icing agents on the subject site represent Areas of Potential Environmental Concern (APECs) on the subject site. Other off-site Potentially Contaminating Activities (PCAs) identified within the Phase I study area are not considered to represent APECs with respect to the subject site.

Potentially contaminating activities (PCAs) and resulting areas of potential environmental concern (APECs) on the Phase I Property are presented in Table 1.

Table 1: Areas of Potential Environmental Concern

Area of Potential Environmental Concern	Location of APEC on Phase I Property	Potentially Contaminating Activity	Location of PCA (on-site or off-site)	Contaminants of Potential Concern	Media potentially impacted (Groundwater, soil and/or sediment)
APEC 1: resulting from former tinsmith at rear of #186 Isabella Street (part of #200 Isabella Street)	Central portion of Phase I Property	Item 34, Table 2, O.Reg. 153/04: Metal fabrication	On-site	Metals	Soil
APEC 2: resulting from former coal and oil business and heating contractor	Central and east portion of Phase I Property	No item: Distribution of fuel oil, coal, and fuel oil burners; Contractors Office	On-Site	PHCs (F_1-F_4), BTEX, PAHs	Soil, Groundwater
APEC 3: Resulting from the importation of fill material across the site	North side of the Phase I Property	Item 30, Table 2, O.Reg. 153/04: Importation of fill material of unknown quality	On-Site	BTEX, PAHs, metals	Soil, Groundwater

Table 1: Areas of Potential Environmental Concern

Area of Potential Environmental Concern	Location of APEC on Phase I Property	Potentially Contaminating Activity	Location of PCA (on-site or off-site)	Contaminants of Potential Concern	Media potentially impacted (Groundwater, soil and/or sediment)
APEC 4: Resulting from potential de-icing of parking lot at #200 Isabella Street	Western portion of 200 Isabella St.	No item: application of salt for de-icing purposes.	On-Site	Sodium, chloride, sodium absorption ratio, electrical conductivity	Soil, Groundwater
APEC 5: Resulting from potential de-icing of parking lot at #178 Isabella Street	Eastern portion of Phase I Property at 178 and 180 Isabella St.	No item: application of salt for de-icing purposes.	On-Site	Sodium, chloride, sodium absorption ratio, electrical conductivity	Soil, Groundwater

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 APECs on the subject site. This was confirmed by a variety of independent sources, and as such, the conclusions of the 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. Two deviations from the sampling and analysis plan were noted and are as follows:

- Duplicate soil and groundwater samples were not submitted for analytical testing.
- Field water quality parameters were not taken.

3.5 Impediments

No physical impediments or denial of access were encountered during the Phase II ESA.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation was conducted on September 13, 2019 and consisted five boreholes (BH1-19 to BH5-19). The boreholes were placed to provide general coverage of the property and to address the aforementioned APECs. The boreholes were advanced using a track-mounted CME 55 power auger drill rig. The drilling contractor was George Downing Estate Drilling of Hawkesbury, Ontario. Drilling occurred under full-time supervision of Paterson personnel. The borehole locations are indicated on the attached Drawing PE4710-3 - Test Hole Location Plan.

4.2 Soil Sampling

A total of 35 soil samples were obtained from the boreholes by means of split spoon sampling and grab sampling from auger flights. Split spoon samples were taken at approximate 0.6 m intervals. The depths at which split spoon, and grab 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 asphalt or topsoil material, followed by fill material, which is underlain by a native silty clay. Bedrock surface depth was not determined during the subsurface drilling program. The fill material consisted of crushed stone at BH1-19, silty sand with some gravel at BH2-19, BH3-19 and BH5-19. Some concrete and brick fragments were noted in the fill material at BH5-19.

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 an RKI Eagle gas detector. The detection limit of the gastech is 5 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/manipulated gently as the measurements were taken. The peak reading registered within the first 15 seconds was recorded as the vapour measurement. The vapour readings were found to range from 0 to 15 ppm. These readings are not indicative of volatile

substances such as gasoline. It should be noted however that combustible vapours cannot be used to identify heavier products such as waste oil.

Please refer to the Soil Profile and Test Data sheets attached for soil sample headspace results. 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

Two (2) groundwater monitoring wells were installed by George Downing Estate Drilling of Hawkesbury, Ontario, under the full-time supervision of Paterson personnel. The monitoring wells consisted of 51 mm diameter Schedule 40 threaded PVC risers and screens. A sand pack consisting of silica sand was placed around the screen, and a bentonite seal was placed above the screen to minimize cross-contamination. Monitoring well construction details are provided on the Soil Profile and Test Data Sheets in Appendix 1. A summary of monitoring well construction details, including the three wells from the previous Phase II ESA which were sampled, is provided below in Table 2.

Table 2: Monitoring Well Construction Details

Well ID	Ground Surface Elevation	Total Depth (m BGS)	Screened Interval (m BGS)	Sand Pack (m BGS)	Bentonite Seal (m BGS)	Casing Type
BH1	100.88	9.45	4.62-7.62	4.42-7.62	0.61-4.42	Flushmount
BH2	101.33	6.09	3.09-6.09	2.44-6.09	0.61-2.44	Stickup
BH3	101.37	8.66	4.57-7.62	4.29-7.62	0.00-4.29	Stickup
BH2-19	101.35	4.57	1.52-4.57	1.37-4.57	0.30-1.37	Stickup
BH3-19	100.86	4.57	1.52-4.57	1.37-4.57	0.30-1.37	Stickup

4.5 Field Measurement of Water Quality Parameters

Field water quality parameters were not taken during the sampling program.

4.6 Groundwater Sampling

Groundwater sampling protocols were followed using the MECP document entitled “Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario”, dated May 1996. Groundwater samples were obtained from each monitoring well, as well as two of the monitoring wells placed during the previous Phase II-ESA, 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 sampling are provided in the Sampling and Analysis Plan in Appendix 1.

4.7 Analytical Testing

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

Table 3: Soil Samples Submitted

Sample ID	Sample Depth/ Stratigraphic Unit	Parameters Analyzed									Rationale
		PHCs (F1 –F4)	BTEX	PAHs	Metals	Mercury	Chromium (VI)	Electrical Conductivity	SAR	pH	
September 17, 2019											
BH1-19-SS2	0.76-1.37 m bgs; silty clay							X	X		Assess potential impacts from de-icing
BH2-19-AU1	0.00 – 0.61 m bgs; fill			X	X	X	X	X	X		Assess potential impacts from heating contractor and coal and oil business
BH2-19-SS4	2.29-2.90 m bgs; silty clay	X								X	
BH3-19-AU1	0.00 – 0.61 m bgs; fill			X	X	X	X	X	X		Assess potential impacts from de-icing and coal and oil business
BH5-19-SS1	0.00 – 0.61 m bgs; fill				X	X	X				Assess quality of fill/soil in area of former tinsmith

Table 4: Groundwater Samples Submitted										
Sample ID	Sample Depth/ Stratigraphic Unit	Parameters Analyzed								Rationale
		PHC (F_1-F_4)	BTEX	PAHs	Metals	Mercury	Chromium (VI)	Sodium	Chloride	
September 12, 2019										
BH1-GW1	4.62 – 7.62 m bgs; silty clay	X	X		X	X	X	X	X	Assess potential impacts from de-icing product application.
BH2-GW1	3.09 – 6.09 m bgs; silty clay			X						Assess potential impacts from former coal and oil business.
September 17, 2019										
BH2-19-GW1	1.52-4.57 m bgs, silty clay							X	X	Assess potential impacts from de-icing.
BH3-19-GW1	1.52-4.57 m bgs, silty clay	X	X							Assess potential impacts from former coal and oil business and heating contractor.
September 24, 2019										
BH1-GW2	4.62 – 7.62 m bgs; silty clay	X[1]								Re-assess initial results of testing from BH1
[1] PHCs (F2-F4) – Fraction 1 omitted										

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

4.8 Residue Management

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

4.9 Elevation Surveying

Monitoring well/borehole locations were surveyed using a laser level. Elevations were surveyed relative to a temporary benchmark (top spindle of fire hydrant on south side of Isabella Street). The elevation of the temporary benchmark was assumed to be 100.00 metres above sea level (m ASL). The location of the site benchmark is shown on Drawing PE4710-3 – Test Hole Location Plan.

4.10 Quality Assurance and Quality Control Measures

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

5.0 REVIEW AND EVALUATION

5.1 Geology

Site geology details are provided in the Soil Profile and Test Data Sheets provided in Appendix 1. Site soils consist of a layer of fill material, which is underlain by a native silty clay. Refusal to a dynamic cone penetration test was encountered at a depth of approximately 17.9 m bgs (determined during the previous Phase II ESA in October 2016). The fill material consisted of brown silt/sand with gravel in BH2-19 and BH3-19, and with some concrete and brick fragments in BH5-19 which was located within the former building footprint. Groundwater was encountered in the silty clay at BH2-19 and BH3-19 at depths of 3.59 m and 4.27 m below existing grade.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured using an electronic water level meter. Groundwater levels are summarized below in Table 5. All elevations are relative to the temporary benchmark. It should be noted that groundwater levels are expected to fluctuate throughout the year with seasonal variations.

Table 5: Groundwater Level Measurements

Borehole Location	Ground Surface Elevation (m)	Water Level Depth (m below grade)	Water Level Elevation (m)	Date of Measurement
BH1	100.88	2.33	98.55	September 12, 2019
BH2	101.33	2.51	98.82	September 12, 2019
BH3	101.37	3.70	97.67	September 12, 2019
BH2-19	101.34	3.59	97.75	September 17, 2019
BH3-19	100.86	4.27	96.59	September 17, 2019
BH1	100.88	2.11	98.77	September 24, 2019
BH2	101.33	2.56	98.77	September 24, 2019
BH3	101.37	2.77	98.60	September 24, 2019
BH2-19	101.34	2.51	98.83	September 24, 2019
BH3-19	100.86	3.50	97.36	September 24, 2019

Based on the groundwater elevations from the September 24, 2019 monitoring event, groundwater contour mapping was completed. Groundwater contours are shown on Drawing PE4710-4 - Groundwater Contour Plan. Based on the contour mapping, groundwater flow at the subject site appears to be in a southerly direction. A horizontal hydraulic gradient of approximately 0.07 m/m was calculated.

5.3 Fine-Medium Soil Texture

Coarse-grained soil standards have been used for the subject site. Grain size analysis was not completed.

5.4 Soil: Field Screening

Field screening of the soil samples collected during drilling resulted in soil vapour readings of 0 ppm to 15 ppm. Field screening results of each individual soil sample are provided on the Soil Profile and Test Data Sheets appended to this report.

5.5 Soil Quality

Five soil samples were submitted to Paracel Laboratories for analysis of a combination of PHC, BTEX, PAH, metal, electrical conductivity, and/or sodium absorption ratio parameters. The results of the soil analysis are presented in Table 6 and 7. The laboratory certificates of analysis are provided in Appendix 1.

Table 6: Analytical Test Results – Soil
BTEX and PHCs, and pH

Parameter	MDL (µg/g)	Soil Sample (µg/g) September 13, 2019	MECP Table 3 Residential, Coarse (µg/g)
		BH2-19-SS4	
Benzene	0.02	nd	0.21
Toluene	0.05	nd	2.3
Ethylbenzene	0.05	nd	2
Xylene	0.05	nd	3.1
PHC F1	7	nd	55
PHC F2	4	nd	98
PHC F3	8	nd	300
PHC F3	6	nd	2800
pH	-	7.70	-

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold** – Value exceeds selected MECP Standard

No BTEX or PHC parameters were identified in any of the soil samples above the method detection limits of the laboratory.

Table 7: Analytical Test Results – Soil
Metals

Parameter	MDL (µg/g)	Soil Samples (µg/g) September 13, 2019			MECP Table 3 Residential Coarse (µg/g)
		BH3-19-AU1	BH2-19-AU1	BH5-19-SS1	
Antimony	1.0	nd	nd	nd	7.5
Arsenic	1.0	4.8	2.2	2.0	18
Barium	1.0	148	360	179	390
Beryllium	1.0	nd	nd	nd	4
Boron	1.0	nd	6.0	nd	120
Cadmium	0.5	nd	nd	nd	1.2
Chromium	1.0	17.1	16.7	53.3	160
Chromium (VI)	0.2	nd	nd	nd	8
Cobalt	1.0	4.2	4.4	10.8	22
Copper	1.0	24.9	14.3	31.3	140
Lead	1.0	**199**	62.8	67.1	120
Mercury	0.1	0.2	nd	nd	0.27
Molybdenum	1.0	nd	nd	nd	6.9
Nickel	1.0	10.6	12.2	30.1	100
Selenium	1.0	nd	nd	nd	2.4
Silver	0.5	nd	nd	nd	20
Thallium	1.0	nd	nd	nd	1
Uranium	1.0	nd	nd	nd	23
Vanadium	1.0	18.1	15.3	49.2	86
Zinc	1.0	120	57.3	96.8	340

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold** – Value exceeds selected MECP Standard

Lead was determined to be present at BH2-19 at a concentration in excess of the applicable MECP standard. All other metals parameters are in compliance with the MECP Table 3 Standards.

Table 8: Analytical Test Results – Soil
PAHs

Parameter	MDL (µg/g)	Soil Samples (µg/g) September 13, 2019		MECP Table 3 Residential, Coarse (µg/g)
		BH3-19-AU1	BH2-19-AU1	
Acenaphthene	0.02	0.03	nd	7.9
Acenaphthylene	0.02	**0.42**	0.04	0.15
Anthracene	0.02	0.28	0.04	0.67

Table 8: Analytical Test Results – Soil
PAHs

Parameter	MDL (µg/g)	Soil Samples (µg/g) September 13, 2019		MECP Table 3 Residential, Coarse (µg/g)
		BH3-19-AU1	BH2-19-AU1	
Benzo[a]anthracene	0.02	**1.04**	0.16	0.5
Benzo[a]pyrene	0.02	**1.05**	0.15	0.3
Benzo[b]fluoranthene	0.02	**1.41**	0.20	0.78
Benzo[g,h,i]perylene	0.02	0.71	0.11	6.6
Benzo[k]fluoranthene	0.02	**0.79**	0.09	0.78
Chrysene	0.02	1.16	0.17	7.0
Dibenzo[a,h]anthracene	0.02	**0.18**	0.02	0.1
Fluoranthene	0.02	**1.24**	0.26	0.69
Fluorene	0.02	0.03	nd	62
Indeno[1,2,3-cd]pyrene	0.02	**0.67**	0.08	0.38
Methylnaphthalene (1&2)	0.04	0.30	0.06	0.99
Naphthalene	0.01	0.12	0.02	0.6
Phenanthrene	0.02	0.42	0.13	6.2
Pyrene	0.02	1.20	0.23	78

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold** – Value exceeds selected MECP Standard

Multiple PAH parameters in the sample collected from BH2-19 are not in compliance with the applicable MECP standard. The PAH concentrations identified in the sample from BH3-19 are in compliance with the MECP Table 3 standards.

Table 9: Analytical Test Results – Soil
Electrical Conductivity and Sodium Absorption Ratio (SAR)

Parameter	MDL	Soil Samples (µg/g) September 13, 2019			MECP Table 3 Residential, Coarse
		BH1-19-SS2	BH3-19-AU1	BH2-19-AU1	
SAR (no unit)	0.01	**15.7**	3.12	1.32	5
Conductivity (uS/cm)	5	**3650**	593	302	700

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold** – Value exceeds selected MECP Standard

The sodium absorption ratio and the conductivity of the sample from BH1-19 are in excess of the MECP Table 3 standards. The parameters measured for the samples from BH2-19 and BH3-19 are in compliance with the standards.

Table 10: Maximum Concentrations – Soil			
Parameter	**Maximum Concentration (µg/g unless indicated otherwise)**	**Borehole/ Test Pit**	**Depth Interval (m BGS)**
Metals			
Arsenic	4.8	BH3-19-AU1	0.00 – 0.61; fill
Barium	360	BH2-19-AU1	0.00 – 0.61; fill
Boron	6.0	BH2-19-AU1	0.00 – 0.61; fill
Chromium	53.3	BH5-19-SS1	0.00 – 0.61; fill
Cobalt	10.8	BH5-19-SS1	0.00 – 0.61; fill
Copper	31.3	BH5-19-SS1	0.00 – 0.61; fill
Lead	**199**	BH3-19-AU1	0.00 – 0.61; fill
Mercury	0.2	BH3-19-AU1	0.00 – 0.61; fill
Nickel	30.1	BH5-19-SS1	0.00 – 0.61; fill
Vanadium	49.2	BH5-19-SS1	0.00 – 0.61; fill
Zinc	120	BH3-19-AU1	0.00 – 0.61; fill
PAHs			
Acenaphthene	0.03	BH3-19-AU1	0.00 – 0.61; fill
Acenaphthylene	**0.42**	BH3-19-AU1	0.00 – 0.61; fill
Anthracene	0.28	BH3-19-AU1	0.00 – 0.61; fill
Benzo[a]anthracene	**1.04**	BH3-19-AU1	0.00 – 0.61; fill
Benzo[a]pyrene	**1.05**	BH3-19-AU1	0.00 – 0.61; fill
Benzo[b]fluoranthene	**1.41**	BH3-19-AU1	0.00 – 0.61; fill
Benzo[g,h,i]perylene	0.71	BH3-19-AU1	0.00 – 0.61; fill
Benzo[k]fluoranthene	**0.79**	BH3-19-AU1	0.00 – 0.61; fill
Chrysene	1.16	BH3-19-AU1	0.00 – 0.61; fill
Dibenzo[a,h]anthracene	**0.18**	BH3-19-AU1	0.00 – 0.61; fill
Fluoranthene	**1.24**	BH3-19-AU1	0.00 – 0.61; fill
Fluorene	0.03	BH3-19-AU1	0.00 – 0.61; fill
Indeno[1,2,3-cd]pyrene	**0.67**	BH3-19-AU1	0.00 – 0.61; fill
Methylnaphthalene (1&2)	0.30	BH3-19-AU1	0.00 – 0.61; fill
Naphthalene	0.12	BH3-19-AU1	0.00 – 0.61; fill
Phenanthrene	0.42	BH3-19-AU1	0.00 – 0.61; fill
Pyrene	1.20	BH3-19-AU1	0.00 – 0.61; fill
Physical			
SAR (no unit)	**15.7**	BH1-19-SS2	0.76-1.37; silty clay
Conductivity (uS/cm)	**3650**	BH1-19-SS2	0.76-1.37; silty clay

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold** – Value exceeds selected MECP Standard

All other parameter concentrations were below laboratory detection limits.

5.6 Groundwater Quality

Groundwater samples from the monitoring wells installed in BH1, BH2, BH2-19, and BH3-19 were submitted for laboratory analysis of a combination of BTEX, PHC (F_1-F_4), PAH and sodium and chloride parameters. The groundwater samples were

obtained from the screened intervals noted on Table 2. The results of the analytical testing are presented below in Tables 9, and 10. The laboratory certificates of analysis are provided in Appendix 1.

Table 11: Analytical Test Results – Groundwater
BTEX and PHC (F_1 – F_4)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)			MECP Table 3 Standards, Residential Coarse (µg/L)
		BH1-GW1	BH1-GW2	BH3-19-GW1	
		September 12, 2019	September 24, 2019	September 17, 2019	
Benzene	0.5	nd	-	nd	44
Toluene	0.5	nd	-	nd	18000
Ethylbenzene	0.5	nd	-	nd	2300
Xylene	0.5	nd	-	nd	4200
PHC F_1	25	nd	-	nd	750
PHC F_2	100	**2400**	nd	nd	150
PHC F_3	100	nd	nd	nd	500
PHC F_4	100	nd	nd	nd	500

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold** – Value exceeds selected MECP Standard

There were no detected concentrations of BTEX or PHC (F_1-F_4) in the sample from BH3-19. The concentration of PHC F2 in BH1-GW1 was in excess of the Table 3 Standard. The concentration of PHC F2 was suspected to be in error due to a high level of sediment in the groundwater sample. A second sample from this well was collected and analysed for PHCs (F2-F4) to confirm the error. The concentrations of PHCs (F2) are in compliance with the MECP Table 3 Standard.

Table 12: Analytical Test Results – Groundwater
Sodium and Chloride

Parameter	MDL	Groundwater Samples (µg/L)		MECP Table 3 Standards, Residential Coarse (µg/L)
		BH1-GW1	BH2-19-GW1	
		September 12, 2019	September 17, 2019	
Sodium (ug/L)	200	617000	260000	2300000
Chloride (mg/L)	1	1530	426	2300

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold** – Value exceeds selected MECP Standard

The concentrations of sodium and chloride in the analyzed groundwater samples were in compliance with the selected MECP Table 3 standards.

Table 13: Analytical Test Results – Groundwater
Metals

Parameter	MDL (µg/L)	Groundwater Sample (µg/L) September 12, 2019	MECP Table 3 Residential Coarse (µg/L)
		BH1-GW1	
Antimony	0.5	nd	7.5
Arsenic	1.0	nd	18
Barium	1.0	147	29000
Beryllium	0.5	nd	67
Boron	10	132	45000
Cadmium	0.2	nd	2.7
Chromium	1.0	nd	810
Chromium (VI)	10	nd	140
Cobalt	0.5	nd	66
Copper	0.5	0.649	87
Lead	0.2	nd	25
Mercury	0.1	nd	0.29
Molybdenum	0.5	3.52	9200
Nickel	1.0	2.80	490
Selenium	1.0	nd	63
Silver	0.2	nd	1.5
Thallium	0.5	nd	510
Uranium	0.2	2.85	420
Vanadium	0.5	1.93	250
Zinc	5.0	nd	1100

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold** – Value exceeds selected MECP Standard

The concentrations of metals parameters in the analyzed groundwater sample were in compliance with the selected MECP Table 3 standards.

Table 14: Analytical Test Results – Groundwater
PAHs

Parameter	MDL (µg/L)	Groundwater Sample (µg/L) September 12, 2019	MECP Table 3 Residential, Coarse (µg/L)
		BH2-GW1	
Acenaphthene	0.05	nd	600
Acenaphthylene	0.05	nd	1.8
Anthracene	0.01	nd	2.4
Benzo[a]anthracene	0.02	nd	4.7
Benzo[a]pyrene	0.02	nd	0.81
Benzo[b]fluoranthene	0.02	nd	0.75
Benzo[g,h,i]perylene	0.02	nd	0.2
Benzo[k]fluoranthene	0.02	nd	0.4

Table 14: Analytical Test Results – Groundwater
PAHs

Parameter	MDL (µg/L)	Groundwater Sample (µg/L) September 12, 2019	MECP Table 3 Residential, Coarse (µg/L)
		BH2-GW1	
Chrysene	0.02	nd	1
Dibenzo[a,h]anthracene	0.02	nd	0.52
Fluoranthene	0.02	nd	130
Fluorene	0.02	nd	400
Indeno[1,2,3-cd]pyrene	0.02	nd	0.2
Methylnaphthalene (1&2)	0.04	nd	1800
Naphthalene	0.01	nd	1400
Phenanthrene	0.02	nd	580
Pyrene	0.02	nd	68

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold** – Value exceeds selected MECP Standard

No PAH concentrations were detected in the analyzed groundwater sample. The parameters analysed were in compliance with the selected MECP Table 3 standards.

Table 15: Maximum Concentrations – Groundwater

Parameter	Maximum Concentration (µg/L)	Borehole/Sample Location	Depth Interval (m BGS)
PHC F2	2400[1]	BH1-GW1	4.62 – 7.62 m bgs; silty clay
Sodium	617000		
Chloride (mg/L)	1530		
Barium	147		
Boron	132		
Copper	0.649		
Molybdenum	3.52		
Nickel	2.80		
Uranium	2.85		
Vanadium	1.93		

[1] This PHC Fraction 2 concentration was considered to be the result of a high level of sediment in the groundwater sample; subsequent re-sampling did not identify any PHCs above the method detection limit.

All other parameters analysed were not detected above the method detection limits.

5.7 Quality Assurance and Quality Control Results

All samples submitted as part of this Phase II ESA were handled in accordance with the Analytical Protocol with respect to holding time, preservation method, storage requirement, and container type.

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

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

5.8 Phase II Conceptual Site Model

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

Site Description

The Phase II Property is located on the south side of Isabella Street and north of Pretoria Avenue, between Bank Street and O'Connor Street, in the City of Ottawa. The Phase II Property has an area of approximately 0.28 hectares. At the time of the Phase II Environmental Site Assessment (ESA), the Phase II Property was vacant. The ground surface on the eastern and western side were asphalt, while the central portion of the site (a former building footprint) was overgrown with vegetation.

Potentially Contaminating Activities

Potentially Contaminating Activities on the subject site include the historical uses of the site as a tinsmith, coal and oil business and heating contractor, fill material, and the potential use of de-icing products on the parking surfaces. Additional off-site PCAs identified in the Phase I study area were not considered to result in Areas of Potential Environmental Concern on the subject site.

Areas of Potential Environmental Concern

Based on the results of the Phase I ESA completed for the subject site, Areas of Potential Environmental Concern were identified. As per Column A of Table 2

outlined in Ontario Regulation 153/04 and amended by O.Reg. 269/11, potentially contaminating activities (PCAs) identified on the subject property or within the Phase I study area that were considered to result in APECs on the subject land are summarized in Table 16 below.

Table 16: Areas of Potential Environmental Concern

Area of Potential Environmental Concern	Location of Area of Potential Environmental Concern with respect to Phase I Property	Potentially Contaminating Activity	Location of PCA (on-site or off-site)	Contaminants of Potential Concern	Media Potentially Impacted (Groundwater, Soil, and/or Sediment)
APEC 1: resulting from former tinsmith at rear of #186 Isabella Street (part of #200 Isabella Street)	Central portion of Phase I Property	Item 34, Table 2, O.Reg. 153/04: Metal fabrication	On-site	Metals	Soil and Groundwater
APEC 2: resulting from former coal and oil business and heating contractor	Central and east portion of Phase I Property	No item: Distribution of fuel oil, coal, and fuel oil burners; Contractor business	On-site	PHCs (F_1-F_4), BTEX, PAHs	Groundwater
APEC 3: Resulting from the importation of fill material across the site	Entire Phase I Property	Item 30, Table 2, O.Reg. 153/04: Importation of fill material of unknown quality	On-site	BTEX, PAHs, metals	Soil and Groundwater
APEC 4: Resulting from potential de-icing of parking lot at #200 Isabella Street	Western portion of 200 Isabella St.	No item: application of salt for de-icing purposes.	On-site	Sodium, chloride, sodium absorption ratio, electrical conductivity	Soil and Groundwater
APEC 5: Resulting from potential de-icing of parking lot at #178 Isabella Street	Eastern portion of Phase I Property at 178 and 180 Isabella St.	No item: application of salt for de-icing purposes.	On-site	Sodium, chloride, sodium absorption ratio, electrical conductivity	Soil Groundwater

PCAs within the Phase I study area were not considered to represent APECs on the subject site due to their separation distance and/or location downgradient or cross-gradient with respect to the Phase II Property.

Contaminants of Potential Concern

Based on the findings of the Phase II ESA, contaminants of concern include sodium and chloride, sodium absorption ratio, electrical conductivity, metals (lead), and PAHs (acenaphthylene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, fluoranthene, and indeno(1,2,3-cd)pyrene) in the fill material. Detailed descriptions of these contaminant groups are provided in Section 3.3 of this report.

Subsurface Structures and Utilities

The subject site is located in a municipally serviced area. The site is currently vacant, with the exception of a residential dwelling used as office space at 205 Pretoria Avenue. A catch basin was observed on the subject site, near Isabella Street in the paved portion of 200 Isabella Street.

Physical Setting

Site Stratigraphy

Site stratigraphy is provided in the Soil Profile and Test Data Sheets provided in Appendix 1 and illustrated on Drawing PE4710-6 - Cross-Section A-A'. Stratigraphy consists of:

- **Pavement Structure** at BH1-19 consisting of 0.1 m of asphaltic concrete over crushed stone, to a depth of approximately 0.6 m below ground surface. Pavement was also present at the surface at BH3-19 but was underlain by a layer of sandy fill material instead of crushed stone.
- **Topsoil** at BH3-19, BH4-19 and BH5-19 consisting of 0.03 to 0.1 m of soil with some brown silty sand.
- **Fill Material** was encountered beneath the pavement structure in BH2-19 and below the topsoil layer in BH3-19 and BH5-19 and ranged in thickness from approximately 0.1-0.6 m; the fill in BH5-19 extended much deeper, to 2.80 m below ground surface. The fill generally consisted of brown silty sand with gravel. Occasional concrete and brick fragments were identified in the fill recovered from BH5-19.
- **Native silty clay** was encountered in all boreholes beneath the fill material, preceded in several boreholes by a layer of silty sand. This is the deepest unit investigated.

Hydrogeological Characteristics

The water table at the subject site was encountered in the silty clay at the subject site. Groundwater levels were measured at the subject site on September 24, 2019. Groundwater was encountered at depths of 3.59 m and 4.27 m below existing grade. It is noted that water levels fluctuate with seasonal variations.

Based on the groundwater elevations from the September 24, 2019 monitoring event, groundwater contour mapping was completed. Groundwater contours are shown on Drawing PE4710-4 - Groundwater Contour Plan. Based on the contour mapping, groundwater flow at the subject site appears to be in a southerly direction. A horizontal hydraulic gradient of approximately 0.07 m/m was calculated.

Approximate Depth to Bedrock

Based on a DCPT performed during the field drilling program in 2016 the approximate depth to bedrock at the subject site is 17.9 m bgs.

Approximate Depth to Water Table

Depth to water table at the subject site varies between approximately 2.52 and 6.79 m below existing grade.

Sections 41 and 43.1 of the Regulation

Section 41 of the Regulation (Site Condition Standards, Environmentally Sensitive Areas) does not apply to the subject site.

Section 43.1 of the Regulation does not apply to the subject site in that the subject site is not a Shallow Soil Property and is not within 30 m of a water body.

Fill Placement

Fill placement has occurred at the subject site. The fill material consists of crushed stone in areas of former pavement except within the former building footprints, where building demolition debris has been left in place. The soil sample from the fill material with building debris did not exceed the MECP Table 3 Standards for metals; the soil sample from the fill material on the eastern side of the Phase II Property exceeded the MECP Table 3 Standards for lead and some PAH parameters. It is understood that the fill material will be removed in conjunction with the redevelopment of the subject site.

Proposed Buildings and Other Structures

It is our understanding that the subject site will be redeveloped with a residential building with a footprint covering the majority of the subject land.

Existing Buildings and Structures

A residential dwelling, used as office space by a marketing company, is present at 205 Pretoria Avenue. There are no existing buildings or structures on the Isabella Street portion of the Phase II Property.

Water Bodies

There are no water bodies on the subject site or within the Phase I study area. The nearest water body is Patterson Creek which is located approximately 300 m south of the site.

Areas of Natural Significance

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

Environmental Condition

Areas Where Contaminants are Present

Based on the screening and analytical results, the groundwater on the subject site is not impacted above the MECP Table 3 Standards. The soil on the eastern side of the Phase II Property contains lead and some PAH contaminants in excess of the applicable MECP Table 3 Standards. The soil on the western side of the Phase II Property has a sodium absorption ratio and electrical conductivity in excess of the Table 3 Standards. Analytical test results and areas where contaminants are present, are shown on Drawings PE4710-4– Analytical Testing Plan for soil and groundwater.

Distribution of Contaminants

The approximate horizontal distribution of contaminants on the Phase II Property is shown on Drawing PE4710-5 – Analytical Testing Plan – Soil and PE4710-6 – Analytical Testing Plan - Groundwater.

The approximate vertical distribution of contaminants in soil is shown on Drawing PE4710– Cross-Section A-A' and Drawing PE4710-8 – Cross-Section B-B'.

Discharge of Contaminants

The PAH and lead impacted soil identified at BH3-19 is expected to have been a result of spillage directly to the ground surface or the presence of coal in the fill material. The impacts may also be associated with use of this portion of the Phase II Property for parking; contaminants may have been released directly to the ground surface as a result of a small automobile leak.

Migration of Contaminants

Physical transport of contaminated soil at the subject site does not appear to have occurred. Since the groundwater is in compliance with the MECP Table 3 standards for both PAHs and metals, the contamination is considered to be limited to the fill overburden.

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. Downward leaching is not considered to have affected contaminant distribution at the Phase II Property as the site is partly paved and based on analytical test results the groundwater is in compliance with MECP Table 3. Fluctuations in the groundwater level and groundwater flow are not considered to have affected contaminant distribution based on the depth of the water table within the native silty clay, well below the shallow fill material.

Potential for Vapour Intrusion

During redevelopment of the site, all soil exceeding the MECP Table 3 Standards will be removed and disposed off-site. As such, there is no anticipated potential for future vapour intrusion at the Phase II Property.

6.0 CONCLUSIONS

Assessment

A Phase II-Environmental Site Assessment (ESA) was conducted for the properties at 178, 180, 182 and 200 Isabella Street and 205 Pretoria Avenue, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address the Areas of Potential Environmental Concern identified during the Phase I ESA. The Phase II-ESA consisted of the drilling of five (5) boreholes and installation of two groundwater monitoring wells to assess the soil and groundwater quality at the subject site.

Soil samples obtained from the boreholes were screened using visual observations and vapour measurements. Site soils consist of a layer of fill material, including demolition debris in former building locations, which is underlain by native silty clay. Based on the screening results, samples were selected for testing of BTEX/PHC, metals, PAHs, sodium absorption ratio, electrical conductivity, and pH parameters. Based on the analytical results, some of the soil on the subject site is not in compliance with the MECP Table 3 standards. Exceedances of lead and multiple PAH parameters were identified in BH3-19, and SAR and electrical conductivity were in excess at BH1-19.

Groundwater samples were collected from the monitoring wells installed in BH2-19 and BH3-19, as well as BH1 and BH2 installed during the previous Phase II ESA, and analyzed for various parameters including BTEX/PHCs, PAHs, metals, sodium, and chloride. Based on the analytical groundwater results the groundwater on the subject site has not been impacted by the past activities of the subject site.

Recommendations

Fill and Building Demolition Debris

Based on the results of the Phase II ESA, contaminated material is considered to be confined to the upper fill layer. It is our understanding that the impacted fill and building demolition debris identified during the field program will be removed as part of the site redevelopment. This fill material should be disposed of at an approved waste disposal facility. The removal of this material should be monitored to ensure that proper segregation occurs, and that the removal of this material is effective in remediating the property.

Monitoring Wells

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

7.0 STATEMENT OF LIMITATIONS

This Phase II - Environmental Site Assessment report has been prepared in general accordance with O.Reg. 153/04 as amended by O.Reg. 269/11 and meets the requirements of CSA Z769-00. The conclusions presented herein are based on information gathered from a limited sampling and testing program. The test results represent conditions at specific test locations at the time of the field program.

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

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

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

Paterson Group Inc.

Anna Graham, M.E.S.

Mark D'Arcy, P.Eng.

Report Distribution:

- ❑ Minto Communities Inc.
- ❑ Paterson Group

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE4710-3 – TEST HOLE LOCATION PLAN

DRAWING PE4710-4 - GROUNDWATER CONTOUR PLAN

DRAWING PE4710-5 – ANALYTICAL TESTING PLAN – SOIL

DRAWING PE4710-6 – ANALYTICAL TESTING PLAN – GROUNDWATER

DRAWING PE4710-7 – CROSS-SECTION A-A'

DRAWING PE4710-8 – CROSS-SECTION B-B'

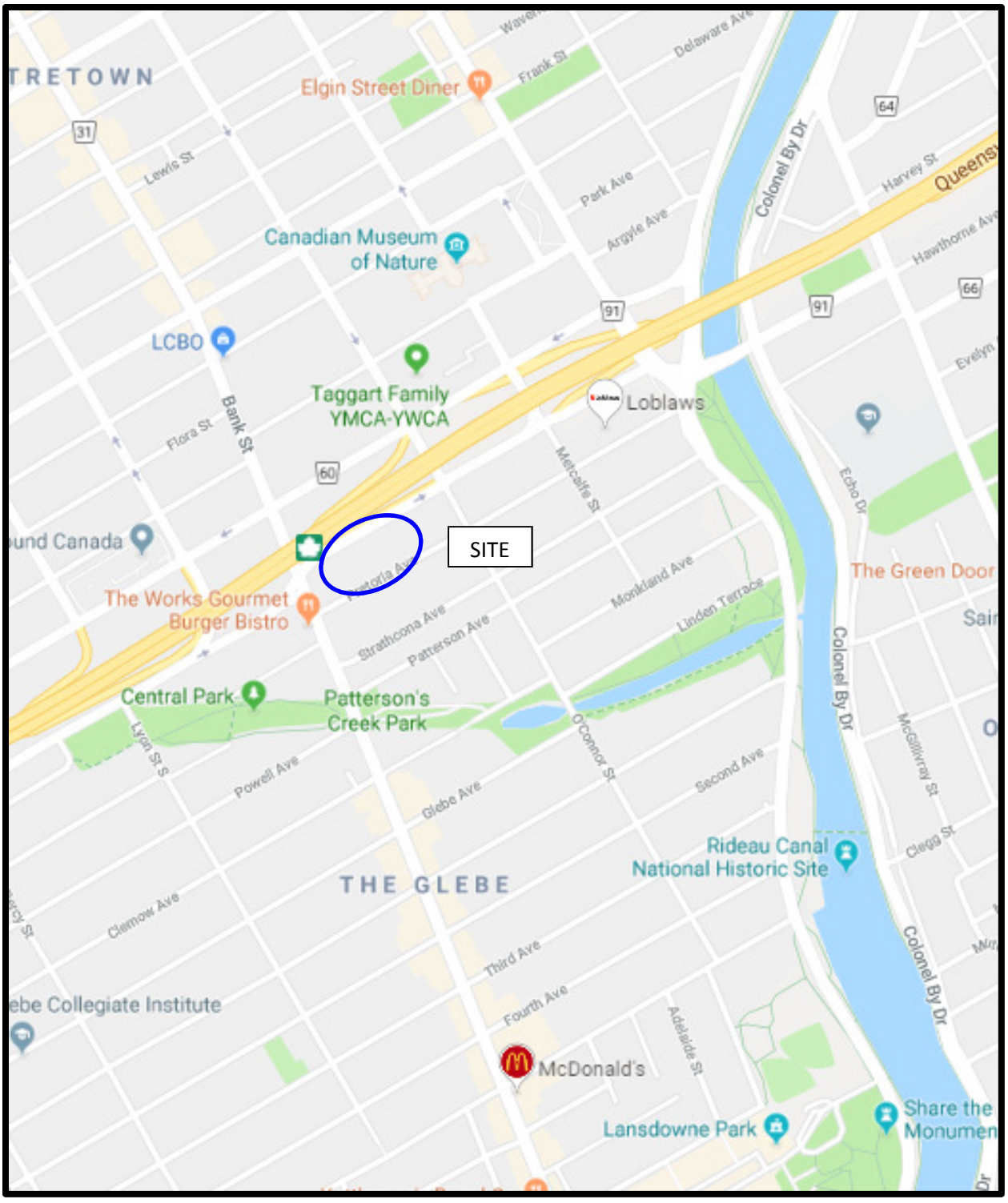
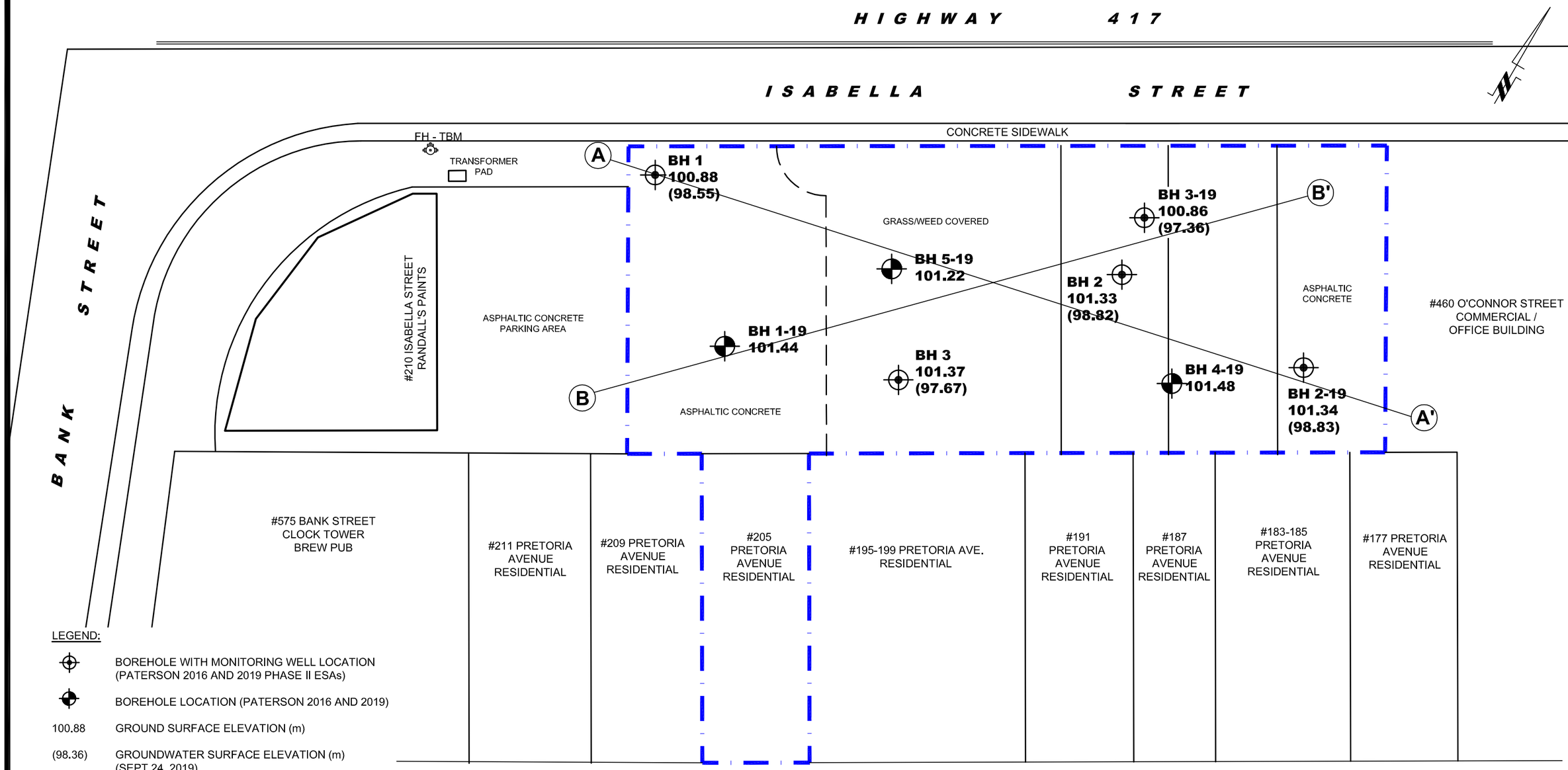


FIGURE 1

KEY PLAN



LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION (PATERSON 2016 AND 2019 PHASE II ESAs)
- BOREHOLE LOCATION (PATERSON 2016 AND 2019)
- 100.88 GROUND SURFACE ELEVATION (m)
- (98.36) GROUNDWATER SURFACE ELEVATION (m) (SEPT.24, 2019)

TBM - TOP SPINDLE OF FIRE HYDRANT LOCATED IN FRONT OF 210 ISABELLA STREET. AN ARBITRARY ELEVATION OF 100.00m WAS ASSIGNED TO THE TBM.

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL
0			

MINTO COMMUNITIES INC.

PHASE I - ENVIRONMENTAL SITE ASSESSMENT
178-200 ISABELLA STREET AND 205 PRETORIA AVENUE
OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:400	Date: 9/2019
Drawn by: AG	Report No.: PE4710-2
Checked by: MB	Dwg. No.: PE4710-3
Approved by: MSD	Revision No.: 0

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HIGHWAY 417

ISABELLA STREET

CONCRETE SIDEWALK

FH - TBM

TRANSFORMER PAD

#210 ISABELLA STREET
RANDALL'S PAINTS

ASPHALTIC CONCRETE PARKING AREA

BH 1
100.88
(98.55)

#200 ISABELLA STREET
VACANT
(FORMER TINSMITH AT REAR OF #186 ISABELLA)

GRASS/WEED COVERED

BH 5-19
101.22

BH 1-19
101.44

BH 3
101.37
(97.67)

ASPHALTIC CONCRETE

0.07m/m

98

98.2

98.4

98.6

#182 ISABELLA STREET
VACANT

#180 ISABELLA STREET
VACANT

#178 ISABELLA STREET
VACANT

BH 2-19
100.86
(97.36)

BH 2
101.33
(98.82)

BH 4-19
101.48

ASPHALTIC CONCRETE

BH 3-19
101.34
(98.83)

#460 O'CONNOR STREET
COMMERCIAL /
OFFICE BUILDING

#575 BANK STREET
CLOCK TOWER
BREW PUB

#211 PRETORIA AVENUE
RESIDENTIAL

#209 PRETORIA AVENUE
RESIDENTIAL

#205 PRETORIA AVENUE
RESIDENTIAL

#195-199 PRETORIA AVE.
RESIDENTIAL

#191 PRETORIA AVENUE
RESIDENTIAL

#187 PRETORIA AVENUE
RESIDENTIAL

#183-185 PRETORIA AVENUE
RESIDENTIAL

#177 PRETORIA AVENUE
RESIDENTIAL

PRETORIA AVENUE

LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION
- 100.88 GROUND SURFACE ELEVATION (m)
- (98.36) GROUNDWATER SURFACE ELEVATION (m)
- 98.6 GROUNDWATER CONTOUR
- (0.189m/m) APPROX. GROUNDWATER FLOW DIRECTION (HORIZONTAL HYDRAULIC GRADIENT)

TBM - TOP SPINDLE OF FIRE HYDRANT LOCATED IN FRONT OF 210 ISABELLA STREET. AN ARBITRARY ELEVATION OF 100.00m WAS ASSIGNED TO THE TBM.

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consulting engineers

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Ottawa, Ontario K2E 7J5
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NO.	REVISIONS	DATE	INITIAL
0			

AMBASSADOR REALTY INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
178, 180, 182 & 200 ISABELLA STREET

OTTAWA, ONTARIO

Title:

GROUNDWATER CONTOUR PLAN

Scale: 1:400	Date: 09/2019
Drawn by: RCG	Report No.: PE4710-2
Checked by: MB	Dwg. No.: PE4710-4
Approved by: MSD	Revision No.: 0

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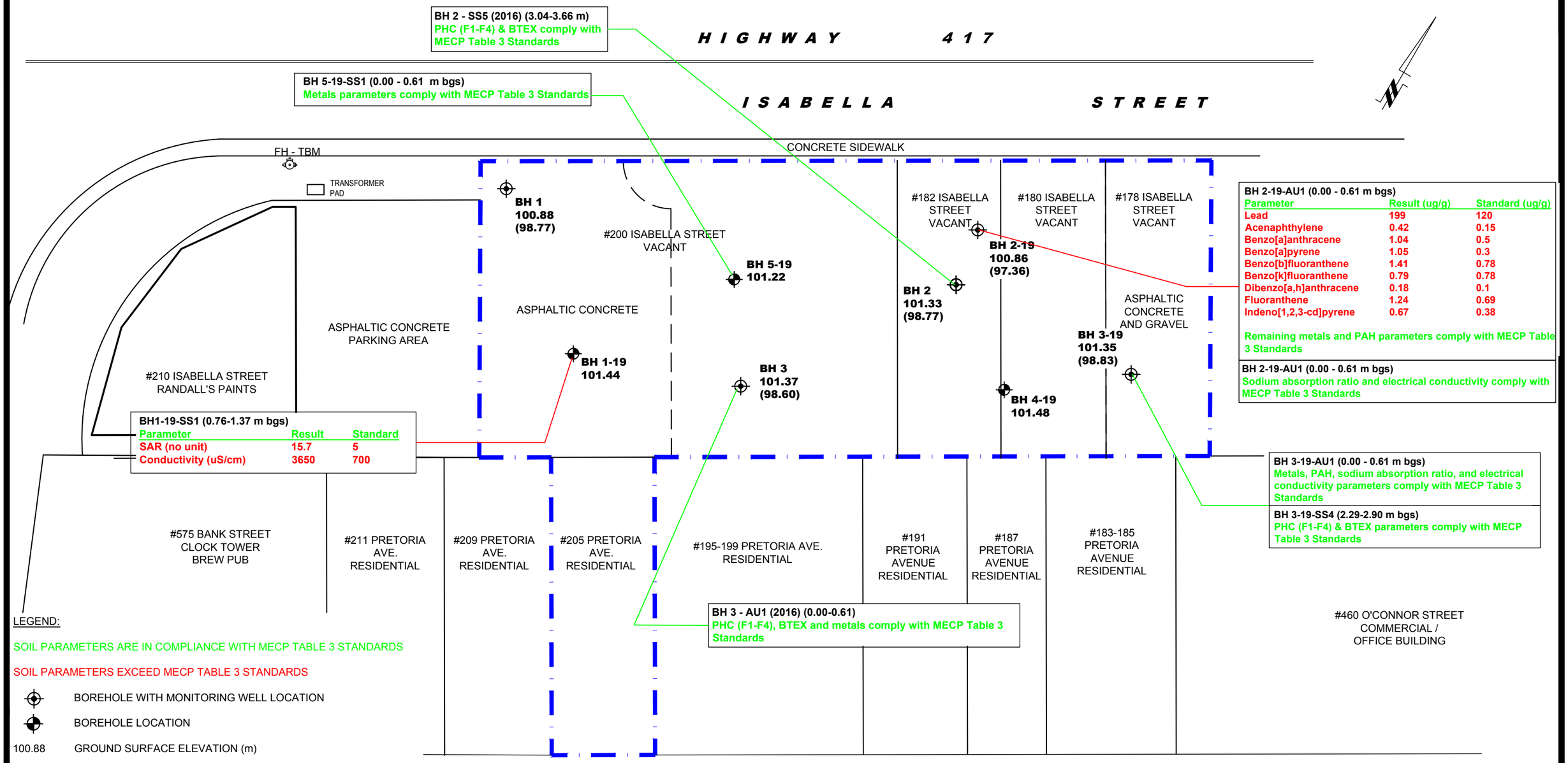

LEGEND:

SOIL PARAMETERS ARE IN COMPLIANCE WITH MECP TABLE 3 STANDARDS

SOIL PARAMETERS EXCEED MECP TABLE 3 STANDARDS

BOREHOLE WITH MONITORING WELL LOCATION

BOREHOLE LOCATION

100.88 GROUND SURFACE ELEVATION (m)

(98.36) GROUNDWATER SURFACE ELEVATION (m)

TBM - TEMPORAY BENCHMARK - TOP OF FIRE HYDRANT SPINDLE. ASSIGNED AN ASSUMED ELEVATION OF 100.00 m ABOVE SEA LEVEL (ASL)

patersongroup
consulting engineers

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NO.	REVISIONS	DATE	INITIAL
0			

MINTO COMMUNITIES INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
178, 180, 182 & 200 ISABELLA STREET AND 205 PRETORIA AVNEUE
OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL

Scale: 1:400	Date: 09/2019
Drawn by: MPG	Report No.: PE4710-2
Checked by: MB	Dwg. No.: PE4710-5
Approved by: MSD	Revision No.: 0

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HIGHWAY 417

ISABELLA STREET

FH - TBM

CONCRETE SIDEWALK

BH 1-GW1 (2016) (4.62-7.62)
PAHs comply with MECP Table 3 Standards

BH1-GW1 (4.62-7.62 m bgs)

Parameter	Result (ug/L)	Standard (ug/L)
PHC (F2)	2400	150

Remaining PHC and BTEX parameters are in compliance with the MECP Table 3 Standards

BH1-GW2 (4.62-7.62 m bgs)
PHCs F2-F4 comply with MECP Table 3 Standards

BH3-19-GW1 (1.52-4.57 m bgs)
PHCs F2-F4 and BTEX parameters comply with MECP Table 3 Standards

BH2-19-GW1 (1.52-4.57 m bgs)
Sodium and chloride comply with MECP Table 3 Standards

BH 2-GW1 (2016) (3.09-6.09)
PHC (F1-F4) & BTEX comply with MECP Table 3 Standards

BH 3-GW1 (2016) (4.62-7.62)
PHC (F1-F4) & BTEX comply with MECP Table 3 Standards

BH 1
100.88
(98.77)

BH 5-19
101.22

BH 1-19
101.44

BH 3
101.37
(98.60)

BH 3-19
100.86
(97.36)

BH 2
101.33
(98.77)

BH 4-19
101.48

BH 2-19
101.35
(98.83)

#200 ISABELLA STREET
VACANT

#182 ISABELLA STREET
VACANT

#180 ISABELLA STREET
VACANT

#178 ISABELLA STREET
VACANT

ASPHALTIC CONCRETE

ASPHALTIC CONCRETE
PARKING AREA

ASPHALTIC CONCRETE
AND GRAVEL

#210 ISABELLA STREET
RANDALL'S PAINTS

#460 O'CONNOR STREET
COMMERCIAL /
OFFICE BUILDING

#575 BANK STREET
CLOCK TOWER
BREW PUB

#211 PRETORIA AVE.
RESIDENTIAL

#209 PRETORIA AVE.
RESIDENTIAL

#205 PRETORIA AVE.
RESIDENTIAL

#195-199 PRETORIA AVE.
RESIDENTIAL

#191 PRETORIA AVENUE
RESIDENTIAL

#187 PRETORIA AVENUE
RESIDENTIAL

#183-185 PRETORIA AVENUE
RESIDENTIAL

#177 PRETORIA AVENUE
RESIDENTIAL

#460 O'CONNOR STREET
COMMERCIAL /
OFFICE BUILDING

LEGEND:

GROUNDWATER PARAMETERS ARE IN COMPLIANCE WITH MECP TABLE 3 STANDARDS

GROUNDWATER PARAMETERS EXCEED MECP TABLE 3 STANDARDS

BOREHOLE WITH MONITORING WELL LOCATION

BOREHOLE LOCATION

100.88 GROUND SURFACE ELEVATION (m)

(98.36) GROUNDWATER SURFACE ELEVATION (m)

TBM - TEMPORAY BENCHMARK - TOP OF FIRE HYDRANT SPINDLE. ASSIGNED AN ASSUMED ELEVATION OF 100.00 m ABOVE SEA LEVEL (ASL)

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consulting engineers

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MINTO COMMUNITIES INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
178, 180, 182 & 200 ISABELLA STREET AND 205 PRETORIA AVNEUE
OTTAWA, ONTARIO

Title:
ANALYTICAL TESTING PLAN - GROUNDWATER

Scale: 1:400	Date: 09/2019
Drawn by: MPG	Report No.: PE4710-2
Checked by: MB	Dwg. No.: PE4710-6
Approved by: MSD	Revision No.: 0

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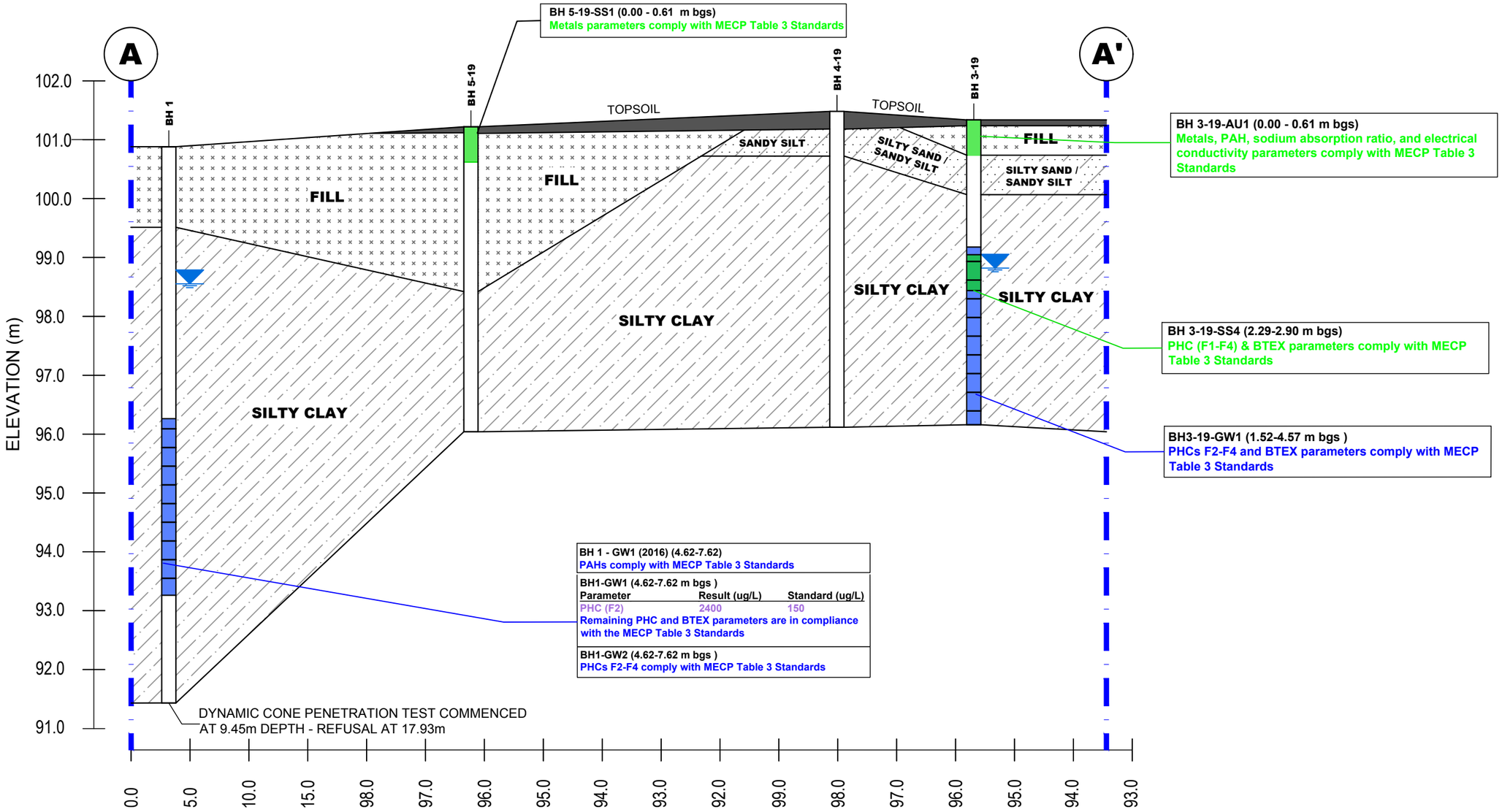

LEGEND:

SOIL RESULTS IN COMPLIANCE WITH MECP TABLE 3 STANDARDS

SOIL RESULTS EXCEEDS MECP TABLE 3 STANDARDS

GROUNDWATER RESULTS IN COMPLIANCE WITH MECP TABLE 3 STANDARDS

GROUNDWATER RESULTS EXCEED MECP TABLE 3 STANDARDS

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NO.	REVISIONS	DATE	INITIAL

MINTO COMMUNITIES INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
178-200 ISABELLA STREET AND 205 PRETORIA AVENUE
OTTAWA, ONTARIO

Title:

CROSS SECTION A-A

Scale: AS SHOWN	Date: 10/2019
Drawn by: RCG	Report No.: PE4710-2
Checked by: MB	Dwg. No.: PE4710-7
Approved by: MSD	Revision No.:

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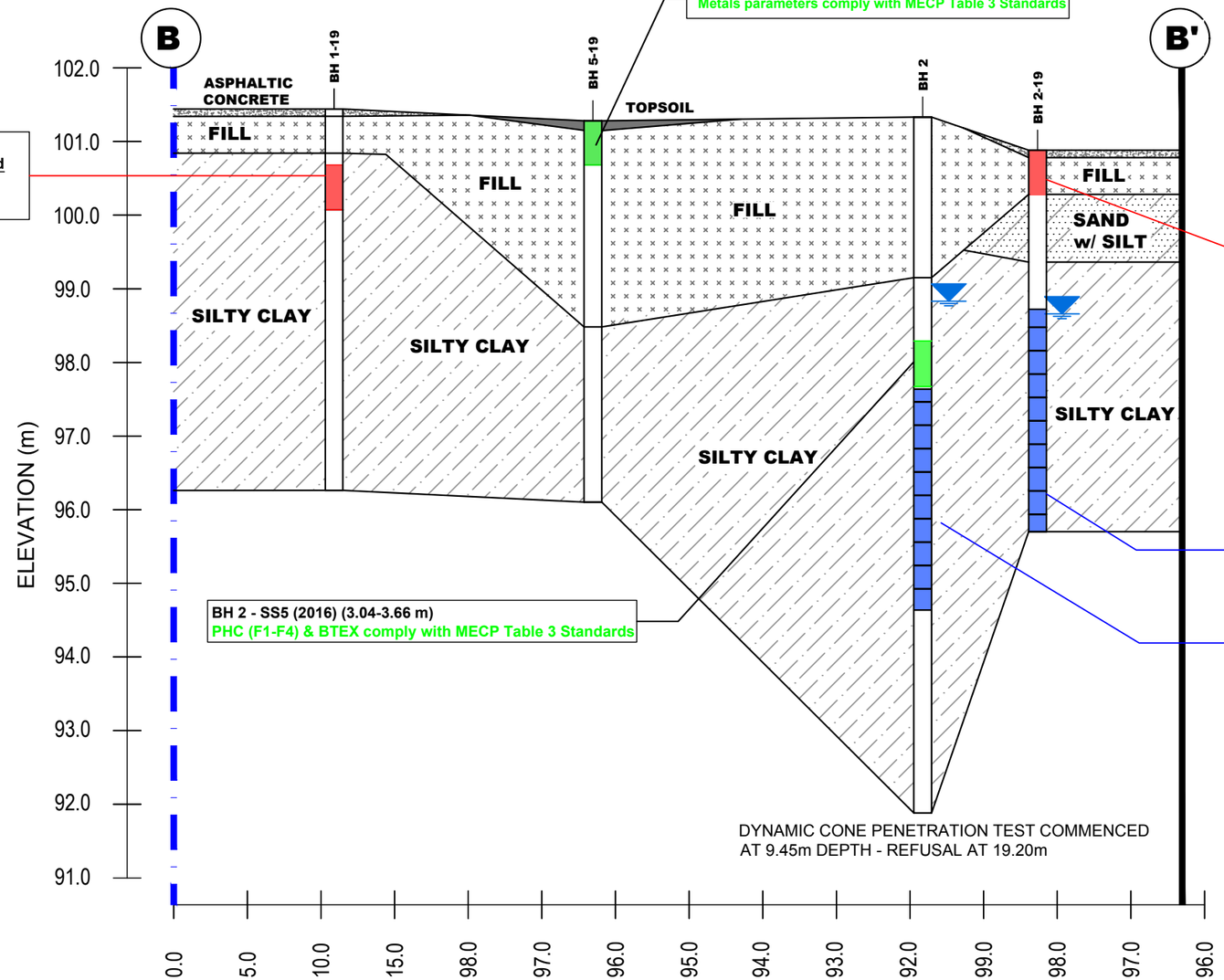

BH 5-19-SS1 (0.00 - 0.61 m bgs)
Metals parameters comply with MECP Table 3 Standards

BH1-19-SS1 (0.76-1.37 m bgs)

Parameter	Result	Standard
SAR (no unit)	15.7	5
Conductivity (uS/cm)	3650	700

BH 2-19-AU1 (0.00 - 0.61 m bgs)

Parameter	Result (ug/g)	Standard (ug/g)
Lead	199	120
Acenaphthylene	0.42	0.15
Benzo[a]anthracene	1.04	0.5
Benzo[a]pyrene	1.05	0.3
Benzo[b]fluoranthene	1.41	0.78
Benzo[k]fluoranthene	0.79	0.78
Dibenzo[a,h]anthracene	0.18	0.1
Fluoranthene	1.24	0.69
Indeno[1,2,3-cd]pyrene	0.67	0.38

Remaining metals and PAH parameters comply with MECP Table 3 Standards

BH 2-19-AU1 (0.00 - 0.61 m bgs)
Sodium absorption ratio and electrical conductivity comply with MECP Table 3 Standards

BH2-19-GW1 (1.52-4.57 m bgs)
Sodium and chloride comply with MECP Table 3 Standards

BH 2 - GW1 (2016) (3.09-6.09)
PHC (F1-F4) & BTEX comply with MECP Table 3 Standards

BH 2 - SS5 (2016) (3.04-3.66 m)
PHC (F1-F4) & BTEX comply with MECP Table 3 Standards

LEGEND:

SOIL RESULTS IN COMPLIANCE WITH MECP TABLE 3 STANDARDS

SOIL RESULTS EXCEEDS MECP TABLE 3 STANDARDS

GROUNDWATER RESULTS IN COMPLIANCE WITH MECP TABLE 3 STANDARDS

GROUNDWATER RESULTS EXCEED MECP TABLE 3 STANDARDS

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NO.	REVISIONS	DATE	INITIAL

MINTO COMMUNITIES INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
178-200 ISABELLA STREET AND 205 PRETORIA AVENUE
OTTAWA, ONTARIO

Title:
CROSS SECTION B-B

Scale: AS SHOWN	Date: 10/2019
Drawn by: RCG	Report No.: PE4710-2
Checked by: MB	Dwg. No.: PE4710-8
Approved by: MSD	Revision No.:

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APPENDIX 1

SAMPLING AND ANALYSIS PLAN

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

LABORATORY CERTIFICATES OF ANALYSIS

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Services

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Sampling & Analysis Plan

Phase II Environmental Site Assessment

178, 180, 182 and 200 Isabella Street and
205 Pretoria Avenue
Ottawa, Ontario

Prepared For

Minto Communities Inc.

September 10, 2019

Report: PE4710-SAP

TABLE OF CONTENTS

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Minto Communities Inc. to conduct a Phase II Environmental Site Assessment (ESA) at the properties addressed 178, 180, 182 and 200 Isabella Street and 205 Pretoria Avenue, in the City of Ottawa, Ontario. Based on our September 2019 Phase I ESA completed for the subject property, a subsurface investigation program, consisting of borehole drilling and re-sampling of previously placed monitoring wells, was developed.

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1-19	Place borehole on the western side of the Phase I Property (200 Isabella Street), to assess any potential impacts from de-icing the parking lot.	Intercept the fill and native material to obtain soil samples for analytical testing.
BH2-19	Place borehole on the eastern side of the Phase I Property (178 Isabella Street) to assess any potential impacts from de-icing the parking lot and from the former coal and oil business on-site.	Boreholes to be advanced approximately 2 m below the expected long-term groundwater table and install a monitoring well.
BH3-19	Place borehole in central portion of the Phase I Property (182 Isabella Street) to assess any potential impacts from the former coal and oil business on site.	
BH4-19	Place borehole in the eastern portion of the Phase I Property (180 Isabella Street) to assess any potential impacts from the former coal and oil and heating contractor businesses on site.	Intercept the fill and native material to obtain soil samples for analytical testing.
BH5-19	Place borehole in central portion of the Phase I Property (200 Isabella Street) to assess any potential impacts from fill material on site.	Intercept the fill and native material to obtain soil samples for analytical testing.

At each borehole, split-spoon samples of overburden soils will be obtained at 0.76 m (2'6") intervals until practical refusal to augering. All soil samples will be retained, and samples will be selected for submission following a preliminary screening analysis.

Upon refusal, rock coring shall be undertaken to the required depth, if necessary. Approximately every metre the well shall be purged by inertial pumping and the water level recorded to determine if groundwater water is entering the borehole.

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

2.0 ANALYTICAL TESTING PROGRAM

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

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

The analytical testing program for 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 the 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 catch basin of known geodetic elevation.

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 analysed 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 the 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 an RKI Eagle, PID, etc. depending on the 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 a brush in soapy water, inside and out, including the 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 the 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 the bag.
- ❒ Insert the probe into soil bag, creating a seal with your hand around the opening.
- ❒ Gently manipulate soil in the 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 the Sampling and Analysis Plan.

3.2 Monitoring Well Installation Procedure

Equipment

- ❒ 5' x 2" [1.52 m x 50 mm] threaded sections of Schedule 40 PVC slotted well screen (5' x 1 ¼" [1.52 m x 32 mm] if installing in a cored hole in bedrock)
- ❒ 5' x 2" [1.52 m x 50 mm] threaded sections of Schedule 40 PVC riser pipe (5' x 1 ¼" [1.52 m x 32 mm] if installing in a 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 the required depth, using drilling and sampling procedures described above.
- ❒ If the borehole is deeper than required monitoring well, backfill with bentonite chips to the 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 the screen. Thread the second section of the screen if required. Thread risers onto the screen. Lower into the borehole to the required depth. Ensure slip-cap or J-plug is inserted to prevent backfill materials from entering the 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 the 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 the surrounding ground surface.

3.3 Monitoring Well Sampling Procedure

Equipment

- ❒ Water level metre or interface probe on hydrocarbon/LNAPL sites
- ❒ Spray bottles containing water and methanol to clean water level tape or interface probe
- ❒ Peristaltic pump
- ❒ Polyethylene tubing for peristaltic pump
- ❒ Flexible tubing for peristaltic pump
- ❒ Latex or nitrile gloves (depending on suspected contaminant)
- ❒ Allen keys and/or 9/16" socket wrench to remove well caps
- ❒ Graduated bucket with volume measurements
- ❒ pH/Temperature/Conductivity combo pen
- ❒ Laboratory-supplied sample bottles

Sampling Procedure

- ❒ Locate well and use a socket wrench or Allan key to open metal flush mount protector cap. Remove plastic well cap.
- ❒ Measure water level, with respect to the existing ground surface, using water level meter or interface probe. If using an interface probe on suspected NAPL site, measure the thickness of the free product.
- ❒ Measure the total depth of well.
- ❒ Clean water level tape or interface probe using methanol and water. Change gloves between wells.
- ❒ Calculate the volume of standing water within well and record.
- ❒ Insert polyethylene tubing into well and attach to the peristaltic pump. Turn on the peristaltic pump and purge into the 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 the 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 the 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 a continuous stream of non-turbulent flow into sample bottles. Ensure no headspace is present in VOC vials.
- ❒ Replace well cap and flushmount casing cap.

4.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

The QA/QC program for this Phase II ESA is as follows:

- ❒ All non-dedicated sampling equipment (split spoons) will be decontaminated according to the SOPs listed above.
- ❒ All groundwater sampling equipment is dedicated (polyethylene and flexible peristaltic tubing is replaced for each well).
- ❒ Where groundwater samples are to be analyzed for VOCs, one laboratory-provided trip blank will be submitted for analysis with every laboratory submission.
- ❒ Approximately one (1) field duplicate will be submitted for every ten (10) samples submitted for laboratory analysis. A minimum of one (1) field duplicate per project will be submitted. Field duplicates will be submitted for soil and groundwater samples.
- ❒ Where combo pens are used to measure field chemistry, they will be calibrated on an approximately monthly basis, according to the frequency of use.

5.0 DATA QUALITY OBJECTIVES

The purpose of setting data quality objectives (DQOs) is to ensure that the level of uncertainty in data collected during the Phase II ESA is low enough that decision-making is not affected, and that the overall objectives of the investigation are met.

The quality of data is assessed by comparing field duplicates with original samples. If the relative percent difference (RPD) between the duplicate and the sample is within 20%, the data are considered to be of sufficient quality so as not to affect decision-making. The RPD is calculated as follows:

$$RPD = \left| \frac{x_1 - x_2}{(x_1 + x_2)/2} \right| \times 100\%$$

Where x_1 is the concentration of a given parameter in an original sample and x_2 is the concentration of that same parameter in the field duplicate sample.

For the purpose of calculating the RPD, it is desirable to select field duplicates from samples for which parameters are present in concentrations above laboratory detection limits, i.e. samples which are expected to be contaminated. If parameters are below laboratory detection limits for selected samples or duplicates, the RPD may be calculated using a concentration equal to one half (0.5 x) the laboratory detection limit.

It is also important to consider data quality in the overall context of the project. For example, if the DQOs are not met for a given sample, yet the concentrations of contaminants in both the sample and the duplicate exceed the MOE site remediation standards by a large margin, the decision-making usefulness of the sample may not be considered to be impaired. The proximity of other samples which meet the DQOs must also be considered in developing the Phase II Conceptual Site Model; often there are enough data available to produce a reliable Phase II Conceptual Site Model even if DQOs are not met for certain individual samples.

These considerations are discussed in the body of the report.

6.0 PHYSICAL IMPEDIMENTS TO SAMPLING & ANALYSIS PLAN

Physical impediments to the Sampling and Analysis plan may include:

- ❒ The location of underground utilities
- ❒ Poor recovery of split-spoon soil samples
- ❒ Insufficient groundwater volume for groundwater samples
- ❒ Breakage of sampling containers following sampling or while in transit to the laboratory
- ❒ Elevated detection limits due to matrix interference (generally related to soil colour or presence of organic material)
- ❒ Elevated detection limits due to high concentrations of certain parameters, necessitating dilution of samples in the laboratory
- ❒ Drill rig breakdowns
- ❒ Winter conditions
- ❒ Other site-specific impediments

Site-specific impediments to the Sampling and Analysis plan are discussed in the body of the Phase II ESA report.

patersongroup Consulting Engineers

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
178-200 Isabella Street and 205 Pretoria Avenue
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located at the intersection of Bank Street and Isabella Street. An arbitrary elevation of 100.00m was assigned to the TBM.

FILE NO. PE4710

REMARKS

HOLE NO. BH 1-19

BORINGS BY CME 55 Power Auger **DATE** 2019 September 13

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE									
Asphaltic concrete 0.10						0	101.44		
FILL: Crushed stone		AU	1						
0.60									
		SS	2	100	10	1	100.44		
		SS	3	100	6	2	99.44		
Brown **SILTY CLAY,** trace sand		SS	4	100	3				
		SS	5	100	1	3	98.44		
- grey by 3.6m depth									
		SS	6	4	2	4	97.44		
		SS	7	100	W	5	96.44		
5.18									
End of Borehole									

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

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
178-200 Isabella Street and 205 Pretoria Avenue
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located at the intersection of Bank Street and Isabella Street. An arbitrary elevation of 100.00m was assigned to the TBM.

FILE NO. PE4710

REMARKS

HOLE NO. BH 2-19

BORINGS BY CME 55 Power Auger **DATE** 2019 September 13

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	101.35
Asphaltic concrete 0.10							
FILL: Dark brown sand with silt and gravel		AU	1				
0.60							
Loose, brown **SAND** with silt		SS	2	79	9	1	100.35
1.52							
		SS	3	100	8	2	99.35
Brown **SILTY CLAY**		SS	4	100	4		
- grey by 3.2m depth		SS	5	100	1	3	98.35
		SS	6	100	W	4	97.35
		SS	7	100	W	5	96.35
5.18							
End of Borehole							
(GWL @ 3.50m - Sept. 24, 2019)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
178-200 Isabella Street and 205 Pretoria Avenue
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located at the intersection of Bank Street and Isabella Street. An arbitrary elevation of 100.00m was assigned to the TBM.

FILE NO. PE4710

REMARKS

HOLE NO. BH 3-19

BORINGS BY CME 55 Power Auger **DATE** 2019 September 13

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									
TOPSOIL 0.10						0	100.86		
FILL: Brown silty sand with gravel		AU	1						
0.60									
Compact, brown **SILTY SAND**		SS	2	75	11	1	99.86		
1.27									
Brown **SILTY CLAY**		SS	3	100	9	2	98.86		
		SS	4	100	W				
- grey by 2.7m depth						3	97.86		
		SS	5	100	W				
		SS	6	100	W	4	96.86		
		SS	7	100	W				
						5	95.86		
5.18									
End of Borehole									
(GWL @ 2.51m - Sept. 24, 2019)									

Lower Explosive Limit % scale: 20 40 60 80

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

▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
178-200 Isabella Street and 205 Pretoria Avenue
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located at the intersection of Bank Street and Isabella Street. An arbitrary elevation of 100.00m was assigned to the TBM.

FILE NO. PE4710

REMARKS

HOLE NO. BH 4-19

BORINGS BY CME 55 Power Auger **DATE** 2019 September 13

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									
TOPSOIL: Brown silty sand with organics, occasional gravel						0	101.48		
0.30		SS	1	83	21				
Compact, brown **SAND** with silt									
0.76		SS	2	100	10	1	100.48		
		SS	3	100	6	2	99.48		
Brown **SILTY CLAY**		SS	4	100	2				
		SS	5	100	1	3	98.48		
- grey by 3.5m depth		SS	6	100	W	4	97.48		
		SS	7	100	W	5	96.48		
5.18									
End of Borehole									

Photo Ionization Detector: 20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
178-200 Isabella Street and 205 Pretoria Avenue
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located at the intersection of Bank Street and Isabella Street. An arbitrary elevation of 100.00m was assigned to the TBM.

FILE NO. PE4710

REMARKS

HOLE NO. BH 5-19

BORINGS BY CME 55 Power Auger **DATE** 2019 September 13

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									
TOPSOIL 0.08		SS	1	33	4	0	101.22		
FILL: Brown silty sand with gravel, occasional concrete and brick fragments		SS	2	18	26	1	100.22		
		SS	3	71	6	2	99.22		
2.54									
FILL: Brown sand, trace gravel 2.80		SS	4	54	11	3	98.22		
		SS	5	100	1				
Grey **SILTY CLAY**		SS	6	100	W	4	97.22		
		SS	7	100	1	5	96.22		
5.18									
End of Borehole									

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

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

▲ Full Gas Resp. △ Methane Elim.

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

The standard terminology to describe the relative strength of cohesionless soils is the compactness condition, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm. An SPT N value of "P" denotes that the split-spoon sampler was pushed 300 mm into the soil without the use of a falling hammer.

Compactness Condition	'N' Value	Relative Density %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory shear vane tests, unconfined compression tests, or occasionally by the Standard Penetration Test (SPT). Note that the typical correlations of undrained shear strength to SPT N value (tabulated below) tend to underestimate the consistency for sensitive silty clays, so Paterson reviews the applicable split spoon samples in the laboratory to provide a more representative consistency value based on tactile examination.

Consistency	Undrained Shear Strength (kPa)	'N' Value
Very Soft	<12	<2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their "sensitivity". The sensitivity, S_t, is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil. The classes of sensitivity may be defined as follows:

Low Sensitivity:	$S_t < 2$
Medium Sensitivity:	$2 < S_t < 4$
Sensitive:	$4 < S_t < 8$
Extra Sensitive:	$8 < S_t < 16$
Quick Clay:	$S_t > 16$

ROCK DESCRIPTION

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NQ or larger size core. However, it can be used on smaller core sizes, such as BQ, if the bulk of the fractures caused by drilling stresses (called "mechanical breaks") are easily distinguishable from the normal in situ fractures.

RQD %	**ROCK QUALITY**
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube, generally recovered using a piston sampler
G	-	"Grab" sample from test pit or surface materials
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size BQ, NQ, HQ, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

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

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

CONSOLIDATION TEST

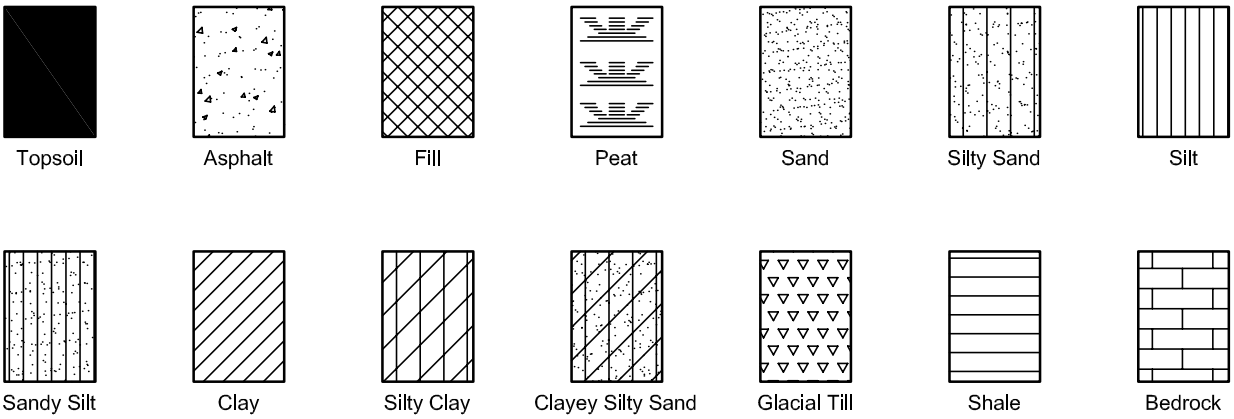
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

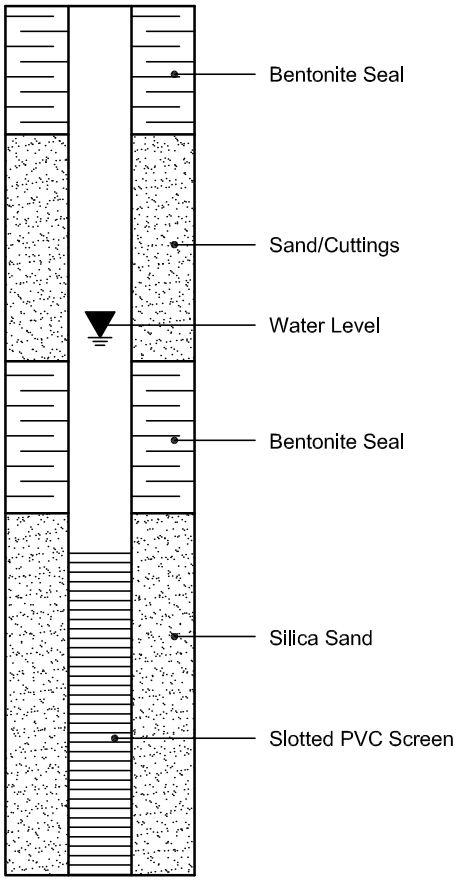
SYMBOLS AND TERMS (continued)

STRATA PLOT

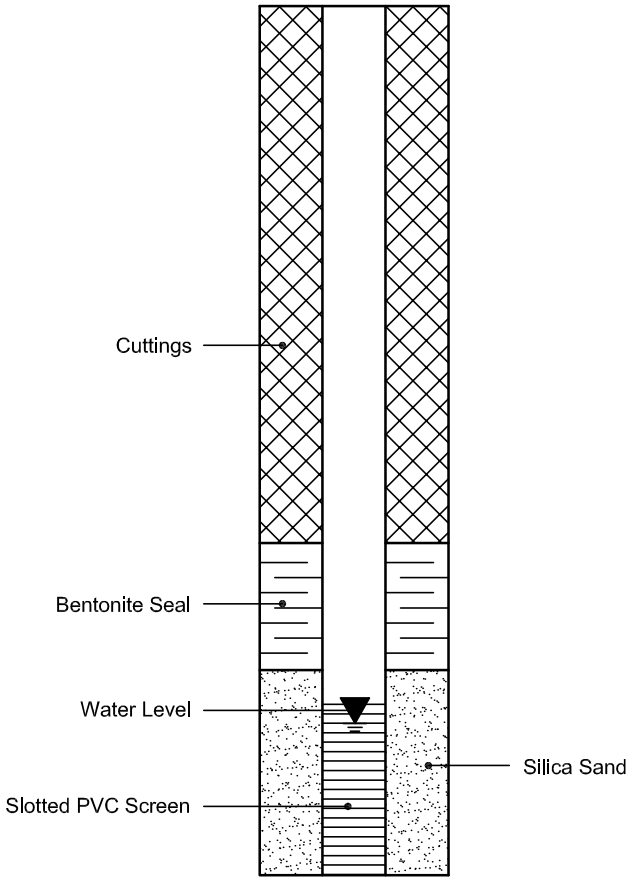


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 27119
Project: PE4710
Custody: 123221

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

Order #: 1938423

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

Paracel ID	Client ID
1938423-01	BH1-19-SS2
1938423-02	BH2-19-AU1
1938423-03	BH3-19-AU1
1938423-04	BH3-19-SS4
1938423-05	BH5-19-SS1

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27119

Report Date: 24-Sep-2019
Order Date: 18-Sep-2019
Project Description: PE4710

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	23-Sep-19	24-Sep-19
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	20-Sep-19	24-Sep-19
Conductivity	MOE E3138 - probe @25 °C, water ext	24-Sep-19	24-Sep-19
Mercury by CVAA	EPA 7471B - CVAA, digestion	24-Sep-19	24-Sep-19
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	24-Sep-19	24-Sep-19
PHC F1	CWS Tier 1 - P&T GC-FID	23-Sep-19	24-Sep-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	19-Sep-19	23-Sep-19
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	24-Sep-19	24-Sep-19
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	19-Sep-19	24-Sep-19
SAR	Calculated	24-Sep-19	24-Sep-19
Solids, %	Gravimetric, calculation	23-Sep-19	24-Sep-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27119

Report Date: 24-Sep-2019

Order Date: 18-Sep-2019

Project Description: PE4710

	Client ID:	BH1-19-SS2	BH2-19-AU1	BH3-19-AU1	BH3-19-SS4
	Sample Date:	13-Sep-19 09:00	13-Sep-19 09:00	13-Sep-19 09:00	13-Sep-19 09:00
	Sample ID:	1938423-01	1938423-02	1938423-03	1938423-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	70.9	91.4	93.0	64.5
General Inorganics					
SAR	0.01 N/A	15.7	3.12	1.32	-
Conductivity	5 uS/cm	3650	593	302	-
pH	0.05 pH Units	-	-	-	7.70
Metals					
Antimony	1.0 ug/g dry	-	<1.0	<1.0	-
Arsenic	1.0 ug/g dry	-	4.8	2.2	-
Barium	1.0 ug/g dry	-	148	360	-
Beryllium	0.5 ug/g dry	-	<0.5	<0.5	-
Boron	5.0 ug/g dry	-	<5.0	6.0	-
Cadmium	0.5 ug/g dry	-	<0.5	<0.5	-
Chromium	5.0 ug/g dry	-	17.1	16.7	-
Chromium (VI)	0.2 ug/g dry	-	<0.2	<0.2	-
Cobalt	1.0 ug/g dry	-	4.2	4.4	-
Copper	5.0 ug/g dry	-	24.9	14.3	-
Lead	1.0 ug/g dry	-	199	62.8	-
Mercury	0.1 ug/g dry	-	0.2	<0.1	-
Molybdenum	1.0 ug/g dry	-	<1.0	<1.0	-
Nickel	5.0 ug/g dry	-	10.6	12.2	-
Selenium	1.0 ug/g dry	-	<1.0	<1.0	-
Silver	0.3 ug/g dry	-	<0.3	<0.3	-
Thallium	1.0 ug/g dry	-	<1.0	<1.0	-
Uranium	1.0 ug/g dry	-	<1.0	<1.0	-
Vanadium	10.0 ug/g dry	-	18.1	15.3	-
Zinc	20.0 ug/g dry	-	120	57.3	-
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	-	-	-	109%
Hydrocarbons					

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27119

Report Date: 24-Sep-2019

Order Date: 18-Sep-2019

Project Description: PE4710

	Client ID:	BH1-19-SS2	BH2-19-AU1	BH3-19-AU1	BH3-19-SS4
	Sample Date:	13-Sep-19 09:00	13-Sep-19 09:00	13-Sep-19 09:00	13-Sep-19 09:00
	Sample ID:	1938423-01	1938423-02	1938423-03	1938423-04
	MDL/Units	Soil	Soil	Soil	Soil
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
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	-	0.03	<0.02	-
Acenaphthylene	0.02 ug/g dry	-	0.42	0.04	-
Anthracene	0.02 ug/g dry	-	0.28	0.04	-
Benzo [a] anthracene	0.02 ug/g dry	-	1.04	0.16	-
Benzo [a] pyrene	0.02 ug/g dry	-	1.05	0.15	-
Benzo [b] fluoranthene	0.02 ug/g dry	-	1.41	0.20	-
Benzo [g,h,i] perylene	0.02 ug/g dry	-	0.71	0.11	-
Benzo [k] fluoranthene	0.02 ug/g dry	-	0.79	0.09	-
Chrysene	0.02 ug/g dry	-	1.16	0.17	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	-	0.18	0.02	-
Fluoranthene	0.02 ug/g dry	-	1.24	0.26	-
Fluorene	0.02 ug/g dry	-	0.03	<0.02	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	-	0.67	0.08	-
1-Methylnaphthalene	0.02 ug/g dry	-	0.12	0.02	-
2-Methylnaphthalene	0.02 ug/g dry	-	0.18	0.03	-
Methylnaphthalene (1&2)	0.04 ug/g dry	-	0.30	0.06	-
Naphthalene	0.01 ug/g dry	-	0.12	0.02	-
Phenanthrene	0.02 ug/g dry	-	0.42	0.13	-
Pyrene	0.02 ug/g dry	-	1.20	0.23	-
2-Fluorobiphenyl	Surrogate	-	116%	97.9%	-
Terphenyl-d14	Surrogate	-	104%	89.1%	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27119

Report Date: 24-Sep-2019

Order Date: 18-Sep-2019

Project Description: PE4710

	Client ID:	BH5-19-SS1	-	-	-
	Sample Date:	13-Sep-19 09:00	-	-	-
	Sample ID:	1938423-05	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	87.7	-	-	-
Metals					
Antimony	1.0 ug/g dry	<1.0	-	-	-
Arsenic	1.0 ug/g dry	2.0	-	-	-
Barium	1.0 ug/g dry	179	-	-	-
Beryllium	0.5 ug/g dry	<0.5	-	-	-
Boron	5.0 ug/g dry	<5.0	-	-	-
Cadmium	0.5 ug/g dry	<0.5	-	-	-
Chromium	5.0 ug/g dry	53.3	-	-	-
Chromium (VI)	0.2 ug/g dry	<0.2	-	-	-
Cobalt	1.0 ug/g dry	10.8	-	-	-
Copper	5.0 ug/g dry	31.3	-	-	-
Lead	1.0 ug/g dry	67.1	-	-	-
Mercury	0.1 ug/g dry	<0.1	-	-	-
Molybdenum	1.0 ug/g dry	<1.0	-	-	-
Nickel	5.0 ug/g dry	30.1	-	-	-
Selenium	1.0 ug/g dry	<1.0	-	-	-
Silver	0.3 ug/g dry	<0.3	-	-	-
Thallium	1.0 ug/g dry	<1.0	-	-	-
Uranium	1.0 ug/g dry	<1.0	-	-	-
Vanadium	10.0 ug/g dry	49.2	-	-	-
Zinc	20.0 ug/g dry	96.8	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
Conductivity	ND	5	uS/cm						
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	*1.19*		*ug/g*		*88.9*	*50-140*			
Surrogate: Terphenyl-d14	*1.42*		*ug/g*		*106*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*2.58*		*ug/g*		*80.5*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
SAR	0.08	0.01	N/A	0.08			0.0	200	
Conductivity	1260	5	uS/cm	1300			3.8	5	
pH	8.63	0.05	pH Units	8.70			0.8	2.3	
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	14	4	ug/g dry	17			21.7	30	
F3 PHCs (C16-C34)	49	8	ug/g dry	140			96.0	30	QR-04
F4 PHCs (C34-C50)	57	6	ug/g dry	370			147.0	30	QR-04
Metals									
Antimony	ND	1.0	ug/g dry	ND			0.0	30	
Arsenic	7.8	1.0	ug/g dry	8.0			2.3	30	
Barium	96.7	1.0	ug/g dry	96.2			0.5	30	
Beryllium	0.8	0.5	ug/g dry	0.8			7.2	30	
Boron	11.4	5.0	ug/g dry	9.5			18.1	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	22.5	5.0	ug/g dry	22.7			0.8	30	
Cobalt	12.6	1.0	ug/g dry	12.8			1.4	30	
Copper	16.1	5.0	ug/g dry	16.4			1.8	30	
Lead	17.4	1.0	ug/g dry	17.3			0.4	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	30	
Molybdenum	3.1	1.0	ug/g dry	2.8			11.1	30	
Nickel	22.3	5.0	ug/g dry	22.5			1.1	30	
Selenium	ND	1.0	ug/g dry	ND			0.0	30	
Silver	0.3	0.3	ug/g dry	ND			0.0	30	
Thallium	ND	1.0	ug/g dry	ND			0.0	30	
Uranium	1.4	1.0	ug/g dry	1.4			2.3	30	
Vanadium	38.2	10.0	ug/g dry	38.9			1.8	30	
Zinc	72.0	20.0	ug/g dry	73.7			2.3	30	
Physical Characteristics									
% Solids	91.7	0.1	% by Wt.	91.4			0.3	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	ND				40	
Acenaphthylene	ND	0.02	ug/g dry	ND			0.0	40	
Anthracene	ND	0.02	ug/g dry	ND			0.0	40	
Benzo [a] anthracene	ND	0.02	ug/g dry	ND			0.0	40	
Benzo [a] pyrene	ND	0.02	ug/g dry	ND			0.0	40	
Benzo [b] fluoranthene	0.022	0.02	ug/g dry	0.022			0.2	40	
Benzo [g,h,i] perylene	ND	0.02	ug/g dry	ND			0.0	40	
Benzo [k] fluoranthene	ND	0.02	ug/g dry	ND			0.0	40	
Chrysene	0.022	0.02	ug/g dry	0.022			1.9	40	
Dibenzo [a,h] anthracene	ND	0.02	ug/g dry	ND				40	
Fluoranthene	0.031	0.02	ug/g dry	0.033			8.3	40	
Fluorene	ND	0.02	ug/g dry	ND				40	
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g dry	ND			0.0	40	
1-Methylnaphthalene	ND	0.02	ug/g dry	ND			0.0	40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND			0.0	40	
Naphthalene	0.011	0.01	ug/g dry	ND			0.0	40	
Phenanthrene	0.022	0.02	ug/g dry	0.024			8.8	40	
Pyrene	0.030	0.02	ug/g dry	0.033			7.3	40	
Surrogate: 2-Fluorobiphenyl	*1.24*		*ug/g dry*		*82.5*	*50-140*			
Surrogate: Terphenyl-d14	*1.29*		*ug/g dry*		*86.0*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*3.80*		*ug/g dry*		*106*	*50-140*			

Method Quality Control: Spike

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

Method Quality Control: Spike

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

Qualifier Notes:

Login Qualifiers :

Container(s) - Bottle and COC sample ID don't match -
Applies to samples: BH5-19-SS1

QC Qualifiers :

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

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

PARACEL LABORATORIES LTD.

Paracel ID: 1938423

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

Chain of Custody (Lab Use Only)
№ 123221

Page 1 of 1

Client Name: Paterson Group	Project Reference: PE4710
Contact Name: Mark D'Arcy	Quote #
Address: 154 Colonnade Rd. S.	PO # 27119
Telephone: 226-7381	Email Address: mdarcy@patersongroup.ca

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

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

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

Paracel Order Number: 1938423 (corrected to 1938442)

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Date	Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	Electrical conductivity	SAR	pH				
1	BH1-19-SS2	S		1	4 Sept 13/19									✓	✓					
2	BH1-19-SS3	S		1	13/19									ON HOLD						
3	BH2-19-AU1	S		2	"				✓	✓	✓	✓		✓	✓					
4	BH2-19-SS2	S		2	"									ON HOLD						
5	BH3-19-AU1	S		2	"				✓	✓	✓	✓		✓	✓					
6	BH3-19-SS3	S		2	"									ON HOLD						
7	BH3-19-SS4	S		2	"		✓									✓				
8	BH5-19-SS4	S		1	"					✓	✓	✓								
9	BH5-19-SS5	S		1	"									ON HOLD						
10																				

Comments: Lead - SS4

Method of Delivery: Paracel

Relinquished By (Sign): N. Sullivan	Received by Driver/Depot: M. Nicouse	Received at Lab: Dhneepam Dohmai	Verified By: [signature]
Relinquished By (Print): Nick Sullivan	Date/Time: 18/09/19 4:30 PM	Date/Time: SEP 18, 2019 05:41	Date/Time: 9-19-19 13:19
Date/Time: Sept. 17, 2019.	Temperature: °C	Temperature: 19.2 °C	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 27624
Project: PE4710
Custody: 123190

Report Date: 19-Sep-2019
Order Date: 13-Sep-2019

Order #: 1937635

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

Paracel ID	Client ID
1937635-01	BH1-GW1
1937635-02	BH2-GW1

Approved By:

Dale Robertson, BSc
Laboratory Director

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Anions	EPA 300.1 - IC	14-Sep-19	15-Sep-19
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	15-Sep-19	17-Sep-19
Chromium, hexavalent - water	MOE E3056 - colourimetric	19-Sep-19	19-Sep-19
PHC F1	CWS Tier 1 - P&T GC-FID	15-Sep-19	17-Sep-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	18-Sep-19	19-Sep-19
REG 153: Mercury by CVAA	EPA 245.2 - Cold Vapour AA	18-Sep-19	19-Sep-19
REG 153: Metals by ICP/MS, water	EPA 200.8, ICP-MS	19-Sep-19	19-Sep-19
REG 153: PAHs by GC-MS	EPA 625 - GC-MS, extraction	18-Sep-19	18-Sep-19

PARACEL LABORATORIES LTD.

Order #: 1937635

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27624

Report Date: 19-Sep-2019

Order Date: 13-Sep-2019

Project Description: PE4710

	Client ID:	BH1-GW1	BH2-GW1	-	-
	Sample Date:	12-Sep-19 12:00	12-Sep-19 12:00	-	-
	Sample ID:	1937635-01	1937635-02	-	-
	MDL/Units	Water	Water	-	-
Anions					
Chloride	1 mg/L	1530	-	-	-
Metals					
Mercury	0.1 ug/L	<0.1	-	-	-
Antimony	0.500 ug/L	<0.500	-	-	-
Arsenic	1.00 ug/L	<1.00	-	-	-
Barium	1.00 ug/L	147	-	-	-
Beryllium	0.500 ug/L	<0.500	-	-	-
Boron	10.0 ug/L	132	-	-	-
Cadmium	0.200 ug/L	<0.200	-	-	-
Chromium	1.00 ug/L	<1.00	-	-	-
Chromium (VI)	10 ug/L	<10	-	-	-
Cobalt	0.500 ug/L	<0.500	-	-	-
Copper	0.500 ug/L	0.649	-	-	-
Lead	0.200 ug/L	<0.200	-	-	-
Molybdenum	0.500 ug/L	3.52	-	-	-
Nickel	1.00 ug/L	2.80	-	-	-
Selenium	1.00 ug/L	<1.00	-	-	-
Silver	0.200 ug/L	<0.200	-	-	-
Sodium	200 ug/L	617000	-	-	-
Thallium	0.500 ug/L	<0.500	-	-	-
Uranium	0.200 ug/L	2.85	-	-	-
Vanadium	0.500 ug/L	1.93	-	-	-
Zinc	5.00 ug/L	<5.00	-	-	-
Volatiles					
Benzene	0.5 ug/L	<0.5	-	-	-
Ethylbenzene	0.5 ug/L	<0.5	-	-	-
Toluene	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	-	-	-
Toluene-d8	Surrogate	114%	-	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	-	-	-
F2 PHCs (C10-C16)	100 ug/L	2400	-	-	-
F3 PHCs (C16-C34)	100 ug/L	<100	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27624

Report Date: 19-Sep-2019

Order Date: 13-Sep-2019

Project Description: PE4710

	Client ID:	BH1-GW1	BH2-GW1	-	-
	Sample Date:	12-Sep-19 12:00	12-Sep-19 12:00	-	-
	Sample ID:	1937635-01	1937635-02	-	-
	MDL/Units	Water	Water	-	-
F4 PHCs (C34-C50)	100 ug/L	<100	-	-	-
Semi-Volatiles					
Acenaphthene	0.05 ug/L	-	<0.05	-	-
Acenaphthylene	0.05 ug/L	-	<0.05	-	-
Anthracene	0.01 ug/L	-	<0.01	-	-
Benzo [a] anthracene	0.01 ug/L	-	<0.01	-	-
Benzo [a] pyrene	0.01 ug/L	-	<0.01	-	-
Benzo [b] fluoranthene	0.05 ug/L	-	<0.05	-	-
Benzo [g,h,i] perylene	0.05 ug/L	-	<0.05	-	-
Benzo [k] fluoranthene	0.05 ug/L	-	<0.05	-	-
Chrysene	0.05 ug/L	-	<0.05	-	-
Dibenzo [a,h] anthracene	0.05 ug/L	-	<0.05	-	-
Fluoranthene	0.01 ug/L	-	<0.01	-	-
Fluorene	0.05 ug/L	-	<0.05	-	-
Indeno [1,2,3-cd] pyrene	0.05 ug/L	-	<0.05	-	-
1-Methylnaphthalene	0.05 ug/L	-	<0.05	-	-
2-Methylnaphthalene	0.05 ug/L	-	<0.05	-	-
Methylnaphthalene (1&2)	0.10 ug/L	-	<0.10	-	-
Naphthalene	0.05 ug/L	-	<0.05	-	-
Phenanthrene	0.05 ug/L	-	<0.05	-	-
Pyrene	0.01 ug/L	-	<0.01	-	-
2-Fluorobiphenyl	Surrogate	-	69.7%	-	-
Terphenyl-d14	Surrogate	-	111%	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L						
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Metals									
Mercury	ND	0.1	ug/L						
Antimony	ND	0.500	ug/L						
Arsenic	ND	1.00	ug/L						
Barium	ND	1.00	ug/L						
Beryllium	ND	0.500	ug/L						
Boron	ND	10.0	ug/L						
Cadmium	ND	0.200	ug/L						
Chromium (VI)	ND	10	ug/L						
Chromium	ND	1.00	ug/L						
Cobalt	ND	0.500	ug/L						
Copper	ND	0.500	ug/L						
Lead	ND	0.200	ug/L						
Molybdenum	ND	0.500	ug/L						
Nickel	ND	1.00	ug/L						
Selenium	ND	1.00	ug/L						
Silver	ND	0.200	ug/L						
Sodium	ND	200	ug/L						
Thallium	ND	0.500	ug/L						
Uranium	ND	0.200	ug/L						
Vanadium	ND	0.500	ug/L						
Zinc	ND	5.00	ug/L						
Semi-Volatiles									
Acenaphthene	ND	0.05	ug/L						
Acenaphthylene	ND	0.05	ug/L						
Anthracene	ND	0.01	ug/L						
Benzo [a] anthracene	ND	0.01	ug/L						
Benzo [a] pyrene	ND	0.01	ug/L						
Benzo [b] fluoranthene	ND	0.05	ug/L						
Benzo [g,h,i] perylene	ND	0.05	ug/L						
Benzo [k] fluoranthene	ND	0.05	ug/L						
Chrysene	ND	0.05	ug/L						
Dibenzo [a,h] anthracene	ND	0.05	ug/L						
Fluoranthene	ND	0.01	ug/L						
Fluorene	ND	0.05	ug/L						
Indeno [1,2,3-cd] pyrene	ND	0.05	ug/L						
1-Methylnaphthalene	ND	0.05	ug/L						
2-Methylnaphthalene	ND	0.05	ug/L						
Methylnaphthalene (1&2)	ND	0.10	ug/L						
Naphthalene	ND	0.05	ug/L						
Phenanthrene	ND	0.05	ug/L						
Pyrene	ND	0.01	ug/L						
Surrogate: 2-Fluorobiphenyl	*17.6*		*ug/L*		*88.1*	*50-140*			
Surrogate: Terphenyl-d14	*24.3*		*ug/L*		*122*	*50-140*			
Volatiles									
Benzene	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Surrogate: Toluene-d8	*75.2*		*ug/L*		*94.0*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	265	5	mg/L	269			1.5	10	
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Metals									
Mercury	ND	0.1	ug/L	ND			0.0	20	
Antimony	ND	0.500	ug/L	ND			0.0	20	
Arsenic	ND	1.00	ug/L	ND			0.0	20	
Barium	146	2.00	ug/L	147			1.0	20	
Beryllium	ND	0.500	ug/L	ND			0.0	20	
Boron	131	20.0	ug/L	132			1.0	20	
Cadmium	ND	0.200	ug/L	ND			0.0	20	
Chromium (VI)	ND	10	ug/L	ND			0.0	20	
Chromium	ND	1.00	ug/L	ND			0.0	20	
Cobalt	ND	0.500	ug/L	ND			0.0	20	
Copper	0.8	0.500	ug/L	0.6			16.3	20	
Lead	ND	0.200	ug/L	ND				20	
Molybdenum	4.0	0.500	ug/L	3.5			13.2	20	
Nickel	2.8	1.00	ug/L	2.8			0.5	20	
Selenium	ND	1.00	ug/L	ND			0.0	20	
Silver	ND	0.200	ug/L	ND			0.0	20	
Sodium	618000	8000	ug/L	617000			0.1	20	
Thallium	ND	0.500	ug/L	ND			0.0	20	
Uranium	2.9	0.200	ug/L	2.8			3.1	20	
Vanadium	1.9	0.500	ug/L	1.9			0.7	20	
Zinc	ND	5.00	ug/L	ND			0.0	20	
Volatiles									
Benzene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: Toluene-d8	*73.9*		*ug/L*		*92.4*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	9.29	1	mg/L		92.9	85-115			
Hydrocarbons									
F1 PHCs (C6-C10)	1900	25	ug/L		95.2	68-117			
F2 PHCs (C10-C16)	1660	100	ug/L		103	60-140			
F3 PHCs (C16-C34)	4750	100	ug/L		121	60-140			
F4 PHCs (C34-C50)	2990	100	ug/L		120	60-140			
Metals									
Mercury	3.05	0.1	ug/L	ND	102	70-130			
Antimony	42.6	0.500	ug/L	ND	85.2	70-130			
Arsenic	58.7	1.00	ug/L	ND	117	70-130			
Barium	194	1.00	ug/L	147	94.4	70-130			
Beryllium	56.8	0.500	ug/L	ND	114	70-130			
Boron	164	10.0	ug/L	132	62.4	70-130			QM-4X
Cadmium	51.3	0.200	ug/L	ND	103	70-130			
Chromium (VI)	202	10	ug/L	ND	101	70-130			
Chromium	55.5	1.00	ug/L	ND	111	70-130			
Cobalt	52.5	0.500	ug/L	ND	105	70-130			
Copper	51.3	0.500	ug/L	0.6	101	70-130			
Lead	51.6	0.200	ug/L	ND	103	70-130			
Molybdenum	58.1	0.500	ug/L	3.5	109	70-130			
Nickel	53.4	1.00	ug/L	2.8	101	70-130			
Selenium	62.2	1.00	ug/L	ND	124	70-130			
Silver	47.2	0.200	ug/L	ND	94.3	70-130			
Sodium	1190	200	ug/L		119	80-120			
Thallium	52.2	0.500	ug/L	ND	104	70-130			
Uranium	58.2	0.200	ug/L	2.8	111	70-130			
Vanadium	59.2	0.500	ug/L	1.9	115	70-130			
Zinc	70.0	5.00	ug/L	ND	140	70-130			QS-02
Semi-Volatiles									
Acenaphthene	4.51	0.05	ug/L		90.2	50-140			
Acenaphthylene	3.95	0.05	ug/L		79.1	50-140			
Anthracene	3.88	0.01	ug/L		77.6	50-140			
Benzo [a] anthracene	3.95	0.01	ug/L		79.0	50-140			
Benzo [a] pyrene	3.42	0.01	ug/L		68.4	50-140			
Benzo [b] fluoranthene	6.02	0.05	ug/L		120	50-140			
Benzo [g,h,i] perylene	3.86	0.05	ug/L		77.2	50-140			
Benzo [k] fluoranthene	5.93	0.05	ug/L		119	50-140			
Chrysene	4.22	0.05	ug/L		84.4	50-140			
Dibenzo [a,h] anthracene	4.33	0.05	ug/L		86.7	50-140			
Fluoranthene	4.47	0.01	ug/L		89.5	50-140			
Fluorene	4.06	0.05	ug/L		81.2	50-140			
Indeno [1,2,3-cd] pyrene	4.19	0.05	ug/L		83.9	50-140			
1-Methylnaphthalene	3.10	0.05	ug/L		62.1	50-140			
2-Methylnaphthalene	3.43	0.05	ug/L		68.6	50-140			
Naphthalene	4.34	0.05	ug/L		86.7	50-140			
Phenanthrene	3.41	0.05	ug/L		68.2	50-140			
Pyrene	4.44	0.01	ug/L		88.8	50-140			
Surrogate: 2-Fluorobiphenyl	*14.8*		*ug/L*		*73.9*	*50-140*			
Volatiles									
Benzene	29.1	0.5	ug/L		72.7	60-130			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Ethylbenzene	36.1	0.5	ug/L		90.2	60-130			
Toluene	37.4	0.5	ug/L		93.5	60-130			
m,p-Xylenes	78.0	0.5	ug/L		97.6	60-130			
o-Xylene	40.0	0.5	ug/L		100	60-130			

Qualifier Notes:

QC Qualifiers :

QM-4X : The spike recovery was outside of QC acceptance limits due to elevated analyte concentration.

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

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

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

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Paracel ID: 1937635

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racel@paracellabs.com

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№ 123190

Page 1 of 1

Client Name: Peterson	Project Reference: PE4710	**Turnaround Time:**
Contact Name: Mark D'Arcy	Quote #	☐ 1 Day ☐ 3 Day
Address: 154 Colonnade Road	PO # 27624	☐ 2 Day ☑ Regular
Telephone: 226 7381	Email Address: MDarcy@peterson-group.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: 1937635

	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)	Chloride						
1	BH1-GW1	W		7	12 Sept	PM	✓			✓	✓	✓		✓						
2	BH2-GW1	W		1	12 Sept	12:00			✓											
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: A. Flouse	Received at Lab: Jinnefarm Rahmani
Relinquished By (Print): PHILIP PRICE	Date/Time: 19/09/19 1230	Date/Time: SEP 13,2019 01:20
Date/Time: 12 Sept 2019 2:30pm	Temperature: 13 °C FH	Temperature: 10.8°C
		Verified By: BJam
		Date/Time: 09/13/19 13:09
		pH Verified ☐ By: B.J

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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: 27502
Project: PE4710
Custody: 123252

Report Date: 27-Sep-2019
Order Date: 25-Sep-2019

Order #: 1939396

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

Paracel ID	Client ID
1939396-01	BH1-GW2

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27502

Report Date: 27-Sep-2019
Order Date: 25-Sep-2019
Project Description: PE4710

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	26-Sep-19	27-Sep-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27502

Report Date: 27-Sep-2019

Order Date: 25-Sep-2019

Project Description: PE4710

	Client ID:	BH1-GW2	-	-	-
	Sample Date:	24-Sep-19 12:40	-	-	-
	Sample ID:	1939396-01	-	-	-
	MDL/Units	Water	-	-	-
Hydrocarbons					
F2 PHCs (C10-C16)	100 ug/L	<100	-	-	-
F3 PHCs (C16-C34)	100 ug/L	<100	-	-	-
F4 PHCs (C34-C50)	100 ug/L	<100	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F2 PHCs (C10-C16)	1450	100	ug/L		90.4	60-140			
F3 PHCs (C16-C34)	4200	100	ug/L		107	60-140			
F4 PHCs (C34-C50)	2490	100	ug/L		101	60-140			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

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

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Paracel ID: 1939396

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el@paracellabs.com

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.Nº 123252

Page 1 of 1

Client Name: Paterson Group	Project Reference: PE 4710	**Turnaround Time:**	
Contact Name: Mark D'Arcy	Quote #	☐ 1 Day	☐ 3 Day
Address: 154 Colonnade Rd, Nepean, on	PO # 27502	☑ 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: 1939396

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F2-F4	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)							
1	BH1 - GW2	GW		1	Sept 24/19	12:40PM	✓													✓
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: T. Louie	Received at Lab: Dumai	Verified By: Bjorn
Relinquished By (Print): Nicholas Doucette	Date/Time: 25/09/19 3:40 PM	Date/Time: Sept 25, 2019 04:40	Date/Time: 09/25/19 18:18
Date/Time:	Temperature: °C	Temperature: 13.7 °C	pH Verified [ ] By: NA

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 27701
Project: PE4710
Custody: 123240

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

Order #: 1938545

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

Paracel ID	Client ID
1938545-01	BH3-19-GW1

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27701

Report Date: 25-Sep-2019
Order Date: 19-Sep-2019
Project Description: PE4710

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	20-Sep-19	24-Sep-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27701

Report Date: 25-Sep-2019

Order Date: 19-Sep-2019

Project Description: PE4710

	Client ID:	BH3-19-GW1	-	-	-
	Sample Date:	19-Sep-19 00:00	-	-	-
	Sample ID:	1938545-01	-	-	-
	MDL/Units	Water	-	-	-
Hydrocarbons					
F2 PHCs (C10-C16)	100 ug/L	<100	-	-	-
F3 PHCs (C16-C34)	100 ug/L	<100	-	-	-
F4 PHCs (C34-C50)	100 ug/L	<100	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F2 PHCs (C10-C16)	1420	100	ug/L		88.8	60-140			
F3 PHCs (C16-C34)	4180	100	ug/L		107	60-140			
F4 PHCs (C34-C50)	2320	100	ug/L		93.5	60-140			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

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

Paracel ID: 1938545

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Page 1 of 1

Client Name: Paterson Group	Project Reference: PE 4710
Contact Name: Mark D'Arcy	Quote #
Address: 154 Colonnade Rd, Nepean, On	PO # 27701
Telephone: 613-226-7381	Email Address: mdarcy@patersongroup.ca

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

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

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

Paracel Order Number: 1938545

	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)	Required Analyses
1	BH3-19-GW1	GW		1	Sept 19/19	10:30 AM	✓							
2														
3														
4														
5														
6														
7														
8														
9														
10														

Comments: F2-F4 only as per Mark. SC.

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot:	Received at Lab:	Verified By:
Relinquished By (Print): Nicholas Doucette	Date/Time: 19/09/19 3:40 PM	Date/Time: Sept 19 2019 04:30	Date/Time: Sept 19/19 5:38p
Date/Time:	Temperature: °C	Temperature: 18.1 °C	pH Verified ☐ By: N/A

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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: 27697
Project: PE4710
Custody: 123222

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

Order #: 1938425

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

Paracel ID	Client ID
1938425-01	BH2-19-GW1
1938425-02	BH3-19-GW1

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27697

Report Date: 24-Sep-2019
Order Date: 18-Sep-2019
Project Description: PE4710

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Anions	EPA 300.1 - IC	20-Sep-19	20-Sep-19
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	21-Sep-19	21-Sep-19
Metals, ICP-MS	EPA 200.8 - ICP-MS	23-Sep-19	23-Sep-19
PHC F1	CWS Tier 1 - P&T GC-FID	20-Sep-19	21-Sep-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27697

Report Date: 24-Sep-2019

Order Date: 18-Sep-2019

Project Description: PE4710

	Client ID:	BH2-19-GW1	BH3-19-GW1	-	-
	Sample Date:	17-Sep-19 10:15	17-Sep-19 11:30	-	-
	Sample ID:	1938425-01	1938425-02	-	-
	MDL/Units	Water	Water	-	-
Anions					
Chloride	1 mg/L	426	-	-	-
Metals					
Sodium	200 ug/L	260000	-	-	-
Volatiles					
Benzene	0.5 ug/L	-	<0.5	-	-
Ethylbenzene	0.5 ug/L	-	<0.5	-	-
Toluene	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	-	-
Toluene-d8	Surrogate	-	88.1%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	-	<25	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L						
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
Metals									
Sodium	ND	200	ug/L						
Volatiles									
Benzene	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: Toluene-d8	*75.1*		*ug/L*		*93.8*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	667	10	mg/L	668			0.2	10	
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Metals									
Sodium	76200	200	ug/L	78500			3.0	20	
Volatiles									
Benzene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: Toluene-d8	*71.7*		*ug/L*		*89.7*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	9.22	1	mg/L		92.2	85-115			
Hydrocarbons									
F1 PHCs (C6-C10)	1550	25	ug/L		77.6	68-117			
Metals									
Sodium	84400		ug/L	78500	58.7	80-120			QM-07
Volatiles									
Benzene	35.1	0.5	ug/L		87.8	60-130			
Ethylbenzene	32.0	0.5	ug/L		80.0	60-130			
Toluene	33.6	0.5	ug/L		84.1	60-130			
m,p-Xylenes	70.7	0.5	ug/L		88.4	60-130			
o-Xylene	33.5	0.5	ug/L		83.8	60-130			
Surrogate: Toluene-d8	*66.7*		*ug/L*		*83.3*	*50-140*			

Qualifier Notes:

QC Qualifiers :

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

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

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

Paracel ID: 1938425

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paracel@paracellabs.com

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Nº 123222

Page 1 of 1

Client Name: Paterson Group	Project Reference: PE 4710		**Turnaround Time:**
Contact Name: Mark D'Arcy	Quote #		☐ 1 Day ☐ 3 Day
Address: 154 Colonnade Rd, Nepean, On	PO # 27697		☐ 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: 1938425

	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)	Conductivity	Chloride	Sodium				
1	BH2-19-GW1	GW		2	Sept 17/19	10:15AM				✓				✓	✓	✓				
2	BH3-19-GW1	GW		2	Sept 17/19	11:30AM	✓													
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Parcel

Relinquished By (Sign): [signature]	Received by Driver/Depot: M. Krause	Received at Lab: Suneet Dhamal	Verified By: [signature]
Relinquished By (Print): Nicholas Doucette	Date/Time: 18/09/19 4:30 PM	Date/Time: 09/18/2019 05:40	Date/Time: Sept 19/19
Date/Time:	Temperature:	Temperature: 12.2 °C	pH Verified ☐ By: SC

10:49a