paterson group

Consulting Engineers

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

Geotechnical Engineering
Environmental Engineering
Hydrogeology
Geological Engineering
Materials Testing
Building Science
Archaeological Services

www.patersongroup.ca

January 31, 2018
File: PE4215-LET.01

Mr. Loutfi Frangian
3047 Courtyard Crescent
Ottawa, Ontario
K1T 3R7

Attention: **Mr. Loutfi Frangian**

Subject: **Phase II – Environmental Site Assessment**
3996 and 3998 Innes Road
Ottawa, Ontario

Dear Sir,

Further to your request and authorization, Paterson Group (Paterson) carried out a Phase II - Environmental Site Assessment (ESA) for the aforementioned site. The results of the Phase II - ESA are summarized in the following report.

Background Information

The subject site is currently developed with a duplex residential building. The building is a single storey with a full basement level and sloped and shingled roof. The subject site is currently serviced with municipal water and sewer.

The subject site is situated on the south side of Innes Road, east of the intersection with Mer Bleue Road. The surrounding properties consist of residential and commercial properties.

A retail fuel outlet is situated approximately 50 m to the east of the subject site, although the pump island and tanks are located at least 75 m and 100 m away from the subject site, respectively. Based on the distance of the fueling equipment from the subject site, it was our opinion that the retail fuel outlet did not have the potential to impact the subject land. The client, however, requested that a Phase II ESA be conducted for due diligence purposes in conjunction with the geotechnical investigation.

Subsurface Investigation

Three (3) boreholes (BH1, BH2, and BH3) were placed on the subject property on January 26, 2018. The boreholes were extended to the bedrock surface, ranging in depth from 2.1 m to 3.0 m below ground surface. The boreholes were completed using a drilling contractor under the full time supervision of Paterson personnel. The locations of the boreholes are illustrated on the enclosed Test Hole Location Plan. The depths at which the split spoon samples were obtained from the test holes are shown as **"SS"** on the Soil Profile and Test Data sheets, attached to this report.

Monitoring Well Installation

Groundwater monitoring wells were installed in two of the boreholes (BH1 and BH2), the locations of which can be seen on the attached Test Hole Location Plan. Typical monitoring well construction details are described below:

- Slotted 32 or 51 mm diameter PVC screen at base of borehole.
- 32 or 51 mm diameter PVC riser pipe from the top of the screen to ground surface.
- No.3 silica sand backfill within annular space around screen.
- Bentonite above sand pack to just below ground surface.
- Flushmount cap at ground surface.

Refer to the Soil Profile and Test Data sheets attached for the actual well construction details.

Survey

Test hole locations and ground surface elevations were determined by Paterson personnel. Elevations were measured to a temporary benchmark (TBM) with an arbitrarily assigned elevation of 100.00 m. The TBM is a fire hydrant located on the south side of Innes Road, in front of the property addressed 4030 Innes Road, approximately 45 m to the east of the subject site.

Soil Sampling Protocol

A total of eighteen (18) soil samples were recovered from the test holes by means of stainless steel split spoon sampling. Upon recovery, all samples were immediately sealed in appropriate containers to facilitate a preliminary screening procedure.

Soil Sample Headspace Analysis

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

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

An RKI Eagle (gastech) calibrated to hexane was used to measure the combustible vapour concentrations in the headspace of all soil samples recovered from the environmental boreholes. To measure the soil vapours, the analyser probe is inserted into the nominal headspace above the soil sample. The sample is agitated/manipulated gently as the measurement is taken. The peak reading registered within the first 15 seconds is recorded as the vapour measurement. The parts per million (ppm) scale is used to measure concentrations of hydrocarbon vapours that are too low to register on the Lower Explosive Limit (LEL) scale. The explosive point, 100% LEL, represents the leanest mixture which will burn (or explode) if ignited.

The combustible vapour readings were found to range from 0 to 35 ppm in the soil samples obtained. These vapour readings are considered to be indicative of normal background concentrations. The results of the vapour survey are presented on the Soil Profile and Test Data sheets.

Subsurface Profile

The soil profile encountered in the boreholes consisted of a layer of topsoil underlain by native brown silty clay/clayey silt with trace gravel and sand. Some fill was identified in BH1. The specific details of the soil profile at the test hole locations are presented on the attached Soil Profile and Test Data sheets.

Groundwater

Paterson returned to site on January 29, 2018 in order to obtain groundwater levels and to collect groundwater samples from the monitoring wells installed during the Phase II ESA field program.

The groundwater levels were found to range from 1.7 to 2.5 m below the existing ground surface in the above noted boreholes. It should be noted that groundwater levels are expected to fluctuate throughout the year with seasonal variations. Although the groundwater elevations did not identify the groundwater flow direction (the water levels were not considered to have stabilized), the groundwater flow direction is expected to be in a northerly direction, towards Bilberry Creek, placing the retail fuel outlet cross-gradient with respect to the subject site.

During the sampling program no hydrocarbon odour was noted in any of the boreholes.

Analytical Test Results

Soil and Groundwater Standards

The soil and groundwater standards for the subject site 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*", dated April 15, 2011. The MOECC Standards are based on the following considerations:

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

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

Soil

Two (2) soil samples were submitted to Paracel Laboratories for analysis of benzene, toluene, ethylbenzene, and xylenes (BTEX) and petroleum hydrocarbons (PHCs, fractions 1 to 4). The results of the analytical testing, and the selected soil standards, are presented in Table 1. A copy of the laboratory certificate of analysis is attached to this report.

Table 1
Analytical Test Results – Soil
BTEX and PHCs (Fractions 1 to 4)

Parameter	MDL (µg/g)	Soil Samples – January 26, 2018		MOECC Table 3 Residential Standards (µg/g)
		BH1-SS4	BH2-SS5	
Benzene	0.02	nd	nd	0.21
Toluene	0.05	nd	nd	2.3
Ethylbenzene	0.05	nd	nd	2
Xylenes	0.05	nd	nd	3.1
F_1 PHCs (C_6-C_{10})	7	nd	nd	55
F_2 PHCs (C_{10}-C_{16})	4	nd	nd	98
F_3 PHCs (C_{16}-C_{34})	8	nd	nd	300
F_4 PHCs (C_{34}-C_{50})	6	nd	nd	2800

Notes:
- MDL - Method Detection Limit
- nd - Not Detected (< MDL)
- Bold and underlined - indicates sample exceeds selected MOECC Standards

No PHC or BTEX parameters were detected in the soil samples analysed. The soil concentrations are in compliance with the selected MOECC Standards.

Groundwater

A groundwater sample was collected from the monitoring well in BH1 on January 29, 2018. The water sample was submitted for PHC and BTEX analysis. The results of the analytical testing, and the selected groundwater standards, are presented in Table 2. A copy of the laboratory certificate of analysis is attached to this report.

Table 2
Analytical Test Results - Groundwater
BTEX and PHCs (Fractions 1 to 4)

Parameter	MDL (ug/L)	Groundwater Sample Date	MOECC Table 3 Residential Standards (µg/L)
		January 29, 2017	
		BH1-GW1	
Benzene	0.5	nd	44
Toluene	0.5	nd	18,000
Ethylbenzene	0.5	nd	2,300
Xylenes	0.5	nd	4,200
F1 PHCs (C_6-C_{10})	25	nd	750
F2 PHCs (C_{10}-C_{16})	100	nd	150
F3 PHCs (C_{16}-C_{34})	100	nd	500
F4 PHCs (C_{34}-C_{50})	100	nd	500

Notes:
- MDL - Method Detection Limit
- nd - Not Detected (< MDL)
- Bold and underlined - Value exceeds selected MOECC Standard

No detectable concentrations of any PHC or BTEX parameters were identified in the groundwater sample. All PHC and BTEX parameters are in compliance with the selected MOECC Standards.

Assessment and Recommendations

Assessment

A Phase II-ESA was conducted on the subject property in order to confirm that the retail fuel outlet to the east of the subject site had not had any impact on the subject site.

Soil

Three (3) boreholes were placed on the subject property on January 26, 2018. Two (2) of the boreholes were instrumented with groundwater monitoring wells.

Two (2) soil samples, one each from BH1 and BH2, were submitted to Paracel Laboratories for PHCs and BTEX analysis. No detectable concentrations of any of the parameters were identified in the samples. All PHCs and BTEX parameter concentrations are in compliance with the selected MOECC Standards.

Groundwater

A groundwater sample from BH1 was collected on January 29, 2018 and was submitted for PHCs and BTEX analysis. No detectable concentrations of any of the parameters were identified in the sample. All PHCs and BTEX parameter concentrations are in compliance with the selected MOECC Standards. The results do not indicate any impact on the subject land from petroleum hydrocarbons.

Statement of Limitations

This Phase II - Environmental Site Assessment letter has been prepared in general accordance with 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. 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.

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 described by the test holes themselves.

This report was prepared for the use of Mr. Loutfi Frangian. Permission from Paterson and Mr. Frangian will be required to release this report to any other party.

We trust that this report satisfies your requirements.

Paterson Group Inc.

Anna Graham, M.E.S.

Mark S. D'Arcy, P.Eng

Report Distribution

- Mr. Loutfi Frangian (2 copies)
- Paterson Group (1 copy)

Attachments

- Soil Profile and Test Data Sheets
- Symbols and Terms
- Analytical Test Results
- Drawing No. PE4215-3 - Test Hole Location Plan

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
3996 Innes Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located in front of 4030 Innes Road. Assumed elevation = 100.00m.

FILE NO. PE4215

REMARKS

HOLE NO. BH 1

BORINGS BY Geoprobe **DATE** January 26, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	98.36
TOPSOIL							
0.30		AU	1				
POSSIBLE FILL: Brown silty clay, trace sand and gravel		SS	2	4	W	1	97.36
		SS	3	4	W		
1.83							
Stiff, brown **SILTY CLAY,** trace sand		SS	4	50	9	2	96.36
2.29							
End of Borehole							
Practical refusal to augering at 2.29m depth							
(GWL @ 1.71m - Jan. 29, 2018)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
3996 Innes Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located in front of 4030 Innes Road. Assumed elevation = 100.00m.

FILE NO. PE4215

REMARKS

HOLE NO. BH 1B

BORINGS BY Geoprobe **DATE** January 26, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	98.28		
TOPSOIL									
0.30		SS	1	4	W				
POSSIBLE FILL: Brown silty clay, trace sand and gravel		SS	2	19	2	1	97.28		
		SS	3	74	8				
2.06						2	96.28		
Stiff, brown **SILTY CLAY,** trace sand 2.16									
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.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
3996 Innes Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located in front of 4030 Innes Road. Assumed elevation = 100.00m.

FILE NO. PE4215

REMARKS

HOLE NO. BH 2

BORINGS BY Geoprobe **DATE** January 26, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	98.05
TOPSOIL		AU	1				
0.30							
Stiff, brown **SILTY CLAY,** trace sand		SS	2	100	9	1	97.05
		SS	3	100	9		
1.98						2	96.05
GLACIAL TILL: Brown silty clay, some sand, trace gravel, possible cobbles		SS	4	42	13		
		SS	5	100	50+		
2.67							
End of Borehole							
(GWL @ 2.47m - Jan. 29, 2018)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
3996 Innes Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located in front of 4030 Innes Road. Assumed elevation = 100.00m.

FILE NO. PE4215

REMARKS

HOLE NO. BH 3

BORINGS BY Geoprobe **DATE** January 26, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	98.37		
TOPSOIL 0.30									
Loose, brown **SILTY SAND,** trace organics 0.84		SS	1	42					
Stiff, brown **SILTY CLAY,** trace sand 1.22		SS	2	100	8	1	97.37		
Very loose, brown **SILTY SAND** 1.45		SS	3	100	W				
Brown **SILTY CLAY,** trace sand 2.44		SS	4	100	10	2	96.37		
GLACIAL TILL: Brown silty clay, trace sand, gravel, possible cobbles 3.02		SS	5	61	11	3	95.37		
End of Borehole Practical refusal to augering at 3.02m depth									

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

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

▲ Full Gas Resp. △ Methane Elim.

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

The standard terminology to describe the strength of cohesionless soils is the relative density, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm.

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

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their “sensitivity”. The sensitivity is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil.

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube
PS	-	Piston sample
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size AXT, BXL, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

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

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

CONSOLIDATION TEST

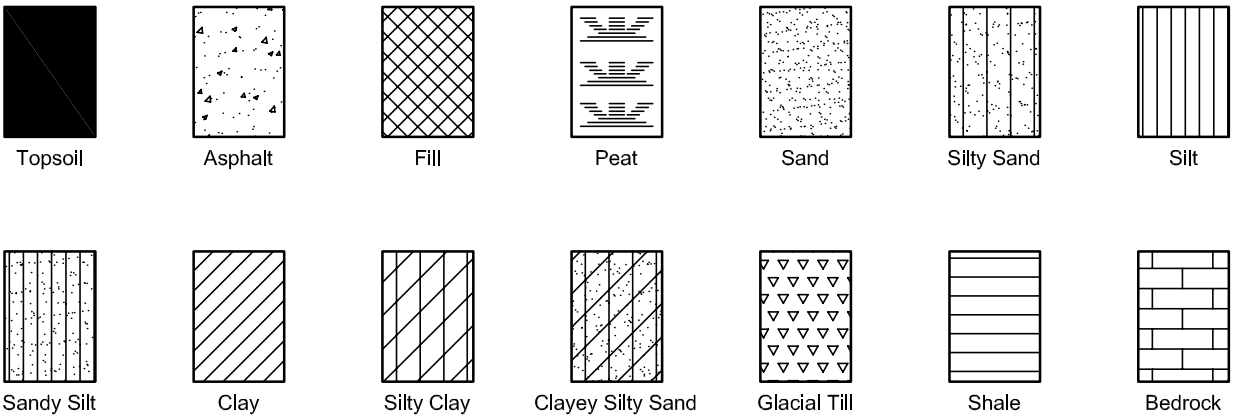
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

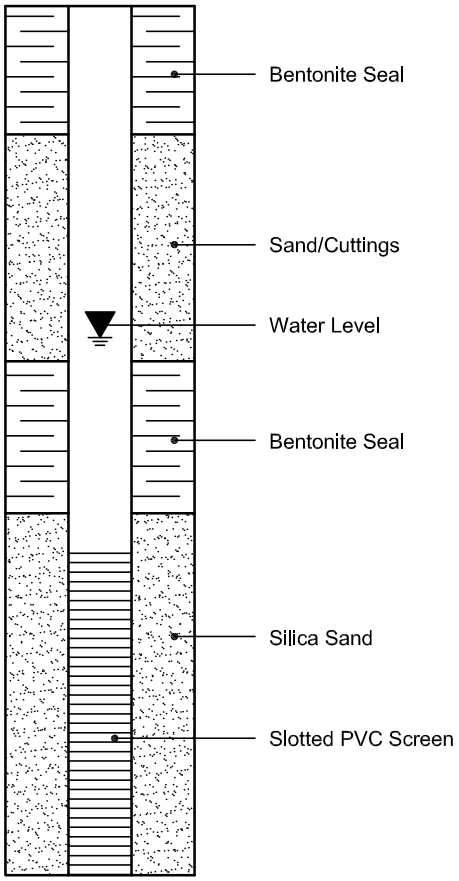
SYMBOLS AND TERMS (continued)

STRATA PLOT

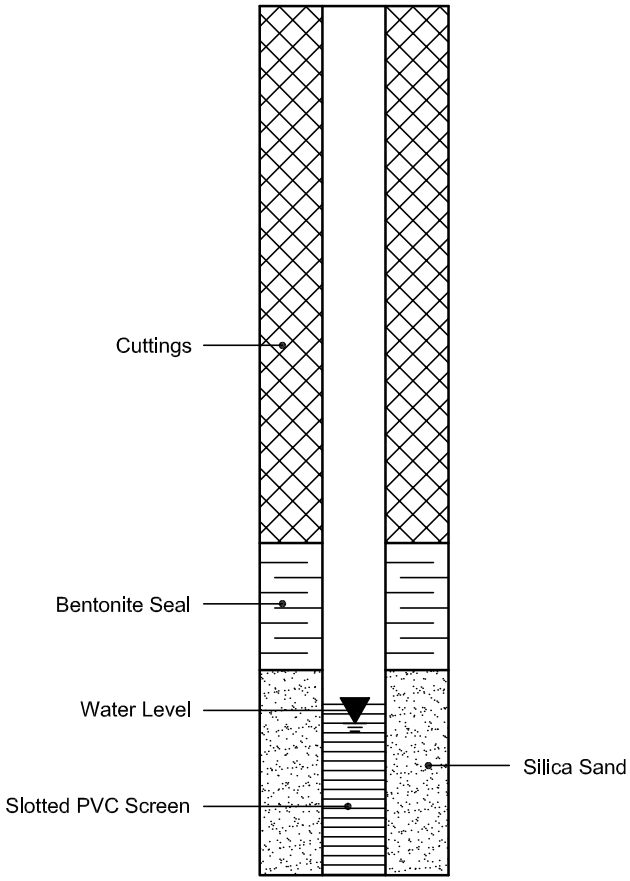


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



PARACEL LABORATORIES LTD.
TRUSTED. RESPONSIVE. RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 23201
Project: PE4125
Custody: 114243

Report Date: 31-Jan-2018
Order Date: 26-Jan-2018

Order #: 1804459

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

Paracel ID	Client ID
1804459-01	BH1-SS4
1804459-02	BH2-SS5

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23201

Report Date: 31-Jan-2018
Order Date: 26-Jan-2018
Project Description: PE4125

Analysis Summary Table

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

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23201

Report Date: 31-Jan-2018
Order Date: 26-Jan-2018
Project Description: PE4125

	Client ID:	BH1-SS4	BH2-SS5	-	-
	Sample Date:	26-Jan-18	26-Jan-18	-	-
	Sample ID:	1804459-01	1804459-02	-	-
	MDL/Units	Soil	Soil	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	68.4	98.5	-	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	-	-
Toluene	0.05 ug/g dry	<0.05	<0.05	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	-	-
o-Xylene	0.05 ug/g dry	<0.05	<0.05	-	-
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	-	-
Toluene-d8	Surrogate	55.3%	55.4%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	-	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	-	-
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	-	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	-	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23201

Report Date: 31-Jan-2018
Order Date: 26-Jan-2018
Project Description: PE4125

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*7.80*		*ug/g*		*97.5*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	23			0.0	40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND				30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND				30	
Physical Characteristics									
% Solids	87.9	0.1	% by Wt.	97.6			10.4	25	
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*6.11*		*ug/g dry*		*54.8*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	94	7	ug/g		94.4	80-120			
F2 PHCs (C10-C16)	92	4	ug/g	ND	86.0	60-140			
F3 PHCs (C16-C34)	229	8	ug/g	ND	103	60-140			
F4 PHCs (C34-C50)	162	6	ug/g	ND	109	60-140			
Volatiles									
Benzene	0.627	0.02	ug/g		94.4	60-130			
Ethylbenzene	0.864	0.05	ug/g		92.6	60-130			
Toluene	21.7	0.05	ug/g		124	60-130			
m,p-Xylenes	3.11	0.05	ug/g		92.8	60-130			
o-Xylene	1.45	0.05	ug/g		101	60-130			
Surrogate: Toluene-d8	*8.18*		*ug/g*		*102*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

PARACEL LABORATORIES LTD.

TRUSTED . RESPONSIVE . RELIABLE .

Paracel ID: 1804459

Chain of Custody (Lab Use Only)

№ 114243

Page 1 of 1

Client Name: Paterson Group	Project Reference: PE4215	**Turnaround Time:**	
Contact Name: Mark Darcy	Quote #	☐ 1 Day	☐ 3 Day
Address: 154 Colonnade Rd S,	PO # 23201	☐ 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: 1804459

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)							
1	BH1-SS4	S		2	Jan 26, 2018	-	X									120	trial			
2	BH2-SS5	S		2	↓	-	X									"				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Paracel.

Relinquished By (Sign):	Received by Driver/Depot:	Received at Lab:	Verified By:
Relinquished By (Print): ERIN ARDLEY	Date/Time: 26/01/18 2:50	Date/Time: Jan 26/18	Date/Time: 01/26/18 4:21 PM
Date/Time: Jan 26, 2018	Temperature: °C	Temperature: 12.1 °C 4:18	pH Verified [ ] By:

PARACEL LABORATORIES LTD.
TRUSTED. RESPONSIVE. RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 23340
Project: PE4215
Custody: 115541

Report Date: 31-Jan-2018
Order Date: 29-Jan-2018

Order #: 1805076

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

Paracel ID	Client ID
1805076-01	BH1-GW1

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23340

Report Date: 31-Jan-2018
Order Date: 29-Jan-2018
Project Description: PE4215

Analysis Summary Table

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

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 23340

Report Date: 31-Jan-2018

Order Date: 29-Jan-2018

Project Description: PE4215

	Client ID:	BH1-GW1	-	-	-
	Sample Date:	29-Jan-18	-	-	-
	Sample ID:	1805076-01	-	-	-
	MDL/Units	Water	-	-	-
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	107%	-	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	-	-	-
F2 PHCs (C10-C16)	100 ug/L	<100	-	-	-
F3 PHCs (C16-C34)	100 ug/L	<100	-	-	-
F4 PHCs (C34-C50)	100 ug/L	<100	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Volatiles									
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	*89.4*		*ug/L*		*112*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Volatiles									
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	*87.3*		*ug/L*		*109*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1940	25	ug/L		96.9	68-117			
F2 PHCs (C10-C16)	1590	100	ug/L		88.5	60-140			
F3 PHCs (C16-C34)	3550	100	ug/L		95.5	60-140			
F4 PHCs (C34-C50)	3000	100	ug/L		121	60-140			
Volatiles									
Benzene	34.4	0.5	ug/L		86.1	60-130			
Ethylbenzene	38.0	0.5	ug/L		94.9	60-130			
Toluene	34.6	0.5	ug/L		86.4	60-130			
m,p-Xylenes	75.8	0.5	ug/L		94.8	60-130			
o-Xylene	38.4	0.5	ug/L		96.0	60-130			
Surrogate: Toluene-d8	*80.2*		*ug/L*		*100*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

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

PARACEL LABORATORIES LTD.

TRUSTED . RESPONSIVE . RELIABLE .

Paracel ID: 1805076

Chain of Custody
(Lab Use Only)
№ 115541

Page 1 of 1

Client Name: PATERSON GROUP	Project Reference: PE 4215
Contact Name: ADRIAN MENKHART	Quote #
Address: 154 COLONNADE RD S.	PO # 23340
Telephone: 613-226-7381	Email Address: amenkhart@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: 1805076

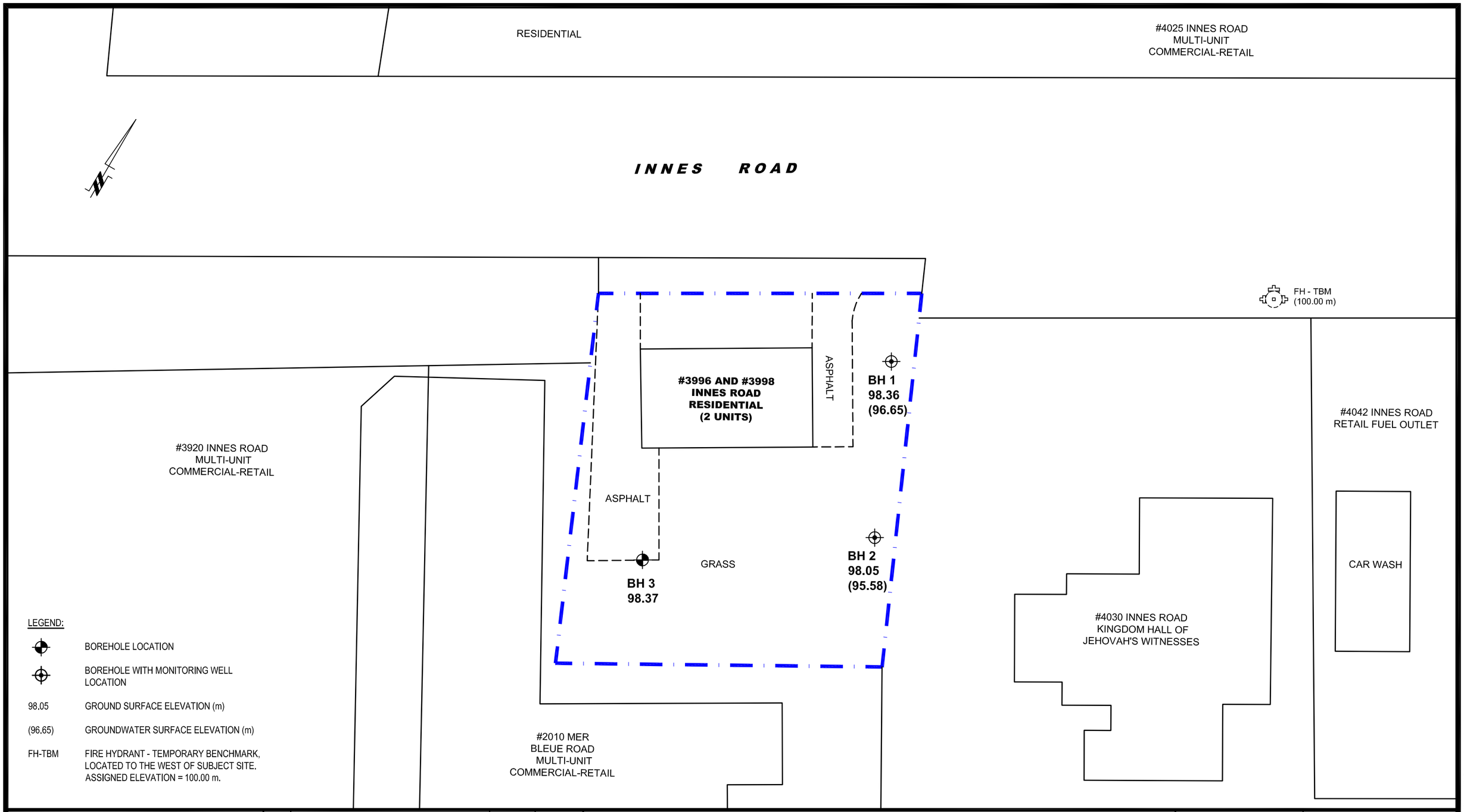
	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)							
1	BH1-GW1	GW		3	Jan 29/18	12PM	✓													✓
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Required Analyses

Comments:

Method of Delivery: Walk-in

Relinquished By (Sign):	Received by Driver/Depot:	Received at Lab:	Verified By:
Relinquished By (Print): ADRIAN M	Date/Time:	Date/Time: Jan 29/18	Date/Time: 01/29/18 1:46pm
Date/Time: Jan 29 2018	Temperature: °C	Temperature: 7.5 °C 1:42p	pH Verified [ ] By:



LEGEND:

⊕	BOREHOLE LOCATION
⊕	BOREHOLE WITH MONITORING WELL LOCATION
98.05	GROUND SURFACE ELEVATION (m)
(96.65)	GROUNDWATER SURFACE ELEVATION (m)
FH-TBM	FIRE HYDRANT - TEMPORARY BENCHMARK, LOCATED TO THE WEST OF SUBJECT SITE. ASSIGNED ELEVATION = 100.00 m.

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL
0			

MR. LOUTFI FRANGIAN

PHASE I - ENVIRONMENTAL SITE ASSESSMENT
3996 AND 3998 INNES ROAD
OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:600	Date: 01/2018
Drawn by: AG	Report No.: PE4215-1
Checked by: AG	Dwg. No.: PE4215-3
Approved by: MSD	Revision No.: 0

p:\autocad drawings\environmental\pe42xx\pe4215-3 - test hole location plan.dwg