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August 7, 2018
File: PE4378-LET.01

Hadwen Properties Limited
c/o The Properties Group
236 Metcalfe Street
Ottawa, Ontario
K2P 1R3

Attention: **Tim Eberts**

Subject: **Phase II - Environmental Site Assessment**
1987 Robertson Road
Ottawa, Ontario

Dear Sir,

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

1.0 Background Information

The Phase II ESA Property is designated as the southern part of the property, addressed 1987 Robertson Road, in the City of Ottawa, Ontario. The subject site is occupied by a large storage/warehouse style building, a gravelled laneway around the exterior of the building and is grass covered in the remaining area. The Phase II ESA Property is presented in Drawing PE4378-2 – Test Hole Location Plan, appended to this report.

2.0 Previous Engineering Report

The following report was reviewed prior to conducting this assessment:

- "Phase I, II - Environmental Site Assessment, 3818 Richmond Road, Ottawa," prepared by Paterson Group, dated March 2012.

A change in address has since been made for this Phase I, II – ESA property to 1987 Robertson Road. The report indicated that the property has most recently been used as a lumber supply business. While no specific concerns were identified, the general use of the land was considered to warrant the completion of a limited Phase II – ESA, which Paterson subsequently completed. The results of the Phase II ESA did identify some

limited impacted soil in the northwest corner of the site from the former railway spurline, but no grass contamination.

3.0 Subsurface Investigation

As part of the field program, eight (8) boreholes (BH1 to BH8) were placed on the Phase II Property on July 12, 2018. The boreholes were conducted using a truck mounted drill rig under the full-time supervision of Paterson personnel.

Five (5) boreholes (BH1, and BH3-BH6) were placed along the outside perimeter of the large storage/warehouse style building – one (1) on the east side, two (2) on the south side and two (2) on the north side of the warehouse. Two (2) boreholes (BH7 and BH8) were placed along the north east portion of the subject site, and borehole (BH2) was placed along south of borehole (BH6). Two (2) of the boreholes (BH5 and BH6) were equipped with groundwater monitoring wells.

Boreholes 1 through 3 (BH1-BH3 and HB8) were terminated on the inferred bedrock surface at depths ranging from 1.8 to 2.4 m below the existing grade. Boreholes BH5 and BH6 were subsequently advanced to depths of 7.2 m and 6.3 m below ground surface by means of coring the bedrock, in order to intercept the groundwater table. The locations of the boreholes are illustrated on the enclosed Test Hole Location Plan.

The depths at which the auger, split spoon and rock core samples were obtained from the test holes are shown as **"AU"**, **"SS"** and **"RC"** on the Soil Profile and Test Data sheets, attached to this report.

Subsurface Profile

The soil profile encountered within the boreholes consisted of a layer of fill that was comprised of silty-sand and gravel, underlain by a layer of silty-clay, and glacier till or bedrock. The specific details of the soil profile at the test hole locations are presented on the attached Soil Profile and Test Data sheets.

Monitoring Well Installation

Groundwater monitoring wells were installed in BH5 and BH6, the location of which can be seen on the attached Test Hole Location Plan. Typical monitoring well construction details are described below:

- Slotted 32 mm diameter PVC screen at base of borehole.
- 32 mm diameter PVC riser pipe from the top of the screen to ground surface.
- No.3 silica sand backfilled within annular space around screen.

- Bentonite above sand pack to just below ground surface.
- Clean backfill from top of bentonite plug to the ground surface.

Refer to the Soil Profile and Test Data sheets attached for the actual well construction in BH5 and BH6.

Soil Sampling Protocol

A total of thirty (3) soil samples were recovered from the test holes by means of stainless steel split spoon or auger sampling. Upon recovery, all samples were immediately sealed in appropriate containers to facilitate a preliminary screening procedure. No unusual visual or olfactory observations were made regarding the soil samples obtained from the boreholes.

All samples recovered as part of this investigation will be stored in the laboratory for a period of one (1) month after issuance of this report. All samples will then be discarded unless this firm is otherwise directed.

Soil Sample Headspace Analysis

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 boreholes. The technical protocol was obtained from Appendix C of the MOE 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.

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 15 ppm in the soil samples obtained. These results are not considered to represent significant petroleum hydrocarbon contamination.

Groundwater

A site visit was conducted on July 26, 2018 in order to obtain stabilized groundwater levels and to sample the groundwater from the monitoring wells MW3, BH5 and BH6. The groundwater levels in the monitoring wells were found to be 3.76m (MW3), 2.4 m (BH5) and 2.0 m (BH6) below the existing ground surface. Based on the groundwater elevations, the groundwater flow direction is to the northwest. It should be noted that groundwater levels are expected to fluctuate throughout the year with seasonal variations. No unusual visual or olfactory observations were noted regarding the groundwater obtained.

4.0 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:

- Coarse grained soil conditions.
- Surface soil and groundwater conditions.
- Non-potable groundwater situation.
- Commercial 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

Based on our visual observations, six (6) soil samples were submitted to Paracel Laboratories for petroleum hydrocarbons PHCs (Fractions 1 to 4) and benzene, toluene, ethylbenzene and xylene (BTEX) analyses. Four (4) soil samples were submitted or metal analyses. 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 Results - Soil BTEX and PHCs (Fractions 1 to 4)

Parameter	MDL (µg/g)	Soil Samples (µg/g)						Table 3 Standards Commercial Property Use
		BH1-AU1	BH3-AU1	BH4 - AU1	BH5-AU1	BH6-AU1	BH8-AU1	
Benzene	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.32
Ethylbenzene	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	9.5
Toluene	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	68
Xylenes (Total)	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	26
F_1 PHCs (C_6-C_{10})	7	<7	<7	<7	<7	<7	<7	55
F_2 PHCs (C_{10}-C_{16})	4	<4	<4	<4	<4	<4	<4	230
F_3 PHCs (C_{16}-C_{34})	8	27	<8	<8	40	<8	21	1,700
F_4 PHCs (C_{34}-C_{50})	6	13	<6	<6	26	<6	20	3,300

* Notes: MDL - Method Detection Limit

The soil results comply with the MOECC Table 3 Standards.

Table 2. Analytical Results - Metals (Soil)

Parameter	MDL (µg/g)	Soil Samples (µg/g)				Table 3 Standards Commercial Property Use
		BH1-AU1	BH4-AU1	BH5-AU1	BH8-AU1	
Antimony	1	<1.0	<1.0	<1.0	<1.0	40
Arsenic	1	<1.0	<1.0	1.3	<1.0	18
Barium	1	61.1	31.3	113	77.3	670
Beryllium	0.5	<0.5	<0.5	<0.5	<0.5	8
Boron	5.0	<5.0	<5.0	6.9	<5.0	120
Cadmium	0.5	<0.5	<0.5	<0.5	<0.5	1.9
Chromium	5.0	12.8	8.6	16.4	15.9	160
Cobalt	1	4.5	3.4	6.0	5.4	80
Copper	5.0	9.9	8.6	13.7	12.8	230
Lead	1	14.9	3.4	15.7	11.4	120
Molybdenum	1	<1.0	<1.0	<1.0	<1.0	40
Nickel	5.0	10.3	10.3	14.8	11.2	270
Selenium	1	<1.0	<1.0	<1.0	<1.0	5.5
Silver	0.3	<0.3	<0.3	<0.3	<0.3	40
Thallium	1	<1.0	<1.0	<1.0	<1.0	3.3
Uranium	1	<1.0	<1.0	<1.0	<1.0	33
Vanadium	10	21.2	21.8	19.5	24.4	86
Zinc	20	43.7	21.0	73.7	40.0	340

* Notes: MDL - Method Detection Limit
Bold and underlined results exceed the MOECC Table 3 standards

All of the detected metal parameter concentrations comply with the MOECC Table 3 Standards.

Groundwater

Groundwater samples were collected from the monitoring wells MW3 and MW5 and MW6 (installed on July 12, 2018). The water samples were submitted for PHCs and volatile organic compounds (VOCs) analyses. The results of the analytical testing, and the selected MOECC Standards are presented in Tables 3 and 4, respectively. A copy of the laboratory certificate of analysis is attached to this report.

Table 3. Analytical Results - Groundwater PHCs (Fractions 1 to 4)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)			Table 3 Standards Commercial Property Use
		MW3-GW	MW5-GW1	MW6-GW1	
F_1 PHCs (C_6-C_{10})	25	<25	<25	<25	750
F_2 PHCs (C_{10}-C_{16})	100	<100	<100	<100	150
F_3 PHCs (C_{16}-C_{34})	100	<100	<100	<100	500
F_4 PHCs (C_{34}-C_{50})	100	<100	<100	<100	500

* Notes: MDL - Method Detection Limit
nd - Not Detected (<MDL)

No detectable PHC concentrations were identified in the groundwater samples analyzed. The groundwater results comply with the MOECC Table 3 Standards.

Table 4. Analytical Results - Groundwater Volatile Organic Compounds (VOCs)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)			Table 3 Standards Commercial Property Use
		MW3-GW	MW5-GW1	MW6-GW1	
Acetone	5	<5.0	<5.0	<5.0	130,000
Benzene	0.5	<0.5	<0.5	<0.5	44
Bromodichloromethane	0.5	<0.5	<0.5	<0.5	85,000
Bromoform	0.5	<0.5	<0.5	<0.5	380
Bromomethane	0.5	<0.5	<0.5	<0.5	5.6
Carbon Tetrachloride	0.2	<0.2	<0.2	<0.2	0.79
Chlorobenzene	0.5	<0.5	<0.5	<0.5	630
Chloroform	0.5	<0.5	<0.5	<0.5	2.4
Dibromochloromethane	0.5	<0.5	<0.5	<0.5	82,000
Dichlorodifluoromethane	1	<1.0	<1.0	<1.0	4,400
m - Dichlorobenzene	0.5	<0.5	<0.5	<0.5	9,600
o - Dichlorobenzene	0.5	<0.5	<0.5	<0.5	4,600

Table 4. Analytical Results - Groundwater Volatile Organic Compounds (VOCs)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)			Table 3 Standards Commercial Property Use
		MW3-GW	MW5-GW1	MW6-GW1	
p - Dichlorobenzene	0.5	<0.5	<0.5	<0.5	8
1,1-Dichloroethane	0.5	<0.5	<0.5	<0.5	320
1,2-Dichloroethane	0.5	<0.5	<0.5	<0.5	1.6
1,1-Dichloroethylene	0.5	<0.5	<0.5	<0.5	1.6
c-1,2-Dichloroethylene	0.5	<0.5	<0.5	<0.5	1.6
t-1,2-Dichloroethylene	0.5	<0.5	<0.5	<0.5	1.6
1,2-Dichloropropane	0.5	<0.5	<0.5	<0.5	16
Hexane	1	<0.5	<0.5	<0.5	51
c-1,3-Dichloropropene	0.5	<0.5	<0.5	<0.5	5.2
t-1,3-Dichloropropene	0.5	<0.5	<0.5	<0.5	5.2
Ethylene dibromide	0.2	<0.5	<0.5	<0.5	0.25
Ethylbenzene	0.5	<0.2	<0.2	<0.2	2,300
Methyl Ethyl Ketone	5	<1.0	<1.0	<1.0	470,000
Methyl Isobutyl Ketone	5	<5.0	<5.0	<5.0	140,000
Methyl tert-Butyl Ether	2	<5.0	<5.0	<5.0	190
Methylene Chloride	5	<2.0	<2.0	<2.0	610
Styrene	0.5	<0.5	<0.5	<0.5	1,300
1,1,1,2-tetrachloroethane	0.5	<0.5	<0.5	<0.5	3.4
1,1,2,2-tetrachloroethane	0.5	<0.5	<0.5	<0.5	3.2
Tetrachloroethylene	0.5	<0.5	<0.5	<0.5	1.6
Toluene	0.5	<0.5	<0.5	<0.5	18,000
1,1,1-Trichloroethane	0.5	<0.5	<0.5	<0.5	640
1,1,2-Trichloroethane	0.5	<0.5	<0.5	<0.5	4.7
Trichloroethylene	0.5	<0.5	<0.5	<0.5	1.6
Trichlorofluoromethane	1	<1.0	<1.0	<1.0	2,500
Vinyl Chloride	0.5	<0.5	<0.5	<0.5	0.5
Total Xylenes	0.5	<0.5	<0.5	<0.5	4,200

* Notes: MDL - Method Detection Limit
nd - Not Detected (< MDL)
nv - No current MOECC standard
Bold and underlined results exceed the MOECC Table 3 standards

No detectable VOC concentrations were identified in the groundwater samples analyzed. The groundwater results comply with the MOECC Table 3 Standards.

5.0 Assessment and Recommendations

Assessment

A Phase II – ESA was completed to determine the current condition of the Phase I Property as a baseline prior to the occupation of the land by a new tenant.

Soil

A total of eight (8) boreholes (BH1-BH8) were placed on the subject property on July 12, 2018. Five (5) boreholes (BH1, and BH3-BH6) were placed along the outside perimeter of the large storage/warehouse style building – one (1) on the east side, two (2) on the south side and two (2) on the north side of the warehouse. Two (2) boreholes (BH7 and BH8) were placed in the north east portion of the subject site. Two (2) of the eight boreholes (BH5 and BH6) were equipped with groundwater monitoring wells. No unusual visual or olfactory observations were made regarding the soil samples obtained from any of the boreholes.

Based on the locations and general coverage purpose around the warehouse, six (6) soil samples were submitted to Paracel Laboratories for metals and/or PHC and BTEX analyses.

The majority of the results were non-delectable with low PHC concentrations in 3 samples. The soil results comply with the MOECC Table 3 Standards. All metals also comply with the MOECC Table 3 Standards.

No detectable metal parameters were identified in the soil samples analyzed. The soil results comply with the MOECC Table standards.

Groundwater

Groundwater samples were collected on July 26, 2018 from monitoring wells MW3 (previously installed), MW5 (fBH5) and MW6 (BH6). No sheen or unusual odours were noted in the groundwater samples recovered from the above noted monitoring wells.

Three (3) groundwater samples were submitted for VOCs and PHCs analysis. No detectable PHC or VOC concentrations were identified in the groundwater samples analyzed. The groundwater results comply with the MOECC Table 3 standards.

Based on the findings of the Phase II ESA the subject site does not appear to have been impacted by on-site activities.

Recommendations

If the monitoring wells installed onsite are not going to be used in the future, they should be abandoned according to Ontario Regulation 903. However, it is recommended that they be maintained for future groundwater monitoring purposes.

6.0 Statement of Limitations

This Phase II - Environmental Site Assessment report has been prepared in general accordance with the agreed scope-of-work and the requirements of CSA Z768-01. The client should be aware of 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. 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 Mr. Claude Brunet. Permission and notification from the above noted party and this firm will be required to release this report to any other party.

We trust that this report satisfies your requirements.

Paterson Group Inc.

Mandy Witteman, MASc, EIT.

Mark S. D'Arcy, P.Eng.

Report Distribution

- ❑ Hadwen Properties Limited (2 copies)
- ❑ Paterson Group (1 copy)

Attachments

- ❑ Soil Profile and Test Data Sheets
- ❑ Symbols and Terms
- ❑ Laboratory Certificates for Analysis
- ❑ Drawing No. PE4378-2 – 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
1987 Robertson Road
Ottawa, Ontario

DATUM TBM - Finished floor slab of existing building at entrance. Assumed elevation = 100.00m.

FILE NO. PE4378

REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** July 12, 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									
FILL: Brown silty sand, some gravel		Ai	1			0	99.93		
0.18									
Very stiff, brown **SILTY CLAY**		SS	2	75	12	1	98.93		
1.52									
GLACIAL TILL: Brown silty clay, some sand and gravel		SS	3	38	4	2	97.93		
2.23									
End of Borehole									
Practical refusal to augering at 2.23m depth									

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

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
1987 Robertson Road
Ottawa, Ontario

DATUM TBM - Finished floor slab of existing building at entrance. Assumed elevation = 100.00m.

FILE NO. PE4378

REMARKS

HOLE NO. BH 2

BORINGS BY CME 55 Power Auger **DATE** July 12, 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	99.93		
FILL: Brown silty sand, some gravel		AU	1						
0.46									
Very stiff, brown **SILTY CLAY**		SS	2	21	13	1	98.93		
1.52									
GLACIAL TILL: Brown silty clay, trace sand and gravel		SS	3	57	50+				
1.88									
End of Borehole									
Practical refusal to augering at 1.88m depth									

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

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
1987 Robertson Road
Ottawa, Ontario

DATUM TBM - Finished floor slab of existing building at entrance. Assumed elevation = 100.00m.

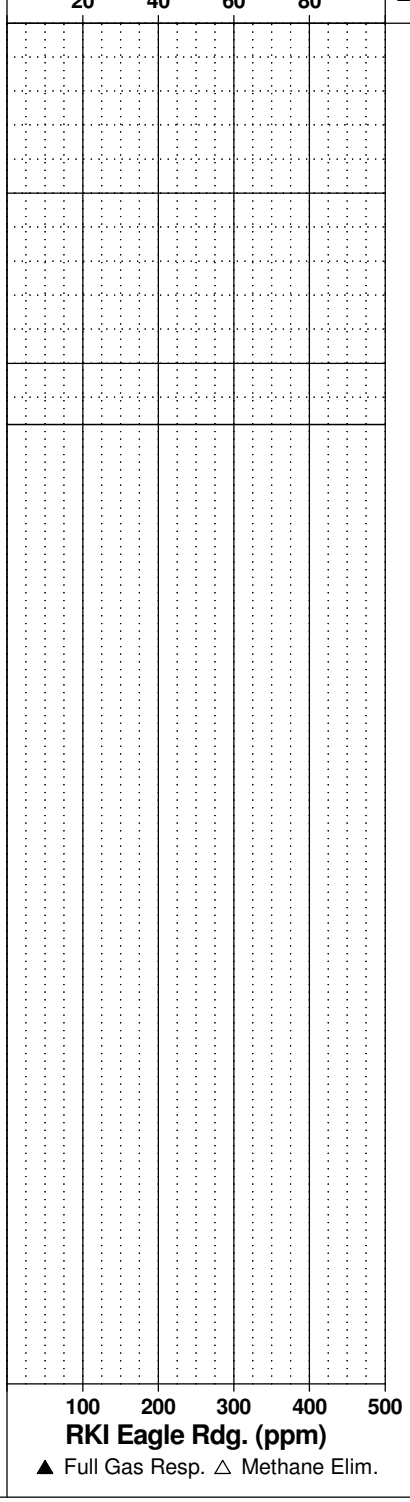
FILE NO. PE4378

REMARKS

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** July 12, 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									
FILL: Brown silty sand, trace gravel and cobbles		AU	1			0	99.53		
0.48									
Very stiff, brown **SILTY CLAY**		SS	2	33	10	1	98.53		
1.52									
Brown **SILTY FINE SAND**		SS	3	54	3	2	97.53		
2.36		SS	4	0	50+				
End of Borehole									
Practical refusal to augering at 2.36m depth									



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
1987 Robertson Road
Ottawa, Ontario

DATUM TBM - Finished floor slab of existing building at entrance. Assumed elevation = 100.00m.

FILE NO. PE4378

REMARKS

HOLE NO. BH 4

BORINGS BY CME 55 Power Auger **DATE** July 12, 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	99.68		
		AU	1						
FILL: Brown silty fine sand, trace gravel		SS	2	75	9	1	98.68		
1.83		SS	3	71	3	2	97.68		
		SS	4	67	9				
Brown **SILTY CLAY**						3	96.68		
- grey by 2.4m depth		SS	5	100	10				
		SS	6	100	9	4	95.68		
		SS	7	100	7	5	94.68		
		SS	8	100	4				
5.94									
End of Borehole									

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

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
1987 Robertson Road
Ottawa, Ontario

DATUM TBM - Finished floor slab of existing building at entrance. Assumed elevation = 100.00m.

FILE NO. PE4378

REMARKS

HOLE NO. BH 5

BORINGS BY CME 55 Power Auger **DATE** July 12, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	99.89
FILL: Gravel and silty sand, some gravel, piece of brick		AU	1				
0.51							
		SS	2	58	9	1	98.89
Brown **SILTY CLAY**		SS	3	100	9	2	97.89
2.29							
		SS	4	100	10	3	96.89
GLACIAL TILL: Grey silty clay, trace sand and gravel		SS	5	70	10		
3.56							
		RC	1	96	83	4	95.89
		RC	2	95	89	5	94.89
BEDROCK: Sandstone							
		RC	3	98	84	6	93.89
7.14		RC	4	100	77	7	92.89
End of Borehole							
(GWL @ 2.40m - July 26, 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
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Ottawa, Ontario

DATUM TBM - Finished floor slab of existing building at entrance. Assumed elevation = 100.00m.

FILE NO. PE4378

REMARKS

HOLE NO. BH 6

BORINGS BY CME 55 Power Auger **DATE** July 12, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	99.92
FILL: Brown silty sand, some gravel		AU	1				
0.51							
Brown **SILTY CLAY**		SS	2	67	18	1	98.92
1.52							
GLACIAL TILL: Brown silty clay, some sand, trace gravel		SS	3		50+		
1.98						2	97.92
		RC	1	94	94		
		RC	2	100	86	3	96.92
BEDROCK: Sandstone						4	95.92
		RC	3	100	72	5	94.92
		RC	4	100	81	6	93.92
6.27							
End of Borehole							
(GWL @ 2.00m - July 26, 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
1987 Robertson Road
Ottawa, Ontario

DATUM TBM - Finished floor slab of existing building at entrance. Assumed elevation = 100.00m.

FILE NO. PE4378

REMARKS

HOLE NO. BH 7

BORINGS BY CME 55 Power Auger **DATE** July 12, 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
FILL: Brown silty sand, trace gravel and cobbles		AU	1				
0.36							
Brown **SILTY CLAY**		SS	2	88	11	1	97.05
		SS	3	92	9	2	96.05
2.44							
GLACIAL TILL: Brown silty clay, trace sand and gravel		SS	4	79	4		
		SS	5	67	3	3	95.05
3.66							
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.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
1987 Robertson Road
Ottawa, Ontario

DATUM TBM - Finished floor slab of existing building at entrance. Assumed elevation = 100.00m.

FILE NO. PE4378

REMARKS

HOLE NO. BH 8

BORINGS BY CME 55 Power Auger **DATE** July 12, 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									
FILL: Brown silty sand, some gravel		AU	1			0	99.25		
0.38									
Brown **SILTY CLAY**		SS	2	46	9	1	98.25		
		SS	3	78	50+				
1.75									
End of Borehole									
Practical refusal to augering at 1.75m depth									

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

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

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

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

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

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

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

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

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

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

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

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

CONSOLIDATION TEST

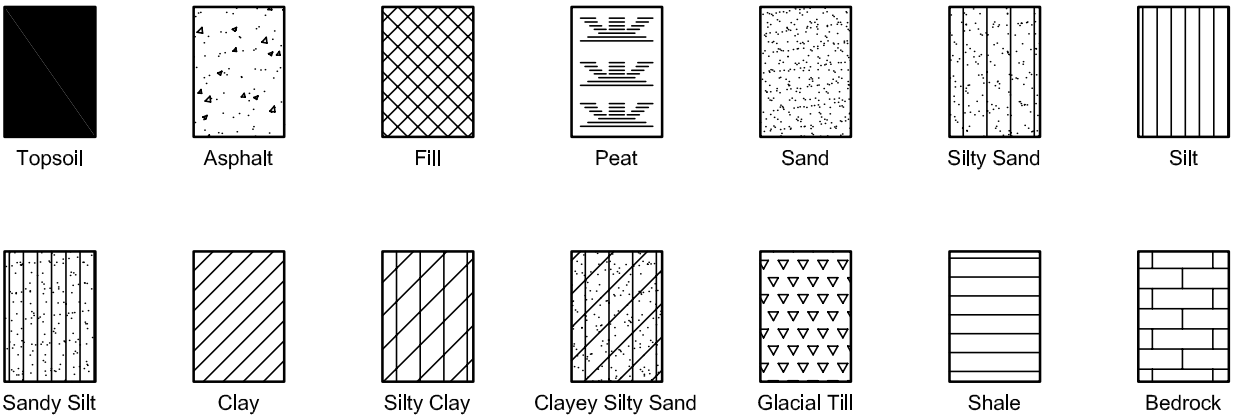
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

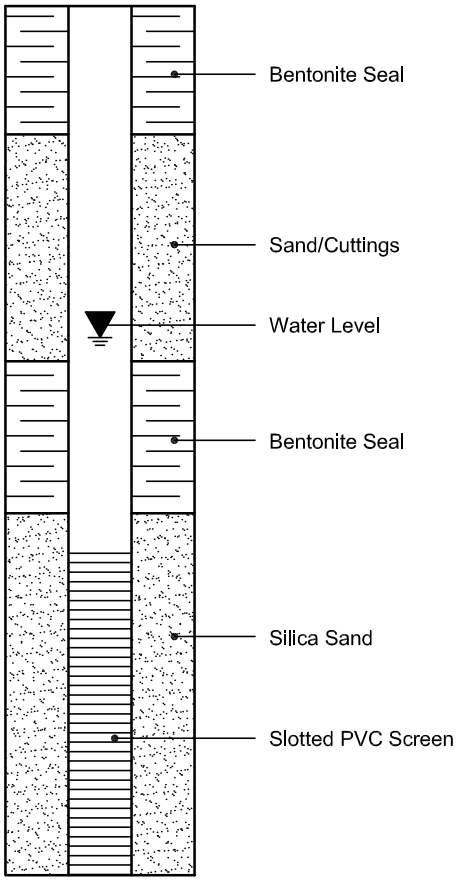
SYMBOLS AND TERMS (continued)

STRATA PLOT

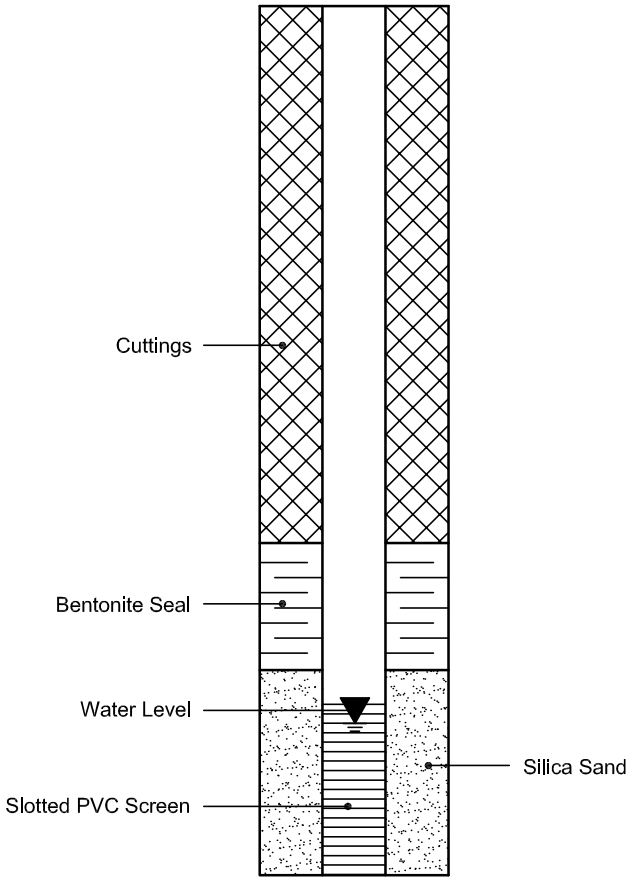


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 23572
Project: PE4378
Custody: 118689

Report Date: 20-Jul-2018
Order Date: 16-Jul-2018

Order #: 1829080

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

Paracel ID	Client ID
1829080-01	BH1-18-AU1
1829080-02	BH3-18-AU1
1829080-03	BH4-18-AU1
1829080-04	BH5-18-AU1
1829080-05	BH6-18-AU1
1829080-06	BH8-18-AU1

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23572

Report Date: 20-Jul-2018
Order Date: 16-Jul-2018
Project Description: PE4378

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	19-Jul-18	20-Jul-18
PHC F1	CWS Tier 1 - P&T GC-FID	19-Jul-18	20-Jul-18
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	17-Jul-18	19-Jul-18
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	18-Jul-18	19-Jul-18
Solids, %	Gravimetric, calculation	20-Jul-18	20-Jul-18

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 23572

Report Date: 20-Jul-2018

Order Date: 16-Jul-2018

Project Description: PE4378

	Client ID:	BH1-18-AU1	BH3-18-AU1	BH4-18-AU1	BH5-18-AU1
	Sample Date:	07/12/2018 09:00	07/12/2018 09:00	07/12/2018 09:00	07/12/2018 09:00
	Sample ID:	1829080-01	1829080-02	1829080-03	1829080-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	99.0	99.7	99.8	99.8
Metals					
Antimony	1.0 ug/g dry	<1.0	-	<1.0	<1.0
Arsenic	1.0 ug/g dry	<1.0	-	<1.0	1.3
Barium	1.0 ug/g dry	61.1	-	31.3	113
Beryllium	0.5 ug/g dry	<0.5	-	<0.5	<0.5
Boron	5.0 ug/g dry	<5.0	-	<5.0	6.9
Cadmium	0.5 ug/g dry	<0.5	-	<0.5	<0.5
Chromium	5.0 ug/g dry	12.8	-	8.6	16.4
Cobalt	1.0 ug/g dry	4.5	-	3.4	6.0
Copper	5.0 ug/g dry	9.9	-	8.6	13.7
Lead	1.0 ug/g dry	14.9	-	3.4	15.7
Molybdenum	1.0 ug/g dry	<1.0	-	<1.0	<1.0
Nickel	5.0 ug/g dry	10.3	-	5.8	14.8
Selenium	1.0 ug/g dry	<1.0	-	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	-	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	-	<1.0	<1.0
Uranium	1.0 ug/g dry	<1.0	-	<1.0	<1.0
Vanadium	10.0 ug/g dry	21.2	-	21.8	19.5
Zinc	20.0 ug/g dry	43.7	-	21.0	73.7
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene-d8	Surrogate	84.3%	93.5%	88.1%	86.7%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	27	<8	<8	40
F4 PHCs (C34-C50)	6 ug/g dry	13	<6	<6	26

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23572

Report Date: 20-Jul-2018
Order Date: 16-Jul-2018
Project Description: PE4378

	Client ID:	BH6-18-AU1	BH8-18-AU1	-	-
	Sample Date:	07/12/2018 09:00	07/12/2018 09:00	-	-
	Sample ID:	1829080-05	1829080-06	-	-
	MDL/Units	Soil	Soil	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	97.0	99.2	-	-
Metals					
Antimony	1.0 ug/g dry	-	<1.0	-	-
Arsenic	1.0 ug/g dry	-	<1.0	-	-
Barium	1.0 ug/g dry	-	77.3	-	-
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	-	15.9	-	-
Cobalt	1.0 ug/g dry	-	5.4	-	-
Copper	5.0 ug/g dry	-	12.8	-	-
Lead	1.0 ug/g dry	-	11.4	-	-
Molybdenum	1.0 ug/g dry	-	<1.0	-	-
Nickel	5.0 ug/g dry	-	11.2	-	-
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	-	24.4	-	-
Zinc	20.0 ug/g dry	-	40.0	-	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	-	-
Toluene	0.05 ug/g dry	<0.05	<0.05	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	-	-
o-Xylene	0.05 ug/g dry	<0.05	<0.05	-	-
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	-	-
Toluene-d8	Surrogate	84.4%	86.6%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	-	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	-	-
F3 PHCs (C16-C34)	8 ug/g dry	<8	21	-	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	20	-	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23572

Report Date: 20-Jul-2018
Order Date: 16-Jul-2018
Project Description: PE4378

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	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						
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	*2.80*		*ug/g*		*87.5*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND				30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND				30	
Metals									
Antimony	ND	1.0	ug/g dry	ND			0.0	30	
Arsenic	ND	1.0	ug/g dry	ND			0.0	30	
Barium	58.0	1.0	ug/g dry	61.1			5.3	30	
Beryllium	ND	0.5	ug/g dry	ND			0.0	30	
Boron	ND	5.0	ug/g dry	ND			0.0	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium	11.7	5.0	ug/g dry	12.8			9.0	30	
Cobalt	4.2	1.0	ug/g dry	4.5			7.4	30	
Copper	10.3	5.0	ug/g dry	9.9			4.6	30	
Lead	14.1	1.0	ug/g dry	14.9			5.6	30	
Molybdenum	ND	1.0	ug/g dry	ND			0.0	30	
Nickel	9.2	5.0	ug/g dry	10.3			11.1	30	
Selenium	ND	1.0	ug/g dry	ND			0.0	30	
Silver	ND	0.3	ug/g dry	ND			0.0	30	
Thallium	ND	1.0	ug/g dry	ND			0.0	30	
Uranium	ND	1.0	ug/g dry	ND			0.0	30	
Vanadium	20.0	10.0	ug/g dry	21.2			6.1	30	
Zinc	42.0	20.0	ug/g dry	43.7			4.0	30	
Physical Characteristics									
% Solids	95.1	0.1	% by Wt.	95.1			0.0	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	*3.83*		*ug/g dry*		*99.4*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	211	7	ug/g		106	80-120			
F2 PHCs (C10-C16)	84	4	ug/g	ND	87.0	60-140			
F3 PHCs (C16-C34)	197	8	ug/g	ND	83.5	60-140			
F4 PHCs (C34-C50)	112	6	ug/g	ND	74.7	60-140			
Metals									
Antimony	35.8		ug/L	ND	71.7	70-130			
Arsenic	37.4		ug/L	ND	74.4	70-130			
Barium	67.1		ug/L	24.4	85.3	70-130			
Beryllium	39.8		ug/L	ND	79.7	70-130			
Boron	46.0		ug/L	ND	91.3	70-130			
Cadmium	36.2		ug/L	ND	72.3	70-130			
Chromium	45.1		ug/L	5.1	80.0	70-130			
Cobalt	42.6		ug/L	1.8	81.6	70-130			
Copper	43.2		ug/L	ND	78.5	70-130			
Lead	48.4		ug/L	6.0	84.9	70-130			
Molybdenum	36.6		ug/L	ND	72.9	70-130			
Nickel	43.7		ug/L	ND	79.2	70-130			
Selenium	40.6		ug/L	ND	81.0	70-130			
Silver	36.2		ug/L	ND	72.4	70-130			
Thallium	43.9		ug/L	ND	87.7	70-130			
Uranium	45.8		ug/L	ND	91.2	70-130			
Vanadium	49.4		ug/L	ND	81.8	70-130			
Zinc	55.0		ug/L	ND	75.0	70-130			
Volatiles									
Benzene	2.67	0.02	ug/g		66.8	60-130			
Ethylbenzene	3.95	0.05	ug/g		98.7	60-130			
Toluene	3.72	0.05	ug/g		92.9	60-130			
m,p-Xylenes	7.28	0.05	ug/g		91.0	60-130			
o-Xylene	3.78	0.05	ug/g		94.5	60-130			
Surrogate: Toluene-d8	*2.89*		*ug/g*		*90.4*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

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Page 1 of 1

Client Name: Paterson Group	Project Reference: PE4378
Contact Name: Mark D'Arcy	Quote #
Address:	PO # 23572
Telephone: 226-7381	Email Address:

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: 1829080

Required Analyses

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)		
1	BH1-18-AU1	S	-	2	July 12/18	see	✓			✓					250ml + 1 vial -
2	BH3-18-AU1	S	-	2	"	jars	✓								↓
3	BH4-18-AU1	S	-	2	"	'	✓			✓					↓
4	BH5-18-AU1	S	-	2	"	'	✓			✓					↓
5	BH6-18-AU1	S	-	2	"	'	✓								↓
6	BH8-18-AU1	S	-	2	"	'	✓			✓					↓
7															
8															
9															
10															

Comments:

Method of Delivery: Paracel

Relinquished By (Sign): [signature]	Received by Driver/Depot: M. Trouse	Received at Lab: SUMPORN DOHMAI	Verified By: [signature]
Relinquished By (Print): ADMIN M	Date/Time: 16/07/18 3:10	Date/Time: JUL 16, 2018 03.45	Date/Time: 071618 4:21pm
Date/Time: July 16 2018	Temperature: °C PH	Temperature: 17.5 °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: 24809
Project: PE4378
Custody: 44338

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

Order #: 1830513

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

Paracel ID	Client ID
1830513-01	MW3-GW
1830513-02	MW5-GW1
1830513-03	MW6-GW1

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 24809

Report Date: 31-Jul-2018
Order Date: 26-Jul-2018
Project Description: PE4378

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHC F1	CWS Tier 1 - P&T GC-FID	27-Jul-18	28-Jul-18
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	27-Jul-18	28-Jul-18
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	27-Jul-18	28-Jul-18

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 24809

Report Date: 31-Jul-2018
Order Date: 26-Jul-2018
Project Description: PE4378

	Client ID:	MW3-GW	MW5-GW1	MW6-GW1	-
	Sample Date:	07/26/2018 09:00	07/26/2018 09:00	07/26/2018 09:00	-
	Sample ID:	1830513-01	1830513-02	1830513-03	-
	MDL/Units	Water	Water	Water	-
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	<5.0	-
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	-
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Chloroform	0.5 ug/L	<0.5	<0.5	<0.5	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Ethylene dibromide (dibromoethan	0.2 ug/L	<0.2	<0.2	<0.2	-
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	-
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 24809

Report Date: 31-Jul-2018
Order Date: 26-Jul-2018
Project Description: PE4378

	Client ID:	MW3-GW	MW5-GW1	MW6-GW1	-
	Sample Date:	07/26/2018 09:00	07/26/2018 09:00	07/26/2018 09:00	-
	Sample ID:	1830513-01	1830513-02	1830513-03	-
	MDL/Units	Water	Water	Water	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	-
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	-
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	-
4-Bromofluorobenzene	Surrogate	101%	100%	105%	-
Dibromofluoromethane	Surrogate	105%	105%	104%	-
Toluene-d8	Surrogate	103%	99.8%	103%	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	<25	-
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	-
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	-
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<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									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*88.0*		*ug/L*		*110*	*50-140*			
Surrogate: Dibromofluoromethane	*87.8*		*ug/L*		*110*	*50-140*			
Surrogate: Toluene-d8	*81.1*		*ug/L*		*101*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*81.6*		*ug/L*		*102*	*50-140*			
Surrogate: Dibromofluoromethane	*84.5*		*ug/L*		*106*	*50-140*			
Surrogate: Toluene-d8	*81.1*		*ug/L*		*101*	*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)	1780	25	ug/L		88.8	68-117			
F2 PHCs (C10-C16)	1650	100	ug/L		103	60-140			
F3 PHCs (C16-C34)	4130	100	ug/L		105	60-140			
F4 PHCs (C34-C50)	2730	100	ug/L		110	60-140			
Volatiles									
Acetone	94.1	5.0	ug/L		94.1	50-140			
Benzene	27.2	0.5	ug/L		67.9	60-130			
Bromodichloromethane	32.1	0.5	ug/L		80.2	60-130			
Bromoform	42.8	0.5	ug/L		107	60-130			
Bromomethane	25.2	0.5	ug/L		62.9	50-140			
Carbon Tetrachloride	32.8	0.2	ug/L		82.0	60-130			
Chlorobenzene	30.0	0.5	ug/L		74.9	60-130			
Chloroform	29.5	0.5	ug/L		73.6	60-130			
Dibromochloromethane	37.9	0.5	ug/L		94.8	60-130			
Dichlorodifluoromethane	26.7	1.0	ug/L		66.8	50-140			
1,2-Dichlorobenzene	29.3	0.5	ug/L		73.2	60-130			
1,3-Dichlorobenzene	28.4	0.5	ug/L		71.0	60-130			
1,4-Dichlorobenzene	28.7	0.5	ug/L		71.7	60-130			
1,1-Dichloroethane	26.7	0.5	ug/L		66.8	60-130			
1,2-Dichloroethane	28.2	0.5	ug/L		70.6	60-130			
1,1-Dichloroethylene	28.8	0.5	ug/L		71.9	60-130			
cis-1,2-Dichloroethylene	28.8	0.5	ug/L		72.0	60-130			
trans-1,2-Dichloroethylene	29.6	0.5	ug/L		73.9	60-130			
1,2-Dichloropropane	27.3	0.5	ug/L		68.2	60-130			
cis-1,3-Dichloropropylene	28.1	0.5	ug/L		70.3	60-130			
trans-1,3-Dichloropropylene	27.7	0.5	ug/L		69.3	60-130			
Ethylbenzene	28.5	0.5	ug/L		71.2	60-130			
Ethylene dibromide (dibromoethane	29.8	0.2	ug/L		74.5	60-130			
Hexane	32.5	1.0	ug/L		81.3	60-130			
Methyl Ethyl Ketone (2-Butanone)	71.7	5.0	ug/L		71.7	50-140			
Methyl Isobutyl Ketone	88.2	5.0	ug/L		88.2	50-140			
Methyl tert-butyl ether	61.4	2.0	ug/L		61.4	50-140			
Methylene Chloride	30.2	5.0	ug/L		75.6	60-130			
Styrene	27.4	0.5	ug/L		68.5	60-130			
1,1,1,2-Tetrachloroethane	33.9	0.5	ug/L		84.8	60-130			
1,1,2,2-Tetrachloroethane	32.7	0.5	ug/L		81.6	60-130			
Tetrachloroethylene	28.5	0.5	ug/L		71.4	60-130			
Toluene	28.5	0.5	ug/L		71.4	60-130			
1,1,1-Trichloroethane	29.3	0.5	ug/L		73.2	60-130			
1,1,2-Trichloroethane	28.5	0.5	ug/L		71.3	60-130			
Trichloroethylene	26.4	0.5	ug/L		66.1	60-130			
Trichlorofluoromethane	29.0	1.0	ug/L		72.4	60-130			
Vinyl chloride	30.2	0.5	ug/L		75.5	50-140			
m,p-Xylenes	61.6	0.5	ug/L		77.0	60-130			
o-Xylene	30.2	0.5	ug/L		75.4	60-130			
Surrogate: 4-Bromofluorobenzene	*77.8*		*ug/L*		*97.3*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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.

Paracel ID: 1830513

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icel@paracellabs.com

Chain of Custody (Lab Use Only)
№ 44338

Page 1 of 1

Client Name: Mark D'Arcy	Project Reference: PE4378
Contact Name: Paterson Group	Quote #
Address: 154 Colonnade Rd	PO # 24809
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: 1830513

Required Analyses

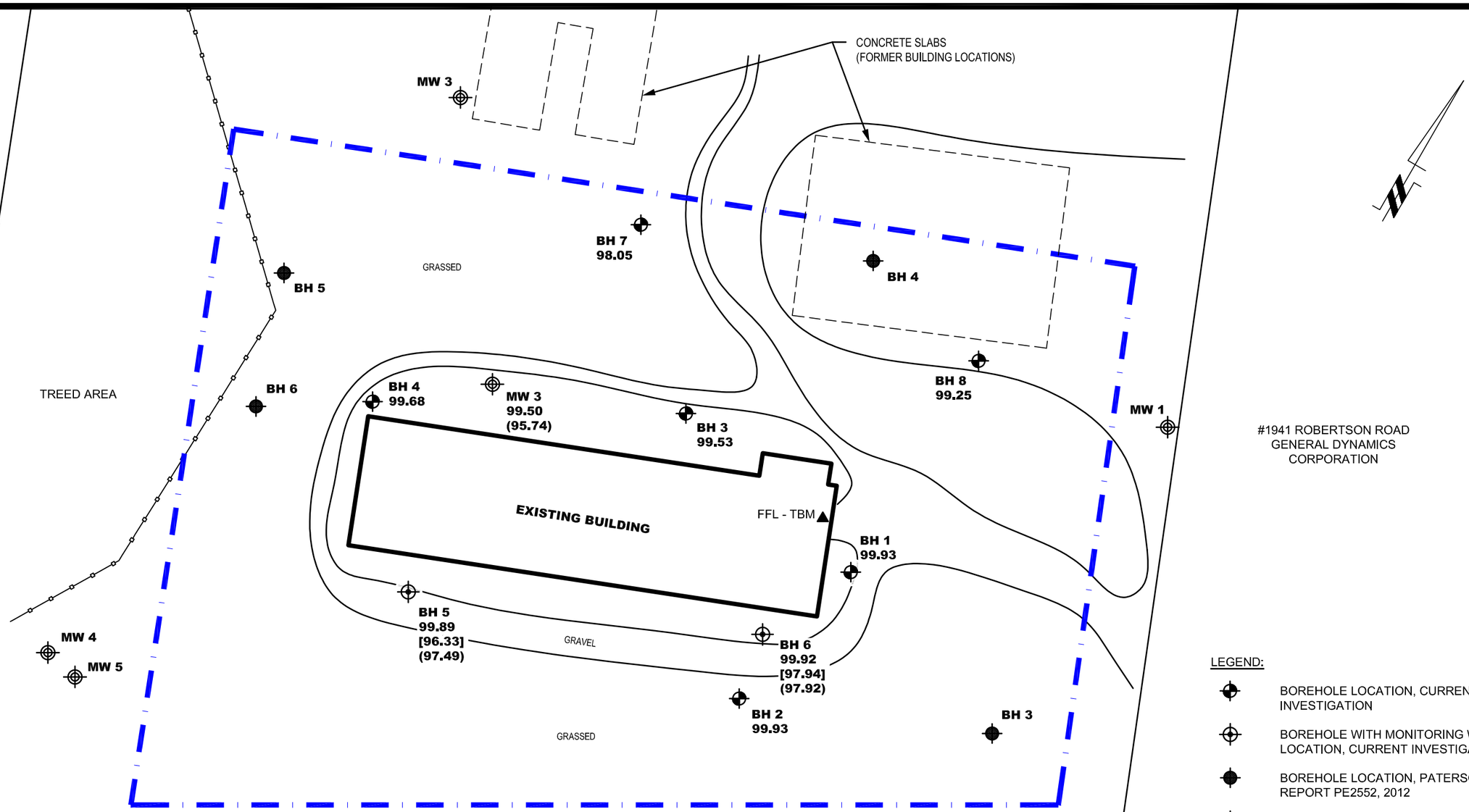
	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHC F1-F4	VOCs
1	MW3-GW	W		3	26 July '18	AM	✓	✓
2	MW5-GW1	W		3	↓	AM	✓	✓
3	MW6-GW1	W		3	↓	AM	✓	✓
4								
5								
6								
7								
8								
9								
10								

Comments:

Method of Delivery: Paracel

Relinquished By (Sign): [signature]	Received by Driver/Depot: T. Rouse	Received at Lab: Sunteeporn Dokmai	Verified By: [signature]
Relinquished By (Print): PHILIP PRICE	Date/Time: 26/07/18 4:05	Date/Time: Jul 26, 2018 05.05	Date/Time: Jul 26/18 6:45
Date/Time: 26 July 2018	Temperature: °C	Temperature: 21.7 °C	pH Verified [ ] By:

Chain of Custody (Blank) - Rev 0.4 Feb 2016



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

NO.	REVISIONS	DATE	INITIAL
0			

HADWEN PROPERTIES LTD.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1987 ROBERTSON ROAD
OTTAWA, ONTARIO

Title:
TEST HOLE LOCATION PLAN

Scale: 1:1000	Date: 07/2018
Drawn by: MPG	Report No.: PE4378-LET.01
Checked by: MW	Dwg. No.: PE4378-2
Approved by: MSD	Revision No.: 0

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