



Geotechnical
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Supplemental Phase II Environmental Site Assessment

Existing Commercial Property
2012 Ogilvie Road
Ottawa, Ontario

Prepared For

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EXECUTIVE SUMMARY

Assessment

A supplemental Phase II Environmental Site Assessment (ESA) was conducted for the property addressed as 2012 Ogilvie Road, Ottawa, Ontario. The purpose of the Phase II ESA was to provide supplemental assessment of soil and groundwater contamination identified by a previous investigation by Paterson Group, and was completed concurrently with an environmental and geotechnical investigation by Inspec-Sol. The Phase II ESA consisted of drilling 11 exterior boreholes and 1 interior borehole, the excavation of 1 test pit, and the installation of 10 groundwater monitoring wells to assess soil and groundwater quality at the subject site.

Soil samples were obtained from the boreholes and were screened using visual observations and organic vapour measurements. Based on the screening results, samples were selected for analysis of benzene, toluene, ethylbenzene, and xylenes (BTEX), petroleum hydrocarbons, fractions 1 through 4 (PHCs F₁-F₄), and volatile organic compounds (VOCs). Based on the analytical results from the previous investigations, BTEX and PHC concentrations at several soil samples exceeded the applicable MOECC Table 3 standards at several locations, including the eastern property boundary in the vicinity of a former automotive service garage, and within the area of the former gas dispensing site. The current investigation produced analytical results in compliance with the applicable MOECC Table 3 standards.

A total of 12 groundwater samples were collected from the monitoring wells installed by Paterson (and one monitoring well previously installed by others), and analyzed for VOCs, BTEX, and PHCs. Concentrations of VOC parameters in BH9, immediately to the north of the subject building, exceeded the applicable MOECC Table 3 standards. These impacts are interpreted to be associated with the historical presence of a former dry-cleaning facility within the existing building. All other groundwater samples collected during the 2015 sampling program were in compliance with the applicable MOECC Table 3 standards.

Recommendations

Based on the above results, concentrations of BTEX and PHCs in soil and VOCs in groundwater at the subject property exceed the applicable MOECC Table 3 standards. It is our understanding that the subject site is to be redeveloped with several commercial buildings. It is our recommendation that an environmental site remediation program involving the excavation and off-site disposal of all impacted soil and the pumping and treatment or off-site disposal of all impacted groundwater be completed concurrently with the site redevelopment.

1.0 INTRODUCTION

At the request of Trinity Development Group (Trinity), Paterson Group (Paterson) conducted a supplemental Phase II Environmental Site Assessment of the property addressed as 2012 Ogilvie Road, in the City of Ottawa, Ontario. The purpose of this Phase II ESA was to further assess and delineate soil and groundwater impacts identified during the previous Phase II ESA conducted at the subject site by Paterson in 2013.

1.1 Site Description

Address:	2012 Ogilvie Road (locally addressed as 2012, 2015, 2016, and 2018 Ogilvie Road and 1401 Blair Place), Ottawa, ON.
Legal Description:	Part of Lot 20, Concession 2, former Township of Gloucester, currently the City of Ottawa.
Property Identification Number:	04363-0103.
Location:	The subject site is located on the south side of Ogilvie Road, to the east of Blair Place, in the City of Ottawa, Ontario. The subject site is shown on Figure 1 - Key Plan, appended to this report.
Latitude and Longitude:	45° 26' 10" N, 75° 36' 12" W.
Configuration:	Rectangular
Site Area:	7.9 hectares (approximate).

1.2 Property Ownership

The subject property is currently owned by Trinity Development Group. Paterson was engaged to conduct this Phase II-ESA by Mr. Ryan Moore of Trinity. The offices of Trinity are located at 3250 Bloor Street West, Suite 100, Toronto, Ontario. Mr. Moore can be reached by telephone at (416) 255-8800.

1.3 Current and Proposed Future Uses

The subject site is currently occupied by several commercial buildings and associated paved asphalt parking areas. It is our understanding that the subject site will be redeveloped as a commercial development consisting of several buildings. No further details are currently available.

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 and Climate Change (MOECC), April 2011. The MOECC Table 3 Standards are based on the following considerations:

- Coarse-grained soil conditions
- Non-potable groundwater conditions
- Commercial land use

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The subject site is located on the south side of Ogilvie Road, east of Blair Place, in the City of Ottawa, Ontario. The subject site is currently occupied by three (3) multi-unit commercial buildings, one demolished car wash building, and one demolished fast food restaurant building. The remainder of the site consists of paved asphalt parking areas. Site topography slopes gently to the south. Site drainage consists of sheet flow to catch basins in the parking lot.

No drinking water wells or private sewage systems were observed on the subject property, nor are any expected to be present, as the site is located in a municipally serviced area. No evidence of current or former railway or spur lines on the subject property were observed at the time of the Phase I ESA site visit. No unidentified substances were observed on the subject site.

2.2 Past Investigations

Paterson previously completed a Phase I and Phase II ESA for the subject site in 2013, as well as previous subsurface investigations in 2004 and 2008. The 2013 Phase II ESA identified areas of PHC contamination in soil, in the northwestern and southeastern portions of the subject site, associated respectively with the historical presence of a retail fuel outlet and an automotive service garage, respectively. Groundwater samples from monitoring wells BH24-13 and BH27-13 in the western portion of the subject site also exceeded Table 3 standards for PHCs and, in the case of BH27-13, one VOC parameter (cis-1,2-dichloroethylene). The purpose of the current investigation is to provide further delineation of these impacts.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The drilling portion of the subsurface investigation for the subject site was completed concurrently with an environmental and geotechnical investigation by Inspec-Sol. Paterson supervised the drilling of 11 exterior boreholes and 1 interior borehole, ten of which were instrumented with a groundwater monitoring well installation. Boreholes were advanced to a maximum depth of 7.5 m. Inspec-Sol completed several additional geotechnical boreholes at the subject site.

Subsequently to the drilling portion of the excavation, one test pit was excavated under Paterson's supervision along the eastern boundary of the subject site, in the vicinity of the former automotive service garage.

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 in soil and groundwater identified by the previous Phase II ESA completed by Paterson for the subject site. Contaminants of concern for soil and groundwater are BTEX/PHCs and VOCs.

3.3 Deviations from Sampling and Analysis Plan

The Sampling and Analysis Plan for this project is included in Appendix 1 of this report. No deviations from the Sampling and Analysis Plan were noted.

3.4 Impediments

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

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The exterior drilling portion of the subsurface investigation was conducted on March 12 and 13, 2015, and consisted of the drilling of 11 boreholes on the subject site. The boreholes were placed in the vicinity of the previously-identified areas of contamination on the northwestern and southeastern portions of the subject site. The boreholes were drilled using a truck-mounted CME 55 power auger drill rig. The drilling contractor was George Downing Estate Drilling of Hawkesbury, Ontario.

The interior portion of the drilling program was conducted on March 16, 2015, and consisted of the drilling of one borehole on the interior of the large multi-unit commercial building on the subject site. The borehole was drilled using a portable drilling rig. The drilling contractor was CCC Drilling of Ottawa, Ontario.

The test pit portion of the subsurface investigation was conducted on March 19, 2015, and consisted of the excavation of one test pit on the eastern boundary of the subject site in the vicinity of the former automotive service garage on the subject site. The test pit was excavated by Maurice Yelle Excavation of Ottawa, Ontario.

Drilling and test pit excavation occurred under full-time supervision of Paterson personnel. All borehole and test pit locations are illustrated on Drawing PE3116-8 - Test Hole Location Plan, appended to this report.

4.2 Soil Sampling

A total of 63 soil samples were obtained from boreholes and the test pit by means of split spoon sampling and the sampling of shallow soils directly from auger flights, and grab sampling from the test pit. Split spoon samples were taken at approximate 760 mm intervals. The depths at which split spoon, auger flight, and grab samples were obtained from the boreholes and test pit are shown as “**SS**”, “**AU**”, and “**G**” respectively, on the Soil Profile and Test Data Sheets, appended to this report.

Site soils consist of fill over intermittent layers of silty clay and sandy silt, underlain by glacial till and black shale bedrock. The fill material consists of silty sand with gravel and varies in thickness from 0.3 m to 3.2 m (deeper in the area of the former retail fuel outlet). The silty clay material varies in thickness from 1.5 to 2.7 m. The sandy silt layer varies in thickness between 0.6 and 1.1 m. The glacial till material consists of silty clay with sand and gravel and varies in thickness from 0.4 to 4 m. Bedrock was encountered at depths ranging from 1.5 to 5.8 m.

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 deleterious materials, as well as screening with an RKI Eagle combustible gas detector. The detection limit of the RKI Eagle is 5 ppm, with a precision of +/- 5 ppm.

The soil vapours were measured by inserting the analyzer probe into the nominal headspace above the soil sample. Samples were then agitated and the peak readings recorded. Vapour readings were negligible for all samples. 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

Ten groundwater monitoring wells were installed during the drilling program by George Downing Estate Drilling of Hawkesbury, Ontario and CCC Drilling of Ottawa, Ontario under full-time supervision by Paterson personnel. The monitoring wells consisted of 32 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 is provided below in Table 1.

Table 1: Monitoring Well Construction Details						
Well ID	Ground Surface Elev.	Total Depth (m BGS)	Screened Interval (m BGS)	Sand Pack (m BGS)	Bentonite Seal (m BGS)	Casing Type
BH1-15	75.43	6.32	3.28-6.32	2.98-6.32	0.30-2.98	Flushmount
BH2-15	75.16	6.30	3.25-6.30	2.95-6.30	0.30-2.95	Flushmount
BH3-15	75.45	6.38	3.33-6.38	2.74-6.38	0.30-2.74	Flushmount
BH4-15	75.78	7.29	4.24-7.29	3.96-7.29	0.30-3.96	Flushmount
BH6-15	76.83	4.57	1.52-4.57	1.22-4.57	0.30-1.52	Flushmount
BH8-15	76.04	6.25	3.25-6.25	2.29-6.25	0.30-2.29	Flushmount
BH9-15	75.70	5.49	3.66-5.49	3.36-5.49	0.30-3.36	Flushmount
BH10-15	74.97	5.33	2.29-5.33	1.83-5.33	0.30-1.83	Flushmount
BH11-15	75.08	5.64	2.59-5.64	2.26-5.64	0.30-2.26	Flushmount
BH12-15	-	7.54	4.50-7.54	3.50-7.54	0.30-3.50	Flushmount

4.5 Field Measurement of Water Quality Parameters

Field measurement of water quality parameters was not undertaken as part of this assessment.

4.6 Groundwater Sampling

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

4.7 Analytical Testing

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

Table 2 - Soil Samples Submitted (2015)				
Sample ID	Sample Depth/ Stratigraphic Unit	Parameters Analyzed		Rationale
		BTEX/ PHCs	VOCs	
BH1-15-SS2	0.76-1.37 m; till	X		Assess soil conditions in areas of previously identified contamination/ area of former retail fuel outlet on-site, as well as general site coverage.
BH2-15-SS2	0.76-1.37 m; till	X		
BH3-15-SS2	0.76-1.37 m; till	X		
BH4-15-SS5	3.05-3.66 m; till	X		
BH5-15-SS4	2.29-2.90 m; till	X		
BH6-15-SS7	4.57-5.18 m; fill	X		
BH7-15-SS5	3.05-3.66 m; till	X		
BH8-15-SS3	1.52-2.13 m; till	X		
BH9-15-SS2	0.76-1.37 m; silty clay	X		
BH10-15-SS5	3.05-3.66 m; silty clay	X		Assess soil conditions in vicinity of former automotive service garage
BH11-15-SS5	3.05-3.66 m; silty clay	X		Assess soil conditions inside building in area of former dry cleaner
BH12-15-SS5	2.74-3.35 m; till	X	X	
TP1-15-G3	3.0-3.2 m; till	X		Assess soil conditions at eastern property boundary near former automotive service garage

Sample ID	Screened Interval/ Stratigraphic Unit	Parameters Analyzed		Rationale
		BTEX/ PHCs	VOCs	
BH1-15-GW1	3.28-6.32 m; shale	X	X	Assess groundwater conditions in areas of previously identified groundwater contamination and area of former retail fuel outlet on-site.
BH2-15-GW1	3.25-6.30 m; shale	X	X	
BH3-15-GW1	3.33-6.38 m; shale	X	X	
BH4-15-GW1	4.24-7.29 m; shale	X	X	
BH6-15-GW1	1.52-4.57 m; till	X		
BH8-15-GW1	3.25-6.25 m; shale	X		
BH9-15-GW1	3.66-5.49 m; till	X	X	
BH10-15-GW1	2.29-5.33 m; till	X	X	Assess groundwater conditions in vicinity of former automotive service garage
BH11-15-GW1	2.59-5.64 m; till	X		Assess groundwater quality in vicinity of former dry cleaner in commercial building.
BH12-15-GW1	4.50-7.54 m; shale	X		
BH23-13-GW2	2.31-3.83 m; till	X	X	Assess groundwater conditions in areas of former retail fuel outlet and previously identified groundwater contamination on-site.
MW1-GW1	Unknown (well by others)	X		

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

Soil cuttings, purge water and fluids from equipment cleaning were stored in drums on-site.

4.9 Elevation Surveying

Borehole and monitoring well elevations were interpolated from a topographical survey of the subject site completed by Stantec Geomatics. All elevations are geodetic.

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, and custody, equipment cleaning procedures, and field quality control measurements is provided in the Sampling and Analysis Plan in Appendix 1.

No deviations from the QA/QC procedures in the Sampling & Analysis Plan were noted.

5.0 REVIEW AND EVALUATION

5.1 Geology

Site geology details are provided in the Soil Profile and Test Data Sheets provided in Appendix 1. Site soils consisted of silty sand and gravel fill overlying an intermittent layer of native silty sand and silty clay, underlain by glacial till and black shale bedrock. Groundwater was encountered in the glacial till and upper fractured shale units.

5.2 Groundwater Elevations

Groundwater levels were measured using an electronic water level meter. Groundwater levels are summarized below in Table 5. All elevations are geodetic.

Table 4 - Groundwater Level Measurements				
Borehole Location	Ground Surface Elevation (m)	Water Level Depth (m below grade)	Water Level Elevation (m ASL)	Date of Measurement
BH1-15	75.43	3.00	72.43	March 19, 2015
BH2-15	75.16	1.59	73.57	March 19, 2015
BH3-15	75.45	2.46	72.99	March 19, 2015
BH4-15	75.78	2.01	73.77	March 19, 2015
BH6-15	76.83	2.79	74.04	March 19, 2015
BH8-15	76.04	3.28	72.76	March 19, 2015
BH9-15	75.70	2.19	73.51	March 19, 2015
BH10-15	74.97	2.19	72.78	March 19, 2015
BH11-15	75.08	2.27	72.81	March 19, 2015
BH12-15	-	3.19	-	March 30, 2015
BH23-13	75.81	1.98	73.83	March 19, 2015
MW1	-	2.14	-	March 19, 2015

No free product was observed in the monitoring wells at the subject site.

5.3 Fine-Medium Soil Texture

Based on observed soil conditions, it is our opinion that fine to medium-grained soil standards are not applicable to the subject site.

5.4 Soil - Field Screening

Field screening of the soil samples collected during drilling resulted in organic vapour readings of 0 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.

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

5.5 Soil Quality

A total of 13 samples were submitted for analysis of BTEX and PHCs. One (1) soil sample was submitted for analysis of VOCs. The results of the analytical testing are presented below. The laboratory certificates of analysis are provided in Appendix 1.

Table 5 Analytical Test Results – Soil BTEX and PHCs							
Parameter	MDL (µg/g)	Soil Samples (µg/g) March 12-19, 2015					MOECC Table 3 Commercial Coarse
		BH1- 15-SS2	BH2- 15-SS2	BH3- 15-SS2	BH4- 15-SS4	BH5- 15-SS4	
Benzene	0.02	nd	nd	nd	nd	nd	0.32
Ethylbenzene	0.05	nd	nd	nd	nd	nd	9.5
Toluene	0.05	nd	nd	nd	nd	nd	68
Xylenes	0.05	nd	nd	nd	nd	nd	26
PHC F1	7	nd	7	nd	nd	nd	55
PHC F2	4	nd	23	nd	22	30	230
PHC F3	8	nd	25	nd	33	69	1,700
PHC F4	6	nd	nd	nd	nd	45	3,300

Notes:

- MDL – Method Detection Limit
- Nd – not detected above the MDL
- N/V – no value provided by the MOECC
- **Bold** – Value exceeds applicable MOECC Standard

Table 5 (Continued)						
Analytical Test Results – Soil BTEX and PHCs						
Parameter	MDL (µg/g)	Soil Samples (µg/g) March 12-19, 2015				MOECC Table 3 Commercial Coarse
		BH6-15-SS7	BH7-15-SS5	BH8-15-SS3	BH9-15-SS2	
Benzene	0.02	nd	nd	nd	nd	0.32
Ethylbenzene	0.05	nd	nd	nd	nd	9.5
Toluene	0.05	0.06	nd	nd	nd	68
Xylenes	0.05	0.10	nd	nd	nd	26
PHC F1	7	11	nd	nd	nd	55
PHC F2	4	22	22	13	nd	230
PHC F3	8	22	22	22	40	1,700
PHC F4	6	nd	nd	22	75	3,300

Notes:

- MDL – Method Detection Limit
- Nd – not detected above the MDL
- N/V – no value provided by the MOECC
- Bold** – Value exceeds selected MOECC Standard

Table 5 (Continued)						
Analytical Test Results – Soil BTEX and PHCs						
Parameter	MDL (µg/g)	Soil Samples (µg/g) March 12-19, 2015				MOECC Table 3 Commercial Coarse
		BH10-15-SS5	BH11-15-SS5	BH12-15-SS5	TP1-G3	
Benzene	0.02	nd	nd	0.94	nd	0.32
Ethylbenzene	0.05	nd	nd	0.88	nd	9.5
Toluene	0.05	nd	nd	0.09	nd	68
Xylenes	0.05	nd	nd	1.20	nd	26
PHC F1	7	28	nd	19	88	55
PHC F2	4	57	nd	nd	431	230
PHC F3	8	52	nd	nd	394	1,700
PHC F4	6	nd	nd	nd	6	3,300

Notes:

- MDL – Method Detection Limit
- Nd – not detected above the MDL
- N/V – no value provided by the MOECC
- Bold** – Value exceeds applicable MOECC Standard

Concentrations of benzene at BH12-15-SS5 and PHC F1 and F2 at TP1-G3 exceed MOECC Table 3 standards. All other sample results are in compliance with MOECC Table 3 standards.

Table 6 Analytical Test Results – Soil VOCs			
Parameter	MDL (µg/g)	Soil Sample (µg/g) March 16, 2015	MOECC Table 3 Commercial Coarse
		BH12-15-SS5	
Acetone	0.50	nd	16
Benzene	0.02	0.94	0.21
Bromodichloromethane	0.05	nd	13
Bromoform	0.05	nd	0.27
Bromomethane	0.05	nd	0.05
Carbon Tetrachloride	0.05	nd	0.05
Chlorobenzene	0.05	nd	2.4
Chloroform	0.05	nd	0.05
Dibromochloromethane	0.05	nd	9.4
1,2-Dibromoethane	0.05	nd	0.05
Dichlorodifluoromethane	0.05	nd	16
1,2-Dichlorobenzene	0.05	nd	3.4
1,3-Dichlorobenzene	0.05	nd	4.8
1,4-Dichlorobenzene	0.05	nd	0.083
1,1-Dichloroethane	0.05	nd	3.5
1,2-Dichloroethane	0.05	nd	0.05
1,1-Dichloroethylene	0.05	nd	0.05
cis-1,2-Dichloroethylene	0.05	nd	3.4
trans-1,2-Dichloroethylene	0.05	nd	0.084
1,2-Dichloropropane	0.05	nd	0.05
1,3-Dichloropropylene, total	0.05	nd	0.05
Ethylbenzene	0.05	0.88	2
Hexane	0.05	0.36	2.8
Methyl Ethyl Ketone	0.50	nd	16
Methyl Isobutyl Ketone	0.50	nd	1.7
Methyl tert-butyl ether	0.05	nd	0.75
Methylene Chloride	0.05	nd	0.1
Styrene	0.05	nd	0.7
1,1,1,2-Tetrachloroethane	0.05	nd	0.058
1,1,2,2-Tetrachloroethane	0.05	nd	0.05
Tetrachloroethylene	0.05	nd	0.28
Toluene	0.05	0.09	2.3
1,2,4-Trichlorobenzene	0.05	nd	0.36
1,1,1-Trichloroethane	0.05	nd	0.38
1,1,2-Trichloroethane	0.05	nd	0.05
Trichloroethylene	0.05	nd	0.061
Trichlorofluoromethane	0.05	nd	4
Vinyl Chloride	0.02	nd	0.02
Xylenes, total	0.05	1.20	3.1
Notes:			
<ul style="list-style-type: none"> ▪ MDL – Method Detection Limit ▪ Nd – not detected above the MDL ▪ N/V – no value provided by the MOECC ▪ Bold – Value exceeds MOECC Table 3 Standard 			

As noted above, the concentration of benzene at BH12-15-SS5 exceeds Table 3 standards. All other VOC concentrations are in compliance with Table 3 standards.

Sample locations and analytical results are shown on Drawing PE3116-9 – Analytical Testing Plan - Soil, appended to this report.

The maximum concentrations of analyzed parameters in the soil at the site are summarized below in Table 8.

Table 8 Maximum Concentrations – Soil			
Parameter	Maximum Concentration	Borehole	Depth Interval (m BGS)
Benzene	0.94	BH12-15-SS5	2.74-3.35 m (glacial till)
Ethylbenzene	0.88	BH12-15-SS5	2.74-3.35 m (glacial till)
Hexane	0.36	BH12-15-SS5	2.74-3.35 m (glacial till)
Toluene	0.09	BH12-15-SS5	2.74-3.35 m (glacial till)
Xylenes	1.20	BH12-15-SS5	2.74-3.35 m (glacial till)
PHC F1	88	TP1-G3	3.0-3.2 m (glacial till)
PHC F2	431	TP1-G3	3.0-3.2 m (glacial till)
PHC F3	394	TP1-G3	3.0-3.2 m (glacial till)
PHC F4	75	BH0-15-SS2	3.05-3.66 m (silty clay)
Notes:			
▪ Bold – Value exceeds MOECC Table 3 Standard			

All other parameter concentrations were below laboratory detection limits.

5.6 Groundwater Quality

Groundwater samples were obtained from the monitoring wells installed during the 2015 investigation, as well as BH23-13 (installed during the previous investigation) and a monitoring well installed by others (designated MW1 for the purposes of this investigation). Samples were submitted for laboratory analysis of BTEX and PHCs, and selected samples were submitted for VOCs. The groundwater samples were obtained from the screened intervals noted on Table 1 above. The results of the analytical testing are presented below. The laboratory certificates of analysis are provided in Appendix 1.

Table 9 Analytical Test Results – Groundwater BTEX/PHCs						
Parameter	MDL (µg/L)	Groundwater Samples (µg/L) March 19-30, 2015				MOECC Table 3 Commercial Coarse
		BH1-15- GW1	BH2-15- GW1	BH3-15- GW1	BH4-15- GW1	
Benzene	0.5	nd	nd	nd	nd	44
Ethylbenzene	0.5	nd	nd	nd	nd	2,300
Toluene	0.5	nd	nd	nd	nd	18,000
Xylenes	0.5	nd	nd	nd	nd	4,200
PHCs F1	25	nd	nd	nd	nd	750
PHCs F2	100	nd	nd	nd	nd	150
PHCs F3	100	nd	nd	nd	nd	500
PHCs F4	100	nd	nd	nd	nd	500

Notes:

- MDL – Method Detection Limit
- nd – not detected above the MDL
- **nd** – Value exceeds MOECC Table 3 standards

Table 9 (continued) Analytical Test Results – Groundwater BTEX/PHCs						
Parameter	MDL (µg/L)	Groundwater Samples (µg/L) March 19-30, 2015				MOECC Table 3 Commercial Coarse
		BH6-15- GW1	BH8-15- GW1	BH9-15- GW1	BH10-15- GW1	
Benzene	0.5	0.5	nd	3.1	nd	44
Ethylbenzene	0.5	4.0	nd	nd	1.9	2,300
Toluene	0.5	0.6	nd	nd	2.8	18,000
Xylenes	0.5	0.9	nd	nd	14.3	4,200
PHCs F1	25	nd	nd	131	130	750
PHCs F2	100	nd	nd	nd	nd	150
PHCs F3	100	nd	nd	nd	nd	500
PHCs F4	100	nd	nd	nd	nd	500

Notes:

- MDL – Method Detection Limit
- nd – not detected above the MDL
- **nd** – Value exceeds MOECC Table 3 standards

Table 9 (continued)						
Analytical Test Results – Groundwater						
BTEX/PHCs						
Parameter	MDL (µg/L)	Groundwater Samples (µg/L)				MOECC Table 3 Commercial Coarse
		BH11-15-GW1	BH12-15-GW1	BH23-13-GW2	MW1-GW1	
Benzene	0.5	nd	nd	nd	nd	44
Ethylbenzene	0.5	nd	nd	nd	nd	2,300
Toluene	0.5	nd	nd	nd	nd	18,000
Xylenes	0.5	nd	nd	nd	nd	4,200
PHCs F1	25	nd	nd	nd	nd	750
PHCs F2	100	nd	nd	nd	nd	150
PHCs F3	100	nd	nd	nd	nd	500
PHCs F4	100	nd	nd	nd	nd	500

Notes:

- MDL – Method Detection Limit
- nd – not detected above the MDL
- **nd** – Value exceeds MOECC Table 3 standards

All BTEX and PHC concentrations were in compliance with the selected MOECC Table 3 standards.

Concentrations of cis-1,2-dichloroethylene, tetrachloroethylene, trichloroethylene, and vinyl chloride exceeded the selected MOECC Table 3 standards at BH9-15. All other VOC concentrations were in compliance with Table 3 standards.

The maximum final concentrations of all parameters analyzed in groundwater are summarized below.

Table 11 - Maximum Concentrations – Groundwater			
Parameter	Maximum Conc. (µg/L)	Borehole/Sample Location	Depth Interval (m BGS)
Acetone	104	BH10-15-GW1	2.29-5.33 m (glacial till)
Benzene	3.1	BH9-15-GW1	3.66-5.49 m (glacial till)
Chloroform	2.1	BH2-15-GW1	3.25-6.30 m (shale)
cis-1,2-Dichloroethane	255	BH9-15-GW1	3.66-5.49 m (glacial till)
trans-1,2-Dichloroethane	1.2	BH9-15-GW1	3.66-5.49 m (glacial till)
Ethylbenzene	1.9	BH10-15-GW1	2.29-5.33 m (glacial till)
Methyl Ethyl Ketone	8.0	BH10-15-GW1	2.29-5.33 m (glacial till)
Tetrachloroethylene	54.2	BH9-15-GW1	3.66-5.49 m (glacial till)
Toluene	2.8	BH10-15-GW1	2.29-5.33 m (glacial till)
Trichloroethylene	27.4	BH9-15-GW1	3.66-5.49 m (glacial till)
Vinyl Chloride	18.6	BH9-15-GW1	3.66-5.49 m (glacial till)
Xylene	14.3	BH10-15-GW1	2.29-5.33 m (glacial till)

The concentrations of all other parameters were below laboratory detection limits.

It is our interpretation that the analyzed parameter concentrations do not indicate the presence of dense non-aqueous phase liquids (DNAPLs) or light non-aqueous phase liquids (LNAPLs).

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, and incorporates the findings of the previous Phase II ESA completed by Paterson. Conclusions and recommendations are discussed in a subsequent section.

Site Description

Potentially Contaminating Activities and Areas of Potential Environmental Concern

Areas of Potential Environmental Concern (APECs) identified include the historical presence of an automotive service garage, retail fuel outlet, and dry cleaner on the subject site. Additional Potentially Contaminating Activities were identified within the Phase I ESA study area but were not considered to represent Areas of Potential Environmental Concern.

Contaminants of Potential Concern

BTEX, PHCs, and VOCs were selected as Contaminants of Concern in soil and groundwater based on the previously identified Areas of Potential Environmental Concern and on previous testing undertaken at the subject site.

Subsurface Structures and Utilities

Underground service locates were completed prior to the subsurface investigation. Sewer and water services extend from Ogilvie Road and Blair Place to the subject site, and private site stormwater services are present on-site.

Physical Setting

Site Stratigraphy

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

- Asphaltic concrete, 50 to 100 mm in thickness (not observed at BH12-15 or TP1-15).

- Concrete slab, 130 mm in thickness, observed at the interior borehole (BH12-15).
- Topsoil, 400 mm in thickness, observed at TP1-15.
- Crushed stone, observed beneath the asphaltic concrete layer, varying in thickness from 150 to 310 mm.
- Fill material – the fill material consists of silty sand with gravel, varying in thickness from 0.5 to 3.4 m. Groundwater was not encountered in this layer.
- An intermittent layer of silty clay was encountered at depths varying between 0.9 and 1.8 m, and varying in thickness between 2.1 and 2.7 m. Groundwater was not encountered in this layer.
- An intermittent layer of sandy silt was encountered at depths varying from 3.2 and 4 m, and varying in thickness between 0.6 and 1.1 m. Groundwater was encountered in this layer and in the underlying glacial till layer at BH20-13.
- Glacial till - the glacial till material consists of silty sand with clay and gravel. The till layer was encountered at depths varying from 0.25 to 4.6 m, and varied in thickness from 0.4 to 4.7 m. The glacial till was not encountered at BH5-15 and BH9-15. Groundwater was encountered in this layer. The glacial till layer, along with the upper shale bedrock layer, is considered to represent a local aquifer at the subject site.
- Black shale, encountered at depths varying from 1.5 to 5.8 m below existing grade. Groundwater was encountered in this layer. The shale layer, along with the glacial till layer, is considered to represent a local aquifer at the subject site.

Hydrogeological Characteristics

Groundwater was encountered in the glacial till and shale units. This unit is interpreted to function as a local aquifer at the subject site.

Water levels were measured at the subject site on March 19 and 30, 2015. Groundwater was encountered at depths varying from 0.30 to 3.2 m below existing grade.

Approximate Depth to Bedrock

Bedrock surface or practical refusal to augering were encountered at depths ranging from 1.5 to 5.8 m below ground surface.

Approximate Depth to Water Table

Depth to water table at the subject site varies between approximately 0.3 and 3.2 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, in that there are no Environmentally Sensitive Areas in the vicinity of the RSC Property, and the soil pH at the RSC Property is between 5 and 9.

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 material was identified at the subject site. The fill material consisted of silty sand with gravel, and was likely placed at the time of site development or concurrently with the decommissioning of the former retail fuel outlet or the former automotive service garage. The majority of fill material encountered did not exhibit any visual or olfactory evidence of contamination. Selected fill samples in areas of potential environmental concern were analyzed for suspected contaminants of concern, as detailed in preceding sections.

Proposed Buildings and Other Structures

It is our understanding that the site is to be redeveloped with several structures as part of a commercial development. No further information is available regarding the proposed development.

Existing Buildings and Structures

The subject site is currently occupied with several commercial buildings as noted in preceding sections.

Water Bodies

There are no water bodies on the subject site or within the Phase I study area. The closest water body is Green's Creek, located approximately 1 km to the southeast of the subject site.

Areas of Natural Significance

No areas of natural significance are present on the subject site.

Environmental Condition

Areas Where Contaminants Are Present

Based on screening and analytical results, the areas where contaminants are present in concentrations greater than MOECC Table 3 standards are shown on Drawings PE3116-9 and PE3116-10.

Types of Contaminants

Based on the Areas of Potential Environmental Concern identified as part of the Phase I ESA and on analytical testing, concentrations of BTEX and PHCs in soil and PHCs and VOCs in groundwater were encountered at concentrations exceeding the selected MOECC Table 3 standards. The VOC parameters encountered in groundwater are typically associated with dry cleaning, and are considered to be related to the historical presence of the dry cleaner on the subject site.

Contaminated Media

Based on the results of the Phase II ESA, contaminated media at the subject site are soil and groundwater.

What Is Known About Areas Where Contaminants Are Present

Contaminants were identified in the approximate locations of the aforementioned Areas of Potential Environmental Concern at the subject site (automotive service garage, retail fuel outlet, dry cleaner) and are interpreted to be associated with the historical activities at those locations.

Distribution of Contaminants

The horizontal distribution of contaminants is shown on Drawings PE3116-9 and PE3116-10. Vertically, contaminants in soil were observed in the fill and glacial till stratigraphic units, and contaminants in groundwater were observed in the glacial till and bedrock aquifer unit.

Discharge of Contaminants

The discharge of contaminants at the subject site is considered to have been associated with the historical presence of the automotive service garage, retail fuel outlet, and dry cleaner on the subject site. No specific information regarding spills, leaks, etc. was available for review during the Phase I ESA.

Migration of Contaminants

The migration of contaminants within the soil, or from soil to groundwater, is interpreted to be limited by the presence of the paved asphalt layer over much of the site, and by the lack of any observed soil disturbances by which impacted soil may be physically transported.

Migration of contaminants within site groundwater is interpreted to be controlled primarily by groundwater flow at the subject site as well as seasonal fluctuations.

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.

Given the presence of asphalt over much of the site, leaching is not considered to have significantly affected contaminant transport at the subject site. Groundwater levels were observed between 1.59 and 3.00 m below existing grade, and as such, in areas where contaminants are present, it is possible that groundwater flow and/or fluctuations may affect contaminant movement at the subject site.

Potential for Vapour Intrusion

Although VOC concentrations exceeding MOECC Table 3 standards were observed in site groundwater adjacent to the subject building, VOC concentrations at the interior borehole location (BH12-15) were in compliance with MOECC Table 3 standards. Furthermore, given the slab-on-grade construction of the building at 2016 Ogilvie Road, the potential for vapour intrusion is considered to be limited. Buildings are not currently present in the areas of BTEX/PHC contamination, and the potential for vapour intrusion at those locations is considered to be negligible.

It is our understanding that VOC and BTEX/PHC contamination at the subject site will be addressed concurrently with the redevelopment of the subject site.

6.0 CONCLUSIONS

Assessment

A supplemental Phase II Environmental Site Assessment (ESA) was conducted for the property addressed as 2012 Ogilvie Road, Ottawa, Ontario. The purpose of the Phase II ESA was to provide supplemental assessment of soil and groundwater contamination identified by a previous investigation by Paterson Group, and was completed concurrently with an environmental and geotechnical investigation by Inspec-Sol. The Phase II ESA consisted of drilling 11 exterior boreholes and 1 interior borehole, the excavation of 1 test pit, and the installation of 10 groundwater monitoring wells to assess soil and groundwater quality at the subject site.

Soil samples were obtained from the boreholes and were screened using visual observations and organic vapour measurements. Based on the screening results, samples were selected for analysis of benzene, toluene, ethylbenzene, and xylenes (BTEX), petroleum hydrocarbons, fractions 1 through 4 (PHCs F₁-F₄), and volatile organic compounds (VOCs). Based on the analytical results from the previous investigations, BTEX and PHC concentrations at several soil samples exceeded the applicable MOECC Table 3 standards at several locations, including the eastern property boundary in the vicinity of a former automotive service garage, and within the area of the former gas dispensing site. The current investigation produced analytical results in compliance with the applicable MOECC Table 3 standards.

A total of 12 groundwater samples were collected from the monitoring wells installed by Paterson (and one monitoring well previously installed by others), and analyzed for VOCs, BTEX, and PHCs. Concentrations of VOC parameters in BH9, immediately to the north of the subject building, exceeded the applicable MOECC Table 3 standards. These impacts are interpreted to be associated with the historical presence of a former dry-cleaning facility within the existing building. All other groundwater samples collected during the 2015 sampling program were in compliance with the applicable MOECC Table 3 standards.

Recommendations

Based on the above results, concentrations of BTEX and PHCs in soil and VOCs in groundwater at the subject property exceed the applicable MOECC Table 3 standards. It is our understanding that the subject site is to be redeveloped with several commercial buildings. It is our recommendation that an environmental site remediation program involving the excavation and off-site disposal of all impacted soil and the pumping and treatment or off-site disposal of all impacted groundwater be completed concurrently with the site redevelopment.

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 Trinity Development Group Inc. Permission and notification from Trinity and Paterson will be required to release this report to any other party.

Paterson Group Inc.



Daniel J. Arnott, P.Eng., QP_{esa}



Carlos P. Da Silva, P.Eng., QP_{esa}



Report Distribution:

- Trinity Development Group Inc.
- Paterson Group

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE3116-3 – TEST HOLE LOCATION PLAN (2013)

DRAWING PE3116-8 - TEST HOLE LOCATION PLAN (2015)

DRAWING PE3116-9 – ANALYTICAL TESTING PLAN (SOIL)

**DRAWING PE3116-10 – ANALYTICAL TESTING PLAN
(GROUNDWATER)**

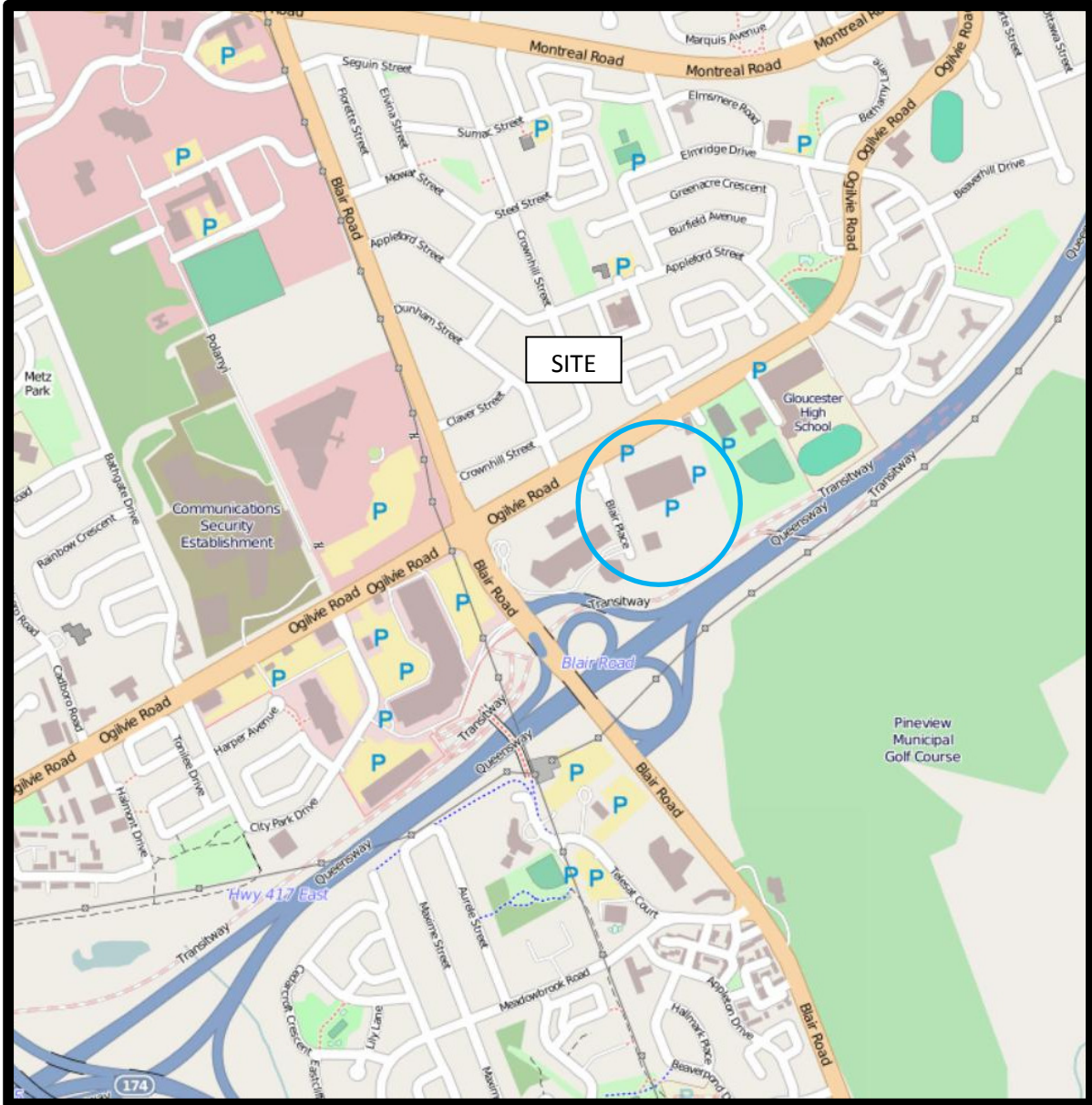
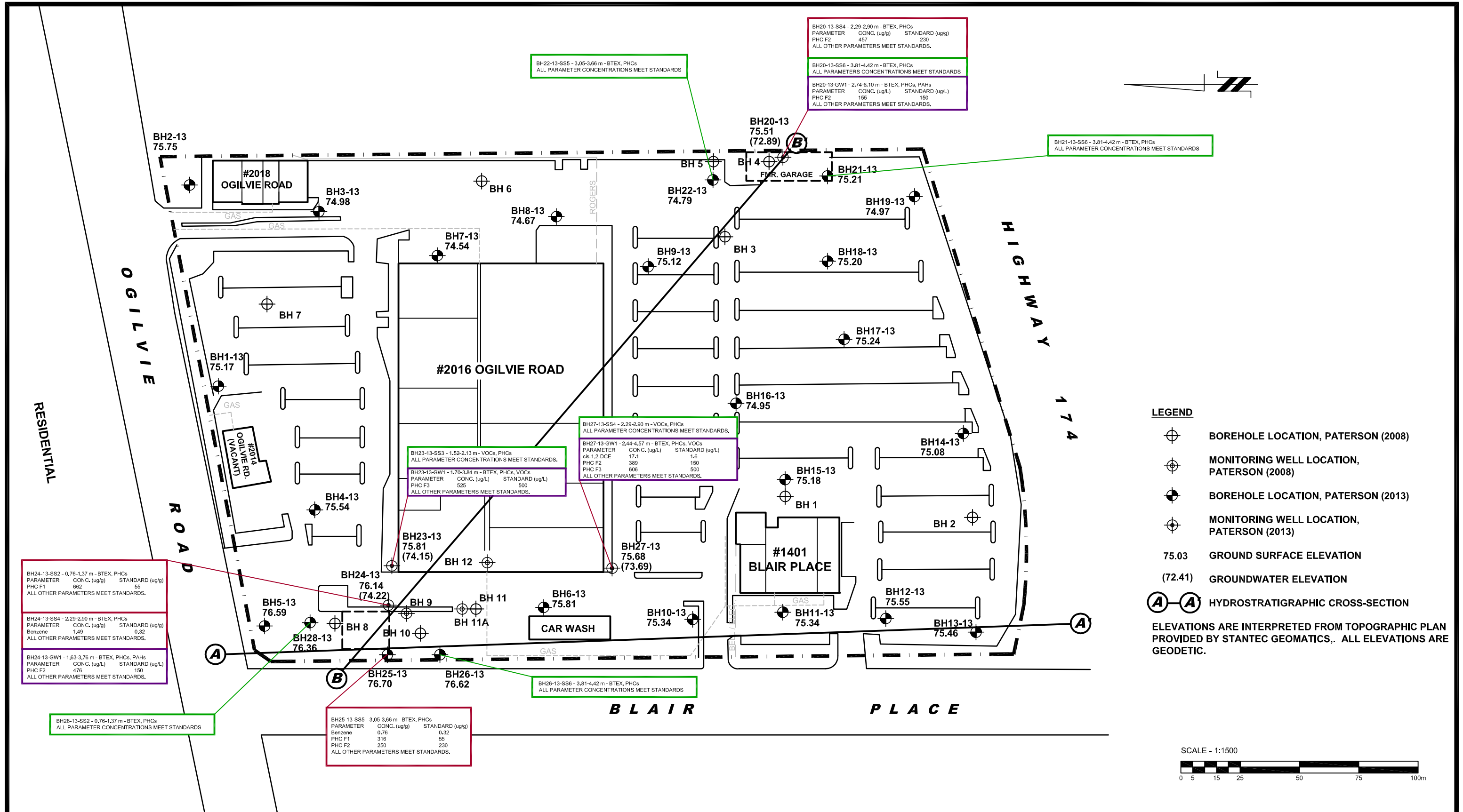
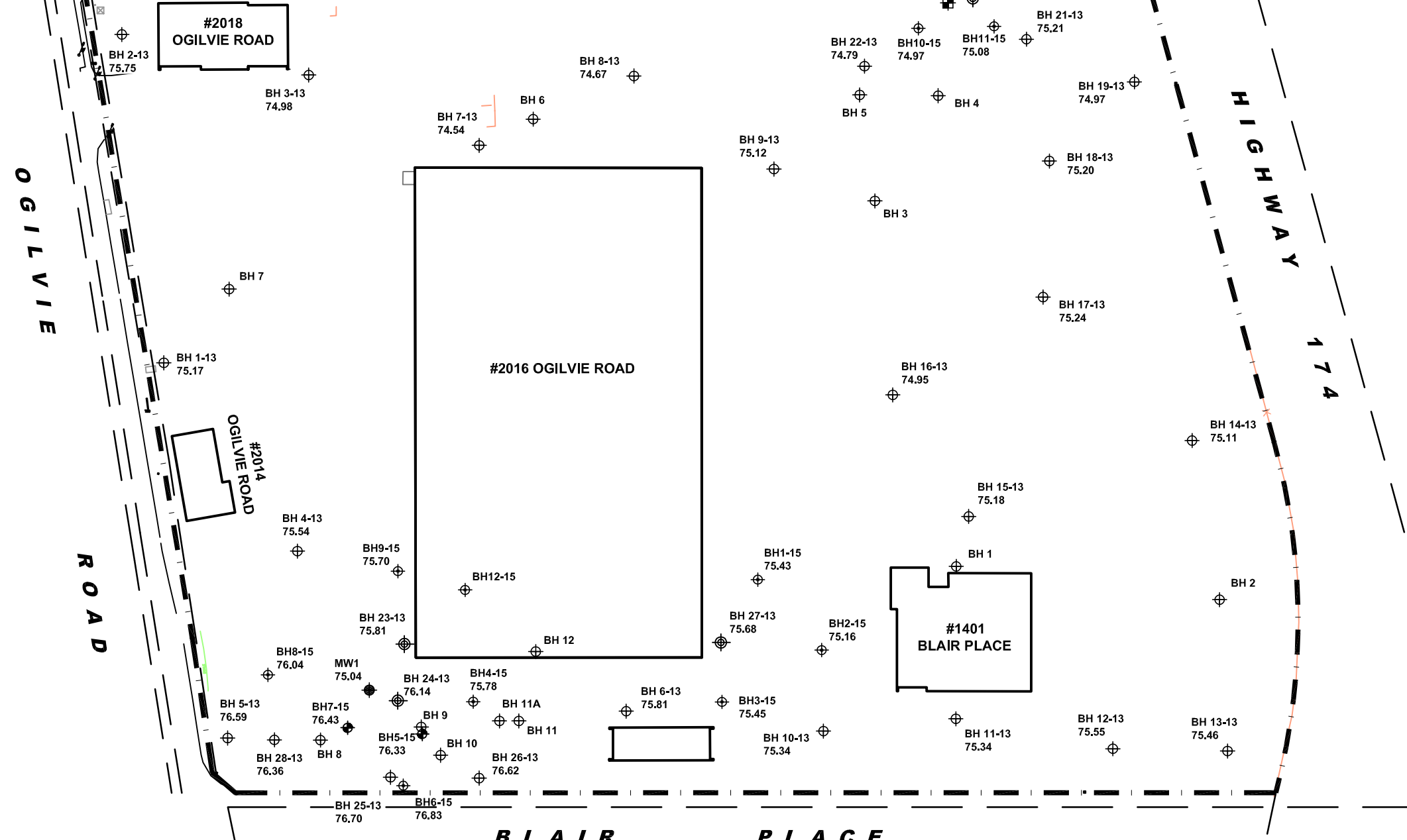


FIGURE 1
KEY PLAN





LEGEND:

- ⊕ BOREHOLE LOCATION WITH MONITORING WELL INSTALLED, PATERSON, 2015 (CURRENT INVESTIGATION)
- ⊙ BOREHOLE LOCATION, PATERSON, 2015
- ⊕ BOREHOLE WITH MONITORING WELL INSTALLED, PATERSON, PREVIOUS INVESTIGATIONS (2008, 2013)
- ⊕ BOREHOLE LOCATION, PATERSON GROUP, PREVIOUS INVESTIGATIONS (2008, 2013)
- MONITORING WELL LOCATION BY OTHERS
- ⊕ TEST PIT LOCATION, PATERSON, 2015

76.14 GROUND SURFACE ELEVATION (m)

BASE PLAN, TEST HOLE LOCATIONS AND GROUND SURFACE ELEVATIONS AT TEST HOLE LOCATIONS PROVIDED BY STANTEC GEOMATICS LIMITED.

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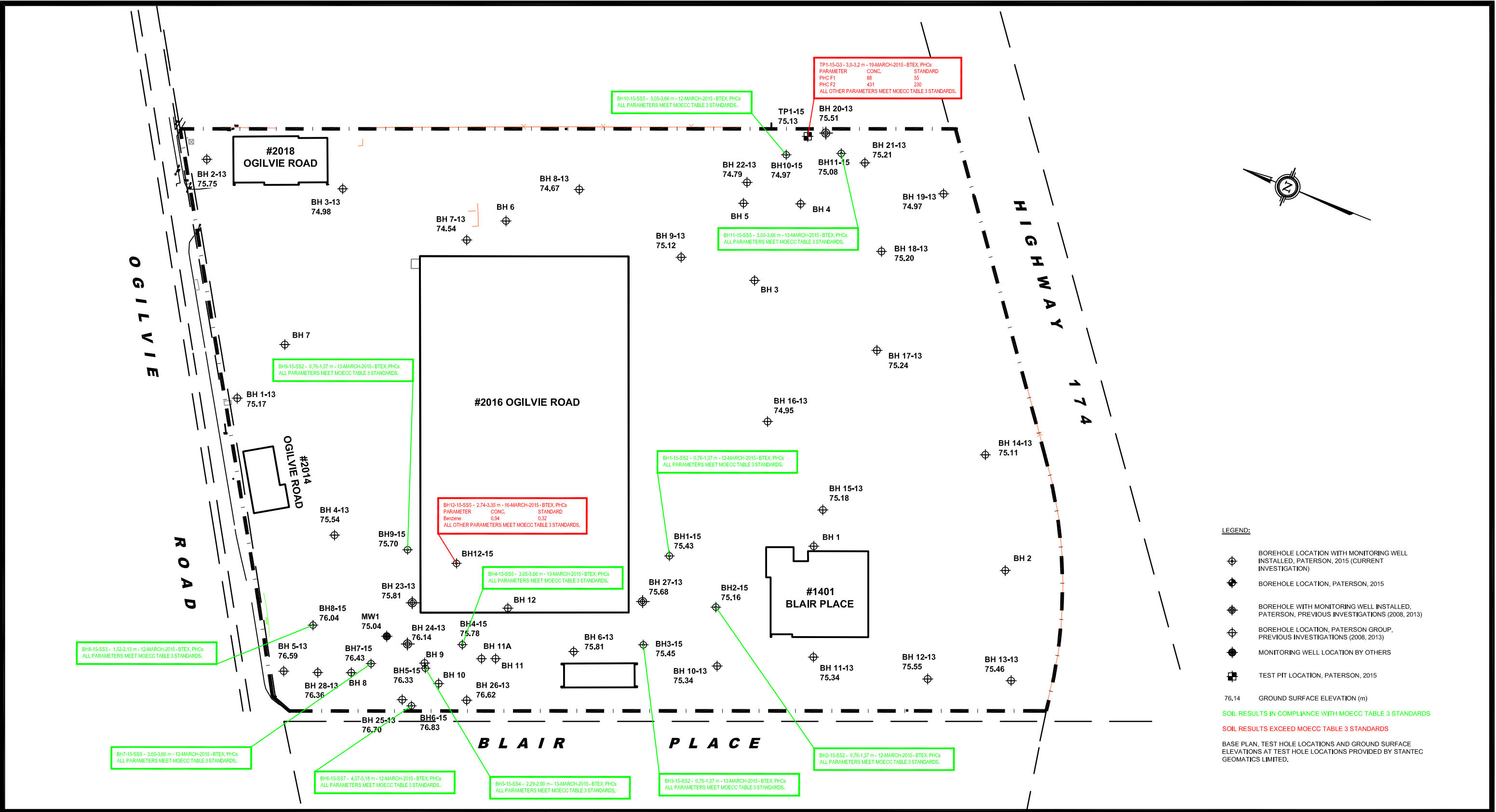
NO.	REVISIONS	DATE	INITIAL

TRINITY DEVELOPMENT GROUP INC.
PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2012 OGILVIE ROAD

OTTAWA, ONTARIO

TEST HOLE LOCATION PLAN

Scale:	1:1500	Date:	03/2015
Drawn by:	MPG	Report No.:	PE3116-3
Checked by:	DJA	Drawing No.:	PE3116-8
Approved by:	MSD		



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NO.	REVISIONS	DATE	INITIAL

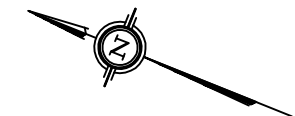
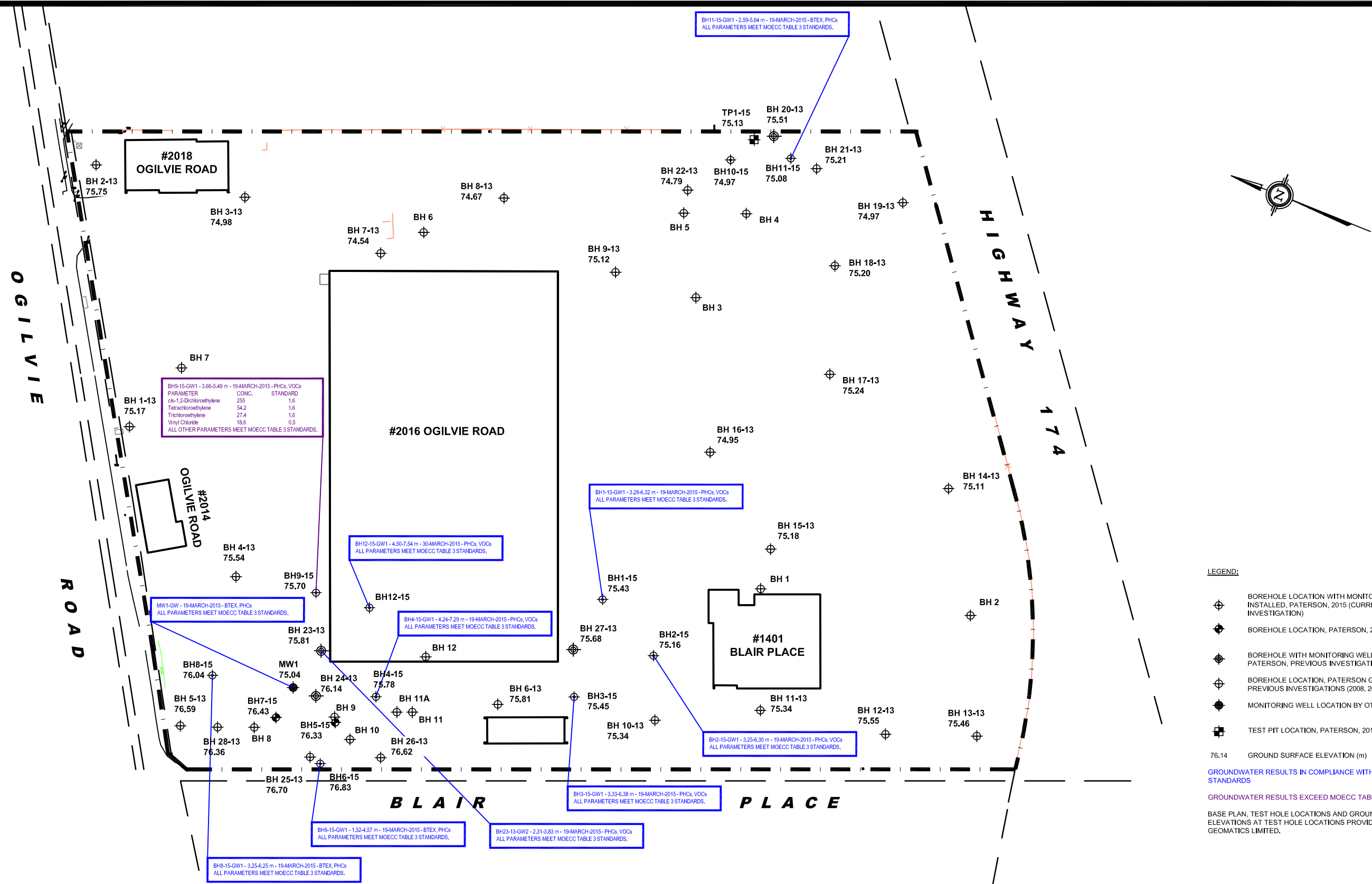
TRINITY DEVELOPMENT GROUP INC.
PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2012 OGILVIE ROAD

OTTAWA, ONTARIO

ANALYTICAL TESTING PLAN - SOIL

Scale:	1:1500	Date:	03/2015
Drawn by:	MPG	Report No.:	PE3116-3
Checked by:	DJA	Drawing No.:	PE3116-9
Approved by:	MSD		

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- LEGEND:**
- BOREHOLE LOCATION WITH MONITORING WELL INSTALLED, PATERSON, 2015 (CURRENT INVESTIGATION)
 - BOREHOLE LOCATION, PATERSON, 2015
 - BOREHOLE WITH MONITORING WELL INSTALLED, PATERSON, PREVIOUS INVESTIGATIONS (2008, 2013)
 - BOREHOLE LOCATION, PATERSON GROUP, PREVIOUS INVESTIGATIONS (2008, 2013)
 - MONITORING WELL LOCATION BY OTHERS
 - TEST PIT LOCATION, PATERSON, 2015
 - 76.14 GROUND SURFACE ELEVATION (m)
 - GROUNDWATER RESULTS IN COMPLIANCE WITH MOECC TABLE 3 STANDARDS
 - GROUNDWATER RESULTS EXCEED MOECC TABLE 3 STANDARDS
 - BASE PLAN, TEST HOLE LOCATIONS AND GROUND SURFACE ELEVATIONS AT TEST HOLE LOCATIONS PROVIDED BY STANTEC GEOMATICS LIMITED.

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NO.	REVISIONS	DATE	INITIAL

TRINITY DEVELOPMENT GROUP INC.
PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2012 OGILVIE ROAD

OTTAWA, ONTARIO

ANALYTICAL TESTING PLAN - GROUNDWATER

Scale:	1:1500	Date:	03/2015
Drawn by:	MPG	Report No.:	PE3116-3
Checked by:	DJA	Drawing No.:	PE3116-10
Approved by:	MSD		

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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

Sampling & Analysis Plan

Supplemental Phase II ESA
Existing Commercial Property, 2012 Ogilvie Road
Ottawa, Ontario

Prepared For

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March 2015

Report: PE3116-SAP-2

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1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Trinity Development Group Ltd. to conduct a Supplemental Phase II Environmental Site Assessment (ESA) for the property located at 2012 Ogilvie Road, Ottawa, Ontario. Based on a Phase I ESA and subsurface investigations previously completed by Paterson for the subject property, a subsurface investigation program, consisting of borehole drilling and test pit excavation, was developed. The subsurface investigation was completed concurrently with a geotechnical investigation by Inspec-Sol.

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1-15 to BH9-15	Assessment of soil quality in area of previously identified impacts associated with former retail fuel outlet.	Drilled to intercept water table for monitoring well installation.
BH10-15 BH11-15	Assessment of soil quality in vicinity of former automotive service garage.	Drilled to intercept water table for monitoring well installation.
BH12-15	Drilled within footprint of existing commercial building to assess groundwater impacts associated with former dry cleaning business.	Drilled to intercept water table for monitoring well installation.
TP1-15	Excavated to assess soil conditions at property boundary in vicinity of former automotive service garage.	Advanced to practical refusal on bedrock surface

Borehole and test pit locations are shown on the Test Hole Location Plan appended to the main report.

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

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.

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 MOE site condition standards.
- In boreholes with evidence of contamination as described above, a sample should be submitted from the stratigraphic unit below the 'worst-case' sample to determine whether the contaminant(s) have migrated downward.
- Parameters analyzed should be consistent with the Contaminants of Potential Concern identified in the Phase I ESA.

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

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

3.0 STANDARD OPERATING PROCEDURES

3.1 Environmental Drilling Procedure

Purpose

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

Equipment

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

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

Determining Borehole Locations

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

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

Drilling Procedure

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

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

Spoon Washing Procedure

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

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

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

Screening Procedure

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

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

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

3.2 Monitoring Well Installation Procedure

Equipment

- 1.52 m x 51 mm threaded sections of Schedule 40 PVC slotted well screen (1.52 m x 32 mm if installing in cored hole in bedrock)
- 1.52 m x 51 mm threaded sections of Schedule 40 PVC riser pipe (1.52 m x 32 mm if installing in cored hole in bedrock)
- Threaded end-cap
- Slip-cap or J-plug
- Asphalt cold patch or concrete
- Silica Sand
- Bentonite chips (Holeplug)
- Steel flushmount casing

Procedure

- Drill borehole to required depth, using drilling and sampling procedures described above.
- If borehole is deeper than required monitoring well, backfill with bentonite chips to required depth. This should only be done on wells where contamination is not suspected, in order to prevent downward migration of contamination.
- Only one monitoring well should be installed per borehole.
- Monitoring wells should not be screened across more than one stratigraphic unit to prevent potential migration of contaminants between units.
- Where LNAPLs are the suspected contaminants of concern, monitoring wells should be screened straddling the water table in order to capture any free product floating on top of the water table.
- Thread the end cap onto a section of screen. Thread second section of screen if required. Thread risers onto screen. Lower into borehole to required depth. Ensure slip-cap or J-plug is inserted to prevent backfill materials entering well.
- As drillers remove augers, backfill borehole annulus with silica sand until the level of sand is approximately 0.3 m above the top of the screen.
- Backfill with holeplug until at least 0.3 m of holeplug is present above the top of the silica sand.

- Backfill remainder of borehole with holeplug or with auger cuttings (if contamination is not suspected).
- Install flushmount casing. Seal space between flushmount and borehole annulus with concrete, cold patch, or holeplug to match surrounding ground surface.

3.3 Monitoring Well Sampling Procedure

Equipment

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

Sampling Procedure

- Locate well and use socket wrench or Allan key to open metal flush mount protector cap. Remove plastic well cap.
- Measure water level, with respect to existing ground surface, using water level meter or interface probe. If using interface probe on suspected NAPL site, measure the thickness of free product.
- Measure total depth of well.
- Clean water level tape or interface probe using methanol and water. Change gloves between wells.
- Calculate volume of standing water within well and record.
- Insert polyethylene tubing into well and attach to peristaltic pump. Turn on peristaltic pump and purge into graduated bucket. Purge at least three well volumes of water from the well. Measure and record field chemistry. Continue to purge, measuring field chemistry after every well volume purged, until appearance or field chemistry stabilizes.

- Note appearance of purge water, including colour, opacity (clear, cloudy, silty), sheen, presence of LNAPL, and odour. Note any other unusual features (particulate matter, effervescence (bubbling) of dissolved gas, etc.).
- Fill required sample bottles. If sampling for metals, attach 75-micron filter to discharge tube and filter metals sample. If sampling for VOCs, use low flow rate to ensure continuous stream of non-turbulent flow into sample bottles. Ensure no headspace is present in VOC vials.
- Replace well cap and flushmount casing cap.

4.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

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

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

5.0 DATA QUALITY OBJECTIVES

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

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

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

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

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

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

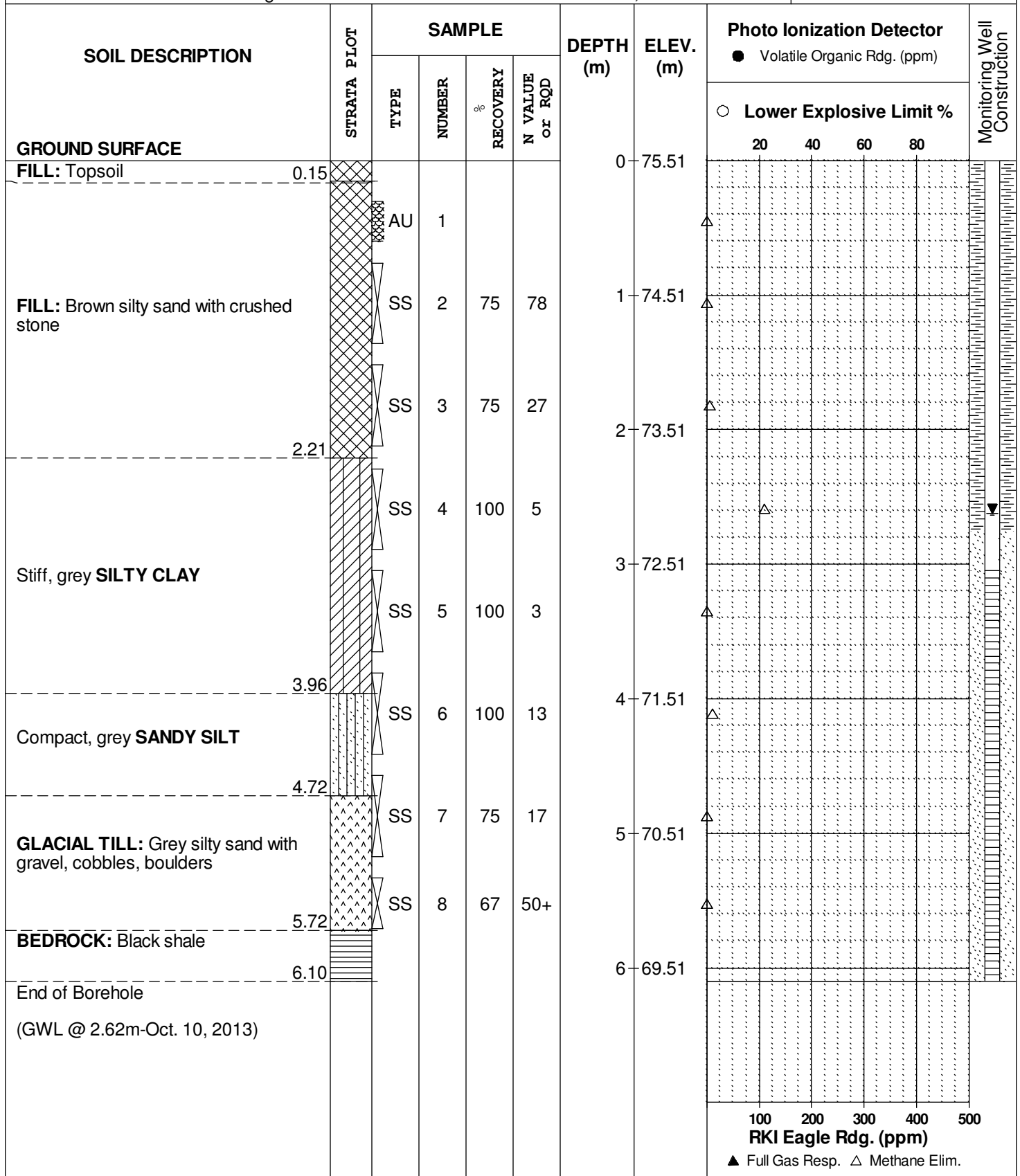
REMARKS

BORINGS BY CME 55 Power Auger

DATE October 2, 2013

FILE NO. **PE3116**

HOLE NO. **BH20-13**



DATUM Ground surface elevations provided by Stantec Geomatics Limited.

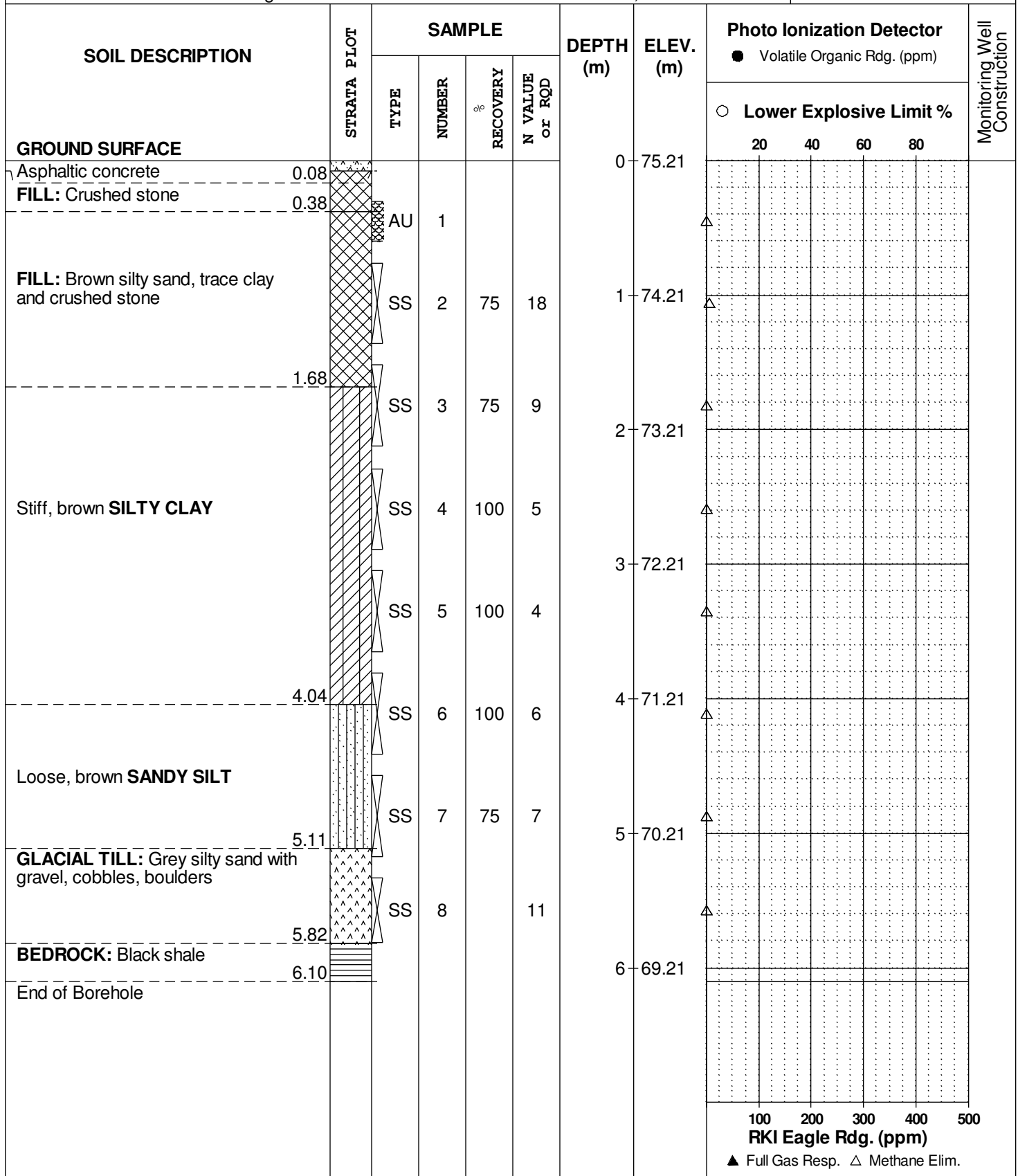
REMARKS

BORINGS BY CME 55 Power Auger

DATE October 2, 2013

FILE NO. PE3116

HOLE NO. BH21-13



DATUM Ground surface elevations provided by Stantec Geomatics Limited.

FILE NO. PE3116

REMARKS

HOLE NO. BH22-13

BORINGS BY CME 55 Power Auger

DATE October 2, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rdg. (ppm)					
								○ Lower Explosive Limit %					
								20	40	60	80		
GROUND SURFACE													
Asphaltic concrete	0.08					0	74.79						
FILL: Crushed stone	0.38												
		AU	1										
FILL: Brown silty sand with crushed stone						1	73.79						
		SS	2	67	14								
	1.68												
		SS	3	83	7	2	72.79						
Stiff, brown SILTY CLAY													
		SS	4	100	4								
	3.20												
		SS	5	75	10	3	71.79						
Loose, brown SANDY SILT													
	3.81												
GLACIAL TILL: Grey sandy silt with gravel, cobbles, boulders						4	70.79						
		SS	6	33	6								
	4.34												
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles, boulders													
		SS	7	92	50+								
	4.90												
End of Borehole													
BH terminated on inferred bedrock surface at 4.90m depth													

100 200 300 400 500
RKI Eagle Rdg. (ppm)
▲ Full Gas Resp. △ Methane Elim.

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Shoppers City East - Ogilvie Road at Blair Place
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

REMARKS

BORINGS BY CME 55 Power Auger

DATE October 4, 2013

FILE NO. **PE3116**

HOLE NO. **BH23-13**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rdg. (ppm)	○ Lower Explosive Limit %			
								20	40	60	80	
GROUND SURFACE						0	75.81					
Asphaltic concrete	0.08	AU	1									
FILL: Brown silty sand with crushed stone		SS	2	67	18	1	74.81					
	1.83	SS	3	93	50+							
Concrete	1.98					2	73.81					
GLACIAL TILL: Grey silty sand with clay, gravel, cobbles, boulders		SS	4	75	12							
	3.50	SS	5	67	23	3	72.81					
BEDROCK: Black shale	3.83	SS	6		50+							
End of Borehole (GWL @ 1.66m-Oct. 10, 2013)												

100 200 300 400 500
RKI Eagle Rdg. (ppm)
▲ Full Gas Resp. △ Methane Elim.

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Shoppers City East - Ogilvie Road at Blair Place
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

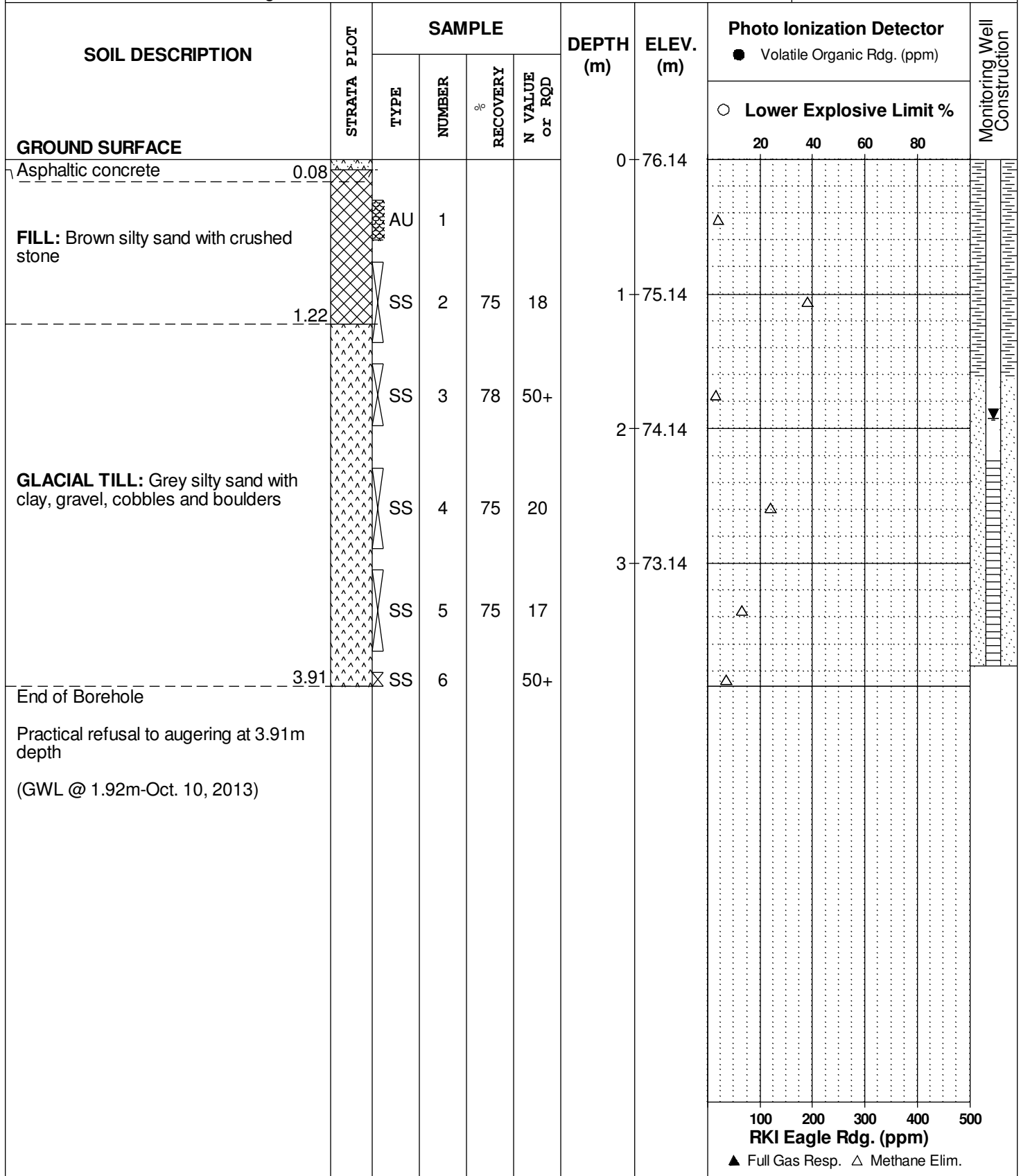
FILE NO. PE3116

REMARKS

HOLE NO. BH24-13

BORINGS BY CME 55 Power Auger

DATE October 4, 2013



SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Shoppers City East - Ogilvie Road at Blair Place
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

REMARKS

BORINGS BY CME 55 Power Auger

DATE October 4, 2013

FILE NO. **PE3116**

HOLE NO. **BH25-13**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rdg. (ppm)					
GROUND SURFACE								○ Lower Explosive Limit %					
								20	40	60	80		
Asphaltic concrete	0.08	AU	1			0	76.70						
FILL: Brown silty sand with crushed stone		SS	2	33	10	1	75.70						
		SS	3	50	5	2	74.70						
		SS	4	50	4								
		SS	5	33	6	3	73.70					820	
GLACIAL TILL: Grey silty sand wity clay, gravel, cobbles, boulders	2.74	SS	6	33	13	4	72.70						
	4.29												
End of Borehole													
BH terminated on inferred bedrock surface at 4.29m depth													
								100	200	300	400	500	
								RKI Eagle Rdg. (ppm)					
								▲ Full Gas Resp. △ Methane Elim.					

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

FILE NO. **PE3116**

REMARKS

HOLE NO. **BH26-13**

BORINGS BY CME 55 Power Auger

DATE October 4, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rdg. (ppm)					
								○ Lower Explosive Limit %					
								20	40	60	80		
GROUND SURFACE						0	76.62						
Asphaltic concrete	0.08												
FILL ; Brown silty sand with crushed stone		AU	1										
	1.07					1	75.62						
		SS	2	75	12								
		SS	3	75	30								
		SS	4	75	10								
GLACIAL TILL : Grey silty sand with clay, gravel, cobbles and boulders		SS	5	50	18								
		SS	6		50+								
	4.27					4	72.62						
End of Borehole													
Practical refusal to augering at 4.27m depth													
								100	200	300	400	500	
								RKI Eagle Rdg. (ppm)					
								▲ Full Gas Resp. △ Methane Elim.					

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Shoppers City East - Ogilvie Road at Blair Place
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

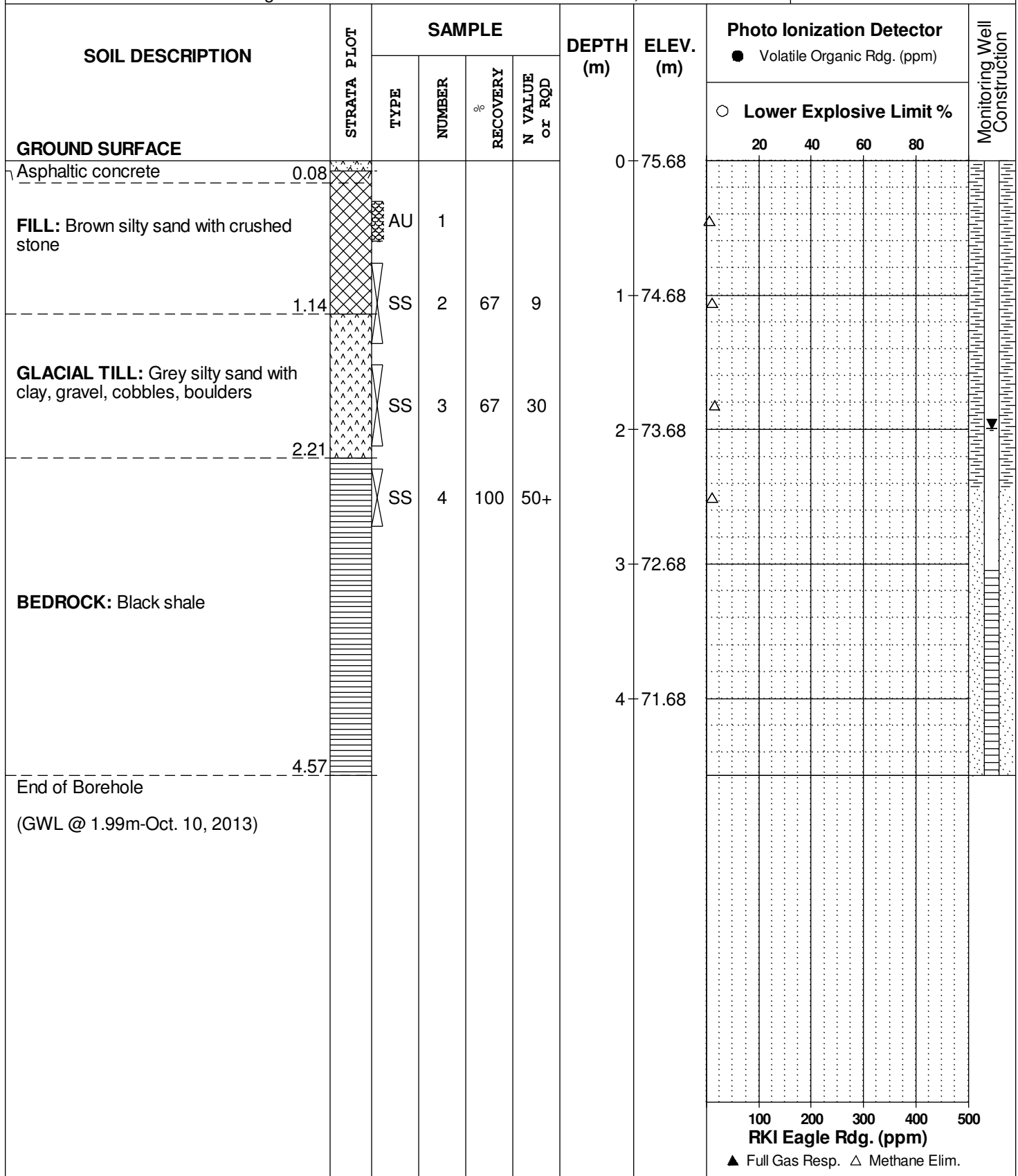
REMARKS

BORINGS BY CME 55 Power Auger

DATE October 4, 2013

FILE NO. PE3116

HOLE NO. BH27-13



SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Shoppers City East - Ogilvie Road at Blair Place
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

REMARKS

BORINGS BY CME 55 Power Auger

DATE October 4, 2013

FILE NO. **PE3116**

HOLE NO. **BH28-13**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rdg. (ppm)					
								○ Lower Explosive Limit %					
								20	40	60	80		
GROUND SURFACE													
Asphaltic concrete	0.08					0	76.36						
FILL: Brown silty sand with crushed stone	0.76												
		SS	1	83	24	1	75.36						
		SS	2	67	36	2	74.36						
GLACIAL TILL: Brown to grey silty sand with gravel, cobbles and boulders		SS	3	67	28	3	73.36						
		SS	4	75	28	4	72.36						
	4.05	SS	5	0	50+	4	72.36						
End of Borehole													

100 200 300 400 500
RKI Eagle Rdg. (ppm)
▲ Full Gas Resp. △ Methane Elim.

DATUM

REMARKS

BORINGS BY CME 55 Power Auger

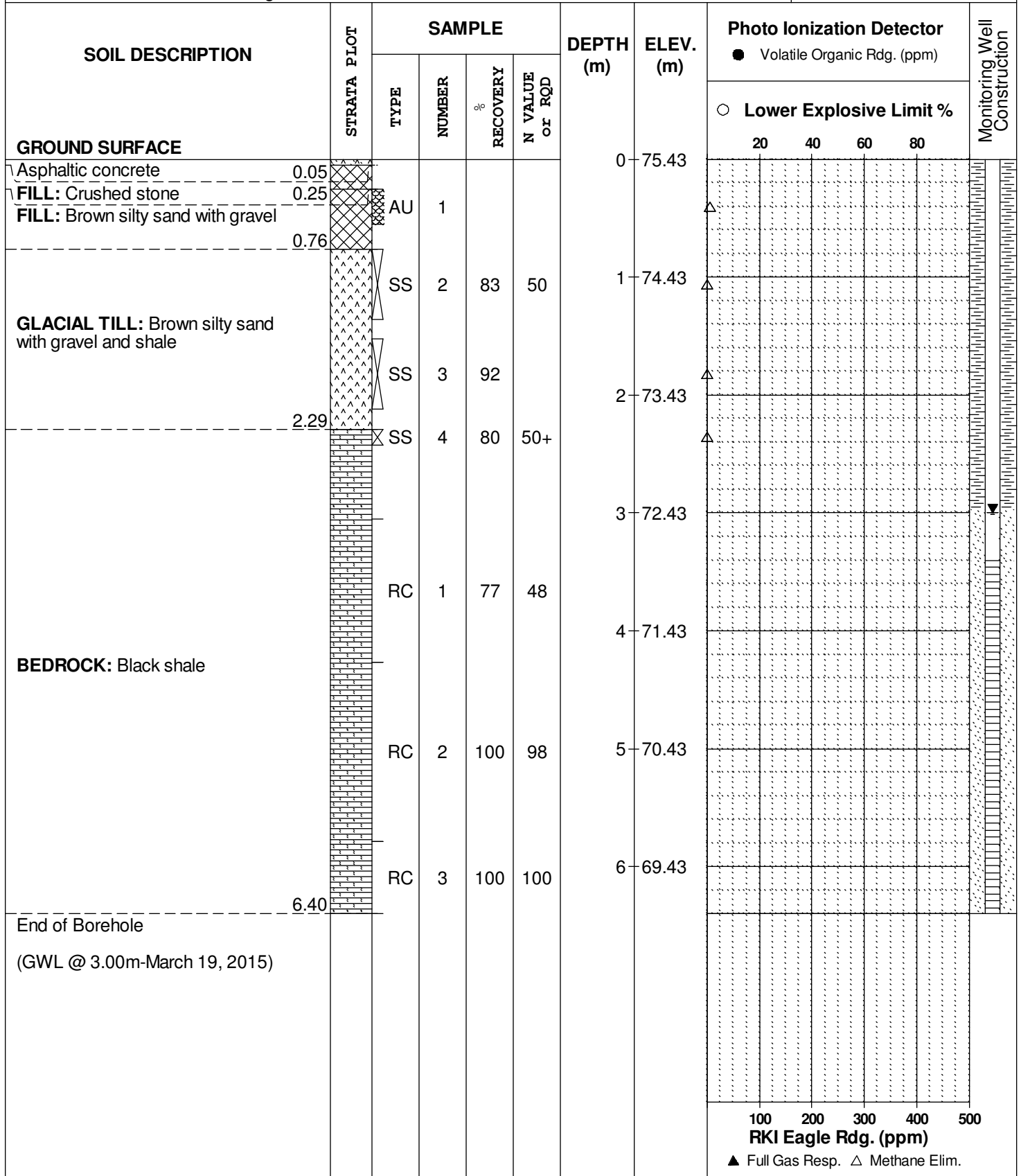
DATE March 12, 2015

FILE NO.

PE3116

HOLE NO.

BH 1-15



DATUM

REMARKS

BORINGS BY CME 55 Power Auger

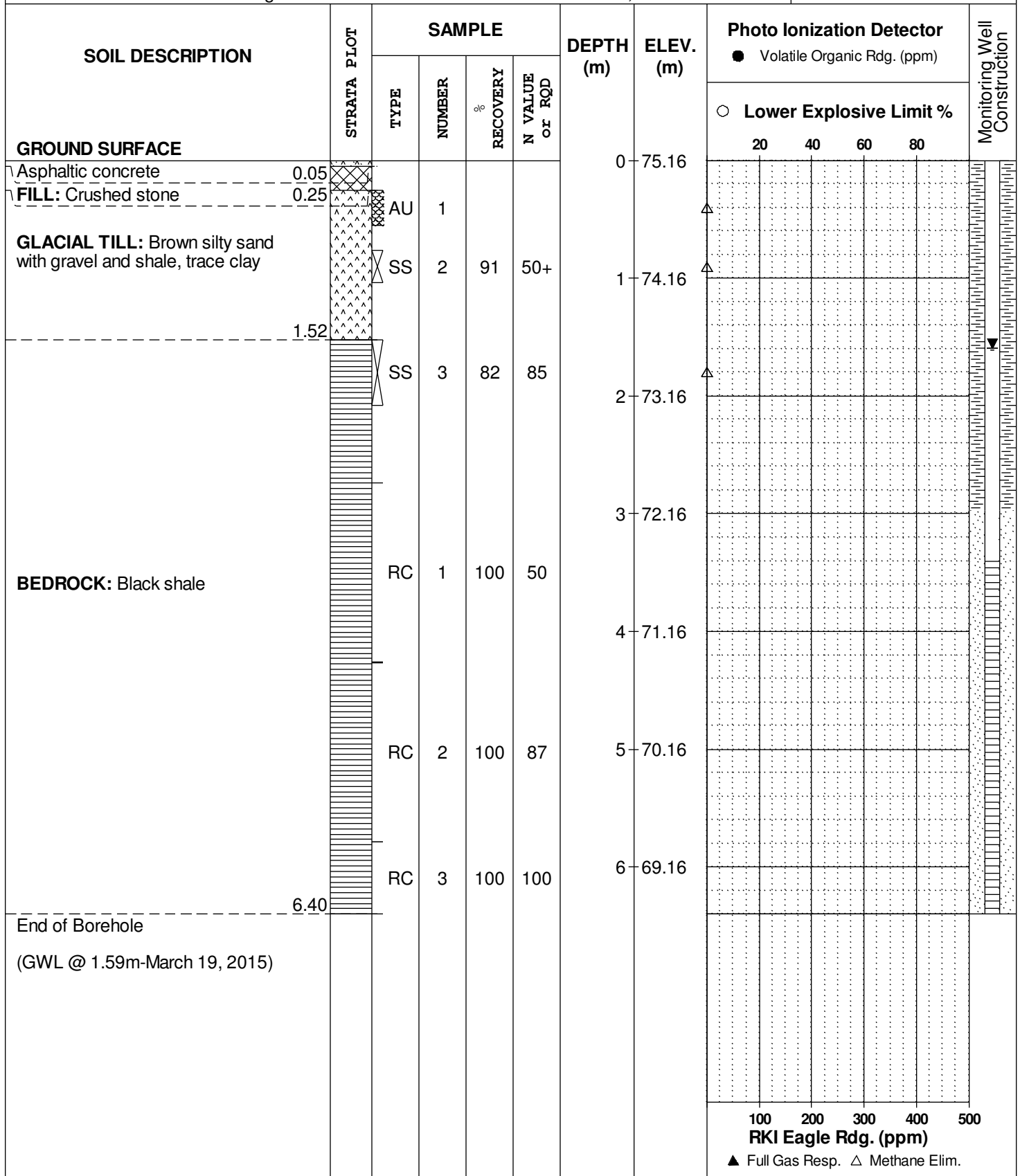
DATE March 12, 2015

FILE NO.

PE3116

HOLE NO.

BH 2-15



SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Shoppers City East - Ogilvie Road at Blair Place
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY CME 55 Power Auger

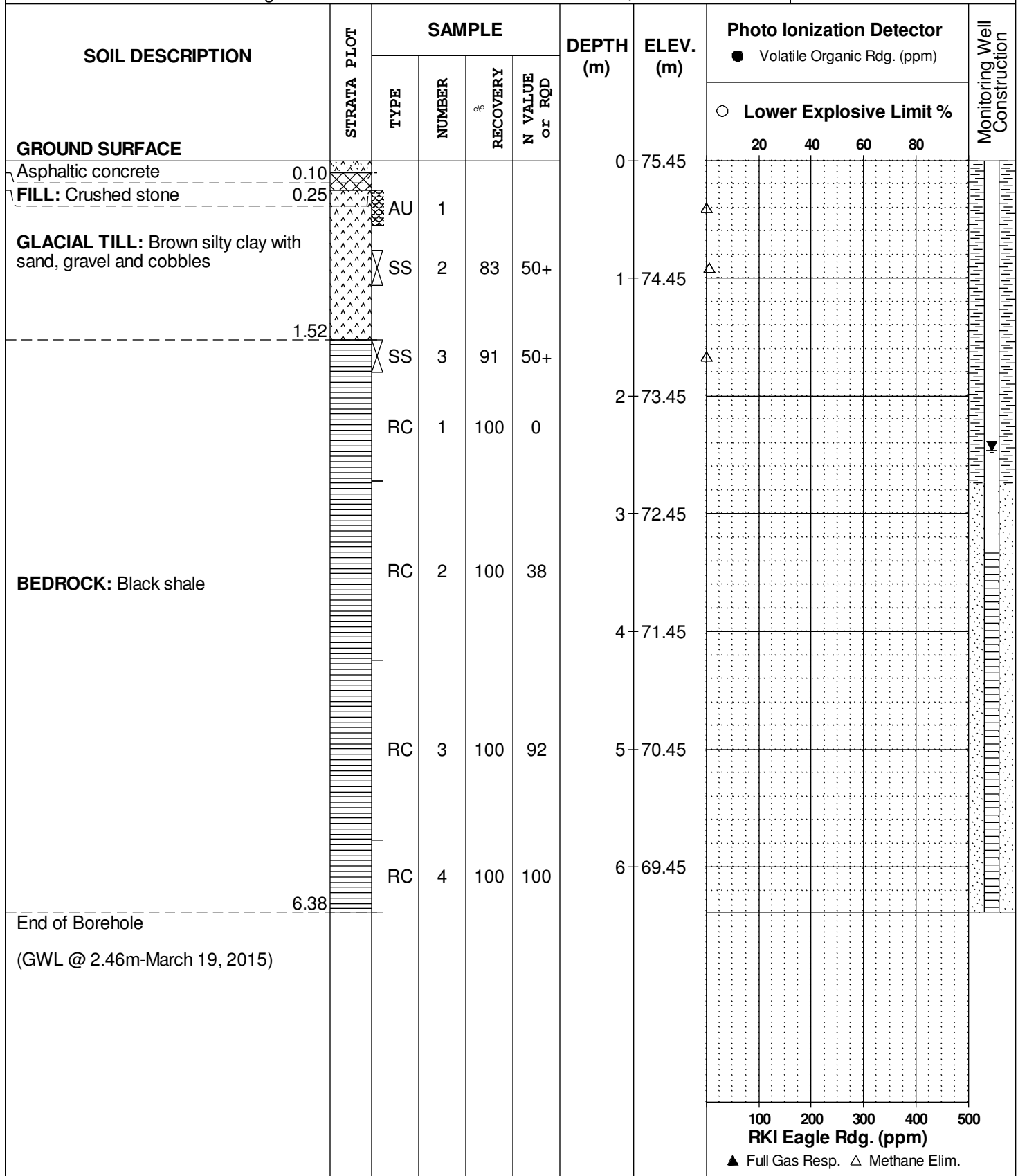
DATE March 13, 2015

FILE NO.

PE3116

HOLE NO.

BH 3-15



DATUM

REMARKS

BORINGS BY CME 55 Power Auger

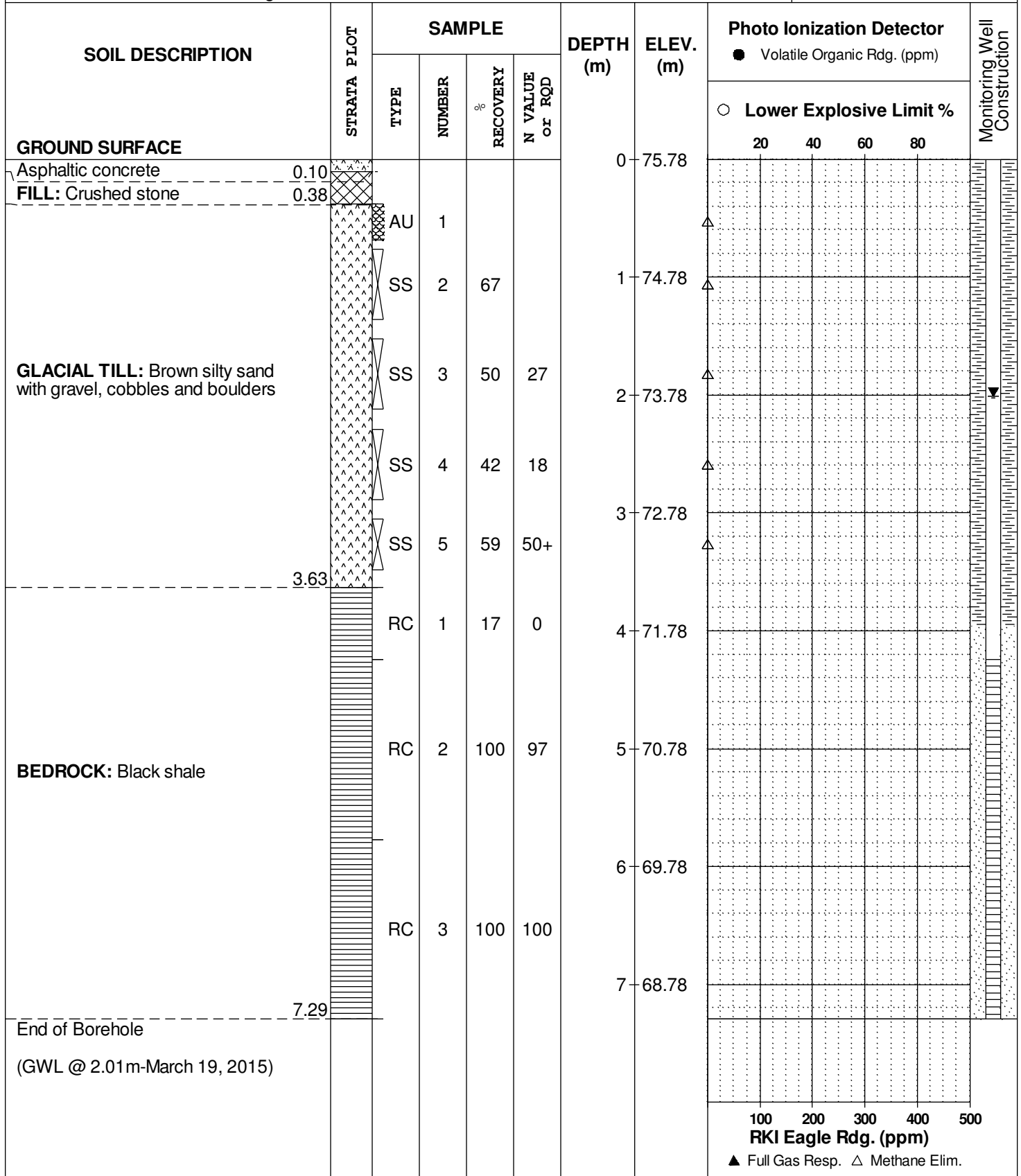
DATE March 13, 2015

FILE NO.

PE3116

HOLE NO.

BH 4-15



SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Shoppers City East - Ogilvie Road at Blair Place
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY CME 55 Power Auger

DATE March 13, 2015

FILE NO.

PE3116

HOLE NO.

BH 5-15

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rdg. (ppm)	○ Lower Explosive Limit %			
								20	40	60	80	
GROUND SURFACE						0	76.33					
Asphaltic concrete	0.05											
FILL: Crushed stone	0.30											
		AU	1									
		SS	2	42	23	1	75.33					
FILL: Brown silty sand with gravel		SS	3	17	38	2	74.33					
		SS	4	75	22							
		SS	5	44	50+	3	73.33					
End of Borehole	3.28											
Practical refusal to augering at 3.28m depth												
								100	200	300	400	500
								RKI Eagle Rdg. (ppm)				
								▲ Full Gas Resp. △ Methane Elim.				

DATUM

REMARKS

BORINGS BY CME 55 Power Auger

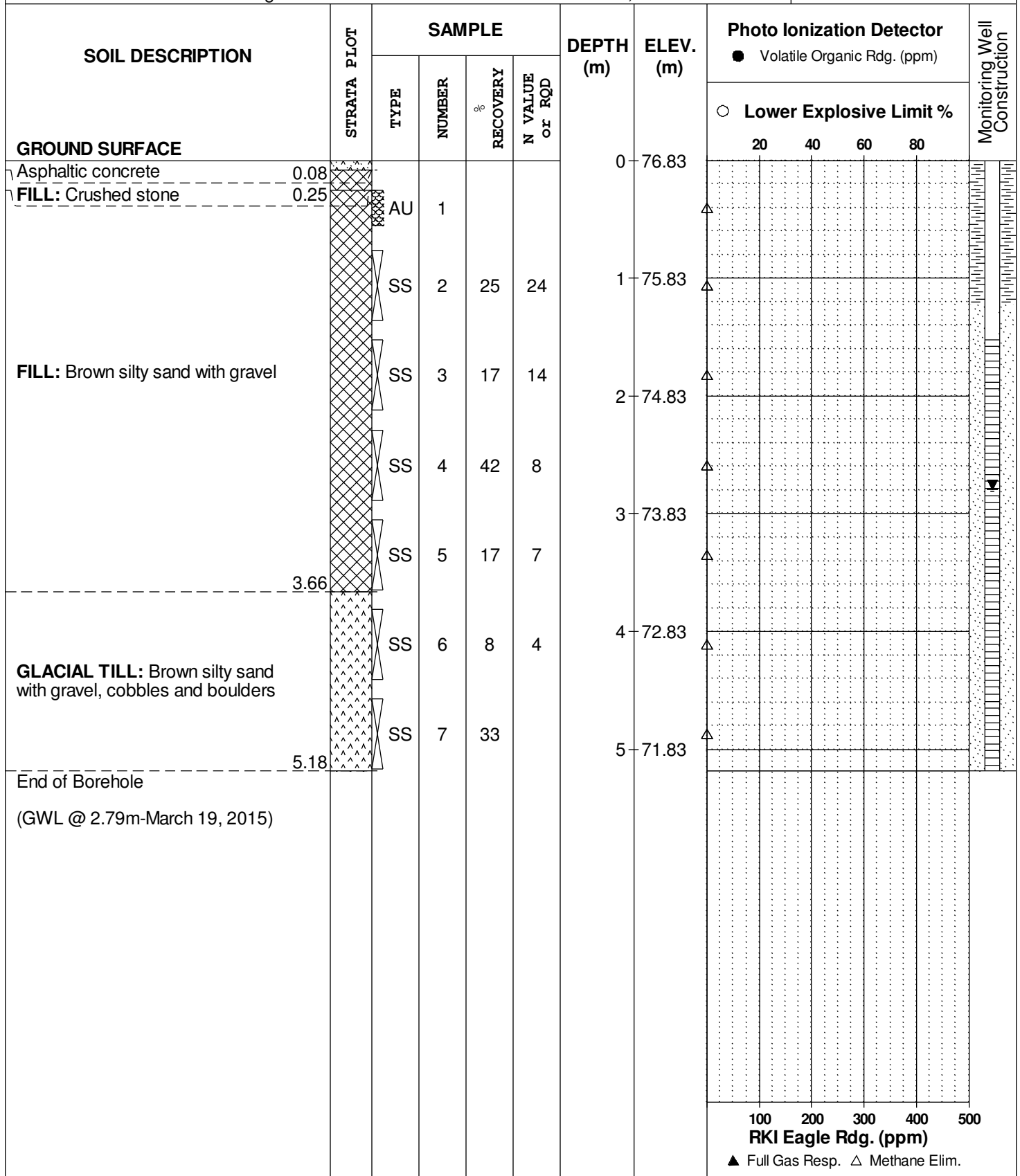
DATE March 12, 2015

FILE NO.

PE3116

HOLE NO.

BH 6-15



SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Shoppers City East - Ogilvie Road at Blair Place
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY CME 55 Power Auger

DATE March 12, 2015

FILE NO.

PE3116

HOLE NO.

BH 7-15

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rdg. (ppm)	○ Lower Explosive Limit %			
								20	40	60	80	
GROUND SURFACE						0	76.43					
Asphaltic concrete	0.10											
FILL: Crushed stone with sand	0.41	AU	1									
FILL: Brown silty sand with gravel	1.52	SS	2	33	14	1	75.43					
GLACIAL TILL: Brown silty clay with sand, gravel, cobbles and shale		SS	3	75	39	2	74.43					
		SS	4	33	55							
		SS	5	42	13	3	73.43					
		SS	6	67	50+							
End of Borehole	3.99											
Practical refusal to augering at 3.99m depth												
								100	200	300	400	500
								RKI Eagle Rdg. (ppm)				
								▲ Full Gas Resp. △ Methane Elim.				

DATUM

REMARKS

BORINGS BY CME 55 Power Auger

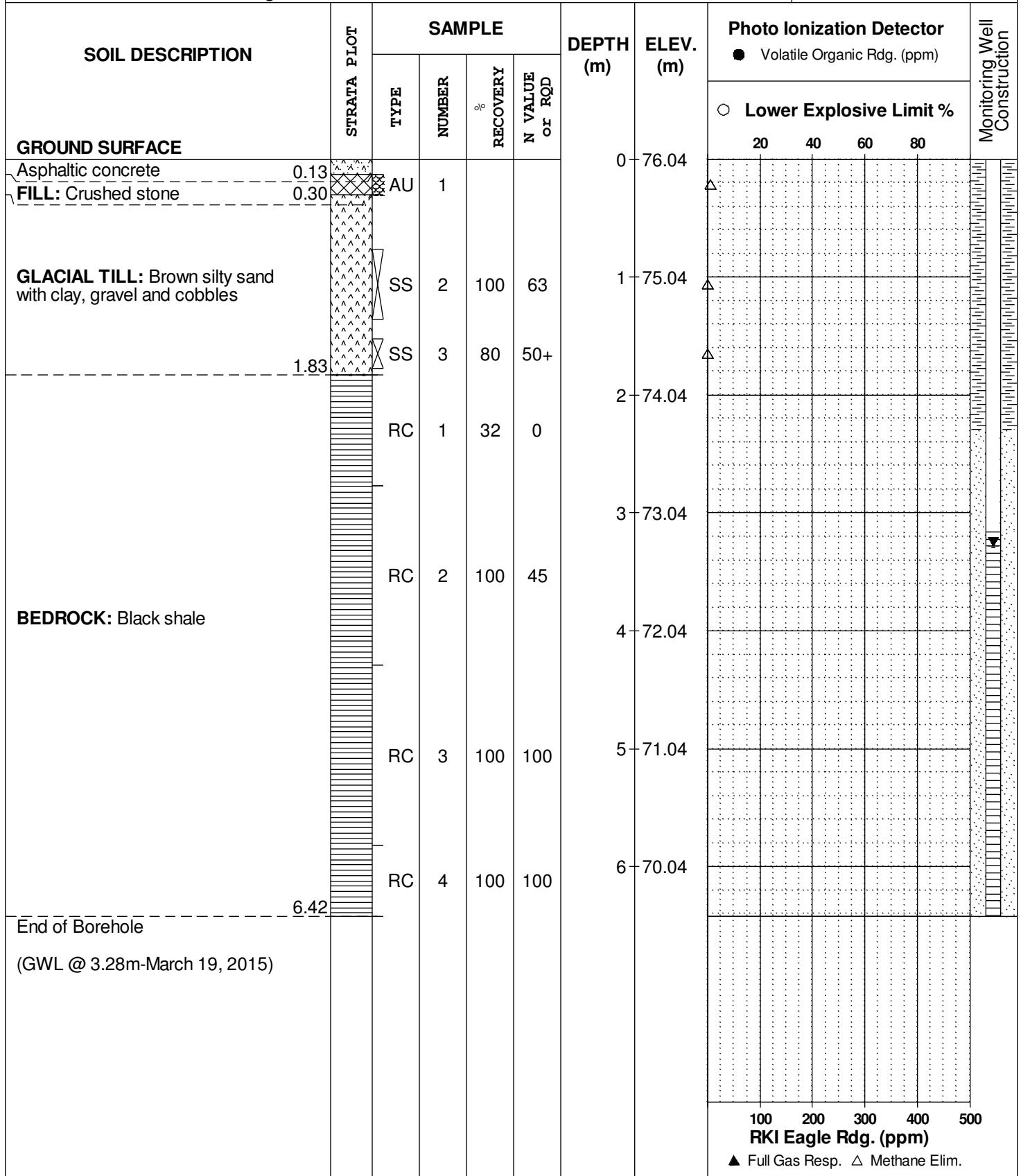
DATE March 12, 2015

FILE NO.

PE3116

HOLE NO.

BH 8-15



DATUM

REMARKS

BORINGS BY CME 55 Power Auger

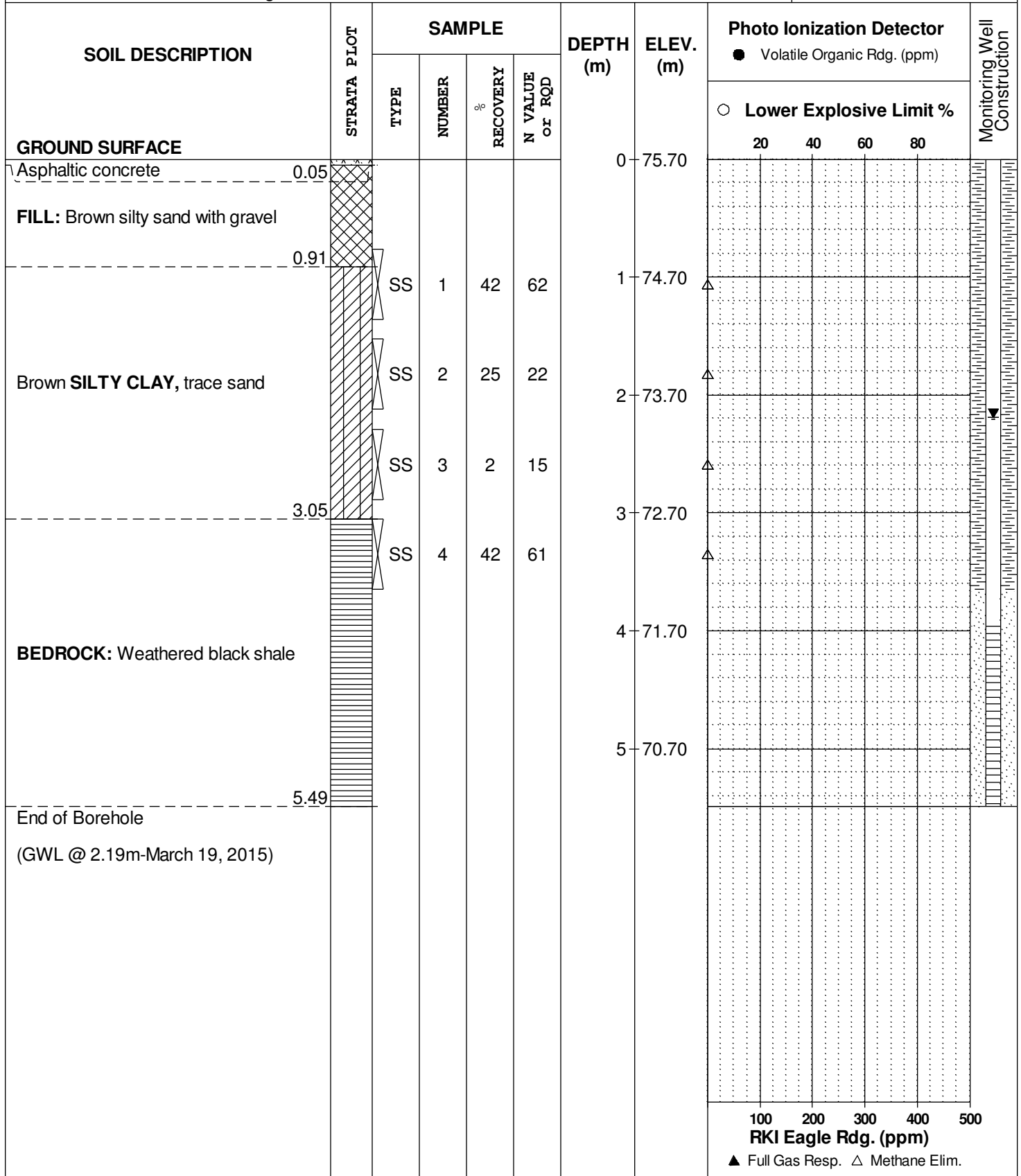
DATE March 13, 2015

FILE NO.

PE3116

HOLE NO.

BH 9-15



DATUM

REMARKS

BORINGS BY CME 55 Power Auger

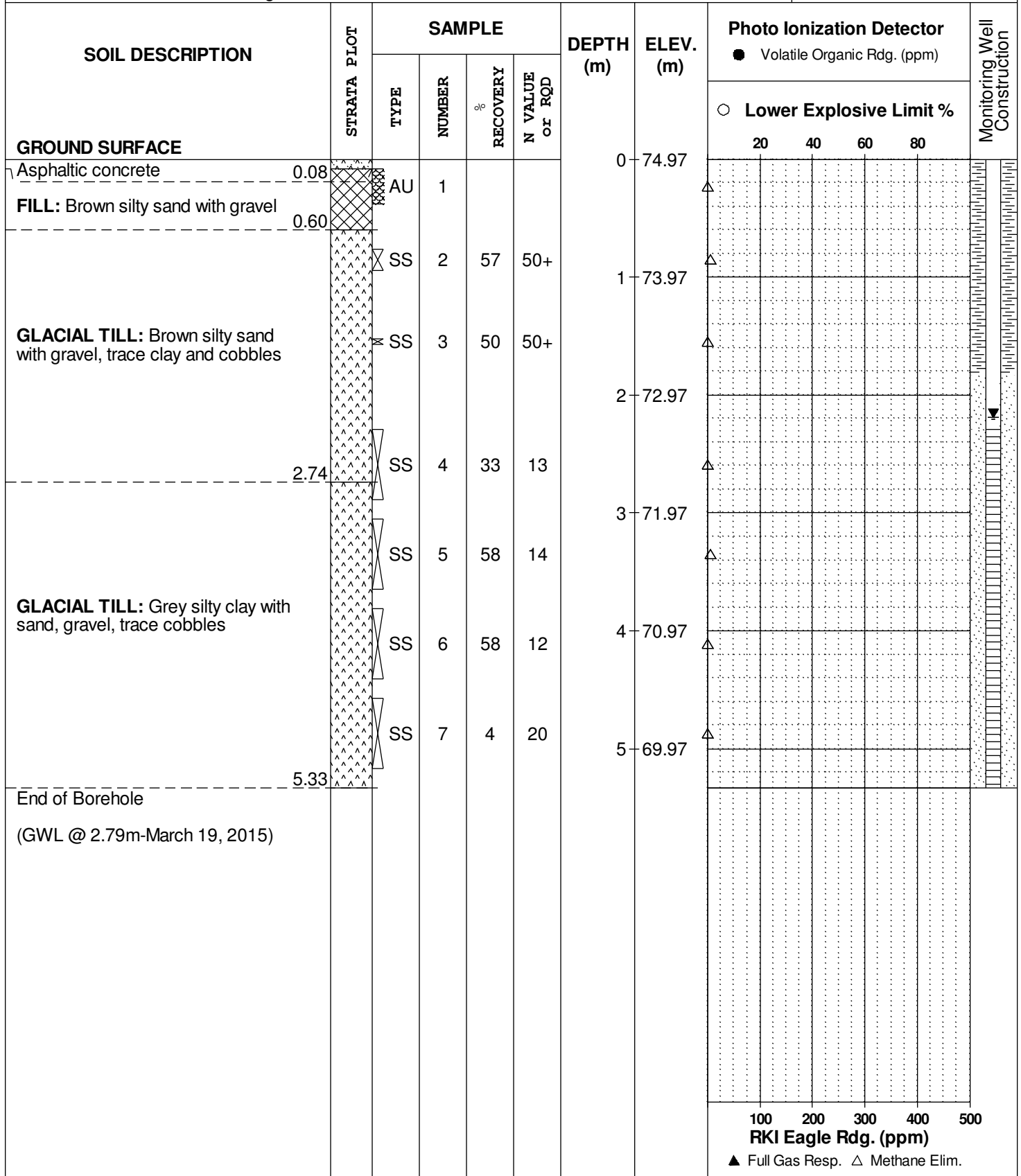
DATE March 12, 2015

FILE NO.

PE3116

HOLE NO.

BH10-15



DATUM

REMARKS

BORINGS BY CME 55 Power Auger

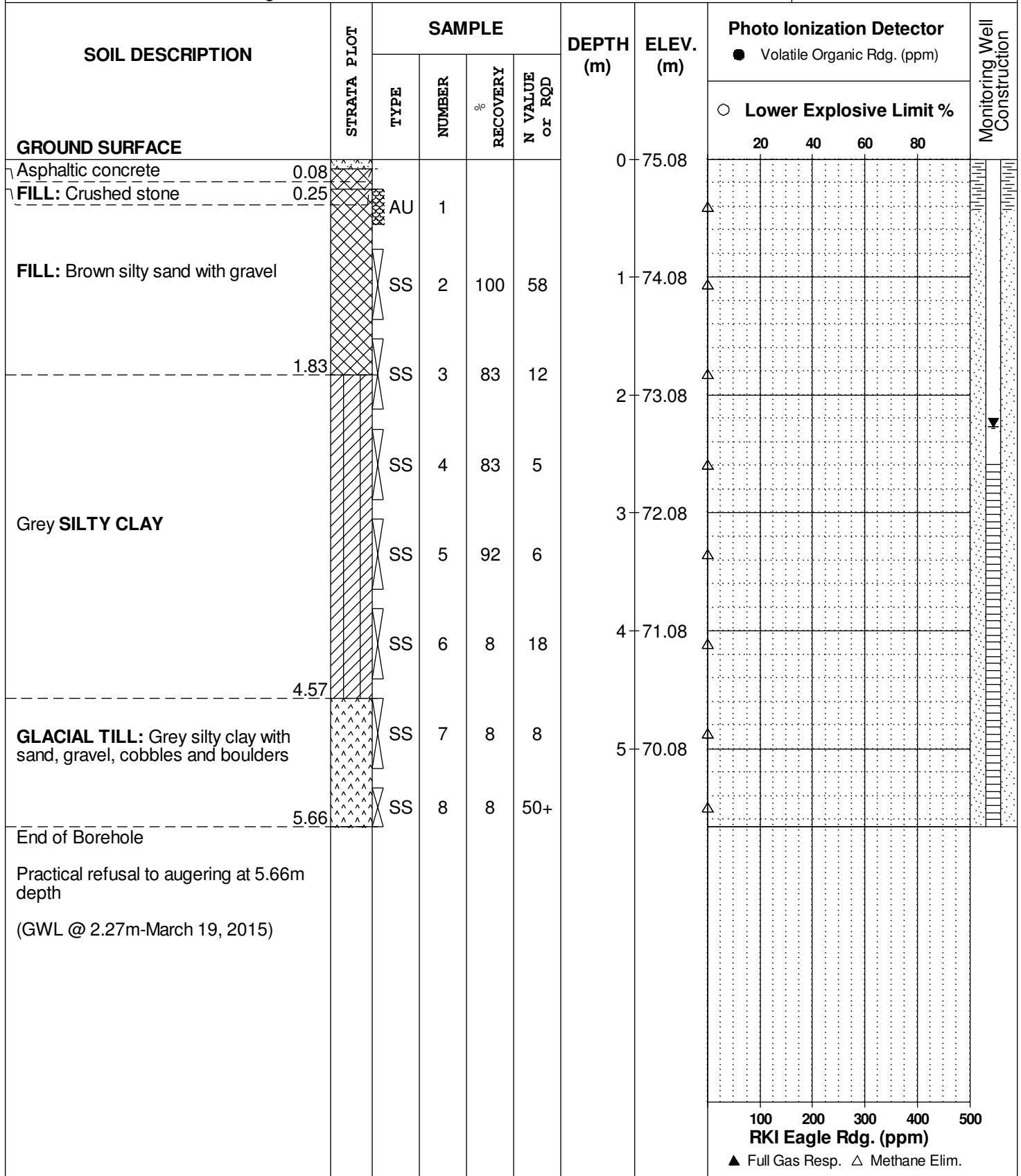
DATE March 13, 2015

FILE NO.

PE3116

HOLE NO.

BH11-15



100 200 300 400 500
RKI Eagle Rdg. (ppm)
▲ Full Gas Resp. △ Methane Elim.

DATUM

REMARKS

BORINGS BY Portable Drill

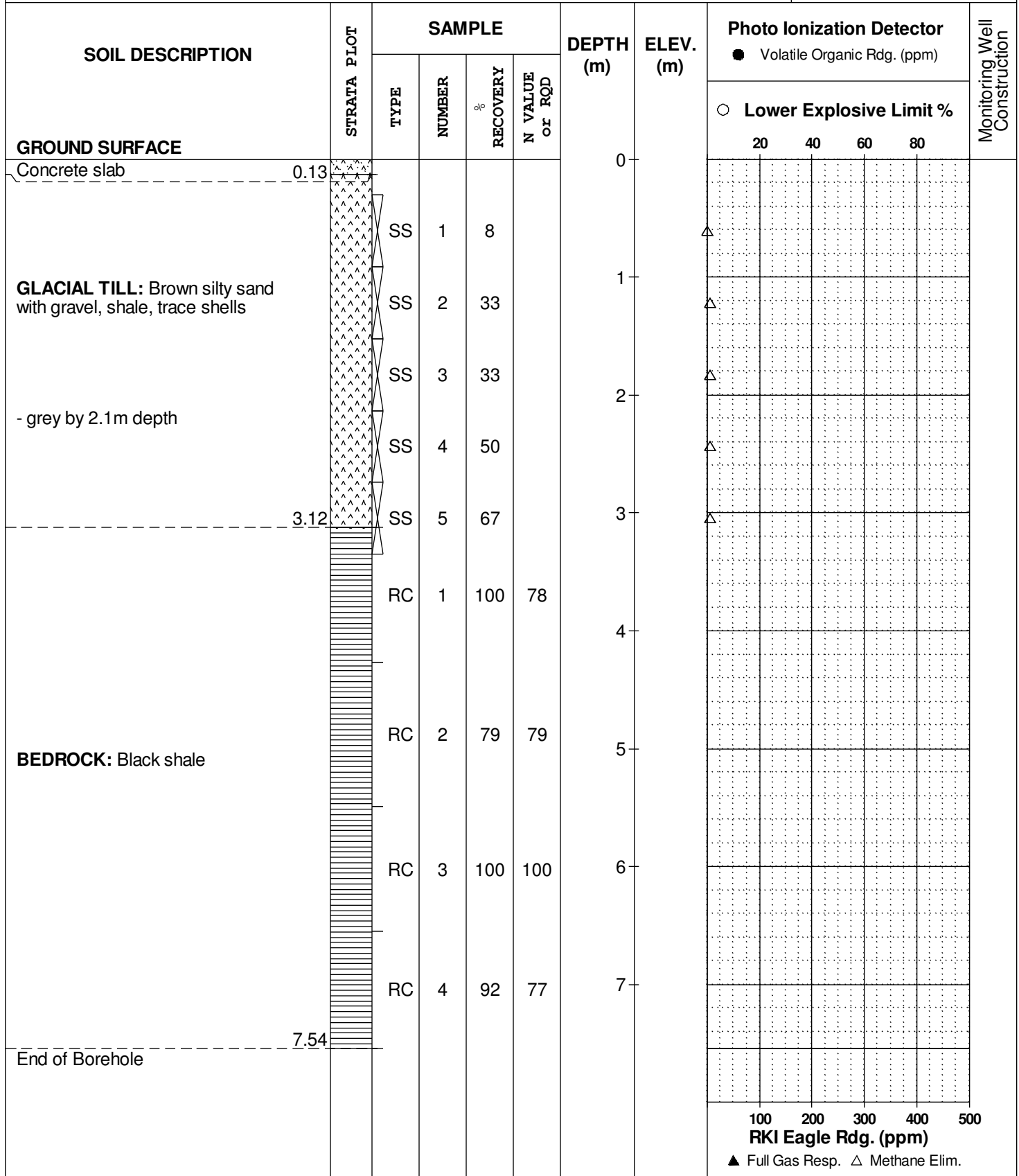
DATE March 16, 2015

FILE NO.

PE3116

HOLE NO.

BH12-15



DATUM

REMARKS

BORINGS BY Hydraulic Shovel

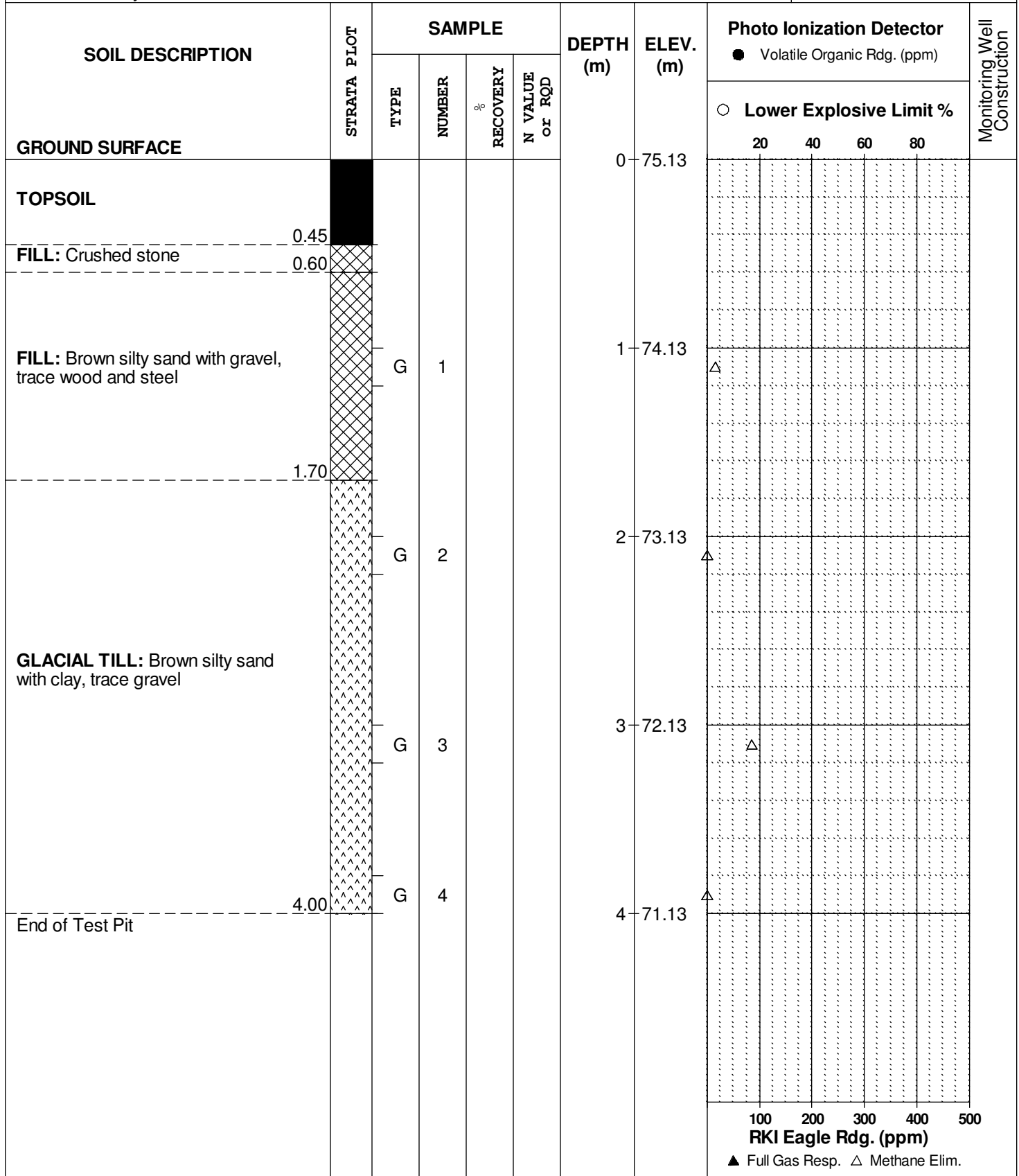
DATE March 19, 2015

FILE NO.

PE3116

HOLE NO.

TP 1-15



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)
D _{xx}	-	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
D ₁₀	-	Grain size at which 10% of the soil is finer (effective grain size)
D ₆₀	-	Grain size at which 60% of the soil is finer
C _c	-	Concavity coefficient = $(D_{30})^2 / (D_{10} \times D_{60})$
C _u	-	Uniformity coefficient = D_{60} / D_{10}

C_c and C_u are used to assess the grading of sands and gravels:

Well-graded gravels have: $1 < C_c < 3$ and $C_u > 4$

Well-graded sands have: $1 < C_c < 3$ and $C_u > 6$

Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.

C_c and C_u 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
C _{cr}	-	Recompression index (in effect at pressures below p' _c)
C _c	-	Compression index (in effect at pressures above p' _c)
OC Ratio		Overconsolidation ratio = p'_c / p'_o
Void Ratio		Initial sample void ratio = volume of voids / volume of solids
W _o	-	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)

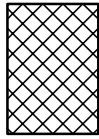
STRATA PLOT



Topsoil



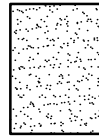
Asphalt



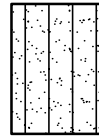
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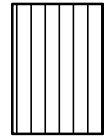
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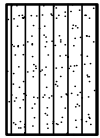
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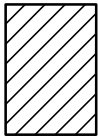
Silty Sand



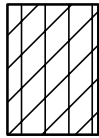
Silt



Sandy Silt



Clay



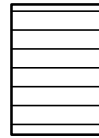
Silty Clay



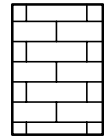
Clayey Silty Sand



Glacial Till



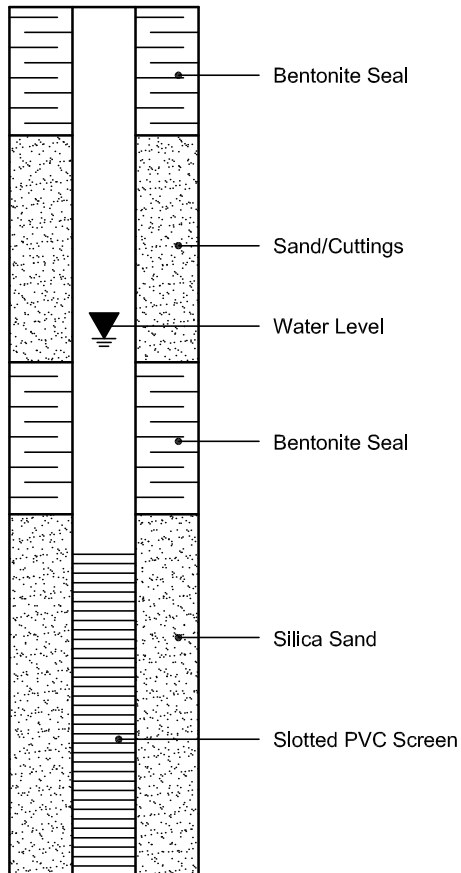
Shale



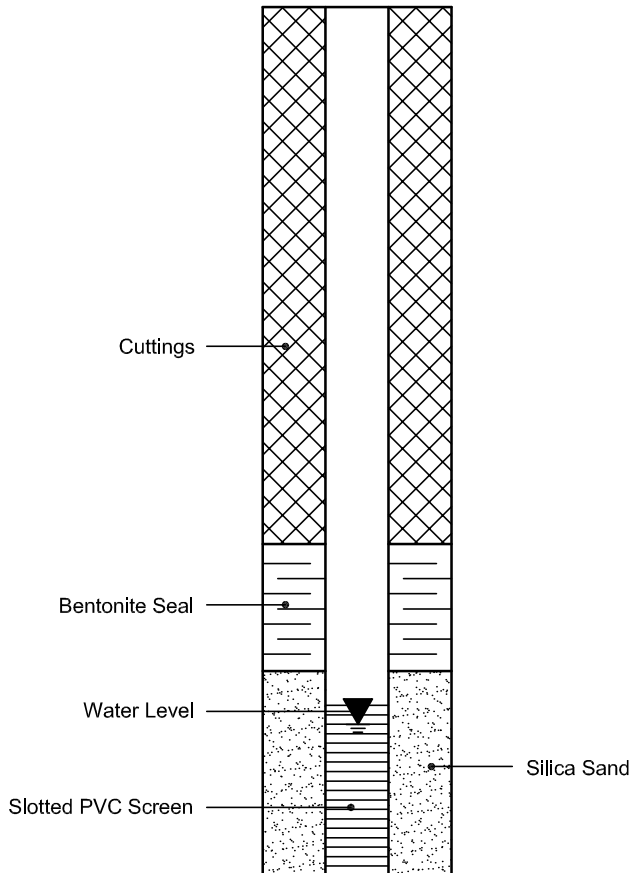
Bedrock

MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Eric Leveque

Phone: (613) 226-7381
Fax: (613) 226-6344

Client PO: 17620
Project: PE3116
Custody: 102468

Report Date: 17-Mar-2015
Order Date: 13-Mar-2015

Order #: 1511399

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

Paracel ID	Client ID
1511399-01	BH1-15-SS2
1511399-02	BH2-15-SS2
1511399-03	BH6-15-SS7
1511399-04	BH7-15-SS5
1511399-05	BH8-15-SS3
1511399-06	BH10-15-SS5

Approved By:



Mark Foto, M.Sc. For Dale Robertson, BSc
Laboratory Director

Any use of these results implies your agreement that our total liability in connection with this work, however arising shall be limited to the amount paid by you for this work, and that our employees or agents shall not under circumstances be liable to you in connection with this work

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**
Client PO: 17620

Project Description: PE3116

Report Date: 17-Mar-2015
Order Date: 13-Mar-2015

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	16-Mar-15	16-Mar-15
PHC F1	CWS Tier 1 - P&T GC-FID	16-Mar-15	16-Mar-15
PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	16-Mar-15	16-Mar-15
Solids, %	Gravimetric, calculation	16-Mar-15	16-Mar-15

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NIAGARA
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KINGSTON
1058 Gardiners Rd.
Kingston, ON K7P 1R7

Certificate of Analysis

Report Date: 17-Mar-2015

Order Date: 13-Mar-2015

Client: Paterson Group Consulting Engineers

Client PO: 17620

Project Description: PE3116

Client ID:	BH1-15-SS2	BH2-15-SS2	BH6-15-SS7	BH7-15-SS5
Sample Date:	12-Mar-15	12-Mar-15	12-Mar-15	12-Mar-15
Sample ID:	1511399-01	1511399-02	1511399-03	1511399-04
MDL/Units	Soil	Soil	Soil	Soil

Physical Characteristics

% Solids	0.1 % by Wt.	82.3	86.9	91.7	90.2
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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	0.06	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	0.07	<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	0.10	<0.05
Toluene-d8	Surrogate	102%	100%	101%	101%

Hydrocarbons

F1 PHCs (C6-C10)	7 ug/g dry	<7	7	11	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	23	22	22
F3 PHCs (C16-C34)	8 ug/g dry	<8	25	22	22
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	<6

Client ID:	BH8-15-SS3	BH10-15-SS5	-	-
Sample Date:	12-Mar-15	12-Mar-15	-	-
Sample ID:	1511399-05	1511399-06	-	-
MDL/Units	Soil	Soil	-	-

Physical Characteristics

% Solids	0.1 % by Wt.	90.2	76.7	-	-
----------	--------------	------	------	---	---

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	99.9%	100%	-	-

Hydrocarbons

F1 PHCs (C6-C10)	7 ug/g dry	<7	28	-	-
F2 PHCs (C10-C16)	4 ug/g dry	13	57	-	-
F3 PHCs (C16-C34)	8 ug/g dry	22	52	-	-
F4 PHCs (C34-C50)	6 ug/g dry	22	<6	-	-

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Certificate of Analysis

Report Date: 17-Mar-2015

Client: **Paterson Group Consulting Engineers**

Order Date: 13-Mar-2015

Client PO: 17620

Project Description: PE3116

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	8.15		ug/g		102	50-140			

Certificate of Analysis

Report Date: 17-Mar-2015

Client: Paterson Group Consulting Engineers

Order Date: 13-Mar-2015

Client PO: 17620

Project Description: PE3116

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND				30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND				30	
Physical Characteristics									
% Solids	79.6	0.1	% by Wt.	82.3			3.3	25	
Volatiles									
Benzene	ND	0.02	ug/g dry	ND			0.0	50	
Ethylbenzene	ND	0.05	ug/g dry	ND			0.0	50	
Toluene	0.381	0.05	ug/g dry	0.482			23.4	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	5.53		ug/g dry	ND	103	50-140			

Certificate of Analysis

Report Date: 17-Mar-2015

Client: **Paterson Group Consulting Engineers**

Order Date: 13-Mar-2015

Client PO: 17620

Project Description: PE3116

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	193	7	ug/g	ND	96.7	80-120			
F2 PHCs (C10-C16)	109	4	ug/g	ND	95.6	60-140			
F3 PHCs (C16-C34)	243	8	ug/g	ND	103	60-140			
F4 PHCs (C34-C50)	159	6	ug/g	ND	102	60-140			
Volatiles									
Benzene	3.56	0.02	ug/g	ND	89.0	60-130			
Ethylbenzene	3.42	0.05	ug/g	ND	85.4	60-130			
Toluene	3.33	0.05	ug/g	ND	83.2	60-130			
m,p-Xylenes	6.39	0.05	ug/g	ND	79.9	60-130			
o-Xylene	3.32	0.05	ug/g	ND	83.0	60-130			
Surrogate: Toluene-d8	7.16		ug/g		89.5	50-140			

Certificate of Analysis

Report Date: 17-Mar-2015

Client: Paterson Group Consulting Engineers

Order Date: 13-Mar-2015

Client PO: 17620

Project Description: PE3116

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 ___ of ___

Client Name: PATERSON	Project Reference: PE3116	TAT: <input checked="" type="checkbox"/> Regular [] 3 Day
Contact Name: ERIC LEVEQUE	Quote #	[] 2 Day [] 1 Day
Address: 154 COLONNADE ROAD	PO # 17620	Date Required: _____
Telephone: 613-226-7381	Email Address: eleveque@patersongroup.ca	

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: 1511399		Matrix	Air Volume	# of Containers	Sample Taken		PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)							
Sample ID/Location Name					Date	Time														
1	BH1-15-SS2	S		2	March 12, 2015		X													
2	BH2-15-SS2	S		2			X													
3	BH6-15-SS7	S		2			X													
4	BH7-15-SS5	S		2			X													
5	BH8-15-SS3	S		2			X													
6	BH10-15-SS5	S		2			X													
7																				
8																				
9																				
10																				

Comments: _____ Method of Delivery: **Swift**

Relinquished By (Sign):	Received by Driver/Depot: JOHN NUYENS	Received at Lab: SCR	Verified By: MC
Relinquished By (Print):	Date/Time: 13 / MAR / 15	Date/Time: Mar 13 / 15	Date/Time: Mar 13 / 15 2:55
Date/Time:	Temperature: _____ °C	Temperature: 7.8 °C 2:32p	pH Verified [] By: N/A

Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Eric Leveque

Phone: (613) 226-7381
Fax: (613) 226-6344

Client PO: 17577

Report Date: 18-Mar-2015

Project: PE3116

Order Date: 16-Mar-2015

Custody: 21623

Order #: 1512030

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

Parcel ID	Client ID
1512030-01	BH3-15-SS2
1512030-02	BH4-15-SS4
1512030-03	BH5-15-SS4
1512030-04	BH9-15-SS2
1512030-05	BH11-15-SS5

Approved By:



Mark Foto, M.Sc. For Dale Robertson, BSc
Laboratory Director

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Certificate of Analysis

Report Date: 18-Mar-2015

Client: Paterson Group Consulting Engineers

Order Date: 16-Mar-2015

Client PO: 17577

Project Description: PE3116

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	16-Mar-15	18-Mar-15
PHC F1	CWS Tier 1 - P&T GC-FID	16-Mar-15	18-Mar-15
PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	16-Mar-15	17-Mar-15
Solids, %	Gravimetric, calculation	16-Mar-15	16-Mar-15

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1058 Gardiners Rd.
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Certificate of Analysis

Report Date: 18-Mar-2015

Order Date: 16-Mar-2015

Client: Paterson Group Consulting Engineers

Client PO: 17577

Project Description: PE3116

Client ID:	BH3-15-SS2	BH4-15-SS4	BH5-15-SS4	BH9-15-SS2
Sample Date:	13-Mar-15	13-Mar-15	13-Mar-15	13-Mar-15
Sample ID:	1512030-01	1512030-02	1512030-03	1512030-04
MDL/Units	Soil	Soil	Soil	Soil

Physical Characteristics

% Solids	0.1 % by Wt.	89.7	91.2	92.9	84.9
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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	100%	98.8%	101%	100%

Hydrocarbons

F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	22	30	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	33	69	40
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	45	78

Client ID:	BH11-15-SS5	-	-	-
Sample Date:	13-Mar-15	-	-	-
Sample ID:	1512030-05	-	-	-
MDL/Units	Soil	-	-	-

Physical Characteristics

% Solids	0.1 % by Wt.	68.8	-	-	-
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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	101%	-	-	-

Hydrocarbons

F1 PHCs (C6-C10)	7 ug/g dry	<7	-	-	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	-	-	-
F3 PHCs (C16-C34)	8 ug/g dry	<8	-	-	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	-	-	-

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Kingston, ON K7P 1R7

Certificate of Analysis

Report Date: 18-Mar-2015

Client: **Paterson Group Consulting Engineers**

Order Date: 16-Mar-2015

Client PO: 17577

Project Description: PE3116

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	8.15		ug/g		102	50-140			

Certificate of Analysis

Report Date: 18-Mar-2015

Client: Paterson Group Consulting Engineers

Order Date: 16-Mar-2015

Client PO: 17577

Project Description: PE3116

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND				30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND				30	
Physical Characteristics									
% Solids	87.6	0.1	% by Wt.	89.3			1.9	25	
Volatiles									
Benzene	ND	0.02	ug/g dry	ND			0.0	50	
Ethylbenzene	ND	0.05	ug/g dry	ND			0.0	50	
Toluene	0.381	0.05	ug/g dry	0.482			23.4	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	5.53		ug/g dry	ND	103	50-140			

Certificate of Analysis

Report Date: 18-Mar-2015

Client: **Paterson Group Consulting Engineers**

Order Date: 16-Mar-2015

Client PO: 17577

Project Description: PE3116

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	193	7	ug/g	ND	96.7	80-120			
F2 PHCs (C10-C16)	122	4	ug/g	ND	93.3	60-140			
F3 PHCs (C16-C34)	291	8	ug/g	ND	108	60-140			
F4 PHCs (C34-C50)	192	6	ug/g	ND	106	60-140			
Volatiles									
Benzene	3.56	0.02	ug/g	ND	89.0	60-130			
Ethylbenzene	3.42	0.05	ug/g	ND	85.4	60-130			
Toluene	3.33	0.05	ug/g	ND	83.2	60-130			
m,p-Xylenes	6.39	0.05	ug/g	ND	79.9	60-130			
o-Xylene	3.32	0.05	ug/g	ND	83.0	60-130			
Surrogate: Toluene-d8	7.16		ug/g		89.5	50-140			

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**
Client PO: 17577

Project Description: PE3116

Report Date: 18-Mar-2015
Order Date: 16-Mar-2015

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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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Eric Leveque

Phone: (613) 226-7381
Fax: (613) 226-6344

Client PO: 17627
Project: PE3116
Custody: 102470

Report Date: 24-Mar-2015
Order Date: 17-Mar-2015
Revised Report **Order #: 1512123**

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

Paracel ID	Client ID
1512123-01	BH12-15-SS5

Approved By:



Mark Foto, M.Sc. For Dale Robertson, BSc
Laboratory Director

Any use of these results implies your agreement that our total liability in connection with this work, however arising shall be limited to the amount paid by you for this work, and that our employees or agents shall not under circumstances be liable to you in connection with this work

Certificate of Analysis

Report Date: 24-Mar-2015

Client: Paterson Group Consulting Engineers

Order Date: 17-Mar-2015

Client PO: 17627

Project Description: PE3116

Analysis Summary Table

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

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Certificate of Analysis

Report Date: 24-Mar-2015

Order Date: 17-Mar-2015

 Client: **Paterson Group Consulting Engineers**

Project Description: PE3116

Client PO: 17627

Client ID:	BH12-15-SS5	-	-	-
Sample Date:	16-Mar-15	-	-	-
Sample ID:	1512123-01	-	-	-
MDL/Units	Soil	-	-	-

Physical Characteristics

% Solids	0.1 % by Wt.	92.0	-	-	-
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Volatiles

Acetone	0.50 ug/g dry	<0.50	-	-	-
Benzene	0.02 ug/g dry	0.94	-	-	-
Bromodichloromethane	0.05 ug/g dry	<0.05	-	-	-
Bromoform	0.05 ug/g dry	<0.05	-	-	-
Bromomethane	0.05 ug/g dry	<0.05	-	-	-
Carbon Tetrachloride	0.05 ug/g dry	<0.05	-	-	-
Chlorobenzene	0.05 ug/g dry	<0.05	-	-	-
Chloroform	0.05 ug/g dry	<0.05	-	-	-
Dibromochloromethane	0.05 ug/g dry	<0.05	-	-	-
Dichlorodifluoromethane	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-
1,3-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-
1,4-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-
1,1-Dichloroethane	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichloroethane	0.05 ug/g dry	<0.05	-	-	-
1,1-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
cis-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
trans-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichloropropane	0.05 ug/g dry	<0.05	-	-	-
cis-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	-	-	-
trans-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	-	-	-
1,3-Dichloropropene, total	0.05 ug/g dry	<0.05	-	-	-
Ethylbenzene	0.05 ug/g dry	0.88	-	-	-
Ethylene dibromide (dibromoethane)	0.05 ug/g dry	<0.05	-	-	-
Hexane	0.05 ug/g dry	0.36	-	-	-
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	<0.50	-	-	-
Methyl Isobutyl Ketone	0.50 ug/g dry	<0.50	-	-	-
Methyl tert-butyl ether	0.05 ug/g dry	<0.05	-	-	-
Methylene Chloride	0.05 ug/g dry	<0.05	-	-	-
Styrene	0.05 ug/g dry	<0.05	-	-	-
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	<0.05	-	-	-

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Certificate of Analysis

Report Date: 24-Mar-2015

Order Date: 17-Mar-2015

 Client: **Paterson Group Consulting Engineers**

Project Description: PE3116

Client PO: 17627

	MDL/Units	Client ID: Sample Date: Sample ID:			
		BH12-15-SS5 16-Mar-15 1512123-01	-	-	-
		Soil	-	-	-
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	<0.05	-	-	-
Tetrachloroethylene	0.05 ug/g dry	<0.05	-	-	-
Toluene	0.05 ug/g dry	<0.05	-	-	-
1,1,1-Trichloroethane	0.05 ug/g dry	<0.05	-	-	-
1,1,2-Trichloroethane	0.05 ug/g dry	<0.05	-	-	-
Trichloroethylene	0.05 ug/g dry	<0.05	-	-	-
Trichlorofluoromethane	0.05 ug/g dry	<0.05	-	-	-
Vinyl chloride	0.02 ug/g dry	<0.02	-	-	-
m,p-Xylenes	0.05 ug/g dry	1.10	-	-	-
o-Xylene	0.05 ug/g dry	0.11	-	-	-
Xylenes, total	0.05 ug/g dry	1.20	-	-	-
4-Bromofluorobenzene	Surrogate	98.4%	-	-	-
Dibromofluoromethane	Surrogate	93.5%	-	-	-
Toluene-d8	Surrogate	99.5%	-	-	-

Hydrocarbons

F1 PHCs (C6-C10)	7 ug/g dry	19	-	-	-
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	-	-	-

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Certificate of Analysis

Report Date: 24-Mar-2015

Client: **Paterson Group Consulting Engineers**

Order Date: 17-Mar-2015

Client PO: 17627

Project Description: PE3116

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Volatiles									
Acetone	ND	0.50	ug/g						
Benzene	ND	0.02	ug/g						
Bromodichloromethane	ND	0.05	ug/g						
Bromoform	ND	0.05	ug/g						
Bromomethane	ND	0.05	ug/g						
Carbon Tetrachloride	ND	0.05	ug/g						
Chlorobenzene	ND	0.05	ug/g						
Chloroform	ND	0.05	ug/g						
Dibromochloromethane	ND	0.05	ug/g						
Dichlorodifluoromethane	ND	0.05	ug/g						
1,2-Dichlorobenzene	ND	0.05	ug/g						
1,3-Dichlorobenzene	ND	0.05	ug/g						
1,4-Dichlorobenzene	ND	0.05	ug/g						
1,1-Dichloroethane	ND	0.05	ug/g						
1,2-Dichloroethane	ND	0.05	ug/g						
1,1-Dichloroethylene	ND	0.05	ug/g						
cis-1,2-Dichloroethylene	ND	0.05	ug/g						
trans-1,2-Dichloroethylene	ND	0.05	ug/g						
1,2-Dichloropropane	ND	0.05	ug/g						
cis-1,3-Dichloropropylene	ND	0.05	ug/g						
trans-1,3-Dichloropropylene	ND	0.05	ug/g						
1,3-Dichloropropene, total	ND	0.05	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Ethylene dibromide (dibromoethane)	ND	0.05	ug/g						
Hexane	ND	0.05	ug/g						
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g						
Methyl Isobutyl Ketone	ND	0.50	ug/g						
Methyl tert-butyl ether	ND	0.05	ug/g						
Methylene Chloride	ND	0.05	ug/g						
Styrene	ND	0.05	ug/g						
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g						
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g						
Tetrachloroethylene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
1,1,1-Trichloroethane	ND	0.05	ug/g						
1,1,2-Trichloroethane	ND	0.05	ug/g						
Trichloroethylene	ND	0.05	ug/g						
Trichlorofluoromethane	ND	0.05	ug/g						
Vinyl chloride	ND	0.02	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: 4-Bromofluorobenzene	7.97		ug/g		99.7	50-140			
Surrogate: Dibromofluoromethane	6.62		ug/g		82.7	50-140			
Surrogate: Toluene-d8	7.95		ug/g		99.4	50-140			

Certificate of Analysis

Report Date: 24-Mar-2015

Client: **Paterson Group Consulting Engineers**

Order Date: 17-Mar-2015

Client PO: 17627

Project Description: PE3116

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	26	7	ug/g dry	20			24.9	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	87.1	0.1	% by Wt.	85.4			2.0	25	
Volatiles									
Acetone	ND	0.50	ug/g dry	ND				50	
Benzene	ND	0.02	ug/g dry	ND				50	
Bromodichloromethane	ND	0.05	ug/g dry	ND				50	
Bromoform	ND	0.05	ug/g dry	ND				50	
Bromomethane	ND	0.05	ug/g dry	ND				50	
Carbon Tetrachloride	ND	0.05	ug/g dry	ND				50	
Chlorobenzene	ND	0.05	ug/g dry	ND				50	
Chloroform	ND	0.05	ug/g dry	ND				50	
Dibromochloromethane	ND	0.05	ug/g dry	ND				50	
Dichlorodifluoromethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,3-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,4-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
cis-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
trans-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
1,2-Dichloropropane	ND	0.05	ug/g dry	ND				50	
cis-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
trans-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Ethylene dibromide (dibromoethane)	ND	0.05	ug/g dry	ND				50	
Hexane	ND	0.05	ug/g dry	ND				50	
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g dry	ND				50	
Methyl Isobutyl Ketone	ND	0.50	ug/g dry	ND				50	
Methyl tert-butyl ether	ND	0.05	ug/g dry	ND				50	
Methylene Chloride	ND	0.05	ug/g dry	ND				50	
Styrene	ND	0.05	ug/g dry	ND				50	
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
Tetrachloroethylene	ND	0.05	ug/g dry	ND				50	
Toluene	0.126	0.05	ug/g dry	0.137			8.8	50	
1,1,1-Trichloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2-Trichloroethane	ND	0.05	ug/g dry	ND				50	
Trichloroethylene	ND	0.05	ug/g dry	ND				50	
Trichlorofluoromethane	ND	0.05	ug/g dry	ND				50	
Vinyl chloride	ND	0.02	ug/g dry	ND				50	
m,p-Xylenes	0.117	0.05	ug/g dry	0.089			27.2	50	
o-Xylene	0.069	0.05	ug/g dry	0.054			23.5	50	
Surrogate: 4-Bromofluorobenzene	9.22		ug/g dry	ND	97.4	50-140			
Surrogate: Dibromofluoromethane	7.48		ug/g dry	ND	79.1	50-140			
Surrogate: Toluene-d8	9.50		ug/g dry	ND	100	50-140			

Certificate of Analysis

Report Date: 24-Mar-2015

Client: **Paterson Group Consulting Engineers**

Order Date: 17-Mar-2015

Client PO: 17627

Project Description: PE3116

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	170	7	ug/g	ND	85.1	80-120			
F2 PHCs (C10-C16)	103	4	ug/g	ND	98.4	60-140			
F3 PHCs (C16-C34)	251	8	ug/g	ND	116	60-140			
F4 PHCs (C34-C50)	165	6	ug/g	ND	115	60-140			
Volatiles									
Acetone	10.9	0.50	ug/g	ND	109	50-140			
Benzene	3.75	0.02	ug/g	ND	93.7	60-130			
Bromodichloromethane	4.75	0.05	ug/g	ND	119	60-130			
Bromoform	4.43	0.05	ug/g	ND	111	60-130			
Bromomethane	5.13	0.05	ug/g	ND	128	50-140			
Carbon Tetrachloride	4.74	0.05	ug/g	ND	119	60-130			
Chlorobenzene	3.29	0.05	ug/g	ND	82.3	60-130			
Chloroform	4.61	0.05	ug/g	ND	115	60-130			
Dibromochloromethane	4.03	0.05	ug/g	ND	101	60-130			
Dichlorodifluoromethane	3.90	0.05	ug/g	ND	97.6	50-140			
1,2-Dichlorobenzene	3.59	0.05	ug/g	ND	89.7	60-130			
1,3-Dichlorobenzene	3.65	0.05	ug/g	ND	91.3	60-130			
1,4-Dichlorobenzene	3.64	0.05	ug/g	ND	90.9	60-130			
1,1-Dichloroethane	4.28	0.05	ug/g	ND	107	60-130			
1,2-Dichloroethane	4.29	0.05	ug/g	ND	107	60-130			
1,1-Dichloroethylene	3.94	0.05	ug/g	ND	98.4	60-130			
cis-1,2-Dichloroethylene	3.74	0.05	ug/g	ND	93.5	60-130			
trans-1,2-Dichloroethylene	3.76	0.05	ug/g	ND	94.0	60-130			
1,2-Dichloropropane	3.62	0.05	ug/g	ND	90.4	60-130			
cis-1,3-Dichloropropylene	3.76	0.05	ug/g	ND	93.9	60-130			
trans-1,3-Dichloropropylene	4.73	0.05	ug/g	ND	118	60-130			
Ethylbenzene	3.39	0.05	ug/g	ND	84.8	60-130			
Ethylene dibromide (dibromoethane)	3.22	0.05	ug/g	ND	80.6	60-130			
Hexane	3.94	0.05	ug/g	ND	98.5	60-130			
Methyl Ethyl Ketone (2-Butanone)	7.98	0.50	ug/g	ND	79.8	50-140			
Methyl Isobutyl Ketone	9.53	0.50	ug/g	ND	95.3	50-140			
Methyl tert-butyl ether	10.8	0.05	ug/g	ND	108	50-140			
Methylene Chloride	3.09	0.05	ug/g	ND	77.1	60-130			
Styrene	3.39	0.05	ug/g	ND	84.7	60-130			
1,1,1,2-Tetrachloroethane	4.17	0.05	ug/g	ND	104	60-130			
1,1,1,2,2-Tetrachloroethane	3.09	0.05	ug/g	ND	77.2	60-130			
Tetrachloroethylene	4.05	0.05	ug/g	ND	101	60-130			
Toluene	3.43	0.05	ug/g	ND	85.8	60-130			
1,1,1-Trichloroethane	5.12	0.05	ug/g	ND	128	60-130			
1,1,2-Trichloroethane	3.72	0.05	ug/g	ND	92.9	60-130			
Trichloroethylene	3.33	0.05	ug/g	ND	83.3	60-130			
Trichlorofluoromethane	5.27	0.05	ug/g	ND	132	50-140			
Vinyl chloride	3.59	0.02	ug/g	ND	89.7	50-140			
m,p-Xylenes	6.43	0.05	ug/g	ND	80.4	60-130			
o-Xylene	3.29	0.05	ug/g	ND	82.2	60-130			
Surrogate: 4-Bromofluorobenzene	8.27		ug/g		103	50-140			

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Certificate of Analysis

Client: **Paterson Group Consulting Engineers**
Client PO: 17627

Project Description: PE3116

Report Date: 24-Mar-2015
Order Date: 17-Mar-2015

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

Revision 1 - This report includes additional VOC data.

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 ___ of ___

Client Name: PATERSON	Project Reference: PE3116	TAT: <input checked="" type="checkbox"/> Regular [] 3 Day [] 2 Day [] 1 Day Date Required: _____
Contact Name: ERIC LEVEQUE	Quote #	
Address: 154 COLONNADE ROAD	PO # 17627	
Telephone: 613-226-7381	Email Address: eleveque@patersongroup.ca	

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

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

Parcel Order Number: 1512123		Matrix	Air Volume	# of Containers	Sample Taken		PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)							
Sample ID/Location Name					Date	Time														
1	BH12-15-SS5	S		2	March 16, 2015		X													
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments: _____ Method of Delivery: **Paracel**

Relinquished By (Sign):	Received by Driver/Depot: [Signature]	Received at Lab: [Signature]	Verified By: [Signature]
Relinquished By (Print):	Date/Time: 17/03/15 7:30 PM	Date/Time: Mar 17/15 3:25	Date/Time: Mar 17/15 3:56
Date/Time:	Temperature: _____ °C	Temperature: 13.7 °C	pH Verified [] By: N/A

Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Eric Leveque

Phone: (613) 226-7381
Fax: (613) 226-6344

Client PO: 17581
Project: PE3116
Custody: 102609

Report Date: 24-Mar-2015
Order Date: 20-Mar-2015

Order #: 1512314

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

Paracel ID	Client ID
1512314-01	TP1-G3

Approved By:



Mark Foto, M.Sc. For Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 24-Mar-2015

Order Date: 20-Mar-2015

 Client: **Paterson Group Consulting Engineers**

Client PO: 17581

Project Description: PE3116

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	23-Mar-15	23-Mar-15
PHC F1	CWS Tier 1 - P&T GC-FID	23-Mar-15	23-Mar-15
PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	23-Mar-15	23-Mar-15
Solids, %	Gravimetric, calculation	23-Mar-15	23-Mar-15

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Certificate of Analysis

Report Date: 24-Mar-2015

Order Date: 20-Mar-2015

 Client: **Paterson Group Consulting Engineers**

Project Description: PE3116

Client PO: 17581

Client ID:	TP1-G3	-	-	-
Sample Date:	19-Mar-15	-	-	-
Sample ID:	1512314-01	-	-	-
MDL/Units	Soil	-	-	-

Physical Characteristics

% Solids	0.1 % by Wt.	72.9	-	-	-
----------	--------------	------	---	---	---

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	110%	-	-	-

Hydrocarbons

F1 PHCs (C6-C10)	7 ug/g dry	88	-	-	-
F2 PHCs (C10-C16)	4 ug/g dry	431	-	-	-
F3 PHCs (C16-C34)	8 ug/g dry	394	-	-	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	-	-	-

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Certificate of Analysis

Report Date: 24-Mar-2015

Order Date: 20-Mar-2015

Client: **Paterson Group Consulting Engineers**

Client PO: 17581

Project Description: PE3116

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	9.04		ug/g		113	50-140			

Certificate of Analysis

Report Date: 24-Mar-2015

Client: **Paterson Group Consulting Engineers**

Order Date: 20-Mar-2015

Client PO: 17581

Project Description: PE3116

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	4340	70	ug/g dry	5030			14.6	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	85.8	0.1	% by Wt.	88.4			3.0	25	
Volatiles									
Benzene	4.22	0.20	ug/g dry	4.34			2.9	50	
Ethylbenzene	54.8	0.50	ug/g dry	56.5			3.1	50	
Toluene	66.4	0.50	ug/g dry	67.1			1.1	50	
m,p-Xylenes	182	0.50	ug/g dry	184			1.0	50	
o-Xylene	83.0	0.50	ug/g dry	84.4			1.7	50	
Surrogate: Toluene-d8	6.90		ug/g dry	ND	111	50-140			

Certificate of Analysis

Report Date: 24-Mar-2015
Order Date: 20-Mar-2015

Client: **Paterson Group Consulting Engineers**
Client PO: 17581

Project Description: PE3116

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	186	7	ug/g	ND	93.1	80-120			
F2 PHCs (C10-C16)	149	4	ug/g	ND	127	60-140			
F3 PHCs (C16-C34)	293	8	ug/g	ND	120	60-140			
F4 PHCs (C34-C50)	202	6	ug/g	ND	124	60-140			
Volatiles									
Benzene	4.66	0.02	ug/g	ND	116	60-130			
Ethylbenzene	3.88	0.05	ug/g	ND	97.0	60-130			
Toluene	4.03	0.05	ug/g	ND	101	60-130			
m,p-Xylenes	7.42	0.05	ug/g	ND	92.8	60-130			
o-Xylene	3.71	0.05	ug/g	ND	92.9	60-130			
Surrogate: Toluene-d8	7.31		ug/g		91.4	50-140			

Certificate of Analysis

Report Date: 24-Mar-2015

Client: **Paterson Group Consulting Engineers**

Order Date: 20-Mar-2015

Client PO: 17581

Project Description: PE3116

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: <u>Paterson Group</u>	Project Reference: <u>PE3116</u>	TAT: <input checked="" type="checkbox"/> Regular [] 3 Day [] 2 Day [] 1 Day Date Required: _____
Contact Name: <u>Eric Leveque</u>	Quote #	
Address: <u>154 Colonnade</u>	PO # <u>17501</u>	
Telephone: <u>613-226-7381</u>	Email Address: <u>e.leveque@patersongroup.ca</u>	

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

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

Required Analyses

Paracel Order Number: <u>1512314</u>		Matrix	Air Volume	# of Containers	Sample Taken		PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)								
Sample ID/Location Name					Date	Time															
1	<u>TPI-63</u>	<u>S</u>		<u>2</u>	<u>Mar 19/15</u>		<input checked="" type="checkbox"/>													<u>120ml + vial</u>	
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					

Comments: Please also send to Dan Arnott please report, separate from GW samples Method of Delivery: Paracel
arnott@patersongroup.ca

Relinquished By (Sign): <u>[Signature]</u>	Received by Driver/Depot: <u>[Signature]</u>	Received at Lab: <u>[Signature]</u>	Verified By: <u>[Signature]</u>
Relinquished By (Print): <u>Dan Arnott</u>	Date/Time: <u>20/03/15 12:30 PM</u>	Date/Time: <u>Mar 20/15 1:10</u>	Date/Time: <u>Mar 20/15 1:37</u>
Date/Time: <u>8:50am 20 Mar 15</u>	Temperature: <u>7.1</u> °C	Temperature: <u>13.4</u> °C	pH Verified [] By: <u>N/A</u>

Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Eric Leveque

Phone: (613) 226-7381
Fax: (613) 226-6344

Client PO: 17581
Project: PE3116
Custody: 102608/610

Report Date: 24-Mar-2015
Order Date: 20-Mar-2015

Order #: 1512317

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

Parcel ID	Client ID
1512317-01	BH1-15-GW1
1512317-02	BH2-15-GW1
1512317-03	BH3-15-GW1
1512317-04	BH4-15-GW1
1512317-05	BH6-15-GW1
1512317-06	BH8-15-GW1
1512317-07	BH9-15-GW1
1512317-08	BH10-15-GW1
1512317-09	BH11-15-GW1
1512317-10	MW1-GW1
1512317-11	BH23-13-GW2

Approved By:



Mark Foto, M.Sc. For Dale Robertson, BSc
Laboratory Director

Any use of these results implies your agreement that our total liability in connection with this work, however arising shall be limited to the amount paid by you for this work, and that our employees or agents shall not under circumstances be liable to you in connection with this work

Certificate of Analysis

Report Date: 24-Mar-2015

Order Date: 20-Mar-2015

Client: **Paterson Group Consulting Engineers**

Client PO: 17581

Project Description: PE3116

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	20-Mar-15	21-Mar-15
PHC F1	CWS Tier 1 - P&T GC-FID	20-Mar-15	20-Mar-15
PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	23-Mar-15	23-Mar-15
REG 153 - VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	20-Mar-15	21-Mar-15

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Certificate of Analysis

Report Date: 24-Mar-2015

Order Date: 20-Mar-2015

 Client: **Paterson Group Consulting Engineers**

Client PO: 17581

Project Description: PE3116

Client ID:	BH1-15-GW1	BH2-15-GW1	BH3-15-GW1	BH4-15-GW1
Sample Date:	19-Mar-15	19-Mar-15	19-Mar-15	19-Mar-15
Sample ID:	1512317-01	1512317-02	1512317-03	1512317-04
MDL/Units	Water	Water	Water	Water

Volatiles

Compound	MDL/Units	BH1-15-GW1	BH2-15-GW1	BH3-15-GW1	BH4-15-GW1
Acetone	5.0 ug/L	49.0	44.6	<5.0	<5.0
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Chloroform	0.5 ug/L	<0.5	2.1	<0.5	<0.5
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylene dibromide (dibromoethane)	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	7.2	<5.0	<5.0	<5.0
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	<2.0
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5

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Certificate of Analysis

Report Date: 24-Mar-2015

Order Date: 20-Mar-2015

 Client: **Paterson Group Consulting Engineers**

Project Description: PE3116

Client PO: 17581

	Client ID:	BH1-15-GW1	BH2-15-GW1	BH3-15-GW1	BH4-15-GW1
	Sample Date:	19-Mar-15	19-Mar-15	19-Mar-15	19-Mar-15
	Sample ID:	1512317-01	1512317-02	1512317-03	1512317-04
	MDL/Units	Water	Water	Water	Water
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
4-Bromofluorobenzene	Surrogate	119%	121%	119%	116%
Dibromofluoromethane	Surrogate	125%	126%	129%	129%
Toluene-d8	Surrogate	96.3%	96.4%	94.7%	92.4%

Hydrocarbons

F1 PHCs (C6-C10)	25 ug/L	<25	<25	<25	<25
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	<100
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	<100
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	<100
F1 + F2 PHCs	125 ug/L	<125	<125	<125	<125
F3 + F4 PHCs	200 ug/L	<200	<200	<200	<200

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KINGSTON
 1058 Gardiners Rd.
 Kingston, ON K7P 1R7

Certificate of Analysis

Report Date: 24-Mar-2015

Order Date: 20-Mar-2015

 Client: **Paterson Group Consulting Engineers**

Project Description: PE3116

Client PO: 17581

Client ID:	BH6-15-GW1	BH8-15-GW1	BH9-15-GW1	BH10-15-GW1
Sample Date:	19-Mar-15	19-Mar-15	19-Mar-15	19-Mar-15
Sample ID:	1512317-05	1512317-06	1512317-07	1512317-08
MDL/Units	Water	Water	Water	Water

Volatiles

Compound	MDL/Units	BH6-15-GW1	BH8-15-GW1	BH9-15-GW1	BH10-15-GW1
Acetone	5.0 ug/L	-	-	44.9	104
Benzene	0.5 ug/L	-	-	3.1	<0.5
Bromodichloromethane	0.5 ug/L	-	-	<0.5	<0.5
Bromoform	0.5 ug/L	-	-	<0.5	<0.5
Bromomethane	0.5 ug/L	-	-	<0.5	<0.5
Carbon Tetrachloride	0.2 ug/L	-	-	<0.2	<0.2
Chlorobenzene	0.5 ug/L	-	-	<0.5	<0.5
Chloroform	0.5 ug/L	-	-	<0.5	<0.5
Dibromochloromethane	0.5 ug/L	-	-	<0.5	<0.5
Dichlorodifluoromethane	1.0 ug/L	-	-	<1.0	<1.0
1,2-Dichlorobenzene	0.5 ug/L	-	-	<0.5	<0.5
1,3-Dichlorobenzene	0.5 ug/L	-	-	<0.5	<0.5
1,4-Dichlorobenzene	0.5 ug/L	-	-	<0.5	<0.5
1,1-Dichloroethane	0.5 ug/L	-	-	<0.5	<0.5
1,2-Dichloroethane	0.5 ug/L	-	-	<0.5	<0.5
1,1-Dichloroethylene	0.5 ug/L	-	-	<0.5	<0.5
cis-1,2-Dichloroethylene	0.5 ug/L	-	-	255	<0.5
trans-1,2-Dichloroethylene	0.5 ug/L	-	-	1.2	<0.5
1,2-Dichloropropane	0.5 ug/L	-	-	<0.5	<0.5
cis-1,3-Dichloropropylene	0.5 ug/L	-	-	<0.5	<0.5
trans-1,3-Dichloropropylene	0.5 ug/L	-	-	<0.5	<0.5
1,3-Dichloropropene, total	0.5 ug/L	-	-	<0.5	<0.5
Ethylbenzene	0.5 ug/L	-	-	<0.5	1.9
Ethylene dibromide (dibromoethane)	0.2 ug/L	-	-	<0.2	<0.2
Hexane	1.0 ug/L	-	-	<1.0	<1.0
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	-	-	<5.0	8.0
Methyl Isobutyl Ketone	5.0 ug/L	-	-	<5.0	<5.0
Methyl tert-butyl ether	2.0 ug/L	-	-	<2.0	<2.0
Methylene Chloride	5.0 ug/L	-	-	<5.0	<5.0
Styrene	0.5 ug/L	-	-	<0.5	<0.5
1,1,1,2-Tetrachloroethane	0.5 ug/L	-	-	<0.5	<0.5
1,1,1,2,2-Tetrachloroethane	0.5 ug/L	-	-	<0.5	<0.5

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Certificate of Analysis

Report Date: 24-Mar-2015

Order Date: 20-Mar-2015

 Client: **Paterson Group Consulting Engineers**

Project Description: PE3116

Client PO: 17581

	MDL/Units	Client ID:	BH6-15-GW1	BH8-15-GW1	BH9-15-GW1	BH10-15-GW1
		Sample Date:	19-Mar-15	19-Mar-15	19-Mar-15	19-Mar-15
		Sample ID:	1512317-05	1512317-06	1512317-07	1512317-08
			Water	Water	Water	Water
Tetrachloroethylene	0.5 ug/L		-	-	54.2	<0.5
Toluene	0.5 ug/L		-	-	<0.5	2.8
1,1,1-Trichloroethane	0.5 ug/L		-	-	<0.5	<0.5
1,1,2-Trichloroethane	0.5 ug/L		-	-	<0.5	<0.5
Trichloroethylene	0.5 ug/L		-	-	27.4	<0.5
Trichlorofluoromethane	1.0 ug/L		-	-	<1.0	<1.0
Vinyl chloride	0.5 ug/L		-	-	18.6	<0.5
m,p-Xylenes	0.5 ug/L		-	-	<0.5	7.8
o-Xylene	0.5 ug/L		-	-	<0.5	6.5
Xylenes, total	0.5 ug/L		-	-	<0.5	14.3
4-Bromofluorobenzene	Surrogate		-	-	116%	96.8%
Dibromofluoromethane	Surrogate		-	-	114%	132%
Toluene-d8	Surrogate		-	-	88.9%	89.7%
Benzene	0.5 ug/L		0.5	<0.5	-	-
Ethylbenzene	0.5 ug/L		4.0	<0.5	-	-
Toluene	0.5 ug/L		0.6	<0.5	-	-
m,p-Xylenes	0.5 ug/L		0.9	<0.5	-	-
o-Xylene	0.5 ug/L		<0.5	<0.5	-	-
Xylenes, total	0.5 ug/L		0.9	<0.5	-	-
Toluene-d8	Surrogate		94.5%	92.4%	-	-

Hydrocarbons

F1 PHCs (C6-C10)	25 ug/L	<25	<25	131 [1]	130
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	<100
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	<100
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	<100
F1 + F2 PHCs	125 ug/L	<125	<125	-	-
F1 + F2 PHCs	125 ug/L	-	-	131	130
F3 + F4 PHCs	200 ug/L	<200	<200	-	-
F3 + F4 PHCs	200 ug/L	-	-	<200	<200

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Certificate of Analysis

Report Date: 24-Mar-2015

Order Date: 20-Mar-2015

 Client: **Paterson Group Consulting Engineers**

Project Description: PE3116

Client PO: 17581

Client ID:	BH11-15-GW1	MW1-GW1	BH23-13-GW2	-
Sample Date:	19-Mar-15	19-Mar-15	19-Mar-15	-
Sample ID:	1512317-09	1512317-10	1512317-11	-
MDL/Units	Water	Water	Water	-

Volatiles

Compound	MDL/Units	BH11-15-GW1	MW1-GW1	BH23-13-GW2	-
Acetone	5.0 ug/L	-	-	<5.0	-
Benzene	0.5 ug/L	-	-	<0.5	-
Bromodichloromethane	0.5 ug/L	-	-	<0.5	-
Bromoform	0.5 ug/L	-	-	<0.5	-
Bromomethane	0.5 ug/L	-	-	<0.5	-
Carbon Tetrachloride	0.2 ug/L	-	-	<0.2	-
Chlorobenzene	0.5 ug/L	-	-	<0.5	-
Chloroform	0.5 ug/L	-	-	<0.5	-
Dibromochloromethane	0.5 ug/L	-	-	<0.5	-
Dichlorodifluoromethane	1.0 ug/L	-	-	<1.0	-
1,2-Dichlorobenzene	0.5 ug/L	-	-	<0.5	-
1,3-Dichlorobenzene	0.5 ug/L	-	-	<0.5	-
1,4-Dichlorobenzene	0.5 ug/L	-	-	<0.5	-
1,1-Dichloroethane	0.5 ug/L	-	-	<0.5	-
1,2-Dichloroethane	0.5 ug/L	-	-	<0.5	-
1,1-Dichloroethylene	0.5 ug/L	-	-	<0.5	-
cis-1,2-Dichloroethylene	0.5 ug/L	-	-	<0.5	-
trans-1,2-Dichloroethylene	0.5 ug/L	-	-	<0.5	-
1,2-Dichloropropane	0.5 ug/L	-	-	<0.5	-
cis-1,3-Dichloropropylene	0.5 ug/L	-	-	<0.5	-
trans-1,3-Dichloropropylene	0.5 ug/L	-	-	<0.5	-
1,3-Dichloropropene, total	0.5 ug/L	-	-	<0.5	-
Ethylbenzene	0.5 ug/L	-	-	<0.5	-
Ethylene dibromide (dibromoethane)	0.2 ug/L	-	-	<0.2	-
Hexane	1.0 ug/L	-	-	<1.0	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	-	-	<5.0	-
Methyl Isobutyl Ketone	5.0 ug/L	-	-	<5.0	-
Methyl tert-butyl ether	2.0 ug/L	-	-	<2.0	-
Methylene Chloride	5.0 ug/L	-	-	<5.0	-
Styrene	0.5 ug/L	-	-	<0.5	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	-	-	<0.5	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	-	-	<0.5	-
Tetrachloroethylene	0.5 ug/L	-	-	<0.5	-

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Certificate of Analysis

Report Date: 24-Mar-2015

Order Date: 20-Mar-2015

Client: **Paterson Group Consulting Engineers**

Project Description: PE3116

Client PO: 17581

	Client ID: Sample Date: Sample ID: MDL/Units	BH11-15-GW1 19-Mar-15 1512317-09 Water	MW1-GW1 19-Mar-15 1512317-10 Water	BH23-13-GW2 19-Mar-15 1512317-11 Water	- - - -
Toluene	0.5 ug/L	-	-	<0.5	-
1,1,1-Trichloroethane	0.5 ug/L	-	-	<0.5	-
1,1,2-Trichloroethane	0.5 ug/L	-	-	<0.5	-
Trichloroethylene	0.5 ug/L	-	-	<0.5	-
Trichlorofluoromethane	1.0 ug/L	-	-	<1.0	-
Vinyl chloride	0.5 ug/L	-	-	<0.5	-
m,p-Xylenes	0.5 ug/L	-	-	<0.5	-
o-Xylene	0.5 ug/L	-	-	<0.5	-
Xylenes, total	0.5 ug/L	-	-	<0.5	-
4-Bromofluorobenzene	Surrogate	-	-	115%	-
Dibromofluoromethane	Surrogate	-	-	129%	-
Toluene-d8	Surrogate	-	-	90.0%	-
Benzene	0.5 ug/L	<0.5	<0.5	-	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	-	-
Toluene	0.5 ug/L	<0.5	<0.5	-	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	-	-
o-Xylene	0.5 ug/L	<0.5	<0.5	-	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	-	-
Toluene-d8	Surrogate	90.9%	92.3%	-	-

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	-
F1 + F2 PHCs	125 ug/L	<125	<125	-	-
F1 + F2 PHCs	125 ug/L	-	-	<125	-
F3 + F4 PHCs	200 ug/L	<200	<200	-	-
F3 + F4 PHCs	200 ug/L	-	-	<200	-

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Certificate of Analysis

Report Date: 24-Mar-2015

Client: **Paterson Group Consulting Engineers**

Order Date: 20-Mar-2015

Client PO: 17581

Project Description: PE3116

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	38.2		ug/L		119	50-140			
Surrogate: Dibromofluoromethane	40.9		ug/L		128	50-140			
Surrogate: Toluene-d8	31.6		ug/L		98.8	50-140			
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						

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Certificate of Analysis

Report Date: 24-Mar-2015
Order Date: 20-Mar-2015

Client: **Paterson Group Consulting Engineers**
Client PO: 17581

Project Description: PE3116

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Surrogate: Toluene-d8	31.6		ug/L		98.8	50-140			

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Certificate of Analysis

Report Date: 24-Mar-2015

Client: **Paterson Group Consulting Engineers**

Order Date: 20-Mar-2015

Client PO: 17581

Project Description: PE3116

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	37.7		ug/L	ND	118	50-140			
Surrogate: Dibromofluoromethane	37.6		ug/L	ND	118	50-140			
Surrogate: Toluene-d8	29.7		ug/L	ND	92.8	50-140			
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	29.7		ug/L	ND	92.8	50-140			

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Certificate of Analysis

Report Date: 24-Mar-2015

Client: **Paterson Group Consulting Engineers**

Order Date: 20-Mar-2015

Client PO: 17581

Project Description: PE3116

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1790	25	ug/L	ND	89.6	68-117			
F2 PHCs (C10-C16)	1530	100	ug/L	ND	85.3	60-140			
F3 PHCs (C16-C34)	3540	100	ug/L	ND	95.1	60-140			
F4 PHCs (C34-C50)	2480	100	ug/L	ND	100	60-140			
Volatiles									
Acetone	98.0	5.0	ug/L	ND	98.0	50-140			
Benzene	34.8	0.5	ug/L	ND	87.0	50-140			
Bromodichloromethane	39.5	0.5	ug/L	ND	98.7	50-140			
Bromoform	38.6	0.5	ug/L	ND	96.5	50-140			
Bromomethane	32.1	0.5	ug/L	ND	80.4	50-140			
Carbon Tetrachloride	45.1	0.2	ug/L	ND	113	50-140			
Chlorobenzene	30.3	0.5	ug/L	ND	75.7	50-140			
Chloroform	48.0	0.5	ug/L	ND	120	50-140			
Dibromochloromethane	39.1	0.5	ug/L	ND	97.8	50-140			
Dichlorodifluoromethane	39.4	1.0	ug/L	ND	98.4	50-140			
1,2-Dichlorobenzene	31.6	0.5	ug/L	ND	79.0	50-140			
1,3-Dichlorobenzene	31.0	0.5	ug/L	ND	77.4	50-140			
1,4-Dichlorobenzene	30.6	0.5	ug/L	ND	76.5	50-140			
1,1-Dichloroethane	45.0	0.5	ug/L	ND	113	50-140			
1,2-Dichloroethane	39.5	0.5	ug/L	ND	98.7	50-140			
1,1-Dichloroethylene	22.8	0.5	ug/L	ND	57.0	50-140			
cis-1,2-Dichloroethylene	35.1	0.5	ug/L	ND	87.7	50-140			
trans-1,2-Dichloroethylene	33.0	0.5	ug/L	ND	82.4	50-140			
1,2-Dichloropropane	34.2	0.5	ug/L	ND	85.4	50-140			
cis-1,3-Dichloropropylene	37.7	0.5	ug/L	ND	94.2	50-140			
trans-1,3-Dichloropropylene	37.1	0.5	ug/L	ND	92.8	50-140			
Ethylbenzene	25.8	0.5	ug/L	ND	64.4	50-140			
Ethylene dibromide (dibromoethane)	34.4	0.2	ug/L	ND	86.0	50-140			
Hexane	26.6	1.0	ug/L	ND	66.4	50-140			
Methyl Ethyl Ketone (2-Butanone)	99.1	5.0	ug/L	ND	99.1	50-140			
Methyl Isobutyl Ketone	79.2	5.0	ug/L	ND	79.2	50-140			
Methyl tert-butyl ether	71.3	2.0	ug/L	ND	71.3	50-140			
Methylene Chloride	33.1	5.0	ug/L	ND	82.8	50-140			
Styrene	24.9	0.5	ug/L	ND	62.2	50-140			
1,1,1,2-Tetrachloroethane	44.8	0.5	ug/L	ND	112	50-140			
1,1,1,2,2-Tetrachloroethane	30.6	0.5	ug/L	ND	76.6	50-140			
Tetrachloroethylene	32.7	0.5	ug/L	ND	81.7	50-140			
Toluene	32.5	0.5	ug/L	ND	81.2	50-140			
1,1,1-Trichloroethane	41.6	0.5	ug/L	ND	104	50-140			
1,1,2-Trichloroethane	35.9	0.5	ug/L	ND	89.6	50-140			
Trichloroethylene	35.0	0.5	ug/L	ND	87.6	50-140			
Trichlorofluoromethane	49.0	1.0	ug/L	ND	123	50-140			
Vinyl chloride	24.3	0.5	ug/L	ND	60.7	50-140			
m,p-Xylenes	55.4	0.5	ug/L	ND	69.3	50-140			
o-Xylene	31.3	0.5	ug/L	ND	78.2	50-140			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>28.0</i>		<i>ug/L</i>		<i>87.5</i>	<i>50-140</i>			
Benzene	34.8	0.5	ug/L	ND	87.0	50-140			
Ethylbenzene	25.8	0.5	ug/L	ND	64.4	50-140			

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Certificate of Analysis

Report Date: 24-Mar-2015
Order Date: 20-Mar-2015

Client: **Paterson Group Consulting Engineers**
Client PO: 17581

Project Description: PE3116

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Toluene	32.5	0.5	ug/L	ND	81.2	50-140			
m,p-Xylenes	55.4	0.5	ug/L	ND	69.3	50-140			
o-Xylene	31.3	0.5	ug/L	ND	78.2	50-140			

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Certificate of Analysis

Client: **Paterson Group Consulting Engineers**
Client PO: 17581

Project Description: PE3116

Report Date: 24-Mar-2015
Order Date: 20-Mar-2015

Qualifier Notes:

Sample Qualifiers :

- 1 : Peaks quantified in the TPH(gas)/PHC(F1) range do not have a fingerprint pattern typical of petroleum hydrocarbons - may be solvents or other volatile compounds.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

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

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Page 1 of 2

Client Name: Peterson Group	Project Reference: \$PE3116	TAT: <input checked="" type="checkbox"/> Regular [] 3 Day [] 2 Day [] 1 Day Date Required: _____
Contact Name: Eric Leveque	Quote #	
Address: 154 Colonnade	PO # 17581	
Telephone: 613-226-7301	Email Address: eleveque@petersongroup.ca	

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: 1512317				Required Analyses															
Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken		PHCs FI-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)							
				Date	Time														
1 BH1-15-GW1	GW		3	19 Mar 15		X	X												
2 BH2-15-GW1						X	X												
3 BH3-15-GW1						X	X												
4 BH4-15-GW1						X	X												
5 BH6-15-GW1						X	X												
6 BH8-15-GW1						X	X												
7 BH9-15-GW1						X	X												
8 BH10-15-GW1						X	X												
9 BH11-15-GW1						X	X												
10																			

Comments: **Please also send to Dan Arnott danott@petersongroup.ca**

Method of Delivery: **Paracel**

Relinquished By (Sign): M-LB	Received by Driver/Depot: A. ROUSE	Received at Lab: M.C.	Verified By: M.C.
Relinquished By (Print): Mike Beaudoin	Date/Time: 20/03/15 12:30 PM	Date/Time: Mar 20/15 1:10	Date/Time: Mar 20/15 1:43
Date/Time: 9:01am 20-march-15	Temperature: _____ °C	Temperature: 12.6 °C	pH Verified [] By: N/A

Client Name: <i>Peterson Group</i>	Project Reference: <i>PE3116</i>	TAT: <input checked="" type="checkbox"/> Regular [] 3 Day [] 2 Day [] 1 Day Date Required: _____
Contact Name: <i>Eric Leveque</i>	Quote #	
Address: <i>154 Colonnade</i>	PO # <i>17561</i>	
Telephone: <i>613-226-7381</i>	Email Address: <i>e.leveque@petersongroup.ca</i>	

Criteria: O. Reg. 153/04 (As Amended) Table 5 [] 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: <i>1512317</i>		Matrix	Air Volume	# of Containers	Sample Taken		PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	Cr-VI	B (HWS)
Sample ID/Location Name					Date	Time							
1	<i>MW1-GW1</i>	<i>GW</i>		<i>3</i>	<i>Mar 19/15</i>		<input checked="" type="checkbox"/>						
2	<i>BH23-13-GW2</i>	<i>GW</i>		<i>3</i>	<i>Mar 19/15</i>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					
3													
4													
5													
6													
7													
8													
9													
10													

Comments: *Please also send to Dan Arnot darnott@petersongroup.ca.*

Method of Delivery: *Paracel*

Relinquished By (Sign): <i>[Signature]</i>	Received by Driver/Depot: <i>[Signature]</i>	Received at Lab: <i>[Signature]</i>	Verified By: <i>[Signature]</i>
Relinquished By (Print): <i>Mike Bowden</i>	Date/Time: <i>20/03/15 12:30</i>	Date/Time: <i>Mar 20/15 1:10</i>	Date/Time: <i>Mar 20/15 1:43</i>
Date/Time: <i>9:01 am 20-march-15</i>	Temperature: <i>PH</i>	Temperature: <i>12.6°C</i>	pH Verified [] By: <i>NA</i>

Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Dan Arnott

Phone: (613) 226-7381
Fax: (613) 226-6344

Client PO: 17587
Project: PE3116
Custody: 102617

Report Date: 2-Apr-2015
Order Date: 30-Mar-2015

Order #: 1514072

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

Paracel ID	Client ID
1514072-01	BH12-15-GW1

Approved By:



Mark Foto, M.Sc. For Dale Robertson, BSc
Laboratory Director

Any use of these results implies your agreement that our total liability in connection with this work, however arising shall be limited to the amount paid by you for this work, and that our employees or agents shall not under circumstances be liable to you in connection with this work

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**
Client PO: 17587

Project Description: PE3116

Report Date: 02-Apr-2015
Order Date: 30-Mar-2015

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHC F1	CWS Tier 1 - P&T GC-FID	31-Mar-15	1-Apr-15
PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	1-Apr-15	1-Apr-15
REG 153 - VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	31-Mar-15	1-Apr-15

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Certificate of Analysis

Report Date: 02-Apr-2015

Order Date: 30-Mar-2015

 Client: **Paterson Group Consulting Engineers**

Client PO: 17587

Project Description: PE3116

Client ID:	BH12-15-GW1	-	-	-
Sample Date:	30-Mar-15	-	-	-
Sample ID:	1514072-01	-	-	-
MDL/Units	Water	-	-	-

Volatiles

Acetone	5.0 ug/L	<5.0	-	-	-
Benzene	0.5 ug/L	<0.5	-	-	-
Bromodichloromethane	0.5 ug/L	<0.5	-	-	-
Bromoform	0.5 ug/L	<0.5	-	-	-
Bromomethane	0.5 ug/L	<0.5	-	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	-	-	-
Chlorobenzene	0.5 ug/L	<0.5	-	-	-
Chloroform	0.5 ug/L	<0.5	-	-	-
Dibromochloromethane	0.5 ug/L	<0.5	-	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	-	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	-	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	-	-	-
Ethylbenzene	0.5 ug/L	<0.5	-	-	-
Ethylene dibromide (dibromoethane)	0.2 ug/L	<0.2	-	-	-
Hexane	1.0 ug/L	<1.0	-	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	-	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	-	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	-	-	-
Methylene Chloride	5.0 ug/L	<5.0	-	-	-
Styrene	0.5 ug/L	<0.5	-	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	-	-	-

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Certificate of Analysis

Report Date: 02-Apr-2015

Order Date: 30-Mar-2015

 Client: **Paterson Group Consulting Engineers**

Project Description: PE3116

Client PO: 17587

	Client ID:	BH12-15-GW1	-	-	-
	Sample Date:	30-Mar-15	-	-	-
	Sample ID:	1514072-01	-	-	-
	MDL/Units	Water	-	-	-
Toluene	0.5 ug/L	<0.5	-	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	-	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	-	-	-
Trichloroethylene	0.5 ug/L	<0.5	-	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	-	-	-
Vinyl chloride	0.5 ug/L	<0.5	-	-	-
m,p-Xylenes	0.5 ug/L	<0.5	-	-	-
o-Xylene	0.5 ug/L	<0.5	-	-	-
Xylenes, total	0.5 ug/L	<0.5	-	-	-
4-Bromofluorobenzene	Surrogate	121%	-	-	-
Dibromofluoromethane	Surrogate	107%	-	-	-
Toluene-d8	Surrogate	117%	-	-	-

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	-	-	-
F1 + F2 PHCs	125 ug/L	<125	-	-	-
F3 + F4 PHCs	200 ug/L	<200	-	-	-

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Client: **Paterson Group Consulting Engineers**

Order Date: 30-Mar-2015

Client PO: 17587

Project Description: PE3116

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	38.6		ug/L		121	50-140			
Surrogate: Dibromofluoromethane	39.9		ug/L		125	50-140			
Surrogate: Toluene-d8	30.0		ug/L		93.8	50-140			

Certificate of Analysis

Report Date: 02-Apr-2015

Client: **Paterson Group Consulting Engineers**

Order Date: 30-Mar-2015

Client PO: 17587

Project Description: PE3116

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	38.9		ug/L	ND	121	50-140			
Surrogate: Dibromofluoromethane	32.6		ug/L	ND	102	50-140			
Surrogate: Toluene-d8	36.7		ug/L	ND	115	50-140			

Certificate of Analysis

Report Date: 02-Apr-2015

Client: **Paterson Group Consulting Engineers**

Order Date: 30-Mar-2015

Client PO: 17587

Project Description: PE3116

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1550	25	ug/L	ND	77.3	68-117			
F2 PHCs (C10-C16)	1410	100	ug/L	ND	78.1	60-140			
F3 PHCs (C16-C34)	3630	100	ug/L	ND	97.7	60-140			
F4 PHCs (C34-C50)	2300	100	ug/L	ND	92.6	60-140			
Volatiles									
Acetone	63.0	5.0	ug/L	ND	63.0	50-140			
Benzene	27.1	0.5	ug/L	ND	67.7	50-140			
Bromodichloromethane	27.8	0.5	ug/L	ND	69.4	50-140			
Bromoform	39.6	0.5	ug/L	ND	99.0	50-140			
Bromomethane	26.1	0.5	ug/L	ND	65.2	50-140			
Carbon Tetrachloride	27.8	0.2	ug/L	ND	69.4	50-140			
Chlorobenzene	38.1	0.5	ug/L	ND	95.4	50-140			
Chloroform	27.2	0.5	ug/L	ND	68.1	50-140			
Dibromochloromethane	37.4	0.5	ug/L	ND	93.5	50-140			
Dichlorodifluoromethane	29.6	1.0	ug/L	ND	74.0	50-140			
1,2-Dichlorobenzene	30.4	0.5	ug/L	ND	76.1	50-140			
1,3-Dichlorobenzene	30.5	0.5	ug/L	ND	76.2	50-140			
1,4-Dichlorobenzene	31.0	0.5	ug/L	ND	77.5	50-140			
1,1-Dichloroethane	24.9	0.5	ug/L	ND	62.3	50-140			
1,2-Dichloroethane	28.1	0.5	ug/L	ND	70.2	50-140			
1,1-Dichloroethylene	26.6	0.5	ug/L	ND	66.6	50-140			
cis-1,2-Dichloroethylene	28.4	0.5	ug/L	ND	71.0	50-140			
trans-1,2-Dichloroethylene	26.8	0.5	ug/L	ND	67.1	50-140			
1,2-Dichloropropane	27.2	0.5	ug/L	ND	67.9	50-140			
cis-1,3-Dichloropropylene	24.2	0.5	ug/L	ND	60.6	50-140			
trans-1,3-Dichloropropylene	25.4	0.5	ug/L	ND	63.6	50-140			
Ethylbenzene	31.0	0.5	ug/L	ND	77.6	50-140			
Ethylene dibromide (dibromoethane)	35.0	0.2	ug/L	ND	87.5	50-140			
Hexane	22.6	1.0	ug/L	ND	56.4	50-140			
Methyl Ethyl Ketone (2-Butanone)	61.8	5.0	ug/L	ND	61.8	50-140			
Methyl Isobutyl Ketone	57.7	5.0	ug/L	ND	57.7	50-140			
Methyl tert-butyl ether	61.5	2.0	ug/L	ND	61.5	50-140			
Methylene Chloride	26.5	5.0	ug/L	ND	66.2	50-140			
Styrene	32.1	0.5	ug/L	ND	80.2	50-140			
1,1,1,2-Tetrachloroethane	34.3	0.5	ug/L	ND	85.7	50-140			
1,1,1,2,2-Tetrachloroethane	37.0	0.5	ug/L	ND	92.5	50-140			
Tetrachloroethylene	35.8	0.5	ug/L	ND	89.6	50-140			
Toluene	37.1	0.5	ug/L	ND	92.7	50-140			
1,1,1-Trichloroethane	27.2	0.5	ug/L	ND	67.9	50-140			
1,1,2-Trichloroethane	27.0	0.5	ug/L	ND	67.4	50-140			
Trichloroethylene	26.8	0.5	ug/L	ND	67.0	50-140			
Trichlorofluoromethane	28.6	1.0	ug/L	ND	71.6	50-140			
Vinyl chloride	27.5	0.5	ug/L	ND	68.8	50-140			
m,p-Xylenes	66.7	0.5	ug/L	ND	83.4	50-140			
o-Xylene	34.1	0.5	ug/L	ND	85.3	50-140			
Surrogate: 4-Bromofluorobenzene	27.1		ug/L		84.7	50-140			

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Certificate of Analysis

Client: **Paterson Group Consulting Engineers**
Client PO: 17587

Project Description: PE3116

Report Date: 02-Apr-2015
Order Date: 30-Mar-2015

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.

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Page ___ of ___

Client Name: <i>Peterson Group</i>	Project Reference: <i>PE3116</i>	TAT: <input checked="" type="checkbox"/> Regular [] 3 Day
Contact Name: <i>Dan Arnett</i>	Quote #	[] 2 Day [] 1 Day
Address: <i>54 Colonnade</i>	PO # <i>17587</i>	Date Required: _____
Telephone: <i>613-226-7461</i>	Email Address: <i>darnett@petersongroup.ca</i>	
Criteria: <input checked="" type="checkbox"/> 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)

Parcel Order Number:		Matrix		# of Containers	Sample Taken		PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP				B (HWS)
Sample ID/Location Name					Date	Time				Hg	Cr-VI			
1	<i>BH12-15-GW1</i>	<i>GW</i>		<i>3</i>	<i>Mar 30/15</i>		<i>XX</i>							
2														
3														
4														
5														
6														
7														
8														
9														
10														

Comments: _____

Method of Delivery: *Paracel*

Relinquished By (Sign): <i>[Signature]</i>	Received by Driver/Depot: <i>[Signature]</i>	Received at Lab: <i>[Signature]</i>	Verified By: <i>[Signature]</i>
Relinquished By (Print):	Date/Time: <i>30/03/15 4:40</i>	Date/Time: <i>Mar 30/15 8:50</i>	Date/Time: <i>Mar 30/15 6:15</i>
Date/Time:	Temperature: _____ °C	Temperature: <i>14.1</i> °C	pH Verified [] By: <i>N/A</i>