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Phase II Environmental Site Assessment

Residential Properties
3817, 3819, 3835 and 3843 Innes Road
Ottawa, Ontario

Prepared For

7053525 Canada Inc.

June 5, 2015

Report: PE3532-2

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EXECUTIVE SUMMARY

Assessment

A Phase II Environmental Site Assessment (ESA) was conducted for the property addressed as 3817, 3819, 3835 and 3843 Innes Road, Ottawa, Ontario. The purpose of the Phase II ESA was to address areas of potential environmental concern identified by the Phase I ESA. The Phase II ESA consisted of the drilling of three (3) boreholes and the installation of three (3) 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. The soil vapour survey results were negligible, as a result, samples were selected based on field observations. Two (2) soils samples were analysed for benzene, toluene, ethylbenzene, and xylenes (BTEX) and petroleum hydrocarbons, fractions 1 through 4 (PHCs F1-F4). The analytical results are in compliance with the selected MOECC Table 3 and Table 1 standards. The soils at the subject site are not considered to be contaminated.

Groundwater samples were collected from each monitoring well installed in the boreholes, and analyzed for BTEX and PHCs. All groundwater samples were in compliance with the selected MOECC Table 3 Standards.

Conclusions

Based on the findings of the Phase II ESA, the soil and groundwater beneath the subject site are considered to be in compliance with the selected MOECC Table 3 standards. At this time, no further investigative work is recommended.

1.0 INTRODUCTION

At the request of 7053525 Canada Inc., Paterson Group (Paterson) conducted a Phase II Environmental Site Assessment of the residential properties addressed as 3817, 3819, 3835 and 3843 Innes Road, in the City of Ottawa, Ontario. The purpose of this Phase II ESA was address areas of potential environmental concern associated with the former on-site fuel storage tank and the use of the adjacent property to the east as a retail fuel outlet.

1.1 Site Description

Address:	3817, 3819, 3835 and 3843 Innes Road, Ottawa, ON.
Legal Description:	Lot 27 and Part of Lots 28, 29 and 30, Registrar's Compiled Plan 905, City of Ottawa, Ontario.
Property Identification Number:	04413-0389 (3817 and 3819 Innes Road), 04413-0387, 04413-0212.
Location:	The subject site is located on the north side of Innes Road, between Belcourt Boulevard and Viseneau Drive.
Latitude and Longitude:	45° 27' 10" N, 75° 30' 47" W.
Configuration:	Rectangular
Site Area:	0.72 hectares (approximate).

1.2 Property Ownership

The subject property is currently owned by 7053525 Canada Inc. Paterson was engaged to conduct this Phase II-ESA by Mr. Ed Suwaya of 7053525 Canada Inc. Mr. Suwaya can be reached by telephone at (613) 834-7555.

1.3 Current and Proposed Future Uses

The subject site is currently occupied by four (4) residential dwellings and five (5) storage sheds. The remainder of the property is occupied by asphalt, concrete and gravel laneways, and grassed lawns. It is our understanding that commercial redevelopment of the subject site is proposed.

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
- Residential land use

Soil results at the subject site were also compared to the MOECC Table 1 (background) standards, for the purpose of assessing the suitability of the on-site soil and fill material for off-site disposal, if necessary during the redevelopment of the site.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The subject site is located on the north side of Innes Road, between Belcourt Boulevard and Viseneau Drive, in the City of Ottawa, Ontario. The subject site is occupied by four (4) residential dwellings, with gravel and/or asphalt drive ways and grassed lawns. Site topography slopes downward to the southwest. Site drainage consists of sheet flow towards storm drains on Innes Road, as well as infiltration in the vegetated areas of the site.

2.2 Past Investigations

Paterson previously completed a Phase I and Limited Phase II – Environmental Site Assessment for the subject site, in June, 2009, to the requirements of the CSA Z768-01 and CSA Z769-00 standards. Based on the historical research and observations at the time of the Phase I site visit, the presence of a retail fuel outlet on the neighbouring property to the east and the oil tank in the basement of the residential dwelling, located at 3843 Innes Road, were considered to generate areas of potential environmental concern on the subject site. As a result, a limited Phase II-ESA was carried out.

As part of the limited Phase II-ESA, two (2) boreholes were drilled along the eastern perimeter of the subject site (adjacent to the retail fuel outlet), and one (1) borehole was drilled to the east of the single family dwelling addressed 3843

Innes Road. No visual or olfactory signs of petroleum hydrocarbon (PHC) contamination were noted in any of the recovered soil samples. Two (2) soil samples were submitted for analytical testing for PHCs (F1-F4). No PHC parameters were detected in the two (2) soil samples, as a result, the soil is in compliance with the selected MOECC standards for the subject site. No further investigation was recommended at that time.

Paterson carried out a Phase I-ESA at the subject site, in May, 2015, in accordance with O.Reg. 153/04. The Phase I-ESA identified the aforementioned potentially contaminating activities (former use of the aboveground fuel oil tank at 3843 Innes Road and the adjacent retail fuel outlet), which were considered to represent areas of potential environmental concern on the subject site. Based on the results of the Phase I-ESA, a Phase II ESA was recommended to address these areas of potential environmental concern.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation consisted of drilling three (3) boreholes at the subject site. Boreholes were drilled through overburden soils and cored through bedrock to a maximum depth of 8.71 m below ground surface (bgs). Groundwater monitoring wells were installed in all of the boreholes.

3.2 Media Investigated

During the subsurface investigation, soil samples and groundwater samples were obtained and submitted for laboratory analysis. The rationale for sampling and analyzing these media is based on the Contaminants of Potential Concern identified in the Phase I ESA.

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

The subject site is located in an area of glacial till overburden soils with relatively shallow limestone bedrock. Site-specific findings regarding site stratigraphy and groundwater flow are provided in subsequent sections.

Contaminants of Potential Concern

Based on the historic use of a on-site oil tank and the past and current use of the retail fuel outlet on the adjacent property to the east, the following Contaminants of Potential Concern (CPCs) have been identified:

- Specific Volatile Organic Compounds (BTEX) – this suite of parameters includes Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) associated with gasoline and diesel/fuel oil. These parameters were selected as CPCs for the subject property based on the use of fuel oil as a heating source and the neighbouring retail fuel outlet. BTEX may be present in the soil matrix as well as in the dissolved phase in the groundwater system.
- Petroleum Hydrocarbon Fractions 1 through 4 (PHCs F_1-F_4) – this suite of parameters encompasses gasoline (Fraction 1), diesel and fuel oil (Fraction 2), and heavy oils (Fractions 3 and 4). PHCs F_1-F_4 were selected as CPCs for the Phase I property based on the use of fuel oil as a heating source and the neighbouring retail fuel outlet. PHCs may be present in the soil matrix, sorbed to soil particles, as well as in free or dissolved phase in the groundwater system. PHCs are generally considered to be LNAPLs – light non-aqueous phase liquids, indicating that when present in sufficient concentrations above the solubility limit, they will partition into a separate phase above the water table, due to their lower density.

Existing Buildings and Structures

The subject site is currently occupied by four (4) residential dwellings and five (5) storage sheds. No other buildings or structures are present on the subject site.

Water Bodies

The closest water body is Bilberry Creek, located approximately 880 m to the northeast of the site. There are no water bodies on the subject site or within the Phase I study area.

Areas of Natural Significance

No areas of natural significance were identified within the Phase I study area.

Drinking Water Wells

A total of 18 domestic drinking water wells were identified within 250 m of the subject site, including one located on the subject site, at 3843 Innes Road. The domestic well at the subject site was completed in 1960. The water supply wells

on the subject site and within 250 m of the subject site are not expected to be in current use.

Neighbouring Land Use

Neighbouring land use in the Phase I study area is residential and commercial. The properties to the north and west consist of residential dwellings, while the properties to the east and south consist of retail commercial outlets, including a retail fuel outlet located immediately to the east of the subject site.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

The only on-site potentially contaminating activity is considered to be the former use of a heating oil aboveground storage tank at 3843 Innes Road. The only other PCA identified within the Phase I study area is the adjacent retail fuel outlet, located at 3869 Innes Road, immediately east of the subject site.

3.4 Deviations from Sampling and Analysis Plan

The Sampling and Analysis Plan for this project is included in Appendix 1 of this report. Field measurements of groundwater quality were not taken and trip blanks and duplicates were not submitted during the groundwater sampling event.

3.5 Impediments

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

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation was conducted on May 19, 2015, and consisted of the drilling of three (3) boreholes on the subject site. The boreholes were placed to assess the APECs on the eastern portion of the subject site, in the vicinity of the on-site aboveground fuel oil storage tank and the adjacent retail fuel outlet. 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. Drilling occurred under full-time supervision of Paterson personnel.

Borehole locations are shown on Drawing PE3532-3 - Test Hole Location Plan, appended to this report.

4.2 Soil Sampling

Eight (8) soil samples were obtained from the boreholes by means of split spoon sampling and the sampling of shallow soils directly from auger flights. Split spoon samples were taken at approximate 0.76 m intervals. The depths at which split spoon and auger flight samples were obtained from the boreholes are shown as "**SS**" and "**AU**", respectively, on the Soil Profile and Test Data Sheets, appended to this report.

Site soils consist of silty sand fill, underlain by glacial till. The glacial till consisted of a silty sand matrix with gravel and cobbles. Bedrock surface was encountered at depths ranging from 2.72 m to 4.57 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 mateials, as well as screening with an RKI Eagle Gas Detector (Gastech). The detection limit of the Gastech 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

Three (3) groundwater monitoring wells were installed during the drilling program by George Downing Estate Drilling of Hawkesbury, 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 Elevation**	**Total Depth (m BGS)**	**Screened Interval (m BGS)**	**Sand Pack (m BGS)**	**Bentonite Seal (m BGS)**	**Casing Type**
BH1	100.46	8.71	5.66-8.71	4.88-8.71	0.30-4.88	Flushmount
BH2	101.90	7.34	4.27-7.34	3.65-7.34	0.30-4.27	Flushmount
BH3	100.80	7.04	4.24-7.04	3.65-7.04	0.30-3.65	Flushmount

4.5 Field Measurement of Water Quality Parameters

During the May 2015 sampling event, attempts were made to measure water quality parameters in the field using a multi-parameter analyzer. All wells were purged of three well volumes or purged dry and allowed to stabilize prior to sampling.

4.5 Groundwater Sampling

Groundwater sampling protocols were followed using the MOE 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			
Sample ID	**Sample Depth/ Stratigraphic Unit**	**Parameters Analyzed**	**Rationale**
		BTEX / PHCs F1-F4	
BH1-SS1	0.76-1.37 m; fill	X	Assess potential impacts from retail fuel outlet to the east and on-site fill material.
BH2-SS4	3.05-3.66 m; glacial till	X	Assess potentially impacted soil from former aboveground storage tank and fill pipes.

Table 3: Groundwater Samples Submitted			
Sample ID	**Screened Interval/ Stratigraphic Unit**	**Parameters Analyzed**	**Rationale**
		BTEX / PHCs F1-F4	
BH1-GW1	4.13-8.71 m; bedrock	X	Assessment of potential groundwater impacts from adjacent retail fuel outlet.
BH2-GW1	4.80-7.34 m; bedrock	X	Assessment of potential groundwater impacts from on-site aboveground storage tank.
BH3-GW1	3.97-7.04 m; bedrock	X	Assessment of potential groundwater impacts from adjacent retail fuel outlet.

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 retained on-site.

4.9 Elevation Surveying

All monitoring well locations and elevations were surveyed by Paterson personnel, following the drilling program. All elevations are relative to the arbitrarily selected elevation of 100.00 m of the temporary benchmark man-hole on Innes Road, immediately south of the subject site.

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 topsoil and brown silty sand with gravel or trace clay, overlying compact to very dense glacial till consisting of brown silty sand with gravel, cobbles and boulders, underlain by limestone bedrock with shale partings. Refusal to augering was encountered at depths varying from 1.09 to 3.35 m below existing grade. Groundwater was encountered in the glacial till and bedrock layers at depths ranging from 3.97 to 4.80 m below existing grade.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured using an electronic water level meter. Groundwater levels are summarized below in Table 4. All elevations are relative to the temporary benchmark (man-hole on Innes Road) with an arbitrarily selected elevation of 100.00 m above sea level.

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	100.46	4.13	96.33	June 8, 2015
BH2	101.90	4.80	97.10	June 8, 2015
BH3	100.80	3.97	96.83	June 8, 2015

Based on the groundwater elevations from the June 2015 monitoring event, groundwater contour mapping was completed for the upper bedrock stratigraphic unit. Groundwater contours are shown on Drawing PE3532-5 - Groundwater Contour Plan. Based on the contour mapping, groundwater flow at the subject site appears to be in a southerly direction, towards Innes Road. A horizontal hydraulic gradient of approximately 0.022 m/m was calculated.

5.3 Fine-Medium Soil Texture

Based on observed soil conditions, it is our opinion that fine- to medium-grained soil standards do not apply to the subject site. As such, the more stringent coarse-grained soil standards have been used for the subject site. A grain-size analysis was not completed.

5.4 Soil: Field Screening

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

The organic vapour readings obtained from field screening of soil samples were negligible, indicating there is low potential for BTEX, PHC F_1, or PHC F_2 hydrocarbon contamination.

Soil samples were selected for analysis based on location, screening results, and visual and olfactory observations.

5.5 Soil Quality

Two (2) samples were submitted for analysis of BTEX and PHCs. 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/PHCs

Parameter	MDL (µg/g)	Soil Samples (µg/g) May 19, 2015		MOECC Table 1	MOECC Table 3 Residential Coarse
		BH1-SS1	BH2-SS4		
Benzene	0.02	nd	nd	0.02	0.21
Ethylbenzene	0.05	nd	nd	0.05	2.0
Toluene	0.05	nd	nd	0.2	1.0
Xylenes	0.05	nd	nd	0.05	3.1
PHCs F_1	7	nd	nd	25	55
PHCs F_2	4	nd	nd	10	98
PHCs F_3	8	56	94	240	300
PHCs F_4	6	24	70	120	2,800

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold** - Value exceeds MOECC Table 1 Standard
- **Bold** – Value exceeds MOECC Table 3 Standard

All BTEX and PHC concentrations are in compliance with MOECC Table 1 and Table 3 standards.

Sample locations and analytical results are shown on Drawing PE3532-4 – Analytical Testing Plan and Drawing PE3532-6 – Cross-Sections, appended to this report.

The maximum concentrations of analyzed parameters in the soil at the site are summarized below in Table 6.

Table 6: Maximum Concentrations – Soil

Parameter	Maximum Concentration (µg/g)	Sample	Depth Interval (m BGS)
PHCs F_3	94	BH2-SS4	3.05-3.66 m; glacial till
PHCs F_4	70	BH2-SS4	3.05-3.66 m; glacial till

All other parameter concentrations were below laboratory detection limits.

5.6 Groundwater Quality

Groundwater samples from the monitoring wells at BH1, BH2 and BH3 were submitted for laboratory analysis of BTEX and PHCs. The groundwater samples were obtained from the screened intervals noted on Table 1. The results of the analytical testing are presented below. The laboratory certificates of analysis are provided in Appendix 1.

Table 7: Analytical Test Results – Groundwater – BTEX/PHCs

Parameter	MDL (µg/L)	Groundwater Samples (µg/L) May 28, 2015			MOECC Table 3 Standards
		BH1-GW1	BH2-GW1	BH3-GW1	
Benzene	0.5	nd	nd	0.5	44
Ethylbenzene	0.5	nd	nd	nd	2,300
Toluene	0.5	nd	nd	1.2	18,000
Xylenes	0.5	nd	nd	nd	4,200
PHCs F_1	25	nd	nd	nd	750
PHCs F_2	100	nd	nd	nd	150
PHCs F_3	100	nd	nd	498	500
PHCs F_4	100	nd	nd	362	500

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

All BTEX and PHC concentrations are in compliance with MOECC Table 3 standards.

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

Table 8: Maximum Concentrations – Groundwater			
Parameter	**Maximum Concentration (µg/L)**	**Borehole/Sample Location**	**Depth Interval (m BGS)**
Benzene	0.5	BH3-GW1	3.97-7.04 m; bedrock
Toluene	1.2	BH3-GW1	3.97-7.04 m; bedrock
PHCs F_3	498	BH3-GW1	3.97-7.04 m; bedrock
PHCs F_4	362	BH3-GW1	3.97-7.04 m; bedrock

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

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

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

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

5.8 Phase II Conceptual Site Model

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

Site Description

Potentially Contaminating Activities and Areas of Potential Environmental Concern

The Phase I ESA completed by Paterson identified two (2) PCAs (on and off-site) within the Phase I ESA study area which were considered to represent APECs with respect to the subject site:

- Potential for impacts associated with the historical use of an aboveground storage tank for fuel oil, at 3843 Innes Road, on the northeastern portion of the subject site (Item 28, Column A, Table 2, O.Reg. 153/04 - "Gasoline and Associated Products Storage in Fixed Tanks").

- Potential for subsurface impairment associated with the presence of a retail fuel outlet adjacent to the east of the subject site, at 3869 Innes Road (Item 28, Column A, Table 2, O.Reg. 153/04 - "Gasoline and Associated Products Storage in Fixed Tanks").

No other PCAs were identified within the Phase I study area.

Contaminants of Potential Concern

The following Contaminants of Concern were identified with respect to the subject site:

- Benzene, toluene, ethylbenzene, and xylenes (BTEX) - this suite of parameters includes the volatile organic compounds benzene, toluene, ethylbenzene, and xylenes (BTEX), commonly associated with gasoline and diesel fuel. These parameters were selected as CPCs for soil and groundwater at the subject site based on the presence of retail fuel outlet to the east.

- Petroleum Hydrocarbons, Fractions 1 through 4 (PHCs F1-F4) - this suite of parameters encompasses gasoline (Fraction 1), diesel and fuel oil (Fraction 2), and heavy oils (Fractions 3 and 4). PHCs F1-F4 were selected as CPCs for the Phase I property based on the historical presence of the aboveground storage tank within 3843 Innes Road and the presence of the retail fuel outlet to the east of the subject site. PHCs may be present in the soil matrix, sorbed to soil particles, as well as in free or dissolved phase in the groundwater system. PHCs are generally considered to be LNAPLs – light non-aqueous phase liquids, indicating that when present in sufficient concentrations above the solubility limit, they will partition into a separate phase above the water table, due to their lower density.

Subsurface Structures and Utilities

The subject site is located in a municipally serviced area, with various underground services located on-site. In general, service trenches may have the potential to affect contaminant transport and distribution by providing preferential pathways, particularly in areas where the permeability of the trench backfill

material is higher than that of the surrounding materials. Based on the analytical results presented above, it is our interpretation that service trenches have not significantly affected contaminant transport or distribution at the subject 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 and illustrated on Drawing PE3532-6 – Cross-Sections. Stratigraphy consists of:

- An intermittent topsoil, 0.1 m in thickness. The topsoil was encountered in some of the vegetated areas on the subject site.
- Fill material, consisting of silty sand with gravel or trace clay, encountered in boreholes BH1 and BH3, varying in thickness from 0.94 to 1.52 m.
- Glacial till, consisting of silty sand with gravel, cobbles and boulders, varying in thickness between 1.20 and 3.48 m, and encountered below topsoil or fill material. Groundwater was encountered in this layer in BH1.
- Limestone bedrock with shale partings was identified beneath the glacial till. Bedrock was investigated to depths of 7.29 to 8.71 m below ground. Groundwater was identified in this layer. The bedrock layer is interpreted to represent a local aquifer at the subject site. This is the deepest unit investigated.

Hydrogeological Characteristics

Groundwater was encountered in the glacial till and bedrock layers. The glacial till and bedrock is interpreted to function as a local aquifer at the subject site.

Water levels were measured at the subject site on June 8, 2015. Groundwater was encountered at depths varying from 3.97 to 4.80 m below existing grade.

Based on the groundwater elevations from the June 2015 monitoring event, groundwater contour mapping was completed and the horizontal hydraulic gradient for the subject site was calculated. Groundwater flow at the subject site appears to be in a southerly direction. A hydraulic gradient of approximately 0.022 m/m was calculated. Water levels and interpreted groundwater contours are illustrated on Drawings PE3532-3 and PE3532-4.

Approximate Depth to Bedrock

Based on the drilling and coring program, the bedrock was encountered at the subject site at depths varying from 2.72 to 4.57 m below existing grade.

Approximate Depth to Water Table

Depth to water table at the subject site varies from approximately 3.97 to 4.80 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 property, and the soil pH at the 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. This fill material consists of silty sand with gravel and trace clay. No evidence of deleterious material or contamination was identified in the fill material. The analytical results from the fill layer indicate that it is in compliance with MOECC Table 1 standards.

Proposed Buildings and Other Structures

It is our understanding that several commercial buildings are proposed for the site. The proposed buildings do not represent a change to a more sensitive land use (from residential to commercial) and therefore, a record of site condition is not required.

Existing Buildings and Structures

The subject site is currently occupied by four (4) residential dwellings and five (5) storage sheds.

Water Bodies

There are no water bodies on the subject site or within the Phase I study area. The closest water body is the Bilberry Creek, located approximately 880 m to the northeast of the subject site.

Areas of Natural Significance

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

Environmental Condition

Based on visual and olfactory observations and on analytical testing results, the soil and groundwater present beneath the subject property are considered to be in compliance with the 2011 MOECC Table 3 standards selected for the site, in the sample locations discussed above. Soil samples analysed also meet the MOECC Table 1 standards, therefore, the soil analysed is considered to be suitable for reuse off-site as clean fill.

Analytical test results for soil and groundwater are presented on Drawing PE3532-4.

6.0 CONCLUSIONS

Assessment

A Phase II Environmental Site Assessment (ESA) was conducted for the property addressed as 3817, 3819, 3835 and 3843 Innes Road, Ottawa, Ontario. The purpose of the Phase II ESA was to address areas of potential environmental concern identified by the Phase I ESA. The Phase II ESA consisted of the drilling of three (3) boreholes and the installation of three (3) 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. The soil vapour survey results were negligible, as a result, samples were selected based on field observations. Two (2) soils samples were analysed for benzene, toluene, ethylbenzene, and xylenes (BTEX) and petroleum hydrocarbons, fractions 1 through 4 (PHCs F1-F4). The analytical results are in compliance with the selected MOECC Table 3 and Table 1 standards. The soils at the subject site are not considered to be contaminated.

Groundwater samples were collected from each monitoring well installed in the boreholes, and analyzed for BTEX and PHCs. All groundwater samples were in compliance with the selected MOECC Table 3 Standards.

Conclusions

Based on the findings of the Phase II ESA, the soil and groundwater beneath the subject site are considered to be in compliance with the selected MOECC Table 3 standards. At this time, no further investigative work is recommended.

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 7053525 Canada Inc. Permission and notification from 7053525 Canada Inc. and Paterson will be required to release this report to any other party.

Paterson Group Inc.

Sean Moggridge, B.Eng.

Mark S. D'Arcy, P.Eng.

Report Distribution:

- 7053525 Canada Inc.
- Paterson Group

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE3532-3 – TEST HOLE LOCATION PLAN

DRAWING PE3532-4 – ANALYTICAL TESTING PLAN

DRAWING PE3532-5 – GROUNDWATER CONTOUR PLAN

DRAWING PE3532-6 – CROSS-SECTION A-A'

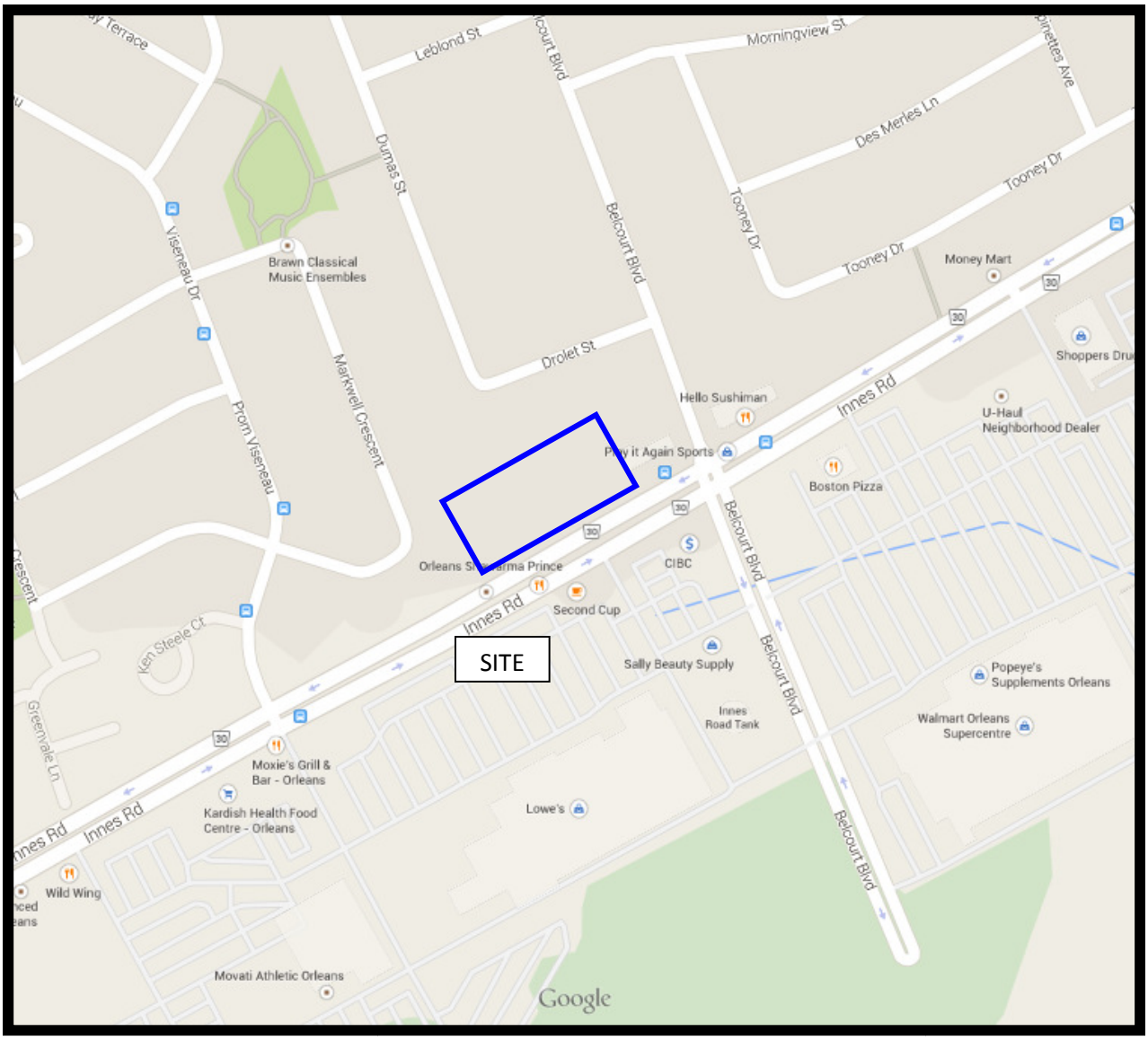

FIGURE 1

KEY PLAN

RESIDENTIAL

#1909 MARKWELL CRESCENT

#6656 DROLET STREET

#6662 DROLET STREET

#6664 DROLET STREET

#6668 DROLET STREET

#1911 MARKWELL CRESCENT

GRASS

GRASS

#3843 INNES ROAD RES.

SHED

BH 2
101.90
(97.10)

GRASS

CONC. PAD

APPROXIMATE LOCATION OF ABOVEGROUND STORAGE TANK

ON THE RUN CONVENIENCE STORE

RESIDENTIAL

#3819 INNES ROAD RESIDENTIAL

CONCRETE PAD

GRAVEL PAD

STORAGE SHEDS

#1913 MARKWELL CRESCENT

SHED

ASPHALT

GRAVEL

HYDRO

A

BH 3
100.80
(96.83)

#3869 INNES ROAD RETAIL FUEL OUTLET

CONCRETE PAD

GRAVEL

GRAVEL

#1915 MARKWELL CRESCENT

#3835 INNES ROAD RESIDENTIAL

#3817 INNES ROAD RESIDENTIAL

GRASS

GRASS

GRASS

BH 1
100.46
(96.33)

FUEL PUMPS

#1911 MARKWELL CRESCENT

GRAVEL

A'

LEGEND:

BOREHOLE WITH MONITORING WELL LOCATION

100.46 GROUND SURFACE ELEVATION (m)

(98.33) GROUNDWATER SURFACE ELEVATION (m)

TBM - TOP OF MANHOLE COVER , NORTH SIDE OF INNES ROAD, NEAR THE SOUTHEAST CORNER OF SUBJECT SITE. ASSUMED ELEVATION = 100.00m.

TBM

INNES ROAD

paterson group
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL

7053525 CANADA INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
RESIDENTIAL PROPERTIES
3817, 3819, 3835 AND 3843 INNES ROAD

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:400	Date: 06/2015
Drawn by: CPB	Report No.: PE3532-2
Checked by: SM	Drawing No.: PE3532-3
Approved by: MSD	

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BH2-SS4 - 3.05-3.66 m - BTEX/PHCs (F1-F4)
ALL PARAMETER CONCENTRATIONS MEET STANDARDS

BH2-GW1 - 4.80-7.34 m - BTEX/PHCs (F1-F4)
ALL PARAMETER CONCENTRATIONS MEET STANDARDS

BH3-GW1 - 3.97-7.04 m - BTEX/PHCs (F1-F4)
ALL PARAMETER CONCENTRATIONS MEET STANDARDS

#1909 MARKWELL CRESCENT

#6656 DROLET STREET

#1911 MARKWELL CRESCENT

#1913 MARKWELL CRESCENT

#1915 MARKWELL CRESCENT

#1911 MARKWELL CRESCENT

RESIDENTIAL

GRASS

GRASS

#3819 INNES ROAD RESIDENTIAL

CONCRETE PAD

SHED

ASPHALT

CONCRETE PAD

GRAVEL

GRAVEL PAD

STORAGE SHEDS

GRAVEL

#3817 INNES ROAD RESIDENTIAL

GRASS

#3835 INNES ROAD RESIDENTIAL

GRASS

GRAVEL

#3843 INNES ROAD RES.

SHED

BH 2
101.90
(97.10)

CONC. PAD

APPROXIMATE LOCATION OF ABOVEGROUND STORAGE TANK

HYDRO

GRASS

GRASS

GRAVEL

ON THE RUN CONVENIENCE STORE

BH 3
100.80
(96.83)

#3869 INNES ROAD RETAIL FUEL OUTLET

BH 1
100.46
(96.33)

FUEL PUMPS

LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION
- 100.46 GROUND SURFACE ELEVATION (m)
- (98.33) GROUNDWATER SURFACE ELEVATION (m)

Soil Results in compliance with MOE Standards

Soil Results in compliance with MOE Standards

TBM

BH1-SS1 - 0.76-1.37 m - BTEX/PHCs (F1-F4)
ALL PARAMETER CONCENTRATIONS MEET STANDARDS

BH1-GW1 - 4.13-8.71 m - BTEX/PHCs (F1-F4)
ALL PARAMETER CONCENTRATIONS MEET STANDARDS

INNES ROAD

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NO.	REVISIONS	DATE	INITIAL

7053525 CANADA INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
RESIDENTIAL PROPERTIES
3817, 3819, 3835 AND 3843 INNES ROAD

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN

Scale: 1:400	Date: 06/2015
Drawn by: CPB	Report No.: PE3532-2
Checked by: SM	Drawing No.: PE3532-4
Approved by: MSD	

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RESIDENTIAL

#1909 MARKWELL CRESCENT

#6656 DROLET STREET

#6662 DROLET STREET

#6664 DROLET STREET

#6668 DROLET STREET

#1911 MARKWELL CRESCENT

RESIDENTIAL

#1913 MARKWELL CRESCENT

#1915 MARKWELL CRESCENT

#1911 MARKWELL CRESCENT

GRASS

GRASS

#3819 INNES ROAD RESIDENTIAL

CONCRETE PAD

SHED

ASPHALT

CONCRETE PAD

GRAVEL

GRAVEL PAD

STORAGE SHEDS

GRAVEL

#3817 INNES ROAD RESIDENTIAL

GRASS

#3835 INNES ROAD RESIDENTIAL

GRASS

GRAVEL

#3843 INNES ROAD RES.

SHED

BH 2
101.90
(97.10)

GRASS

CONC. PAD

97.0

APPROXIMATE LOCATION OF ABOVEGROUND STORAGE TANK

HYDRO

BH 3
100.80
(96.83)

96.8

(0.022 m/m)

96.6

ON THE RUN CONVENIENCE STORE

#3869 INNES ROAD RETAIL FUEL OUTLET

96.4

FUEL PUMPS

GRASS

BH 1
100.46
(96.33)

GRAVEL

GRASS

TBM

INNES ROAD

LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION
- 100.46 GROUND SURFACE ELEVATION (m)
- (98.33) GROUNDWATER SURFACE ELEVATION (m)
- 95.4 GROUNDWATER CONTOUR
- APPROX. GROUNDWATER FLOW DIRECTION (HORIZONTAL HYDRAULIC GRADIENT)

paterson group
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NO.	REVISIONS	DATE	INITIAL

7053525 CANADA INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
RESIDENTIAL PROPERTIES
3817, 3819, 3835 AND 3843 INNES ROAD
OTTAWA, ONTARIO

Title:

GROUNDWATER CONTOUR PLAN

Scale: 1:400	Date: 05/2015
Drawn by: CPB	Report No.: PE3532-2
Checked by: SM	Drawing No.: PE3532-5
Approved by: MSD	

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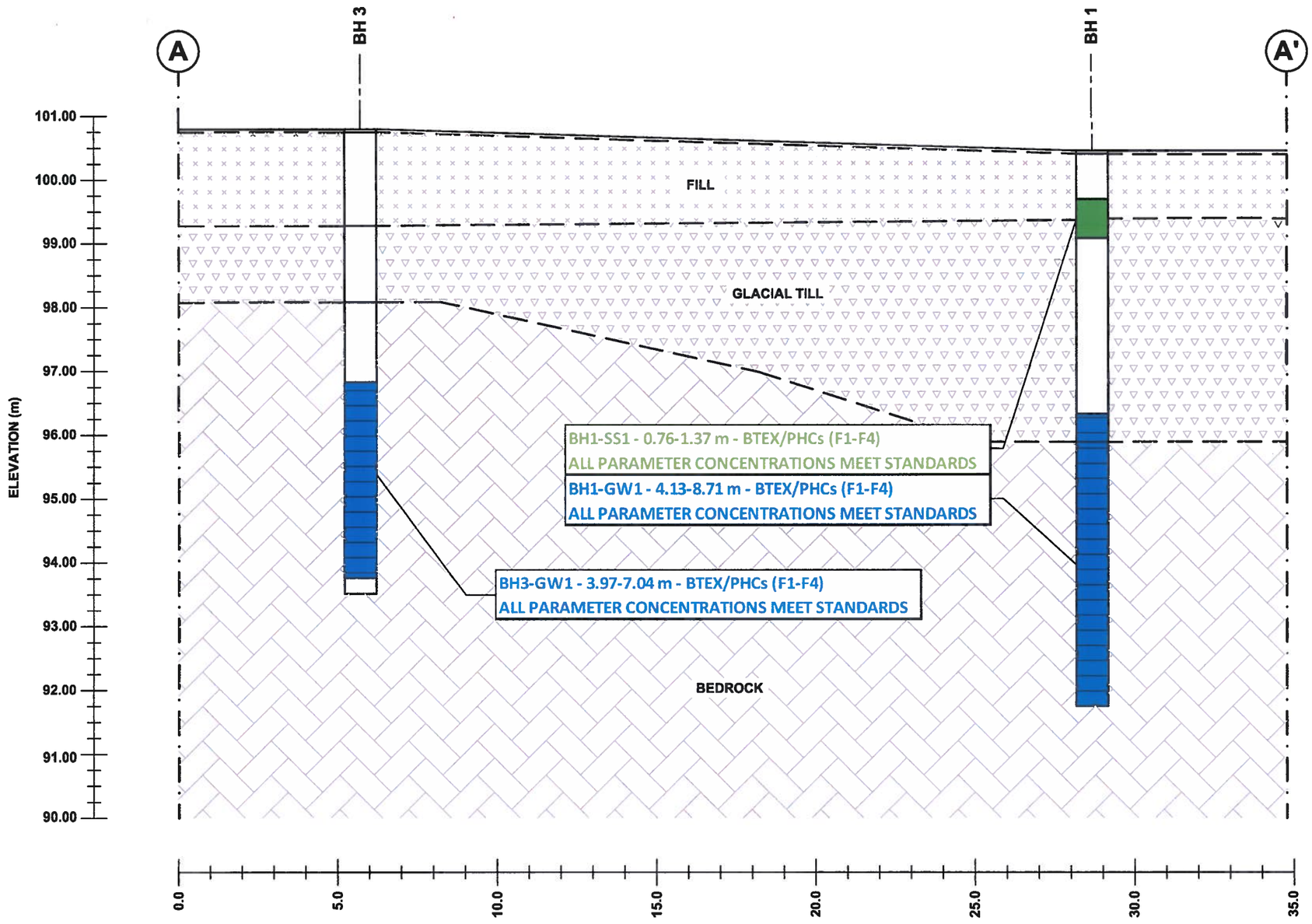

LEGEND:

Soil Results in compliance with MOE Standards

Soil Results in compliance with MOE Standards

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NO.	REVISIONS	DATE	INITIAL

7053525 CANADA INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
RESIDENTIAL PROPERTIES
3817, 3819, 3835 AND 3843 INNES ROAD
OTTAWA, ONTARIO

Title:

CROSS-SECTION A-A'

Scale: AS SHOWN	Date: 6/2015
Drawn by: CPB	Report No.: PE3532-2
Checked by: SM	Drawing No.: PE3532-6
Approved by: MSD	

p:\autocad drawings\environmental\pe35xx\pe3532-6 x section a-a' dwg

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 Studies

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patersongroup

Sampling & Analysis Plan

Residential Property
3817, 3819, 3835 and 3843 Innes Road
Ottawa, Ontario

Prepared For

7053525 Canada Inc.

May 2015

Report: PE3532-SAP

Table of Contents

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by 7053525 Canada Inc. to conduct a Phase II-Environmental Site Assessment (ESA) for the property at 3817, 3819, 3835, 3843 Innes Road, in the City of Ottawa, Ontario. Based on the Phase I-ESA completed by Paterson for the subject property, the following subsurface investigation program was developed:

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1, BH3	Assessment of potential impacts from retail fuel outlet to east of subject site.	Drill deep enough to intercept water table and install groundwater monitoring well.
BH2	Assessment of potential impacts from former use of aboveground storage tank in 3843 Innes Road	Drill deep enough to intercept water table and install groundwater monitoring well.

Test hole locations are shown on the Test Hole Location Plan appended to the main report.

At each borehole, split-spoon samples of overburden soils will be obtained at 0.76 m (2'6") intervals until approximately 1.5 m below the water table. 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.

If it is considered necessary to drill into bedrock to intercept the groundwater table, boreholes will be advanced into bedrock as required using diamond coring equipment. Rock core samples will be retained for review.

Following borehole drilling, monitoring wells will be installed in selected boreholes for the measurement of water levels and the collection of groundwater samples.

2.0 ANALYTICAL TESTING PROGRAM

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

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

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

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

3.0 STANDARD OPERATING PROCEDURES

3.1 Environmental Drilling Procedure

Purpose

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

Equipment

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

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

Determining Borehole Locations

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

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

Drilling Procedure

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

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

Spoon Washing Procedure

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

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

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

The spoon-washing procedure may be bypassed if a GeoProbe direct-push drill rig with disposable plastic sampling tubes is used.

Screening Procedure

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

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

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

3.2 Monitoring Well Installation Procedure

Equipment

- 1.5 m x 5 cm threaded sections of Schedule 40 PVC slotted well screen (1.5 m x 3.2 cm if installing in cored hole in bedrock)
- 1.5 m x 5 cm threaded sections of Schedule 40 PVC riser pipe (1.5 m x 3.2 cm if installing in cored hole in bedrock)
- Threaded end-cap
- Slip-cap or J-plug
- Asphalt cold patch or concrete
- Silica Sand
- Bentonite chips (Holeplug)
- Steel flushmount casing

Procedure

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

- Install flushmount casing. Seal space between flushmount and borehole annulus with concrete, cold patch, or holeplug to match surrounding ground surface.

3.3 Monitoring Well Sampling Procedure

Equipment

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

Sampling Procedure

- Locate well and use socket wrench or Allan key to open metal flush mount protector cap. Remove plastic well cap.
- Measure water level, with respect to existing ground surface, using water level meter or interface probe. If using interface probe on suspected NAPL site, measure the thickness of free product.
- Measure total depth of well.
- Clean water level tape or interface probe using methanol and water. Change gloves between wells.
- Calculate volume of standing water within well and record.
- Insert polyethylene tubing into well and attach to peristaltic pump. Turn on peristaltic pump and purge into graduated bucket. Purge at least three well volumes of water from the well. Measure and record field chemistry. Continue to purge, measuring field chemistry after every well volume purged, until appearance or field chemistry stabilizes.
- Note appearance of purge water, including colour, opacity (clear, cloudy, silty), sheen, presence of LNAPL, and odour. Note any other unusual features (particulate matter, effervescence (bubbling) of dissolved gas, etc.).

- Fill required sample bottles. If sampling for metals, attach 75-micron filter to discharge tube and filter metals sample. If sampling for VOCs, use low flow rate to ensure continuous stream of non-turbulent flow into sample bottles. Ensure no headspace is present in VOC vials.
- Replace well cap and flushmount casing cap.

4.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

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

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

5.0 DATA QUALITY OBJECTIVES

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

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

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

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

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

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

These considerations are discussed in the body of the report.

6.0 PHYSICAL IMPEDIMENTS TO SAMPLING & ANALYSIS PLAN

Physical impediments to the Sampling and Analysis plan may include:

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

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

patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
3817, 3819, 3835 and 3843 Innes Road
Ottawa, Ontario

DATUM TBM - Top of manhole cover located on the north side of Innes Road, near the southeast corner of subject site. Assumed elevation = 100.00m.

FILE NO. PE3532

REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** May 19, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	100.46
FILL: Brown silty sand with gravel 0.15							
FILL: Brown silty sand		SS	1	83	50+	1	99.46
1.09							
		RC	1	52		2	98.46
GLACIAL TILL: Boulders with clay seams						3	97.46
		RC	2	42		4	96.46
4.57							
		RC	3	72		5	95.46
BEDROCK: Grey limestone with shale partings		RC	4	100	100	6	94.46
						7	93.46
		RC	5	100	100	8	92.46
8.71							
End of Borehole							
(GWL @ 4.13m-June 8, 2015)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

Monitoring Well Construction

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
3817, 3819, 3835 and 3843 Innes Road
Ottawa, Ontario

DATUM TBM - Top of manhole cover located on the north side of Innes Road, near the southeast corner of subject site. Assumed elevation = 100.00m.

FILE NO. PE3532

REMARKS

HOLE NO. BH 2

BORINGS BY CME 55 Power Auger **DATE** May 19, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	101.90
TOPSOIL 0.10							
GLACIAL TILL: Compact to very dense, brown silty sand with gravel, cobbles and boulders		SS	1	42	14	1	100.90
		SS	2	70	50+	2	99.90
		SS	3	40	50+		
3.35		SS	4	44	50+	3	98.90
BEDROCK: Grey limestone with shale partings		RC	1	100	84	4	97.90
		RC	2	100	100	5	96.90
		RC	3	100	100	6	95.90
7.34						7	94.90
End of Borehole							
(GWL @ 4.80m-June 8, 2015)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

Monitoring Well Construction

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
3817, 3819, 3835 and 3843 Innes Road
Ottawa, Ontario

DATUM TBM - Top of manhole cover located on the north side of Innes Road, near the southeast corner of subject site. Assumed elevation = 100.00m.

FILE NO. PE3532

REMARKS

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** May 19, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	100.80
FILL: Brown silty sand, trace clay		SS	1	17	11	1	99.80
1.52							
GLACIAL TILL: Compact to dense, brown silty sand with gravel and cobbles		SS	2	25	15	2	98.80
		SS	3	56	50+		
2.72						3	97.80
		RC	1	92	92	4	96.80
BEDROCK: Grey limestone with shale partings		RC	2	100	100	5	95.80
						6	94.80
		RC	3	100	100	7	93.80
7.29							
End of Borehole							
(GWL @ 3.97m-June 8, 2015)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

Monitoring Well Construction

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

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

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

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

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

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

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

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

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

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

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

CONSOLIDATION TEST

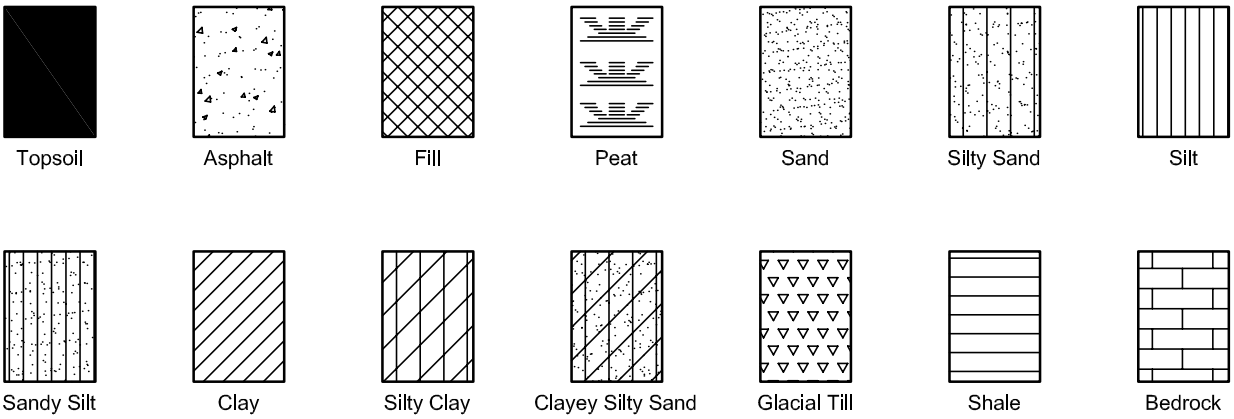
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

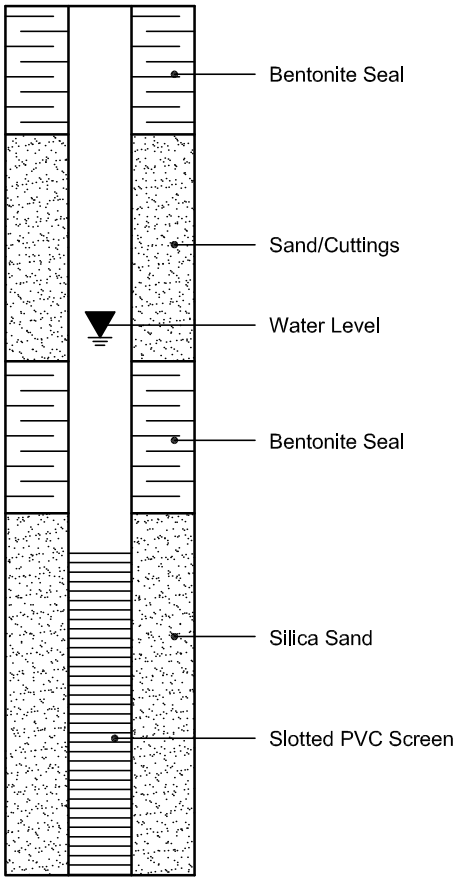
SYMBOLS AND TERMS (continued)

STRATA PLOT

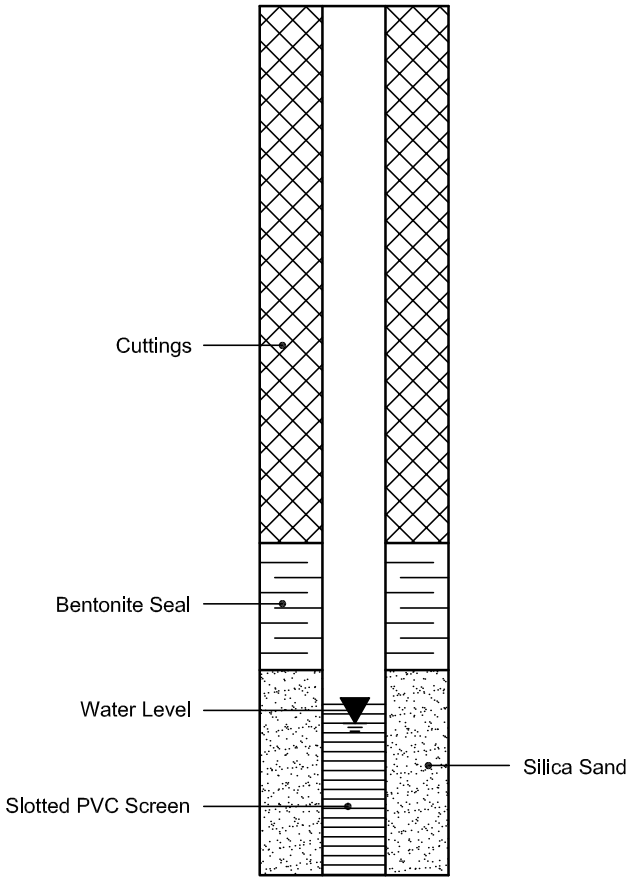


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



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Certificate of Analysis

Paterson Group Consulting Engineers
154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Eric Leveque

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

Client PO: 17771
Project: PE3532
Custody: 104860

Report Date: 27-May-2015
Order Date: 21-May-2015
Order #: 1521243

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

Paracel ID	Client ID
1521243-01	BH1-SS1
1521243-02	BH2-SS4

Approved By: Mark Foto

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

Certificate of Analysis

Report Date: 27-May-2015
Order Date:21-May-2015

Client: **Paterson Group Consulting Engineers**
Client PO: 17771 Project Description: PE3532

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	26-May-15	27-May-15
PHC F1	CWS Tier 1 - P&T GC-FID	26-May-15	26-May-15
PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	25-May-15	26-May-15
Solids, %	Gravimetric, calculation	23-May-15	23-May-15

PARACEL LABORATORIES LTD.

Order #: 1521243

Certificate of Analysis

Report Date: 27-May-2015
Order Date:21-May-2015

Client: **Paterson Group Consulting Engineers**
Client PO: 17771

Project Description: PE3532

	Client ID:	BH1-SS1	BH2-SS4	-	-
	Sample Date:	19-May-15	19-May-15	-	-
	Sample ID:	1521243-01	1521243-02	-	-
	MDL/Units	Soil	Soil	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	92.0	91.7	-	-
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	87.4%	85.5%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	-	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	-	-
F3 PHCs (C16-C34)	8 ug/g dry	56	94	-	-
F4 PHCs (C34-C50)	6 ug/g dry	24	70	-	-

Certificate of Analysis

Report Date: 27-May-2015
Order Date:21-May-2015

Client: **Paterson Group Consulting Engineers**
Client PO: 17771 Project Description: PE3532

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	*6.81*		*ug/g*		*85.1*	*50-140*			

Certificate of Analysis

Report Date: 27-May-2015
Order Date:21-May-2015

Client: **Paterson Group Consulting Engineers**
Client PO: 17771 Project Description: PE3532

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	
Physical Characteristics									
% Solids	75.6	0.1	% by Wt.	74.4			1.6	25	
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*1.86*		*ug/g dry*	*ND*	*86.0*	*50-140*			

Certificate of Analysis

Report Date: 27-May-2015
Order Date:21-May-2015

Client: **Paterson Group Consulting Engineers**
Client PO: 17771 Project Description: PE3532

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	207	7	ug/g	ND	103	80-120			
F2 PHCs (C10-C16)	72	4	ug/g	ND	80.0	80-120			
F3 PHCs (C16-C34)	160	8	ug/g	ND	86.0	80-120			
F4 PHCs (C34-C50)	120	6	ug/g	ND	96.8	80-120			
Volatiles									
Benzene	3.80	0.02	ug/g	ND	95.0	60-130			
Ethylbenzene	3.35	0.05	ug/g	ND	83.8	60-130			
Toluene	3.45	0.05	ug/g	ND	86.3	60-130			
m,p-Xylenes	7.24	0.05	ug/g	ND	90.5	60-130			
o-Xylene	3.48	0.05	ug/g	ND	87.1	60-130			
Surrogate: Toluene-d8	*6.91*		*ug/g*		*86.4*	*50-140*			

Certificate of Analysis

Report Date: 27-May-2015
Order Date:21-May-2015

Client: **Paterson Group Consulting Engineers**
Client PO: 17771 Project Description: PE3532

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 Group	Project Reference: PE3532	TAT: [X] Regular [ ] 3 Day
Contact Name: ERIC LEVEQUE	Quote #	[ ] 2 Day [ ] 1 Day
Address: 154 Colonnade	PO # 17771	Date Required:
Telephone: 613-226-7381	Email Address: elevegue@patersongroup.ca	

Criteria: [X] 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: 152143

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)							
1	BH1-SS1	S		2	May 19/15	pm	X										+120ml+1vial-			
2	BH2-SS4	S		2	May 19/15	pm	X										↓			
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Swift

Relinquished By (Sign):	Received by Driver/Depot: Y. GRATTON #1260	Received at Lab: SUNEEPORN DOLMAT	Verified By: D. Charlebois
Relinquished By (Print):	Date/Time: 21/5/2015	Date/Time: MAY 21 2015 03:48	Date/Time: May 21 4:08
Date/Time:	Temperature: ___ °C	Temperature: 17.9 °C	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers
154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Eric Leveque

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

Client PO: 17840
Project: PE3532
Custody: 104864

Report Date: 4-Jun-2015
Order Date: 29-May-2015
Order #: 1523038

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

Paracel ID	Client ID
1523038-01	BH1-GW1
1523038-02	BH2-GW1
1523038-03	BH3-GW1

Approved By:

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

Certificate of Analysis

Report Date: 04-Jun-2015
Order Date:29-May-2015

Client: **Paterson Group Consulting Engineers**
Client PO: 17840 Project Description: PE3532

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	2-Jun-15	3-Jun-15
PHC F1	CWS Tier 1 - P&T GC-FID	2-Jun-15	3-Jun-15
PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	2-Jun-15	2-Jun-15

Certificate of Analysis

Report Date: 04-Jun-2015
Order Date:29-May-2015

Client: **Paterson Group Consulting Engineers**
Client PO: 17840

Project Description: PE3532

	Client ID:	BH1-GW1	BH2-GW1	BH3-GW1	-
	Sample Date:	28-May-15	28-May-15	28-May-15	-
	Sample ID:	1523038-01	1523038-02	1523038-03	-
	MDL/Units	Water	Water	Water	-
Volatiles					
Benzene	0.5 ug/L	<0.5	<0.5	0.5	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Toluene	0.5 ug/L	<0.5	<0.5	1.2	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	-
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	-
Toluene-d8	Surrogate	116%	114%	111%	-
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	498	-
F4 PHCs (C34-C50)	100 ug/L	<100	<100	362	-
F1 + F2 PHCs	125 ug/L	<125	<125	<125	-
F3 + F4 PHCs	200 ug/L	<200	<200	860	-

Certificate of Analysis

Report Date: 04-Jun-2015
Order Date:29-May-2015

Client: **Paterson Group Consulting Engineers**
Client PO: 17840 Project Description: PE3532

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Volatiles									
Benzene	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: Toluene-d8	*35.6*		*ug/L*		*111*	*50-140*			

Certificate of Analysis

Report Date: 04-Jun-2015
Order Date:29-May-2015

Client: **Paterson Group Consulting Engineers**
Client PO: 17840 Project Description: PE3532

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Volatiles									
Benzene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: Toluene-d8	*37.1*		*ug/L*	*ND*	*116*	*50-140*			

Certificate of Analysis

Report Date: 04-Jun-2015
Order Date:29-May-2015

Client: **Paterson Group Consulting Engineers**
Client PO: 17840 Project Description: PE3532

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1840	25	ug/L	ND	92.0	68-117			
F2 PHCs (C10-C16)	1030	100	ug/L	ND	115	60-140			
F3 PHCs (C16-C34)	2180	100	ug/L	ND	117	60-140			
F4 PHCs (C34-C50)	1390	100	ug/L	ND	112	60-140			
Volatiles									
Benzene	27.4	0.5	ug/L	ND	68.6	50-140			
Ethylbenzene	36.2	0.5	ug/L	ND	90.4	50-140			
Toluene	41.4	0.5	ug/L	ND	104	50-140			
m,p-Xylenes	80.8	0.5	ug/L	ND	101	50-140			
o-Xylene	39.3	0.5	ug/L	ND	98.2	50-140			
Surrogate: Toluene-d8	*34.4*		*ug/L*		*107*	*50-140*			

Certificate of Analysis

Report Date: 04-Jun-2015
Order Date:29-May-2015

Client: **Paterson Group Consulting Engineers**
Client PO: 17840 Project Description: PE3532

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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Client Name: Paterson Group	Project Reference: PE3532	TAT: [X] Regular [ ] 3 Day
Contact Name: Eric Levesque	Quote #	[ ] 2 Day [ ] 1 Day
Address: 154 Colonnade	PO # 17640	Date Required:
Telephone: 613-226-7381	Email Address: elevesque@patersongroup.ca	

Criteria: [X] 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: 1523038

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)							
1	BH1-GW1	GW		3	May 28/15	AM	X													X
2	BH2-GW1	GW		3	↓	↓	X													X
3	BH3-GW1	GW		3	↓	↓	X													X
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments: Please also send to Sean Moggride

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot:	Received at Lab:	Verified By:
	T. Deuse	SUNFORN PARACEL	D. Charlebois
Relinquished By (Print):	Date/Time: 29/05/15 3:15pm	Date/Time: MAY 29 2015 05:55	Date/Time: June 1 12:46
Date/Time:	Temperature: ____ °C	Temperature: 16.5 °C	pH Verified [ ] By: