Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Services

patersongroup

Phase II Environmental Site Assessment Update

Vacant Property –
Proposed Residential Development
1034 McGarry Terrace and 1117 Longfields Drive
Ottawa, Ontario

Prepared For

1897365 Ontario Inc.

November 3, 2017

Report: PE2830-3

Paterson Group Inc.

Consulting Engineers
154 Colonnade Road South
Ottawa (Nepean), Ontario
Canada K2E 7J5

Tel: (613) 226-7381
Fax: (613) 226-6344
www.patersongroup.ca

Table of Contents

List of Figures

List of Appendices

EXECUTIVE SUMMARY

Assessment

A Phase II ESA was conducted for the property at 1034 McGarry Terrace and 1117 Longfields Drive, Ottawa, Ontario. The purpose of the Phase II ESA was to address the areas of potential environmental concern identified during the Phase I ESA, in particular the historical use of the property as an automobile service garage, and the former presence of underground storage tanks on the property. The subsurface investigation at the subject site consisted of the drilling of three (3) boreholes and the installation of three (3) groundwater monitoring wells.

Soil samples were obtained from the boreholes and screened using visual observations and organic vapour measurements. Three (3) soil samples were submitted for laboratory analysis of BTEX or VOCs and PHCs. No detectable concentrations of any of the parameters were identified above the laboratory method detection limits. All soil samples were in compliance with the selected MOECC Table 3 standards.

Groundwater samples were obtained from the monitoring wells and analyzed for BTEX or VOCs and PHCs. No detectable concentrations of any of the parameters were identified above the laboratory method detection limits. All groundwater samples were in compliance with the MOECC Table 3 standards.

Conclusion

Soil and Groundwater

Although a site remediation previously conducted at the location of the former automotive service garage, due to the age of the results, and the dated standards, a Phase II-ESA was conducted on the subject property. Based on the results of this Phase II-ESA, the subject site is considered to have been effectively remediated. No further investigation is recommended at this time.

Monitoring Wells

Prior to the development of the subject property, the monitoring wells installed in BH7, BH8 and BH9 should be abandoned according to Ontario Regulation 903. The monitoring wells will be registered with the MOECC under this regulation. Further information can be provided upon request in this regard.

1.0 INTRODUCTION

At the request of 1897365 Ontario Inc., Paterson Group (Paterson) conducted a Phase II Environmental Site Assessment of the property addressed as 1034 McGarry Terrace and 1117 Longfields Drive, in the City of Ottawa, Ontario. The purpose of this Phase II ESA was to address concerns identified in the Phase I ESA.

1.1 Site Description

Address:	1034 McGarry Terrace and 1117 Longfields Drive, Ottawa, Ontario.
Legal Description:	Part of Lot 15, Concession 2, Rideau Front (1034 McGarry Terrace) and Block 4 of Plan 4M1303 (1117 Longfields Drive), in the City of Ottawa, Ontario.
Property Identification Number:	0473-20003, 0473-21456 and 0473-22607.
Location:	The subject site is located at the intersection of Longfields Drive and Marketplace Avenue, and can be accessed by the McGarry Terrace cul-de-sac, in the City of Ottawa, Ontario. The subject site is shown on Figure 1 - Key Plan following the body of this report.
Latitude and Longitude:	45° 16' 17" N, 75° 44' 21" W.
Configuration:	Irregular.
Site Area:	0.9 hectares.

1.2 Property Ownership

The subject property was formerly owned by Tega Developments.

1.3 Current and Proposed Future Uses

The subject site is currently vacant. The site was initially developed as a residence and farmstead, and was later utilised as a commercial auto repair garage. Auto repair activities have not been carried out for at least the past ten

years. The eastern portion of the property has always been, and currently is, vacant. It is our understanding that the subject property will be redeveloped with a residential condominium, with underground parking.

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:

- Deep bedrock condition (more than 3 m of overburden)
- Coarse-grained soil conditions
- Non-potable groundwater conditions
- Residential land use

Although a potable water drinking well is located on the subject property, the above noted Table 3 Standards were selected based on the intended use of the property. Due to the fact that the property will be redeveloped in the near future, and that the new dwellings will be services with municipal water, a potable groundwater condition (MOECC Table 2) was not used as a site condition standard in this report.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The subject site is currently vacant however it was recently occupied by a residential dwelling and two (2) storage buildings, one of which was used as a commercial auto repair garage. The eastern side of the property is vacant and covered in vegetation. Site drainage consists of sheet flow from paved areas to McGarry Terrace and to grassed areas, where infiltration may occur. Site topography slopes to the east. An elevation change occurs at the south property boundary of the 1034 McGarry Terrace property, where the grade drops by 2 to 3 m. The regional topography slopes gently downward to the south-southeast towards the Jock River.

No standing water was observed on the exterior of the subject property. The dwelling is serviced by a private septic system and potable water well. No rail lines or loading areas were observed at the subject site. No unidentified

substances were observed on-site. No water bodies are present on the subject site.

2.2 Past Investigations

Paterson has completed a Phase I ESA in conjunction with this Phase II ESA, provided under separate cover. As part of the environmental site assessment works, Paterson was allowed to review a Phase I-II ESA report and a remediation report prepared by Oliver, Mangione, McCalla and Associated Limited (1997) which addressed the garage operation. Contaminated soil and liquid waste material were removed from site. Based on the results of the remediation report, the clean-up is considered to have been effective in removing the contamination. However, due to the fact that the works were conducted more than 15 years ago, and under different environmental standards, a Phase II-ESA was recommended in order to verify that the soil and groundwater conditions comply with today's standards.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation conducted as a component of this Phase II ESA consisted of the drilling of three (3) boreholes at the subject property, each instrumented with groundwater monitoring wells. Boreholes were drilled into overburden soils to depths ranging between 7.01 to 8.23 m below grade. All holes were terminated in glacial till.

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. Contaminants of concern in the soil are BTEX and PHCs. Contaminants of concern for groundwater are VOCs and PHCs.

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

Based on the Geological Survey of Canada website, bedrock in the area of the site consists of interbedded sandstone and dolomite of the March Formation. Overburden soils are indicated to be till, with a drift thickness of 10 to 15 m.

Contaminants of Potential Concern

The following CPCs were identified with respect to the subject site:

- BTEX - this suite of parameters includes Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX), associated with gasoline and diesel fuel. These parameters were selected as CPCs based on the presence of the on-site garage at the subject property, as well as the reported former presence of an underground diesel storage tank. BTEX may be present in the soil matrix as well as in the dissolved phase in the groundwater system.

- 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 presence of the service garage as well as the former USTs located on the subject property. 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.

- Volatile Organic Compounds (VOCs) – this suite of parameters includes chlorinated solvents and degradation products (Tetrachloroethylene, Trichloroethylene, Dichloroethylenes, and Vinyl Chloride) associated with de-greasing and dry cleaning, as well as chloroform, a byproduct of chlorine disinfection of municipally-treated water.

The mechanisms of contaminant transport within the site soils include physical transportation and leaching. Physical transportation includes any intentional or unintentional movement or distribution of soil by physical means.

Given that no soil disturbance was evident during the site visit, physical transport is not considered to significantly contribute to contaminant transport in soils at the subject site. Leaching may occur in areas of the site where the ground surface is permeable; precipitation infiltrating in these areas may transport surficial contaminants into lower strata. The potential for leaching at the subject site is interpreted to be limited by the presence of the buildings and paved parking areas, but may still occur in permeable areas such cracks and fissures in the asphalt or concrete ground surfaces.

The mechanisms of contaminant transport within the groundwater system include advection, dispersion, and diffusion. Advection and dispersion will be the dominant mechanisms of contaminant transport in soils with higher hydraulic conductivities, such as sands, gravels, silts, and some glacial till soils, whereas diffusion will dominate in soils with lower hydraulic conductivity, such as clays.

Existing Buildings and Structures

The subject site is occupied by a two storey residential dwelling with basement and two (2) single storey garage/storage buildings.

Water Bodies

There are no water bodies on the subject site or within the study area.

Areas of Natural Significance

No areas of natural significance were identified on the subject site or within the study area.

Drinking Water Wells

A drinking water well is reported to be present near the front of the dwelling.

Neighbouring Land Use

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

Potentially Contaminating Activities and Areas of Potential Environmental Concern

Potentially Contaminating Activities and Areas of Potential Environmental Concern identified include the former use of the subject property as an automotive service garage in addition to the former on-site presence of underground storage tanks. No other areas of potential environmental concern

were identified within the study area. The retail fuel outlet located at the intersection of Strandherd and Longfields Drive is not considered to be an area of potential environmental concern due to the significant distance separating the retail fuel outlet and the subject site, as well as the recent development of that property (approximately 10 years).

Assessment of Uncertainty and/or Absence of Information

The information available for review as part of the preparation of the Phase I ESA was considered to be sufficient to conclude that there are areas of potential environmental concern on the subject site and neighbouring properties which have the potential to have impacted the subject site. The presence of potentially contaminating activities was confirmed by a variety of independent sources, including, in some cases, observations made during the Phase I site visit. As such, the conclusions of the Phase I are not affected by uncertainty which may be present with respect to the individual sources.

3.4 Deviations from Sampling and Analysis Plan

The Sampling and Analysis Plan for this project is included in Appendix 1 of this report. Field measurement of water quality parameters was not undertaken. No other deviations were noted.

3.5 Impediments

No physical impediments or denial of access were encountered during the Phase II Environmental Site Assessment.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation was conducted on September 16, 2013, and consisted of the drilling of three (3) boreholes on the subject site. The boreholes were placed to provide general coverage of the property and to address the aforementioned areas of potential environmental concern. The boreholes were advanced 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 No. PE2830-4 – Test Hole Location And Groundwater Contour Plan, appended to this report.

4.2 Soil Sampling

A total of 32 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.

Generally, site soils consist of a layer of asphalt followed by fill material (between 5 cm and 1.45 m) followed by glacial till to depths of up to 8.23 m.

4.3 Field Screening Measurements

All soil samples collected underwent a preliminary screening procedure, which included visual screening for colour and evidence of deleterious fill, as well as screening with a MiniRae photoionization detector. The detection limit is 0.1 ppm, with a precision of +/- 0.1 ppm.

The soil vapours were measured by inserting the analyzer probe into the nominal headspace above the soil sample. Samples were then agitated and the peak readings recorded. The vapour readings ranged from 0 to 0.3 ppm. 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.

The groundwater monitoring wells were developed upon completion using a dedicated inertial lift pump. A minimum of three (3) well volumes were removed from the wells.

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
BH7	104.24	7.62	6.1-7.62	5.8-7.62	0.6-5.8	Flushmount
BH8	103.64	7.01	5.47-7.01	5.17-7.01	0.6-5.17	Flushmount
BH9	103.36	7.62	6.1-7.62	5.8-7.62	0.6-5.8	Flushmount

4.5 Field Measurement of Water Quality Parameters

Field measurement of water quality parameters was not undertaken as a 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

Sample ID	Sample Depth/ Stratigraphic Unit	Parameters Analyzed			Rationale
		PHC F_1-F_4	BTEX	VOC	
BH7 – SS8	5.3 – 6.0 m; glacial till	X	X		Assessment of potential impacts from the former diesel UST.
BH8 – SS10	6.0 – 6.7 m; glacial till	X		X	Assessment of potential impacts from the former automotive garage.
BH9 -- SS8	4.5 – 5.0 m; glacial till	X		X	Assessment of potential impacts from the former automotive garage and UST.

Table 3: Groundwater Samples Submitted

Sample ID	Screened Interval/ Stratigraphic Unit	Parameters Analyzed			Rationale
		PHCs F_1-F_4	VOCs	BTEX	
BH7-GW1	6.1-7.62 m; glacial till	X		X	Assessment of potential impacts from the former diesel UST.
BH8-GW1	5.47-7.01 m; glacial till	X	X		Assessment of potential impacts from the former automotive garage.
BH9-GW1	6.1-7.62 m; glacial till	X	X		Assessment of potential impacts from the former automotive garage and UST.

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 collected and disposed of.

4.9 Elevation Surveying

Monitoring well locations were surveyed using a laser level. Elevations were surveyed relative to a temporary benchmark being the finished top spindle of the fire hydrant located at the south end of the McGarry Terrace cul-de-sac. Based on a topographic plan produced by Annis, O'Sullivan, Vollbekk Ltd., the top spindle of the fire hydrant has a geodetic elevation of 103.75 m. The location of the benchmark is shown on Drawing PE2830-3 – Test Hole Location and Groundwater Contour Plan.

4.10 Quality Assurance and Quality Control Measures

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

5.0 REVIEW AND EVALUATION

5.1 Geology

Site geology details are provided in the Soil Profile and Test Data Sheets in Appendix 1. Site soils encountered during the subsurface investigation include a thickness of fill material (consisting of crushed stone and brown silty sand) followed by native glacial till. The fill material was not observed to contain any deleterious material and no visual or olfactory evidence of contamination was noted in the fill material.

Refusal to augering was encountered in Borehole 8 at 7.01 m below the surface. Refusal was not encountered in the remaining two boreholes (BH7 and BH9).

All groundwater monitoring wells were installed in overburden. Site stratigraphy is shown on Drawing PE2830-5 - Cross-Section A-A'.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured during the groundwater sampling events on September 20, 2013, using an electronic water level meter.

Groundwater levels are summarized below in Table 4. All measurements are relative to the site temporary benchmark.

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
BH7	104.24	7.45	96.79	September 20, 2013
BH8	103.64	5.20	98.44	September 20, 2013
BH9	103.36	5.34	98.02	September 20, 2013

Based on the groundwater elevations from the September 2013 monitoring event, groundwater contour mapping was completed for the subject property. Groundwater contours are shown on Drawing PE2830-4 – Test Hole Location and Groundwater Contour Plan. Based on the contour mapping, groundwater flow at the subject site appears to be in a northerly direction. A horizontal hydraulic gradient of approximately 0.125 m/m was calculated. No free product, sheen or odour was observed in the monitoring wells sampled at the subject site. The water was observed to be clear and generally free of sediment.

5.3 Coarse Soil Texture

Based on field soil observations, coarse-grained soil standards are 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 ppm to 0.5 ppm. 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 indicates that there is low potential for significant VOC or PHC contamination in site soils, although higher-fraction hydrocarbons may not be as readily detectable by combustible gas or PID detectors.

5.5 Soil Quality

Three (3) soil samples were submitted for analysis of VOC or 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 Sampling Program
BTEX/PHCs

Parameter	MDL (µg/g)	Soil Samples (µg/g)			Table 3 Residential Coarse
		September 16, 2013			
		BH7-SS8	BH8-SS10	BH9-SS8	
Benzene	0.02	nd	nd	nd	0.21
Ethylbenzene	0.05	nd	nd	nd	2
Toluene	0.05	nd	nd	nd	2.3
Xylenes	0.05	nd	nd	nd	3.1
PHC F1	7	nd	nd	nd	55
PHC F2	4	nd	nd	nd	98
PHC F3	8	nd	nd	nd	300
PHC F4	6	nd	nd	nd	2800

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

No analytical test parameters were identified in any of the soil samples. The test results are in compliance with the selected MOECC Table 3 standards. Furthermore, the analytical test results comply with MOECC Table 2 standards, which apply to a similar style of property with the exception of potable ground water use.

Table 6:
Analytical Test Results – Soil Sampling Program
VOCs

Parameter	MDL (µg/g)	Soil Samples (µg/g)		Table 3 Residential Coarse
		September 16, 2013		
		BH8-SS10	BH9-SS8	
Acetone	0.5	nd	nd	16
Benzene	0.02	nd	nd	0.21
Bromodichloromethane	0.05	nd	nd	13
Bromoform	0.05	nd	nd	0.27
Bromomethane	0.05	nd	nd	0.05
Carbon Tetrachloride	0.05	nd	nd	0.05
Chlorobenzene	0.05	nd	nd	2.4
Chloroethane	0.05	nd	nd	nv
Chloroform	0.05	nd	nd	0.05
Chloromethane	0.2	nd	nd	nv

Table 6: (continued)
Analytical Test Results – Soil Sampling Program
VOCs

Parameter	MDL (µg/g)	Soil Samples (µg/g) September 16, 2013		Table 3 Residential Coarse
		BH8-SS10	BH9-SS8	
Dibromochloromethane	0.05	nd	nd	9.4
Dichlorodifluoromethane	0.05	nd	nd	16
1,2-DibroMOECCthane	0.05	nd	nd	nv
1,2-Dichlorobenzene	0.05	nd	nd	3.4
1,3-Dichlorobenzene	0.05	nd	nd	4.8
1,4-Dichlorobenzene	0.05	nd	nd	0.083
1,1-Dichloroethane	0.05	nd	nd	3.5
1,2-Dichloroethane	0.05	nd	nd	0.05
1,1-Dichloroethylene	0.05	nd	nd	0.05
Cis-1,2-Dichloroethylene	0.05	nd	nd	3.4
Trans-1,2-Dichloroethylene	0.05	nd	nd	0.084
1,2-Dichloropropane	0.05	nd	nd	0.05
Cis-1,3-Dichloropropylene	0.05	nd	nd	nv
Trans-1,3-Dichloropropylene	0.05	nd	nd	nv
1,3-Dichloropropene, total	0.05	nd	nd	0.05
Ethylbenzene	0.05	nd	nd	2
Hexane	0.05	nd	nd	2.8
Methyl Ethyl Ketone	0.5	nd	nd	16
Methyl Butyl Ketone	2.0	nd	nd	1.7
Methyl tert-butyl ether	0.05	nd	nd	0.75
Methylene Chloride	0.05	nd	nd	0.1
Styrene	0.05	nd	nd	0.7
1,1,1,2-Tetrachloroethane	0.05	nd	nd	0.058
1,1,2,2-Tetrachloroethane	0.05	nd	nd	0.05
Tetrachloroethylene	0.05	nd	nd	0.28
Toluene	0.05	nd	nd	2.3
1,2,4-Trichlorobenzene	0.05	nd	nd	0.36
1,1,1-Trichloroethane	0.05	nd	nd	0.38
1,1,2-Trichloroethane	0.05	nd	nd	0.05
Trichloroethylene	0.05	nd	nd	0.061
Trichlorofluoromethane	0.05	nd	nd	4
1,3,5-Trimethylbenzene	0.05	nd	nd	nv
Vinyl Chloride	0.02	nd	nd	0.02
Xylenes, total	0.05	nd	nd	3.1

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- nv – no published standard
- **Bold** – Value exceeds MOECC Table 3 standards

No analytical parameters were detected in any of the samples. All results are in compliance with the MOECC Table 3 standards. Furthermore, the analytical test results comply with MOECC Table 2 standards, which apply to a similar style of property with the exception of potable ground water use.

Based on the analytical results, no contaminants were identified as being by-products of chemical or biological transformations which have or may have occurred.

5.6 Groundwater Quality

Groundwater samples from each monitoring well were submitted for laboratory analysis of PHCs and VOCs or BTEX. The groundwater samples were obtained from the screened intervals noted on Table 1. The results of the analytical testing are presented below in Tables 7 and 8. The laboratory certificates of analysis are provided in Appendix 1.

Table 7:
Analytical Test Results – Groundwater
VOCs

Parameter	MDL (µg/L)	Groundwater Sample (µg/L) September 20, 2013		Table 3 Residential Coarse
		BH8-GW1	BH9-GW1	
Acetone	5.0	nd	nd	130000
Benzene	0.5	nd	nd	44
Bromodichloromethane	0.5	nd	nd	85000
Bromoform	0.5	nd	nd	380
Bromomethane	0.5	nd	nd	5.6
Carbon Tetrachloride	0.2	nd	nd	0.79
Chlorobenzene	0.5	nd	nd	630
Chloroethane	1.0	nd	nd	n/v
Chloroform	0.5	nd	nd	2.4
Dibromochloromethane	0.5	nd	nd	82000
Dichlorodifluoromethane	1.0	nd	nd	4400
1,2-DibroMOECCthane	0.2	nd	nd	0.25
1,2-Dichlorobenzene	0.5	nd	nd	4600
1,3-Dichlorobenzene	0.5	nd	nd	9600
1,4-Dichlorobenzene	0.5	nd	nd	8
1,1-Dichloroethane	0.5	nd	nd	320
1,2-Dichloroethane	0.5	nd	nd	1.6
1,1-Dichloroethylene	0.5	nd	nd	1.6
cis-1,2-Dichloroethylene	0.5	nd	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	1.6
1,2-Dichloropropane	0.5	nd	nd	16
1,3-Dichloropropene	0.5	nd	nd	5.2
Ethylbenzene	0.5	nd	nd	2300
Hexane	1.0	nd	nd	51
Methyl Ethyl Ketone	5.0	nd	nd	470000
Methyl Butyl Ketone	10.0	nd	nd	n/v
Methyl Isobutyl Ketone	5.0	nd	nd	140000
Methyl tert-butyl Ether	2.0	nd	nd	190
Methylene Chloride	5.0	nd	nd	610

Table 7 (continued):
Analytical Test Results – Groundwater
VOCs

Parameter	MDL (µg/L)	Groundwater Sample (µg/L) September 20, 2013		Table 3 Residential Coarse
		BH8-GW1	BH9-GW1	
Styrene	0.5	nd	nd	1300
1,1,1,2-Tetrachloroethane	0.5	nd	nd	3.3
1,1,2,2-Tetrachloroethane	0.5	nd	nd	3.2
Tetrachloroethylene	0.5	nd	nd	1.6
Toluene	0.5	nd	nd	18000
1,2,4-Trichlorobenzene	0.5	nd	nd	180
1,1,1-Trichloroethane	0.5	nd	nd	640
1,1,2-Trichloroethane	0.5	nd	nd	4.7
Trichloroethylene	0.5	nd	nd	1.6
Trichlorofluoromethane	1.0	nd	nd	2500
1,3,5-Trimethylbenzene	0.5	nd	nd	n/v
Vinyl Chloride	0.5	nd	nd	0.5
Xylenes	0.5	nd	nd	4200

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

Table 8:
Analytical Test Results – Groundwater
PHCs and BTEX

Parameter	MDL (µg/L)	Groundwater Samples (µg/L) September 20, 2013			Table 3 Residential Coarse
		BH7-GW1	BH8-GW1	BH9-GW1	
PHCs F1	25	nd	nd	nd	750
PHCs F2	100	nd	nd	nd	150
PHCs F3	100	nd	nd	nd	500
PHCs F4	100	nd	nd	nd	500
Benzene	0.5	nd	nd	nd	44
Ethylbenzene	0.5	nd	nd	nd	2300
Toluene	0.5	nd	nd	nd	18000
Xylenes	0.5	nd	nd	nd	4200

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

Based on analytical test results, no VOC, PHC or BTEX parameters were detected in the groundwater samples. All parameters comply with MOECC Table 3 standards. Furthermore, the analytical test results comply with MOECC Table 2 standards, which apply to a similar style of property with the exception of potable ground water use.

It is our interpretation that the analyzed parameter concentrations do not indicate the potential presence of light non-aqueous phase liquids (LNAPLs) or dense non-aqueous phase liquids (DNAPLs). No free phase hydrocarbons were noted in the wells sampled at the time of sampling.

5.7 Quality Assurance and Quality Control Results

Duplicate samples were not collected for this field program.

5.8 Phase II Conceptual Site Model

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

Site Description

Potentially Contaminating Activity and Areas of Potential Environmental Concern

Potentially Contaminating Activities and Areas of Potential Environmental Concern identified include the historical use of the subject site as an automobile service garage as well as the former presence of two (2) underground storage tanks.

BTEX, VOCs and PHCs in soil and groundwater are identified as the Contaminants of Concern with respect to the subject site potentially resulting from these APECs.

Subsurface Structures and Utilities

Underground service locates were completed prior to the subsurface investigation. Underground services exist along McGarry Terrace, to the north of the site, and Marketplace Avenue, to the south of the site. Underground services on the subject site itself are limited to the southwest corner of the west garage (natural gas) and a small area near the northwest corner of the property (Bell). These buried services are not considered to be pathways for contaminant transport considering their very limited depths below grade.

The groundwater table at the subject site was encountered below anticipated service trench depth.

Physical Setting

Site Stratigraphy

The site stratigraphy, from ground surface to the deepest aquifer or aquitard investigated, is illustrated on Drawing PE2830-5 - Cross-Section A-A'. Stratigraphy consists of:

- Fill, consisting of grey crushed stone over brown silty sand and gravel, varying in thickness from 0.69 to 1.45 m. Groundwater was not observed in this stratigraphic unit.
- Below the fill, a thickness of glacial till consisting of dense brown silty sand with gravel, cobbles and boulders, was encountered to a depth of 8.23 meters. Groundwater was encountered in this stratigraphic unit.

Hydrogeological Characteristics

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

Water levels were measured at the subject site in September 20, 2013. Water levels are summarized above in Section 6.2 of this report and are shown on Drawing PE2830-4 and PE2830-5.

Based on the groundwater elevations from the September 2013 monitoring event, groundwater contour mapping was completed and the horizontal hydraulic gradient for the subject site was calculated. Groundwater flow at the subject site was in a northwesterly direction. A hydraulic gradient of approximately 0.125 m/m was calculated.

Approximate Depth to Bedrock

No refusal to augering was encountered in any of the boreholes.

Approximate Depth to Water Table

Depth to water table at the subject site varies between approximately 5.2 and 7.45 m below existing grade.

Sections 41 and 43.1 of the Regulation

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

Section 43.1 of the Regulation does not apply to the subject site in that the subject site is not a Shallow Soil Property nor is it within 30 m of a water body.

Fill Placement

Fill material was identified at the subject site. This fill material did not exhibit any visual or olfactory evidence of contamination.

Proposed Buildings and Other Structures

It is our understanding that the property will be redeveloped with a residential apartment building with underground parking.

Existing Buildings and Structures

The subject site is currently occupied by a residential dwelling and two (2) garages used for storage. One of these garages was formerly used as an automotive service garage.

Water Bodies

No water bodies are present within the study area.

Areas of Natural Significance

There are no areas of natural significance within the Phase I study area.

Environmental Condition

Areas Where Contaminants are Present

Based on screening and analytical results, there are no areas on the subject site where contaminants are present.

Contaminated Media

Based on the results of the Phase II ESA, there are no contaminants of concern present in either the soil or groundwater at the subject site. Analytical testing indicates that the subject site soil and groundwater meet the selected MOECC standards.

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.

Concentrations of CoCs in soil were in compliance with the selected MOECC Table 3 standards, and as such, leaching is not considered to affect contaminant transport at the subject site.

Potential for Vapour Intrusion

Based on test results, no VOCs were detected in the soil, and as a result, vapour intrusion is considered to be negligible, or non-existent.

6.0 CONCLUSIONS

Assessment

A Phase II ESA was conducted for the property at 1034 McGarry Terrace and 1117 Longfields Drive, Ottawa, Ontario. The purpose of the Phase II ESA was to address the areas of potential environmental concern identified during the Phase I ESA, in particular the historical use of the property as an automobile service garage, and the former presence of underground storage tanks on the property. The subsurface investigation at the subject site consisted of the drilling of three (3) boreholes and the installation of three (3) groundwater monitoring wells.

Soil samples were obtained from the boreholes and screened using visual observations and organic vapour measurements. Three (3) soil samples were submitted for laboratory analysis of BTEX or VOCs and PHCs. No detectable concentrations of any of the parameters were identified above the laboratory method detection limits. All soil samples were in compliance with the selected MOECC Table 3 standards.

Groundwater samples were obtained from the monitoring wells and analyzed for BTEX or VOCs and PHCs. No detectable concentrations of any of the parameters were identified above the laboratory method detection limits. All groundwater samples were in compliance with the MOECC Table 3 standards.

Conclusion

Soil and Groundwater

Although a site remediation previously conducted at the location of the former automotive service garage, due to the age of the results, and the dated standards, a Phase II-ESA was conducted on the subject property. Based on the results of this Phase II-ESA, the subject site is considered to have been effectively remediated. No further investigation is recommended at this time.

Monitoring Wells

Prior to the development of the subject property, the monitoring wells installed in BH7, BH8 and BH9 should be abandoned according to Ontario Regulation 903. The monitoring wells will be registered with the MOECC under this regulation. Further information can be provided upon request in this regard.

7.0 STATEMENT OF LIMITATIONS

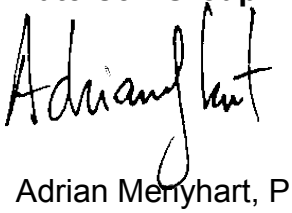
This Phase II - Environmental Site Assessment Update report has been prepared in general accordance with the agreed scope-of-work, in compliance with O.Reg. 153/04 as amended by O.Reg. 269/11, and meets the requirements of CSA Z769-00. The conclusions presented herein are based on information gathered 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 1897365 Ontario Inc. Permission and notification from 1897365 Ontario Inc. and Paterson will be required to release this report to any other party.

Paterson Group Inc.



Adrian Menyhart, P.Eng.

Mark S. D'Arcy, P.Eng.

Report Distribution:

- 1897365 Ontario Inc. (6 copies)
- Paterson Group (1 copy)

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE2830-4 – TEST HOLE LOCATION AND GROUNDWATER CONTOUR PLAN

DRAWING PE2830-5 - CROSS-SECTION A-A’

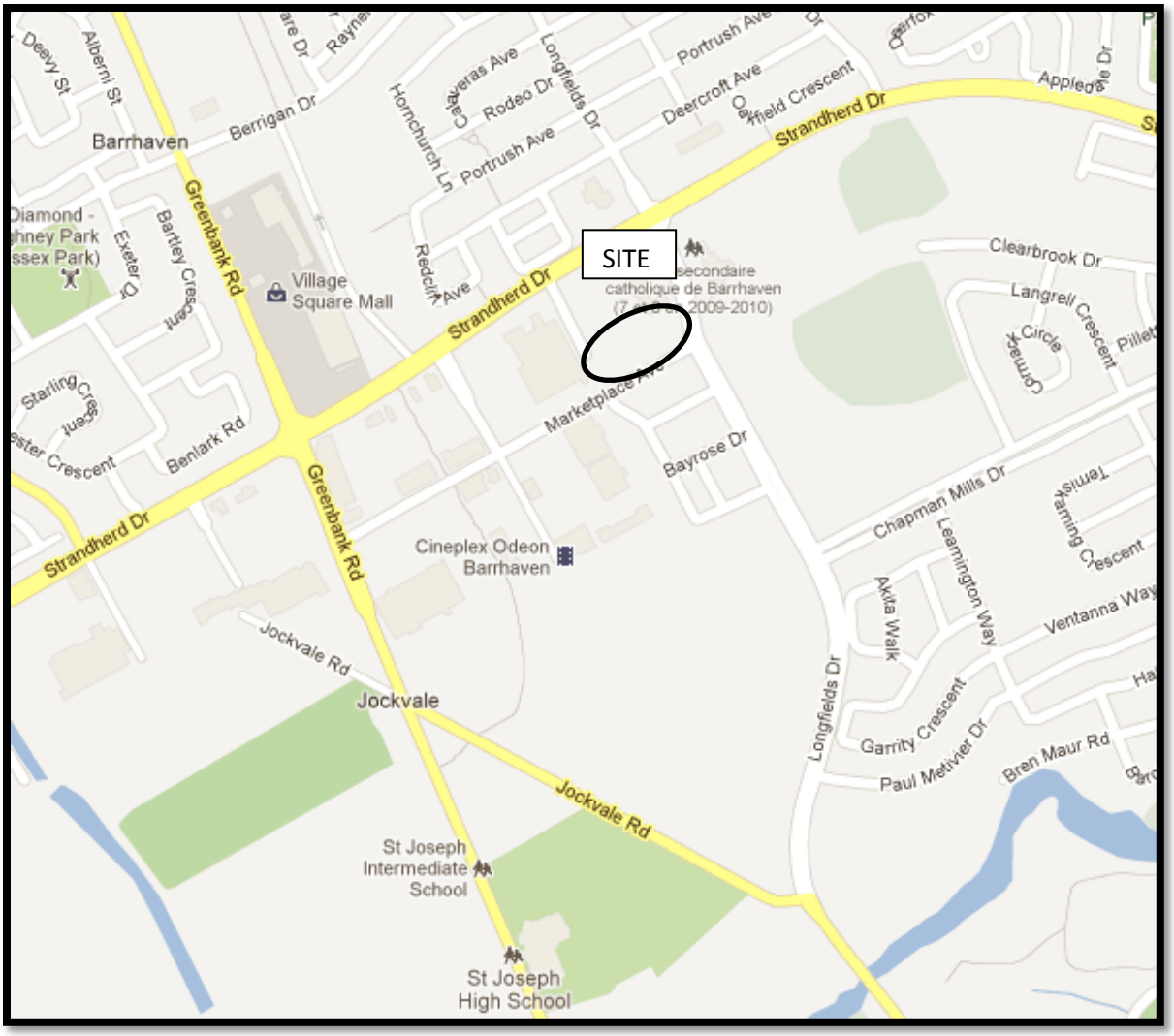
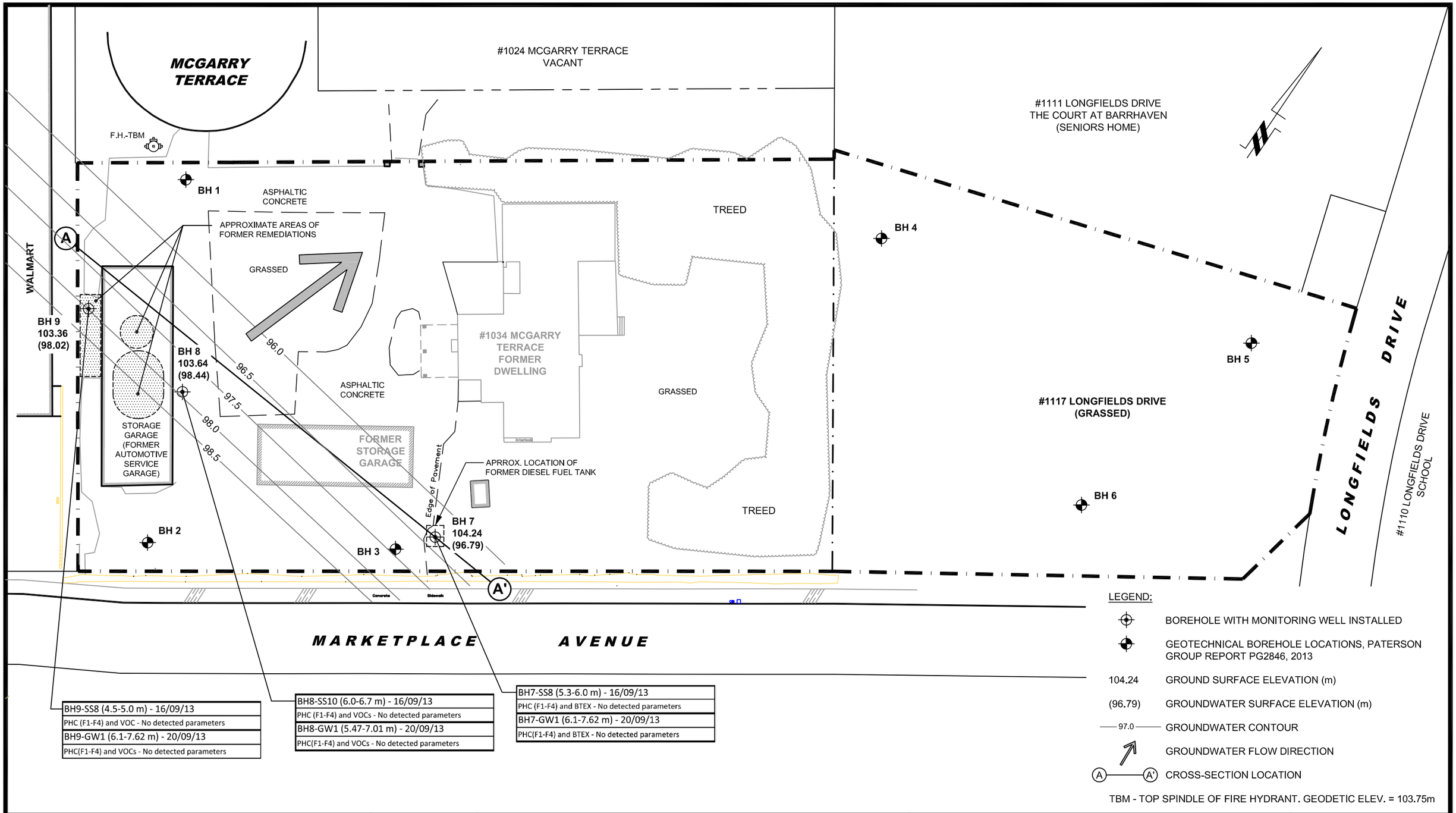


FIGURE 1

KEYPLAN



paterson group
consulting engineers
154 Colonnade Road South, Ottawa, Ontario K2E 7J5

Scale:	1:500
Des.:	AM
Dwn:	MPG
Chkd:	MSD

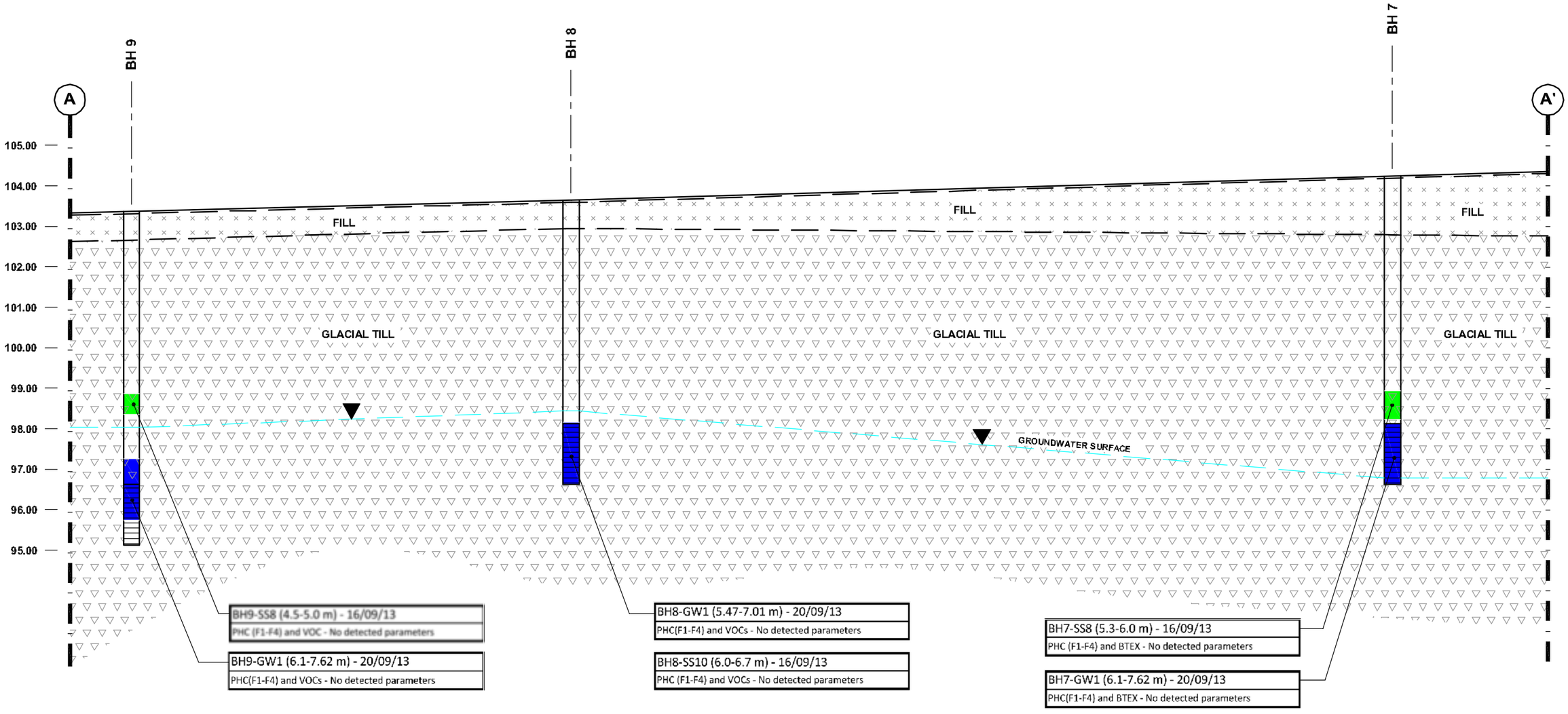
TEGA DEVELOPMENTS

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1034 McGARRY TERRACE & 1117 LONGFIELDS DR.
OTTAWA, ONTARIO

TEST HOLE LOCATION AND GROUNDWATER CONTOUR PLAN

Dwg. No. PE2830-4
Report No.: PE2830-3
Date: 09/2013

11x17



paterson group
consulting engineers
154 Colonnade Road South, Ottawa, Ontario K2E 7J5

Scale:	1:200H; 1:100V
Des.:	AM
Dwn:	MPG
Chkd:	MSD

TEGA DEVELOPMENTS

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1034 McGARRY TERRACE & 1117 LONGFIELDS DRIVE
OTTAWA, ONTARIO

CROSS-SECTION A-A'

Dwg. No. **PE2830-5**
Report No.: PE2830-3
Date: 09/2013

11x17

APPENDIX 1

SAMPLING AND ANALYSIS PLAN

SOIL PROFILE AND TEST DATA SHEETS

LABORATORY CERTIFICATES OF ANALYSIS

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Services

Paterson Group Inc.

Consulting Engineers
154 Colonnade Road South
Ottawa (Nepean), Ontario
Canada K2E 7J5

Tel: (613) 226-7381
Fax: (613) 226-6344
www.patersongroup.ca

patersongroup

Sampling and Analysis Plan

Phase II Environmental Site Assessment
1034 McGarry Terrace and 1117 Longfields Drive
Ottawa, Ontario

Prepared For

Tega Developments

September 2013

Report: PE2830-SAP

Table of Contents

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Tega Developments to conduct a Phase II Environmental Site Assessment (ESA) for the property located at 1034 McGarry Terrace and 1117 Longfields Drive, Ottawa, Ontario. Based on the results of a Phase I ESA completed by Paterson for the subject property, the following subsurface investigation program was developed:

Borehole	Location & Rationale	Proposed Depth & Rationale
BH7	Located to address former underground diesel fuel tank.	Drilled to intercept water table.
BH8	Located to address former automotive service garage.	Drilled to intercept water table.
BH9	Located to address former automotive service garage and underground waste oil tank.	Drilled to intercept water table.

Borehole 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 well into the native material. All soil samples will be retained, and samples will be selected for submission following a preliminary screening analysis. Boreholes BH7, BH8 and BH9 will be instrumented with monitoring wells 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:

- A sample from select boreholes 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
- 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.

- If two or more stratigraphic units are present within a 1.2 m sampling run, these units should be measured, segregated, and retained in separate bags.
- If a single stratigraphic unit is present within a 1.2 m sampling run, the sampling run should be split into two 0.6 m sections and retained in separate bags to provide more accurate vertical resolution when delineating potential contamination.
- 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.
- 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 (split 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 top
- Rinse in clean water
- Apply a small amount of methyl hydrate to the inside of the spoon (a sprey 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 VOC contamination.

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

- 1.5 m x 5 cm threaded sections of Schedule 40 PVC slotted well screen (1.5 m x 3 cm if installing in cored hole in bedrock or using direct-push rig)
- 1.5 m x 5 cm threaded sections of Schedule 40 PVC riser pipe (1.5 m x 3 cm if installing in cored hole in bedrock or using direct-push rig)
- 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 or casing, 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 I - II Environmental Site Assessment
Prop. Multi-Storey Buildings - 1034 McGarry Terrace
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant. Geodetic elevation = 103.75m.

FILE NO. PE2830

REMARKS

HOLE NO. BH 7

BORINGS BY CME 55 Power Auger **DATE** September 16, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	104.24
TOPSOIL 0.08		AU	1				
FILL: Brown silty sand with gravel, cobbles		SS	2	50	10	1	103.24
1.45		SS	3	83	8	2	102.24
		SS	4	88	50+		
		SS	5	71	50+	3	101.24
GLACIAL TILL: Dense to very dense, brown silty sand with gravel, cobbles and boulders		SS	6	100	76	4	100.24
		SS	7	83	43	5	99.24
		SS	8	83	39		
		SS	9	71	43	6	98.24
		SS	10		56	7	97.24
7.62							
End of Borehole							
(GWL @ 7.45m-Sept. 20, 2013)							

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 I - II Environmental Site Assessment
Prop. Multi-Storey Buildings - 1034 McGarry Terrace
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant. Geodetic elevation = 103.75m.

FILE NO. PE2830

REMARKS

HOLE NO. BH 8

BORINGS BY CME 55 Power Auger **DATE** September 16, 2013

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE								
Asphaltic concrete	0.05		AU	1				
FILL: Crushed stone	0.28		AU	2				
FILL: Brown silty sand	0.69		SS	3	33	7	1	102.64
			SS	4	75	49	2	101.64
			SS	5	100	72	3	100.64
			SS	6	83	36		
GLACIAL TILL: Very dense to dense, brown silty sand with gravel, cobbles and boulders			SS	7	100	35	4	99.64
			SS	8	100	28	5	98.64
			SS	9	83	24	6	97.64
			SS	10		24		
	7.01		SS	11		50+	7	96.64
End of Borehole								
Practical refusal to augering at 7.01m depth								
(GWL @ 5.20m-Sept. 20, 2013)								

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase I - II Environmental Site Assessment
Prop. Multi-Storey Buildings - 1034 McGarry Terrace
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant. Geodetic elevation = 103.75m.

FILE NO. PE2830

REMARKS

HOLE NO. BH 9

BORINGS BY CME 55 Power Auger **DATE** September 16, 2013

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE								
Asphaltic concrete	0.05		AU	1				
FILL: Crushed stone	0.25		AU	2				
FILL: Brown silty sand with gravel	0.69		SS	3	50	28	1	102.36
			SS	4	59	50+	2	101.36
			SS	5	86	50+	3	100.36
			SS	6	71	50+	4	99.36
GLACIAL TILL: Very dense, brown silty sand with gravel, cobbles and boulders			SS	7	65	50+	5	98.36
			SS	8	71	50+	6	97.36
			SS	9	100	50+	7	96.36
			SS	10	0	50+	8	95.36
			SS	11	0	68		
End of Borehole	8.23							
(GWL @ 5.34m-Sept. 20, 2013)								

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

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

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

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

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

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

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

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

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

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

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

CONSOLIDATION TEST

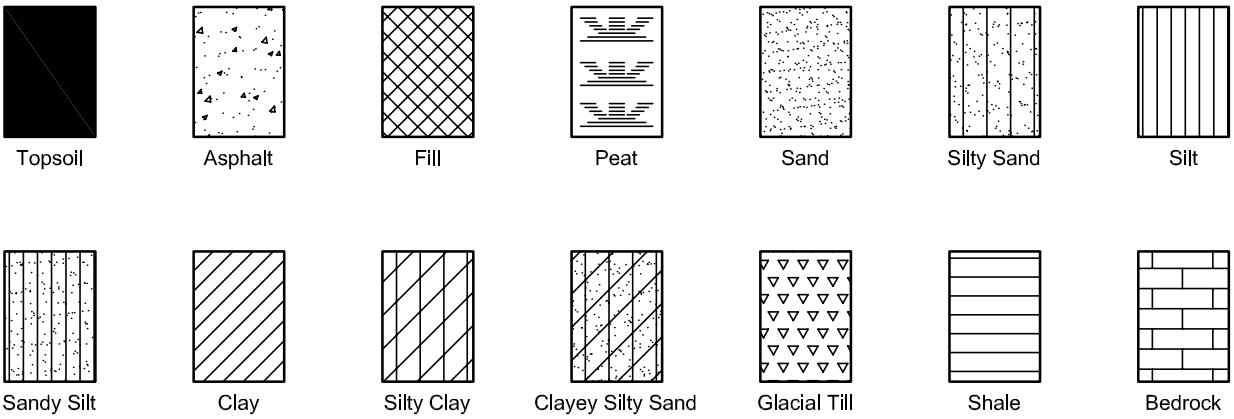
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

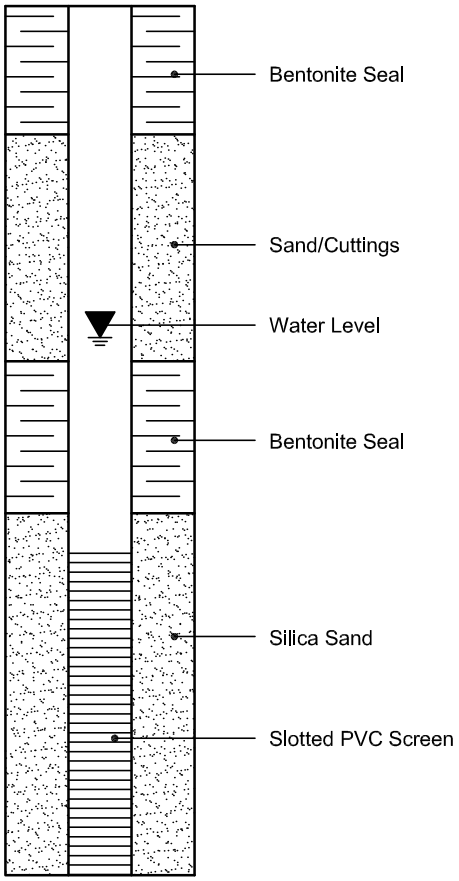
SYMBOLS AND TERMS (continued)

STRATA PLOT

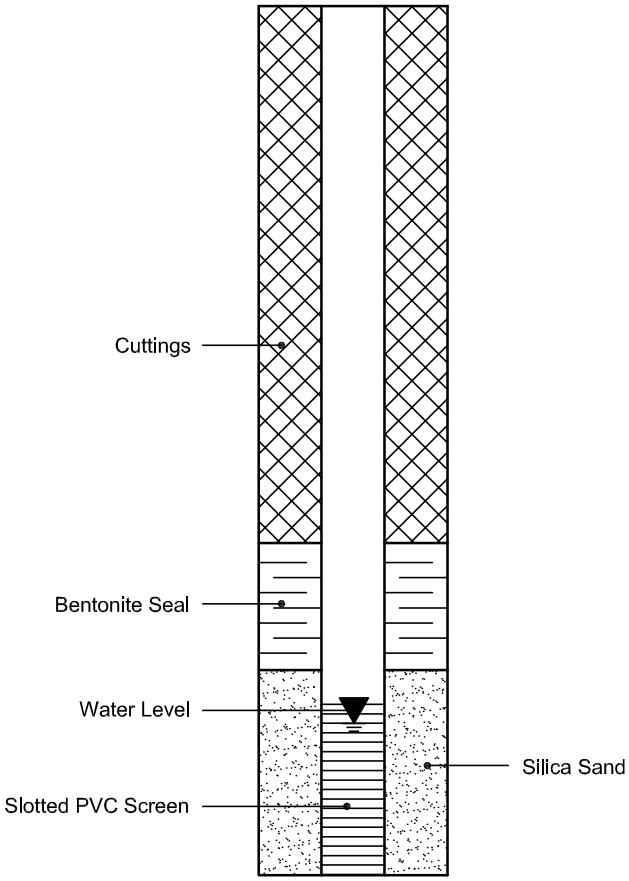


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



PARACEL LABORATORIES LTD. | TRUSTED. RESPONSIVE. RELIABLE.

OTTAWA • KINGSTON • NIAGARA • MISSISSAUGA • SARNIA

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

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: 15046
Project: PE2830
Custody: 97970

Report Date: 23-Sep-2013
Order Date: 17-Sep-2013
Order #: 1338134

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

Paracel ID	Client ID
1338134-01	BH7-SS8
1338134-02	BH8-SS10
1338134-03	BH9-SS8

Approved By:

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

Certificate of Analysis

Report Date: 23-Sep-2013
Order Date:17-Sep-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 15046 Project Description: PE2830

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	20-Sep-13	23-Sep-13
PHC F1	CWS Tier 1 - P&T GC-FID	20-Sep-13	23-Sep-13
PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	19-Sep-13	21-Sep-13
Solids, %	Gravimetric, calculation	19-Sep-13	19-Sep-13
VOCs by P&T GC-MS	EPA 8260 - P&T GC-MS	20-Sep-13	23-Sep-13

Certificate of Analysis

Report Date: 23-Sep-2013
Order Date:17-Sep-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 15046

Project Description: PE2830

	Client ID:	BH7-SS8	BH8-SS10	BH9-SS8	-
	Sample Date:	16-Sep-13	16-Sep-13	16-Sep-13	-
	Sample ID:	1338134-01	1338134-02	1338134-03	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	93.2	91.4	91.1	-
Volatiles					
Acetone	0.50 ug/g dry	-	<0.50	<0.50	-
Benzene	0.02 ug/g dry	-	<0.02	<0.02	-
Bromodichloromethane	0.05 ug/g dry	-	<0.05	<0.05	-
Bromoform	0.05 ug/g dry	-	<0.05	<0.05	-
Bromomethane	0.05 ug/g dry	-	<0.05	<0.05	-
Carbon Tetrachloride	0.05 ug/g dry	-	<0.05	<0.05	-
Chlorobenzene	0.05 ug/g dry	-	<0.05	<0.05	-
Chloroethane	0.05 ug/g dry	-	<0.05	<0.05	-
Chloroform	0.05 ug/g dry	-	<0.05	<0.05	-
Chloromethane	0.20 ug/g dry	-	<0.20	<0.20	-
Dibromochloromethane	0.05 ug/g dry	-	<0.05	<0.05	-
Dichlorodifluoromethane	0.05 ug/g dry	-	<0.05	<0.05	-
1,2-Dibromoethane	0.05 ug/g dry	-	<0.05	<0.05	-
1,2-Dichlorobenzene	0.05 ug/g dry	-	<0.05	<0.05	-
1,3-Dichlorobenzene	0.05 ug/g dry	-	<0.05	<0.05	-
1,4-Dichlorobenzene	0.05 ug/g dry	-	<0.05	<0.05	-
1,1-Dichloroethane	0.05 ug/g dry	-	<0.05	<0.05	-
1,2-Dichloroethane	0.05 ug/g dry	-	<0.05	<0.05	-
1,1-Dichloroethylene	0.05 ug/g dry	-	<0.05	<0.05	-
cis-1,2-Dichloroethylene	0.05 ug/g dry	-	<0.05	<0.05	-
trans-1,2-Dichloroethylene	0.05 ug/g dry	-	<0.05	<0.05	-
1,2-Dichloroethylene, total	0.05 ug/g dry	-	<0.05	<0.05	-
1,2-Dichloropropane	0.05 ug/g dry	-	<0.05	<0.05	-
cis-1,3-Dichloropropylene	0.05 ug/g dry	-	<0.05	<0.05	-
trans-1,3-Dichloropropylene	0.05 ug/g dry	-	<0.05	<0.05	-
1,3-Dichloropropene, total	0.05 ug/g dry	-	<0.05	<0.05	-
Ethylbenzene	0.05 ug/g dry	-	<0.05	<0.05	-
Hexane	0.05 ug/g dry	-	<0.05	<0.05	-
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	-	<0.50	<0.50	-
Methyl Butyl Ketone (2-Hexanone)	2.00 ug/g dry	-	<2.00	<2.00	-
Methyl Isobutyl Ketone	0.50 ug/g dry	-	<0.50	<0.50	-

Certificate of Analysis

Report Date: 23-Sep-2013
Order Date:17-Sep-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 15046

Project Description: PE2830

	Client ID:	BH7-SS8	BH8-SS10	BH9-SS8	-
	Sample Date:	16-Sep-13	16-Sep-13	16-Sep-13	-
	Sample ID:	1338134-01	1338134-02	1338134-03	-
	MDL/Units	Soil	Soil	Soil	-
Methyl tert-butyl ether	0.05 ug/g dry	-	<0.05	<0.05	-
Methylene Chloride	0.05 ug/g dry	-	<0.05	<0.05	-
Styrene	0.05 ug/g dry	-	<0.05	<0.05	-
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	-	<0.05	<0.05	-
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	-	<0.05	<0.05	-
Tetrachloroethylene	0.05 ug/g dry	-	<0.05	<0.05	-
Toluene	0.05 ug/g dry	-	<0.05	<0.05	-
1,2,4-Trichlorobenzene	0.05 ug/g dry	-	<0.05	<0.05	-
1,1,1-Trichloroethane	0.05 ug/g dry	-	<0.05	<0.05	-
1,1,2-Trichloroethane	0.05 ug/g dry	-	<0.05	<0.05	-
Trichloroethylene	0.05 ug/g dry	-	<0.05	<0.05	-
Trichlorofluoromethane	0.05 ug/g dry	-	<0.05	<0.05	-
1,3,5-Trimethylbenzene	0.05 ug/g dry	-	<0.05	<0.05	-
Vinyl chloride	0.02 ug/g dry	-	<0.02	<0.02	-
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	-
4-Bromofluorobenzene	Surrogate	-	123%	121%	-
Dibromofluoromethane	Surrogate	-	95.5%	95.1%	-
Toluene-d8	Surrogate	-	104%	105%	-
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	106%	-	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	-
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	<8	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	-

Certificate of Analysis

Report Date: 23-Sep-2013
Order Date:17-Sep-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 15046 Project Description: PE2830

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						
Chloroethane	ND	0.05	ug/g						
Chloroform	ND	0.05	ug/g						
Chloromethane	ND	0.20	ug/g						
Dibromochloromethane	ND	0.05	ug/g						
Dichlorodifluoromethane	ND	0.05	ug/g						
1,2-Dibromoethane	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-Dichloroethylene, total	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						
Hexane	ND	0.05	ug/g						
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g						
Methyl Butyl Ketone (2-Hexanone)	ND	2.00	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						
1,2,4-Trichlorobenzene	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						
1,3,5-Trimethylbenzene	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	*7.58*		*ug/g*		*94.7*	*50-140*			
Surrogate: Dibromofluoromethane	*8.78*		*ug/g*		*110*	*50-140*			
Surrogate: Toluene-d8	*7.97*		*ug/g*		*99.6*	*50-140*			

Certificate of Analysis

Report Date: 23-Sep-2013
Order Date:17-Sep-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 15046 Project Description: PE2830

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*7.97*		*ug/g*		*99.6*	*50-140*			

Certificate of Analysis

Report Date: 23-Sep-2013
Order Date:17-Sep-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 15046 Project Description: PE2830

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	83.7	0.1	% by Wt.	80.3			4.2	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	
Chloroethane	ND	0.05	ug/g dry	ND				50	
Chloroform	ND	0.05	ug/g dry	ND				50	
Chloromethane	ND	0.20	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-Dibromoethane	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	
Hexane	ND	0.05	ug/g dry	ND				50	
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g dry	ND				50	
Methyl Butyl Ketone (2-Hexanone)	ND	2.00	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	ND	0.05	ug/g dry	ND				50	
1,2,4-Trichlorobenzene	ND	0.05	ug/g dry	ND				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	
1,3,5-Trimethylbenzene	ND	0.05	ug/g dry	ND				50	
Vinyl chloride	ND	0.02	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: 4-Bromofluorobenzene	*6.93*		*ug/g dry*	*ND*	*94.1*	*50-140*			
Surrogate: Dibromofluoromethane	*7.29*		*ug/g dry*	*ND*	*98.9*	*50-140*			

Certificate of Analysis

Report Date: 23-Sep-2013
Order Date:17-Sep-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 15046 Project Description: PE2830

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Surrogate: Toluene-d8	*7.57*		*ug/g dry*	*ND*	*103*	*50-140*			
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	*7.57*		*ug/g dry*	*ND*	*103*	*50-140*			

Certificate of Analysis

Report Date: 23-Sep-2013
Order Date:17-Sep-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 15046 Project Description: PE2830

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	204	7	ug/g	ND	102	80-120			
F2 PHCs (C10-C16)	104	4	ug/g	ND	93.3	60-140			
F3 PHCs (C16-C34)	225	8	ug/g	ND	97.8	60-140			
F4 PHCs (C34-C50)	126	6	ug/g	ND	82.3	60-140			
Volatiles									
Acetone	6.54	0.50	ug/g	ND	65.4	50-140			
Benzene	3.92	0.02	ug/g	ND	98.1	60-130			
Bromodichloromethane	3.28	0.05	ug/g	ND	82.0	60-130			
Bromoform	3.73	0.05	ug/g	ND	93.4	60-130			
Bromomethane	2.73	0.05	ug/g	ND	68.3	50-140			
Carbon Tetrachloride	3.31	0.05	ug/g	ND	82.8	60-130			
Chlorobenzene	4.19	0.05	ug/g	ND	105	60-130			
Chloroethane	3.81	0.05	ug/g	ND	95.3	50-140			
Chloroform	3.46	0.05	ug/g	ND	86.5	60-130			
Chloromethane	2.63	0.20	ug/g	ND	65.8	50-140			
Dibromochloromethane	4.00	0.05	ug/g	ND	100	60-130			
Dichlorodifluoromethane	2.90	0.05	ug/g	ND	72.6	50-140			
1,2-Dibromoethane	3.87	0.05	ug/g	ND	96.6	60-130			
1,2-Dichlorobenzene	3.77	0.05	ug/g	ND	94.3	60-130			
1,3-Dichlorobenzene	3.88	0.05	ug/g	ND	97.1	60-130			
1,4-Dichlorobenzene	3.93	0.05	ug/g	ND	98.2	60-130			
1,1-Dichloroethane	4.49	0.05	ug/g	ND	112	60-130			
1,2-Dichloroethane	3.40	0.05	ug/g	ND	85.0	60-130			
1,1-Dichloroethylene	3.55	0.05	ug/g	ND	88.7	60-130			
cis-1,2-Dichloroethylene	3.70	0.05	ug/g	ND	92.5	60-130			
trans-1,2-Dichloroethylene	3.71	0.05	ug/g	ND	92.7	60-130			
1,2-Dichloropropane	3.77	0.05	ug/g	ND	94.3	60-130			
cis-1,3-Dichloropropylene	3.12	0.05	ug/g	ND	78.1	60-130			
trans-1,3-Dichloropropylene	2.92	0.05	ug/g	ND	72.9	60-130			
Ethylbenzene	4.26	0.05	ug/g	ND	107	60-130			
Hexane	2.68	0.05	ug/g	ND	67.0	60-130			
Methyl Ethyl Ketone (2-Butanone)	7.30	0.50	ug/g	ND	73.0	50-140			
Methyl Butyl Ketone (2-Hexanone)	9.25	2.00	ug/g	ND	92.5	50-140			
Methyl Isobutyl Ketone	8.91	0.50	ug/g	ND	89.1	50-140			
Methyl tert-butyl ether	9.28	0.05	ug/g	ND	92.8	50-140			
Methylene Chloride	3.11	0.05	ug/g	ND	77.8	60-130			
Styrene	4.52	0.05	ug/g	ND	113	60-130			
1,1,1,2-Tetrachloroethane	4.10	0.05	ug/g	ND	102	60-130			
1,1,2,2-Tetrachloroethane	4.09	0.05	ug/g	ND	102	60-130			
Tetrachloroethylene	3.69	0.05	ug/g	ND	92.1	60-130			
Toluene	4.00	0.05	ug/g	ND	99.9	60-130			
1,2,4-Trichlorobenzene	3.70	0.05	ug/g	ND	92.4	60-130			
1,1,1-Trichloroethane	3.52	0.05	ug/g	ND	87.9	60-130			
1,1,2-Trichloroethane	3.06	0.05	ug/g	ND	76.4	60-130			
Trichloroethylene	3.20	0.05	ug/g	ND	80.0	60-130			
Trichlorofluoromethane	2.56	0.05	ug/g	ND	63.9	50-140			
1,3,5-Trimethylbenzene	4.01	0.05	ug/g	ND	100	60-130			
Vinyl chloride	3.60	0.02	ug/g	ND	90.0	50-140			
m,p-Xylenes	8.47	0.05	ug/g	ND	106	60-130			

Certificate of Analysis

Report Date: 23-Sep-2013
Order Date:17-Sep-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 15046 Project Description: PE2830

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
o-Xylene	3.91	0.05	ug/g	ND	97.7	60-130			
Surrogate: 4-Bromofluorobenzene	*7.44*		*ug/g*		*93.0*	*50-140*			
Benzene	3.92	0.02	ug/g	ND	98.1	60-130			
Ethylbenzene	4.26	0.05	ug/g	ND	107	60-130			
Toluene	4.00	0.05	ug/g	ND	99.9	60-130			
m,p-Xylenes	8.47	0.05	ug/g	ND	106	60-130			
o-Xylene	3.91	0.05	ug/g	ND	97.7	60-130			

Certificate of Analysis

Report Date: 23-Sep-2013
Order Date:17-Sep-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 15046 Project Description: PE2830

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

OTTAWA ◉ KINGSTON ◉ NIAGARA ◉ MISSISSAUGA ◉ SARNIA

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

Chain of Custody
(Lab Use Only)
№ 97970

Page ___ of ___

Client Name: Paterson Group	Project Reference: PE 2630	TAT: [X] Regular	[ ] 3 Day
Contact Name: ERIC LÉVEQUE	Quote #	[ ] 2 Day	[ ] 1 Day
Address: 154 Colonnade	PO # 15046	Date Required:	
Telephone: 613-226-7381	Email Address: elevesque@patersongroup.ca		

Criteria: [X] 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: 1338134

	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	BH7-S5D	S		2	Sept 16/13	NOON	X										- 12 mL + 1 vial			
2	BH9-SS1U	S		2	↓	↓	X	X									↓			
3	BH9-S5D	S		2	↓	↓	X	X												
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Paracel Courier

Relinquished By (Sign):	Received by Driver/Depot: DEPOT	Received at Lab: SUNEEPORN	Verified By: MC
Relinquished By (Print):	Date/Time: 17/09/13 4:27PM	Date/Time: SEP 17, 2013 05:10	Date/Time: Sept 17/13 6:19
Date/Time: SEPT 17 2013	Temperature: ____ °C	Temperature: 16.3 °C	pH Verified [ ] By: N/A

PARACEL LABORATORIES LTD. | TRUSTED. RESPONSIVE. RELIABLE.

OTTAWA • KINGSTON • NIAGARA • MISSISSAUGA • SARNIA

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

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: 15045
Project: PE2830
Custody: 13331

Report Date: 24-Sep-2013
Order Date: 20-Sep-2013
Order #: 1338345

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

Paracel ID	Client ID
1338345-01	BH7-GW1
1338345-02	BH8-GW1
1338345-03	BH9-GW1

Approved By: Mark Foto

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

Certificate of Analysis

Report Date: 24-Sep-2013
Order Date:20-Sep-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 15045 Project Description: PE2830

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	22-Sep-13	23-Sep-13
PHC F1	CWS Tier 1 - P&T GC-FID	22-Sep-13	23-Sep-13
PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	23-Sep-13	24-Sep-13
VOCs by P&T GC-MS	EPA 624 - P&T GC-MS	22-Sep-13	23-Sep-13

Certificate of Analysis

Report Date: 24-Sep-2013
Order Date:20-Sep-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 15045

Project Description: PE2830

	Client ID:	BH7-GW1	BH8-GW1	BH9-GW1	-
	Sample Date:	20-Sep-13	20-Sep-13	20-Sep-13	-
	Sample ID:	1338345-01	1338345-02	1338345-03	-
	MDL/Units	Water	Water	Water	-
Volatiles					
Acetone	5.0 ug/L	-	<5.0	<5.0	-
Benzene	0.5 ug/L	-	<0.5	<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	-
Chloroethane	1.0 ug/L	-	<1.0	<1.0	-
Chloroform	0.5 ug/L	-	<0.5	<0.5	-
Chloromethane	3.0 ug/L	-	<3.0	<3.0	-
Dibromochloromethane	0.5 ug/L	-	<0.5	<0.5	-
Dichlorodifluoromethane	1.0 ug/L	-	<1.0	<1.0	-
1,2-Dibromoethane	0.2 ug/L	-	<0.2	<0.2	-
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	-	<0.5	<0.5	-
trans-1,2-Dichloroethylene	0.5 ug/L	-	<0.5	<0.5	-
1,2-Dichloroethylene, total	0.5 ug/L	-	<0.5	<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	<0.5	-
Hexane	1.0 ug/L	-	<1.0	<1.0	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	-	<5.0	<5.0	-
Methyl Butyl Ketone (2-Hexanone)	10.0 ug/L	-	<10.0	<10.0	-
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	-

Certificate of Analysis

Report Date: 24-Sep-2013
Order Date:20-Sep-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 15045

Project Description: PE2830

	Client ID:	BH7-GW1	BH8-GW1	BH9-GW1	-
	Sample Date:	20-Sep-13	20-Sep-13	20-Sep-13	-
	Sample ID:	1338345-01	1338345-02	1338345-03	-
	MDL/Units	Water	Water	Water	-
Styrene	0.5 ug/L	-	<0.5	<0.5	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	-	<0.5	<0.5	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	-	<0.5	<0.5	-
Tetrachloroethylene	0.5 ug/L	-	<0.5	<0.5	-
Toluene	0.5 ug/L	-	<0.5	<0.5	-
1,2,4-Trichlorobenzene	0.5 ug/L	-	<0.5	<0.5	-
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	-	<0.5	<0.5	-
Trichlorofluoromethane	1.0 ug/L	-	<1.0	<1.0	-
1,3,5-Trimethylbenzene	0.5 ug/L	-	<0.5	<0.5	-
Vinyl chloride	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	-
4-Bromofluorobenzene	Surrogate	-	93.6%	93.4%	-
Dibromofluoromethane	Surrogate	-	123%	125%	-
Toluene-d8	Surrogate	-	84.8%	85.0%	-
Benzene	0.5 ug/L	<0.5	-	-	-
Ethylbenzene	0.5 ug/L	<0.5	-	-	-
Toluene	0.5 ug/L	<0.5	-	-	-
m,p-Xylenes	0.5 ug/L	<0.5	-	-	-
o-Xylene	0.5 ug/L	<0.5	-	-	-
Xylenes, total	0.5 ug/L	<0.5	-	-	-
Toluene-d8	Surrogate	85.7%	-	-	-
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	-	-	-
F1 + F2 PHCs	125 ug/L	-	<125	<125	-
F3 + F4 PHCs	200 ug/L	<200	-	-	-
F3 + F4 PHCs	200 ug/L	-	<200	<200	-

Certificate of Analysis

Report Date: 24-Sep-2013
Order Date:20-Sep-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 15045 Project Description: PE2830

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						
Chloroethane	ND	1.0	ug/L						
Chloroform	ND	0.5	ug/L						
Chloromethane	ND	3.0	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dibromoethane	ND	0.2	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-Dichloroethylene, total	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						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Butyl Ketone (2-Hexanone)	ND	10.0	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						
1,2,4-Trichlorobenzene	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						
1,3,5-Trimethylbenzene	ND	0.5	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	*30.7*		*ug/L*		*95.9*	*50-140*			
Surrogate: Dibromofluoromethane	*39.8*		*ug/L*		*124*	*50-140*			
Surrogate: Toluene-d8	*30.8*		*ug/L*		*96.1*	*50-140*			

Certificate of Analysis

Report Date: 24-Sep-2013
Order Date:20-Sep-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 15045 Project Description: PE2830

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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	*30.8*		*ug/L*		*96.1*	*50-140*			

Certificate of Analysis

Report Date: 24-Sep-2013
Order Date:20-Sep-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 15045 Project Description: PE2830

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	
Chloroethane	ND	1.0	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Chloromethane	ND	3.0	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dibromoethane	ND	0.2	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	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Butyl Ketone (2-Hexanone)	ND	10.0	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	
1,2,4-Trichlorobenzene	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	
1,3,5-Trimethylbenzene	ND	0.5	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	*30.4*		*ug/L*	*ND*	*95.2*	*50-140*			
Surrogate: Dibromofluoromethane	*36.4*		*ug/L*	*ND*	*114*	*50-140*			
Surrogate: Toluene-d8	*28.9*		*ug/L*	*ND*	*90.2*	*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	

Certificate of Analysis

Report Date: 24-Sep-2013
Order Date:20-Sep-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 15045 Project Description: PE2830

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Surrogate: Toluene-d8	*28.9*		*ug/L*	*ND*	*90.2*	*50-140*			

Certificate of Analysis

Report Date: 24-Sep-2013
Order Date:20-Sep-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 15045 Project Description: PE2830

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1900	25	ug/L	ND	94.8	68-117			
F2 PHCs (C10-C16)	1690	100	ug/L	ND	93.9	60-140			
F3 PHCs (C16-C34)	3630	100	ug/L	ND	97.7	60-140			
F4 PHCs (C34-C50)	2240	100	ug/L	ND	90.3	60-140			
Volatiles									
Acetone	56.0	5.0	ug/L	ND	56.0	50-140			
Benzene	28.7	0.5	ug/L	ND	71.8	50-140			
Bromodichloromethane	21.0	0.5	ug/L	ND	52.4	50-140			
Bromoform	25.1	0.5	ug/L	ND	62.8	50-140			
Bromomethane	25.1	0.5	ug/L	ND	62.8	50-140			
Carbon Tetrachloride	23.9	0.2	ug/L	ND	59.7	50-140			
Chlorobenzene	33.4	0.5	ug/L	ND	83.4	50-140			
Chloroethane	22.7	1.0	ug/L	ND	56.8	50-140			
Chloroform	22.9	0.5	ug/L	ND	57.3	50-140			
Chloromethane	28.9	3.0	ug/L	ND	72.2	50-140			
Dibromochloromethane	21.0	0.5	ug/L	ND	52.6	50-140			
Dichlorodifluoromethane	28.7	1.0	ug/L	ND	71.8	50-140			
1,2-Dibromoethane	25.4	0.2	ug/L	ND	63.5	50-140			
1,2-Dichlorobenzene	25.3	0.5	ug/L	ND	63.3	50-140			
1,3-Dichlorobenzene	25.2	0.5	ug/L	ND	63.1	50-140			
1,4-Dichlorobenzene	28.0	0.5	ug/L	ND	70.0	50-140			
1,1-Dichloroethane	21.2	0.5	ug/L	ND	53.0	50-140			
1,2-Dichloroethane	22.6	0.5	ug/L	ND	56.5	50-140			
1,1-Dichloroethylene	27.0	0.5	ug/L	ND	67.4	50-140			
cis-1,2-Dichloroethylene	23.5	0.5	ug/L	ND	58.7	50-140			
trans-1,2-Dichloroethylene	24.2	0.5	ug/L	ND	60.4	50-140			
1,2-Dichloropropane	25.5	0.5	ug/L	ND	63.8	50-140			
cis-1,3-Dichloropropylene	24.1	0.5	ug/L	ND	60.2	50-140			
trans-1,3-Dichloropropylene	21.7	0.5	ug/L	ND	54.3	50-140			
Ethylbenzene	29.9	0.5	ug/L	ND	74.8	50-140			
Hexane	24.4	1.0	ug/L	ND	61.1	50-140			
Methyl Ethyl Ketone (2-Butanone)	63.0	5.0	ug/L	ND	63.0	50-140			
Methyl Butyl Ketone (2-Hexanone)	65.5	10.0	ug/L	ND	65.5	50-140			
Methyl Isobutyl Ketone	74.7	5.0	ug/L	ND	74.7	50-140			
Methyl tert-butyl ether	60.7	2.0	ug/L	ND	60.7	50-140			
Methylene Chloride	24.9	5.0	ug/L	ND	62.2	50-140			
Styrene	31.8	0.5	ug/L	ND	79.5	50-140			
1,1,1,2-Tetrachloroethane	26.2	0.5	ug/L	ND	65.6	50-140			
1,1,2,2-Tetrachloroethane	32.4	0.5	ug/L	ND	81.0	50-140			
Tetrachloroethylene	27.7	0.5	ug/L	ND	69.2	50-140			
Toluene	33.5	0.5	ug/L	ND	83.7	50-140			
1,2,4-Trichlorobenzene	27.0	0.5	ug/L	ND	67.6	50-140			
1,1,1-Trichloroethane	23.4	0.5	ug/L	ND	58.5	50-140			
1,1,2-Trichloroethane	25.7	0.5	ug/L	ND	64.2	50-140			
Trichloroethylene	25.6	0.5	ug/L	ND	64.0	50-140			
Trichlorofluoromethane	29.8	1.0	ug/L	ND	74.4	50-140			
1,3,5-Trimethylbenzene	24.5	0.5	ug/L	ND	61.2	50-140			
Vinyl chloride	29.5	0.5	ug/L	ND	73.8	50-140			
m,p-Xylenes	71.2	0.5	ug/L	ND	89.0	50-140			

Certificate of Analysis

Report Date: 24-Sep-2013
Order Date:20-Sep-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 15045 Project Description: PE2830

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
o-Xylene	31.4	0.5	ug/L	ND	78.6	50-140			
Surrogate: 4-Bromofluorobenzene	*25.9*		*ug/L*		*81.0*	*50-140*			
Benzene	28.7	0.5	ug/L	ND	71.8	50-140			
Ethylbenzene	29.9	0.5	ug/L	ND	74.8	50-140			
Toluene	33.5	0.5	ug/L	ND	83.7	50-140			
m,p-Xylenes	71.2	0.5	ug/L	ND	89.0	50-140			
o-Xylene	31.4	0.5	ug/L	ND	78.6	50-140			

Certificate of Analysis

Report Date: 24-Sep-2013
Order Date:20-Sep-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 15045 Project Description: PE2830

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

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

PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

OTTAWA ◉ KINGSTON ◉ NIAGARA ◉ MISSISSAUGA ◉ SARNIA

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

Chain of Custody
(Lab Use Only)
№ 13331

Page 1 of 1

Client Name: ~~ERIC LEVEQUE~~ Paterson Group
Contact Name: ERIC LEVEQUE
Address: 154 Colonnade
Telephone: 613-226-7381

Project Reference: PE2830
Quote #
PO # 15045
Email Address: elevequeq@patersongroup.ca

TAT: [ ] Regular [ ] 3 Day
[X] 2 Day [ ] 1 Day
Date Required:

Criteria: [X] 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)

Paracel Order Number: 1338345

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	VOC	PHC	BTEX							
1	BH7-GW1	GW		3	Sept 20/13	9		X	X							
2	BH8-GW1	↓		↓	↓	9:30	X	X	X							
3	BH9-GW1	↓		↓	↓	10	X	X								
4																
5																
6																
7																
8																
9																
10																

Comments:

Method of Delivery: Paracel Courier

Relinquished By (Sign):	Received by Driver/Depot:	Received at Lab:	Verified By:
MIKE B.	T SCOUSE	SUNEE PORN	MC
Relinquished By (Print):	Date/Time: 20/09/13 2:17 PM	Date/Time: SEP 30 2013 03:10	Date/Time: Sept 20 13 3:30
Date/Time:	Temperature: °C	Temperature: 19.4 °C	pH Verified [ ] By: N/A