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Phase II Environmental Site Assessment

Parking Lot and Vacant Land
716 and 770 Brookfield Road
Ottawa, Ontario

Prepared For

Atlantis Investments Limited
c/o Dickinson Wright LLP

October 25, 2017

Report: PE3323-2

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EXECUTIVE SUMMARY

Assessment

A Phase II ESA was conducted for the property addressed as 716 and 770 Brookfield Road in 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 a reported former underground storage tank and fill material on the property, identified during a previous Phase I-ESA conducted by Paterson in 2004.

A preliminary subsurface investigation was conducted in order to assess the quality of the rubble material found within the old foundation of the former office building and dwelling, as well as to assess the upper fill material at other specific locations on the property. Thirteen test pits were excavated for this purpose. The subsurface investigation at the subject site was conducted concurrently with a geotechnical investigation and consisted of the drilling of six (6) boreholes and the installation of two (2) groundwater monitoring wells to be used in addition with groundwater monitoring wells already present on the subject property. Based on well records available through the Ministry of the Environment, six (6) monitoring wells were drilled in the southeast corner of the property in 2007, to address a former UST in this location.

Soil samples were obtained from the test pits and boreholes and screened using visual observations and organic vapour measurements. Seven (7) soil samples collected from the test pits and five (5) soil samples from the boreholes were submitted for laboratory analysis of BTEX, PHCs, PAHs and metals. Based on analytical test results, eight (8) exceedances of metals, three (3) of PHCs and three (3) of PAHs were identified in site soils.

Groundwater samples were obtained from the monitoring wells at BH2, BH3 and MWA (in addition to one duplicate sample from that well) and submitted for analysis of VOCs, PHCs and PAHs. Concentrations of all test parameters were found to be non-detect, or, well below the MOE Table 3 standards.

Recommendations

It is our understanding that the subject site is to be redeveloped with a commercial/residential building. It is our recommendation that an environmental site remediation program, involving the removal of all contaminated soil (fill, including demolition debris) be completed concurrently with site redevelopment.

Any impacted soil and building demolition debris removed from the site during redevelopment will require disposal at an approved waste disposal facility. It is recommended that Paterson personnel be present onsite during the remediation program to direct excavation activities in the areas where impacted material has been identified or is expected to exist. It is recommended that confirmatory soil samples be collected upon completion of the soil remediation program to ensure that the site meets the MOE Table 3 Standards. Prior to the commencement of any site development activities, it is recommended that the groundwater monitoring wells be re-sampled to confirm the current groundwater quality.

1.0 INTRODUCTION

At the request of Dickinson Wright LLP, Paterson Group (Paterson) conducted a Phase II Environmental Site Assessment on the property addressed as 716 and 770 Brookfield Road, in the City of Ottawa, Ontario. The purpose of this Phase II ESA was to address concerns identified in the Phase I ESA prepared by Paterson, dated August 21, 2014.

1.1 Site Description

Address:	716 and 770 Brookfield Road, Ottawa, Ontario.
Legal Description:	Part of Blocks B and C and Hobson Road, of Plan 787, Parts 1 and 2 of RP 4R8677, in the City of Ottawa.
Property Identification Number:	04071-0001, 04071-0110, 04071-0113.
Location:	The site is situated on the south side of Brookfield Road, at the intersection of Brookfield and Hobson Road, 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° 22' 22" N, 75° 41' 13" W.
Configuration:	Rectangular.
Site Area:	1.98 ha (approximate).

1.2 Property Ownership

The subject property is currently owned by 770 Brookfield Properties Limited. Paterson was retained to complete this Phase II ESA by Mr. Robert Farmer of Dickinson Wright LLP. The offices of Dickinson Wright LLP are located at 199 Bay Street, Suite 2200, Commerce Court West, Toronto, Ontario. Mr. Farmer can be reached by telephone at (416) 777-2404.

1.3 Current and Proposed Future Uses

The majority of the subject property (western portion) is currently paved, and serves as a paid parking lot while the eastern portion is vacant and largely covered in grass and some shrubbery. Proposed uses for the property include the construction of a commercial/residential mixed use building, with below grade 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 (MOE), April 2011. The MOE Table 3 Standards are based on the following considerations:

- Coarse-grained soil conditions
- Full depth soils
- Non-potable groundwater conditions
- Residential land use

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The subject site is located on the south site of Brookfield Road, east of Riverside Drive, in the City of Ottawa. The majority of the property is paved and serves as a paid parking lot; the remainder of the property is vacant. The topography of the site is mainly flat; however a small elevation change is present near Brookfield Road, where a small slope exists. Site drainage consists of infiltration in vegetated areas, and sheet drainage to catch basins located in the parking lot area.

No private sewage systems were observed on the subject property, nor are any expected to be present, as the site is located in a municipally-serviced area. Based on a search of available well records, one domestic well was located on the subject property, near the western property boundary. This well was installed in 1958, and likely provided drinking water to a dwelling formerly located in this area of the property. No signs of this well were observed during the site visit. Six (6) existing groundwater monitoring wells were encountered on the subject property, in the southeast corner. Since these wells were found to be viable and in good condition, information was collected from these wells and incorporated into this Phase II-ESA. No evidence of current or former railway or spur lines on the subject property was observed at the time of the site inspection. There were no unidentified substances observed on the subject site.

2.2 Past Investigations

Paterson recently conducted a Phase I-ESA on the subject property, provided under a separate cover. Six (6) groundwater monitoring wells were identified in the southeast corner of the property. Based on search results returned from a search for drilled wells in the study area, these monitoring wells were installed by AMEC in 2007, to address a former underground storage tank in this area. No other information in this regard was available for review. A second APEC was identified on the subject property based on the presence of fill on unknown quality, which was encountered during a geotechnical investigation conducted by Paterson in 2004 (see following paragraphs).

- “Phase I – Environmental Site Assessment, Parking Lot, 770 Brookfield Road, Ottawa, Ontario”, Prepared by Paterson Group, February 2004

In 2004, Paterson conducted a Phase I-ESA on the west portion of the subject property. At that time, that property was occupied by a parking lot. The eastern side of 770 Brookfield Road was occupied by an office building (now demolished).

Historical research conducted as part of the Phase I-ESA revealed that a retail fuel outlet and garage was formerly located at the southeast corner of the intersection of Riverside Drive and Brookfield Road, 2801 Riverside Drive. The fuel outlet and garage had been in operation since the late 1950's to early 1960's (and was still in operation at the time of preparing the Phase I-ESA). A second retail fuel outlet and garage was located immediately south of the first, at 2805 Riverside Drive. This fuel outlet operated from the 1950's-1960's until the 1990's.

Based on previous projects Paterson has conducted on these properties, the former retail fuel outlets were not considered to pose an environmental concern to the subject property.

- "Geotechnical Investigation, 770 Brookfield Road, Ottawa, Ontario" Prepared by Paterson Group, dated March 2004.

Five boreholes were placed on the western portion of 770 Brookfield Road and 716 Brookfield Road for the purpose of the geotechnical investigation. Silty fill sand followed by silty clay was identified in each of the boreholes. Bedrock was inferred to be located between 11 and 14.5 m depth below grade. Groundwater levels were found to be between 2.60 and 3.45 m below grade. Based on these elevations, groundwater flow is expected to head in a westerly direction, towards the Rideau River.

Finally, prior to completing the Phase I-ESA for the subject property, a preliminary subsurface investigation was conducted, consisting of the placement of 13 test holes, excavated using a hydraulic shovel. The primary purpose of the test holes was to determine the quality of the rubble material, placed within the footprint of the former building, following its demolition. Findings of this preliminary subsurface investigation, including analytical test results, are included as part of this Phase II.

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 six (6) boreholes at the subject property, in addition to

test pits. Monitoring wells were installed in BH2 and BH3 to supplement the existing wells.

Boreholes were advanced to a maximum depth of 5.94 m below grade, terminating in native clay. One dynamic cone penetration test (DCPT) was conducted in BH3, where a cone was advanced to a maximum depth of 22.09 m below grade before achieving refusal.

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 for soil are PHCs, BTEX and metals, while those in groundwater are PHCs, VOCs and PAH.

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

Based on information from the Geological Survey of Canada mapping and the current and previous subsurface investigations, drift thickness in the area of the subject site is on the order of 15 to 25 m below grade. Overburden soils consist primarily of fill over native gray silty clay. Groundwater in the monitoring wells onsite was encountered within native clay strata at depths between 1.89 and 3.10 m below grade.

Contaminants of Potential Concern

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

- Volatile Organic Compounds (VOCs) – this suite of parameters includes Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX), associated with gasoline, as well as chlorinated solvents (Tetrachloroethylene, Trichloroethylene, Dichloroethylenes, and Vinyl Chloride) which may be related to the former reported UST. These parameters were selected as CPCs for the Phase I study area due to the historical presence of a UST. BTEX may be present in the soil matrix, and VOCs may be present in the groundwater.

- 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 a former UST. Gasoline, diesel and heavy oils may have been present in the former UST. 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.

- Metals – this suite of parameters encompasses various metals for which MOE standards exist. Metals be present in the fill material present on site, and are not expected to be present in the groundwater due to their very low solubility.
- Polycyclic Aromatic Hydrocarbons (PAHs) – this suite of parameters encompasses various complex hydrocarbons, commonly associated with coal and/or combustion. PAHs may be present in the soil matrix or dissolved in site groundwater. PAHs were selected as CPCs for the Phase II property based on the presence of fill material of unknown quality, and to a lesser extent, the former presence of a UST located in the southeast corner of the property.

The mechanisms of contaminant transport within the site soils include physical transportation and leaching. Physical transport is not anticipated to be an issue at the subject site, given the partially developed nature of the site. Leaching is anticipated to play a small role in the contaminant transportation, given the presence of somewhat permeable fill material and an asphalt parking lot surface.

The mechanisms of contaminant transport within the groundwater system include advection, dispersion, and diffusion. Diffusion and advection will likely dominate in the fill and native clay where relatively higher hydraulic conductivity is likely to be present.

Existing Buildings and Structures

No formal buildings exist on the subject property. A small booth, formerly used by a parking lot attendant, is present near the parking lot entrance off Brookfield Road. The booth was not occupied at the time of the site visit.

Water Bodies

There are no water bodies on the subject site or within the Phase II study area. The nearest major water body is the Rideau River, located approximately 500 m to the west.

Areas of Natural Significance

No areas of natural significance were identified on the site or in the Phase I study area.

Drinking Water Wells

A search of water well records was conducted using the Ontario Well Records map. Based on the search results, a total of 15 wells are located within the study area, four (4) of which are located on the subject site.

Three of the on-site wells consist of monitoring wells drilled in the southeast corner of the property as part of a Phase II-ESA conducted in 2007 by another firm. Based on the limited information included in this particular well record, it appears as though an underground fuel storage tank was located in this area of the property, adjacent to a building listed as a maintenance building.

The fourth water well record on the subject site appears to have been located near the western property edge, in the asphaltic parking area. This well was constructed in 1958 to be used for domestic purposes.

Neighbouring Land Use

Neighbouring land use in the Phase I study area is commercial to the north and west, institutional to the east and residential to the south.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

The Areas of Potential Environmental Concern identified in the Phase I ESA are summarized below in Table 1. Other Potentially Contaminating Activities within the Phase I study area are not considered to pose an environmental concern to the subject site based on information collected about those properties during Phase II-ESAs conducted by Paterson in past years.

Table 1 - Areas of Potential Environmental Concern					
Area of Potential Environmental Concern	**Location of Areas of Potential Environmental Concern with respect to Phase I Property**	**Potentially Contaminating Activity**	**Location of PCA (on-site or off-site)**	**Contaminants of Potential Concern**	**Media Potentially Impacted (Groundwater, Soil, and/or Sediment)**
770 Brookfield Road	Portion of subject site	Item 28 – Gasoline and Associated Products Storage in Fixed Tanks	On-Site (southeast corner of property)	BTEX, PHCs	Soil and Groundwater
770 Brookfield Road	Portion of subject site	Item 30 – Importation of Fill of Unknown Quality	On-site (western portion of property)	Metals, BTEX/PHCs, PAHs	Soil

Assessment of Uncertainty and/or Absence of Information

The information available for review as part of the preparation of the Phase I ESA is considered to be sufficient to conclude that there are areas of potential environmental concern on the subject site which have the potential to have impacted the subject site. The presence of potentially contaminating activities was confirmed by a variety of independent sources, and as such, the conclusions of this report 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. No deviations from the sampling and analysis plan 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

A preliminary subsurface investigation was conducted on June 11, 2014 and consisted of the excavation of 13 test pits, 11 of which were placed within, or near the former building, and 2 were placed near a former residential dwelling located in the northwest corner of the property. A subsurface investigation was conducted on July 16, 2014, and consisted of the drilling of six (6) boreholes on the subject site.

The boreholes were placed across the site in order to provide a general assessment of soil and groundwater conditions across the site, as well as in the vicinity of the reported underground storage tank located in the southeast corner of the property. The boreholes were advanced using a truck-mounted CME 55 power auger drill rig and the test holes were excavated using a hydraulic shovel operated by Ivan Latimer Excavating Ltd. The drilling contractor was George Downing Estate Drilling of Hawkesbury, Ontario. Test pit and borehole locations are shown on Drawing No. PE3323-3 – Test Hole Location Plan, appended to this report.

4.2 Soil Sampling

As part of the preliminary subsurface investigation 33 soil samples were collected and an additional 36 soil samples were obtained from the boreholes by means of split spoon sampling and the sampling of shallow soils directly from auger flights. Split spoon samples were taken at approximate 0.76 m intervals. The depths at which split spoon and auger flight samples were obtained from the boreholes are shown as "**SS**" and "**AU**" respectively on the Soil Profile and Test Data Sheets, appended to this report.

Site soils consist of fill over native grey clay. Asphalt was encountered at ground surface in the boreholes advanced in the parking area. Test holes placed within the former building footprint identified the presence of rubble (bricks, concrete, plastic, wire, steel) to depths of 1.5 m below grade at the basement concrete floor slab. The fill material consists of brown silty sand, in some cases with gravel. A hydrocarbon odour was noted in a sample collected from BH1. The remaining samples did not show evidence of hydrocarbon impacts. Due to the fact that this Phase II-ESA was conducted in conjunction with a geotechnical investigation, a Dynamic Cone Penetration Test (DCPT) was conducted in BH3. An inferred bedrock depth was recorded at 22.09 m below grade.

4.3 Field Screening Measurements

Samples collected from site, underwent a preliminary screening procedure which included visual screening for colour and evidence of deleterious fill. A MiniRae 2000 photoionization detector (PID) was used to determine the selection of samples to be submitted for analytical testing.

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 ppm to 73.4 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

Two (2) groundwater monitoring wells were installed in boreholes BH2 and BH3 (referred to as MW2 and MW3) during the current 2014 investigation drilling program, all of which were installed by George Downing Estate Drilling of Hawkesbury, Ontario, under full-time supervision by Paterson personnel. These monitoring wells consisted of 50 mm diameter Schedule 40 threaded PVC risers and screens. A sand pack consisting of silica sand was placed around the screen, and a bentonite seal was placed above the screen to minimize cross-contamination. Monitoring well construction details are provided on the Soil Profile and Test Data Sheets in Appendix 1. A summary of monitoring well construction details is provided below in Table 2.

In addition to the two (2) groundwater monitoring wells installed during the Phase-II ESA, water levels were collected from the six existing groundwater monitoring wells. In addition to water levels, water from each of these existing wells was purged in order to visually assess the groundwater quality. One groundwater sample (collected from a well nearest to the former UST tank) was collected from one of these wells.

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 2: 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
MW2	78.67	6.10	3.0 – 6.10	2.51 – 6.10	0 – 2.51	PVC
MW3	78.88	6.10	3.0 – 6.10	2.51 – 6.10	0 – 2.51	PVC
MWA	77.37	4.60	Unknown	Unknown	Unknown	PVC
MWB	77.49	4.61	Unknown	Unknown	Unknown	PVC
MWC	77.41	3.90	Unknown	Unknown	Unknown	PVC
MWD	77.40	5.24	Unknown	Unknown	Unknown	PVC
MWE	77.38	3.88	Unknown	Unknown	Unknown	PVC
MWF	77.50	5.29	Unknown	Unknown	Unknown	PVC

The well construction details of monitoring wells A through F (monitoring wells installed by others) are unknown.

4.5 Field Measurement of Water Quality Parameters

Prior to sampling, water quality parameters were measured in the field using a multi-parameter analyzer. Parameters measured in the field included temperature, electrical conductivity, and total dissolved solids.

Field parameters were measured after each well volume purged. Wells were purged prior to sampling until at least three well volumes had been removed or the field parameters were relatively stable. Stabilized field parameter values are summarized below in Table 3.

Table 3: Field Measurement of Water Quality Parameters, July 24, 2014

Parameter	BH2(MW2)-GW1	BH3(MW3)-GW2	MWA-GW1
Temperature (°C)	11.6	12.5	15.2
pH	6.51	6.97	7.91
Electrical Conductivity (µS/cm)	1868	1935	2049
Total Dissolved Solids (ppm)	928	921	1028

4.6 Groundwater Sampling

Groundwater sampling protocols were followed using the MOE document entitled "Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario", dated May 1996.

Groundwater samples were obtained from each monitoring well, using dedicated sampling equipment. Standing water was purged from each well prior to sampling. Samples were stored in coolers to reduce analyte volatilization during transportation. Details of our standard operating procedure for groundwater sampling are provided in the Sampling and Analysis Plan in Appendix 1.

4.7 Analytical Testing

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

Table 4: Soil Samples Submitted

Sample ID	Sample Depth/ Stratigraphic Unit	Parameters Analyzed			Rationale
		BTEX, PHCs F_1-F_4	PAH	Metals	
TP1-G2	0.4, rubble			X	Assessment of rubble material.
TP3-G1	0.5, rubble			X	Assessment of rubble material.
TP4-G1	0.7, rubble			X	Assessment of rubble material.
TP7-G2	1.5, rubble			X	Assessment of rubble material.
TP9-G3	2.1, fill	X	X		Assessment of fill material.
TP12-G2	0.5, fill			X	Assessment of fill material.
TP13-G2	1.0, fill			X	Assessment of fill material.
BH1-SS4	2.28 – 2.89; silty clay	X			To assess former underground storage tank.
BH3-SS3	1.52 – 2.13; fill	X		X	To assess fill material and general coverage.
BH4-SS2	0.76 – 1.37; fill			X	To assess fill material and general coverage.
BH5-AU1	0 – 0.6; fill	X		X	To assess fill material and general coverage.

Table 5: Groundwater Samples Submitted

Sample ID	Screened Interval/ Stratigraphic Unit	Parameters Analyzed			Rationale
		BTEX/ PHCs F_1-F_4	PAH	VOCs	
MW2-GW1	3.05 – 6.10	X	X	X	Assess groundwater in vicinity, and downgradient of former UST.
MW3-GW1	3.05 – 6.10	X	X	X	General groundwater coverage.
MWA-GW1	Unknown	X	X	X	Assess groundwater in vicinity of former UST.
DUP-1 (MW1)	Unknown			X	QA/QC

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

4.8 Residue Management

Soil cuttings, purge water and fluids from equipment cleaning were retained on-site.

4.9 Elevation Surveying

Groundwater surface elevations at the borehole locations were determined by Paterson personnel based on Geodetic elevation of the top spindle of a fire hydrant located on Brookfield Road (78.769 m). The geodetic elevation was based on a Topographical Plan prepared by Annis, O'Sullivan, Vollebekk Ltd in 2003, as part of the previous Phase II-ESA. The accuracy of this benchmark elevation was not verified by Paterson.

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 soils consist of fill over native silty clay. The fill material consists of silty sand with some gravel and was found to be 0.55 and 2.08 m in thickness. Native silty clay was encountered to depths ranging between 4.4 and 6.09 m below grade, where the boreholes were terminated. A Dynamic Cone Penetration Test (DCPT) was conducted in Borehole 3, where refusal was encountered at 22.09 m below grade, at the inferred bedrock surface. Rubble material (building demolition debris) was encountered in the test holes located within the former building footprint. Rubble was encountered in these test holes from surface to a depth of approximately 1.5 m below grade.

Groundwater monitoring wells were installed at BH2 and BH3 (whose samples are labelled as MW2 and MW3, respectively). Site stratigraphy is shown on Drawing PE3323-6 - Cross-Section A-A'.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured during the groundwater sampling event on July 24, 2014, using an electronic water level meter. Groundwater levels are summarized below in Table 6. All measurements are geodetic based on the topographic plan of the subject site.

Table 6: Groundwater Level Measurements

Borehole Location	Ground Surface Elevation (m)	Water Level Depth (m below grade)	Water Level Elevation (m ASL)	Date of Measurement
BH2	78.67	3.02	75.65	July 24, 2014
BH3	78.88	3.10	75.78	July 24, 2014
MWA	77.37	1.66	75.84	July 24, 2014
MWB	77.49	1.91	75.58	July 24, 2014
MWC	77.41	1.96	75.45	July 24, 2014
MWD	77.40	2.18	75.22	July 24, 2014
MWE	77.38	1.80	75.58	July 24, 2014
MWF	77.50	2.58	74.92	July 24, 2014

Based on the groundwater elevations from the July 24, 2014 monitoring event, groundwater contour mapping was completed for the upper aquifer. Groundwater contours are shown on Drawing PE3323-4 – Groundwater Contour Plan.

Based on the contour mapping, groundwater flow at the subject site appears to be in a southwesterly direction. A horizontal hydraulic gradient of approximately 0.06 m/m was calculated. No free product was observed in the monitoring wells sampled at the subject site.

5.3 Fine-Medium Soil Texture

Fine-grained soil standards were not selected for use at 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 73.4 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 the potential for PHC contamination in site soils.

It is noted that higher-fraction hydrocarbons may not be as readily detectable by combustible gas or PID detectors.

5.5 Soil Quality

A total of seven (7) soil samples from the test pits were submitted for analysis of metals and/or PAHs, PHCs and BTEX and four (4) soil samples from the boreholes were submitted for analysis of a combination of metals, PHCs, BTEX and metals. The results of the analytical testing are presented below. The laboratory certificates of analysis are provided in Appendix 1.

Table 7:
Analytical Test Results – Soil (Test Pits)
Metals

Parameter	MDL (µg/g)	Soil Samples (µg/g)						MOE Table 3 Residential Coarse
		TP1-G2	TP3-G1	TP4-G1	TP7-G2	TP12-G2	TP13-G2	
Antimony	1.0	4.3	**8.0**	**17.4**	nd	2.5	nd	7.5
Arsenic	1.0	3.8	5.2	5.8	3.5	nd	2.8	18
Barium	1.0	98.9	115	86.0	71.4	372	324	390
Beryllium	1.0	nd	nd	nd	nd	nd	nd	4
Boron (total)	1.0	89.9	**544**	**215**	50.4	5.2	4.2	120
Cadmium	0.5	nd	nd	nd	nd	nd	nd	1.2
Chromium (total)	1.0	23.1	21.1	30.3	15.5	97.7	93.2	160
Cobalt	1.0	6.4	4.3	5.7	4.8	**23.0**	15.8	22
Copper	1.0	43.8	34.4	23.0	18.3	45.2	39.7	140
Lead	1.0	27.4	47.4	46.7	41.2	11.1	10.7	120
Molybdenum	1.0	1.1	5.1	nd	nd	nd	nd	6.9
Nickel	1.0	20.8	10.8	14.6	11.2	51.5	45.1	100
Selenium	1.0	nd	nd	nd	nd	nd	nd	2.4
Silver	0.5	nd	nd	nd	nd	nd	nd	20
Thallium	1.0	nd	nd	nd	nd	nd	nd	1
Uranium	1.0	nd	nd	nd	nd	nd	nd	23
Vanadium	1.0	23.7	16.5	22.4	18.6	**90.2**	75.5	86
Zinc	1.0	**589**	**438**	132	210	101	93.1	340

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

Several metals parameters were detected above MOE Table 3 standards in soil samples collected from the test pits. These include antimony, boron, cobalt, vanadium and zinc.

Table 7:
Analytical Test Results – Soil (Boreholes)
Metals

Parameter	MDL (µg/g)	Soil Samples (µg/g)			MOE Table 3 Residential Coarse
		BH3-SS3	BH4-SS2	BH5-AU1	
Antimony	1.0	nd	nd	nd	7.5
Arsenic	1.0	3.3	7.9	3.7	18
Barium	1.0	165	109	148	390
Beryllium	1.0	nd	nd	nd	4
Boron (available)	0.5	0.9	0.6	nd	120
Boron (total)	1.0	7.4	6.7	6.2	120
Cadmium	0.5	nd	nd	nd	1.2
Chromium (total)	1.0	55.4	23.1	32.7	160
Chromium (VI)	0.2	nd	nd	nd	8
Cobalt	1.0	10.8	9.5	8.5	22
Copper	1.0	33.7	21.9	20.6	140
Lead	1.0	11.6	16.2	30.5	120
Mercury	0.1	nd	nd	nd	0.27
Molybdenum	1.0	nd	1.1	1.3	6.9
Nickel	1.0	28.8	18.9	20	100
Selenium	1.0	nd	nd	nd	2.4
Silver	0.5	nd	nd	nd	20
Thallium	1.0	nd	nd	nd	1
Uranium	1.0	nd	nd	nd	23
Vanadium	1.0	51.4	30.6	36.3	86
Zinc	1.0	65.2	45.1	54.3	340

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

All metal parameter concentrations were found to be in compliance with MOE Table 3 residential standards.

Table 8:
Analytical Test Results – Soil
BTEX and PHCs F1-F4

Parameter	MDL (µg/g)	Soil Samples (µg/g)				MOE Table 3 Residential Coarse Standards
		TP9-G3	BH1-SS4	BH3-SS3	BH5-AU1	
Benzene	0.02	nd	nd	nd	nd	0.21
Ethylbenzene	0.05	0.06	nd	nd	nd	2
Toluene	0.05	nd	nd	nd	nd	2.3
Xylenes	0.05	0.18	nd	nd	nd	3.1
PHC F1	7	**73**	nd	nd	nd	55
PHC F2	4	**398**	65	nd	nd	98
PHC F3	8	**2410**	23	22	41	300
PHC F4	6	2180	nd	13	49	2800

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

No BTEX parameters were detected in any of the samples with the exception of TP9-G3, where ethylbenzene and xylenes were identified. All BTEX parameters are in compliance with MOE Table 3 standards. PHC parameters were found to be in compliance with MOE Table 3 standards with the exception of the F1, F2 and F3 PHC fractions in TP9-G3, which were found to exceed.

Table 9:
Analytical Test Results – Soil
PAHs

Parameter	MDL (µg/g)	Soil Samples (µg/g)	MOE Table 3 Residential Coarse Standards
		TP9-G3	
Acenaphthene	0.02	< 2.00	7.9
Acenaphthylene	0.02	< 2.00	0.15
Anthracene	0.02	< 2.00	0.67
Benzo[a]anthracene	0.02	< 2.00	0.5
Benzo[a]pyrene	0.02	< 2.00	0.3
Benzo[b]fluoranthene	0.02	< 2.00	0.78
Benzo[g,h,i]perylene	0.02	< 2.00	6.6
Benzo[k]fluoranthene	0.02	< 2.00	0.78
Chrysene	0.02	< 2.00	7
Dibenzo[a,h]anthracene	0.02	< 2.00	0.1
Fluoranthene	0.02	< 2.00	0.69
Fluorene	0.02	< 2.00	62
Indeno[1,2,3-cd]pyrene	0.02	< 2.00	0.38
1 - Methylnaphthalene	0.02	**5.48**	0.99
2 - Methylnaphthalene	0.02	**5.77**	0.99
Naphthalene	0.02	< 1.00	0.6
Phenanthrene	0.02	**9.71**	6.2
Pyrene	0.02	< 2.00	78

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

1- and 2-Methylnaphthalene and phenanthrene were found to exceed the MOE Table 3 standards. Due to elevated instrument background, an elevated reporting limit was presented for the remaining analytical test parameters. This may be attributed to the nature of the soil sample, where elevated amounts of background material may have disturbed the analysis.

The maximum concentrations of analyzed parameters in the soil at the site are summarized below in Table 10.

Table 10: Maximum Concentrations – Soil

Parameter	Maximum Concentration (µg/g)	Borehole	Depth Interval (m BGS)
Antimony	**17.4**	TP4-G1	0.7; rubble
Arsenic	7.9	BH4-SS2	0.76-1.37; fill
Barium	372	TP12-G2	0.5, fill
Boron (available)	0.9	BH3-SS3	1.52 - 2.13; fill
Boron (total)	**544**	TP3-G1	0.5; rubble
Chromium (total)	97.7	TP12-G2	0.5; fill
Cobalt	**23**	TP12-G2	0.5; fill
Copper	45.2	TP12-G2	0.5; fill
Lead	47.4	TP3-G1	0.5; rubble
Molybdenum	5.1	TP3-G1	0.5; rubble
Nickel	51.5	TP12-G2	0.5; fill
Vanadium	**90.2**	TP12-G2	0.5; fill
Zinc	**589**	TP1-G2	0.4; rubble
Ethylbenzene	0.06	TP9-G3	2.1; fill
Xylenes	0.18	TP9-G3	2.1; fill
PHC F1	**73**	TP9-G3	2.1; fill
PHC F2	**398**	TP9-G3	2.1; fill
PHC F3	**2410**	TP9-G3	2.1; fill
PHC F4	2180	TP9-G3	2.1; fill
1 - Methylnaphthalene	**5.48**	TP9-G3	2.1; fill
2 - Methylnaphthalene	**5.77**	TP9-G3	2.1; fill
Phenanthrene	**9.71**	TP9-G3	2.1; fill

Notes:
- **Bold** – Value exceeds MOE Table 3 standards

All other parameter concentrations were below laboratory detection limits.

5.6 Groundwater Quality

Groundwater samples from the monitoring wells at BH2 (MW2) and BH3 (MW3) as well as MWA were submitted for laboratory analysis of VOCs, PHCs, and PAHs. A duplicate sample taken from MWA was submitted for analysis of VOCs. The groundwater samples were obtained from the screened intervals noted on Table 1. The results of the analytical testing are presented below in Tables 10, 11, and 12. The laboratory certificates of analysis are provided in Appendix 1.

Table 11:
Analytical Test Results – Groundwater
VOCs

Parameter	MDL (µg/L)	Groundwater Sample (µg/L)				MOE Table 3 Residential Coarse Standards
		July 24, 2014				
		BH2 (MW2)-GW1	BH3 (MW3)-GW1	MWA-GW1	DUP-1 (MWA)	
Acetone	5.0	nd	nd	nd	nd	130000
Benzene	0.5	nd	nd	nd	nd	44
Bromodichloromethane	0.5	nd	nd	nd	nd	85000
Bromoform	0.5	nd	nd	nd	nd	380
Bromomethane	0.5	nd	nd	nd	nd	5.6
Carbon Tetrachloride	0.2	nd	nd	nd	nd	0.79
Chlorobenzene	0.5	nd	nd	nd	nd	630
Chloroform	0.5	nd	nd	nd	nd	2.4
Dibromochloromethane	0.5	nd	nd	nd	nd	82000
Dichlorodifluoromethane	1.0	nd	nd	171	182	4400
1,2-Dichlorobenzene	0.5	nd	nd	nd	nd	4600
1,3-Dichlorobenzene	0.5	nd	nd	nd	nd	9600
1,4-Dichlorobenzene	0.5	nd	nd	nd	nd	8
1,1-Dichloroethane	0.5	nd	nd	nd	nd	320
1,2-Dichloroethane	0.5	nd	nd	nd	nd	1.6
1,1-Dichloroethylene	0.5	nd	nd	nd	nd	1.6
cis-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	1.6
1,2-Dichloropropane	0.5	nd	nd	nd	nd	16
1,3-Dichloropropene	0.5	nd	nd	nd	nd	5.2
Ethylbenzene	0.5	nd	nd	nd	nd	2300
Ethylene Dibromide	0.2	nd	nd	nd	nd	0.25
Hexane	1.0	nd	nd	nd	nd	51
Methyl Ethyl Ketone	5.0	nd	nd	nd	nd	470000
Methyl Isobutyl Ketone	5.0	nd	nd	nd	nd	140000
Methyl tert-butyl Ether	2.0	nd	nd	nd	nd	190
Methylene Chloride	5.0	nd	nd	nd	nd	610
Styrene	0.5	nd	nd	nd	nd	1300
1,1,1,2-Tetrachloroethane	0.5	nd	nd	nd	nd	3.3
1,1,2,2-Tetrachloroethane	0.5	nd	nd	nd	nd	3.2
Tetrachloroethylene	0.5	nd	nd	nd	nd	1.6
Toluene	0.5	nd	nd	nd	nd	18000
1,1,1-Trichloroethane	0.5	nd	nd	nd	nd	640
1,1,2-Trichloroethane	0.5	nd	nd	nd	nd	4.7
Trichloroethylene	0.5	nd	nd	nd	nd	1.6
Trichlorofluoromethane	1.0	nd	nd	nd	nd	2500
Vinyl Chloride	0.5	nd	nd	nd	nd	0.5
Xylenes	0.5	nd	nd	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 MOE Standard

None of the VOC parameter were detected in the groundwater samples, with the exception of dichlorodifluoromethane, which was detected in samples MWA-GW1 and DUP-1 (a duplicate sample from MWA-GW1). All concentrations are in compliance with MOE Table 3 standards.

Table 12:
Analytical Test Results – Groundwater
PHCs

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)				MOE Table 3 Residential Coarse Standards
		July 24, 2014				
		BH2 (MW2)-GW1	BH3 (MW3)-GW1	MWA-GW1	DUP-1 (MWA)	
PHCs F1	25	nd	nd	nd	nd	750
PHCs F2	100	nd	nd	nd	nd	150
PHCs F3	100	nd	nd	nd	nd	500
PHCs F4	100	nd	nd	nd	nd	500

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

No PHC parameters were detected in any of the samples, all parameter concentrations were found to be in compliance with MOE Table 3 standards.

Table 13:
Analytical Test Results – Groundwater
PAHs

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)			MOE Table 3 Residential Coarse Standards
		July 24, 2014			
		BH2 MW2)-GW1	BH3 MW3)-GW1	MWA-GW1	
Acenaphthene	0.05	0.18	nd	nd	600
Acenaphthylene	0.05	nd	nd	nd	1.8
Anthracene	0.01	nd	nd	nd	2.4
Benzo[a]anthracene	0.01	nd	nd	nd	4.7
Benzo[a]pyrene	0.01	nd	nd	nd	0.81
Benzo[b]fluoranthene	0.05	nd	nd	nd	0.75
Benzo[g,h,i]perylene	0.05	nd	nd	nd	0.2
Benzo[k]fluoranthene	0.05	nd	nd	nd	0.4
Chrysene	0.05	nd	nd	nd	1
Dibenzo[a,h]anthracene	0.05	nd	nd	nd	0.52
Fluoranthene	0.01	nd	0.02	nd	130
Fluorene	0.05	nd	nd	nd	400
Indeno[1,2,3-cd]pyrene	0.05	nd	nd	nd	0.2
1 - Methylnaphthalene	0.05	nd	nd	nd	1800
2 - Methylnaphthalene	0.05	0.06	nd	nd	1800
Naphthalene	0.05	nd	nd	nd	1400
Phenanthrene	0.05	0.21	0.18	nd	580
Pyrene	0.01	nd	0.01	nd	68

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

No PAH parameters were detected in the samples collected from MWA. Three (3) PAH parameters were detected in each sample from BH2 and BH3 at concentrations less than the MOE Table 3 standards. All PAH parameter concentrations are in compliance with the Table 3 standards.

Table 14: Maximum Concentrations – Groundwater

Parameter	Maximum Concentration (µg/L)	Borehole	Depth Interval (m BGS)
Dichlorodifluoromethane	182	DUP-1	Unknown
Acenaphthene	0.18	BH2(MW2)-GW1	3.05 – 6.09
Fluoranthene	0.02	BH3(MW3)-GW1	3.05 – 6.09
2-Methylnaphthalene	0.06	BH2(MW2)-GW1	3.05 – 6.09
Phenanthrene	0.21	BH2(MW2)-GW1	3.05 – 6.09
Pyrene	0.01	BH3(MW3)-GW1	3.05 – 6.09

Notes:
- **Bold** – Value exceeds MOE Table 3 standards

All other parameter concentrations were below laboratory detection limits.

5.7 Quality Assurance and Quality Control Results

As per the Sampling and Analysis Plan, a duplicate groundwater sample was obtained at MWA and analyzed for VOCs with the intent of calculating the relative percent difference (RPD) between duplicate sample values as a way of assessing the quality of the analytical results. Only one analytical test parameter (dichlorodifluoromethane) was detected in the suite of VOCs analyzed. Based on RPD calculations (as outlined in the Sampling and Analysis Plan), the RPD between the original sample and the duplicate was found to be 6%, which meets the QA/QC target of 20%.

All samples submitted as part of the 2014 sampling event were handled in accordance with the Analytical Protocol with respect to holding time, preservation method, storage requirement, and container type.

As per Subsection 47(3) of O.Reg. 153/04 as amended by O.Reg. 269/11, a Certificate of Analysis has been received for each sample submitted for analysis during the 2014 sampling event, and all Certificates of Analysis are appended to this report.

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

5.8 Phase II Conceptual Site Model

The following section has been prepared in accordance with the requirements of O.Reg. 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

Areas of Potential Environmental Concern (APECs) identified include the reported historical presence of an underground storage tank and fill material of unknown quality. Additional Potentially Contaminating Activities were identified within the Phase I study area but were not considered to represent Areas of Potential Environmental Concern.

PHCs, BTEX, PAHs and metals in soil and PHCs, PAHs and VOCs in 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. Public utilities travel along the north and east sides of the properties, adjacent to Brookfield and Hobson Roads, respectively. Privately owned electrical and sewer conduits are located within the parking lot area. No other significant utilities were noted by the utility companies. Most utilities are shown on Drawing PE3323-3 Test Hole Location Plan.

Physical Setting

Site Stratigraphy

The site stratigraphy, from ground surface to the deepest aquifer or aquitard investigated, is illustrated on Drawing PE3323-6 - Cross-Section A-A'. Stratigraphy consists of:

- Fill, consisting of silty sand with gravel, varying in thickness from 0.55 to 2.08 m or building demolition debris in the footprint of the former building. Groundwater was not observed in this stratigraphic unit.
- Silty clay - this unit was encountered in every borehole.

Hydrogeological Characteristics

Groundwater was encountered in the native silty clay at the subject site. This unit is interpreted to function as a local aquifer at the subject site.

Water levels were measured at the subject site on July 24, 2014. Water levels are summarized above in Section 6.2 of this report and are shown on the attached drawings.

Based on the groundwater elevations from the July 2014 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 calculated to be in a southwesterly direction. A hydraulic gradient of approximately 0.06 m/m was calculated.

Approximate Depth to Bedrock

Bedrock was not encountered in any of the boreholes, however a Dynamic Cone Penetration Test was conducted at Borehole 3 (BH3). A maximum cone depth of 22.1 m was achieved before encountering refusal.

Approximate Depth to Water Table

The depth to water table at the subject site varies between approximately 1.80 and 3.10 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. It is not located within 30 m of a water body.

Fill Placement

Fill material was identified at the subject site. The source of the fill is unknown. Selected fill samples in areas of potential environmental concern were analyzed for suspected contaminants of concern, as detailed in preceding sections.

Proposed Buildings and Other Structures

It is our understanding that the site is to be redeveloped with a residential/ condominium building with at least one level of underground parking.

Existing Buildings and Structures

No buildings currently exist on the subject property. A small booth, formerly used by the parking lot attendant, is located near the entrance to the parking lot.

Water Bodies

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

Areas of Natural Significance

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

Environmental Condition

Areas Where Contaminants are Present

Based on screening and analytical results, contaminants were identified in excess of the MOE Table 3 site standards. The areas where contaminants are present in concentrations greater than the MOE Table 3 standards are shown on Drawing PE3323-5.

Types of Contaminants

Based on the Areas of Potential Environmental Concern identified as part of the Phase I ESA and analytical testing, contaminants found at concentrations greater than the MOE Table 3 standards at the subject site consist of metals and to a lesser degree PHCs and PAHs in soil. No contaminated groundwater was identified.

Contaminated Media

Based on the results of the Phase II ESA, the contaminants of concern are present in the soil at the subject site.

What Is Known About Areas Where Contaminants Are Present

Contaminants were identified in the vicinity of the two (2) former buildings on the property. The provenance of the fill material is unknown.

Distribution of Contaminants

The horizontal distribution of contaminants is shown on Drawing PE3323-3. Vertically, the contaminants were observed in the fill and rubble strata. Contaminants were observed in the vicinity of the former on-site buildings.

Discharge of Contaminants

The discharge of contaminants at the subject site is considered to have been associated with the fill material and the demolition of the former on-site building. No further information concerning the discharge of contaminants is available.

Migration of Contaminants

The migration of contaminants within the soil, or from the soil to groundwater, is interpreted to be limited due to the fact that the majority of the elevated contaminant concentrations were encountered within the rubble, and that the

rubble was placed within the building's basement, where a thick concrete slab still exists. Migration through this slab is considered to be negligible, or non-existent. Contaminants identified in areas other than within the former building basement were identified above the water table, and are not expected to have migrated any significant distance.

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.

Based on analytical test results, it is not likely that downward leaching through the fill layer into the water table has occurred. The primary contaminant of concern on the property are metals, which were identified in relatively low concentrations and do not readily dissolve in groundwater.

Potential for Vapour Intrusion

No buildings exist on site and the only structure present (a small booth) is no longer in use. As such, vapour intrusion is not a concern.

It is understood that the subject property will be redeveloped with a commercial/residential building, with underground parking.

All contaminated material will be removed, and as a result, vapour intrusion into the proposed building will not be a concern.

6.0 CONCLUSIONS

Assessment

A Phase II ESA was conducted for the property addressed as 716 and 770 Brookfield Road in 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 a reported former underground storage tank and fill material on the property, identified during a previous Phase I-ESA conducted by Paterson in 2004.

A preliminary subsurface investigation was conducted in order to assess the quality of the rubble material found within the old foundation of the former office building and dwelling, as well as to assess the upper fill material at other specific locations on the property. Thirteen test pits were excavated for this purpose. The subsurface investigation at the subject site was conducted concurrently with a geotechnical investigation and consisted of the drilling of six (6) boreholes and the installation of two (2) groundwater monitoring wells to be used in addition with groundwater monitoring wells already present on the subject property. Based on well records available through the Ministry of the Environment, six (6) monitoring wells were drilled in the southeast corner of the property in 2007, to address a former UST in this location.

Soil samples were obtained from the test pits and boreholes and screened using visual observations and organic vapour measurements. Seven (7) soil samples collected from the test pits and five (5) soil samples from the boreholes were submitted for laboratory analysis of BTEX, PHCs, PAHs and metals. Based on analytical test results, eight (8) exceedances of metals, three (3) of PHCs and three (3) of PAHs were identified in site soils.

Groundwater samples were obtained from the monitoring wells at BH2, BH3 and MWA (in addition to one duplicate sample from that well) and submitted for analysis of VOCs, PHCs and PAHs. Concentrations of all test parameters were found to be non-detect, or, well below the MOE Table 3 standards.

Recommendations

It is our understanding that the subject site is to be redeveloped with a commercial/residential building. It is our recommendation that an environmental site remediation program, involving the removal of all contaminated soil (fill, including demolition debris) be completed concurrently with site redevelopment.

Any impacted soil and building demolition debris removed from the site during redevelopment will require disposal at an approved waste disposal facility. It is recommended that Paterson personnel be present onsite during the remediation program to direct excavation activities in the areas where impacted material has been identified or is expected to exist. It is recommended that confirmatory soil samples be collected upon completion of the soil remediation program to ensure that the site meets the MOE Table 3 Standards. Prior to the commencement of any site development activities, it is recommended that the groundwater monitoring wells be re-sampled to confirm the current groundwater quality.

7.0 STATEMENT OF LIMITATIONS

This Phase II - Environmental Site Assessment report has been prepared in general accordance with O.Reg. 153/04 as amended by O.Reg. 269/11, and meets the requirements of CSA Z769-00. The conclusions presented herein are based on information gathered from a limited sampling and testing program. The test results represent conditions at specific test locations at the time of the field program.

The client should be aware that any information pertaining to soils and all test hole logs are furnished as a matter of general information only and test hole descriptions or logs are not to be interpreted as descriptive of conditions at locations other than those of the test holes themselves.

Should any conditions be encountered at the subject site and/or historical information that differ from our findings, we request that we be notified immediately in order to allow for a reassessment.

This report was prepared for the sole use of Atlantis Investments Limited and Dickinson Wright LLP. Permission and notification from Atlantis Investments Limited, Dickinson Wright LLP 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.

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FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE3323-3 – TEST HOLE LOCATION PLAN

DRAWING PE3323-4 – GROUNDWATER CONTOUR PLAN

DRAWING PE3323-5 – ANALYTICAL TEST RESULTS PLAN

DRAWING PE3323-6 – CROSS-SECTION A-A’

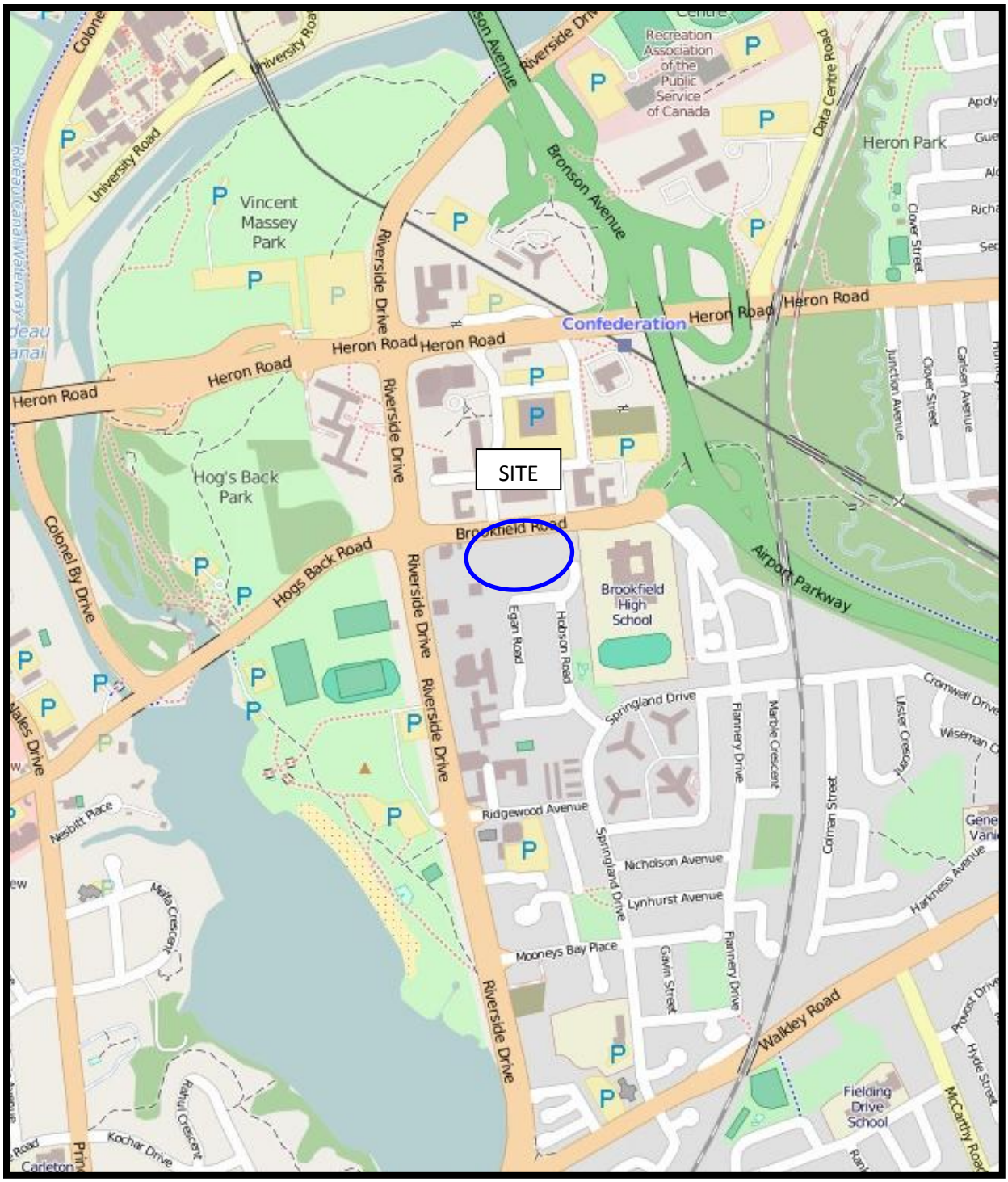
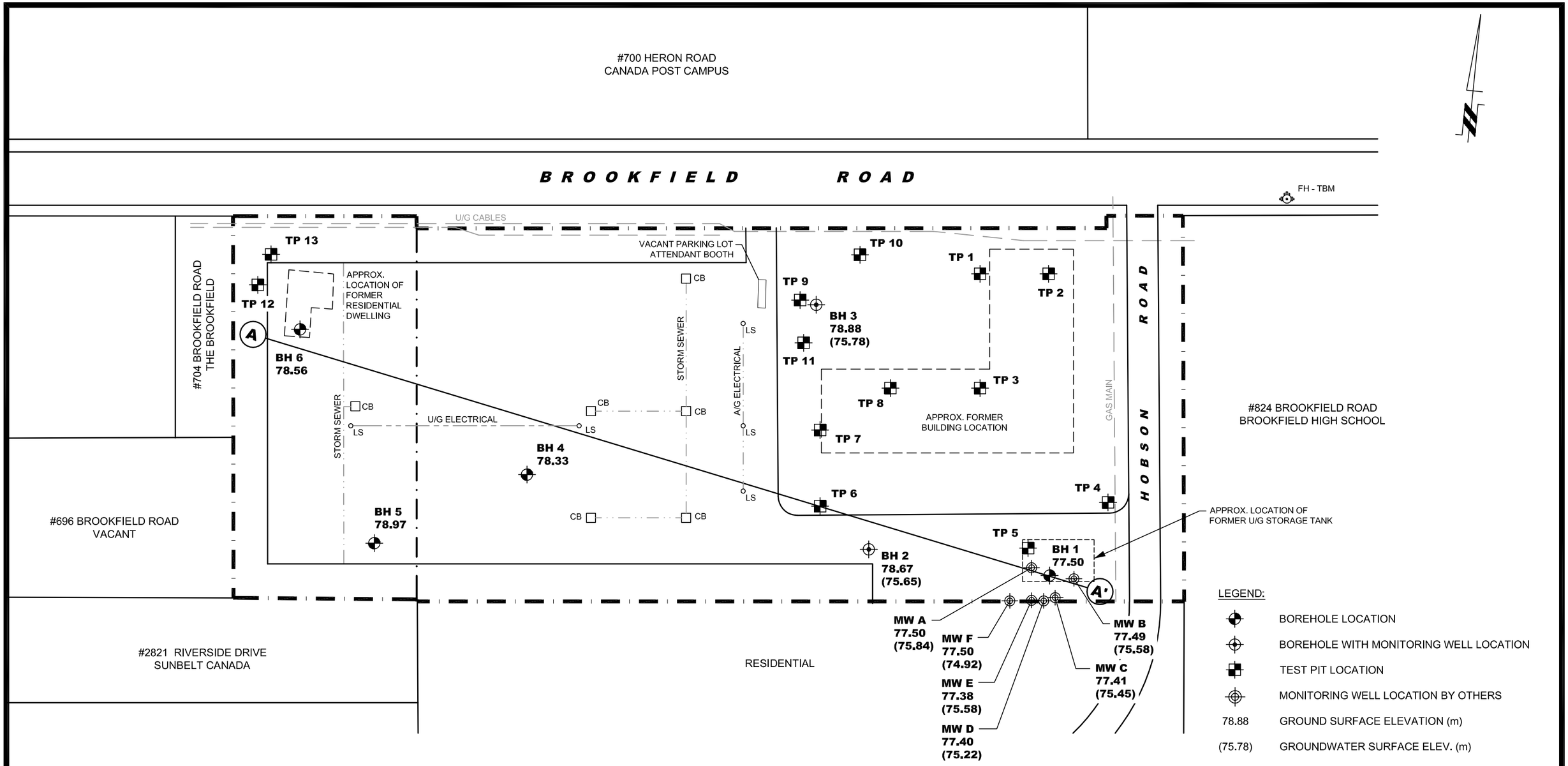


FIGURE 1

KEY PLAN



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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
716 AND 770 BROOKFIELD ROAD

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Drawn by:	Checked by:	Date:
MPG	MSD	08/2014
Scale: 1:1000		Drawing No.: PE3323-3
Report No.: PE3323-2		

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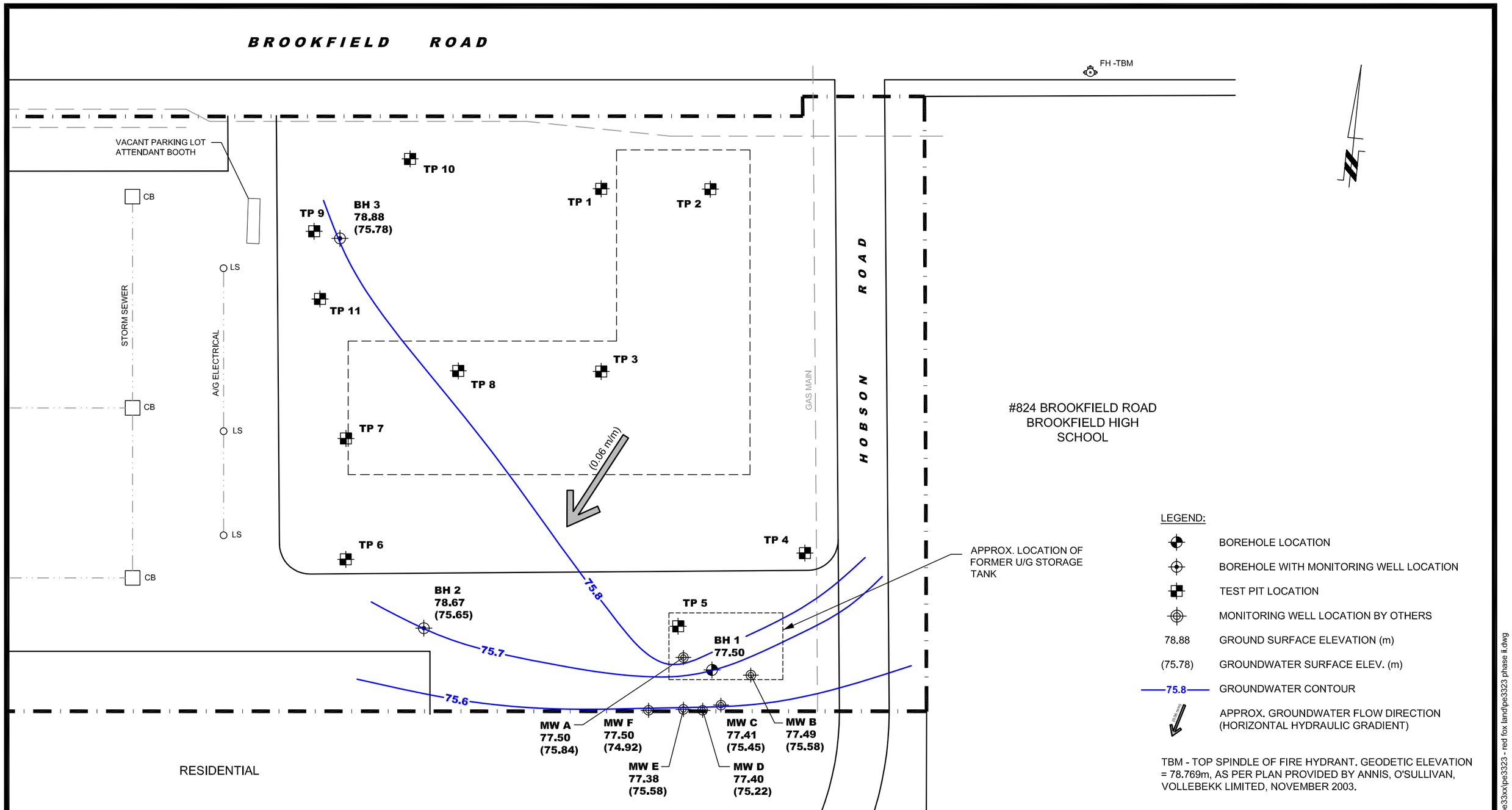

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
716 AND 770 BROOKFIELD ROAD

OTTAWA, ONTARIO

Title:

GROUNDWATER CONTOUR PLAN

Drawn by:	Checked by:	Date:
MPG	MSD	08/2014
Scale: 1:1000		Drawing No.: PE3323-4
Report No.: PE3323-2		

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TP13-G2 (1.0 m)	Result	MOE
SOIL		
Metals - complies with MOE Table 3		

TP12-G2 (0.5 m)	Result	MOE
SOIL		
Metals	µg/g	
Cobalt	23	22
Vanadium	90.2	86

BH3-SS3 (1.52 - 2.13 m)	Result	MOE
SOIL		
Metals - complies with MOE Table 3		
PHCs and BTEX - complies with MOE Table 3		
GROUNDWATER		
PHCs - complies with MOE Table 3		
PAH - complies with MOE Table 3		
VOC - complies with MOE Table 3		

TP1-G2 (0.4 m)	Result	MOE
SOIL		
Metals	µg/g	
Zinc	589	340

TP3-G1 (0.5 m)	Result	MOE
SOIL		
Metals	µg/g	
Antimony	8	7.5
Boron (total)	544	120
Zinc	438	340

BROOKFIELD ROAD

U/G CABLES

TP 13

TP 12

BH 6
78.56

#704 BROOKFIELD ROAD
THE BROOKFIELD

APPROX. LOCATION OF FORMER RESIDENTIAL DWELLING

VACANT PARKING LOT
ATTENDANT BOOTH

TP 10

TP 9

BH 3
78.88
(75.78)

TP 11

TP 1

TP 2

TP 8

TP 3

TP 7

APPROX. FORMER BUILDING LOCATION

TP 6

TP 4

TP 5

HOBSON ROAD

GAS MAIN

STORM SEWER

CB

LS

A/G ELECTRICAL

TP9-G3 (2.1 m)	Result	MOE
SOIL		
PHC	µg/g	
F1	73	55
F2	398	98
F2	2410	300
PAHs	µg/g	
1-Methylnaphthalene	5.48	0.99
2-Methylnaphthalene	5.77	0.99
Phenanthrene	9.71	6.2

BH 4
78.33

BH 5
78.97

BH 2
78.67
(75.65)

#696 BROOKFIELD ROAD
VACANT

TBM - TOP SPINDLE OF FIRE HYRANT. GEODETIC ELEVATION = 78.769m

MWA	Result	MOE
GROUNDWATER		
PHCs - complies with MOE Table 3		
PAH - complies with MOE Table 3		
VOC - complies with MOE Table 3		

TP4-G1 (0.7 m)	Result	MOE
SOIL		
Metals	µg/g	
Antimony	17.4	7.5
Boron (total)	215	120

BH1-SS4 (2.28 - 2.89 m)	Result	MOE
SOIL		
PHCs and BTEX - complies with MOE Table 3		

MW A
77.50
(75.84)

MW F
77.50
(74.92)

MW E
77.38
(75.58)

MW D
77.40
(75.22)

BH 1
77.50

MW C
77.41
(75.45)

MW B
77.49
(75.58)

BH5-AU1 (0 - 0.6 m)	Result	MOE
SOIL		
Metals - complies with MOE Table 3		
PHCs and BTEX - complies with MOE Table 3		

TP7-G2 (1.5 m)	Result	MOE
SOIL		
Metals - complies with MOE Table 3		

BH4-SS2 (0.76 - 1.37 m)	Result	MOE
SOIL		
Metals - complies with MOE Table 3		

BH2-GW1	Result	MOE
GROUNDWATER		
PHCs - complies with MOE Table 3		
PAH - complies with MOE Table 3		
VOC - complies with MOE Table 3		

Legend:
Soil Results in Compliance with MOE Standards
Soil Result Exceeds MOE Standards
Groundwater Results in Compliance with MOE Standards
Groundwater Result Exceeds MOE Standards

LEGEND:

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- TEST PIT LOCATION
- MONITORING WELL LOCATION BY OTHERS
- 78.88 GROUND SURFACE ELEVATION (m)
- (75.78) GROUNDWATER SURFACE ELEV. (m)

TBM - TOP SPINDLE OF FIRE HYDRANT. GEODETIC ELEVATION = 78.769m, AS PER PLAN PROVIDED BY ANNIS, O'SULLIVAN, VOLLEBEKK LIMITED, NOVEMBER 2003.

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consulting engineers

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NO.	REVISIONS	DATE	INITIAL

ATLANTIS INVESTMENTS LTD. c/o DICKINSON WRIGHT LLP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
716 AND 770 BROOKFIELD ROAD

OTTAWA, ONTARIO

Title:

ANALYTICAL TEST RESULTS PLAN

Drawn by:	Checked by:	Date:
MPG	MSD	08/2014
Scale: 1:1000		Drawing No.: PE3323-5
Report No.: PE3323-2		

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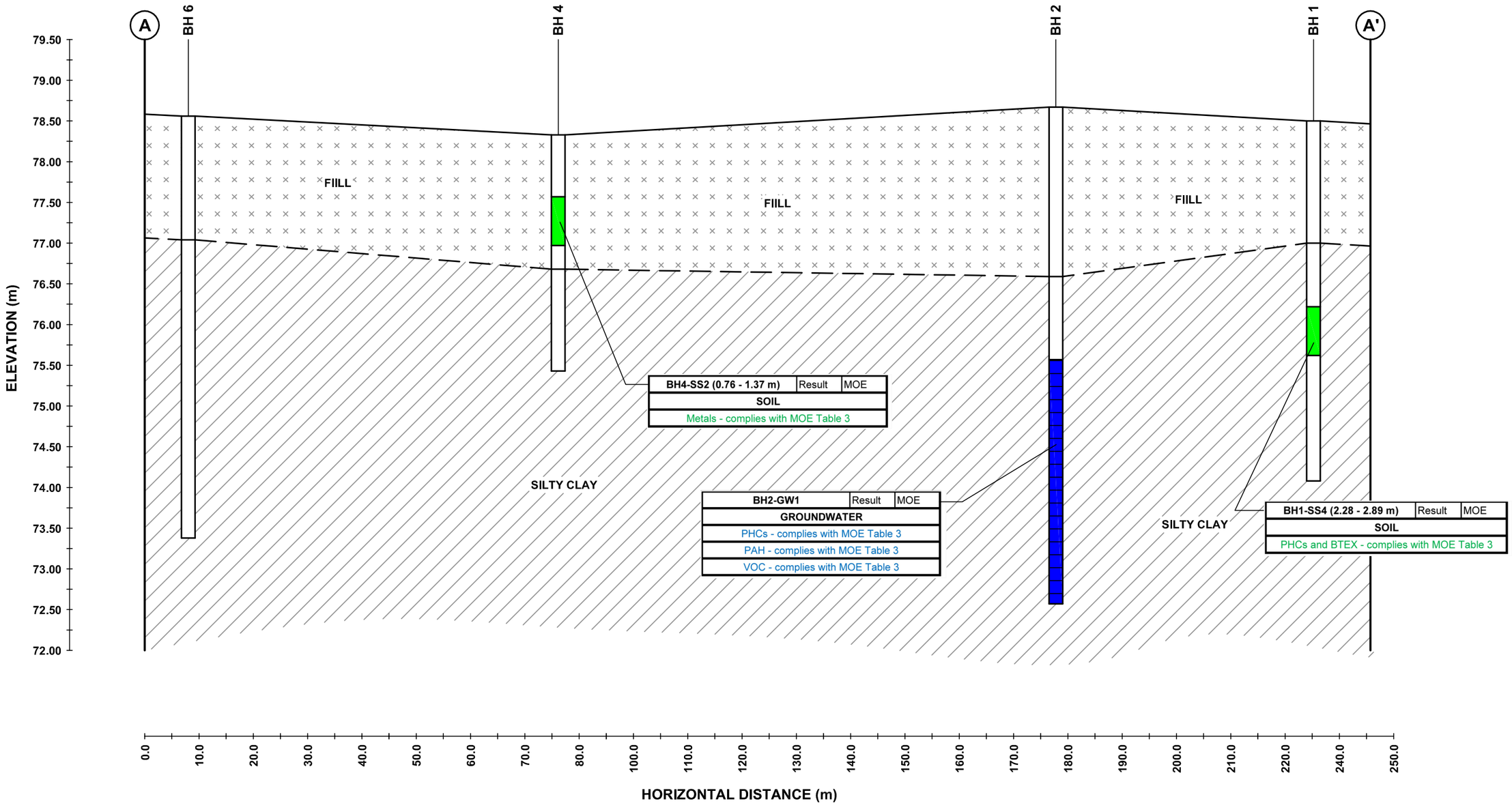

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
716 AND 770 BROOKFIELD ROAD

OTTAWA, ONTARIO

Title:

CROSS-SECTION A-A'

Drawn by:	Checked by:	Date:
MPG	MSD	08/2014
Scale: AS SHOWN		Drawing No.: PE3323-6
Report No.: PE3323-2		

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APPENDIX 1

SAMPLING AND ANALYSIS PLAN

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

LABORATORY CERTIFICATES OF ANALYSIS

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Services

Paterson Group Inc.

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Sampling and Analysis Plan

Parking Lot and Vacant Land
716 and 770 Brookfield Road
Ottawa, Ontario

Prepared For

Atlantis Investments Limited
c/o Dickinson Wright LLP

September 4 2014

Report: PE3323-SAP

Table of Contents

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Dickinson Wright LLP to conduct a Phase II Environmental Site Assessment (ESA) for the property located at 716 and 770 Brookfield Road, 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:

Testhole	Location & Rationale	Proposed Depth & Rationale
TP1 through TP13	Located within, and adjacent to, the footprints of the former office building and former residential dwelling, located on the subject property.	Excavated to depths limited to the fill material on-site and extended into native material where possible.
BH1	Located in southeast corner of the property. Drilled to assess soil conditions in the vicinity of a reported former underground storage tank.	Drilled into the native soils into groundwater table.
BH2	Located west of the reported former underground storage tank. Drilled to assess soil and groundwater quality. Groundwater monitoring well installed.	Drilled to intercept groundwater table.
BH3	Drilled to assess fill material as well as to assess an area of hydrocarbon impacted fill material encountered in TP9. Groundwater monitoring well installed.	Drilled to intercept groundwater table.
BH4	Drilled near centre of property, for general coverage and to assess fill previously identified.	Drilled into native soils.
BH5	Drilled near southern edge of property, for general coverage.	Drilled into native soils.
BH6	Located near northwest corner of property. Drilled within suspected footprint of former residential dwelling.	Drilled to intercept groundwater table.

Borehole locations are shown on the Test Hole Location Plan, and analytical test results are presented on the Analytical Test Results 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 or until bedrock is encountered. All soil samples will be retained, and samples will be selected for submission following a preliminary screening analysis. Boreholes BH2 and BH3 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 50 mm threaded sections of Schedule 40 PVC slotted well screen (1.5 m x 31.75 mm if installing in cored hole in bedrock or using direct-push rig)
- 1.5 m x 50 mm threaded sections of Schedule 40 PVC riser pipe (1.5 m x 31.75 mm 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.
- Where multi-parameter analyzers are used to measure field chemistry, they will be calibrated on an approximately monthly basis, according to frequency of use.

5.0 DATA QUALITY OBJECTIVES

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

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

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

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

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

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

These considerations are discussed in the body of the report.

6.0 PHYSICAL IMPEDIMENTS TO SAMPLING & ANALYSIS PLAN

Physical impediments to the Sampling and Analysis plan may include:

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

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

patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
770 Brookfield Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the south side of Brookfield Road, near the northeast corner of subject property. Geodetic elevation = 78.769m.

FILE NO. PE3323

REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** July 16, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	77.50
TOPSOIL		AU	1				
0.56							
FILL: Brown silty sand with clay		SS	2	67	14	1	76.50
1.50							
		SS	3	96	8	2	75.50
Stiff to firm, brown **SILTY CLAY,** trace sand							
- grey-brown by 2.3m depth		SS	4	100	3	3	74.50
- soft and grey by 3.0m depth		SS	5	100	1		
		SS	6	100	1	4	73.50
4.42							
End of Borehole							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
770 Brookfield Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the south side of Brookfield Road, near the northeast corner of subject property. Geodetic elevation = 78.769m.

FILE NO. PE3323

REMARKS

HOLE NO. BH 2

BORINGS BY CME 55 Power Auger **DATE** July 16, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	78.67
Asphaltic concrete 0.08							
FILL: Brown silty sand, some gravel		AU	1				
- some clay by 1.1m depth		SS	2	50	6	1	77.67
		SS	3	75	6	2	76.67
2.08							
Stiff to firm, brown **SILTY CLAY**		SS	4	92	8	3	75.67
- grey-brown by 3.0m depth		SS	5	83	5		
- soft to very soft and grey by 3.8m depth		SS	6	100	2	4	74.67
		SS	7	100	W	5	73.67
		SS	8	100	W	6	72.67
6.10							
End of Borehole							
(GWL @ 3.02m-July 24, 2014)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
770 Brookfield Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the south side of Brookfield Road, near the northeast corner of subject property. Geodetic elevation = 78.769m.

FILE NO. PE3323

REMARKS

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** July 16, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	78.88
		AU	1				
FILL: Brown silty sand, some gravel		SS	2	33	17	1	77.88
		SS	3	17	7		
2.08						2	76.88
Brown to dark brown **SILTY CLAY,** 2.23 some gravel, trace sand		SS	4	100	6		
						3	75.88
Firm, grey-brown **SILTY CLAY**		SS	5	100	6		
- soft and grey by 3.8m depth		SS	6	100	2	4	74.88
		SS	7	100	1	5	73.88
		SS	8	100	W		
6.10						6	72.88
Dynamic Cone Penetration Test commenced at 6.10m depth. Practical DCPT refusal at 22.10m depth							
(GWL @ 3.10m-July 24, 2014)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
770 Brookfield Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the south side of Brookfield Road, near the northeast corner of subject property. Geodetic elevation = 78.769m.

FILE NO. **PE3323**

REMARKS

HOLE NO. **BH 4**

BORINGS BY CME 55 Power Auger **DATE** July 16, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	78.33
Asphaltic concrete 0.13		AU	1				
FILL: Brown to dark brown silty sand with gravel		SS	2	83	22	1	77.33
1.65		SS	3	75	12	2	76.33
Stiff, brown **SILTY CLAY** - grey-brown by 2.2m depth		SS	4	83	5		
2.90							
End of Borehole							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)
○ **Lower Explosive Limit %**

20 40 60 80

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

Monitoring Well Construction

patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
770 Brookfield Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the south side of Brookfield Road, near the northeast corner of subject property. Geodetic elevation = 78.769m.

REMARKS

FILE NO. PE3323

HOLE NO. BH 5

BORINGS BY CME 55 Power Auger **DATE** July 16, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
Asphaltic concrete 0.10						0	78.97
FILL: Brown silty sand with gravel		AU	1				
0.66							
		SS	2	92	8	1	77.97
Firm to stiff, brown **SILTY CLAY,** trace sand							
		SS	3	100	11	2	76.97
2.13							
End of Borehole							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
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Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the south side of Brookfield Road, near the northeast corner of subject property. Geodetic elevation = 78.769m.

FILE NO. PE3323

REMARKS

HOLE NO. BH 6

BORINGS BY CME 55 Power Auger **DATE** July 16, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	78.56
Asphaltic concrete 0.10		AU	1				
FILL: Brown to dark brown silty sand with gravel		SS	2	33	10	1	77.56
1.52							
		SS	3	100	10	2	76.56
Stiff to firm, brown **SILTY CLAY** with sand		SS	4	100	5		
- grey-brown by 2.9m depth						3	75.56
		SS	5	100	3		
- grey by 3.8m depth		SS	6	100	2	4	74.56
		SS	7	100	3	5	73.56
5.18							
End of Borehole							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

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

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

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

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

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

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

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

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

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

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

CONSOLIDATION TEST

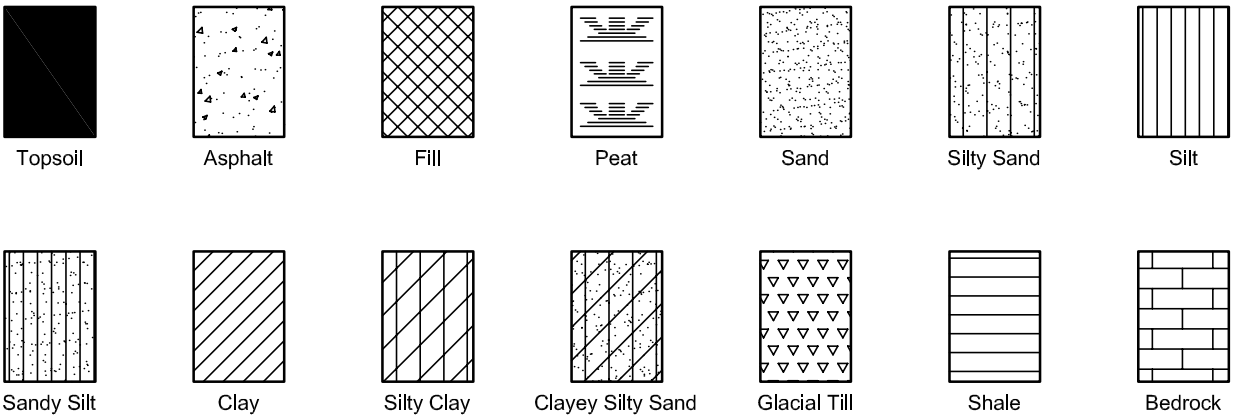
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

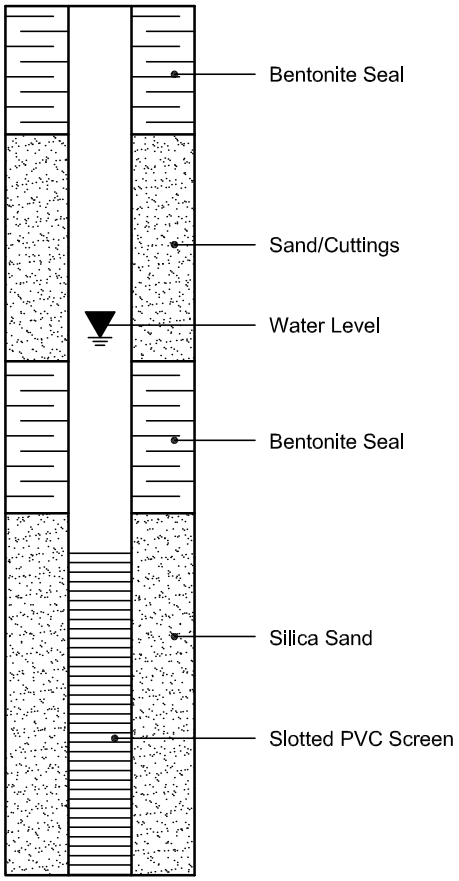
SYMBOLS AND TERMS (continued)

STRATA PLOT

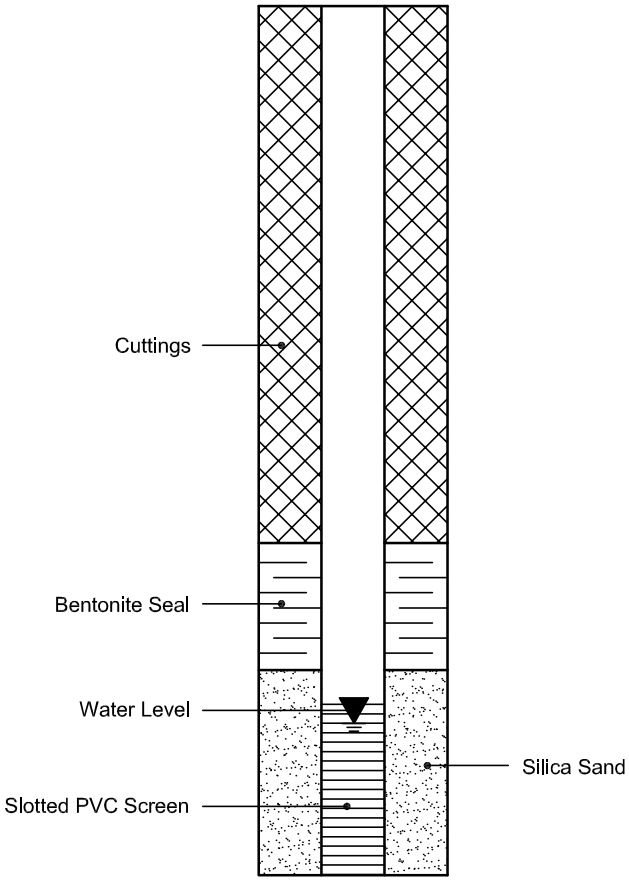


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



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Certificate of Analysis

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

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

Client PO: 16347
Project: PE3323
Custody: 16364

Report Date: 17-Jun-2014
Order Date: 12-Jun-2014
Revised Report **Order #: 1424254**

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

Paracel ID	Client ID
1424254-01	TP1-G2
1424254-02	TP3-G1
1424254-03	TP4-G1
1424254-04	TP7-G2
1424254-05	TP9-G3
1424254-06	TP12-G2
1424254-07	TP13-G2

Approved By: Mark Foto

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

Certificate of Analysis

Report Date: 17-Jun-2014
Order Date:12-Jun-2014

Client: **Paterson Group Consulting Engineers**
Client PO: 16347 Project Description: PE3323

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	14-Jun-14	15-Jun-14
MOE Metals by ICP-OES, soil Reg 153	based on MOE E3470, ICP-OES	16-Jun-14	16-Jun-14
PHC F1	CWS Tier 1 - P&T GC-FID	14-Jun-14	15-Jun-14
PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	13-Jun-14	16-Jun-14
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	13-Jun-14	16-Jun-14
Solids, %	Gravimetric, calculation	16-Jun-14	16-Jun-14

PARACEL LABORATORIES LTD.

Order #: 1424254

Certificate of Analysis

Report Date: 17-Jun-2014
Order Date:12-Jun-2014

Client: **Paterson Group Consulting Engineers**
Client PO: 16347

Project Description: PE3323

	Client ID:	TP1-G2	TP3-G1	TP4-G1	TP7-G2
	Sample Date:	11-Jun-14	11-Jun-14	11-Jun-14	11-Jun-14
	Sample ID:	1424254-01	1424254-02	1424254-03	1424254-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	85.6	79.7	85.5	85.6
Metals					
Antimony	1.0 ug/g dry	4.3	8.0	17.4	<1.0
Arsenic	1.0 ug/g dry	3.8	5.2	5.8	3.5
Barium	1.0 ug/g dry	98.9	115	86.0	71.4
Beryllium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Boron	1.0 ug/g dry	89.9	544	215	50.4
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	1.0 ug/g dry	23.1	21.1	30.3	15.5
Cobalt	1.0 ug/g dry	6.4	4.3	5.7	4.8
Copper	1.0 ug/g dry	43.8	34.4	23.0	18.3
Lead	1.0 ug/g dry	27.4	47.4	46.7	41.2
Molybdenum	1.0 ug/g dry	1.1	5.1	<1.0	<1.0
Nickel	1.0 ug/g dry	20.8	10.8	14.6	11.2
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Vanadium	1.0 ug/g dry	23.7	16.5	22.4	18.6
Zinc	1.0 ug/g dry	589	438	132	210

PARACEL LABORATORIES LTD.

Order #: 1424254

Certificate of Analysis

Report Date: 17-Jun-2014
Order Date:12-Jun-2014

Client: **Paterson Group Consulting Engineers**
Client PO: 16347

Project Description: PE3323

	Client ID:	TP9-G3	TP12-G2	TP13-G2	-
	Sample Date:	11-Jun-14	12-Jun-14	12-Jun-14	-
	Sample ID:	1424254-05	1424254-06	1424254-07	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	92.6	77.8	79.3	-
Metals					
Antimony	1.0 ug/g dry	-	2.5	<1.0	-
Arsenic	1.0 ug/g dry	-	<1.0	2.8	-
Barium	1.0 ug/g dry	-	372	324	-
Beryllium	1.0 ug/g dry	-	<1.0	<1.0	-
Boron	1.0 ug/g dry	-	5.2	4.2	-
Cadmium	0.5 ug/g dry	-	<0.5	<0.5	-
Chromium	1.0 ug/g dry	-	97.7	93.2	-
Cobalt	1.0 ug/g dry	-	23.0	15.8	-
Copper	1.0 ug/g dry	-	45.2	39.7	-
Lead	1.0 ug/g dry	-	11.1	10.7	-
Molybdenum	1.0 ug/g dry	-	<1.0	<1.0	-
Nickel	1.0 ug/g dry	-	51.5	45.1	-
Selenium	1.0 ug/g dry	-	<1.0	<1.0	-
Silver	0.5 ug/g dry	-	<0.5	<0.5	-
Thallium	1.0 ug/g dry	-	<1.0	<1.0	-
Uranium	1.0 ug/g dry	-	<1.0	<1.0	-
Vanadium	1.0 ug/g dry	-	90.2	75.5	-
Zinc	1.0 ug/g dry	-	101	93.1	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	-	-	-
Ethylbenzene	0.05 ug/g dry	0.06	-	-	-
Toluene	0.05 ug/g dry	<0.05	-	-	-
m,p-Xylenes	0.05 ug/g dry	0.07	-	-	-
o-Xylene	0.05 ug/g dry	0.11	-	-	-
Xylenes, total	0.05 ug/g dry	0.18	-	-	-
Toluene-d8	Surrogate	92.2%	-	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	73	-	-	-
F2 PHCs (C10-C16)	4 ug/g dry	398	-	-	-
F3 PHCs (C16-C34)	8 ug/g dry	2410	-	-	-
F4 PHCs (C34-C50)	6 ug/g dry	2180	-	-	-
Semi-Volatiles					

Certificate of Analysis

Report Date: 17-Jun-2014
Order Date:12-Jun-2014

Client: **Paterson Group Consulting Engineers**
Client PO: 16347

Project Description: PE3323

	Client ID:	TP9-G3	TP12-G2	TP13-G2	-
	Sample Date:	11-Jun-14	12-Jun-14	12-Jun-14	-
	Sample ID:	1424254-05	1424254-06	1424254-07	-
	MDL/Units	Soil	Soil	Soil	-
Acenaphthene	0.02 ug/g dry	<2.00 [1] [3]	-	-	-
Acenaphthylene	0.02 ug/g dry	<2.00 [1] [3]	-	-	-
Anthracene	0.02 ug/g dry	<2.00 [1] [3]	-	-	-
Benzo [a] anthracene	0.02 ug/g dry	<2.00 [1] [3]	-	-	-
Benzo [a] pyrene	0.02 ug/g dry	<2.00 [1] [3]	-	-	-
Benzo [b] fluoranthene	0.02 ug/g dry	<2.00 [1] [3]	-	-	-
Benzo [g,h,i] perylene	0.02 ug/g dry	<2.00 [1] [3]	-	-	-
Benzo [k] fluoranthene	0.02 ug/g dry	<2.00 [1] [3]	-	-	-
Chrysene	0.02 ug/g dry	<2.00 [1] [3]	-	-	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	<2.00 [1] [3]	-	-	-
Fluoranthene	0.02 ug/g dry	<2.00 [1] [3]	-	-	-
Fluorene	0.02 ug/g dry	<2.00 [1] [3]	-	-	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	<2.00 [1] [3]	-	-	-
1-Methylnaphthalene	0.02 ug/g dry	5.48 [3]	-	-	-
2-Methylnaphthalene	0.02 ug/g dry	5.77 [3]	-	-	-
Methylnaphthalene (1&2)	0.04 ug/g dry	11.3 [3]	-	-	-
Naphthalene	0.01 ug/g dry	<1.00 [1] [3]	-	-	-
Phenanthrene	0.02 ug/g dry	9.71 [3]	-	-	-
Pyrene	0.02 ug/g dry	<2.00 [1] [3]	-	-	-

Certificate of Analysis

Report Date: 17-Jun-2014
Order Date:12-Jun-2014

Client: **Paterson Group Consulting Engineers**
Client PO: 16347 Project Description: PE3323

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	1.0	ug/g						
Boron	ND	1.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium	ND	1.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	1.0	ug/g						
Lead	ND	1.0	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	1.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.5	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	1.0	ug/g						
Zinc	ND	1.0	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	*0.688*		*ug/g*		*51.6*	*50-140*			
Surrogate: Terphenyl-d14	*1.17*		*ug/g*		*88.1*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*7.52*		*ug/g*		*94.0*	*50-140*			

Certificate of Analysis

Report Date: 17-Jun-2014
Order Date:12-Jun-2014

Client: **Paterson Group Consulting Engineers**
Client PO: 16347 Project Description: PE3323

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	325	7	ug/g dry	305			6.2	40	
Metals									
Antimony	ND	1.0	ug/g dry	ND				30	
Arsenic	8.86	1.0	ug/g dry	9.94			11.4	30	
Barium	258	10.0	ug/g dry	253			2.0	30	
Beryllium	ND	1.0	ug/g dry	ND			0.0	30	
Boron	5.78	1.0	ug/g dry	5.13			12.0	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium	18.8	1.0	ug/g dry	19.5			3.3	30	
Cobalt	8.00	1.0	ug/g dry	8.53			6.4	30	
Copper	60.7	1.0	ug/g dry	65.6			7.6	30	
Lead	264	10.0	ug/g dry	257			2.9	30	
Molybdenum	ND	1.0	ug/g dry	ND			0.0	30	
Nickel	16.6	1.0	ug/g dry	17.9			7.4	30	
Selenium	ND	1.0	ug/g dry	ND				30	
Silver	ND	0.5	ug/g dry	ND			0.0	30	
Thallium	ND	1.0	ug/g dry	ND				30	
Uranium	ND	1.0	ug/g dry	ND				30	
Vanadium	24.1	1.0	ug/g dry	25.8			7.0	30	
Zinc	125	1.0	ug/g dry	133			6.2	30	
Physical Characteristics									
% Solids	71.4	0.1	% by Wt.	70.0			2.0	25	
Semi-Volatiles									
Acenaphthene	0.020	0.02	ug/g dry	ND			0.0	40	
Acenaphthylene	ND	0.02	ug/g dry	ND				40	
Anthracene	ND	0.02	ug/g dry	ND				40	
Benzo [a] anthracene	0.080	0.02	ug/g dry	0.022			115.0	40	QR-04
Benzo [a] pyrene	0.106	0.02	ug/g dry	0.032			107.0	40	QR-04
Benzo [b] fluoranthene	0.076	0.02	ug/g dry	ND			0.0	40	
Benzo [g,h,i] perylene	0.067	0.02	ug/g dry	ND			0.0	40	
Benzo [k] fluoranthene	0.072	0.02	ug/g dry	ND			0.0	40	
Chrysene	0.118	0.02	ug/g dry	ND			0.0	40	
Dibenzo [a,h] anthracene	ND	0.02	ug/g dry	ND				40	
Fluoranthene	0.191	0.02	ug/g dry	0.025			154.0	40	QR-04
Fluorene	ND	0.02	ug/g dry	ND				40	
Indeno [1,2,3-cd] pyrene	0.059	0.02	ug/g dry	ND			0.0	40	
1-Methylnaphthalene	ND	0.02	ug/g dry	ND				40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND				40	
Naphthalene	0.017	0.01	ug/g dry	ND			0.0	40	
Phenanthrene	0.195	0.02	ug/g dry	0.032			144.0	40	QR-04
Pyrene	0.190	0.02	ug/g dry	0.027			151.0	40	QR-04
Surrogate: 2-Fluorobiphenyl	*0.770*		*ug/g dry*	*ND*	*51.7*	*50-140*			
Surrogate: Terphenyl-d14	*0.749*		*ug/g dry*	*ND*	*50.3*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*5.82*		*ug/g dry*	*ND*	*53.7*	*50-140*			

Certificate of Analysis

Report Date: 17-Jun-2014
Order Date:12-Jun-2014

Client: **Paterson Group Consulting Engineers**
Client PO: 16347 Project Description: PE3323

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	192	7	ug/g	ND	96.2	80-120			
F2 PHCs (C10-C16)	106	4	ug/g	ND	118	80-120			
F3 PHCs (C16-C34)	156	8	ug/g	ND	83.9	80-120			
F4 PHCs (C34-C50)	112	6	ug/g	ND	90.3	80-120			
Metals									
Antimony	297		ug/L	ND	119	70-130			
Arsenic	448		ug/L	199	99.8	70-130			
Barium	281		ug/L	ND	112	70-130			
Beryllium	258		ug/L	ND	103	70-130			
Boron	360		ug/L	103	103	70-130			
Cadmium	261		ug/L	7.53	101	70-130			
Chromium	624		ug/L	389	94.0	70-130			
Cobalt	407		ug/L	171	94.8	70-130			
Copper	1550		ug/L	1310	94.1	70-130			
Lead	257		ug/L	ND	103	70-130			
Molybdenum	259		ug/L	15.4	97.3	70-130			
Nickel	586		ug/L	358	91.0	70-130			
Selenium	228		ug/L	ND	91.0	70-130			
Silver	245		ug/L	6.41	95.5	70-130			
Thallium	189		ug/L	ND	75.8	70-130			
Uranium	229		ug/L	ND	91.7	70-130			
Vanadium	747		ug/L	516	92.3	70-130			
Zinc	249		ug/L	ND	99.5	70-130			
Semi-Volatiles									
Acenaphthene	0.109	0.02	ug/g	ND	65.1	50-140			
Acenaphthylene	0.132	0.02	ug/g	ND	78.9	50-140			
Anthracene	0.136	0.02	ug/g	ND	81.6	50-140			
Benzo [a] anthracene	0.152	0.02	ug/g	ND	91.2	50-140			
Benzo [a] pyrene	0.131	0.02	ug/g	ND	78.4	50-140			
Benzo [b] fluoranthene	0.107	0.02	ug/g	ND	64.4	50-140			
Benzo [g,h,i] perylene	0.100	0.02	ug/g	ND	59.7	50-140			
Benzo [k] fluoranthene	0.098	0.02	ug/g	ND	58.8	50-140			
Chrysene	0.132	0.02	ug/g	ND	78.9	50-140			
Dibenzo [a,h] anthracene	0.119	0.02	ug/g	ND	71.2	50-140			
Fluoranthene	0.096	0.02	ug/g	ND	57.8	50-140			
Fluorene	0.115	0.02	ug/g	ND	69.2	50-140			
Indeno [1,2,3-cd] pyrene	0.102	0.02	ug/g	ND	61.2	50-140			
1-Methylnaphthalene	0.100	0.02	ug/g	ND	59.9	50-140			
2-Methylnaphthalene	0.100	0.02	ug/g	ND	60.3	50-140			
Naphthalene	0.093	0.01	ug/g	ND	55.6	50-140			
Phenanthrene	0.130	0.02	ug/g	ND	78.2	50-140			
Pyrene	0.117	0.02	ug/g	ND	70.2	50-140			
Surrogate: 2-Fluorobiphenyl	*0.667*		*ug/g*		*50.0*	*50-140*			
Volatiles									
Benzene	3.32	0.02	ug/g	ND	83.0	60-130			
Ethylbenzene	4.06	0.05	ug/g	ND	102	60-130			
Toluene	3.87	0.05	ug/g	ND	96.6	60-130			
m,p-Xylenes	7.95	0.05	ug/g	ND	99.3	60-130			

Certificate of Analysis

Report Date: 17-Jun-2014
Order Date:12-Jun-2014

Client: **Paterson Group Consulting Engineers**
Client PO: 16347 Project Description: PE3323

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
o-Xylene	3.93	0.05	ug/g	ND	98.3	60-130			

Certificate of Analysis

Report Date: 17-Jun-2014
Order Date:12-Jun-2014

Client: **Paterson Group Consulting Engineers**
Client PO: 16347 Project Description: PE3323

Qualifier Notes:

Sample Qualifiers :

1 : Raised reporting limits due to elevated instrument background.

3 : The surrogate recovery for this sample is not available due to sample dilution required from high analyte concentration and/or matrix interference's.

QC Qualifiers :

QR-04 : Duplicate results exceeds RPD limits due to non-homogeneous matrix.

Sample Data Revisions

None

Work Order Revisions / Comments:

Revision 1 - this report includes an updated client Project reference number.

Other Report Notes:

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

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

CCME PHC additional information:

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

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Chain of Custody (Lab Use Only)

Nº 16364

Page 1 of 1

Client Name: PATERSON GROUP	Project Reference: PE 5823	TAT: [ ] Regular [ ] 3 Day	
Contact Name: ADRIAN MENYHART	Quote #	[~~1~~ 2 Day] [ ] 1 Day	
Address: 154 COLONNADE RD. S.	PO # 16347	Date Required:	
Telephone: 613-226-7381	Email Address: amenyhart@patersongroup.ca		

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

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

Paracel Order Number: 1424254

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Required Analyses: METALS ICP	PAH	BTEX/PHC F1							
1	TP1-G2	S		1	JUNE 11'14	10 AM	✓								ZIPLOCK	BAG
2	TP3-G1	″		″	″	″	✓								↓	″
3	TP4-G1	″		″	″	″	✓									″
4	TP7-G2	″		″	″	″	✓									″
5	TP9-G3	″		2	″	″		✓	✓						glass+vial	″
6	TP12-G2	″		1	June 12/14	4pm	X								ZIPLOCK BAG	″
7	TP13-G2	″		1	″	″	X								↓	″
8																
9																
10																

Comments:

Method of Delivery: Paracel Carrier

Relinquished By (Sign):	Received by Driver/Depot: TT LOUISE	Received at Lab: SUNEEPORN DOKMAI	Verified By: MJ
Relinquished By (Print):	Date/Time: 12/06/14 4:35PM	Date/Time: JUN 13 2014 12:10	Date/Time: June 13/14 12:22
Date/Time: JUNE 12 2014.	Temperature: _____ °C	Temperature: 14.3 °C	pH Verified [ ] By: N/A

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Certificate of Analysis

Paterson Group Consulting Engineers

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

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

Client PO: 16473
Project: PE3323
Custody: 16359

Report Date: 23-Jul-2014
Order Date: 17-Jul-2014
Order #: 1429285

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

Paracel ID	Client ID
1429285-01	BH1-SS4
1429285-02	BH3-SS3
1429285-03	BH4-SS2
1429285-04	BH5-AU1

Approved By: Mark Foto

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

Certificate of Analysis

Report Date: 23-Jul-2014
Order Date:17-Jul-2014

Client: **Paterson Group Consulting Engineers**
Client PO: 16473 Project Description: PE3323

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Boron, available	MOE (HWE), EPA 200.7 - ICP-OES	21-Jul-14	21-Jul-14
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	21-Jul-14	22-Jul-14
Chromium, hexavalent	MOE E3056 - Extraction, colourimetric	18-Jul-14	21-Jul-14
Mercury	EPA 7471B - CVAA, digestion	21-Jul-14	21-Jul-14
MOE Metals by ICP-OES, soil Reg 153	based on MOE E3470, ICP-OES	21-Jul-14	21-Jul-14
PHC F1	CWS Tier 1 - P&T GC-FID	21-Jul-14	22-Jul-14
PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	21-Jul-14	21-Jul-14
Solids, %	Gravimetric, calculation	21-Jul-14	21-Jul-14

Certificate of Analysis

Report Date: 23-Jul-2014
Order Date:17-Jul-2014

Client: **Paterson Group Consulting Engineers**
Client PO: 16473

Project Description: PE3323

	Client ID:	BH1-SS4	BH3-SS3	BH4-SS2	BH5-AU1
	Sample Date:	16-Jul-14	16-Jul-14	16-Jul-14	16-Jul-14
	Sample ID:	1429285-01	1429285-02	1429285-03	1429285-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	65.7	81.4	89.6	89.6
Metals					
Antimony	1.0 ug/g dry	-	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	-	3.3	7.9	3.7
Barium	1.0 ug/g dry	-	165	109	148
Beryllium	1.0 ug/g dry	-	<1.0	<1.0	<1.0
Boron	1.0 ug/g dry	-	7.4	6.7	6.2
Boron, available	0.5 ug/g dry	-	0.9	0.6	<0.5
Cadmium	0.5 ug/g dry	-	<0.5	<0.5	<0.5
Chromium	1.0 ug/g dry	-	55.4	23.1	32.7
Chromium (VI)	0.2 ug/g dry	-	<0.2	<0.2	<0.2
Cobalt	1.0 ug/g dry	-	10.8	9.5	8.5
Copper	1.0 ug/g dry	-	33.7	21.9	20.6
Lead	1.0 ug/g dry	-	11.6	16.2	30.5
Mercury	0.1 ug/g dry	-	<0.1	<0.1	<0.1
Molybdenum	1.0 ug/g dry	-	<1.0	1.1	1.3
Nickel	1.0 ug/g dry	-	28.8	18.9	20.0
Selenium	1.0 ug/g dry	-	<1.0	<1.0	<1.0
Silver	0.5 ug/g dry	-	<0.5	<0.5	<0.5
Thallium	1.0 ug/g dry	-	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	-	<1.0	<1.0	<1.0
Vanadium	1.0 ug/g dry	-	51.4	30.6	36.3
Zinc	1.0 ug/g dry	-	65.2	45.1	54.3
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	-	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	-	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	-	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	-	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	-	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	-	<0.05
Toluene-d8	Surrogate	99.2%	103%	-	102%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	-	<7
F2 PHCs (C10-C16)	4 ug/g dry	65	<4	-	<4

Certificate of Analysis

Report Date: 23-Jul-2014
Order Date:17-Jul-2014

Client: **Paterson Group Consulting Engineers**
Client PO: 16473

Project Description: PE3323

	Client ID:	BH1-SS4	BH3-SS3	BH4-SS2	BH5-AU1
	Sample Date:	16-Jul-14	16-Jul-14	16-Jul-14	16-Jul-14
	Sample ID:	1429285-01	1429285-02	1429285-03	1429285-04
	MDL/Units	Soil	Soil	Soil	Soil
F3 PHCs (C16-C34)	8 ug/g dry	23	22	-	41
F4 PHCs (C34-C50)	6 ug/g dry	<6	13	-	49

Certificate of Analysis

Report Date: 23-Jul-2014
Order Date:17-Jul-2014

Client: **Paterson Group Consulting Engineers**
Client PO: 16473 Project Description: PE3323

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	1.0	ug/g						
Boron, available	ND	0.5	ug/g						
Boron	ND	1.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	1.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	1.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	1.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.5	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	1.0	ug/g						
Zinc	ND	1.0	ug/g						
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*7.62*		*ug/g*		*95.3*	*50-140*			

Certificate of Analysis

Report Date: 23-Jul-2014
Order Date:17-Jul-2014

Client: **Paterson Group Consulting Engineers**
Client PO: 16473 Project Description: PE3323

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	35	8	ug/g dry	29			18.9	30	
F4 PHCs (C34-C50)	26	6	ug/g dry	24			10.8	30	
Metals									
Antimony	ND	1.0	ug/g dry	ND				30	
Arsenic	ND	1.0	ug/g dry	ND				30	
Barium	5.35	1.0	ug/g dry	5.52			3.1	30	
Beryllium	ND	1.0	ug/g dry	ND			0.0	30	
Boron, available	1.51	0.5	ug/g dry	1.27			17.7	35	
Boron	1.94	1.0	ug/g dry	1.88			2.8	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	2.59	1.0	ug/g dry	2.67			3.2	30	
Cobalt	1.46	1.0	ug/g dry	1.46			0.1	30	
Copper	1.44	1.0	ug/g dry	1.58			9.1	30	
Lead	2.52	1.0	ug/g dry	2.41			4.8	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	35	
Molybdenum	ND	1.0	ug/g dry	ND			0.0	30	
Nickel	2.94	1.0	ug/g dry	3.10			5.3	30	
Selenium	ND	1.0	ug/g dry	ND				30	
Silver	ND	0.5	ug/g dry	ND			0.0	30	
Thallium	ND	1.0	ug/g dry	ND				30	
Uranium	ND	1.0	ug/g dry	ND				30	
Vanadium	5.48	1.0	ug/g dry	6.26			13.2	30	
Zinc	5.95	1.0	ug/g dry	5.94			0.3	30	
Physical Characteristics									
% Solids	92.6	0.1	% by Wt.	91.5			1.2	25	

Certificate of Analysis

Report Date: 23-Jul-2014
Order Date:17-Jul-2014

Client: **Paterson Group Consulting Engineers**
Client PO: 16473 Project Description: PE3323

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	195	7	ug/g	ND	97.7	80-120			
F2 PHCs (C10-C16)	84	4	ug/g	ND	84.4	60-140			
F3 PHCs (C16-C34)	273	8	ug/g	29	118	60-140			
F4 PHCs (C34-C50)	204	6	ug/g	24	131	60-140			
Metals									
Antimony	288		ug/L	ND	115	70-130			
Arsenic	284		ug/L	ND	114	70-130			
Barium	356		ug/L	110	98.2	70-130			
Beryllium	248		ug/L	0.91	99.0	70-130			
Boron, available	5.32	0.5	ug/g	1.27	81.1	70-122			
Boron	283		ug/L	37.7	98.0	70-130			
Cadmium	246		ug/L	0.52	98.1	70-130			
Chromium (VI)	4.7	0.2	ug/g	ND	94.0	70-130			
Chromium	278		ug/L	53.4	89.9	70-130			
Cobalt	251		ug/L	29.3	88.6	70-130			
Copper	299		ug/L	31.5	107	70-130			
Lead	299		ug/L	48.1	100	70-130			
Mercury	1.43	0.1	ug/g	ND	95.4	72-128			
Molybdenum	243		ug/L	0.78	97.0	70-130			
Nickel	286		ug/L	62.0	89.7	70-130			
Selenium	237		ug/L	ND	94.8	70-130			
Silver	242		ug/L	ND	96.9	70-130			
Thallium	240		ug/L	ND	96.2	70-130			
Uranium	249		ug/L	ND	99.6	70-130			
Vanadium	356		ug/L	125	92.2	70-130			
Zinc	332		ug/L	119	85.2	70-130			
Volatiles									
Benzene	3.89	0.02	ug/g	ND	97.2	60-130			
Ethylbenzene	3.67	0.05	ug/g	ND	91.7	60-130			
Toluene	3.50	0.05	ug/g	ND	87.4	60-130			
m,p-Xylenes	7.14	0.05	ug/g	ND	89.3	60-130			
o-Xylene	3.64	0.05	ug/g	ND	91.0	60-130			
Surrogate: Toluene-d8	*7.90*		*ug/g*		*98.8*	*50-140*			

Certificate of Analysis

Report Date: 23-Jul-2014
Order Date:17-Jul-2014

Client: **Paterson Group Consulting Engineers**
Client PO: 16473 Project Description: PE3323

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

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Page 1 of 1

Client Name: PATERSON GROUP	Project Reference: PE3323	TAT: [✓] Regular	[ ] 3 Day
Contact Name: ADRIAN MENYHART	Quote #	[ ] 2 Day	[ ] 1 Day
Address: 154 COLONNADE RD. S.	PO # 16473	Date Required:	
Telephone: 613-226-7381	Email Address: amenyhart@patersongroup.ca		

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

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

Paracel Order Number: 1429285

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	PHC F1-F4	BTEX	Metals (full) M&E + Boron						
1	BH1-SS3	S		2		July 16'14	✓	✓							
2	BH3-SS3	S		2			✓	✓	✓						
3	BH4-SS2	S		1					✓						
4	~~BH5-SS~~ BH5-AV1	S		2			✓	✓	✓						
5															
6															
7															
8															
9															
10															

(should be BH1-SS4 per Adrian) -myc

jars read BH1-SS4 -myc

-120ml + 1vial -

-120ml -

-120ml + 1vial -

Comments: * received extra sample: BH2-SS2 → put on hold per Adrian. -myc

Method of Delivery: Paracel Courier

Relinquished By (Sign):	Received by Driver/Depot: M. Blouse	Received at Lab: SUNEETA PORN DOKMAI	Verified By: MC
Relinquished By (Print):	Date/Time: 17/07/14 3:50 PM	Date/Time: JUL 17, 2014 05:18	Date/Time: July 18/14 10:39
Date/Time: JULY 17 2014.	Temperature: ____ °C	Temperature: 19.8 °C	pH Verified [ ] By: N/A

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Certificate of Analysis

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

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

Client PO: 16501
Project: PE3323
Custody: 99252

Report Date: 29-Jul-2014
Order Date: 24-Jul-2014
Order #: 1430276

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

Paracel ID	Client ID
1430276-01	MW2-GW1
1430276-02	MW3-GW1
1430276-03	MWA-GW1
1430276-04	DUP-1

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 29-Jul-2014
Order Date:24-Jul-2014

Client: **Paterson Group Consulting Engineers**
Client PO: 16501 Project Description: PE3323

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHC F1	CWS Tier 1 - P&T GC-FID	25-Jul-14	25-Jul-14
PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	28-Jul-14	29-Jul-14
REG 153 - VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	25-Jul-14	25-Jul-14
REG 153: PAHs by GC-MS	EPA 625 - GC-MS, extraction	25-Jul-14	26-Jul-14

Certificate of Analysis

Report Date: 29-Jul-2014
Order Date:24-Jul-2014

Client: **Paterson Group Consulting Engineers**
Client PO: 16501

Project Description: PE3323

	Client ID:	MW2-GW1	MW3-GW1	MWA-GW1	DUP-1
	Sample Date:	24-Jul-14	24-Jul-14	24-Jul-14	24-Jul-14
	Sample ID:	1430276-01	1430276-02	1430276-03	1430276-04
	MDL/Units	Water	Water	Water	Water
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Chloroform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	171	182
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylene dibromide (dibromoethan	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	<2.0
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5

Certificate of Analysis

Report Date: 29-Jul-2014
Order Date:24-Jul-2014

Client: **Paterson Group Consulting Engineers**
Client PO: 16501

Project Description: PE3323

	Client ID:	MW2-GW1	MW3-GW1	MWA-GW1	DUP-1
	Sample Date:	24-Jul-14	24-Jul-14	24-Jul-14	24-Jul-14
	Sample ID:	1430276-01	1430276-02	1430276-03	1430276-04
	MDL/Units	Water	Water	Water	Water
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
4-Bromofluorobenzene	Surrogate	115%	115%	122%	116%
Dibromofluoromethane	Surrogate	102%	97.8%	96.3%	101%
Toluene-d8	Surrogate	87.8%	88.3%	86.3%	87.0%
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	<25	-
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	-
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	-
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	-
F1 + F2 PHCs	125 ug/L	<125	<125	<125	-
F3 + F4 PHCs	200 ug/L	<200	<200	<200	-
Semi-Volatiles					
Acenaphthene	0.05 ug/L	0.18	<0.05	<0.05	-
Acenaphthylene	0.05 ug/L	<0.05	<0.05	<0.05	-
Anthracene	0.01 ug/L	<0.01	<0.01	<0.01	-
Benzo [a] anthracene	0.01 ug/L	<0.01	<0.01	<0.01	-
Benzo [a] pyrene	0.01 ug/L	<0.01	<0.01	<0.01	-
Benzo [b] fluoranthene	0.05 ug/L	<0.05	<0.05	<0.05	-
Benzo [g,h,i] perylene	0.05 ug/L	<0.05	<0.05	<0.05	-
Benzo [k] fluoranthene	0.05 ug/L	<0.05	<0.05	<0.05	-
Chrysene	0.05 ug/L	<0.05	<0.05	<0.05	-
Dibenzo [a,h] anthracene	0.05 ug/L	<0.05	<0.05	<0.05	-
Fluoranthene	0.01 ug/L	<0.01	0.02	<0.01	-
Fluorene	0.05 ug/L	<0.05	<0.05	<0.05	-
Indeno [1,2,3-cd] pyrene	0.05 ug/L	<0.05	<0.05	<0.05	-
1-Methylnaphthalene	0.05 ug/L	<0.05	<0.05	<0.05	-

Certificate of Analysis

Report Date: 29-Jul-2014
Order Date:24-Jul-2014

Client: **Paterson Group Consulting Engineers**
Client PO: 16501

Project Description: PE3323

	Client ID:	MW2-GW1	MW3-GW1	MWA-GW1	DUP-1
	Sample Date:	24-Jul-14	24-Jul-14	24-Jul-14	24-Jul-14
	Sample ID:	1430276-01	1430276-02	1430276-03	1430276-04
	MDL/Units	Water	Water	Water	Water
2-Methylnaphthalene	0.05 ug/L	0.06	<0.05	<0.05	-
Methylnaphthalene (1&2)	0.10 ug/L	<0.10	<0.10	<0.10	-
Naphthalene	0.05 ug/L	<0.05	<0.05	<0.05	-
Phenanthrene	0.05 ug/L	0.21	0.18	<0.05	-
Pyrene	0.01 ug/L	<0.01	0.01	<0.01	-
2-Fluorobiphenyl	Surrogate	84.7%	88.9%	89.0%	-
Terphenyl-d14	Surrogate	67.5%	69.0%	70.7%	-

Certificate of Analysis

Report Date: 29-Jul-2014
Order Date:24-Jul-2014

Client: **Paterson Group Consulting Engineers**
Client PO: 16501 Project Description: PE3323

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						
Semi-Volatiles									
Acenaphthene	ND	0.05	ug/L						
Acenaphthylene	ND	0.05	ug/L						
Anthracene	ND	0.01	ug/L						
Benzo [a] anthracene	ND	0.01	ug/L						
Benzo [a] pyrene	ND	0.01	ug/L						
Benzo [b] fluoranthene	ND	0.05	ug/L						
Benzo [g,h,i] perylene	ND	0.05	ug/L						
Benzo [k] fluoranthene	ND	0.05	ug/L						
Chrysene	ND	0.05	ug/L						
Dibenzo [a,h] anthracene	ND	0.05	ug/L						
Fluoranthene	ND	0.01	ug/L						
Fluorene	ND	0.05	ug/L						
Indeno [1,2,3-cd] pyrene	ND	0.05	ug/L						
1-Methylnaphthalene	ND	0.05	ug/L						
2-Methylnaphthalene	ND	0.05	ug/L						
Methylnaphthalene (1&2)	ND	0.10	ug/L						
Naphthalene	ND	0.05	ug/L						
Phenanthrene	ND	0.05	ug/L						
Pyrene	ND	0.01	ug/L						
Surrogate: 2-Fluorobiphenyl	*14.0*		*ug/L*		*70.1*	*50-140*			
Surrogate: Terphenyl-d14	*14.0*		*ug/L*		*70.1*	*50-140*			
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane,	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						

Certificate of Analysis

Report Date: 29-Jul-2014
Order Date:24-Jul-2014

Client: **Paterson Group Consulting Engineers**
Client PO: 16501 Project Description: PE3323

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*37.6*		*ug/L*		*118*	*50-140*			
Surrogate: Dibromofluoromethane	*20.2*		*ug/L*		*63.2*	*50-140*			
Surrogate: Toluene-d8	*32.5*		*ug/L*		*102*	*50-140*			

Certificate of Analysis

Report Date: 29-Jul-2014
Order Date:24-Jul-2014

Client: **Paterson Group Consulting Engineers**
Client PO: 16501 Project Description: PE3323

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane,	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*38.5*		*ug/L*	*ND*	*120*	*50-140*			
Surrogate: Dibromofluoromethane	*36.6*		*ug/L*	*ND*	*114*	*50-140*			
Surrogate: Toluene-d8	*30.8*		*ug/L*	*ND*	*96.3*	*50-140*			

Certificate of Analysis

Report Date: 29-Jul-2014
Order Date:24-Jul-2014

Client: **Paterson Group Consulting Engineers**
Client PO: 16501 Project Description: PE3323

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1870	25	ug/L	ND	93.7	68-117			
F2 PHCs (C10-C16)	1710	100	ug/L	ND	95.0	60-140			
F3 PHCs (C16-C34)	3340	100	ug/L	ND	89.8	60-140			
F4 PHCs (C34-C50)	2060	100	ug/L	ND	83.1	60-140			
Semi-Volatiles									
Acenaphthene	4.53	0.05	ug/L	ND	90.5	50-140			
Acenaphthylene	4.26	0.05	ug/L	ND	85.2	50-140			
Anthracene	4.35	0.01	ug/L	ND	87.0	50-140			
Benzo [a] anthracene	4.22	0.01	ug/L	ND	84.5	50-140			
Benzo [a] pyrene	4.09	0.01	ug/L	ND	81.8	50-140			
Benzo [b] fluoranthene	4.27	0.05	ug/L	ND	85.5	50-140			
Benzo [g,h,i] perylene	3.59	0.05	ug/L	ND	71.9	50-140			
Benzo [k] fluoranthene	4.13	0.05	ug/L	ND	82.7	50-140			
Chrysene	4.63	0.05	ug/L	ND	92.6	50-140			
Dibenzo [a,h] anthracene	4.11	0.05	ug/L	ND	82.1	50-140			
Fluoranthene	4.17	0.01	ug/L	ND	83.5	50-140			
Fluorene	4.19	0.05	ug/L	ND	83.8	50-140			
Indeno [1,2,3-cd] pyrene	4.21	0.05	ug/L	ND	84.2	50-140			
1-Methylnaphthalene	3.45	0.05	ug/L	ND	69.1	50-140			
2-Methylnaphthalene	3.88	0.05	ug/L	ND	77.7	50-140			
Naphthalene	4.12	0.05	ug/L	ND	82.5	50-140			
Phenanthrene	4.56	0.05	ug/L	ND	91.2	50-140			
Pyrene	4.36	0.01	ug/L	ND	87.3	50-140			
Surrogate: 2-Fluorobiphenyl	*16.0*		*ug/L*		*79.8*	*50-140*			
Volatiles									
Acetone	85.1	5.0	ug/L	ND	85.1	50-140			
Benzene	37.8	0.5	ug/L	ND	94.6	50-140			
Bromodichloromethane	32.8	0.5	ug/L	ND	82.1	50-140			
Bromoform	31.2	0.5	ug/L	ND	78.0	50-140			
Bromomethane	51.3	0.5	ug/L	ND	128	50-140			
Carbon Tetrachloride	30.6	0.2	ug/L	ND	76.4	50-140			
Chlorobenzene	33.9	0.5	ug/L	ND	84.8	50-140			
Chloroform	37.4	0.5	ug/L	ND	93.6	50-140			
Dibromochloromethane	29.2	0.5	ug/L	ND	73.1	50-140			
Dichlorodifluoromethane	46.2	1.0	ug/L	ND	116	50-140			
1,2-Dichlorobenzene	34.8	0.5	ug/L	ND	86.9	50-140			
1,3-Dichlorobenzene	32.6	0.5	ug/L	ND	81.4	50-140			
1,4-Dichlorobenzene	33.2	0.5	ug/L	ND	83.0	50-140			
1,1-Dichloroethane	38.8	0.5	ug/L	ND	97.0	50-140			
1,2-Dichloroethane	35.9	0.5	ug/L	ND	89.8	50-140			
1,1-Dichloroethylene	40.7	0.5	ug/L	ND	102	50-140			
cis-1,2-Dichloroethylene	38.0	0.5	ug/L	ND	95.0	50-140			
trans-1,2-Dichloroethylene	40.9	0.5	ug/L	ND	102	50-140			
1,2-Dichloropropane	39.0	0.5	ug/L	ND	97.4	50-140			
cis-1,3-Dichloropropylene	37.5	0.5	ug/L	ND	93.7	50-140			
trans-1,3-Dichloropropylene	31.3	0.5	ug/L	ND	78.2	50-140			
Ethylbenzene	30.6	0.5	ug/L	ND	76.4	50-140			
Ethylene dibromide (dibromoethane,	33.0	0.2	ug/L	ND	82.5	50-140			

Certificate of Analysis

Report Date: 29-Jul-2014
Order Date:24-Jul-2014

Client: **Paterson Group Consulting Engineers**
Client PO: 16501 Project Description: PE3323

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hexane	40.4	1.0	ug/L	ND	101	50-140			
Methyl Ethyl Ketone (2-Butanone)	77.1	5.0	ug/L	ND	77.1	50-140			
Methyl Isobutyl Ketone	76.7	5.0	ug/L	ND	76.7	50-140			
Methyl tert-butyl ether	87.0	2.0	ug/L	ND	87.0	50-140			
Methylene Chloride	45.1	5.0	ug/L	ND	113	50-140			
Styrene	29.8	0.5	ug/L	ND	74.6	50-140			
1,1,1,2-Tetrachloroethane	29.7	0.5	ug/L	ND	74.2	50-140			
1,1,2,2-Tetrachloroethane	36.4	0.5	ug/L	ND	91.0	50-140			
Tetrachloroethylene	34.6	0.5	ug/L	ND	86.6	50-140			
Toluene	31.2	0.5	ug/L	ND	77.9	50-140			
1,1,1-Trichloroethane	33.7	0.5	ug/L	ND	84.2	50-140			
1,1,2-Trichloroethane	36.3	0.5	ug/L	ND	90.6	50-140			
Trichloroethylene	32.3	0.5	ug/L	ND	80.7	50-140			
Trichlorofluoromethane	37.1	1.0	ug/L	ND	92.8	50-140			
Vinyl chloride	39.6	0.5	ug/L	ND	99.1	50-140			
m,p-Xylenes	73.6	0.5	ug/L	ND	92.0	50-140			
o-Xylene	33.6	0.5	ug/L	ND	83.9	50-140			

Certificate of Analysis

Report Date: 29-Jul-2014
Order Date:24-Jul-2014

Client: **Paterson Group Consulting Engineers**
Client PO: 16501 Project Description: PE3323

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

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

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Client Name: PATERSON	Project Reference: PE3323	TAT: [✓] Regular [ ] 3 Day
Contact Name: ADRIAN MENYHART	Quote #	[ ] 2 Day [ ] 1 Day
Address: 154 Colonnade Road	PO # [redacted] 16501	Date Required:
Telephone: 613-226-7381	Email Address: amenyhart@patersongroup.ca	

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

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

Required Analyses

Paracel Order Number: 1430276

	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	MW2-GW1	GW		4	24/07/14		✓	✓	✓											✓
2	MW3-GW1	GW		4	24/07/14		✓	✓	✓											✓
3	[redacted]	[redacted]		[redacted]																
4	MWA-GW1	GW		4	24/07/14		✓	✓	✓											✓
5	DUP-1	GW		2	24/07/14			✓												✓
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Paracel Courier

Relinquished By (Sign):	Received by Driver/Depot: T. Skouse	Received at Lab: SUNEEP GORAYA DORMAN	Verified By: MJC
Relinquished By (Print):	Date/Time: 24/07/14 3:20PM	Date/Time: July 24, 2014 04:10	Date/Time: July 24/14 4:51
Date/Time:	Temperature: ____ °C	Temperature: 9.8 °C	pH Verified [ ] By: N/A