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**Phase II – Environmental Site Assessment  
Update**

961-979 Wellington Street West &  
26-40 Armstrong Avenue  
Ottawa, Ontario

Prepared For

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## TABLE OF CONTENTS

EXECUTIVE SUMMARY.....	iii
1.0 INTRODUCTION.....	1
1.1 Site Description .....	1
1.2 Property Ownership.....	2
1.3 Current and Proposed Future Uses.....	2
1.4 Applicable Site Condition Standard .....	2
2.0 BACKGROUND INFORMATION.....	3
2.1 Physical Setting .....	3
2.2 Past Investigations .....	3
3.0 SCOPE OF INVESTIGATION .....	5
3.1 Overview of Site Investigations.....	5
3.2 Media Investigated .....	6
3.3 Updated Phase I Conceptual Site Model.....	6
3.4 Deviations from Sampling and Analysis Plan .....	8
3.5 Impediments .....	8
4.0 INVESTIGATION METHOD .....	9
4.1 Subsurface Investigation .....	9
4.2 Soil Sampling.....	9
4.3 Field Screening Measurements .....	10
4.4 Groundwater Monitoring Well Installation .....	11
4.5 Groundwater Sampling.....	11
4.6 Residue Management.....	11
4.7 Analytical Testing .....	12
4.8 Elevation Surveying.....	13
4.9 Quality Assurance and Quality Control Measures .....	13
5.0 REVIEW AND EVALUATION .....	13
5.1 Geology .....	13
5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient .....	13
5.3 Field Screening.....	14
5.4 Fine/Coarse Soil Texture .....	14
5.5 Soil Quality .....	14
5.6 Groundwater Quality.....	18
5.7 Quality Assurance and Quality Control Results .....	25
5.8 Updated Phase II Conceptual Site Model.....	25
6.0 CONCLUSION .....	31
7.0 STATEMENT OF LIMITATIONS .....	33

## List of Figures

Figure 1 – Key Plan

Drawing PE4752-3R – Test Hole Location Plan

Drawing PE4752-4A – Analytical Testing Plan – Soil (BTEX & VOCs)

Drawing PE4752-4B – Analytical Testing Plan – Soil (PHCs)

Drawing PE4752-4C – Analytical Testing Plan – Soil (Metals)

Drawing PE4752-5 – Analytical Testing Plan – Groundwater

Drawing PE4752-6A – Cross Section A-A' – Soil (BTEX & VOCs)

Drawing PE4752-6B – Cross Section A-A' – Soil (PHCs)

Drawing PE4752-6C – Cross Section A-A' – Soil (Metals)

Drawing PE4752-7 – Cross Section A-A' – Groundwater (BTEX and PHCs)

## List of Appendices

- Appendix 1    Sampling and Analysis Plan
  - Soil Profile and Test Data Sheets
  - Symbols and Terms
  - Laboratory Certificates of Analysis

## **EXECUTIVE SUMMARY**

### **Assessment**

A Phase II ESA Update was conducted for the property located at 961-979 Wellington Street West and 26-40 Armstrong Street, Ottawa, Ontario. The purpose of this investigation was to assess the soil and groundwater conditions present on the subject site in order to update the findings of the previous 2012 Phase II ESA, 2013 Phase I-II ESA, and 2016 Phase II ESA.

As part of this Phase II ESA Update, a groundwater sampling program was conducted on October 28, 2019, followed later by a subsurface investigation on March 9, 2020, which consisted of drilling two (2) boreholes (BH1-20 and BH2-20) on the property addressed 40 Armstrong Street. The boreholes were advanced to depths of 4.55 m and 5.08 m below ground surface and terminated within the underlying bedrock. Upon completion, both boreholes were equipped with groundwater monitoring wells.

Two (2) soil samples, recovered from BH1-20 and BH2-20, were submitted for laboratory analysis of metals. All parameter concentrations analysed were in compliance with the MECP Table 7 standards.

Six (6) groundwater samples, recovered from BHMW1, BHMW2, BH2-16, BH3-16, and BH2-20, were submitted for laboratory analysis of PHCs, VOCs, and/or metals. All parameter concentrations analysed were in compliance with the selected MECP Table 7 standards.

Based on the findings of the previous subsurface investigations, PHC F<sub>3</sub> and lead impacted fill material was identified in the soil samples recovered from BH2-16 and BH4-16, in the vicinity of a former on-site residential dwelling and the existing on-site automotive service garage. The extent of the impact is considered to be limited to the fill material present on the western portion of the subject site.

Based on the findings of the current and previous groundwater sampling events, there is no impacted groundwater present on-site and therefore no risk of any off-site migration of contaminants.

### **Recommendations**

Based on the findings of the previous Phase II ESA investigations, PHC F<sub>3</sub> and lead impacted fill material is present on the subject site, requiring some remedial work. It is our understanding that the subject site is to be developed with a multi-storey residential building in the near future, requiring all overburden soil to be removed.



It is our recommendation that an environmental site remediation program be completed in conjunction with site development. This will require the segregation of clean soil from impacted soils, the latter of which will require disposal at an approved waste disposal facility.

Prior to off-site disposal at a licensed landfill, a leachate analysis of a representative sample of contaminated soil must be conducted in accordance with Ontario Regulation 347/558.

It is recommended that Paterson personnel be present on-site during remediation activities to direct the excavation and segregation of impacted soil, as well as to conduct confirmatory sampling as required.

It is recommended that all groundwater monitoring wells be decommissioned, in accordance with O.Reg. 903, at the time of the construction excavation.

## 1.0 INTRODUCTION

At the request of Magil Laurentian Realty Investments Inc. (Magil), Paterson Group (Paterson) conducted a Phase II – Environmental Site Assessment Update for the properties addressed 961, 967, 969, 973, and 979 Wellington Street West as well as 26, 36, and 40 Armstrong Avenue, in the City of Ottawa, Ontario. The purpose of this investigation was to assess the soil and groundwater conditions present on the subject site in order to update the findings of the previous 2016 Phase II ESA investigation conducted by Paterson for the respective addresses. The findings of the field programs are presented in this report.

### 1.1 Site Description

Address:	961, 967, 969, 973, & 979 Wellington Street West & 26, 36, & 40 Armstrong Street, Ottawa, Ontario.
Legal Description:	Part of Lot 37, Concession 1, Ottawa Front, Formerly the Township of Nepean, in the City of Ottawa, Ontario.
Location:	The subject site is located on the north side of Wellington Street West, between Hilda Street and Garland Street, in the City of Ottawa, Ontario. Refer to Figure 1 - Key Plan, appended to this report
Latitude and Longitude:	45° 24' 21.9" N, 75° 43' 22.0" W
Configuration:	Rectangular
Site Area:	0.30 hectares (approximate)
Zoning:	TM – Traditional Mainstreet Zone R4T – Residential Fourth Density Zone
Current Use:	The subject site is currently occupied by a former office building, a former automotive service garage, a former doughnut shop, three (3) residential dwellings, and two (2) low-rise residential apartment buildings.
Services:	The subject site is located in a municipally serviced area.

## 1.2 Property Ownership

The subject property is currently owned by Magil Laurentian Realty Investments Inc. Paterson was engaged to conduct this Phase II ESA by Ms. Maureen Flanigan of Magil Laurentian Realty Investments Inc. The Magil offices are located at 651 Churchill Avenue North, Ottawa, Ontario. Ms. Flanigan can be reached at 613-686-6319.

## 1.3 Current and Proposed Future Uses

The subject site is currently occupied by a former office building, a former automotive service garage, a former doughnut shop, three (3) residential dwellings, and two (2) low-rise residential apartment buildings.

It is our understanding that the subject property is to be redeveloped with a multi-storey residential building, with ground floor commercial units and underground parking.

## 1.4 Applicable Site Condition Standard

The site condition standards for the subject property were obtained from Table 7 of the document entitled, *“Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act”*, prepared by the Ministry of the Environment, Conservation and Parks (MECP), and dated April 15, 2011. The selected MECP standards are based on the following considerations:

- Coarse-grained soil conditions;
- Shallow soil conditions;
- Non-potable groundwater conditions;
- Residential land use.

The residential standards were selected based on the future land use of the subject site. Grain size analysis was not conducted as part of this assessment, however, the coarse-grained soil standards were chosen as a conservative approach.

The MECP Table 1 standards for Full Depth Background Site Conditions were also referenced for additional consideration in order to assess the on-site soil conditions prior to future off-site disposal.

## 2.0 BACKGROUND INFORMATION

### 2.1 Physical Setting

The subject site encompasses the entirety of the city block, bounded by Armstrong Street to the north, Hilda Street to the east, Wellington Street West to the south, and Garland Street to the west. The block contains several buildings, consisting of a combination of low-rise residential apartment buildings, residential dwellings, former commercial office and retail buildings, and a former automotive service garage.

The site topography slopes gently down to the south, towards Wellington Street West, whereas the regional topography slopes gradually down to the north, in the general direction of the Ottawa River. Water drainage on the subject site occurs via infiltration within the landscaped portions of the site, as well as via sheet flow towards catch basins located on the adjacent streets.

### 2.2 Past Investigations

Paterson and others have conducted several environmental and geotechnical investigations in the study area, including previous Phase I ESAs and Phase II ESAs for the subject property, as detailed below:

- *“Phase II Environmental Site Assessment, 973 Wellington Street West, Ottawa, Ontario”*, prepared by DST Consulting Engineers, dated July 2012.

Based on the recommendation of a previous Phase I ESA completed for the subject property, a Phase II was completed for the property addressed 973 Wellington Street West (occupied by an automotive service garage). Two (2) boreholes were advanced into the bedrock and instrumented with groundwater monitoring wells. One (1) of the wells was placed in the building interior, and the second was placed near the front of the building (south side). One (1) soil sample and two (2) groundwater samples were submitted for laboratory analysis of PHCs, BTEX, and metals.

All parameters were in compliance with the selected MECP Table 7 standards, with the exception of the concentration of cobalt in the groundwater sample obtained from the monitoring well located in the garage interior. Based on these results, additional groundwater sampling was recommended by DST to verify the groundwater conditions.

- *“Phase I-II Environmental Site Assessment, 969 Wellington Street West, Ottawa, Ontario”*, prepared by Paterson Group, dated April 18, 2013.

A combined Phase I and Phase II ESA was completed for the property addressed 969 Wellington Street West. The Phase I portion of the assessment identified the on-site and adjacent automotive service garage as areas of potential concern. The Phase II portion of the assessment included the advancement of two (2) boreholes in the building interior. Bedrock was encountered at depths ranging from approximately 0.76 m to 1.14 m below ground surface and one (1) of the boreholes was advanced into the bedrock to intercept the groundwater table and was equipped with a groundwater monitoring well. One (1) soil sample was collected from one of the boreholes and submitted for analysis of PHCs and BTEX and one (1) groundwater sample was submitted for analysis of VOCs and PHCs.

No detectable concentrations of any of the aforementioned parameters were identified, and thus, the results were in compliance with the selected MECP Table 7 standards. No further work was recommended following the Phase I-II ESA.

- *“Phase I Environmental Site Assessment, 979 Wellington Street West, Ottawa, Ontario”*, prepared by Paterson Group, dated August 29, 2016.

This Phase I ESA was completed for the portion of the property occupied by a two-storey office building. Based on the historical research, the property was originally developed in the early 1900s with a residential dwelling addressed 42 Armstrong Street and a commercial building addressed 977 and 979 Wellington Street West. The commercial structure was used for retail purposes and by offices starting in 2002. The residential dwelling at the rear was demolished in the 1970s and the site has been used as a parking lot since then.

Off-site PCAs which were considered to represent APECs included a contractor’s yard at 3 Irving Avenue, a possible dry cleaners on Wellington Street West and Spadina Avenue, and a possible automotive service garage at 70 Garland Street. At the time of the site visit, the adjacent automotive service garage at 973 Wellington Street West was present and considered to represent an APEC.

Based on the previous geotechnical investigation, fill material of unknown quality, identified throughout the property, was also considered to represent an APEC. A Phase II ESA was recommended for the site.

- *“Phase II Environmental Site Assessment, 979 Wellington Street West, Ottawa, Ontario”*, prepared by Paterson Group, dated October 21, 2016.

To address the APECs identified in the 2016 Phase I ESA, four (4) boreholes were advanced on-site, of which three (3) were instrumented with groundwater monitoring wells.

Soil samples were submitted for laboratory testing of VOCs, PHCs F<sub>1</sub>-F<sub>4</sub>, and metals. PHC F<sub>3</sub> and lead concentrations were found to be in excess of the selected MECP Table 7 standards in the soil samples collected from BH2-16 (on the eastern portion of the site) and BH4-16 (at the northern end of the site, behind the building).

Groundwater samples were submitted for analysis of VOC and PHCs F<sub>1</sub>-F<sub>4</sub> parameters. With the exception of chloroform, no VOC or PHC concentrations were detected above the laboratory method detection limits. The presence of chloroform was considered to be the result of the use of chlorinated municipal water during the bedrock coring process and was later not detected in a subsequent sample analysis. A soil remediation program was recommended to be carried out at the time of site redevelopment.

## **3.0 SCOPE OF INVESTIGATION**

### **3.1 Overview of Site Investigations**

The subsurface investigation conducted as part of the 2012 Phase II ESA consisted of drilling two (2) boreholes on the property addressed 973 Wellington Street West, on May 14 and 15, 2012, to a depth of approximately 5.20 m and 5.60 m (BHMW1 and BHMW2 respectively). Groundwater monitoring wells were installed in both boreholes at this time.

The subsurface investigation conducted as a part of the 2013 Phase I-II ESA consisted of the drilling of two (2) boreholes on the property addressed 969 Wellington Street West, March 27, 2013, to a depth of approximately 0.76 m and 5.66 m (BH2-13 and BH1-13 respectively). A groundwater monitoring well was installed in borehole BH1-13 at this time.

The subsurface investigation conducted as a part of the 2016 Phase II ESA consisted of the drilling of four (4) boreholes on the property addressed 979 Wellington Street West, on August 24, 2016, to a depth of approximately 7.50 m below ground surface. Borehole BH4-16 was completed on practical refusal to auguring at a depth of 0.97 m below ground surface. Groundwater monitoring wells were installed in boreholes BH1-16, BH2-16, and BH3-16 at this time.

As part of this Phase II ESA Update, a groundwater sampling program was conducted on October 28, 2019. Later, a subsurface investigation was conducted on March 9, 2020, which consisted of drilling two (2) boreholes (BH1-20 and BH2-20) on the property addressed 40 Armstrong Street. The boreholes were advanced to depths of 4.55 m and 5.08 m below ground surface and terminated within the underlying bedrock. Upon completion, both boreholes were equipped with groundwater monitoring wells.

### **3.2 Media Investigated**

During the subsurface investigations, soil 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.

The contaminants of potential concern for the soil and groundwater on the subject site are considered to be:

- Volatile Organic Compounds (VOCs);
- Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX);
- Petroleum Hydrocarbons, fractions 1 - 4 (PHCs F<sub>1</sub>-F<sub>4</sub>);
- Metals (including Mercury and Hexavalent Chromium).

### **3.3 Updated Phase I Conceptual Site Model**

#### **Geological and Hydrogeological Setting**

Based on the available mapping information from NRCAN, the bedrock in the area of the subject site consists of interbedded shale and limestone of the Verulam Formation, whereas the overburden consists of Paleozoic bedrock with a thickness ranging from approximately 0 m to 1 m.

The site topography slopes gently down to the south, towards Wellington Street West, whereas the regional topography slopes gradually down to the north, in the general direction of the Ottawa River. Based on the regional topography, the groundwater in the area of the subject site is interpreted to be flowing in a northerly direction.

#### **Drinking Water Wells**

Based on a search of available MECP water well records, no drinking water wells are expected to be present within the Phase I study area.

## **Existing Buildings and Structures**

There are eight (8) buildings currently situated on the subject site. These buildings consist of a combination of low-rise residential apartment buildings, residential dwellings, former commercial office and retail buildings, and a former automotive service garage.

## **Neighbouring Land Use**

Neighbouring land use within the Phase I study area consists primarily of residential and commercial properties.

## **Water Bodies and Areas of Natural and Scientific Interest**

No water bodies or areas of natural and scientific interest were identified on the subject site or within the Phase I study area. The nearest water body with respect to the subject site is the Ottawa River, located approximately 600 m to the north.

## **Potentially Contaminating Activities and Areas of Potential Environmental Concern**

Based on the findings of this assessment, seven (7) potentially contaminating activities (PCAs), resulting in areas of potential environmental concern (APECs) were identified as pertaining to the subject site. The APECs are described as follows:

- A former auto service garage, situated on-site at 973 Wellington Street West.
- A former auto body shop, situated on-site at 969 Wellington Street West.
- Fill material of unknown quality, situated within the southern portion of the subject site.
- A possible former auto service garage, situated at 70 Garland Street (now addressed 987 Wellington Street West).
- A possible former dry cleaners, situated at 992 Wellington Street West.
- A possible former dry cleaners, situated at 14 Spadina Avenue.
- A former underground fuel storage tank and contractor yard, situated at 3 Irving Avenue.



Additional existing and historical off-site PCAs were identified within the Phase I study area, however, based on their separation distances, down-gradient or cross-gradient orientation, as well as information contained within our files, these sites are not considered to pose an environmental concern to the subject site.

### **Contaminants of Potential Concern**

The contaminants of potential concern (CPCs) associated with the subject site are considered to be:

- Volatile Organic Compounds (VOCs);
- Benzene, Toluene, Ethylbenzene and Xylenes (BTEX);
- Petroleum hydrocarbons; fractions 1 through 4 (PHCs F<sub>1</sub>-F<sub>4</sub>);
- Metals (including Mercury and Hexavalent Chromium).

These contaminants have the potential to be present in the soil/fill matrix as well as the groundwater on the subject site.

### **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 PCAs and APECs associated with the subject site. The presence of these PCAs were 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. There were no deviations made from the Sampling and Analysis Plan.

## **3.5 Impediments**

No physical impediments or denial of access was encountered during this Phase II – Environmental Site Assessment Update.

## 4.0 INVESTIGATION METHOD

### 4.1 Subsurface Investigation

The previous subsurface investigations were conducted on May 14 and 15, 2012, March 27, 2013, and August 24, 2016 and consisted of the placement of eight (8) boreholes on-site using either a track-mounted CME 55 power auger drill rig, or a portable drill rig. The drilling programs were conducted by OGS Inc. of Almonte, Ontario and by George Downing Estate Drilling of Hawkesbury, Ontario under full-time supervision of Paterson personnel (2013 and 2016 investigations only).

The boreholes were drilled through the overburden and cored into the bedrock to depths ranging from approximately 5.20 m to 7.52 m below ground surface, with the exception of BH2-13 and BH4-16 which were terminated on practical refusal to augering on inferred bedrock at depths of approximately 0.76 m and 0.97 m, respectively. All boreholes, with the exception of BH2-13 and BH4-16, were instrumented with groundwater monitoring wells upon their completion.

As part of this Phase II ESA Update, two (2) boreholes (BH1-20 and BH2-20) were advanced on the subject site on March 9, 2020. The boreholes were drilled to a depth of 4.55 m and 5.08 m below ground surface, respectively, and terminated within the underlying bedrock unit. Upon completion, both boreholes were instrumented with groundwater monitoring wells.

All borehole locations are shown on Drawing No. PE4752-3R – Test Hole Location Plan, appended to this report.

### 4.2 Soil Sampling

Soil sampling protocols were followed using the MECP document entitled, *“Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario”*, dated May 1996. The samples were recovered using a stainless-steel split spoon while wearing protective gloves (changed after each sample), and immediately placed into plastic bags. If significant contamination was encountered, the samples were instead placed into glass jars. Sampling equipment was routinely washed in soapy water and rinsed with methylhydrate after each split spoon to prevent any cross contamination of the samples. The samples were also stored in coolers to reduce analyte volatilization during transportation.

All soil samples obtained as part of the current and previous subsurface investigations were recovered from the boreholes by means of auger and split spoon sampling, with samples taken at approximate 0.76 m intervals. The depths at which split spoon, auger flight, and rock core samples were obtained from the boreholes are shown as “SS”, “AU”, and “RC” on the Soil Profile and Test Data Sheets in Appendix 1.

The soil profile at the subject site generally consisted of an asphaltic concrete pavement structure, underlain by fill material (brown silty sandy with crushed stone) on top of grey limestone bedrock. The fill material was typically encountered extending to depths ranging from approximately 0.36 m to 1.40 m below ground surface.

Specific details of the soil profile at each test hole location are presented on the Soil Profile and Test Data sheets appended to this report.

### **4.3 Field Screening Measurements**

All of the soil samples were submitted to a preliminary screening procedure using an RKI Eagle gas detector with methane elimination and calibrated to hexane.

The soil samples recovered from the boreholes were placed immediately into airtight plastic bags with nominal headspace. All lumps of soil inside the bags were broken by hand, and the soil was allowed to come to room temperature prior to conducting the vapour survey, ensuring consistency of readings between samples. To measure the soil vapours, the analyser probe was inserted into the nominal headspace above the soil sample. The sample was agitated and manipulated gently as the measurement was taken. The peak reading registered within the first 15 seconds was recorded as the vapour measurement. The parts per million (ppm) scale was used to measure concentrations of organic/combustible vapours.

The vapour readings were found to range from 0 ppm to 25 ppm. Samples with the highest vapour readings for a given borehole were generally selected for analysis. Additional samples were selected from different stratigraphic units to attempt to delineate the vertical extent of the contamination within a given borehole.

The results of the vapour survey are presented in the Soil Profile and Test Data Sheets in Appendix 1.

#### 4.4 Groundwater Monitoring Well Installation

A total of eight (8) groundwater monitoring wells were installed on the subject site (BHMW1 and BHMW2 in 2012; BH1-13 in 2013; BH1-16, BH2-16, and BH3-16 in 2016; and BH1-20 and BH2-20 in 2020). The monitoring wells consist of 32 mm (1.25”) 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 the monitoring well construction details is provided below in Table 2.

The groundwater monitoring wells were developed upon completion using a dedicated inertial lift pump, with a minimum of three (3) well volumes being removed from the wells at the time of installation. The wells were developed until the appearance of the water was noted to be stabilized.

<b>Table 1 Monitoring Well Construction Details</b>						
<b>Well ID</b>	<b>Ground Surface Elevation</b>	<b>Total Depth (m BGS)</b>	<b>Screened Interval (m BGS)</b>	<b>Sand Pack (m BGS)</b>	<b>Bentonite Seal (m BGS)</b>	<b>Casing Type</b>
BHMW1	99.57	5.20	2.20 – 5.20	1.80 – 5.20	0.30 – 1.80	Flushmount
BHMW2	99.46	5.61	2.61 – 5.61	2.25 – 5.61	0.30 – 2.25	Flushmount
BH1-13	99.26	5.66	3.35 – 5.66	2.00 – 5.66	0.00 – 2.00	Flushmount
BH1-16	98.91	7.48	4.48 – 7.48	4.00 – 7.48	0.25 – 4.00	Flushmount
BH2-16	99.43	6.79	3.79 – 6.79	3.60 – 6.79	0.70 – 3.60	Flushmount
BH3-16	99.72	7.52	4.52 – 7.52	3.90 – 7.52	0.80 – 3.90	Flushmount
BH1-20	100.45	4.55	1.55 – 4.55	1.00 – 4.55	0.10 – 1.00	Flushmount
BH2-20	100.81	5.08	2.08 – 5.08	1.50 – 5.08	0.10 – 1.50	Flushmount

#### 4.5 Groundwater Sampling

Groundwater sampling protocols were followed using the MECP 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.

#### 4.6 Residue Management

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

## 4.7 Analytical Testing

The following soil and groundwater samples were submitted for laboratory analysis as part of this Phase II ESA Update:

<b>Table 2 Testing Parameters for Submitted Soil Samples</b>				
Sample ID	Sample Depth & Stratigraphic Unit	Parameters Analyzed		Rationale
		Metals <sup>1</sup>		
BH1-20-AU1	0.00 – 0.36 m Fill Material	X		To assess for potential impacts on the subject site resulting from the presence of fill material of unknown quality.
BH2-20-SS2	0.00 – 0.60 m Fill Material	X		To assess for potential impacts on the subject site resulting from the presence of fill material of unknown quality.

1 – Including Mercury and Chromium VI

<b>Table 3 Testing Parameters for Submitted Groundwater Samples</b>					
Sample ID	Sample Depth & Stratigraphic Unit	Parameters Analyzed			Rationale
		PHCs F <sub>2</sub> -F <sub>4</sub>	VOCs	Metals <sup>1</sup>	
BH2-16	3.79 – 6.79 m Bedrock		X		For confirmatory analysis. (October 2019)
BH3-16	4.52 – 7.52 m Bedrock		X		For confirmatory analysis. (October 2019)
BHMW1	2.20 – 5.20 m Bedrock	X	X	X	For confirmatory analysis. (October 2019)
BHMW2	2.61 – 5.61 m Bedrock	X	X		For confirmatory analysis. (October 2019)
BH2-20-GW1	2.08 – 5.08 m Bedrock	X	X		To assess for potential impacts resulting from a former on-site auto service garage. (September 2020)
BHMW1-GW3	2.20 – 5.20 m Bedrock			X	For confirmatory analysis. (September 2020)

1 – Including Mercury and Chromium VI

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

## 4.8 Elevation Surveying

Monitoring well locations were surveyed using a laser level, with the elevations surveyed relative to the top spindle of a fire hydrant, located at the intersection of Garland Street and Wellington Street West, with an assumed elevation of 100 m above sea level. The elevations of the monitoring wells are shown on Drawing PE4752-3R – Test Hole Location Plan.

## 4.9 Quality Assurance and Quality Control Measures

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

## 5.0 REVIEW AND EVALUATION

### 5.1 Geology

Site geology details are provided in the Soil Profile and Test Data Sheets provided in Appendix 1. Site soils generally consist of an asphaltic concrete pavement structure, underlain by crushed stone and/or silty sand fill material over top of grey limestone bedrock. Bedrock was generally encountered on the subject site at depths ranging from approximately 0.36 m to 1.35 m below the existing ground surface.

### 5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured at the subject site on September 4, 2020, using an electronic water level meter. The groundwater elevations at each borehole location are measured relative to a nearby temporary benchmark with an assumed elevation of 100 m above sea level. Groundwater levels are summarized below in Table 4.

<b>Table 4 Groundwater Level Measurements</b>				
<b>Borehole Location</b>	<b>Ground Surface Elevation</b>	<b>Water Level Depth (m below grade)</b>	<b>Water Level Elevation (m ASL)</b>	<b>Date of Measurement</b>
BHMW1	99.57	2.57	97.00	September 4, 2020
BHMW2	99.46	2.60	96.86	September 4, 2020
BH1-16	98.91	2.17	96.74	September 4, 2020
BH2-16	99.43	2.14	97.29	September 4, 2020
BH3-16	99.72	2.33	97.39	September 4, 2020
BH1-20	100.45	1.63	98.82	September 4, 2020
BH2-20	100.81	4.28	96.53	September 4, 2020

The groundwater on-site was encountered within the underlying bedrock unit at depths ranging from approximately 1.63 m to 4.28 m below ground surface. No unusual visual or olfactory observations were noted in the groundwater samples obtained from the boreholes.

Using the groundwater elevations recorded during the September 4, 2020 sampling event, groundwater contour mapping was completed as part of this assessment. According to the mapped contour data, illustrated on Drawing PE4752-3R Test Hole Location Plan in the appendix, the groundwater flow on the subject site is interpreted to be in a northerly direction. A horizontal hydraulic gradient of approximately 0.022 m/m was also calculated as part of this assessment.

It should be noted that groundwater levels fluctuate throughout the year with seasonal variations.

### **5.3 Field Screening**

Field screening of the soil samples collected during the previous drilling programs resulted in organic vapour readings ranging from 0 ppm to 25 ppm. These vapour readings indicate that there is a negligible potential for the presence of volatile substances. Heavier substances, such as heavy oil, may not be detected by the above field screening method, however, visual observations did not suggest the presence of hydrocarbon contamination. Field screening results of each individual soil sample are provided on the Soil Profile and Test Data Sheets appended to this report.

### **5.4 Fine/Coarse Soil Texture**

Grain size analysis was not completed as part of this investigation. Coarse grained soil standards were chosen based on the nature of the recovered soil samples.

### **5.5 Soil Quality**

As part of the 2012 Phase II ESA, one (1) soil sample, recovered from BHMW2, was submitted for laboratory analysis of PHCs F<sub>1</sub>-F<sub>4</sub> and metals.

As part of the 2013 Phase I-II ESA, one (1) soil sample, recovered from BH1-13, was submitted for laboratory analysis of BTEX and PHCs F<sub>1</sub>-F<sub>4</sub>



As part of the 2016 Phase II ESA, six (6) soil samples, recovered from BH1-16 - BH4-16, were submitted for laboratory analysis of either PHCs F<sub>1</sub>-F<sub>4</sub>, VOCs, and/or metals.

As part of the current Phase II ESA Update, two (2) soil samples were submitted for laboratory analysis of metals.

The results of the analytical testing are presented below in Tables 5 to 7. The laboratory certificates of analysis are provided in Appendix 1.

<b>Table 5 Analytical Test Results – Soil BTEX &amp; PHCs</b>								
Parameter	MDL (µg/g)	Soil Samples (µg/g)					MECP Table 1 (µg/g)	MECP Table 7 (µg/g)
		May 14, 2012	Mar 27, 2013	Aug 24, 2016				
		BHMW2 -AS1	BH1-13- SS1	BH1-16- SS2	BH2-16- AU1	BH4-16- SS2		
Benzene	0.02	nd	nd	nt	nd	nt	0.02	0.21
Ethylbenzene	0.05	nd	nd	nt	nd	nt	0.05	2
Toluene	0.05	nd	nd	nt	nd	nt	0.2	2.3
Xylenes	0.05	nd	nd	nt	nd	nt	0.05	3.1
PHCs F <sub>1</sub>	7	nd	nd	nt	nd	nt	25	55
PHCs F <sub>2</sub>	4	nd	nd	nd <sup>2</sup>	<u>30</u>	nd <sup>2</sup>	10	98
PHCs F <sub>3</sub>	8	207	nd	63 <sup>2</sup>	<b>957</b>	<b>348<sup>2</sup></b>	240	300
PHCs F <sub>4</sub>	6	<u>365</u>	nd	73 <sup>1,2</sup>	<u>1,000<sup>1</sup></u>	<u>320<sup>2</sup></u>	120	2,800
PHCs F <sub>4G</sub>	50	nt	nt	nt	<u>1,030</u>	<u>479<sup>2</sup></u>	120	2,800

Notes:

- MDL – Method Detection Limit
- nt – not tested for this parameter
- nd – not detected above the MDL
- Underlined – results exceed MECP Table 1 standards
- Bold and underlined** – results exceed selected MECP standards
- 1 – GC-FID signal did not return to baseline by C<sub>50</sub>
- 2 – holding time had been exceeded upon receipt of the sample at the laboratory

All detected BTEX and PHC concentrations are in compliance with the selected MECP Table 7 standards, with two (2) exceptions. The concentration of PHC F<sub>3</sub> in the soil samples recovered from BH2-16 and BH4-16 were in excess of the MECP Table 7 standards.

It should be noted that several PHC parameters were detected in samples BHMW2-AS1, BH2-16-AU1, and BH4-16-SS2 at concentrations exceeding the MECP Table 1 standards. These exceedances are not considered to pose an environmental concern to the subject site, however, if the soil is ever to be removed from the property, it should be classified as contaminated and disposed of at an approved waste disposal site.



<b>Table 6 Analytical Test Results – Soil Metals</b>									
Parameter	MDL (µg/g)	Soil Samples (µg/g)						MECP Table 1 (µg/g)	MECP Table 7 (µg/g)
		May 14, 2012	Aug 24, 2016			Mar 9, 2020			
		BHMW2 -AS1	BH1-16- SS2	BH2-16- AU1	BH4-16- SS2	BH1-20- AU1	BH2-20- SS2		
Antimony	0.2	nd	nd	nd	nd	nd	nd	1.3	7.5
Arsenic	1.0	1	1	7.5	2	3.7	16.4	18	18
Barium	0.5	120	64	206	190	84.3	104	220	390
Beryllium	0.2	nd	nd	nd	nd	0.6	0.9	2.5	4
Boron	5.0	9.7	9.4	14.4	8.0	9.4	9.2	36	120
Cadmium	0.1	nd	nd	nd	1.0	nd	nd	1.2	1.2
Chromium	1.0	10	15	19.1	20	24.5	26.4	70	160
Chromium (VI)	0.2	nt	nd	nd <sup>1</sup>	<u>1.6</u>	nd	nd	0.66	8
Cobalt	0.1	4	5	6.3	5	3.3	7.4	21	22
Copper	0.5	13	13	61	13	13.4	13.5	92	140
Lead	1.0	23	7	<b>227</b>	<b>1,800</b>	55.7	39.8	120	120
Mercury	0.05	nt	nd	0.2	nd	nd	nd	0.27	0.27
Molybdenum	0.5	nd	nd	nd	nd	nd	<u>2.8</u>	2	6.9
Nickel	0.5	11	12	13.6	12	9.5	17.5	82	100
Selenium	0.5	nd	nd	nd	nd	nd	nd	1.5	2.4
Silver	0.2	nd	nd	nd	nd	nd	nd	0.5	20
Thallium	0.05	nd	nd	nd	nd	nd	nd	1	1
Uranium	0.05	nd	nd	nd	nd	nd	nd	2.5	23
Vanadium	5.0	nd	29	20.5	23	23.3	30.9	86	86
Zinc	5.0	nd	24	203	134	30.0	49.3	290	340

Notes:

- MDL – Method Detection Limit
- nt – not tested for this parameter
- nd – not detected above the MDL
- Underlined – results exceed MECP Table 1 standards
- Bold and underlined** – results exceed selected MECP standards

All detected metals concentrations are in compliance with the selected MECP Table 7 standards, with two (2) exceptions. The concentration of lead in the soil samples recovered from BH2-16 and BH4-16 are in excess of the MECP Table 7 standards.

It should be noted that several metal parameters were detected in samples BH4-16-SS2 and BH2-20-SS2 at concentrations exceeding the MECP Table 1 standards. These exceedances are not considered to pose an environmental concern to the subject site, however, if the soil is ever to be removed from the property, it should be classified as contaminated and disposed of at an approved waste disposal site.

<b>Table 7 Analytical Test Results – Soil VOCs</b>				
Parameter	MDL (µg/g)	Soil Sample (µg/g)	MECP Table 1 (µg/g)	MECP Table 7 (µg/g)
		Aug 24, 2016 BH2-16-AU1		
Acetone	0.50	nd	0.5	16
Benzene	0.02	nd	0.02	0.21
Bromodichloromethane	0.05	nd	0.05	13
Bromoform	0.05	nd	0.05	0.27
Bromomethane	0.05	nd	0.05	0.05
Carbon Tetrachloride	0.05	nd	0.05	0.05
Chlorobenzene	0.05	nd	0.05	2.4
Chloroform	0.05	nd	0.05	0.05
Dibromochloromethane	0.05	nd	0.05	9.4
Dichlorodifluoromethane	0.05	nd	0.05	16
1,2-Dichlorobenzene	0.05	nd	0.05	3.4
1,3-Dichlorobenzene	0.05	nd	0.05	4.8
1,4-Dichlorobenzene	0.05	nd	0.05	0.083
1,1-Dichloroethane	0.05	nd	0.05	3.5
1,2-Dichloroethane	0.05	nd	0.05	0.05
1,1-Dichloroethylene	0.05	nd	0.05	0.05
cis-1,2-Dichloroethylene	0.05	nd	0.05	3.4
trans-1,2-Dichloroethylene	0.05	nd	0.05	0.084
1,2-Dichloropropane	0.05	nd	0.05	0.05
1,3-Dichloropropene	0.05	nd	0.05	0.05
Ethylbenzene	0.05	nd	0.05	2
Ethylene Dibromide	0.05	nd	0.05	0.05
Hexane	0.05	nd	0.05	2.8
Methyl Ethyl Ketone	0.50	nd	0.5	16
Methyl Isobutyl Ketone	0.50	nd	0.5	1.7
Methyl tert-butyl Ether	0.05	nd	0.05	0.75
Methylene Chloride	0.05	nd	0.05	0.1
Styrene	0.05	nd	0.05	0.7
1,1,1,2-Tetrachloroethane	0.05	nd	0.05	0.058
1,1,2,2-Tetrachloroethane	0.05	nd	0.05	0.05
Tetrachloroethylene	0.05	nd	0.05	0.28
Toluene	0.05	nd	0.2	2.3
1,2,4-Trichlorobenzene	0.05	nd	0.05	0.36
1,1,1-Trichloroethane	0.05	nd	0.05	0.38
1,1,2-Trichloroethane	0.05	nd	0.05	0.05
Trichloroethylene	0.05	nd	0.05	0.061
Trichlorofluoromethane	0.05	nd	0.25	4
Vinyl Chloride	0.02	nd	0.2	0.02
Xylenes	0.05	nd	0.05	3.1

Notes:

- MDL – Method Detection Limit
- nt – not tested for this parameter
- nd – not detected above the MDL
- Underlined – results exceed MECP Table 1 standards
- Bold and underlined** – results exceed selected MECP standards

No VOC parameters were detected in the soil sample analyzed. The results are in compliance with the selected MECP Table 7 and MECP Table 1 standards.

<b>Table 8 Maximum Concentrations – Soil</b>			
<b>Parameter</b>	<b>Maximum Concentration</b>	<b>Sample ID</b>	<b>Depth Interval (m BGS)</b>
PHCs F <sub>2</sub>	30	BH2-16-AU1	0.10 – 0.75
PHCs F <sub>3</sub>	<b><u>957</u></b>	BH2-16-AU1	0.10 – 0.75
PHCs F <sub>4</sub>	1,000	BH2-16-AU1	0.10 – 0.75
PHCs F <sub>4G</sub>	1,030	BH2-16-AU1	0.10 – 0.75
Arsenic	16.4	BH2-20-SS2	0.75 – 0.85
Barium	206	BH2-16-AU1	0.10 – 0.75
Boron	14.4	BH2-16-AU1	0.10 – 0.75
Cadmium	1.0	BH4-16-SS2	0.81 – 0.97
Chromium	26.4	BH2-20-SS2	0.75 – 0.85
Chromium (VI)	1.6	BH4-16-SS2	0.81 – 0.97
Cobalt	7.4	BH2-20-SS2	0.75 – 0.85
Copper	61	BH2-16-AU1	0.10 – 0.75
Lead	<b><u>1,800</u></b>	BH4-16-SS2	0.81 – 0.97
Mercury	0.2	BH2-16-AU1	0.10 – 0.75
Nickel	17.5	BH2-20-SS2	0.75 – 0.85
Vanadium	30.9	BH2-20-SS2	0.75 – 0.85
Zinc	203	BH2-16-SS1	0.10 – 0.75
Notes:			
<input type="checkbox"/> <b><u>Bold and Underlined</u></b> – Value exceeds selected MECP Standards			

All other parameter concentrations analyzed were below the laboratory detection limits.

## 5.6 Groundwater Quality

As part of the 2012 Phase II ESA, two (2) groundwater samples recovered from BHMW1 and BHMW2 were submitted for laboratory analysis of PHCs, BTEX, and metals.

As part of the 2013 Phase I-II ESA, one (1) groundwater sample recovered from BH1-13 was submitted for laboratory analysis of VOCs, BTEX, and PHCs F<sub>1</sub>-F<sub>4</sub>.

As part of the 2016 Phase II ESA, three (3) groundwater samples recovered from BH1-16, BH2-16, and BH3-16 were submitted for laboratory analysis of either PHCs F<sub>1</sub>-F<sub>4</sub>, VOCs, and/or metals.

As part of the current Phase II ESA Update, six (6) groundwater samples recovered from BHMW1, BHMW2, BH2-16, BH3-16, and BH2-20 were submitted for laboratory analysis of PHCs, VOCs, and/or metals.

All groundwater samples were obtained from the screened intervals shown on the Soil Profile and Test Data Sheets in Appendix 1. The results of the analytical testing are presented below in Tables 9 to 15. The laboratory certificates of analysis are provided in Appendix 1.

<b>Table 9 Analytical Test Results – Groundwater BTEX &amp; PHCs</b>								
Parameter	MDL (µg/L)	Groundwater Samples (µg/L)						MECP Table 7 Residential Standards (µg/L)
		May 15, 2012	May 16, 2012	Apr 3, 2013	Aug 30, 2016			
		BHMW1	BHMW2	BH1-13- GW1	BH1-16- GW1	BH2-16- GW1	BH3-16- GW1	
Benzene	0.5	nd	0.43	nd	nd	nd	nd	0.5
Ethylbenzene	0.5	0.3	nd	nd	nd	nd	nd	54
Toluene	0.5	1.5	1.1	nd	nd	nd	nd	320
Xylenes	0.5	1.6	0.52	nd	nd	nd	nd	72
PHCs F <sub>1</sub>	25	nd	nd	nd	nd	nd	nd	420
PHCs F <sub>2</sub>	100	nd	nd	nd	nd	nd	nd	150
PHCs F <sub>3</sub>	100	nd	nd	nd	nd	nd	nd	500
PHCs F <sub>4</sub>	100	nd	nd	nd	nd	nd	nd	500

Notes:

- MDL – Method Detection Limit
- nd – not detected above the MDL
- nt – not tested for this parameter
- Bold and Underlined** – results exceed selected MECP standards

All detected BTEX and PHC concentrations were in compliance with the selected MECP Table 7 standards.

In addition to the sampling of monitoring well BH2-20, the monitoring wells installed in BHMW1 and BHMW2 were resampled for confirmatory analysis as part of this Phase II ESA Update.

<b>Table 10 Analytical Test Results – Groundwater PHCs</b>					
Parameter	MDL (µg/L)	Groundwater Samples (µg/L)			MECP Table 7 Residential Standards (µg/L)
		Oct 28, 2019		Sept 4, 2020	
		BHMW1	BHMW2	BH2-20-GW1	
PHCs F <sub>1</sub>	25	nd	nd	nd	420
PHCs F <sub>2</sub>	100	nd	nd	nd	150
PHCs F <sub>3</sub>	100	nd	nd	nd	500
PHCs F <sub>4</sub>	100	nd	nd	nd	500

Notes:

- MDL – Method Detection Limit
- nd – not detected above the MDL
- nt – not tested for this parameter
- Bold and Underlined** – results exceed selected MECP standards

No PHC parameters were detected in the groundwater samples analyzed. The results are in compliance with the selected MECP Table 7 standards.

<b>Table 11 Analytical Test Results – Groundwater Metals</b>					
Parameter	MDL (µg/L)	Groundwater Samples (µg/L)			MECP Table 7 Residential Standards (µg/L)
		May 15, 2012	May 16, 2012	Oct 6, 2016	
		BHMW1	BHMW2	BH3-16-GW2	
Antimony	0.5	1	1.3	0.7	16,000
Arsenic	1	nd	nd	2	1,500
Barium	1	140	110	nt	23,000
Beryllium	0.5	nd	nd	nd	53
Boron	10	100	240	160	36,000
Cadmium	0.1	0.34	nd	nd	2.1
Chromium	1	nd	nd	39	640
Chromium (VI)	10	nt	nt	nd	110
Cobalt	0.5	<b>80</b>	41	nd	52
Copper	0.5	2.9	2.8	7.6	69
Lead	0.1	nd	nd	0.2	20
Mercury	0.5	nt	nt	nd	0.1
Molybdenum	0.1	7.8	23	8.4	7,300
Nickel	1	4.1	2.7	3	390
Selenium	1	12	2.8	2	50
Silver	0.1	nd	nd	nd	1.2
Sodium	200	920,000	320,000	nt	1,800,000
Thallium	0.1	0.17	0.095	nd	400
Uranium	0.1	2	3	3.2	330
Vanadium	0.5	nd	nd	12.5	200
Zinc	5.0	11	nd	nd	890

Notes:

- MDL – Method Detection Limit
- nd – not detected above the MDL
- nt – not tested for this parameter
- Bold and Underlined** – results exceed selected MECP standards

All detected metals concentrations were in compliance with the selected MECP Table 7 standards, with one (1) exception. The concentration of cobalt in the groundwater sample recovered from BHMW1 was in excess of the MECP Table 7 standards.

In 2019 and 2020, two (2) additional groundwater samples were obtained from BHMW1 and retested for metal parameters (as seen on Table 12 below). The results were in compliance with the selected MECP Table 7 standards. It is suspected that the initial cobalt exceedance recorded in the 2016 originated from a high sediment content within the sample.

As part of the current Phase II ESA Update, monitoring well BHMW1 was resampled twice, on October 28, 2019 and September 4, 2020, for confirmatory analysis.

<b>Table 12 Analytical Test Results – Groundwater Metals</b>				
Parameter	MDL (µg/L)	Groundwater Samples (µg/L)		MECP Table 7 Residential Standards (µg/L)
		Oct 28, 2019	Sept 4, 2020	
		BHMW1	BHMW1-GW3	
Antimony	0.5	1.0	0.9	16,000
Arsenic	1	4	1	1,500
Barium	1	358	365	23,000
Beryllium	0.5	nd	nd	53
Boron	10	231	486	36,000
Cadmium	0.1	nd	nd	2.1
Chromium	1	nd	nd	640
Chromium (VI)	10	nd	nd	110
Cobalt	0.5	22.6	3.6	52
Copper	0.5	0.9	5.0	69
Lead	0.1	nd	0.3	20
Mercury	0.5	nd	nd	0.1
Molybdenum	0.1	5.1	3.7	7,300
Nickel	1	8	16	390
Selenium	1	nd	nd	50
Silver	0.1	nd	nd	1.2
Sodium	200	777,000	137,000	1,800,000
Thallium	0.1	nd	nd	400
Uranium	0.1	1.9	4.8	330
Vanadium	0.5	2.1	1.6	200
Zinc	5.0	nd	5	890

Notes:  
 MDL – Method Detection Limit  
 nd – not detected above the MDL  
 nt – not tested for this parameter  
 **Bold and Underlined** – results exceed selected MECP standards

All detected metal concentrations are in compliance with the selected MECP Table 7 standards.

**Table 13**  
**Analytical Test Results – Groundwater**  
**VOCs**

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)				MECP Table 7 Residential Standards (µg/L)
		Apr 3, 2013	Aug 30, 2016			
		BH1-13-GW1	BH1-16-GW1	BH2-16-GW1	BH3-16-GW1	
Acetone	0.50	nd	nd	nd	nd	100,000
Benzene	0.02	nd	nd	nd	nd	0.5
Bromodichloromethane	0.05	nd	nd	nd	nd	67,000
Bromoform	0.05	nd	nd	nd	nd	5
Bromomethane	0.05	nd	nd	nd	nd	0.89
Carbon Tetrachloride	0.05	nd	nd	nd	nd	0.2
Chlorobenzene	0.05	nd	nd	nd	nd	140
Chloroform	0.05	nd	1.8	<b>10.8</b>	<b>5.1</b>	2
Dibromochloromethane	0.05	nd	nd	nd	nd	65,000
Dichlorodifluoromethane	0.05	nd	nd	nd	nd	3,500
1,2-Dichlorobenzene	0.05	nd	nd	nd	nd	15
1,3-Dichlorobenzene	0.05	nd	nd	nd	nd	7,600
1,4-Dichlorobenzene	0.05	nd	nd	nd	nd	0.5
1,1-Dichloroethane	0.05	nd	nd	nd	nd	11
1,2-dichloroethane	0.05	nd	nd	nd	nd	0.5
1,1-Dichloroethylene	0.05	nd	nd	nd	nd	0.5
Cis-1,2-Dichloroethylene	0.05	nd	nd	nd	nd	1.6
Trans-1,2-dichloroethylene	0.05	nd	nd	nd	nd	1.6
1,2-dichloropropane	0.05	nd	nd	nd	nd	0.58
Cis-1,3-Dichloropropylene	0.05	nd	nd	nd	nd	N/V
Trans-1,3-Dichloropropylene	0.05	nd	nd	nd	nd	N/V
1,3-Dichloropropene, total	0.05	nd	nd	nd	nd	0.5
Ethylbenzene	0.05	nd	nd	nd	nd	54
Ethylene dibromide	0.05	nd	nd	nd	nd	0.2
Hexane	0.05	nd	nd	nd	nd	5
Methyl Ethyl ketone	0.05	nd	nd	nd	nd	21,000
Methyl Isobutyl ketone	0.05	nd	nd	nd	nd	5,200
Methyl tert-butyl ether	0.05	nd	nd	nd	nd	15
Methylene Chloride	0.05	nd	nd	nd	nd	26
Styrene	0.05	nd	nd	nd	nd	43
1,1,1,2-Tetrachloroethane	0.05	nd	nd	nd	nd	1.1
1,1,2,2-Tetrachloroethane	0.05	nd	nd	nd	nd	0.5
Tetrachloroethylene	0.05	nd	nd	nd	nd	0.5
Trichlorofluoromethane	0.05	nd	nd	nd	nd	2,000
Vinyl Chloride	0.02	nd	nd	nd	nd	0.5
Xylenes	0.05	nd	nd	nd	nd	72

Notes:

- MDL – Method Detection Limit
- nd – not detected above the MDL
- nt – not tested for this parameter
- nd** – results exceed selected MECP standards

All detected VOC concentrations are in compliance with the selected MECP Table 7 standards with the exception of chloroform in samples BH2-16-GW1 and BH3-16-GW1. These chloroform concentrations were considered to be the result of the use of municipal water for the rock coring process and were expected to dissipate over time.

Monitoring wells BH1-16, BH2-16, and BH3-16 were later resampled on October 6, 2016 to confirm that the chloroform had dissipated.

<b>Table 14 Analytical Test Results – Groundwater VOCs</b>					
Parameter	MDL (µg/L)	Groundwater Samples (µg/L)			MECP Table 7 Residential Standards (µg/L)
		Oct 6, 2016			
		BH1-16-GW2	BH2-16-GW2	BH3-16-GW2	
Acetone	0.50	nd	nd	nd	100,000
Benzene	0.02	nd	nd	nd	0.5
Bromodichloromethane	0.05	nd	nd	nd	67,000
Bromoform	0.05	nd	nd	nd	5
Bromomethane	0.05	nd	nd	nd	0.89
Carbon Tetrachloride	0.05	nd	nd	nd	0.2
Chlorobenzene	0.05	nd	nd	nd	140
Chloroform	0.05	nd	1.1	nd	2
Dibromochloromethane	0.05	nd	nd	nd	65,000
Dichlorodifluoromethane	0.05	nd	nd	nd	3,500
1,2-Dichlorobenzene	0.05	nd	nd	nd	15
1,3-Dichlorobenzene	0.05	nd	nd	nd	7,600
1,4-Dichlorobenzene	0.05	nd	nd	nd	0.5
1,1-Dichloroethane	0.05	nd	nd	nd	11
1,2-dichloroethane	0.05	nd	nd	nd	0.5
1,1-Dichloroethylene	0.05	nd	nd	nd	0.5
Cis-1,2-Dichloroethylene	0.05	nd	nd	nd	1.6
Trans-1,2-dichloroethylene	0.05	nd	nd	nd	1.6
1,2-dichloropropane	0.05	nd	nd	nd	0.58
Cis-1,3-Dichloropropylene	0.05	nd	nd	nd	N/V
Trans-1,3-Dichloropropylene	0.05	nd	nd	nd	N/V
1,3-Dichloropropene, total	0.05	nd	nd	nd	0.5
Ethylbenzene	0.05	nd	nd	nd	54
Ethylene dibromide	0.05	nd	nd	nd	0.2
Hexane	0.05	nd	nd	nd	5
Methyl Ethyl ketone	0.05	nd	nd	nd	21,000
Methyl Isobutyl ketone	0.05	nd	nd	nd	5,200
Methyl tert-butyl ether	0.05	nd	nd	nd	15
Methylene Chloride	0.05	nd	nd	nd	26
Styrene	0.05	nd	nd	nd	43
1,1,1,2-Tetrachloroethane	0.05	nd	nd	nd	1.1
1,1,2,2-Tetrachloroethane	0.05	nd	nd	nd	0.5
Tetrachloroethylene	0.05	nd	nd	nd	0.5
Trichlorofluoromethane	0.05	nd	nd	nd	2,000
Vinyl Chloride	0.02	nd	nd	nd	0.5
Xylenes	0.05	nd	nd	nd	72

Notes:

- MDL – Method Detection Limit
- nd – not detected above the MDL
- nt – not tested for this parameter
- nd** – results exceed selected MECP standards

All detected VOC concentrations were in compliance with the selected MECP Table 7 standards.



In addition to the sampling of monitoring well BH2-20, the monitoring wells installed in BH2-16, BH3-16, BHMW1, BHMW2, were resampled for confirmatory analysis.

<b>Table 15 Analytical Test Results – Groundwater VOCs</b>							
Parameter	MDL (µg/L)	Groundwater Samples (µg/L)					MECP Table 7 Residential Standards (µg/L)
		Oct 28, 2019				Sept 4, 2020	
		BH2-16- GW2	BH3-16- GW2	BHMW1	BHMW2	BH2-20- GW1	
Acetone	0.50	nd	nd	nd	nd	nd	100,000
Benzene	0.02	nd	nd	nd	nd	nd	0.5
Bromodichloromethane	0.05	nd	nd	nd	nd	nd	67,000
Bromoform	0.05	nd	nd	nd	nd	nd	5
Bromomethane	0.05	nd	nd	nd	nd	nd	0.89
Carbon Tetrachloride	0.05	nd	nd	nd	nd	nd	0.2
Chlorobenzene	0.05	nd	nd	nd	nd	nd	140
Chloroform	0.05	nd	nd	nd	nd	nd	2
Dibromochloromethane	0.05	nd	nd	nd	nd	nd	65,000
Dichlorodifluoromethane	0.05	nd	nd	nd	nd	nd	3,500
1,2-Dichlorobenzene	0.05	nd	nd	nd	nd	nd	15
1,3-Dichlorobenzene	0.05	nd	nd	nd	nd	nd	7,600
1,4-Dichlorobenzene	0.05	nd	nd	nd	nd	nd	0.5
1,1-Dichloroethane	0.05	nd	nd	nd	nd	nd	11
1,2-dichloroethane	0.05	nd	nd	nd	nd	nd	0.5
1,1-Dichloroethylene	0.05	nd	nd	nd	nd	nd	0.5
Cis-1,2-Dichloroethylene	0.05	nd	nd	nd	nd	nd	1.6
Trans-1,2-dichloroethylene	0.05	nd	nd	nd	nd	nd	1.6
1,2-dichloropropane	0.05	nd	nd	nd	nd	nd	0.58
Cis-1,3-Dichloropropylene	0.05	nd	nd	nd	nd	nd	N/V
Trans-1,3-Dichloropropylene	0.05	nd	nd	nd	nd	nd	N/V
1,3-Dichloropropene, total	0.05	nd	nd	nd	nd	nd	0.5
Ethylbenzene	0.05	nd	nd	nd	nd	nd	54
Ethylene dibromide	0.05	nd	nd	nd	nd	nd	0.2
Hexane	0.05	nd	nd	nd	nd	nd	5
Methyl Ethyl ketone	0.05	nd	nd	nd	nd	nd	21,000
Methyl Isobutyl ketone	0.05	nd	nd	nd	nd	nd	5,200
Methyl tert-butyl ether	0.05	nd	nd	nd	nd	nd	15
Methylene Chloride	0.05	nd	nd	nd	nd	nd	26
Styrene	0.05	nd	nd	nd	nd	nd	43
1,1,1,2-Tetrachloroethane	0.05	nd	nd	nd	nd	nd	1.1
1,1,2,2-Tetrachloroethane	0.05	nd	nd	nd	nd	nd	0.5
Tetrachloroethylene	0.05	nd	nd	nd	nd	nd	0.5
Trichlorofluoromethane	0.05	nd	nd	nd	nd	nd	2,000
Vinyl Chloride	0.02	nd	nd	nd	nd	nd	0.5
Xylenes	0.05	nd	nd	nd	nd	nd	72

Notes:  
 MDL – Method Detection Limit  
 nd – not detected above the MDL  
 **nd** – results exceed selected MECP standards

No VOC parameters were detected in the groundwater samples analyzed. The results are in compliance with the selected MECP Table 7 standards.

## 5.7 Quality Assurance and Quality Control Results

As per the Sampling and Analysis Plan, an analysis of a trip blank for VOC parameters in addition to the analysis of a duplicate groundwater sample (obtained from BH2-16 during the August 30, 2016 sampling event) for BTEX and PHC F<sub>1</sub> parameters was conducted. Additional duplicate groundwater samples were obtained from BH2-16 during the October 28, 2019 sampling event as well as from BH2-20 during the September 4, 2020 sampling event and analyzed for VOCs. Based on the analytical test results, none of the aforementioned parameters were detected above the laboratory method detection limit in either the original samples or the field duplicate samples. As a result, the quality of the field data collected during this Phase II ESA Update is considered to be sufficient to meet the overall objectives of this assessment.

All samples submitted as part of this Phase II ESA were handled in accordance with the analytical protocols 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 the Environmental Protection Act, the certificates of analysis have been received for each sample submitted for laboratory analysis and have been appended to this report.

## 5.8 Updated 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 Activities (PCAs) and Areas of Potential Environmental Concern (APECs)

As described in Section 6.1 of the Phase I ESA report, as well as in Section 2.2 of this report, the following PCAs, as described by Table 2 of O.Reg. 153/04, are considered to result in APECs on the subject site:

- “Item 10: Commercial Autobody Shops”*

This PCA was identified as a result of the presence of a former autobody shop at 969 Wellington Street West.

*“Item 28: Gasoline and Associated Products Storage in Fixed Tanks”*

This PCA was identified as a result of the presence of a former underground fuel storage tank and contractor storage yard, located at 3 Irving Avenue.

*“Item 30: Importation of Fill Material of Unknown Quality”*

This PCA was identified as a result of the presence fill material located throughout the subject site.

*“Item 37: Operation of Dry-Cleaning Equipment (Where Chemicals Are Used)”*

This PCA was identified as a result of the possible presence of a dry cleaners at 992 Wellington Street West and 14 Spadina Avenue.

*“Item 52: Storage, Maintenance, Fuelling, and Repair of Equipment, Vehicles, and Material Used to Maintain Transportation Systems”*

This PCA was identified as a result of the presence of a former auto service garage, located at 973 Wellington Street West, as well as the possible presence of a former auto service garage at 987 Wellington Street West.

### **Contaminants of Potential Concern**

The contaminants of potential concern (CPCs) associated with the aforementioned APECs are considered to be:

- Volatile Organic Compounds (VOCs);
- Benzene, Toluene, Ethylbenzene and Xylenes (BTEX);
- Petroleum hydrocarbons; fractions 1 through 4 (PHCs F<sub>1</sub>-F<sub>4</sub>);
- Metals (including Mercury and Hexavalent Chromium).

These contaminants have the potential to be present in the soil/fill matrix as well as the groundwater on the subject site.

## **Subsurface Structures and Utilities**

Underground service locates were completed prior to the subsurface investigation. Underground utilities on the subject site include electrical cables, natural gas services, municipal water services, as well as municipal wastewater sewage services.

## **Physical Setting**

### **Site Stratigraphy**

The site stratigraphy of the subject site generally consists of:

- Asphaltic concrete pavement structure, encountered at ground surface and extending to a depth of approximately 0.10 m below ground surface.
- Fill material, consisting of crushed stone or brown silty sand and gravel, encountered at a depth of approximately 0.10 m and extending to a depth of approximately 1.35 m below ground surface.
- Limestone bedrock; encountered at depths ranging from approximately 0.36 m to 1.35 m below the existing ground surface.

### **Hydrogeological Characteristics**

Groundwater levels at the subject site were remeasured at each monitoring well, with the exception of BH1-13, on September 4, 2020. The water table at the subject site was encountered within the underlying bedrock unit, at depths ranging from approximately 1.63 m to 4.28 m below the existing ground surface.

Based on the regional topography in combination with information in our files, the groundwater flow in the vicinity of the subject property is towards the north in the direction of the Ottawa River.

### **Approximate Depth to Bedrock**

Based on information from the previous subsurface investigations, grey limestone bedrock was generally encountered at depths ranging from 0.36 m to 1.35 m below the existing ground surface.

### **Approximate Depth to Water Table**

Based on the findings of the current groundwater sampling event, the depth to water table at the subject property is approximately 1.63 m to 4.28 m below the existing ground surface.

## **Sections 41 and 43.1 of the Regulation**

Section 41 of the Regulation does not apply to the subject site as there are no areas of natural significance or bodies of water located on the subject site or within 30 m of the subject site. The subject site is not considered to be environmentally sensitive.

Section 43.1 of the Regulation applies to the subject site as bedrock is located at a depth of less than 2 m below the ground surface, and thus is considered to be a Shallow Soil Property.

## **Fill Placement**

Fill material, consisting of brown silty sand and gravel, was encountered extending to depths ranging from approximately 0.36 m to 1.35 m below ground surface.

## **Existing Buildings and Structures**

The subject site is currently occupied by a former office building, a former automotive service garage, a former doughnut shop, three (3) residential dwellings, and two (2) low-rise residential apartment buildings.

## **Proposed Buildings and Other Structures**

It is our understanding that the subject site is to be redeveloped with a multi-storey residential building with ground floor commercial units and underground parking.

The proposed redevelopment will result in a change to a more sensitive land use and therefore a Record of Site Condition (RSC) will be required.

## **Water Bodies and Areas of Natural Significance**

There are no water bodies or areas of natural significance located on or within 250 m of the subject property.

## **Environmental Condition**

### **Areas Where Contaminants are Present**

Based on the findings of the current and previous subsurface investigations, lead and PHC F<sub>3</sub> impacted fill material was identified in BH2-16 and BH4-16, located in the western portion of the subject site. No impacted groundwater was identified on the subject site. The analytical test results for the soil and groundwater samples tested are shown on the Analytical Testing Plans, appended to this report.

### **Types of Contaminants**

Based on the findings of the current and previous subsurface investigations, the contaminants of concern on the subject property include lead and PHC F<sub>3</sub> in the soil/fill.

### **Contaminated Media**

As noted above, lead and PHC F<sub>3</sub> parameters were identified at concentrations exceeding the selected MECP Table 7 standards in the soil/fill located at BH2-16 and BH4-16. The groundwater is not impacted.

### **What Is Known About Areas Where Contaminants Are Present**

Based on the findings of the current and previous subsurface investigations, lead and PHC F<sub>3</sub> impacted fill material was identified in the western portion of the subject site, in the vicinity of a former on-site residential dwelling and the former on-site automotive service garage. Currently, these areas are used as parking lots.

### **Distribution and Migration of Contaminants**

As previously noted, PHC and metal impacted fill material was identified in the western portion of the subject site, in the vicinity of BH2-16 and BH4-16. Based on their low mobility, as well as the clean groundwater results, it is anticipated that these PHC and metal impacts are contained within the fill material in this portion of the subject site.

## **Discharge of Contaminants**

The PHC impacted soil identified at BH2-16 is expected to have been a result of spillage directly to the ground surface from the adjacent on-site automotive service garage. The impacts may have also been associated with use of this portion of the subject site for parking, as contaminants may have been released directly to the ground surface as a result of a small automobile leak.

The lead and PHC impacts identified in the fill material recovered from BH4-16 are considered to have resulted from building debris associated with the former residential dwelling, and possibly the use of the site for parking, as noted above.

## **Climatic and Meteorological Conditions**

In general, climatic and meteorological conditions have the potential to affect contaminant distribution. Two (2) ways by which climatic and meteorological conditions may affect contaminant distribution include the downward leaching of contaminants via the infiltration of precipitation, and the migration of contaminants via groundwater levels and/or flow, which may fluctuate seasonally.

Downward leaching is not considered to have affected contaminant distribution at the subject site, as the site is largely paved, and the groundwater test results comply with the MECP Table 7 standards. Fluctuations in the groundwater level and groundwater flow are not considered to have affected contaminant distribution based on the depth of the water table within the bedrock, well below the shallow fill material.

## **Potential for Vapour Intrusion**

Given the location of PHC F<sub>3</sub> impacted soil outside of the building footprint in the shallow fill material, as well as the low-volatility of PHC F<sub>3</sub>, the potential for vapours to be present within the subject structure are considered to be very low and does not pose a safety hazard to the current occupants.

During redevelopment of the subject site, all soil exceeding the MECP Table 7 standards will be removed and disposed off-site. As such, there is no anticipated potential for future vapour intrusion at the subject site.

## 6.0 CONCLUSION

A Phase II ESA Update was conducted for the property located at 961-979 Wellington Street West and 26-40 Armstrong Street, Ottawa, Ontario. The purpose of this investigation was to assess the soil and groundwater conditions present on the subject site in order to update the findings of the previous 2012 Phase II ESA, 2013 Phase I-II ESA, and 2016 Phase II ESA.

As part of this Phase II ESA Update, a groundwater sampling program was conducted on October 28, 2019, followed later by a subsurface investigation on March 9, 2020, which consisted of drilling two (2) boreholes (BH1-20 and BH2-20) on the property addressed 40 Armstrong Street. The boreholes were advanced to depths of 4.55 m and 5.08 m below ground surface and terminated within the underlying bedrock. Upon completion, both boreholes were equipped with groundwater monitoring wells.

Two (2) soil samples, recovered from BH1-20 and BH2-20, were submitted for laboratory analysis of metals. All parameter concentrations analysed were in compliance with the MECP Table 7 standards.

Six (6) groundwater samples, recovered from BHMW1, BHMW2, BH2-16, BH3-16, and BH2-20, were submitted for laboratory analysis of PHCs, VOCs, and/or metals. All parameter concentrations analysed were in compliance with the selected MECP Table 7 standards.

Based on the findings of the previous subsurface investigations, PHC F<sub>3</sub> and lead impacted fill material was identified in the soil samples recovered from BH2-16 and BH4-16, in the vicinity of a former on-site residential dwelling and the existing on-site automotive service garage. The extent of the impact is considered to be limited to the fill material present on the western portion of the subject site.

Based on the findings of the current and previous groundwater sampling events, there is no impacted groundwater present on-site and therefore no risk of any off-site migration of contaminants.



## Recommendations

Based on the findings of the previous Phase II ESA investigations, PHC F<sub>3</sub> and lead impacted fill material is present on the subject site, requiring some remedial work. It is our understanding that the subject site is to be developed with a multi-storey residential building in the near future, requiring all overburden soil to be removed.

It should be noted that several PHC and metal parameters were detected in samples BHMW2-AS1, BH2-16-AU1, and BH4-16-SS2 and/or BH2-20-SS2 at concentrations exceeding the MECP Table 1 standards. These exceedances are not considered to pose an environmental concern to the subject site, however, if the soil is ever to be removed from the property, it should be classified as contaminated and disposed of at an approved waste disposal site

It is our recommendation that an environmental site remediation program be completed in conjunction with site development. This will require the segregation of clean soil from impacted soils, the latter of which will require disposal at an approved waste disposal facility.

Prior to off-site disposal at a licensed landfill, a leachate analysis of a representative sample of contaminated soil must be conducted in accordance with Ontario Regulation 347/558.

It is recommended that Paterson personnel be present on-site during remediation activities to direct the excavation and segregation of impacted soil, as well as to conduct confirmatory sampling as required.

It is recommended that all groundwater monitoring wells be decommissioned, in accordance with O.Reg. 903, at the time of the construction excavation.

## 7.0 STATEMENT OF LIMITATIONS

This Phase II - Environmental Site Assessment Update report has been prepared as per the agreed scope-of-work, 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 Magil Laurentian Realty Investments Inc. Permission and notification from Magil Laurentian and Paterson will be required to release this report to any other party.

### Paterson Group Inc.



Nick Sullivan, B.Sc.



Mark S. D'Arcy, P.Eng., QP<sub>ESA</sub>



### Report Distribution:

- Magil Laurentian Realty Investments Inc.
- Paterson Group Inc.

# **FIGURES**

**FIGURE 1 – KEY PLAN**

**DRAWING PE4752-3R – TEST HOLE LOCATION PLAN**

**DRAWING PE4752-4A – ANALYTICAL TESTING PLAN – SOIL (BTEX & VOCs)**

**DRAWING PE4752-4B – ANALYTICAL TESTING PLAN – SOIL (PHCs)**

**DRAWING PE4752-4C – ANALYTICAL TESTING PLAN – SOIL (METALS)**

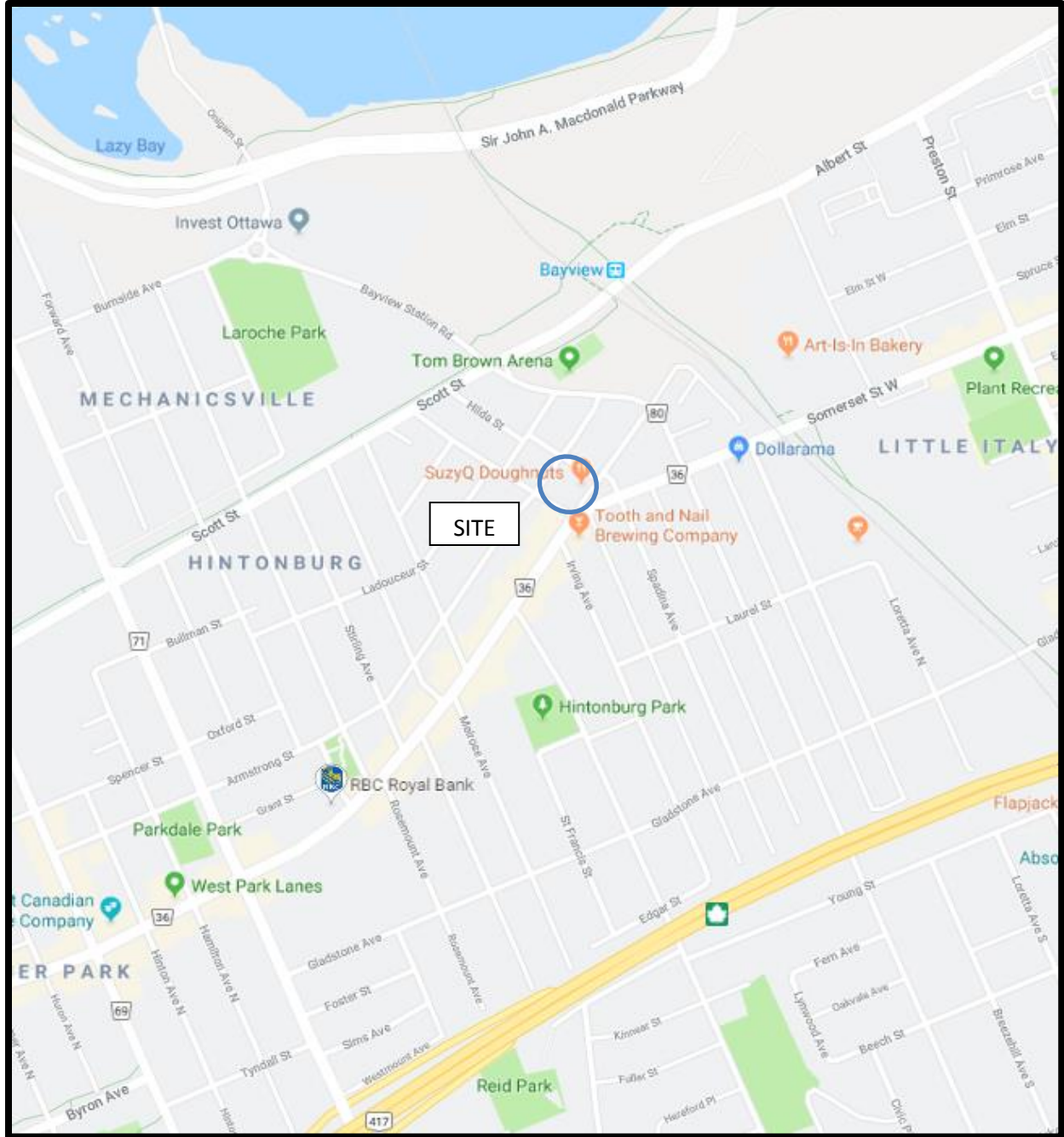
**DRAWING PE4752-5 – ANALYTICAL TESTING PLAN – GROUNDWATER**

**DRAWING PE4752-6A – CROSS SECTION A-A' – SOIL (BTEX & VOCs)**

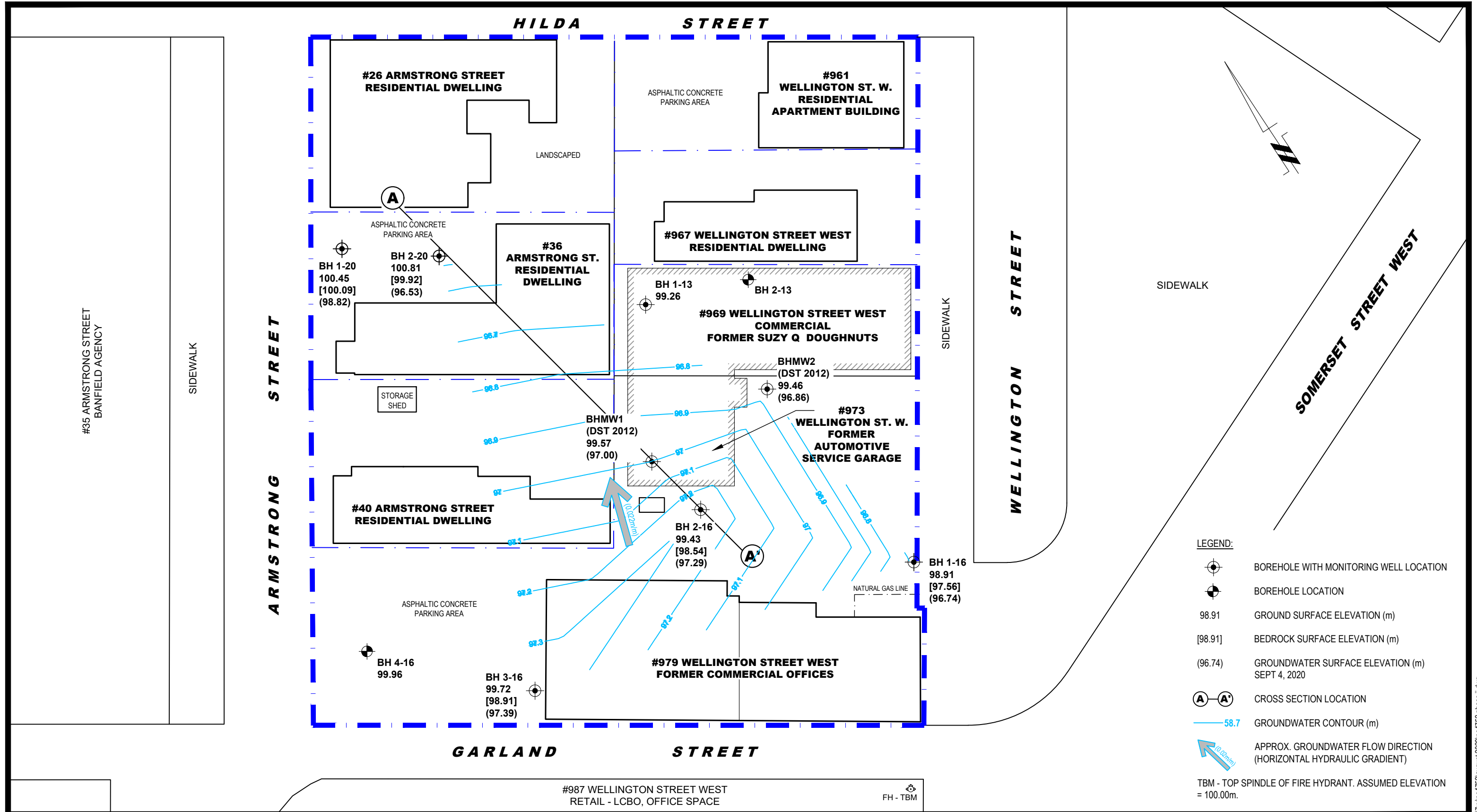
**DRAWING PE4752-6B – CROSS SECTION A-A' – SOIL (PHCs)**

**DRAWING PE4752-6C – CROSS SECTION A-A' – SOIL (METALS)**

**DRAWING PE4752-7 – CROSS SECTION A-A' – GROUNDWATER**



**FIGURE 1**  
**KEY PLAN**



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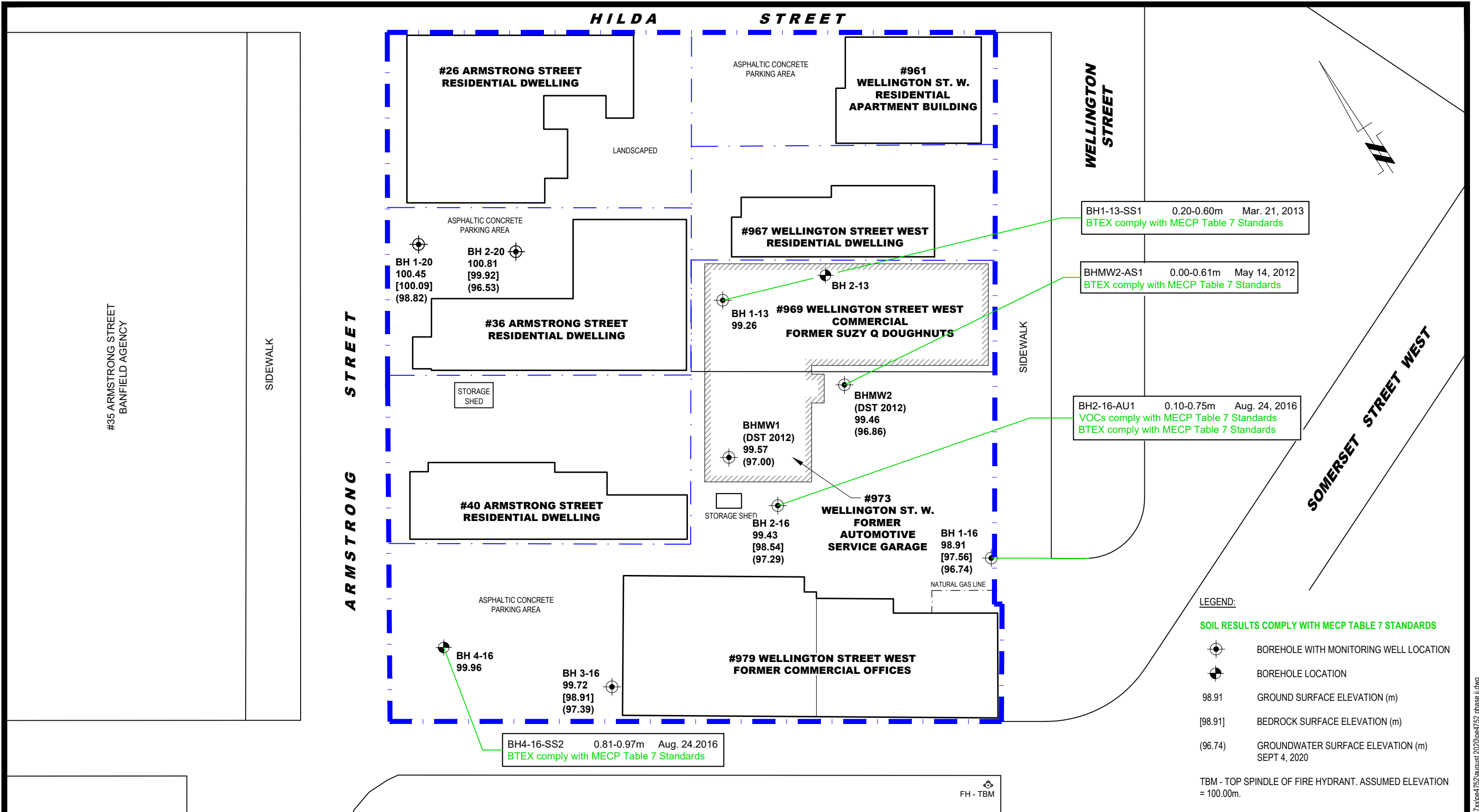
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NO.	REVISIONS	DATE	INITIAL

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**PHASE II - ENVIRONMENTAL SITE ASSESSMENT**  
 961-979 WELLINGTON STREET WEST & 26-40 ARMSTRONG STREET  
 OTTAWA, ONTARIO  
**TEST HOLE LOCATION PLAN**

Scale:	1:300	Date:	10/2020
Drawn by:	AG	Report No.:	PE4752-2R
Checked by:	NS	Dwg. No.:	<b>PE4752-3R</b>
Approved by:	MSD	Revision No.:	

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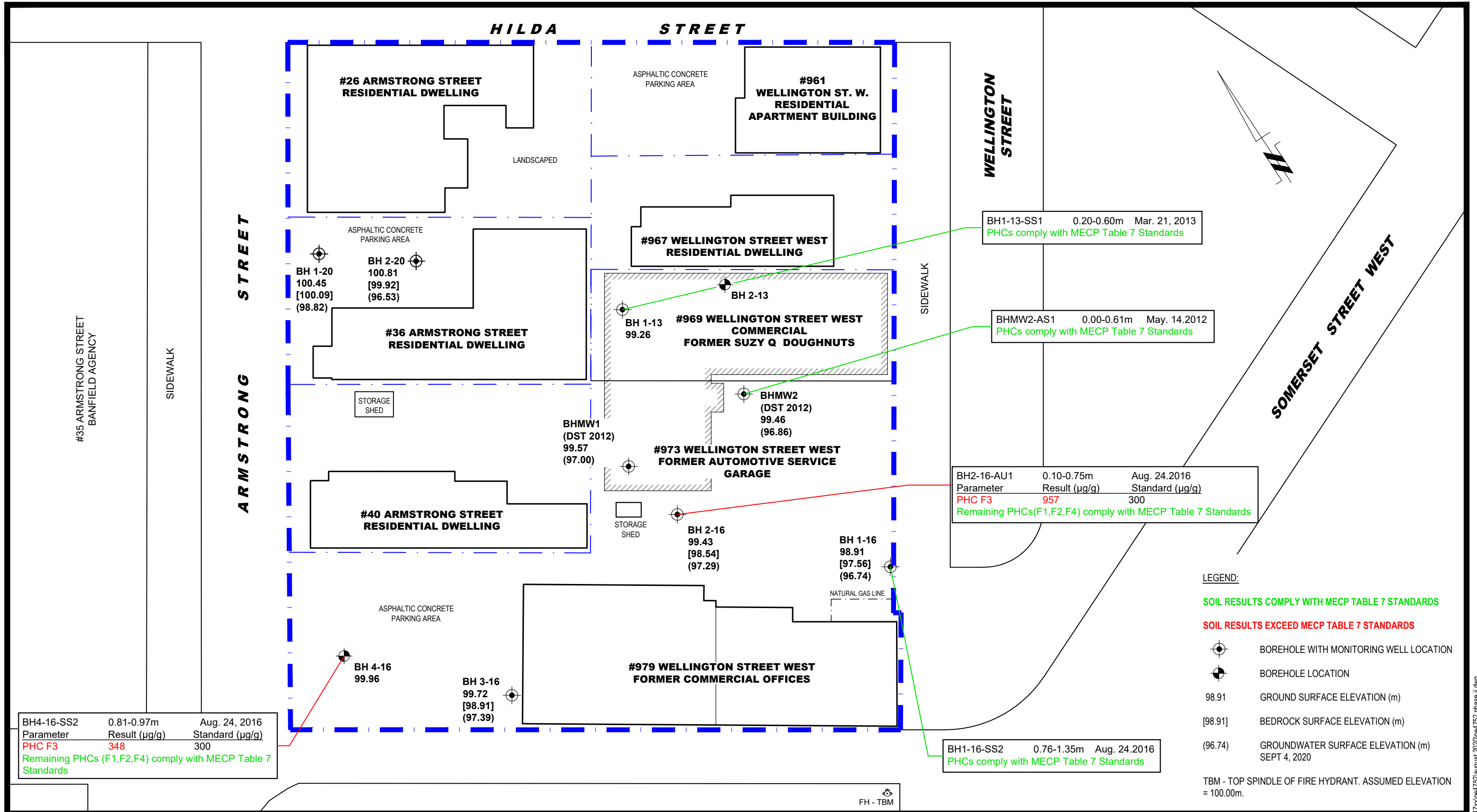
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**PHASE II - ENVIRONMENTAL SITE ASSESSMENT**  
**961-979 WELLINGTON STREET WEST & 26-40 ARMSTRONG STREET**  
 OTTAWA, ONTARIO  
 Title:  
**ANALYTICAL TESTING PLAN - SOIL (BTEX, VOCs)**

Scale:	1:300	Date:	10/2020
Drawn by:	RCG	Report No.:	PE4752-2R
Checked by:	NS	Dwg. No.:	<b>PE4752-4A</b>
Approved by:	MSD	Revision No.:	





- LEGEND:**
- SOIL RESULTS COMPLY WITH MECP TABLE 7 STANDARDS
  - SOIL RESULTS EXCEED MECP TABLE 7 STANDARDS
  - BOREHOLE WITH MONITORING WELL LOCATION
  - BOREHOLE LOCATION
  - 98.91 GROUND SURFACE ELEVATION (m)
  - [98.91] BEDROCK SURFACE ELEVATION (m)
  - (96.74) GROUNDWATER SURFACE ELEVATION (m) SEPT 4, 2020
  - TBM - TOP SPINDLE OF FIRE HYDRANT. ASSUMED ELEVATION = 100.00m.

BH4-16-SS2	0.81-0.97m	Aug. 24, 2016
Parameter	Result (µg/g)	Standard (µg/g)
PHC F3	348	300
Remaining PHCs (F1,F2,F4) comply with MECP Table 7 Standards		

BH1-16-SS2	0.76-1.35m	Aug. 24, 2016
PHCs comply with MECP Table 7 Standards		

BH2-16-AU1	0.10-0.75m	Aug. 24, 2016
Parameter	Result (µg/g)	Standard (µg/g)
PHC F3	957	300
Remaining PHCs(F1,F2,F4) comply with MECP Table 7 Standards		

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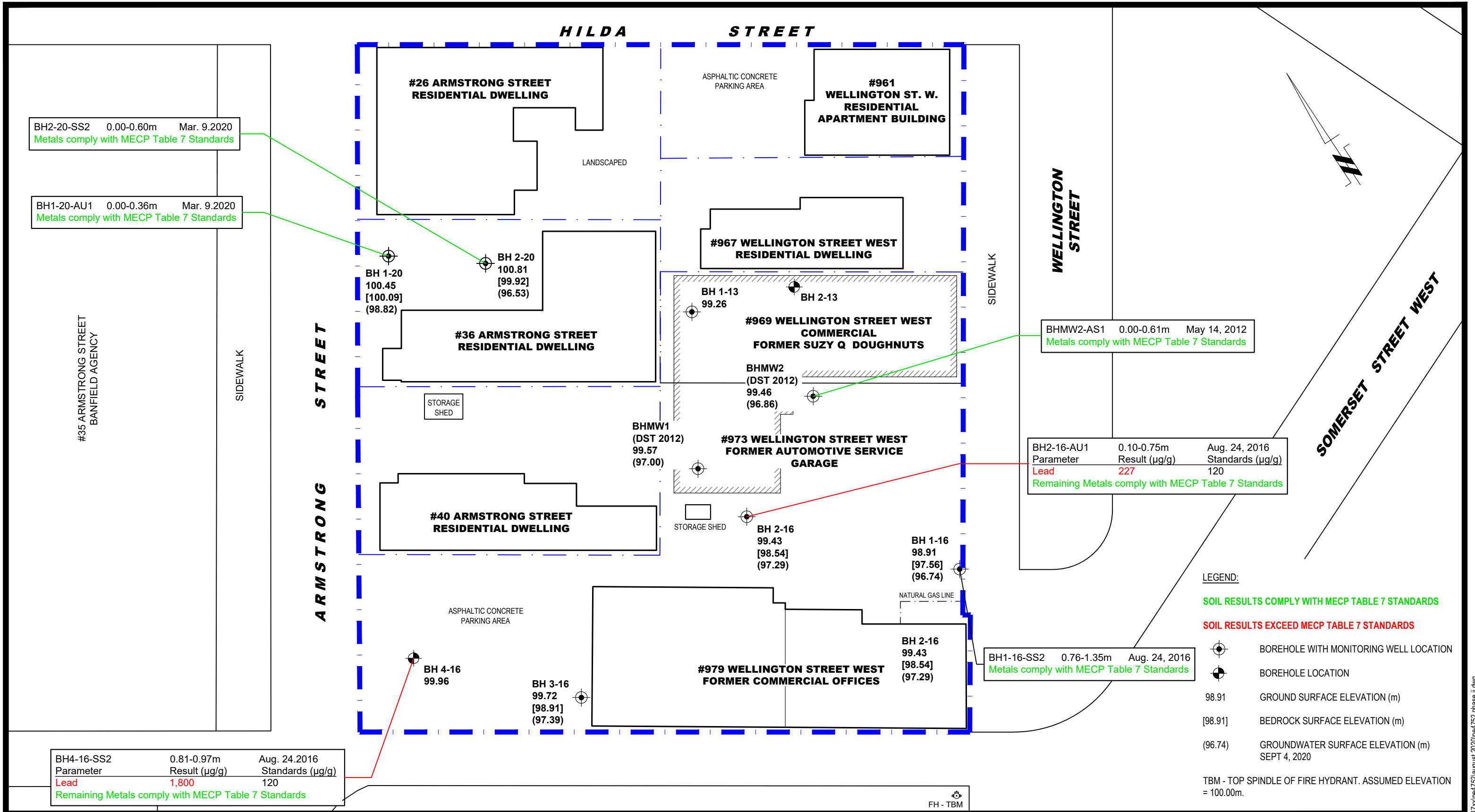
NO.	REVISIONS	DATE	INITIAL

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT  
961-979 WELLINGTON STREET WEST & 26-40 ARMSTRONG STREET  
OTTAWA, ONTARIO

Title: **ANALYTICAL TESTING PLAN - SOIL (PHCs)**

Scale:	1:300	Date:	10/2020
Drawn by:	RCG	Report No.:	PE4752-2R
Checked by:	NS	Dwg. No.:	<b>PE4752-4B</b>
Approved by:	MSD	Revision No.:	

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BH2-20-SS2 0.00-0.60m Mar. 9.2020  
Metals comply with MECP Table 7 Standards

BH1-20-AU1 0.00-0.36m Mar. 9.2020  
Metals comply with MECP Table 7 Standards

BHMW2-AS1 0.00-0.61m May 14, 2012  
Metals comply with MECP Table 7 Standards

BH2-16-AU1	0.10-0.75m	Aug. 24, 2016
Parameter	Result (µg/g)	Standards (µg/g)
Lead	227	120

Remaining Metals comply with MECP Table 7 Standards

BH1-16-SS2 0.76-1.35m Aug. 24, 2016  
Metals comply with MECP Table 7 Standards

BH4-16-SS2	0.81-0.97m	Aug. 24.2016
Parameter	Result (µg/g)	Standards (µg/g)
Lead	1,800	120

Remaining Metals comply with MECP Table 7 Standards

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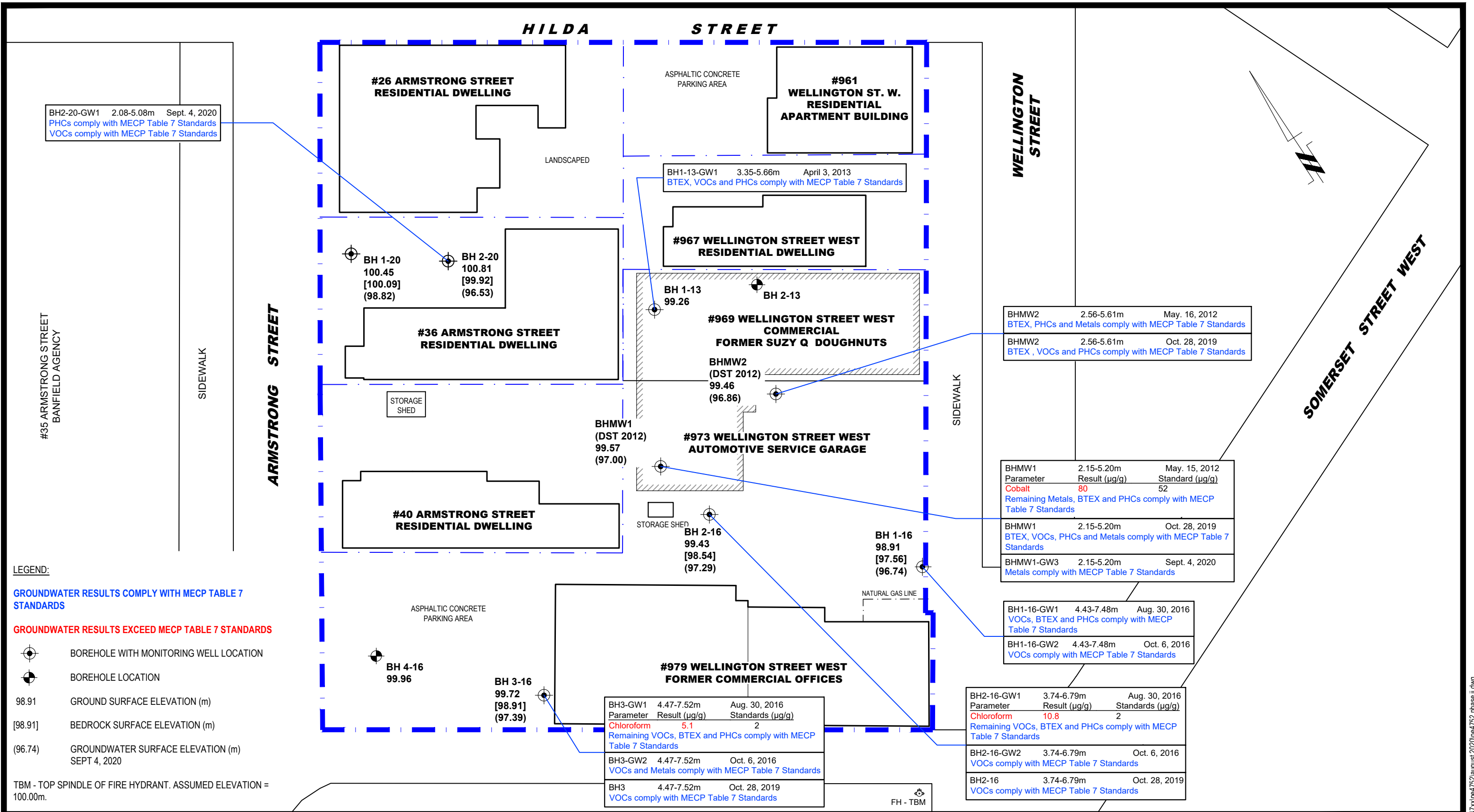
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961-979 WELLINGTON STREET WEST & 26-40 ARMSTRONG STREET  
OTTAWA, ONTARIO  
Title: **ANALYTICAL TESTING PLAN - SOIL (METALS)**

Scale:	1:300	Date:	10/2020
Drawn by:	RCG	Report No.:	PE4752-2R
Checked by:	NS	Dwg. No.:	<b>PE4752-4C</b>
Approved by:	MSD	Revision No.:	





BH2-20-GW1 2.08-5.08m Sept. 4, 2020  
 PHCs comply with MECP Table 7 Standards  
 VOCs comply with MECP Table 7 Standards

BH1-13-GW1 3.35-5.66m April 3, 2013  
 BTEX, VOCs and PHCs comply with MECP Table 7 Standards

BH 1-20 100.45 [100.09] (98.82)  
 BH 2-20 100.81 [99.92] (96.53)

BH 1-13 99.26  
 BH 2-13

BHMW2 2.56-5.61m May. 16, 2012  
 BTEX, PHCs and Metals comply with MECP Table 7 Standards  
 BHMW2 2.56-5.61m Oct. 28, 2019  
 BTEX, VOCs and PHCs comply with MECP Table 7 Standards

BHMW1 (DST 2012) 99.57 (97.00)

BHMW1	2.15-5.20m	May. 15, 2012
Parameter	Result (µg/g)	Standard (µg/g)
Cobalt	80	52
Remaining Metals, BTEX and PHCs comply with MECP Table 7 Standards		

BHMW1 2.15-5.20m Oct. 28, 2019  
 BTEX, VOCs, PHCs and Metals comply with MECP Table 7 Standards

BHMW1-GW3 2.15-5.20m Sept. 4, 2020  
 Metals comply with MECP Table 7 Standards

BH 2-16 99.43 [98.54] (97.29)  
 BH 1-16 98.91 [97.56] (96.74)

BH1-16-GW1 4.43-7.48m Aug. 30, 2016  
 VOCs, BTEX and PHCs comply with MECP Table 7 Standards

BH1-16-GW2 4.43-7.48m Oct. 6, 2016  
 VOCs comply with MECP Table 7 Standards

- LEGEND:**
- GROUNDWATER RESULTS COMPLY WITH MECP TABLE 7 STANDARDS
  - GROUNDWATER RESULTS EXCEED MECP TABLE 7 STANDARDS
  - BOREHOLE WITH MONITORING WELL LOCATION
  - BOREHOLE LOCATION
  - 98.91 GROUND SURFACE ELEVATION (m)
  - [98.91] BEDROCK SURFACE ELEVATION (m)
  - (96.74) GROUNDWATER SURFACE ELEVATION (m) SEPT 4, 2020

TBM - TOP SPINDLE OF FIRE HYDRANT. ASSUMED ELEVATION = 100.00m.

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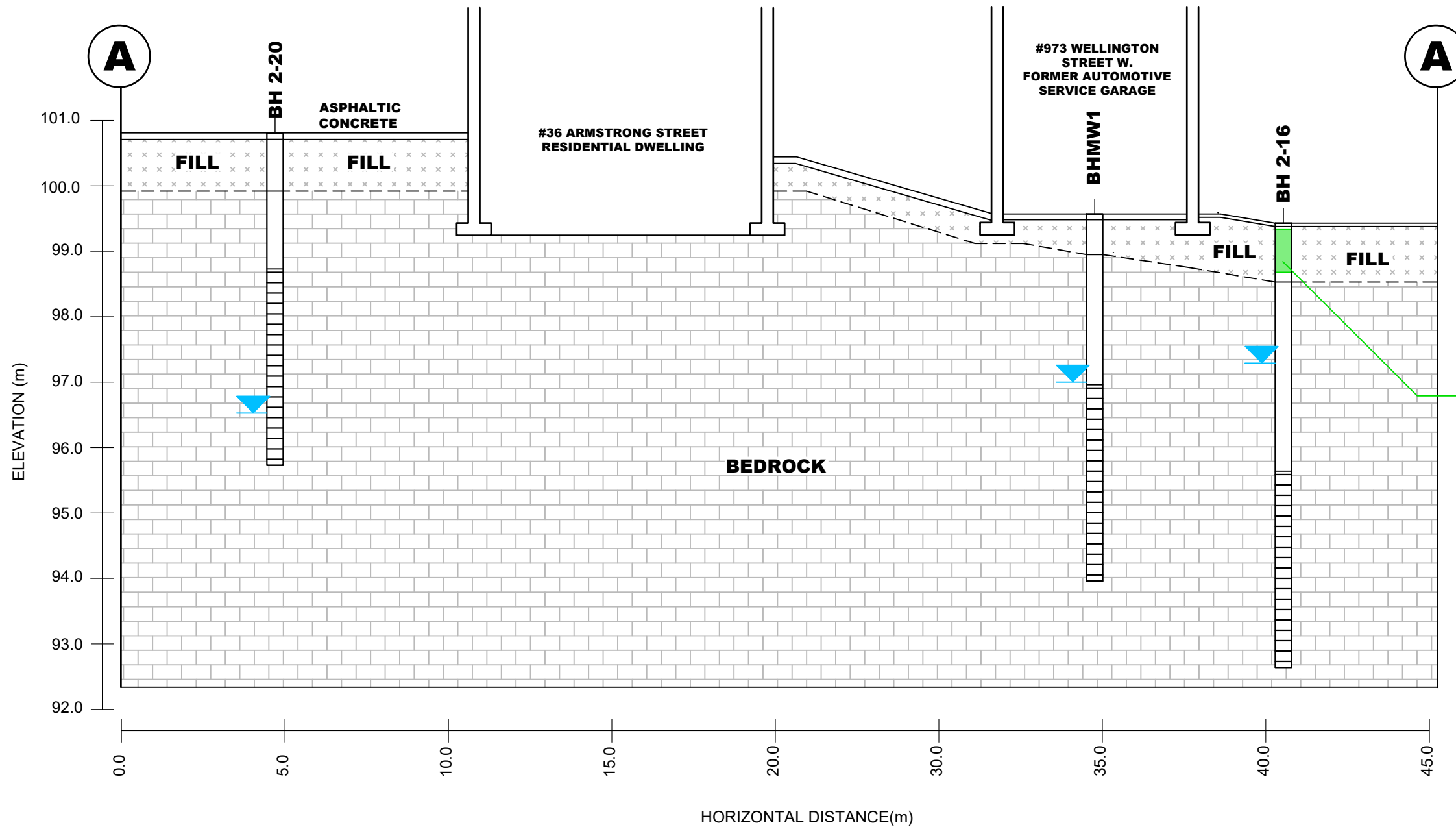
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NO.	REVISIONS	DATE	INITIAL

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 961-979 WELLINGTON STREET WEST & 26-40 ARMSTRONG STREET  
 OTTAWA, ONTARIO

Title: **ANALYTICAL TESTING PLAN - GROUNDWATER**

Scale:	1:300	Date:	10/2020
Drawn by:	RCG	Report No.:	PE4752-2R
Checked by:	NS	Dwg. No.:	<b>PE4752-5</b>
Approved by:	MSD	Revision No.:	



BH2-16-AU1 0.10-0.75m Aug. 24, 2016  
 VOCs comply with MECP Table 7 Standards  
 BTEX comply with MECP Table 7 Standards

SOIL RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

SOIL RESULT EXCEED MECP TABLE 7 STANDARDS

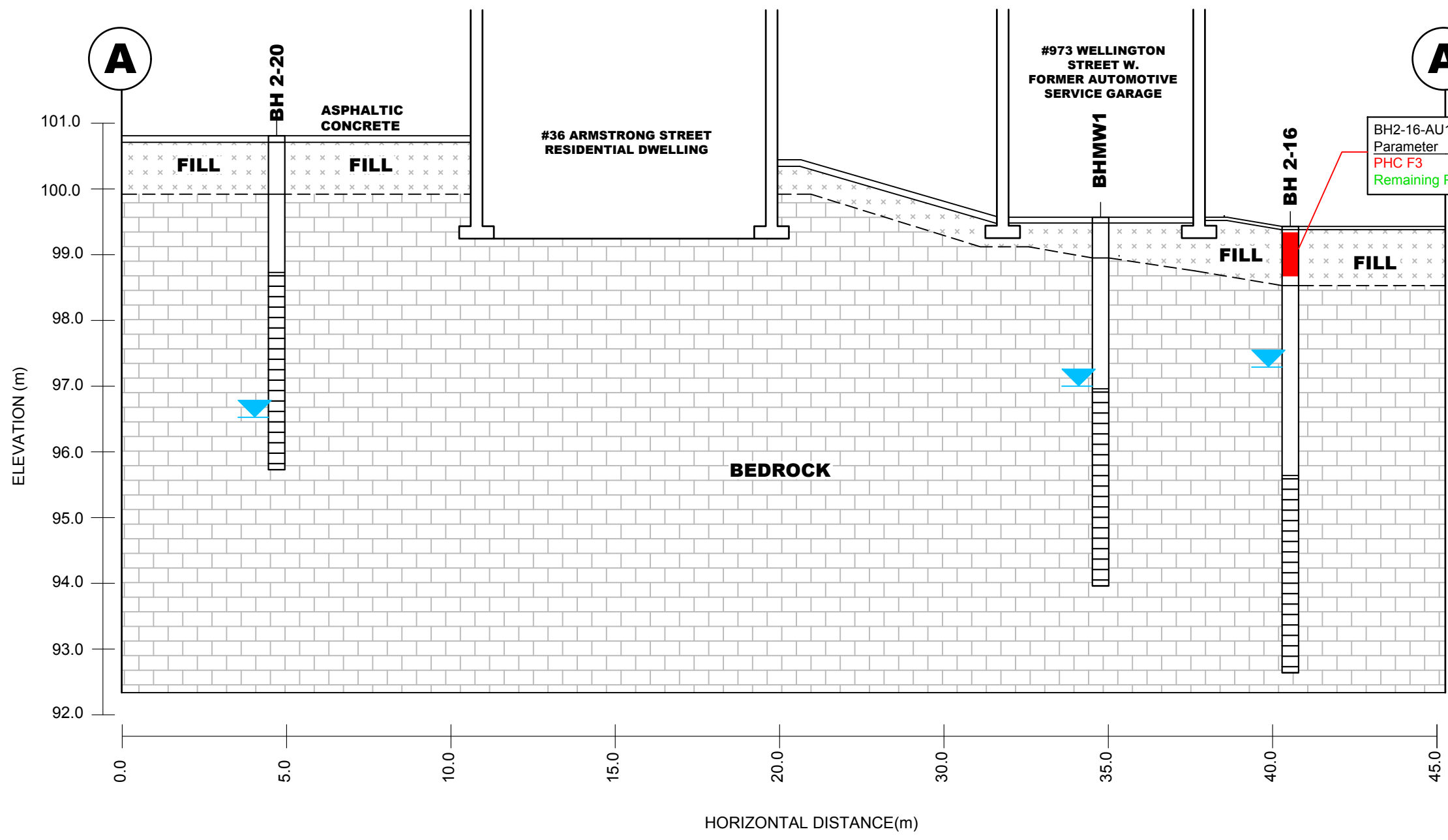
**patersongroup**  
 consulting engineers

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

NO.	REVISIONS	DATE	INITIAL

MAGIL LAURENTIAN REALTY INVESTMENTS INC.  
 PHASE II - ENVIRONMENTAL SITE ASSESSMENT  
 961-979 WELLINGTON STREET WEST & 26-40 ARMSTRONG STREET  
 OTTAWA, ONTARIO  
 Title: **CROSS SECTION A-A' - SOIL (BTEX, VOCs)**

Scale:	AS SHOWN	Date:	10/2020
Drawn by:	RCG	Report No.:	PE4752-2R
Checked by:	NS	Dwg. No.:	<b>PE4752-6A</b>
Approved by:	MSD	Revision No.:	



BH2-16-AU1	0.10-0.75m	Aug. 24, 2016
Parameter	Result (µg/g)	Standard (µg/g)
PHC F3	957	300
Remaining PHCs(F1,F2,F4) comply with MECP Table 7 Standards		

SOIL RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

SOIL RESULT EXCEED MECP TABLE 7 STANDARDS

**patersongroup**  
consulting engineers

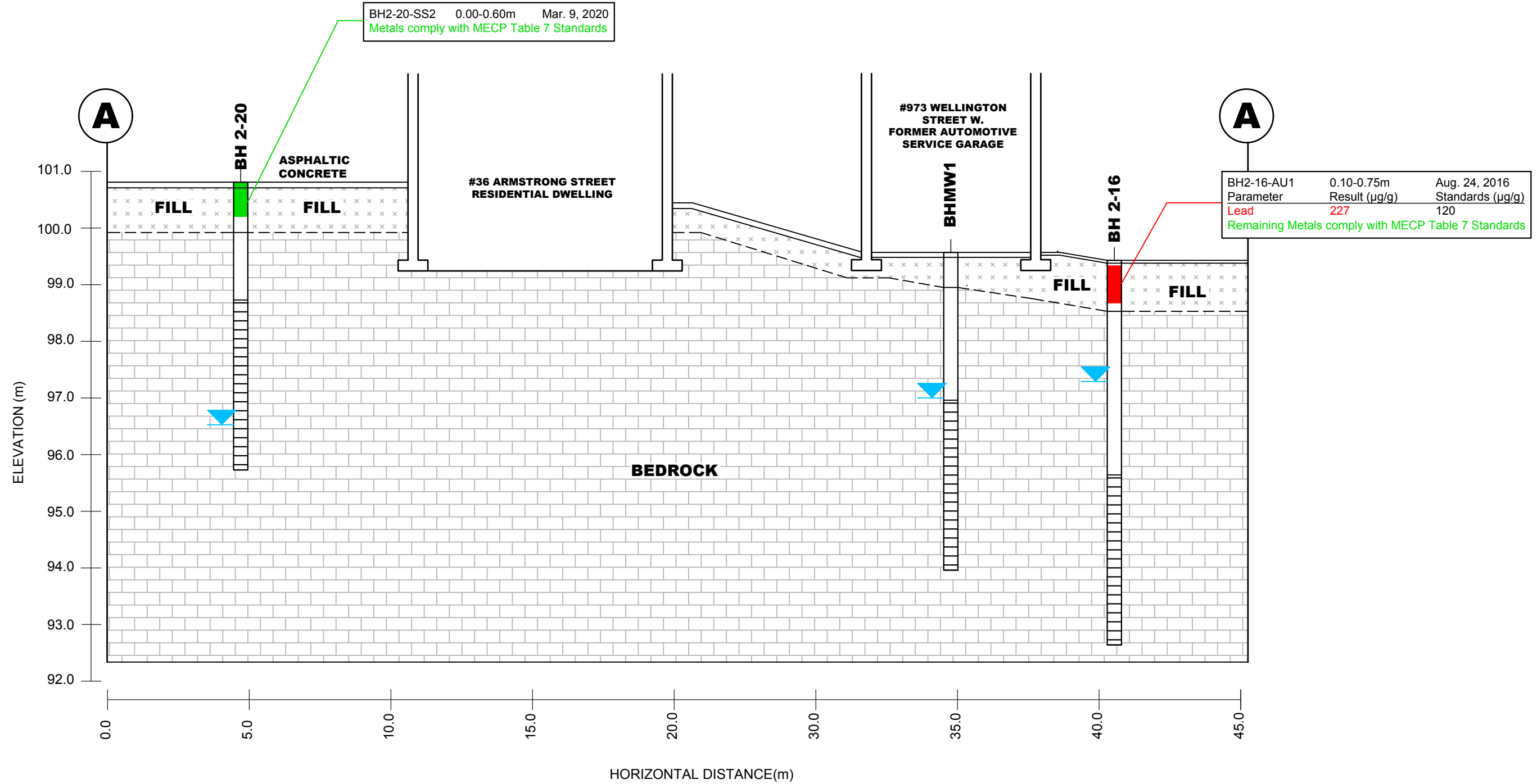
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NO.	REVISIONS	DATE	INITIAL

MAGIL LAURENTIAN REALTY INVESTMENTS INC.  
PHASE II - ENVIRONMENTAL SITE ASSESSMENT  
961-979 WELLINGTON STREET WEST & 26-40 ARMSTRONG STREET  
OTTAWA, ONTARIO

Title: **CROSS SECTION A-A' - SOIL (PHCs)**

Scale:	AS SHOWN	Date:	10/2020
Drawn by:	RCG	Report No.:	PE4752-2R
Checked by:	NS	Dwg. No.:	<b>PE4752-6B</b>
Approved by:	MSD	Revision No.:	



SOIL RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

SOIL RESULT EXCEED MECP TABLE 7 STANDARDS

**patersongroup**  
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Ottawa, Ontario K2E 7J5  
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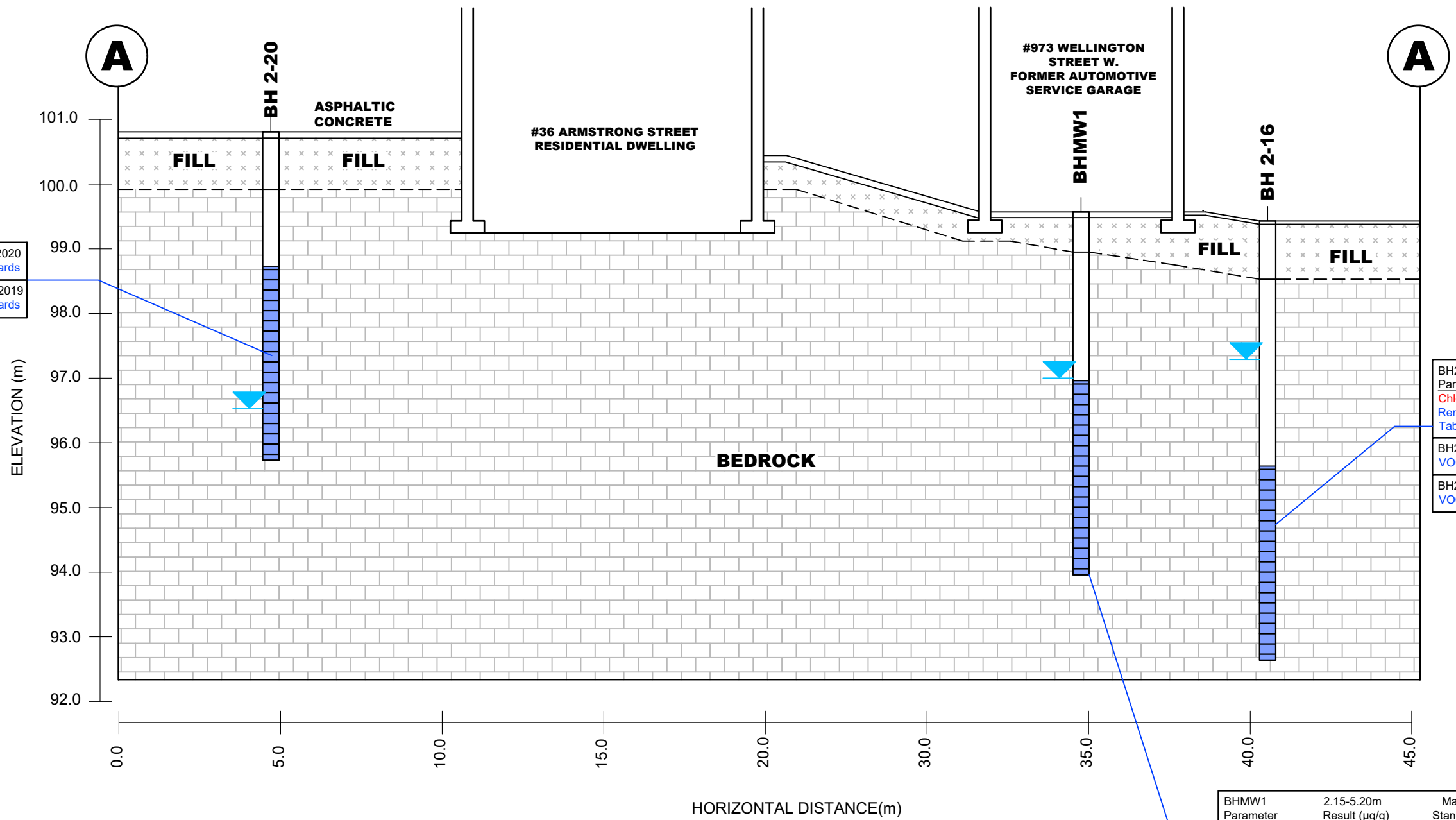
NO.	REVISIONS	DATE	INITIAL

MAGIL LAURENTIAN REALTY INVESTMENTS INC.  
PHASE II - ENVIRONMENTAL SITE ASSESSMENT  
961-979 WELLINGTON STREET WEST & 26-40 ARMSTRONG STREET  
OTTAWA, ONTARIO

Title: **CROSS SECTION A-A' - SOIL (METALS)**

Scale:	AS SHOWN	Date:	10/2020
Drawn by:	RCG	Report No.:	PE4752-2R
Checked by:	NS	Dwg. No.:	<b>PE4752-6C</b>
Approved by:	MSD	Revision No.:	

BH2-20-GW1	2.08-5.08m	Sept. 4, 2020
PHCs comply with MECP Table 7 Standards		
BH2-20-GW1	2.08-5.08m	Oct. 28, 2019
VOCs comply with MECP Table 7 Standards		



BH2-GW1	3.74-6.79m	Aug. 30, 2016
Parameter	Result (µg/g)	Standards (µg/g)
Chloroform	10.8	2
Remaining VOCs, BTEX and PHCs comply with MECP Table 7 Standards		
BH2-GW2	3.74-6.79m	Oct. 6, 2016
VOCs comply with MECP Table 7 Standards		
BH2	3.74-6.79m	Oct. 28, 2019
VOCs comply with MECP Table 7 Standards		

BHMW1	2.15-5.20m	May. 15, 2012
Parameter	Result (µg/g)	Standard (µg/g)
Cobalt	80	52
Remaining Metals, BTEX and PHCs comply with MECP Table 7 Standards		
BHMW1	2.15-5.20m	Oct. 28, 2019
BTEX, VOCs, PHCs and Metals comply with MECP Table 7 Standards		
BHMW1-GW3	2.15-5.20m	Sept. 4, 2020
Metals comply with MECP Table 7 Standards		

GROUNDWATER RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

GROUNDWATER RESULT EXCEED MECP TABLE 7 STANDARDS

**patersongroup**  
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NO.	REVISIONS	DATE	INITIAL

MAGIL LAURENTIAN REALTY INVESTMENTS INC.  
PHASE II - ENVIRONMENTAL SITE ASSESSMENT  
961-979 WELLINGTON STREET WEST & 26-40 ARMSTRONG STREET  
OTTAWA, ONTARIO  
Title: **CROSS SECTION A-A' - GROUNDWATER**

Scale:	AS SHOWN	Date:	10/2020
Drawn by:	RCG	Report No.:	PE4752-2R
Checked by:	NS	Dwg. No.:	<b>PE4752-7</b>
Approved by:	MSD	Revision No.:	

# **APPENDIX 1**

**SAMPLING AND ANALYSIS PLAN**

**SOIL PROFILE AND TEST DATA SHEETS**

**SYMBOLS AND TERMS**

**LABORATORY CERTIFICATES OF ANALYSIS**



Geotechnical  
Engineering

Environmental  
Engineering

Hydrogeology

Geological  
Engineering

Materials Testing

Building Science

Archaeological  
Services

## Sampling & Analysis Plan

Phase II - Environmental Site Assessment Update  
961-979 Wellington Street West  
& 26-40 Armstrong Street  
Ottawa, Ontario

Prepared For

Magil Laurentian Realty Investments Inc.

### Paterson Group Inc.

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March 1, 2020

Report: PE4752-SAP

**TABLE OF CONTENTS**

1.0 SAMPLING PROGRAM ..... 1  
2.0 ANALYTICAL TESTING PROGRAM..... 2  
3.0 STANDARD OPERATING PROCEDURES ..... 3  
    3.1 Environmental Drilling Procedure ..... 3  
    3.2 Monitoring Well Installation Procedure ..... 6  
    3.3 Monitoring Well Sampling Procedure ..... 7  
4.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) ..... 8  
5.0 DATA QUALITY OBJECTIVES ..... 9  
6.0 PHYSICAL IMPEDIMENTS..... 10



## 1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Magil Laurentian Realty Investments Inc., to conduct a Phase II - Environmental Site Assessment (Phase II ESA) Update for the properties addressed 961-979 Wellington Street West and 26-40 Armstrong Street, Ottawa, Ontario.

Based on the findings of the Phase I ESA conducted by Paterson, as well as the findings of previous subsurface investigations completed for the subject site by Paterson and others, a subsurface investigation program was developed.

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1-20	Northern portion of subject site; to assess for potential impacts resulting from the presence of an on-site auto service garage, a former on-site autobody shop, as well as the presence of fill material of unknown quality.	3-6 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH2-20	Northern portion of subject site; to assess for potential impacts resulting from the presence of an on-site auto service garage, a former on-site autobody shop, as well as the presence of fill material of unknown quality.	3-6 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.

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

Following the borehole drilling, groundwater monitoring wells will be installed in BH1-20 and BH2-20 for the collection of groundwater samples.

A groundwater sampling program was also developed in tandem with this subsurface investigation, consisting of the resampling of all other remaining groundwater monitoring wells previously installed on-site.

All borehole locations are shown on Drawing PE4752-3R Test Hole Location Plan, appended to the main report.

## 2.0 ANALYTICAL TESTING PROGRAM

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

- At least one sample from each borehole should be submitted, in order to delineate the horizontal extent of contamination across the site.
- At least one sample from each stratigraphic unit should be submitted, in order to delineate the vertical extent of contamination at the site.
- In boreholes where there is visual or olfactory evidence of contamination, or where organic vapour meter or photoionization detector readings indicate the presence of contamination, the 'worst-case' sample from each borehole should be submitted for comparison with MECP 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 soil at the subject site is based on the following general considerations:

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

## 3.0 STANDARD OPERATING PROCEDURES

### 3.1 Environmental Drilling Procedure

#### Purpose

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

#### Equipment

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

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

#### Determining Borehole Locations

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

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

---

## Drilling Procedure

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

- Continuous split spoon samples (every 0.6 m or 2') or semi-continuous (every 0.76 m or 2'6") are required.
- Make sure samples are well sealed in plastic bags with no holes prior to screening and are kept cool but unfrozen.
- If sampling for VOCs, BTEX, or PHCs F<sub>1</sub>, a soil core from each soil sample, which may be analyzed, must be taken and placed in the laboratory-provided methanol vial.
- Note all and any odours or discolouration of samples.
- Split spoon samplers must be washed between samples.
- If obvious contamination is encountered, continue sampling until vertical extent of contamination is delineated.
- As a general rule, environmental boreholes should be deep enough to intercept the groundwater table (unless this is impossible/impractical - call project manager to discuss).
- If at all possible, soil samples should be submitted to a preliminary screening procedure on site, either using a RKI Eagle, PID, etc. depending on type of suspected contamination.

## Spoon Washing Procedure

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

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

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

---

## Screening Procedure

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

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

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

## 3.2 Monitoring Well Installation Procedure

### Equipment

- 5' x 2" threaded sections of Schedule 40 PVC slotted well screen (5' x 1 ¼" if installing in cored hole in bedrock)
- 5' x 2" threaded sections of Schedule 40 PVC riser pipe (5' x 1 ¼" if installing in cored hole in bedrock)
- Threaded end-cap
- Slip-cap or J-plug
- Asphalt cold patch or concrete
- Silica Sand
- Bentonite chips (Holeplug)
- Steel flushmount casing

### Procedure

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

### 3.3 Monitoring Well Sampling Procedure

#### Equipment

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

#### Sampling Procedure

- Locate well and use socket wrench or Allan key to open metal flush mount protector cap. Remove plastic well cap.
- Measure water level, with respect to existing ground surface, using water level meter or interface probe. If using interface probe on suspected NAPL site, measure the thickness of free product.
- Measure total depth of well.
- Clean water level tape or interface probe using methanol and water. Change gloves between wells.
- Calculate volume of standing water within well and record.
- Insert polyethylene tubing into well and attach to peristaltic pump. Turn on peristaltic pump and purge into graduated bucket. Purge at least three well volumes of water from the well. Measure and record field chemistry. Continue to purge, measuring field chemistry after every well volume purged, until appearance or field chemistry stabilizes.
- Note appearance of purge water, including colour, opacity (clear, cloudy, silty), sheen, presence of LNAPL, and odour. Note any other unusual features (particulate matter, effervescence (bubbling) of dissolved gas, etc.).
- Fill required sample bottles. If sampling for metals, attach 75-micron filter to discharge tube and filter metals sample. If sampling for VOCs, use low flow rate to ensure continuous stream of non-turbulent flow into sample bottles. Ensure no headspace is present in VOC vials.
- Replace well cap and flushmount casing cap.

## **4.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)**

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

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



## 5.0 DATA QUALITY OBJECTIVES

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

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

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

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

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

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.



# LOG OF BOREHOLE/MONITORING WELL BHMW1

REF. No.: OE-OT-014804	DST CONSULTING ENGINEERS INC.
CLIENT: Carling Otto	
PROJECT: Phase II Environmental Site Assessment	METHOD: Portable Drill
LOCATION: 973 Wellington Street West, Ottawa, Ontario	DIAMETER: 31.75 mm ID
SURFACE ELEVATION: 100.08 meters	DATE: May 14, 2012

THVC *				SAMPLES		SUBSURFACE PROFILE				REMARKS	
PPM		PPM		No.	Type	SPT Value	SYMBL	MATERIAL DESCRIPTION	DPTH m		ELEV m
○	PPM	200	400	600	800						
■	% LEL	20	40	60	80						
SURFACE											
							CONCRETE			100	Monitoring well protected by Flush mount Casing
							CRUSHED LIMESTONE (FILL)			99	
							BEDROCK - LIMESTONE			98	Groundwater depth is 1.78 m.b.g.s. (5/16/2012)
										97	
										96	
										95	
								End of Borehole at 5.2 m		94	
										93	

GASTECHBHMW OE-OT-014804\_WELLINGTON.GPJ DST\_MIN.GDT 5/29/12

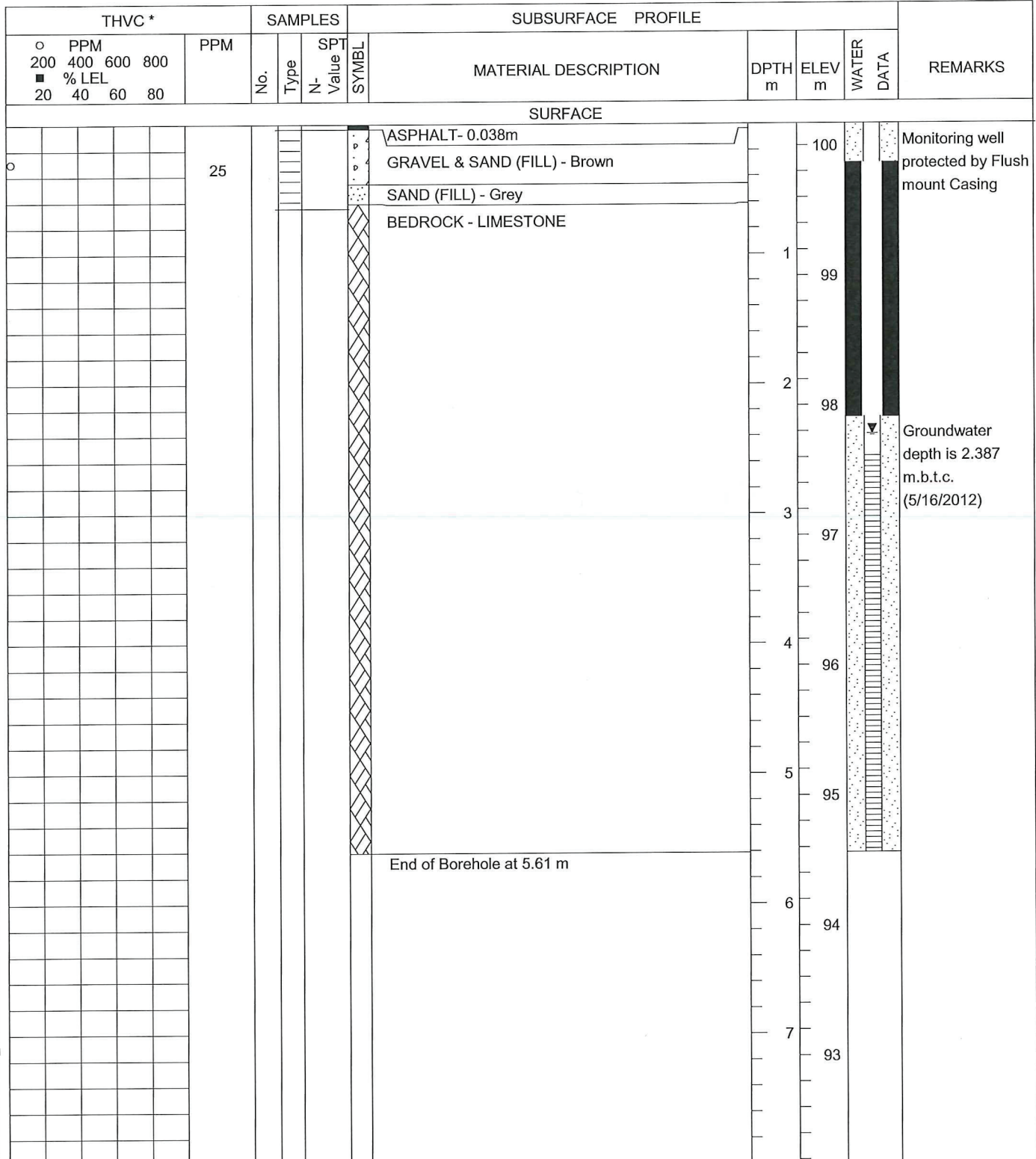


Coring  
 m.b.t.c. Meter Below Top of Casing  
 m.b.g.s. Meter Below Grade Surface

\* - Total Hydrocarbon Vapour Concentration  
 NR - No Recovery  
 ND - Not Detectable  
 RKI Eagle

# LOG OF BOREHOLE/MONITORING WELL BHMW2

REF. No.: OE-OT-014804	DST CONSULTING ENGINEERS INC.
CLIENT: Carling Otto	
PROJECT: Phase II Environmental Site Assessment	METHOD: Portable Drill
LOCATION: 973 Wellington Street West, Ottawa, Ontario	DIAMETER: 31.75 mm ID
SURFACE ELEVATION: 100.17 meters	DATE: May 15, 2012



GASTECHBHMW OE-OT-014804\_WELLINGTON.GPJ DST\_MIN.GDT 5/29/12



Coring  
 m.b.t.c. Meter Below Top of Casing  
 m.b.g.s. Meter Below Grade Surface

\* - Total Hydrocarbon Vapour Concentration  
 NR - No Recovery  
 ND - Not Detectable  
 RKL Eagle

## SOIL PROFILE AND TEST DATA

Phase I - II Environmental Site Assessment  
969 Wellington Street West  
Ottawa, Ontario

**DATUM** TBM - Top spindle of fire hydrant located on the northwest corner of Garland Street and Wellington Street West. Assumed elevation = 100.00m.

**REMARKS**

**BORINGS BY** Portable Drill

**DATE** March 27, 2013

**FILE NO.** PE2934

**HOLE NO.** BH 1-13

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rdg. (ppm) ○ Lower Explosive Limit %					
<b>GROUND SURFACE</b>								20	40	60	80		
Concrete	0.10					0	99.26						
FILL: Crushed stone	0.20												
FILL: Brown silty sand with gravel, trace clay	0.60	SS	1	62									
FILL: Brown silty clay with sand	1.14	SS	2	48		1	98.26						
						2	97.26						
		RC	1	100	86								
						3	96.26						
<b>BEDROCK:</b> Grey limestone interbedded with shale						4	95.26						
		RC	2	59	26								
						5	94.26						
End of Borehole	5.66												

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

## SOIL PROFILE AND TEST DATA

Phase I - II Environmental Site Assessment  
969 Wellington Street West  
Ottawa, Ontario

**DATUM** TBM - Top spindle of fire hydrant located on the northwest corner of Garland Street and Wellington Street West. Assumed elevation = 100.00m.

**FILE NO.** PE2934

**REMARKS**

**HOLE NO.** BH 2-13

**BORINGS BY** Portable Drill

**DATE** March 27, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			<input checked="" type="radio"/> Volatile Organic Rdg. (ppm) <input type="radio"/> Lower Explosive Limit %				
<b>GROUND SURFACE</b>						0						
Concrete	0.10											
FILL: Crushed stone	0.30											
FILL: Brown sand, trace gravel and brick	0.76	SS	1	67								
End of Borehole												

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

**DATUM** TBM - Top spindle of fire hydrant located on the northwest corner of Garland Street and Wellington Street West. Assumed elevation = 100.00m.

**REMARKS**

**FILE NO.** PE3837

**HOLE NO.** BH 1-16

**BORINGS BY** CME 55 Power Auger

**DATE** August 24, 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction						
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rdg. (ppm)										
GROUND SURFACE										○ Lower Explosive Limit %								
						20 40 60 80				100 200 300 400 500								
Asphaltic concrete	0.05					0	98.91											
<b>FILL:</b> Crushed stone with silt	0.60	AU	1															
<b>FILL:</b> Brown sandy silt with clay, trace gravel and cobbles	1.35	SS	2*	87	38	1	97.91											
		RC	1	100	81	2	96.91											
		RC	2	100	91	3	95.91											
<b>BEDROCK:</b> Grey limestone		RC	3	100	92	4	94.91											
		RC	4	100	85	5	93.91											
						6	92.91											
						7	91.91											
End of Borehole	7.48																	
(GWL @ 2.17m - Sept. 4, 2020)																		
* Sample SS2 submitted for analytical testing																		

▲ Full Gas Resp. △ Methane Elim.



## SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment  
979 Wellington Street West  
Ottawa, Ontario

**DATUM** TBM - Top spindle of fire hydrant located on the northwest corner of Garland Street and Wellington Street West. Assumed elevation = 100.00m.

**REMARKS**

**FILE NO.**  
**PE3837**

**HOLE NO.**  
**BH 2-16**

**BORINGS BY** CME 55 Power Auger

**DATE** August 24, 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rdg. (ppm)	○ Lower Explosive Limit %			
							20	40	60	80		
<b>GROUND SURFACE</b>						0	99.43					
Asphaltic concrete	0.05	AU	1*									
<b>FILL: Crushed stone with silt</b>	0.89	SS	2	60	50+	1	98.43					
		RC	1	91	84	2	97.43					
		RC	2	98	93	3	96.43					
<b>BEDROCK: Grey limestone</b>		RC	3	99	95	4	95.43					
		RC	4	100	100	5	94.43					
		RC	5	100	100	6	93.43					
End of Borehole	6.79											
(GWL @ 2.14m - Sept. 4, 2020) * Sample AU1 submitted for analytical testing												
							100	200	300	400	500	
							<b>RKI Eagle Rdg. (ppm)</b>					
							▲ Full Gas Resp. △ Methane Elim.					

**DATUM** TBM - Top spindle of fire hydrant located on the northwest corner of Garland Street and Wellington Street West. Assumed elevation = 100.00m.

**REMARKS**

**FILE NO.** PE3837

**HOLE NO.** BH 3-16

**BORINGS BY** CME 55 Power Auger

**DATE** August 24, 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rdg. (ppm)					
GROUND SURFACE								○ Lower Explosive Limit %					
								20	40	60	80		
Asphaltic concrete	0.05					0	99.72						
FILL: Crushed stone with silt	0.81	AU	1										
		SS	2	50	50+	1	98.72						
		RC	1	80	48								
		RC	2	97	86	2	97.72						
		RC	3	97	33	3	96.72						
BEDROCK: Grey limestone		RC	4	100	93	4	95.72						
		RC	5	100	90	5	94.72						
						6	93.72						
						7	92.72						
End of Borehole	7.52												
(GWL @ 2.33m - Sept. 4, 2020)													

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

**DATUM** TBM - Top spindle of fire hydrant located on the northwest corner of Garland Street and Wellington Street West. Assumed elevation = 100.00m.

**FILE NO.** PE3837

**REMARKS**

**HOLE NO.** BH 4-16

**BORINGS BY** CME 55 Power Auger

**DATE** August 24, 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			<input checked="" type="radio"/> Volatile Organic Rdg. (ppm)	<input type="radio"/> Lower Explosive Limit %				
						20      40      60      80				100    200    300    400    500			
<b>GROUND SURFACE</b>							0	99.96					
Asphaltic concrete	0.05												
<b>FILL:</b> Crushed stone with silt		AU	1										
	0.81												
<b>FILL:</b> Grey-brown sand, trace concrete	0.97	SS	2*	75	50+								
End of Borehole													
Practical refusal to augering at 0.97m depth													
* Sample SS2 submitted for analytical testing													

**RKI Eagle Rdg. (ppm)**  
 ▲ Full Gas Resp.    Δ Methane Elim.

## SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment  
36 and 40 Armstrong Street  
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant. Assumed elevation = 100.00m.

FILE NO. **PE4752**

REMARKS

HOLE NO. **BH 1-20**

BORINGS BY CME 55 Power Auger

DATE March 9, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rdg. (ppm)				
<b>GROUND SURFACE</b>								○ Lower Explosive Limit %				
								20	40	60	80	
Asphaltic concrete	0.10	AU	1			0	100.45					
FILL: Brown silty sand with gravel	0.36											
		RC	1	100	73	1	99.45					
		RC	2	100	96	2	98.45					
<b>BEDROCK:</b> Good to excellent quality, grey limestone												
		RC	3	100	70	3	97.45					
						4	96.45					
End of Borehole	4.55											
(GWL @ 1.63m - Sept. 4, 2020)												
								100	200	300	400	500
								<b>RKI Eagle Rdg. (ppm)</b>				
								▲ Full Gas Resp. △ Methane Elim.				

DATUM TBM - Top spindle of fire hydrant. Assumed elevation = 100.00m.

REMARKS

BORINGS BY CME 55 Power Auger

DATE March 9, 2020

FILE NO. **PE4752**

HOLE NO. **BH 2-20**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rdg. (ppm)	○ Lower Explosive Limit %			
GROUND SURFACE								20	40	60	80	
Asphaltic concrete	0.10	AU	1			0	100.81					
<b>FILL:</b> Brown silty sand with crushed stone	0.89	SS	2	67	50+							
		RC	1	100	100	1	99.81					
		RC	2	96	81	2	98.81					
<b>BEDROCK:</b> Excellent to fair quality, grey limestone		RC	3	100	100	3	97.81					
		RC	4	100	64	4	96.81					
	5.08					5	95.81					
End of Borehole (GWL @ 4.28m - Sept. 4, 2020)												

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

# SYMBOLS AND TERMS

## SOIL DESCRIPTION

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

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

The standard terminology to describe the relative strength of cohesionless soils is the compactness condition, 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. An SPT N value of "P" denotes that the split-spoon sampler was pushed 300 mm into the soil without the use of a falling hammer.

Compactness Condition	'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 shear vane tests, unconfined compression tests, or occasionally by the Standard Penetration Test (SPT). Note that the typical correlations of undrained shear strength to SPT N value (tabulated below) tend to underestimate the consistency for sensitive silty clays, so Paterson reviews the applicable split spoon samples in the laboratory to provide a more representative consistency value based on tactile examination.

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,  $S_t$ , is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil. The classes of sensitivity may be defined as follows:

Low Sensitivity:	$S_t < 2$
Medium Sensitivity:	$2 < S_t < 4$
Sensitive:	$4 < S_t < 8$
Extra Sensitive:	$8 < S_t < 16$
Quick Clay:	$S_t > 16$

### 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 NQ or larger size core. However, it can be used on smaller core sizes, such as BQ, 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, generally recovered using a piston sampler
G	-	"Grab" sample from test pit or surface materials
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size BQ, NQ, HQ, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

## SYMBOLS AND TERMS (continued)

### PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

WC%	-	Natural water content or water content of sample, %
LL	-	Liquid Limit, % (water content above which soil behaves as a liquid)
PL	-	Plastic Limit, % (water content above which soil behaves plastically)
PI	-	Plasticity Index, % (difference between LL and PL)
D <sub>xx</sub>	-	Grain size at which xx% of the soil, by weight, is of finer grain sizes These grain size descriptions are not used below 0.075 mm grain size
D <sub>10</sub>	-	Grain size at which 10% of the soil is finer (effective grain size)
D <sub>60</sub>	-	Grain size at which 60% of the soil is finer
C <sub>c</sub>	-	Concavity coefficient = $(D_{30})^2 / (D_{10} \times D_{60})$
C <sub>u</sub>	-	Uniformity coefficient = $D_{60} / D_{10}$

C<sub>c</sub> and C<sub>u</sub> are used to assess the grading of sands and gravels:

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

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

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

C<sub>c</sub> and C<sub>u</sub> 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' <sub>o</sub>	-	Present effective overburden pressure at sample depth
p' <sub>c</sub>	-	Preconsolidation pressure of (maximum past pressure on) sample
C <sub>cr</sub>	-	Recompression index (in effect at pressures below p' <sub>c</sub> )
C <sub>c</sub>	-	Compression index (in effect at pressures above p' <sub>c</sub> )
OC Ratio		Overconsolidation ratio = $p'_c / p'_o$
Void Ratio		Initial sample void ratio = volume of voids / volume of solids
W <sub>o</sub>	-	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.
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## SYMBOLS AND TERMS (continued)

### STRATA PLOT



Topsoil



Asphalt



Fill



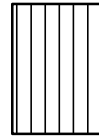
Peat



Sand



Silty Sand



Silt



Sandy Silt



Clay



Silty Clay



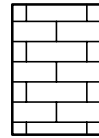
Clayey Silty Sand



Glacial Till



Shale



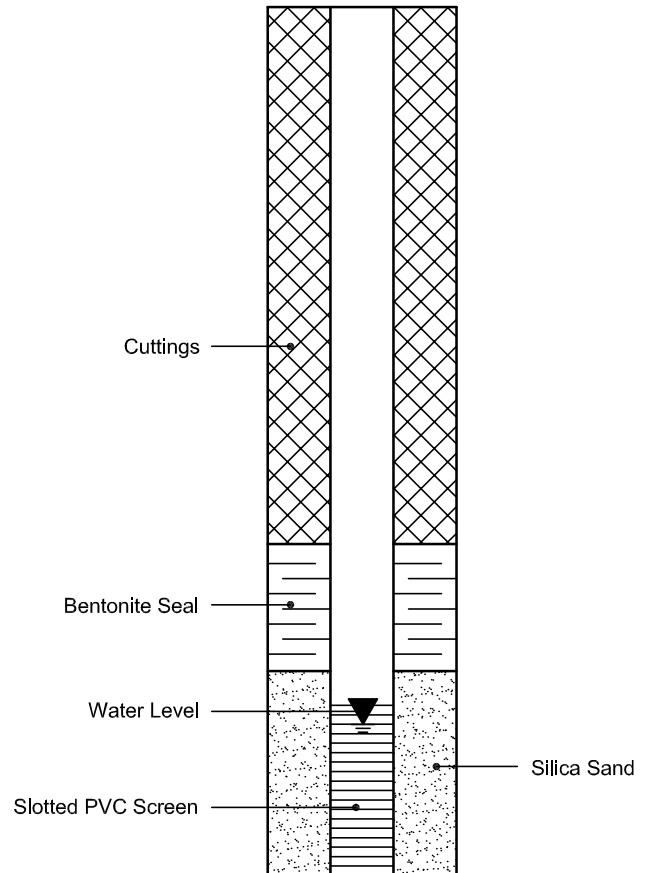
Bedrock

### MONITORING WELL AND PIEZOMETER CONSTRUCTION

#### MONITORING WELL CONSTRUCTION



#### PIEZOMETER CONSTRUCTION



## *Certificate of Analysis*

### **Paterson Group Consulting Engineers**

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

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

Client PO: 14334  
Project: PE2934  
Custody: 97191

Report Date: 3-Apr-2013  
Order Date: 28-Mar-2013

**Order #: 1313231**

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

<b>Paracel ID</b>	<b>Client ID</b>
1313231-01	BH1 SS1

Approved By:



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

**Certificate of Analysis**

Client: **Paterson Group Consulting Engineers**  
Client PO: 14334

Project Description: PE2934

Report Date: 03-Apr-2013  
Order Date: 28-Mar-2013

**Analysis Summary Table**

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	1-Apr-13	2-Apr-13
PHC F1	CWS Tier 1 - P&T GC-FID	1-Apr-13	2-Apr-13
PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	1-Apr-13	3-Apr-13
Solids, %	Gravimetric, calculation	2-Apr-13	2-Apr-13

**Certificate of Analysis**

Report Date: 03-Apr-2013

Order Date: 28-Mar-2013

 Client: **Paterson Group Consulting Engineers**

Project Description: PE2934

Client PO: 14334

<b>Client ID:</b>	BH1 SS1	-	-	-
<b>Sample Date:</b>	27-Mar-13	-	-	-
<b>Sample ID:</b>	1313231-01	-	-	-
<b>MDL/Units</b>	Soil	-	-	-

**Physical Characteristics**

% Solids	0.1 % by Wt.	80.2	-	-	-
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**Volatiles**

Benzene	0.02 ug/g dry	<0.02	-	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	-	-	-
Toluene	0.05 ug/g dry	<0.05	-	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	-	-	-
o-Xylene	0.05 ug/g dry	<0.05	-	-	-
Xylenes, total	0.05 ug/g dry	<0.05	-	-	-
Toluene-d8	Surrogate	75.1%	-	-	-

**Hydrocarbons**

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

**Certificate of Analysis**

Report Date: 03-Apr-2013  
Order Date: 28-Mar-2013

Client: **Paterson Group Consulting Engineers**  
Client PO: 14334

Project Description: PE2934

**Method Quality Control: Blank**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Hydrocarbons</b>									
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						
<b>Volatiles</b>									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	8.39		ug/g		105	50-140			

**Certificate of Analysis**

Report Date: 03-Apr-2013

Client: Paterson Group Consulting Engineers

Order Date: 28-Mar-2013

Client PO: 14334

Project Description: PE2934

**Method Quality Control: Duplicate**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Hydrocarbons</b>									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	184	8	ug/g dry	172			6.6	30	
F4 PHCs (C34-C50)	241	6	ug/g dry	148			47.7	30	QR-04
<b>Physical Characteristics</b>									
% Solids	89.2	0.1	% by Wt.	88.8			0.4	25	
<b>Volatiles</b>									
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	10.3		ug/g dry	ND	112	50-140			

**Certificate of Analysis**

Report Date: 03-Apr-2013

Client: **Paterson Group Consulting Engineers**

Order Date: 28-Mar-2013

Client PO: 14334

Project Description: PE2934

**Method Quality Control: Spike**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Hydrocarbons</b>									
F1 PHCs (C6-C10)	199	7	ug/g	ND	99.4	80-120			
F2 PHCs (C10-C16)	94	4	ug/g	ND	104	80-120			
F3 PHCs (C16-C34)	158	8	ug/g	ND	84.9	80-120			
F4 PHCs (C34-C50)	116	6	ug/g	ND	93.5	80-120			
<b>Volatiles</b>									
Benzene	1.01	0.02	ug/g	ND	81.7	50-140			
Ethylbenzene	2.29	0.05	ug/g	ND	77.9	50-140			
Toluene	14.4	0.05	ug/g	ND	100	50-140			
m,p-Xylenes	6.17	0.05	ug/g	ND	69.1	50-140			
o-Xylene	2.54	0.05	ug/g	ND	70.8	50-140			
Surrogate: Toluene-d8	11.0		ug/g		104	50-140			

**Certificate of Analysis**

Client: **Paterson Group Consulting Engineers**  
Client PO: 14334

Project Description: PE2934

Report Date: 03-Apr-2013  
Order Date: 28-Mar-2013

**Qualifier Notes:**

**QC Qualifiers :**

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

**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.





## Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South  
Nepean, ON K2E 7J5  
Attn: Karyn Munch

Client PO: 20167  
Project: PE3837  
Custody: 108919

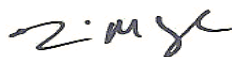
Report Date: 1-Sep-2016  
Order Date: 26-Aug-2016

**Order #: 1635496**

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

<b>Parcel ID</b>	<b>Client ID</b>
1635496-01	BH1-SS2
1635496-02	BH2-AU1
1635496-03	BH4-SS2

Approved By:



Tim McCooeye  
Senior Advisor

Certificate of Analysis  
**Client: Paterson Group Consulting Engineers**  
**Client PO: 20167**

Report Date: 01-Sep-2016  
 Order Date: 26-Aug-2016  
**Project Description: PE3837**

### Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Boron, available	MOE (HWE), EPA 200.7 - ICP-OES	31-Aug-16	31-Aug-16
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	27-Aug-16	31-Aug-16
Mercury by CVAA	EPA 7471B - CVAA, digestion	31-Aug-16	31-Aug-16
Metals, ICP-MS	EPA 6020 - Digestion - ICP-MS	31-Aug-16	31-Aug-16
PHC F1	CWS Tier 1 - P&T GC-FID	30-Aug-16	1-Sep-16
PHC F4G (gravimetric)	CWS Tier 1 - Extraction Gravimetric	1-Sep-16	1-Sep-16
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	30-Aug-16	31-Aug-16
REG 153: VOCs by P&T GC/MS	EPA 8260 - P&T GC-MS	30-Aug-16	1-Sep-16
Solids, %	Gravimetric, calculation	30-Aug-16	30-Aug-16

Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
 Client PO: 20167

Report Date: 01-Sep-2016  
 Order Date: 26-Aug-2016  
 Project Description: PE3837

<b>Client ID:</b>	BH1-SS2	BH2-AU1	BH4-SS2	-
<b>Sample Date:</b>	24-Aug-16	24-Aug-16	24-Aug-16	-
<b>Sample ID:</b>	1635496-01	1635496-02	1635496-03	-
<b>MDL/Units</b>	Soil	Soil	Soil	-

**Physical Characteristics**

% Solids	0.1 % by Wt.	89.1	97.6	87.7	-
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**Metals**

Antimony	1 ug/g dry	<1	-	<1	-
Arsenic	1 ug/g dry	1	-	2	-
Barium	1 ug/g dry	64	-	190	-
Beryllium	0.5 ug/g dry	<0.5	-	<0.5	-
Boron	5.0 ug/g dry	9.4	-	8.0	-
Boron, available	0.5 ug/g dry	<0.5 [1]	-	<0.5 [1]	-
Cadmium	0.5 ug/g dry	<0.5	-	1.0	-
Chromium	5 ug/g dry	15	-	20	-
Chromium (VI)	0.2 ug/g dry	<0.2	-	1.6	-
Cobalt	1 ug/g dry	5	-	5	-
Copper	5 ug/g dry	13	-	13	-
Lead	1 ug/g dry	7	-	1800	-
Mercury	0.1 ug/g dry	<0.1	-	<0.1	-
Molybdenum	1 ug/g dry	<1	-	<1	-
Nickel	5 ug/g dry	12	-	12	-
Selenium	1 ug/g dry	<1	-	<1	-
Silver	0.3 ug/g dry	<0.3	-	<0.3	-
Thallium	1 ug/g dry	<1	-	<1	-
Uranium	1 ug/g dry	<1	-	<1	-
Vanadium	10 ug/g dry	29	-	23	-
Zinc	20 ug/g dry	24	-	134	-

**Volatiles**

Acetone	0.50 ug/g dry	-	<0.50	-	-
Benzene	0.02 ug/g dry	-	<0.02	-	-
Bromodichloromethane	0.05 ug/g dry	-	<0.05	-	-
Bromoform	0.05 ug/g dry	-	<0.05	-	-
Bromomethane	0.05 ug/g dry	-	<0.05	-	-
Carbon Tetrachloride	0.05 ug/g dry	-	<0.05	-	-
Chlorobenzene	0.05 ug/g dry	-	<0.05	-	-
Chloroform	0.05 ug/g dry	-	<0.05	-	-
Dibromochloromethane	0.05 ug/g dry	-	<0.05	-	-
Dichlorodifluoromethane	0.05 ug/g dry	-	<0.05	-	-
1,2-Dichlorobenzene	0.05 ug/g dry	-	<0.05	-	-

Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
 Client PO: 20167

Report Date: 01-Sep-2016  
 Order Date: 26-Aug-2016  
 Project Description: PE3837

	Client ID: Sample Date: Sample ID:	BH1-SS2 24-Aug-16 1635496-01 Soil	BH2-AU1 24-Aug-16 1635496-02 Soil	BH4-SS2 24-Aug-16 1635496-03 Soil	- - - -
	MDL/Units				
1,3-Dichlorobenzene	0.05 ug/g dry	-	<0.05	-	-
1,4-Dichlorobenzene	0.05 ug/g dry	-	<0.05	-	-
1,1-Dichloroethane	0.05 ug/g dry	-	<0.05	-	-
1,2-Dichloroethane	0.05 ug/g dry	-	<0.05	-	-
1,1-Dichloroethylene	0.05 ug/g dry	-	<0.05	-	-
cis-1,2-Dichloroethylene	0.05 ug/g dry	-	<0.05	-	-
trans-1,2-Dichloroethylene	0.05 ug/g dry	-	<0.05	-	-
1,2-Dichloropropane	0.05 ug/g dry	-	<0.05	-	-
cis-1,3-Dichloropropylene	0.05 ug/g dry	-	<0.05	-	-
trans-1,3-Dichloropropylene	0.05 ug/g dry	-	<0.05	-	-
1,3-Dichloropropene, total	0.05 ug/g dry	-	<0.05	-	-
Ethylbenzene	0.05 ug/g dry	-	<0.05	-	-
Ethylene dibromide (dibromoethane)	0.05 ug/g dry	-	<0.05	-	-
Hexane	0.05 ug/g dry	-	<0.05	-	-
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	-	<0.50	-	-
Methyl Isobutyl Ketone	0.50 ug/g dry	-	<0.50	-	-
Methyl tert-butyl ether	0.05 ug/g dry	-	<0.05	-	-
Methylene Chloride	0.05 ug/g dry	-	<0.05	-	-
Styrene	0.05 ug/g dry	-	<0.05	-	-
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	-	<0.05	-	-
1,1,1,2,2-Tetrachloroethane	0.05 ug/g dry	-	<0.05	-	-
Tetrachloroethylene	0.05 ug/g dry	-	<0.05	-	-
Toluene	0.05 ug/g dry	-	<0.05	-	-
1,1,1-Trichloroethane	0.05 ug/g dry	-	<0.05	-	-
1,1,2-Trichloroethane	0.05 ug/g dry	-	<0.05	-	-
Trichloroethylene	0.05 ug/g dry	-	<0.05	-	-
Trichlorofluoromethane	0.05 ug/g dry	-	<0.05	-	-
Vinyl chloride	0.02 ug/g dry	-	<0.02	-	-
m,p-Xylenes	0.05 ug/g dry	-	<0.05	-	-
o-Xylene	0.05 ug/g dry	-	<0.05	-	-
Xylenes, total	0.05 ug/g dry	-	<0.05	-	-
4-Bromofluorobenzene	Surrogate	-	100%	-	-
Dibromofluoromethane	Surrogate	-	103%	-	-
Toluene-d8	Surrogate	-	102%	-	-
<b>Hydrocarbons</b>					
F1 PHCs (C6-C10)	7 ug/g dry	-	<7	-	-
F2 PHCs (C10-C16)	4 ug/g dry	-	30	-	-

Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
 Client PO: 20167

Report Date: 01-Sep-2016

Order Date: 26-Aug-2016

Project Description: PE3837

	Client ID:	BH1-SS2	BH2-AU1	BH4-SS2	-
	Sample Date:	24-Aug-16	24-Aug-16	24-Aug-16	-
	Sample ID:	1635496-01	1635496-02	1635496-03	-
	MDL/Units	Soil	Soil	Soil	-
F3 PHCs (C16-C34)	8 ug/g dry	-	957	-	-
F4 PHCs (C34-C50)	6 ug/g dry	-	1000 [2]	-	-
F4G PHCs (gravimetric)	50 ug/g dry	-	1030	-	-

Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
 Client PO: 20167

Report Date: 01-Sep-2016  
 Order Date: 26-Aug-2016  
 Project Description: PE3837

### Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Hydrocarbons</b>									
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						
F4G PHCs (gravimetric)	ND	50	ug/g						
<b>Metals</b>									
Antimony	ND	1	ug/g						
Arsenic	ND	1	ug/g						
Barium	ND	1	ug/g						
Beryllium	ND	0.5	ug/g						
Boron, available	ND	0.5	ug/g						MET1
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium	ND	5	ug/g						
Cobalt	ND	1	ug/g						
Copper	ND	5	ug/g						
Lead	ND	1	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1	ug/g						
Nickel	ND	5	ug/g						
Selenium	ND	1	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1	ug/g						
Uranium	ND	1	ug/g						
Vanadium	ND	10	ug/g						
Zinc	ND	20	ug/g						
<b>Volatiles</b>									
Acetone	ND	0.50	ug/g						
Benzene	ND	0.02	ug/g						
Bromodichloromethane	ND	0.05	ug/g						
Bromoform	ND	0.05	ug/g						
Bromomethane	ND	0.05	ug/g						
Carbon Tetrachloride	ND	0.05	ug/g						
Chlorobenzene	ND	0.05	ug/g						
Chloroform	ND	0.05	ug/g						
Dibromochloromethane	ND	0.05	ug/g						
Dichlorodifluoromethane	ND	0.05	ug/g						
1,2-Dichlorobenzene	ND	0.05	ug/g						
1,3-Dichlorobenzene	ND	0.05	ug/g						
1,4-Dichlorobenzene	ND	0.05	ug/g						
1,1-Dichloroethane	ND	0.05	ug/g						
1,2-Dichloroethane	ND	0.05	ug/g						
1,1-Dichloroethylene	ND	0.05	ug/g						
cis-1,2-Dichloroethylene	ND	0.05	ug/g						
trans-1,2-Dichloroethylene	ND	0.05	ug/g						
1,2-Dichloropropane	ND	0.05	ug/g						
cis-1,3-Dichloropropylene	ND	0.05	ug/g						
trans-1,3-Dichloropropylene	ND	0.05	ug/g						
1,3-Dichloropropene, total	ND	0.05	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Ethylene dibromide (dibromoethane)	ND	0.05	ug/g						
Hexane	ND	0.05	ug/g						
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g						
Methyl Isobutyl Ketone	ND	0.50	ug/g						
Methyl tert-butyl ether	ND	0.05	ug/g						
Methylene Chloride	ND	0.05	ug/g						
Styrene	ND	0.05	ug/g						
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g						
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g						

Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
 Client PO: 20167

Report Date: 01-Sep-2016  
 Order Date: 26-Aug-2016  
 Project Description: PE3837

**Method Quality Control: Blank**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Tetrachloroethylene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
1,1,1-Trichloroethane	ND	0.05	ug/g						
1,1,2-Trichloroethane	ND	0.05	ug/g						
Trichloroethylene	ND	0.05	ug/g						
Trichlorofluoromethane	ND	0.05	ug/g						
Vinyl chloride	ND	0.02	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: 4-Bromofluorobenzene	3.34		ug/g		105	50-140			
Surrogate: Dibromofluoromethane	4.19		ug/g		131	50-140			
Surrogate: Toluene-d8	3.54		ug/g		111	50-140			



Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
 Client PO: 20167

Report Date: 01-Sep-2016  
 Order Date: 26-Aug-2016  
 Project Description: PE3837

### Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Hydrocarbons</b>									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
<b>Metals</b>									
Antimony	1.3	1	ug/g dry	ND			0.0	30	
Arsenic	3.4	1	ug/g dry	3.0			13.5	30	
Barium	52.4	1	ug/g dry	63.4			19.0	30	
Beryllium	ND	0.5	ug/g dry	0.66			0.0	30	
Boron, available	ND	0.5	ug/g dry	ND				35	MET1
Boron	11.6	5.0	ug/g dry	11.6			0.4	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium	15.2	5	ug/g dry	18.1			17.6	30	
Cobalt	8.7	1	ug/g dry	10.1			15.1	30	
Copper	85.4	5	ug/g dry	91.6			7.0	30	
Lead	18.8	1	ug/g dry	21.5			13.7	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	30	
Molybdenum	3.7	1	ug/g dry	ND			0.0	30	
Nickel	18.7	5	ug/g dry	21.7			14.9	30	
Selenium	3.1	1	ug/g dry	ND			0.0	30	
Silver	ND	0.3	ug/g dry	ND			0.0	30	
Thallium	ND	1	ug/g dry	ND			0.0	30	
Uranium	ND	1	ug/g dry	ND			0.0	30	
Vanadium	23.4	10	ug/g dry	27.1			14.5	30	
Zinc	68.7	20	ug/g dry	76.2			10.4	30	
<b>Physical Characteristics</b>									
% Solids	78.9	0.1	% by Wt.	79.8			1.1	25	
<b>Volatiles</b>									
Acetone	ND	0.50	ug/g dry	ND				50	
Benzene	ND	0.02	ug/g dry	ND				50	
Bromodichloromethane	ND	0.05	ug/g dry	ND				50	
Bromoform	ND	0.05	ug/g dry	ND				50	
Bromomethane	ND	0.05	ug/g dry	ND				50	
Carbon Tetrachloride	ND	0.05	ug/g dry	ND				50	
Chlorobenzene	ND	0.05	ug/g dry	ND				50	
Chloroform	ND	0.05	ug/g dry	ND				50	
Dibromochloromethane	ND	0.05	ug/g dry	ND				50	
Dichlorodifluoromethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,3-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,4-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
cis-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
trans-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
1,2-Dichloropropane	ND	0.05	ug/g dry	ND				50	
cis-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
trans-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Ethylene dibromide (dibromoethane)	ND	0.05	ug/g dry	ND				50	
Hexane	ND	0.05	ug/g dry	ND				50	
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g dry	ND				50	
Methyl Isobutyl Ketone	ND	0.50	ug/g dry	ND				50	
Methyl tert-butyl ether	ND	0.05	ug/g dry	ND				50	
Methylene Chloride	ND	0.05	ug/g dry	ND				50	
Styrene	ND	0.05	ug/g dry	ND				50	
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
Tetrachloroethylene	ND	0.05	ug/g dry	ND				50	

Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
 Client PO: 20167

Report Date: 01-Sep-2016  
 Order Date: 26-Aug-2016  
 Project Description: PE3837

### Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Toluene	ND	0.05	ug/g dry	ND				50	
1,1,1-Trichloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2-Trichloroethane	ND	0.05	ug/g dry	ND				50	
Trichloroethylene	ND	0.05	ug/g dry	ND				50	
Trichlorofluoromethane	ND	0.05	ug/g dry	ND				50	
Vinyl chloride	ND	0.02	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: 4-Bromofluorobenzene	6.47		ug/g dry		104	50-140			
Surrogate: Dibromofluoromethane	7.45		ug/g dry		120	50-140			
Surrogate: Toluene-d8	6.38		ug/g dry		103	50-140			

Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
 Client PO: 20167

Report Date: 01-Sep-2016  
 Order Date: 26-Aug-2016  
 Project Description: PE3837

### Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Hydrocarbons</b>									
F1 PHCs (C6-C10)	207	7	ug/g		104	80-120			
F2 PHCs (C10-C16)	94	4	ug/g	ND	90.7	60-140			
F3 PHCs (C16-C34)	227	8	ug/g	ND	106	60-140			
F4 PHCs (C34-C50)	170	6	ug/g	ND	119	60-140			
F4G PHCs (gravimetric)	840	50	ug/g		84.0	80-120			
<b>Metals</b>									
Antimony	42.1		ug/L	ND	83.4	70-130			
Arsenic	42.1		ug/L	1.2	81.9	70-130			
Barium	71.7		ug/L	25.4	92.6	70-130			
Beryllium	46.7		ug/L	ND	92.8	70-130			
Boron, available	4.49	0.5	ug/g	ND	89.8	70-122			MET1
Boron	46.6		ug/L	ND	84.0	70-130			
Cadmium	40.0		ug/L	ND	79.8	70-130			
Chromium	52.1		ug/L	7.2	89.8	70-130			
Cobalt	48.4		ug/L	4.1	88.7	70-130			
Copper	80.3		ug/L	36.6	87.3	70-130			
Lead	55.9		ug/L	8.6	94.5	70-130			
Mercury	1.32	0.1	ug/g	ND	88.1	70-130			
Molybdenum	38.1		ug/L	ND	75.7	70-130			
Nickel	53.8		ug/L	8.7	90.2	70-130			
Selenium	40.3		ug/L	ND	80.1	70-130			
Silver	42.8		ug/L	ND	85.6	70-130			
Thallium	47.5		ug/L	ND	94.8	70-130			
Uranium	48.6		ug/L	ND	96.7	70-130			
Vanadium	55.6		ug/L	10.8	89.6	70-130			
Zinc	68.8		ug/L	30.5	76.7	70-130			
<b>Volatiles</b>									
Acetone	11.5	0.50	ug/g		115	50-140			
Benzene	4.30	0.02	ug/g		108	60-130			
Bromodichloromethane	3.60	0.05	ug/g		90.0	60-130			
Bromoform	2.78	0.05	ug/g		69.4	60-130			
Bromomethane	3.56	0.05	ug/g		88.9	50-140			
Carbon Tetrachloride	2.74	0.05	ug/g		68.5	60-130			
Chlorobenzene	4.31	0.05	ug/g		108	60-130			
Chloroform	4.11	0.05	ug/g		103	60-130			
Dibromochloromethane	3.60	0.05	ug/g		89.9	60-130			
Dichlorodifluoromethane	2.90	0.05	ug/g		72.5	50-140			
1,2-Dichlorobenzene	3.60	0.05	ug/g		90.1	60-130			
1,3-Dichlorobenzene	3.81	0.05	ug/g		95.3	60-130			
1,4-Dichlorobenzene	3.71	0.05	ug/g		92.9	60-130			
1,1-Dichloroethane	5.15	0.05	ug/g		129	60-130			
1,2-Dichloroethane	3.89	0.05	ug/g		97.3	60-130			
1,1-Dichloroethylene	3.49	0.05	ug/g		87.3	60-130			
cis-1,2-Dichloroethylene	4.26	0.05	ug/g		106	60-130			
trans-1,2-Dichloroethylene	4.41	0.05	ug/g		110	60-130			
1,2-Dichloropropane	4.79	0.05	ug/g		120	60-130			
cis-1,3-Dichloropropylene	4.29	0.05	ug/g		107	60-130			
trans-1,3-Dichloropropylene	4.56	0.05	ug/g		114	60-130			
Ethylbenzene	4.86	0.05	ug/g		121	60-130			
Ethylene dibromide (dibromoethane)	4.63	0.05	ug/g		116	60-130			
Hexane	5.19	0.05	ug/g		130	60-130			

Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
 Client PO: 20167

Report Date: 01-Sep-2016  
 Order Date: 26-Aug-2016  
 Project Description: PE3837

### Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Methyl Ethyl Ketone (2-Butanone)	12.4	0.50	ug/g		124	50-140			
Methyl Isobutyl Ketone	12.2	0.50	ug/g		122	50-140			
Methyl tert-butyl ether	12.6	0.05	ug/g		126	50-140			
Methylene Chloride	4.21	0.05	ug/g		105	60-130			
Styrene	4.59	0.05	ug/g		115	60-130			
1,1,1,2-Tetrachloroethane	4.00	0.05	ug/g		99.9	60-130			
1,1,2,2-Tetrachloroethane	4.85	0.05	ug/g		121	60-130			
Tetrachloroethylene	3.74	0.05	ug/g		93.4	60-130			
Toluene	4.70	0.05	ug/g		117	60-130			
1,1,1-Trichloroethane	3.22	0.05	ug/g		80.5	60-130			
1,1,2-Trichloroethane	4.22	0.05	ug/g		106	60-130			
Trichloroethylene	3.92	0.05	ug/g		98.0	60-130			
Trichlorofluoromethane	2.89	0.05	ug/g		72.2	50-140			
Vinyl chloride	2.95	0.02	ug/g		73.9	50-140			
m,p-Xylenes	8.82	0.05	ug/g		110	60-130			
o-Xylene	4.71	0.05	ug/g		118	60-130			
Surrogate: 4-Bromofluorobenzene	2.64		ug/g		82.4	50-140			

Certificate of Analysis  
Client: Paterson Group Consulting Engineers  
Client PO: 20167

Report Date: 01-Sep-2016  
Order Date: 26-Aug-2016  
Project Description: PE3837

**Qualifier Notes:**

**Sample Qualifiers :**

- 1 : Analyzed using ICP-MS.
- 2 : GC-FID signal did not return to baseline by C50

**QC Qualifiers :**

MET1 : Analyzed using ICP-MS.

**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.

Client Name: Paterson Group	Project Reference: PE3837	Turnaround Time: <input type="checkbox"/> 1 Day <input type="checkbox"/> 3 Day <input type="checkbox"/> 2 Day <input checked="" type="checkbox"/> Regular Date Required: _____
Contact Name: Karyn Munch	Quote #	
Address: 154 Colonnade Rd S.	PO # 20167	
Telephone:	Email Address: kmunch@patersongroup.ca	

Criteria:  O. Reg. 153/04 (As Amended) Table 7  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: 1635496		Matrix	Air Volume	# of Containers	Sample Taken		PHCs F1-F4-BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)				
Sample ID/Location Name	Date				Time												
1	BH1-SS2	S	1	1	Aug 24/16	am				✓	✓	✓	✓	-120ml			
2	BH2-AU1	S	2	1		am	✓			✓	✓	✓	✓	-120ml + 7 vials			
3	BH4-SS2	S	1	1		pm				✓	✓	✓	✓	-120ml			
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Comments: \_\_\_\_\_ Method of Delivery: Paracel

Relinquished By (Sign): <i>K Munch</i>	Received by Driver/Depot: <i>A. Fournier</i>	Received at Lab: <i>SUNBORN POX MAT</i>	Verified By: <i>[Signature]</i>
Relinquished By (Print): K. Munch	Date/Time: 26/08/16 4:20	Date/Time: AUG 26 2016 05:10	Date/Time: 26/08/16 17:35
Date/Time: Aug 26/16 10:30 AM	Temperature: _____ °C	Temperature: 18.9 °C	pH Verified By: _____

## Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South  
Nepean, ON K2E 7J5  
Attn: Karyn Munch

Client PO: 20906  
Project: PE3837  
Custody: 109156

Report Date: 14-Oct-2016  
Order Date: 7-Oct-2016

**Order #: 1642013**

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

<b>Parcel ID</b>	<b>Client ID</b>
1642013-01	BH1-SS2
1642013-02	BH2-AU1
1642013-03	BH4-SS2

Approved By:



Mark Foto, M.Sc.  
Lab Supervisor

Certificate of Analysis  
**Client: Paterson Group Consulting Engineers**  
**Client PO: 20906**

Report Date: 14-Oct-2016  
 Order Date: 7-Oct-2016  
**Project Description: PE3837**

### Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Boron, available	MOE (HWE), EPA 200.7 - ICP-OES	12-Oct-16	12-Oct-16
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	13-Oct-16	14-Oct-16
Mercury by CVAA	EPA 7471B - CVAA, digestion	12-Oct-16	12-Oct-16
PHC F4G (gravimetric)	CWS Tier 1 - Extraction Gravimetric	13-Oct-16	13-Oct-16
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	11-Oct-16	11-Oct-16
REG 153: Metals by ICP/OES, soil	based on MOE E3470, ICP-OES	12-Oct-16	12-Oct-16
Solids, %	Gravimetric, calculation	11-Oct-16	11-Oct-16



Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
 Client PO: 20906

Report Date: 14-Oct-2016  
 Order Date: 7-Oct-2016  
 Project Description: PE3837

<b>Client ID:</b>	BH1-SS2	BH2-AU1	BH4-SS2	-
<b>Sample Date:</b>	24-Aug-16	24-Aug-16	24-Aug-16	-
<b>Sample ID:</b>	1642013-01	1642013-02	1642013-03	-
<b>MDL/Units</b>	Soil	Soil	Soil	-

**Physical Characteristics**

% Solids	0.1 % by Wt.	89.1	97.6	87.7	-
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**Metals**

Antimony	1.0 ug/g dry	-	<1.0	-	-
Arsenic	1.0 ug/g dry	-	7.5	-	-
Barium	1.0 ug/g dry	-	206	-	-
Beryllium	1.0 ug/g dry	-	<1.0	-	-
Boron	1.0 ug/g dry	-	14.4	-	-
Boron, available	0.5 ug/g dry	-	0.6	-	-
Cadmium	0.5 ug/g dry	-	<0.5	-	-
Chromium	1.0 ug/g dry	-	19.1	-	-
Chromium (VI)	0.2 ug/g dry	-	<0.2 [1]	-	-
Cobalt	1.0 ug/g dry	-	6.3	-	-
Copper	1.0 ug/g dry	-	61.0	-	-
Lead	1.0 ug/g dry	-	227	-	-
Mercury	0.1 ug/g dry	-	0.2 [2]	-	-
Molybdenum	1.0 ug/g dry	-	<1.0	-	-
Nickel	1.0 ug/g dry	-	13.6	-	-
Selenium	1.0 ug/g dry	-	<1.0	-	-
Silver	0.5 ug/g dry	-	<0.5	-	-
Thallium	1.0 ug/g dry	-	<1.0	-	-
Uranium	1.0 ug/g dry	-	<1.0	-	-
Vanadium	1.0 ug/g dry	-	20.5	-	-
Zinc	1.0 ug/g dry	-	203	-	-

**Hydrocarbons**

F2 PHCs (C10-C16)	4 ug/g dry	<4 [1]	-	<4 [1]	-
F3 PHCs (C16-C34)	8 ug/g dry	63 [1]	-	348 [1]	-
F4 PHCs (C34-C50)	6 ug/g dry	73 [1]	-	320 [1] [4]	-
F4G PHCs (gravimetric)	50 ug/g dry	-	-	479 [1]	-

Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
 Client PO: 20906

Report Date: 14-Oct-2016  
 Order Date: 7-Oct-2016  
 Project Description: PE3837

**Method Quality Control: Blank**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Hydrocarbons</b>									
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
F4G PHCs (gravimetric)	ND	50	ug/g						
<b>Metals</b>									
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						

Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
 Client PO: 20906

Report Date: 14-Oct-2016  
 Order Date: 7-Oct-2016  
 Project Description: PE3837

**Method Quality Control: Duplicate**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Hydrocarbons</b>									
F2 PHCs (C10-C16)	19	4	ug/g dry	15			25.3	30	
F3 PHCs (C16-C34)	113	8	ug/g dry	100			13.0	30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND				30	
<b>Metals</b>									
Antimony	ND	1.0	ug/g dry	ND				30	
Arsenic	ND	1.0	ug/g dry	ND				30	
Barium	185	10.0	ug/g dry	185			0.0	30	
Beryllium	ND	1.0	ug/g dry	ND			0.0	30	
Boron, available	ND	0.5	ug/g dry	0.52			0.0	35	
Boron	8.96	1.0	ug/g dry	9.38			4.6	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	45.8	10.0	ug/g dry	45.8			0.0	30	
Cobalt	13.5	1.0	ug/g dry	12.8			5.6	30	
Copper	27.5	1.0	ug/g dry	25.0			9.4	30	
Lead	12.7	1.0	ug/g dry	12.7			0.0	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	30	
Molybdenum	ND	1.0	ug/g dry	ND			0.0	30	
Nickel	25.8	1.0	ug/g dry	24.5			5.3	30	
Selenium	ND	1.0	ug/g dry	ND			0.0	30	
Silver	ND	0.5	ug/g dry	ND			0.0	30	
Thallium	ND	1.0	ug/g dry	ND			0.0	30	
Uranium	ND	1.0	ug/g dry	ND				30	
Vanadium	62.1	1.0	ug/g dry	58.4			6.1	30	
Zinc	72.5	1.0	ug/g dry	68.6			5.5	30	
<b>Physical Characteristics</b>									
% Solids	96.5	0.1	% by Wt.	96.4			0.2	25	

Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
 Client PO: 20906

Report Date: 14-Oct-2016  
 Order Date: 7-Oct-2016  
 Project Description: PE3837

### Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Hydrocarbons</b>									
F2 PHCs (C10-C16)	93	4	ug/g	15	80.8	60-140			
F3 PHCs (C16-C34)	260	8	ug/g	100	80.2	60-140			
F4 PHCs (C34-C50)	185	6	ug/g	ND	139	60-140			
F4G PHCs (gravimetric)	950	50	ug/g		95.0	80-120			
<b>Metals</b>									
Antimony	307		ug/L	ND	123	70-130			
Arsenic	338		ug/L	ND	135	70-130			
Barium	978		ug/L	764	85.4	70-130			
Beryllium	254		ug/L	1.64	101	70-130			
Boron, available	4.27	0.5	ug/g	0.52	75.0	70-122			
Boron	444		ug/L	188	103	70-130			
Cadmium	257		ug/L	2.35	102	70-130			
Chromium (VI)	0.2		mg/L	ND	90.0	70-130			
Chromium	1100		ug/L	916	73.6	70-130			
Cobalt	477		ug/L	256	88.6	70-130			
Copper	727		ug/L	500	90.8	70-130			
Lead	466		ug/L	255	84.3	70-130			
Mercury	1.40	0.1	ug/g	ND	93.4	70-130			
Molybdenum	247		ug/L	13.1	93.7	70-130			
Nickel	697		ug/L	489	83.1	70-130			
Selenium	208		ug/L	ND	83.1	70-130			
Silver	228		ug/L	4.64	89.3	70-130			
Thallium	194		ug/L	ND	77.4	70-130			
Uranium	296		ug/L	ND	118	70-130			
Vanadium	1380		ug/L	1170	83.1	70-130			
Zinc	1550		ug/L	1370	70.0	70-130			

Certificate of Analysis  
Client: Paterson Group Consulting Engineers  
Client PO: 20906

Report Date: 14-Oct-2016  
Order Date: 7-Oct-2016  
Project Description: PE3837

**Qualifier Notes:**

***Login Qualifiers :***

Sample - One or more parameter received past hold time -  
*Applies to samples: BH1-SS2, BH2-AU1, BH4-SS2*

***Sample Qualifiers :***

- 1 : Holding time had been exceeded upon receipt of the sample at the laboratory.
- 2 : This analysis was conducted after the accepted holding time had been exceeded.
- 4 : GC-FID signal did not return to baseline by C50

**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.

Client Name: <u>Paterson Group</u>	Project Reference: <u>PE3837</u>	<b>Turnaround Time:</b> <input type="checkbox"/> 1 Day <input type="checkbox"/> 3 Day <input type="checkbox"/> 2 Day <input checked="" type="checkbox"/> Regular Date Required: _____
Contact Name: <u>Karyn Munch</u>	Quote #	
Address: <u>154 Colonnade Rd. S Ottawa, ON</u>	PO # <u>20906</u>	
Telephone: <u>613-226-7381</u>	Email Address: <u>Kmunch@patersongroup.ca</u>	

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)

Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken		PHCs F1-F4+BTEX	VOC's	PAHs	Metals by ICP				F2-Fa
				Date	Time				Hg	Cd	Pb	B (HWS)	
1 BH1-GW2	GW		2	Oct 6/16	PM		✓						
2 BH2-GW2	GW		2	Oct 6/16	PM		✓						
3 BH3-GW2	GW		5	Oct 6/16	PM		✓		✓	✓	✓		
4 BH1-SS2 *	S		1	Aug 24/16	am								As per Karyn - RS
5 BH2-AW *	S		1	↓	am							✓	
6 BH4-SS2 *	S		1	↓	pm				✓	✓	✓	✓	
7													
8													
9													
10													

Comments: \* previously submitted; please let me know if you're enough sample left (I realize F2-Fa will be qualified due to hold time expiring)

Method of Delivery: Paracel

Relinquished By (Sign): _____	Received by Driver/Depot: <u>A. J. JENSEN</u>	Received at Lab: <u>QUINCY GRW DOCK MAT</u>	Verified By: <u>S</u>
Relinquished By (Print): _____	Date/Time: <u>07/10/16 4:30 PM</u>	Date/Time: <u>OCT 07, 2016 09:47</u>	Date/Time: <u>7/10/16 18:41</u>
Date/Time: _____	Temperature: <u>°C</u>	Temperature: <u>18.5 °C</u>	pH Verified <input type="checkbox"/> By: _____

## Certificate of Analysis

**Paterson Group Consulting Engineers**

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

Client PO: 29653  
Project: PE4752  
Custody: 126423

Report Date: 31-Mar-2020  
Order Date: 25-Mar-2020

**Order #: 2013228**

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

Paracel ID	Client ID
2013228-01	BH1-AU1
2013228-02	BH2-SS2

Approved By:



Mark Foto, M.Sc.  
Lab Supervisor

Certificate of Analysis

Report Date: 31-Mar-2020

Client: **Paterson Group Consulting Engineers**

Order Date: 25-Mar-2020

Client PO: 29653

Project Description: **PE4752**

### Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	26-Mar-20	27-Mar-20
Mercury by CVAA	EPA 7471B - CVAA, digestion	30-Mar-20	31-Mar-20
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	30-Mar-20	30-Mar-20
Solids, %	Gravimetric, calculation	30-Mar-20	30-Mar-20



Certificate of Analysis

Report Date: 31-Mar-2020

Client: Paterson Group Consulting Engineers

Order Date: 25-Mar-2020

Client PO: 29653

Project Description: PE4752

<b>Client ID:</b>	BH1-AU1	BH2-SS2	-	-
<b>Sample Date:</b>	09-Mar-20 09:00	09-Mar-20 09:00	-	-
<b>Sample ID:</b>	2013228-01	2013228-02	-	-
<b>MDL/Units</b>	Soil	Soil	-	-

**Physical Characteristics**

% Solids	0.1 % by Wt.	90.0	80.9	-	-
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**Metals**

Antimony	1.0 ug/g dry	<1.0	<1.0	-	-
Arsenic	1.0 ug/g dry	3.7	16.4	-	-
Barium	1.0 ug/g dry	84.3	104	-	-
Beryllium	0.5 ug/g dry	0.6	0.9	-	-
Boron	5.0 ug/g dry	9.4	9.2	-	-
Cadmium	0.5 ug/g dry	<0.5	<0.5	-	-
Chromium	5.0 ug/g dry	24.5	26.4	-	-
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	-	-
Cobalt	1.0 ug/g dry	3.3	7.4	-	-
Copper	5.0 ug/g dry	13.4	13.5	-	-
Lead	1.0 ug/g dry	55.7	39.8	-	-
Mercury	0.1 ug/g dry	<0.1	<0.1	-	-
Molybdenum	1.0 ug/g dry	<1.0	2.8	-	-
Nickel	5.0 ug/g dry	9.5	17.5	-	-
Selenium	1.0 ug/g dry	<1.0	<1.0	-	-
Silver	0.3 ug/g dry	<0.3	<0.3	-	-
Thallium	1.0 ug/g dry	<1.0	<1.0	-	-
Uranium	1.0 ug/g dry	<1.0	<1.0	-	-
Vanadium	10.0 ug/g dry	23.3	30.9	-	-
Zinc	20.0 ug/g dry	30.0	49.3	-	-

Certificate of Analysis

Report Date: 31-Mar-2020

Client: Paterson Group Consulting Engineers

Order Date: 25-Mar-2020

Client PO: 29653

Project Description: PE4752

**Method Quality Control: Blank**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Metals</b>									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						

Certificate of Analysis

Report Date: 31-Mar-2020

Client: Paterson Group Consulting Engineers

Order Date: 25-Mar-2020

Client PO: 29653

Project Description: PE4752

**Method Quality Control: Duplicate**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Metals</b>									
Antimony	ND	1.0	ug/g dry	ND			NC	30	
Arsenic	3.7	1.0	ug/g dry	3.7			0.3	30	
Barium	88.3	1.0	ug/g dry	84.3			4.7	30	
Beryllium	ND	0.5	ug/g dry	0.6			NC	30	
Boron	8.6	5.0	ug/g dry	9.4			9.1	30	
Cadmium	ND	0.5	ug/g dry	ND			NC	30	
Chromium (VI)	ND	0.2	ug/g dry	ND			NC	35	
Chromium	24.7	5.0	ug/g dry	24.5			0.8	30	
Cobalt	3.3	1.0	ug/g dry	3.3			0.1	30	
Copper	13.3	5.0	ug/g dry	13.4			1.0	30	
Lead	57.6	1.0	ug/g dry	55.7			3.4	30	
Mercury	ND	0.1	ug/g dry	ND			NC	30	
Molybdenum	1.0	1.0	ug/g dry	ND			NC	30	
Nickel	9.3	5.0	ug/g dry	9.5			2.0	30	
Selenium	ND	1.0	ug/g dry	ND			NC	30	
Silver	0.3	0.3	ug/g dry	ND			NC	30	
Thallium	ND	1.0	ug/g dry	ND			NC	30	
Uranium	ND	1.0	ug/g dry	ND			NC	30	
Vanadium	22.2	10.0	ug/g dry	23.3			4.9	30	
Zinc	29.2	20.0	ug/g dry	30.0			2.8	30	
<b>Physical Characteristics</b>									
% Solids	90.3	0.1	% by Wt.	93.2			3.2	25	

Certificate of Analysis

Report Date: 31-Mar-2020

Client: Paterson Group Consulting Engineers

Order Date: 25-Mar-2020

Client PO: 29653

Project Description: PE4752

**Method Quality Control: Spike**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Metals</b>									
Antimony	40.7	1.0	ug/g	ND	80.8	70-130			
Arsenic	43.6	1.0	ug/g	1.5	84.3	70-130			
Barium	70.1	1.0	ug/g	33.7	72.8	70-130			
Beryllium	40.5	0.5	ug/g	ND	80.5	70-130			
Boron	39.1	5.0	ug/g	ND	70.7	70-130			
Cadmium	41.5	0.5	ug/g	ND	82.6	70-130			
Chromium (VI)	0.1	0.2	ug/g	ND	68.5	70-130			QM-05
Chromium	51.5	5.0	ug/g	9.8	83.3	70-130			
Cobalt	43.2	1.0	ug/g	1.3	83.8	70-130			
Copper	44.4	5.0	ug/g	5.4	78.1	70-130			
Lead	63.6	1.0	ug/g	22.3	82.8	70-130			
Mercury	1.44	0.1	ug/g	ND	96.0	70-130			
Molybdenum	42.4	1.0	ug/g	ND	83.9	70-130			
Nickel	44.0	5.0	ug/g	ND	80.4	70-130			
Selenium	41.4	1.0	ug/g	ND	82.5	70-130			
Silver	44.4	0.3	ug/g	ND	88.7	70-130			
Thallium	44.5	1.0	ug/g	ND	88.8	70-130			
Uranium	42.9	1.0	ug/g	ND	85.3	70-130			
Vanadium	51.7	10.0	ug/g	ND	84.8	70-130			
Zinc	46.8	20.0	ug/g	ND	69.7	70-130			QS-02

Certificate of Analysis

Report Date: 31-Mar-2020

Client: Paterson Group Consulting Engineers

Order Date: 25-Mar-2020

Client PO: 29653

Project Description: PE4752

**Qualifier Notes:**

***QC Qualifiers :***

QM-05 : The spike recovery was outside acceptance limits for the matrix spike due to matrix interference.

QS-02 : Spike level outside of control limits. Analysis batch accepted based on other QC included in the batch.

**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.

NC: Not Calculated

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.



## *Certificate of Analysis*

### **Paterson Group Consulting Engineers**

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

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

Client PO: 13905  
Project: PE2934  
Custody: 95991

Report Date: 9-Apr-2013  
Order Date: 3-Apr-2013

**Order #: 1314149**

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

<b>Paracel ID</b>	<b>Client ID</b>
1314149-01	BH1-GW1

Approved By:



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

**Certificate of Analysis**

Client: **Paterson Group Consulting Engineers**  
Client PO: 13905

Project Description: PE2934

Report Date: 09-Apr-2013  
Order Date: 3-Apr-2013

**Analysis Summary Table**

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHC F1	CWS Tier 1 - P&T GC-FID	5-Apr-13	9-Apr-13
PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	4-Apr-13	4-Apr-13
VOCs by P&T GC-MS	EPA 624 - P&T GC-MS	5-Apr-13	9-Apr-13



**Certificate of Analysis**

Report Date: 09-Apr-2013

Client: Paterson Group Consulting Engineers

Order Date: 3-Apr-2013

Client PO: 13905

Project Description: PE2934

<b>Client ID:</b>	BH1-GW1	-	-	-
<b>Sample Date:</b>	03-Apr-13	-	-	-
<b>Sample ID:</b>	1314149-01	-	-	-
<b>MDL/Units</b>	Water	-	-	-

**Volatiles**

Acetone	5.0 ug/L	<5.0	-	-	-
Benzene	0.5 ug/L	<0.5	-	-	-
Bromodichloromethane	0.5 ug/L	<0.5	-	-	-
Bromoform	0.5 ug/L	<0.5	-	-	-
Bromomethane	0.5 ug/L	<0.5	-	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	-	-	-
Chlorobenzene	0.5 ug/L	<0.5	-	-	-
Chloroethane	1.0 ug/L	<1.0	-	-	-
Chloroform	0.5 ug/L	<0.5	-	-	-
Chloromethane	3.0 ug/L	<3.0	-	-	-
Dibromochloromethane	0.5 ug/L	<0.5	-	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	-	-	-
1,2-Dibromoethane	0.2 ug/L	<0.2	-	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
1,2-Dichloroethylene, total	0.5 ug/L	<0.5	-	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	-	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	-	-	-
Ethylbenzene	0.5 ug/L	<0.5	-	-	-
Hexane	1.0 ug/L	<1.0	-	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	-	-	-
Methyl Butyl Ketone (2-Hexanone)	10.0 ug/L	<10.0	-	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	-	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	-	-	-
Methylene Chloride	5.0 ug/L	<5.0	-	-	-

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 Mississauga, ON L5N 6J3

**NIAGARA FALLS**  
 5415 Morning Glory Cr.  
 Niagara Falls, ON L2J 0A3

**SARNIA**  
 123 Christina St. N.  
 Sarnia, ON N7T 5T7

**Certificate of Analysis**

Report Date: 09-Apr-2013

Client: **Paterson Group Consulting Engineers**

Order Date: 3-Apr-2013

Client PO: 13905

Project Description: PE2934

	Client ID:	BH1-GW1	-	-	-
	Sample Date:	03-Apr-13	-	-	-
	Sample ID:	1314149-01	-	-	-
	MDL/Units	Water	-	-	-
Styrene	0.5 ug/L	<0.5	-	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	-	-	-
Toluene	0.5 ug/L	<0.5	-	-	-
1,2,4-Trichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	-	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	-	-	-
Trichloroethylene	0.5 ug/L	<0.5	-	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	-	-	-
1,3,5-Trimethylbenzene	0.5 ug/L	<0.5	-	-	-
Vinyl chloride	0.5 ug/L	<0.5	-	-	-
m,p-Xylenes	0.5 ug/L	<0.5	-	-	-
o-Xylene	0.5 ug/L	<0.5	-	-	-
Xylenes, total	0.5 ug/L	<0.5	-	-	-
4-Bromofluorobenzene	Surrogate	108%	-	-	-
Dibromofluoromethane	Surrogate	120%	-	-	-
Toluene-d8	Surrogate	97.3%	-	-	-

**Hydrocarbons**

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

**Certificate of Analysis**

Report Date: 09-Apr-2013

Client: **Paterson Group Consulting Engineers**

Order Date: 3-Apr-2013

Client PO: 13905

Project Description: PE2934

**Method Quality Control: Blank**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Hydrocarbons</b>									
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						
<b>Volatiles</b>									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroethane	ND	1.0	ug/L						
Chloroform	ND	0.5	ug/L						
Chloromethane	ND	3.0	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dibromoethane	ND	0.2	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloroethylene, total	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Butyl Ketone (2-Hexanone)	ND	10.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,2,4-Trichlorobenzene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
1,3,5-Trimethylbenzene	ND	0.5	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	44.7		ug/L		140	50-140			
Surrogate: Dibromofluoromethane	36.7		ug/L		115	50-140			
Surrogate: Toluene-d8	30.3		ug/L		94.6	50-140			

**Certificate of Analysis**

Report Date: 09-Apr-2013

Client: **Paterson Group Consulting Engineers**

Order Date: 3-Apr-2013

Client PO: 13905

Project Description: PE2934

**Method Quality Control: Duplicate**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Hydrocarbons</b>									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
<b>Volatiles</b>									
Acetone	76.4	5.0	ug/L	76.3			0.1	30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	2.06	0.5	ug/L	ND			0.0	30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroethane	ND	1.0	ug/L	ND				30	
Chloroform	1.11	0.5	ug/L	ND			0.0	30	
Chloromethane	ND	3.0	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dibromoethane	ND	0.2	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Butyl Ketone (2-Hexanone)	ND	10.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,2,4-Trichlorobenzene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
1,3,5-Trimethylbenzene	ND	0.5	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	36.3		ug/L	ND	113	50-140			
Surrogate: Dibromofluoromethane	23.9		ug/L	ND	74.8	50-140			
Surrogate: Toluene-d8	34.1		ug/L	ND	106	50-140			

**Certificate of Analysis**

Report Date: 09-Apr-2013

Client: **Paterson Group Consulting Engineers**

Order Date: 3-Apr-2013

Client PO: 13905

Project Description: PE2934

**Method Quality Control: Spike**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Hydrocarbons</b>									
F1 PHCs (C6-C10)	1840	25	ug/L	ND	92.2	68-117			
F2 PHCs (C10-C16)	1570	100	ug/L	ND	87.4	60-140			
F3 PHCs (C16-C34)	3590	100	ug/L	ND	96.4	60-140			
F4 PHCs (C34-C50)	2430	100	ug/L	ND	98.2	60-140			
<b>Volatiles</b>									
Acetone	86.1	5.0	ug/L	ND	86.1	50-140			
Benzene	46.1	0.5	ug/L	ND	115	60-130			
Bromodichloromethane	48.2	0.5	ug/L	ND	121	60-130			
Bromoform	45.7	0.5	ug/L	ND	114	60-130			
Bromomethane	37.9	0.5	ug/L	ND	94.8	50-140			
Carbon Tetrachloride	46.0	0.2	ug/L	ND	115	60-130			
Chlorobenzene	48.7	0.5	ug/L	ND	122	60-130			
Chloroethane	35.8	1.0	ug/L	ND	89.5	50-140			
Chloroform	41.4	0.5	ug/L	ND	103	60-130			
Chloromethane	36.8	3.0	ug/L	ND	91.9	50-140			
Dibromochloromethane	48.0	0.5	ug/L	ND	120	60-130			
Dichlorodifluoromethane	27.8	1.0	ug/L	ND	69.4	50-140			
1,2-Dibromoethane	41.0	0.2	ug/L	ND	102	60-130			
1,2-Dichlorobenzene	41.3	0.5	ug/L	ND	103	60-130			
1,3-Dichlorobenzene	41.9	0.5	ug/L	ND	105	60-130			
1,4-Dichlorobenzene	39.2	0.5	ug/L	ND	97.9	60-130			
1,1-Dichloroethane	38.5	0.5	ug/L	ND	96.2	60-130			
1,2-Dichloroethane	42.9	0.5	ug/L	ND	107	60-130			
1,1-Dichloroethylene	40.9	0.5	ug/L	ND	102	60-130			
cis-1,2-Dichloroethylene	41.6	0.5	ug/L	ND	104	60-130			
trans-1,2-Dichloroethylene	42.6	0.5	ug/L	ND	106	60-130			
1,2-Dichloropropane	45.5	0.5	ug/L	ND	114	60-130			
cis-1,3-Dichloropropylene	46.9	0.5	ug/L	ND	117	60-130			
trans-1,3-Dichloropropylene	50.5	0.5	ug/L	ND	126	60-130			
Ethylbenzene	45.0	0.5	ug/L	ND	112	60-130			
Hexane	44.3	1.0	ug/L	ND	111	60-130			
Methyl Ethyl Ketone (2-Butanone)	94.8	5.0	ug/L	ND	94.8	50-140			
Methyl Butyl Ketone (2-Hexanone)	107	10.0	ug/L	ND	107	50-140			
Methyl Isobutyl Ketone	125	5.0	ug/L	ND	125	50-140			
Methyl tert-butyl ether	103	2.0	ug/L	ND	103	50-140			
Methylene Chloride	46.7	5.0	ug/L	ND	117	60-130			
Styrene	46.2	0.5	ug/L	ND	116	60-130			
1,1,1,2-Tetrachloroethane	40.4	0.5	ug/L	ND	101	60-130			
1,1,2,2-Tetrachloroethane	50.8	0.5	ug/L	ND	127	60-130			
Tetrachloroethylene	39.0	0.5	ug/L	ND	97.6	60-130			
Toluene	43.1	0.5	ug/L	ND	108	60-130			
1,2,4-Trichlorobenzene	43.3	0.5	ug/L	ND	108	60-130			
1,1,1-Trichloroethane	46.5	0.5	ug/L	ND	116	60-130			
1,1,2-Trichloroethane	45.2	0.5	ug/L	ND	113	60-130			
Trichloroethylene	42.4	0.5	ug/L	ND	106	60-130			
Trichlorofluoromethane	36.9	1.0	ug/L	ND	92.2	60-130			
1,3,5-Trimethylbenzene	44.6	0.5	ug/L	ND	112	60-130			
Vinyl chloride	39.2	0.5	ug/L	ND	98.0	50-140			
m,p-Xylenes	99.7	0.5	ug/L	ND	125	60-130			

**Certificate of Analysis**

Report Date: 09-Apr-2013

Client: **Paterson Group Consulting Engineers**

Order Date: 3-Apr-2013

Client PO: 13905

Project Description: PE2934

**Method Quality Control: Spike**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
o-Xylene	48.8	0.5	ug/L	ND	122	60-130			
Surrogate: 4-Bromofluorobenzene	32.9		ug/L		103	50-140			

**Certificate of Analysis**

Client: **Paterson Group Consulting Engineers**  
Client PO: 13905

Project Description: PE2934

Report Date: 09-Apr-2013  
Order Date: 3-Apr-2013

**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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www.paracellabs.com

**Chain of Custody**  
(Lab Use Only)  
**Nº 95991**

OTTAWA • KINGSTON • NIAGARA • MISSISSAUGA • SARNIA

Client Name: <i>Peterson Group</i>	Project Reference: <i>PE 2934</i>	TAT: <input checked="" type="checkbox"/> Regular     3 Day
Contact Name: <i>Eric Leveque</i>	Quote #	2 Day     1 Day
Address: <i>154 Colonnade</i>	PO # <i>13905</i>	Date Required: _____
Telephone: <i>613-226-7381</i>	Email Address: <i>e.levéque@petersongroup.ca</i>	

Criteria: | | O. Reg. 153/04 Table  | O. Reg. 153/11 (Current) Table  | RSC Filing | | O. Reg. 558/00 | | PWQO | | CCME | | SUB (Storm) | | SUB (Sanitary) Municipality: \_\_\_\_\_ | | Other: \_\_\_\_\_

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)					Required Analyses															
Paracel Order Number: <i>1314149</i>		Matrix	Air Volume	# of Containers	Sample Taken		PHCs FI-F4+BTEx	VOCs	PAHs	Metals by ICP/MS	Hg	CrVI	B (HWS)							
Sample ID/Location Name					Date	Time														
1	<i>BH1-GW1</i>	<i>GW</i>		<i>2</i>	<i>Apr 3/13</i>	<i>10:30 AM</i>	<i>X</i>	<i>X</i>												
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments: \_\_\_\_\_ Method of Delivery: *Paracel*

Relinquished By (Print & Sign): <i>[Signature]</i>	Received by Driver/Depot: <i>A. Drouse</i>	Received at Lab: <i>M/C</i>	Verified By: <i>M/C</i>
Date/Time: <i>03/04/13 2:52 PM</i>	Temperature: _____ °C	Date/Time: <i>Apr 3/13 4:55</i>	Date/Time: <i>Apr 3/13 16:09</i>
Date/Time: <i>Apr 3 2013</i>	Temperature: <i>13.2</i> °C	pH Verified     By: <i>N/A</i>	



## Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South  
Nepean, ON K2E 7J5  
Attn: Karyn Munch

Client PO: 20143  
Project: PE3837  
Custody: 108921

Report Date: 6-Sep-2016  
Order Date: 31-Aug-2016

**Order #: 1636199**

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

<b>Parcel ID</b>	<b>Client ID</b>
1636199-01	BH1-GW1
1636199-02	BH2-GW1
1636199-03	BH3-GW1
1636199-04	Trip Blank
1636199-05	Duplicate

Approved By:



Mark Foto, M.Sc.  
Lab Supervisor

Certificate of Analysis  
Client: Paterson Group Consulting Engineers  
Client PO: 20143

Report Date: 06-Sep-2016  
Order Date: 31-Aug-2016  
Project Description: PE3837

### Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	31-Aug-16	2-Sep-16
PHC F1	CWS Tier 1 - P&T GC-FID	31-Aug-16	2-Sep-16
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	2-Sep-16	2-Sep-16
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	31-Aug-16	1-Sep-16

Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
 Client PO: 20143

Report Date: 06-Sep-2016  
 Order Date: 31-Aug-2016  
 Project Description: PE3837

Client ID:	BH1-GW1	BH2-GW1	BH3-GW1	Trip Blank
Sample Date:	30-Aug-16	30-Aug-16	30-Aug-16	29-Aug-16
Sample ID:	1636199-01	1636199-02	1636199-03	1636199-04
MDL/Units	Water	Water	Water	Water

**Volatiles**

	MDL/Units	BH1-GW1	BH2-GW1	BH3-GW1	Trip Blank
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	1.8	10.8	5.1	<0.5
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylene dibromide (dibromoethane)	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<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
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

Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
 Client PO: 20143

Report Date: 06-Sep-2016  
 Order Date: 31-Aug-2016  
 Project Description: PE3837

	Client ID: Sample Date: Sample ID:	BH1-GW1 30-Aug-16 1636199-01 Water	BH2-GW1 30-Aug-16 1636199-02 Water	BH3-GW1 30-Aug-16 1636199-03 Water	Trip Blank 29-Aug-16 1636199-04 Water
	MDL/Units				
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	93.0%	113%	112%	106%
Dibromofluoromethane	Surrogate	106%	108%	108%	107%
Toluene-d8	Surrogate	93.4%	94.4%	91.8%	94.9%

**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	-
	Client ID: Sample Date: Sample ID:	Duplicate 30-Aug-16 1636199-05 Water	-	-	-
	MDL/Units		-	-	-

**Volatiles**

Benzene	0.5 ug/L	<0.5	-	-	-
Ethylbenzene	0.5 ug/L	<0.5	-	-	-
Toluene	0.5 ug/L	<0.5	-	-	-
m,p-Xylenes	0.5 ug/L	<0.5	-	-	-
o-Xylene	0.5 ug/L	<0.5	-	-	-
Xylenes, total	0.5 ug/L	<0.5	-	-	-
Toluene-d8	Surrogate	99.2%	-	-	-

**Hydrocarbons**

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

Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
 Client PO: 20143

Report Date: 06-Sep-2016  
 Order Date: 31-Aug-2016  
 Project Description: PE3837

### Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Hydrocarbons</b>									
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						
<b>Volatiles</b>									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane)	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	97.7		ug/L		122	50-140			
Surrogate: Dibromofluoromethane	90.1		ug/L		113	50-140			
Surrogate: Toluene-d8	82.9		ug/L		104	50-140			
Benzene	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: Toluene-d8	82.9		ug/L		104	50-140			

Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
 Client PO: 20143

Report Date: 06-Sep-2016  
 Order Date: 31-Aug-2016  
 Project Description: PE3837

### Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Hydrocarbons</b>									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
<b>Volatiles</b>									
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	98.7		ug/L		123	50-140			
Surrogate: Dibromofluoromethane	92.4		ug/L		115	50-140			
Surrogate: Toluene-d8	77.4		ug/L		96.8	50-140			
Benzene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: Toluene-d8	77.4		ug/L		96.8	50-140			

Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
 Client PO: 20143

Report Date: 06-Sep-2016  
 Order Date: 31-Aug-2016  
 Project Description: PE3837

### Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Hydrocarbons</b>									
F1 PHCs (C6-C10)	1980	25	ug/L		98.8	68-117			
F2 PHCs (C10-C16)	1350	100	ug/L		75.2	60-140			
F3 PHCs (C16-C34)	3550	100	ug/L		95.5	60-140			
F4 PHCs (C34-C50)	2240	100	ug/L		90.3	60-140			
<b>Volatiles</b>									
Acetone	89.7	5.0	ug/L		89.7	50-140			
Benzene	27.8	0.5	ug/L		69.6	60-130			
Bromodichloromethane	29.0	0.5	ug/L		72.5	60-130			
Bromoform	35.0	0.5	ug/L		87.6	60-130			
Bromomethane	43.5	0.5	ug/L		109	50-140			
Carbon Tetrachloride	26.0	0.2	ug/L		65.0	60-130			
Chlorobenzene	35.7	0.5	ug/L		89.3	60-130			
Chloroform	28.8	0.5	ug/L		71.9	60-130			
Dibromochloromethane	32.5	0.5	ug/L		81.3	60-130			
Dichlorodifluoromethane	26.6	1.0	ug/L		66.5	50-140			
1,2-Dichlorobenzene	29.4	0.5	ug/L		73.5	60-130			
1,3-Dichlorobenzene	28.5	0.5	ug/L		71.3	60-130			
1,4-Dichlorobenzene	30.7	0.5	ug/L		76.7	60-130			
1,1-Dichloroethane	27.6	0.5	ug/L		68.9	60-130			
1,2-Dichloroethane	29.8	0.5	ug/L		74.4	60-130			
1,1-Dichloroethylene	35.6	0.5	ug/L		89.0	60-130			
cis-1,2-Dichloroethylene	33.5	0.5	ug/L		83.7	60-130			
trans-1,2-Dichloroethylene	31.5	0.5	ug/L		78.8	60-130			
1,2-Dichloropropane	30.7	0.5	ug/L		76.7	60-130			
cis-1,3-Dichloropropylene	35.8	0.5	ug/L		89.4	60-130			
trans-1,3-Dichloropropylene	32.1	0.5	ug/L		80.2	60-130			
Ethylbenzene	42.7	0.5	ug/L		107	60-130			
Ethylene dibromide (dibromoethane)	36.5	0.2	ug/L		91.3	60-130			
Hexane	30.5	1.0	ug/L		76.4	60-130			
Methyl Ethyl Ketone (2-Butanone)	81.4	5.0	ug/L		81.4	50-140			
Methyl Isobutyl Ketone	81.6	5.0	ug/L		81.6	50-140			
Methyl tert-butyl ether	73.4	2.0	ug/L		73.4	50-140			
Methylene Chloride	35.2	5.0	ug/L		88.0	60-130			
Styrene	39.2	0.5	ug/L		98.1	60-130			
1,1,1,2-Tetrachloroethane	34.8	0.5	ug/L		86.9	60-130			
1,1,2,2-Tetrachloroethane	38.4	0.5	ug/L		96.0	60-130			
Tetrachloroethylene	41.6	0.5	ug/L		104	60-130			
Toluene	37.1	0.5	ug/L		92.8	60-130			
1,1,1-Trichloroethane	29.7	0.5	ug/L		74.2	60-130			
1,1,2-Trichloroethane	31.0	0.5	ug/L		77.6	60-130			
Trichloroethylene	42.8	0.5	ug/L		107	60-130			
Trichlorofluoromethane	26.3	1.0	ug/L		65.8	60-130			
Vinyl chloride	38.6	0.5	ug/L		96.4	50-140			
m,p-Xylenes	76.6	0.5	ug/L		95.8	60-130			
o-Xylene	37.5	0.5	ug/L		93.7	60-130			
Surrogate: 4-Bromofluorobenzene	73.8		ug/L		92.2	50-140			
Benzene	27.8	0.5	ug/L		69.6	60-130			
Ethylbenzene	42.7	0.5	ug/L		107	60-130			
Toluene	37.1	0.5	ug/L		92.8	60-130			
m,p-Xylenes	76.6	0.5	ug/L		95.8	60-130			
o-Xylene	37.5	0.5	ug/L		93.7	60-130			

Certificate of Analysis  
Client: **Paterson Group Consulting Engineers**  
Client PO: 20143

Report Date: 06-Sep-2016  
Order Date: 31-Aug-2016  
Project Description: **PE3837**

**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.



Client Name: <u>Paterson Group</u>	Project Reference: <u>PE3837</u>	<b>Turnaround Time:</b> <input type="checkbox"/> 1 Day <input type="checkbox"/> 3 Day  <input type="checkbox"/> 2 Day <input checked="" type="checkbox"/> Regular Date Required: _____
Contact Name: <u>Karyn Munch</u>	Quote #	
Address: <u>154 Colonnade Rd S</u>	PO # <u>20143</u>	
Telephone: <u>013.226.7381</u>	Email Address: <u>kmunch@patersongroup.ca</u>	

Criteria:  O. Reg. 153/04 (As Amended) Table 7  RSC Filing  O. Reg. 558/00  PWQO  CCME  SUB (Storm)  SUB (Sanitary) Municipality: \_\_\_\_\_  Other: \_\_\_\_\_

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

**Required Analyses**

Parcel Order Number: <u>1636199</u>		Matrix	Air Volume	# of Containers	Sample Taken		PHCs FI-FI-PAHs	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	BTEX PHCs
Sample ID/Location Name					Date	Time								
1	BH1-GW1	GW		3	AUG 30/16	4:15	✓							
2	BH2-GW1	GW		3	"	4:00	✓							
3	BH3-GW1	GW		3	"	5:00	✓							
4	Trip Blank	O		2	8/29/16			✓						
5	Duplicate	GW		3	8/30/16		✓						✓	
6														
7														
8														
9														
10														

Comments: \_\_\_\_\_ Method of Delivery: Paracel

Relinquished By (Sign): <u>KMunch</u>	Received by Driver/Depot: <u>M. BOUJE</u>	Received at Lab: <u>SUNEPORN DOKMAS</u>	Verified By: <u>[Signature]</u>
Relinquished By (Print): <u>Karyn Munch</u>	Date/Time: <u>31/08/16 12:15</u>	Date/Time: <u>AUG 31 2016 12:48</u>	Date/Time: <u>31/08/16 13:27</u>
Date/Time: <u>11:20</u>	Temperature: _____ °C	Temperature: <u>12.3 °C</u>	pH Verified [ ] By: _____

## Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South  
Nepean, ON K2E 7J5  
Attn: Karyn Munch

Client PO: 20906  
Project: PE3837  
Custody: 109156

Report Date: 14-Oct-2016  
Order Date: 7-Oct-2016

**Order #: 1641510**

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

<b>Parcel ID</b>	<b>Client ID</b>
1641510-01	BH1-GW2
1641510-02	BH2-GW2
1641510-03	BH3-GW2

Approved By:

DRAFT REPORT  
DATA SUBJECT TO CHANGE

Certificate of Analysis  
Client: Paterson Group Consulting Engineers  
Client PO: 20906

Report Date: 14-Oct-2016  
Order Date: 7-Oct-2016  
Project Description: PE3837

## Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent - water	MOE E3056 - colourimetric	13-Oct-16	13-Oct-16
Mercury by CVAA	EPA 245.1 - Cold Vapour AA	13-Oct-16	13-Oct-16
Metals, ICP-MS	EPA 200.8 - ICP-MS	12-Oct-16	12-Oct-16
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	7-Oct-16	10-Oct-16

Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
 Client PO: 20906

Report Date: 14-Oct-2016

Order Date: 7-Oct-2016

Project Description: PE3837

<b>Client ID:</b>	BH1-GW2	BH2-GW2	BH3-GW2	-
<b>Sample Date:</b>	06-Oct-16	06-Oct-16	06-Oct-16	-
<b>Sample ID:</b>	1641510-01	1641510-02	1641510-03	-
<b>MDL/Units</b>	Water	Water	Water	-

**Metals**

Mercury	0.1 ug/L	-	-	<0.1	-
Antimony	0.5 ug/L	-	-	0.7	-
Arsenic	1 ug/L	-	-	2	-
Beryllium	0.5 ug/L	-	-	<0.5	-
Boron	10 ug/L	-	-	160	-
Cadmium	0.1 ug/L	-	-	<0.1	-
Chromium	1 ug/L	-	-	39	-
Chromium (VI)	10 ug/L	-	-	<10	-
Cobalt	0.5 ug/L	-	-	<0.5	-
Copper	0.5 ug/L	-	-	7.6	-
Lead	0.1 ug/L	-	-	0.2	-
Molybdenum	0.5 ug/L	-	-	8.4	-
Nickel	1 ug/L	-	-	3	-
Selenium	1 ug/L	-	-	2	-
Silver	0.1 ug/L	-	-	<0.1	-
Thallium	0.1 ug/L	-	-	<0.1	-
Uranium	0.1 ug/L	-	-	3.2	-
Vanadium	0.5 ug/L	-	-	12.5	-
Zinc	5 ug/L	-	-	<5	-

**Volatiles**

Acetone	5.0 ug/L	<5.0	<5.0	<5.0	-
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	-
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Chloroform	0.5 ug/L	<0.5	1.1	<0.5	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-

Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
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Project Description: PE3837

	Client ID: Sample Date: Sample ID:	BH1-GW2 06-Oct-16 1641510-01 Water	BH2-GW2 06-Oct-16 1641510-02 Water	BH3-GW2 06-Oct-16 1641510-03 Water	- - - -
	MDL/Units				
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Ethylene dibromide (dibromoethane)	0.2 ug/L	<0.2	<0.2	<0.2	-
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	-
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	-
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	-
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	-
4-Bromofluorobenzene	Surrogate	119%	113%	121%	-
Dibromofluoromethane	Surrogate	89.0%	87.0%	88.6%	-
Toluene-d8	Surrogate	104%	103%	103%	-

Certificate of Analysis  
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Report Date: 14-Oct-2016  
 Order Date: 7-Oct-2016  
 Project Description: PE3837

### Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Metals</b>									
Mercury	ND	0.1	ug/L						
Antimony	ND	0.5	ug/L						
Arsenic	ND	1	ug/L						
Beryllium	ND	0.5	ug/L						
Boron	ND	10	ug/L						
Cadmium	ND	0.1	ug/L						
Chromium (VI)	ND	10	ug/L						
Chromium	ND	1	ug/L						
Cobalt	ND	0.5	ug/L						
Copper	ND	0.5	ug/L						
Lead	ND	0.1	ug/L						
Molybdenum	ND	0.5	ug/L						
Nickel	ND	1	ug/L						
Selenium	ND	1	ug/L						
Silver	ND	0.1	ug/L						
Thallium	ND	0.1	ug/L						
Uranium	ND	0.1	ug/L						
Vanadium	ND	0.5	ug/L						
Zinc	ND	5	ug/L						
<b>Volatiles</b>									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane,	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						

Certificate of Analysis  
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 Client PO: 20906

Report Date: 14-Oct-2016

Order Date: 7-Oct-2016

Project Description: PE3837

**Method Quality Control: Blank**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	96.9		ug/L		121	50-140			
Surrogate: Dibromofluoromethane	69.6		ug/L		87.0	50-140			
Surrogate: Toluene-d8	82.8		ug/L		104	50-140			

Certificate of Analysis  
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 Client PO: 20906

Report Date: 14-Oct-2016  
 Order Date: 7-Oct-2016  
 Project Description: PE3837

### Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Metals</b>									
Mercury	ND	0.1	ug/L	ND			0.0	20	
Antimony	0.92	0.5	ug/L	1.07			15.8	20	
Arsenic	5.5	1	ug/L	5.6			2.7	20	
Beryllium	ND	0.5	ug/L	ND			0.0	20	
Boron	3350	1000	ug/L	3280			2.0	20	
Cadmium	ND	0.1	ug/L	ND			0.0	20	
Chromium (VI)	ND	10	ug/L	ND				20	
Chromium	16.0	1	ug/L	17.7			9.6	20	
Cobalt	3.73	0.5	ug/L	3.77			1.2	20	
Copper	17.6	0.5	ug/L	18.0			2.6	20	
Lead	ND	0.1	ug/L	ND			0.0	20	
Molybdenum	1.26	0.5	ug/L	ND			0.0	20	
Nickel	2.4	1	ug/L	2.3			2.2	20	
Selenium	ND	1	ug/L	3.2			0.0	20	
Silver	ND	0.1	ug/L	ND			0.0	20	
Thallium	ND	0.1	ug/L	ND			0.0	20	
Uranium	ND	0.1	ug/L	ND			0.0	20	
Vanadium	59.2	0.5	ug/L	60.5			2.2	20	
Zinc	ND	5	ug/L	ND			0.0	20	
<b>Volatiles</b>									
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	
1,1,1,2,2-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	



Certificate of Analysis  
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Report Date: 14-Oct-2016

Order Date: 7-Oct-2016

**Project Description: PE3837**
**Method Quality Control: Duplicate**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	92.4		ug/L		116	50-140			
Surrogate: Dibromofluoromethane	71.1		ug/L		88.9	50-140			
Surrogate: Toluene-d8	82.6		ug/L		103	50-140			

Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
 Client PO: 20906

Report Date: 14-Oct-2016  
 Order Date: 7-Oct-2016  
 Project Description: PE3837

### Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Metals</b>									
Mercury	2.71	0.1	ug/L	ND	90.3	70-130			
Antimony	46.8		ug/L	1.07	91.4	80-120			
Arsenic	44.5		ug/L		88.9	80-120			
Beryllium	41.6		ug/L	ND	83.1	80-120			
Boron	41		ug/L		82.1	80-120			
Cadmium	45.2		ug/L		90.4	80-120			
Chromium (VI)	208	10	ug/L	ND	104	70-130			
Chromium	44.3		ug/L		88.7	80-120			
Cobalt	45.0		ug/L		89.9	80-120			
Copper	44.6		ug/L		89.2	80-120			
Lead	40.4		ug/L	ND	80.7	80-120			
Molybdenum	41.9		ug/L	ND	83.9	80-120			
Nickel	44.1		ug/L		88.3	80-120			
Selenium	44.8		ug/L		89.6	80-120			
Silver	44.2		ug/L		88.5	80-120			
Thallium	40.1		ug/L	ND	80.3	80-120			
Uranium	43.1		ug/L	ND	86.0	80-120			
Vanadium	103		ug/L	60.5	84.4	80-120			
Zinc	45		ug/L	ND	82.5	80-120			
<b>Volatiles</b>									
Acetone	70.0	5.0	ug/L		70.0	50-140			
Benzene	30.7	0.5	ug/L		76.8	60-130			
Bromodichloromethane	26.4	0.5	ug/L		65.9	60-130			
Bromoform	26.6	0.5	ug/L		66.4	60-130			
Bromomethane	22.0	0.5	ug/L		55.0	50-140			
Carbon Tetrachloride	26.0	0.2	ug/L		65.1	60-130			
Chlorobenzene	35.2	0.5	ug/L		88.1	60-130			
Chloroform	29.8	0.5	ug/L		74.4	60-130			
Dibromochloromethane	28.6	0.5	ug/L		71.5	60-130			
Dichlorodifluoromethane	22.5	1.0	ug/L		56.3	50-140			
1,2-Dichlorobenzene	43.3	0.5	ug/L		108	60-130			
1,3-Dichlorobenzene	42.8	0.5	ug/L		107	60-130			
1,4-Dichlorobenzene	43.3	0.5	ug/L		108	60-130			
1,1-Dichloroethane	30.6	0.5	ug/L		76.5	60-130			
1,2-Dichloroethane	29.1	0.5	ug/L		72.7	60-130			
1,1-Dichloroethylene	29.4	0.5	ug/L		73.5	60-130			
cis-1,2-Dichloroethylene	30.1	0.5	ug/L		75.2	60-130			
trans-1,2-Dichloroethylene	28.9	0.5	ug/L		72.3	60-130			
1,2-Dichloropropane	33.7	0.5	ug/L		84.3	60-130			
cis-1,3-Dichloropropylene	27.2	0.5	ug/L		68.1	60-130			
trans-1,3-Dichloropropylene	29.2	0.5	ug/L		73.0	60-130			
Ethylbenzene	33.5	0.5	ug/L		83.7	60-130			
Ethylene dibromide (dibromoethane,	33.9	0.2	ug/L		84.8	60-130			
Hexane	24.8	1.0	ug/L		62.1	60-130			
Methyl Ethyl Ketone (2-Butanone)	68.8	5.0	ug/L		68.8	50-140			
Methyl Isobutyl Ketone	69.7	5.0	ug/L		69.7	50-140			
Methyl tert-butyl ether	71.4	2.0	ug/L		71.4	50-140			
Methylene Chloride	28.0	5.0	ug/L		70.0	60-130			
Styrene	34.7	0.5	ug/L		86.8	60-130			
1,1,1,2-Tetrachloroethane	31.2	0.5	ug/L		77.9	60-130			
1,1,1,2,2-Tetrachloroethane	30.6	0.5	ug/L		76.6	60-130			
Tetrachloroethylene	37.3	0.5	ug/L		93.4	60-130			

Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
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Report Date: 14-Oct-2016  
 Order Date: 7-Oct-2016  
 Project Description: PE3837

### Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Toluene	36.2	0.5	ug/L		90.5	60-130			
1,1,1-Trichloroethane	27.8	0.5	ug/L		69.6	60-130			
1,1,2-Trichloroethane	28.3	0.5	ug/L		70.6	60-130			
Trichloroethylene	29.8	0.5	ug/L		74.5	60-130			
Trichlorofluoromethane	30.5	1.0	ug/L		76.2	60-130			
Vinyl chloride	25.1	0.5	ug/L		62.8	50-140			
m,p-Xylenes	69.1	0.5	ug/L		86.4	60-130			
o-Xylene	33.6	0.5	ug/L		83.9	60-130			
Surrogate: 4-Bromofluorobenzene	88.9		ug/L		111	50-140			

Certificate of Analysis  
**Client: Paterson Group Consulting Engineers**  
**Client PO: 20906**

Report Date: 14-Oct-2016  
Order Date: 7-Oct-2016  
**Project Description: PE3837**

**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.

Client Name: <b>Paterson Group</b>	Project Reference: <b>PE3837</b>	<b>Turnaround Time:</b> <input type="checkbox"/> 1 Day <input type="checkbox"/> 3 Day <input type="checkbox"/> 2 Day <input checked="" type="checkbox"/> Regular Date Required: _____
Contact Name: <b>Karyn Munch</b>	Quote #	
Address: <b>154 Colonnade Rd. S Ottawa, ON</b>	PO # <b>20906</b>	
Telephone: <b>613-226-7381</b>	Email Address: <b>Kmunch@patersongroup.ca</b>	

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

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

Parcel Order Number: <b>1641510-Water</b> <b>1642013-Soil</b>		Matrix	Air Volume	# of Containers	Sample Taken		PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	F2-F4
Sample ID/Location Name					Date	Time								
1	BH1-GW2	GW		2	Oct 6/16	PM		✓						
2	BH2-GW2	GW		2	Oct 6/16	PM		✓						
3	BH3-GW2	GW		5	Oct 6/16	PM		✓	✓	✓	✓			
4	BH1-SS2 *	S		1	Aug 24/16	am								As per Karyn - RS
5	BH2-AU *	S		1	↓	am							✓	5
6	BH4-SS2 *	S		1	↓	pm			✓	✓	✓		✓	5
7														
8														
9														
10														

Comments: **\*previously submitted; please let me know if you've enough sample left (I realize F2-F4 will be qualified due to hold time expiry).**

Method of Delivery: **Paracel**

Relinquished By (Sign):	Received by Driver/Depot: <b>A. STANSE</b>	Received at Lab: <b>SUNEEPARN DOKMAI</b>	Verified By: <b>S</b>
Relinquished By (Print):	Date/Time: <b>07/10/16 4:30 PM</b>	Date/Time: <b>07/07/2016 05:47</b>	Date/Time: <b>7/10/16 18:41</b>
Date/Time:	Temperature: <b>°C</b>	Temperature: <b>18.5 °C</b>	pH Verified <input type="checkbox"/> By: <b>S</b>

## Certificate of Analysis

### Paterson Group Consulting Engineers

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

Client PO: 27632  
Project: PE4752  
Custody: 50470

Report Date: 4-Nov-2019  
Order Date: 28-Oct-2019

**Order #: 1944106**

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

Parcel ID	Client ID
1944106-01	BH2
1944106-02	BH3
1944106-03	BHMW1
1944106-04	BHMW2
1944106-05	DUP1

Approved By:



Mark Foto, M.Sc.  
Lab Supervisor

Certificate of Analysis  
**Client: Paterson Group Consulting Engineers**  
**Client PO: 27632**

Report Date: 04-Nov-2019

Order Date: 28-Oct-2019

**Project Description: PE4752**

### Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent - water	MOE E3056 - colourimetric	30-Oct-19	30-Oct-19
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	31-Oct-19	1-Nov-19
Metals, ICP-MS	EPA 200.8 - ICP-MS	29-Oct-19	29-Oct-19
PHC F1	CWS Tier 1 - P&T GC-FID	31-Oct-19	2-Nov-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	31-Oct-19	1-Nov-19
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	31-Oct-19	2-Nov-19

Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
 Client PO: 27632

Report Date: 04-Nov-2019

Order Date: 28-Oct-2019

Project Description: PE4752

Client ID:	BH2	BH3	BHMW1	BHMW2
Sample Date:	28-Oct-19 09:00	28-Oct-19 09:00	28-Oct-19 09:00	28-Oct-19 09:00
Sample ID:	1944106-01	1944106-02	1944106-03	1944106-04
MDL/Units	Water	Water	Water	Water

**Metals**

Element	MDL/Units	BH2	BH3	BHMW1	BHMW2
Mercury	0.1 ug/L	-	-	<0.1	-
Antimony	0.5 ug/L	-	-	1.0	-
Arsenic	1 ug/L	-	-	4	-
Barium	1 ug/L	-	-	358	-
Beryllium	0.5 ug/L	-	-	<0.5	-
Boron	10 ug/L	-	-	231	-
Cadmium	0.1 ug/L	-	-	<0.1	-
Chromium	1 ug/L	-	-	<1	-
Chromium (VI)	10 ug/L	-	-	<10	-
Cobalt	0.5 ug/L	-	-	22.6	-
Copper	0.5 ug/L	-	-	0.9	-
Lead	0.1 ug/L	-	-	<0.1	-
Molybdenum	0.5 ug/L	-	-	5.1	-
Nickel	1 ug/L	-	-	8	-
Selenium	1 ug/L	-	-	<1	-
Silver	0.1 ug/L	-	-	<0.1	-
Sodium	200 ug/L	-	-	777000	-
Thallium	0.1 ug/L	-	-	<0.1	-
Uranium	0.1 ug/L	-	-	1.9	-
Vanadium	0.5 ug/L	-	-	2.1	-
Zinc	5 ug/L	-	-	<5	-

**Volatiles**

Element	MDL/Units	BH2	BH3	BHMW1	BHMW2
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	<1.0	<1.0
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5



Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
 Client PO: 27632

Report Date: 04-Nov-2019

Order Date: 28-Oct-2019

Project Description: PE4752

	Client ID:	BH2	BH3	BHMW1	BHMW2
	Sample Date:	28-Oct-19 09:00	28-Oct-19 09:00	28-Oct-19 09:00	28-Oct-19 09:00
	Sample ID:	1944106-01	1944106-02	1944106-03	1944106-04
	MDL/Units	Water	Water	Water	Water
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylene dibromide (dibromoethane)	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<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
1,1,1,2,2-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
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	117%	117%	117%	123%
Dibromofluoromethane	Surrogate	93.2%	88.2%	94.1%	90.4%
Toluene-d8	Surrogate	99.8%	96.8%	99.7%	101%

**Hydrocarbons**

F1 PHCs (C6-C10)	25 ug/L	-	-	<25	<25
F2 PHCs (C10-C16)	100 ug/L	-	-	<170 [1]	<100
F3 PHCs (C16-C34)	100 ug/L	-	-	<170 [1]	<100

Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
 Client PO: 27632

Report Date: 04-Nov-2019  
 Order Date: 28-Oct-2019  
 Project Description: PE4752

	Client ID:	BH2	BH3	BHMW1	BHMW2
	Sample Date:	28-Oct-19 09:00	28-Oct-19 09:00	28-Oct-19 09:00	28-Oct-19 09:00
	Sample ID:	1944106-01	1944106-02	1944106-03	1944106-04
	MDL/Units	Water	Water	Water	Water
F4 PHCs (C34-C50)	100 ug/L	-	-	<170 [1]	<100

Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
 Client PO: 27632

Report Date: 04-Nov-2019

Order Date: 28-Oct-2019

Project Description: PE4752

<b>Client ID:</b>	DUP1	-	-	-
<b>Sample Date:</b>	28-Oct-19 09:00	-	-	-
<b>Sample ID:</b>	1944106-05	-	-	-
<b>MDL/Units</b>	Water	-	-	-

**Volatiles**

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

Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
 Client PO: 27632

Report Date: 04-Nov-2019

Order Date: 28-Oct-2019

Project Description: PE4752

	Client ID:	DUP1	-	-	-
	Sample Date:	28-Oct-19 09:00	-	-	-
	Sample ID:	1944106-05	-	-	-
	MDL/Units	Water	-	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	-	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	-	-	-
Trichloroethylene	0.5 ug/L	<0.5	-	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	-	-	-
Vinyl chloride	0.5 ug/L	<0.5	-	-	-
m,p-Xylenes	0.5 ug/L	<0.5	-	-	-
o-Xylene	0.5 ug/L	<0.5	-	-	-
Xylenes, total	0.5 ug/L	<0.5	-	-	-
4-Bromofluorobenzene	Surrogate	126%	-	-	-
Dibromofluoromethane	Surrogate	92.0%	-	-	-
Toluene-d8	Surrogate	102%	-	-	-

Certificate of Analysis  
Client: Paterson Group Consulting Engineers  
Client PO: 27632

Report Date: 04-Nov-2019  
Order Date: 28-Oct-2019  
Project Description: PE4752

**Method Quality Control: Blank**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Hydrocarbons</b>									
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						
<b>Metals</b>									
Mercury	ND	0.1	ug/L						
Antimony	ND	0.5	ug/L						
Arsenic	ND	1	ug/L						
Barium	ND	1	ug/L						
Beryllium	ND	0.5	ug/L						
Boron	ND	10	ug/L						
Cadmium	ND	0.1	ug/L						
Chromium (VI)	ND	10	ug/L						
Chromium	ND	1	ug/L						
Cobalt	ND	0.5	ug/L						
Copper	ND	0.5	ug/L						
Lead	ND	0.1	ug/L						
Molybdenum	ND	0.5	ug/L						
Nickel	ND	1	ug/L						
Selenium	ND	1	ug/L						
Silver	ND	0.1	ug/L						
Sodium	ND	200	ug/L						
Thallium	ND	0.1	ug/L						
Uranium	ND	0.1	ug/L						
Vanadium	ND	0.5	ug/L						
Zinc	ND	5	ug/L						
<b>Volatiles</b>									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane)	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						

Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
 Client PO: 27632

Report Date: 04-Nov-2019

Order Date: 28-Oct-2019

Project Description: PE4752

### Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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	91.9		ug/L		115	50-140			
Surrogate: Dibromofluoromethane	67.2		ug/L		83.9	50-140			
Surrogate: Toluene-d8	78.9		ug/L		98.6	50-140			

Certificate of Analysis  
Client: Paterson Group Consulting Engineers  
Client PO: 27632

Report Date: 04-Nov-2019

Order Date: 28-Oct-2019

Project Description: PE4752

**Method Quality Control: Duplicate**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Hydrocarbons</b>									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
<b>Metals</b>									
Mercury	ND	0.1	ug/L	ND				20	
Antimony	0.85	0.5	ug/L	ND			0.0	20	
Arsenic	ND	1	ug/L	ND			0.0	20	
Barium	94.2	1	ug/L	84.5			10.9	20	
Beryllium	ND	0.5	ug/L	ND			0.0	20	
Boron	204	10	ug/L	194			5.0	20	
Cadmium	ND	0.1	ug/L	ND			0.0	20	
Chromium (VI)	ND	10	ug/L	ND			0.0	20	
Chromium	ND	1	ug/L	ND			0.0	20	
Cobalt	0.65	0.5	ug/L	0.64			1.2	20	
Copper	3.65	0.5	ug/L	3.78			3.5	20	
Lead	ND	0.1	ug/L	ND			0.0	20	
Molybdenum	8.09	0.5	ug/L	7.88			2.6	20	
Nickel	3.1	1	ug/L	3.0			1.1	20	
Selenium	ND	1	ug/L	ND			0.0	20	
Silver	ND	0.1	ug/L	ND			0.0	20	
Sodium	58400	200	ug/L	60800			4.2	20	
Thallium	ND	0.1	ug/L	ND			0.0	20	
Uranium	3.5	0.1	ug/L	3.2			10.9	20	
Vanadium	1.37	0.5	ug/L	1.41			3.2	20	
Zinc	6	5	ug/L	ND			0.0	20	
<b>Volatiles</b>									
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	

Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
 Client PO: 27632

Report Date: 04-Nov-2019  
 Order Date: 28-Oct-2019  
 Project Description: PE4752

### Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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	93.9		ug/L		117	50-140			
Surrogate: Dibromofluoromethane	66.8		ug/L		83.5	50-140			
Surrogate: Toluene-d8	78.9		ug/L		98.7	50-140			



Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
 Client PO: 27632

Report Date: 04-Nov-2019

Order Date: 28-Oct-2019

Project Description: PE4752

### Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Hydrocarbons</b>									
F1 PHCs (C6-C10)	1620	25	ug/L		80.9	68-117			
F2 PHCs (C10-C16)	1370	100	ug/L		85.5	60-140			
F3 PHCs (C16-C34)	3410	100	ug/L		87.0	60-140			
F4 PHCs (C34-C50)	1890	100	ug/L		76.4	60-140			
<b>Metals</b>									
Mercury	3.47	0.1	ug/L	ND	116	70-130			
Antimony	38.1		ug/L	ND	75.5	80-120			QM-07
Arsenic	48.6		ug/L	ND	95.7	80-120			
Barium	132		ug/L	84.5	95.2	80-120			
Beryllium	51.2		ug/L	ND	102	80-120			
Boron	226		ug/L	194	65.8	80-120			QM-07
Cadmium	45.4		ug/L	ND	90.8	80-120			
Chromium (VI)	175	10	ug/L	ND	87.5	70-130			
Chromium	54.3		ug/L	ND	108	80-120			
Cobalt	49.9		ug/L	0.64	98.5	80-120			
Copper	52.7		ug/L	3.78	97.8	80-120			
Lead	40.8		ug/L	ND	81.5	80-120			
Molybdenum	54.0		ug/L	7.88	92.2	80-120			
Nickel	49.0		ug/L	3.0	91.9	80-120			
Selenium	45.1		ug/L	ND	88.8	80-120			
Silver	36.3		ug/L	ND	72.5	80-120			QM-07
Sodium	67400		ug/L	60800	65.3	80-120			QM-07
Thallium	39.9		ug/L	ND	79.7	80-120			QM-07
Uranium	42.0		ug/L	3.2	77.7	80-120			QM-07
Vanadium	55.0		ug/L	1.41	107	80-120			
Zinc	49		ug/L	5	88.0	80-120			
<b>Volatiles</b>									
Acetone	104	5.0	ug/L		104	50-140			
Benzene	36.8	0.5	ug/L		92.0	60-130			
Bromodichloromethane	29.6	0.5	ug/L		74.0	60-130			
Bromoform	29.8	0.5	ug/L		74.4	60-130			
Bromomethane	35.7	0.5	ug/L		89.2	50-140			
Carbon Tetrachloride	27.9	0.2	ug/L		69.8	60-130			
Chlorobenzene	34.7	0.5	ug/L		86.8	60-130			
Chloroform	30.4	0.5	ug/L		76.0	60-130			
Dibromochloromethane	29.6	0.5	ug/L		74.0	60-130			
Dichlorodifluoromethane	30.5	1.0	ug/L		76.3	50-140			
1,2-Dichlorobenzene	33.8	0.5	ug/L		84.4	60-130			
1,3-Dichlorobenzene	32.7	0.5	ug/L		81.8	60-130			
1,4-Dichlorobenzene	34.6	0.5	ug/L		86.6	60-130			
1,1-Dichloroethane	31.8	0.5	ug/L		79.5	60-130			
1,2-Dichloroethane	30.7	0.5	ug/L		76.7	60-130			
1,1-Dichloroethylene	35.0	0.5	ug/L		87.5	60-130			
cis-1,2-Dichloroethylene	34.7	0.5	ug/L		86.7	60-130			
trans-1,2-Dichloroethylene	34.1	0.5	ug/L		85.3	60-130			
1,2-Dichloropropane	36.3	0.5	ug/L		90.8	60-130			
cis-1,3-Dichloropropylene	28.2	0.5	ug/L		70.6	60-130			
trans-1,3-Dichloropropylene	27.1	0.5	ug/L		67.7	60-130			
Ethylbenzene	31.9	0.5	ug/L		79.8	60-130			
Ethylene dibromide (dibromoethane)	31.2	0.2	ug/L		78.0	60-130			

Certificate of Analysis  
 Client: Paterson Group Consulting Engineers  
 Client PO: 27632

Report Date: 04-Nov-2019

Order Date: 28-Oct-2019

Project Description: PE4752

### Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hexane	34.5	1.0	ug/L		86.2	60-130			
Methyl Ethyl Ketone (2-Butanone)	67.5	5.0	ug/L		67.5	50-140			
Methyl Isobutyl Ketone	71.7	5.0	ug/L		71.7	50-140			
Methyl tert-butyl ether	62.9	2.0	ug/L		62.9	50-140			
Methylene Chloride	34.9	5.0	ug/L		87.2	60-130			
Styrene	32.4	0.5	ug/L		81.1	60-130			
1,1,1,2-Tetrachloroethane	31.4	0.5	ug/L		78.6	60-130			
1,1,2,2-Tetrachloroethane	34.9	0.5	ug/L		87.3	60-130			
Tetrachloroethylene	32.2	0.5	ug/L		80.4	60-130			
Toluene	33.8	0.5	ug/L		84.4	60-130			
1,1,1-Trichloroethane	27.6	0.5	ug/L		68.9	60-130			
1,1,2-Trichloroethane	35.5	0.5	ug/L		88.8	60-130			
Trichloroethylene	32.3	0.5	ug/L		80.7	60-130			
Trichlorofluoromethane	24.1	1.0	ug/L		60.2	60-130			
Vinyl chloride	26.1	0.5	ug/L		65.2	50-140			
m,p-Xylenes	70.3	0.5	ug/L		87.9	60-130			
o-Xylene	31.8	0.5	ug/L		79.5	60-130			
Surrogate: 4-Bromofluorobenzene	84.7		ug/L		106	50-140			

Certificate of Analysis  
Client: **Paterson Group Consulting Engineers**  
Client PO: **27632**

Report Date: 04-Nov-2019

Order Date: 28-Oct-2019

Project Description: **PE4752**

**Qualifier Notes:**

**Sample Qualifiers :**

1 : Elevated Reporting Limits due to limited sample volume.

**QC Qualifiers :**

QM-07 : The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

QS-02 : Spike level outside of control limits. Analysis batch accepted based on other QC included in the batch.

**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.
- When reported, data for F4G has been processed using a silica gel cleanup.



Client Name: <b>Patersen Group</b>	Project Ref: <b>VE4752</b>	Page <b>1</b> of <b>1</b>
Contact Name: <b>Mark D'Arcy</b>	Quote #:	<b>Turnaround Time</b> <input type="checkbox"/> 1 day <input type="checkbox"/> 3 day <input type="checkbox"/> 2 day <input checked="" type="checkbox"/> Regular Date Required: _____
Address: <b>154 Colonnade Rd</b>	PO #: <b>27632</b>	
Telephone: <b>613 226 7381</b>	E-mail: <b>mdarcy@patersengroup.ca</b>	

Regulation 153/04		Other Regulation		Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)			Required Analysis							
<input type="checkbox"/> Table 1	<input type="checkbox"/> Res/Park	<input type="checkbox"/> Med/Fine	<input type="checkbox"/> REG 558	<input type="checkbox"/> PWQO	Matrix	Air Volume	# of Containers	Sample Taken Date      Time		PHC (Fi-Fu)	VOC	Metals (ICP)	HS	Cr VI
<input type="checkbox"/> Table 2	<input type="checkbox"/> Ind/Comm	<input type="checkbox"/> Coarse	<input type="checkbox"/> CCME	<input type="checkbox"/> MISA										
<input checked="" type="checkbox"/> Table 3	<input type="checkbox"/> Agri/Other		<input type="checkbox"/> SU - Sani	<input type="checkbox"/> SU - Storm										
For RSC: <input type="checkbox"/> Yes <input type="checkbox"/> No		Mun: _____		Other: _____										
Sample ID/Location Name					Matrix	Air Volume	# of Containers	Date	Time	PHC (Fi-Fu)	VOC	Metals (ICP)	HS	Cr VI
1	BH2				W		2	28 Oct	AM	/	/			
2	BH3				W		2	↓	↓	/	/			
3	BHMW1				W		6	↓	↓	/	/	/	/	/
4	BHMW2				W		3	↓	↓	/	/			
5	Dup1				W		2	↓	-	/	/			
6														
7														
8														
9														
10														

Comments: **\* 2 vial Reads Dup2 on One vial**      **Reported Dup1**

Method of Delivery: **Parcel**

Relinquished By (Sign): <b>[Signature]</b>	Received By Driver/Depot: <b>[Signature]</b>	Received at Lab: <b>[Signature]</b>	Verified By: <b>[Signature]</b>
Relinquished By (Print): <b>Philip Price</b>	Date/Time: <b>28/10/19 4:20</b>	Date/Time: <b>10-23-19 17:10</b>	Date/Time: <b>10-28-19 17:22</b>
Date/Time: <b>28 Oct 2019</b>	Temperature: <b>11.1 °C</b>	Temperature: <b>15.6 °C</b>	pH Verified: <b>[Signature]</b> By: <b>MA</b>

## Certificate of Analysis

**Paterson Group Consulting Engineers**

154 Colonnade Road South  
Nepean, ON K2E 7J5  
Attn: Nick Sullivan

Client PO: 30736  
Project: PE4752  
Custody: 128146

Report Date: 14-Sep-2020  
Order Date: 8-Sep-2020

**Order #: 2037135**

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

Paracel ID	Client ID
2037135-01	BHMW1-GW3
2037135-02	BH2-20-GW1
2037135-03	BH10-GW1

Approved By:



Dale Robertson, BSc  
Laboratory Director

Certificate of Analysis

Report Date: 14-Sep-2020

Client: Paterson Group Consulting Engineers

Order Date: 8-Sep-2020

Client PO: 30736

Project Description: PE4752

**Analysis Summary Table**

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent - water	MOE E3056 - colourimetric	12-Sep-20	12-Sep-20
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	10-Sep-20	10-Sep-20
Metals, ICP-MS	EPA 200.8 - ICP-MS	11-Sep-20	11-Sep-20
PHC F1	CWS Tier 1 - P&T GC-FID	9-Sep-20	9-Sep-20
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	11-Sep-20	14-Sep-20
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	9-Sep-20	9-Sep-20

Certificate of Analysis

Report Date: 14-Sep-2020

Client: Paterson Group Consulting Engineers

Order Date: 8-Sep-2020

Client PO: 30736

Project Description: PE4752

<b>Client ID:</b>	BHMW1-GW3	BH2-20-GW1	BH10-GW1	-
<b>Sample Date:</b>	04-Sep-20 09:00	04-Sep-20 09:00	04-Sep-20 09:00	-
<b>Sample ID:</b>	2037135-01	2037135-02	2037135-03	-
<b>MDL/Units</b>	Water	Water	Water	-

**Metals**

Element	MDL/Units	BHMW1-GW3	BH2-20-GW1	BH10-GW1	
Mercury	0.1 ug/L	<0.1	-	-	-
Antimony	0.5 ug/L	0.9	-	-	-
Arsenic	1 ug/L	1	-	-	-
Barium	1 ug/L	365	-	-	-
Beryllium	0.5 ug/L	<0.5	-	-	-
Boron	10 ug/L	486	-	-	-
Cadmium	0.1 ug/L	<0.1	-	-	-
Chromium	1 ug/L	<1	-	-	-
Chromium (VI)	10 ug/L	<10	-	-	-
Cobalt	0.5 ug/L	3.6	-	-	-
Copper	0.5 ug/L	5.0	-	-	-
Lead	0.1 ug/L	0.3	-	-	-
Molybdenum	0.5 ug/L	3.7	-	-	-
Nickel	1 ug/L	16	-	-	-
Selenium	1 ug/L	<1	-	-	-
Silver	0.1 ug/L	<0.1	-	-	-
Sodium	200 ug/L	1370000	-	-	-
Thallium	0.1 ug/L	<0.1	-	-	-
Uranium	0.1 ug/L	4.8	-	-	-
Vanadium	0.5 ug/L	1.6	-	-	-
Zinc	5 ug/L	5	-	-	-

**Volatiles**

Element	MDL/Units	BHMW1-GW3	BH2-20-GW1	BH10-GW1	
Acetone	5.0 ug/L	-	<5.0	<5.0	-
Benzene	0.5 ug/L	-	<0.5	<0.5	-
Bromodichloromethane	0.5 ug/L	-	<0.5	<0.5	-
Bromoform	0.5 ug/L	-	<0.5	<0.5	-
Bromomethane	0.5 ug/L	-	<0.5	<0.5	-
Carbon Tetrachloride	0.2 ug/L	-	<0.2	<0.2	-
Chlorobenzene	0.5 ug/L	-	<0.5	<0.5	-
Chloroform	0.5 ug/L	-	<0.5	<0.5	-
Dibromochloromethane	0.5 ug/L	-	<0.5	<0.5	-
Dichlorodifluoromethane	1.0 ug/L	-	<1.0	<1.0	-
1,2-Dichlorobenzene	0.5 ug/L	-	<0.5	<0.5	-
1,3-Dichlorobenzene	0.5 ug/L	-	<0.5	<0.5	-
1,4-Dichlorobenzene	0.5 ug/L	-	<0.5	<0.5	-



Certificate of Analysis

Report Date: 14-Sep-2020

Client: Paterson Group Consulting Engineers

Order Date: 8-Sep-2020

Client PO: 30736

Project Description: PE4752

	Client ID:	BHMW1-GW3	BH2-20-GW1	BH10-GW1	-
	Sample Date:	04-Sep-20 09:00	04-Sep-20 09:00	04-Sep-20 09:00	-
	Sample ID:	2037135-01	2037135-02	2037135-03	-
	MDL/Units	Water	Water	Water	-
1,1-Dichloroethane	0.5 ug/L	-	<0.5	<0.5	-
1,2-Dichloroethane	0.5 ug/L	-	<0.5	<0.5	-
1,1-Dichloroethylene	0.5 ug/L	-	<0.5	<0.5	-
cis-1,2-Dichloroethylene	0.5 ug/L	-	<0.5	<0.5	-
trans-1,2-Dichloroethylene	0.5 ug/L	-	<0.5	<0.5	-
1,2-Dichloropropane	0.5 ug/L	-	<0.5	<0.5	-
cis-1,3-Dichloropropylene	0.5 ug/L	-	<0.5	<0.5	-
trans-1,3-Dichloropropylene	0.5 ug/L	-	<0.5	<0.5	-
1,3-Dichloropropene, total	0.5 ug/L	-	<0.5	<0.5	-
Ethylbenzene	0.5 ug/L	-	<0.5	<0.5	-
Ethylene dibromide (dibromoethane, 1,2-)	0.2 ug/L	-	<0.2	<0.2	-
Hexane	1.0 ug/L	-	<1.0	<1.0	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	-	<5.0	<5.0	-
Methyl Isobutyl Ketone	5.0 ug/L	-	<5.0	<5.0	-
Methyl tert-butyl ether	2.0 ug/L	-	<2.0	<2.0	-
Methylene Chloride	5.0 ug/L	-	<5.0	<5.0	-
Styrene	0.5 ug/L	-	<0.5	<0.5	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	-	<0.5	<0.5	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	-	<0.5	<0.5	-
Tetrachloroethylene	0.5 ug/L	-	<0.5	<0.5	-
Toluene	0.5 ug/L	-	<0.5	<0.5	-
1,1,1-Trichloroethane	0.5 ug/L	-	<0.5	<0.5	-
1,1,2-Trichloroethane	0.5 ug/L	-	<0.5	<0.5	-
Trichloroethylene	0.5 ug/L	-	<0.5	<0.5	-
Trichlorofluoromethane	1.0 ug/L	-	<1.0	<1.0	-
Vinyl chloride	0.5 ug/L	-	<0.5	<0.5	-
m,p-Xylenes	0.5 ug/L	-	<0.5	<0.5	-
o-Xylene	0.5 ug/L	-	<0.5	<0.5	-
Xylenes, total	0.5 ug/L	-	<0.5	<0.5	-
4-Bromofluorobenzene	Surrogate	-	118%	120%	-
Dibromofluoromethane	Surrogate	-	112%	112%	-
Toluene-d8	Surrogate	-	113%	110%	-

**Hydrocarbons**

F1 PHCs (C6-C10)	25 ug/L	-	<25	-	-
F2 PHCs (C10-C16)	100 ug/L	-	<100	-	-
F3 PHCs (C16-C34)	100 ug/L	-	<100	-	-



Certificate of Analysis

Report Date: 14-Sep-2020

Client: Paterson Group Consulting Engineers

Order Date: 8-Sep-2020

Client PO: 30736

Project Description: PE4752

	Client ID:	BHMW1-GW3	BH2-20-GW1	BH10-GW1	-
	Sample Date:	04-Sep-20 09:00	04-Sep-20 09:00	04-Sep-20 09:00	-
	Sample ID:	2037135-01	2037135-02	2037135-03	-
	MDL/Units	Water	Water	Water	-
F4 PHCs (C34-C50)	100 ug/L	-	<100	-	-

Certificate of Analysis

Report Date: 14-Sep-2020

Client: Paterson Group Consulting Engineers

Order Date: 8-Sep-2020

Client PO: 30736

Project Description: PE4752

**Method Quality Control: Blank**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Hydrocarbons</b>									
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						
<b>Metals</b>									
Mercury	ND	0.1	ug/L						
Antimony	ND	0.5	ug/L						
Arsenic	ND	1	ug/L						
Barium	ND	1	ug/L						
Beryllium	ND	0.5	ug/L						
Boron	ND	10	ug/L						
Cadmium	ND	0.1	ug/L						
Chromium (VI)	ND	10	ug/L						
Chromium	ND	1	ug/L						
Cobalt	ND	0.5	ug/L						
Copper	ND	0.5	ug/L						
Lead	ND	0.1	ug/L						
Molybdenum	ND	0.5	ug/L						
Nickel	ND	1	ug/L						
Selenium	ND	1	ug/L						
Silver	ND	0.1	ug/L						
Sodium	ND	200	ug/L						
Thallium	ND	0.1	ug/L						
Uranium	ND	0.1	ug/L						
Vanadium	ND	0.5	ug/L						
Zinc	ND	5	ug/L						
<b>Volatiles</b>									
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, 1,2)	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						

Certificate of Analysis

Report Date: 14-Sep-2020

Client: Paterson Group Consulting Engineers

Order Date: 8-Sep-2020

Client PO: 30736

Project Description: PE4752

**Method Quality Control: Blank**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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	92.0		ug/L		115	50-140			
Surrogate: Dibromofluoromethane	87.9		ug/L		110	50-140			
Surrogate: Toluene-d8	90.9		ug/L		114	50-140			

Certificate of Analysis

Report Date: 14-Sep-2020

Client: Paterson Group Consulting Engineers

Order Date: 8-Sep-2020

Client PO: 30736

Project Description: PE4752

**Method Quality Control: Duplicate**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Hydrocarbons</b>									
F1 PHCs (C6-C10)	ND	25	ug/L	ND			NC	30	
<b>Metals</b>									
Mercury	0.34	0.1	ug/L	0.32			5.2	20	
Antimony	0.87	0.5	ug/L	ND			NC	20	
Arsenic	ND	1	ug/L	ND			NC	20	
Barium	23.7	1	ug/L	21.6			9.1	20	
Beryllium	ND	0.5	ug/L	ND			NC	20	
Boron	22	10	ug/L	22			0.0	20	
Cadmium	ND	0.1	ug/L	ND			NC	20	
Chromium (VI)	ND	10	ug/L	ND			NC	20	
Chromium	ND	1	ug/L	ND			NC	20	
Cobalt	ND	0.5	ug/L	ND			NC	20	
Copper	1.15	0.5	ug/L	1.14			1.4	20	
Lead	ND	0.1	ug/L	ND			NC	20	
Molybdenum	1.09	0.5	ug/L	1.06			3.2	20	
Nickel	ND	1	ug/L	ND			NC	20	
Selenium	ND	1	ug/L	ND			NC	20	
Silver	ND	0.1	ug/L	ND			NC	20	
Sodium	16500	200	ug/L	16500			0.2	20	
Thallium	ND	0.1	ug/L	ND			NC	20	
Uranium	ND	0.1	ug/L	ND			NC	20	
Vanadium	ND	0.5	ug/L	ND			NC	20	
Zinc	12	5	ug/L	11			2.9	20	
<b>Volatiles</b>									
Acetone	ND	5.0	ug/L	ND			NC	30	
Benzene	ND	0.5	ug/L	ND			NC	30	
Bromodichloromethane	ND	0.5	ug/L	ND			NC	30	
Bromoform	ND	0.5	ug/L	ND			NC	30	
Bromomethane	ND	0.5	ug/L	ND			NC	30	
Carbon Tetrachloride	ND	0.2	ug/L	ND			NC	30	
Chlorobenzene	ND	0.5	ug/L	ND			NC	30	
Chloroform	ND	0.5	ug/L	ND			NC	30	
Dibromochloromethane	ND	0.5	ug/L	ND			NC	30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND			NC	30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,1-Dichloroethane	ND	0.5	ug/L	ND			NC	30	
1,2-Dichloroethane	ND	0.5	ug/L	ND			NC	30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
1,2-Dichloropropane	ND	0.5	ug/L	ND			NC	30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND			NC	30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND			NC	30	
Ethylbenzene	ND	0.5	ug/L	ND			NC	30	
Ethylene dibromide (dibromoethane, 1,2-	ND	0.2	ug/L	ND			NC	30	
Hexane	ND	1.0	ug/L	ND			NC	30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND			NC	30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND			NC	30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND			NC	30	
Methylene Chloride	ND	5.0	ug/L	ND			NC	30	
Styrene	ND	0.5	ug/L	ND			NC	30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND			NC	30	
1,1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND			NC	30	
Tetrachloroethylene	ND	0.5	ug/L	ND			NC	30	
Toluene	ND	0.5	ug/L	ND			NC	30	

Certificate of Analysis

Report Date: 14-Sep-2020

Client: Paterson Group Consulting Engineers

Order Date: 8-Sep-2020

Client PO: 30736

Project Description: PE4752

**Method Quality Control: Duplicate**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
1,1,1-Trichloroethane	ND	0.5	ug/L	ND			NC	30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND			NC	30	
Trichloroethylene	ND	0.5	ug/L	ND			NC	30	
Trichlorofluoromethane	ND	1.0	ug/L	ND			NC	30	
Vinyl chloride	ND	0.5	ug/L	ND			NC	30	
m,p-Xylenes	ND	0.5	ug/L	ND			NC	30	
o-Xylene	ND	0.5	ug/L	ND			NC	30	
Surrogate: 4-Bromofluorobenzene	91.2		ug/L		114	50-140			
Surrogate: Dibromofluoromethane	91.2		ug/L		114	50-140			
Surrogate: Toluene-d8	88.6		ug/L		111	50-140			

Certificate of Analysis

Report Date: 14-Sep-2020

Client: Paterson Group Consulting Engineers

Order Date: 8-Sep-2020

Client PO: 30736

Project Description: PE4752

**Method Quality Control: Spike**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Hydrocarbons</b>									
F1 PHCs (C6-C10)	1800	25	ug/L	ND	90.1	68-117			
F2 PHCs (C10-C16)	1490	100	ug/L	ND	93.3	60-140			
F3 PHCs (C16-C34)	4340	100	ug/L	ND	111	60-140			
F4 PHCs (C34-C50)	2500	100	ug/L	ND	101	60-140			
<b>Metals</b>									
Mercury	3.14	0.1	ug/L	0.32	94.1	70-130			
Antimony	46.0	0.5	ug/L	ND	91.4	80-120			
Arsenic	50.1	1	ug/L	ND	99.2	80-120			
Barium	71.8	1	ug/L	21.6	100	80-120			
Beryllium	51.9	0.5	ug/L	ND	104	80-120			
Boron	65	10	ug/L	22	86.7	80-120			
Cadmium	48.6	0.1	ug/L	ND	97.1	80-120			
Chromium (VI)	174	10	ug/L	ND	87.0	70-130			
Chromium	54.4	1	ug/L	ND	109	80-120			
Cobalt	51.0	0.5	ug/L	ND	102	80-120			
Copper	49.1	0.5	ug/L	1.14	96.0	80-120			
Lead	44.4	0.1	ug/L	ND	88.7	80-120			
Molybdenum	47.3	0.5	ug/L	1.06	92.4	80-120			
Nickel	49.6	1	ug/L	ND	98.3	80-120			
Selenium	44.8	1	ug/L	ND	89.3	80-120			
Silver	46.3	0.1	ug/L	ND	92.6	80-120			
Sodium	24100	200	ug/L	16500	75.9	80-120			QM-07
Thallium	46.0	0.1	ug/L	ND	91.9	80-120			
Uranium	47.2	0.1	ug/L	ND	94.3	80-120			
Vanadium	54.3	0.5	ug/L	ND	108	80-120			
Zinc	58	5	ug/L	11	93.3	80-120			
<b>Volatiles</b>									
Acetone	76.4	5.0	ug/L	ND	76.4	50-140			
Benzene	39.8	0.5	ug/L	ND	99.6	60-130			
Bromodichloromethane	42.2	0.5	ug/L	ND	106	60-130			
Bromoform	43.6	0.5	ug/L	ND	109	60-130			
Bromomethane	36.2	0.5	ug/L	ND	90.6	50-140			
Carbon Tetrachloride	44.9	0.2	ug/L	ND	112	60-130			
Chlorobenzene	37.1	0.5	ug/L	ND	92.8	60-130			
Chloroform	40.7	0.5	ug/L	ND	102	60-130			
Dibromochloromethane	41.8	0.5	ug/L	ND	104	60-130			
Dichlorodifluoromethane	41.3	1.0	ug/L	ND	103	50-140			
1,2-Dichlorobenzene	39.6	0.5	ug/L	ND	99.1	60-130			
1,3-Dichlorobenzene	41.5	0.5	ug/L	ND	104	60-130			
1,4-Dichlorobenzene	40.0	0.5	ug/L	ND	99.9	60-130			
1,1-Dichloroethane	41.0	0.5	ug/L	ND	103	60-130			
1,2-Dichloroethane	37.6	0.5	ug/L	ND	94.0	60-130			
1,1-Dichloroethylene	41.6	0.5	ug/L	ND	104	60-130			
cis-1,2-Dichloroethylene	39.4	0.5	ug/L	ND	98.4	60-130			
trans-1,2-Dichloroethylene	40.4	0.5	ug/L	ND	101	60-130			
1,2-Dichloropropane	38.9	0.5	ug/L	ND	97.4	60-130			
cis-1,3-Dichloropropylene	40.4	0.5	ug/L	ND	101	60-130			
trans-1,3-Dichloropropylene	37.9	0.5	ug/L	ND	94.6	60-130			

Certificate of Analysis

Report Date: 14-Sep-2020

Client: Paterson Group Consulting Engineers

Order Date: 8-Sep-2020

Client PO: 30736

Project Description: PE4752

**Method Quality Control: Spike**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Ethylbenzene	37.9	0.5	ug/L	ND	94.7	60-130			
Ethylene dibromide (dibromoethane, 1,2-	36.1	0.2	ug/L	ND	90.2	60-130			
Hexane	39.2	1.0	ug/L	ND	97.9	60-130			
Methyl Ethyl Ketone (2-Butanone)	83.6	5.0	ug/L	ND	83.6	50-140			
Methyl Isobutyl Ketone	94.5	5.0	ug/L	ND	94.5	50-140			
Methyl tert-butyl ether	97.6	2.0	ug/L	ND	97.6	50-140			
Methylene Chloride	39.6	5.0	ug/L	ND	99.0	60-130			
Styrene	35.3	0.5	ug/L	ND	88.2	60-130			
1,1,1,2-Tetrachloroethane	39.7	0.5	ug/L	ND	99.2	60-130			
1,1,2,2-Tetrachloroethane	46.4	0.5	ug/L	ND	116	60-130			
Tetrachloroethylene	38.3	0.5	ug/L	ND	95.8	60-130			
Toluene	38.6	0.5	ug/L	ND	96.6	60-130			
1,1,1-Trichloroethane	42.5	0.5	ug/L	ND	106	60-130			
1,1,2-Trichloroethane	38.9	0.5	ug/L	ND	97.2	60-130			
Trichloroethylene	39.9	0.5	ug/L	ND	99.8	60-130			
Trichlorofluoromethane	44.3	1.0	ug/L	ND	111	60-130			
Vinyl chloride	37.9	0.5	ug/L	ND	94.8	50-140			
m,p-Xylenes	78.5	0.5	ug/L	ND	98.1	60-130			
o-Xylene	39.4	0.5	ug/L	ND	98.6	60-130			
Surrogate: 4-Bromofluorobenzene	87.8		ug/L		110	50-140			
Surrogate: Dibromofluoromethane	88.5		ug/L		111	50-140			
Surrogate: Toluene-d8	77.7		ug/L		97.1	50-140			

Certificate of Analysis

Report Date: 14-Sep-2020

Client: Paterson Group Consulting Engineers

Order Date: 8-Sep-2020

Client PO: 30736

Project Description: PE4752

**Qualifier Notes:**

**QC Qualifiers :**

QM-07 : The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

**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.

NC: Not Calculated

***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.
- When reported, data for F4G has been processed using a silica gel cleanup.





Parcel ID: 2037135



Office  
319 St. Laurent Blvd.  
Toronto, Ontario K1G 4J8  
416-749-1947  
parcel@paracellabs.com  
paracellabs.com

Parcel Order Number  
(Lab Use Only)

2037135

Chain Of Custody  
(Lab Use Only)

No. 128146

Client Name: <i>Peterson Group</i>	Project Ref: <i>PE4752</i>	Page <u>1</u> of <u>1</u>
Contact Name: <i>Nick Sullivan / Mark D'Arcy</i>	Quote #:	Turnaround Time <input type="checkbox"/> 1 day <input type="checkbox"/> 3 day <input type="checkbox"/> 2 day <input checked="" type="checkbox"/> Regular
Address: <i>154 Colonnade Rd. S.</i>	PO #: <i>30736</i>	
Telephone: <i>613-226-7381</i>	E-mail: <i>mdarcy@petersongroup.ca nsullivan@petersongroup.ca</i>	
Date Required: _____		

Regulation 153/04		Other Regulation		Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)		Required Analysis												
<input type="checkbox"/> Table 1	<input checked="" type="checkbox"/> Res/Park	<input type="checkbox"/> Med/Fine	<input type="checkbox"/> REG 558	<input type="checkbox"/> PWQO	Matrix	Air Volume	# of Containers	Sample Taken Date      Time		PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP			B (HWS)	<i>PHCs F1-F4</i>	
<input type="checkbox"/> Table 2	<input type="checkbox"/> Ind/Comm	<input type="checkbox"/> Coarse	<input type="checkbox"/> CCME	<input type="checkbox"/> MISA									Hg	CrVI				
<input checked="" type="checkbox"/> Table 3	<input type="checkbox"/> Agri/Other		<input type="checkbox"/> SU - Sani	<input type="checkbox"/> SU - Storm														
For RSC: <input type="checkbox"/> Yes <input type="checkbox"/> No		Mun: _____		Other: _____														
Sample ID/Location Name																		
1	<i>BHMWI-GW3</i>			<i>GW</i>	<i>3</i>	<i>3</i>	<i>Sep. 4. 20</i>	<i>AM</i>					<i>X</i>	<i>X</i>	<i>X</i>			
2	<i>BH2-20-GW1</i>			<i>↓</i>	<i>3</i>	<i>3</i>	<i>↓</i>	<i>↓</i>				<i>X</i>						<i>X</i>
3	<i>BH10-GW1</i>			<i>↓</i>	<i>2</i>	<i>2</i>	<i>↓</i>	<i>↓</i>				<i>X</i>						
4																		
5																		
6																		
7																		
8																		
9																		
10																		

Comments:			Method of Delivery: <i>Drop Box</i>		
Relinquished By (Sign): <i>N. Sullivan</i>	Received By Driver/Depot:	Received at Lab: <i>Da</i>	Verified By: <i>[Signature]</i>		
Relinquished By (Print): <i>Nick Sullivan</i>	Date/Time:	Date/Time: <i>8 Sep 2020 16:05</i>	Date/Time: <i>9-9-20 10/11</i>		
Date/Time: <i>Sep 8. 2020</i>	Temperature: _____ °C	Temperature: <i>16.6</i> °C	pH Verified: <i>X</i> By: <i>[Signature]</i>		