PATERSON GROUP

Phase II Environmental Site Assessment

150 and 160 Laurier Avenue
Ottawa, Ontario

Prepared for JADCO Corporation

Report: PE4822-2
October 25, 2022

TABLE OF CONTENTS

EXECUTIVE SUMMARY iii
1.0 INTRODUCTION 1
1.1 Site Description 1
1.2 Property Ownership 1
1.3 Current and Proposed Future Uses 1
1.4 Applicable Site Condition Standard 2
2.0 BACKGROUND INFORMATION 2
2.1 Physical Setting 2
2.2 Past Investigations 3
3.0 SCOPE OF INVESTIGATION 3
3.1 Overview of Site Investigation 3
3.2 Media Investigated 3
3.3 Phase I Conceptual Site Model 4
3.4 Deviations from Sampling and Analysis Plan 6
3.5 Impediments 6
4.0 INVESTIGATION METHOD 6
4.1 Subsurface Investigation 6
4.2 Soil Sampling 7
4.3 Field Screening Measurements 7
4.4 Groundwater Monitoring Well Installation 7
4.5 Groundwater Sampling 8
4.6 Analytical Testing 8
4.7 Residue Management 10
4.8 Elevation Surveying 10
4.9 Quality Assurance and Quality Control Measures 10
5.0 REVIEW AND EVALUATION 10
5.1 Geology 10
5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient 11
5.3 Fine-Coarse Soil Texture 11
5.4 Soil: Field Screening 11
5.5 Soil Quality 12
5.6 Groundwater Quality 16
5.7 Quality Assurance and Quality Control Results 20
5.8 Phase II Conceptual Site Model 21
6.0 CONCLUSIONS 25
7.0 STATEMENT OF LIMITATIONS 27

List of Figures

Figure 1 - Key Plan
Drawing PE4822-3 – Test Hole Location Plan
Drawing PE4822-4 – Analytical Testing Plan – Soil – Metals, CrVI, Mercury
Drawing PE4822-4A – Cross-section A – A' – Soil - Metals, CrVI, Mercury
Drawing PE4822-4B – Cross-section B – B' – Soil – Metals, CrVI, Mercury
Drawing PE4822-5 – Analytical Testing Plan – Soil – PCBs, VOCs, PHCs
Drawing PE4822-5A – Cross-section A – A' – Soil – PCBs, VOCs, PHCs
Drawing PE4822-5B – Cross-section B – B' – Soil – PCBs, VOCs, PHCs
Drawing PE4822-6 – Analytical Testing Plan – Groundwater
Drawing PE4822-6A – Cross-section A – A' – Groundwater
Drawing PE4822-6B – Cross-section B – B' – Groundwater

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 was conducted for the property addressed 150 and 160 Laurier Avenue West, in the Ottawa, Ontario. The purpose of the Phase II ESA was to address potentially contaminating activities (PCAs) that were identified during the Phase I ESA and considered to result in areas of potential environmental concern (APECs) on the Phase II ESA Property.

The subsurface investigation consisted of four (4) boreholes, all which were instrumented with groundwater monitoring wells. The general soil profile encountered during the field program consisted of fill material consisting of silty sand with gravel and clay, underlain by silty clay, overlying glacial till (clayey silt to silty sand, with cobbles and boulders), followed by shale bedrock.

Seven (7) soil samples were submitted for laboratory analysis of volatile organic compounds (VOCs), petroleum hydrocarbons (PHCs, Fractions F_1-F_4), polychlorinated biphenyls (PCBs) and metals (including hydride forming compounds: arsenic (As), antimony (Sb), selenium (Se)), mercury and hexavalent chromium (CrVI). No VOC, PHC or PCB concentrations were identified in any of the soil samples analysed. Concentrations metal parameters, below the site standards, were identified in the samples analysed, with the exception of lead, mercury and vanadium concentrations identified in soil/fill of BH1, BH2 and BH4. The remaining soil results comply with MECP Table 3 Residential Standards.

Groundwater samples from monitoring wells BH2, BH3 and BH4 were collected during the August 31, 2022 sampling event. No free product or petroleum hydrocarbon sheen was noted on the purge water during the groundwater sampling events.

Three groundwater samples (plus one duplicate) were submitted for laboratory analysis of VOCs, PHCs (F1-F4), PCBs, PAHs and metals (including CrVI and mercury). Based on the analytical test results, the groundwater results are in compliance with the MECP Table 3 standards. As a result, the groundwater beneath the subject site is not considered to be contaminated.

Recommendations

Based on the findings of this assessment, metals impacted fill was identified underneath the asphaltic concrete parking areas on the subject site, requiring some remedial work. It is our understanding that the subject site is to be redeveloped for mixed commercial and residential purposes.

Soil

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

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.

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 the Ontario Regulation 347/558.

Any clean soil that requires removal from the Phase II Property for construction purposes must be handled in accordance with Ontario Regulation 406/19: On-site and Excess Soil Management. Further information regarding O.Reg 406/19 can be provided upon request.

Monitoring Wells

If the monitoring wells installed on the Phase II ESA Property are not going to be used in the future, or will be destroyed during site redevelopment, they should be abandoned according to Ontario Regulation 903. The wells will be registered with the MECP under this regulation.

1.0 INTRODUCTION

At the request of JADCO Corporation, Paterson Group (Paterson) conducted a Phase II Environmental Site Assessment at 150 and 160 Laurier Avenue West, in the City of Ottawa, Ontario. The purpose of this Phase II ESA has been to address areas of potential environmental concern (APECs) identified on the Phase II ESA Property, during the Phase I ESA conducted by Paterson in August of 2022.

1.1 Site Description

Address:	150 and 160 Laurier Avenue West, Ottawa, Ontario.
Location:	The subject site is situated on the south side of Laurier Avenue West, 100 m west of Elgin Street, in the City of Ottawa.
Latitude and Longitude:	45° 25’ 13.90" N, 75° 41' 37.72" W

Site Description:

Configuration:	Rectangular
Area:	1,225 m^2 (approximately)
Zoning:	MD – Mixed Use Downtown Zone.

1.2 Property Ownership

Paterson was engaged to conduct this Phase II-ESA by Mr. André Doudak of JADCO Corporation. The head office is located at 345 Samson Boulevard, Suite 100, Laval, Quebec. Mr. Doudak can be reached by telephone at (514) 591-6720.

1.3 Current and Proposed Future Uses

The Phase II ESA Property is currently occupied by a five-storey commercial office building with a single storey underground parking garage, and associated parking lots on the east and west sides of the property.

It is our understanding that the Phase II ESA Property will to be redeveloped with a high-rise building with up to five levels of underground parking. Due to the change in land use to a more sensitive land use (Residential to residential), a record of site condition (RSC) will be required as per O.Reg 154/03.

1.4 Applicable Site Condition Standard

The site condition standards for the property were obtained from Table 3 of the document entitled "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", prepared by the Ontario Ministry of Environment, Conservation and Parks (MECP), April 2011. The MECP selected Table 3 Standards are based on the following considerations:

- ❒ Fine-grained soil conditions
- ❒ Full depth generic site conditions
- ❒ Non-potable groundwater conditions
- ❒ Residential land use

Section 35 of O.Reg. 153/04 does apply to the Phase II ESA Property in that the property does not rely upon potable groundwater.

Section 41 of O.Reg. 153/04 does not apply to the Phase II ESA Property, as the property is not within 30m of an environmentally sensitive area.

Section 43.1 of O.Reg. 153/04 does not apply to the Phase II ESA Property in that the property is not a Shallow Soil property.

The intended use of the Phase II ESA Property is mixed use (residential and commercial); therefore, the Residential Standards have been selected for the purpose of this Phase II ESA.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The Phase II ESA Property is comprised of 150 and 160 Laurier Avenue West, which is situated on the south side of Laurier Avenue West, 100 m west of Elgin Street, in the City of Ottawa, Ontario. The site is situated a commercial use area.

The Phase II ESA Property is occupied by a five-storey commercial office building with associated parking lots on the east and west sides of the property. Site drainage consists primarily of infiltration and sheetflow to catch basins located on Laurier Avenue West.

The site is relatively flat and at the grade with adjacent properties, while the regional topography slopes gently down in an eastern direction.

2.2 Past Investigations

Paterson completed a due diligence Phase I ESA in August of 2022 for the Phase II ESA Property. Based on the findings of the Phase I ESA, four (4) potentially contaminating activities (PCAs) were determined to result in areas of potential environmental concern (APECs) on the Phase II ESA Property:

- APEC 1: Resulting from the presence of two above ground storage tanks (ASTs) on-site (PCA 28).
- APEC 2: Resulting from the presence of an on-site transformer (PCA 55).
- APEC 3: Resulting from fill material of unknown quality (PCA 30).
- APEC 4: Resulting from the former presence of an automotive service garage on the adjacent property to the south; 15 Gloucester Avenue (PCA 52).

The rationale for identifying the above APECs is based on a review of fire insurance plans, aerial photographs, field observations, and personal interviews. A Phase II ESA was recommended to address the aforementioned APECs.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation was conducted on January 9, 2020 in conjunction with a geotechnical investigation. The field program consisted of drilling four (4) boreholes to address the APECs identified on the Phase II ESA Property. All of the boreholes (BH1 through BH4), with the exception of BH3, were cored into the bedrock. All boreholes were completed with monitoring well installations. Boreholes were drilled to a maximum depth of 21.2 m below the ground surface (mbgs).

3.2 Media Investigated

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

Contaminants of potential concern on the Phase II ESA Property include petroleum hydrocarbons (PHCs, F1-F4), volatile organic compounds (VOCs), polycyclic

aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and metals (including arsenic (As), antimony (Sb) and selenium (Se)), mercury (Hg) and hexavalent chromium (CrVI). These CPCs may be present in the soil and/or groundwater beneath the Phase II ESA Property.

3.3 Phase I Conceptual Site Model

According to the Geological Survey of Canada website, the bedrock in the area of the Phase I ESA Property is reported to consist of shale of the Carlsbad Formation. The overburden is reported to consist of offshore marine sediments, with a drift thickness of 10 to 25 m across the site.

Existing Buildings and Structures

The subject site is occupied by a five-storey commercial office building with a single storey underground parking garage. The building is surrounded by two asphaltic concrete parking lots.

Subsurface Structures and Utilities

The Phase I ESA Property is situated in a municipally serviced area.

Areas of Natural Significance

No areas of natural significance and features were identified on the subject property or within the Phase I ESA study area.

Water Bodies

There are no waterbodies on the subject property or within the Phase I ESA study area.

Drinking Water Wells

There are no potable water wells on the Phase I ESA Property, nor are they expected to be present as the subject land is situated in a municipally serviced area.

Neighbouring Land Use

Neighbouring land use in the Phase I study area consists of commercial office, institutional and residential apartment buildings.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

Based on the findings of the Phase I, four on-site PCAs were considered to result in APECs. These APECs have been summarized in Table 1, along with its respective location and contaminants of potential concern (CPCs) on the Phase I Property.

Table 1: Potentially Contaminating Activities and Areas of Potential Environmental Concern

Area of Potential Environmental Concern	Location of Area of Potential Environmental Concern	Potentially Contaminating Activity	Location of PCA (on-site or off-site)	Contaminants of Potential Concern	Media Potentially Impacted (Groundwater, Soil, and/or Sediment)
APEC 1: Resulting from the presence of two above ground storage tanks (ASTs) on-site	Eastern portion of the Phase I ESA Property	PCA 28 – Gasoline and Associated Products Storage in Fixed Tanks	On-site	PHCs BTEX	Soil and/or Groundwater
APEC 2: Resulting from the presence of several on-site transformers	Northern portion of the Phase I ESA Property	PCA 55 – Transformer Manufacturing, Processing and Use	On-site	PCBs PHCs PAHs	Soil and/or Groundwater
APEC 3: Resulting from fill material of unknown quality	In the at grade parking lot areas of the Phase I ESA Property	PCA 30 – Importation of Fill Material of Unknown Quality	On-site	Metals As, Sb, Se Hg CrVI	Soil
APEC 4: Resulting from the former presence of an automotive service garage on the adjacent property to the south: 15 Gloucester Avenue	Southeastern portion of the Phase I ESA Property	PCA 52 – Storage, maintenance, fuelling and repair of equipment, vehicles, and material used to maintain transportation systems	Off-site	PHCs VOCs	Soil and/or Groundwater

Contaminants of Potential Concern

As per the APEC in Table 1, the contaminants of potential concern (CPCs) in soil and/or groundwater include:

- ❒ Volatile organic compounds (VOCs);
- ❒ Petroleum hydrocarbons (PHCs, Fractions F_1-F_4);
- ❒ Polycyclic aromatic hydrocarbons (PAHs);
- ❒ Polychlorinated biphenyls (PCBs);
- ❒ Metals (including arsenic (As), antimony (Sb), selenium (Se));
- ❒ Mercury (Hg); and
- ❒ Hexavalent Chromium (CrVI).

These CPCs may be present in the soil and/or groundwater of the Phase I Property.

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 that resulted in APECs on the Phase I Property.

A variety of independent sources were consulted as part of this assessment, 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

There were no deviations from the Sampling and Analysis Plan which is included in Appendix 1 of this report.

3.5 Impediments

No physical impediments were encountered during the Phase II ESA field program.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation conducted for this Phase II ESA consisted of drilling four (4) boreholes (BH1 through BH4) across the Phase II ESA Property. The boreholes were drilled to a maximum depth of 21.2 m below ground surface (bgs) to intercept groundwater.

The boreholes were drilled using a low clearance track mounted drill rig operated by George Downing Estate Drilling of Hawkesbury, Ontario, under full-time supervision of Paterson personnel. The borehole locations are indicated on the attached Drawing PE4822-3 - Test Hole Location Plan.

4.2 Soil Sampling

A total of 49 soil samples and eleven (11) rock core samples were obtained from the boreholes by means of grab sampling from auger flights/auger samples and split spoon sampling. Split spoon samples were taken at approximate 0.76 m intervals.

The depths at which grab samples, split spoon, and rock core samples were obtained from the boreholes are shown as "**AU**", "**SS**" and "**RC**", respectively on the Soil Profile and Test Data Sheets.

The borehole profiles generally consist of fill material consisting of silty sand with gravel and clay, underlain by silty clay, overlying glacial till (clayey silt to silty sand, with cobbles and boulders) followed by shale bedrock.

4.3 Field Screening Measurements

All soil samples collected were subjected to a preliminary screening procedure, which included visual screening for colour and evidence of deleterious fill material, as well as olfactory screening.

4.4 Groundwater Monitoring Well Installation

Four (4) groundwater monitoring wells were installed on the Phase II ESA Property as part of the subsurface investigation. The monitoring wells consisted of 32 mm diameter, Schedule 40 threaded PVC risers and screens. BH1 was installed with a deep bedrock well, while the remaining boreholes were overburden wells. Monitoring well construction details are listed below in Table 2 and are also presented on the Soil Profile and Test Data Sheets provided in Appendix 1.

Borehole locations and elevations were surveyed geodetically by Paterson personnel.

TABLE 2. Monitoring Well Construction Details						
Well ID	**Ground Surface Elevation**	**Total Depth (m BGS)**	**Screened Interval (m BGS)**	**Sand Pack (m BGS)**	**Bentonite Seal (m BGS)**	**Casing Type**
BH1	69.49	20.80	17.80-20.80	17.37-20.80	0.08-17.37	Flushmount
BH2	69.07	12.09	9.09-12.09	8.53-12.11	0.08-8.53	Flushmount
BH3	69.65	15.47	12.47-15.47	11.81-15.47	0.08-11.81	Flushmount
BH4	68.82	12.19	9.19-12.19	8.53-12.19	0.13-8.53	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 Analytical Testing

Based on the guidelines outlined in the Sampling and Analysis Plan appended to this report, the following soil and groundwater samples, as well as analyzed parameters are presented in Tables 3 and 4.

TABLE 3: Soil Samples Submitted and Analyzed Parameters								
Sample ID	**Sample Depth / Stratigraphic Unit**	**Parameters Analyzed**						**Rationale**
		VOCs	**PHCs (F1-F4)**	**Metals**	**Hg**	**CrVI**	**PCBs**	
January 9, 2020								
BH1-AU1	0.10-0.76m Fill			X	X	X		Assess the quality of the fill material.
BH3-AU1	0.13-0.76m Fill			X	X	X		Assess the quality of the fill material.
BH3-SS7	6.09-6.71m Clay	X	X					Assess potential impacts in the soil resulting from the on-site UST.

TABLE 3: Soil Samples Submitted and Analyzed Parameters

Sample ID	Sample Depth / Stratigraphic Unit	Parameters Analyzed						Rationale
		VOCs	PHCs (F1-F4)	Metals	Hg	CrVI	PCBs	
January 13, 2020								
BH2-SS2	0.76-1.37m Fill			X	X	X		Assess the quality of the fill material.
BH2-SS8	7.62-8.23m Clay	X	X					Assess potential impacts in the soil resulting from the on-site UST and off-site garage.
January 15, 2020								
BH4-SS2	0.76-1.37m Fill			X	X	X		Assess the quality of the fill material
BH4-SS8	7.62-8.23m Clay	X	X				X	Assess potential impacts in the soil resulting from the on-site UST and transformers.

TABLE 4: Groundwater Samples Submitted and Analyzed Parameters

Sample ID	Screened Interval	Parameters Analyzed							Rationale
		VOCs	PHCs (F1-F4)	Metals	Hg	CrVI	PCBs	PAHs	
August 31, 2022									
BH2-GW	9.09-12.09m	X	X	X	X	X		X	Assess potential groundwater impacts from the UST on-site in the southeastern corner of the property.
BH3-GW	12.47-15.47	X	X	X	X	X		X	
BH4-GW	9.19-12.19	X	X	X	X	X	X	X	Assess potential groundwater impacts from the UST on-site UST in the southeastern corner and transformers in the northern portion of the property.
DUP	12.47-15.47	X							Duplicate groundwater sample (BH3-GW) for QA/QC purposes.

Paracel Laboratories (Paracel), of Ottawa, Ontario, performed the laboratory analysis on the samples submitted for analytical testing. Paracel is a member of the Standards Council of Canada/Canadian Association for Laboratory

Accreditation (SCC/CALA). Paracel is accredited and certified by SCC/CALA for specific tests registered with the association.

4.7 Residue Management

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

4.8 Elevation Surveying

Borehole locations and elevations were surveyed in the field by Paterson personnel using laser level survey equipment. Ground surface elevations at the borehole locations were referenced to a temporary benchmark (TBM), consisting of the top of spindle of the fire hydrant located on the west side of Elgin Street in front of 150 Elgin Street. A Geodetic elevation of 70.16 m was previously provided for this TBM by Stantec Geomatics during a previous investigation for an adjacent site. This geodetic elevation was transferred to the fire hydrant in front of 160 Laurier Avenue West, which was used to survey the borehole locations.

Borehole locations, TBM, and ground surface elevations are presented on Drawing PE4822-3 – Test Hole Location Plan in Appendix 2.

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 soils consist of fill material consisting of silty sand with gravel and clay, underlain by silty clay, overlying glacial till (clayey silt to silty sand, with cobbles and boulders) and shale bedrock.

Bedrock was encountered at depths ranging from approximately 14.5 to 17.6m below grade in BH1, BH2, and BH4 and it was inferred at a depth of 15.47m in BH3. Bedrock was cored to a maximum depth of 21.2 m below grade.

Groundwater was encountered within the overburden at depths ranging from approximately 6.85 to 7.24 mbgs. Groundwater was encountered at 10.84 mbgs within the well screened in bedrock.

Site geology details are provided in the Soil Profile and Test Data Sheets provided in Appendix 1.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Initial groundwater levels were measured as per the geotechnical investigation on January 22 of 2020 using an electronic water level meter. Groundwater levels are summarized below in Table 5.

TABLE 5: Groundwater Level Measurements

Borehole Location	Ground Surface Elevation (m)	Water Level Depth (m below grade)	Water Level Elevation (m ASL)	Date of Measurement
BH1*	69.49	10.84*	58.65	August 31, 2022
BH2	69.07	7.24	61.83	August 31, 2022
BH3	69.65	6.85	62.80	August 31, 2022
BH4	68.82	7.02	61.80	August 31, 2022

* The well in BH1 is screened in the bedrock

Based on the groundwater elevations measured during the sampling events, groundwater contour mapping was completed. Groundwater contours are shown on Drawing PE4822-3.

Based on the contour mapping, groundwater flow at the subject site is in a northerly direction. A horizontal hydraulic gradient of approximately 0.02 m/m was calculated.

5.3 Fine-Coarse Soil Texture

Grain-size analysis was not completed for the Phase II ESA Property. However, it is assumed that fine-grained material is present on the Phase II ESA Property. As such, fine-grained soil standards were used.

5.4 Soil: Field Screening

Fill material was identified across the Phase II property beneath the pavement structure. The fill material generally consisted of brown silty sand with trace gravel and/or clay.

The field screening results of each individual soil sample are provided on the Soil Profile and Test Data Sheets appended to this report.

5.5 Soil Quality

Seven (7) soil samples were submitted for VOCs, PHCs (F1-F4), PCBs and/or metals analysis. The results of the analytical testing are presented below in Tables 6 through 9. The laboratory certificate of analysis is provided in Appendix 1.

TABLE 6: Analytical Test Results – Soil
Metals

Parameter	MDL (µg/g)	Soil Samples (µg/g)				MECP Table 3 Residential Standards (µg/g)
		January 9, 2020	January 13, 2020	January 9, 2020	January 15, 2020	
		BH1-AU1	BH2-SS2	BH3-AU1	BH4-SS2	
Chromium (VI)	0.2	nd	0.7	nd	0.3	10
Mercury	0.1	nd	0.8	nd	**6.0**	1.8
Antimony	1.0	1.4	nd	nd	nd	7.5
Arsenic	1.0	8.1	3.3	3.6	2.8	18
Barium	1.0	140	362	46.5	171	390
Beryllium	0.5	nd	0.6	nd	nd	5
Boron	5.0	18.1	5.8	5.7	nd	120
Cadmium	0.5	nd	nd	nd	0.7	1.2
Chromium	5.0	19.5	93.4	16.9	23.5	160
Cobalt	1.0	4.5	18.0	5.1	6.4	22
Copper	5.0	43.4	44.9	11.6	19.7	180
Lead	1.0	**277**	30.3	41.6	**161**	120
Molybdenum	1.0	1.5	nd	1.8	nd	6.9
Nickel	5.0	13.1	51.1	36.9	14.5	130
Selenium	1.0	nd	nd	nd	nd	2.4
Silver	0.3	0.4	nd	nd	0.9	25
Thallium	1.0	nd	nd	nd	nd	1
Uranium	1.0	nd	nd	nd	nd	23
Vanadium	10.0	18.2	**88.8**	18.6	29.6	86
Zinc	20.0	77.5	120	30.6	84.1	340

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- NA – Parameter not analyzed
- Bold and Underlined – Exceeds selected MECP Standards

All metal concentrations comply with the selected MECP Table 3 Standards, with the exception of lead, mercury and vanadium identified in Samples BH1-AU1 (Lead, 277 ug/g), BH2-SS2 (Vanadium, 88.8 ug/g) and BH4-SS2 (Lead, 161 ug/g; Mercury, 6 ug/g).

Suspect vanadium in BH2-SS2 is due to the underlying clay material. Barium, cobalt and chromium levels were also identified above background levels within the samples.

TABLE 7: Analytical Test Results – Soil
PCBs

Parameter	MDL (µg/g)	Soil Samples (µg/g)	MECP Table 3 Residential Standards (µg/g)
		January 15, 2020	
		BH4-SS8	
PCBs, total	0.05	nd	0.35

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- NA – Parameter not analyzed
- Bold and Underlined – Exceeds selected MECP Standards

No detectable PCB concentration was identified in the soil sample analyzed. All soil samples comply with the MECP Table 3 Residential Standards.

TABLE 8: Analytical Test Results – Soil
PHCs F_1-F_4

Parameter	MDL (µg/g)	Soil Samples (µg/g)			MECP Table 3 Residential Standards (µg/g)
		January 13, 2020	January 9, 2020	January 15, 2020	
		BH2-SS8	BH3-SS7	BH4-SS8	
PHC F_1	7	nd	nd	nd	55
PHC F_2	4	nd	nd	nd	98
PHC F_3	8	nd	nd	nd	300
PHC F_4	6	nd	nd	nd	2800

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- NA – Parameter not analyzed

No detectable PHC parameters were identified in any of the soil samples analyzed. All of the results comply with the MECP Table 3 Residential Standards.

TABLE 9: Analytical Test Results – Soil
VOCs

Parameter	MDL (µg/g)	Soil Samples (µg/g)			MECP Table 3 Residential Standards (µg/g)
		January 13, 2020	January 9, 2020	January 15, 2020	
		BH2-SS8	BH3-SS7	BH4-SS8	
Acetone	0.50	nd	nd	nd	28
Benzene	0.02	nd	nd	nd	0.17
Bromodichloromethane	0.05	nd	nd	nd	13
Bromoform	0.05	nd	nd	nd	0.26
Bromomethane	0.05	nd	nd	nd	0.05
Carbon Tetrachloride	0.05	nd	nd	nd	0.12
Chlorobenzene	0.05	nd	nd	nd	2.7
Chloroform	0.05	nd	nd	nd	0.18
Dibromochloromethane	0.05	nd	nd	nd	9.4
Dichlorodifluoromethane	0.05	nd	nd	nd	25
1,2-Dichlorobenzene	0.05	nd	nd	nd	4.3
1,3-Dichlorobenzene	0.05	nd	nd	nd	6
1,4-Dichlorobenzene	0.05	nd	nd	nd	0.097
1,1-Dichloroethane	0.05	nd	nd	nd	11
1,2-Dichloroethane	0.05	nd	nd	nd	0.05
1,1-Dichloroethylene	0.05	nd	nd	nd	0.05
cis-1,2-Dichloroethylene	0.05	nd	nd	nd	30
trans-1,2-Dichloroethylene	0.05	nd	nd	nd	0.75
1,2-Dichloropropane	0.05	nd	nd	nd	0.085
cis-1,3-Dichloropropylene	0.05	nd	nd	nd	
trans-1,3-Dichloropropylene	0.05	nd	nd	nd	
1,3-Dichloropropene, total	0.05	nd	nd	nd	0.083
Ethylbenzene	0.05	nd	nd	nd	15
Ethylene dibromide	0.05	nd	nd	nd	0.05
Hexane	0.05	nd	nd	nd	34
Methyl Ethyl Ketone	0.50	nd	nd	nd	44
Methyl Isobutyl Ketone	0.50	nd	nd	nd	4.3
Methyl tert-butyl ether	0.05	nd	nd	nd	1.4
Methylene Chloride	0.05	nd	nd	nd	0.96
Styrene	0.05	nd	nd	nd	2.2
1,1,1,2-Tetrachloroethane	0.05	nd	nd	nd	0.05
1,1,2,2-Tetrachloroethane	0.05	nd	nd	nd	0.05
Tetrachloroethylene	0.05	nd	nd	nd	2.3
Toluene	0.05	nd	nd	nd	6
1,1,1-Trichloroethane	0.05	nd	nd	nd	3.4
1,1,2-Trichloroethane	0.05	nd	nd	nd	0.05
Trichloroethylene	0.05	nd	nd	nd	0.52
Trichlorofluoromethane	0.05	nd	nd	nd	5.8
Vinyl Chloride	0.02	nd	nd	nd	0.022

TABLE 9 Continued: Analytical Test Results – Soil
VOCs

Parameter	MDL (µg/g)	Soil Samples (µg/g)			MECP Table 3 Residential Standards (µg/g)
		January 13, 2020	January 9, 2020	January 15, 2020	
		BH2-SS8	BH3-SS7	BH4-SS8	
m/p-Xylene	0.05	nd	nd	nd	
o-Xylene	0.05	nd	nd	nd	
Xylenes, total	0.05	nd	nd	nd	25

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- NA – Parameter not analyzed

No detectable VOC parameters were identified in any of the soil samples analyzed. All of the results comply with the MECP Table 3 Residential Standards.

The analytical results for VOCs, PHCs, PCBs and Metals tested in soil are shown on Drawing PE4822-4 – and Drawing PE4822-5 -.

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

TABLE 10: Maximum Concentrations – Soil

Parameter	Maximum Concentration (µg/g)	Borehole	Depth Interval (m BGS)
Antimony	1.4	BH1-AU1	0-0.10m; Fill
Arsenic	8.1	BH1-AU1	0-0.10m; Fill
Barium	362	BH2-SS2	0.76-1.37m; Fill
Beryllium	0.6	BH2-SS2	0.76-1.37m; Fill
Boron	18.1	BH1-AU1	0-0.10m; Fill
Cadmium	0.7	BH4-SS2	0.76-1.37m; Fill
Chromium	93.4	BH2-SS2	0.76-1.37m; Fill
Chromium (VI)	0.7	BH2-SS2	0.76-1.37m; Fill
Cobalt	18	BH2-SS2	0.76-1.37m; Fill
Copper	44.9	BH2-SS2	0.76-1.37m; Fill
Lead	**277**	BH1-AU1	0-0.10m; Fill
Mercury	**6.0**	BH4-SS2	0.76-1.37m; Fill
Molybdenum	1.8	BH3-AU1	0-0.13m; Fill
Nickel	51.1	BH2-SS2	0.76-1.37m; Fill
Silver	0.9	BH4-SS2	0.76-1.37m; Fill
Vanadium	**88.8**	BH2-SS2	0.76-1.37m; Fill
Zinc	84.1	BH4-SS2	0.76-1.37m; Fill

Note:
- **Bold and Underlined** – Parameters in parenthesis exceed the Table 3 Background Standards.

Remaining parameters analysed were not identified above the laboratory method detection limits.

5.6 Groundwater Quality

Groundwater samples from monitoring wells installed in BH2 through BH4 were submitted for laboratory analysis of VOCs, PHCs (fractions, F1-F4), PAHs, PCBs and metals analyses. The groundwater samples were obtained from the screened intervals noted in Table 2. The results of the analytical testing are presented in Tables 11 through 15. The laboratory certificates of analysis are provided in Appendix 1.

TABLE 11: Analytical Test Results – Groundwater
Metals (including CrVI and Mercury)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)			MECP Table 3 Standards (µg/L)
		August 31, 2022			
		BH2-GW	BH3-GW	BH4-GW	
Antimony	0.5	nd	nd	0.6	20000
Arsenic	1	nd	6	nd	1900
Barium	1	20	24	9	29000
Beryllium	0.5	nd	nd	nd	67
Boron	10	42	604	104	45000
Cadmium	0.1	nd	nd	nd	2.7
Chromium	1	nd	nd	2	810
Chromium (VI)	10	nd	nd	nd	140
Cobalt	0.5	nd	nd	nd	66
Copper	0.5	1.8	1.1	3.7	87
Lead	0.1	0.4	nd	0.1	25
Mercury	0.1	nd	nd	nd	2.8
Molybdenum	0.5	0.9	12.1	3.8	9200
Nickel	1	nd	2	nd	490
Selenium	1	nd	nd	nd	63
Silver	0.1	nd	nd	nd	1.5
Sodium	200	20200	258000	102000	2300000
Thallium	0.1	nd	nd	nd	510
Uranium	0.1	0.1	0.5	1.1	420
Vanadium	0.5	1.1	0.6	6.9	250
Zinc	5	61	13	5	1100

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL

All metal concentrations comply with the selected MECP Table 3 standards.

TABLE 12: Analytical Test Results – Groundwater
PCBs

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)	MECP Table 3 Standards (µg/L)
		August 31, 2022	
		BH4-GW	
PCBs, total	0.05	nd	15

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL

No detectable PCB concentration was identified in the groundwater sample analyzed. The groundwater results comply with the MECP Table 3 Standards.

TABLE 13: Analytical Test Results – Groundwater
PHCs (F1-F4)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)				MECP Table 3 Standards (µg/L)
		August 31, 2022				
		BH2-GW	BH3-GW	BH4-GW	DUP	
PHC F_1	25	nd	nd	nd	nd	750
PHC F_2	100	nd	nd	nd	nd	150
PHC F_3	100	nd	nd	nd	nd	500
PHC F_4	100	nd	nd	nd	nd	500

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL

No detectable PHC concentrations were identified in the groundwater samples analyzed. The groundwater results comply with the MECP Table 3 Standards.

TABLE 14: Analytical Test Results – Groundwater
VOCs

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)				MECP Table 3 Standards (µg/L)
		August 31, 2022				
		BH2-GW	BH3-GW	BH4-GW	DUP*	
Acetone	5.0	16.3	nd	12.4	nd	130000
Benzene	0.5	nd	nd	nd	nd	430
Bromodichloromethane	0.5	nd	nd	nd	nd	85000
Bromoform	0.5	nd	nd	nd	nd	770
Bromomethane	0.5	nd	nd	nd	nd	56
Carbon Tetrachloride	0.2	nd	nd	nd	nd	8.4
Chlorobenzene	0.5	nd	nd	nd	nd	630
Chloroform	0.5	nd	nd	nd	nd	22
Dibromochloromethane	0.5	nd	nd	nd	nd	82000
Dichlorodifluoromethane	1.0	nd	nd	nd	nd	4400
1,2-Dichlorobenzene	0.5	nd	nd	nd	nd	9600
1,3-Dichlorobenzene	0.5	nd	nd	nd	nd	9600
1,4-Dichlorobenzene	0.5	nd	nd	nd	nd	67
1,1-Dichloroethane	0.5	nd	nd	1.6	nd	3100
1,2-Dichloroethane	0.5	nd	nd	nd	nd	12
1,1-Dichloroethylene	0.5	nd	nd	nd	nd	17
cis-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	17
trans-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	17
1,2-Dichloropropane	0.5	nd	nd	nd	nd	140
cis-1,3-Dichloropropylene	0.5	nd	nd	nd	nd	
trans-1,3-Dichloropropylene	0.5	nd	nd	nd	nd	
1,3-Dichloropropene, total	0.5	nd	nd	nd	nd	45
Ethylbenzene	0.5	nd	nd	nd	nd	2300
Ethylene dibromide	0.2	nd	nd	nd	nd	0.83
Hexane	1.0	nd	nd	nd	nd	520
Methyl Ethyl Ketone (2-Butanone)	5.0	nd	nd	nd	nd	1500000
Methyl Isobutyl Ketone	5.0	nd	nd	nd	nd	580000
Methyl tert-butyl ether	2.0	nd	nd	nd	nd	1400
Methylene Chloride	5.0	nd	nd	nd	nd	5500
Styrene	0.5	nd	nd	nd	nd	9100
1,1,1,2-Tetrachloroethane	0.5	nd	nd	nd	nd	28
1,1,2,2-Tetrachloroethane	0.5	nd	nd	nd	nd	15
Tetrachloroethylene	0.5	nd	nd	nd	nd	17
Toluene	0.5	nd	nd	nd	nd	18000
1,1,1-Trichloroethane	0.5	nd	nd	nd	nd	6700
1,1,2-Trichloroethane	0.5	nd	nd	nd	nd	30
Trichloroethylene	0.5	nd	nd	nd	nd	17
Trichlorofluoromethane	1.0	nd	nd	nd	nd	2500

TABLE 14 Continued: Analytical Test Results – Groundwater
VOCs

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)				MECP Table 3 Standards (µg/L)
		August 31, 2022				
		BH2-GW	BH3-GW	BH4-GW	DUP*	
Vinyl Chloride	0.5	nd	nd	nd	nd	1.7
m/p-Xylene	0.5	nd	nd	nd	nd	
o-Xylene	0.5	nd	nd	nd	nd	
Xylenes, total	0.5	nd	nd	nd	nd	4200

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- * - Duplicate of BH3

Several VOC parameters were detected in the groundwater samples analyzed. All VOC concentrations comply with the selected MECP Table 3 Standards.

TABLE 15: Analytical Test Results – Groundwater
PAHs

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)			MECP Table 3 Standards (µg/L)
		August 31, 2022			
		BH2-GW	BH3-GW	BH4-GW	
Acenaphthene	0.05	nd	nd	nd	1700
Acenaphthylene	0.05	nd	nd	nd	1.8
Anthracene	0.01	nd	nd	nd	2.4
Benzo[a]anthracene	0.01	nd	nd	nd	4.7
Benzo[a]pyrene	0.01	nd	nd	nd	0.81
Benzo[b]fluoranthene	0.05	nd	nd	nd	0.75
Benzo[g,h,i]perylene	0.05	nd	nd	nd	0.2
Benzo[k]fluoranthene	0.05	nd	nd	nd	0.4
Chrysene	0.05	nd	nd	nd	1
Dibenzo[a,h]anthracene	0.05	nd	nd	nd	0.52
Fluoranthene	0.01	0.04	nd	nd	130
Fluorene	0.05	nd	nd	nd	400
Indeno [1,2,3-cd] pyrene	0.05	nd	nd	nd	0.2
1-Methylnaphthalene	0.05	nd	nd	nd	1800
2-Methylnaphthalene	0.05	nd	nd	nd	1800
Methylnaphthalene (1&2)	0.10	nd	nd	nd	1800
Naphthalene	0.05	nd	nd	nd	6400
Phenanthrene	0.05	nd	nd	nd	580
Pyrene	0.01	0.03	nd	nd	68

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL

Several PAH parameters were detected in one of the groundwater samples analyzed. All PAH concentrations comply with the selected MECP Table 3 Standards.

The maximum concentrations of analyzed parameters in the groundwater at the site are summarized below in Table 16.

TABLE 16: Maximum Concentrations – Groundwater

Parameter	Maximum Concentration (µg/L)	Borehole	Screened Interval (m BGS)
Arsenic	6	BH3-GW	7.77-10.88
Barium	24	BH3-GW	7.77-10.88
Boron	604	BH3-GW	7.77-10.88
Chromium	2	BH4-GW	8.53-12.19
Copper	3.7	BH4-GW	8.53-12.19
Lead	0.4	BH2-GW	9.04-12.11m
Molybdenum	12.1	BH3-GW	7.77-10.88
Nickel	2	BH3-GW	7.77-10.80
Sodium	258000	BH3-GW	7.77-10.80
Uranium	1.1	BH4-GW	8.53-12.19
Vanadium	6.9	BH4-GW	8.53-12.19
Zinc	61	BH2-GW	9.04-12.11m
Acetone	16.3	BH2-GW	9.04-12.11m
1,1-Dichloroethane	1.6	BH4-GW	8.53-12.19
Fluoranthene	0.04	BH2-GW	9.09-12.09m
Pyrene	0.03	BH2-GW	9.09-12.09m

Note:
Bold and Underlined – Parameters in parenthesis exceed the Table 3 Background Standards.

Remaining parameters analysed were not identified above the laboratory method detection limits.

5.7 Quality Assurance and Quality Control Results

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

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

A duplicate groundwater sample was obtained from BH3 and analysed for VOCs. Test results for the duplicate groundwater sample were non-detect, as were the results of the original BH3 sample.

Based on the analytical laboratory results, it is our opinion that the overall quality of the field data collected during this Phase II-ESA is considered to be sufficient to meet the overall objectives of this assessment.

5.8 Phase II Conceptual Site Model

The following section has been prepared in accordance with the requirements of O.Reg. 153/04, as amended by the Environmental Protection Act. Conclusions and recommendations are discussed in a subsequent section.

Site Description

Potentially Contaminating Activity and Areas of Potential Environmental Concern

Based on the results of the Phase I ESA completed for the subject site, four (4) PCAs and the resultant APECs are summarized in Table1 in Section 3.3, along with their respective locations and contaminants of potential concern (CPCs).

Contaminants of Potential Concern

As per Section 3.3, the contaminants of potential concern (CPCs) in soil and/or groundwater include volatile organic compounds (VOCs), petroleum hydrocarbons (PHCs, F1-F4), polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and metals (including arsenic (As), antimony (Sb) and selenium (Se)), mercury (Hg) and hexavalent chromium (CrVI).

Subsurface Structures and Utilities

The Phase II ESA Property is situated in a municipally serviced area.

Based on the findings of the Phase II ESA, underground utilities are not expected to have affected contaminant distribution and transport.

Physical Setting

Site Stratigraphy

The site stratigraphy, from ground surface to the deepest aquifer or aquitard investigated, is illustrated on Drawings PE4822-4A, 4B. The stratigraphy consists of:

- An asphaltic concrete structure of approximately 0.1 m thick, overlies the fill material consisting of brown silty sand with trace gravel and/or clay was identified in all of the boreholes. The fill material extended to depths of approximately 0.81 to 1.52 mbgs. Groundwater was not encountered in this layer.

- Silty clay was encountered in all of the boreholes below the fill, extending to depths of approximately 12.20 to 14.60 mbgs. Groundwater was encountered in this layer.
- Glacial till consisting of silty clay to silty sand with gravel, cobbles and possible boulders was encountered in all of the boreholes below the silty clay, extending to depths of approximately 14.50 to 17.60 mbgs.
- Shale bedrock was encountered in all of the boreholes, with the exception of BH3. The remaining holes were terminated in this layer at depths ranging from approximately 20.80 to 21.21 mbgs. BH3 was terminated at a depth of 15.47 m on the inferred bedrock surface.

Hydrogeological Characteristics

Groundwater on the subject property was encountered in the overburden. During the most recent groundwater monitoring event, groundwater flow was measured in a northerly direction, with a hydraulic gradient of 0.02 m/m. Groundwater contours are shown on Drawing PE4822-3 – Test Hole Location Plan.

Approximate Depth to Bedrock

Bedrock was encountered during the drilling program at depths ranging from approximately 14.50 to 17.58 mbgs.

Approximate Depth to Water Table

The depth to the water table at the subject site varies between approximately 6.85 to 10.84 m below existing grade. Groundwater was observed in the overburden wells (BH2, BH3, and BH4) between 6.85 to 7.24 mbgs, whereas groundwater in the bedrock seated well (BH1) was observed at 10.84 mbgs.

Sections 41 and 43.1 of the Regulation

Section 41 of the Regulation does not apply to the Phase II ESA Property, in that the subject property is not within 30m of an environmentally sensitive area.

Section 43.1 of the Regulation does not apply to the Phase II ESA Property as bedrock is located more than 2 m below ground surface.

Fill Placement

The fill material consisted of brown silty sand with trace gravel and/or clay was identified in all of the boreholes and formed the base for the asphaltic concrete layer. The fill extended to depths of 0.81 to 1.52 mbgs.

Existing Buildings and Structures

The subject site is occupied by a five-storey commercial office building with an underground parking garage. No other permanent structures are present on the Phase II property.

Proposed Buildings and Other Structures

The Phase II ESA Property is anticipated to be redeveloped with a high-rise building with up to five levels of underground parking.

Areas of Natural Significance

There are no areas of natural significance in the Phase II Study Area.

Water Bodies

There are no natural water bodies in the Phase II Study Area.

Environmental Condition

Areas Where Contaminants are Present

Based on the findings of the Phase II ESA, the fill material in BH1, BH2 and BH4 is shown to be impacted with some metals (i.e lead, mercury and vanadium). Vanadium is suspected naturally occurring in silty clay within the area, therefore it is not considered a contaminant.

Types of Contaminants

Based on the findings of this Phase II ESA, soil and/or groundwater contaminants at the Phase II Property include the following:

- ❒ Lead;
- ❒ Mercury.

Contaminated Media

The fill material extending from 0.30 to 0.76 m in BH1 is impacted with lead in excess of the selected MECP Table 3 residential standards. The fill material

extending from 0.76 to 1.37 m in BH2 is impacted with mercury in excess of the selected MECP Table 3 residential standards. The fill material extending from 0.76 to 1.37 m in BH4 is impacted with lead and mercury in excess of the selected MECP Table 3 residential standards.

What Is Known About Areas Where Contaminants Are Present

Based on the findings of the Phase II ESA, metals (lead) impacted fill was identified within the western portion of the site (BH1). This contaminant is associated with the fill material of unknown quality.

Metals (lead, mercury and vanadium) impacted soil/fill was identified on the eastern portion of the subject site (BH2 and BH4). This contamination is associated with the presence of fill material of unknown quality and possibly naturally occurring levels in silty clay for vanadium.

Distribution and Migration of Contaminants

Based on the findings of the Phase II ESA, distribution and migration of contaminants is not considered to have occurred on the Phase II ESA Property.

Discharge of Contaminants

Based on the findings of the Phase II ESA, discharge of contaminants is not considered to have occurred on the Phase II ESA Property.

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 by means of 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 3 standards. Fluctuations in the groundwater level and groundwater flow are also not considered to have affected the contaminant based on the depth of the water table, well below the shallow soil/fill material.

Potential for Vapour Intrusion

Based on the findings of the Phase II ESA there is no potential for vapour intrusion on the Phase II ESA Property.

6.0 CONCLUSIONS

Assessment

A Phase II ESA was conducted for the property addressed 150 and 160 Laurier Avenue West, in the Ottawa, Ontario. The purpose of the Phase II ESA was to address potentially contaminating activities (PCAs) that were identified during the Phase I ESA and considered to result in areas of potential environmental concern (APECs) on the Phase II ESA Property.

The subsurface investigation consisted of four (4) boreholes, all which were instrumented with groundwater monitoring wells. The general soil profile encountered during the field program consisted of fill material consisting of silty sand with gravel and clay, underlain by silty clay, overlying glacial till (clayey silt to silty sand, with cobbles and boulders), followed by shale bedrock.

Seven (7) soil samples were submitted for laboratory analysis of volatile organic compounds (VOCs), petroleum hydrocarbons (PHCs, Fractions F_1-F_4), polychlorinated biphenyls (PCBs) and metals (including hydride forming compounds: arsenic (As), antimony (Sb), selenium (Se)), mercury and hexavalent chromium (CrVI). No VOC, PHC or PCB concentrations were identified in any of the soil samples analysed. Concentrations metal parameters, below the site standards, were identified in the samples analysed, with the exception of lead, mercury and vanadium concentrations identified in soil/fill of BH1, BH2 and BH4. The remaining soil results comply with MECP Table 3 Residential Standards.

Groundwater samples from monitoring wells BH2, BH3 and BH4 were collected during the August 31, 2022 sampling event. No free product or petroleum hydrocarbon sheen was noted on the purge water during the groundwater sampling events.

Three groundwater samples (plus one duplicate) were submitted for laboratory analysis of VOCs, PHCs (F1-F4), PCBs, PAHs and metals (including CrVI and mercury). Based on the analytical test results, the groundwater results are in compliance with the MECP Table 3 standards. As a result, the groundwater beneath the subject site is not considered to be contaminated.

Recommendations

Based on the findings of this assessment, metals impacted fill was identified underneath the asphaltic concrete parking areas on the subject site, requiring some remedial work. It is our understanding that the subject site is to be redeveloped for mixed commercial and residential purposes.

Soil

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

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.

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 the Ontario Regulation 347/558.

Any clean soil that requires removal from the Phase II Property for construction purposes must be handled in accordance with Ontario Regulation 406/19: On-site and Excess Soil Management. Further information regarding O.Reg 406/19 can be provided upon request.

Monitoring Wells

If the monitoring wells installed on the Phase II ESA Property are not going to be used in the future, or will be destroyed during site redevelopment, they should be abandoned according to Ontario Regulation 903. The wells will be registered with the MECP under this regulation.

7.0 STATEMENT OF LIMITATIONS

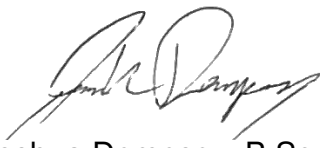
This Phase II – Environmental Site Assessment report has been prepared in general accordance with O.Reg. 153/04, as amended, and meets the requirements of CSA Z769-00 (reaffirmed 2022). The conclusions presented herein are based on information gathered from a limited sampling and testing program. The test results represented 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 JADCO Corporation. Notification from JADCO Corporation and Paterson Group will be required to release this report to any other party.

Paterson Group Inc.



Joshua Dempsey, B.Sc.

Mark D'Arcy, P.Eng., QP_{ESA}

Report Distribution:

- JADCO Corporation
- Paterson Group

FIGURES

Figure 1 - Key Plan

Drawing PE4822-3 – Test Hole Location Plan

Drawing PE4822-4 – Analytical Testing Plan – Soil – Metals, CrVI, Mercury

Drawing PE4822-4A – Cross-section A – A' – Soil – Metals, CrVI, Mercury

Drawing PE4822-4B – Cross-section B – B' – Soil – Metals, CrVI, Mercury

Drawing PE4822-5 – Analytical Testing Plan – Soil – PCBs, VOCs, PHCs

Drawing PE4822-5A – Cross-section A – A' – Soil – PCBs, VOCs, PHCs

Drawing PE4822-5B – Cross-section B – B' – Soil – PCBs, VOCs, PHCs

Drawing PE4822-6 – Analytical Testing Plan – Groundwater

Drawing PE4822-6A – Cross-section A – A' – Groundwater

Drawing PE4822-6B – Cross-section B – B' – Groundwater

FIGURE 1

KEY PLAN

#161 LAURIER AVENUE WEST
COMMERCIAL OFFICE BUILDING

#141 LAURIER AVENUE WEST
COMMERCIAL OFFICE BUILDING

#66 SLATER STREET
COMMERCIAL OFFICE BUILDING

#100 ELGIN STREET
LORD ELGIN HOTEL

LAURIER AVENUE WEST

FH-TBM

BH 1
69.49
[54.99]
(58.65)

HYDROVAULT FOOTPRINT

#150 LAURIER AVENUE WEST

BH 4
68.82
[51.55]
{61.80}

#162 LAURIER AVENUE WEST
COMMERCIAL OFFICE BUILDING

#160 LAURIER AVENUE WEST
PARKING LOT

A/C UNIT

62.1
62.2
62.3
62.4
62
61.9
(0.02m/m)

ASPHALTIC CONCRETE
PARKING LOT

#140 LAURIER AVENUE WEST
FIRST BAPTIST CHURCH

PENTHOUSE
MECHANICAL ROOM

BH 3
69.65
{62.80}

DIESEL
ABOVEGROUND
STORAGE TANK

BH 2
69.07
[51.49]
{61.83}

MECHANICAL
EQUIPMENT

#31 GLOUCESTER STREET
COMMERCIAL OFFICE BUILDING

LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION (DEEP WELL)
- BOREHOLE WITH MONITORING WELL LOCATION
- 69.49 GROUND SURFACE ELEVATION (m)
- [54.99] BEDROCK SURFACE ELEVATION (m)
- (58.65) GROUNDWATER SURFACE ELEVATION (m) (DEEP WELL - AUGUST 31, 2022)
- {61.83} GROUNDWATER SURFACE ELEVATION (m) (AUGUST 31, 2022)
- 97.7 GROUNDWATER CONTOUR (m)
- (0.06m/m) APPROX. GROUNDWATER FLOW DIRECTION (HORIZONTAL HYDRAULIC GRADIENT)

TBM- TOP SPINDLE OF FIRE HYDRANT LOCATED ON LAURIER AVENUE WEST. GEODETIC ELEVATION = 69.88 m

SCALE: 1:250

0 1 2 3 4 5 10 15m

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL

JADCO CORPORATION

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
150 AND 160 LAURIER AVENUE WEST

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:250	Date: 10/2022
Drawn by: YA	Report No.: PE4822-2
Checked by: JD	Dwg. No.: PE4822-3
Approved by: MSD	Revision No.:

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11x17

#161 LAURIER AVENUE WEST
COMMERCIAL OFFICE BUILDING

#141 LAURIER AVENUE WEST
COMMERCIAL OFFICE BUILDING

#66 SLATER STREET
COMMERCIAL OFFICE BUILDING

#100 ELGIN STREET
LORD ELGIN HOTEL

BH1-AU1	0.10-0.76m	09-JAN-2020
Parameter	Result(µg/g)	Standard(µg/g)
Lead	277	120

Remaining Metals, CrVI and Mercury comply with the MECP Table 3 Standards

BH4-SS2	0.76-1.37m	15-JAN-2020
Parameter	Result(µg/g)	Standard(µg/g)
Lead	161	120
Mercury	6	0.27

Remaining Metals and CrVI comply with the MECP Table 3 Standards

LAURIER AVENUE WEST

FH-TBM

A

BH 1
69.49
[54.99]
(58.65)

HYDROVAULT FOOTPRINT

#150 LAURIER AVENUE WEST

A/C UNIT

PENTHOUSE
MECHANICAL ROOM

MECHANICAL
EQUIPMENT

B'

BH 4
68.82
[51.55]
{61.80}

ASPHALTIC CONCRETE
PARKING LOT

BH2-SS2	0.76-1.37m	13-JAN-2020
Parameter	Result(µg/g)	Standard(µg/g)
Mercury	0.8	0.27
Vanadium	88.8	86

Remaining Metals and CrVI comply with the MECP Table 3 Standards

#140 LAURIER AVENUE WEST
FIRST BAPTIST CHURCH

#162 LAURIER AVENUE WEST
COMMERCIAL OFFICE BUILDING

BH3-AU1	0.13-0.76 m	09-JAN-2020

Metals, CrVI and Mercury comply with the MECP Table 3 Standards

#160 LAURIER AVENUE WEST
PARKING LOT

B

BH 3
69.65
{62.80}

DIESEL
ABOVEGROUND
STORAGE TANK

BH 2
69.07
[51.49]
{61.83}

A'

#31 GLOUCESTER STREET
COMMERCIAL OFFICE BUILDING

LEGEND:

SOIL RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 3 STANDARDS

- BOREHOLE WITH MONITORING WELL LOCATION (DEEP WELL)
- BOREHOLE WITH MONITORING WELL LOCATION
- 69.49 GROUND SURFACE ELEVATION (m)
- [54.99] BEDROCK SURFACE ELEVATION (m)
- (58.65) GROUNDWATER SURFACE ELEVATION (m) (DEEP WELL - AUGUST 31, 2022)
- {61.83} GROUNDWATER SURFACE ELEVATION (m) (AUGUST 31, 2022)
- A—A' CROSS SECTION

TBM- TOP SPINDLE OF FIRE HYDRANT LOCATED ON LAURIER AVENUE WEST. GEODETIC ELEVATION = 69.88 m

SCALE: 1:250

0 1 2 3 4 5 10 15m

PATERSON GROUP
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NO.	REVISIONS	DATE	INITIAL

JADCO CORPORATION

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
150 AND 160 LAURIER AVENUE WEST

OTTAWA, ONTARIO

Title: **ANALYTICAL TESTING PLAN - SOIL (METALS, CrVI, MERCURY)**

Scale: 1:250	Date: 10/2022
Drawn by: YA	Report No.: PE4822-2
Checked by: JD	Dwg. No.: PE4822-4
Approved by: MSD	Revision No.:

11x17

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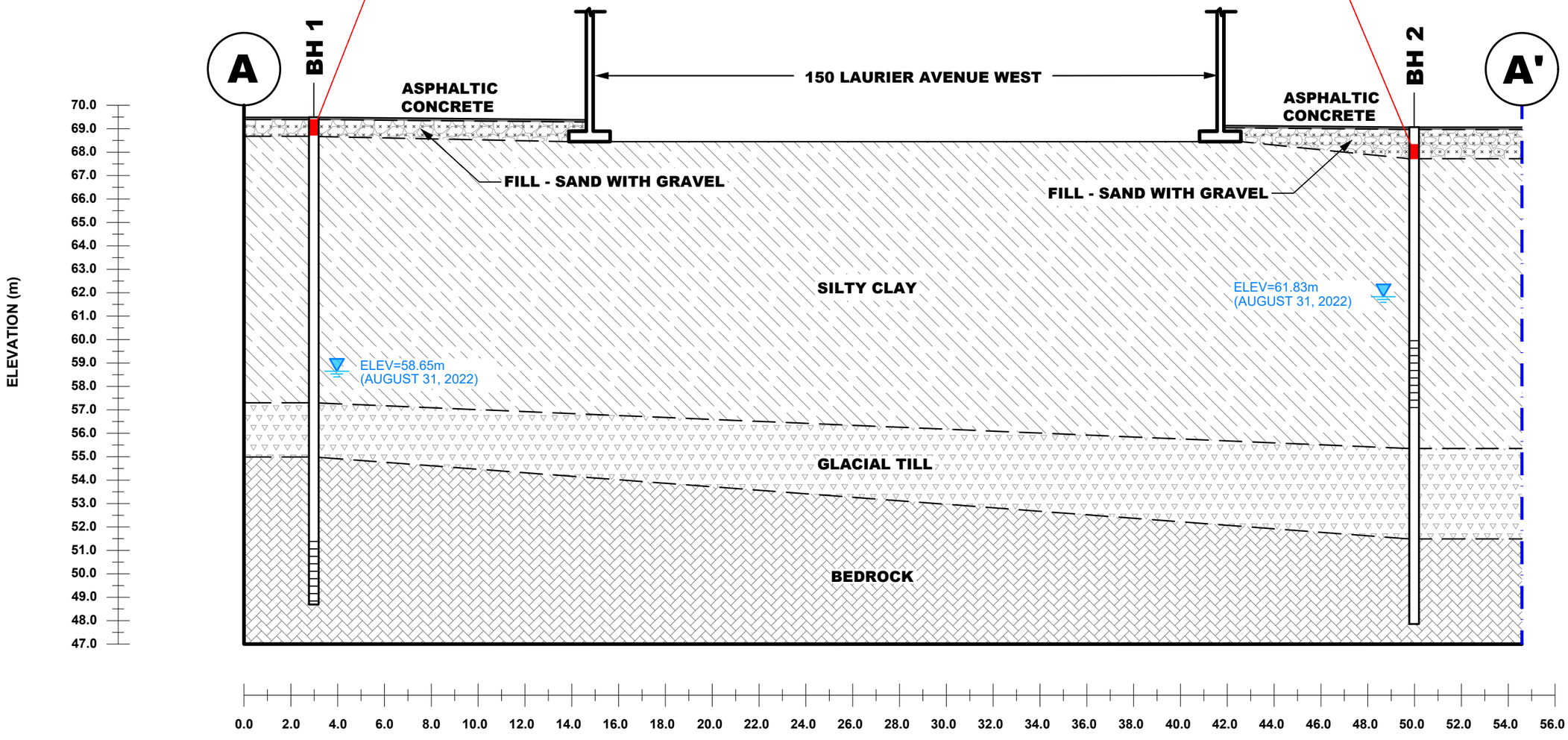
BH1-AU1	0.10-0.76m	09-JAN-2020
Parameter	Result(µg/g)	Standard(µg/g)
Lead	277	120

Remaining Metals, CrVI and Mercury comply with the MECP Table 3 Standards

BH2-SS2	0.76-1.37m	13-JAN-2020
Parameter	Result(µg/g)	Standard(µg/g)
Mercury	0.8	0.27
Vanadium	88.8	86

Remaining Metals and CrVI comply with the MECP Table 3 Standards



SOIL RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 3 STANDARDS

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
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JADCO CORPORATION

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
150 AND 160 LAURIER AVENUE WEST

OTTAWA, ONTARIO

Title: CROSS SECTION A-A' - SOIL (METALS, CrVI, MERCURY)

Scale: AS SHOWN	Date: 10/2022
Drawn by: YA	Report No.: PE4822-2
Checked by: JD	Dwg. No.: PE4822-4A
Approved by: MSD	Revision No.:

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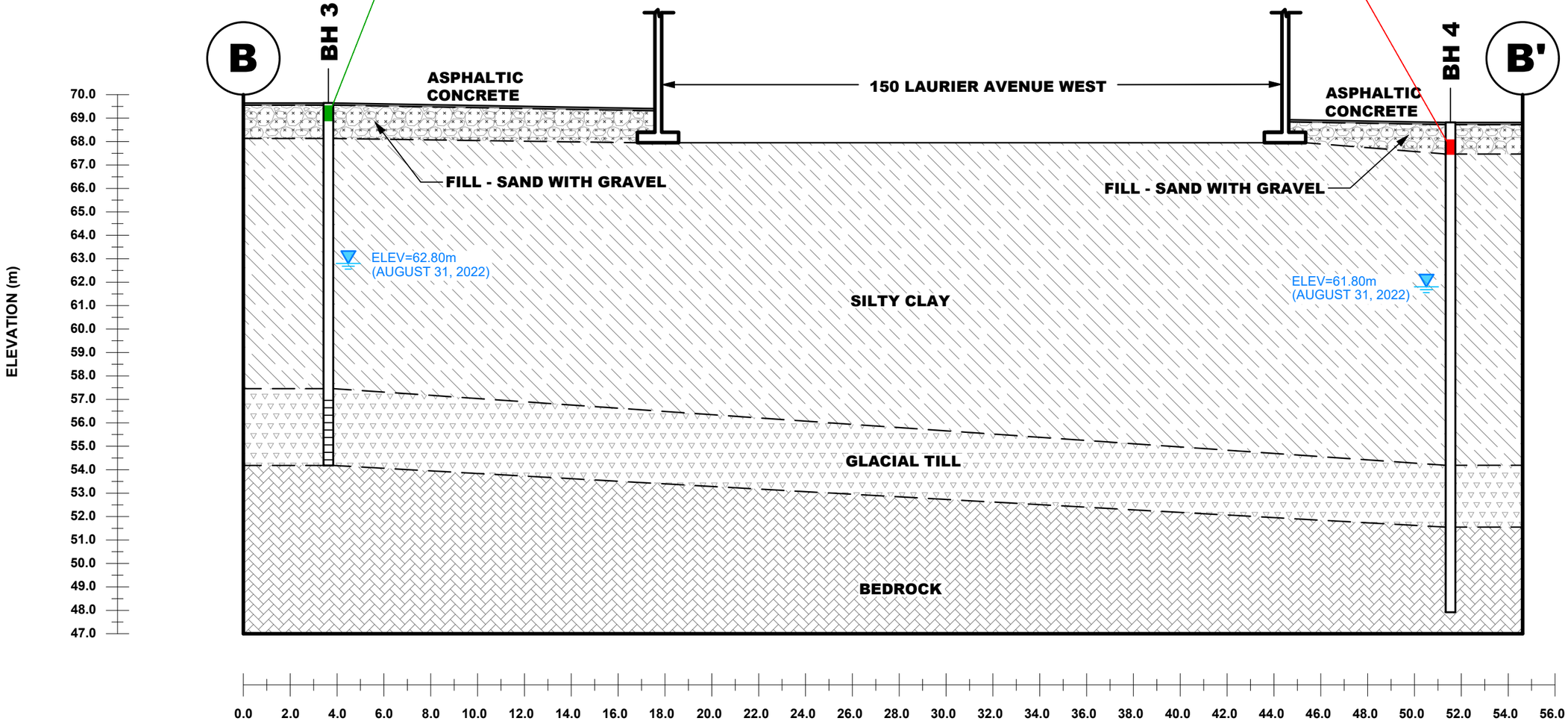
11x17

BH3-AU1 0.13-0.76 m 09-JAN-2020
Metals, CrVI and Mercury comply with the MECP Table 3 Standards

BH4-SS2	0.76-1.37m	15-JAN-2020
Parameter	Result(µg/g)	Standard(µg/g)
Lead	161	120
Mercury	6	0.27

Remaining Metals and CrVI comply with the MECP Table 3 Standards



SOIL RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 3 STANDARDS

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL

JADCO CORPORATION

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
150 AND 160 LAURIER AVENUE WEST
OTTAWA, ONTARIO

Title: CROSS SECTION B-B' - SOIL (METALS, CrVI, MERCURY)

Scale: AS SHOWN	Date: 10/2022
Drawn by: YA	Report No.: PE4822-2
Checked by: JD	Dwg. No.: PE4822-4B
Approved by: MSD	Revision No.:

11x17

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#161 LAURIER AVENUE WEST
COMMERCIAL OFFICE BUILDING

#141 LAURIER AVENUE WEST
COMMERCIAL OFFICE BUILDING

#66 SLATER STREET
COMMERCIAL OFFICE BUILDING

#100 ELGIN STREET
LORD ELGIN HOTEL

LAURIER AVENUE WEST

FH-TBM

A

BH 1
69.49
[54.99]
(58.65)

HYDROVAULT FOOTPRINT

#150 LAURIER AVENUE WEST

A/C UNIT

PENTHOUSE
MECHANICAL ROOM

MECHANICAL
EQUIPMENT

B'

BH 4
68.82
[51.55]
{61.80}

ASPHALTIC CONCRETE
PARKING LOT

BH4-SS8 7.62-8.23m 15-JAN-2020
PCBs comply with the MECP Table 3 Standards

BH4-SS8 7.62-8.23m 15-JAN-2020
VOCs and PHCs comply with the MECP Table 3 Standards

BH2-SS8 7.62-8.23m 13-JAN-2020
VOCs and PHCs comply with the MECP Table 3 Standards

#162 LAURIER AVENUE WEST
COMMERCIAL OFFICE BUILDING

#160 LAURIER AVENUE WEST
PARKING LOT

#140 LAURIER AVENUE WEST
FIRST BAPTIST CHURCH

B

BH 3
69.65
{62.80}

BH 2
69.07
[51.49]
{61.83}

A'

DIESEL
ABOVEGROUND
STORAGE TANK

BH3-SS7 6.09-6.71m 09-JAN-2020
VOCs and PHCs comply with the MECP Table 3 Standards

#31 GLOUCESTER STREET
COMMERCIAL OFFICE BUILDING

LEGEND:

SOIL RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 3 STANDARDS

- BOREHOLE WITH MONITORING WELL LOCATION (DEEP WELL)
- BOREHOLE WITH MONITORING WELL LOCATION
- 69.49 GROUND SURFACE ELEVATION (m)
- [54.99] BEDROCK SURFACE ELEVATION (m)
- (58.65) GROUNDWATER SURFACE ELEVATION (m) (DEEP WELL - AUGUST 31, 2022)
- {61.83} GROUNDWATER SURFACE ELEVATION (m) (AUGUST 31, 2022)
- A—A' CROSS SECTION

TBM- TOP SPINDLE OF FIRE HYDRANT LOCATED ON LAURIER AVENUE WEST. GEODETIC ELEVATION = 69.88 m

SCALE: 1:250

0 1 2 3 4 5 10 15m

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL

JADCO CORPORATION

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
150 AND 160 LAURIER AVENUE WEST
OTTAWA, ONTARIO

Title: **ANALYTICAL TESTING PLAN - SOIL (PCBs, VOCs, PHCs)**

Scale: 1:250	Date: 10/2022
Drawn by: YA	Report No.: PE4822-2
Checked by: JD	Dwg. No.: PE4822-5
Approved by: MSD	Revision No.:

11x17

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BH2-SS8 7.62-8.23m 13-JAN-2020
VOCs and PHCs comply with the MECP Table 3 Standards

A

BH 1

150 LAURIER AVENUE WEST

BH 2

A'

ASPHALTIC CONCRETE

ASPHALTIC CONCRETE

FILL - SAND WITH GRAVEL

FILL - SAND WITH GRAVEL

SILTY CLAY

ELEV=61.83m
(AUGUST 31, 2022)

ELEV=58.65m
(AUGUST 31, 2022)

GLACIAL TILL

BEDROCK

ELEVATION (m)

70.0 69.0 68.0 67.0 66.0 65.0 64.0 63.0 62.0 61.0 60.0 59.0 58.0 57.0 56.0 55.0 54.0 53.0 52.0 51.0 50.0 49.0 48.0 47.0

0.0 2.0 4.0 6.0 8.0 10.0 12.0 14.0 16.0 18.0 20.0 22.0 24.0 26.0 28.0 30.0 32.0 34.0 36.0 38.0 40.0 42.0 44.0 46.0 48.0 50.0 52.0 54.0 56.0

HORIZONTAL DISTANCE (m)

SOIL RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 3 STANDARDS

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TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL

JADCO CORPORATION

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
150 AND 160 LAURIER AVENUE WEST
OTTAWA, ONTARIO

Title: CROSS SECTION A-A' - SOIL (PCBs, VOCs, PHCs)

Scale: AS SHOWN	Date: 10/2022
Drawn by: YA	Report No.: PE4822-2
Checked by: JD	Dwg. No.: PE4822-5A
Approved by: MSD	Revision No.:

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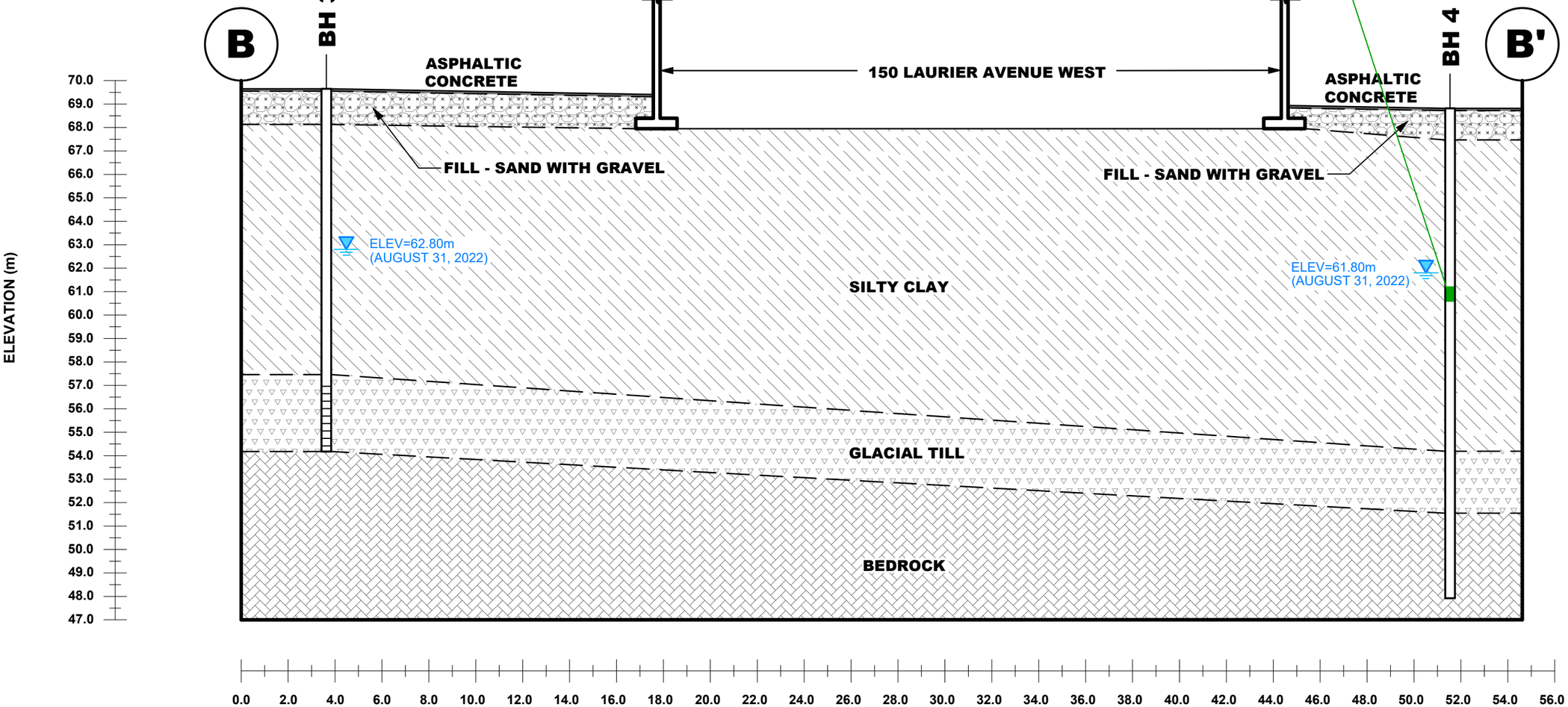
11x17

BH4-SS8	7.62-8.23m	15-JAN-2020
PCBs comply with the MECP Table 3 Standards		
BH4-SS8	7.62-8.23m	15-JAN-2020
VOCs and PHCs comply with the MECP Table 3 Standards		



SOIL RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 3 STANDARDS

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL

JADCO CORPORATION

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
150 AND 160 LAURIER AVENUE WEST

OTTAWA, ONTARIO

Title: CROSS SECTION B-B' - SOIL (PCBs, VOCs, PHCs)

Scale: AS SHOWN	Date: 10/2022
Drawn by: YA	Report No.: PE4822-2
Checked by: JD	Dwg. No.: PE4822-5B
Approved by: MSD	Revision No.:

11x17

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#161 LAURIER AVENUE WEST
COMMERCIAL OFFICE BUILDING

#141 LAURIER AVENUE WEST
COMMERCIAL OFFICE BUILDING

#66 SLATER STREET
COMMERCIAL OFFICE BUILDING

#100 ELGIN STREET
LORD ELGIN HOTEL

BH4-GW	9.14-12.19m	31-AUG-2022
Metals, CrVI and Mercury comply with the MECP Table 3 Standards		
BH4-GW	9.14-12.19 m	31-AUG-2022
PCBs comply with the MECP Table 3 Standards		
BH4-GW	9.14-12.19 m	31-AUG-2022
VOCs and PHCs comply with the MECP Table 3 Standards		
BH4-GW	9.14-12.19 m	31-AUG-2022
PAHs comply with the MECP Table 3 Standards		

LAURIER AVENUE WEST

FH-TBM

A

BH 1
69.49
[54.99]
(58.65)

HYDROVAULT FOOTPRINT

#150 LAURIER AVENUE WEST

B'

BH 4
68.82
[51.55]
{61.80}

ASPHALTIC CONCRETE
PARKING LOT

BH2-GW	9.04-12.11m	31-AUG-2022
Metals, CrVI and Mercury comply with the MECP Table 3 Standards		
BH2-GW	9.04-12.11m	31-AUG-2022
VOCs and PHCs comply with the MECP Table 3 Standards		
BH2-GW	9.04-12.11m	31-AUG-2022
PAHS comply with the MECP Table 3 Standards		

#140 LAURIER AVENUE WEST
FIRST BAPTIST CHURCH

#162 LAURIER AVENUE WEST
COMMERCIAL OFFICE BUILDING

#160 LAURIER AVENUE WEST
PARKING LOT

A/C UNIT

PENTHOUSE
MECHANICAL ROOM

B

BH 3
69.65
{62.80}

DIESEL
ABOVEGROUND
STORAGE TANK

BH 2
69.07
[51.49]
{61.83}

A'

MECHANICAL
EQUIPMENT

BH3-GW	12.47-15.47m	31-AUG-2022
Metals, CrVI and Mercury comply with the MECP Table 3 Standards		
BH3-GW	12.47-15.47 m	31-AUG-2022
VOCs and PHCs comply with the MECP Table 3 Standards		
DUP (BH3)	12.47-15.47 m	31-AUG-2022
VOCs comply with the MECP Table 3 Standards		
BH3-GW	12.47-15.47m	31-AUG-2022
PAHs comply with the MECP Table 3 Standards		

#31 GLOUCESTER STREET
COMMERCIAL OFFICE BUILDING

LEGEND:

GROUNDWATER RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

GROUNDWATER RESULT EXCEEDS MECP TABLE 3 STANDARDS

- BOREHOLE WITH MONITORING WELL LOCATION (DEEP WELL)
- BOREHOLE WITH MONITORING WELL LOCATION
- 69.49 — GROUND SURFACE ELEVATION (m)
- [54.99] — BEDROCK SURFACE ELEVATION (m)
- (58.65) — GROUNDWATER SURFACE ELEVATION (m) (DEEP WELL - AUGUST 31, 2022)
- {61.83} — GROUNDWATER SURFACE ELEVATION (m) (AUGUST 31, 2022)
- A–A' — CROSS SECTION

TBM- TOP SPINDLE OF FIRE HYDRANT LOCATED ON LAURIER AVENUE WEST. GEODETIC ELEVATION = 69.88 m

SCALE: 1:250

0 1 2 3 4 5 10 15m

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL

JADCO CORPORATION

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
150 AND 160 LAURIER AVENUE WEST

OTTAWA, ONTARIO

Title: **ANALYTICAL TESTING PLAN - GROUNDWATER (METALS, CrVI, MERCURY, PCBs, VOCs, PHCs, PAHs)**

Scale: 1:250	Date: 10/2022
Drawn by: YA	Report No.: PE4822-2
Checked by: JD	Dwg. No.: PE4822-6
Approved by: MSD	Revision No.:

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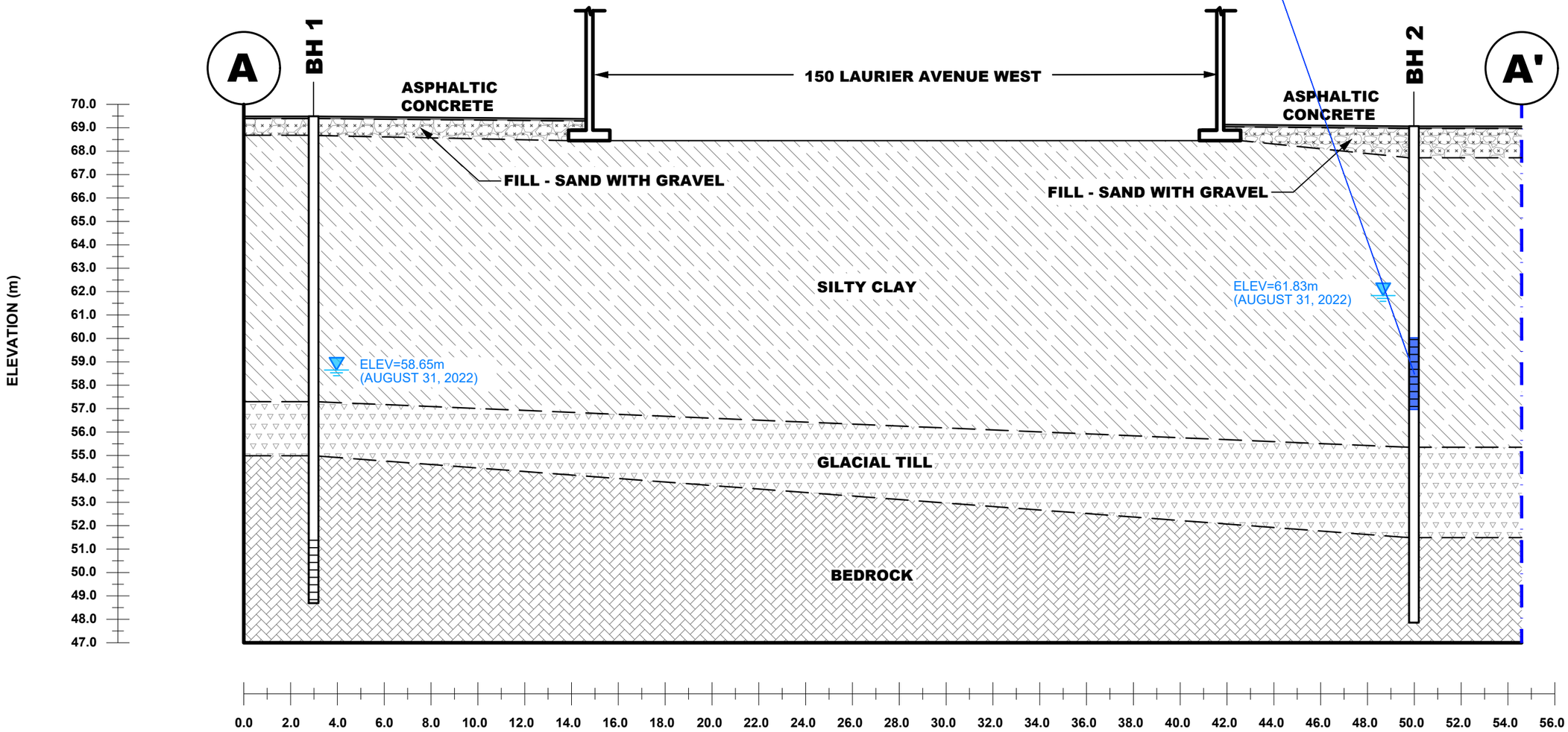
BH2-GW	9.04-12.11m	31-AUG-2022
Metals, CrVI and Mercury comply with the MECP Table 3 Standards		
BH2-GW	9.04-12.11m	31-AUG-2022
VOCs and PHCs comply with the MECP Table 3 Standards		
BH2-GW	9.04-12.11m	31-AUG-2022
PAHS comply with the MECP Table 3 Standards		



GROUNDWATER RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

GROUNDWATER RESULT EXCEEDS MECP TABLE 3 STANDARDS

PATERSON GROUP
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OTTAWA, ON
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NO.	REVISIONS	DATE	INITIAL

JADCO CORPORATION

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
150 AND 160 LAURIER AVENUE WEST

OTTAWA, ONTARIO

Title: CROSS SECTION A-A' - GROUNDWATER (METALS, CrVI, MERCURY, PCBs, VOCs, PHCs, PAHs)

Scale: AS SHOWN	Date: 10/2022
Drawn by: YA	Report No.: PE4822-2
Checked by: JD	Dwg. No.: PE4822-6A
Approved by: MSD	Revision No.:

11x17

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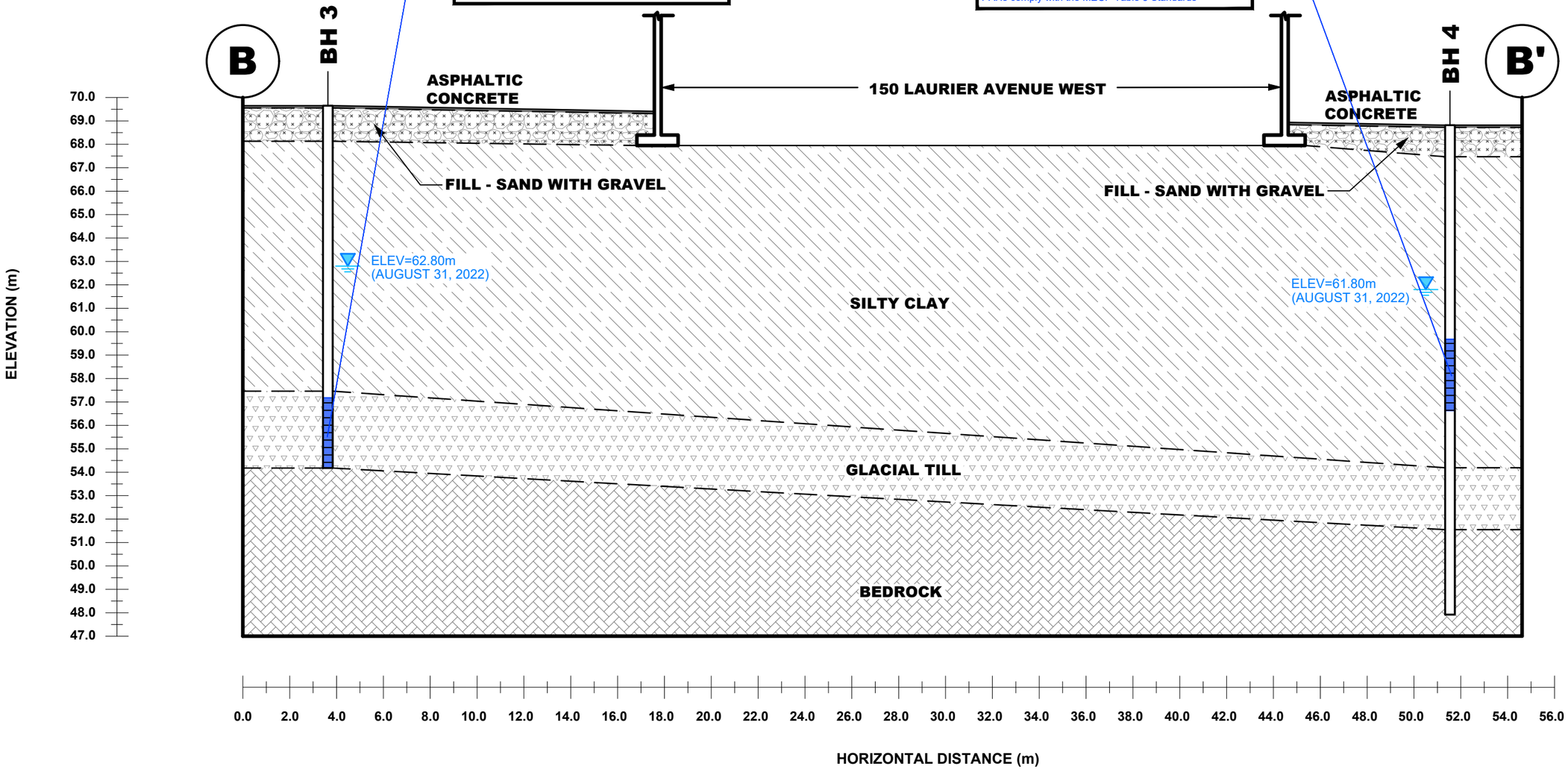
BH3-GW	12.47-15.47m	31-AUG-2022
Metals, CrVI and Mercury comply with the MECP Table 3 Standards		
BH3-GW	12.47-15.47 m	31-AUG-2022
VOCs and PHCs comply with the MECP Table 3 Standards		
DUP (BH3)	12.47-15.47 m	31-AUG-2022
VOCs comply with the MECP Table 3 Standards		
BH3-GW	12.47-15.47m	31-AUG-2022
PAHs comply with the MECP Table 3 Standards		

BH4-GW	9.14-12.19m	31-AUG-2022
Metals, CrVI and Mercury comply with the MECP Table 3 Standards		
BH4-GW	9.14-12.19 m	31-AUG-2022
PCBs comply with the MECP Table 3 Standards		
BH4-GW	9.14-12.19 m	31-AUG-2022
VOCs and PHCs comply with the MECP Table 3 Standards		
BH4-GW	9.14-12.19 m	31-AUG-2022
PAHs comply with the MECP Table 3 Standards		



GROUNDWATER RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

GROUNDWATER RESULT EXCEEDS MECP TABLE 3 STANDARDS

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL

JADCO CORPORATION

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
150 AND 160 LAURIER AVENUE WEST
OTTAWA, ONTARIO

Title: CROSS SECTION B-B' - GROUNDWATER (METALS, CrVI, MERCURY, PCBs, VOCs, PHCs, PAHs)

Scale: AS SHOWN	Date: 10/2022
Drawn by: YA	Report No.: PE4822-2
Checked by: JD	Dwg. No.: PE4822-6B
Approved by: MSD	Revision No.:

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APPENDIX 1

SAMPLING AND ANALYSIS PLAN

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

LABORATORY CERTIFICATES OF ANALYSIS

PATERSON GROUP

Sampling and Analysis

150 and 160 Laurier Avenue West
Ottawa, Ontario

Prepared for JADCO Corporation

Report: PE4822-SAP
January 9, 2020

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 TO SAMPLING & ANALYSIS PLAN 10

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by JADCO Corporation, to conduct a Phase II – Environmental Site Assessment (Phase II ESA) at 150 and 160 Laurier Avenue West, in the City of Ottawa, Ontario.

Based on the findings of the Phase I ESA, the following subsurface investigation program was developed.

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1	Placed on the northwest portion of the Phase II property to assess for potential soil and groundwater impacts resulting from the potential fill material of unknown quality, hydro vault along the northern portion of the building.	5-7 m; Drill to intercept water table for monitoring well installation. Core bedrock if there is no evidence of water in the overburden.
BH2	Placed on the southeast portion of the Phase II property to assess for potential soil and groundwater impacts from the potential fill material of unknown quality, presence of an above ground storage tank located at the southeast corner of the property and an off-site garage to the south.	5-7 m; Drill to intercept water table for monitoring well installation. Core bedrock if there is no evidence of water in the overburden.
BH3	Placed on the southwest portion of the Phase II property to assess for potential soil and groundwater impacts resulting from the potential fill material of unknown quality.	5-7 m; Drill to intercept water table for monitoring well installation. Core bedrock if there is no evidence of water in the overburden.
BH4	Placed on the northeast portion of the Phase II property to assess for potential soil and groundwater impacts resulting from the potential fill material of unknown quality, hydro vault along the northern portion of the building.	5-7 m; Drill to intercept water table for monitoring well installation. Core bedrock if there is no evidence of water in the overburden.

Borehole locations are shown on Drawing PE4822-3 – Test Hole Location Plan, appended to the main report.

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 all boreholes for the collection of groundwater samples.

2.0 ANALYTICAL TESTING PROGRAM

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

- ❒ At least one sample from each borehole should be submitted, in order to delineate the horizontal extent of contamination across the site.
- ❒ At least one sample from each stratigraphic unit should be submitted, in order to delineate the vertical extent of contamination at the site.
- ❒ In boreholes where there is visual or olfactory evidence of contamination, or where organic vapour meter or photoionization detector readings indicate the presence of contamination, the 'worst-case' sample from each borehole should be submitted for comparison with 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_1, 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 TO SAMPLING & ANALYSIS PLAN

Physical impediments to the Sampling and Analysis plan may include:

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

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

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9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
150 Laurier Avenue West
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4822

REMARKS

HOLE NO. BH 1

BORINGS BY CME-55 Low Clearance Drill **DATE** January 9, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	69.49
Asphaltic concrete 0.10		AU	1				
FILL: Brown silty sand with gravel 0.81		SS	2	54	14	1	68.49
		SS	3	62	12	2	67.49
		SS	4	100	P	3	66.49
Very stiff to stiff, brown **SILTY CLAY**						4	65.49
		SS	5	100	P	5	64.49
- grey by 4.6m depth						6	63.49
		SS	6	100	P	7	62.49
		SS	7	100	P	8	61.49
		SS	8	100	P	9	60.49
		SS	9	100	P	10	59.49
						11	58.49
12.19						12	57.49
GLACIAL TILL: Grey silty clay with gravel, cobbles and boulders, trace sand		SS	10	100	3	13	56.49
		SS	11	100	5	14	55.49
14.50		RC	1	100	53	15	54.49
		RC	2	100	15	16	53.49
BEDROCK: Fair quality, black shale		RC	3	100	68	17	52.49
		RC	4	100	77	18	51.49
						19	50.49
		RC	5	88	54	20	49.49
20.80							
End of Borehole							
(GWL @ 10.84 - August 31, 2022)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
150 Laurier Avenue West
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4822

REMARKS

HOLE NO. BH 2

BORINGS BY CME-55 Low Clearance Drill **DATE** January 14, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	69.07
Asphaltic concrete 0.10		AU	1				
FILL: Brown silty sand with gravel and clay 1.35		SS	2	54	19	1	68.07
		SS	3	58	10	2	67.07
		SS	4	50	4		
Stiff, brown **SILTY CLAY**		SS	5	100	P	3	66.07
						4	65.07
- grey by 3.0m depth		SS	6	100	P	5	64.07
		SS	7	100	P	6	63.07
						7	62.07
		SS	8	100	P	8	61.07
		SS	9	42	P	9	60.07
						10	59.07
		SS	10	62	P	11	58.07
		SS	11	100	P	12	57.07
13.72						13	56.07
GLACIAL TILL: Grey clayey silt with gravel, cobbles and boulders		SS	12	100	P	14	55.07
15.24						15	54.07
GLACIAL TILL: Grey silty sand with gravel, cobbles and boulders, some clay		SS	13	21	3	16	53.07
		SS	14	0	5	17	52.07
17.58		RC	1	100	0	18	51.07
BEDROCK: Very poor to poor quality, grey shale		RC	2	100	27	19	50.07
						20	49.07
		RC	3	100	41	21	48.07
21.21							
End of Borehole							
(GWL @ 7.24 - August 31, 2022)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
150 Laurier Avenue West
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4822

REMARKS

HOLE NO. BH 3

BORINGS BY CME-55 Low Clearance Drill **DATE** January 9, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
Asphaltic concrete 0.13		AU	1			0	69.65
FILL: Brown silty sand with gravel, trace clay 1.52		SS	2	17	12	1	68.65
		SS	3	100	13	2	67.65
		SS	4	100	6	3	66.65
Very stiff to stiff, brown **SILTY CLAY**		SS	5	100	P	4	65.65
- grey by 3.0m depth		SS	6	100	P	5	64.65
		SS	7	100	P	6	63.65
		SS	8	100	P	7	62.65
		SS	9	71	P	8	61.65
		SS	10	100	P	9	60.65
12.19						10	59.65
GLACIAL TILL: Grey silty clay to clayey silt with sand, gravel, cobbles and boulders		SS	11	83	10	11	58.65
13.72		SS	12	75	3	12	57.65
GLACIAL TILL: Grey silty sand with clay, gravel, cobbles and boulders		SS	13	58	53	13	56.65
15.47		SS	14	89	50+	14	55.65
End of Borehole						15	54.65
Practical refusal to augering at 15.47m depth							
(GWL @ 6.85 - August 31, 2022)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

Monitoring Well Construction

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
150 Laurier Avenue West
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4822

REMARKS

HOLE NO. BH 4

BORINGS BY CME-55 Low Clearance Drill **DATE** January 15, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	68.82
Asphaltic concrete 0.10		AU	1				
FILL: Brown silty sand with gravel, some clay and concrete debris 1.35		SS	2	50	9	1	67.82
		SS	3	100	5	2	66.82
		SS	4	8	4		
Stiff, brown **SILTY CLAY**		SS	5	100	P	3	65.82
						4	64.82
- grey by 3.0m depth		SS	6	58	P	5	63.82
		SS	7	71	P	6	62.82
						7	61.82
		SS	8	100	P	8	60.82
						9	59.82
						10	58.82
						11	57.82
						12	56.82
						13	55.82
14.63						14	54.82
GLACIAL TILL: Grey silty sand with gravel, cobbles and boulders, some clay		SS	9	25	24	15	53.82
						16	52.82
17.27		SS	10	29	24	17	51.82
		RC	1	100	84		
						18	50.82
BEDROCK: Good to fair quality, black shale		RC	2	96	91	19	49.82
		RC	3	100	68	20	48.82
20.90							
End of Borehole							
(GWL @ 7.02 - August 31, 2022)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

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

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

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

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

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

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

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

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

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

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

CONSOLIDATION TEST

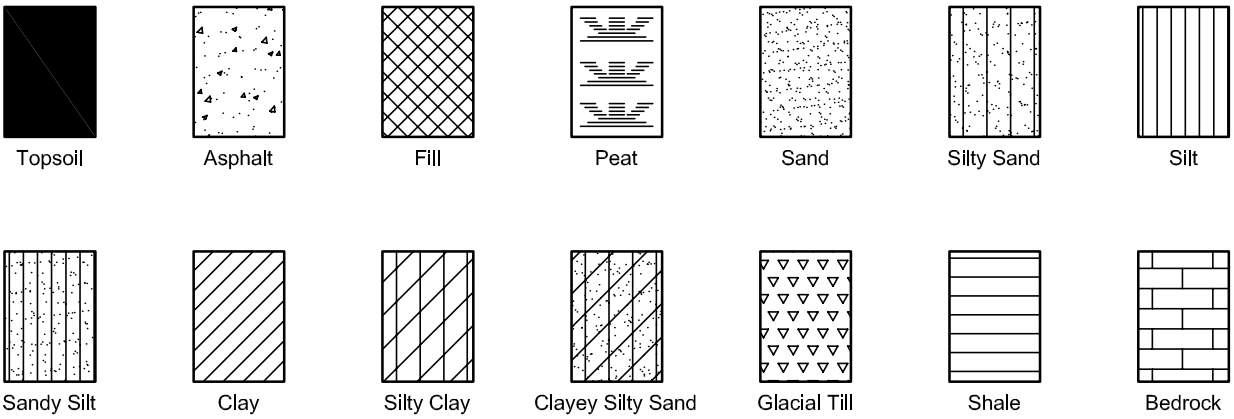
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

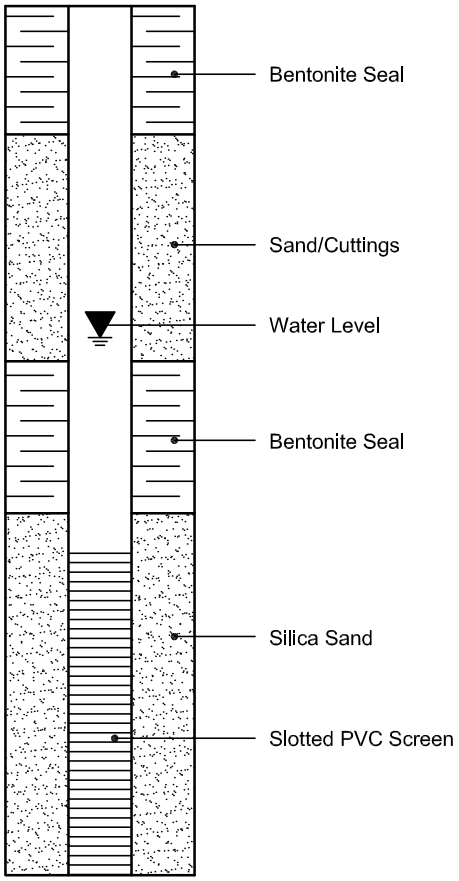
SYMBOLS AND TERMS (continued)

STRATA PLOT

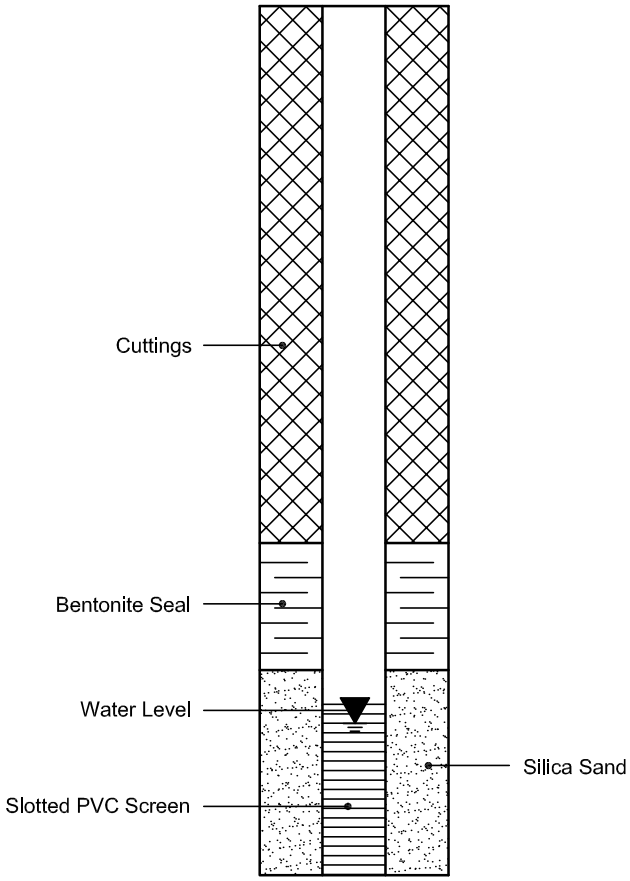


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



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Paterson Group Consulting Engineers

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Nepean, ON K2E 7J5
Attn: Mark D'Arcy

Client PO: 28474
Project: PE4822
Custody: 125917

Report Date: 27-Jan-2020
Order Date: 22-Jan-2020

Order #: 2004395

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

Paracel ID	Client ID
2004395-01	BH1-AU1
2004395-02	BH2-SS2
2004395-03	BH2-SS8
2004395-04	BH3-AU1
2004395-05	BH3-SS7
2004395-06	BH4-SS2
2004395-07	BH4-SS8

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
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Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	23-Jan-20	24-Jan-20
Mercury by CVAA	EPA 7471B - CVAA, digestion	24-Jan-20	24-Jan-20
PCBs, total	SW846 8082A - GC-ECD	21-Jan-20	24-Jan-20
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	23-Jan-20	23-Jan-20
PHC F1	CWS Tier 1 - P&T GC-FID	24-Jan-20	25-Jan-20
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	23-Jan-20	24-Jan-20
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	24-Jan-20	24-Jan-20
REG 153: VOCs by P&T GC/MS	EPA 8260 - P&T GC-MS	24-Jan-20	25-Jan-20
Solids, %	Gravimetric, calculation	23-Jan-20	25-Jan-20

Certificate of Analysis

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Client PO: 28474

Report Date: 27-Jan-2020

Order Date: 22-Jan-2020

Project Description: PE4822

	Client ID:	BH1-AU1	BH2-SS2	BH2-SS8	BH3-AU1
	Sample Date:	09-Jan-20 09:00	13-Jan-20 09:00	13-Jan-20 09:00	09-Jan-20 09:00
	Sample ID:	2004395-01	2004395-02	2004395-03	2004395-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	93.1	76.6	59.6	94.3
General Inorganics					
pH	0.05 pH Units	-	8.03	-	-
Metals					
Antimony	1.0 ug/g dry	1.4	<1.0	-	<1.0
Arsenic	1.0 ug/g dry	8.1	3.3	-	3.6
Barium	1.0 ug/g dry	140	362	-	46.5
Beryllium	0.5 ug/g dry	<0.5	0.6	-	<0.5
Boron	5.0 ug/g dry	18.1	5.8	-	5.7
Cadmium	0.5 ug/g dry	<0.5	<0.5	-	<0.5
Chromium	5.0 ug/g dry	19.5	93.4	-	16.9
Chromium (VI)	0.2 ug/g dry	<0.2	0.7	-	<0.2
Cobalt	1.0 ug/g dry	4.5	18.0	-	5.1
Copper	5.0 ug/g dry	43.4	44.9	-	11.6
Lead	1.0 ug/g dry	277	30.3	-	41.6
Mercury	0.1 ug/g dry	<0.1	0.8	-	<0.1
Molybdenum	1.0 ug/g dry	1.5	<1.0	-	1.8
Nickel	5.0 ug/g dry	13.1	51.1	-	36.9
Selenium	1.0 ug/g dry	<1.0	<1.0	-	<1.0
Silver	0.3 ug/g dry	0.4	<0.3	-	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	-	<1.0
Uranium	1.0 ug/g dry	<1.0	<1.0	-	<1.0
Vanadium	10.0 ug/g dry	18.2	88.8	-	18.6
Zinc	20.0 ug/g dry	77.5	120	-	30.6
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	-

Certificate of Analysis

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Order Date: 22-Jan-2020

Project Description: PE4822

	Client ID:	BH1-AU1	BH2-SS2	BH2-SS8	BH3-AU1
	Sample Date:	09-Jan-20 09:00	13-Jan-20 09:00	13-Jan-20 09:00	09-Jan-20 09:00
	Sample ID:	2004395-01	2004395-02	2004395-03	2004395-04
	MDL/Units	Soil	Soil	Soil	Soil
1,2-Dichlorobenzene	0.05 ug/g dry	-	-	<0.05	-
1,3-Dichlorobenzene	0.05 ug/g dry	-	-	<0.05	-
1,4-Dichlorobenzene	0.05 ug/g dry	-	-	<0.05	-
1,1-Dichloroethane	0.05 ug/g dry	-	-	<0.05	-
1,2-Dichloroethane	0.05 ug/g dry	-	-	<0.05	-
1,1-Dichloroethylene	0.05 ug/g dry	-	-	<0.05	-
cis-1,2-Dichloroethylene	0.05 ug/g dry	-	-	<0.05	-
trans-1,2-Dichloroethylene	0.05 ug/g dry	-	-	<0.05	-
1,2-Dichloropropane	0.05 ug/g dry	-	-	<0.05	-
cis-1,3-Dichloropropylene	0.05 ug/g dry	-	-	<0.05	-
trans-1,3-Dichloropropylene	0.05 ug/g dry	-	-	<0.05	-
1,3-Dichloropropene, total	0.05 ug/g dry	-	-	<0.05	-
Ethylbenzene	0.05 ug/g dry	-	-	<0.05	-
Ethylene dibromide (dibromoethan	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	-
1,1,2,2-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	-	-	111%	-
Dibromofluoromethane	Surrogate	-	-	71.3%	-
Toluene-d8	Surrogate	-	-	123%	-

Hydrocarbons

Certificate of Analysis

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Order Date: 22-Jan-2020

Project Description: PE4822

	Client ID:	BH1-AU1	BH2-SS2	BH2-SS8	BH3-AU1
	Sample Date:	09-Jan-20 09:00	13-Jan-20 09:00	13-Jan-20 09:00	09-Jan-20 09:00
	Sample ID:	2004395-01	2004395-02	2004395-03	2004395-04
	MDL/Units	Soil	Soil	Soil	Soil
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

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Order Date: 22-Jan-2020

Project Description: PE4822

	Client ID:	BH3-SS7	BH4-SS2	BH4-SS8	-
	Sample Date:	09-Jan-20 09:00	15-Jan-20 09:00	15-Jan-20 09:00	-
	Sample ID:	2004395-05	2004395-06	2004395-07	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	57.3	87.8	59.4	-
General Inorganics					
pH	0.05 pH Units	8.50	-	-	-
Metals					
Antimony	1.0 ug/g dry	-	<1.0	-	-
Arsenic	1.0 ug/g dry	-	2.8	-	-
Barium	1.0 ug/g dry	-	171	-	-
Beryllium	0.5 ug/g dry	-	<0.5	-	-
Boron	5.0 ug/g dry	-	<5.0	-	-
Cadmium	0.5 ug/g dry	-	0.7	-	-
Chromium	5.0 ug/g dry	-	23.5	-	-
Chromium (VI)	0.2 ug/g dry	-	0.3	-	-
Cobalt	1.0 ug/g dry	-	6.4	-	-
Copper	5.0 ug/g dry	-	19.7	-	-
Lead	1.0 ug/g dry	-	161	-	-
Mercury	0.1 ug/g dry	-	6.0	-	-
Molybdenum	1.0 ug/g dry	-	<1.0	-	-
Nickel	5.0 ug/g dry	-	14.5	-	-
Selenium	1.0 ug/g dry	-	<1.0	-	-
Silver	0.3 ug/g dry	-	0.9	-	-
Thallium	1.0 ug/g dry	-	<1.0	-	-
Uranium	1.0 ug/g dry	-	<1.0	-	-
Vanadium	10.0 ug/g dry	-	29.6	-	-
Zinc	20.0 ug/g dry	-	84.1	-	-
Volatiles					
Acetone	0.50 ug/g dry	<0.50	-	<0.50	-
Benzene	0.02 ug/g dry	<0.02	-	<0.02	-
Bromodichloromethane	0.05 ug/g dry	<0.05	-	<0.05	-
Bromoform	0.05 ug/g dry	<0.05	-	<0.05	-
Bromomethane	0.05 ug/g dry	<0.05	-	<0.05	-
Carbon Tetrachloride	0.05 ug/g dry	<0.05	-	<0.05	-
Chlorobenzene	0.05 ug/g dry	<0.05	-	<0.05	-
Chloroform	0.05 ug/g dry	<0.05	-	<0.05	-
Dibromochloromethane	0.05 ug/g dry	<0.05	-	<0.05	-
Dichlorodifluoromethane	0.05 ug/g dry	<0.05	-	<0.05	-

Certificate of Analysis

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Report Date: 27-Jan-2020

Order Date: 22-Jan-2020

Project Description: PE4822

	Client ID:	BH3-SS7	BH4-SS2	BH4-SS8	-
	Sample Date:	09-Jan-20 09:00	15-Jan-20 09:00	15-Jan-20 09:00	-
	Sample ID:	2004395-05	2004395-06	2004395-07	-
	MDL/Units	Soil	Soil	Soil	-
1,2-Dichlorobenzene	0.05 ug/g dry	<0.05	-	<0.05	-
1,3-Dichlorobenzene	0.05 ug/g dry	<0.05	-	<0.05	-
1,4-Dichlorobenzene	0.05 ug/g dry	<0.05	-	<0.05	-
1,1-Dichloroethane	0.05 ug/g dry	<0.05	-	<0.05	-
1,2-Dichloroethane	0.05 ug/g dry	<0.05	-	<0.05	-
1,1-Dichloroethylene	0.05 ug/g dry	<0.05	-	<0.05	-
cis-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	-	<0.05	-
trans-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	-	<0.05	-
1,2-Dichloropropane	0.05 ug/g dry	<0.05	-	<0.05	-
cis-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	-	<0.05	-
trans-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	-	<0.05	-
1,3-Dichloropropene, total	0.05 ug/g dry	<0.05	-	<0.05	-
Ethylbenzene	0.05 ug/g dry	<0.05	-	<0.05	-
Ethylene dibromide (dibromoethar	0.05 ug/g dry	<0.05	-	<0.05	-
Hexane	0.05 ug/g dry	<0.05	-	<0.05	-
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	<0.50	-	<0.50	-
Methyl Isobutyl Ketone	0.50 ug/g dry	<0.50	-	<0.50	-
Methyl tert-butyl ether	0.05 ug/g dry	<0.05	-	<0.05	-
Methylene Chloride	0.05 ug/g dry	<0.05	-	<0.05	-
Styrene	0.05 ug/g dry	<0.05	-	<0.05	-
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	<0.05	-	<0.05	-
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	<0.05	-	<0.05	-
Tetrachloroethylene	0.05 ug/g dry	<0.05	-	<0.05	-
Toluene	0.05 ug/g dry	<0.05	-	<0.05	-
1,1,1-Trichloroethane	0.05 ug/g dry	<0.05	-	<0.05	-
1,1,2-Trichloroethane	0.05 ug/g dry	<0.05	-	<0.05	-
Trichloroethylene	0.05 ug/g dry	<0.05	-	<0.05	-
Trichlorofluoromethane	0.05 ug/g dry	<0.05	-	<0.05	-
Vinyl chloride	0.02 ug/g dry	<0.02	-	<0.02	-
m,p-Xylenes	0.05 ug/g dry	<0.05	-	<0.05	-
o-Xylene	0.05 ug/g dry	<0.05	-	<0.05	-
Xylenes, total	0.05 ug/g dry	<0.05	-	<0.05	-
4-Bromofluorobenzene	Surrogate	115%	-	115%	-
Dibromofluoromethane	Surrogate	71.0%	-	73.2%	-
Toluene-d8	Surrogate	126%	-	126%	-

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	Client ID:	BH3-SS7	BH4-SS2	BH4-SS8	-
	Sample Date:	09-Jan-20 09:00	15-Jan-20 09:00	15-Jan-20 09:00	-
	Sample ID:	2004395-05	2004395-06	2004395-07	-
	MDL/Units	Soil	Soil	Soil	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	-	<7	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	-	<4	-
F3 PHCs (C16-C34)	8 ug/g dry	<8	-	<8	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	-	<6	-
PCBs					
PCBs, total	0.05 ug/g dry	-	-	<0.05	-
Decachlorobiphenyl	Surrogate	-	-	117%	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	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						
PCBs									
PCBs, total	ND	0.05	ug/g						
Surrogate: Decachlorobiphenyl	*0.108*		*ug/g*		*108*	*60-140*			
Volatiles									
Acetone	ND	0.50	ug/g						
Benzene	ND	0.02	ug/g						
Bromodichloromethane	ND	0.05	ug/g						
Bromoform	ND	0.05	ug/g						
Bromomethane	ND	0.05	ug/g						
Carbon Tetrachloride	ND	0.05	ug/g						
Chlorobenzene	ND	0.05	ug/g						
Chloroform	ND	0.05	ug/g						
Dibromochloromethane	ND	0.05	ug/g						
Dichlorodifluoromethane	ND	0.05	ug/g						
1,2-Dichlorobenzene	ND	0.05	ug/g						
1,3-Dichlorobenzene	ND	0.05	ug/g						
1,4-Dichlorobenzene	ND	0.05	ug/g						
1,1-Dichloroethane	ND	0.05	ug/g						
1,2-Dichloroethane	ND	0.05	ug/g						
1,1-Dichloroethylene	ND	0.05	ug/g						
cis-1,2-Dichloroethylene	ND	0.05	ug/g						
trans-1,2-Dichloroethylene	ND	0.05	ug/g						
1,2-Dichloropropane	ND	0.05	ug/g						
cis-1,3-Dichloropropylene	ND	0.05	ug/g						
trans-1,3-Dichloropropylene	ND	0.05	ug/g						
1,3-Dichloropropene, total	ND	0.05	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Ethylene dibromide (dibromoethane	ND	0.05	ug/g						
Hexane	ND	0.05	ug/g						
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g						
Methyl Isobutyl Ketone	ND	0.50	ug/g						
Methyl tert-butyl ether	ND	0.05	ug/g						
Methylene Chloride	ND	0.05	ug/g						

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Styrene	ND	0.05	ug/g						
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g						
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g						
Tetrachloroethylene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
1,1,1-Trichloroethane	ND	0.05	ug/g						
1,1,2-Trichloroethane	ND	0.05	ug/g						
Trichloroethylene	ND	0.05	ug/g						
Trichlorofluoromethane	ND	0.05	ug/g						
Vinyl chloride	ND	0.02	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: 4-Bromofluorobenzene	*3.52*		*ug/g*		*110*	*50-140*			
Surrogate: Dibromofluoromethane	*2.17*		*ug/g*		*68.0*	*50-140*			
Surrogate: Toluene-d8	*3.88*		*ug/g*		*121*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
pH	7.29	0.05	pH Units	7.26			0.4	2.3	
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND				30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND				30	
Metals									
Antimony	1.3	1.0	ug/g dry	ND			0.0	30	
Arsenic	2.4	1.0	ug/g dry	2.4			0.0	30	
Barium	38.4	1.0	ug/g dry	34.3			11.2	30	
Beryllium	ND	0.5	ug/g dry	ND			0.0	30	
Boron	5.6	5.0	ug/g dry	ND			0.0	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	12.9	5.0	ug/g dry	12.5			3.4	30	
Cobalt	3.4	1.0	ug/g dry	3.2			4.9	30	
Copper	13.6	5.0	ug/g dry	12.1			11.7	30	
Lead	18.4	1.0	ug/g dry	16.9			8.3	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	30	
Molybdenum	ND	1.0	ug/g dry	ND			0.0	30	
Nickel	7.7	5.0	ug/g dry	7.4			3.3	30	
Selenium	ND	1.0	ug/g dry	ND			0.0	30	
Silver	0.3	0.3	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			0.0	30	
Vanadium	17.3	10.0	ug/g dry	17.6			1.3	30	
Zinc	39.2	20.0	ug/g dry	35.1			11.0	30	
PCBs									
PCBs, total	ND	0.05	ug/g dry	ND				40	
Surrogate: Decachlorobiphenyl	*0.149*		*ug/g dry*		*122*	*60-140*			
Physical Characteristics									
% Solids	86.7	0.1	% by Wt.	86.6			0.1	25	
Volatiles									
Acetone	ND	0.50	ug/g dry	ND				50	
Benzene	ND	0.02	ug/g dry	ND				50	
Bromodichloromethane	ND	0.05	ug/g dry	ND				50	
Bromoform	ND	0.05	ug/g dry	ND				50	
Bromomethane	ND	0.05	ug/g dry	ND				50	
Carbon Tetrachloride	ND	0.05	ug/g dry	ND				50	
Chlorobenzene	ND	0.05	ug/g dry	ND				50	
Chloroform	ND	0.05	ug/g dry	ND				50	
Dibromochloromethane	ND	0.05	ug/g dry	ND				50	
Dichlorodifluoromethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,3-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,4-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
cis-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
trans-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
1,2-Dichloropropane	ND	0.05	ug/g dry	ND				50	
cis-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
trans-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Ethylene dibromide (dibromoethane	ND	0.05	ug/g dry	ND				50	
Hexane	ND	0.05	ug/g dry	ND				50	
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g dry	ND				50	
Methyl Isobutyl Ketone	ND	0.50	ug/g dry	ND				50	
Methyl tert-butyl ether	ND	0.05	ug/g dry	ND				50	
Methylene Chloride	ND	0.05	ug/g dry	ND				50	
Styrene	ND	0.05	ug/g dry	ND				50	
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
Tetrachloroethylene	ND	0.05	ug/g dry	ND				50	
Toluene	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	*4.21*		*ug/g dry*		*111*	*50-140*			
Surrogate: Dibromofluoromethane	*2.52*		*ug/g dry*		*66.5*	*50-140*			
Surrogate: Toluene-d8	*4.79*		*ug/g dry*		*126*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	175	7	ug/g		87.3	80-120			
F2 PHCs (C10-C16)	81	4	ug/g	ND	81.3	60-140			
F3 PHCs (C16-C34)	213	8	ug/g	ND	87.8	60-140			
F4 PHCs (C34-C50)	121	6	ug/g	ND	79.0	60-140			
Metals									
Antimony	39.3		ug/L	ND	78.4	70-130			
Arsenic	51.2		ug/L	1.0	101	70-130			
Barium	60.8		ug/L	13.7	94.2	70-130			
Beryllium	46.2		ug/L	ND	92.3	70-130			
Boron	44.6		ug/L	ND	85.5	70-130			
Cadmium	45.4		ug/L	ND	90.8	70-130			
Chromium (VI)	1.6	0.2	ug/g	ND	27.5	70-130			QM-05
Chromium	56.0		ug/L	5.0	102	70-130			
Cobalt	51.6		ug/L	1.3	101	70-130			
Copper	53.8		ug/L	ND	97.8	70-130			
Lead	53.4		ug/L	6.8	93.3	70-130			
Mercury	1.65	0.1	ug/g	ND	110	70-130			
Molybdenum	48.1		ug/L	ND	96.0	70-130			
Nickel	51.5		ug/L	ND	97.0	70-130			
Selenium	47.6		ug/L	ND	95.0	70-130			
Silver	44.0		ug/L	ND	87.8	70-130			
Thallium	46.5		ug/L	ND	93.0	70-130			
Uranium	48.4		ug/L	ND	96.4	70-130			
Vanadium	57.8		ug/L	ND	102	70-130			
Zinc	60.8		ug/L	ND	93.6	70-130			
PCBs									
PCBs, total	0.475	0.05	ug/g	ND	97.0	60-140			
Surrogate: Decachlorobiphenyl	*0.156*		*ug/g*		*127*	*60-140*			
Volatiles									
Acetone	7.25	0.50	ug/g		72.5	50-140			
Benzene	2.44	0.02	ug/g		61.0	60-130			
Bromodichloromethane	2.70	0.05	ug/g		67.4	60-130			
Bromoform	3.80	0.05	ug/g		94.9	60-130			
Bromomethane	2.63	0.05	ug/g		65.8	50-140			
Carbon Tetrachloride	2.84	0.05	ug/g		71.0	60-130			
Chlorobenzene	3.62	0.05	ug/g		90.5	60-130			
Chloroform	2.70	0.05	ug/g		67.4	60-130			
Dibromochloromethane	3.91	0.05	ug/g		97.8	60-130			
Dichlorodifluoromethane	2.55	0.05	ug/g		63.7	50-140			
1,2-Dichlorobenzene	3.23	0.05	ug/g		80.6	60-130			
1,3-Dichlorobenzene	3.13	0.05	ug/g		78.2	60-130			
1,4-Dichlorobenzene	3.21	0.05	ug/g		80.4	60-130			
1,1-Dichloroethane	2.91	0.05	ug/g		72.8	60-130			
1,2-Dichloroethane	2.88	0.05	ug/g		72.1	60-130			
1,1-Dichloroethylene	2.62	0.05	ug/g		65.4	60-130			
cis-1,2-Dichloroethylene	2.54	0.05	ug/g		63.4	60-130			
trans-1,2-Dichloroethylene	4.95	0.05	ug/g		124	60-130			
1,2-Dichloropropane	2.70	0.05	ug/g		67.5	60-130			
cis-1,3-Dichloropropylene	2.51	0.05	ug/g		62.7	60-130			
trans-1,3-Dichloropropylene	2.46	0.05	ug/g		61.4	60-130			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Ethylbenzene	3.67	0.05	ug/g		91.8	60-130			
Ethylene dibromide (dibromoethane	3.62	0.05	ug/g		90.5	60-130			
Hexane	3.41	0.05	ug/g		85.4	60-130			
Methyl Ethyl Ketone (2-Butanone)	9.36	0.50	ug/g		93.6	50-140			
Methyl Isobutyl Ketone	6.03	0.50	ug/g		60.3	50-140			
Methyl tert-butyl ether	7.55	0.05	ug/g		75.5	50-140			
Methylene Chloride	3.04	0.05	ug/g		76.0	60-130			
Styrene	3.58	0.05	ug/g		89.5	60-130			
1,1,1,2-Tetrachloroethane	3.81	0.05	ug/g		95.2	60-130			
1,1,2,2-Tetrachloroethane	2.49	0.05	ug/g		62.3	60-130			
Tetrachloroethylene	3.37	0.05	ug/g		84.2	60-130			
Toluene	3.53	0.05	ug/g		88.2	60-130			
1,1,1-Trichloroethane	2.72	0.05	ug/g		68.0	60-130			
1,1,2-Trichloroethane	2.54	0.05	ug/g		63.5	60-130			
Trichloroethylene	3.05	0.05	ug/g		76.2	60-130			
Trichlorofluoromethane	2.95	0.05	ug/g		73.7	50-140			
Vinyl chloride	3.34	0.02	ug/g		83.4	50-140			
m,p-Xylenes	7.56	0.05	ug/g		94.5	60-130			
o-Xylene	3.88	0.05	ug/g		97.0	60-130			

Qualifier Notes:

QC Qualifiers :

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

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

PARACEL LABORATORIES LTD.

Paracel ID: 2004395

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2004395	Nº 125917

Client Name: Paterson Group	Project Ref: PE4822	Page 1 of 1
Contact Name: Mark D'Arcy	Quote #:	Turnaround Time
Address:	PO #: 28474	☐ 1 day ☐ 3 day
	E-mail:	☐ 2 day ☑ Regular
Telephone: 226-7381		Date Required:

Regulation 153/04: ☐ Table 1 ☑ Res/Park ☐ Med/Fine ☐ Table 2 ☐ Ind/Comm ☐ Coarse ☑ Table 3 ☐ Agri/Other ☐ Table — For RSC: ☐ Yes ☑ No

Other Regulation: ☑ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm Mun: ☐ Other:

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

Required Analysis

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs + PHCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	PH	PCB's				
1	BH1-AU1	S	-	1	Jan 9/20					✓	✓	✓					250		
2	BH2-SS2	S	-	1	Jan 13/20			✓		✓	✓	✓		✓			120		
3	BH2-SS8	S	-	2	"			✓		✓	✓	✓					120	1 vial	
4	BH3-AU1	S	-	1	Jan 9/20					✓	✓	✓					250		
5	BH3-SS7	S	-	2	"			✓						✓			120	1 vial	
6	BH4-SS2	S	-	1	Jan 15/20					✓	✓	✓					250		
7	BH4-SS8	S	-	2	"			✓							✓		120	1 vial	
8																			
9																			
10																			

Comments: Sample dates taken from containers. NO Reg. 558 for mark. [illegible]

Method of Delivery: Swift

Relinquished By (Sign):	Received By Driver/Depot: Tel 1262	Received at Lab:	Verified By:
Relinquished By (Print): Nic Doucette	Date/Time: 3:23	Date/Time: Jan 22/2020 3:55pm	Date/Time: 01/23/2020 9:52
Date/Time:	Temperature: °C	Temperature: 8.7 °C	pH Verified: ☐ By:

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Certificate of Analysis

Paterson Group Consulting Engineers

9 Auriga Drive
Ottawa, ON K2E 7T9
Attn: Mark D'Arcy

Client PO: 55701
Project: PE4822
Custody: 139367

Report Date: 9-Sep-2022
Order Date: 2-Sep-2022

Order #: 2236538

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

Paracel ID	Client ID
2236538-01	BH2-GW
2236538-02	BH3-GW
2236538-03	BH4-GW
2236538-04	DUP

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent - water	MOE E3056 - colourimetric	6-Sep-22	6-Sep-22
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	6-Sep-22	6-Sep-22
Metals, ICP-MS	EPA 200.8 - ICP-MS	6-Sep-22	6-Sep-22
PCBs, total	EPA 608 - GC-ECD	8-Sep-22	8-Sep-22
PHC F1	CWS Tier 1 - P&T GC-FID	6-Sep-22	6-Sep-22
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	8-Sep-22	8-Sep-22
REG 153: PAHs by GC-MS	EPA 625 - GC-MS, extraction	8-Sep-22	9-Sep-22
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	6-Sep-22	6-Sep-22

Certificate of Analysis

Report Date: 09-Sep-2022

Client: Paterson Group Consulting Engineers

Order Date: 2-Sep-2022

Client PO: 55701

Project Description: PE4822

	Client ID:	BH2-GW	BH3-GW	BH4-GW	DUP
	Sample Date:	31-Aug-22 09:00	31-Aug-22 09:00	31-Aug-22 09:00	31-Aug-22 09:00
	Sample ID:	2236538-01	2236538-02	2236538-03	2236538-04
	MDL/Units	Water	Water	Water	Water
Metals					
Mercury	0.1 ug/L	<0.1	<0.1	<0.1	-
Antimony	0.5 ug/L	<0.5	<0.5	0.6	-
Arsenic	1 ug/L	<1	6	<1	-
Barium	1 ug/L	20	24	9	-
Beryllium	0.5 ug/L	<0.5	<0.5	<0.5	-
Boron	10 ug/L	42	604	104	-
Cadmium	0.1 ug/L	<0.1	<0.1	<0.1	-
Chromium	1 ug/L	<1	<1	2	-
Chromium (VI)	10 ug/L	<10	<10	<10	-
Cobalt	0.5 ug/L	<0.5	<0.5	<0.5	-
Copper	0.5 ug/L	1.8	1.1	3.7	-
Lead	0.1 ug/L	0.4	<0.1	0.1	-
Molybdenum	0.5 ug/L	0.9	12.1	3.8	-
Nickel	1 ug/L	<1	2	<1	-
Selenium	1 ug/L	<1	<1	<1	-
Silver	0.1 ug/L	<0.1	<0.1	<0.1	-
Sodium	200 ug/L	20200	258000	102000	-
Thallium	0.1 ug/L	<0.1	<0.1	<0.1	-
Uranium	0.1 ug/L	0.1	0.5	1.1	-
Vanadium	0.5 ug/L	1.1	0.6	6.9	-
Zinc	5 ug/L	61	13	5	-
Volatiles					
Acetone	5.0 ug/L	16.3	<5.0	12.4	<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

Report Date: 09-Sep-2022

Client: Paterson Group Consulting Engineers

Order Date: 2-Sep-2022

Client PO: 55701

Project Description: PE4822

	Client ID:	BH2-GW	BH3-GW	BH4-GW	DUP
	Sample Date:	31-Aug-22 09:00	31-Aug-22 09:00	31-Aug-22 09:00	31-Aug-22 09:00
	Sample ID:	2236538-01	2236538-02	2236538-03	2236538-04
	MDL/Units	Water	Water	Water	Water
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	1.6	<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, 1,2-)	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
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	81.8%	81.8%	80.4%	80.4%
Dibromofluoromethane	Surrogate	94.5%	96.0%	95.1%	96.4%
Toluene-d8	Surrogate	111%	109%	110%	109%
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	-

Certificate of Analysis

Report Date: 09-Sep-2022

Client: Paterson Group Consulting Engineers

Order Date: 2-Sep-2022

Client PO: 55701

Project Description: PE4822

	Client ID:	BH2-GW	BH3-GW	BH4-GW	DUP
	Sample Date:	31-Aug-22 09:00	31-Aug-22 09:00	31-Aug-22 09:00	31-Aug-22 09:00
	Sample ID:	2236538-01	2236538-02	2236538-03	2236538-04
	MDL/Units	Water	Water	Water	Water
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	-
Semi-Volatiles					
Acenaphthene	0.05 ug/L	<0.05	<0.05	<0.05	-
Acenaphthylene	0.05 ug/L	<0.05	<0.05	<0.05	-
Anthracene	0.01 ug/L	<0.01	<0.01	<0.01	-
Benzo [a] anthracene	0.01 ug/L	<0.01	<0.01	<0.01	-
Benzo [a] pyrene	0.01 ug/L	<0.01	<0.01	<0.01	-
Benzo [b] fluoranthene	0.05 ug/L	<0.05	<0.05	<0.05	-
Benzo [g,h,i] perylene	0.05 ug/L	<0.05	<0.05	<0.05	-
Benzo [k] fluoranthene	0.05 ug/L	<0.05	<0.05	<0.05	-
Chrysene	0.05 ug/L	<0.05	<0.05	<0.05	-
Dibenzo [a,h] anthracene	0.05 ug/L	<0.05	<0.05	<0.05	-
Fluoranthene	0.01 ug/L	0.04	<0.01	<0.01	-
Fluorene	0.05 ug/L	<0.05	<0.05	<0.05	-
Indeno [1,2,3-cd] pyrene	0.05 ug/L	<0.05	<0.05	<0.05	-
1-Methylnaphthalene	0.05 ug/L	<0.05	<0.05	<0.05	-
2-Methylnaphthalene	0.05 ug/L	<0.05	<0.05	<0.05	-
Methylnaphthalene (1&2)	0.10 ug/L	<0.10	<0.10	<0.10	-
Naphthalene	0.05 ug/L	<0.05	<0.05	<0.05	-
Phenanthrene	0.05 ug/L	<0.05	<0.05	<0.05	-
Pyrene	0.01 ug/L	0.03	<0.01	<0.01	-
2-Fluorobiphenyl	Surrogate	90.7%	86.9%	80.4%	-
Terphenyl-d14	Surrogate	104%	100%	89.7%	-
PCBs					
PCBs, total	0.05 ug/L	-	-	<0.05	-
Decachlorobiphenyl	Surrogate	-	-	96.9%	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Metals									
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						
PCBs									
PCBs, total	ND	0.05	ug/L						
Surrogate: Decachlorobiphenyl	*0.390*		*ug/L*		*78.1*	*60-140*			
Semi-Volatiles									
Acenaphthene	ND	0.05	ug/L						
Acenaphthylene	ND	0.05	ug/L						
Anthracene	ND	0.01	ug/L						
Benzo [a] anthracene	ND	0.01	ug/L						
Benzo [a] pyrene	ND	0.01	ug/L						
Benzo [b] fluoranthene	ND	0.05	ug/L						
Benzo [g,h,i] perylene	ND	0.05	ug/L						
Benzo [k] fluoranthene	ND	0.05	ug/L						
Chrysene	ND	0.05	ug/L						
Dibenzo [a,h] anthracene	ND	0.05	ug/L						
Fluoranthene	ND	0.01	ug/L						
Fluorene	ND	0.05	ug/L						
Indeno [1,2,3-cd] pyrene	ND	0.05	ug/L						
1-Methylnaphthalene	ND	0.05	ug/L						
2-Methylnaphthalene	ND	0.05	ug/L						
Methylnaphthalene (1&2)	ND	0.10	ug/L						
Naphthalene	ND	0.05	ug/L						
Phenanthrene	ND	0.05	ug/L						
Pyrene	ND	0.01	ug/L						
Surrogate: 2-Fluorobiphenyl	*18.7*		*ug/L*		*93.6*	*50-140*			
Surrogate: Terphenyl-d14	*22.6*		*ug/L*		*113*	*50-140*			
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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						
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	*65.0*		*ug/L*		*81.3*	*50-140*			
Surrogate: Dibromofluoromethane	*75.1*		*ug/L*		*93.9*	*50-140*			
Surrogate: Toluene-d8	*87.0*		*ug/L*		*109*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND			NC	30	
Metals									
Mercury	ND	0.1	ug/L	ND			NC	20	
Antimony	ND	0.5	ug/L	ND			NC	20	
Arsenic	ND	1	ug/L	ND			NC	20	
Barium	80.3	1	ug/L	73.1			9.5	20	
Beryllium	ND	0.5	ug/L	ND			NC	20	
Boron	48	10	ug/L	51			5.8	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	1.80	0.5	ug/L	1.82			1.0	20	
Lead	ND	0.1	ug/L	ND			NC	20	
Molybdenum	2.57	0.5	ug/L	2.76			7.3	20	
Nickel	1.1	1	ug/L	1.2			6.7	20	
Selenium	ND	1	ug/L	ND			NC	20	
Silver	ND	0.1	ug/L	ND			NC	20	
Sodium	32200	200	ug/L	32300			0.5	20	
Thallium	ND	0.1	ug/L	ND			NC	20	
Uranium	0.7	0.1	ug/L	0.7			1.2	20	
Vanadium	0.53	0.5	ug/L	0.53			0.2	20	
Zinc	ND	5	ug/L	ND			NC	20	
Volatiles									
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	0.81	0.5	ug/L	0.88			8.3	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	
1,1,2,2-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	

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	*63.0*		*ug/L*		*78.8*	*50-140*			
Surrogate: Dibromofluoromethane	*76.1*		*ug/L*		*95.2*	*50-140*			
Surrogate: Toluene-d8	*90.0*		*ug/L*		*113*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1830	25	ug/L	ND	91.7	68-117			
F2 PHCs (C10-C16)	1490	100	ug/L	ND	93.2	60-140			
F3 PHCs (C16-C34)	3240	100	ug/L	ND	82.7	60-140			
F4 PHCs (C34-C50)	1820	100	ug/L	ND	73.4	60-140			
Metals									
Mercury	2.73	0.1	ug/L	ND	91.0	70-130			
Arsenic	50.5	1	ug/L	ND	99.4	80-120			
Barium	115	1	ug/L	73.1	84.8	80-120			
Beryllium	46.7	0.5	ug/L	ND	93.3	80-120			
Boron	83	10	ug/L	42	81.3	80-120			
Cadmium	43.9	0.1	ug/L	ND	87.8	80-120			
Chromium (VI)	190	10	ug/L	ND	95.0	70-130			
Chromium	48.0	1	ug/L	ND	95.8	80-120			
Cobalt	45.6	0.5	ug/L	ND	91.0	80-120			
Copper	46.2	0.5	ug/L	1.82	88.9	80-120			
Lead	43.7	0.1	ug/L	ND	87.4	80-120			
Molybdenum	46.6	0.5	ug/L	2.76	87.7	80-120			
Nickel	45.5	1	ug/L	1.2	88.6	80-120			
Selenium	45.7	1	ug/L	ND	91.1	80-120			
Silver	41.2	0.1	ug/L	ND	82.2	80-120			
Sodium	28800	200	ug/L	20200	85.5	80-120			
Thallium	44.9	0.1	ug/L	ND	89.7	80-120			
Uranium	46.9	0.1	ug/L	0.7	92.5	80-120			
Vanadium	48.7	0.5	ug/L	0.53	96.4	80-120			
Zinc	45	5	ug/L	ND	86.1	80-120			
PCBs									
PCBs, total	0.711	0.05	ug/L	ND	71.1	65-135			
Surrogate: Decachlorobiphenyl	*0.415*		*ug/L*		*83.0*	*60-140*			
Semi-Volatiles									
Acenaphthene	4.02	0.05	ug/L	ND	80.4	50-140			
Acenaphthylene	3.71	0.05	ug/L	ND	74.2	50-140			
Anthracene	4.06	0.01	ug/L	ND	81.3	50-140			
Benzo [a] anthracene	4.34	0.01	ug/L	ND	86.7	50-140			
Benzo [a] pyrene	4.84	0.01	ug/L	ND	96.9	50-140			
Benzo [b] fluoranthene	5.77	0.05	ug/L	ND	115	50-140			
Benzo [g,h,i] perylene	4.26	0.05	ug/L	ND	85.2	50-140			
Benzo [k] fluoranthene	4.77	0.05	ug/L	ND	95.4	50-140			
Chrysene	4.29	0.05	ug/L	ND	85.8	50-140			
Dibenzo [a,h] anthracene	4.62	0.05	ug/L	ND	92.4	50-140			
Fluoranthene	4.01	0.01	ug/L	ND	80.2	50-140			
Fluorene	3.85	0.05	ug/L	ND	77.0	50-140			
Indeno [1,2,3-cd] pyrene	4.85	0.05	ug/L	ND	97.0	50-140			
1-Methylnaphthalene	4.38	0.05	ug/L	ND	87.5	50-140			
2-Methylnaphthalene	4.76	0.05	ug/L	ND	95.2	50-140			
Naphthalene	4.01	0.05	ug/L	ND	80.2	50-140			
Phenanthrene	3.74	0.05	ug/L	ND	74.9	50-140			
Pyrene	4.10	0.01	ug/L	ND	81.9	50-140			
Surrogate: 2-Fluorobiphenyl	*17.3*		*ug/L*		*86.3*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Surrogate: Terphenyl-d14	*21.7*		*ug/L*		*109*	*50-140*			
Volatiles									
Acetone	91.3	5.0	ug/L	ND	91.3	50-140			
Benzene	44.8	0.5	ug/L	ND	112	60-130			
Bromodichloromethane	36.3	0.5	ug/L	ND	90.6	60-130			
Bromoform	39.7	0.5	ug/L	ND	99.2	60-130			
Bromomethane	36.0	0.5	ug/L	ND	89.9	50-140			
Carbon Tetrachloride	32.3	0.2	ug/L	ND	80.7	60-130			
Chlorobenzene	34.1	0.5	ug/L	ND	85.4	60-130			
Chloroform	31.4	0.5	ug/L	ND	78.4	60-130			
Dibromochloromethane	36.7	0.5	ug/L	ND	91.8	60-130			
Dichlorodifluoromethane	38.2	1.0	ug/L	ND	95.5	50-140			
1,2-Dichlorobenzene	31.4	0.5	ug/L	ND	78.6	60-130			
1,3-Dichlorobenzene	30.1	0.5	ug/L	ND	75.2	60-130			
1,4-Dichlorobenzene	30.6	0.5	ug/L	ND	76.6	60-130			
1,1-Dichloroethane	30.5	0.5	ug/L	ND	76.3	60-130			
1,2-Dichloroethane	41.8	0.5	ug/L	ND	105	60-130			
1,1-Dichloroethylene	38.1	0.5	ug/L	ND	95.3	60-130			
cis-1,2-Dichloroethylene	38.6	0.5	ug/L	ND	96.5	60-130			
trans-1,2-Dichloroethylene	36.6	0.5	ug/L	ND	91.6	60-130			
1,2-Dichloropropane	38.7	0.5	ug/L	ND	96.8	60-130			
cis-1,3-Dichloropropylene	39.2	0.5	ug/L	ND	98.1	60-130			
trans-1,3-Dichloropropylene	37.2	0.5	ug/L	ND	92.9	60-130			
Ethylbenzene	31.0	0.5	ug/L	ND	77.4	60-130			
Ethylene dibromide (dibromoethane, 1,2-	32.2	0.2	ug/L	ND	80.6	60-130			
Hexane	43.1	1.0	ug/L	ND	108	60-130			
Methyl Ethyl Ketone (2-Butanone)	99.6	5.0	ug/L	ND	99.6	50-140			
Methyl Isobutyl Ketone	78.0	5.0	ug/L	ND	78.0	50-140			
Methyl tert-butyl ether	57.3	2.0	ug/L	ND	57.3	50-140			
Methylene Chloride	31.4	5.0	ug/L	ND	78.5	60-130			
Styrene	31.8	0.5	ug/L	ND	79.4	60-130			
1,1,1,2-Tetrachloroethane	36.6	0.5	ug/L	ND	91.6	60-130			
1,1,2,2-Tetrachloroethane	29.3	0.5	ug/L	ND	73.2	60-130			
Tetrachloroethylene	38.4	0.5	ug/L	ND	96.0	60-130			
Toluene	32.7	0.5	ug/L	ND	81.8	60-130			
1,1,1-Trichloroethane	30.7	0.5	ug/L	ND	76.6	60-130			
1,1,2-Trichloroethane	36.7	0.5	ug/L	ND	91.8	60-130			
Trichloroethylene	35.4	0.5	ug/L	ND	88.5	60-130			
Trichlorofluoromethane	34.1	1.0	ug/L	ND	85.2	60-130			
Vinyl chloride	35.1	0.5	ug/L	ND	87.7	50-140			
m,p-Xylenes	63.8	0.5	ug/L	ND	79.7	60-130			
o-Xylene	31.4	0.5	ug/L	ND	78.5	60-130			
Surrogate: 4-Bromofluorobenzene	*64.2*		*ug/L*		*80.3*	*50-140*			
Surrogate: Dibromofluoromethane	*74.4*		*ug/L*		*93.0*	*50-140*			
Surrogate: Toluene-d8	*75.2*		*ug/L*		*93.9*	*50-140*			

Qualifier Notes:

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.

PARACEL LABORATORIES LTD.

Paracel ID: 2236538

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2236538	№ 139367

Client Name: PATERSON	Project Ref: PE4822	Page 1 of 1
Contact Name: MARK DARCY / JOSH DEMPSEY	Quote #:	Turnaround Time
Address: 9 AURIGA DR. NEPEAN, ON.	PO #: 55701	☐ 1 day ☐ 3 day
Telephone: 613 226 7381	E-mail: JDEMPSEY@PATERSONGROUP.CA MDARCY@PATERSONGROUP.CA	☐ 2 day ☒ Regular
		Date Required:

☑ REG 153/04 ☐ REG 406/19

☐ Table 1 ☐ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other
☐ Table
For RSC: ☐ Yes ☐ No

Other Regulation: ☐ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm ☐ Mun: ☐ 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: Date	Sample Taken: Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	PCB's
1	BH 2 - GW	GW	\	7	AUG 31/22	\	✓	✓	✓	✓	✓	✓		
2	BH3 - GW	↓	\	7	↓	\	✓	✓	✓	✓	✓	✓		
3	BH4 - GW	↓	\	8	↓	\	✓	✓	✓	✓	✓	✓		✓
4	DUP.	GW	\	2	↓	\		✓						
5														
6														
7														
8														
9														
10														

Comments: → TIMES ARE NOTED ON THE SAMPLES.

Method of Delivery: PARACEL COURIER

Relinquished By (Sign):	Received By Driver/Depot:	Received at Lab:	Verified By:
Relinquished By (Print): DOMINIC LANDRY	Date/Time: 02/09/22 3:10	Date/Time: Sept 2/22 17:20	Date/Time: Sept 7/22 17:40
Date/Time: AUG 31/2022	Temperature: °C	Temperature: 15.8 °C	pH Verified: ☐ By: