Geotechnical Engineering

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Building Science

Paterson Group Inc.

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

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

patersongroup

Phase II Environmental Site Assessment

3277 St. Joseph Boulevard
Ottawa, Ontario

Prepared For

DCR Phoenix c/o Landric Homes

April 9, 2021

Report: PE5155-2

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EXECUTIVE SUMMARY

Assessment

A Phase II ESA was conducted for 3277 St. Joseph boulevard, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address a potentially contaminating activity (PCA) that was identified during the Phase I ESA and was considered to result in an area of potential environmental concern (APEC) on the Phase II Property. The subsurface investigation consisted of drilling eight boreholes, three of which were completed as groundwater monitoring wells.

Soil samples were obtained from the boreholes and screened using visual observations and organic vapour measurements. Nine soil samples were submitted for laboratory analysis of metals, polycyclic aromatic hydrocarbons (PAHs), petroleum hydrocarbons (PHCs) and BTEX. All metals, PAH, PHC and BYTEX concentrations identified in the soil samples were in compliance with MECP Table 3 Standards with one exception. The vanadium concentration identified in BH1-21 exceeds the MECP Table Standards.

Vanadium was identified in fill material consisting of predominantly silty clay. Clay in the region of the City of Ottawa has been known to contain metals concentrations above MECP standards, notably vanadium. It is possible that the marginal vanadium exceedance is a result of a naturally occurring metal, as no sources of vanadium were noted in the Phase I ESA.

Three groundwater samples including one duplicate were obtained from the monitoring wells installed in BH1-21 and BH6-21 and were analyzed for metals, PAHS, PHCs and BTEX.

All metals, PAHS, PHCs and BTEX concentrations in the groundwater samples analyzed were in compliance with the MECP Table 3 Standards.

Recommendations

Monitoring Wells

It is expected that the groundwater monitoring wells will be abandoned in accordance with O.Reg. 903, at the time of construction excavation. It is recommended that the integrity of the monitoring wells be maintained, prior to future construction, for possible further groundwater monitoring purposes.

Soil

Based on the findings of the Phase II ESA, one sample of fill material was identified to have a marginal vanadium exceedance. Based on the single exceedance, it is possible that the vanadium exceedance results from the natural occurrence within local silty clay. It is recommended that Paterson further assess the area where vanadium was encountered at the time of site redevelopment and additional confirmatory samples are collected. If impacted material is identified above the site standard, it will require disposal at a licensed waste disposal facility.

All excess soils removed from the property must be managed in accordance with Ontario Regulation 406/19 – On Site and Excess Soil Management.

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1.0 INTRODUCTION

At the request of Landric Homes, for DCR Phoenix, Paterson Group (Paterson) conducted a Phase II Environmental Site Assessment (ESA) for 3277 St. Joseph Boulevard, in the City of Ottawa, Ontario. The purpose of this Phase II ESA has been to address an area of potential environmental concern (APEC) identified on the Phase II Property, during the Phase I ESA conducted by Paterson in February 2021.

1.1 Site Description

Address:	3277 St. Joseph Boulevard, Ottawa, Ontario
Legal Description:	Part of Lot 35, Concession 1 (Old Survey), Geographic Township of Cumberland, in the City of Ottawa Ontario, and Part of Block 2, Registered Plan 4M-1542, City of Ottawa.
Location:	The subject site is located on the north-western quadrant of the St. Joseph Boulevard and Tenth Line Road intersection.
Latitude and Longitude:	45° 29' 2.6" N, 75° 30' 6.9" W
Site Description:	
Configuration:	Irregular
Site Area:	0.44 ha (approximate)

1.2 Property Ownership

Paterson was engaged to conduct this Phase II ESA by Mr. Matthew Firestone of Landric Homes, whose offices are located at 63 Montreal Road East, Gatineau, Quebec.

1.3 Current and Proposed Future Uses

The Phase II – Property currently exists as vacant land and the study area consists of a mixture of commercial and residential properties. It is our understanding that the subject site is to be developed for residential purposes.

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 Ministry of the Environment, Conservation and Parks (MECP), April 2011. The MECP selected Table 3 Standards are based on the following considerations:

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

The residential standards were selected based on the proposed future use of the subject site. Coarse-grained soil standards were chosen as a conservative approach. Grain size analysis was not completed.

A comparison of the soil test data to the MECP Table 1 Standards was also conducted. The Table 1 standards are considered to be indicative of typical Ontario background concentrations and are commonly used to assess whether soil is clean for off-site disposal purposes.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The Phase II property is located in a mixed residential and commercial area. The subject site is located on the north-western quadrant of the St. Joseph Boulevard and Tenth Line Road intersection, in the City of Ottawa. St. Joseph Boulevard followed by vacant land and residential dwellings are located to the south, and Tenth Line Road followed by commercial properties are located to the east. The properties to the west and north of the subject site are occupied by residential dwellings.

The general area of the Phase II – Property slopes significantly downward to the north/northeast towards the Ottawa River. Site drainage consists primarily of surface infiltration, in addition to surface runoff towards manholes located along Eric Czapnik Way.

2.2 Past Investigations

Paterson completed a Geotechnical Investigation for the subject site in August of 2020. The geotechnical assessment indicated fill material across the majority of the site which was identified as a potentially contaminating activity (PCA) that resulted in an APEC for the subject site.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation was conducted through February 24 to March 3, 2021. The field program consisted of drilling eight boreholes, three of which were completed as groundwater monitoring wells. The boreholes were drilled to a maximum depth of 12.80 m below the existing grade.

3.2 Media Investigated

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

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

The Geological Survey of Canada website on the Urban Geology of the National Capital Area was consulted as part of this assessment. Based on this information, bedrock in the area of the site consists of interbedded limestone, sandstone, and shale of the Rockcliffe Formation. Overburden consists of Paleozoic rocks, with a drift thickness of 0 to 1 m. The findings of the Geotechnical Investigation indicate that fill material extends to depths ranging from 1.47 to 12.80 m.

Contaminants of Potential Concern

Based on the areas of potential environmental concern on the subject site, the Contaminants of Potential Concern (CPCs) on the Phase I Property consist of metals and polycyclic aromatic hydrocarbons (PAHs).

Existing Buildings and Structures

The Phase II – Property consists of vacant land however, there is a municipal sewer easement running north-south through the central portion of the subject site.

Water Bodies

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

Areas of Natural Significance

There are no areas of natural and scientific interest on the subject property or within the Phase I ESA study area.

Water Well Records

A search of the MECPs web site for all drilled well records within 250 m of the subject site was conducted on January 19, 2021. Based on the search results, one domestic well, drilled in 1965, was identified on the Phase I Property. Seven additional domestic wells drilled between 1963 and 1977 were identified in the Phase – I Study Area. Based on the well records for the surrounding area, the subsurface profile consists primarily of native clay overlaying limestone bedrock. The bedrock was intercepted at an average depth of 12 meters.

The on-site domestic well was likely associated with the residential dwelling that was formerly located in the southern area of the Phase I Property. The well would no longer be in use. Based on availability of municipal services within the study area, any recent developments would be serviced with municipal potable water.

Neighbouring Land Use

Neighbouring land use in the Phase I study area consists of residential and commercial properties. Land use is shown on Drawing PE5155-2 Surrounding Land Use Plan.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

One PCA was identified on the Phase I – Property as a result of the importation of fill material of unknown quality during the construction of Tenth Line Road.

Two additional PCAs were identified in the Phase I - Study Area as a result of waste generators associated with the Ottawa Police East Division Station and a historical diesel spill that occurred in 1993.

Based on their separation distance, and cross or down gradient orientation with respect to the Phase I – Property, the waste generators and historic spill do not result in APECs on the subject site. However, the importation and storage of fill material of unknown quality on the Phase I - Property during the construction of Tenth Line Road results in an APEC on the subject site.

Assessment of Uncertainty and/or Absence of Information

The information available for review as part of the preparation of this Phase I ESA is considered to be sufficient to conclude that there are three PCAs, one of which results in an APEC on the subject site. The presence of three PCAs was confirmed by a variety of independent sources, and as such, the conclusions of this report are not affected by uncertainty which may be present with respect to the individual sources.

3.4 Deviations from Sampling and Analysis Plan

The Sampling and Analysis Plan for this project is included in Appendix 1 of this report. No deviations from the sampling and analysis plan were identified during the Phase II ESA.

3.5 Impediments

No significant impediments were encountered during the Phase II program. All borehole locations required significant ground preparation due to the slope in certain locations.

Although groundwater was encountered at Borehole BH5-21, collection of a sample from that location was not possible due to the very slow groundwater recharge. Consequently, a groundwater sample was not collected from BH5-21.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation was conducted through February 24 to March 3, 2021. The field program consisted the drilling of eight boreholes on the Phase II Property, three of which were completed with monitoring well installations.

The boreholes were placed to address the aforementioned area of potential environmental concern (APEC) and general coverage for geotechnical purposes.

The boreholes were drilled with a track-mounted drill rig, operated by George Downing Estate Drilling of Hawkesbury, Ontario, under the full-time supervision of Paterson personnel. Borehole locations are shown on Drawing PE5155-3 – Test Hole Location Plan appended to this report.

4.2 Soil Sampling

A total of 61 soil samples were obtained from the boreholes by means of sampling from shallow auger flights and split spoon sampling. The depths at which auger samples and split spoon samples were obtained from the boreholes are shown as "**AU**" and "**SS**" on the Soil Profile and Test Data Sheets, appended to this report.

Site soils generally consist of between 1.47 and 8.69 m of fill, consisting of brown silty clay, gravel and cobbles and crushed stone. This fill overlays bedrock or native brown silty clay and sandy silt till. Bedrock was encountered at depths ranging from 1.47 to 8.69 m below the fill material in five of the boreholes. The layer of native material was identified in three boreholes and extended to bedrock at depths of 5.64m to 9.19m below the existing grade.

4.3 Field Screening Measurements

Soil samples recovered at the time of sampling were placed immediately into airtight plastic bags with nominal headspace. All lumps of soil inside the bags were broken by hand, and the soil was allowed to come to room temperature prior to conducting the vapour survey. Allowing the samples to stabilize to room temperature ensures consistency of readings between samples.

To measure the soil vapours, the analyser probe is inserted into the nominal headspace above the soil sample. A photo ionization detector (PID) was used to measure the volatile organic vapour concentrations. The sample is agitated/manipulated gently as the measurement is taken. The peak reading registered within the first 15 seconds is recorded as the vapour measurement.

The PID readings were found to range from 0 to 4.2 ppm in the soil samples obtained.

These results do not indicate the potential for significant contamination from volatile contaminants. Vapour readings are noted on the Soil Profile and Test Data Sheets in Appendix 1.

Vapour readings are noted on the Soil Profile and Test Data Sheets in Appendix 1.

4.4 Groundwater Monitoring Well Installation

Three groundwater monitoring wells were installed on the Phase II Property as part of the current subsurface investigation.

The monitoring wells consisted of 50 mm diameter Schedule 40 threaded PVC risers and screens. Monitoring well construction details are listed below in Table 1 and are also presented on the Soil Profile and Test Data Sheets provided in Appendix 1.

Table 1: Monitoring Well Construction Details

Well ID	Ground Surface Elevation	Total Depth (m BGS)	Screened Interval (m BGS)	Sand Pack (m BGS)	Bentonite Seal (m BGS)	Casing Type
BH1-21	72.40	8.0	5.0-8.0	5.0-8.0	0.0-5.0	Stick-up
BH5-21	70.91	6.20	3.20-6.20	2.80-6.20	0.0-2.80	Stick-up
BH6-21	68.32	12.20	9.20-12.20	8.80-12.20	0.0-8.50	Stick-up

4.5 Field Measurement of Water Quality Parameters

Groundwater sampling was conducted at BH1-21, BH5-21, and BH6-21 on March 9, 2021. No water quality parameters were measured in the field at that time, due to limited groundwater sample volume.

4.6 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.

4.7 Analytical Testing

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

Table 2: Soil Samples Submitted

Sample ID	Screened Interval/ Stratigraphic Unit	Parameter Analyzed				Rationale
		Metals	PAHs	PHCs (F_1-F_4)	BTEX	
BH1-21-SS5	3.05 – 3.66 m Brown Silty Clay Fill	X		X	X	Assess potential impacts from APEC 1 (fill of unknown quality)
BH2-21-SS2	0.76 – 1.37 m Brown Silty Clay Fill	X				Assess potential impacts from APEC 1 (fill of unknown quality)
BH4-21-SS3	1.52 - 2.13 m Brown Silty Clay Fill		X			Assess potential impacts from APEC 1 (fill of unknown quality)
BH4-21-SS4	2.29 - 2.90 m Brown Silty Clay Fill	X		X	X	Assess potential impacts from APEC 1 (fill of unknown quality)
BH5-21-SS2	0.76 – 1.37 m Brown Silty Clay Fill	X		X	X	Assess potential impacts from APEC 1 (fill of unknown quality)
BH6-21-SS6	3.81 - 4.42 m Brown Silty Clay Fill		X			Assess potential impacts from APEC 1 (fill of unknown quality)
BH7-SS3	1.52 - 2.13 m Brown Silty Clay Fill			X	X	Assess potential impacts from APEC 1 (fill of unknown quality)
BH8-SS11	7.62 – 8.23 m Grey Sandy Silt Till	X				Assess potential impacts from APEC 1 (fill of unknown quality)

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

Table 3: Groundwater Samples Submitted

Sample ID	Screened Interval/ Stratigraphic Unit	Parameters Analyzed				Rationale
		Metals	PAHs	PHCs	BTEX	
BH1–21-GW1	5.0-8.0 Bedrock (Limestone)	X				Asses potential impacts from APEC 1 (importation of fill material of unknown quality)
BH103-GW1*	5.0-8.0 Bedrock (Limestone)	X				Asses potential impacts from APEC 1(importation of fill material of unknown quality)
BH6-21-GW1	9.20-12.20 Bedrock (Limestone)		X	X	X	Asses potential impacts from APEC 1 (importation of fill material of unknown quality)

* – Duplicate of BH1-21-GW1

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

4.8 Residue Management

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

4.9 Elevation Surveying

Boreholes were surveyed at geodetic elevations by Paterson personnel.

4.10 Quality Assurance and Quality Control Measures

A summary of quality assurance and quality control (QA/QC) measures, including 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

The soil profile consists of between 1.47 and 8.69 m of fill overlying brown silty clay and sandy silt till. Bedrock was encountered at a minimum depth of 1.19 m below the existing grade.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured during the groundwater sampling event on March 8, 2021, using an electronic water level meter. Groundwater levels are summarized below in Table 4.

Table 4: Groundwater Level Measurements

Borehole Location	Ground Surface Elevation (m)	Water Level Depth (m below grade)	Water Level Elevation (Asl)	Date of Measurement
BH1-21	72.40	7.78	64.62	March 8, 2021
BH5-21	70.91	5.55	65.36	March 8, 2021
BH6-21	68.32	8.52	59.80	March 8, 2021

Based on the groundwater levels recorded, the groundwater appears to flow to the north/northeast

5.3 Fine-Coarse Soil Texture

No grain size analysis was completed for the subject site. Coarse-grained standards were selected based on the observed stratigraphy.

5.4 Soil: Field Screening

Field screening of the soil samples collected during drilling resulted in vapour readings ranging from 0 to 4.2 ppm. No visual or olfactory indications of potential contamination were identified in the soil samples at the time of the field program. 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

Eight soil samples were submitted for analysis of metals, PAHs, PHCs (F_1-F_4) and BTEX. The results of the analytical testing are presented below in Tables 5 and 6. The laboratory certificates of analysis are provided in Appendix 1. Analytical test results are shown on Drawings PE5155-4 – Analytical Testing Plan-Soil (BTEX, PHCs, PAHS) and PE5155-5 - Analytical Testing Plan-Soil (Metals).

Table 5: Analytical Test Results – Soil – Metals

Parameter	MDL (µg/g)	Soil Samples (µg/g)					MECP Table 3 Residential Standards (µg/g)
		Feb 24/2021	Feb 25/2021	Feb 24/2021	Feb 26/2021	March 3/2021	
		BH1-21-SS5	BH2-21-SS2	BH4-21-SS4	BH5-21-SS2	BH8-SS11	
Antimony	1.0	nd	nd	nd	nd	nd	7.5
Arsenic	1.0	3.9	2.9	3.6	3.5	3.4	18
Barium	1.0	232	98.4	280	219	102	390
Beryllium	0.5	0.9	nd	0.8	1.0	0.6	4
Boron	5.0	8.3	8.5	9.5	8.2	11.8	120
Cadmium	0.5	nd	nd	nd	nd	nd	1.2
Chromium	5.0	113	31.6	75.4	80.5	19.6	160
Cobalt	1.0	21.6	7.4	15.2	16.5	7.4	22
Copper	5.0	44.8	18.5	32.2	26.0	13.7	140
Lead	1.0	8.7	37.9	38.8	15.8	7.4	120
Molybdenum	1.0	nd	1.0	1.0	1.2	1.1	6.9
Nickel	5.0	60.0	19.8	41.6	41.1	17.3	100
Selenium	1.0	nd	nd	nd	nd	nd	2.4
Silver	0.3	nd	nd	nd	nd	nd	20
Thallium	1.0	nd	nd	nd	nd	nd	1
Uranium	1.0	nd	nd	nd	nd	nd	23
Vanadium	10.0	**89.5**	31.0	65.8	72.6	21.9	86
Zinc	20.0	100	82.4	114	102	nd	340

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

Bold and Underlined – Results exceed the selected MECP standards

The metal concentrations comply with the MECP Table 3 standards with the exception of a marginal vanadium exceedance identified in BH1-21-SS3.

Table 6: Analytical Test Results – Soil – PAHs

Parameter	MDL (µg/g)	Soil Samples (µg/g)		MECP Table 3 Residential Standards (µg/g)
		Feb 24/2021	Feb 26/2021	
		BH4-21-SS3	BH6-21-SS6	
Acenaphthene	0.02	nd	nd	7.9
Acenaphthylene	0.02	0.04	nd	0.15
Anthracene	0.02	0.03	nd	0.67
Benzo(a)anthracene	0.02	0.04	nd	0.5
Benzo(a)pyrene	0.02	0.06	nd	0.3
Benzo(b)fluoranthene	0.02	0.06	nd	0.78
Benzo(g,h,i)perylene	0.02	0.05	nd	6.6

Table 6: Analytical Test Results – Soil – PAHs				
Parameter	MDL (µg/g)	Soil Samples (µg/g)		MECP Table 3 Residential Standards (µg/g)
		Feb 24/2021	Feb 26/2021	
		BH4-21-SS3	BH6-21-SS6	
Benzo(k)fluoranthene	0.02	0.03	nd	0.78
Chrysene	0.02	0.05	nd	7
Dibenzo(a,h)anthracene	0.02	nd	nd	0.1
Fluoranthene	0.02	0.08	nd	0.69
Fluorene	0.02	nd	nd	62
Indeno(1,2,3-cd) pyrene	0.02	0.04	nd	0.38
1-Methylnaphthalene	0.02	nd	nd	0.99
2-Methylnaphthalene	0.02	nd	nd	0.99
Methylnaphthalene (1 & 2)	0.04	nd	nd	0.99
Naphthalene	0.01	nd	nd	0.6
Phenanthrene	0.02	0.04	nd	6.2
Pyrene	0.02	0.07	nd	78

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- NA – Parameter not analysed
- **Bold and Underlined** – Results exceed the selected MECP standards

The identified PAH concentrations are in compliance with the MECP Table 3 Standards.

Table 7: Analytical Test Results – Soil – PHCs (F_1-F_4) and BTEX						
Parameter	MDL (µg/g)	Soil Samples (µg/g)				MECP Table 3 Residential Standards (µg/g)
		Feb 24/2021	Feb 24/2021	Feb 26/2021	March 3/2021	
		BH1-21-SS5	BH4-21-SS4	BH5-21-SS2	BH7-SS3	
Benzene	0.02	nd	nd	nd	nd	0.21
Ethylbenzene	0.05	nd	nd	nd	nd	2
Toluene	0.05	nd	nd	0.08	nd	2.3
Xylenes, total	0.05	nd	nd	nd	nd	3.1
F1 PHCs (C6-C10)	7	nd	nd	nd	nd	55
F2 PHCs (C10-C16)	4	nd	nd	nd	nd	98
F3 PHCs (C16-C34)	8	nd	nd	14	nd	300
F4 PHCs (C34-C50)	6	nd	nd	7	nd	2800

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- NA – Parameter not analysed
- **Bold and Underlined** – Results exceed the selected MECP standards

The majority of the analyzed PHC(F_1-F_4) and BTEX concentrations were non-detect with some values slightly over the detection threshold that are in compliance with the applicable MECP Table 3 standards.

The maximum concentrations of analyzed parameters in the soil at the site are summarized in Table 8.

TABLE 8: Maximum Concentrations – Soil

Parameter	Maximum Concentration (µg/g)	Soil Sample	Depth Interval (m BGS)
Arsenic	3.9	BH1-21-SS5	3.05 – 3.66, Fill
Barium	280	BH4-21-SS4	2.29 - 2.90, Fill
Beryllium	1.0	BH5-21-SS2	0.76 – 1.37, Fill
Boron	11.8	BH8-SS11	7.62 – 8.23, Native
Chromium	113	BH1-21-SS5	3.05 – 3.66, Fill
Cobalt	21.6	BH1-21-SS5	3.05 – 3.66, Fill
Copper	44.8	BH1-21-SS5	3.05 – 3.66, Fill
Lead	38.8	BH4-21-SS4	2.29 - 2.90, Fill
Molybdenum	1.2	BH5-21-SS2	0.76 – 1.37, Fill
Nickel	60	BH1-21-SS5	3.05 – 3.66, Fill
Vanadium	**89.5**	BH1-21-SS5	3.05 – 3.66, Fill
Zinc	114	BH4-21-SS4	2.29 - 2.90, Fill
Acenaphthylene	0.04	BH4-21-SS3	1.52 - 2.13, Fill
Anthracene	0.03	BH4-21-SS3	1.52 - 2.13, Fill
Benzo(a)anthracene	0.04	BH4-21-SS3	1.52 - 2.13, Fill
Benzo(a)pyrene	0.06	BH4-21-SS3	1.52 - 2.13, Fill
Benzo(b)fluoranthene	0.06	BH4-21-SS3	1.52 - 2.13, Fill
Benzo(g,h,i)perylene	0.05	BH4-21-SS3	1.52 - 2.13, Fill
Benzo(k)fluoranthene	0.03	BH4-21-SS3	1.52 - 2.13, Fill
Chrysene	0.05	BH4-21-SS3	1.52 - 2.13, Fill
Fluoranthene	0.08	BH4-21-SS3	1.52 - 2.13, Fill
Indeno(1,2,3-cd) pyrene	0.04	BH4-21-SS3	1.52 - 2.13, Fill
Phenanthrene	0.04	BH4-21-SS3	1.52 - 2.13, Fill
Pyrene	0.07	BH4-21-SS3	1.52 - 2.13, Fill
Toluene	0.08	BH5-21-SS2	0.76 – 1.37, Fill
F3 PHCs (C16-C34)	14	BH5-21-SS2	0.76 – 1.37, Fill
F4 PHCs (C34-C50)	7	BH5-21-SS2	0.76 – 1.37, Fill

Notes:
- **Bold and Underlined** – Results exceed the selected MECP standards

All other parameter results were non-detect.

5.6 Groundwater Quality

Groundwater samples from monitoring wells installed in BH1-21 and BH6-21 were submitted for laboratory analysis of metals, PHCs (F1-F4), BTEX and PAHs. The groundwater samples were obtained from the screened intervals noted in Table 1. The results of the analytical testing are presented below in Tables 9, 10 and 11. The laboratory certificate of analysis is provided in Appendix 1. Analytical test results are shown on PE5155- 6– Analytical Testing Plan – Groundwater.

Note that following the purging of groundwater at BH5-21, groundwater had not recharged sufficiently to collect a sample.

Table 9: Analytical Test Results – Groundwater – Metals

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)		MECP Table 3 Residential Standards (µg/L)
		March 8/2021		
		BH1-21-GW1	BH103-GW1*	
Antimony	0.5	nd	nd	20000
Arsenic	1	1	1	1900
Barium	1	110	151	29000
Beryllium	0.5	nd	nd	67
Boron	10	80	77	45000
Cadmium	0.1	nd	nd	2.7
Chromium	1	nd	4	810
Cobalt	0.5	0.6	1.4	66
Copper	0.5	0.9	5.6	87
Lead	0.1	0.5	2.0	25
Molybdenum	0.5	150	125	9200
Nickel	1	1	3	490
Selenium	1	nd	nd	63
Silver	0.1	nd	nd	1.5
Sodium	200	108000	114000	2300000
Thallium	0.1	nd	nd	510
Uranium	0.1	0.4	0.4	420
Vanadium	0.5	0.5	3.8	250

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- NA – Parameter not analysed
- **Bold and Underlined** – Results exceed the selected MECP standards
- * - Duplicate of BH1-21-GW1

All detected metals parameters are in compliance with the applicable MECP Table 3 standards.

Table 10: Analytical Test Results – Groundwater – PAHs			
Parameter	**MDL (µg/L)**	**Groundwater Samples (µg/L)**	**MECP Table 3 Residential Standards (µg/L)**
		Feb 24/2021	
		BH6-21-GW1	
Acenaphthene	0.02	nd	7.9
Acenaphthylene	0.02	nd	0.15
Anthracene	0.02	nd	0.67
Benzo(a)anthracene	0.02	nd	0.5
Benzo(a)pyrene	0.02	nd	0.3
Benzo(b)fluoranthene	0.02	nd	0.78
Benzo(g,h,i)perylene	0.02	nd	6.6
Benzo(k)fluoranthene	0.02	nd	0.78
Chrysene	0.02	nd	7
Dibenzo(a,h)anthracene	0.02	nd	0.1
Fluoranthene	0.02	0.03	0.69
Fluorene	0.02	nd	62
Indeno(1,2,3-cd) pyrene	0.02	nd	0.38
1-Methylnaphthalene	0.02	nd	0.99
2-Methylnaphthalene	0.02	nd	0.99
Methylnaphthalene (1 & 2)	0.04	nd	0.99
Naphthalene	0.01	0.10	0.6
Phenanthrene	0.02	0.07	6.2
Pyrene	0.02	0.02	78

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- NA – Parameter not analysed
- **Bold and Underlined** – Results exceed the selected MECP standards

The majority of the PAH parameters were non-detect with all detected parameters being in compliance with the applicable MECP Table 3 standards.

Table 11: Analytical Test Results – Groundwater – PHCs (F_1-F_4) and BTEX			
Parameter	**MDL (µg/L)**	**Groundwater Samples (µg/L)**	**MECP Table 3 Residential Standards (µg/L)**
		BH6-21-GW1	
Benzene	0.5	nd	44
Ethylbenzene	0.5	nd	2300
Toluene	0.5	nd	18000
Xylenes, total	0.5	nd	4200
F1 PHCs (C6-C10)	25	nd	750
F2 PHCs (C10-C16)	100	nd	150
F3 PHCs (C16-C34)	100	nd	500
F4 PHCs (C34-C50)	100	nd	500

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- NA – Parameter not analysed
- **Bold and Underlined** – Results exceed the selected MECP standards

The PHC and BTEX concentrations were all non-detect and therefore in compliance with the applicable MECP Table 3 standards.

The maximum concentrations of analyzed parameters in the groundwater on the Phase II - Property are summarized in Table 12.

TABLE 12: Maximum Concentrations – Groundwater

Parameter	Maximum Concentration (µg/L)	Groundwater Sample	Screened Interval (m BGS)
Arsenic	1	BH1-21-GW1	5.0-8.0
Barium	151	BH103-GW1	5.0-8.0
Boron	80	BH1-21-GW1	5.0-8.0
Chromium	4	BH103-GW1	5.0-8.0
Cobalt	1.4	BH103-GW1	5.0-8.0
Copper	5.6	BH103-GW1	5.0-8.0
Lead	2.0	BH103-GW1	5.0-8.0
Molybdenum	150	BH1-21-GW1	5.0-8.0
Nickel	3	BH103-GW1	5.0-8.0
Sodium	114000	BH103-GW1	5.0-8.0
Uranium	0.4	BH1-21-GW1 and BH103-GW1	5.0-8.0
Vanadium	3.8	BH103-GW1	5.0-8.0
Fluoranthene	0.03	BH6-21-GW1	9.20-12.20
Naphthalene	0.10	BH6-21-GW1	9.20-12.20
Phenanthrene	0.07	BH6-21-GW1	9.20-12.20
Pyrene	0.02	BH6-21-GW1	9.20-12.20

Notes:
- **Bold and Underlined** – Results exceed the selected MECP standards

5.7 Phase II Conceptual Site Model

The following section has been prepared in accordance with the requirements of O.Reg. 269/11 amended by the Environmental Protection Act. Conclusions and recommendations are discussed in a subsequent section.

Site Description

The Phase II Property is currently vacant and is situated in a municipal urban setting of mixed commercial and residential uses.

Potentially Contaminating Activity and Areas of Potential Environmental Concern

As indicated in the Phase I-ESA report and Table 1 in Section 2.2 of this report, the following PCAs were considered to result in APECs on the Phase I/Phase II Property:

- ❑ Fill material of unknown quality across the entire site.

Contaminants of Potential Concern and Impacted Media

Contaminants of potential concern associated with the aforementioned PCA include metals and PAHs in the soil and groundwater.

Subsurface Structures and Utilities

Underground service locates were completed prior to the subsurface investigation. Underground utilities on the Phase II Property include private electrical and sewer services as well as hydro and gas lines.

Physical Setting

Site Stratigraphy

The site stratigraphy, from the ground surface to the deepest aquifer or aquitard investigated consists of:

- ❒ Topsoil overlaying 1.47 to 8.69 m of fill, consisting of brown silty clay with gravel and occasional crushed stone.
- ❒ Native grey sandy silt till was generally found to underlie the fill material followed by limestone bedrock.
- ❒ The bedrock surface was encountered at depths ranging from approximately 1.47 to 9.19 m below the existing grade.

Hydrogeological Characteristics

Groundwater at the Phase II Property was encountered in the fill and overburden material.

Water levels were measured at the subject site on March 8, 2021 at depths ranging from 5.55 to 8.52m below grade.

Based on the groundwater levels recorded, the groundwater appears to flow in a northerly direction towards the Ottawa River.

Approximate Depth to Bedrock

Bedrock is present at an average depth of 6.1 m below the existing grade.

Approximate Depth to Water Table

Depth to the water table at the subject site varies between approximately 5.55 to 8.52m below the existing grade.

Sections 41 and 43.1 of the Regulation

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

Section 43.1 of the Regulation does not apply to the subject site in that the subject site is not a Shallow Soil Property.

Fill Placement

A surficial covering of topsoil overlying approximately 1.47 to 8.69 m of fill, consisting of brown silty clay, gravel and occasional crushed stone was observed on the Phase II - Property. No visual or olfactory signs of impacts were observed in the fill material, and no deleterious material was observed.

Proposed Buildings and Other Structures

It is our understanding that the subject site is to be redeveloped for residential purposes.

Areas of Natural Significance and Water Bodies

No areas of natural significance are present on or within the vicinity of the Phase II Property.

There are no water bodies on the subject property, or within the Phase I ESA study area.

Environmental Condition

Areas Where Contaminants are Present

Based on the analytical test results, vanadium impacts were identified in the fill material within BH1-21. Vanadium was not detected in the groundwater at that location.

Types of Contaminants

Based on the analytical test results, the soil (fill material) in the area of BH1-21 is impacted with vanadium.

Contaminated Media

Contaminated media at the subject site is limited to fill material at Borehole BH1-21. No impacted groundwater was identified.

What Is Known About Areas Where Contaminants Are Present

The vanadium concentration in excess of the selected standards identified in BH1-21 is expected to be a result of the importation of fill material of unknown quality during the construction of Tenth Line Road.

The majority of the fill material at the subject site consisted predominantly of silty clay. Silty clay in this area of the City of Ottawa is known to contain elevated concentrations of metals parameters, such as vanadium. It is considered possible that the marginal vanadium exceedance identified at Borehole BH1-21 represents a naturally occurring exceedance of the site standard.

Distribution and Migration of Contaminants

Based on the findings of the Phase II ESA, no significant distribution and/or migration of contaminants is considered to have occurred. Vanadium is considered to be localised at Borehole BH1-21, and limited to the soil only.

Discharge of Contaminants

Based on the analytical testing results, vanadium impacts were identified in BH1-21. The vanadium concentration in excess of the selected standards identified in BH1-21 is expected to be a result of the importation of fill material during the construction of Tenth Line Road and is confined to the upper fill layer. Vanadium may also be naturally occurring, as it was identified in fill consisting of silty clay, commonly known to contain vanadium.

Climatic and Meteorological Conditions

In general, climatic and meteorological conditions have the potential to affect contaminant distribution.

Two ways by which climatic and meteorological conditions may affect contaminant distribution include the downward leaching of contaminants by means of the infiltration of precipitation, and the migration of contaminants via groundwater levels and/or flow, which may fluctuate seasonally. It is our opinion that climatic and meteorological conditions have not significantly influenced contaminant transport in the past.

Potential for Vapour Intrusion

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

6.0 CONCLUSIONS

Assessment

A Phase II ESA was conducted for 3277 St. Joseph boulevard, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address a potentially contaminating activity (PCA) that was identified during the Phase I ESA and was considered to result in an area of potential environmental concern (APEC) on the Phase II Property. The subsurface investigation consisted of drilling eight boreholes, three of which were completed as groundwater monitoring wells.

Soil samples were obtained from the boreholes and screened using visual observations and organic vapour measurements. Nine soil samples were submitted for laboratory analysis of metals, polycyclic aromatic hydrocarbons (PAHs), petroleum hydrocarbons (PHCs) and BTEX. All metals, PAH, PHC and BYTEX concentrations identified in the soil samples were in compliance with MECP Table 3 Standards with one exception. The vanadium concentration identified in BH1-21 exceeds the MECP Table Standards.

Vanadium was identified in fill material consisting of predominantly silty clay. Clay in the region of the City of Ottawa has been known to contain metals concentrations above MECP standards, notably vanadium. It is possible that the marginal vanadium exceedance is a result of a naturally occurring metal, as no sources of vanadium were noted in the Phase I ESA.

Three groundwater samples including one duplicate were obtained from the monitoring wells installed in BH1-21 and BH6-21 and were analyzed for metals, PAHS, PHCs and BTEX.

All metals, PAHS, PHCs and BTEX concentrations in the groundwater samples analyzed were in compliance with the MECP Table 3 Standards.

Recommendations

Monitoring Wells

It is expected that the groundwater monitoring wells will be abandoned in accordance with O.Reg. 903, at the time of construction excavation. It is recommended that the integrity of the monitoring wells be maintained, prior to future construction, for possible further groundwater monitoring purposes.

Soil

Based on the findings of the Phase II ESA, one sample of fill material was identified to have a marginal vanadium exceedance. Based on the single exceedance, it is possible that the vanadium exceedance results from the natural occurrence within local silty clay. It is recommended that Paterson further assess the area where vanadium was encountered at the time of site redevelopment and additional confirmatory samples are collected. If impacted material is identified above the site standard, it will require disposal at a licensed waste disposal facility. All excess soils removed from the property must be managed in accordance with Ontario Regulation 406/19 – On Site and Excess Soil Management.

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. The conclusions presented herein are based on information gathered from a limited sampling and testing program. The test results represent conditions at specific test locations at the time of the field program.

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

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

This report was prepared for the sole use of DCR Phoenix c/o Landric Homes. Notification from DCR Phoenix c/o Landric Homes. and Paterson Group will be required to release this report to any other party.

Paterson Group Inc.

Samuel Berube, B.Eng.

Adrian Menyhart, P.Eng., ing., QP$_{ESA}$

Report Distribution:

- DCR Phoenix c/o Landric Homes
- Paterson Group

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE5155-3 – TEST HOLE LOCATION PLAN

DRAWING PE5155-4– ANALYTICAL TESTING PLAN – SOIL (BTEX, PHCs, PAHs)

DRAWING PE5155-4A– CROSS SECTION A-A' – SOIL (BTEX, PHCs, PAHs)

DRAWING PE5155-4B– CROSS SECTION B-B' – SOIL (BTEX, PHCs, PAHs)

DRAWING PE5155-5– ANALYTICAL TESTING PLAN – SOIL (METALS)

DRAWING PE5155-5A– CROSS SECTION A-A' – SOIL (METALS)

DRAWING PE5155-5B– CROSS SECTION B-B' – SOIL (METALS)

DRAWING PE5155-6– ANALYTICAL TESTING PLAN – GROUNDWATER (BTEX, PHCs, PAHs, METALS)

DRAWING PE5155-6A– CROSS SECTION A-A' – GROUNDWATER (BTEX, PHCs, PAHs, METALS)

DRAWING PE5155-6B– CROSS SECTION B-B' – GROUNDWATER (BTEX, PHCs, PAHs, METALS)

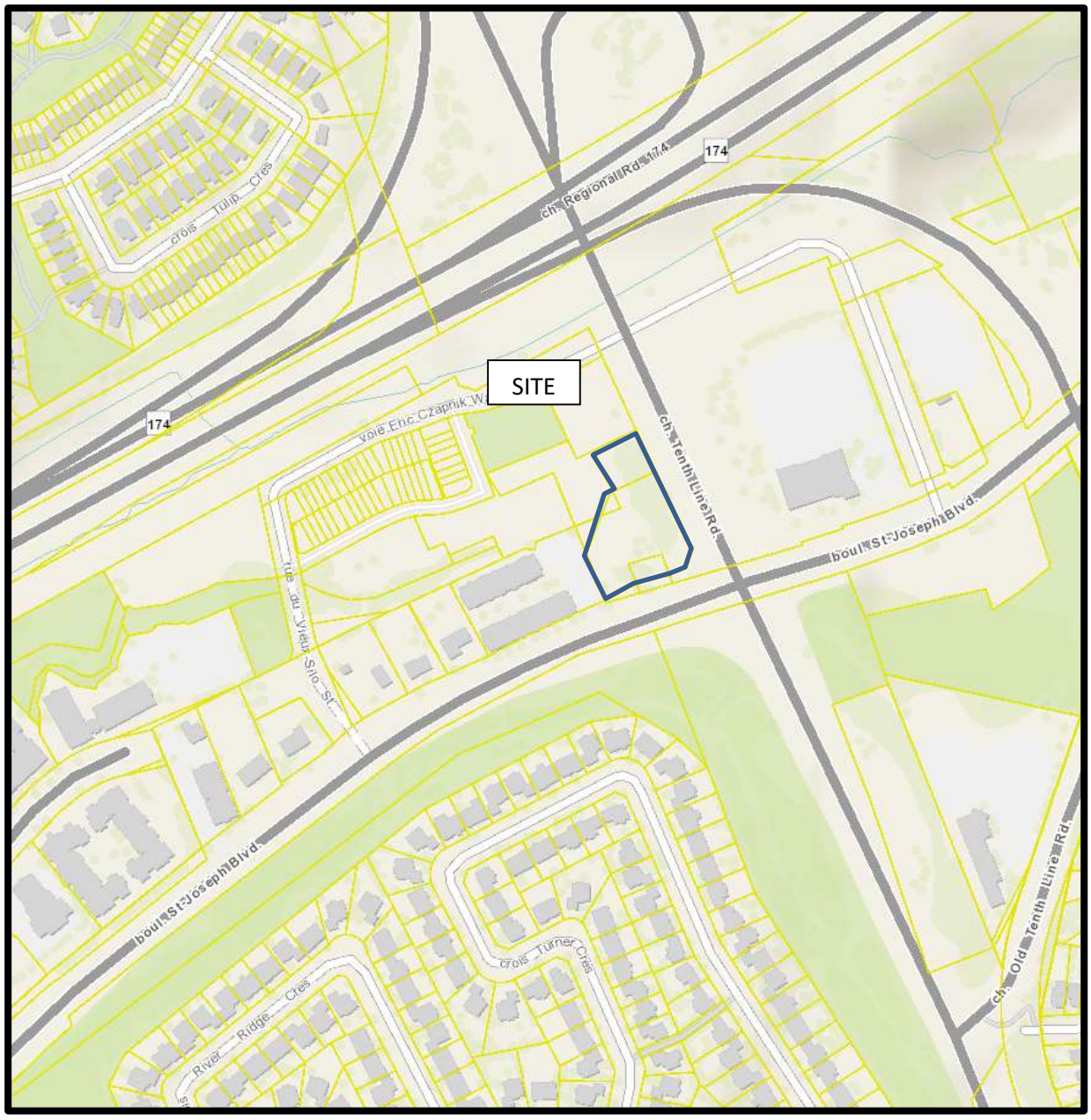
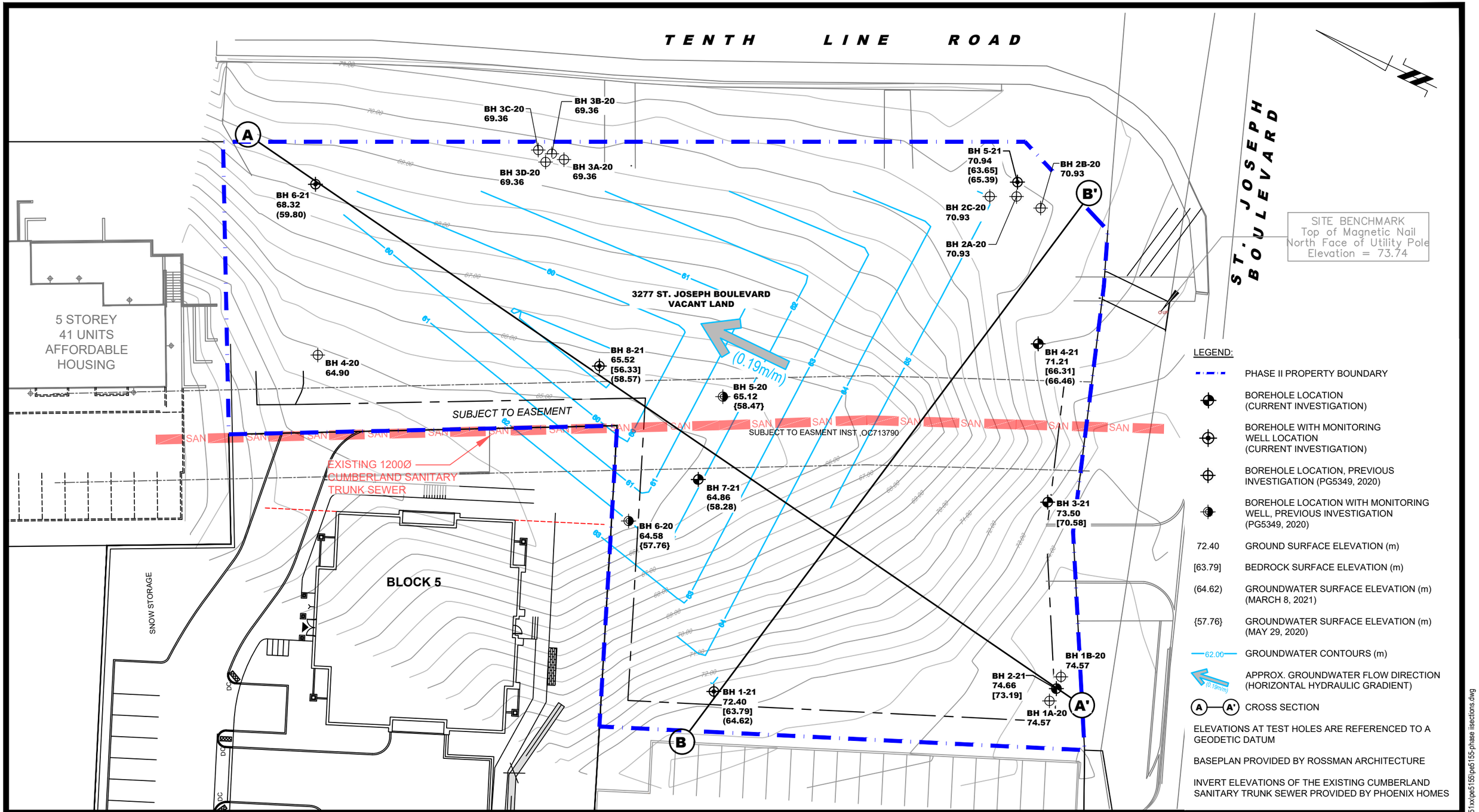


FIGURE 1

KEY PLAN



patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL

LANDRIC HOMES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
3277 ST JOSEPH BLVD.

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:400	Date: 04/2021
Drawn by: YA	Report No.: PE5155-3
Checked by: SB	Dwg. No.: PE5155-3
Approved by: AM	Revision No.:

11x17

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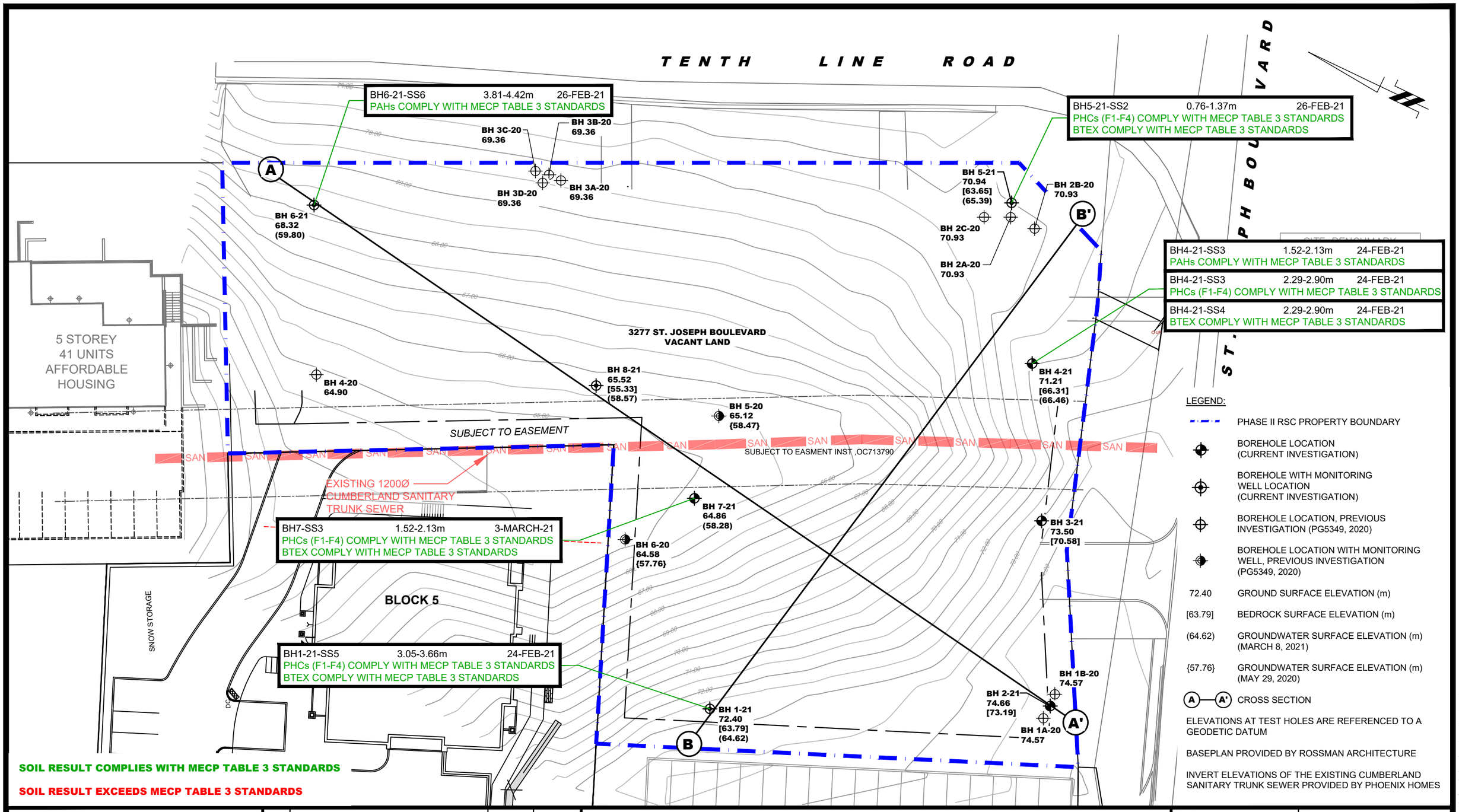

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consulting engineers
154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

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LANDRIC HOMES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
3277 ST JOSEPH BLVD.
OTTAWA, ONTARIO

Title:
ANALYTICAL TESTING PLAN - SOIL (BTEX, PHCs, PAHs)

Scale: 1:400	Date: 04/2021
Drawn by: YA	Report No.: PE5155-3
Checked by: SB	Dwg. No.: PE5155-4
Approved by: AM	Revision No.:

11x17

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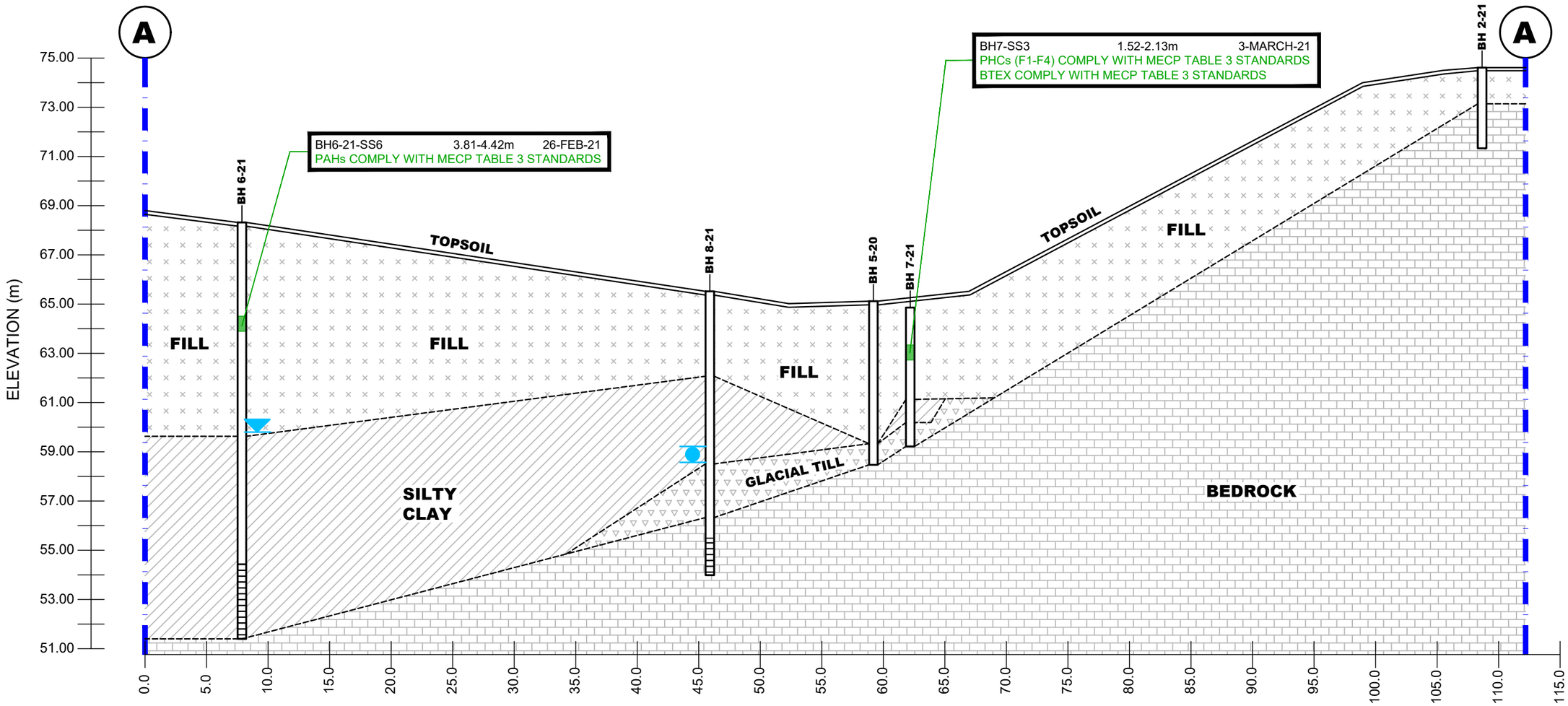

LEGEND:

SOIL RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 3 STANDARDS

GROUNDWATER LEVEL (MARCH, 2021)

GROUNDWATER LEVEL (PIEZOMETER) (MARCH, 2021)

patersongroup
consulting engineers

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

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
3277 ST JOSEPH BLVD.

OTTAWA, ONTARIO

Title:

CROSS SECTION A-A' - SOIL (BTEX, PHCs, PAHs)

Scale: AS SHOWN	Date: 04/2021
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Checked by: SB	Dwg. No.: PE5155-4A
Approved by: AM	Revision No.:

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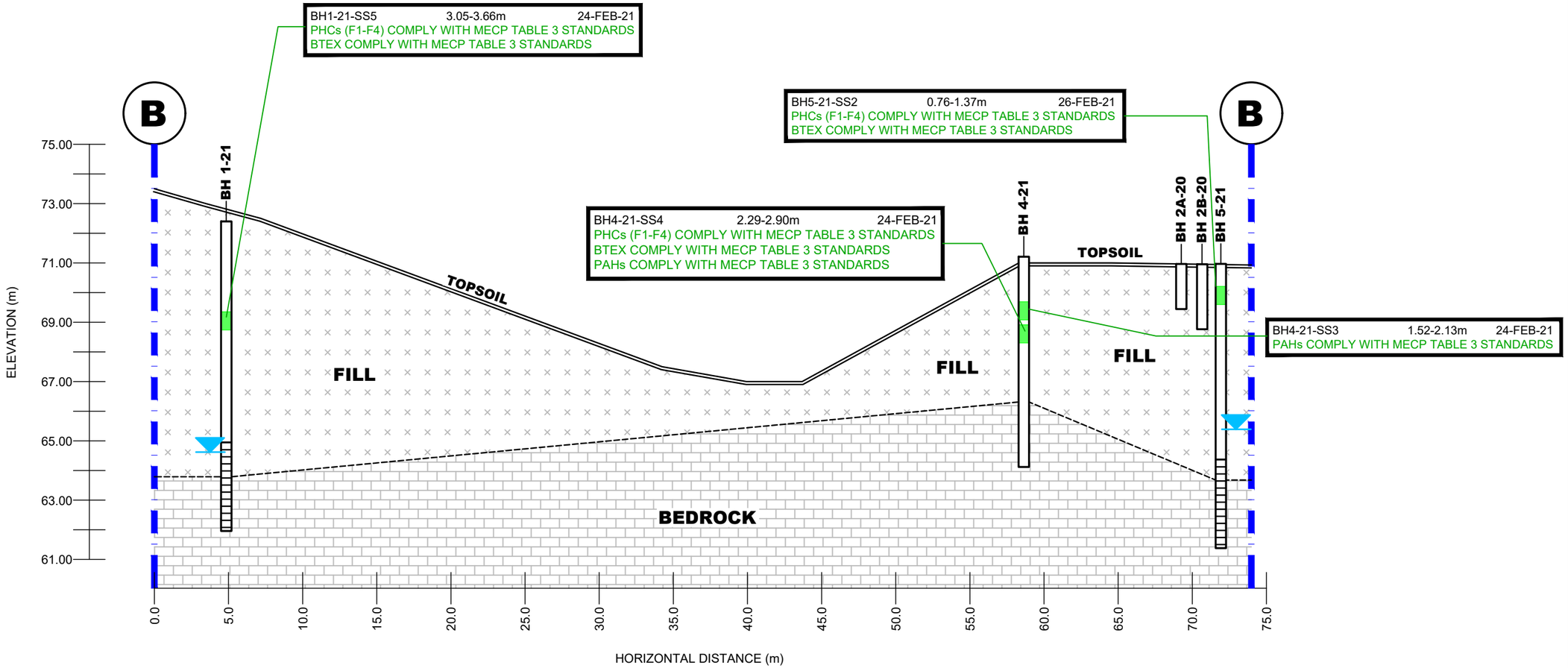

LEGEND:

SOIL RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 3 STANDARDS

GROUNDWATER LEVEL (MARCH, 2021)

GROUNDWATER LEVEL (PIEZOMETER) (MARCH, 2021)

patersongroup
consulting engineers

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

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Title:

CROSS SECTION B-B' - SOIL (BTEX, PHCs, PAHs)

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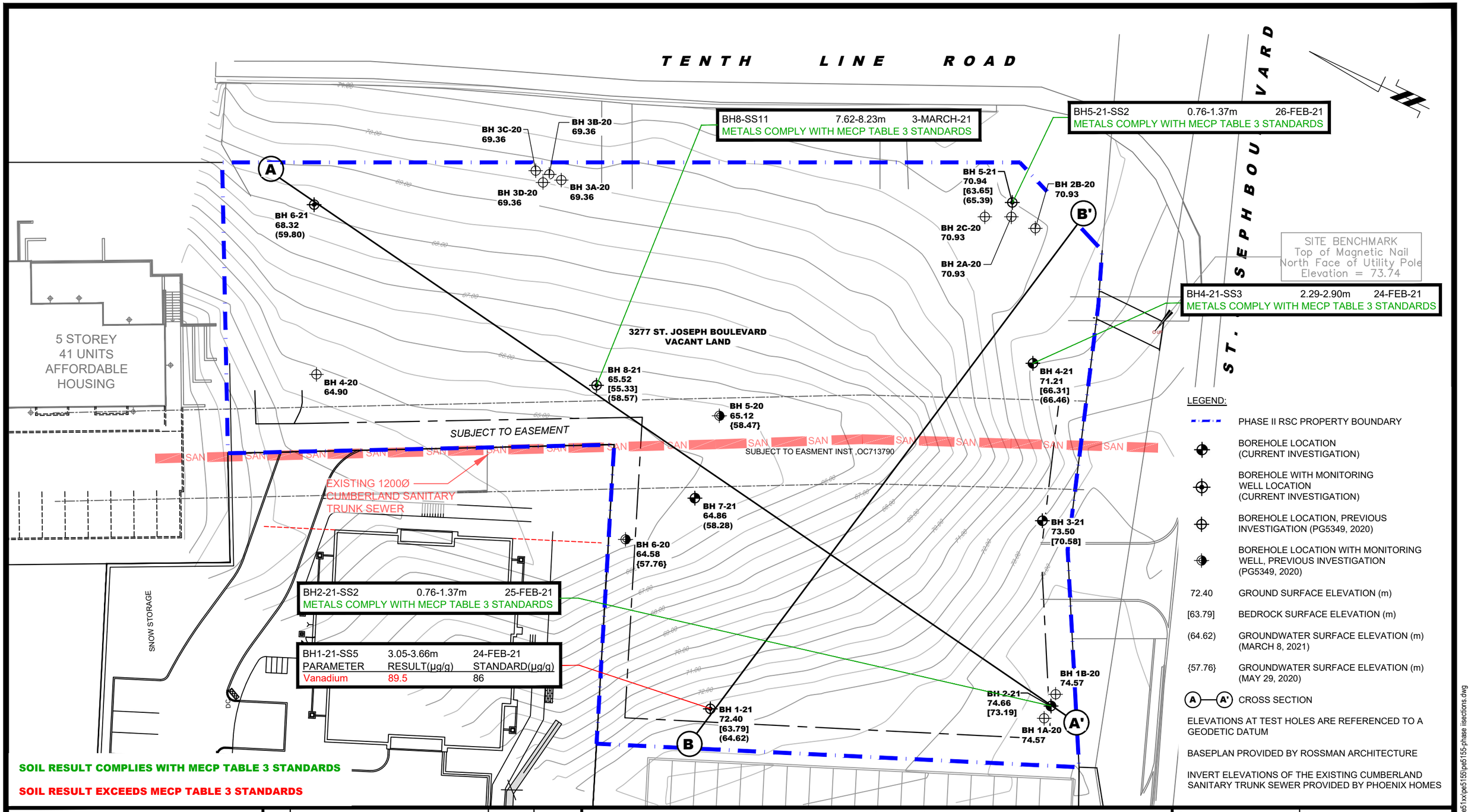

patersongroup
consulting engineers
154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

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LANDRIC HOMES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
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OTTAWA, ONTARIO

Title:
ANALYTICAL TESTING PLAN - SOIL (METALS)

Scale: 1:400	Date: 04/2021
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Checked by: SB	Dwg. No.: PE5155-5
Approved by: AM	Revision No.:

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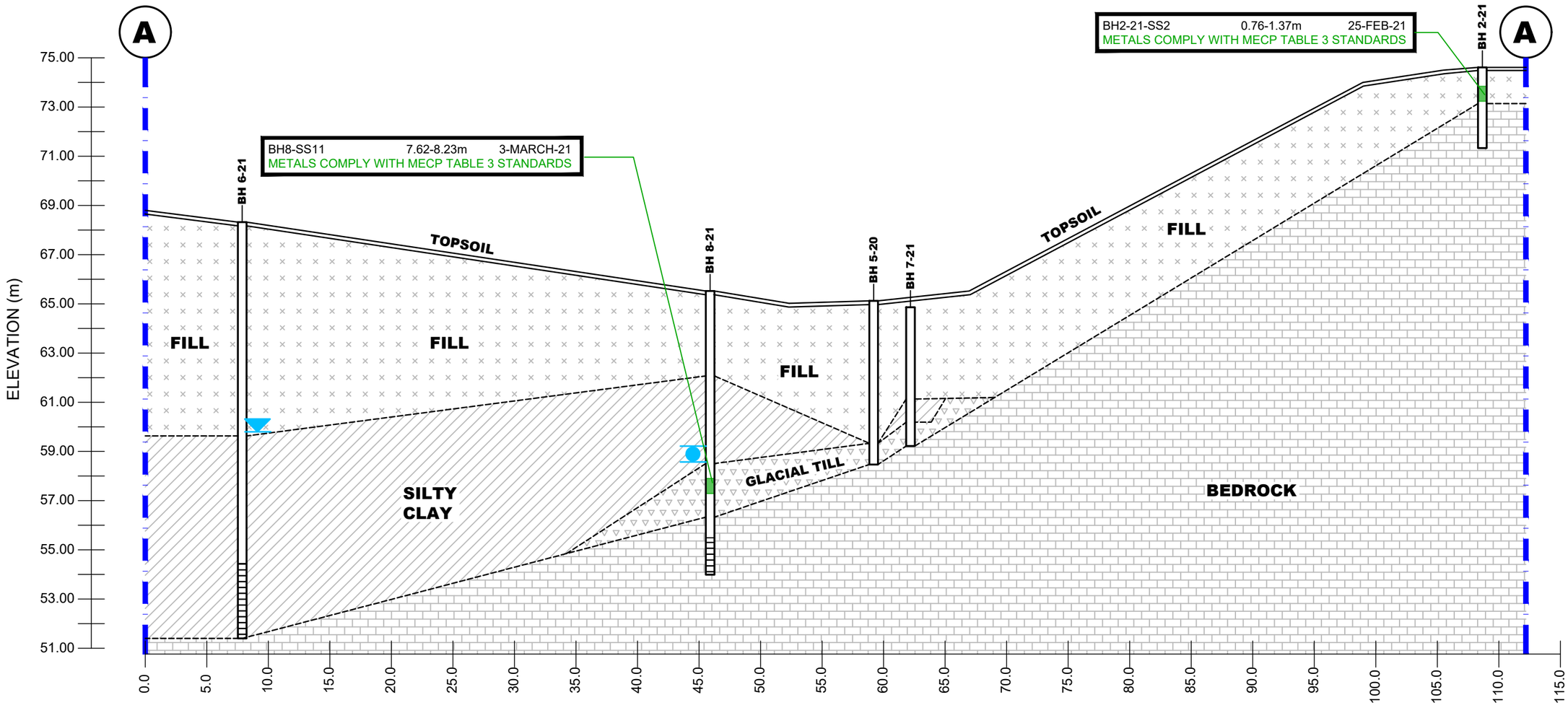

LEGEND:

SOIL RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 3 STANDARDS

GROUNDWATER LEVEL (MARCH, 2021)

GROUNDWATER LEVEL (PIEZOMETER) (MARCH, 2021)

patersongroup
consulting engineers

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

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OTTAWA, ONTARIO

Title:

CROSS SECTION A-A' - SOIL (METALS)

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Approved by: AM	Revision No.:

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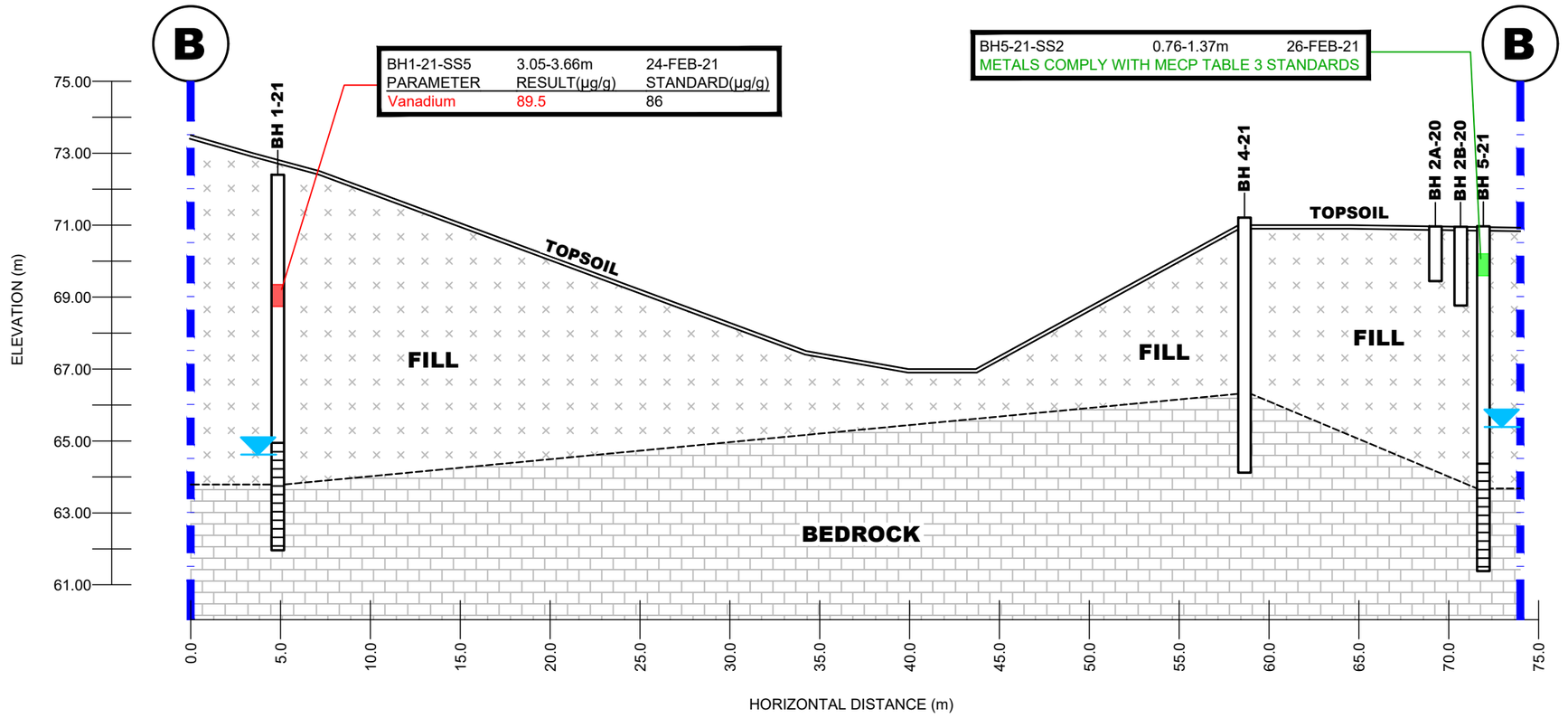

LEGEND:

SOIL RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 3 STANDARDS

GROUNDWATER LEVEL (MARCH, 2021)

GROUNDWATER LEVEL (PIEZOMETER) (MARCH, 2021)

patersongroup
consulting engineers

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

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
3277 ST JOSEPH BLVD.

OTTAWA, ONTARIO

Title:

CROSS SECTION B-B' - SOIL (METALS)

Scale: AS SHOWN	Date: 04/2021
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Checked by: SB	Dwg. No.: PE5155-5B
Approved by: AM	Revision No.:

11x17

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BH6-21-GW1 3.86-6.86m 08-MARCH-19
PAHs COMPLY WITH MECP TABLE 3 STANDARDS
BTEX COMPLY WITH MECP TABLE 3 STANDARDS
PHCs COMPLY WITH MECP TABLE 3 STANDARDS

TENTH LINE ROAD

ST. JOSEPH BOULEVARD

BH 3C-20
69.36
BH 3B-20
69.36
BH 3D-20
69.36
BH 3A-20
69.36
BH 6-21
68.32
(59.80)
BH 5-21
70.94
[63.65]
(65.39)
BH 2B-20
70.93
BH 2C-20
70.93
BH 2A-20
70.93
A
B'

SITE BENCHMARK
Top of Magnetic Nail
North Face of Utility Pole
Elevation = 73.74

5 STOREY
41 UNITS
AFFORDABLE
HOUSING

3277 ST. JOSEPH BOULEVARD
VACANT LAND

BH 4-20
64.90
BH 8-21
65.52
[55.33]
(58.57)
BH 5-20
65.12
{58.47}
BH 4-21
71.21
[66.31]
(66.46)

SUBJECT TO EASEMENT

SAN

MH - S
T/G=65.82
N.INV.=56.50
S.INV.=59.89

SUBJECT TO EASMENT INST. OC713790

MH - S
T/G=65.97
N.INV.=59.94
S.INV.=62.29

MH - S
T/G = 71.47
N.INV.=62.32
S.INV.=67.52

EXISTING 1200Ø
CUMBERLAND SANITARY
TRUNK SEWER

BH 7-21
64.86
(58.28)
BH 6-20
64.58
{57.76}
BH 3-21
73.50
[70.58]

BLOCK 5

SNOW STORAGE

BH1-21-GW1 5.0-8.0m 8-MARCH-21
METALS COMPLY WITH MECP TABLE 3 STANDARDS

DUP (BH1-21-GW1) 5.0-8.0m 8-MARCH-21
METALS COMPLY WITH MECP TABLE 3 STANDARDS

BH 1B-20
74.57
BH 2-21
74.66
[73.19]
BH 1-21
72.40
[63.79]
(64.62)
BH 1A-20
74.57
A'
B

GROUNDWATER RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

GROUNDWATER RESULT EXCEEDS MECP TABLE 3 STANDARDS

LEGEND:

- PHASE II RSC PROPERTY BOUNDARY
- BOREHOLE LOCATION (CURRENT INVESTIGATION)
- BOREHOLE WITH MONITORING WELL LOCATION (CURRENT INVESTIGATION)
- BOREHOLE LOCATION, PREVIOUS INVESTIGATION (PG5349, 2020)
- BOREHOLE LOCATION WITH MONITORING WELL, PREVIOUS INVESTIGATION (PG5349, 2020)
- 72.40 GROUND SURFACE ELEVATION (m)
- [63.79] BEDROCK SURFACE ELEVATION (m)
- (64.62) GROUNDWATER SURFACE ELEVATION (m) (MARCH 8, 2021)
- {57.76} GROUNDWATER SURFACE ELEVATION (m) (MAY 29, 2020)
- A — A' CROSS SECTION

ELEVATIONS AT TEST HOLES ARE REFERENCED TO A GEODETIC DATUM

BASEPLAN PROVIDED BY ROSSMAN ARCHITECTURE

INVERT ELEVATIONS OF THE EXISTING CUMBERLAND SANITARY TRUNK SEWER PROVIDED BY PHOENIX HOMES

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

NO.	REVISIONS	DATE	INITIAL

LANDRIC HOMES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
3277 ST JOSEPH BLVD.

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - GROUNDWATER (BTEX, PHCs, PAHs, METALS)

Scale: 1:400	Date: 04/2021
Drawn by: YA	Report No.: PE5155-3
Checked by: SB	Dwg. No.: PE5155-6
Approved by: AM	Revision No.:

11x17

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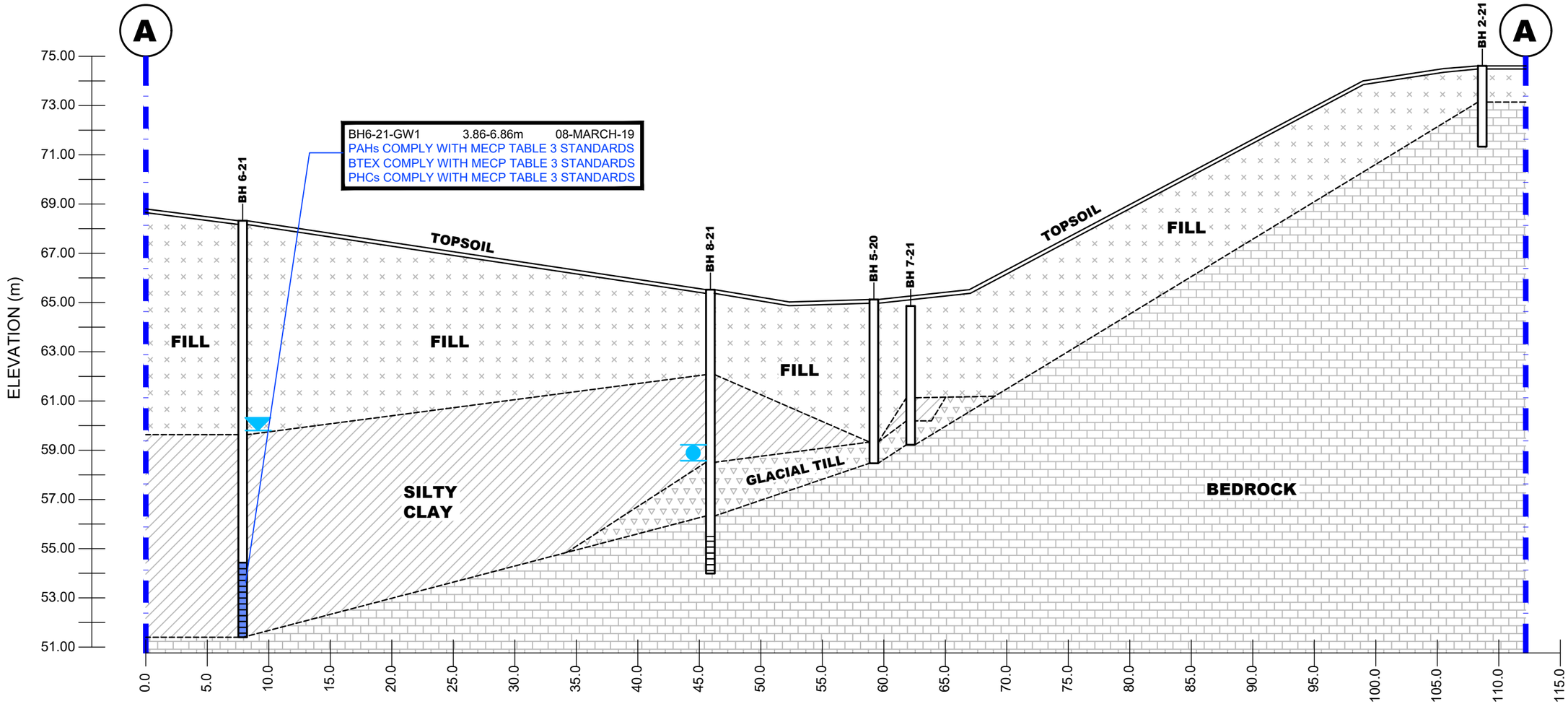

LEGEND:

GROUNDWATER RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

GROUNDWATER RESULT EXCEEDS MECP TABLE 3 STANDARDS

GROUNDWATER LEVEL (MARCH, 2021)

GROUNDWATER LEVEL (PIEZOMETER) (MARCH, 2021)

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL

LANDRIC HOMES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
3277 ST JOSEPH BLVD.

OTTAWA, ONTARIO

Title:
CROSS SECTION A-A' - GROUNDWATER (BTEX, PHCs, PAHs, METALS)

Scale: AS SHOWN	Date: 04/2021
Drawn by: RCG	Report No.: PE5155-3
Checked by: SB	Dwg. No.: PE5155-6A
Approved by: AM	Revision No.:

11x17

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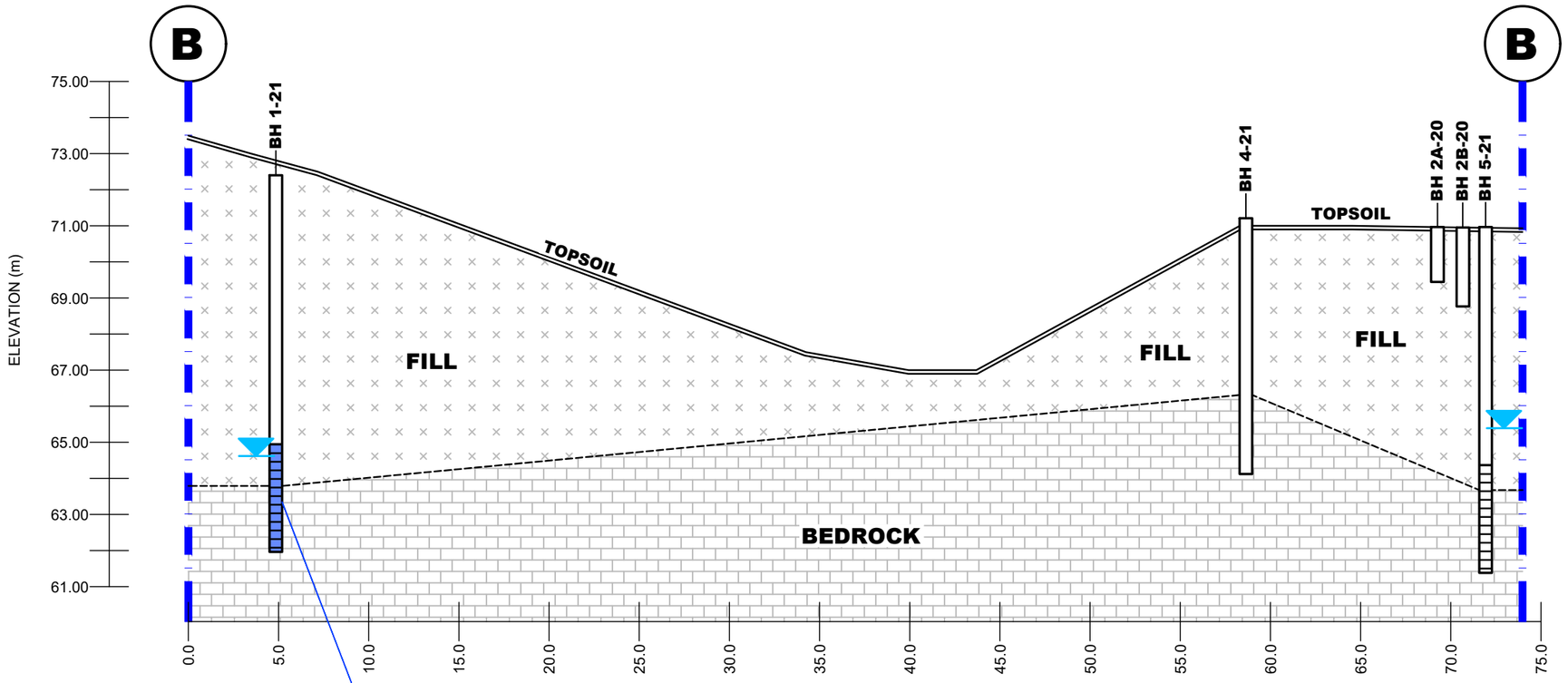

BH1-21-GW1	5.0-8.0m	8-MARCH-21
METALS COMPLY WITH MECP TABLE 3 STANDARDS		
DUP (BH1-21-GW1)	5.0-8.0m	8-MARCH-21
METALS COMPLY WITH MECP TABLE 3 STANDARDS		

LEGEND:

GROUNDWATER RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

GROUNDWATER RESULT EXCEEDS MECP TABLE 3 STANDARDS

GROUNDWATER LEVEL (MARCH, 2021)

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patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL

LANDRIC HOMES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
3277 ST JOSEPH BLVD.
OTTAWA, ONTARIO

Title:
CROSS SECTION B-B' - GROUNDWATER BTEX, PHCs, PAHs, METALS)

Scale: AS SHOWN	Date: 04/2021
Drawn by: RCG	Report No.: PE5155-3
Checked by: SB	Dwg. No.: PE5155-6B
Approved by: AM	Revision No.:

11x17

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APPENDIX 1

SAMPLING AND ANALYSIS PLAN

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

LABORATORY CERTIFICATE OF ANALYSIS

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Paterson Group Inc.

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

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

patersongroup

Sampling & Analysis Plan

Phase II Environmental Site Assessment
3277 St. Joesph Boulevard
Ottawa, Ontario

Prepared For
DCR Phoenix c/o Landric Homes

February 2021
Report: PE5155-SAP

TABLE OF CONTENTS

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by DCR Phoenix c/o Landric Homes. to conduct a Phase II Environmental Site Assessment (ESA) of 3277 St. Joseph Boulevard, Ottawa, Ontario. Based on our 2021 Phase I ESA completed for the subject property, a subsurface investigation program, consisting of borehole drilling, was developed.

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1-21	Assess potential impacts from APEC 1 (fill of unknown quality)	Borehole to be advanced to approximately 2m below the expected long-term groundwater table and install a monitoring well.
BH2-21	Assess potential impacts from APEC 1 (fill of unknown quality)	Through the fill material into the native soil, and intercept the groundwater table, as applicable
BH3-21	Assess potential impacts from APEC 1 (fill of unknown quality)	Through the fill material into the native soil, and intercept the groundwater table, as applicable
BH4-21	Assess potential impacts from APEC 1 (fill of unknown quality)	Through the fill material into the native soil, and intercept the groundwater table, as applicable
BH5-21	Assess potential impacts from APEC 1 (fill of unknown quality)	Borehole to be advanced to approximately 2m below the expected long-term groundwater table and install a monitoring well.
BH6-21	Assess potential impacts from APEC 1 (fill of unknown quality)	Borehole to be advanced to approximately 2m below the expected long-term groundwater table and install a monitoring well.
BH7-21	Assess potential impacts from APEC 1 (fill of unknown quality)	Through the fill material into the native soil, and intercept the groundwater table, as applicable
BH8-21	Assess potential impacts from APEC 1 (fill of unknown quality)	Through the fill material into the native soil, and intercept the groundwater table, as applicable

At each borehole, split-spoon samples of 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.

Upon refusal, rock coring shall be undertaken to the required depth. Approximately every metre the well shall be purged by inertial pumping and the water level recorded to determine if groundwater water is entering the borehole.

Following borehole drilling, monitoring wells will be installed in selected boreholes (as above) for the measurement of water levels and the collection of groundwater samples. Borehole locations are shown on the Test Hole Location Plan appended to the main report.

2.0 ANALYTICAL TESTING PROGRAM

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

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

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

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

- ❒ Parameters analyzed should be consistent with the Contaminants of Concern identified in the Phase I ESA and with the contaminants identified in the soil samples.

3.0 STANDARD OPERATING PROCEDURES

3.1 Environmental Drilling Procedure

Purpose

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

Equipment

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

- ❒ glass soil sample jars
- ❒ two buckets
- ❒ cleaning brush (toilet brush works well)
- ❒ dish detergent
- ❒ methyl hydrate
- ❒ water (if not available on site - water jugs available in the 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 catch basin of known geodetic elevation.

Drilling Procedure

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

- ❒ Continuous split spoon samples (every 0.6 m or 2') or semi-continuous (every 0.76 m or 2'6") are required.
- ❒ Make sure samples are well sealed in plastic bags with no holes prior to screening and are kept cool but unfrozen.
- ❒ If sampling for VOCs, BTEX, or PHCs F1, a soil core from each soil sample which may be analysed 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 the 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 an RKI Eagle, PID, etc. depending on the 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 a brush in soapy water, inside and out, including the 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 the 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 the bag.
- ❒ Insert the probe into soil bag, creating a seal with your hand around the opening.
- ❒ Gently manipulate soil in the 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 the Sampling and Analysis Plan.

3.2 Monitoring Well Installation Procedure

Equipment

- ❒ 5' x 2" [1.52 m x 50 mm] threaded sections of Schedule 40 PVC slotted well screen (5' x 1 ¼" [1.52 m x 32 mm] if installing in a cored hole in bedrock)
- ❒ 5' x 2" [1.52 m x 50 mm] threaded sections of Schedule 40 PVC riser pipe (5' x 1 ¼" [1.52 m x 32 mm] if installing in a 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 the required depth, using drilling and sampling procedures described above.
- ❒ If the borehole is deeper than required monitoring well, backfill with bentonite chips to the 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 the screen. Thread the second section of the screen if required. Thread risers onto the screen. Lower into the borehole to the required depth. Ensure slip-cap or J-plug is inserted to prevent backfill materials from entering the 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 the 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 the 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 a socket wrench or Allan key to open metal flush mount protector cap. Remove plastic well cap.
- ❒ Measure water level, with respect to the existing ground surface, using water level meter or interface probe. If using an interface probe on suspected NAPL site, measure the thickness of the free product.
- ❒ Measure the total depth of well.
- ❒ Clean water level tape or interface probe using methanol and water. Change gloves between wells.
- ❒ Calculate the volume of standing water within well and record.
- ❒ Insert polyethylene tubing into well and attach to the peristaltic pump. Turn on the peristaltic pump and purge into the 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 the 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 the 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 a 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 the 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 (0.5 x) 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 MECP 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 the laboratory
- ❒ Drill rig breakdowns
- ❒ Winter conditions
- ❒ Other site-specific impediments

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

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II Environmental Site Assessment
Proposed Hillside Development
3277 St. Joseph Boulevard - Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5155

REMARKS

HOLE NO. BH 1-21

BORINGS BY CME 55 Power Auger **DATE** 2021 February 24

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	72.40		
FILL: Brown silty sand with crushed stone, gravel and clay		AU	1						
0.61						1	71.40		
FILL: Brown silty clay, with sand and gravel		SS	2	33	5				
		SS	3	33	6	2	70.40		
2.21									
FILL: Brown silty clay trace sand and gravel		SS	4	58	8				
		SS	5	58	7	3	69.40		
		SS	6	58	5				
		SS	7	67	5	4	68.40		
- Some topsoil and organics by 6.5 m depth		SS	8	50	5				
		SS	9	58	6	5	67.40		
6.71									
FILL: Brown silty clay with topsoil, sand, gravel, trace organics - Topsoil content decreasing with depth		SS	10	25	10	6	66.40		
		SS	11	33	12				
8.61		SS	12	0	+50	7	65.40		
BEDROCK: Excellent quality Grey Limestone		RC	1	100	93	8	64.40		
						9	63.40		
						10	62.40		
10.44		RC	2	100	100				
End of Borehole									
(GWL @ 7.78 m depth - March 8, 2021)									

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.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II Environmental Site Assessment
Proposed Hillside Development
3277 St. Joseph Boulevard - Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5155

REMARKS

HOLE NO. BH 2-21

BORINGS BY CME 55 Power Auger **DATE** 2021 February 25

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	74.66
TOPSOIL 0.15		AU	1				
FILL: Brown silty clay with sand and gravel						1	73.66
- Clay content decreasing with depth 1.47		SS	2	17	+50		
BEDROCK: Fair to excellent quality Grey Limestone		RC	1	100	62	2	72.66
3.28		RC	2	100	100	3	71.66
End of Borehole							
(Piezometer dry/blocked - March 8, 2021)							

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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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II Environmental Site Assessment
Proposed Hillside Development
3277 St. Joseph Boulevard - Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5155

REMARKS

HOLE NO. BH 3-21

BORINGS BY CME 55 Power Auger **DATE** 2021 February 25

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	73.50
TOPSOIL with brown silty sand and gravel 0.15		AU	1				
FILL: Brown silty sand with crushed stone, trace clay		SS	2	8	12	1	72.50
2.21						2	71.50
FILL: Granular crushed stone with silty clay some blast rock 2.92		RC	1	100	63		
BEDROCK: Fair to excellent quality Grey Limestone		RC	2	100	51	3	70.50
		RC	3	100	73	4	69.50
		RC	4	100	86	5	68.50
6.73						6	67.50
End of Borehole							
(Piezometer dry/blocked - March 8, 2021)							

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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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II Environmental Site Assessment
Proposed Hillside Development
3277 St. Joseph Boulevard - Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5155

REMARKS

HOLE NO. BH 4-21

BORINGS BY CME 55 Power Auger **DATE** 2021 February 24

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	71.21
FILL: Brown silty sand with gravel, topsoil, organics, some clay		AU	1				
0.61							
FILL: Brown silty clay with sand, gravel, crushed stone, trace topsoil		SS	2	42	11	1	70.21
		SS	3	58	24	2	69.21
- Crushed stone and rock fragments increasing at 1.8 m depth		SS	4	25	38		
2.97						3	68.21
FILL: Brown silty sand with gravel, cobbles trace clay - Some blast rock rock by 3.5 m depth		SS	5	33	0		
		SS	6	0	0	4	67.21
4.90		SS	7	0	0		
BEDROCK: Fair to good quality Grey Limestone		RC	1	100	65	5	66.21
		RC	2	100	82	6	65.21
7.09						7	64.21
End of Borehole							
(GWL @ 4.75 m depth - March 8, 2021)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

Monitoring Well Construction

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II Environmental Site Assessment
Proposed Hillside Development
3277 St. Joseph Boulevard - Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5155

REMARKS

HOLE NO. BH 5-21

BORINGS BY CME 55 Power Auger **DATE** 2021 February 26

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							0	70.94
TOPSOIL	0.10		AU	1				
FILL: Brown silty sand with gravel	0.76		SS	2	42	12	1	69.94
FILL: Brown silty clay with sand trace gravel, cobbles, boulders, some blast rock	1.52		SS	3	47	+50	2	68.94
FILL: Blast rock with crushed stone, some sand and clay			RC	1	22		3	67.94
			SS	4	42	38	4	66.94
			RC	2	15		5	65.94
			SS	5	4	21	6	64.94
	6.86							
FILL: Brown silty clay, some sand, trace gravel, topsoil and organics	7.29						7	63.94
BEDROCK: Good to excellent quality Grey Limestone			RC	3	100	79	8	62.94
			RC	4	100	80	9	61.94
	9.53							
End of Borehole								
(GWL @ 5.55 m depth - March 8, 2021)								

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

Monitoring Well Construction

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II Environmental Site Assessment
Proposed Hillside Development
3277 St. Joseph Boulevard - Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5155

REMARKS

HOLE NO. BH 6-21

BORINGS BY CME 55 Power Auger **DATE** 2021 February 26

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	68.32
TOPSOIL 0.15		AU	1				
FILL: Brown silty clay with sand, gravel, some topsoil, trace asphalt and cobbles		SS	2	67	8	1	67.32
		SS	3	33	12	2	66.32
		SS	4	50	9		
		SS	5	42	22	3	65.32
		SS	6	42	16	4	64.32
4.57							
FILL: Brown silty clay trace sand, gravel, and organics		SS	7	75	5	5	63.32
		SS	8	50	17		
		SS	9	100	19	6	62.32
		SS	10	100	21	7	61.32
		SS	11	75	37	8	60.32
8.69		SS	12	100	19		
Very stiff brown **SILTY CLAY**		SS	13	100	6	9	59.32
						10	58.32
10.67							
Stiff grey **SILTY CLAY**						11	57.32
						12	56.32
12.80							
End of Borehole							
(GWL @ 8.52 m depth - March 8, 2021)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II Environmental Site Assessment
Proposed Hillside Development
3277 St. Joseph Boulevard - Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5155

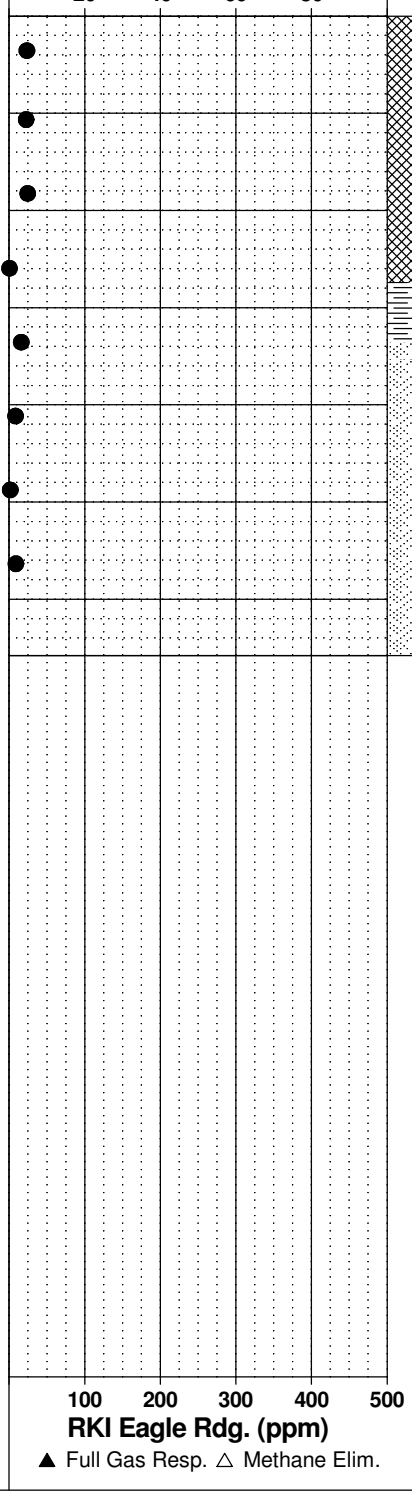
REMARKS

HOLE NO. BH 7-21

BORINGS BY CME 55 Power Auger **DATE** 2021 March 3

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	64.86
TOPSOIL 0.10		AU	1				
FILL: Brown silty clay trace sand, gravel, organics, cobbles and topsoil		SS	2	67	7	1	63.86
		SS	3	42	4	2	62.86
		SS	4	13	6		
		SS	5	71	0	3	61.86
3.73							
Hard to very stiff brown **SILTY CLAY**		SS	6	92	13	4	60.86
		SS	7	79	15	5	59.86
5.64		SS	8	42	+50		
GLACIAL TILL: Brown sandy silt to silty sand with clay, gravel, cobbles and boulders						6	58.86
6.58							
End of Borehole							
Practical refusal to augering at 6.58 m depth							
(Piezometer destroyed - March 8, 2021)							

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



Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II Environmental Site Assessment
Proposed Hillside Development
3277 St. Joseph Boulevard - Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5155

REMARKS

HOLE NO. BH 8-21

BORINGS BY CME 55 Power Auger **DATE** 2021 March 3

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
TOPSOIL 0.15		AU	1			0	65.52
FILL: Brown silty clay trace sand, gravel and organics		SS	2	42	6	1	64.52
		SS	3	33	4	2	63.52
		SS	4	67	8		
3.45		SS	5	92	11	3	62.52
Hard to very stiff brown **SILTY CLAY**		SS	6	100	12	4	61.52
		SS	7	100	10	5	60.52
		SS	8	100	9	6	59.52
		SS	9	100	3		
- Grey by 6.7 m depth 7.01		SS	10	25	20	7	58.52
GLACIAL TILL: Grey clayey silt with sand, gravel, cobbles and boulders		SS	11	54	50	8	57.52
		SS	12	46	+50		
9.19						9	56.52
BEDROCK: Poor to fair quality Grey Limestone		RC	1	79	30	10	55.52
		RC	2	100	41	11	54.52
11.53							
End of Borehole							
(GWL @ 6.95 m depth - March 8, 2021)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

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

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

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

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

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

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

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

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

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

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

CONSOLIDATION TEST

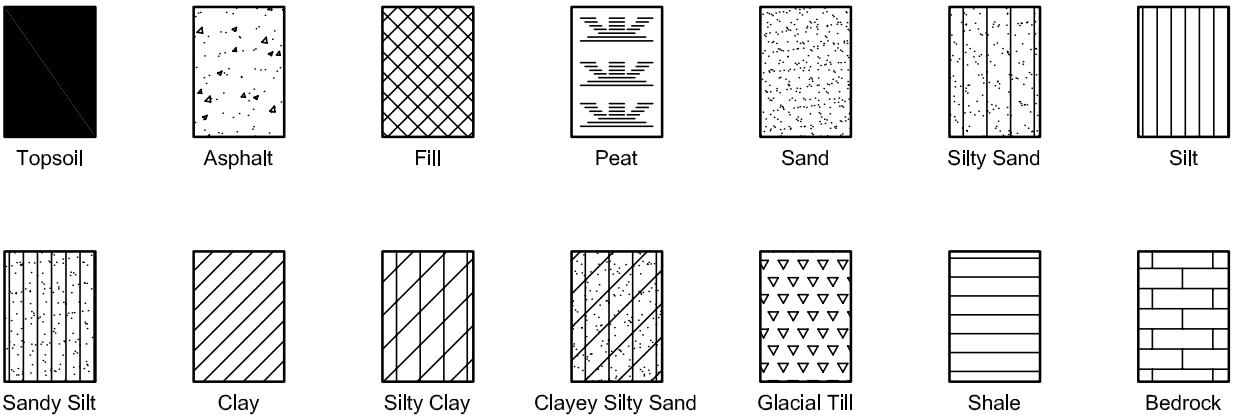
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

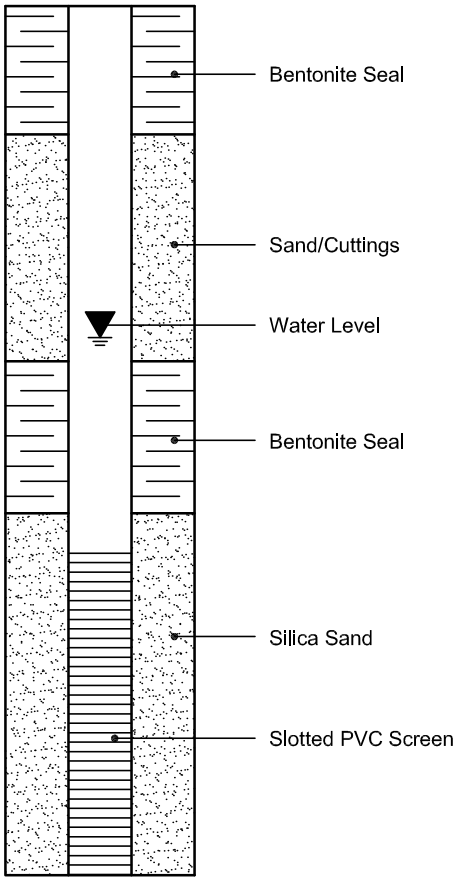
SYMBOLS AND TERMS (continued)

STRATA PLOT

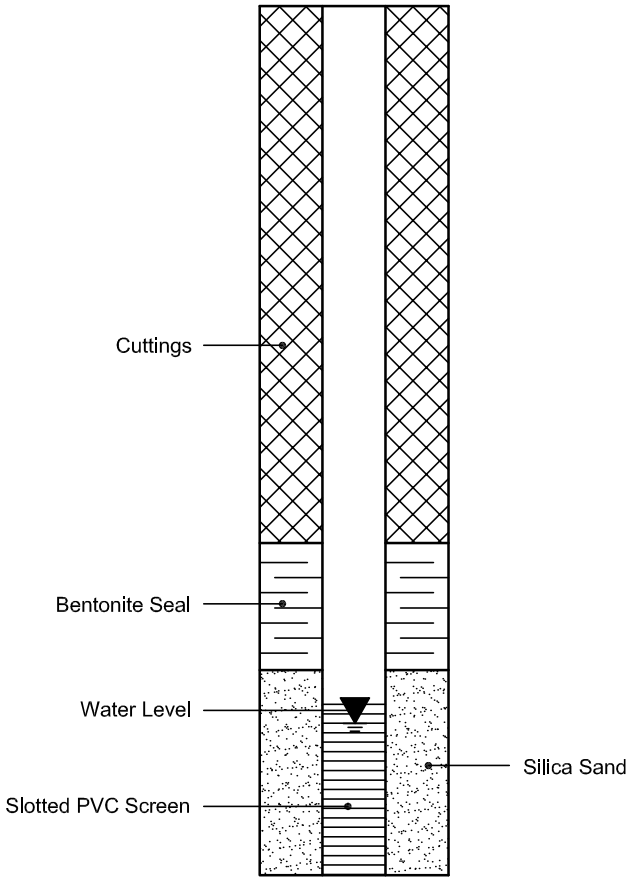


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 30486
Project: PE5155
Custody: 55627

Report Date: 5-Mar-2021
Order Date: 2-Mar-2021

Order #: 2110265

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

Paracel ID	Client ID
2110265-01	BH2-21-SS2
2110265-02	BH1-21-SS5
2110265-03	BH4-21-SS3
2110265-04	BH4-21-SS4
2110265-05	BH5-21-SS2
2110265-06	BH6-21-SS6
2110265-07	BH6-21-SS13

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 05-Mar-2021

Client: Paterson Group Consulting Engineers

Order Date: 2-Mar-2021

Client PO: 30486

Project Description: PE5155

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	3-Mar-21	3-Mar-21
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	2-Mar-21	3-Mar-21
PHC F1	CWS Tier 1 - P&T GC-FID	3-Mar-21	3-Mar-21
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	2-Mar-21	4-Mar-21
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	4-Mar-21	4-Mar-21
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	2-Mar-21	5-Mar-21
Solids, %	Gravimetric, calculation	3-Mar-21	3-Mar-21

Certificate of Analysis

Report Date: 05-Mar-2021

Client: **Paterson Group Consulting Engineers**

Order Date: 2-Mar-2021

Client PO: **30486**

Project Description: PE5155

	Client ID:	BH2-21-SS2	BH1-21-SS5	BH4-21-SS3	BH4-21-SS4
	Sample Date:	25-Feb-21 09:00	24-Feb-21 09:00	24-Feb-21 09:00	24-Feb-21 09:00
	Sample ID:	2110265-01	2110265-02	2110265-03	2110265-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	87.0	74.5	82.0	77.9
General Inorganics					
pH	0.05 pH Units	-	-	7.60	-
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	-	<1.0
Arsenic	1.0 ug/g dry	2.9	3.9	-	3.6
Barium	1.0 ug/g dry	98.4	232	-	280
Beryllium	0.5 ug/g dry	<0.5	0.9	-	0.8
Boron	5.0 ug/g dry	8.5	8.3	-	9.5
Cadmium	0.5 ug/g dry	<0.5	<0.5	-	<0.5
Chromium	5.0 ug/g dry	31.6	113	-	75.4
Cobalt	1.0 ug/g dry	7.4	21.6	-	15.2
Copper	5.0 ug/g dry	18.5	44.8	-	32.2
Lead	1.0 ug/g dry	37.9	8.7	-	38.8
Molybdenum	1.0 ug/g dry	1.0	<1.0	-	1.0
Nickel	5.0 ug/g dry	19.8	60.0	-	41.6
Selenium	1.0 ug/g dry	<1.0	<1.0	-	<1.0
Silver	0.3 ug/g dry	<0.3	<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	31.0	89.5	-	65.8
Zinc	20.0 ug/g dry	82.4	100	-	114
Volatiles					
Benzene	0.02 ug/g dry	-	<0.02	-	<0.02
Ethylbenzene	0.05 ug/g dry	-	<0.05	-	<0.05
Toluene	0.05 ug/g dry	-	<0.05	-	<0.05
m,p-Xylenes	0.05 ug/g dry	-	<0.05	-	<0.05
o-Xylene	0.05 ug/g dry	-	<0.05	-	<0.05
Xylenes, total	0.05 ug/g dry	-	<0.05	-	<0.05
Toluene-d8	Surrogate	-	108%	-	108%
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

Certificate of Analysis

Report Date: 05-Mar-2021

Client: Paterson Group Consulting Engineers

Order Date: 2-Mar-2021

Client PO: 30486

Project Description: PE5155

	Client ID:	BH2-21-SS2	BH1-21-SS5	BH4-21-SS3	BH4-21-SS4
	Sample Date:	25-Feb-21 09:00	24-Feb-21 09:00	24-Feb-21 09:00	24-Feb-21 09:00
	Sample ID:	2110265-01	2110265-02	2110265-03	2110265-04
	MDL/Units	Soil	Soil	Soil	Soil
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	-	-	<0.02	-
Acenaphthylene	0.02 ug/g dry	-	-	0.04	-
Anthracene	0.02 ug/g dry	-	-	0.03	-
Benzo [a] anthracene	0.02 ug/g dry	-	-	0.04	-
Benzo [a] pyrene	0.02 ug/g dry	-	-	0.06	-
Benzo [b] fluoranthene	0.02 ug/g dry	-	-	0.06	-
Benzo [g,h,i] perylene	0.02 ug/g dry	-	-	0.05	-
Benzo [k] fluoranthene	0.02 ug/g dry	-	-	0.03	-
Chrysene	0.02 ug/g dry	-	-	0.05	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	-	-	<0.02	-
Fluoranthene	0.02 ug/g dry	-	-	0.08	-
Fluorene	0.02 ug/g dry	-	-	<0.02	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	-	-	0.04	-
1-Methylnaphthalene	0.02 ug/g dry	-	-	<0.02	-
2-Methylnaphthalene	0.02 ug/g dry	-	-	<0.02	-
Methylnaphthalene (1&2)	0.04 ug/g dry	-	-	<0.04	-
Naphthalene	0.01 ug/g dry	-	-	<0.01	-
Phenanthrene	0.02 ug/g dry	-	-	0.04	-
Pyrene	0.02 ug/g dry	-	-	0.07	-
2-Fluorobiphenyl	Surrogate	-	-	98.9%	-
Terphenyl-d14	Surrogate	-	-	93.9%	-

Certificate of Analysis

Report Date: 05-Mar-2021

Client: Paterson Group Consulting Engineers

Order Date: 2-Mar-2021

Client PO: 30486

Project Description: PE5155

	Client ID:	BH5-21-SS2	BH6-21-SS6	BH6-21-SS13	-
	Sample Date:	26-Feb-21 09:00	26-Feb-21 09:00	26-Feb-21 09:00	-
	Sample ID:	2110265-05	2110265-06	2110265-07	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	79.7	93.0	68.7	-
General Inorganics					
pH	0.05 pH Units	-	-	7.08	-
Metals					
Antimony	1.0 ug/g dry	<1.0	-	-	-
Arsenic	1.0 ug/g dry	3.5	-	-	-
Barium	1.0 ug/g dry	219	-	-	-
Beryllium	0.5 ug/g dry	1.0	-	-	-
Boron	5.0 ug/g dry	8.2	-	-	-
Cadmium	0.5 ug/g dry	<0.5	-	-	-
Chromium	5.0 ug/g dry	80.5	-	-	-
Cobalt	1.0 ug/g dry	16.5	-	-	-
Copper	5.0 ug/g dry	26.0	-	-	-
Lead	1.0 ug/g dry	15.8	-	-	-
Molybdenum	1.0 ug/g dry	1.2	-	-	-
Nickel	5.0 ug/g dry	41.1	-	-	-
Selenium	1.0 ug/g dry	<1.0	-	-	-
Silver	0.3 ug/g dry	<0.3	-	-	-
Thallium	1.0 ug/g dry	<1.0	-	-	-
Uranium	1.0 ug/g dry	<1.0	-	-	-
Vanadium	10.0 ug/g dry	72.6	-	-	-
Zinc	20.0 ug/g dry	102	-	-	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	-	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	-	-	-
Toluene	0.05 ug/g dry	0.08	-	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	-	-	-
o-Xylene	0.05 ug/g dry	<0.05	-	-	-
Xylenes, total	0.05 ug/g dry	<0.05	-	-	-
Toluene-d8	Surrogate	109%	-	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	-	-	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	-	-	-
F3 PHCs (C16-C34)	8 ug/g dry	14	-	-	-
F4 PHCs (C34-C50)	6 ug/g dry	7	-	-	-

Certificate of Analysis

Report Date: 05-Mar-2021

Client: **Paterson Group Consulting Engineers**

Order Date: 2-Mar-2021

Client PO: **30486**

Project Description: PE5155

	Client ID:	BH5-21-SS2	BH6-21-SS6	BH6-21-SS13	-
	Sample Date:	26-Feb-21 09:00	26-Feb-21 09:00	26-Feb-21 09:00	-
	Sample ID:	2110265-05	2110265-06	2110265-07	-
	MDL/Units	Soil	Soil	Soil	-
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	-	<0.02	-	-
Acenaphthylene	0.02 ug/g dry	-	<0.02	-	-
Anthracene	0.02 ug/g dry	-	<0.02	-	-
Benzo [a] anthracene	0.02 ug/g dry	-	<0.02	-	-
Benzo [a] pyrene	0.02 ug/g dry	-	<0.02	-	-
Benzo [b] fluoranthene	0.02 ug/g dry	-	<0.02	-	-
Benzo [g,h,i] perylene	0.02 ug/g dry	-	<0.02	-	-
Benzo [k] fluoranthene	0.02 ug/g dry	-	<0.02	-	-
Chrysene	0.02 ug/g dry	-	<0.02	-	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	-	<0.02	-	-
Fluoranthene	0.02 ug/g dry	-	<0.02	-	-
Fluorene	0.02 ug/g dry	-	<0.02	-	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	-	<0.02	-	-
1-Methylnaphthalene	0.02 ug/g dry	-	<0.02	-	-
2-Methylnaphthalene	0.02 ug/g dry	-	<0.02	-	-
Methylnaphthalene (1&2)	0.04 ug/g dry	-	<0.04	-	-
Naphthalene	0.01 ug/g dry	-	<0.01	-	-
Phenanthrene	0.02 ug/g dry	-	<0.02	-	-
Pyrene	0.02 ug/g dry	-	<0.02	-	-
2-Fluorobiphenyl	Surrogate	-	93.5%	-	-
Terphenyl-d14	Surrogate	-	89.9%	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	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	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	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						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	*1.27*		*ug/g*		*95.2*	*50-140*			
Surrogate: Terphenyl-d14	*1.40*		*ug/g*		*105*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*8.63*		*ug/g*		*108*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
pH	7.62	0.05	pH Units	7.62			0.0	2.3	
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND			NC	40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND			NC	30	
F3 PHCs (C16-C34)	32	8	ug/g dry	33			3.3	30	
F4 PHCs (C34-C50)	18	6	ug/g dry	18			1.5	30	
Metals									
Antimony	1.4	1.0	ug/g dry	1.5			3.4	30	
Arsenic	3.6	1.0	ug/g dry	3.4			5.3	30	
Barium	72.5	1.0	ug/g dry	72.5			0.0	30	
Beryllium	0.7	0.5	ug/g dry	0.8			11.1	30	
Boron	7.5	5.0	ug/g dry	6.9			7.2	30	
Cadmium	ND	0.5	ug/g dry	ND			NC	30	
Chromium	22.2	5.0	ug/g dry	21.9			1.3	30	
Cobalt	7.4	1.0	ug/g dry	7.6			1.9	30	
Copper	12.3	5.0	ug/g dry	12.6			2.8	30	
Lead	11.2	1.0	ug/g dry	11.4			1.7	30	
Molybdenum	ND	1.0	ug/g dry	ND			NC	30	
Nickel	14.5	5.0	ug/g dry	14.8			2.1	30	
Selenium	ND	1.0	ug/g dry	ND			NC	30	
Silver	ND	0.3	ug/g dry	ND			NC	30	
Thallium	ND	1.0	ug/g dry	ND			NC	30	
Uranium	ND	1.0	ug/g dry	ND			NC	30	
Vanadium	36.2	10.0	ug/g dry	35.8			1.0	30	
Zinc	45.8	20.0	ug/g dry	46.1			0.7	30	
Physical Characteristics									
% Solids	90.7	0.1	% by Wt.	93.0			2.4	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	ND			NC	40	
Acenaphthylene	ND	0.02	ug/g dry	ND			NC	40	
Anthracene	ND	0.02	ug/g dry	ND			NC	40	
Benzo [a] anthracene	ND	0.02	ug/g dry	ND			NC	40	
Benzo [a] pyrene	ND	0.02	ug/g dry	ND			NC	40	
Benzo [b] fluoranthene	ND	0.02	ug/g dry	ND			NC	40	
Benzo [g,h,i] perylene	ND	0.02	ug/g dry	ND			NC	40	
Benzo [k] fluoranthene	ND	0.02	ug/g dry	ND			NC	40	
Chrysene	ND	0.02	ug/g dry	ND			NC	40	
Dibenzo [a,h] anthracene	ND	0.02	ug/g dry	ND			NC	40	
Fluoranthene	ND	0.02	ug/g dry	ND			NC	40	
Fluorene	ND	0.02	ug/g dry	ND			NC	40	
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g dry	ND			NC	40	
1-Methylnaphthalene	ND	0.02	ug/g dry	ND			NC	40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND			NC	40	
Naphthalene	ND	0.01	ug/g dry	ND			NC	40	
Phenanthrene	ND	0.02	ug/g dry	ND			NC	40	
Pyrene	ND	0.02	ug/g dry	ND			NC	40	
Surrogate: 2-Fluorobiphenyl	*1.87*		*ug/g dry*		*106*	*50-140*			
Surrogate: Terphenyl-d14	*1.92*		*ug/g dry*		*109*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g dry	ND			NC	50	
Ethylbenzene	ND	0.05	ug/g dry	ND			NC	50	
Toluene	ND	0.05	ug/g dry	ND			NC	50	
m,p-Xylenes	ND	0.05	ug/g dry	ND			NC	50	
o-Xylene	ND	0.05	ug/g dry	ND			NC	50	
Surrogate: Toluene-d8	*11.5*		*ug/g dry*		*109*	*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)	205	7	ug/g	ND	102	80-120			
F2 PHCs (C10-C16)	95	4	ug/g	ND	86.0	60-140			
F3 PHCs (C16-C34)	325	8	ug/g	33	108	60-140			
F4 PHCs (C34-C50)	195	6	ug/g	18	104	60-140			
Metals									
Antimony	43.9	1.0	ug/g	ND	86.7	70-130			
Arsenic	51.3	1.0	ug/g	1.4	99.9	70-130			
Barium	80.0	1.0	ug/g	29.0	102	70-130			
Beryllium	54.7	0.5	ug/g	ND	109	70-130			
Boron	52.4	5.0	ug/g	ND	99.3	70-130			
Cadmium	50.5	0.5	ug/g	ND	101	70-130			
Chromium	63.6	5.0	ug/g	8.8	110	70-130			
Cobalt	56.4	1.0	ug/g	3.0	107	70-130			
Copper	57.2	5.0	ug/g	5.1	104	70-130			
Lead	53.4	1.0	ug/g	4.6	97.8	70-130			
Molybdenum	51.6	1.0	ug/g	ND	102	70-130			
Nickel	57.6	5.0	ug/g	5.9	103	70-130			
Selenium	47.0	1.0	ug/g	ND	93.8	70-130			
Silver	46.7	0.3	ug/g	ND	93.3	70-130			
Thallium	46.1	1.0	ug/g	ND	91.9	70-130			
Uranium	48.6	1.0	ug/g	ND	96.7	70-130			
Vanadium	70.0	10.0	ug/g	14.3	111	70-130			
Zinc	69.1	20.0	ug/g	ND	101	70-130			
Semi-Volatiles									
Acenaphthene	0.170	0.02	ug/g	ND	76.8	50-140			
Acenaphthylene	0.152	0.02	ug/g	ND	68.7	50-140			
Anthracene	0.197	0.02	ug/g	ND	89.1	50-140			
Benzo [a] anthracene	0.163	0.02	ug/g	ND	73.6	50-140			
Benzo [a] pyrene	0.158	0.02	ug/g	ND	71.4	50-140			
Benzo [b] fluoranthene	0.180	0.02	ug/g	ND	81.5	50-140			
Benzo [g,h,i] perylene	0.142	0.02	ug/g	ND	64.1	50-140			
Benzo [k] fluoranthene	0.187	0.02	ug/g	ND	84.7	50-140			
Chrysene	0.187	0.02	ug/g	ND	84.6	50-140			
Dibenzo [a,h] anthracene	0.158	0.02	ug/g	ND	71.4	50-140			
Fluoranthene	0.169	0.02	ug/g	ND	76.3	50-140			
Fluorene	0.175	0.02	ug/g	ND	79.3	50-140			
Indeno [1,2,3-cd] pyrene	0.141	0.02	ug/g	ND	63.6	50-140			
1-Methylnaphthalene	0.177	0.02	ug/g	ND	80.0	50-140			
2-Methylnaphthalene	0.205	0.02	ug/g	ND	92.9	50-140			
Naphthalene	0.195	0.01	ug/g	ND	88.4	50-140			
Phenanthrene	0.168	0.02	ug/g	ND	75.9	50-140			
Pyrene	0.176	0.02	ug/g	ND	79.6	50-140			
Surrogate: 2-Fluorobiphenyl	*1.71*		*ug/g*		*96.9*	*50-140*			
Surrogate: Terphenyl-d14	*1.82*		*ug/g*		*103*	*50-140*			
Volatiles									
Benzene	4.80	0.02	ug/g	ND	120	60-130			
Ethylbenzene	4.60	0.05	ug/g	ND	115	60-130			
Toluene	4.51	0.05	ug/g	ND	113	60-130			

Certificate of Analysis

Report Date: 05-Mar-2021

Client: Paterson Group Consulting Engineers

Order Date: 2-Mar-2021

Client PO: 30486

Project Description: PE5155

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
m,p-Xylenes	8.74	0.05	ug/g	ND	109	60-130			
o-Xylene	4.42	0.05	ug/g	ND	111	60-130			
Surrogate: Toluene-d8	*8.19*		*ug/g*		*102*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

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.

PARAC LABORATORIES

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Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
216265	No 55627

Client Name: Paterson Group	Project Ref: PE5155	Page 1 of 1
Contact Name: Adrian Menyhart	Quote #:	Turnaround Time
Address: 154 Colonnade Rd	PO #: 30486	☐ 1 day ☐ 3 day
	E-mail: amenyhart@patersongroup.ca jandrechek@ " " "	☐ 2 day ☑ Regular
Telephone: 613-226-7381		Date Required:

Regulation 153/04	Other Regulation
☐ Table 1 ☐ Res/Park ☐ Med/Fine	☐ REG 558 ☐ PWQO
☐ Table 2 ☐ Ind/Comm ☐ Coarse	☐ CCME ☐ MISA
☑ Table 3 ☐ Agri/Other	☐ SU - Sani ☐ SU - Storm
☐ Table ___	Mun: ___
For RSC: ☐ Yes ☐ No	☐ 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	Required Analysis: BTEX/PHCs	ICP METALS	PAHs	PH
1	BH2-21-SS2	S		1	25-FEB-21	—		X		
2	BH3-21-SS5			2	24-FEB-21	—	X	X		
3	BH4-21-SS3			1	24-FEB-21	—			X	X
4	BH4-21-SS4			2	24-FEB-21	—	X	X		
5	BH5-21-SS2			2	26-FEB-21	—	X	X		
6	BH6-21-SS6			1	26-FEB-21	—			X	
7	BH6-21-SS13	↓		1	26-FEB-21	—				X
8										
9										
10										

Comments:

Method of Delivery: PARACEL COURIER

Relinquished By (Sign):	Received By Driver/Depot: M. DeLuse	Received at Lab:	Verified By:
Relinquished By (Print): Jesse Andrechek	Date/Time: 02/03/21 3:44	Date/Time: 3-2-21 17:05	Date/Time: 3-2-21 17:10
Date/Time: 2-MAR-21	Temperature: °C FH	Temperature: 12.7 °C	pH Verified: ☐ By:

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 31964
Project: PE5155
Custody: 59308

Report Date: 8-Mar-2021
Order Date: 4-Mar-2021

Order #: 2110499

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

Paracel ID	Client ID
2110499-01	BH7-SS3
2110499-02	BH8-SS11

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 08-Mar-2021

Client: Paterson Group Consulting Engineers

Order Date: 4-Mar-2021

Client PO: 31964

Project Description: PE5155

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	5-Mar-21	5-Mar-21
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	4-Mar-21	5-Mar-21
PHC F1	CWS Tier 1 - P&T GC-FID	5-Mar-21	5-Mar-21
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	5-Mar-21	5-Mar-21
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	5-Mar-21	5-Mar-21
Solids, %	Gravimetric, calculation	5-Mar-21	5-Mar-21

Certificate of Analysis

Report Date: 08-Mar-2021

Client: Paterson Group Consulting Engineers

Order Date: 4-Mar-2021

Client PO: 31964

Project Description: PE5155

	Client ID:	BH7-SS3	BH8-SS11	-	-
	Sample Date:	03-Mar-21 09:00	03-Mar-21 09:00	-	-
	Sample ID:	2110499-01	2110499-02	-	-
	MDL/Units	Soil	Soil	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	67.0	88.0	-	-
General Inorganics					
pH	0.05 pH Units	-	7.73	-	-
Metals					
Antimony	1.0 ug/g dry	-	<1.0	-	-
Arsenic	1.0 ug/g dry	-	3.4	-	-
Barium	1.0 ug/g dry	-	102	-	-
Beryllium	0.5 ug/g dry	-	0.6	-	-
Boron	5.0 ug/g dry	-	11.8	-	-
Cadmium	0.5 ug/g dry	-	<0.5	-	-
Chromium	5.0 ug/g dry	-	19.6	-	-
Cobalt	1.0 ug/g dry	-	7.4	-	-
Copper	5.0 ug/g dry	-	13.7	-	-
Lead	1.0 ug/g dry	-	7.4	-	-
Molybdenum	1.0 ug/g dry	-	1.1	-	-
Nickel	5.0 ug/g dry	-	17.3	-	-
Selenium	1.0 ug/g dry	-	<1.0	-	-
Silver	0.3 ug/g dry	-	<0.3	-	-
Thallium	1.0 ug/g dry	-	<1.0	-	-
Uranium	1.0 ug/g dry	-	<1.0	-	-
Vanadium	10.0 ug/g dry	-	21.9	-	-
Zinc	20.0 ug/g dry	-	<20.0	-	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	-	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	-	-	-
Toluene	0.05 ug/g dry	<0.05	-	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	-	-	-
o-Xylene	0.05 ug/g dry	<0.05	-	-	-
Xylenes, total	0.05 ug/g dry	<0.05	-	-	-
Toluene-d8	Surrogate	109%	-	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	-	-	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	-	-	-
F3 PHCs (C16-C34)	8 ug/g dry	<8	-	-	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	-	-	-

Certificate of Analysis

Report Date: 08-Mar-2021

Client: Paterson Group Consulting Engineers

Order Date: 4-Mar-2021

Client PO: 31964

Project Description: PE5155

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	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	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						
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*8.52*		*ug/g*		*107*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
pH	7.38	0.05	pH Units	7.37			0.1	2.3	
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND			NC	40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND			NC	30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND			NC	30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND			NC	30	
Metals									
Antimony	1.7	1.0	ug/g dry	1.3			23.3	30	
Arsenic	5.5	1.0	ug/g dry	5.9			7.4	30	
Barium	1510	1.0	ug/g dry	1580			4.4	30	
Beryllium	0.6	0.5	ug/g dry	0.6			4.0	30	
Boron	22.0	5.0	ug/g dry	29.3			28.4	30	
Cadmium	ND	0.5	ug/g dry	ND			NC	30	
Chromium	21.9	5.0	ug/g dry	24.6			11.6	30	
Cobalt	9.5	1.0	ug/g dry	9.9			4.1	30	
Copper	22.3	5.0	ug/g dry	23.6			5.2	30	
Lead	92.9	1.0	ug/g dry	104			11.1	30	
Molybdenum	1.4	1.0	ug/g dry	1.3			5.7	30	
Nickel	19.5	5.0	ug/g dry	20.5			4.7	30	
Selenium	ND	1.0	ug/g dry	ND			NC	30	
Silver	ND	0.3	ug/g dry	ND			NC	30	
Thallium	ND	1.0	ug/g dry	ND			NC	30	
Uranium	ND	1.0	ug/g dry	ND			NC	30	
Vanadium	20.6	10.0	ug/g dry	23.2			11.9	30	
Zinc	125	20.0	ug/g dry	130			3.6	30	
Physical Characteristics									
% Solids	86.9	0.1	% by Wt.	88.0			1.2	25	
Volatiles									
Benzene	ND	0.02	ug/g dry	ND			NC	50	
Ethylbenzene	ND	0.05	ug/g dry	ND			NC	50	
Toluene	ND	0.05	ug/g dry	ND			NC	50	
m,p-Xylenes	ND	0.05	ug/g dry	ND			NC	50	
o-Xylene	ND	0.05	ug/g dry	ND			NC	50	
Surrogate: Toluene-d8	*10.4*		*ug/g dry*		*109*	*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)	191	7	ug/g	ND	95.4	80-120			
F2 PHCs (C10-C16)	92	4	ug/g	ND	77.5	60-140			
F3 PHCs (C16-C34)	260	8	ug/g	ND	89.0	60-140			
F4 PHCs (C34-C50)	181	6	ug/g	ND	97.7	60-140			
Metals									
Antimony	44.6	1.0	ug/g	ND	88.2	70-130			
Arsenic	53.0	1.0	ug/g	2.4	101	70-130			
Barium	55.4	1.0	ug/g	ND	111	70-130			
Beryllium	55.2	0.5	ug/g	ND	110	70-130			
Boron	58.4	5.0	ug/g	11.7	93.4	70-130			
Cadmium	51.5	0.5	ug/g	ND	103	70-130			
Chromium	62.1	5.0	ug/g	9.9	104	70-130			
Cobalt	58.1	1.0	ug/g	3.9	108	70-130			
Copper	60.6	5.0	ug/g	9.4	102	70-130			
Lead	82.6	1.0	ug/g	41.5	82.1	70-130			
Molybdenum	51.5	1.0	ug/g	ND	102	70-130			
Nickel	60.9	5.0	ug/g	8.2	105	70-130			
Selenium	45.3	1.0	ug/g	ND	90.3	70-130			
Silver	44.6	0.3	ug/g	ND	89.0	70-130			
Thallium	45.3	1.0	ug/g	ND	90.1	70-130			
Uranium	45.9	1.0	ug/g	ND	91.5	70-130			
Vanadium	65.4	10.0	ug/g	ND	112	70-130			
Zinc	98.3	20.0	ug/g	52.0	92.6	70-130			
Volatiles									
Benzene	4.43	0.02	ug/g	ND	111	60-130			
Ethylbenzene	4.90	0.05	ug/g	ND	123	60-130			
Toluene	4.75	0.05	ug/g	ND	119	60-130			
m,p-Xylenes	9.14	0.05	ug/g	ND	114	60-130			
o-Xylene	4.55	0.05	ug/g	ND	114	60-130			
Surrogate: Toluene-d8	*8.21*		*ug/g*		*103*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

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.

PARACE LABORATORIES L

Paracel ID: 2110499

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Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2110499	№ 59308

Client Name: Paterson Group
Contact Name: Adrian Meyhart
Address: 154 colonnade Rd S
Telephone: 613-226-7381

Project Ref: PE 5155
Quote #:
PO #: 31964
E-mail: ameyhart@patersongroup.ca

Page 1 of 1

Turnaround Time
☐ 1 day ☐ 3 day
☐ 2 day ☑ Regular
Date Required:

Regulation 153/04	Other Regulation
☐ Table 1 ☐ Res/Park ☐ Med/Fine	☐ REG 558 ☐ PWQO
☐ Table 2 ☐ Ind/Comm ☐ Coarse	☐ CCME ☐ MISA
☐ Table 3 ☐ Agri/Other	☐ SU - Sani ☐ SU - Storm
☐ Table	Mun:
For RSC: ☐ Yes ☐ No	☐ 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	Required Analysis: PAH's F1-F4 + BTEX	Metals by ICP	pH
1	BH7-SS3	S		2	March 3rd		X		
2	BH8-SS11	S		1	March 3rd			X	X
3									
4									
5									
6									
7									
8									
9									
10									

Comments:

Method of Delivery: PACKEL COURIER

Relinquished By (Sign):	Received By Driver/Depot: M. Louise	Received at Lab: Shreepavan Dhamsi	Verified By:
Relinquished By (Print): Mohammed Ramadan	Date/Time: 04/03/21 3:35	Date/Time: Mar 04, 2021 04:06	Date/Time: 3-4-21 16:22
Date/Time:	Temperature: °C	Temperature: 9.3 °C	pH Verified: ☐ By:

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 31973
Project: PE5155
Custody: 59313

Report Date: 11-Mar-2021
Order Date: 9-Mar-2021

Order #: 2111256

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

Paracel ID	Client ID
2111256-01	BH103-GW1
2111256-02	BH1-21-GW1
2111256-03	BH6-21-GW1

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 11-Mar-2021

Client: Paterson Group Consulting Engineers

Order Date: 9-Mar-2021

Client PO: 31973

Project Description: PE5155

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	11-Mar-21	11-Mar-21
Metals, ICP-MS	EPA 200.8 - ICP-MS	10-Mar-21	10-Mar-21
PHC F1	CWS Tier 1 - P&T GC-FID	10-Mar-21	11-Mar-21
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	10-Mar-21	10-Mar-21
REG 153: PAHs by GC-MS	EPA 625 - GC-MS, extraction	10-Mar-21	10-Mar-21

Certificate of Analysis

Report Date: 11-Mar-2021

Client: Paterson Group Consulting Engineers

Order Date: 9-Mar-2021

Client PO: 31973

Project Description: PE5155

	Client ID:	BH103-GW1	BH1-21-GW1	BH6-21-GW1	-
	Sample Date:	08-Mar-21 09:00	08-Mar-21 09:00	08-Mar-21 09:00	-
	Sample ID:	2111256-01	2111256-02	2111256-03	-
	MDL/Units	Water	Water	Water	-
Metals					
Antimony	0.5 ug/L	<0.5	<0.5	-	-
Arsenic	1 ug/L	1	1	-	-
Barium	1 ug/L	151	110	-	-
Beryllium	0.5 ug/L	<0.5	<0.5	-	-
Boron	10 ug/L	77	80	-	-
Cadmium	0.1 ug/L	<0.1	<0.1	-	-
Chromium	1 ug/L	4	<1	-	-
Cobalt	0.5 ug/L	1.4	0.6	-	-
Copper	0.5 ug/L	5.6	0.9	-	-
Lead	0.1 ug/L	2.0	0.5	-	-
Molybdenum	0.5 ug/L	125	150	-	-
Nickel	1 ug/L	3	1	-	-
Selenium	1 ug/L	<1	<1	-	-
Silver	0.1 ug/L	<0.1	<0.1	-	-
Sodium	200 ug/L	114000	108000	-	-
Thallium	0.1 ug/L	<0.1	<0.1	-	-
Uranium	0.1 ug/L	0.4	0.4	-	-
Vanadium	0.5 ug/L	3.8	0.5	-	-
Zinc	5 ug/L	43	17	-	-
Volatiles					
Benzene	0.5 ug/L	-	-	<0.5	-
Ethylbenzene	0.5 ug/L	-	-	<0.5	-
Toluene	0.5 ug/L	-	-	<0.5	-
m,p-Xylenes	0.5 ug/L	-	-	<0.5	-
o-Xylene	0.5 ug/L	-	-	<0.5	-
Xylenes, total	0.5 ug/L	-	-	<0.5	-
Toluene-d8	Surrogate	-	-	118%	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	-	-	<25	-
F2 PHCs (C10-C16)	100 ug/L	-	-	<100	-
F3 PHCs (C16-C34)	100 ug/L	-	-	<100	-
F4 PHCs (C34-C50)	100 ug/L	-	-	<100	-
Semi-Volatiles					
Acenaphthene	0.05 ug/L	-	-	<0.05	-
Acenaphthylene	0.05 ug/L	-	-	<0.05	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 31973

Report Date: 11-Mar-2021

Order Date: 9-Mar-2021

Project Description: PE5155

	Client ID:	BH103-GW1	BH1-21-GW1	BH6-21-GW1	-
	Sample Date:	08-Mar-21 09:00	08-Mar-21 09:00	08-Mar-21 09:00	-
	Sample ID:	2111256-01	2111256-02	2111256-03	-
	MDL/Units	Water	Water	Water	-
Anthracene	0.01 ug/L	-	-	<0.01	-
Benzo [a] anthracene	0.01 ug/L	-	-	<0.01	-
Benzo [a] pyrene	0.01 ug/L	-	-	<0.01	-
Benzo [b] fluoranthene	0.05 ug/L	-	-	<0.05	-
Benzo [g,h,i] perylene	0.05 ug/L	-	-	<0.05	-
Benzo [k] fluoranthene	0.05 ug/L	-	-	<0.05	-
Chrysene	0.05 ug/L	-	-	<0.05	-
Dibenzo [a,h] anthracene	0.05 ug/L	-	-	<0.05	-
Fluoranthene	0.01 ug/L	-	-	0.03	-
Fluorene	0.05 ug/L	-	-	<0.05	-
Indeno [1,2,3-cd] pyrene	0.05 ug/L	-	-	<0.05	-
1-Methylnaphthalene	0.05 ug/L	-	-	<0.05	-
2-Methylnaphthalene	0.05 ug/L	-	-	<0.05	-
Methylnaphthalene (1&2)	0.10 ug/L	-	-	<0.10	-
Naphthalene	0.05 ug/L	-	-	0.10	-
Phenanthrene	0.05 ug/L	-	-	0.07	-
Pyrene	0.01 ug/L	-	-	0.02	-
2-Fluorobiphenyl	Surrogate	-	-	88.4%	-
Terphenyl-d14	Surrogate	-	-	118%	-

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									
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	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						
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	*15.0*		*ug/L*		*75.1*	*50-140*			
Surrogate: Terphenyl-d14	*20.9*		*ug/L*		*104*	*50-140*			
Volatiles									
Benzene	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: Toluene-d8	*95.8*		*ug/L*		*120*	*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									
Antimony	ND	0.5	ug/L	ND			NC	20	
Arsenic	ND	1	ug/L	ND			NC	20	
Barium	ND	1	ug/L	ND			NC	20	
Beryllium	ND	0.5	ug/L	ND			NC	20	
Boron	ND	10	ug/L	ND			NC	20	
Cadmium	ND	0.1	ug/L	ND			NC	20	
Chromium	ND	1	ug/L	ND			NC	20	
Cobalt	ND	0.5	ug/L	ND			NC	20	
Copper	ND	0.5	ug/L	ND			NC	20	
Lead	ND	0.1	ug/L	ND			NC	20	
Molybdenum	ND	0.5	ug/L	ND			NC	20	
Nickel	ND	1	ug/L	ND			NC	20	
Selenium	ND	1	ug/L	ND			NC	20	
Silver	ND	0.1	ug/L	ND			NC	20	
Sodium	ND	200	ug/L	ND			NC	20	
Thallium	ND	0.1	ug/L	ND			NC	20	
Uranium	ND	0.1	ug/L	ND			NC	20	
Vanadium	ND	0.5	ug/L	ND			NC	20	
Zinc	ND	5	ug/L	ND			NC	20	
Volatiles									
Benzene	ND	0.5	ug/L	ND			NC	30	
Ethylbenzene	ND	0.5	ug/L	ND			NC	30	
Toluene	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: Toluene-d8	*94.5*		*ug/L*		*118*	*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)	2200	25	ug/L	ND	110	68-117			
F2 PHCs (C10-C16)	1250	100	ug/L	ND	78.4	60-140			
F3 PHCs (C16-C34)	3380	100	ug/L	ND	86.2	60-140			
F4 PHCs (C34-C50)	2200	100	ug/L	ND	88.7	60-140			
Metals									
Antimony	49.1	0.5	ug/L	ND	98.2	80-120			
Arsenic	52.6	1	ug/L	ND	105	80-120			
Barium	57.3	1	ug/L	ND	114	80-120			
Beryllium	57.2	0.5	ug/L	ND	114	80-120			
Boron	52	10	ug/L	ND	104	80-120			
Cadmium	56.8	0.1	ug/L	ND	113	80-120			
Chromium	58.1	1	ug/L	ND	116	80-120			
Cobalt	55.9	0.5	ug/L	ND	112	80-120			
Copper	54.8	0.5	ug/L	ND	109	80-120			
Lead	45.6	0.1	ug/L	ND	91.1	80-120			
Molybdenum	50.8	0.5	ug/L	ND	101	80-120			
Nickel	54.5	1	ug/L	ND	109	80-120			
Selenium	51.3	1	ug/L	ND	102	80-120			
Silver	52.2	0.1	ug/L	ND	104	80-120			
Sodium	11900	200	ug/L	ND	119	80-120			
Thallium	46.4	0.1	ug/L	ND	92.7	80-120			
Uranium	44.6	0.1	ug/L	ND	89.0	80-120			
Vanadium	58.4	0.5	ug/L	ND	117	80-120			
Zinc	54	5	ug/L	ND	108	80-120			
Semi-Volatiles									
Acenaphthene	4.24	0.05	ug/L	ND	84.7	50-140			
Acenaphthylene	3.90	0.05	ug/L	ND	78.0	50-140			
Anthracene	4.54	0.01	ug/L	ND	90.8	50-140			
Benzo [a] anthracene	4.08	0.01	ug/L	ND	81.6	50-140			
Benzo [a] pyrene	4.32	0.01	ug/L	ND	86.4	50-140			
Benzo [b] fluoranthene	5.46	0.05	ug/L	ND	109	50-140			
Benzo [g,h,i] perylene	4.21	0.05	ug/L	ND	84.1	50-140			
Benzo [k] fluoranthene	5.13	0.05	ug/L	ND	103	50-140			
Chrysene	4.77	0.05	ug/L	ND	95.3	50-140			
Dibenzo [a,h] anthracene	4.54	0.05	ug/L	ND	90.9	50-140			
Fluoranthene	4.15	0.01	ug/L	ND	83.0	50-140			
Fluorene	3.98	0.05	ug/L	ND	79.6	50-140			
Indeno [1,2,3-cd] pyrene	4.37	0.05	ug/L	ND	87.4	50-140			
1-Methylnaphthalene	4.25	0.05	ug/L	ND	85.1	50-140			
2-Methylnaphthalene	4.60	0.05	ug/L	ND	92.0	50-140			
Naphthalene	4.60	0.05	ug/L	ND	92.0	50-140			
Phenanthrene	4.28	0.05	ug/L	ND	85.7	50-140			
Pyrene	4.18	0.01	ug/L	ND	83.5	50-140			
Surrogate: 2-Fluorobiphenyl	*15.8*		*ug/L*		*79.2*	*50-140*			
Surrogate: Terphenyl-d14	*23.7*		*ug/L*		*118*	*50-140*			
Volatiles									
Benzene	45.7	0.5	ug/L	ND	114	60-130			
Ethylbenzene	45.0	0.5	ug/L	ND	112	60-130			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Toluene	38.0	0.5	ug/L	ND	95.0	60-130			
m,p-Xylenes	92.2	0.5	ug/L	ND	115	60-130			
o-Xylene	42.5	0.5	ug/L	ND	106	60-130			
Surrogate: Toluene-d8	*82.8*		*ug/L*		*104*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

PARACE LABORATORIES L

Paracel ID: 2111256

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Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2111256	№ 59313

Client Name: Paterson	Project Ref: PE 5155	Page __ of __
Contact Name: Adrian Menyhart	Quote #:	Turnaround Time
Address: 154 Colonnade	PO #: 31973	☐ 1 day ☐ 3 day ☐ 2 day ☑ Regular
Telephone: 613 226 7381	E-mail: AMenyhart@Patersongroup.ca	Date Required:

Regulation 153/04	Other Regulation
☐ Table 1 ☐ Res/Park ☐ Med/Fine	☐ REG 558 ☐ PWQO
☐ Table 2 ☐ Ind/Comm ☐ Coarse	☐ CCME ☐ MISA
☒ Table 3 ☐ Agri/Other	☐ SU - Sani ☐ SU - Storm
☐ Table ___	Mun:
For RSC: ☐ Yes ☐ No	☐ 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	PAH	PHC F1-F4	Btex	Metals ICP
1	BH103-GW1	GW		1	Mar 8 2021					✓
2	BH1-21-GW1	GW		1	↓					✓
3	BH6-21-GW1	GW		4	↓		✓	✓	✓	
4										
5										
6										
7										
8										
9										
10										

Comments:

Method of Delivery: DLB

Relinquished By (Sign): G Pax	Received By Driver/Depot:	Received at Lab:	Verified By:
Relinquished By (Print): Grant Paterson	Date/Time:	Date/Time: 3-9-21 17:20	Date/Time: 3-9-21 17:20
Date/Time: March 9 2021	Temperature: °C	Temperature: 10.7 °C	pH Verified: ☐ By: NA