PATERSON GROUP

Phase II Environmental Site Assessment

Northern Part of 1919 Riverside Drive
Ottawa, Ontario

Prepared for Schlegel Villages

Report: PE5409-2
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EXECUTIVE SUMMARY

Assessment

A Phase II ESA was conducted for the northern part of the property addressed 1919 Riverside Drive, in the Ottawa, Ontario. The purpose of the Phase II ESA was to address potentially contaminating activities (PCAs) that were identified during the Phase I ESA and considered to result in areas of potential environmental concern (APECs) on the Phase II Property.

The subsurface investigation consisted of twelve (12) boreholes, three (3) of which were instrumented with groundwater monitoring wells. The general soil profile encountered during the field program consisted of either topsoil or an asphaltic concrete structure, followed by a fill material consisting of silty clay or silty sand to sandy silt with some gravel and traces of clay and/or organics with occasional cobbles, underlain by silty sand and silty clay and/or glacial till, followed by shale bedrock. The unknown quality of the fill material was considered an area of potential environmental concern (APEC).

Five (5) soil samples, including a duplicate sample, were submitted for laboratory analysis of benzene, toluene, ethylbenzene and xylenes (BTEX), petroleum hydrocarbons (PHCs, Fractions F_1-F_4), polycyclic aromatic hydrocarbons (PAHs) and/or metals (including hydride forming compounds: arsenic (As), Antimony (Sb), Selenium (Se)). All of the soil results comply with MECP Table 3 Residential Standards.

Groundwater samples from monitoring wells BH8-22, BH9-22 and BH12-22 were collected during the July 7, 2022, sampling event. No free product or petroleum hydrocarbon sheen was noted on the purge water during the groundwater sampling events.

Groundwater samples were analyzed for BTEX and PHCs. No BTEX or PHCs were detected above the laboratory detection limits. The groundwater results comply with the MECP Table 3 Standards.

Based on the findings of the Phase II ESA, no further environmental investigation is recommended at this time.

Recommendations

It is our understanding that the Phase II Property will be redeveloped for residential purposes.

Any excess soil requiring off-site disposal during construction must be managed in accordance with Ontario Regulation 406/19 – On-site and Excess Soil Management.

It is recommended that additional analytical testing be carried out to determine the appropriate method of disposal for any soils deemed excess during the redevelopment of the site.

Monitoring Wells

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

1.0 INTRODUCTION

At the request of Schlegel Villages, Paterson Group (Paterson) conducted a Phase II Environmental Site Assessment for the northern part of 1919 Riverside Drive (the Phase II Property), in the City of Ottawa, Ontario. The purpose of this Phase II ESA has been to address areas of potential environmental concern (APECs) identified on the Phase II Property, during the Phase I ESA conducted by Paterson in October of 2021.

1.1 Site Description

Address:	Norther Part of 1919 Riverside Drive, Ottawa, Ontario
Legal Description:	Part of Lots 15 and 16, Junction Gore and Part of Road allowance between Lots 15 and 16, in the City of Ottawa, Ontario.
Location:	The Phase II Property is located on the east side of Riverside Drive, south of Smyth Road, in the City of Ottawa, Ontario. For the purpose of this assessment, Riverside Drive is considered to run in a north-south direction. The subject site is shown on Figure 1 - Key Plan following the body of this report.
Latitude and Longitude:	45° 23' 51.31" N, 75° 40’ 2.74" W.

Site Description:

Configuration:	Irregular.
Site Area:	22,611 m^2 (approximate).
Zoning:	I2F – Institutional Zone.

1.2 Property Ownership

Paterson was engaged to conduct this Phase II-ESA by Mr. Brad Schlegel of Schlegel Villages. The office of Schlegel Villages is located at 325 Max Beker Drive, Ottawa, Ontario.

1.3 Current and Proposed Future Uses

The Phase II Property exists as an asphaltic concrete paved parking lot associated with the Ottawa Hospital (Riverside Campus), which is considered institutional use.

It is our understanding that the Phase II Property will be redeveloped for residential purposes. A record of site condition (RSC) is not required.

1.4 Applicable Site Condition Standard

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

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

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

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

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

The intended use of the Phase II Property is residential therefore, the Residential Standards have been selected for the purpose of this Phase II ESA.

Additionally, the soil test results have been compared to the MECP Table 1 Standards, which are considered to be indicative of typical Ontario background concentrations, which 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 exists as an asphaltic concrete parking lot associated with the Ottawa Hospital.

Site drainage consists primarily of sheet flow to catch basins located across the site and on the adjacent laneways.

The site topography is above the grade of Smyth Road and slopes down towards the south. The regional topography slopes down in a northwesterly/westerly direction towards the Rideau River.

2.2 Past Investigations

Paterson completed a Phase I ESA in October of 2021 for the Phase II Property. Based on the findings of the Phase I ESA, four (4) potentially contaminating activities (PCAs) were determined to result in areas of potential environmental concern (APECs) on the Phase II Property:

As per Column A of Table 2 of the O.Reg. 153/04, as amended, the following PCAs that generated APECs on the Phase I Property are:

- PCA 28 – "Gasoline and Associated Products Storage in Fixed Tanks" associated with a historical UST and current AST on the adjacent property south of the Phase I Property (APEC 1).
- PCA Other – "Diesel Spill" associated with a historical spill associated with the former UST on the adjacent property south of the Phase I Property (APEC 1).
- PCA 46 – "Rail Yards, Tracks and Spurs," associated with the railway tracks present along the eastern property boundary of the Phase I Property (APEC 2).
- PCA Other – "Use of Road Salt," associated with the use of road salt for vehicular and pedestrian safety on the Phase I Property (APEC 3).

Based on the findings of the Phase I ESA, it is more than likely that road salt was applied to the surface of the walkways, paved access lane and parking lot across the Phase I Property for the safety of vehicular and pedestrian traffic under conditions of ice and/or snow.

According to Section 49.1 of O.Reg. 153/04, if an applicable site condition standard is exceeded at a property solely because of the following reason, the applicable site condition standard is deemed not to be exceeded for the purpose of Part XV.1 of the Act: "The qualified person has determined, based on a phase one environmental site assessment or a phase two environmental site assessment, that a substance has been applied to surfaces for the safety of vehicular or pedestrian traffic under conditions of snow or ice or both."

In accordance with Section 49.1 of O.Reg. 153/04, any EC and SAR concentrations on the subject property that exceed the MECP Table 3 standards for a residential/institutional land use are deemed not to be exceeded for the purpose of Part XV.1 of the Act. This exemption is being relied on for the use of road salt (APEC 3).

APECs 1 and 2 are shown on Drawing PE5409-1 – Site Plan, while the corresponding PCAs are shown in red on Drawing PE5409-2 – Surrounding Land Use Plan, in the Figures Section of the Phase I ESA report.

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

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation was conducted during the interim of July 20 to July 23, 2022. The field program consisted of drilling 12 boreholes across the Phase II Property to address the APECs identified in the Phase I ESA as well as to gain general coverage for a geotechnical investigation. Three (3) boreholes were completed with monitoring well installations. Boreholes were drilled to a maximum depth of 9.04 m below the ground surface (mbgs).

3.2 Media Investigated

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

Contaminants of potential concern on the Phase II Property include benzene, toluene, ethylbenzene and xylenes (BTEX), petroleum hydrocarbons (PHCs, F1-F4) and polycyclic aromatic hydrocarbons (PAHs). These CPCs may be present in the soil and/or groundwater beneath the Phase II Property.

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

Based on information from the Geological Survey of Canada mapping, drift thickness in the area of the subject site is on the order of 2 to 3 m across the site. The overburden consists of off-shore marine sediments. Bedrock in the area consists of shale of the Billings Formation.

Existing Buildings and Structures

There are no buildings present on the Phase I Property. Structures on-site include a parking meter, barricade and pole mounted lights as well as catch basins.

Subsurface Services and Utilities

The Phase I Property is situated in a municipally serviced area. Underground utilities and/or structures include electricity, water and sewer entering the site from Riverside Drive and passing through the central portion of the site to Balmoral Place.

Areas of Natural Significance and Water Bodies

No areas of natural significance were identified in the Phase I Study Area. The Rideau River is located approximately 225m west of the Phase I Property. No other natural water bodies were identified in the Phase I Study Area.

Drinking Water Wells

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

Neighbouring Land Use

Neighbouring land use in the Phase I Study Area consists of residential and institutional land uses. Land use is shown on Drawing PE5409-2 - Surrounding Land Use Plan.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

As per Section 7.1 of the Phase I ESA report, three (3) off-site PCAs and the resultant APECs are summarized in Table 1, along with their respective locations and contaminants of potential concern (CPCs).

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

Area of Potential Environmental Concern	Location of Area of Potential Environmental Concern	Potentially Contaminating Activity	Location of PCA (on-site or off-site)	Contaminants of Potential Concern	Media Potentially Impacted (Groundwater, Soil, and/or Sediment)
APEC 1: Resulting from the former presence of a UST and current presence of an AST on the adjacent property to the south	Southeastern corner of the Phase I Property	PCA 28 – Gasoline and Associated Products Storage in Fixed Tanks	Off-site	BTEX PHCs (F_1-F_4)	Soil and Groundwater
APEC 1: Resulting from the former spill associated with the former UST on the adjacent to the south	Southeastern corner of the Phase I Property	PCA Other – Diesel Spill	Off-site	BTEX PHCs (F_1-F_4)	Soil and Groundwater
APEC 2: Resulting from the presence of a railway track along the eastern property boundary	Eastern side of the Phase I Property	PCA 46 – Rail Yards, Tracks and Spurs	Off-site	PHCs (F_1-F_4) PAHs Metals	Soil and Groundwater

Contaminants of Potential Concern

As per Section 7.1 of the Phase I ESA report, the contaminants of potential concern (CPCs) in soil and/or groundwater include benzene, toluene, ethylbenzene, and xylenes (BTEX), petroleum hydrocarbons (PHCs, F1-F4), polycyclic aromatic hydrocarbons (PAHs) and metals.

Assessment of Uncertainty and/or Absence of Information

The information available for review as part of the preparation of the Phase I-ESA is considered to be sufficient to conclude that there are off-site PCAs that have resulted in APECs on the Phase I Property.

A variety of independent sources were consulted as part of this assessment, and as such, the conclusions of this report are not affected by uncertainty which may be present with respect to the individual sources.

3.4 Deviations from Sampling and Analysis Plan

The placement of some boreholes was limited due to the underground utilities located along the central portion of the Phase II Property. There were no other deviations from the Sampling and Analysis Plan which is included in Appendix 1 of this report.

3.5 Impediments

With the exception of the some of the underground utilities, no other physical impediments were encountered during the Phase II ESA field program.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation conducted for this Phase II ESA consisted of drilling 12 boreholes (BH1-22 through BH12-22) across the Phase II Property. Three (3) boreholes were instrumented with monitoring well installations.

The boreholes were drilled to a maximum depth of 9.04 m below ground surface (mbgs) to intercept groundwater.

The boreholes were drilled using a low clearance track mounted drill rig operated by George Downing Estate Drilling of Hawkesbury, Ontario, under full-time supervision of Paterson personnel. The borehole locations are indicated on the attached Drawing PE5409-3 - Test Hole Location Plan.

4.2 Soil Sampling

A total of 82 soil samples and 14 rock core samples were obtained from the boreholes by means of auger sampling from auger flights/auger samples and split spoon sampling. Split spoon samples were taken at approximate 0.76 m intervals.

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

The borehole profiles generally consisted of either topsoil or an asphaltic concrete structure, followed by a fill material consisting of silty clay or silty sand to sandy silt with some gravel and traces of clay and/or organics with occasional cobbles, underlain by silty sand and silty clay and/or glacial till, followed by shale interbedded in limestone bedrock. Bedrock was encountered in boreholes BH6-22, BH7-22, BH9-22. BH10-22, BH11-22 and BH12-22 at depths ranging from approximately to 3.66 to 5.28 mbgs.

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 2.0 to 104.8 ppm in the soil samples obtained. These results are not indicative of any potential for significant contamination from volatile contaminants. Vapour readings are noted on the Soil Profile and Test Data Sheets in Appendix 1. The results of the vapour survey are presented on the Soil Profile and Test Data sheets.

4.4 Groundwater Monitoring Well Installation

Three (3) groundwater monitoring wells were installed on the Phase II Property as part of the subsurface investigation. The monitoring wells consisted of 32 mm diameter, Schedule 40 threaded PVC risers and screens. Monitoring well construction details are listed below in Table 2 and are also presented on the Soil Profile and Test Data Sheets provided in Appendix 1.

Borehole locations and elevations were surveyed geodetically by Paterson personnel.

TABLE 2. Monitoring Well Construction Details						
Well ID	**Ground Surface Elevation**	**Total Depth (m BGS)**	**Screened Interval (m BGS)**	**Sand Pack (m BGS)**	**Bentonite Seal (m BGS)**	**Casing Type**
BH8-22	69.70	6.99	3.99-6.99	3.28-6.99	0.18-3.28	Flushmount
BH9-22	66.90	9.04	6.04-9.04	5.27-9.04	0.18-5.27	Flushmount
BH12-22	67.37	7.49	5.99-7.49	5.80-7.49	0.18-5.80	Flushmount

4.5 Groundwater Sampling

Groundwater sampling protocols were followed using the MECP document entitled “Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario”, dated May 1996. Groundwater samples were obtained from each monitoring well, using dedicated sampling equipment. Standing water was purged from each well prior to sampling. Samples were stored in coolers to reduce analyte volatilization during transportation. Details of our standard operating procedure for groundwater sampling are provided in the Sampling and Analysis Plan in Appendix 1.

4.6 Analytical Testing

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

TABLE 3: Soil Samples Submitted and Analyzed Parameters						
Sample ID	**Sample Depth / Stratigraphic Unit**	**Parameters Analyzed**				**Rationale**
		BTEX	**PHCs (F1-F4)**	**PAHs**	**Metals**	
June 21 to June 23, 2022						
BH7-22-SS2	0.76-1.37m Fill			X	X	Assess the fill material of unknown quality.
BH8-22-AU1	0.30-0.61m Fill			X	X	
BH8-22-SS5	3.05-3.66m Native	X	X			Assess the potential impact in soil due to the former railway.
BH9-22-SS2	0.76-1.37m Fill	X	X	X	X	Assess the fill material of unknown quality as a result of a former roadway.
BH12-22-SS4	2.29-2.93m Fill	X	X			Assess the potential impact in due to the former UST and presence of an AST.
DUP	2.29-2.93m Fill	X	X			Duplicate soil sample (BH9-22-SS2) for QA/QC purposes.

TABLE 4: Groundwater Samples Submitted and Analyzed Parameters				
Sample ID	**Screened Interval**	**Parameters Analyzed**		**Rationale**
		BTEX	**PHCs (F1-F4)**	
July 7, 2022				
BH8-22-GW1	3.99-6.99m	X	X	Assess the potential impact due to the former railway.
BH9-22-GW1	6.04-9.04m	X	X	Assess the potential impact due to former roadway.
BH12-22-GW1	5.99-7.49m	X	X	Assess potential groundwater impacts from the UST on the adjacent property to the south.
DUP	6.04-9.04m	X	X	Duplicate groundwater sample (BH9-22-GW1) for QA/QC purposes.

Paracel Laboratories (Paracel), of Ottawa, Ontario, performed the laboratory analysis on the samples submitted for analytical testing.

Paracel is a member of the Standards Council of Canada/Canadian Association for Laboratory Accreditation (SCC/CALA). Paracel is accredited and certified by SCC/CALA for specific tests registered with the association.

4.7 Residue Management

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

4.8 Elevation Surveying

Boreholes were surveyed at geodetic elevations by Paterson personnel.

4.9 Quality Assurance and Quality Control Measures

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

5.0 REVIEW AND EVALUATION

5.1 Geology

Site soils consisted of either topsoil or an asphaltic concrete structure including a granular engineered fill, followed by a fill material consisting of silty clay or silty

sand to sandy silt with some gravel and traces of clay and/or organics with occasional cobbles, underlain by silty sand and silty clay and/or glacial till, followed by shale interbedded in limestone bedrock.

Fill material of unknown quality was encountered in some of the boreholes on-site during the field program and as such, it has been considered an APEC on the Phase II Property.

Bedrock was encountered at depths ranging from approximately 3.66 to 5.28 below grade. Bedrock was cored to a maximum depth of 9.04 m below grade.

Groundwater was encountered within the overburden at depths ranging from approximately 2.64 to 3.77 mbgs.

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

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured during the groundwater sampling event on July 6, 2022, using an electronic water level meter. Groundwater levels are summarized below in Table 5.

TABLE 5: Groundwater Level Measurements

Borehole Location	Ground Surface Elevation (m)	Water Level Depth (m below grade)	Water Level Elevation (m ASL)	Date of Measurement
BH8-22	69.70	3.77	65.93	July 6, 2022
BH9-22	66.90	3.10	63.80	July 6, 2022
BH12-22	67.37	2.64	64.73	July 6, 2022

Based on the groundwater elevations measured during the sampling events, groundwater contour mapping was completed. Groundwater contours are shown on Drawing PE5409-3.

Based on the contour mapping, groundwater flow at the subject site is in a westerly direction. A horizontal hydraulic gradient of approximately 0.03m/m was calculated.

5.3 Fine-Coarse Soil Texture

Coarse-grained soil standards are applicable to the Phase II Property.

5.4 Soil: Field Screening

Field screening of the soil samples collected during drilling resulted in vapour readings ranging from 2.0 to 104.8 ppm. Soil samples submitted for analytical testing were based on a combination of visual observations, vapour readings and location of the groundwater table. 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

Five (5) soil samples and a duplicate sample were submitted for BTEX, PHCs (F1-F4), PAHs and/or metals analysis. The results of the analytical testing are presented below in Tables 6, 7 and 8. The laboratory certificate of analysis is provided in Appendix 1.

TABLE 6: Analytical Test Results – Soil
BTEX and PHCs F_1-F_4

Parameter	MDL (µg/g)	Soil Samples (µg/g) June 21- 23, 2022				MECP Table 3 Residential Standards (µg/g)
		BH8-22-SS5	BH9-22-SS2	BH12-22-SS4	DUP	
Benzene	0.02	nd	nd	nd	nd	0.21
Toluene	0.05	nd	nd	nd	nd	2.3
Ethylbenzene	0.05	nd	nd	nd	nd	2
Xylenes	0.05	nd	nd	nd	nd	3.1
PHC F_1	7	nd	nd	nd	nd	55
PHC F_2	4	(12)	nd	nd	5	98
PHC F_3	8	13	40	nd	35	300
PHC F_4	6	20	60	nd	22	2800

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- Parameter exceeds the MECP Table 1 Background Standards
- DUP (BH9-22-SS2)

No detectable BTEX parameters were identified in any of the soil samples analyzed. Concentrations of PHCs, F2-F4 were detected in three (3) of the soil samples analyzed. All of the identified concentrations comply with the MECP Table 3 Residential Standards.

PHC, fraction F2 in soil sample BH8-22-SS5 exceeds the MECP Table 1 Residential Standards.

TABLE 7: Analytical Test Results – Soil
PAHs

Parameter	MDL (µg/g)	Soil Samples (µg/g) June 21 and 22, 2022			MECP Table 3 Residential Standards (µg/g)
		BH7-22-SS2	BH8-22-AU1	BH9-22-SS2	
Acenaphthene	0.02	nd	nd	nd	7.9
Acenaphthylene	0.02	nd	nd	0.02	0.15
Anthracene	0.02	nd	nd	0.04	0.67
Benzo[a]anthracene	0.02	nd	nd	0.06	0.5
Benzo[a]pyrene	0.02	nd	nd	0.07	0.3
Benzo[b]fluoranthene	0.02	nd	nd	0.06	0.78
Benzo[g,h,i]perylene	0.02	nd	nd	0.04	6.6
Benzo[k]fluoranthene	0.02	nd	nd	0.04	0.78
Chrysene	0.02	nd	nd	0.06	7
Dibenzo[a,h]anthracene	0.02	nd	nd	nd	0.1
Fluoranthene	0.02	nd	nd	0.11	0.69
Fluorene	0.02	nd	nd	nd	62
Indeno [1,2,3-cd] pyrene	0.02	nd	nd	0.04	0.38
1-Methylnaphthalene	0.02	nd	nd	nd	0.99
2-Methylnaphthalene	0.02	nd	nd	nd	0.99
Methylnaphthalene (1&2)	0.04	nd	nd	nd	0.99
Naphthalene	0.01	nd	nd	nd	0.6
Phenanthrene	0.02	nd	nd	0.05	6.2
Pyrene	0.02	nd	nd	0.13	78

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

PAH parameters were detected in one soil sample analyzed, while the remaining were undetected. All of the analyzed soil samples comply with the selected MECP Table 3 Residential Standards. These soil samples also comply with the MECP Table 1 Standards.

TABLE 8: Analytical Test Results – Soil
Metals

Parameter	MDL (µg/g)	Soil Samples (µg/g) June 21 and June 22, 2022			MECP Table 3 Residential Standards (µg/g)
		BH7-22-SS2	BH8-22-AU1	BH9-22-SS2	
Antimony	1.0	nd	nd	nd	7.5
Arsenic	1.0	2.9	2.6	2.7	18
Barium	1.0	139	51.1	115	390
Beryllium	0.5	0.6	nd	0.5	4
Boron	5.0	nd	nd	nd	120
Cadmium	0.5	nd	nd	nd	1.2
Chromium	5.0	44.8	28.1	35.8	160
Cobalt	1.0	9.1	6.7	8.6	22
Copper	5.0	20.6	9.7	19.3	140
Lead	1.0	4.4	15.9	7.4	120
Molybdenum	1.0	nd	nd	nd	6.9
Nickel	5.0	24.5	14.4	20.7	100
Selenium	1.0	nd	nd	nd	2.4
Silver	0.3	nd	nd	nd	20
Thallium	1.0	nd	nd	nd	1
Uranium	1.0	nd	nd	nd	23
Vanadium	10.0	42.6	33.2	38.9	86
Zinc	20.0	42.9	47.9	44.3	340

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

All of the soil samples comply with the selected MECP Table 3 Residential Standards. These soil samples also comply with the MECP Table 1 Standards.

The analytical results for BTEX, PHCs, PAHs and Metals tested in soil are shown on Drawing PE5409-4 – Analytical Testing Plan – Soil.

The maximum concentrations of analyzed parameters in the soil at the site are summarized below in Table 9.

TABLE 9: Maximum Concentrations – Soil			
Parameter	**Maximum Concentration (µg/g)**	**Borehole**	**Depth Interval (m BGS)**
PHC F2	(13)	BH8-22-SS5	3.05-3.66m; Native
PHC F3	40	BH9-22-SS2	0.76-1.37m; Fill
PHC F4	60		
Acenaphthylene	0.02		
Anthracene	0.04		
Benzo[a]anthracene	0.06		
Benzo[a]pyrene	0.07		
Benzo[b]fluoranthene	0.06		
Benzo[g,h,i]perylene	0.04		
Benzo[k]fluoranthene	0.04		
Chrysene	0.06		
Fluoranthene	0.11		
Indeno [1,2,3-cd] pyrene	0.04		
Phenanthrene	0.05		
Pyrene	0.13		
Arsenic	2.9	BH7-22-SS2	0.76-1.37m; Fill
Barium	139		
Beryllium	0.6		
Chromium	44.8		
Cobalt	9.1		
Copper	20.6		
Lead	15.9	BH8-22-AU1	0.3-0.61m; Fill
Nickel	24.5	BH7-22-SS2	0.76-1.37m; Fill
Vanadium	42.6		
Zinc	47.9	BH8-22-AU1	0.3-0.61m; Fill

Note:
- (-) – Parameters in parenthesis exceed the Table 1 Background Standards.

No other parameters were identified above the laboratory method detection limits.

5.6 Groundwater Quality

Groundwater samples from monitoring wells installed in BH8-22, BH9-22 and BH12-22 were submitted for laboratory analysis of BTEX and PHCs (fractions, F1-F4 analyses. The groundwater samples were obtained from the screened intervals noted in Table 2. The results of the analytical testing are presented in Table 10. The laboratory certificates of analysis are provided in Appendix 1.

TABLE 10: Analytical Test Results – Groundwater
BTEX and PHCs

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)				MECP Table 3 Standards (µg/L)
		July 7, 2022				
		BH8-22-GW1	BH9-22-GW1	BH12-22-GW1	DUP	
Benzene	0.5	nd	nd	nd	nd	44
Toluene	0.5	nd	nd	nd	nd	18000
Ethylbenzene	0.5	nd	nd	nd	nd	2300
Xylenes	0.5	nd	nd	nd	nd	4200
PHC F_1	25	nd	nd	nd	nd	750
PHC F_2	100	nd	nd	nd	nd	150
PHC F_3	100	nd	nd	nd	nd	500
PHC F_4	100	nd	nd	nd	nd	500

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- DUP (BH9-22-GW1)

No detectable BTEX or PHC concentrations were identified in the groundwater samples analyzed. All of the groundwater results comply with the MECP Table 3 Standards.

The analytical results for BTEX and PHCs tested in groundwater are shown on Drawing PE5409-5–Analytical Testing Plan – Groundwater.

5.7 Quality Assurance and Quality Control Results

All samples submitted as part of the June 2022 sampling events were handled in accordance with the Analytical Protocol with respect to preservation method, storage requirement, and container type.

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

A duplicate soil sample and groundwater sample (DUP) were obtained from BH2-22-SS2 and BH9-22-GW1, respectively, and analyzed for BTEX and PHCs.

Test results for the duplicate soil and RPD calculations are provided below in Table 11.

TABLE 11: QA/QC Results – Soil (PHCs)

Parameter	BH9-22-SS2	DUP	RDP (%)	QA/QC Results
PHC, F3	40	35	13	Within the acceptable range
PHC, F4	60	22	92	Outside the acceptable range

The relative percent different (RPD) for the original and the duplicate soil sample concentrations for PHCs, F3 and F4, were 13% and 92%, respectively. The RPD value above 20%, is considered outside the acceptable range. This occurs when smaller concentrations or low values yield a numerical difference that is considered large, relative to the original or duplicate value, which in turn, results in larger RPD value.

Therefore, RPD is not reliable measure, quantitatively, in a scenario where low concentrations yield a numerical difference that is relatively larger than the original or duplicate sample concentration.

The groundwater test results of the original sample and duplicate sample were all non-detect.

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

5.8 Phase II Conceptual Site Model

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

Site Description

Potentially Contaminating Activity and Areas of Potential Environmental Concern

As per Section 3.3, three (3) off-site PCAs were considered to result in two (2) APECs on the Phase II Property; however, fill material was identified on the Phase II Property during the subsurface investigation. The unknown quality of the fill is considered to represent an APEC.

APECs on the Phase II Property are summarized in Table 12, along with their respective locations and contaminants of potential concern (CPCs).

Table 12: Potentially Contaminating Activities and Areas of Potential Environmental Concern

Area of Potential Environmental Concern	Location of Area of Potential Environmental Concern	Potentially Contaminating Activity	Location of PCA (on-site or off-site)	Contaminants of Potential Concern	Media Potentially Impacted (Groundwater, Soil, and/or Sediment)
APEC 1: Resulting from the former presence of a UST and current presence of an AST on the adjacent south property	Southeastern corner of the Phase II Property	PCA 28 – Gasoline and Associated Products Storage in Fixed Tanks	Off-site	BTEX PHCs (F_1-F_4)	Soil and Groundwater
APEC 1: Resulting from the former spill associated with the former UST on the adjacent south property	Southeastern corner of the Phase II Property	PCA Other – Diesel Spill	Off-site	BTEX PHCs (F_1-F_4)	Soil and Groundwater
APEC 2: Resulting from the presence of a railway track along the eastern property boundary	Eastern side of the Phase II Property	PCA 46 – Rail Yards, Tracks and Spurs	Off-site	BTEX PHCs (F_1-F_4) PAHs	Soil and Groundwater
APEC 3: Resulting from fill material of unknown quality	Northern and central reas of the on the Phase II Property	PCA 30 – Importation of Fill Material of Unknown Quality	On-site	Metals PAHs	Soil

Contaminants of Potential Concern

As per Section 3.3, in combination with the field observations, the contaminants of potential concern (CPCs) in soil and/or groundwater include benzene, toluene, ethylbenzene, and xylenes (BTEX), petroleum hydrocarbons (PHCs, F1-F4) polycyclic aromatic hydrocarbons (PAHs) and metals (including arsenic (As), antimony (Sb) and selenium (Se).

Fill Material

The fill material consisted of silty clay or silty sand to sandy silt with some gravel and traces of clay and/or organics with occasional cobbles was identified in several boreholes and extended to depths of approximately 0.48 to 4.88 mbgs.

Subsurface Structures and Utilities

The Phase II Property is situated in a municipally serviced area. Underground utilities and/or structures include electricity, water and sewer entering the site from Riverside Drive and passing through the central portion of the site to Balmoral Place.

Based on the findings of the analytical results, any former underground utilities are not expected to affect contaminant distribution and transport on the Phase II Property.

Physical Setting

Site Stratigraphy

The site stratigraphy, from ground surface to the deepest aquifer or aquitard investigated, is illustrated on Drawings PE5409-4A and 5A. The stratigraphy consists of:

- An asphaltic concrete structure of approximately 0.05 to 0.10m thick, overlying a granular fill material was encountered at BH4-22, BH5-22, BH6-22, BH7-22 BH9-22 and BH10-22, and extended to depths of 0.53 to 0.76 mbgs.
- Topsoil was encountered at BH1-22, BH2-22, BH3-22, BH8-22, BH11-22 and BH12-22, and extended to depths of 0.05 to 0.28 mbgs.
- Fill material consisting of silty clay or silty sand to sandy silt with some gravel and traces of clay and/or organics with occasional cobbles was encountered in BH2-22, BH3-22, BH6-22, BH7-22, BH8-22, BH9-22, BH10-22, BH11-22, and BH12-22, and extended to depths of approximately 0.48 to 4.88 mbgs. Groundwater was encountered in this layer at BH9-22.
- Silty Clay and/or silty sand was encountered in BH1-22, BH2-22, BH3-22, BH4-22, BH5-22, BH7-22, BH10-22, BH11-22 and BH11-22, and extended to depths of approximately 1.45 to 6.25mbgs.
- Glacial till consisting of silty clay to clayey silt or silty sand, with some sand, gravel, cobbles and boulders was encountered in all of the boreholes at depths ranging from 1.09 to 6.25 mbgs. BH1-22, BH2-22, BH3-22, BH4-22, BH5-22, BH8-22 and BH11-22 were terminated in this layer at depths ranging from approximately 3.18 to 7.77 to mbgs. Groundwater was encountered in this layer at BH8-22 and BH12-22.

- Shale bedrock was encountered at BH6-22, BH7-22, BH9-22, BH10-22 and BH12-22, and terminated in this layer at depths ranging from approximately 7.49 to 9.04 mbgs.

Hydrogeological Characteristics

Groundwater at the Phase II Property was encountered in the overburden. During the most recent groundwater monitoring event, groundwater flow was measured in a westerly direction, with a hydraulic gradient of 0.03 m/m. Groundwater contours are shown on Drawing PE5409-3 – Test Hole Location Plan.

Approximate Depth to Bedrock

Bedrock was encountered during the drilling program at depths ranging from approximately 3.66 to 5.28 mbgs

Approximate Depth to Water Table

The depth to the water table at the Phase II Property varies between approximately 2.64 to 3.77 m below existing grade.

Sections 35, 41 and 43.1 of the Regulation

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

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

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

Existing Buildings and Structures

The Phase II Property exists as an asphaltic concrete paved parking lot associated with the Ottawa Hospital (Riverside Campus), which is classified as institutional use. Structures include entrance and exit barrier gates for vehicular parking. No other structures are present.

Proposed Buildings and Other Structures

The proposed site development for the Phase II Property will include two (2) residential apartment buildings and a community/recreational building.

Areas of Natural Significance

There are no areas of natural significance or no natural water bodies in the Phase I Study Area.

Natural Water Bodies

The Rideau River is located approximately 225m west of the Phase II Property. No other natural water bodies were identified in the Phase I Study Area.

Environmental Condition

Areas Where Contaminants are Present

Based on the analytical results for soil and groundwater, there are no contaminants present on or beneath the Phase II Property.

Types of Contaminants

Based on the analytical results for soil and groundwater, there are no contaminants on or beneath the Phase II Property.

Contaminated Media

Based on the analytical results for soil and groundwater, there is no contaminated media on the Phase II Property.

What Is Known About Areas Where Contaminants Are Present

Based on the findings of the Phase II ESA, there is no contaminated media on the Phase II Property.

Distribution and Migration of Contaminants

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

Discharge of Contaminants

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

Climatic and Meteorological Conditions

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

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

Based on the analytical results, contaminant distribution is does not apply to the Phase II Property.

Potential for Vapour Intrusion

Based on the findings of the Phase II ESA, potential for vapour intrusion on the Phase II Property does not exist.

6.0 CONCLUSIONS

6.1 Assessment

A Phase II ESA was conducted for the northern part of the property addressed 1919 Riverside Drive, in the Ottawa, Ontario. The purpose of the Phase II ESA was to address potentially contaminating activities (PCAs) that were identified during the Phase I ESA and considered to result in areas of potential environmental concern (APECs) on the Phase II Property.

The subsurface investigation consisted of twelve (12) boreholes, three (3) of which were instrumented with groundwater monitoring wells. The general soil profile encountered during the field program consisted of either topsoil or an asphaltic concrete structure, followed by a fill material consisting of silty clay or silty sand to sandy silt with some gravel and traces of clay and/or organics with occasional cobbles, underlain by silty sand and silty clay and/or glacial till, followed by shale bedrock. The unknown quality of the fill material was considered an area of potential environmental concern (APEC).

Five (5) soil samples, including a duplicate sample, were submitted for laboratory analysis of benzene, toluene, ethylbenzene and xylenes (BTEX), petroleum hydrocarbons (PHCs, Fractions F_1-F_4), polycyclic aromatic hydrocarbons (PAHs) and/or metals (including hydride forming compounds: arsenic (As), Antimony (Sb), Selenium (Se)). All of the soil results comply with MECP Table 3 Residential Standards.

Groundwater samples from monitoring wells BH8-22, BH9-22 and BH12-22 were collected during the July 7, 2022, sampling event. No free product or petroleum hydrocarbon sheen was noted on the purge water during the groundwater sampling events.

Groundwater samples were analyzed for BTEX and PHCs. No BTEX or PHCs were detected above the laboratory detection limits. The groundwater results comply with the MECP Table 3 Standards.

Based on the findings of the Phase II ESA, no further environmental investigation is recommended at this time.

6.4 Recommendations

It is our understanding that the Phase II Property will be redeveloped for residential purposes.

Any excess soil requiring off-site disposal during construction must be managed in accordance with Ontario Regulation 406/19 – On-site and Excess Soil Management. It is recommended that additional analytical testing be carried out to determine the appropriate method of disposal for any soils deemed excess during the redevelopment of the site.

Monitoring Wells

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

7.0 STATEMENT OF LIMITATIONS

This Phase II - Environmental Site Assessment report has been prepared under the supervision of a Qualified Person, in general accordance with O.Reg. 153/04, as amended, and 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 Schlegel Villages. Notification from Schlegel Villages and Paterson Group will be required to release this report to any other party.

Paterson Group Inc.

Mandy Witteman, M.A.Sc., P.Eng.

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

Report Distribution:

- Schlegel Villages
- Paterson Group

FIGURES

Figure 1 - Key Plan

Drawing PE5409-1 –Site Plan

Drawing PE5409-2 –Surrounding Land Use Plan

Drawing PE5409-3 – Test Hole Location Plan & Groundwater Contour Plan

Drawing PE5409-4 – Analytical Testing Plan – Soil

Drawing PE5409-4A – Cross-section A – A' – Soil

Drawing PE5409-5 – Analytical Testing Plan – Groundwater

Drawing PE5409-5A – Cross-section A – A' – Groundwater

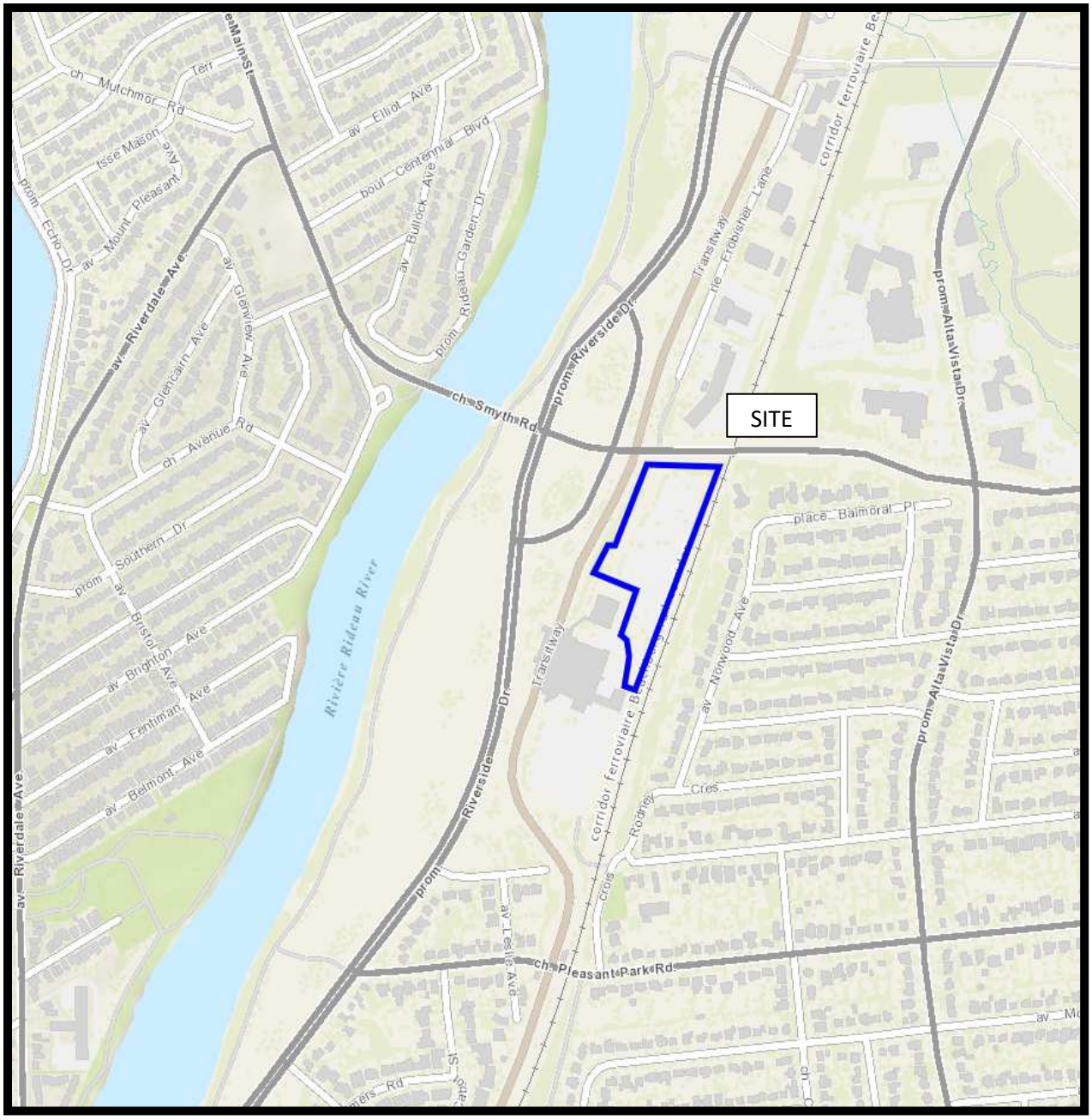

FIGURE 1

KEY PLAN

patersongroup

TRANSITWAY

1967 RIVERSIDE DRIVE
INSTITUTIONAL
(OTTAWA HOSPITAL)

1919 RIVERSIDE DRIVE
INSTITUTIONAL
(LIFE LABS)

MW3

ACCESS PATH

SMYTH ROAD

PART OF 1919 RIVERSIDE DRIVE

1833 FROBISHER LANE
RESIDENTIAL

ABOVEGROUND
STORAGE TANK

FORMER
UNDERGROUND
STORAGE TANK

ASPHALTIC CONCRETE
PARKING LOT

ASPHALTIC CONCRETE
PARKING LOT

ROW OF JERSEY BARRIERS

APEC 1

APEC 2

RAILWAY LINE

1922-1882NORWOOD AVENUE
RESIDENTIAL

133 BALMORAL PLACE
RESIDENTIAL

LEGEND:

MONITORING WELL
(DRILLED BY OTHERS, 2012)

AREAS OF POTENTIAL ENVIRONMENTAL CONCERN:

1) RESULTING FROM THE PRESENCE OF A FORMER UNDERGROUND STORAGE TANK, THE PRESENCE OF AN ABOVEGROUND STORAGE TANK AND FORMER SPILL (PCA 28, OTHER)
2) RESULTING FROM THE PRESENCE OF A RAILWAY TRACK (PCA 46)

SCALE: 1:1000

0 10 20 30 40 50m 75m

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL

SCHLEGEL VILLAGES

PHASE I - ENVIRONMENTAL SITE ASSESSMENT
PART OF 1919 RIVERSIDE DRIVE

OTTAWA, ONTARIO

Title:

SITE PLAN

Scale: 1:1000	Date: 10/2021
Drawn by: YA	Report No.: PE5409-1
Checked by: MW	Dwg. No.: PE5409-1
Approved by: MSD	Revision No.:

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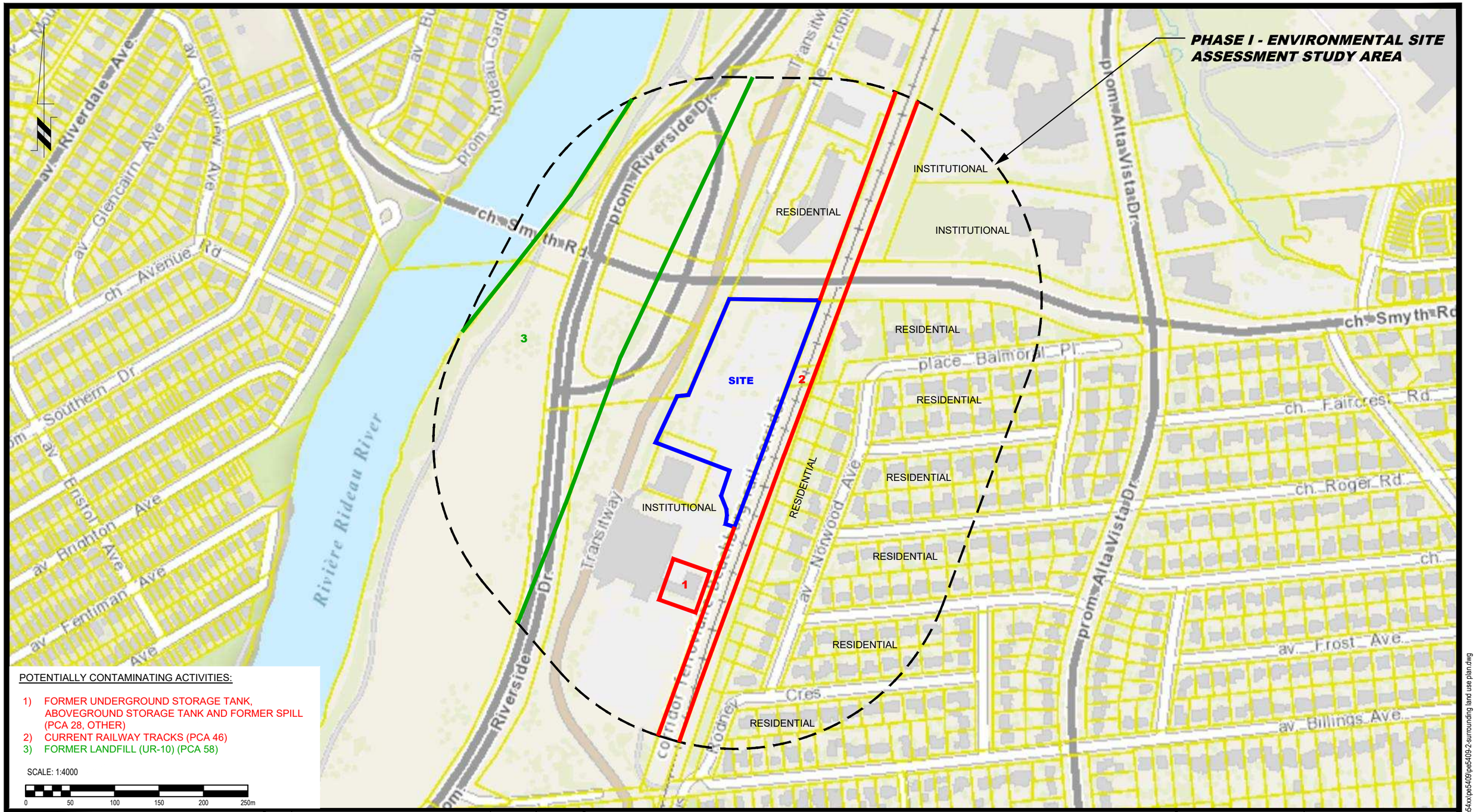

POTENTIALLY CONTAMINATING ACTIVITIES:

1) FORMER UNDERGROUND STORAGE TANK, ABOVEGROUND STORAGE TANK AND FORMER SPILL (PCA 28, OTHER)
2) CURRENT RAILWAY TRACKS (PCA 46)
3) FORMER LANDFILL (UR-10) (PCA 58)

SCALE: 1:4000

0 50 100 150 200 250m

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL

SCHLEGEL VILLAGES

PHASE I - ENVIRONMENTAL SITE ASSESSMENT
PART OF 1919 RIVERSIDE DRIVE

OTTAWA, ONTARIO

Title:

SURROUNDING LAND USE PLAN

Scale: 1:4000	Date: 10/2021
Drawn by: YA	Report No.: PE5409-1
Checked by: MW	Dwg. No.: PE5409-2
Approved by: MSD	Revision No.:

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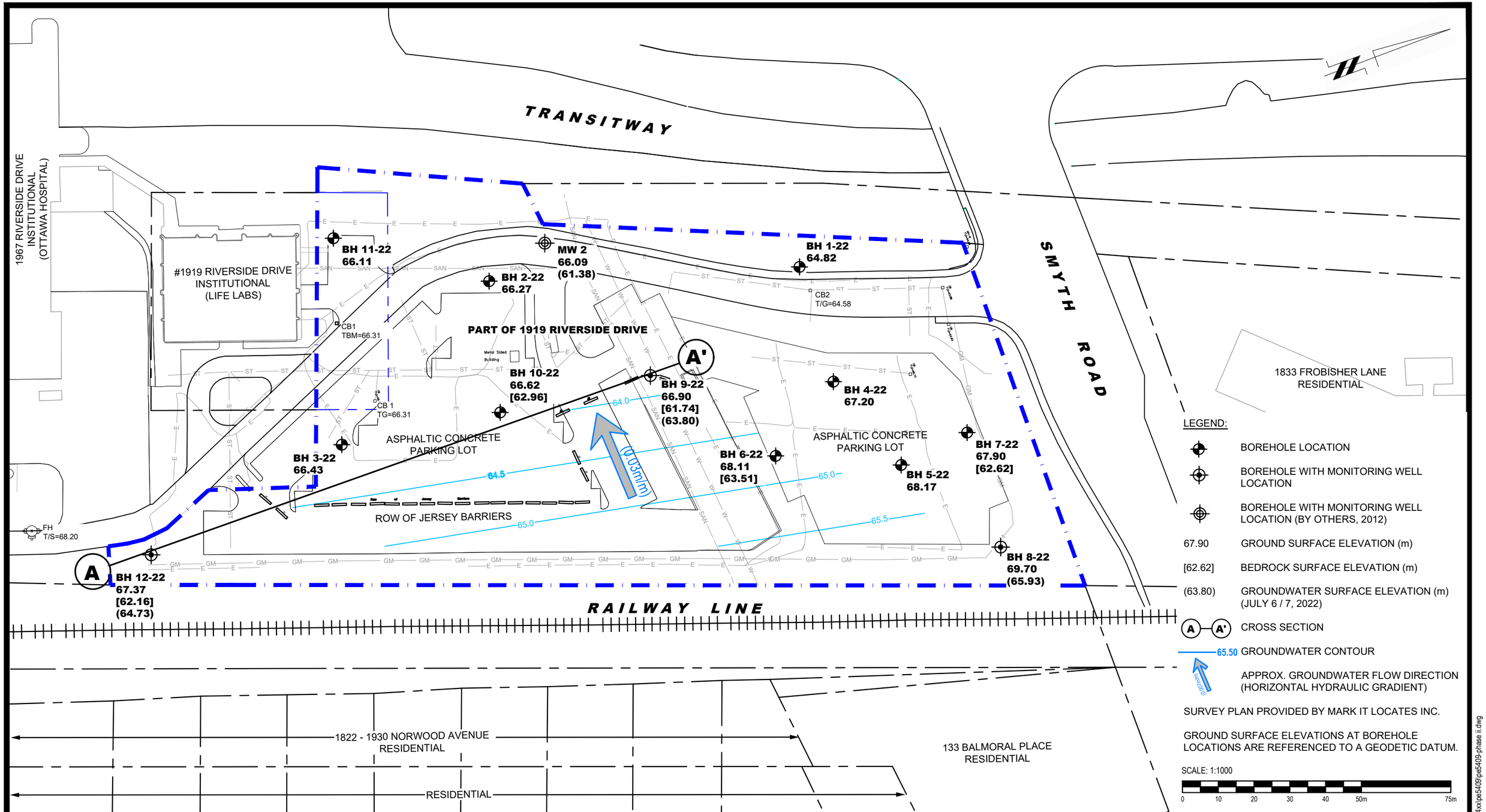

PATERSON GROUP
SOLUTION ORIENTED ENGINEERING

NO.	REVISIONS	DATE	INITIAL

SCHLEGEL VILLAGES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
PART OF 1919 RIVERSIDE DRIVE

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:1000	Date: 07/2022
Drawn by: YA	Report No.: PE5409-2
Checked by: MW	Dwg. No.: PE5409-3
Approved by: MSD	Revision No.:

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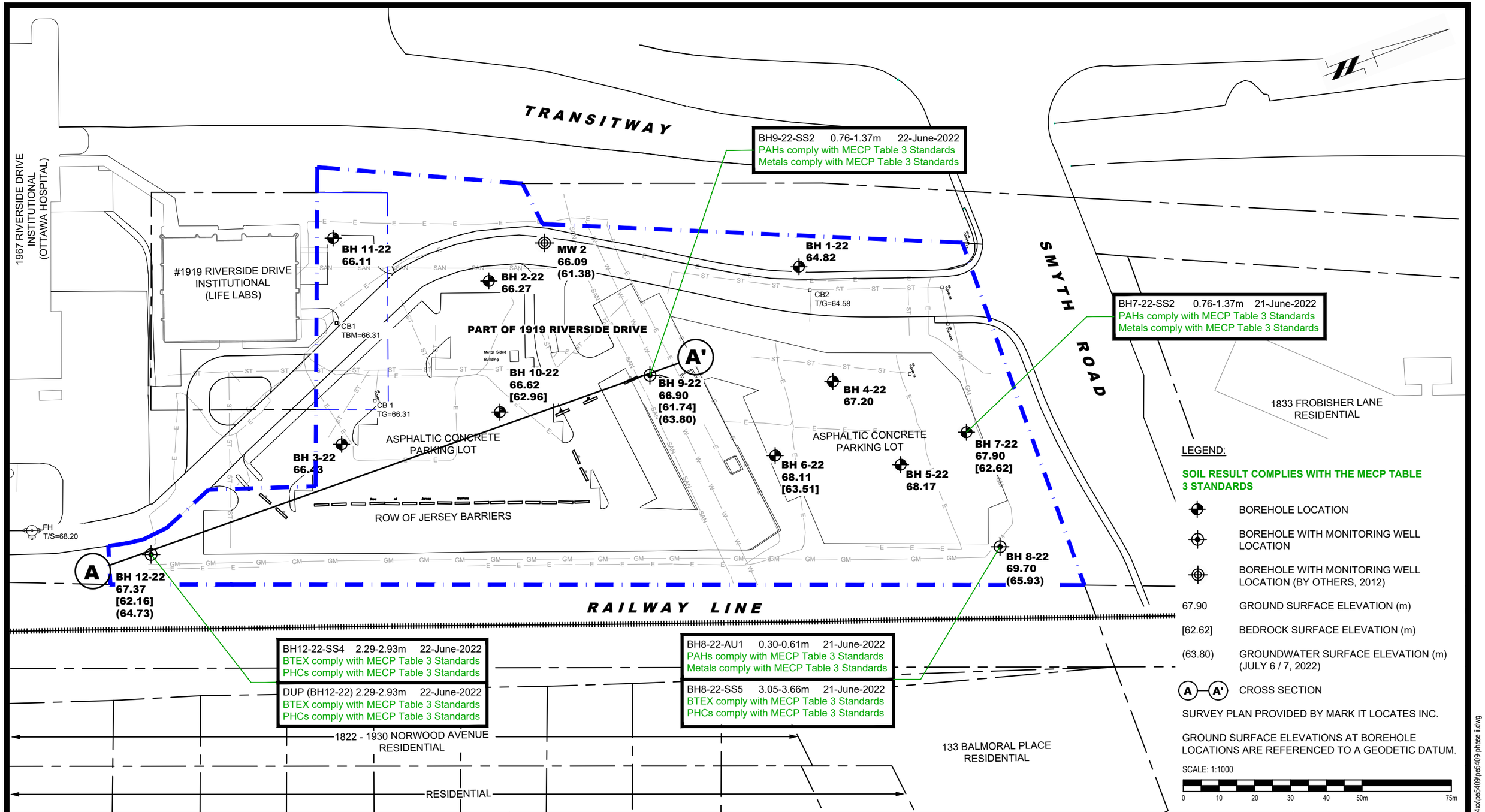

PATERSON GROUP
SOLUTION ORIENTED ENGINEERING

NO.	REVISIONS	DATE	INITIAL

SCHLEGEL VILLAGES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
PART OF 1919 RIVERSIDE DRIVE

OTTAWA, ONTARIO

Title: ANALYTICAL TESTING PLAN - SOIL

Scale: 1:1000	Date: 07/2022
Drawn by: YA	Report No.: PE5409-2
Checked by: MW	Dwg. No.: PE5409-4
Approved by: MSD	Revision No.:

11x17

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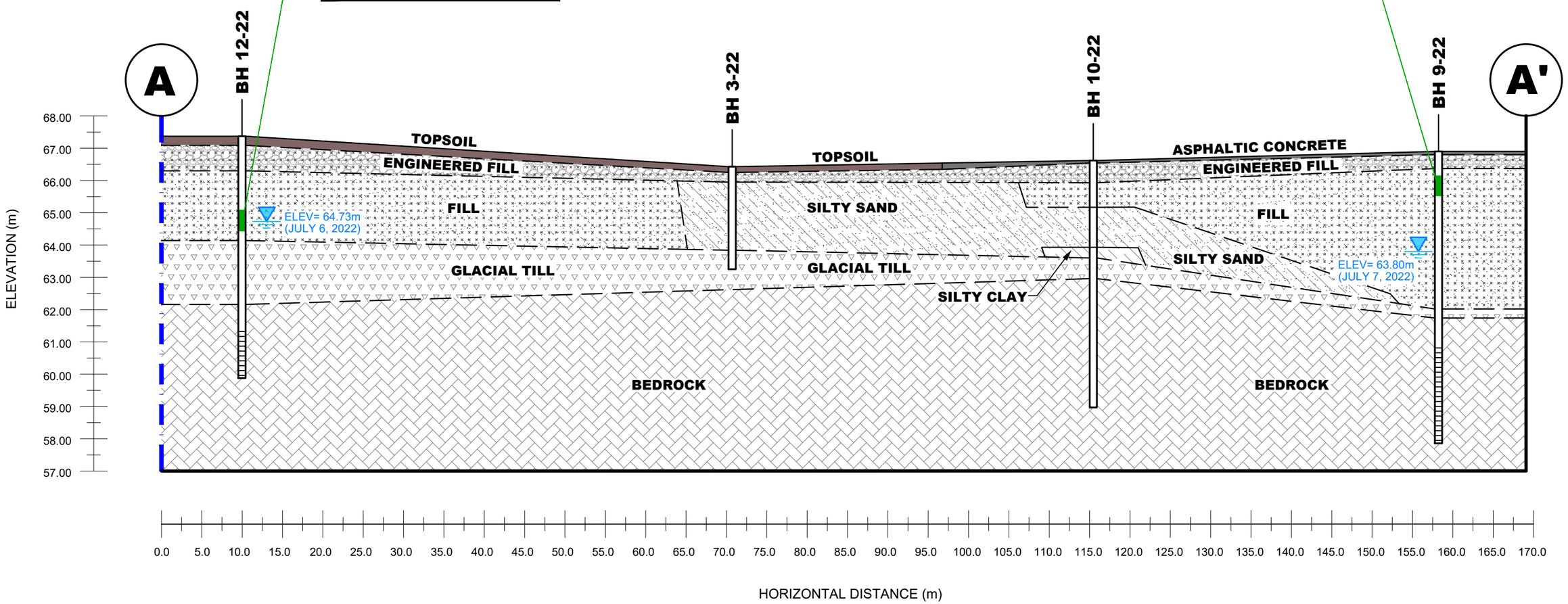
BH12-22-SS4 2.29-2.93m 22-June-2022
BTEX comply with MECP Table 3 Standards
PHCs comply with MECP Table 3 Standards

DUP (BH12-22) 2.29-2.93m 22-June-2022
BTEX comply with MECP Table 3 Standards
PHCs comply with MECP Table 3 Standards

BH9-22-SS2 0.76-1.37m 22-June-2022
PAHs comply with MECP Table 3 Standards
Metals comply with MECP Table 3 Standards



SOIL RESULT COMPLIES WITH THE MECP TABLE 3 STANDARDS

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NO.	REVISIONS	DATE	INITIAL

SCHLEGEL VILLAGES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
PART OF 1919 RIVERSIDE DRIVE

OTTAWA, ONTARIO

Title:

CROSS SECTION A-A ' - SOIL

Scale: AS SHOWN	Date: 07/2022
Drawn by: YA	Report No.: PE5409-2
Checked by: MW	Dwg. No.: PE5409-4A
Approved by: MSD	Revision No.:

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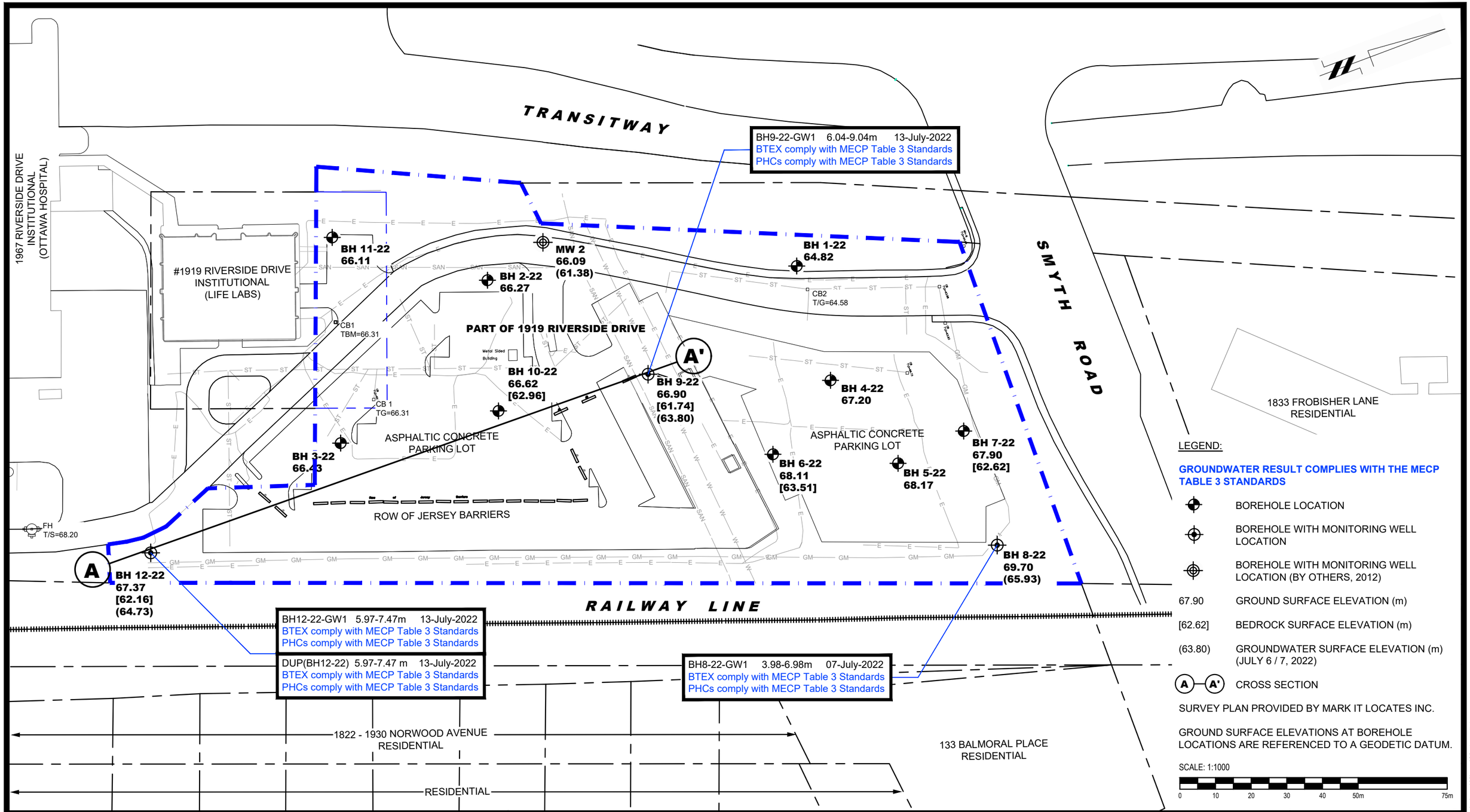

PATERSON GROUP
SOLUTION ORIENTED ENGINEERING

NO.	REVISIONS	DATE	INITIAL

SCHLEGEL VILLAGES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
PART OF 1919 RIVERSIDE DRIVE

OTTAWA, ONTARIO

Title: ANALYTICAL TESTING PLAN - GROUNDWATER

Scale: 1:1000	Date: 07/2022
Drawn by: YA	Report No.: PE5409-2
Checked by: MW	Dwg. No.: PE5409-5
Approved by: MSD	Revision No.:

11x17

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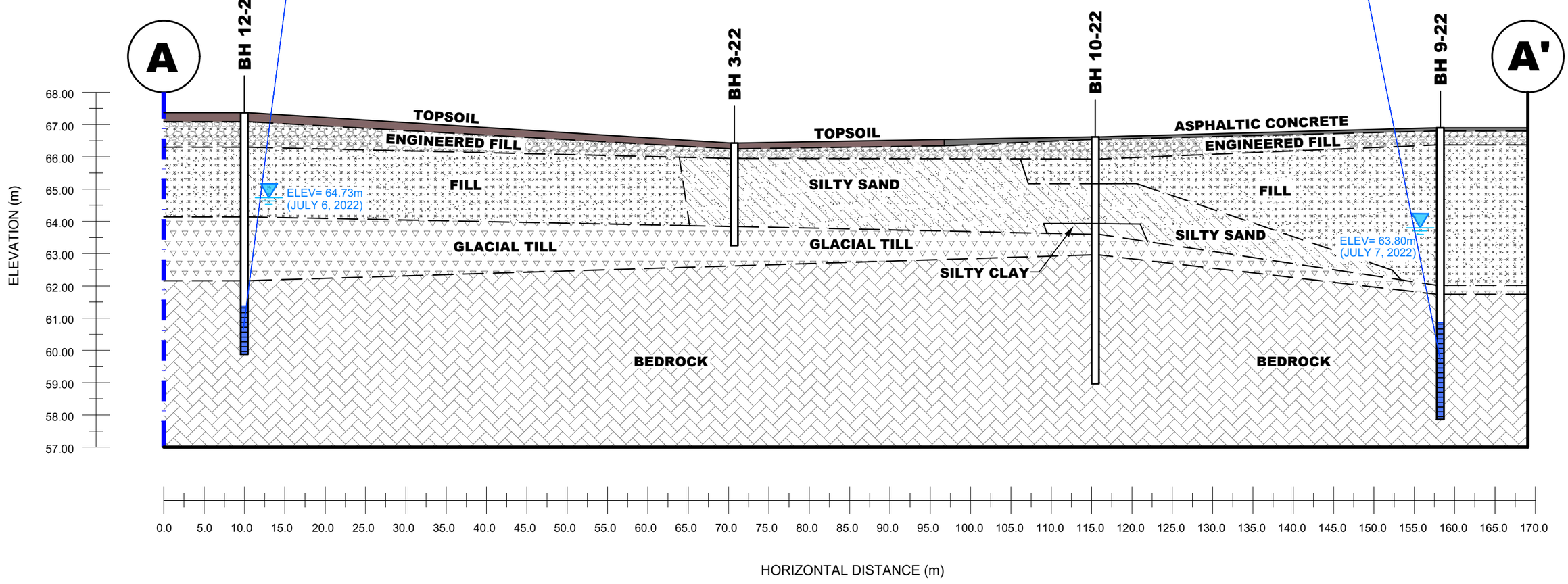
BH12-22-GW1 5.97-7.47m 13-July-2022
BTEX comply with MECP Table 3 Standards
PHCs comply with MECP Table 3 Standards

DUP(BH12-22) 5.97-7.47 m 13-July-2022
BTEX comply with MECP Table 3 Standards
PHCs comply with MECP Table 3 Standards

BH9-22-GW1 6.04-9.04m 13-July-2022
BTEX comply with MECP Table 3 Standards
PHCs comply with MECP Table 3 Standards



GROUNDWATER RESULT COMPLIES WITH THE MECP TABLE 3 STANDARDS

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NO.	REVISIONS	DATE	INITIAL

SCHLEGEL VILLAGES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
PART OF 1919 RIVERSIDE DRIVE

OTTAWA, ONTARIO

Title: **CROSS SECTION A-A ' - GROUNDWATER**

Scale: AS SHOWN	Date: 07/2022
Drawn by: YA	Report No.: PE5409-2
Checked by: MW	Dwg. No.: PE5409-5A
Approved by: MSD	Revision No.:

11x17

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APPENDIX 1

SAMPLING AND ANALYSIS PLAN

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

LABORATORY CERTIFICATES OF ANALYSIS

PATERSON GROUP

Sampling and Analysis Plan

Phase II-Environmental Site Assessment

Northern Part of 1919 Riverside Drive
Ottawa, Ontario

Prepared for Schlegel Villages

Report: PE5409-SAP
July 2022

TABLE OF CONTENTS

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Mr. Brad Schlegel of Schlegel Villages to conduct a Phase II Environmental Site Assessment (ESA) for the Phase II Property located at 1919 Riverside Drive, Ottawa, Ontario.

The Phase II ESA was carried out in conjunction with a geotechnical investigation and to address the APECs identified in the Paterson Phase I ESA, dated July 2022. The following subsurface investigation program was developed to identify any potential environmental concerns.

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1-22	Placed to gain overall coverage of the subject site.	Boreholes to be advanced to approximately 6.0m or until practical refusal is reached for geotechnical purposes.
BH2-22	Placed to gain overall coverage of the subject site.	
BH3-22	Placed to gain overall coverage of the subject site.	
BH4-22	Placed to gain overall coverage of the subject site.	
BH5-22	Placed to gain overall coverage of the subject site.	
BH6-22	Placed to gain overall coverage of the subject site.	
BH7-22	Placed to gain overall coverage of the subject site.	Boreholes to be advanced to approximately 8.5 m and cored through bedrock for geotechnical purposes.
BH8-22	Assess site conditions on the Phase II Property due to the former railway.	Boreholes to be advanced to approximately 7.0 m to intercept the groundwater table for monitoring well installation.
BH9-22	Assess site conditions on the Phase II Property due the former roadway and quality of the fill material	Boreholes to be advanced to approximately 9.0 m to intercept the groundwater table for monitoring well installation.
BH10-22	Placed to gain overall coverage of the subject site.	Boreholes to be advanced to approximately 7.6 m and cored through bedrock for geotechnical purposes.
BH11-22	Placed to gain overall coverage of the subject site.	Boreholes to be advanced to approximately 7.6 m and cored through bedrock for geotechnical purposes.
BH12-22	Assess site conditions on the Phase II Property due the former UST and current AST off-site.	Boreholes to be advanced to approximately 7.0 m to intercept the groundwater table for monitoring well installation.

At each borehole, split-spoon samples of overburden soils will be obtained at 0.76 m (2'6") intervals until groundwater was intercepted.

All soil samples will be retained, and samples will be selected for submission following a preliminary screening analysis.

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's 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 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 should be measured using a measuring tape or wheel rather than paced off. Elevations were surveyed at geodetic elevations by Paterson personnel.

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 analyzed must be taken and placed in the laboratory-provided methanol vial.
- ❒ Note all and any odours or discolouration of samples.
- ❒ Split spoon samplers must be washed between samples.
- ❒ If obvious contamination is encountered, continue sampling until vertical extent of contamination is delineated.
- ❒ As a general rule, environmental boreholes should be deep enough to intercept the groundwater table (unless this is impossible/impractical - call project manager to discuss).
- ❒ If at all possible, soil samples should be submitted to a preliminary screening procedure on site, either using a RKI Eagle, PID, etc. depending on type of suspected contamination.

Spoon Washing Procedure

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

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

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

Screening Procedure

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

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

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

3.2 Monitoring Well Installation Procedure

Equipment

- ❒ 5' x 2" [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 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 cored hole in bedrock)
- ❒ Threaded end-cap
- ❒ Slip-cap or J-plug
- ❒ Asphalt cold patch or concrete
- ❒ Silica Sand
- ❒ Bentonite chips (Holeplug)
- ❒ Steel flushmount casing

Procedure

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

3.3 Monitoring Well Sampling Procedure

Equipment

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

Sampling Procedure

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

4.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

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

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

5.0 DATA QUALITY OBJECTIVES

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

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

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

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

For the purpose of calculating the RPD, it is desirable to select field duplicates from samples for which parameters are present in concentrations above laboratory detection limits, i.e. samples which are expected to be contaminated. If parameters are below laboratory detection limits for selected samples or duplicates, the RPD may be calculated using a concentration equal to one half (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 MOE site remediation standards by a large margin, the decision-making usefulness of the sample may not be considered to be impaired. The proximity of other samples which meet the DQOs must also be considered in developing the Phase II Conceptual Site Model; often there are enough data available to produce a reliable Phase II Conceptual Site Model even if DQOs are not met for certain individual samples.

These considerations are discussed in the body of the report.

6.0 PHYSICAL IMPEDIMENTS TO SAMPLING & ANALYSIS PLAN

Physical impediments to the Sampling and Analysis plan may include:

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

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

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Part of 1919 Riverside Drive
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5409

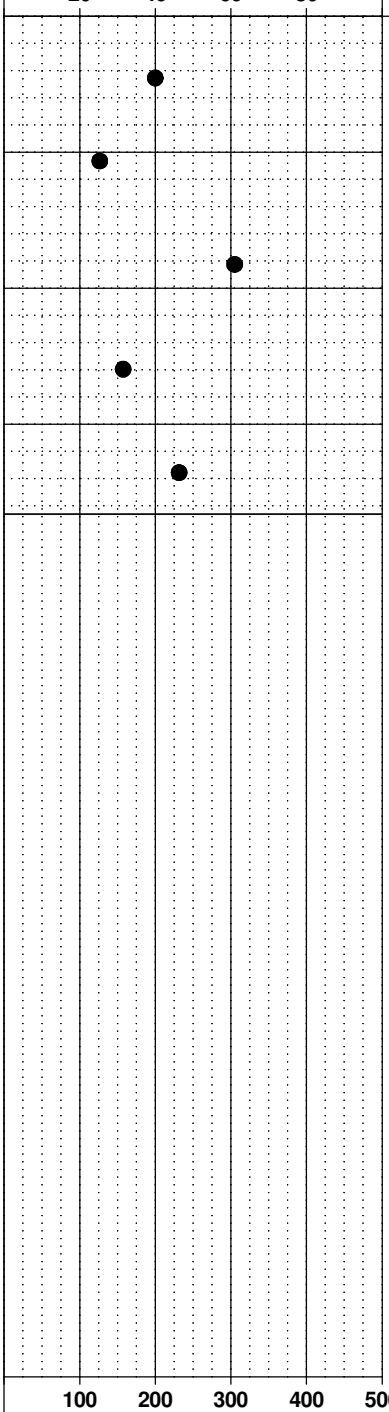
REMARKS

HOLE NO. BH 1-22

BORINGS BY CME-55 Low Clearance Drill **DATE** June 20, 2022

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	64.82
TOPSOIL 0.13							
FILL: Brown silty sand with topsoil and organics 0.69		AU	1				
Very stiff to stiff, brown **SILTY CLAY** with sand 1.12		SS	2	67	15	1	63.82
Compact, brown **SILTY SAND** 1.65							
Very stiff, brown **SILTY CLAY** with sand, trace gravel 2.21		SS	3	67	10	2	62.82
GLACIAL TILL: Dense to very dense, brown silty clay to clayey silt with sand, gravel, cobbles and boulders		SS	4	79	38		
- grey by 2.6m depth 3.66		SS	5	100	24	3	61.82
End of Borehole							

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



▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Part of 1919 Riverside Drive
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5409

REMARKS

HOLE NO. BH 2-22

BORINGS BY CME-55 Low Clearance Drill **DATE** June 20, 2022

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
TOPSOIL 0.13						0	66.27
FILL: Brown silty sand with gravel and crushed stone 0.69		AU	1				
Loose, brown **SILTY SAND,** some to trace clay		SS	2	83	9	1	65.27
		SS	3	92	8	2	64.27
Compact to loose, brown **SILTY SAND,** trace clay 2.21		SS	4	75	12		
		SS	5	67	6	3	63.27
GLACIAL TILL: Dense, grey silty sand to sandy silt with gravel, some clay, cobbles and boulders 3.35		SS	6	83	34	4	62.27
		SS	7	42	50+	5	61.27
End of Borehole 5.21							
Practical refusal to augering at 5.21m depth							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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FILE NO. PE5409

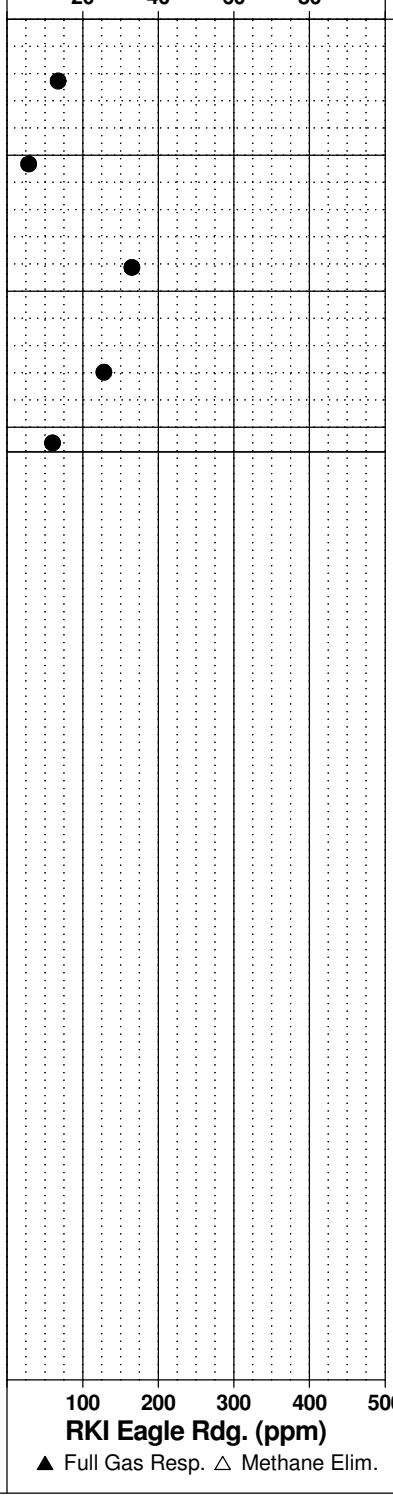
REMARKS

HOLE NO. BH 3-22

BORINGS BY CME-55 Low Clearance Drill **DATE** June 20, 2022

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
TOPSOIL 0.18						0	66.43
FILL: Brown silty sand, with gravel and crushed stone 0.48		AU	1				
		SS	2	58	14	1	65.43
Compact to loose, brown **SILTY SAND**		SS	3	58	6	2	64.43
- grey by 2.2m depth 2.59		SS	4	75	29		
GLACIAL TILL: Compact to dense, grey silty sand with gravel, cobbles and boulders, trace clay 3.18		SS	5	40	50+	3	63.43
End of Borehole							
Practical refusal to augering at 3.18m depth							

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



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FILE NO. PE5409

REMARKS

HOLE NO. BH 4-22

BORINGS BY CME-55 Low Clearance Drill **DATE** June 20, 2022

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	67.20
Asphaltic concrete 0.05							
FILL: Crushed stone with silty sand 0.69		AU	1				
Loose, brown **SILTY SAND,** some to trace clay 1.45		SS	2	83	7	1	66.20
		SS	3	100	17	2	65.20
GLACIAL TILL: Dense to very dense, brown silty clay to clayey silt with sand, some gravel, cobbles and boulders		SS	4	75	21		
- grey by 2.2m depth		SS	5	2	25	3	64.20
		SS	6	83	24	4	63.20
4.65		SS	7	33	50+		
End of Borehole							
Practical refusal to augering at 4.65m depth							

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.

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SOIL PROFILE AND TEST DATA

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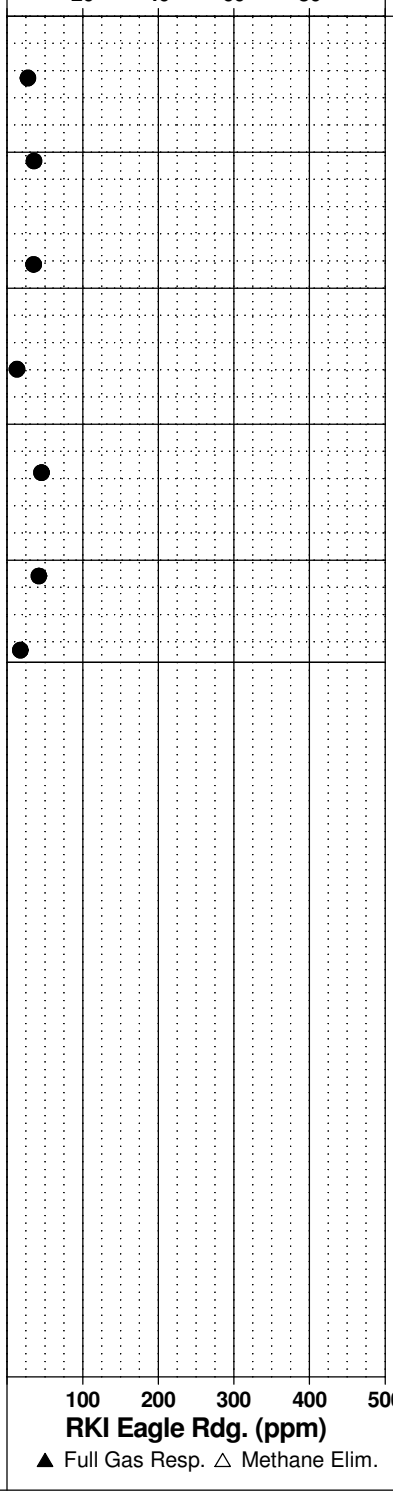
REMARKS

HOLE NO. BH 5-22

BORINGS BY CME-55 Low Clearance Drill **DATE** June 20, 2022

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	68.17
Asphaltic concrete 0.08							
FILL: Crushed stone with sand 0.69		AU	1				
Very stiff, brown **SILTY CLAY,** some sand, trace gravel		SS	2	67	31	1	67.17
1.60							
		SS	3	83	28	2	66.17
GLACIAL TILL: Dense to very dense, brown silty clay to clayey silt with sand, gravel, cobbles and boulders		SS	4	67	21	3	65.17
		SS	5	67	27		
		SS	6	100	32	4	64.17
4.75		SS	7	86	50+		
End of Borehole							
Practical refusal to augering at 4.75m depth							

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



▲ Full Gas Resp. △ Methane Elim.

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FILE NO. PE5409

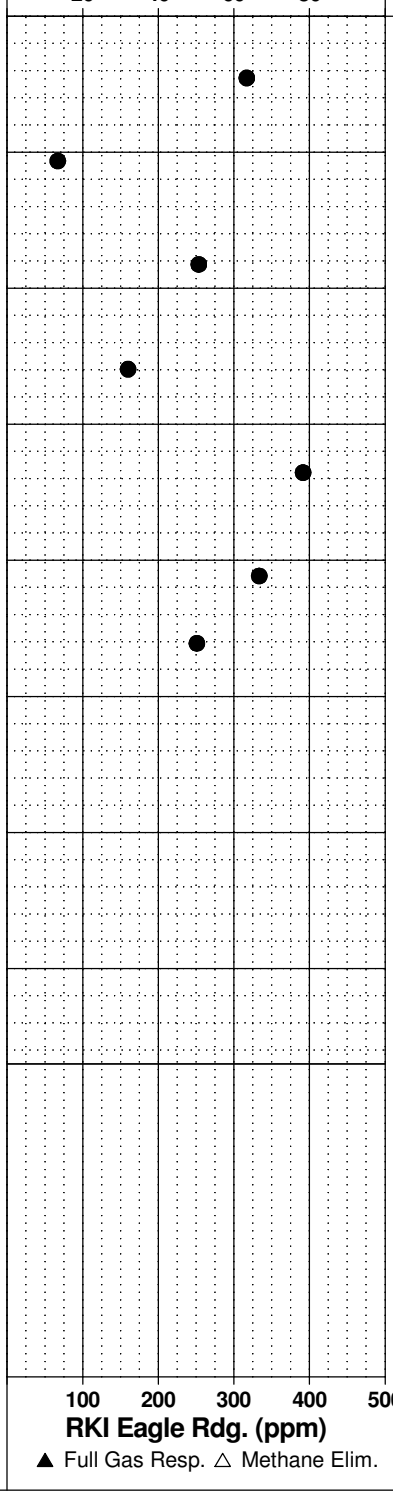
REMARKS

HOLE NO. BH 6-22

BORINGS BY CME-55 Low Clearance Drill **DATE** June 21, 2022

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
Asphaltic concrete 0.05						0	68.11
FILL: Crushed stone with sand 0.69		AU	1				
FILL: Brown silty clay with sand and gravel		SS	2	50	10	1	67.11
1.65		SS	3	100	33	2	66.11
GLACIAL TILL: Dense to very dense, grey silty clay to clayey silt with sand, some gravel, cobbles and boulders		SS	4	83	20	3	65.11
- grey by 3.0m depth		SS	5	75	18		
- silt content increasing with depth		SS	6	92	47	4	64.11
4.60		SS	7	33	50+		
BEDROCK: Fair to good quality, black shale		RC	1	100	50	5	63.11
- interlayered with grey limestone by 6.4m depth		RC	2	100	88	6	62.11
7.70						7	61.11
End of Borehole							

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



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FILE NO. PE5409

REMARKS

HOLE NO. BH 7-22

BORINGS BY CME-55 Low Clearance Drill **DATE** June 21, 2022

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	67.90
Asphaltic concrete 0.05							
FILL: Crushed stone with silty sand 0.76		AU	1				
FILL: Brown silty clay, trace sand and gravel		SS	2	17	5	1	66.90
		SS	3	100	23	2	65.90
2.44							
Hard, brown **SILTY CLAY to CLAYEY SILT,** some sand and gravel 3.18		SS	4	100	25	3	64.90
GLACIAL TILL: Very dense, grey silty clay with sand, some gravel, cobbles and boulders		SS	5	79	26	4	63.90
		SS	6	100	28		
		SS	7	50	50+	5	62.90
5.28							
BEDROCK: Very poor to excellent quality, black shale		RC	1	100	0	6	61.90
		RC	2	100	98	7	60.90
		RC	3	100	100	8	59.90
8.71							
End of Borehole							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

419

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

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FILE NO. PE5409

REMARKS

HOLE NO. BH 8-22

BORINGS BY CME-55 Low Clearance Drill **DATE** June 21, 2022

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
TOPSOIL 0.15						0	69.70
FILL: Brown silty clay with sand, trace gravel 0.61		AU	1				
FILL: Brown silty sand to sandy silt, some gravel, trace clay, occasional cobbles 1.09		SS	2	83	13	1	68.70
		SS	3	92	50+	2	67.70
		SS	4	92	50+		
		SS	5	67	39	3	66.70
GLACIAL TILL: Very dense to dense, brown silty sand to sandy silt with gravel, cobbles and boulders		SS	6	75	50+	4	65.70
- grey by 4.5m depth		SS	7	50	50+	5	64.70
		SS	8	50	33		
		SS	9	42	23	6	63.70
6.99		SS	10	21	50+		
End of Borehole							
Practical spilt spoon refusal at 6.99m depth							
(GWL @ 3.77m - July 7, 2022)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Part of 1919 Riverside Drive
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FILE NO. PE5409

REMARKS

HOLE NO. BH 9-22

BORINGS BY CME-55 Low Clearance Drill **DATE** June 22, 2022

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	66.90
Asphaltic concrete 0.10							
FILL: Brown silty sand with crushed stone 0.53		AU	1				
		SS	2	58	7	1	65.90
FILL: Brown to grey silty clay, some sand, trace gravel and topsoil		SS	3	75	5	2	64.90
		SS	4	54	5		
3.50		SS	5	50	50+	3	63.90
FILL: Brown to grey silty clay with sand, some gravel, cobbles, boulders, wood and concrete fragments		RC	1	27	0	4	62.90
4.88							
GLACIAL TILL: Very dense, grey silty clay to clayey silt, some sand, gravel, cobbles and boulders 5.16		RC	2	100	36	5	61.90
BEDROCK: Poor to excellent quality, black shale		RC	3	100	41	6	60.90
		RC	4	100	93	7	59.90
9.04						8	58.90
End of Borehole						9	57.90
(GWL @ 3.10m - July 7, 2022)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

104.8

Monitoring Well Construction

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Part of 1919 Riverside Drive
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DATUM Geodetic

FILE NO. PE5409

REMARKS

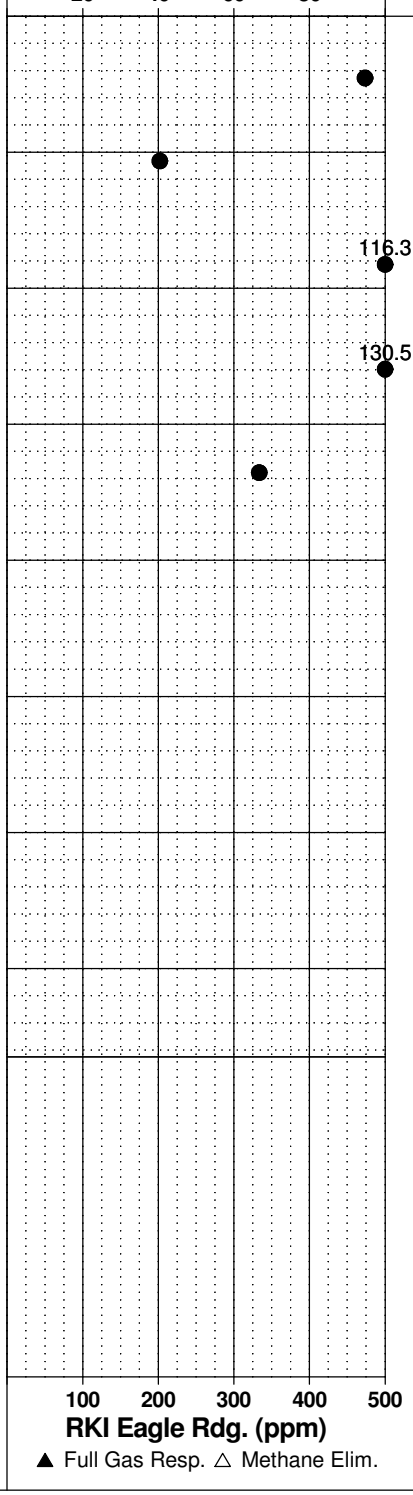
HOLE NO. BH10-22

BORINGS BY CME-55 Low Clearance Drill **DATE** June 22, 2022

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	66.62
Asphaltic concrete 0.08							
FILL: Brown silty sand with gravel and crushed stone 0.69		AU	1				
FILL: Brown silty sand, clay and gravel 1.45		SS	2	33	50+	1	65.62
Very loose to compact, brown **SILTY SAND to SANDY SILT,** trace clay		SS	3	50	1	2	64.62
2.69		SS	4	79	13		
Very stiff, grey **SILTY CLAY to CLAYEY SILTY** 3.02						3	63.62
GLACIAL TILL: Very dense silty clay to clayey silt with sand, gravel, cobbles and boulders 3.66		SS	5	54	50+		
		RC	1	100	49	4	62.62
BEDROCK: Fair to good quality, black shale		RC	2	100	83	5	61.62
		RC	3	100	51	6	60.62
7.65						7	59.62
End of Borehole							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**



Monitoring Well Construction

patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Part of 1919 Riverside Drive
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY CME-55 Low Clearance Drill **DATE** June 23, 2022

FILE NO. PE5409

HOLE NO. BH11-22

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									
TOPSOIL 0.05						0	66.11		
FILL: Crushed stone 0.69		AU	1						
FILL: Brown silty sand to sandy silt, some crushed stone and gravel 1.45		SS	2	50	14	1	65.11		
FILL: Grey sandy silt, trace clay 1.83		SS	3	75	10	2	64.11		
FILL: Brown silty clay, trace sand 2.44		SS	4	71	7				
FILL: Brown silty sand, some clay, trace gravel 3.73		SS	5	83	2	3	63.11		
Loose, brown **SILTY SAND,** trace gravel		SS	6	50	6	4	62.11		
- some topsoil by 3.8m depth		SS	7	42	5				
- grey by 5.2m depth 5.59		SS	8	58	50+	5	61.11		
Very stiff, grey **SILTY CLAY** 6.25		SS	9	42	33	6	60.11		
GLACIAL TILL: Very dense, grey silty clay to clayey silt, some sand, gravel, cobbles and boulders		SS	10	25	50+	7	59.11		
7.77		SS	11	17	50+				
End of Borehole									
Practical refusal to augering at 7.77m depth									

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

9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Part of 1919 Riverside Drive
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5409

REMARKS

HOLE NO. BH12-22

BORINGS BY CME-55 Low Clearance Drill **DATE** June 23, 2022

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	67.37
TOPSOIL 0.28							
FILL: Brown silty sand with clay, some gravel		AU	1				
1.07		SS	2	67	7	1	66.37
FILL: Grey silty clay with sand, some gravel 1.45							
		SS	3	83	13	2	65.37
FILL: Grey to brown silty sand, some gravel, trace clay		SS	4	42	1		
3.23						3	64.37
		SS	5	88	41		
GLACIAL TILL: Dense to very dense, grey silty sand to sandy silt, some clay, gravel, cobbles and boulders		SS	6	100	50+	4	63.37
		SS	7	21	50+		
5.21						5	62.37
		RC	1	100	71		
BEDROCK: Good to excellent quality, black shale						6	61.37
		RC	2	100	90		
7.49						7	60.37
End of Borehole							
(GWL @ 2.64m - July 6, 2022)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

The standard terminology to describe the relative strength of cohesionless soils is the compactness condition, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm. An SPT N value of "P" denotes that the split-spoon sampler was pushed 300 mm into the soil without the use of a falling hammer.

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

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory shear vane tests, unconfined compression tests, or occasionally by the Standard Penetration Test (SPT). Note that the typical correlations of undrained shear strength to SPT N value (tabulated below) tend to underestimate the consistency for sensitive silty clays, so Paterson reviews the applicable split spoon samples in the laboratory to provide a more representative consistency value based on tactile examination.

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their "sensitivity". The sensitivity, S_t, is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil. The classes of sensitivity may be defined as follows:

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube, generally recovered using a piston sampler
G	-	"Grab" sample from test pit or surface materials
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size BQ, NQ, HQ, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

WC%	-	Natural water content or water content of sample, %
LL	-	Liquid Limit, % (water content above which soil behaves as a liquid)
PL	-	Plastic Limit, % (water content above which soil behaves plastically)
PI	-	Plasticity Index, % (difference between LL and PL)
Dxx	-	Grain size at which xx% of the soil, by weight, is of finer grain sizes These grain size descriptions are not used below 0.075 mm grain size
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 = $(D30)^2 / (D10 \times D60)$
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

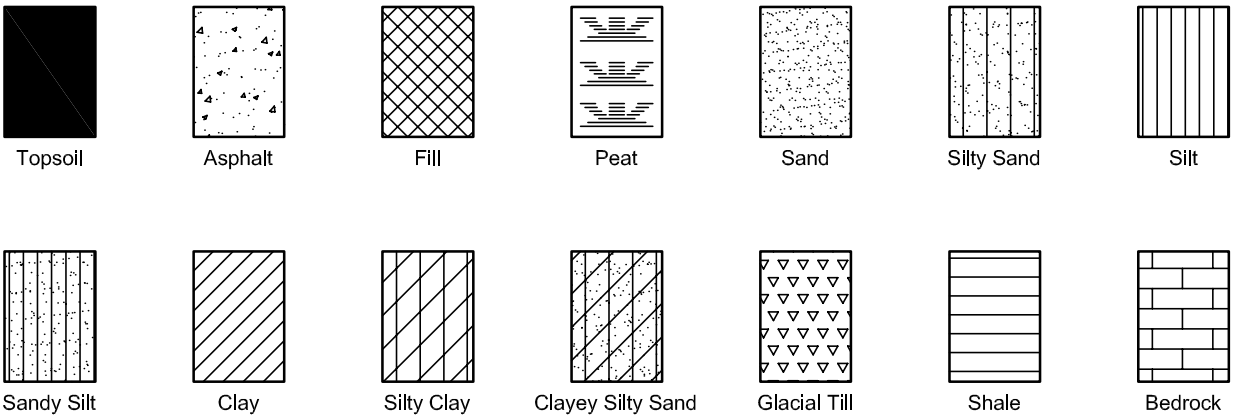
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void 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.

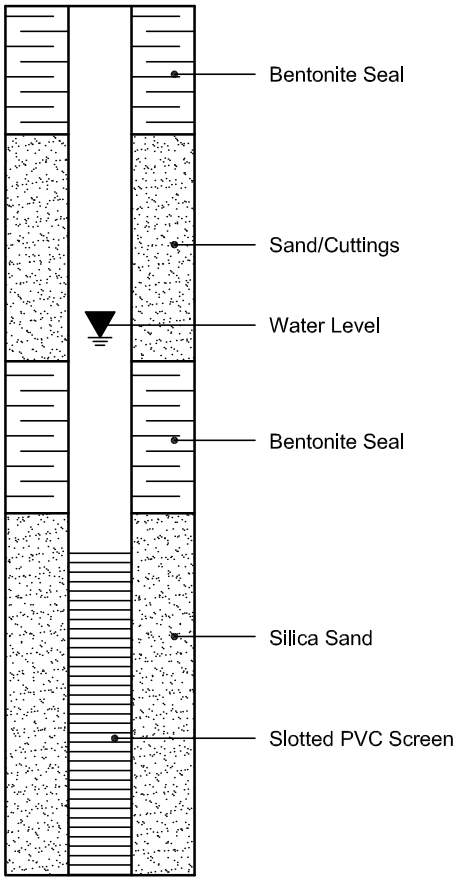
SYMBOLS AND TERMS (continued)

STRATA PLOT

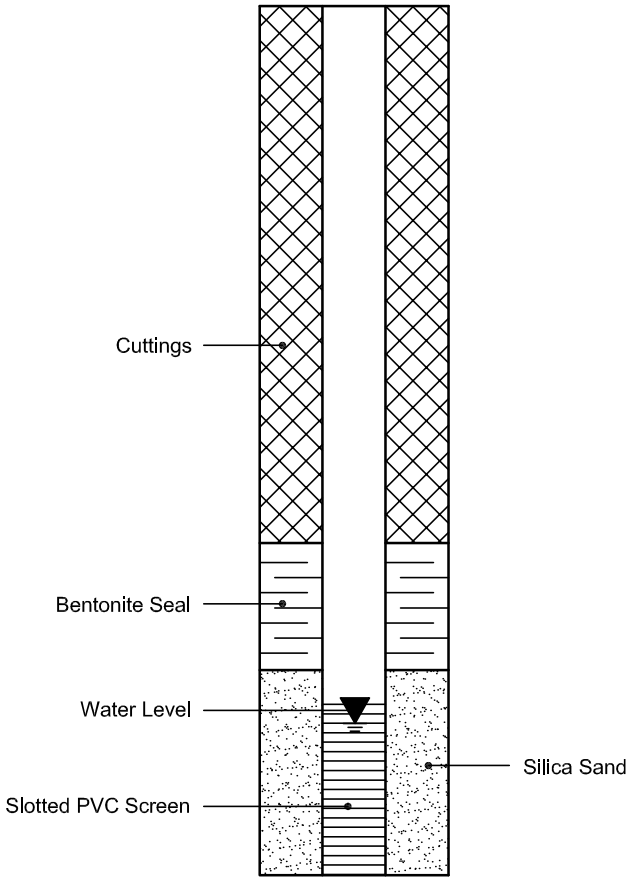


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



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Certificate of Analysis

Paterson Group Consulting Engineers

9 Auriga Drive
Ottawa, ON K2E 7T9
Attn: Mandy Witteman

Client PO: 55170
Project: PE5409
Custody: 136705

Report Date: 13-Jul-2022
Order Date: 4-Jul-2022

Order #: 2228146

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

Paracel ID	Client ID
2228146-01	BH7-22-SS2
2228146-02	BH8-22-AU1
2228146-03	BH8-22-SS5
2228146-04	BH9-22-SS2
2228146-08	BH12-22-SS4
2228146-11	DUP

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 13-Jul-2022

Client: Paterson Group Consulting Engineers

Order Date: 4-Jul-2022

Client PO: 55170

Project Description: PE5409

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	5-Jul-22	5-Jul-22
PHC F1	CWS Tier 1 - P&T GC-FID	5-Jul-22	5-Jul-22
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	5-Jul-22	6-Jul-22
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	12-Jul-22	12-Jul-22
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	5-Jul-22	6-Jul-22
Solids, %	Gravimetric, calculation	6-Jul-22	7-Jul-22

Certificate of Analysis

Report Date: 13-Jul-2022

Client: Paterson Group Consulting Engineers

Order Date: 4-Jul-2022

Client PO: 55170

Project Description: PE5409

	Client ID:	BH7-22-SS2	BH8-22-AU1	BH8-22-SS5	BH9-22-SS2
	Sample Date:	21-Jun-22 09:00	21-Jun-22 09:00	21-Jun-22 09:00	22-Jun-22 09:00
	Sample ID:	2228146-01	2228146-02	2228146-03	2228146-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	78.9	82.9	90.5	84.8
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	-	<1.0
Arsenic	1.0 ug/g dry	2.9	2.6	-	2.7
Barium	1.0 ug/g dry	139	51.1	-	115
Beryllium	0.5 ug/g dry	0.6	<0.5	-	0.5
Boron	5.0 ug/g dry	<5.0	<5.0	-	<5.0
Cadmium	0.5 ug/g dry	<0.5	<0.5	-	<0.5
Chromium	5.0 ug/g dry	44.8	28.1	-	35.8
Cobalt	1.0 ug/g dry	9.1	6.7	-	8.6
Copper	5.0 ug/g dry	20.6	9.7	-	19.3
Lead	1.0 ug/g dry	4.4	15.9	-	7.4
Molybdenum	1.0 ug/g dry	<1.0	<1.0	-	<1.0
Nickel	5.0 ug/g dry	24.5	14.4	-	20.7
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	42.6	33.2	-	38.9
Zinc	20.0 ug/g dry	42.9	47.9	-	44.3
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	-	-	121%	115%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	-	-	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	-	-	12	<4
F3 PHCs (C16-C34)	8 ug/g dry	-	-	13	40
F4 PHCs (C34-C50)	6 ug/g dry	-	-	20	60
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	<0.02	<0.02	-	<0.02

Certificate of Analysis

Report Date: 13-Jul-2022

Client: Paterson Group Consulting Engineers

Order Date: 4-Jul-2022

Client PO: 55170

Project Description: PE5409

	Client ID:	BH7-22-SS2	BH8-22-AU1	BH8-22-SS5	BH9-22-SS2
	Sample Date:	21-Jun-22 09:00	21-Jun-22 09:00	21-Jun-22 09:00	22-Jun-22 09:00
	Sample ID:	2228146-01	2228146-02	2228146-03	2228146-04
	MDL/Units	Soil	Soil	Soil	Soil
Acenaphthylene	0.02 ug/g dry	<0.02	<0.02	-	0.02
Anthracene	0.02 ug/g dry	<0.02	<0.02	-	0.04
Benzo [a] anthracene	0.02 ug/g dry	<0.02	<0.02	-	0.06
Benzo [a] pyrene	0.02 ug/g dry	<0.02	<0.02	-	0.07
Benzo [b] fluoranthene	0.02 ug/g dry	<0.02	<0.02	-	0.06
Benzo [g,h,i] perylene	0.02 ug/g dry	<0.02	<0.02	-	0.04
Benzo [k] fluoranthene	0.02 ug/g dry	<0.02	<0.02	-	0.04
Chrysene	0.02 ug/g dry	<0.02	<0.02	-	0.06
Dibenzo [a,h] anthracene	0.02 ug/g dry	<0.02	<0.02	-	<0.02
Fluoranthene	0.02 ug/g dry	<0.02	<0.02	-	0.11
Fluorene	0.02 ug/g dry	<0.02	<0.02	-	<0.02
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	<0.02	<0.02	-	0.04
1-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	-	<0.02
2-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	-	<0.02
Methylnaphthalene (1&2)	0.04 ug/g dry	<0.04	<0.04	-	<0.04
Naphthalene	0.01 ug/g dry	<0.01	<0.01	-	<0.01
Phenanthrene	0.02 ug/g dry	<0.02	<0.02	-	0.05
Pyrene	0.02 ug/g dry	<0.02	<0.02	-	0.13
2-Fluorobiphenyl	Surrogate	72.9%	92.9%	-	74.4%
Terphenyl-d14	Surrogate	86.6%	111%	-	83.9%

Certificate of Analysis

Report Date: 13-Jul-2022

Client: Paterson Group Consulting Engineers

Order Date: 4-Jul-2022

Client PO: 55170

Project Description: PE5409

	Client ID:	BH12-22-SS4	DUP	-	-
	Sample Date:	23-Jun-22 09:00	23-Jun-22 09:00	-	-
	Sample ID:	2228146-08	2228146-11	-	-
	MDL/Units	Soil	Soil	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	76.3	85.3	-	-
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	141%	115%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	-	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	5	-	-
F3 PHCs (C16-C34)	8 ug/g dry	<8	35	-	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	22	-	-

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	*0.990*		*ug/g*		*74.2*	*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	*9.43*		*ug/g*		*118*	*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)	30	7	ug/g	25			16.4	40	
F2 PHCs (C10-C16)	ND	4	ug/g	ND			NC	30	
F3 PHCs (C16-C34)	ND	8	ug/g	ND			NC	30	
F4 PHCs (C34-C50)	ND	6	ug/g	ND			NC	30	
Metals									
Antimony	4.2	1.0	ug/g	ND			NC	30	
Arsenic	1.7	1.0	ug/g	1.5			12.1	30	
Barium	51.3	1.0	ug/g	43.6			16.2	30	
Beryllium	ND	0.5	ug/g	ND			NC	30	
Boron	ND	5.0	ug/g	ND			NC	30	
Cadmium	ND	0.5	ug/g	ND			NC	30	
Chromium	17.5	5.0	ug/g	14.5			18.5	30	
Cobalt	4.4	1.0	ug/g	3.7			18.0	30	
Copper	7.0	5.0	ug/g	5.9			17.4	30	
Lead	5.5	1.0	ug/g	4.8			14.3	30	
Molybdenum	ND	1.0	ug/g	ND			NC	30	
Nickel	8.2	5.0	ug/g	7.0			15.8	30	
Selenium	ND	1.0	ug/g	ND			NC	30	
Silver	ND	0.3	ug/g	ND			NC	30	
Thallium	ND	1.0	ug/g	ND			NC	30	
Uranium	ND	1.0	ug/g	ND			NC	30	
Vanadium	28.3	10.0	ug/g	23.7			17.8	30	
Zinc	34.4	20.0	ug/g	28.7			18.0	30	
Physical Characteristics									
% Solids	83.1	0.1	% by Wt.	83.0			0.2	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g	ND			NC	40	
Acenaphthylene	ND	0.02	ug/g	ND			NC	40	
Anthracene	ND	0.02	ug/g	ND			NC	40	
Benzo [a] anthracene	ND	0.02	ug/g	ND			NC	40	
Benzo [a] pyrene	ND	0.02	ug/g	ND			NC	40	
Benzo [b] fluoranthene	ND	0.02	ug/g	ND			NC	40	
Benzo [g,h,i] perylene	ND	0.02	ug/g	ND			NC	40	
Benzo [k] fluoranthene	ND	0.02	ug/g	ND			NC	40	
Chrysene	ND	0.02	ug/g	ND			NC	40	
Dibenzo [a,h] anthracene	ND	0.02	ug/g	ND			NC	40	
Fluoranthene	ND	0.02	ug/g	ND			NC	40	
Fluorene	ND	0.02	ug/g	ND			NC	40	
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g	ND			NC	40	
1-Methylnaphthalene	ND	0.02	ug/g	ND			NC	40	
2-Methylnaphthalene	ND	0.02	ug/g	ND			NC	40	
Naphthalene	ND	0.01	ug/g	ND			NC	40	
Phenanthrene	ND	0.02	ug/g	ND			NC	40	
Pyrene	ND	0.02	ug/g	ND			NC	40	
Surrogate: 2-Fluorobiphenyl	*1.30*		*ug/g*		*94.5*	*50-140*			
Surrogate: Terphenyl-d14	*1.51*		*ug/g*		*110*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g	ND			NC	50	
Ethylbenzene	ND	0.05	ug/g	ND			NC	50	
Toluene	ND	0.05	ug/g	ND			NC	50	
m,p-Xylenes	ND	0.05	ug/g	ND			NC	50	
o-Xylene	ND	0.05	ug/g	ND			NC	50	
Surrogate: Toluene-d8	*9.81*		*ug/g*		*119*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	175	7	ug/g	ND	87.7	80-120			
F2 PHCs (C10-C16)	91	4	ug/g	ND	110	60-140			
F3 PHCs (C16-C34)	231	8	ug/g	ND	114	60-140			
F4 PHCs (C34-C50)	137	6	ug/g	ND	107	60-140			
Metals									
Antimony	39.1	1.0	ug/g	ND	78.0	70-130			
Arsenic	42.7	1.0	ug/g	ND	84.1	70-130			
Barium	59.3	1.0	ug/g	17.4	83.7	70-130			
Beryllium	44.9	0.5	ug/g	ND	89.6	70-130			
Boron	42.2	5.0	ug/g	ND	82.7	70-130			
Cadmium	38.2	0.5	ug/g	ND	76.3	70-130			
Chromium	51.4	5.0	ug/g	5.8	91.1	70-130			
Cobalt	44.5	1.0	ug/g	1.5	86.0	70-130			
Copper	43.9	5.0	ug/g	ND	83.1	70-130			
Lead	42.5	1.0	ug/g	1.9	81.2	70-130			
Molybdenum	40.5	1.0	ug/g	ND	80.8	70-130			
Nickel	45.5	5.0	ug/g	ND	85.5	70-130			
Selenium	39.6	1.0	ug/g	ND	78.9	70-130			
Silver	34.7	0.3	ug/g	ND	69.3	70-130			QM-07
Thallium	39.9	1.0	ug/g	ND	79.7	70-130			
Uranium	42.5	1.0	ug/g	ND	84.5	70-130			
Vanadium	54.9	10.0	ug/g	ND	90.9	70-130			
Zinc	52.3	20.0	ug/g	ND	81.5	70-130			
Semi-Volatiles									
Acenaphthene	0.152	0.02	ug/g	ND	88.6	50-140			
Acenaphthylene	0.143	0.02	ug/g	ND	83.0	50-140			
Anthracene	0.166	0.02	ug/g	ND	96.5	50-140			
Benzo [a] anthracene	0.137	0.02	ug/g	ND	80.0	50-140			
Benzo [a] pyrene	0.148	0.02	ug/g	ND	86.0	50-140			
Benzo [b] fluoranthene	0.188	0.02	ug/g	ND	109	50-140			
Benzo [g,h,i] perylene	0.130	0.02	ug/g	ND	75.7	50-140			
Benzo [k] fluoranthene	0.163	0.02	ug/g	ND	94.8	50-140			
Chrysene	0.150	0.02	ug/g	ND	87.6	50-140			
Dibenzo [a,h] anthracene	0.123	0.02	ug/g	ND	71.3	50-140			
Fluoranthene	0.143	0.02	ug/g	ND	83.5	50-140			
Fluorene	0.162	0.02	ug/g	ND	94.3	50-140			
Indeno [1,2,3-cd] pyrene	0.118	0.02	ug/g	ND	68.6	50-140			
1-Methylnaphthalene	0.134	0.02	ug/g	ND	77.9	50-140			
2-Methylnaphthalene	0.161	0.02	ug/g	ND	93.8	50-140			
Naphthalene	0.171	0.01	ug/g	ND	99.4	50-140			
Phenanthrene	0.116	0.02	ug/g	ND	67.7	50-140			
Pyrene	0.147	0.02	ug/g	ND	85.6	50-140			
Surrogate: 2-Fluorobiphenyl	*1.08*		*ug/g*		*78.9*	*50-140*			
Surrogate: Terphenyl-d14	*1.27*		*ug/g*		*92.1*	*50-140*			
Volatiles									
Benzene	4.61	0.02	ug/g	ND	115	60-130			
Ethylbenzene	4.64	0.05	ug/g	ND	116	60-130			
Toluene	4.73	0.05	ug/g	ND	118	60-130			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
m,p-Xylenes	7.40	0.05	ug/g	ND	92.5	60-130			
o-Xylene	4.21	0.05	ug/g	ND	105	60-130			
Surrogate: Toluene-d8	*7.79*		*ug/g*		*97.3*	*50-140*			

Qualifier Notes:

QC Qualifiers :

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

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

PARACEL LABORATORIES LTD.

Paracel ID: 2228146

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2228146	№ 136705

Client Name: Paterson | Project Ref: PE5409 | Page 1 of 1

Contact Name: Mandy Witteman | Quote #:

Address: 9 Auriga Dr. Ottawa | PO #: 55170

Telephone: 613-800-5575 | E-mail: mwitteman@patersongroup.ca

Turnaround Time

☐ 1 day ☐ 3 day

☐ 2 day ☒ Regular

Date Required:

☒ REG 153/04 ☐ REG 406/19

☐ Table 1 ☒ Res/Park ☐ Med/Fine

☐ Table 2 ☐ Ind/Comm ☐ Coarse

☒ Table 3 ☐ Agri/Other

☐ Table

For RSC: ☐ Yes ☐ No

Other Regulation

☐ REG 558 ☐ PWQO

☐ CCME ☐ MISA

☐ SU - Sani ☐ SU - Storm

Mun:

☐ Other:

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

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	BTEX + PHC (F2-F4)				
1	BH7-22-SS2	S		1	June 21/2022				X	X								
2	~~BH~~8-22-AU1			1	June 21/2022				X	X								
3	BH8-22-SS5			2	June 21/2022		X											
4	BH9-22-SS2			1	June 22/2022		X		X	X								
5	BH9-22-SS3			1	June 22/2022				X	X								
6	BH11-22-SS5			2	June 23/2022		X	—		HOLD				—				
7	BH12-22-AU1			1	June 23/2022					X	HOLD			P				
8	BH12-22-SS4			2	June 23/2022		X			X	[HOLD metals only]							
9	BH12-22-SS5			2	June 23/2022		X	—		HOLD				—				
10	BHR-102	S		1	June 23/2022									X				

Comments: BH11-22-SS5: Hold all; BH12-22-AU1: Hold all, BH12-22-SS4: Hold metals only, BH12-22-SS5: Hold all. Call Mandy for questions/concerns

Method of Delivery: PARACEL COURIER

Relinquished By (Sign):	Received By Driver/Depot: A. LECUIE	Received at Lab: Jumeeparm Bhimai	Verified By:
Relinquished By (Print): Nureen Seif	Date/Time: 04/07/22 3:11	Date/Time: JUL 04, 2022 04:20	Date/Time: JUL 5, 22 12:42
Date/Time: July 4th, 2022	Temperature: °C FH.	Temperature: 19.2 °C	pH Verified: ☐ By:

PARACEL LABORATORIES LTD.

Paracel ID: 2228146

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2228146	№ 136709

Client Name: Paterson	Project Ref: PE5409		Page 1 of 1
Contact Name: Mandy Witteman	Quote #:		**Turnaround Time**
Address: 9 Auriga Dr	PO #: 55170		☐ 1 day ☐ 3 day
	E-mail: mwitteman@patersongroup.ca		☐ 2 day ☒ Regular
Telephone: 613-800-5575			Date Required:

☒ REG 153/04 ☐ REG 406/19

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

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

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

Required Analysis

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)					
1	DUP	S		2	June 29/22		X											
2	BH9-22-SS2	↓		1	↓		X											
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

Comments:

Method of Delivery: Paracel Courier

Relinquished By (Sign): [signature]	Received By Driver/Depot: M. [illegible]	Received at Lab: Sreeyam [illegible]	Verified By: [signature]
Relinquished By (Print): Mandy Witteman	Date/Time: 05/07/22 3:17	Date/Time: JUL 05, 2022 04.45	Date/Time: JULY 05, 22 17:28
Date/Time: July 5/2022	Temperature: °C PM.	Temperature: 13.8 °C	pH Verified: ☐ By:

PARACEL LABORATORIES LTD.

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www.paracellabs.com

Certificate of Analysis

Paterson Group Consulting Engineers

9 Auriga Drive
Ottawa, ON K2E 7T9
Attn: Mandy Witteman

Client PO: 55270
Project: PE5409
Custody:

Report Date: 20-Jul-2022
Order Date: 14-Jul-2022

Order #: 2229547

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

Paracel ID	Client ID
2229547-01	BH8-22-GW1
2229547-02	BH9-22-GW1
2229547-03	BH12-22-GW1
2229547-04	DUP

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 55270

Report Date: 20-Jul-2022

Order Date: 14-Jul-2022

Project Description: PE5409

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	18-Jul-22	18-Jul-22
PHC F1	CWS Tier 1 - P&T GC-FID	15-Jul-22	18-Jul-22
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	20-Jul-22	20-Jul-22

Certificate of Analysis

Report Date: 20-Jul-2022

Client: Paterson Group Consulting Engineers

Order Date: 14-Jul-2022

Client PO: 55270

Project Description: PE5409

	Client ID:	BH8-22-GW1	BH9-22-GW1	BH12-22-GW1	DUP
	Sample Date:	07-Jul-22 09:00	13-Jul-22 09:00	13-Jul-22 09:00	13-Jul-22 09:00
	Sample ID:	2229547-01	2229547-02	2229547-03	2229547-04
	MDL/Units	Water	Water	Water	Water
Volatiles					
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Toluene-d8	Surrogate	107%	107%	106%	107%
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	<25	<25
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	<100
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	<100
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	<100

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 55270

Report Date: 20-Jul-2022

Order Date: 14-Jul-2022

Project Description: PE5409

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Volatiles									
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	*89.5*		*ug/L*		*112*	*50-140*			

Certificate of Analysis

Report Date: 20-Jul-2022

Client: Paterson Group Consulting Engineers

Order Date: 14-Jul-2022

Client PO: 55270

Project Description: PE5409

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	
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	*87.9*		*ug/L*		*110*	*50-140*			

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 55270

Report Date: 20-Jul-2022

Order Date: 14-Jul-2022

Project Description: PE5409

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	2150	25	ug/L	ND	108	68-117			
F2 PHCs (C10-C16)	1660	100	ug/L	ND	103	60-140			
F3 PHCs (C16-C34)	4210	100	ug/L	ND	107	60-140			
F4 PHCs (C34-C50)	2110	100	ug/L	ND	85.0	60-140			
Volatiles									
Benzene	42.4	0.5	ug/L	ND	106	60-130			
Ethylbenzene	40.9	0.5	ug/L	ND	102	60-130			
Toluene	41.9	0.5	ug/L	ND	105	60-130			
m,p-Xylenes	79.1	0.5	ug/L	ND	98.9	60-130			
o-Xylene	42.1	0.5	ug/L	ND	105	60-130			
Surrogate: Toluene-d8	*73.0*		*ug/L*		*91.2*	*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.

Paracel ID: 2229547

PARACEL LABORATORIES LTD

Paracel Order Number (Lab Use Only): 2229547

Chain Of Custody (Lab Use Only)

Client Name: Paterson	Project Ref: PE5409
Contact Name: Handy Lefferman	Quote #:
Address: 9 Auriga	PO #: 55170
Telephone: 613 - 800 - 5575	E-mail: mwitteman@patersongroup.ca

Page 1 of 1

Turnaround Time

☐ 1 day ☐ 3 day ☐ 2 day ☒ Regular

Date Required:

☒ REG 153/04 ☐ REG 406/19

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

Other Regulation

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

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

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)					
1	BH8-22-GW1	GW		3	July 7, 2022		X											
2	BH9-22-GW1	↓		3	July 8, 2022		X											
3	BH12-22-GW1	↓		3	↓		X											
4	DUP	↓		3	↓		X											
5																		
6																		
7																		
8																		
9																		
10																		

Required Analysis

Comments:

Method of Delivery: PARACEL COURIER

Relinquished By (Sign):	Received By Driver/Depot: A. Fleuse	Received at Lab:	Verified By:
Relinquished By (Print): Nurein Seif	Date/Time: 14/07/22 4:13	Date/Time: July 14, 22 17:28	Date/Time: July 15 2022
Date/Time: July 14, 2	Temperature: °C PH.	Temperature: 16.8°C	pH Verified: ☐ By: