Phase II – Environmental Site Assessment

Tunney's Pasture (Block 9)

Ottawa, Ontario

Prepared for Arcadis IBI Group

Report: PE6039-2
March 28. 2024

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EXECUTIVE SUMMARY

Paterson Group was retained by Arcadis IBI Group to conduct a Phase II – Environmental Site Assessment (Phase II ESA) for Block 9 of the Tunney's Pasture government office complex, in the City of 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 were considered to result in areas of potential environmental concern (APECs) on the subject site (Phase II Property).

The subsurface investigation for this assessment was conducted on November 15th and 16th, 2023 and consisted of drilling five (5) boreholes (BH16-23 to BH20-23) across the Phase II Property. It should be noted that this field investigation was carried out as part of a larger investigation conducted for multiple sites at the Tunney's Pasture complex. The boreholes were advanced to depths ranging from approximately 5.74 to 7.64 m below the existing ground surface and terminated within the bedrock unit. Upon completion, all five boreholes were instrumented with groundwater monitoring wells in order to access the groundwater table.

In general, the subsurface soil profile encountered at the borehole locations consists of granular fill (silty sand to silty clay and crushed stone) over bedrock. Bedrock was encountered in all five boreholes during the field drilling program at depths ranging from approximately 1.22 to 4.65 m below ground surface. Based on the encountered bedrock depth, more than 1/3 of the site by area is considered to have bedrock surface beyond a depth of 2.0 m (ie. not a shallow soil property as defined by O.Reg. 153/04).

During the field sampling program, the groundwater was measured at depths ranging from approximately 1.54 to 3.67 m below the existing ground surface.

A total of 9 soil samples were submitted for laboratory analysis of BTEX, PHCs (F_1-F_4), VOCs, metals, Hg^+, CrVI, PAHs, PCBs, EC and/or SAR parameters. Based on the analytical test results, all analytical soil results comply with the MECP Table 3 Coarse-Grained Commercial Soil Standards with the exception of various PAH concentrations identified in the upper fill material in BH19-23.

Fill material exceeding CCME Coarse-Grained Commercial Soil Standards was identified in the upper fill material at BH19-23 and lower fill material in BH17-23.

Five groundwater samples were submitted for laboratory analysis of BTEX, PHCs (F_1-F_4), VOCs, metals, Hg^+, CrVI, PAHs, and/or PCB parameters. Based on the analytical test results, all parameter concentrations are in compliance with the MECP Table 3 Non-Potable Groundwater Standards. The results also comply with the selected CCME Tier 1 Federal Interim Groundwater Water Quality Guidelines for Commercial Sites, with the exception of a minor exceedance of molybdenum detected in BH20-23.

Recommendations

Soil

Based on the findings of this assessment, the shallow fill material present at BH19-23 is contaminated with various PAH parameters. Given the low-mobility of these contaminants, it is expected that the contamination is confined to the fill material within a localized area around BH19-23. Samples exceeding the CCME Coarse-Grained Commercial Soil Standards include PAH parameters in upper fill material in BH19-23 and lower fill material in BH17-23.

It is our understanding that the Phase II Property may be redeveloped in the future. As such, the contaminated soil could be fully delineated and remediated in conjunction with site redevelopment. This contaminated soil will require disposal at a licensed waste disposal facility. Prior to off-site disposal of impacted soil at a licensed waste disposal facility, a leachate analysis of a representative sample of contaminated soil must be conducted in accordance with Ontario Regulation 347/558.

Additionally, any excess soil generated on site must be handed in accordance with O. Reg. 406/19: On-Site and Excess Soil Management. Additional excess soil testing and reporting requirements will be required prior to future site excavation activities, in accordance with O. Reg. 406/19. Further delineation of the PAH exceedance can be conducted in conjunction with an excess soil testing program.

Monitoring Wells

It is recommended that the monitoring wells be maintained for future sampling purposes. The monitoring wells will be registered with the MECP under Ontario Regulation 903 (Ontario Water Resources Act). As such a time that the monitoring wells are no longer required, they must be decommissioned in accordance with O.Reg. 903.

1.0 INTRODUCTION

At the request of Arcadis IBI Group, Paterson Group (Paterson) conducted a Phase II – Environmental Site Assessment (Phase II ESA) for Block 9 of the Tunney's Pasture government office complex, in the City of Ottawa, Ontario (the Phase II Property).

The purpose of this Phase II ESA has been to address the areas of potential environmental concern (APECs) identified on the Phase II Property as a result the findings of the Phase I ESA.

1.1 Site Description

Address:	Part of 120 Parkdale Avenue (170 Tunney's Pasture Driveway), Block 9, Tunney's Pasture, Ottawa, Ontario.
Location:	The Phase II Property is bounded to the north by Columbine Driveway, to the west by Tunney's Pasture Driveway and to the east by Parkdale Avenue, in the City of Ottawa, Ontario. Refer to Figure 1 – Key Plan, as well as Drawing PE6039-1 – Site Plan, appended to this report.
Latitude and Longitude:	45° 24' 29" N, 75° 44' 05" W.

Site Description:

Configuration:	Irregular.
Area:	2.8 ha (approximately).
Zoning:	MC – Mixed-Use Centre Zone.
Current Use:	The west and central portions of the Phase II Property consist of vacant land, and the east portion of the Phase II Property is occupied by a parking lot.
Services:	The Phase II Property is located within a municipally serviced area.

1.2 Property Ownership

The Phase II Property is currently owned by the Government of Canada. Paterson was retained to complete this Phase II ESA by Ms. Catriona Moggach of Arcadis IBI Group, whose office is located at 333 Preston Street, Unit #500, Ottawa, Ontario, and can be contacted via telephone at 613-225-1311.

In 2021, Public Service and Procurement Canada (PSPC) partnered with Canada Lands Company (CLC) under a collaboration project to leverage the strengths of each organization to deliver the long-term vision of Tunney's Pasture that includes the site's transition from a federal employment centre into a mixed-use, sustainable, transit-oriented community. CLC is a self-financing federal Crown corporation specializing in real estate and development with a mandate to transform former Government of Canada properties and reintegrates them into local communities while ensuring their long-term goals. Since the launch of this collaboration project, CLC has been committed to working with the community to define amendments to the TPMP and proposed upgrades to the existing roadway and servicing infrastructure that support both federal priorities and future development.

1.3 Applicable Site Condition Standard

The site condition standards for the subject property were obtained from Table 3 of the document entitled, *"Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act"*, prepared by the Ministry of the Environment, Conservation and Parks (MECP), and dated April 15, 2011. The selected MECP standards are based on the following considerations:

- ❒ Full-depth conditions;
- ❒ Coarse-grained soil conditions;
- ❒ Non-potable groundwater conditions;
- ❒ Residential land use.

Grain-size analysis was not conducted as part of this assessment, and as such, the coarse-grained soil standards were selected as a conservative approach.

It should be noted that in addition to the provincial MECP standards, the federal Canadian Council of Ministers of the Environment (CCME) commercial standards were also selected for additional consideration.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The Phase II Property is currently vacant of any buildings (demolished between approximately 2019 to 2021). The property is presently used as a construction staging area for adjacent developments.

The site topography is relatively flat, while the regional topography appears to slope down towards the northwest, in the general direction the Ottawa River. The Phase II Property is generally considered to be at grade with respect to the surrounding properties.

Water drainage on the Phase II Property occurs primarily via surface run-off towards catch basins present within the parking lot and on the adjacent streets, as well as via infiltration within the grassed/landscaped areas.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation for this assessment was conducted on November 15th and 16th, 2023 and consisted of drilling five (5) boreholes (BH16-23 to BH20-23) across the Phase II Property. It should be noted that this field investigation was carried out as part of a larger investigation conducted for multiple sites at the Tunney's Pasture complex.

The boreholes were advanced to depths ranging from approximately 5.74 to 7.64 m below the existing ground surface, and terminated within the bedrock unit. Bedrock surface was encountered in all five boreholes during the field drilling program at depths ranging from approximately 1.22 to 4.65 m below ground surface. Based on the encountered bedrock depth, more than 1/3 of the site by area is considered to have bedrock surface beyond a depth of 2.0 m (ie. not a shallow soil property as defined by O.Reg. 153/04).

Upon completion, all five boreholes were instrumented with groundwater monitoring wells in order to access the groundwater table. During the field sampling program, the groundwater was measured at depths ranging from approximately 1.54 to 3.67 m below the existing ground surface.

3.2 Media Investigated

During the course of this subsurface investigation, soil and groundwater samples were obtained from the Phase II Property and submitted for laboratory analysis. The rationale for sampling and analyzing these media is based on the contaminants of potential concern identified in the Phase I ESA.

The contaminants of potential concern for the soil and/or groundwater on the Phase II Property include the following:

- Benzene, Ethylbenzene, Toluene, and Xylenes (BTEX);
- Petroleum Hydrocarbons, fractions 1 – 4 (PHCs F_1-F_4);
- Volatile Organic Compounds (VOCs);
- Polycyclic Aromatic Hydrocarbons (PAHs);
- Polychlorinated Biphenyls (PCBs);
- Metals (including Arsenic, Antimony, and Selenium);
- Mercury (Hg^+);
- Hexavalent Chromium (CrVI);
- Electrical Conductivity (EC);
- Sodium Adsorption Ratio (SAR).

These CPCs have the potential to be present in the soil matrix and/or the groundwater situated beneath the Phase II Property.

3.3 Phase I ESA Conceptual Site Model

Geological and Hydrogeological Setting

Based on the available mapping information, the bedrock beneath the Phase II Property generally consists of interbedded limestone and dolomite of the Gull River Formation. The surficial geology consists largely of Paleozoic bedrock, with an overburden ranging from approximately 0 m to 2 m in thickness.

Groundwater is anticipated to be encountered within the bedrock and flow in a northerly direction towards the Ottawa River.

Water Bodies and Areas of Natural and Scientific Interest

No water bodies or areas of natural and scientific interest are present on the Phase II Property or within the Phase I Study Area.

The nearest named water body with respect to the Phase II Property is the Ottawa River, located approximately 400 m to the north.

Drinking Water Wells

Based on the availability of municipal services, no potable drinking water wells are anticipated to remain in use within the Phase I Study Area.

Existing Buildings and Structures

No buildings or structures currently exist on the Phase II Property.

Current and Future Property Use

The Phase II Property currently consists of vacant land and an asphaltic concrete parking lot, and is being used for the storage of excess soils from adjacent developments. While the property is likely to be developed in the near future, no specific plans or intended property use have been provided. Should the property be redeveloped for a more sensitive land use (ie. residential), a record of site condition (RSC) will need to be filed with the MECP.

Neighbouring Land Use

The surrounding lands within the Phase I Study Area consist largely of commercial and residential properties. Current land use is depicted on Drawing PE6039-2 – Surrounding Land Use Plan, in the Figures section of this report.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

As per Section 7.1 of the Phase I ESA report, six potentially contaminating activities (PCAs), resulting in areas of potential environmental concern (APECs), were identified on the Phase II Property. These APECs include:

- Item 30: Importation of Fill Material of Unknown Quality; associated with the potential presence of poor quality fill material used for grading purposes, as well as off-site stockpiled soil for storage during adjacent development, located throughout the Phase II Property (APEC #1)

- Item N/A: Application of Road Salt for De-icing Purposes During Snow and Ice Conditions; associated with the use of road salt throughout the asphalt-covered parking lot occupying the northern and central portions of the Phase II Property (APEC #2).

- Item 28: Gasoline and Associated Products Storage in Fixed Tanks; associated with the two former on-site 1135 L diesel ASTs (APEC #3A), as

well as the related vent and fill pipes (APEC #3B), and the former hydraulic elevator lift (APEC #5)

- ❒ Item 8: Chemical Manufacturing, Processing and Bulk Storage; associated with the handling of contaminants at the former on-site loading dock (APEC #4)

- ❒ Item 55: Transformer Manufacturing, Processing and Use; associated with the three former on-site PCB containing transformers (APEC#7).

Other off-site PCAs were identified within the Phase I Study Area but were deemed not to be of any environmental concern to the Phase II Property based on their separation distances, their inferred down-gradient or cross-gradient orientation with respect to the known groundwater flow to the north, and/or the results of the previous subsurface investigations.

Contaminants of Potential Concern

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

- ❒ Benzene, Ethylbenzene, Toluene, and Xylenes (BTEX);
- ❒ Petroleum Hydrocarbons, fractions 1 – 4 (PHCs F_1-F_4);
- ❒ Volatile Organic Compounds (VOCs);
- ❒ Polycyclic Aromatic Hydrocarbons (PAHs);
- ❒ Polychlorinated Biphenyls (PCBs);
- ❒ Metals (including Arsenic, Antimony, and Selenium);
- ❒ Mercury (Hg^+);
- ❒ Hexavalent Chromium (CrVI);
- ❒ Electrical Conductivity (EC);
- ❒ Sodium Adsorption Ratio (SAR).

These CPCs have the potential to be present in the soil matrix and/or the groundwater situated beneath the Phase II Property.

Assessment of Uncertainty and/or Absence of Information

The information available for review as part of the preparation of this Phase I ESA is considered to be sufficient to conclude that there are PCAs and APECs associated with the Phase II Property.

The presence of any PCAs was confirmed by a variety of independent sources, and as such, the conclusions of this report are not affected by uncertainty which may be present with respect to the individual sources.

3.4 Deviations from the Sampling and Analysis Plan

No deviations from the Sampling and Analysis were made during the course of this Phase II ESA.

3.5 Physical Impediments

Due to the current use of the Phase II Property as an excess soil storage site for adjacent development, the locations of boreholes BH16-23, BH17-23, BH18-23, and BH20-23 had to be adjusted slightly due to access issues. These deviations are not considered to have had a significant impact on the results or conclusions obtained by the investigation.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation for this assessment was conducted on November 15th and 16th, 2023 and consisted of drilling five (5) boreholes (BH16-23 to BH20-23) across the Phase II Property. It should be noted that this field investigation was carried out as part of a larger investigation conducted for multiple sites at the Tunney's Pasture complex.

The boreholes were advanced to depths ranging from approximately 5.74 m to 7.64 m below the existing ground surface and terminated within the bedrock unit. Bedrock was encountered in all five boreholes during the field drilling program at depths ranging from approximately 1.22 to 4.65 m below ground surface.

Upon completion, all five boreholes were instrumented with groundwater monitoring wells in order to access the groundwater table. During the field sampling program, the groundwater was measured at depths ranging from approximately 1.54 m to 3.67 m below the existing ground surface.

Under the full-time supervision of Paterson personnel, the boreholes were drilled using a track-mounted drill rig provided by Marathon Underground Constructors Corporation of Greely, Ontario. The locations of the boreholes are illustrated on Drawing PE6039-3 – Test Hole Location Plan, appended to this report.

4.2 Soil Sampling

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

The samples were recovered using a stainless-steel split spoon, while wearing protective gloves (changed after each sample), and immediately placed into plastic bags. If significant contamination was encountered, the samples were instead placed into glass jars. Sampling equipment was routinely washed in soapy water and rinsed with methylhydrate after each split spoon to prevent any cross contamination of the samples. The samples were also stored in coolers to reduce analyte volatilization during transportation.

A total of 25 soil samples and 12 rock core samples were obtained from the boreholes by means of auger sampling, split spoon sampling, or rock coring. The depths at which auger, split spoon, and rock core samples were obtained from the boreholes are shown as "**AU**", "**SS**", and "**RC**" respectively, on the Soil Profile and Test Data Sheets, appended to this report.

4.3 Field Screening Measurements

All soil samples collected were subjected to a preliminary screening procedure, which included visual screening for colour and evidence of metals, as well as soil vapour screening with a Photo Ionization Detector.

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

The results of the vapour survey are presented on the Soil Profile and Test Data Sheets, appended to this report.

4.4 Groundwater Monitoring Well Installation

Five groundwater monitoring wells were installed on the Phase II Property as part of this assessment. These monitoring wells were constructed using 35 mm diameter Schedule 40 threaded PVC risers and screens. A sand pack consisting of silica sand was placed around the screen with a bentonite seal placed above to minimize cross-contamination. A summary of the monitoring well construction details are listed below in Table 1 as well as on the Soil Profile and Test Data Sheets provided in Appendix 1.

Upon completion, the groundwater monitoring wells were developed using a dedicated inertial lift pump, with a minimum of three well volumes being removed from the wells at the time of installation. The wells were developed until the appearance of the water was noted to have stabilized. In addition, the ground surface elevations of each borehole were subsequently surveyed with respect to a known geodetic elevation.

Table 1
Monitoring Well Construction Details

Well ID	Ground Surface Elevation (m ASL)	Total Depth (m BGS)	Screened Interval (m BGS)	Sand Pack (m BGS)	Bentonite Seal (m BGS)	Casing Type
BH16-23	62.13	7.60	4.55 - 7.60	4.25 – 7.60	0 - 4.25	Flushmount
BH17-23	61.53	5.92	2.87 - 5.92	2.57 - 5.92	0 - 2.57	Flushmount
BH18-23	61.62	5.97	2.92 - 5.97	2.62 - 5.97	0 - 2.62	Flushmount
BH19-23	60.37	5.74	2.69 - 5.74	2.39 - 5.74	0 - 2.39	Flushmount
BH20-23	62.01	7.64	5.00 - 7.64	5.00 – 7.64	0 - 5.00	Flushmount

4.5 Field Measurement of Water Quality Parameters

Groundwater monitoring and sampling was conducted on-site on November 23, 2023. At this time, water quality parameters were measured in the field using a multi-parameter analyzer. Parameters measured in the field included temperature, pH and electrical conductivity.

Field parameters were measured after each well volume purged. Wells were purged prior to sampling until at least three well volumes had been removed or the field parameters were relatively stable. Stabilized field parameter values are summarized below in Table 2 as well as on the Soil Profile and Test Data Sheets provided in Appendix 1.

Table 2
Measurement of Water Quality Parameters

Test Hole ID	Temperature (˚C)	Conductivity (µS)	pH	Date of Measurement (dd-mm-yyyy)
BH16-23	12.6	1398	7.76	23-Nov-2023
BH17-23	12.3	1021	7.74	23-Nov-2023
BH18-23	12.1	830	7.53	23-Nov-2023
BH19-23	12.5	1736	7.80	23-Nov-2023

BH20-24	12.2	1529	7.77	23-Nov-2023

4.6 Groundwater Sampling

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

Standing water was purged from each monitoring well prior to the recovery of the groundwater samples using dedicated sampling equipment. The samples were then stored in coolers to reduce possible analyte volatilization during their transportation. Further details of our standard operating procedure for groundwater sampling are provided in the Sampling and Analysis Plan, appended to this report.

4.7 Analytical Testing

The following soil and groundwater samples were submitted for laboratory analysis:

Table 3
Testing Parameters for Submitted Soil Samples

Sample ID	Sample Depth (mbgs)	Sampling Date (dd-mm-yy)	Rationale	PID Vapour Reading (ppm)	Parameter Groups Analyzed									
					PHCs	BTEX	VOCs	PAHs	PCBs	Metals	Hg	Cr^{VI}	EC	SAR
BH16-23-SS3 2346505-01	1.52 - 2.13	15-Nov-2023	To assess fill material of unknown quality (APEC 1).	1.8				✓		✓	✓	✓		
BH16-23-SS6 2346505-02	3.81 - 4.42	15-Nov-2023	To assess fill material of unknown quality (APEC 1), to assess soil beneath the former loading dock where contaminants were handled (APEC 4), and to assess soil in the upper water table where fuel storage ASTs were formerly present (APEC 3A).	1.9	✓	✓								
BH17-23-SS5 2346505-03	3.05 - 3.66	15-Nov-2023	To assess fill material of unknown quality (APEC 1), and to assess soil in the location of the former vent and fill piping associated with the former diesel ASTs (APEC 3B).	1.4	✓	✓		✓		✓	✓	✓		
BH18-23-SS2 2346505-04	0.76 - 1.37	15-Nov-2023	To assess fill material of unknown quality (APEC 1), and to assess soil within the area where road salt was applied (APEC 2).	1.3				✓		✓	✓	✓	✓	✓
BH18-23-SS5 2346505-05	3.05 - 3.66	15-Nov-2023	To assess fill material of unknown quality (APEC 1), and to assess soil beneath the former loading dock where contaminants were handled (APEC 4)	1.7	✓	✓	✓							
BH19-23-AU1 2346505-06	0.05 - 0.61	15-Nov-2023	To assess fill material of unknown quality (APEC 1), and to assess soil within the area where road salt was applied (APEC 2).	0.3				✓		✓	✓	✓	✓	✓
BH19-23-SS2 2346505-07	0.76 - 1.22	15-Nov-2023	To assess soil with an elevated PID reading within fill material of unknown quality (APEC 1).	9.6	✓	✓								
BH20-23-SS2 2346505-08	0.76 - 1.37	16-Nov-2023	To assess fill material of unknown quality (APEC 1), and to assess soil beneath the former PCB containing transformers (APEC 6).	2.2				✓	✓	✓	✓	✓		
BH20-23-SS5+SS6 2346505-09	3.05 - 4.19	16-Nov-2023	To assess fill material of unknown quality (APEC 1) and to assess soil beneath the former hydraulic elevator (APEC 5).	0.5, 3.5	✓	✓								
DUP-1 2346505-10	0.05 - 0.61	15-Nov-2023	Laboratory QA/QC	0.3						✓				

Table 4
Testing Parameters for Submitted Groundwater Samples

Sample ID	Sample Depth (mbgs)	Sampling Date (dd-mm-yy)	Rationale	Parameter Groups Analyzed					
				PHCs	BTEX	VOCs	PAHs	PCBs	Metals
BH16-23 2348104-01	4.55 - 7.6	23-Nov-2023	To assess groundwater beneath the former loading dock where contaminants were handled (APEC 4), and to assess groundwater where fuel storage ASTs were formerly present (APEC 3A).	✓	✓				
BH17-23 2348104-02	2.87 - 5.92	23-Nov-2023	To assess groundwater in the location of former vent and fill piping associated with the former diesel ASTs (APEC 3B), and to assess groundwater within fill material of unknown quality (APEC 1).	✓	✓		✓		✓
BH18-23 2348104-03	2.92 - 5.97	23-Nov-2023	To assess groundwater beneath the former loading dock where contaminants were handled (APEC 4), and to assess groundwater within fill material of unknown quality (APEC 1).	✓	✓	✓	✓		✓
BH19-23 2348104-04	2.69 - 5.74	23-Nov-2023	To assess groundwater within fill material of unknown quality (APEC 1).	✓	✓		✓		✓
BH20-23 2348104-05	2.92 - 5.97	23-Nov-2023	To assess groundwater within fill material of unknown quality (APEC 1), to assess groundwater beneath the former hydraulic elevator (APEC 5), and to assess groundwater beneath the former PCB containing transformers (APEC 6).	✓	✓		✓	✓	✓
DUP-A (DUP of BH16-23) 2348104-06	4.55 - 7.6	23-Nov-2023	Laboratory QA/QC	✓	✓				

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

4.8 Residue Management

All soil cuttings were removed from the site following the field program, while all purge water and equipment cleaning fluids were retained on-site.

4.9 Elevation Surveying

The ground surface elevations at each borehole location were surveyed using a GPS device by Paterson personnel and referenced to a geodetic datum.

4.10 Quality Assurance and Quality Control Measures

A summary of the quality assurance and quality control (QA/QC) measures, undertaken as part of this assessment, is provided in the Sampling and Analysis Plan in Appendix 1.

5.0 REVIEW AND EVALUATION

5.1 Geology

In general, the subsurface soil profile encountered at the borehole locations consists of brown silty sand and crushed stone to silty clay fill material on bedrock. No native soil was encountered in any of the borehole locations. Bedrock was encountered in all five boreholes during the field drilling program at depths ranging from approximately 1.22 to 4.65 m below the existing ground surface.

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

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured using an electronic water level meter on November 23, 2023. The groundwater levels are summarized below in Table 5.

Table 5
Groundwater Level Measurements

Test Hole ID	Ground Surface Elevation (masl)	Water Level Depth (m)	Water Level Elevation (masl)	Date of Measurement (dd-mm-yyyy)
BH16-23	62.13	3.65	58.48	23-Nov-2023
BH17-23	61.53	3.22	58.31	23-Nov-2023
BH18-23	61.62	3.35	58.27	23-Nov-2023
BH19-23	60.37	1.54	58.83	23-Nov-2023
BH20-24	62.01	3.67	58.34	23-Nov-2023

The groundwater at the Phase II Property was encountered within the bedrock at depths ranging from approximately 1.54 to 3.67 m below the existing ground surface.

No unusual visual or olfactory observations were identified with respect to the recovered groundwater samples.

Using the groundwater elevations recorded during the sampling event, groundwater contour mapping was completed as part of this assessment. According to the mapped contour data, illustrated on Drawing PE6039-3 – Test Hole Location Plan in the appendix, the groundwater flow on the subject site was calculated to be in a northwesterly direction. A horizontal hydraulic gradient of approximately 0.005 m/m was also calculated as part of this assessment. It should be noted that groundwater levels are expected to fluctuate throughout the year with seasonal variations.

5.3 Fine/Coarse Soil Texture

Grain size analysis was not completed as part of this investigation. As a result, the coarse-grained soil standards were chosen as a conservative approach.

5.4 Field Screening

Field screening of the soil samples collected during the drilling program resulted in organic vapour readings ranging from 0.3 ppm to 9.6 ppm, indicating that there is a negligible potential for the presence of volatile substances. 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

A total of 9 soil samples were submitted for laboratory analysis of BTEX, PHCs (F_1-F_4), VOCs, metals, Hg^+, CrVI, PAHs, PCBs, EC, and/or SAR parameters. The results of the analytical testing are presented in the laboratory Certificates of Analysis included in Appendix 1.

BTEX and PHCs

Five (5) soil samples were submitted for analysis of BTEX and PHC parameters. All BTEX and PHC parameter concentrations in the soil samples analyzed are in compliance with the selected MECP Table 3 Coarse-Grained Residential Soil Standards and the CCME Coarse-Grained Commercial Soil Standards.

VOCs

One (1) soil sample was submitted for analysis of VOC parameters. No VOC parameters were detected in the analyzed soil sample. All VOC parameter concentrations in the soil sample analyzed are in compliance with the selected MECP Table 3 Coarse-Grained Residential Soil Standards and the CCME Coarse-Grained Commercial Soil Standards.

PAHs

Five (5) soil samples were submitted for analysis of PAH parameters. PAH concentrations in excess of the selected MECP Table 3 Coarse-Grained Residential Soil Standards were identified in soil sample BH19-23-AU1 including Acenaphthylene, Anthracene, Benzo[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, 1,1-Biphenyl (elevated laboratory detection limit), Dibenzo[a,h]anthracene, Fluoranthene, Indeno [1,2,3-cd] pyrene, and Phenanthrene. The remaining soil samples analyzed were in compliance with the MECP Table 3 Coarse-Grained Residential Soil Standards.

PAH parameter concentrations were identified in excess of CCME Coarse-Grained Commercial Soil Standards in soil samples BH19-23-AU1 and BH17-23-SS5, including Fluorene, Naphthalene, and Phenanthrene.

PCBs

One (1) soil sample was submitted for analysis of total PCBs. No PCBs were detected in the analyzed soil sample. Total PCB concentrations in the soil samples analyzed are in compliance with the selected MECP Table 3 Coarse-Grained

Residential Soil Standards and the CCME Coarse-Grained Commercial Soil Standards.

Metals, including CrVI and Hg

Five (5) soil samples were submitted for analysis of metals parameters (including As, Se, Sb, CrVI and Hg). The identified metals concentrations in the soil samples analyzed are in compliance with the selected MECP Table 3 Coarse-Grained Residential Soil Standards and the CCME Coarse-Grained Commercial Soil Standards.

EC and SAR

Two (2) soil samples were submitted for analysis of electric conductivity (EC) and sodium absorption rate (SAR). All EC and SAR concentrations in the soil samples analyzed are in compliance with the selected MECP Table 3 Coarse-Grained Residential Soil Standards and the CCME Coarse-Grained Commercial Soil Standards, with the exception of the SAR level detected in Sample BH18-23-SS2. This exceedance is considered to be the result of the use of road salt on the Phase II Property during snow and ice conditions and thus, as per Section 49.1 of O. Reg 153/04, is not considered to be a contaminant.

Summary of Soil Results

Based on the analytical results, soil on the Phase II Property is considered to meet the MECP Table 3 Coarse-Grained Residential Soil Standards with the exception of PAH parameter concentrations identified in soil sample BH19-23-AU1.

Given the shallow depth of this sample, and it's location immediately below asphaltic concrete layer, it is possible that the PAH exceedances are a result of asphalt inclusions in the sample.

Soil on the Phase II Property is considered to meet the CCME Coarse-Grained Commercial Soil Standards with the exception of PAH parameter concentrations identified in soil samples BH19-23-AU1 and BH17-23-SS5.

The results of the analytical testing are presented in the laboratory Certificates of Analysis included in Appendix 1.

5.6 Groundwater Quality

A total of 5 groundwater samples were submitted for laboratory analysis of BTEX, PHCs (F_1-F_4), VOCs, metals, Hg^+, CrVI, PAHs, and/or PCB parameters. The results of the analytical testing are presented in the laboratory Certificates of Analysis included in Appendix 1.

BTEX and PHCs

Five (5) groundwater samples were submitted for laboratory analysis of BTEX and PHC parameters. No BTEX or PHC parameter concentrations were detected above the laboratory method detection limits in any of the samples analyzed. The results are in compliance with the MECP Table 3 Non-Potable Groundwater Standards as well as the CCME Tier 1 Federal Interim Groundwater Water Quality Guidelines for Commercial Sites.

VOCs

One (1) groundwater sample was submitted for laboratory analysis of VOC parameters. No VOC parameter concentrations were detected above the laboratory method detection limits in the sample analyzed. The results are in compliance with the MECP Table 3 Non-Potable Groundwater Standards as well as the CCME Tier 1 Federal Interim Groundwater Water Quality Guidelines for Commercial Sites.

PAHs

Four (4) groundwater samples were submitted for laboratory analysis of PAH parameters. No PAH parameter concentrations were detected above the laboratory method detection limits in the samples analyzed. The results are in compliance with the MECP Table 3 Non-Potable Groundwater Standards as well as the CCME Tier 1 Federal Interim Groundwater Water Quality Guidelines for Commercial Sites.

PCBs

One (1) groundwater sample was submitted for laboratory analysis of total PCBs. No PCB parameter concentrations were detected above the laboratory method detection limit in the sample analyzed. The results are in compliance with the MECP Table 3 Non-Potable Groundwater Standards as well as the CCME Tier 1 Federal Interim Groundwater Water Quality Guidelines for Commercial Sites.

Metals, including CrVI and Hg

Four (4) groundwater samples were submitted for laboratory analysis of metals parameters (including As, Se, Sb, CrVI and Hg). The results are in compliance with the MECP Table 3 Non-Potable Groundwater Standards.

The results were also in compliance with the CCME Tier 1 Federal Interim Groundwater Water Quality Guidelines for Commercial Sites, with the exception of an exceedance of molybdenum present in BH20-23.

Summary of Groundwater Results

Based on the analytical results, groundwater on the Phase II Property is considered to meet the MECP Table 3 Coarse-Grained Residential Soil Standards.

The results were also in compliance with the CCME Tier 1 Federal Interim Groundwater Water Quality Guidelines for Commercial Sites, with the exception of a minor exceedance of molybdenum present in BH20-23.

The results of the analytical testing are presented in the laboratory Certificates of Analysis included in Appendix 1.

5.7 Quality Assurance and Quality Control Results

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

As per Subsection 47(3) of O. Reg. 153/04, as amended by the Environmental Protection Act, the certificates of analysis have been received for each sample submitted for laboratory analysis and have been appended to this report.

As per the Sampling and Analysis Plan, a duplicate soil sample was obtained from sample BH19-23-AU1 (soil) and BH16-23 (groundwater) and submitted for laboratory analysis of metals, BTEX and/or PHC parameters. The relative percent difference (RPD) calculations for the original and duplicate samples are presented in the laboratory Certificates of Analysis included in Appendix 1.

The majority of the RPDs calculated for the parameters detected fell within of the acceptable range of 20%. Some parameters falling outside of this range are considered to be a result of smaller identified parameter concentrations having a larger percentage difference for minor deviations. As a result, the data quality

objectives outlined in the Sampling and Analysis Plan, appended to this report, are considered to have been met.

Based on the results of the QA/QC analysis, the quality of the field data collected during this Phase II ESA is considered to be sufficient to meet the overall objectives of this assessment.

5.8 Phase II Conceptual Site Model

The following section has been prepared in accordance with the requirements of O. Reg. 153/04 amended by the Environmental Protection Act. For the purposes of the proposed uses of this Phase II Property, the Phase II Conceptual Site Model was prepared with consideration for O.Reg. 153/04 only. Conclusions and recommendations are discussed in a subsequent section.

Site Description

Potentially Contaminating Activity and Areas of Potential Environmental Concern

As described in Section 7.1 of the Phase I ESA report, as well as Section 2.2 of this report, the following PCAs, as defined by Table 2 of O. Reg. 153/04, are considered to result in APECs on the Phase II Property:

Table 2
Areas of Potential Environmental Concern

Area of Potential Environmental Concern	Location of APEC on Phase I Property	Potentially Contaminating Activity (Table 2 – O. Reg. 153/04)	Location of PCA (On-Site or Off-Site)	Contaminants of Potential Concern	Media Potentially Impacted (Groundwater, Soil, and/or Sediment)
APEC 1 Fill Material of Unknown Quality	Entirety of Phase II Property	*"Item 30: Importation of Fill Material of Unknown Quality"*	On-Site	PHCs (F_1-F_4) Metals (including As, Sb, Se) Hg CrVI PAHs	Soil/Fill
APEC 2 Application of Road Salt	Eastern Portion of Phase II Property	*"Item N/A: Application of Road Salt for De-Icing Purposes During Snow and Ice Conditions"*	On-Site	EC SAR	Soil

Table 2
Areas of Potential Environmental Concern

Area of Potential Environmental Concern	Location of APEC on Phase I Property	Potentially Contaminating Activity (Table 2 – O. Reg. 153/04)	Location of PCA (On-Site or Off-Site)	Contaminants of Potential Concern	Media Potentially Impacted (Groundwater, Soil, and/or Sediment)
APEC 3A Two former diesel ASTs	Central Portion of Phase II Property	*"Item 28: Gasoline and Associated Products Storage in Fixed Tanks"*	On-Site	PHCs (F_1-F_4); BTEXs.	Soil and Groundwater
APEC 3B Vent and Fill Piping Related to the Two Former Diesel ASTs	North-central Portions of Phase II Property	*"Item 28: Gasoline and Associated Products Storage in Fixed Tanks"*	On-Site	PHCs (F_1-F_4); BTEXs.	Soil and Groundwater
APEC 4 Handling of Contaminants at Loading Dock	Central Portion of the Phase II Property	*"Item 8: Chemical Manufacturing, Processing and Bulk Storage"*	On-Site	PHCs (F_1-F_4); VOCs; Metals; PAHs.	Soil and Groundwater
APEC 5 Former Hydraulic Elevator Lift	West Central Portion of the Phase II Property	*"Item 28: Gasoline and Associated Products Storage in Fixed Tanks"*	On-Site	PHCs (F_1-F_4); BTEX.	Soil and Groundwater
APEC 6 Three Former PCB Containing Transformers	Northwest / North-Central Portion of the Phase II Property	*"Item 55: Transformer Manufacturing, Processing and Use"*	On-Site	PHCs (F_1-F_4); PCBs.	Soil and Groundwater

Contaminants of Potential Concern (CPCs)

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

- ❒ Benzene, Ethylbenzene, Toluene, and Xylenes (BTEX);
- ❒ Volatile Organic Compounds (VOCs);
- ❒ Petroleum Hydrocarbons, fractions 1 – 4 (PHCs F_1-F_4);
- ❒ Polycyclic Aromatic Hydrocarbons (PAHs);
- ❒ Polychlorinated Biphenyls (PCBs);
- ❒ Metals (including Arsenic, Antimony, and Selenium);
- ❒ Mercury (Hg^+);
- ❒ Hexavalent Chromium (CrVI);
- ❒ Electrical Conductivity (EC);

- Sodium Adsorption Ratio (SAR).

These CPCs have the potential to be present in the soil matrix and/or the groundwater situated beneath the Phase II Property.

Subsurface Structures and Utilities

Underground service locates were completed prior to the subsurface investigation. Underground utilities identified beneath the Phase II Property include sewer and water lines, as well as buried electrical conduits.

Physical Setting

Site Stratigraphy

The stratigraphy of the Phase II Property generally consists of:

- Fill material (consisting of silty sand to silty clay and crushed stone fill material), extending to bedrock surface;
- Limestone Bedrock; encountered at depths ranging from approximately 1.22 m to 4.65 m below ground surface.

The site stratigraphy, from ground surface to the deepest aquifer or aquitard investigated, is provided in the Soil Profile and Test Data Sheets in Appendix 1.

Hydrogeological Characteristics

The groundwater at the Phase II Property was encountered within the bedrock or lower glacial till at depths ranging from approximately 1.54 m to 3.67 m below the existing ground surface.

Based on the measured groundwater levels, the groundwater was calculated to flow in a north-easterly direction.

Approximate Depth to Bedrock

Bedrock was encountered in all five boreholes during the field drilling program at depths ranging from approximately 1.22 m to 4.65 m below ground surface.

Approximate Depth to Water Table

The depth to the water table is approximately 1.54 m to 3.67 m below the existing ground surface.

Sections 41 and 43.1 of Ontario Regulation 153/04

Section 41 of the Regulation does not apply to the Phase II Property, as the Phase II Property is not within 30 m of an environmentally sensitive area, the pH of the surface soil is between 5 and 9, and the pH of the subsurface soil is between 5 and 11.

Section 43.1 of the Regulation does not apply to the Phase II Property in that the Phase II Property is not a Shallow Soil Property and is not within 30 m of a water body.

Existing Buildings and Structures

No buildings or structures currently exist on the Phase II Property.

Environmental Condition

Areas Where Contaminants are Present

Based on the findings of this assessment, the upper fill material in BH19-23, located within the former vehicle parking area in the eastern portion of the Phase II Property, is contaminated with PAHs.

Based on the analytical test results, the groundwater beneath the Phase II Property is not considered to be contaminated.

Types of Contaminants

Based on the analytical test results, the concentrations of PAH parameters in the soil, including Acenaphthylene, Anthracene, Benzo[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, 1,1-Biphenyl (elevated laboratory detection limit), Dibenzo[a,h]anthracene, Fluoranthene, Indeno [1,2,3-cd] pyrene, and Phenanthrene exceeds the selected MECP Table 3 Coarse-Grained Residential Soil Standards in sample BH19-23-AU1. Based on the shallow sample depth, it is suspected that this exceedance may be a result of asphalt inclusions in the sample, from the paving structure.

It should be noted that the SAR concentration detected in soil sample BH18-23-SS2 is also in excess of the MECP Table 3 Coarse-Grained Residential Soil Standards. This exceedance is considered to be the result of the use of road salt on the Phase II Property during snow and ice conditions and thus, as per Section 49.1 of O. Reg 153/04, is not considered to be a contaminant.

Two (2) soil samples, BH19-23-AU1 and BH17-23-SS5, had concentrations of PAH parameters in excess of CCME Commercial Standards, including Fluorene, Naphthalene, and Phenanthrene.

All groundwater samples were found to comply with the MECP Table 3 Residential Standards.

Groundwater samples also complied with CCME Commercial Standards, with the exception of a minor molybdenum exceedance identified in BH7-23.

Contaminated Media

Based on the findings of this assessment, the upper fill material present in the vicinity of BH19-23 is considered to be contaminated above the MECP Table 3 Coarse-Grained Residential Soil Standards.

In addition to the upper fill material in BH19-23, lower fill material in BH17-23 was identified to exceed CCME Commercial Standards.

Elevated molybdenum concentrations were identified above the CCME standards in the groundwater at borehole BH20-23. This exceedance is potentially naturally elevated, or the result of sediment in the groundwater, and are not considered to pose an environmental risk to the current use of the property.

What Is Known About Areas Where Contaminants Are Present

The fill material present beneath the surficial asphalt at BH19-23 is impacted above the MECP Table 3 Coarse-Grained Residential Soil Standards with various PAH parameters. Given the shallow soil conditions, this sample may have been influenced by the presence of asphalt inclusions in the analyzed sample.

Distribution and Migration of Contaminants

Distribution of PAH impacts above the MECP Table 3 Coarse-Grained Residential Soil Standards is considered to be limited to BH19-23. Based on the low mobility of these contaminants, as well as the clean groundwater results obtained from this borehole, these contaminants are not suspected to have migrated into the water table.

Discharge of Contaminants

PAH concentrations in soil at BH19-23 is suspected to be present due to sample collection within the former asphalt paving structure, as a result of asphalt inclusions.

Climatic and Meteorological Conditions

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

Based on the clean groundwater results obtained during this investigation, no downward migration of contaminants is suspected to have occurred.

Potential for Vapour Intrusion

Given that the Phase II Property currently consists of undeveloped land, and will be redeveloped in the near future, all contaminated soil will be removed from the site. As a result, there is no potential for any current or future vapour intrusion on the Phase II Property.

6.0 CONCLUSIONS

Assessment

Paterson Group was retained by Arcadis IBI Group to conduct a Phase II – Environmental Site Assessment (Phase II ESA) for Block 9 of the Tunney's Pasture government office complex, in the City of 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 were considered to result in areas of potential environmental concern (APECs) on the subject site (Phase II Property).

The subsurface investigation for this assessment was conducted on November 15th and 16th, 2023 and consisted of drilling five (5) boreholes (BH16-23 to BH20-23) across the Phase II Property. It should be noted that this field investigation was carried out as part of a larger investigation conducted for multiple sites at the Tunney's Pasture complex. The boreholes were advanced to depths ranging from approximately 5.74 to 7.64 m below the existing ground surface and terminated

within the bedrock unit. Upon completion, all five boreholes were instrumented with groundwater monitoring wells in order to access the groundwater table.

In general, the subsurface soil profile encountered at the borehole locations consists of granular fill (silty sand to silty clay and crushed stone) over bedrock. Bedrock was encountered in all five boreholes during the field drilling program at depths ranging from approximately 1.22 to 4.65 m below ground surface. Based on the encountered bedrock depth, more than 1/3 of the site by area is considered to have bedrock surface beyond a depth of 2.0 m (ie. not a shallow soil property as defined by O.Reg. 153/04).

During the field sampling program, the groundwater was measured at depths ranging from approximately 1.54 to 3.67 m below the existing ground surface.

A total of 9 soil samples were submitted for laboratory analysis of BTEX, PHCs (F_1-F_4), VOCs, metals, Hg^+, CrVI, PAHs, PCBs, EC and/or SAR parameters. Based on the analytical test results, all analytical soil results comply with the MECP Table 3 Coarse-Grained Commercial Soil Standards with the exception of various PAH concentrations identified in the upper fill material in BH19-23.

Fill material exceeding CCME Coarse-Grained Commercial Soil Standards was identified in the upper fill material at BH19-23 and lower fill material in BH17-23.

Five groundwater samples were submitted for laboratory analysis of BTEX, PHCs (F_1-F_4), VOCs, metals, Hg^+, CrVI, PAHs, and/or PCB parameters. Based on the analytical test results, all parameter concentrations are in compliance with the MECP Table 3 Non-Potable Groundwater Standards. The results also comply with the selected CCME Tier 1 Federal Interim Groundwater Water Quality Guidelines for Commercial Sites, with the exception of a minor exceedance of molybdenum detected in BH20-23.

Recommendations

Soil

Based on the findings of this assessment, the shallow fill material present at BH19-23 is contaminated with various PAH parameters. Given the low-mobility of these contaminants, it is expected that the contamination is confined to the fill material within a localized area around BH19-23. Samples exceeding the CCME Coarse-Grained Commercial Soil Standards include PAH parameters in upper fill material in BH19-23 and lower fill material in BH17-23.

It is our understanding that the Phase II Property may be redeveloped in the future. As such, the contaminated soil could be fully delineated and remediated in conjunction with site redevelopment. This contaminated soil will require disposal at a licensed waste disposal facility. Prior to off-site disposal of impacted soil at a licensed waste disposal facility, a leachate analysis of a representative sample of contaminated soil must be conducted in accordance with Ontario Regulation 347/558.

Additionally, any excess soil generated on site must be handed in accordance with O. Reg. 406/19: On-Site and Excess Soil Management. Additional excess soil testing and reporting requirements will be required prior to future site excavation activities, in accordance with O. Reg. 406/19. Further delineation of the PAH exceedance can be conducted in conjunction with an excess soil testing program.

Monitoring Wells

It is recommended that the monitoring wells be maintained for future sampling purposes. The monitoring wells will be registered with the MECP under Ontario Regulation 903 (Ontario Water Resources Act). As such a time that the monitoring wells are no longer required, they must be decommissioned in accordance with O.Reg. 903.

7.0 STATEMENT OF LIMITATIONS

This Phase II – Environmental Site Assessment report has been prepared in general accordance with O. Reg. 153/04, as amended, and 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 Phase II Property 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 Arcadis Arcadis IBI Group and the Government of Canada. Permission and notification from the aforementioned parties and Paterson Group will be required prior to the release of this report to any other party.

Paterson Group Inc.

Jesse Andrechek, B.Eng.

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

Report Distribution:

- Arcadis IBI Group
- Paterson Group Inc.

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE6039-1 – SITE PLAN

DRAWING PE6039-2 – SURROUNDING LAND USE PLAN

DRAWING PE6039-3 – TEST HOLE LOCATION PLAN

DRAWING PE6039-4 – ANALYTICAL TESTING PLAN – SOIL

DRAWING PE6039-4A – CROSS SECTION A-A' – SOIL

DRAWING PE6039-4B – CROSS SECTION B-B' – SOIL

DRAWING PE6039-5 – ANALYTICAL TESTING PLAN – GROUNDWATER

DRAWING PE6039-5A – CROSS SECTION A-A' – GROUNDWATER

DRAWING PE6039-5B – CROSS SECTION B-B' – GROUNDWATER

APPENDIX 1

SAMPLING AND ANALYSIS PLAN

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

LABORATORY CERTIFICATES OF ANALYSIS

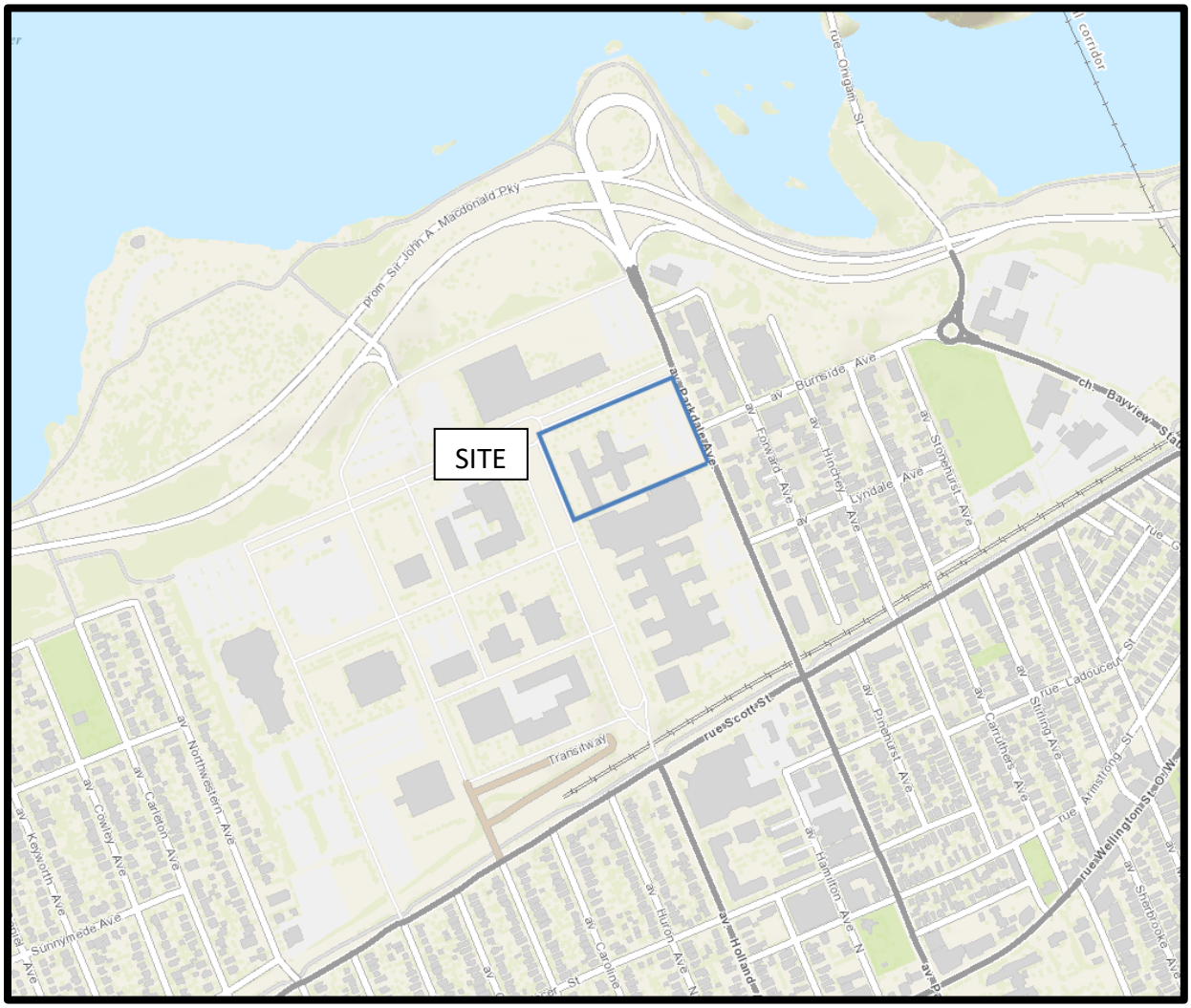
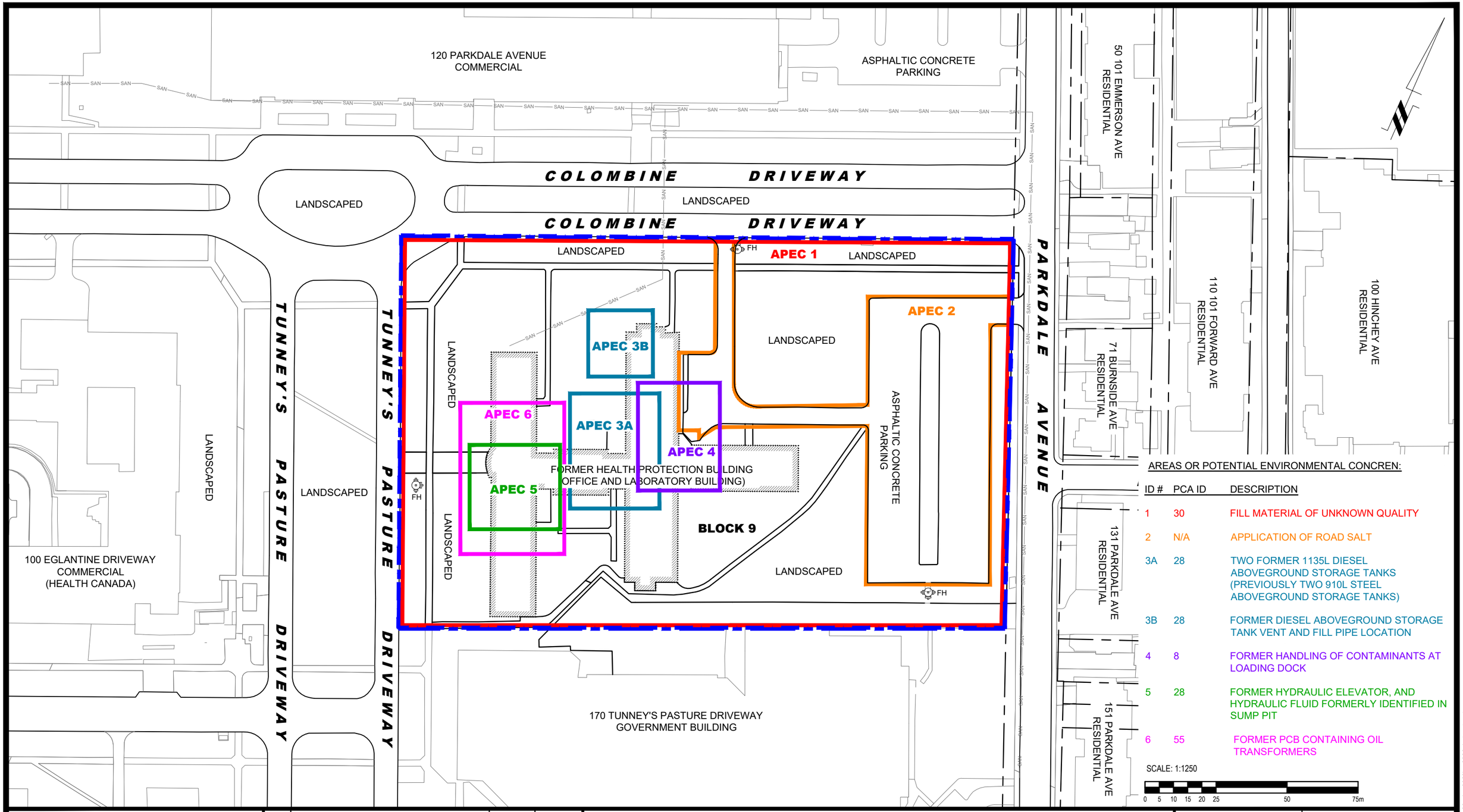


Figure 1

KEY PLAN

PATERSON GROUP



AREAS OR POTENTIAL ENVIRONMENTAL CONCREN:

ID #	PCA ID	DESCRIPTION
1	30	FILL MATERIAL OF UNKNOWN QUALITY
2	N/A	APPLICATION OF ROAD SALT
3A	28	TWO FORMER 1135L DIESEL ABOVEGROUND STORAGE TANKS (PREVIOUSLY TWO 910L STEEL ABOVEGROUND STORAGE TANKS)
3B	28	FORMER DIESEL ABOVEGROUND STORAGE TANK VENT AND FILL PIPE LOCATION
4	8	FORMER HANDLING OF CONTAMINANTS AT LOADING DOCK
5	28	FORMER HYDRAULIC ELEVATOR, AND HYDRAULIC FLUID FORMERLY IDENTIFIED IN SUMP PIT
6	55	FORMER PCB CONTAINING OIL TRANSFORMERS

SCALE: 1:1250

0 5 10 15 20 25 50 75m

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NO.	REVISIONS	DATE	INITIAL

IBI GROUP

PHASE I - ENVIRONMENTAL SITE ASSESSMENT
TUNNEY'S PASTURE - BLOCK 9

OTTAWA, ONTARIO

Title:

SITE PLAN

Scale: 1:1250	Date: 04/2024
Drawn by: YA	Report No.: PE6039-1
Checked by: JA	Dwg. No.: PE6039-1
Approved by: AM	Revision No.:

11x17

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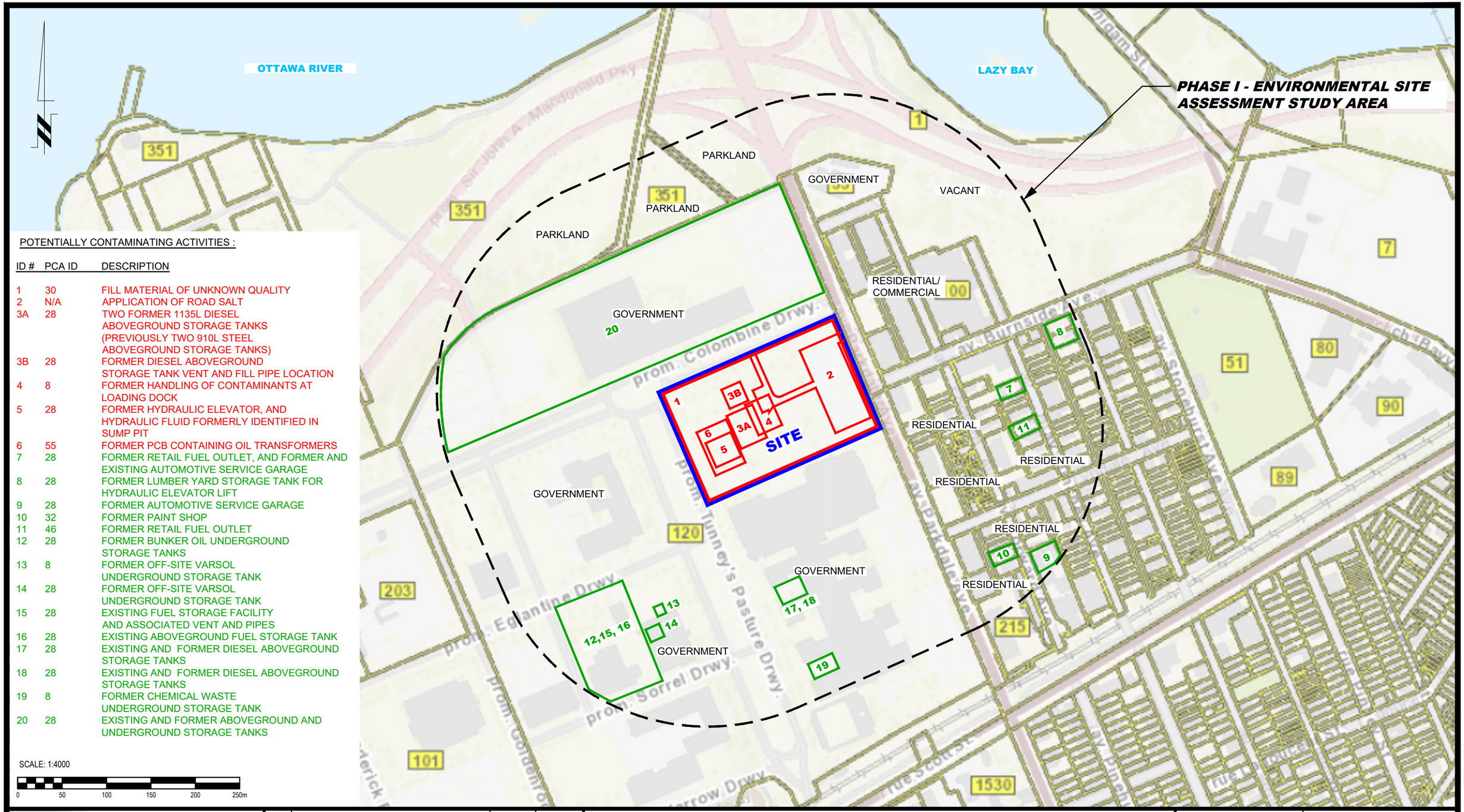

POTENTIALLY CONTAMINATING ACTIVITIES :

ID #	PCA ID	DESCRIPTION
1	30	FILL MATERIAL OF UNKNOWN QUALITY
2	N/A	APPLICATION OF ROAD SALT
3A	28	TWO FORMER 1135L DIESEL ABOVEGROUND STORAGE TANKS (PREVIOUSLY TWO 910L STEEL ABOVEGROUND STORAGE TANKS)
3B	28	FORMER DIESEL ABOVEGROUND STORAGE TANK VENT AND FILL PIPE LOCATION
4	8	FORMER HANDLING OF CONTAMINANTS AT LOADING DOCK
5	28	FORMER HYDRAULIC ELEVATOR, AND HYDRAULIC FLUID FORMERLY IDENTIFIED IN SUMP PIT
6	55	FORMER PCB CONTAINING OIL TRANSFORMERS
7	28	FORMER RETAIL FUEL OUTLET, AND FORMER AND EXISTING AUTOMOTIVE SERVICE GARAGE
8	28	FORMER LUMBER YARD STORAGE TANK FOR HYDRAULIC ELEVATOR LIFT
9	28	FORMER AUTOMOTIVE SERVICE GARAGE
10	32	FORMER PAINT SHOP
11	46	FORMER RETAIL FUEL OUTLET
12	28	FORMER BUNKER OIL UNDERGROUND STORAGE TANKS
13	8	FORMER OFF-SITE VARSOL UNDERGROUND STORAGE TANK
14	28	FORMER OFF-SITE VARSOL UNDERGROUND STORAGE TANK
15	28	EXISTING FUEL STORAGE FACILITY AND ASSOCIATED VENT AND PIPES
16	28	EXISTING ABOVEGROUND FUEL STORAGE TANK
17	28	EXISTING AND FORMER DIESEL ABOVEGROUND STORAGE TANKS
18	28	EXISTING AND FORMER DIESEL ABOVEGROUND STORAGE TANKS
19	8	FORMER CHEMICAL WASTE UNDERGROUND STORAGE TANK
20	28	EXISTING AND FORMER ABOVEGROUND AND UNDERGROUND STORAGE TANKS

SCALE: 1:4000

0 50 100 150 200 250m

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NO.	REVISIONS	DATE	INITIAL

IBI GROUP

PHASE I - ENVIRONMENTAL SITE ASSESSMENT
TUNNEY'S PASTURE - BLOCK 9

OTTAWA, ONTARIO

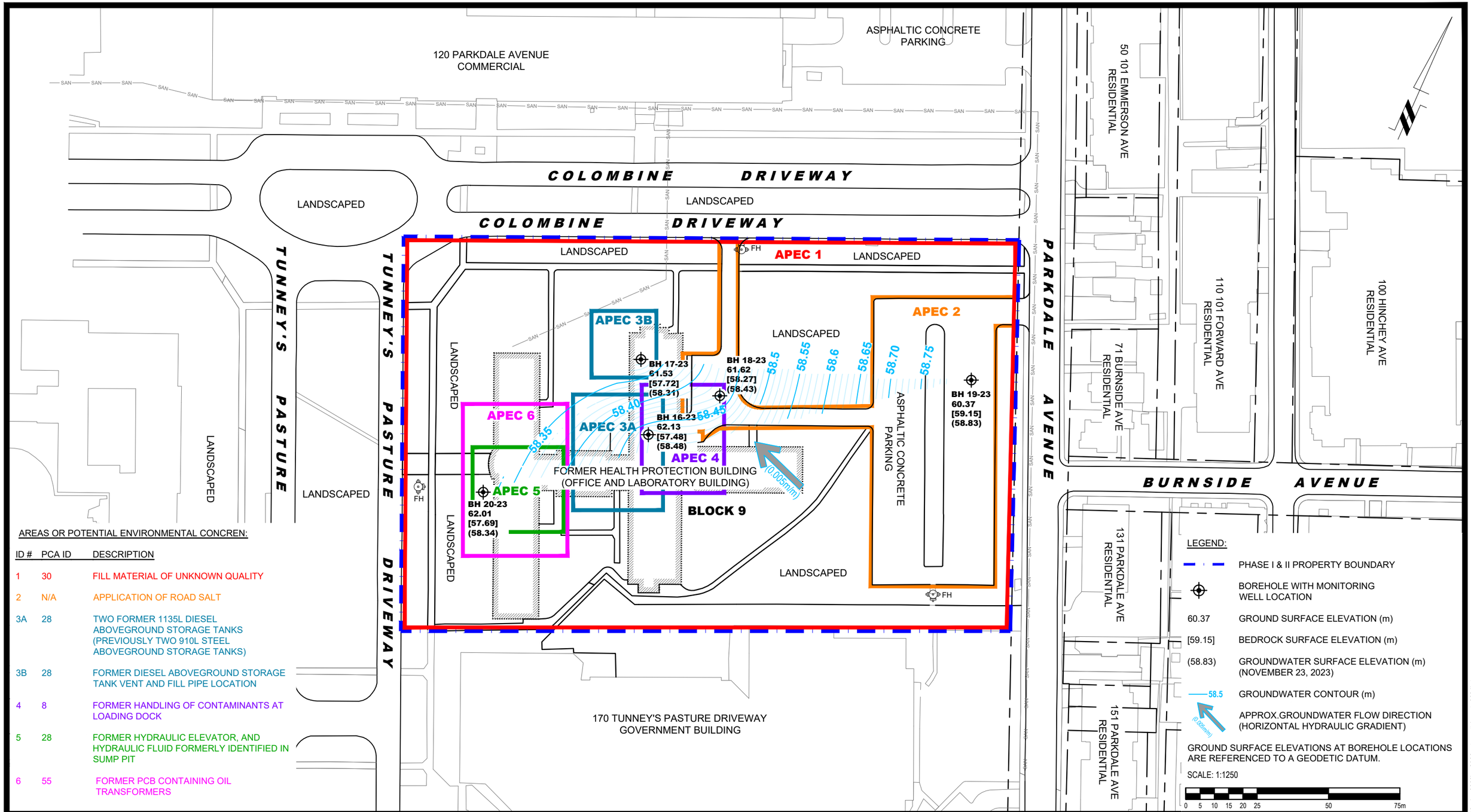
Title:

SURROUNDING LAND USE PLAN

Scale: 1:4000	Date: 05/2023
Drawn by: GK	Report No.: PE6039-1
Checked by: JA	Dwg. No.: PE6039-2
Approved by: AM	Revision No.:

p:\autocad drawings\environmental\pe60xx\pe6039\pe6039-2 surrounding land use plan.dwg

11x17



AREAS OR POTENTIAL ENVIRONMENTAL CONCREN:

ID #	PCA ID	DESCRIPTION
1	30	FILL MATERIAL OF UNKNOWN QUALITY
2	N/A	APPLICATION OF ROAD SALT
3A	28	TWO FORMER 1135L DIESEL ABOVEGROUND STORAGE TANKS (PREVIOUSLY TWO 910L STEEL ABOVEGROUND STORAGE TANKS)
3B	28	FORMER DIESEL ABOVEGROUND STORAGE TANK VENT AND FILL PIPE LOCATION
4	8	FORMER HANDLING OF CONTAMINANTS AT LOADING DOCK
5	28	FORMER HYDRAULIC ELEVATOR, AND HYDRAULIC FLUID FORMERLY IDENTIFIED IN SUMP PIT
6	55	FORMER PCB CONTAINING OIL TRANSFORMERS

LEGEND:

- PHASE I & II PROPERTY BOUNDARY
- BOREHOLE WITH MONITORING WELL LOCATION
- 60.37 GROUND SURFACE ELEVATION (m)
- [59.15] BEDROCK SURFACE ELEVATION (m)
- (58.83) GROUNDWATER SURFACE ELEVATION (m) (NOVEMBER 23, 2023)
- 58.5 GROUNDWATER CONTOUR (m)
- (0.005m/m) APPROX.GROUNDWATER FLOW DIRECTION (HORIZONTAL HYDRAULIC GRADIENT)

GROUND SURFACE ELEVATIONS AT BOREHOLE LOCATIONS ARE REFERENCED TO A GEODETIC DATUM.

SCALE: 1:1250

0 5 10 15 20 25 50 75m

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NO.	REVISIONS	DATE	INITIAL

IBI GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TUNNEY'S PASTURE - BLOCK 9

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:1250	Date: 03/2024
Drawn by: YA	Report No.: PE6039-2
Checked by: JA	Dwg. No.: PE6039-3
Approved by: AM	Revision No.:

11x17

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BH17-23-SS5 3.05-3.66m 15-NOV-2023
Metals comply with MECP Table 3 standards and CCME commercial standards
Hg complies with MECP Table 3 standards and CCME commercial standards
Cr(VI) complies with MECP Table 3 standards and CCME commercial standards
BTEX complies with MECP Table 3 standards and CCME commercial standards
PHCs comply with MECP Table 3 standards and CCME commercial standards
PAHs comply with MECP Table 3 standards

Parameter	Result(µg/g)	CCME(µg/g)
Phenanthrene	0.08	0.046

BH20-23-SS2 0.76-1.37m 16-NOV-2023
Metals comply with MECP Table 3 standards and CCME commercial standards
Hg complies with MECP Table 3 standards and CCME commercial standards
Cr(VI) complies with MECP Table 3 standards and CCME commercial standards
PAHs comply with MECP Table 3 standards and CCME commercial standards
PCBs comply with MECP Table 3 standards and CCME commercial standards

BH20-23-SS5+SS6 3.05-4.19m 16-NOV-2023
BTEX complies with MECP Table 3 standards and CCME commercial standards
PHCs comply with MECP Table 3 standards and CCME commercial standards

100 EGLANTINE DRIVEWAY

BH18-23-SS2 0.76-1.37m 15-NOV-2023

Parameter	Result	Standard
SAR	6.69	5.0

Conductivity complies with MECP Table 3 standards and CCME commercial standards
Metals comply with MECP Table 3 standards and CCME commercial standards
Hg complies with MECP Table 3 standards and CCME commercial standards
Cr(VI) complies with MECP Table 3 standards and CCME commercial standards
PAHs comply with MECP Table 3 standards and CCME commercial standards

BH18-23-SS5 3.05-3.66m 15-NOV-2023
VOCs comply with MECP Table 3 standards and CCME commercial standards
BTEX complies with MECP Table 3 standards and CCME commercial standards
PHCs comply with MECP Table 3 standards and CCME commercial standards

BH19-23-AU1 0.05-0.61m 15-NOV-2023

Parameter	Result(µg/g)	Standard(µg/g)
Acenaphthylene	0.49	0.15
Anthracene	2.52	0.67
Benzo[a]anthracene	5.13	0.5
Benzo[a]pyrene	3.37	0.3
Benzo[b]fluoranthene	3.63	0.78
Benzo[k]fluoranthene	2.29	2.29
1,1-Biphenyl	ND(0.40)	0.31
Dibenzo[a,h]anthracene	0.55	0.1
Fluoranthene	13.4	0.69
Indeno[1,2,3-cd]pyrene	1.92	0.38
Phenanthrene	6.92	6.2
Fluorene	0.77	0.25
Naphthalene	0.36	0.013
Phenanthrene	0.92	0.046

Conductivity complies with MECP Table 3 standards and CCME commercial standards
SAR complies with MECP Table 3 standards and CCME commercial standards
Metals comply with MECP Table 3 standards and CCME commercial standards
Hg complies with MECP Table 3 standards and CCME commercial standards
Cr(VI) complies with MECP Table 3 standards and CCME commercial standards

BH19-23-SS2 0.76-1.22m 15-NOV-2023
BTEX complies with MECP Table 3 standards and CCME commercial standards
PHCs comply with MECP Table 3 standards and CCME commercial standards

BH16-23-SS3 1.52-2.13m 15-NOV-2023
Metals comply with MECP Table 3 standards and CCME commercial standards
Hg complies with MECP Table 3 standards and CCME commercial standards
Cr(VI) complies with MECP Table 3 standards and CCME commercial standards
PAHs comply with MECP Table 3 standards and CCME commercial standards

BH16-23-SS6 3.81-4.42m 15-NOV-2023
BTEX complies with MECP Table 3 standards and CCME commercial standards
PHCs comply with MECP Table 3 standards and CCME commercial standards

120 PARKDALE AVENUE COMMERCIAL
ASPHALTIC CONCRETE PARKING
50 101 EMMERSON AVE RESIDENTIAL
71 BURNSIDE AVE RESIDENTIAL
131 PARKDALE AVE RESIDENTIAL
151 PARKDALE AVE RESIDENTIAL
COLOMBINE DRIVEWAY
LANDSCAPED
TUNNEY'S PASTURE DRIVEWAY
PARKDALE AVENUE
BURNSIDE AVENUE
FH
BH 17-23 61.53 [57.72] (58.31)
BH 18-23 61.62 [58.27] (58.43)
BH 16-23 62.13 [57.48] (58.48)
BH 19-23 60.37 [59.15] (58.83)
BH 20-23 62.01 [57.69] (58.34)
FORMER HEALTH PROTECTION BUILDING (OFFICE AND LABORATORY BUILDING)
BLOCK 9
170 TUNNEY'S PASTURE DRIVEWAY GOVERNMENT BUILDING
A
A'
B
B'

LEGEND:

SOIL RESULT COMPLIES WITH THE MECP TABLE 3 STANDARDS

SOIL RESULT EXCEEDS THE MECP TABLE 3 STANDARDS

PHASE I & II PROPERTY BOUNDARY

BOREHOLE WITH MONITORING WELL LOCATION

60.37 GROUND SURFACE ELEVATION (m)

[59.15] BEDROCK SURFACE ELEVATION (m)

(58.83) GROUNDWATER SURFACE ELEVATION (m) (NOVEMBER 23, 2023)

A—A' CROSS SECTION

GROUND SURFACE ELEVATIONS AT BOREHOLE LOCATIONS ARE REFERENCED TO A GEODETIC DATUM.

SCALE: 1:1250

0 5 10 15 20 25 50 75m

PATERSON GROUP
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OTTAWA, ON
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TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL

IBI GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TUNNEY'S PASTURE - BLOCK 9

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL

Scale: 1:1250	Date: 03/2024
Drawn by: YA	Report No.: PE6039-2
Checked by: JA	Dwg. No.: PE6039-4
Approved by: AM	Revision No.:

11x17

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BH20-23-SS2 0.76-1.37m 16-NOV-2023
Metals comply with MECP Table 3 standards and CCME commercial standards
Hg complies with MECP Table 3 standards and CCME commercial standards
Cr(VI) complies with MECP Table 3 standards and CCME commercial standards
PAHs comply with MECP Table 3 standards and CCME commercial standards
PCBs comply with MECP Table 3 standards and CCME commercial standards

BH20-23-SS5+SS6 3.05-4.19m 16-NOV-2023
BTEX complies with MECP Table 3 standards and CCME commercial standards
PHCs comply with MECP Table 3 standards and CCME commercial standards

BH16-23-SS3 1.52-2.13m 15-NOV-2023
Metals comply with MECP Table 3 standards and CCME commercial standards
Hg complies with MECP Table 3 standards and CCME commercial standards
Cr(VI) complies with MECP Table 3 standards and CCME commercial standards
PAHs comply with MECP Table 3 standards and CCME commercial standards

BH16-23-SS6 3.81-4.42m 15-NOV-2023
BTEX complies with MECP Table 3 standards and CCME commercial standards
PHCs comply with MECP Table 3 standards and CCME commercial standards

BH19-23-AU1 0.05-0.61m 15-NOV-2023

Parameter	Result(µg/g)	Standard(µg/g)
Acenaphthylene	0.49	0.15
Anthracene	2.52	0.67
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Benzo[a]pyrene	3.37	0.3
Benzo[b]fluoranthene	3.63	0.78
Benzo[k]fluoranthene	2.29	2.29
1,1-Biphenyl	ND(0.40)	0.31
Dibenzo[a,h]anthracene	0.55	0.1
Fluoranthene	13.4	0.69
Indeno[1,2,3-cd]pyrene	1.92	0.38
Phenanthrene	6.92	6.2
Fluorene	0.77	0.25
Naphthalene	0.36	0.013
Phenanthrene	0.92	0.046

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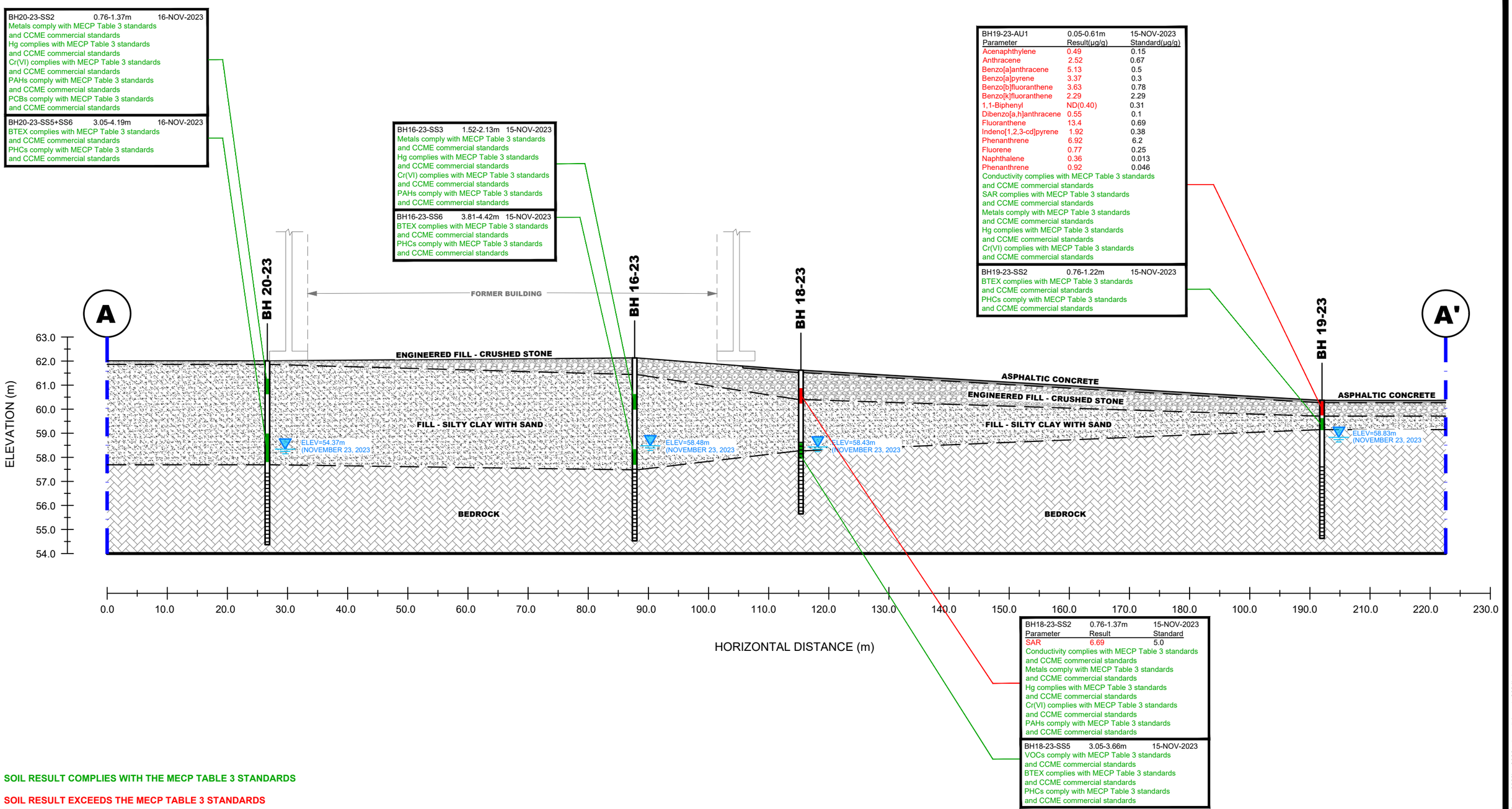
BH19-23-SS2 0.76-1.22m 15-NOV-2023
BTEX complies with MECP Table 3 standards and CCME commercial standards
PHCs comply with MECP Table 3 standards and CCME commercial standards



BH18-23-SS2 0.76-1.37m 15-NOV-2023

Parameter	Result	Standard
SAR	6.69	5.0

Conductivity complies with MECP Table 3 standards and CCME commercial standards
Metals comply with MECP Table 3 standards and CCME commercial standards
Hg complies with MECP Table 3 standards and CCME commercial standards
Cr(VI) complies with MECP Table 3 standards and CCME commercial standards
PAHs comply with MECP Table 3 standards and CCME commercial standards

BH18-23-SS5 3.05-3.66m 15-NOV-2023
VOCs comply with MECP Table 3 standards and CCME commercial standards
BTEX complies with MECP Table 3 standards and CCME commercial standards
PHCs comply with MECP Table 3 standards and CCME commercial standards

SOIL RESULT COMPLIES WITH THE MECP TABLE 3 STANDARDS

SOIL RESULT EXCEEDS THE MECP TABLE 3 STANDARDS

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NO.	REVISIONS	DATE	INITIAL

IBI GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TUNNEY'S PASTURE - BLOCK 9

OTTAWA, ONTARIO

Title:

CROSS SECTION A-A' - SOIL

Scale: AS SHOWN	**Date:** 03/2024
Drawn by: YA	**Report No.:** PE6039-2
Checked by: JA	**Dwg. No.:** PE6039-4A
Approved by: AM	**Revision No.:**

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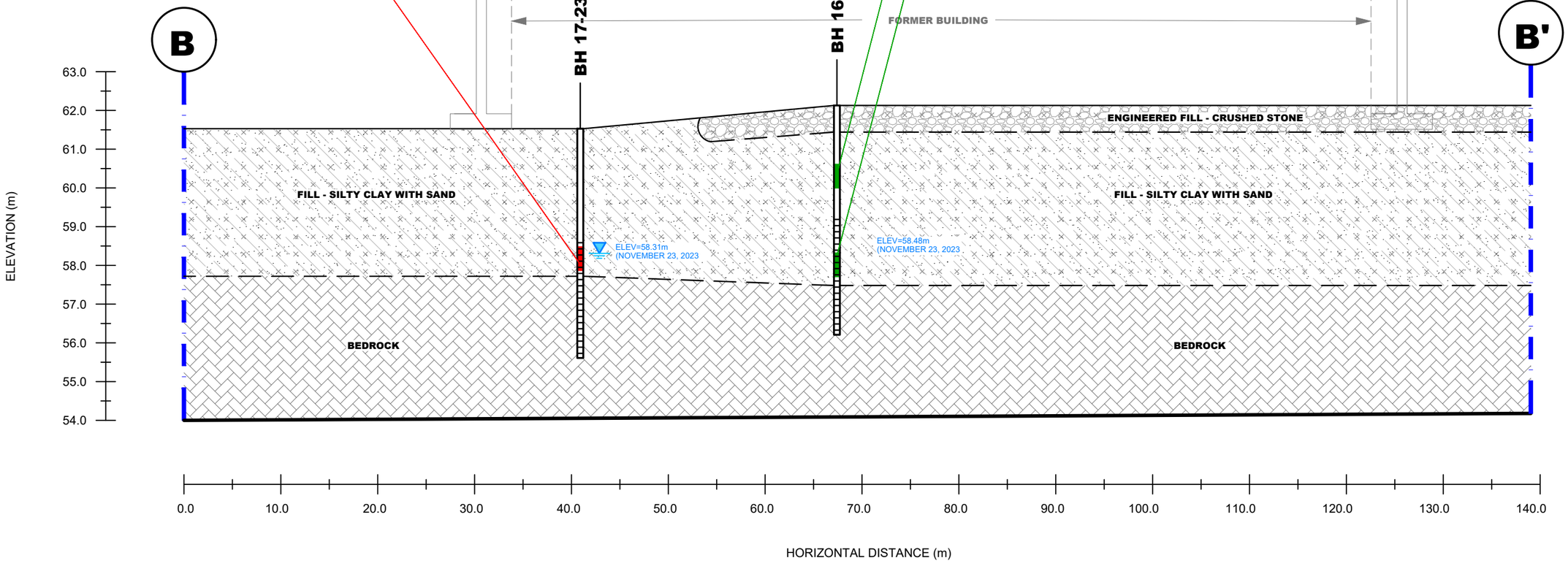
11x17

BH17-23-SS5 3.05-3.66m 15-NOV-2023
Metals comply with MECP Table 3 standards and CCME commercial standards
Hg complies with MECP Table 3 standards and CCME commercial standards
Cr(VI) complies with MECP Table 3 standards and CCME commercial standards
BTEX complies with MECP Table 3 standards and CCME commercial standards
PHCs comply with MECP Table 3 standards and CCME commercial standards
PAHs comply with MECP Table 3 standards

Parameter	Result(µg/g)	CCME(µg/g)
Phenanthrene	0.08	0.046

BH16-23-SS3 1.52-2.13m 15-NOV-2023
Metals comply with MECP Table 3 standards and CCME commercial standards
Hg complies with MECP Table 3 standards and CCME commercial standards
Cr(VI) complies with MECP Table 3 standards and CCME commercial standards
PAHs comply with MECP Table 3 standards and CCME commercial standards

BH16-23-SS6 3.81-4.42m 15-NOV-2023
BTEX complies with MECP Table 3 standards and CCME commercial standards
PHCs comply with MECP Table 3 standards and CCME commercial standards



SOIL RESULT COMPLIES WITH THE MECP TABLE 3 STANDARDS

SOIL RESULT EXCEEDS THE MECP TABLE 3 STANDARDS

PATERSON GROUP
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OTTAWA, ON
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NO.	REVISIONS	DATE	INITIAL

IBI GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TUNNEY'S PASTURE - BLOCK 9

OTTAWA, ONTARIO

Title:

CROSS SECTION B-B' - SOIL

Scale: AS SHOWN	Date: 03/2024
Drawn by: YA	Report No.: PE6039-2
Checked by: JA	Dwg. No.: PE6039-4B
Approved by: AM	Revision No.:

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11x17

BH17-23 2.87-5.92m 23-NOV-2023
Metals comply with MECP Table 3 standards and CCME commercial standards
Hg complies with MECP Table 3 standards and CCME commercial standards
Cr(VI) complies with MECP Table 3 standards and CCME commercial standards
BTEX complies with MECP Table 3 standards and CCME commercial standards
PHCs comply with MECP Table 3 standards and CCME commercial standards
PAHs comply with MECP Table 3 standards and CCME commercial standards

BH18-23 2.92-5.97m 23-NOV-2023
Metals comply with MECP Table 3 standards and CCME commercial standards
Hg complies with MECP Table 3 standards and CCME commercial standards
Cr(VI) complies with MECP Table 3 standards and CCME commercial standards
VOCs comply with MECP Table 3 standards and CCME commercial standards
BTEX complies with MECP Table 3 standards and CCME commercial standards
PHCs comply with MECP Table 3 standards and CCME commercial standards
PAHs comply with MECP Table 3 standards and CCME commercial standards

BH19-23 2.69-5.74m 23-NOV-2023
Metals comply with MECP Table 3 standards and CCME commercial standards
Hg complies with MECP Table 3 standards and CCME commercial standards
Cr(VI) complies with MECP Table 3 standards and CCME commercial standards
BTEX complies with MECP Table 3 standards and CCME commercial standards
PHCs comply with MECP Table 3 standards and CCME commercial standards
PAHs comply with MECP Table 3 standards and CCME commercial standards

BH20-23 4.64-7.64m 23-NOV-2023
Metals comply with MECP Table 3 standards
Hg complies with MECP Table 3 standards and CCME commercial standards
Cr(VI) complies with MECP Table 3 standards and CCME commercial standards
BTEX complies with MECP Table 3 standards and CCME commercial standards
PHCs comply with MECP Table 3 standards and CCME commercial standards
PAHs comply with MECP Table 3 standards and CCME commercial standards
PCBs comply with MECP Table 3 standards and CCME commercial standards

Parameter	Result(µg/L)	CCME(µg/L)
Molybdenum	78.3	73

BH16-23 4.55-7.60m 23-NOV-2023
BTEX complies with MECP Table 3 standards and CCME commercial standards
PHCs comply with MECP Table 3 standards and CCME commercial standards

120 PARKDALE AVENUE COMMERCIAL
ASPHALTIC CONCRETE PARKING
COLOMBINE DRIVEWAY
LANDSCAPED
TUNNEY'S PASTURE DRIVEWAY
PARKDALE AVENUE
BURNSIDE AVENUE
BH 17-23 61.53 [57.72] (58.31)
BH 18-23 61.62 [58.27] (58.43)
BH 19-23 60.37 [59.15] (58.83)
BH 16-23 62.13 [57.48] (58.48)
BH 20-23 62.01 [57.69] (58.34)
FORMER HEALTH PROTECTION BUILDING (OFFICE AND LABORATORY BUILDING)
BLOCK 9
FH
A A'
B B'
71 BURNSIDE AVE RESIDENTIAL
110 101 FORWARD AVE RESIDENTIAL
131 PARKDALE AVE RESIDENTIAL
151 PARKDALE AVE RESIDENTIAL
100 EGLANTINE DRIVEWAY COMMERCIAL (HEALTH CANADA)
170 TUNNEY'S PASTURE DRIVEWAY GOVERNMENT BUILDING

LEGEND:

GROUNDWATER RESULT COMPLIES WITH THE MECP TABLE 3 STANDARDS

GROUNDWATER RESULT EXCEEDS THE MECP TABLE 3 STANDARDS

PHASE I & II PROPERTY BOUNDARY

BOREHOLE WITH MONITORING WELL LOCATION

60.37 GROUND SURFACE ELEVATION (m)

[59.15] BEDROCK SURFACE ELEVATION (m)

(58.83) GROUNDWATER SURFACE ELEVATION (m) (NOVEMBER 23, 2023)

A—A' CROSS SECTION

GROUND SURFACE ELEVATIONS AT BOREHOLE LOCATIONS ARE REFERENCED TO A GEODETIC DATUM.

SCALE: 1:1250

0 5 10 15 20 25 50 75m

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NO.	REVISIONS	DATE	INITIAL

IBI GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TUNNEY'S PASTURE - BLOCK 9

OTTAWA, ONTARIO

Title:
ANALYTICAL TESTING PLAN - GROUNDWATER

Scale: 1:1250	Date: 03/2024
Drawn by: YA	Report No.: PE6039-2
Checked by: JA	Dwg. No.: PE6039-5
Approved by: AM	Revision No.:

11x17

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BH20-23 4.64-7.64m 23-NOV-2023
Metals comply with MECP Table 3 standards
Hg complies with MECP Table 3 standards and CCME commercial standards
Cr(VI) complies with MECP Table 3 standards and CCME commercial standards
BTEX complies with MECP Table 3 standards and CCME commercial standards
PHCs comply with MECP Table 3 standards and CCME commercial standards
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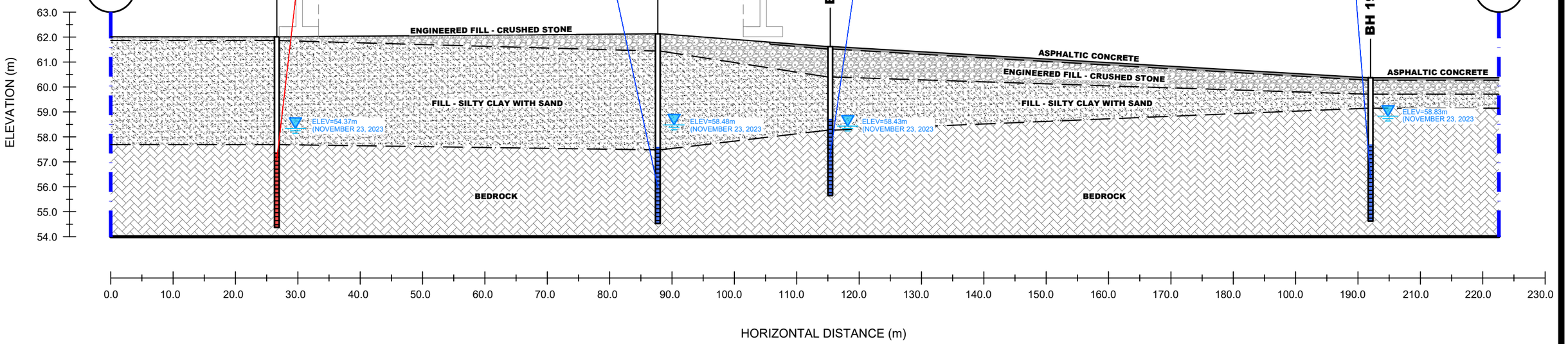
PCBs comply with MECP Table 3 standards and CCME commercial standards

Parameter	Result(µg/L)	CCME(µg/L)
Molybdenum	78.3	73

BH16-23 4.55-7.60m 23-NOV-2023
BTEX complies with MECP Table 3 standards and CCME commercial standards
PHCs comply with MECP Table 3 standards and CCME commercial standards

BH18-23 2.92-5.97m 23-NOV-2023
Metals comply with MECP Table 3 standards and CCME commercial standards
Hg complies with MECP Table 3 standards and CCME commercial standards
Cr(VI) complies with MECP Table 3 standards and CCME commercial standards
VOCs comply with MECP Table 3 standards and CCME commercial standards
BTEX complies with MECP Table 3 standards and CCME commercial standards
PHCs comply with MECP Table 3 standards and CCME commercial standards
PAHs comply with MECP Table 3 standards and CCME commercial standards

BH19-23 2.69-5.74m 23-NOV-2023
Metals comply with MECP Table 3 standards and CCME commercial standards
Hg complies with MECP Table 3 standards and CCME commercial standards
Cr(VI) complies with MECP Table 3 standards and CCME commercial standards
BTEX complies with MECP Table 3 standards and CCME commercial standards
PHCs comply with MECP Table 3 standards and CCME commercial standards
PAHs comply with MECP Table 3 standards and CCME commercial standards



GROUNDWATER RESULT COMPLIES WITH THE MECP TABLE 3 STANDARDS

GROUNDWATER RESULT EXCEEDS THE MECP TABLE 3 STANDARDS

PATERSON GROUP
9 AURIGA DRIVE
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NO.	REVISIONS	DATE	INITIAL

IBI GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TUNNEY'S PASTURE - BLOCK 9

OTTAWA, ONTARIO

Title:

CROSS SECTION A-A' - GROUNDWATER

Scale: AS SHOWN	Date: 03/2024
Drawn by: YA	Report No.: PE6039-2
Checked by: JA	Dwg. No.: PE6039-5A
Approved by: AM	Revision No.:

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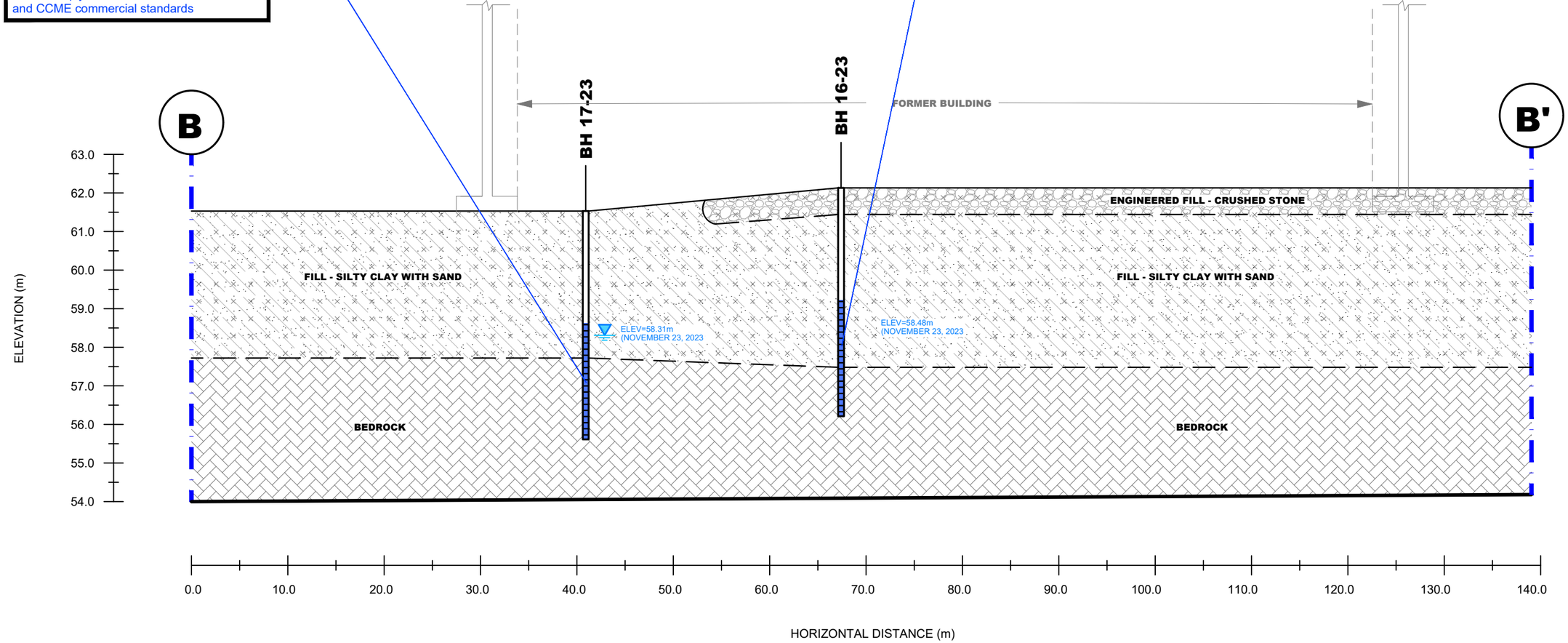
11x17

BH17-23 2.87-5.92m 23-NOV-2023
Metals comply with MECP Table 3 standards and CCME commercial standards
Hg complies with MECP Table 3 standards and CCME commercial standards
Cr(VI) complies with MECP Table 3 standards and CCME commercial standards
BTEX complies with MECP Table 3 standards and CCME commercial standards
PHCs comply with MECP Table 3 standards and CCME commercial standards
PAHs comply with MECP Table 3 standards and CCME commercial standards

BH16-23 4.55-7.60m 23-NOV-2023
BTEX complies with MECP Table 3 standards and CCME commercial standards
PHCs comply with MECP Table 3 standards and CCME commercial standards



GROUNDWATER RESULT COMPLIES WITH THE MECP TABLE 3 STANDARDS

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NO.	REVISIONS	DATE	INITIAL

IBI GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TUNNEY'S PASTURE - BLOCK 9

OTTAWA, ONTARIO

Title:

CROSS SECTION B-B' - GROUNDWATER

Scale: AS SHOWN	Date: 03/2024
Drawn by: YA	Report No.: PE6039-2
Checked by: JA	Dwg. No.: PE6039-5B
Approved by: AM	Revision No.:

11x17

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APPENDIX 1

SAMPLING AND ANALYSIS PLAN

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

LABORATORY CERTIFICATES OF ANALYSIS

PATERSON GROUP

Sampling & Analysis Plan

Tunney's Pasture (Block 9)

Ottawa, Ontario

Prepared for IBI Group

Report: PE6039-SAP
November 1, 2023

TABLE OF CONTENTS

PAGE

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by IBI Group, to conduct a Phase II – Environmental Site Assessment (Phase II ESA) for Block 9 of the Tunney's Pasture government office complex, in the City of Ottawa, Ontario.

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

Borehole	Location & Rationale	Proposed Depth & Rationale
BH16-23	Central portion of the Phase I Property; to assess for potential impacts resulting from fill material of unknown quality, the former loading dock where contaminants were handled, and where fuel storage ASTs were formerly present.	5-7 m; to intercept the groundwater table for the purpose of installing a monitoring well.
BH17-23	North-central portion of the Phase I Property; to assess for potential impacts resulting from fill material of unknown quality, and former vent and fill piping associated with the former diesel ASTs.	5-7 m; to intercept the groundwater table for the purpose of installing a monitoring well.
BH18-23	Central portion of the Phase I Property; to assess for potential impacts resulting from the presence of fill material of unknown quality, the use of road salt for de-icing purposes, the former loading dock where contaminants were handled, and the former oil AST for hydraulic elevator lift.	5-7 m; to intercept the groundwater table for the purpose of installing a monitoring well.
BH19-23	Eastern portion of the Phase I Property; to assess for potential impacts resulting from the presence of fill material of unknown quality, and the use of road salt for de-icing purposes.	5-7 m; to intercept the groundwater table for the purpose of installing a monitoring well.
BH20-23	Western portion of the Phase I Property; to assess for potential impacts resulting from the presence of fill material of unknown quality, the former hydraulic elevator, and the former PCB containing transformers.	5-7 m; to intercept the groundwater table for the purpose of installing a monitoring well.

Borehole locations are shown on Drawing PE6039-3 – Test Hole Location Plan, appended to the main report.

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

Following the borehole drilling, groundwater monitoring wells will be installed in all three boreholes to allow for the collection of groundwater samples.

2.0 ANALYTICAL TESTING PROGRAM

The analytical testing program for soil at the Phase I Property is based on the following general considerations:

- ❒ At least one sample from each borehole should be submitted, in order to delineate the horizontal extent of contamination across the site.

- ❒ At least one sample from each stratigraphic unit should be submitted, in order to delineate the vertical extent of contamination at the site.

- ❒ In boreholes where there is visual or olfactory evidence of contamination, or where organic vapour meter or photoionization detector readings indicate the presence of contamination, the 'worst-case' sample from each borehole should be submitted for comparison with MECP site condition standards.

- ❒ In boreholes with evidence of contamination as described above, a sample should be submitted from the stratigraphic unit below the 'worst-case' sample to determine whether the contaminant(s) have migrated downward.

- ❒ Parameters analyzed should be consistent with the Contaminants of Potential Concern identified in the Phase I ESA.

The analytical testing program for soil at the Phase I Property is based on the following general considerations:

- ❒ Groundwater monitoring wells should be installed in all boreholes with visual or olfactory evidence of soil contamination, in stratigraphic units where soil contamination was encountered, where those stratigraphic units are at or below the water table (i.e. a water sample can be obtained).

- ❒ Groundwater monitoring well screens should straddle the water table at sites where the contaminants of concern are suspected to be LNAPLs.

- ❒ At least one groundwater monitoring well should be installed in a stratigraphic unit below the suspected contamination, where said stratigraphic unit is water-bearing.

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

3.0 STANDARD OPERATING PROCEDURES

3.1 Environmental Drilling Procedure

Purpose

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

Equipment

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

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

Determining Borehole Locations

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

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

Drilling Procedure

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

- ❒ Continuous split spoon samples (every 0.6 m or 2') or semi-continuous (every 0.76 m or 2'6") are required.
- ❒ Make sure samples are well sealed in plastic bags with no holes prior to screening and are kept cool but unfrozen.
- ❒ If sampling for VOCs, BTEX, or PHCs F_1, a soil core from each soil sample, which may be analyzed, must be taken and placed in the laboratory-provided methanol vial.
- ❒ Note all and any odours or discolouration of samples.
- ❒ Split spoon samplers must be washed between samples.
- ❒ If obvious contamination is encountered, continue sampling until vertical extent of contamination is delineated.
- ❒ As a general rule, environmental boreholes should be deep enough to intercept the groundwater table (unless this is impossible/impractical - call project manager to discuss).
- ❒ If at all possible, soil samples should be submitted to a preliminary screening procedure on site, either using a RKI Eagle, PID, etc. depending on type of suspected contamination.

Spoon Washing Procedure

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

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

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

Screening Procedure

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

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

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

3.2 Monitoring Well Installation Procedure

Equipment

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

Procedure

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

3.3 Monitoring Well Sampling Procedure

Equipment

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

Sampling Procedure

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

4.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

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

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

5.0 DATA QUALITY OBJECTIVES

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

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

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

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

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

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

These considerations are discussed in the body of the report.

6.0 PHYSICAL IMPEDIMENTS

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.

SOIL PROFILE AND TEST DATA

PHASE II - ENVIRONMENTAL SITE ASSESSMENT

Tunney's Pasture - Block 9, Ottawa, Ontario

DATUM: Geodetic **EASTING:** 364662.321 **NORTHING:** 5030050.027 **ELEVATION:** 62.13

PROJECT: Phase II - Environmental Site Assessment

BORINGS BY: Truck-Mount Power Auger

REMARKS:

DATE: November 15, 2023

FILE NO. PE6039

HOLE NO. BH16-23

SAMPLE DESCRIPTION	STRATA PLOT	Sample No.	SAMPLE % RECOVERY	N VALUE or RQD	ANALYTICAL TESTS	DEPTH (m)	PID (ppm) 0 16.67 33.33 50	Gas Tech (ppm) 0 50 100 150 200	Monitoring Well Construction
Ground Surface EL 62.13 m									
FILL: Brown silty sand with gravel and crushed stone		AU1				0	0.6		
0.69 m EL 61.44 m									
FILL: Brown silty sand, some gravel		SS2	75	25		1	0.9		
		SS3	75	28		2	1.8		
2.21 m EL 59.92 m									
FILL: Brown silty sand		SS4	33	4			0.8		
2.9 m EL 59.23 m						3			
FILL: Brown silty sand with gravel, cobbles and boulders		SS5	42	4			0.9		
		SS6	33	25		4	1.9		
4.65 m EL 57.48 m		SS7	67	50+			6.6		
BEDROCK: Good to excellent quality, grey limestone		RC1	100	80		5			
						6			
		RC2	100	100		7			
7.6 m EL 54.53 m									
End of Borehole						8			
(GWL @ 3.65m - Nov. 23, 2023)						9			

SOIL PROFILE AND TEST DATA

PHASE II - ENVIRONMENTAL SITE ASSESSMENT

Tunney's Pasture - Block 9, Ottawa, Ontario

DATUM: Geodetic **EASTING:** 364650.197 **NORTHING:** 5030073.011 **ELEVATION:** 61.53

PROJECT: Phase II - Environmental Site Assessment

BORINGS BY: Truck-Mount Power Auger

REMARKS:

DATE: November 15, 2023

FILE NO. PE6039

HOLE NO. BH17-23

SAMPLE DESCRIPTION	STRATA PLOT	Sample No.	SAMPLE % RECOVERY	N VALUE or RQD	ANALYTICAL TESTS	DEPTH (m)	PID (ppm) 0 16.67 33.33 50	Gas Tech (ppm) 0 50 100 150 200	Monitoring Well Construction
Ground Surface EL 61.53 m									
FILL: Brown silty sand, trace gravel		AU1				0	4.3		
		SS2	75	20		1	2.6		
		SS3	50	17		2	1.8		
		SS4	33	1		3	1.5		
3.05 m EL 58.48 m									
FILL: Brown silty sand with gravel, cobbles and boulders		SS5	50	19			1.4		
3.81 m EL 57.72 m						4			
BEDROCK: Good quality, grey limestone		RC1	100	80					
		RC2	100	84		5			
5.92 m EL 55.61 m						6			
End of Borehole									
(GWL @ 3.22m - Nov. 23, 2023)						7			
						8			
						9			

SOIL PROFILE AND TEST DATA

PHASE II - ENVIRONMENTAL SITE ASSESSMENT

Tunney's Pasture - Block 9, Ottawa, Ontario

DATUM: Geodetic **EASTING:** 364679.995 **NORTHING:** 5030071.639 **ELEVATION:** 61.62

PROJECT: Phase II - Environmental Site Assessment

BORINGS BY: Truck-Mount Power Auger

REMARKS:

DATE: November 15, 2023

FILE NO. PE6039

HOLE NO. BH18-23

SAMPLE DESCRIPTION	STRATA PLOT	Sample No.	SAMPLE % RECOVERY	N VALUE or RQD	ANALYTICAL TESTS	DEPTH (m)	PID (ppm) 0 16.67 33.33 50	Gas Tech (ppm) 0 50 100 150 200	Monitoring Well Construction
Ground Surface EL 61.62 m									
Asphaltic concrete 0.05 m EL 61.57 m		AU1				0	1.3		
FILL: Brown silty sand, some clay and gravel 1.22 m EL 60.4 m		SS2	100	7		1	1.3		
		SS3	33	23		2	1.0		
FILL: Brown silty sand with gravel		SS4	8	16			0.9		
3.35 m EL 58.27 m		SS5	17	50+		3			
BEDROCK: Fair to excellent quality, grey limestone		RC1	100	73		4			
		RC2	100	93		5			
5.97 m EL 55.65 m						6			
End of Borehole (GWL @ 3.19m - Nov. 23, 2023)						7			
						8			
						9			

SOIL PROFILE AND TEST DATA

PHASE II - ENVIRONMENTAL SITE ASSESSMENT

Tunney's Pasture - Block 9, Ottawa, Ontario

DATUM: Geodetic **EASTING:** 364757.955 **NORTHING:** 5030109.232 **ELEVATION:** 60.37

PROJECT: Phase II - Environmental Site Assessment

BORINGS BY: Truck-Mount Power Auger

REMARKS:

DATE: November 15, 2023

FILE NO. PE6039

HOLE NO. BH19-23

SAMPLE DESCRIPTION	STRATA PLOT	Sample No.	SAMPLE % RECOVERY	N VALUE or RQD	ANALYTICAL TESTS	DEPTH (m)	PID (ppm) 0 16.67 33.33 50	Gas Tech (ppm) 0 50 100 150 200	Monitoring Well Construction
Ground Surface EL 60.37 m									
Asphaltic concrete 0.03 m EL 60.34 m		AU1				0	0.3		
FILL: Gravel with crushed stone, some silty sand, trace clay 0.66 m EL 59.71 m		SS2	59	50+		1	9.6		
FILL: Brown silty clay, trace gravel, sand and wood 1.22 m EL 59.15 m		RC1	100	100		2			
BEDROCK: Excellent quality, grey limestone		RC2	100	100		3			
		RC3	100	100		4			
5.74 m EL 54.63 m		RC4	100	100		5			
End of Borehole						6			
(GWL @ 1.54m -Nov. 23, 2023)						7			
						8			
						9			

SOIL PROFILE AND TEST DATA

PHASE II - ENVIRONMENTAL SITE ASSESSMENT

Tunney's Pasture - Block 9, Ottawa, Ontario

DATUM: Geodetic **EASTING:** 364617.243 **NORTHING:** 5030010.328 **ELEVATION:** 62.01

PROJECT: Phase II - Environmental Site Assessment

BORINGS BY: Truck-Mount Power Auger

REMARKS:

DATE: November 16, 2023

FILE NO. PE6039

HOLE NO. BH20-23

SAMPLE DESCRIPTION	STRATA PLOT	Sample No.	SAMPLE % RECOVERY	N VALUE or RQD	ANALYTICAL TESTS	DEPTH (m)	PID (ppm) 0 16.67 33.33 50	Gas Tech (ppm) 0 50 100 150 200	Monitoring Well Construction
Ground Surface EL 62.01 m									
FILL: Brown silty sand with organics, trace gravel		AU1				0	1.2		
0.15 m EL 61.86 m		SS2	50	10		1	2.2		
		SS3	50	7		2	0.4		
FILL: Brown silty sand, trace gravel		SS4	4	5		3	1.0		
		SS5	8	4			0.5		
		SS6	40	50+		4	3.5		
4.32 m EL 57.69 m									
BEDROCK: Excellent to good quality, grey limestone		RC1	100	92		5			
						6			
		RC2	100	83		7			
7.64 m EL 54.37 m									
End of Borehole						8			
(GWL @ 3.67m -Nov. 23, 2023)						9			

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 x D60)
Cu	-	Uniformity coefficient = D60 / D10

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

CONSOLIDATION TEST

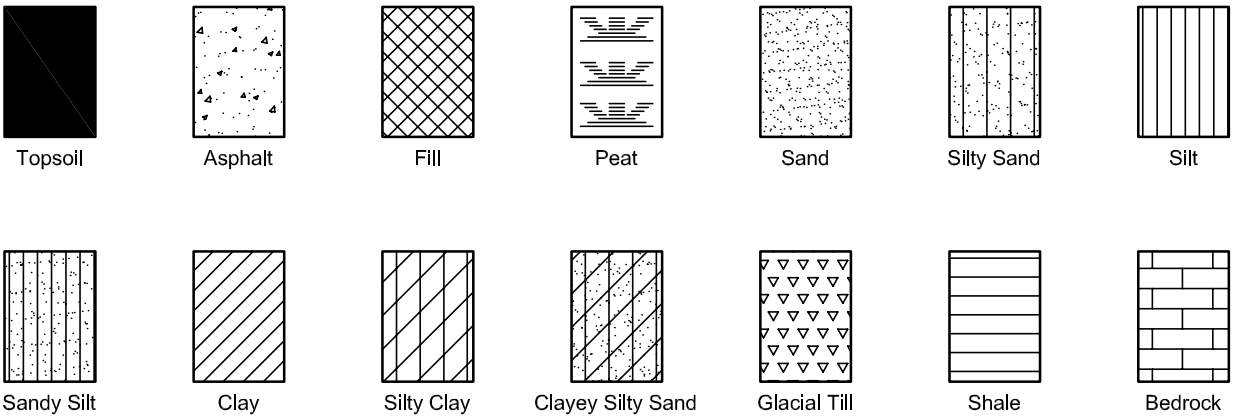
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

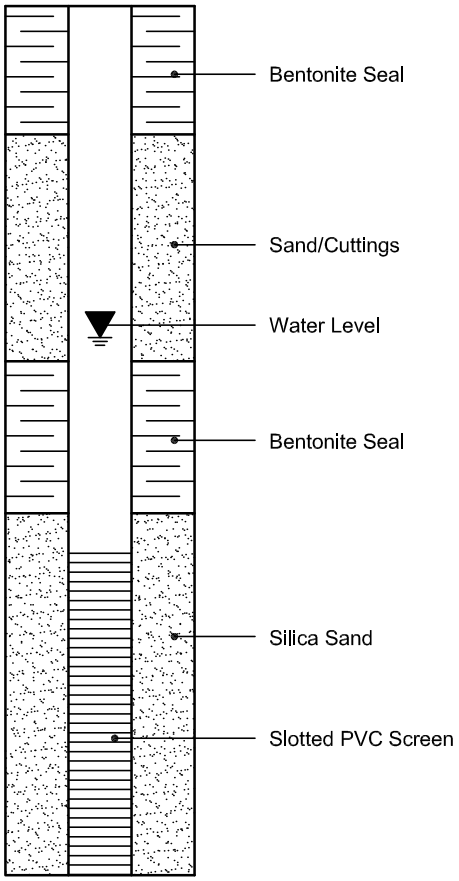
SYMBOLS AND TERMS (continued)

STRATA PLOT

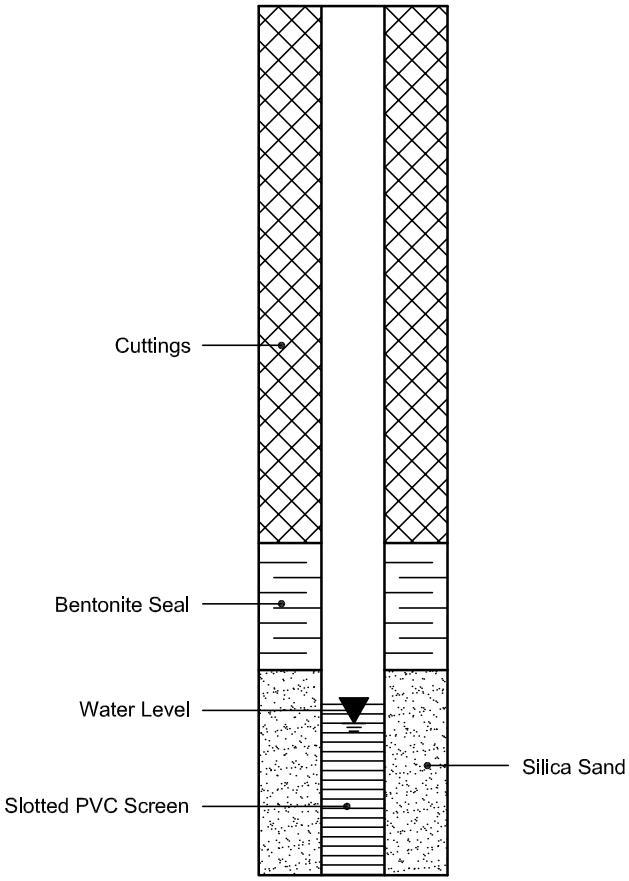


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



Test Hole ID	Date of Construction (dd-mm-yy)	Well Diameter (mm)	Ground Surface Elevation (masl)	Test Hole Depth (m)	Test Hole Bottom Elevation (masl)	Well Screen Length (m)	Well Screen Interval (mbgs)	Well Screen Interval (masl)	Geologic Media Intercepted by Well Screen
BH16-23	15-Nov-2023	35	62.13	7.60	54.53	3.05	4.55 - 7.6	57.58 - 54.53	fill, limestone bedrock
BH17-23	15-Nov-2023	35	61.53	5.92	55.61	3.05	2.87 - 5.92	58.66 - 55.61	fill, limestone bedrock
BH18-23	15-Nov-2023	35	61.62	5.97	55.65	3.05	2.92 - 5.97	58.7 - 55.65	limestone bedrock
BH19-23	15-Nov-2023	35	60.37	5.74	54.63	3.05	2.69 - 5.74	57.68 - 54.63	limestone bedrock
BH20-23	16-Nov-2023	35	62.01	7.64	54.37	2.64	5 - 7.64	57.01 - 54.37	limestone bedrock

Sample ID	Sample Depth (mbgs)	Sampling Date (dd-mm-yy)	Rationale	PID Vapour Reading (ppm)	Parameter Groups Analyzed									
					PHCs	BTEX	VOCs	PAHs	PCBs	Metals	Hg	Cr^{VI}	EC	SAR
BH16-23-SS3 2346505-01	1.52 - 2.13	15-Nov-2023	To assess fill material of unknown quality (APEC 1).	1.8				✓		✓	✓	✓		
BH16-23-SS6 2346505-02	3.81 - 4.42	15-Nov-2023	To assess fill material of unknown quality (APEC 1), to assess soil beneath the former loading dock where contaminants were handled (APEC 4), and to assess soil in the upper water table where fuel storage ASTs were formerly present (APEC 3A).	1.9	✓	✓								
BH17-23-SS5 2346505-03	3.05 - 3.66	15-Nov-2023	To assess fill material of unknown quality (APEC 1), and to assess soil in the location of the former vent and fill piping associated with the former diesel ASTs (APEC 3B).	1.4	✓	✓		✓		✓	✓	✓		
BH18-23-SS2 2346505-04	0.76 - 1.37	15-Nov-2023	To assess fill material of unknown quality (APEC 1), and to assess soil within the area where road salt was applied (APEC 2).	1.3				✓		✓	✓	✓	✓	✓
BH18-23-SS5 2346505-05	3.05 - 3.66	15-Nov-2023	To assess fill material of unknown quality (APEC 1), and to assess soil beneath the former loading dock where contaminants were handled (APEC 4)	1.7	✓	✓	✓							
BH19-23-AU1 2346505-06	0.05 - 0.61	15-Nov-2023	To assess fill material of unknown quality (APEC 1), and to assess soil within the area where road salt was applied (APEC 2).	0.3				✓		✓	✓	✓	✓	✓
BH19-23-SS2 2346505-07	0.76 - 1.22	15-Nov-2023	To assess soil with an elevated PID reading within fill material of unknown quality (APEC 1).	9.6	✓	✓								
BH20-23-SS2 2346505-08	0.76 - 1.37	16-Nov-2023	To assess fill material of unknown quality (APEC 1), and to assess soil beneath the former PCB containing transformers (APEC 6).	2.2				✓	✓	✓	✓	✓		
BH20-23-SS5+SS6 2346505-09	3.05 - 4.19	16-Nov-2023	To assess fill material of unknown quality (APEC 1) and to assess soil beneath the former hydraulic elevator (APEC 5).	0.5, 3.5	✓	✓								
DUP-1 (DUP of BH19-23-AU1) 2346505-10	0.05 - 0.61	15-Nov-2023	Laboratory QA/QC	0.3						✓				

Sample ID	Sample Depth (mbgs)	Sampling Date (dd-mm-yy)	Rationale	Parameter Groups Analyzed							
				PHCs	BTEX	VOCs	PAHs	PCBs	Metals	Hg	Cr^{VI}
BH16-23 2348104-01	4.55 - 7.6	23-Nov-2023	To assess groundwater beneath the former loading dock where contaminants were handled (APEC 4), and to assess groundwater where fuel storage ASTs were formerly present (APEC 3A).	✓	✓						
BH17-23 2348104-02	2.87 - 5.92	23-Nov-2023	To assess groundwater in the location of former vent and fill piping associated with the former diesel ASTs (APEC 3B), and to assess groundwater within fill material of unknown quality (APEC 1).	✓	✓		✓		✓	✓	✓
BH18-23 2348104-03	2.92 - 5.97	23-Nov-2023	To assess groundwater beneath the former loading dock where contaminants were handled (APEC 4), and to assess groundwater within fill material of unknown quality (APEC 1).	✓	✓	✓	✓		✓	✓	✓
BH19-23 2348104-04	2.69 - 5.74	23-Nov-2023	To assess groundwater within fill material of unknown quality (APEC 1).	✓	✓		✓		✓	✓	✓
BH20-23 2348104-05	2.92 - 5.97	23-Nov-2023	To assess groundwater within fill material of unknown quality (APEC 1), to assess groundwater beneath the former hydraulic elevator (APEC 5), and to assess groundwater beneath the former PCB containing transformers (APEC 6).	✓	✓		✓	✓	✓	✓	✓
DUP-A (DUP of BH16-23) 2348104-06	4.55 - 7.6	23-Nov-2023	Laboratory QA/QC	✓	✓						

Parameter	Units	MDL	Regulation	Sample PE6039									
				BH16-23-SS3 2346505-01	BH16-23-SS6 2346505-02	BH17-23-SS5 2346505-03	BH18-23-SS2 2346505-04	BH18-23-SS5 2346505-05	BH19-23-AU1 2346505-06	BH19-23-SS2 2346505-07	BH20-23-SS2 2346505-08	BH20-23-SS5+SS6 2346505-09	DUP-1 (DUP of BH19-23-AU1) 2346505-10
Sample Depth (m)			Reg 153/04-Table 3 Residential, coarse	1.52 - 2.13	3.81 - 4.42	3.05 - 3.66	0.76 - 1.37	3.05 - 3.66	0.05 - 0.61	0.76 - 1.22	0.76 - 1.37	3.05 - 4.19	0.05 - 0.61
Sample Date				15-Nov-2023	15-Nov-2023	15-Nov-2023	15-Nov-2023	15-Nov-2023	15-Nov-2023	15-Nov-2023	16-Nov-2023	16-Nov-2023	15-Nov-2023
Phsical Characteristics													
% Solids	% by Wt.	0.1		96.5	87.2	94.2	86.9	94.0	91.8	81	95.2	91.2	91.5
General Inorganics													
SAR	N/A	0.01	5.0	N/A	N/A	N/A	6.69	N/A	1.8	N/A	N/A	N/A	N/A
Conductivity	uS/cm	5.00	700	N/A	N/A	N/A	555	N/A	526	N/A	N/A	N/A	N/A
Metals													
Antimony	ug/g dry	1.0	7.5	ND (1)	N/A	ND (1)	ND (1)	N/A	ND (1)	N/A	ND (1)	N/A	ND (1)
Arsenic	ug/g dry	1.0	18	5	N/A	3	1	N/A	3	N/A	6	N/A	4
Barium	ug/g dry	1.0	390	49	N/A	69	25	N/A	171	N/A	55	N/A	195
Beryllium	ug/g dry	0.5	4.0	ND (0.5)	N/A	ND (0.5)	ND (0.5)	N/A	ND (0.5)	N/A	ND (0.5)	N/A	0.6
Boron	ug/g dry	0.5	120	ND (5.0)	N/A	5.7	ND (5.0)	N/A	12.5	N/A	ND (5.0)	N/A	15.1
Cadmium	ug/g dry	0.5	1.2	ND (0.5)	N/A	ND (0.5)	ND (0.5)	N/A	ND (0.5)	N/A	ND (0.5)	N/A	ND (0.5)
Chromium	ug/g dry	0.2	160	ND (5)	N/A	7	10	N/A	17	N/A	ND (5)	N/A	21
Chromium (VI)	ug/g dry	5	8.0	ND (0.2)	N/A	ND (0.2)	0.3	N/A	ND (0.2)	N/A	ND (0.2)	N/A	N/A
Cobalt	ug/g dry	1	22	3	N/A	3	4	N/A	6	N/A	4	N/A	7
Copper	ug/g dry	5	140	ND (5)	N/A	6	8	N/A	12	N/A	ND (5)	N/A	13
Lead	ug/g dry	1	120	7	N/A	11	2	N/A	31	N/A	7	N/A	38
Mercury	ug/g dry	0.1	0.27	ND (0.1)	N/A	ND (0.1)	ND (0.1)	N/A	0.2	N/A	ND (0.1)	N/A	N/A
Molybdenum	ug/g dry	1	6.9	4	N/A	3	ND (1)	N/A	ND (1)	N/A	4	N/A	ND (1)
Nickel	ug/g dry	5	100	6	N/A	7	6	N/A	14	N/A	7	N/A	16
Selenium	ug/g dry	1	2.4	ND (1)	N/A	ND (1)	ND (1)	N/A	ND (1)	N/A	ND (1)	N/A	ND (1)
Silver	ug/g dry	0.3	20	ND (0.3)	N/A	ND (0.3)	ND (0.3)	N/A	ND (0.3)	N/A	ND (0.3)	N/A	ND (0.3)
Thallium	ug/g dry	1	1.0	ND (1)	N/A	ND (1)	ND (1)	N/A	ND (1)	N/A	ND (1)	N/A	ND (1)
Uranium	ug/g dry	5	23	ND (5)	N/A	ND (5)	ND (5)	N/A	ND (5)	N/A	ND (5)	N/A	ND (5)
Vanadium	ug/g dry	1	86	ND (1)	N/A	ND (1)	ND (1)	N/A	ND (1)	N/A	ND (1)	N/A	ND (1)
Zinc	ug/g dry	10	340	ND (10)	N/A	ND (10)	21	N/A	19	N/A	ND (10)	N/A	24
Volatiles													
Acetone	ug/g dry	0.50	16	N/A	N/A	N/A	N/A	ND (0.50)	N/A	N/A	N/A	N/A	N/A
Benzene	ug/g dry	0.02	0.21	N/A	N/A	N/A	N/A	ND (0.02)	N/A	N/A	N/A	N/A	N/A
Bromodichloromethane	ug/g dry	0.05	13	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
Bromoform	ug/g dry	0.05	0.27	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
Bromomethane	ug/g dry	0.05	0.05	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
Carbon Tetrachloride	ug/g dry	0.05	0.05	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
Chlorobenzene	ug/g dry	0.05	2.4	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
Chloroform	ug/g dry	0.05	0.05	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
Dibromochloromethane	ug/g dry	0.05	9.4	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
Dichlorodifluoromethane	ug/g dry	0.20	16	N/A	N/A	N/A	N/A	ND (0.20)	N/A	N/A	N/A	N/A	N/A
1,2-Dichlorobenzene	ug/g dry	0.05	3.4	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
1,3-Dichlorobenzene	ug/g dry	0.05	4.8	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
1,4-Dichlorobenzene	ug/g dry	0.05	0.083	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
1,1-Dichloroethane	ug/g dry	0.05	3.5	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
1,2-Dichloroethane	ug/g dry	0.05	0.05	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
1,1-Dichloroethylene	ug/g dry	0.05	0.05	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
cis-1,2-Dichloroethylene	ug/g dry	0.05	3.4	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
trans-1,2-Dichloroethylene	ug/g dry	0.05	0.084	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
1,2-Dichloropropane	ug/g dry	0.05	0.05	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
cis-1,3-Dichloropropylene	ug/g dry	0.05	0.05	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
trans-1,3-Dichloropropylene	ug/g dry	0.05	0.05	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
1,3-Dichloropropene, total	ug/g dry	0.05	0.05	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	ug/g dry	0.05	2.0	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
Ethylene dibromide (dibromoethane,	ug/g dry	0.05	0.05	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
Hexane	ug/g dry	0.05	2.8	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
Methyl Ethyl Ketone (2-Butanone)	ug/g dry	0.05	16	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
Methyl Isobutyl Ketone	ug/g dry	0.05	1.7	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
Methyl tert-butyl ether	ug/g dry	0.05	0.75	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
Methylene Chloride	ug/g dry	0.50	0.1	N/A	N/A	N/A	N/A	ND (0.50)	N/A	N/A	N/A	N/A	N/A
Styrene	ug/g dry	2.00	0.7	N/A	N/A	N/A	N/A	ND (2.00)	N/A	N/A	N/A	N/A	N/A
1,1,1,2-Tetrachloroethane	ug/g dry	0.50	0.058	N/A	N/A	N/A	N/A	ND (0.50)	N/A	N/A	N/A	N/A	N/A
1,1,2,2-Tetrachloroethane	ug/g dry	0.05	0.05	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
Tetrachloroethylene	ug/g dry	0.05	0.28	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
Toluene	ug/g dry	0.05	2.3	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
1,1,1-Trichloroethane	ug/g dry	0.05	0.38	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
1,1,2-Trichloroethane	ug/g dry	0.05	0.05	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
Trichloroethylene	ug/g dry	0.05	0.061	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
Trichlorofluoromethane	ug/g dry	0.05	4.0	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
Vinyl Chloride	ug/g dry	0.05	0.02	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
m/p-Xylene	ug/g dry	0.05	3.1	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
o-Xylene	ug/g dry	0.05	3.1	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
Xylenes, total	ug/g dry	0.05	3.1	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A	N/A	N/A	N/A
BTEX													
Benzene	ug/g dry	0.002	0.21	N/A	ND (0.002)	ND (0.002)	N/A	ND (0.02)	N/A	ND (0.002)	N/A	ND (0.002)	N/A
Ethylbenzene	ug/g dry	0.002	2.0	N/A	ND (0.002)	ND (0.002)	N/A	ND (0.05)	N/A	ND (0.002)	N/A	ND (0.002)	N/A
Toluene	ug/g dry	0.002	2.3	N/A	ND (0.002)	ND (0.002)	N/A	ND (0.05)	N/A	ND (0.002)	N/A	ND (0.002)	N/A
m/p-Xylene	ug/g dry	0.002	3.1	N/A	0.006	ND (0.002)	N/A	ND (0.05)	N/A	ND (0.002)	N/A	0.01	N/A
o-Xylene	ug/g dry	0.002	3.1	N/A	0.004	ND (0.002)	N/A	ND (0.05)	N/A	ND (0.002)	N/A	0.004	N/A
Xylenes, total	ug/g dry	0.002	3.1	N/A	0.01	ND (0.002)	N/A	ND (0.05)	N/A	ND (0.002)	N/A	0.014	N/A
Hydrocarbons													
F1 PHCs (C6-C10)	ug/g dry	7	55	N/A	ND (7)	ND (7)	N/A	10	N/A	ND (7)	N/A	ND (7)	N/A
F2 PHCs (C10-C16)	ug/g dry	4	98	N/A	8	ND (4)	N/A	18	N/A	ND (4)	N/A	ND (4)	N/A
F3 PHCs (C16-C34)	ug/g dry	8	300	N/A	42	ND (8)	N/A	21	N/A	45	N/A	ND (8)	N/A
F4 PHCs (C34-C50)	ug/g dry	6	2800	N/A	10	ND (6)	N/A	9	N/A	91	N/A	ND (6)	N/A
Semi-Volatiles													
1-Methylnaphthalene	ug/g dry	0.02	0.99	ND (0.02)	N/A	ND (0.02)	ND (0.02)	N/A	ND (0.40)	N/A	ND (0.02)	N/A	N/A
2-Methylnaphthalene	ug/g dry	0.02	0.99	ND (0.02)	N/A	ND (0.02)	ND (0.02)	N/A	ND (0.40)	N/A	ND (0.02)	N/A	N/A
Methylnaphthalene (1&2)	ug/g dry	0.04	0.99	ND (0.04)	N/A	ND (0.04)	ND (0.04)	N/A	ND (0.80)	N/A	ND (0.04)	N/A	N/A
Acenaphthene	ug/g dry	0.02	7.9	ND (0.02)	N/A	ND (0.02)	ND (0.02)	N/A	ND (0.40)	N/A	ND (0.02)	N/A	N/A
Acenaphthylene	ug/g dry	0.02	0.15	ND (0.02)	N/A	ND (0.02)	ND (0.02)	N/A	0.49	N/A	ND (0.02)	N/A	N/A
Anthracene	ug/g dry	0.02	0.67	ND (0.02)	N/A	0.03	ND (0.02)	N/A	2.52	N/A	ND (0.02)	N/A	N/A
Benzo[a]anthracene	ug/g dry	0.02	0.5	ND (0.02)	N/A	0.04	0.03	N/A	5.13	N/A	ND (0.02)	N/A	N/A
Benzo[a]pyrene	ug/g dry	0.02	0.3	ND (0.02)	N/A	0.03	0.03	N/A	3.37	N/A	ND (0.02)	N/A	N/A
Benzo[b]fluoranthene	ug/g dry	0.02	0.78	ND (0.02)	N/A	0.03	0.04	N/A	3.63	N/A	ND (0.02)	N/A	N/A
Benzo[g,h,i]perylene	ug/g dry	0.02	6.6	ND (0.02)	N/A	ND (0.02)	ND (0.02)	N/A	1.99	N/A	ND (0.02)	N/A	N/A
Benzo[k]fluoranthene	ug/g dry	0.02	0.78	ND (0.02)	N/A	0.02	0.02	N/A	2.29	N/A	ND (0.02)	N/A	N/A
1,1-Biphenyl	ug/g dry	0.02	0.31	ND (0.02)	N/A	ND (0.02)	ND (0.02)	N/A	ND (0.40)	N/A	ND (0.02)	N/A	N/A
Chrysene	ug/g dry	0.02	7.0	ND (0.02)	N/A	0.03	0.02	N/A	4.48	N/A	ND (0.02)	N/A	N/A
Dibenzo[a,h]anthracene	ug/g dry	0.02	0.1	ND (0.02)	N/A	ND (0.02)	ND (0.02)	N/A	0.55	N/A	ND (0.02)	N/A	N/A
Fluoranthene	ug/g dry	0.02	0.69	ND (0.02)	N/A	0.11	0.04	N/A	13.4	N/A	ND (0.02)	N/A	N/A
Fluorene	ug/g dry	0.02	62	ND (0.02)	N/A	ND (0.02)	ND (0.02)	N/A	0.77	N/A	ND (0.02)	N/A	N/A
Indeno [1,2,3-cd] pyrene	ug/g dry	0.02	0.38	ND (0.02)	N/A	ND (0.02)	ND (0.02)	N/A	1.92	N/A	ND (0.02)	N/A	N/A
Naphthalene	ug/g dry	0.01	0.6	ND (0.01)	N/A	ND (0.01)	ND (0.01)	N/A	0.36	N/A	ND (0.01)	N/A	N/A
Phenanthrene	ug/g dry	0.02	6.2	ND (0.02)	N/A	0.08	0.02	N/A	6.92	N/A	ND (0.02)	N/A	N/A
Pyrene	ug/g dry	0.02	78	ND (0.02)	N/A	0.09	0.03	N/A	10.3	N/A	ND (0.02)	N/A	N/A
Quinoline	ug/g dry	0.10	NV	ND (0.10)	N/A	ND (0.10)	ND (0.10)	N/A	ND (2.00)	N/A	ND (0.10)	N/A	N/A
PCBs													
PCBs, total	ug/g dry	0.05	0.35	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND (0.05)	N/A	N/A

2.00 Sample exceeds Reg 153/04-Table 3 Residential, coarse Standards
ND (0.40) Sample MDL exceeds Reg 153/04-Table 3 Residential, coarse Standards
ND (0.2) No concentrations identified above the MDL
NA Parameter not analysed
NV No value given for indicated parameter

Parameter	Units	MDL	Regulation	Sample PE6039					
				BH16-23 2348104-01	BH17-23 2348104-02	BH18-23 2348104-03	BH19-23 2348104-04	BH20-23 2348104-05	DUP-A (DUP of BH16-23) 2348104-06
Sample Depth (m)			Reg 153/04-Table 3 Non-Potable Groundwater, coarse	4.55 - 7.6	2.87 - 5.92	2.92 - 5.97	2.69 - 5.74	2.92 - 5.97	4.55 - 7.6
Sample Date				23-Nov-2023	23-Nov-2023	23-Nov-2023	23-Nov-2023	23-Nov-2023	23-Nov-2023
Metals									
Mercury	ug/L	0.1	0.29	N/A	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	N/A
Antimony	ug/L	0.5	20000	N/A	ND (0.5)	ND (0.5)	ND (0.5)	0.8	N/A
Arsenic	ug/L	1	1900	N/A	ND (1)	ND (1)	ND (1)	ND (1)	N/A
Barium	ug/L	1	29000	N/A	43	77	129	74	N/A
Beryllium	ug/L	0.5	67	N/A	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
Boron	ug/L	10	45000	N/A	167	70	46	109	N/A
Cadmium	ug/L	0.1	2.7	N/A	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	N/A
Chromium	ug/L	1	810	N/A	ND (1)	ND (1)	ND (1)	ND (1)	N/A
Chromium (VI)	ug/L	10	140	N/A	ND (10)	ND (10)	ND (10)	ND (10)	N/A
Cobalt	ug/L	0.5	66	N/A	1.6	ND (0.5)	ND (0.5)	1	N/A
Copper	ug/L	0.5	87	N/A	1.2	1.7	0.9	4.5	N/A
Lead	ug/L	0.1	25	N/A	ND (0.1)	ND (0.1)	0.2	0.8	N/A
Molybdenum	ug/L	0.5	9200	N/A	20.5	4.8	1.9	78.3	N/A
Nickel	ug/L	1	490	N/A	9	2	4	3	N/A
Selenium	ug/L	1	63	N/A	ND (1)	ND (1)	ND (1)	ND (1)	N/A
Silver	ug/L	0.1	1.5	N/A	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	N/A
Sodium	ug/L	200	2300000	N/A	264000	572000	837000	252000	N/A
Thallium	ug/L	0.1	510	N/A	0.4	ND (0.1)	ND (0.1)	0.1	N/A
Uranium	ug/L	0.1	420	N/A	5.6	2.8	0.5	2.5	N/A
Vanadium	ug/L	0.5	250	N/A	ND (0.5)	ND (0.5)	1.8	1.2	N/A
Zinc	ug/L	5	1100	N/A	7	ND (5)	ND (5)	ND (5)	N/A
Volatiles									
Acetone	ug/L	5.0	130000	N/A	N/A	ND (5.0)	N/A	N/A	N/A
Benzene	ug/L	0.5	44	N/A	N/A	ND (0.5)	N/A	N/A	N/A
Bromodichloromethane	ug/L	0.5	85000	N/A	N/A	ND (0.5)	N/A	N/A	N/A
Bromoform	ug/L	0.5	380	N/A	N/A	ND (0.5)	N/A	N/A	N/A
Bromomethane	ug/L	0.5	5.6	N/A	N/A	ND (0.5)	N/A	N/A	N/A
Carbon Tetrachloride	ug/L	0.2	0.79	N/A	N/A	ND (0.2)	N/A	N/A	N/A
Chlorobenzene	ug/L	0.5	630	N/A	N/A	ND (0.5)	N/A	N/A	N/A
Chloroform	ug/L	0.5	2.4	N/A	N/A	ND (0.5)	N/A	N/A	N/A
Dibromochloromethane	ug/L	0.5	82000	N/A	N/A	ND (0.5)	N/A	N/A	N/A
Dichlorodifluoromethane	ug/L	1.0	4400	N/A	N/A	ND (1.0)	N/A	N/A	N/A
1,2-Dichlorobenzene	ug/L	0.5	4600	N/A	N/A	ND (0.5)	N/A	N/A	N/A
1,3-Dichlorobenzene	ug/L	0.5	9600	N/A	N/A	ND (0.5)	N/A	N/A	N/A
1,4-Dichlorobenzene	ug/L	0.5	8.0	N/A	N/A	ND (0.5)	N/A	N/A	N/A
1,1-Dichloroethane	ug/L	0.5	320	N/A	N/A	ND (0.5)	N/A	N/A	N/A
1,2-Dichloroethane	ug/L	0.5	1.6	N/A	N/A	ND (0.5)	N/A	N/A	N/A
1,1-Dichloroethylene	ug/L	0.5	1.6	N/A	N/A	ND (0.5)	N/A	N/A	N/A
cis-1,2-Dichloroethylene	ug/L	0.5	1.6	N/A	N/A	ND (0.5)	N/A	N/A	N/A
trans-1,2-Dichloroethylene	ug/L	0.5	1.6	N/A	N/A	ND (0.5)	N/A	N/A	N/A
1,2-Dichloropropane	ug/L	0.5	16	N/A	N/A	ND (0.5)	N/A	N/A	N/A
cis-1,3-Dichloropropylene	ug/L	0.5	5.2	N/A	N/A	ND (0.5)	N/A	N/A	N/A
trans-1,3-Dichloropropylene	ug/L	0.5	5.2	N/A	N/A	ND (0.5)	N/A	N/A	N/A
1,3-Dichloropropene, total	ug/L	0.5	5.2	N/A	N/A	ND (0.5)	N/A	N/A	N/A
Ethylbenzene	ug/L	0.5	2300	N/A	N/A	ND (0.5)	N/A	N/A	N/A
Ethylene dibromide (dibromoethane, 1,	ug/L	0.2	NV	N/A	N/A	ND (0.2)	N/A	N/A	N/A
Hexane	ug/L	1.0	51	N/A	N/A	ND (1.0)	N/A	N/A	N/A
Methyl Ethyl Ketone (2-Butanone)	ug/L	5.0	NV	N/A	N/A	ND (5.0)	N/A	N/A	N/A
Methyl Isobutyl Ketone	ug/L	5.0	140000	N/A	N/A	ND (5.0)	N/A	N/A	N/A
Methyl tert-butyl ether	ug/L	2.0	190	N/A	N/A	ND (2.0)	N/A	N/A	N/A
Methylene Chloride	ug/L	5.0	610	N/A	N/A	ND (5.0)	N/A	N/A	N/A
Styrene	ug/L	0.5	1300	N/A	N/A	ND (0.5)	N/A	N/A	N/A
1,1,1,2-Tetrachloroethane	ug/L	0.5	3.3	N/A	N/A	ND (0.5)	N/A	N/A	N/A
1,1,2,2-Tetrachloroethane	ug/L	0.5	3.2	N/A	N/A	ND (0.5)	N/A	N/A	N/A
Tetrachloroethylene	ug/L	0.5	1.6	N/A	N/A	ND (0.5)	N/A	N/A	N/A
Toluene	ug/L	0.5	18000	N/A	N/A	ND (0.5)	N/A	N/A	N/A
1,1,1-Trichloroethane	ug/L	0.5	640	N/A	N/A	ND (0.5)	N/A	N/A	N/A
1,1,2-Trichloroethane	ug/L	0.5	4.7	N/A	N/A	ND (0.5)	N/A	N/A	N/A
Trichloroethylene	ug/L	0.5	1.6	N/A	N/A	ND (0.5)	N/A	N/A	N/A
Trichlorofluoromethane	ug/L	1.0	2500	N/A	N/A	ND (1.0)	N/A	N/A	N/A
Vinyl Chloride	ug/L	0.5	0.5	N/A	N/A	ND (0.5)	N/A	N/A	N/A
m/p-Xylene	ug/L	0.5	4200	N/A	N/A	ND (0.5)	N/A	N/A	N/A
o-Xylene	ug/L	0.5	4200	N/A	N/A	ND (0.5)	N/A	N/A	N/A
Xylenes, total	ug/L	0.5	4200	N/A	N/A	ND (0.5)	N/A	N/A	N/A
BTEX									
Benzene	ug/L	0.5	44	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Ethylbenzene	ug/L	0.5	2300	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Toluene	ug/L	0.5	18000	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
m/p-Xylene	ug/L	0.5	4200	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
o-Xylene	ug/L	0.5	4200	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Xylenes, total	ug/L	0.5	4200	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Hydrocarbons									
F1 PHCs (C6-C10)	ug/L	25	750	ND (25)	ND (25)	ND (25)	ND (25)	ND (25)	ND (25)
F2 PHCs (C10-C16)	ug/L	100	150	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)
F3 PHCs (C16-C34)	ug/L	100	500	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)
F4 PHCs (C34-C50)	ug/L	100	500	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)
Semi-Volatiles									
Acenaphthene	ug/L	0.05	600	N/A	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	N/A
Acenaphthylene	ug/L	0.05	1.8	N/A	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	N/A
Anthracene	ug/L	0.01	2.4	N/A	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	N/A
Benzo[a]anthracene	ug/L	0.01	4.7	N/A	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	N/A
Benzo[a]pyrene	ug/L	0.01	0.81	N/A	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	N/A
Benzo[b]fluoranthene	ug/L	0.05	0.75	N/A	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	N/A
Benzo[g,h,i]perylene	ug/L	0.05	0.2	N/A	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	N/A
Benzo[k]fluoranthene	ug/L	0.05	0.4	N/A	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	N/A
Chrysene	ug/L	0.05	1.0	N/A	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	N/A
Dibenzo[a,h]anthracene	ug/L	0.05	0.52	N/A	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	N/A
Fluoranthene	ug/L	0.01	130	N/A	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	N/A
Fluorene	ug/L	0.05	400	N/A	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	N/A
Indeno [1,2,3-cd] pyrene	ug/L	0.05	NV	N/A	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	N/A
1-Methylnaphthalene	ug/L	0.05	1800	N/A	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	N/A
2-Methylnaphthalene	ug/L	0.05	1800	N/A	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	N/A
Methylnaphthalene (1&2)	ug/L	0.10	1800	N/A	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)	N/A
Naphthalene	ug/L	0.05	1400	N/A	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	N/A
Phenanthrene	ug/L	0.05	580	N/A	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	N/A
Pyrene	ug/L	0.01	68	N/A	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	N/A
PCBs									
PCBs, total	ug/L	0.05	7.8	N/A	N/A	N/A	N/A	ND (0.05)	N/A

2.00 Sample exceeds Reg 153/04-Table 3 Non-Potable Groundwater, coarse Standards
ND (0.2) No concentrations identified above the MDL
NA Parameter not analysed
NV No value given for indicated parameter

Parameter	Sample ID / Screen Interval (m)	Units	Reg 153/04-Table 3 Non-Potable Groundwater, coarse Standards	Concentration
Antimony	BH20-23 2348104-05 - 2.92 - 5.97	ug/L	20000	0.8
Barium	BH19-23 2348104-04 - 2.69 - 5.74	ug/L	29000	129
Boron	BH17-23 2348104-02 - 2.87 - 5.92	ug/L	45000	167
Cobalt	BH17-23 2348104-02 - 2.87 - 5.92	ug/L	66	1.6
Copper	BH20-23 2348104-05 - 2.92 - 5.97	ug/L	87	4.5
Lead	BH20-23 2348104-05 - 2.92 - 5.97	ug/L	25	0.8
Molybdenum	BH20-23 2348104-05 - 2.92 - 5.97	ug/L	9200	78.3
Nickel	BH17-23 2348104-02 - 2.87 - 5.92	ug/L	490	9
Sodium	BH19-23 2348104-04 - 2.69 - 5.74	ug/L	2300000	837000
Thallium	BH17-23 2348104-02 - 2.87 - 5.92	ug/L	510	0.4
Uranium	BH17-23 2348104-02 - 2.87 - 5.92	ug/L	420	5.6
Vanadium	BH19-23 2348104-04 - 2.69 - 5.74	ug/L	250	1.8
Zinc	BH17-23 2348104-02 - 2.87 - 5.92	ug/L	1100	7
All remaining parameters analysed were reported non-detect in all samples.				

Parameter	Sample ID / Depth (m)	Units	Reg 153/04-Table 3 Residential, coarse Standards	Concentration
SAR	BH18-23-SS2 2346505-04 - 0.76 - 1.37	N/A	5.0	6.69
Conductivity	BH18-23-SS2 2346505-04 - 0.76 - 1.37	uS/cm	700	555
Arsenic	BH20-23-SS2 2346505-08 - 0.76 - 1.37	ug/g dry	18	6
Barium	DUP-1 (DUP of BH19-23-AU1) 2346505-10 - 0.05 - 0.61	ug/g dry	390	195
Beryllium	DUP-1 (DUP of BH19-23-AU1) 2346505-10 - 0.05 - 0.61	ug/g dry	4.0	0.6
Boron	DUP-1 (DUP of BH19-23-AU1) 2346505-10 - 0.05 - 0.61	ug/g dry	120	15.1
Chromium	DUP-1 (DUP of BH19-23-AU1) 2346505-10 - 0.05 - 0.61	ug/g dry	160	21
Chromium (VI)	BH18-23-SS2 2346505-04 - 0.76 - 1.37	ug/g dry	8.0	0.3
Cobalt	DUP-1 (DUP of BH19-23-AU1) 2346505-10 - 0.05 - 0.61	ug/g dry	22	7
Copper	DUP-1 (DUP of BH19-23-AU1) 2346505-10 - 0.05 - 0.61	ug/g dry	140	13
Lead	DUP-1 (DUP of BH19-23-AU1) 2346505-10 - 0.05 - 0.61	ug/g dry	120	38
Mercury	BH19-23-AU1 2346505-06 - 0.05 - 0.61	ug/g dry	0.27	0.2
Molybdenum	BH16-23-SS3 2346505-01 - 1.52 - 2.13	ug/g dry	6.9	4
Nickel	DUP-1 (DUP of BH19-23-AU1) 2346505-10 - 0.05 - 0.61	ug/g dry	100	16
Zinc	DUP-1 (DUP of BH19-23-AU1) 2346505-10 - 0.05 - 0.61	ug/g dry	340	24
m/p-Xylene	BH20-23-SS5+SS6 2346505-09 - 3.05 - 4.19	ug/g dry	3.1	0.01
o-Xylene	BH16-23-SS6 2346505-02 - 3.81 - 4.42	ug/g dry	3.1	0.004
Xylenes, total	BH20-23-SS5+SS6 2346505-09 - 3.05 - 4.19	ug/g dry	3.1	0.014
F1 PHCs (C6-C10)	BH18-23-SS5 2346505-05 - 3.05 - 3.66	ug/g dry	55	10
F2 PHCs (C10-C16)	BH18-23-SS5 2346505-05 - 3.05 - 3.66	ug/g dry	98	18
F3 PHCs (C16-C34)	BH19-23-SS2 2346505-07 - 0.76 - 1.22	ug/g dry	300	45
F4 PHCs (C34-C50)	BH19-23-SS2 2346505-07 - 0.76 - 1.22	ug/g dry	2800	91
Acenaphthylene	BH19-23-AU1 2346505-06 - 0.05 - 0.61	ug/g dry	0.15	0.49
Anthracene	BH19-23-AU1 2346505-06 - 0.05 - 0.61	ug/g dry	0.67	2.52
Benzo[a]anthracene	BH19-23-AU1 2346505-06 - 0.05 - 0.61	ug/g dry	0.5	5.13
Benzo[a]pyrene	BH19-23-AU1 2346505-06 - 0.05 - 0.61	ug/g dry	0.3	3.37

Parameter	Sample ID / Depth (m)	Units	Reg 153/04-Table 3 Residential, coarse Standards	Concentration
Benzo[b]fluoranthene	BH19-23-AU1 2346505-06 - 0.05 - 0.61	ug/g dry	0.78	3.63
Benzo[g,h,i]perylene	BH19-23-AU1 2346505-06 - 0.05 - 0.61	ug/g dry	6.6	1.99
Benzo[k]fluoranthene	BH19-23-AU1 2346505-06 - 0.05 - 0.61	ug/g dry	0.78	2.29
1,1-Biphenyl	BH19-23-AU1 2346505-06 - 0.05 - 0.61	ug/g dry	0.31	ND (0.40)
Chrysene	BH19-23-AU1 2346505-06 - 0.05 - 0.61	ug/g dry	7.0	4.48
Dibenzo[a,h]anthracene	BH19-23-AU1 2346505-06 - 0.05 - 0.61	ug/g dry	0.1	0.55
Fluoranthene	BH19-23-AU1 2346505-06 - 0.05 - 0.61	ug/g dry	0.69	13.4
Fluorene	BH19-23-AU1 2346505-06 - 0.05 - 0.61	ug/g dry	62	0.77
Indeno [1,2,3-cd] pyrene	BH19-23-AU1 2346505-06 - 0.05 - 0.61	ug/g dry	0.38	1.92
Naphthalene	BH19-23-AU1 2346505-06 - 0.05 - 0.61	ug/g dry	0.6	0.36
Phenanthrene	BH19-23-AU1 2346505-06 - 0.05 - 0.61	ug/g dry	6.2	6.92
Pyrene	BH19-23-AU1 2346505-06 - 0.05 - 0.61	ug/g dry	78	10.3
All remaining parameters analysed were reported non-detect in all samples.				

Parameter	MDL	BH19-23-AU1 2346505-06	DUP-1 (DUP of BH19-23-AU1) 2346505-10	RPD (%)	QA/QC Result
Metals					
Antimony	1.0	ND (1)	ND (1)	0.0%	Within the acceptable range
Arsenic	1	3	4	28.6%	Outside the acceptable range
Barium	1.0	171	195	13.1%	Within the acceptable range
Beryllium	0.5	ND (0.5)	0.6	18.2%	Within the acceptable range
Boron	0.5	12.5	15.1	18.8%	Within the acceptable range
Cadmium	0.5	ND (0.5)	ND (0.5)	0.0%	Within the acceptable range
Chromium	0.2	17.0	21.0	21.1%	Outside the acceptable range
Cobalt	1.0	6.0	7.0	15.4%	Within the acceptable range
Copper	5	12	13	8.0%	Within the acceptable range
Lead	1	31.0	38.0	20.3%	Outside the acceptable range
Molybdenum	1	ND (1)	ND (1)	0.0%	Within the acceptable range
Nickel	5	14	16	13.3%	Within the acceptable range
Selenium	1	ND (1)	ND (1)	0.0%	Within the acceptable range
Silver	0.3	ND (0.3)	ND (0.3)	0.0%	Within the acceptable range
Thallium	1	ND (1)	ND (1)	0.0%	Within the acceptable range
Uranium	5	ND (5)	ND (5)	0.0%	Within the acceptable range
Vanadium	1	ND (1)	ND (1)	0.0%	Within the acceptable range
Zinc	10	19	24	23.3%	Outside the acceptable range

Parameter	MDL	BH16-23 2348104-01	DUP-A (DUP of BH16-23) 2348104-06	RPD (%)	QA/QC Result
BTEX					
Benzene	0.5	ND (0.5)	ND (0.5)	0.0%	Within the acceptable range
Ethylbenzene	0.5	ND (0.5)	ND (0.5)	0.0%	Within the acceptable range
Toluene	0.5	ND (0.5)	ND (0.5)	0.0%	Within the acceptable range
m/p-Xylene	0.5	ND (0.5)	ND (0.5)	0.0%	Within the acceptable range
o-Xylene	0.5	ND (0.5)	ND (0.5)	0.0%	Within the acceptable range
Xylenes, total	0.5	ND (0.5)	ND (0.5)	0.0%	Within the acceptable range
Hydrocarbons					
F1 PHCs (C6-C10)	25	ND (25)	ND (25)	0.0%	Within the acceptable range
F2 PHCs (C10-C16)	100	ND (100)	ND (100)	0.0%	Within the acceptable range
F3 PHCs (C16-C34)	100	ND (100)	ND (100)	0.0%	Within the acceptable range
F4 PHCs (C34-C50)	100	ND (100)	ND (100)	0.0%	Within the acceptable range

Test Hole ID	Ground Surface Elevation (masl)	Water Level Depth (m)	Water Level Elevation (masl)	Date of Measurement (dd-mm-yyyy)
BH16-23	62.13	3.65	58.48	23-Nov-2023
BH17-23	61.53	3.22	58.31	23-Nov-2023
BH18-23	61.62	3.35	58.27	23-Nov-2023
BH19-23	60.37	1.54	58.83	23-Nov-2023
BH20-24	62.01	3.67	58.34	23-Nov-2023

Test Hole ID	Temperature (˚C)	Conductivity (µS)	pH	Date of Measurement (dd-mm-yyyy)
BH16-23	12.6	1398	7.76	23-Nov-2023
BH17-23	12.3	1021	7.74	23-Nov-2023
BH18-23	12.1	830	7.53	23-Nov-2023
BH19-23	12.5	1736	7.80	23-Nov-2023
BH20-24	12.2	1529	7.77	23-Nov-2023

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Certificate of Analysis

Paterson Group Consulting Engineers (Ottawa)
9 Auriga Drive
Ottawa, ON K2E 7T9
Attn: Jesse Andrechek

Client PO: 58873
Project: PE6039
Custody:

Report Date: 22-Nov-2023
Order Date: 17-Nov-2023

Order #: 2346505

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

Paracel ID	Client ID
2346505-01	BH16-23-SS3
2346505-02	BH16-23-SS6
2346505-03	BH17-23-SS5
2346505-04	BH18-23-SS2
2346505-05	BH18-23-SS5
2346505-06	BH19-23-AU1
2346505-07	BH19-23-SS2
2346505-08	BH20-23-SS2
2346505-09	BH20-23-SS5+SS6
2346505-10	DUP-1

Approved By:

Mark Foto, M.Sc.

Lab Supervisor

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	21-Nov-23	22-Nov-23
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	21-Nov-23	22-Nov-23
Conductivity	MOE E3138 - probe @25 °C, water ext	21-Nov-23	21-Nov-23
Mercury by CVAA	EPA 7471B - CVAA, digestion	21-Nov-23	21-Nov-23
Metals, ICP-MS	EPA 6020 - Digestion - ICP-MS	21-Nov-23	21-Nov-23
PAHs by GC-MS	EPA 8270 - GC-MS, extraction	20-Nov-23	21-Nov-23
PCBs, total	SW846 8082A - GC-ECD	20-Nov-23	21-Nov-23
PHC F1	CWS Tier 1 - P&T GC-FID	20-Nov-23	21-Nov-23
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	20-Nov-23	21-Nov-23
SAR	Calculated	21-Nov-23	21-Nov-23
Solids, %	CWS Tier 1 - Gravimetric	20-Nov-23	21-Nov-23
VOCs by P&T GC-MS	EPA 8260 - P&T GC-MS	20-Nov-23	21-Nov-23

Certificate of Analysis

Report Date: 22-Nov-2023

Client: **Paterson Group Consulting Engineers (Ottawa)**

Order Date: 17-Nov-2023

Client PO: **58873**

Project Description: PE6039

	Client ID:	BH16-23-SS3	BH16-23-SS6	BH17-23-SS5	BH18-23-SS2	-	-
	Sample Date:	15-Nov-23 09:00	15-Nov-23 09:00	15-Nov-23 09:00	15-Nov-23 09:00		
	Sample ID:	2346505-01	2346505-02	2346505-03	2346505-04		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	96.5	87.2	94.2	86.9	-	-
General Inorganics							
SAR	0.01 N/A	-	-	-	6.69	-	-
Conductivity	5 uS/cm	-	-	-	555	-	-
Metals							
Antimony	1 ug/g	<1	-	<1	<1	-	-
Arsenic	1 ug/g	5	-	3	1	-	-
Barium	1 ug/g	49	-	69	25	-	-
Beryllium	0.5 ug/g	<0.5	-	<0.5	<0.5	-	-
Boron	5.0 ug/g	<5.0	-	5.7	<5.0	-	-
Cadmium	0.5 ug/g	<0.5	-	<0.5	<0.5	-	-
Chromium (VI)	0.2 ug/g	<0.2	-	<0.2	0.3	-	-
Chromium	5 ug/g	<5	-	7	10	-	-
Cobalt	1 ug/g	3	-	3	4	-	-
Copper	5 ug/g	<5	-	6	8	-	-
Lead	1 ug/g	7	-	11	2	-	-
Mercury	0.1 ug/g	<0.1	-	<0.1	<0.1	-	-
Molybdenum	1 ug/g	4	-	3	<1	-	-
Nickel	5 ug/g	6	-	7	6	-	-
Selenium	1 ug/g	<1	-	<1	<1	-	-
Silver	0.3 ug/g	<0.3	-	<0.3	<0.3	-	-
Thallium	1 ug/g	<1	-	<1	<1	-	-
Tin	5 ug/g	<5	-	<5	<5	-	-
Uranium	1 ug/g	<1	-	<1	<1	-	-
Vanadium	10 ug/g	<10	-	<10	21	-	-

Certificate of Analysis

Report Date: 22-Nov-2023

Client: **Paterson Group Consulting Engineers (Ottawa)**

Order Date: 17-Nov-2023

Client PO: **58873**

Project Description: PE6039

	Client ID:	BH16-23-SS3	BH16-23-SS6	BH17-23-SS5	BH18-23-SS2	-	-
	Sample Date:	15-Nov-23 09:00	15-Nov-23 09:00	15-Nov-23 09:00	15-Nov-23 09:00		
	Sample ID:	2346505-01	2346505-02	2346505-03	2346505-04		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Metals							
Zinc	20 ug/g	<20	-	<20	<20	-	-
Volatiles							
Benzene	0.002 mg/kg	-	<0.002	<0.002	-	-	-
Ethylbenzene	0.002 mg/kg	-	<0.002	<0.002	-	-	-
Toluene	0.002 mg/kg	-	<0.002	<0.002	-	-	-
m,p-Xylenes	0.002 mg/kg	-	0.006	<0.002	-	-	-
o-Xylene	0.002 mg/kg	-	0.004	<0.002	-	-	-
Xylenes, total	0.002 mg/kg	-	0.010	<0.002	-	-	-
Toluene-d8	Surrogate	-	101%	105%	-	-	-
Hydrocarbons							
F1 PHCs (C6-C10)	7 mg/kg	-	<7	<7	-	-	-
F2 PHCs (C10-C16)	4 mg/kg	-	8	<4	-	-	-
F3 PHCs (C16-C34)	8 mg/kg	-	42	<8	-	-	-
F4 PHCs (C34-C50)	6 mg/kg	-	10	<6	-	-	-
Semi-Volatiles							
1-Methylnaphthalene	0.02 mg/kg	<0.02	-	<0.02	<0.02	-	-
2-Methylnaphthalene	0.02 mg/kg	<0.02	-	<0.02	<0.02	-	-
Methylnaphthalene (1&2)	0.04 mg/kg	<0.04	-	<0.04	<0.04	-	-
Acenaphthene	0.02 mg/kg	<0.02	-	<0.02	<0.02	-	-
Acenaphthylene	0.02 mg/kg	<0.02	-	<0.02	<0.02	-	-
Anthracene	0.02 mg/kg	<0.02	-	0.03	<0.02	-	-
Benzo [a] anthracene	0.02 mg/kg	<0.02	-	0.04	0.03	-	-
Benzo [a] pyrene	0.02 mg/kg	<0.02	-	0.03	0.03	-	-
Benzo [b] fluoranthene	0.02 mg/kg	<0.02	-	0.03	0.04	-	-
Benzo [g,h,i] perylene	0.02 mg/kg	<0.02	-	<0.02	<0.02	-	-

	Client ID:	BH16-23-SS3	BH16-23-SS6	BH17-23-SS5	BH18-23-SS2	-	-
	Sample Date:	15-Nov-23 09:00	15-Nov-23 09:00	15-Nov-23 09:00	15-Nov-23 09:00		
	Sample ID:	2346505-01	2346505-02	2346505-03	2346505-04		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Semi-Volatiles							
Benzo [k] fluoranthene	0.02 mg/kg	<0.02	-	0.02	0.02	-	-
Biphenyl	0.02 mg/kg	<0.02	-	<0.02	<0.02	-	-
Chrysene	0.02 mg/kg	<0.02	-	0.03	0.02	-	-
Dibenzo [a,h] anthracene	0.02 mg/kg	<0.02	-	<0.02	<0.02	-	-
Fluoranthene	0.02 mg/kg	<0.02	-	0.11	0.04	-	-
Fluorene	0.02 mg/kg	<0.02	-	<0.02	<0.02	-	-
Indeno [1,2,3-cd] pyrene	0.02 mg/kg	<0.02	-	<0.02	<0.02	-	-
Naphthalene	0.01 mg/kg	<0.01	-	<0.01	<0.01	-	-
Phenanthrene	0.02 mg/kg	<0.02	-	0.08	0.02	-	-
Pyrene	0.02 mg/kg	<0.02	-	0.09	0.03	-	-
Quinoline	0.10 mg/kg	<0.10	-	<0.10	<0.10	-	-
2-Fluorobiphenyl	Surrogate	56.8%	-	75.1%	58.9%	-	-
Terphenyl-d14	Surrogate	55.3%	-	60.8%	60.8%	-	-

	Client ID:	BH18-23-SS5	BH19-23-AU1	BH19-23-SS2	BH20-23-SS2	-	-
	Sample Date:	15-Nov-23 09:00	15-Nov-23 09:00	15-Nov-23 09:00	16-Nov-23 09:00		
	Sample ID:	2346505-05	2346505-06	2346505-07	2346505-08		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	94.0	91.8	81.0	95.2	-	-
General Inorganics							
SAR	0.01 N/A	-	1.80	-	-	-	-
Conductivity	5 uS/cm	-	526	-	-	-	-
Metals							
Antimony	1 ug/g	-	<1	-	<1	-	-
Arsenic	1 ug/g	-	3	-	6	-	-
Barium	1 ug/g	-	171	-	55	-	-
Beryllium	0.5 ug/g	-	<0.5	-	<0.5	-	-
Boron	5.0 ug/g	-	12.5	-	<5.0	-	-
Cadmium	0.5 ug/g	-	<0.5	-	<0.5	-	-
Chromium (VI)	0.2 ug/g	-	<0.2	-	<0.2	-	-
Chromium	5 ug/g	-	17	-	<5	-	-
Cobalt	1 ug/g	-	6	-	4	-	-
Copper	5 ug/g	-	12	-	<5	-	-
Lead	1 ug/g	-	31	-	7	-	-
Mercury	0.1 ug/g	-	0.2	-	<0.1	-	-
Molybdenum	1 ug/g	-	<1	-	4	-	-
Nickel	5 ug/g	-	14	-	7	-	-
Selenium	1 ug/g	-	<1	-	<1	-	-
Silver	0.3 ug/g	-	<0.3	-	<0.3	-	-
Thallium	1 ug/g	-	<1	-	<1	-	-
Tin	5 ug/g	-	<5	-	<5	-	-
Uranium	1 ug/g	-	<1	-	<1	-	-
Vanadium	10 ug/g	-	19	-	<10	-	-

	Client ID:	BH18-23-SS5	BH19-23-AU1	BH19-23-SS2	BH20-23-SS2	-	-
	Sample Date:	15-Nov-23 09:00	15-Nov-23 09:00	15-Nov-23 09:00	16-Nov-23 09:00		
	Sample ID:	2346505-05	2346505-06	2346505-07	2346505-08		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Metals							
Zinc	20 ug/g	-	47	-	<20	-	-
Volatiles							
Acetone	0.50 mg/kg	<0.50	-	-	-	-	-
Benzene	0.02 mg/kg	<0.02	-	-	-	-	-
Bromodichloromethane	0.05 mg/kg	<0.05	-	-	-	-	-
Bromoform	0.05 mg/kg	<0.05	-	-	-	-	-
Bromomethane	0.05 mg/kg	<0.05	-	-	-	-	-
Carbon Tetrachloride	0.05 mg/kg	<0.05	-	-	-	-	-
Chlorobenzene	0.05 mg/kg	<0.05	-	-	-	-	-
Chloroethane	0.05 mg/kg	<0.05	-	-	-	-	-
Chloroform	0.05 mg/kg	<0.05	-	-	-	-	-
Chloromethane	0.20 mg/kg	<0.20	-	-	-	-	-
Dibromochloromethane	0.05 mg/kg	<0.05	-	-	-	-	-
Dichlorodifluoromethane	0.05 mg/kg	<0.05	-	-	-	-	-
1,2-Dibromoethane	0.05 mg/kg	<0.05	-	-	-	-	-
1,2-Dichlorobenzene	0.05 mg/kg	<0.05	-	-	-	-	-
1,3-Dichlorobenzene	0.05 mg/kg	<0.05	-	-	-	-	-
1,4-Dichlorobenzene	0.05 mg/kg	<0.05	-	-	-	-	-
1,1-Dichloroethane	0.05 mg/kg	<0.05	-	-	-	-	-
1,2-Dichloroethane	0.05 mg/kg	<0.05	-	-	-	-	-
1,1-Dichloroethylene	0.05 mg/kg	<0.05	-	-	-	-	-
cis-1,2-Dichloroethylene	0.05 mg/kg	<0.05	-	-	-	-	-
trans-1,2-Dichloroethylene	0.05 mg/kg	<0.05	-	-	-	-	-
1,2-Dichloroethylene, total	0.05 mg/kg	<0.05	-	-	-	-	-
1,2-Dichloropropane	0.05 mg/kg	<0.05	-	-	-	-	-

	Client ID:	BH18-23-SS5	BH19-23-AU1	BH19-23-SS2	BH20-23-SS2	-	-
	Sample Date:	15-Nov-23 09:00	15-Nov-23 09:00	15-Nov-23 09:00	16-Nov-23 09:00		
	Sample ID:	2346505-05	2346505-06	2346505-07	2346505-08		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Volatiles							
cis-1,3-Dichloropropylene	0.05 mg/kg	<0.05	-	-	-	-	-
trans-1,3-Dichloropropylene	0.05 mg/kg	<0.05	-	-	-	-	-
1,3-Dichloropropene, total	0.05 mg/kg	<0.05	-	-	-	-	-
Ethylbenzene	0.05 mg/kg	<0.05	-	-	-	-	-
Hexane	0.05 mg/kg	<0.05	-	-	-	-	-
Methyl Ethyl Ketone (2-Butanone)	0.50 mg/kg	<0.50	-	-	-	-	-
Methyl Butyl Ketone (2-Hexanone)	2.00 mg/kg	<2.00	-	-	-	-	-
Methyl Isobutyl Ketone	0.50 mg/kg	<0.50	-	-	-	-	-
Methyl tert-butyl ether	0.05 mg/kg	<0.05	-	-	-	-	-
Methylene Chloride	0.05 mg/kg	<0.05	-	-	-	-	-
Styrene	0.05 mg/kg	<0.05	-	-	-	-	-
1,1,1,2-Tetrachloroethane	0.05 mg/kg	<0.05	-	-	-	-	-
1,1,2,2-Tetrachloroethane	0.05 mg/kg	<0.05	-	-	-	-	-
Tetrachloroethylene	0.05 mg/kg	<0.05	-	-	-	-	-
Toluene	0.05 mg/kg	<0.05	-	-	-	-	-
1,2,4-Trichlorobenzene	0.05 mg/kg	<0.05	-	-	-	-	-
1,1,1-Trichloroethane	0.05 mg/kg	<0.05	-	-	-	-	-
1,1,2-Trichloroethane	0.05 mg/kg	<0.05	-	-	-	-	-
Trichloroethylene	0.05 mg/kg	<0.05	-	-	-	-	-
Trichlorofluoromethane	0.05 mg/kg	<0.05	-	-	-	-	-
1,3,5-Trimethylbenzene	0.05 mg/kg	0.12	-	-	-	-	-
Vinyl chloride	0.02 mg/kg	<0.02	-	-	-	-	-
Xylenes, total	0.05 mg/kg	0.38	-	-	-	-	-
m,p-Xylenes	0.05 mg/kg	0.27	-	-	-	-	-
o-Xylene	0.05 mg/kg	0.11	-	-	-	-	-

	Client ID:	BH18-23-SS5	BH19-23-AU1	BH19-23-SS2	BH20-23-SS2	-	-
	Sample Date:	15-Nov-23 09:00	15-Nov-23 09:00	15-Nov-23 09:00	16-Nov-23 09:00		
	Sample ID:	2346505-05	2346505-06	2346505-07	2346505-08		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Volatiles							
1,2,3-Trichlorobenzene	0.05 mg/kg	<0.05	-	-	-	-	-
1,2,4-Trimethylbenzene	0.05 mg/kg	0.11	-	-	-	-	-
4-Bromofluorobenzene	Surrogate	97.6%	-	-	-	-	-
Dibromofluoromethane	Surrogate	97.3%	-	-	-	-	-
Toluene-d8	Surrogate	102%	-	-	-	-	-
Benzene	0.002 mg/kg	-	-	<0.002	-	-	-
Ethylbenzene	0.002 mg/kg	-	-	<0.002	-	-	-
Toluene	0.002 mg/kg	-	-	<0.002	-	-	-
m,p-Xylenes	0.002 mg/kg	-	-	<0.002	-	-	-
o-Xylene	0.002 mg/kg	-	-	<0.002	-	-	-
Xylenes, total	0.002 mg/kg	-	-	<0.002	-	-	-
Toluene-d8	Surrogate	-	-	101%	-	-	-
Hydrocarbons							
F1 PHCs (C6-C10)	7 mg/kg	10	-	<7	-	-	-
F2 PHCs (C10-C16)	4 mg/kg	18	-	<4	-	-	-
F3 PHCs (C16-C34)	8 mg/kg	21	-	45	-	-	-
F4 PHCs (C34-C50)	6 mg/kg	9	-	91	-	-	-
Semi-Volatiles							
1-Methylnaphthalene	0.02 mg/kg	-	<0.40 [1]	-	<0.02	-	-
2-Methylnaphthalene	0.02 mg/kg	-	<0.40 [1]	-	<0.02	-	-
Methylnaphthalene (1&2)	0.04 mg/kg	-	<0.80 [1]	-	<0.04	-	-
Acenaphthene	0.02 mg/kg	-	<0.40 [1]	-	<0.02	-	-
Acenaphthylene	0.02 mg/kg	-	0.49	-	<0.02	-	-
Anthracene	0.02 mg/kg	-	2.52	-	<0.02	-	-
Benzo [a] anthracene	0.02 mg/kg	-	5.13	-	<0.02	-	-

	Client ID:	BH18-23-SS5	BH19-23-AU1	BH19-23-SS2	BH20-23-SS2	-	-
	Sample Date:	15-Nov-23 09:00	15-Nov-23 09:00	15-Nov-23 09:00	16-Nov-23 09:00		
	Sample ID:	2346505-05	2346505-06	2346505-07	2346505-08		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Semi-Volatiles							
Benzo [a] pyrene	0.02 mg/kg	-	3.37	-	<0.02	-	-
Benzo [b] fluoranthene	0.02 mg/kg	-	3.63	-	<0.02	-	-
Benzo [g,h,i] perylene	0.02 mg/kg	-	1.99	-	<0.02	-	-
Benzo [k] fluoranthene	0.02 mg/kg	-	2.29	-	<0.02	-	-
Biphenyl	0.02 mg/kg	-	<0.40 [1]	-	<0.02	-	-
Chrysene	0.02 mg/kg	-	4.48	-	<0.02	-	-
Dibenzo [a,h] anthracene	0.02 mg/kg	-	0.55	-	<0.02	-	-
Fluoranthene	0.02 mg/kg	-	13.4	-	<0.02	-	-
Fluorene	0.02 mg/kg	-	0.77	-	<0.02	-	-
Indeno [1,2,3-cd] pyrene	0.02 mg/kg	-	1.92	-	<0.02	-	-
Naphthalene	0.01 mg/kg	-	0.36	-	<0.01	-	-
Phenanthrene	0.02 mg/kg	-	6.92	-	<0.02	-	-
Pyrene	0.02 mg/kg	-	10.3	-	<0.02	-	-
Quinoline	0.10 mg/kg	-	<2.00 [1]	-	<0.10	-	-
2-Fluorobiphenyl	Surrogate	-	67.9%	-	66.9%	-	-
Terphenyl-d14	Surrogate	-	52.0%	-	54.6%	-	-
PCBs							
PCBs, total	0.05 ug/g	-	-	-	<0.05	-	-
Decachlorobiphenyl	Surrogate	-	-	-	122%	-	-

	Client ID:	BH20-23-SS5+SS6	DUP-1			-	-
	Sample Date:	16-Nov-23 09:00	15-Nov-23 09:00				
	Sample ID:	2346505-09	2346505-10				
	Matrix:	Soil	Soil				
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	91.2	91.5	-	-	-	-
Metals							
Antimony	1 ug/g	-	<1	-	-	-	-
Arsenic	1 ug/g	-	4	-	-	-	-
Barium	1 ug/g	-	195	-	-	-	-
Beryllium	0.5 ug/g	-	0.6	-	-	-	-
Boron	5.0 ug/g	-	15.1	-	-	-	-
Cadmium	0.5 ug/g	-	<0.5	-	-	-	-
Chromium	5 ug/g	-	21	-	-	-	-
Cobalt	1 ug/g	-	7	-	-	-	-
Copper	5 ug/g	-	13	-	-	-	-
Lead	1 ug/g	-	38	-	-	-	-
Molybdenum	1 ug/g	-	<1	-	-	-	-
Nickel	5 ug/g	-	16	-	-	-	-
Selenium	1 ug/g	-	<1	-	-	-	-
Silver	0.3 ug/g	-	<0.3	-	-	-	-
Thallium	1 ug/g	-	<1	-	-	-	-
Tin	5 ug/g	-	<5	-	-	-	-
Uranium	1 ug/g	-	<1	-	-	-	-
Vanadium	10 ug/g	-	24	-	-	-	-
Zinc	20 ug/g	-	57	-	-	-	-
Volatiles							
Benzene	0.002 mg/kg	<0.002	-	-	-	-	-
Ethylbenzene	0.002 mg/kg	<0.002	-	-	-	-	-
Toluene	0.002 mg/kg	<0.002	-	-	-	-	-

	Client ID:	BH20-23-SS5+SS6	DUP-1			-	-
	Sample Date:	16-Nov-23 09:00	15-Nov-23 09:00				
	Sample ID:	2346505-09	2346505-10				
	Matrix:	Soil	Soil				
	MDL/Units						
Volatiles							
m,p-Xylenes	0.002 mg/kg	0.010	-	-	-	-	-
o-Xylene	0.002 mg/kg	0.004	-	-	-	-	-
Xylenes, total	0.002 mg/kg	0.014	-	-	-	-	-
Toluene-d8	Surrogate	101%	-	-	-	-	-
Hydrocarbons							
F1 PHCs (C6-C10)	7 mg/kg	<7	-	-	-	-	-
F2 PHCs (C10-C16)	4 mg/kg	<4	-	-	-	-	-
F3 PHCs (C16-C34)	8 mg/kg	<8	-	-	-	-	-
F4 PHCs (C34-C50)	6 mg/kg	<6	-	-	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics								
Conductivity	ND	5	uS/cm					
Hydrocarbons								
F1 PHCs (C6-C10)	ND	7	mg/kg					
F2 PHCs (C10-C16)	ND	4	mg/kg					
F3 PHCs (C16-C34)	ND	8	mg/kg					
F4 PHCs (C34-C50)	ND	6	mg/kg					
Metals								
Antimony	ND	1	ug/g					
Arsenic	ND	1	ug/g					
Barium	ND	1	ug/g					
Beryllium	ND	0.5	ug/g					
Boron	ND	5.0	ug/g					
Cadmium	ND	0.5	ug/g					
Chromium (VI)	ND	0.2	ug/g					
Chromium	ND	5	ug/g					
Cobalt	ND	1	ug/g					
Copper	ND	5	ug/g					
Lead	ND	1	ug/g					
Mercury	ND	0.1	ug/g					
Molybdenum	ND	1	ug/g					
Nickel	ND	5	ug/g					
Selenium	ND	1	ug/g					
Silver	ND	0.3	ug/g					
Thallium	ND	1	ug/g					
Tin	ND	5	ug/g					
Uranium	ND	1	ug/g					
Vanadium	ND	10	ug/g					
Zinc	ND	20	ug/g					
PCBs								
PCBs, total	ND	0.05	ug/g					
Surrogate: Decachlorobiphenyl	*0.124*		*%*	*124*	*60-140*			
Semi-Volatiles								

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
1-Methylnaphthalene	ND	0.02	mg/kg					
2-Methylnaphthalene	ND	0.02	mg/kg					
Methylnaphthalene (1&2)	ND	0.04	mg/kg					
Acenaphthene	ND	0.02	mg/kg					
Acenaphthylene	ND	0.02	mg/kg					
Anthracene	ND	0.02	mg/kg					
Benzo [a] anthracene	ND	0.02	mg/kg					
Benzo [a] pyrene	ND	0.02	mg/kg					
Benzo [b] fluoranthene	ND	0.02	mg/kg					
Benzo [g,h,i] perylene	ND	0.02	mg/kg					
Benzo [k] fluoranthene	ND	0.02	mg/kg					
Biphenyl	ND	0.02	mg/kg					
Chrysene	ND	0.02	mg/kg					
Dibenzo [a,h] anthracene	ND	0.02	mg/kg					
Fluoranthene	ND	0.02	mg/kg					
Fluorene	ND	0.02	mg/kg					
Indeno [1,2,3-cd] pyrene	ND	0.02	mg/kg					
Naphthalene	ND	0.01	mg/kg					
Phenanthrene	ND	0.02	mg/kg					
Pyrene	ND	0.02	mg/kg					
Quinoline	ND	0.10	mg/kg					
Surrogate: 2-Fluorobiphenyl	*0.895*		*%*	*67.2*	*50-140*			
Surrogate: Terphenyl-d14	*0.833*		*%*	*62.4*	*50-140*			
Volatiles								
Acetone	ND	0.50	mg/kg					
Benzene	ND	0.02	mg/kg					
Bromodichloromethane	ND	0.05	mg/kg					
Bromoform	ND	0.05	mg/kg					
Bromomethane	ND	0.05	mg/kg					
Carbon Tetrachloride	ND	0.05	mg/kg					
Chlorobenzene	ND	0.05	mg/kg					
Chloroethane	ND	0.05	mg/kg					

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Chloroform	ND	0.05	mg/kg					
Chloromethane	ND	0.20	mg/kg					
Dibromochloromethane	ND	0.05	mg/kg					
Dichlorodifluoromethane	ND	0.05	mg/kg					
1,2-Dibromoethane	ND	0.05	mg/kg					
1,2-Dichlorobenzene	ND	0.05	mg/kg					
1,3-Dichlorobenzene	ND	0.05	mg/kg					
1,4-Dichlorobenzene	ND	0.05	mg/kg					
1,1-Dichloroethane	ND	0.05	mg/kg					
1,2-Dichloroethane	ND	0.05	mg/kg					
1,1-Dichloroethylene	ND	0.05	mg/kg					
cis-1,2-Dichloroethylene	ND	0.05	mg/kg					
trans-1,2-Dichloroethylene	ND	0.05	mg/kg					
1,2-Dichloroethylene, total	ND	0.05	mg/kg					
1,2-Dichloropropane	ND	0.05	mg/kg					
cis-1,3-Dichloropropylene	ND	0.05	mg/kg					
trans-1,3-Dichloropropylene	ND	0.05	mg/kg					
1,3-Dichloropropene, total	ND	0.05	mg/kg					
Ethylbenzene	ND	0.05	mg/kg					
Hexane	ND	0.05	mg/kg					
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	mg/kg					
Methyl Butyl Ketone (2-Hexanone)	ND	2.00	mg/kg					
Methyl Isobutyl Ketone	ND	0.50	mg/kg					
Methyl tert-butyl ether	ND	0.05	mg/kg					
Methylene Chloride	ND	0.05	mg/kg					
Styrene	ND	0.05	mg/kg					
1,1,1,2-Tetrachloroethane	ND	0.05	mg/kg					
1,1,2,2-Tetrachloroethane	ND	0.05	mg/kg					
Tetrachloroethylene	ND	0.05	mg/kg					
Toluene	ND	0.05	mg/kg					
1,2,4-Trichlorobenzene	ND	0.05	mg/kg					
1,1,1-Trichloroethane	ND	0.05	mg/kg					
1,1,2-Trichloroethane	ND	0.05	mg/kg					

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Trichloroethylene	ND	0.05	mg/kg					
Trichlorofluoromethane	ND	0.05	mg/kg					
1,3,5-Trimethylbenzene	ND	0.05	mg/kg					
Vinyl chloride	ND	0.02	mg/kg					
m,p-Xylenes	ND	0.05	mg/kg					
o-Xylene	ND	0.05	mg/kg					
Xylenes, total	ND	0.05	mg/kg					
1,2,3-Trichlorobenzene	ND	0.05	mg/kg					
1,2,4-Trimethylbenzene	ND	0.05	mg/kg					
Surrogate: 4-Bromofluorobenzene	*8.54*		*%*	*107*	*50-140*			
Surrogate: Dibromofluoromethane	*7.04*		*%*	*87.9*	*50-140*			
Surrogate: Toluene-d8	*8.13*		*%*	*102*	*50-140*			
Benzene	ND	0.002	mg/kg					
Ethylbenzene	ND	0.002	mg/kg					
Toluene	ND	0.002	mg/kg					
m,p-Xylenes	ND	0.002	mg/kg					
o-Xylene	ND	0.002	mg/kg					
Xylenes, total	ND	0.002	mg/kg					
Surrogate: Toluene-d8	*0.410*		*%*	*102*	*60-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
SAR	1.32	0.01	N/A	1.41			6.6	30	
Conductivity	189	5	uS/cm	189			0.2	5	
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	mg/kg	ND			NC	40	
F2 PHCs (C10-C16)	ND	4	mg/kg	ND			NC	30	
F3 PHCs (C16-C34)	50	8	mg/kg	70			34.2	30	QR-04
F4 PHCs (C34-C50)	141	6	mg/kg	236			50.6	30	QR-04
Metals									
Antimony	ND	1	ug/g	ND			NC	30	
Arsenic	4.5	1	ug/g	4.6			2.5	30	
Barium	62.8	1	ug/g	64.2			2.2	30	
Beryllium	0.63	0.5	ug/g	0.77			20.2	30	
Boron	16.1	5.0	ug/g	16.3			1.4	30	
Cadmium	ND	0.5	ug/g	ND			NC	30	
Chromium (VI)	ND	0.2	ug/g	ND			NC	35	
Chromium	25.2	5	ug/g	26.2			4.1	30	
Cobalt	7.0	1	ug/g	7.3			4.4	30	
Copper	17.4	5	ug/g	18.6			6.3	30	
Lead	8.7	1	ug/g	9.1			3.8	30	
Mercury	ND	0.1	ug/g	ND			NC	30	
Molybdenum	5.8	1	ug/g	1.5			NC	30	
Nickel	22.9	5	ug/g	23.7			3.6	30	
Selenium	ND	1	ug/g	ND			NC	30	
Silver	ND	0.3	ug/g	ND			NC	30	
Thallium	ND	1	ug/g	ND			NC	30	
Tin	ND	5	ug/g	ND			NC	30	
Uranium	ND	1	ug/g	ND			NC	30	
Vanadium	31.4	10	ug/g	32.0			1.9	30	
Zinc	63.0	20	ug/g	66.5			5.5	30	
PCBs									

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
PCBs, total	ND	0.05	ug/g	ND			NC	40	
Surrogate: Decachlorobiphenyl	*0.125*		*%*		*117*	*60-140*			
Physical Characteristics									
% Solids	96.5	0.1	% by Wt.	96.5			0.0	25	
Semi-Volatiles									
1-Methylnaphthalene	ND	0.02	mg/kg	ND			NC	40	
2-Methylnaphthalene	ND	0.02	mg/kg	ND			NC	40	
Acenaphthene	ND	0.02	mg/kg	ND			NC	40	
Acenaphthylene	ND	0.02	mg/kg	ND			NC	40	
Anthracene	ND	0.02	mg/kg	ND			NC	40	
Benzo [a] anthracene	ND	0.02	mg/kg	ND			NC	40	
Benzo [a] pyrene	ND	0.02	mg/kg	ND			NC	40	
Benzo [b] fluoranthene	ND	0.02	mg/kg	ND			NC	40	
Benzo [g,h,i] perylene	ND	0.02	mg/kg	ND			NC	40	
Benzo [k] fluoranthene	ND	0.02	mg/kg	ND			NC	40	
Biphenyl	ND	0.02	mg/kg	ND			NC	40	
Chrysene	ND	0.02	mg/kg	ND			NC	40	
Dibenzo [a,h] anthracene	ND	0.02	mg/kg	ND			NC	40	
Fluoranthene	ND	0.02	mg/kg	ND			NC	40	
Fluorene	ND	0.02	mg/kg	ND			NC	40	
Indeno [1,2,3-cd] pyrene	ND	0.02	mg/kg	ND			NC	40	
Naphthalene	ND	0.01	mg/kg	ND			NC	40	
Phenanthrene	ND	0.02	mg/kg	ND			NC	40	
Pyrene	ND	0.02	mg/kg	ND			NC	40	
Quinoline	ND	0.10	mg/kg	ND			NC	40	
Surrogate: 2-Fluorobiphenyl	*0.781*		*%*		*56.5*	*50-140*			
Surrogate: Terphenyl-d14	*0.703*		*%*		*50.9*	*50-140*			
Volatiles									
Acetone	ND	0.50	mg/kg	ND			NC	50	
Benzene	ND	0.02	mg/kg	ND			NC	50	
Bromodichloromethane	ND	0.05	mg/kg	ND			NC	50	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Bromoform	ND	0.05	mg/kg	ND			NC	50	
Bromomethane	ND	0.05	mg/kg	ND			NC	50	
Carbon Tetrachloride	ND	0.05	mg/kg	ND			NC	50	
Chlorobenzene	ND	0.05	mg/kg	ND			NC	50	
Chloroethane	ND	0.05	mg/kg	ND			NC	50	
Chloroform	ND	0.05	mg/kg	ND			NC	50	
Chloromethane	ND	0.20	mg/kg	ND			NC	50	
Dibromochloromethane	ND	0.05	mg/kg	ND			NC	50	
Dichlorodifluoromethane	ND	0.05	mg/kg	ND			NC	50	
1,2-Dibromoethane	ND	0.05	mg/kg	ND			NC	50	
1,2-Dichlorobenzene	ND	0.05	mg/kg	ND			NC	50	
1,3-Dichlorobenzene	ND	0.05	mg/kg	ND			NC	50	
1,4-Dichlorobenzene	ND	0.05	mg/kg	ND			NC	50	
1,1-Dichloroethane	ND	0.05	mg/kg	ND			NC	50	
1,2-Dichloroethane	ND	0.05	mg/kg	ND			NC	50	
1,1-Dichloroethylene	ND	0.05	mg/kg	ND			NC	50	
cis-1,2-Dichloroethylene	ND	0.05	mg/kg	ND			NC	50	
trans-1,2-Dichloroethylene	ND	0.05	mg/kg	ND			NC	50	
1,2-Dichloropropane	ND	0.05	mg/kg	ND			NC	50	
cis-1,3-Dichloropropylene	ND	0.05	mg/kg	ND			NC	50	
trans-1,3-Dichloropropylene	ND	0.05	mg/kg	ND			NC	50	
Ethylbenzene	ND	0.05	mg/kg	ND			NC	50	
Hexane	ND	0.05	mg/kg	ND			NC	50	
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	mg/kg	ND			NC	50	
Methyl Butyl Ketone (2-Hexanone)	ND	2.00	mg/kg	ND			NC	50	
Methyl Isobutyl Ketone	ND	0.50	mg/kg	ND			NC	50	
Methyl tert-butyl ether	ND	0.05	mg/kg	ND			NC	50	
Methylene Chloride	ND	0.05	mg/kg	ND			NC	50	
Styrene	ND	0.05	mg/kg	ND			NC	50	
1,1,1,2-Tetrachloroethane	ND	0.05	mg/kg	ND			NC	50	
1,1,2,2-Tetrachloroethane	ND	0.05	mg/kg	ND			NC	50	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Tetrachloroethylene	ND	0.05	mg/kg	ND			NC	50	
Toluene	ND	0.05	mg/kg	ND			NC	50	
1,2,4-Trichlorobenzene	ND	0.05	mg/kg	ND			NC	50	
1,1,1-Trichloroethane	ND	0.05	mg/kg	ND			NC	50	
1,1,2-Trichloroethane	ND	0.05	mg/kg	ND			NC	50	
Trichloroethylene	ND	0.05	mg/kg	ND			NC	50	
Trichlorofluoromethane	ND	0.05	mg/kg	ND			NC	50	
1,3,5-Trimethylbenzene	ND	0.05	mg/kg	ND			NC	50	
Vinyl chloride	ND	0.02	mg/kg	ND			NC	50	
m,p-Xylenes	ND	0.05	mg/kg	ND			NC	50	
o-Xylene	ND	0.05	mg/kg	ND			NC	50	
1,2,3-Trichlorobenzene	ND	0.05	mg/kg	ND			NC	50	
1,2,4-Trimethylbenzene	ND	0.05	mg/kg	ND			NC	50	
Surrogate: 4-Bromofluorobenzene	*13.1*		*%*		*105*	*50-140*			
Surrogate: Dibromofluoromethane	*14.3*		*%*		*115*	*50-140*			
Surrogate: Toluene-d8	*14.4*		*%*		*116*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	191	7	mg/kg	ND	111	85-115			
F2 PHCs (C10-C16)	97	4	mg/kg	ND	112	60-140			
F3 PHCs (C16-C34)	293	8	mg/kg	70	105	60-140			
F4 PHCs (C34-C50)	371	6	mg/kg	236	100	60-140			
Metals									
Antimony	35.6	1	ug/g	ND	71.2	70-130			
Arsenic	51.4	1	ug/g	1.8	99.2	70-130			
Barium	72.9	1	ug/g	25.7	94.4	70-130			
Beryllium	46.1	0.5	ug/g	ND	91.6	70-130			
Boron	48.0	5.0	ug/g	6.5	83.1	70-130			
Cadmium	46.3	0.5	ug/g	ND	92.3	70-130			
Chromium (VI)	4.4	0.2	ug/g	ND	75.0	70-130			
Chromium	61.5	5	ug/g	10.5	102	70-130			
Cobalt	51.5	1	ug/g	2.9	97.0	70-130			
Copper	51.7	5	ug/g	7.4	88.6	70-130			
Lead	45.3	1	ug/g	3.6	83.3	70-130			
Mercury	1.23	0.1	ug/g	ND	81.8	70-130			
Molybdenum	47.4	1	ug/g	ND	93.6	70-130			
Nickel	56.5	5	ug/g	9.5	93.9	70-130			
Selenium	43.4	1	ug/g	ND	86.4	70-130			
Silver	40.4	0.3	ug/g	ND	80.7	70-130			
Thallium	44.8	1	ug/g	ND	89.3	70-130			
Tin	46.6	5	ug/g	ND	92.8	70-130			
Uranium	44.0	1	ug/g	ND	87.2	70-130			
Vanadium	64.7	10	ug/g	12.8	104	70-130			
Zinc	68.1	20	ug/g	26.6	82.9	70-130			
PCBs									
PCBs, total	0.454	0.05	ug/g	ND	106	60-140			
Surrogate: Decachlorobiphenyl	*0.123*		*%*		*115*	*60-140*			
Semi-Volatiles									

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
1-Methylnaphthalene	0.099	0.02	mg/kg	ND	57.1	50-140			
2-Methylnaphthalene	0.108	0.02	mg/kg	ND	62.3	50-140			
Acenaphthene	0.117	0.02	mg/kg	ND	67.8	50-140			
Acenaphthylene	0.126	0.02	mg/kg	ND	72.7	50-140			
Anthracene	0.139	0.02	mg/kg	ND	80.4	50-140			
Benzo [a] anthracene	0.126	0.02	mg/kg	ND	73.0	50-140			
Benzo [a] pyrene	0.092	0.02	mg/kg	ND	53.2	50-140			
Benzo [b] fluoranthene	0.117	0.02	mg/kg	ND	67.9	50-140			
Benzo [g,h,i] perylene	0.096	0.02	mg/kg	ND	55.3	50-140			
Benzo [k] fluoranthene	0.124	0.02	mg/kg	ND	71.9	50-140			
Biphenyl	0.125	0.02	mg/kg	ND	72.3	50-140			
Chrysene	0.122	0.02	mg/kg	ND	70.4	50-140			
Dibenzo [a,h] anthracene	0.097	0.02	mg/kg	ND	56.0	50-140			
Fluoranthene	0.148	0.02	mg/kg	ND	85.8	50-140			
Fluorene	0.118	0.02	mg/kg	ND	68.1	50-140			
Indeno [1,2,3-cd] pyrene	0.102	0.02	mg/kg	ND	59.3	50-140			
Naphthalene	0.113	0.01	mg/kg	ND	65.2	50-140			
Phenanthrene	0.125	0.02	mg/kg	ND	72.5	50-140			
Pyrene	0.148	0.02	mg/kg	ND	85.4	50-140			
Quinoline	0.115	0.10	mg/kg	ND	66.6	50-140			
Surrogate: 2-Fluorobiphenyl	*0.797*		*%*		*57.6*	*50-140*			
Surrogate: Terphenyl-d14	*0.710*		*%*		*51.4*	*50-140*			
Volatiles									
Acetone	11.8	0.50	mg/kg	ND	118	50-140			
Benzene	3.90	0.02	mg/kg	ND	97.5	60-130			
Bromodichloromethane	3.75	0.05	mg/kg	ND	93.7	60-130			
Bromoform	2.97	0.05	mg/kg	ND	74.2	60-130			
Bromomethane	4.38	0.05	mg/kg	ND	110	50-140			
Carbon Tetrachloride	2.60	0.05	mg/kg	ND	65.0	60-130			
Chlorobenzene	4.66	0.05	mg/kg	ND	117	60-130			
Chloroethane	4.12	0.05	mg/kg	ND	103	50-140			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Chloroform	3.66	0.05	mg/kg	ND	91.4	60-130			
Chloromethane	3.75	0.20	mg/kg	ND	93.8	50-140			
Dibromochloromethane	3.21	0.05	mg/kg	ND	80.3	60-130			
Dichlorodifluoromethane	3.57	0.05	mg/kg	ND	89.4	50-140			
1,2-Dibromoethane	2.86	0.05	mg/kg	ND	71.6	60-130			
1,2-Dichlorobenzene	4.51	0.05	mg/kg	ND	113	60-130			
1,3-Dichlorobenzene	4.36	0.05	mg/kg	ND	109	60-130			
1,4-Dichlorobenzene	4.63	0.05	mg/kg	ND	116	60-130			
1,1-Dichloroethane	4.16	0.05	mg/kg	ND	104	60-130			
1,2-Dichloroethane	3.28	0.05	mg/kg	ND	81.9	60-130			
1,1-Dichloroethylene	4.29	0.05	mg/kg	ND	107	60-130			
cis-1,2-Dichloroethylene	4.06	0.05	mg/kg	ND	101	60-130			
trans-1,2-Dichloroethylene	4.16	0.05	mg/kg	ND	104	60-130			
1,2-Dichloropropane	3.50	0.05	mg/kg	ND	87.5	60-130			
cis-1,3-Dichloropropylene	2.70	0.05	mg/kg	ND	67.6	60-130			
trans-1,3-Dichloropropylene	3.55	0.05	mg/kg	ND	88.8	60-130			
Ethylbenzene	3.85	0.05	mg/kg	ND	96.1	60-130			
Hexane	4.83	0.05	mg/kg	ND	121	60-130			
Methyl Ethyl Ketone (2-Butanone)	7.53	0.50	mg/kg	ND	75.3	50-140			
Methyl Butyl Ketone (2-Hexanone)	11.0	2.00	mg/kg	ND	110	50-140			
Methyl Isobutyl Ketone	7.63	0.50	mg/kg	ND	76.3	50-140			
Methyl tert-butyl ether	8.35	0.05	mg/kg	ND	83.5	50-140			
Methylene Chloride	4.32	0.05	mg/kg	ND	108	60-130			
Styrene	3.92	0.05	mg/kg	ND	98.1	60-130			
1,1,1,2-Tetrachloroethane	3.06	0.05	mg/kg	ND	76.6	60-130			
1,1,2,2-Tetrachloroethane	3.18	0.05	mg/kg	ND	79.5	60-130			
Tetrachloroethylene	4.65	0.05	mg/kg	ND	116	60-130			
Toluene	4.21	0.05	mg/kg	ND	105	60-130			
1,2,4-Trichlorobenzene	3.08	0.05	mg/kg	ND	77.1	60-130			
1,1,1-Trichloroethane	3.84	0.05	mg/kg	ND	96.0	60-130			
1,1,2-Trichloroethane	3.68	0.05	mg/kg	ND	91.9	60-130			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Trichloroethylene	4.48	0.05	mg/kg	ND	112	60-130			
Trichlorofluoromethane	4.08	0.05	mg/kg	ND	102	50-140			
1,3,5-Trimethylbenzene	4.25	0.05	mg/kg	ND	106	60-130			
Vinyl chloride	3.57	0.02	mg/kg	ND	89.1	50-140			
m,p-Xylenes	8.62	0.05	mg/kg	ND	108	60-130			
o-Xylene	4.41	0.05	mg/kg	ND	110	60-130			
1,2,3-Trichlorobenzene	3.43	0.05	mg/kg	ND	85.8	60-130			
1,2,4-Trimethylbenzene	4.81	0.05	mg/kg	ND	120	60-130			
Surrogate: 4-Bromofluorobenzene	*8.68*		*%*		*108*	*50-140*			
Surrogate: Dibromofluoromethane	*7.23*		*%*		*90.3*	*50-140*			
Surrogate: Toluene-d8	*7.47*		*%*		*93.3*	*50-140*			
Benzene	0.187	0.002	mg/kg	ND	93.4	60-140			
Ethylbenzene	0.219	0.002	mg/kg	ND	109	60-140			
Toluene	0.178	0.002	mg/kg	ND	88.9	60-140			
m,p-Xylenes	0.392	0.002	mg/kg	ND	97.9	60-140			
o-Xylene	0.204	0.002	mg/kg	ND	102	60-140			
Surrogate: Toluene-d8	*0.367*		*%*		*91.6*	*60-140*			

Qualifier Notes:

Sample Qualifiers :

1: Elevated reporting limit due to dilution required because of high target analyte concentration.

QC Qualifiers:

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

Sample Data Revisions:

None

Certificate of Analysis

Report Date: 22-Nov-2023

Client: **Paterson Group Consulting Engineers (Ottawa)**

Order Date: 17-Nov-2023

Client PO: 58873

Project Description: PE6039

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 unlesss otherwise noted.

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: 2346505

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2346505	

Client Name: Paterson Group	Project Ref: PE6039
Contact Name: Jesse Andrechek	Quote #:
Address: 9 Auriga Dr, Ottawa	PO #: 58873
Telephone: 613 226-7381	E-mail: jandrechek@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 + PHCs F1-F4	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	EC/SAR	PCBs			
1	BH16-23-SS3	S			Nov 15/23				X	X	X	X						
2	BH16-23-SS6	↓			↓		X											
3	BH17-23-SS5						X		X	X	X	X						
4	BH18-23-SS2								X	X	X	X		X				
5	BH18-23-SS5							X										
6	BH19-23-AU1								X	X	X	X		X				
7	BH19-23-SS2				↓		X											
8	BH20-23-SS2				Nov 16/23				X	X	X	X			X			
9	BH20-23-SS5+SS6				Nov 16/23		X											
10	DUP-1	↓			Nov 15/23					X								

Comments:

Method of Delivery: Swift

Relinquished By (Sign): Trudy Blair	Received By Driver/Depot:	Received at Lab:	Verified By: SD
Relinquished By (Print): Trudy Blair	Date/Time:	Date/Time: Nov 17 2023 15:50	Date/Time: Nov 17 2023 4:33pm
Date/Time: Nov 17 2023	Temperature: °C	Temperature: 11.9	pH Verified: ☐ By:

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Certificate of Analysis

Paterson Group Consulting Engineers (Ottawa)
9 Auriga Drive
Ottawa, ON K2E 7T9
Attn: Jesse Andrechek

Client PO: 58932
Project: PE6039
Custody: 140703

Report Date: 4-Dec-2023
Order Date: 27-Nov-2023

Order #: 2348104

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

Paracel ID	Client ID
2348104-01	BH16-23
2348104-02	BH17-23
2348104-03	BH18-23
2348104-04	BH19-23
2348104-05	BH20-23
2348104-06	DUP-A

Approved By:

Mark Foto, M.Sc.

Lab Supervisor

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	29-Nov-23	29-Nov-23
Chromium, hexavalent - water	MOE E3056 - colourimetric	29-Nov-23	29-Nov-23
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	28-Nov-23	28-Nov-23
Metals, ICP-MS	EPA 200.8 - ICP-MS	28-Nov-23	29-Nov-23
PCBs, total	EPA 608 - GC-ECD	4-Dec-23	4-Dec-23
PHC F1	CWS Tier 1 - P&T GC-FID	28-Nov-23	29-Nov-23
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	30-Nov-23	1-Dec-23
REG 153: PAHs by GC-MS	EPA 625 - GC-MS, extraction	30-Nov-23	1-Dec-23
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	28-Nov-23	29-Nov-23

	Client ID:	BH16-23	BH17-23	BH18-23	BH19-23	-	-
	Sample Date:	23-Nov-23 09:00	23-Nov-23 09:00	23-Nov-23 09:00	23-Nov-23 09:00		
	Sample ID:	2348104-01	2348104-02	2348104-03	2348104-04		
	Matrix:	Water	Water	Water	Water		
	MDL/Units						
Metals							
Mercury	0.1 ug/L	-	<0.1	<0.1	<0.1	-	-
Antimony	0.5 ug/L	-	<0.5	<0.5	<0.5	-	-
Arsenic	1 ug/L	-	<1	<1	<1	-	-
Barium	1 ug/L	-	43	77	129	-	-
Beryllium	0.5 ug/L	-	<0.5	<0.5	<0.5	-	-
Boron	10 ug/L	-	167	70	46	-	-
Cadmium	0.1 ug/L	-	<0.1	<0.1	<0.1	-	-
Chromium (VI)	10 ug/L	-	<10	<10	<10	-	-
Chromium	1 ug/L	-	<1	<1	<1	-	-
Cobalt	0.5 ug/L	-	1.6	<0.5	<0.5	-	-
Copper	0.5 ug/L	-	1.2	1.7	0.9	-	-
Lead	0.1 ug/L	-	<0.1	<0.1	0.2	-	-
Molybdenum	0.5 ug/L	-	20.5	4.8	1.9	-	-
Nickel	1 ug/L	-	9	2	4	-	-
Selenium	1 ug/L	-	<1	<1	<1	-	-
Silver	0.1 ug/L	-	<0.1	<0.1	<0.1	-	-
Sodium	200 ug/L	-	264000	572000	837000	-	-
Thallium	0.1 ug/L	-	0.4	<0.1	<0.1	-	-
Uranium	0.1 ug/L	-	5.6	2.8	0.5	-	-
Vanadium	0.5 ug/L	-	<0.5	<0.5	1.8	-	-
Zinc	5 ug/L	-	7	<5	<5	-	-
Volatiles							
Acetone	5.0 ug/L	-	-	<5.0	-	-	-
Benzene	0.5 ug/L	-	-	<0.5	-	-	-
Bromodichloromethane	0.5 ug/L	-	-	<0.5	-	-	-

Certificate of Analysis

Report Date: 04-Dec-2023

Client: **Paterson Group Consulting Engineers (Ottawa)**

Order Date: 27-Nov-2023

Client PO: **58932**

Project Description: PE6039

	Client ID:	BH16-23	BH17-23	BH18-23	BH19-23	-	-
	Sample Date:	23-Nov-23 09:00	23-Nov-23 09:00	23-Nov-23 09:00	23-Nov-23 09:00		
	Sample ID:	2348104-01	2348104-02	2348104-03	2348104-04		
	Matrix:	Water	Water	Water	Water		
	MDL/Units						
Volatiles							
Bromoform	0.5 ug/L	-	-	<0.5	-	-	-
Bromomethane	0.5 ug/L	-	-	<0.5	-	-	-
Carbon Tetrachloride	0.2 ug/L	-	-	<0.2	-	-	-
Chlorobenzene	0.5 ug/L	-	-	<0.5	-	-	-
Chloroform	0.5 ug/L	-	-	<0.5	-	-	-
Dibromochloromethane	0.5 ug/L	-	-	<0.5	-	-	-
Dichlorodifluoromethane	1.0 ug/L	-	-	<1.0	-	-	-
1,2-Dichlorobenzene	0.5 ug/L	-	-	<0.5	-	-	-
1,3-Dichlorobenzene	0.5 ug/L	-	-	<0.5	-	-	-
1,4-Dichlorobenzene	0.5 ug/L	-	-	<0.5	-	-	-
1,1-Dichloroethane	0.5 ug/L	-	-	<0.5	-	-	-
1,2-Dichloroethane	0.5 ug/L	-	-	<0.5	-	-	-
1,1-Dichloroethylene	0.5 ug/L	-	-	<0.5	-	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	-	-	<0.5	-	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	-	-	<0.5	-	-	-
1,2-Dichloropropane	0.5 ug/L	-	-	<0.5	-	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	-	-	<0.5	-	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	-	-	<0.5	-	-	-
1,3-Dichloropropene, total	0.5 ug/L	-	-	<0.5	-	-	-
Ethylene dibromide (dibromoethane,	0.2 ug/L	-	-	<0.2	-	-	-
Ethylbenzene	0.5 ug/L	-	-	<0.5	-	-	-
Hexane	1.0 ug/L	-	-	<1.0	-	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	-	-	<5.0	-	-	-
Methyl Isobutyl Ketone	5.0 ug/L	-	-	<5.0	-	-	-
Methyl tert-butyl ether	2.0 ug/L	-	-	<2.0	-	-	-

Certificate of Analysis

Report Date: 04-Dec-2023

Client: **Paterson Group Consulting Engineers (Ottawa)**

Order Date: 27-Nov-2023

Client PO: **58932**

Project Description: PE6039

	Client ID:	BH16-23	BH17-23	BH18-23	BH19-23	-	-
	Sample Date:	23-Nov-23 09:00	23-Nov-23 09:00	23-Nov-23 09:00	23-Nov-23 09:00		
	Sample ID:	2348104-01	2348104-02	2348104-03	2348104-04		
	Matrix:	Water	Water	Water	Water		
	MDL/Units						
Volatiles							
Methylene Chloride	5.0 ug/L	-	-	<5.0	-	-	-
Styrene	0.5 ug/L	-	-	<0.5	-	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	-	-	<0.5	-	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	-	-	<0.5	-	-	-
Tetrachloroethylene	0.5 ug/L	-	-	<0.5	-	-	-
Toluene	0.5 ug/L	-	-	<0.5	-	-	-
1,1,1-Trichloroethane	0.5 ug/L	-	-	<0.5	-	-	-
1,1,2-Trichloroethane	0.5 ug/L	-	-	<0.5	-	-	-
Trichloroethylene	0.5 ug/L	-	-	<0.5	-	-	-
Trichlorofluoromethane	1.0 ug/L	-	-	<1.0	-	-	-
Vinyl chloride	0.5 ug/L	-	-	<0.5	-	-	-
m,p-Xylenes	0.5 ug/L	-	-	<0.5	-	-	-
o-Xylene	0.5 ug/L	-	-	<0.5	-	-	-
Xylenes, total	0.5 ug/L	-	-	<0.5	-	-	-
Dibromofluoromethane	Surrogate	-	-	97.2%	-	-	-
4-Bromofluorobenzene	Surrogate	-	-	88.0%	-	-	-
Toluene-d8	Surrogate	-	-	113%	-	-	-
Benzene	0.5 ug/L	<0.5	<0.5	-	<0.5	-	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	-	<0.5	-	-
Toluene	0.5 ug/L	<0.5	<0.5	-	<0.5	-	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	-	<0.5	-	-
o-Xylene	0.5 ug/L	<0.5	<0.5	-	<0.5	-	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	-	<0.5	-	-
Toluene-d8	Surrogate	107%	111%	-	104%	-	-
Hydrocarbons							

Certificate of Analysis

Report Date: 04-Dec-2023

Client: **Paterson Group Consulting Engineers (Ottawa)**

Order Date: 27-Nov-2023

Client PO: **58932**

Project Description: PE6039

	Client ID:	BH16-23	BH17-23	BH18-23	BH19-23	-	-
	Sample Date:	23-Nov-23 09:00	23-Nov-23 09:00	23-Nov-23 09:00	23-Nov-23 09:00		
	Sample ID:	2348104-01	2348104-02	2348104-03	2348104-04		
	Matrix:	Water	Water	Water	Water		
	MDL/Units						
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	-	-
Semi-Volatiles							
Acenaphthene	0.05 ug/L	-	<0.05	<0.05	<0.05	-	-
Acenaphthylene	0.05 ug/L	-	<0.05	<0.05	<0.05	-	-
Anthracene	0.01 ug/L	-	<0.01	<0.01	<0.01	-	-
Benzo [a] anthracene	0.01 ug/L	-	<0.01	<0.01	<0.01	-	-
Benzo [a] pyrene	0.01 ug/L	-	<0.01	<0.01	<0.01	-	-
Benzo [b] fluoranthene	0.05 ug/L	-	<0.05	<0.05	<0.05	-	-
Benzo [g,h,i] perylene	0.05 ug/L	-	<0.05	<0.05	<0.05	-	-
Benzo [k] fluoranthene	0.05 ug/L	-	<0.05	<0.05	<0.05	-	-
Chrysene	0.05 ug/L	-	<0.05	<0.05	<0.05	-	-
Dibenzo [a,h] anthracene	0.05 ug/L	-	<0.05	<0.05	<0.05	-	-
Fluoranthene	0.01 ug/L	-	<0.01	<0.01	<0.01	-	-
Fluorene	0.05 ug/L	-	<0.05	<0.05	<0.05	-	-
Indeno [1,2,3-cd] pyrene	0.05 ug/L	-	<0.05	<0.05	<0.05	-	-
1-Methylnaphthalene	0.05 ug/L	-	<0.05	<0.05	<0.05	-	-
2-Methylnaphthalene	0.05 ug/L	-	<0.05	<0.05	<0.05	-	-
Methylnaphthalene (1&2)	0.10 ug/L	-	<0.10	<0.10	<0.10	-	-
Naphthalene	0.05 ug/L	-	<0.05	<0.05	<0.05	-	-
Phenanthrene	0.05 ug/L	-	<0.05	<0.05	<0.05	-	-
Pyrene	0.01 ug/L	-	<0.01	<0.01	<0.01	-	-
2-Fluorobiphenyl	Surrogate	-	79.9%	76.6%	76.5%	-	-

		Client ID:	BH16-23	BH17-23	BH18-23	BH19-23		
		Sample Date:	23-Nov-23 09:00	23-Nov-23 09:00	23-Nov-23 09:00	23-Nov-23 09:00	-	-
		Sample ID:	2348104-01	2348104-02	2348104-03	2348104-04		
		Matrix:	Water	Water	Water	Water		
	MDL/Units							
Semi-Volatiles								
Terphenyl-d14	Surrogate		-	72.3%	72.6%	66.6%	-	-

	Client ID:	BH20-23	DUP-A			-	-
	Sample Date:	23-Nov-23 09:00	23-Nov-23 09:00				
	Sample ID:	2348104-05	2348104-06				
	Matrix:	Water	Water				
	MDL/Units						
Metals							
Mercury	0.1 ug/L	<0.1	-	-	-	-	-
Antimony	0.5 ug/L	0.8	-	-	-	-	-
Arsenic	1 ug/L	<1	-	-	-	-	-
Barium	1 ug/L	74	-	-	-	-	-
Beryllium	0.5 ug/L	<0.5	-	-	-	-	-
Boron	10 ug/L	109	-	-	-	-	-
Cadmium	0.1 ug/L	<0.1	-	-	-	-	-
Chromium	1 ug/L	<1	-	-	-	-	-
Chromium (VI)	10 ug/L	<10	-	-	-	-	-
Cobalt	0.5 ug/L	1.0	-	-	-	-	-
Copper	0.5 ug/L	4.5	-	-	-	-	-
Lead	0.1 ug/L	0.8	-	-	-	-	-
Molybdenum	0.5 ug/L	78.3	-	-	-	-	-
Nickel	1 ug/L	3	-	-	-	-	-
Selenium	1 ug/L	<1	-	-	-	-	-
Silver	0.1 ug/L	<0.1	-	-	-	-	-
Sodium	200 ug/L	252000	-	-	-	-	-
Thallium	0.1 ug/L	0.1	-	-	-	-	-
Uranium	0.1 ug/L	2.5	-	-	-	-	-
Vanadium	0.5 ug/L	1.2	-	-	-	-	-
Zinc	5 ug/L	<5	-	-	-	-	-
Volatiles							
Benzene	0.5 ug/L	<0.5	<0.5	-	-	-	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	-	-	-	-
Toluene	0.5 ug/L	<0.5	<0.5	-	-	-	-

	Client ID:	BH20-23	DUP-A			-	-
	Sample Date:	23-Nov-23 09:00	23-Nov-23 09:00				
	Sample ID:	2348104-05	2348104-06				
	Matrix:	Water	Water				
	MDL/Units						
Volatiles							
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	-	-	-	-
o-Xylene	0.5 ug/L	<0.5	<0.5	-	-	-	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	-	-	-	-
Toluene-d8	Surrogate	106%	114%	-	-	-	-
Hydrocarbons							
F1 PHCs (C6-C10)	25 ug/L	<25	<25	-	-	-	-
F2 PHCs (C10-C16)	100 ug/L	<100	<100	-	-	-	-
F3 PHCs (C16-C34)	100 ug/L	<100	<100	-	-	-	-
F4 PHCs (C34-C50)	100 ug/L	<100	<100	-	-	-	-
Semi-Volatiles							
Acenaphthene	0.05 ug/L	<0.05	-	-	-	-	-
Acenaphthylene	0.05 ug/L	<0.05	-	-	-	-	-
Anthracene	0.01 ug/L	<0.01	-	-	-	-	-
Benzo [a] anthracene	0.01 ug/L	<0.01	-	-	-	-	-
Benzo [a] pyrene	0.01 ug/L	<0.01	-	-	-	-	-
Benzo [b] fluoranthene	0.05 ug/L	<0.05	-	-	-	-	-
Benzo [g,h,i] perylene	0.05 ug/L	<0.05	-	-	-	-	-
Benzo [k] fluoranthene	0.05 ug/L	<0.05	-	-	-	-	-
Chrysene	0.05 ug/L	<0.05	-	-	-	-	-
Dibenzo [a,h] anthracene	0.05 ug/L	<0.05	-	-	-	-	-
Fluoranthene	0.01 ug/L	<0.01	-	-	-	-	-
Fluorene	0.05 ug/L	<0.05	-	-	-	-	-
Indeno [1,2,3-cd] pyrene	0.05 ug/L	<0.05	-	-	-	-	-
1-Methylnaphthalene	0.05 ug/L	<0.05	-	-	-	-	-
2-Methylnaphthalene	0.05 ug/L	<0.05	-	-	-	-	-

	Client ID:	BH20-23	DUP-A			-	-
	Sample Date:	23-Nov-23 09:00	23-Nov-23 09:00				
	Sample ID:	2348104-05	2348104-06				
	Matrix:	Water	Water				
	MDL/Units						
Semi-Volatiles							
Methylnaphthalene (1&2)	0.10 ug/L	<0.10	-	-	-	-	-
Naphthalene	0.05 ug/L	<0.05	-	-	-	-	-
Phenanthrene	0.05 ug/L	<0.05	-	-	-	-	-
Pyrene	0.01 ug/L	<0.01	-	-	-	-	-
2-Fluorobiphenyl	Surrogate	78.8%	-	-	-	-	-
Terphenyl-d14	Surrogate	70.9%	-	-	-	-	-
PCBs							
PCBs, total	0.05 ug/L	<0.05	-	-	-	-	-
Decachlorobiphenyl	Surrogate	111%	-	-	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons								
F1 PHCs (C6-C10)	ND	25	ug/L					
F2 PHCs (C10-C16)	ND	100	ug/L					
F3 PHCs (C16-C34)	ND	100	ug/L					
F4 PHCs (C34-C50)	ND	100	ug/L					
Metals								
Mercury	ND	0.1	ug/L					
Antimony	ND	0.5	ug/L					
Arsenic	ND	1	ug/L					
Barium	ND	1	ug/L					
Beryllium	ND	0.5	ug/L					
Boron	ND	10	ug/L					
Cadmium	ND	0.1	ug/L					
Chromium (VI)	ND	10	ug/L					
Chromium	ND	1	ug/L					
Cobalt	ND	0.5	ug/L					
Copper	ND	0.5	ug/L					
Lead	ND	0.1	ug/L					
Molybdenum	ND	0.5	ug/L					
Nickel	ND	1	ug/L					
Selenium	ND	1	ug/L					
Silver	ND	0.1	ug/L					
Sodium	ND	200	ug/L					
Thallium	ND	0.1	ug/L					
Uranium	ND	0.1	ug/L					
Vanadium	ND	0.5	ug/L					
Zinc	ND	5	ug/L					
PCBs								
PCBs, total	ND	0.05	ug/L					
Surrogate: Decachlorobiphenyl	*0.650*		*%*	*130*	*60-140*			
Semi-Volatiles								
Acenaphthene	ND	0.05	ug/L					
Acenaphthylene	ND	0.05	ug/L					

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Anthracene	ND	0.01	ug/L					
Benzo [a] anthracene	ND	0.01	ug/L					
Benzo [a] pyrene	ND	0.01	ug/L					
Benzo [b] fluoranthene	ND	0.05	ug/L					
Benzo [g,h,i] perylene	ND	0.05	ug/L					
Benzo [k] fluoranthene	ND	0.05	ug/L					
Chrysene	ND	0.05	ug/L					
Dibenzo [a,h] anthracene	ND	0.05	ug/L					
Fluoranthene	ND	0.01	ug/L					
Fluorene	ND	0.05	ug/L					
Indeno [1,2,3-cd] pyrene	ND	0.05	ug/L					
1-Methylnaphthalene	ND	0.05	ug/L					
2-Methylnaphthalene	ND	0.05	ug/L					
Methylnaphthalene (1&2)	ND	0.10	ug/L					
Naphthalene	ND	0.05	ug/L					
Phenanthrene	ND	0.05	ug/L					
Pyrene	ND	0.01	ug/L					
Surrogate: 2-Fluorobiphenyl	*15.2*		*%*	*75.8*	*50-140*			
Surrogate: Terphenyl-d14	*12.6*		*%*	*62.8*	*50-140*			
Volatiles								
Acetone	ND	5.0	ug/L					
Benzene	ND	0.5	ug/L					
Bromodichloromethane	ND	0.5	ug/L					
Bromoform	ND	0.5	ug/L					
Bromomethane	ND	0.5	ug/L					
Carbon Tetrachloride	ND	0.2	ug/L					
Chlorobenzene	ND	0.5	ug/L					
Chloroform	ND	0.5	ug/L					
Dibromochloromethane	ND	0.5	ug/L					
Dichlorodifluoromethane	ND	1.0	ug/L					
1,2-Dichlorobenzene	ND	0.5	ug/L					
1,3-Dichlorobenzene	ND	0.5	ug/L					

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
1,4-Dichlorobenzene	ND	0.5	ug/L					
1,1-Dichloroethane	ND	0.5	ug/L					
1,2-Dichloroethane	ND	0.5	ug/L					
1,1-Dichloroethylene	ND	0.5	ug/L					
cis-1,2-Dichloroethylene	ND	0.5	ug/L					
trans-1,2-Dichloroethylene	ND	0.5	ug/L					
1,2-Dichloropropane	ND	0.5	ug/L					
cis-1,3-Dichloropropylene	ND	0.5	ug/L					
trans-1,3-Dichloropropylene	ND	0.5	ug/L					
1,3-Dichloropropene, total	ND	0.5	ug/L					
Ethylbenzene	ND	0.5	ug/L					
Ethylene dibromide (dibromoethane, 1,2-)	ND	0.2	ug/L					
Hexane	ND	1.0	ug/L					
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L					
Methyl Isobutyl Ketone	ND	5.0	ug/L					
Methyl tert-butyl ether	ND	2.0	ug/L					
Methylene Chloride	ND	5.0	ug/L					
Styrene	ND	0.5	ug/L					
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L					
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L					
Tetrachloroethylene	ND	0.5	ug/L					
Toluene	ND	0.5	ug/L					
1,1,1-Trichloroethane	ND	0.5	ug/L					
1,1,2-Trichloroethane	ND	0.5	ug/L					
Trichloroethylene	ND	0.5	ug/L					
Trichlorofluoromethane	ND	1.0	ug/L					
Vinyl chloride	ND	0.5	ug/L					
m,p-Xylenes	ND	0.5	ug/L					
o-Xylene	ND	0.5	ug/L					
Xylenes, total	ND	0.5	ug/L					
Surrogate: 4-Bromofluorobenzene	*79.6*		*%*	*99.5*	*50-140*			
Surrogate: Dibromofluoromethane	*80.7*		*%*	*101*	*50-140*			

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Surrogate: Toluene-d8	*85.9*		*%*	*107*	*50-140*			
Benzene	ND	0.5	ug/L					
Ethylbenzene	ND	0.5	ug/L					
Toluene	ND	0.5	ug/L					
m,p-Xylenes	ND	0.5	ug/L					
o-Xylene	ND	0.5	ug/L					
Xylenes, total	ND	0.5	ug/L					
Surrogate: Toluene-d8	*85.9*		*%*	*107*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND			NC	30	
Metals									
Mercury	ND	0.1	ug/L	ND			NC	20	
Antimony	ND	0.5	ug/L	ND			NC	20	
Arsenic	ND	1	ug/L	ND			NC	20	
Barium	100	1	ug/L	102			1.4	20	
Beryllium	ND	0.5	ug/L	ND			NC	20	
Boron	39	10	ug/L	42			8.2	20	
Cadmium	ND	0.1	ug/L	ND			NC	20	
Chromium (VI)	ND	10	ug/L	ND			NC	20	
Chromium	1.3	1	ug/L	1.3			1.0	20	
Cobalt	0.71	0.5	ug/L	0.71			0.2	20	
Copper	4.34	0.5	ug/L	4.43			2.2	20	
Lead	1.16	0.1	ug/L	1.10			4.7	20	
Molybdenum	0.65	0.5	ug/L	0.80			NC	20	
Nickel	1.9	1	ug/L	2.0			4.3	20	
Selenium	ND	1	ug/L	ND			NC	20	
Silver	ND	0.1	ug/L	ND			NC	20	
Sodium	148000	200	ug/L	152000			2.5	20	
Thallium	ND	0.1	ug/L	ND			NC	20	
Uranium	0.7	0.1	ug/L	0.7			1.9	20	
Vanadium	3.93	0.5	ug/L	4.00			1.8	20	
Zinc	5	5	ug/L	5			4.2	20	
Volatiles									
Acetone	ND	5.0	ug/L	ND			NC	30	
Benzene	ND	0.5	ug/L	ND			NC	30	
Bromodichloromethane	ND	0.5	ug/L	ND			NC	30	
Bromoform	ND	0.5	ug/L	ND			NC	30	
Bromomethane	ND	0.5	ug/L	ND			NC	30	
Carbon Tetrachloride	ND	0.2	ug/L	ND			NC	30	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Chlorobenzene	ND	0.5	ug/L	ND			NC	30	
Chloroform	ND	0.5	ug/L	ND			NC	30	
Dibromochloromethane	ND	0.5	ug/L	ND			NC	30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND			NC	30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,1-Dichloroethane	ND	0.5	ug/L	ND			NC	30	
1,2-Dichloroethane	ND	0.5	ug/L	ND			NC	30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
1,2-Dichloropropane	ND	0.5	ug/L	ND			NC	30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND			NC	30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND			NC	30	
Ethylbenzene	ND	0.5	ug/L	ND			NC	30	
Ethylene dibromide (dibromoethane, 1,2-)	ND	0.2	ug/L	ND			NC	30	
Hexane	ND	1.0	ug/L	ND			NC	30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND			NC	30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND			NC	30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND			NC	30	
Methylene Chloride	ND	5.0	ug/L	ND			NC	30	
Styrene	ND	0.5	ug/L	ND			NC	30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND			NC	30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND			NC	30	
Tetrachloroethylene	ND	0.5	ug/L	ND			NC	30	
Toluene	ND	0.5	ug/L	ND			NC	30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND			NC	30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND			NC	30	
Trichloroethylene	ND	0.5	ug/L	ND			NC	30	
Trichlorofluoromethane	ND	1.0	ug/L	ND			NC	30	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Vinyl chloride	ND	0.5	ug/L	ND			NC	30	
m,p-Xylenes	ND	0.5	ug/L	ND			NC	30	
o-Xylene	ND	0.5	ug/L	ND			NC	30	
Surrogate: 4-Bromofluorobenzene	*67.6*		*%*		*84.5*	*50-140*			
Surrogate: Dibromofluoromethane	*87.0*		*%*		*109*	*50-140*			
Surrogate: Toluene-d8	*84.5*		*%*		*106*	*50-140*			
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	*84.5*		*%*		*106*	*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)	2230	25	ug/L	ND	111	85-115			
F2 PHCs (C10-C16)	1530	100	ug/L	ND	95.6	60-140			
F3 PHCs (C16-C34)	4290	100	ug/L	ND	109	60-140			
F4 PHCs (C34-C50)	2640	100	ug/L	ND	106	60-140			
Metals									
Mercury	2.86	0.1	ug/L	ND	95.4	70-130			
Arsenic	49.4	1	ug/L	ND	97.7	80-120			
Barium	132	1	ug/L	102	61.0	80-120			QM-07
Beryllium	44.0	0.5	ug/L	ND	88.0	80-120			
Boron	77	10	ug/L	42	70.2	80-120			QM-07
Cadmium	40.3	0.1	ug/L	ND	80.5	80-120			
Chromium (VI)	187	10	ug/L	ND	93.5	70-130			
Chromium	50.0	1	ug/L	1.3	97.4	80-120			
Cobalt	47.8	0.5	ug/L	0.71	94.2	80-120			
Copper	49.5	0.5	ug/L	4.43	90.0	80-120			
Lead	39.9	0.1	ug/L	1.10	77.7	80-120			QM-07
Molybdenum	41.7	0.5	ug/L	ND	83.3	80-120			
Nickel	48.2	1	ug/L	2.0	92.5	80-120			
Selenium	41.9	1	ug/L	ND	83.1	80-120			
Silver	49.6	0.1	ug/L	ND	99.2	80-120			
Sodium	9170	200	ug/L	ND	91.7	80-120			
Thallium	41.2	0.1	ug/L	ND	82.3	80-120			
Uranium	44.3	0.1	ug/L	0.7	87.2	80-120			
Vanadium	53.6	0.5	ug/L	4.00	99.2	80-120			
Zinc	44	5	ug/L	5	78.3	80-120			QM-07
PCBs									
PCBs, total	1.15	0.05	ug/L	ND	115	65-135			
Surrogate: Decachlorobiphenyl	*0.380*		*%*		*76.0*	*60-140*			
Semi-Volatiles									
Acenaphthene	5.02	0.05	ug/L	ND	100	50-140			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Acenaphthylene	5.31	0.05	ug/L	ND	106	50-140			
Anthracene	6.18	0.01	ug/L	ND	124	50-140			
Benzo [a] anthracene	6.00	0.01	ug/L	ND	120	50-140			
Benzo [a] pyrene	4.72	0.01	ug/L	ND	94.5	50-140			
Benzo [b] fluoranthene	5.92	0.05	ug/L	ND	118	50-140			
Benzo [g,h,i] perylene	5.32	0.05	ug/L	ND	106	50-140			
Benzo [k] fluoranthene	6.38	0.05	ug/L	ND	128	50-140			
Chrysene	5.88	0.05	ug/L	ND	118	50-140			
Dibenzo [a,h] anthracene	5.21	0.05	ug/L	ND	104	50-140			
Fluoranthene	5.86	0.01	ug/L	ND	117	50-140			
Fluorene	4.90	0.05	ug/L	ND	98.0	50-140			
Indeno [1,2,3-cd] pyrene	5.58	0.05	ug/L	ND	112	50-140			
1-Methylnaphthalene	4.34	0.05	ug/L	ND	86.8	50-140			
2-Methylnaphthalene	4.53	0.05	ug/L	ND	90.6	50-140			
Naphthalene	4.46	0.05	ug/L	ND	89.1	50-140			
Phenanthrene	5.30	0.05	ug/L	ND	106	50-140			
Pyrene	5.99	0.01	ug/L	ND	120	50-140			
Surrogate: 2-Fluorobiphenyl	*18.2*		*%*		*91.2*	*50-140*			
Surrogate: Terphenyl-d14	*13.9*		*%*		*69.3*	*50-140*			
Volatiles									
Acetone	126	5.0	ug/L	ND	126	50-140			
Benzene	39.1	0.5	ug/L	ND	97.8	60-130			
Bromodichloromethane	36.3	0.5	ug/L	ND	90.6	60-130			
Bromoform	42.9	0.5	ug/L	ND	107	60-130			
Bromomethane	40.5	0.5	ug/L	ND	101	50-140			
Carbon Tetrachloride	38.5	0.2	ug/L	ND	96.3	60-130			
Chlorobenzene	45.3	0.5	ug/L	ND	113	60-130			
Chloroform	40.7	0.5	ug/L	ND	102	60-130			
Dibromochloromethane	50.9	0.5	ug/L	ND	127	60-130			
Dichlorodifluoromethane	37.0	1.0	ug/L	ND	92.6	50-140			
1,2-Dichlorobenzene	48.9	0.5	ug/L	ND	122	60-130			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
1,3-Dichlorobenzene	51.3	0.5	ug/L	ND	128	60-130			
1,4-Dichlorobenzene	43.8	0.5	ug/L	ND	110	60-130			
1,1-Dichloroethane	37.0	0.5	ug/L	ND	92.4	60-130			
1,2-Dichloroethane	34.7	0.5	ug/L	ND	86.7	60-130			
1,1-Dichloroethylene	41.3	0.5	ug/L	ND	103	60-130			
cis-1,2-Dichloroethylene	41.0	0.5	ug/L	ND	102	60-130			
trans-1,2-Dichloroethylene	40.3	0.5	ug/L	ND	101	60-130			
1,2-Dichloropropane	35.8	0.5	ug/L	ND	89.6	60-130			
cis-1,3-Dichloropropylene	34.6	0.5	ug/L	ND	86.4	60-130			
trans-1,3-Dichloropropylene	32.5	0.5	ug/L	ND	81.2	60-130			
Ethylbenzene	46.1	0.5	ug/L	ND	115	60-130			
Ethylene dibromide (dibromoethane, 1,2-)	46.0	0.2	ug/L	ND	115	60-130			
Hexane	32.5	1.0	ug/L	ND	81.2	60-130			
Methyl Ethyl Ketone (2-Butanone)	135	5.0	ug/L	ND	135	50-140			
Methyl Isobutyl Ketone	122	5.0	ug/L	ND	122	50-140			
Methyl tert-butyl ether	89.4	2.0	ug/L	ND	89.4	50-140			
Methylene Chloride	44.4	5.0	ug/L	ND	111	60-130			
Styrene	46.6	0.5	ug/L	ND	116	60-130			
1,1,1,2-Tetrachloroethane	38.8	0.5	ug/L	ND	96.9	60-130			
1,1,2,2-Tetrachloroethane	44.4	0.5	ug/L	ND	111	60-130			
Tetrachloroethylene	47.1	0.5	ug/L	ND	118	60-130			
Toluene	44.8	0.5	ug/L	ND	112	60-130			
1,1,1-Trichloroethane	36.8	0.5	ug/L	ND	91.9	60-130			
1,1,2-Trichloroethane	41.8	0.5	ug/L	ND	104	60-130			
Trichloroethylene	33.6	0.5	ug/L	ND	83.9	60-130			
Trichlorofluoromethane	40.8	1.0	ug/L	ND	102	60-130			
Vinyl chloride	47.7	0.5	ug/L	ND	119	50-140			
m,p-Xylenes	83.7	0.5	ug/L	ND	105	60-130			
o-Xylene	43.6	0.5	ug/L	ND	109	60-130			
Surrogate: 4-Bromofluorobenzene	*58.7*		*%*		*73.3*	*50-140*			
Surrogate: Dibromofluoromethane	*82.4*		*%*		*103*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Surrogate: Toluene-d8	*65.5*		*%*		*81.9*	*50-140*			
Benzene	39.1	0.5	ug/L	ND	97.8	60-130			
Ethylbenzene	46.1	0.5	ug/L	ND	115	60-130			
Toluene	44.8	0.5	ug/L	ND	112	60-130			
m,p-Xylenes	83.7	0.5	ug/L	ND	105	60-130			
o-Xylene	43.6	0.5	ug/L	ND	109	60-130			
Surrogate: Toluene-d8	*65.5*		*%*		*81.9*	*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

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

Paracel ID: 2348104

nt Blvd.
1G 4J8
labs.com
om

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2348104	№ 140703

Page 1 of 1

Client Name: Paterson Group
Contact Name: Jesse Andrechek
Address: 9 Auriga Dr, Ottawa
Telephone: 613-226-7381

Project Ref: PE6039
Quote #:
PO #:
E-mail: jandrechek@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)	PCBs
1	BH16-23						X							
2	BH17-23						X		X	X	X	X		
3	BH18-23						X	X	X	X	X	X		
4	BH19-23						X		X	X	X	X		
5	BH20-23						X		X	X	X	X		X
6	DUP-A						X							
7														
8														
9														
10														

Comments:

Method of Delivery: Paracel Courier

Relinquished By (Sign): [signature]
Relinquished By (Print): Jesse Andrechek
Date/Time: 27-NOV/23 3PM

Received By Driver/Depot:
Date/Time:
Temperature: °C

Received at Lab: SD
Date/Time: Nov 27 2023 4:58pm
Temperature: 10.2 °C

Verified By: [signature]
Date/Time: NOV 28 2023
pH Verified: ☐ By:

Chain of Custody (Env) xlsx

Revision 4.0

PATERSON GROUP

Soil & Groundwater Management Plan

Proposed Residential Development

Tunney's Pasture (Block 9)
Ottawa, Ontario

Prepared for Arcadis IBI Group

TABLE OF CONTENTS

1.0 Introduction

This Soil and Groundwater Management Plan (SGMP) was developed to minimize the soil and groundwater onsite that will require off-site disposal and when off-site disposal is required, ensuring that proper handling and disposal methods are undertaken. A high level fee estimate for the required items for soil and groundwater management during construction have been included at the end of this letter.

2.0 Soil Reuse

Soil is considered suitable for reuse on the subject site provided that the soil is not considered heavily impacted (no visible free product or significant petroleum hydrocarbon (PHC) odours) and is not used as final cover for landscaping purposes (with the exception of segregated topsoil and granular materials).

The excavated soil may be suitable for reuse on-site as backfill from a geotechnical perspective provided that it is maintained in a relatively dry condition, can be properly compacted, and is approved by the geotechnical engineer at the time of construction. Additionally, based on the conditions observed. cobbles and boulders are likely to be encountered in certain areas of the excavation. Thus, prior to reusing this soil, it will be necessary to cull out all material in excess of 300 mm in its largest dimension. Alternatively, cobbles and boulders could be processed and blended with the fill to a gradation suitable for reuse as engineered fill.

Site excavated soil can also be used as general landscaping fill where settlement of the ground surface is of minor concern. These materials should be spread in thin lifts and compacted to minimize voids. If these materials are to be used to build up the subgrade level for areas to be paved, they should be compacted in thin lifts to a minimum density of 95% of their respective standard Proctor maximum dry density (SPMDD). Site excavated soil is not suitable for use as backfill against foundation walls due to the frost heave potential of the site excavated soils below settlement sensitive areas, such as concrete sidewalks and exterior concrete entrance areas.

It is recommended that stockpiles of excavated material intended for reuse be protected against increases in moisture content by securely covering the stockpiles prior to and during precipitation events. Therefore, the placement and compaction of the on-site soil should be completed during relatively dry and non-freezing conditions. If, due to any of the above conditions, the existing fill becomes unsuitable for reuse as engineered fill based on the geotechnical engineer, it should be transported and properly disposed off-site, and an imported fill material should be used. Protection of materials from increased moisture content is considered to be the responsibility of the Contractor.

3.0 Groundwater Re-use

Groundwater is considered to be suitable to manage on-site during situations where free product is not observed and no risk to the workers or the natural environment is considered to be present relating to its re-use. The groundwater must be able to be managed without entering any surface water bodies without appropriate treatment and permits.

4.0 Soil Requiring Off-Site Disposal

Soil is considered to require off-site disposal from an environmental perspective when the soil is heavily impacted. Heavily impacted soil is considered impacts that can re-contaminate areas due to leaching and consists of free product visible in the soil and/or significant PHC odours.

Based on the findings of the Phase II ESA investigation, the shallow fill material present beneath the surficial asphalt at BH19-23, located in the eastern portion of the subject property, is contaminated with various polycyclic aromatic hydrocarbons (PAHs). Given the low-mobility of these contaminants, it is expected that the contamination is confined to the upper fill material (approximately 0.61 m depth) beneath the asphaltic concrete parking area. Since this material exceeds excess soil reuse standards, this contaminated soil will require excavation and disposal at a licensed waste disposal facility.

Excavated soil is not considered to be suitable for reuse on site during conditions where, in the opinion of the geotechnical engineer, the soil is saturated and/or does not have a suitable gradation for placement and compaction that will not achieve the required compaction specifications.

Soil to be disposed off-site must be evaluated by environmental personnel prior to their disposal. Heavily impacted soil must be disposed at an approved waste disposal facility. Soil observed to be clean or marginally impacted can be disposed of at a variety of waste disposal facilities, including, but not limited to, clean fill sites (clean soil only) and interim transfer stations. Based on the quality of the soil, as determined by the environmental personnel, the soil must be sent to the appropriate disposal facility.

At this time, soil disposal locations have not been selected. These locations will be selected by the construction contractor prior to mobilization.

5.0 Groundwater Requiring Off-Site Disposal

Groundwater must be disposed of off-site in situations where free product is observed. The groundwater must be disposed of following all applicable laws and regulations. Licensed pumping contractors are required to dispose of any impacted groundwater. If impacted groundwater is observed, all reasonable efforts must be made to limit the quantity of impacted groundwater pumped and disposed. Similarly, if a spill occurs all reasonable efforts should be made to protect the surface and groundwater resources. At no time is groundwater to be disposed of directly to surface water resources.

Any offsite groundwater must be disposed of through an approved method. Grossly impacted groundwater where a sheen and/or odour is identified must be treated prior to removal from site or be removed from site with the intention of offsite treatment. Excess groundwater may also be able to be disposed within the City of Ottawa Sanitary and/or Storm sewer system. Prior to disposal to the sewer system, a sewer discharge agreement must be completed with the City of Ottawa.

5.1 Construction Dewatering

The site-specific construction dewatering protocols will be provided in project- specific geotechnical and/or hydrogeological reports.

Generally, it is recommended that additional analytical testing prior to construction mobilization should be carried out to determine the appropriate disposal method. Any environmentally impacted groundwater should be pumped into a storage tanker for testing and potentially treatment before discharging to the sanitary sewer.

5.2 Groundwater Monitoring Decommissioning

All groundwater monitoring wells must be decommissioned in accordance with Ontario Regulation 903/90. It is recommended that the groundwater monitoring wells remain in place and in viable condition for as long as possible, to allow for any potential re-sampling.

6.0 Permits and Agreements

It is anticipated that the following permits and agreements will be required to conduct the Construction Contractor Obligations (with respect to the Soil and Groundwater Management Plan);

- ❑ Permit to Take Water (or water taking EASR)
- ❑ City of Ottawa Storm and/or Sanitary Sewer Discharge agreement

- ❑ Landfill agreement for soil disposal
- ❑ Clean Fill agreement for soil disposal

7.0 Soil Stockpiles and Handling

Any soil and construction debris that is temporarily stockpiled must be done so within the confines of the perimeter protection/construction fencing. All stockpiles will be covered, by the trade contractor, with plastic tarps (10 mil plastic minimum), or an impermeable geotextile and secured from wind. The stockpiles will be covered with plastic in a reasonable time frame as weather conditions dictate. If the stockpile is continuously being accessed then the stockpile will be covered prior to the end of the work day, as weather conditions dictate. Storm water runoff from the plastic covering is to be diverted away from all surface water resources and from open construction excavations.

Stockpiles should be clearly identified to eliminate cross contamination and improper usage. Soil identified as grossly impacted should be immediately loaded into truck and disposed of at the licensed waste facility. The volume of excess soil disposed of at the landfill should be minimized using segregation during excavation and subsequent stockpile sampling programs.

8.0 Federal and Provincial Confirmatory Soil and Groundwater Sampling Protocols

The soil and groundwater sampling protocols followed during the field sampling programs in Ontario should be in general accordance with the MECP document entitled *"Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario"*, dated May 1996.

8.1 Soil and Groundwater Standards

The soil and groundwater standards for the Ontario portion of the site were taken from the document entitled *"Soil, Groundwater and Sediment Standards for Use under Part XV.I of the Environmental Protection Act"* prepared by the Ontario Ministry of the Environment (now Ministry of the Environment, Conservation and Parks), dated April 15, 2011. Several of the Tables found in the document may be applicable to the subject site. The following Table may be applicable.

The Table 3 Standards are based on the following considerations:

- ❑ Coarse-Grained Soil Conditions

- ❑ Non-Potable Groundwater Conditions
- ❑ Residential Land Use
- ❑ Full Depth Soil Conditions

The applicable federal soil and groundwater standards are considered to be the Canadian Council of Ministers of the Environment (CCME). The standards are taken from the document entitled "*Canadian Environmental Quality Guidelines*", however, due to the proposed use of the block(s) as privately owned operations, only Provincial standards are deemed to apply for future uses.

Note that due to the proposed change in land use to a more sensitive use (e.g. commercial to residential), a Record of Site Condition will be required prior to redevelopment.

8.2 Stockpile Sampling

Stockpiled soils are subject to minimum sampling requirements under O.Reg. 153/04. The sampling requirements are shown below:

MINIMUM STOCKPILE SAMPLING FREQUENCY	
Stockpile Volume (m^3)	Minimum Number of Analysed Samples
≤ 130	3
> 130 to 220	4
> 220 to 320	5
> 320 to 430	6
> 430 to 550	7
> 550 to 670	8
> 670 to 800	9
> 800 to 950	10
> 950 to 1100	11
> 1100 to 1250	12
> 1250 to 1400	13
> 1400 to 1550	14
> 1550 to 1700	15
> 1700 to 1850	16
> 1850 to 2050	17
> 2050 to 2200	18
> 2200 to 2350	19
> 2350 to 2500	20
> 2500 to 2700	21
> 2700 to 2900	22
> 2900 to 3100	23

MINIMUM STOCKPILE SAMPLING FREQUENCY	
Stockpile Volume (m^3)	Minimum Number of Analysed Samples
> 3100 to 3300	24
> 3300 to 3500	25
> 3501 to 3700	26
> 3700 to 3900	27
> 3900 to 4100	28
> 4100 to 4300	29
> 4300 to 4500	30
> 4500 to 4700	31
> 4700 to 5000	32
> 5000	32+(Volume-5000)÷300

The soil samples collected from the stockpiles are required to be tested for the following (as a minimum) Petroleum Hydrocarbons F1-F4, Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX), Metals, hydride forming Metals, sodium adsorption ratio (SAR), electrical conductivity (EC), and any other contaminants of concern, as identified by the environmental consultant (Qualified Person). Analysis for EC and SAR is only required in areas where a substance (namely road salt) has been applied for the purposes of keeping the area safe under conditions of snow or ice.

9.0 Applicable Municipal Laws, Standards, Codes and Guidelines

9.1 Soil and Groundwater Standards

No municipal soil standards and guidelines are considered to apply.

Groundwater discharged into the sewer systems of the City of Ottawa and City of Gatineau must follow the applicable bylaws.

City of Ottawa

The City of Ottawa requires that all discharges fall within the limits of Sewer Use By-law No. 2003-514. A sewer use agreement is expected to be required to manage excess groundwater at selected sites.

10.0 Imported Material

All imported material may originate from a licensed pit, quarry or other aggregate site licensed under the Aggregate Resources Act, or, from a source site where all applicable excess soil regulations have been met. Imported material will be required to meet the

specific standard for its final use. If clean fill is imported onto site from a property not licensed under the Aggregate Resources Act, in-situ, or stockpile sampling as outlined in Section 8.3, will be required prior to final placement.

All imported soil must be placed in accordance with Ontario Regulation 406/19.

11.0 Quality Assurance and Quality Control

A minimum of 10% of samples will be submitted as duplicates for the purposes of QA/QC. Only one parameter grouping per QA/QC sample is required.

Additional QA/QC procedures are outlined in the Environmental Quality Management Plan, available under a separate cover.

12.0 Unexpected Environmental Impacts

If unexpected environmental impacts are encountered during the course of construction or redevelopment of the block(s), the environmental consultant or their representative should be notified immediately and work should avoid the area until an inspection is completed.

Following an inspection by the environmental consultant or their representative recommendations will be made regarding appropriate material handling procedures at the location. Additional investigative work may be required to delineate the impacted areas (if required).

13.0 Estimated Soil and Groundwater Management Budget

The following table presents the approximate costs related to items discussed in this soil and groundwater management plan.

Based on the analytical testing results of the upper fill material beneath the asphaltic concrete parking area compared to the lower native soils, with an average estimated fill depth of 0.61m, it is estimated that up to approximately 2,550 m^3 may require off-site disposal at a licensed waste facility if no re-use alternative can be identified.

Table 1: Estimated Costs for Soil and Groundwater Management	
Item	**Fees**
On-Site and Excess Soil Management (O.Reg. 406/19), including: • Reporting • Supplemental testing • Meetings and Consultation with stakeholders and contractors Note that the On-site and Excess Soil testing will provide valuable information for soil delineation purposes.	$110,000
Soil remediation – tipping fees ($60/mt)	$306,000
Soil remediation. Includes: • Site supervision • Confirmatory soil sampling Reporting	$20,000
Record of Site Condition (O.Reg. 153/04) – initial submission (note that additional revisions and submissions may be required based on Ministry comments)	$20,000 $10,000 (revisions)
Permit to take water or Water taking EASR (whichever is applicable)	$20,000 $8,000
City of Ottawa sewer discharge testing and permits	$5,000
TOTAL	$491,000