PATERSON GROUP

Phase II – Environmental Site Investigation

415 West Hunt Club Road
Ottawa, Ontario

Prepared for Costco Wholesale Corporation

Report: PE6048-2
Date: June 30, 2023

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EXECUTIVE SUMMARY

Assessment

A Phase II ESA was conducted for the property addressed 415 West Hunt Club Road, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address potentially contaminating activities (PCAs) and their resulting areas of potential environmental concern (APECs) that were identified during a previously completed Phase I ESA, as well as a brief historical investigation completed as part of the current assessment.

The Phase II ESA subsurface investigation consisted of drilling three boreholes, BH1-23, BH2-23, and BH3-23, all of which were instrumented with groundwater monitoring wells to address the previously identified APEC. The boreholes were drilled to a maximum depth of 7.52 m.

Soil

A total of four soil samples (including one duplicate) were submitted for analysis of benzene, toluene, ethylbenzene xylenes (BTEX), and/or petroleum hydrocarbons (PHCs, F1-F4).

PHCs (F_1-F_4)

All of the analyzed PHC parameters were non-detect, with the exception of PHC Fraction 4 which was detected at concentrations below the selected site standard, and therefore all samples were in compliance with the selected MECP Table 2 Standards. The location of samples tested for PHCs in the soil are shown on Drawing PE6048-4 – Analytical Testing Plan – Soil.

BTEX

All of the analyzed BTEX concentrations were non-detect and therefore in compliance with the selected MECP Table 2 standards. The location of samples tested for BTEX in the soil are shown on Drawing PE6048-4 – Analytical Testing Plan – Soil.

Groundwater

Groundwater samples from monitoring wells installed in BH1-23, BH2-23 and BH3-23 were collected on March 30, 2023. Four samples including one duplicate sample were submitted for laboratory analysis of volatile organic compounds (VOCs) and BTEX. All groundwater results were non-detect and therefore in compliance with the selected MECP Table 2 Industrial standards. The location of groundwater samples is shown on Drawing PE6048-5 – Analytical Testing Plan – Groundwater.

Recommendations

Based on the results of the subsurface investigation, no further testing or remedial work is required.

Groundwater

It is recommended that the monitoring wells installed on the Phase II Property be maintained for future monitoring. The monitoring wells must be decommissioned in accordance with O. Reg 903.

1.0 INTRODUCTION

At the request of Costco Wholesale Corporation, Paterson Group (Paterson) conducted a Phase II Environmental Site Assessment for the property addressed 415 West Hunt Club Road, in the City of Ottawa, Ontario. The purpose of this Phase II ESA has been to address areas of potential environmental concern (APECs) identified on the Phase II Property during the Phase I ESA conducted by Paterson in June of 2023.

1.1 Site Description

Address:	415 West Hunt Club Road, Ottawa, Ontario
Legal Description:	Part of Lot 29, Concession A, Rideau Front, Geographic Township of Nepean
Property Identification Number:	04052-0499
Location:	The Phase II Property is located on the north side of West Hunt Club Road and the west side of Roydon Place. The Phase I Property area occupies the space between the existing office building and West Hunt Club Road. The project area is depicted on Figure 1 - Key Plan following the body of this report.
Latitude and Longitude:	45° 20' 11.80" N, 75° 43' 14.48" W

Site Description:

Configuration:	Rectangular
Area:	4, 928 m^2 (Approximate)
Zoning:	AM10 - Arterial Mainstreet Subzone
Current Use:	Commercial Office Building and Parking
Services:	Municipally Serviced.

1.2 Property Ownership

Paterson was engaged to conduct this Phase II-ESA by Mr. Gilles Guillemet with Costco Wholesale Corporation.

1.3 Current and Proposed Future Uses

The Phase II Property is currently occupied by an asphaltic parking lot adjacent to a single-storey commercial office building. It is our understanding that an expansion of the existing building is to be constructed immediately south of the existing building in a section of the current parking area.

1.4 Applicable Site Condition Standard

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

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

Section 35 of O.Reg. 153/04 applies to the Phase II Property as the Phase II Property and neighbouring properties are all serviced by municipal services.

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

Section 43.1 of O.Reg. 153/04 does not apply to the Phase II Property in that the property is not a Shallow Soil property and the property is not within 30m of a water body.

Coarse-grained soil standards were chosen as a conservative approach. Grain size analysis was not completed. The Phase II Property will continue to be used for commercial purposes and as such, the MECP Table 3 Industrial Standards have been selected for the purpose of this Phase II ESA.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The Phase II Property is located on the north side of West Hunt Club Road, approximately 5 m west of Roydon Place, in the City of Ottawa, Ontario. According to the City of Ottawa website, the Phase II Property is situated in an arterial main street subzone with surrounding properties consisting of commercial and industrial land use.

The Phase II Property is occupied by an asphaltic parking lot immediately south of an existing single storey commercial office building. The eastern portion of the Phase II Property consists of a treed patio area.

The Phase II Property is relatively flat and at grade with West Hunt Club Road and the regional topography slopes downward to the northeast, towards the Rideau River. Site drainage occurs primarily through sheet flow to catch basins located in the parking lot and along West Hunt Club Road, as well as infiltration in the treed area at the east end of the Phase II Property.

2.2 Past Investigations

The following report was reviewed prior to conducting this assessment:

"Additional Geotechnical Investigation – Costco Regional Office, Hunt Club Road and Roydon Place, City of Ottawa, Ontario" Performed by Trow Consulting Engineers, and dated March 8, 2001.

This report identified contaminated material on the larger property addressed 415 West Hunt Club Road. The report states the material was originally impacted with hydrocarbons and underwent remedial treatment. The report drawings indicate that there were no remediated areas or treated soil placed south of the existing office building, in the current Phase I Property. Limited amounts of other information regarding the soil quality of the site was available in this report.

- ‘Phase I Environmental Site Assessment, 415 West Hunt Club Road – Ottawa, Ontario, prepared by Paterson Group, dated June 2023.

Based on the findings of the 2023 Phase I – ESA performed by Paterson, one APEC was identified on the Phase II Property, resulting from a former bulk petroleum facility. No other potentially contaminating activities (PCAs) considered to result in an APEC on the subject property were identified. A Phase II ESA was recommended based on the findings of the study.

The APEC identified during the Phase I – ESA is identified below in Table 1.

Table 1 - Areas of Potential Environmental Concern

Area of Potential Environmental Concern	Location of Area of Potential Environmental Concern with respect to Phase I Property	Potentially Contaminating Activity	Location of PCA (on-site or off-site)	Contaminants of Potential Concern	Media Potentially Impacted (Groundwater, Soil, and/or Sediment)
APEC 1 Former Bulk Petroleum Facility	Adjacent to the northern border of the Phase I-II Property.	*"Item 41 – Petroleum-derived Gas Refining, Manufacturing, Processing and Bulk Storage*	Off-site	BTEX/VOCs PHCs (F_1–F_4)	Soil Groundwater

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation was conducted on May 3, 2023. The field program consisted of drilling three boreholes (BH1-23, BH2-23, and BH3-23), all of which were instrumented with groundwater monitoring wells to address the APEC identified in the Phase I – ESA. The boreholes were drilled to a maximum depth of 7.52 m below the ground surface (mbgs).

3.2 Media Investigated

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

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

- ❒ Benzene, Toluene, Ethylbenzene, Xylenes (BTEX);
- ❒ Petroleum Hydrocarbons (PHCs);
- ❒ Volatile Organic Compounds (VOCs).

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

The Geological Survey of Canada website on the Urban Geology of the National Capital Area was consulted as part of this assessment. Based on the information from NRCAN, bedrock in the area of the site consists of Palaeozoic sandstone and dolomite of the March Formation. Based on the maps, the thickness of overburden is anticipated to be 10 m to 25 m.

The regional topography in the general area of the Phase II Property slopes down gently to the east, towards the Rideau River.

Groundwater within the Phase II Study Area is generally expected to flow towards the northeast.

Buildings and Structures

The Phase II Property, where the proposed addition is planned to be constructed, is covered by a narrow asphalt parking lot which runs parallel with West Hunt Club Road.

Subsurface Structures and Utilities

It is our understanding that subsurface utilities are present on site. One pad mounted transformer was observed in good condition adjacent to the northeast border of the Phase II Property, between Roydon Place and the waste collection area. No visual or olfactory signs of contamination were observed at the time of the site visit.

Water Bodies and Areas of Natural Significance

No areas of natural significance or water bodies were identified on the Phase II Property.

Drinking Water Wells

The MECP well records webpage indicated five (5) records of domestic wells within the Phase II study area, three of which have been abandoned. One monitoring well record was also found in the study area. One record identified was illegible. The soil stratigraphy identified in the records indicate compact brown silty sand at depths of up to 7.5 m. Well records were also identified by the ERIS report which is provided in Appendix 2. Copies of the MECP records have also been included in Appendix 2.

Monitoring Well Records

No existing monitoring well records were identified on the Phase II Property or within the Phase I Study Area.

Neighbouring Land Use

Land use within the Phase II study area (250 m radius) is primarily used for commercial and industrial purposes. Fourteen existing PCA's were identified during the Phase I ESA. The neighbouring properties and the associated PCA's are depicted on Drawing PE6048-2 – Surrounding Land Use Plan.

Potentially Contaminating Activities (PCAs) and Areas of Potential Environmental Concern (APECs)

Fourteen PCA's were identified during the historical review of the neighbouring properties, all of which were determined to be currently active. Based on the inferred groundwater flow direction to the northeast of the subject property, in addition to the distance of these activities, they are considered to have limited potential to impact the subject site. Of the identified activities, the only PCA considered to have the potential to result in an APEC on the subject site is the former bulk petroleum distribution facility identified on the larger 415 West Hunt Club property.

The identified PCA's can be seen on Drawing PE6048-2 – Surrounding Land Use Plan.

Contaminants of Potential Concern

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

- ❒ Benzene, Toluene, Ethylbenzene, Xylenes (BTEX);
- ❒ Petroleum Hydrocarbons (PHCs); and
- ❒ Volatile Organic Compounds (VOCs).

Assessment of Uncertainty and/or Absence of Information

The information reviewed as part of the preparation of this Phase II ESA is considered to be sufficient to conclude that there is a potentially contaminating activity that results in an area of potential environmental concern on the Phase II Property. The presence/absence of potentially contaminating activities 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.

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

3.4 Deviations from Sampling and Analysis Plan

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

3.5 Impediments

Physical impediments encountered during the Phase II ESA program include underground utilities, structures, and on-site operations which limited the location of certain boreholes.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation was conducted on May 3, 2023. Three boreholes were drilled to a maximum depth of 7.52 m, all of which were instrumented with groundwater monitoring wells.

The boreholes were strategically placed for general coverage and to address the aforementioned APEC listed in Table 1.

The boreholes were drilled with a low clearance drill rig operated by George Downing Estate Drilling of Hawkesbury, Ontario, under full-time supervision of Paterson personnel. The borehole locations are indicated on the attached Drawing PE6048-3 - Test Hole Location Plan.

4.2 Soil Sampling

A total of 30 soil samples were obtained from the boreholes by means of grab sampling from auger flights/auger samples and split spoon sampling. Split spoon samples were taken at approximate 0.76 m intervals. The depths at which split spoon and auger flight samples were obtained from the boreholes are shown as "**SS**" and "**AU**" respectively on the Soil Profile and Test Data Sheets.

The borehole profiles generally consist of a surficial layer of asphaltic concrete over crushed stone (engineered fill, ranging from 0.05-0.6 m in thickness), followed by compact brown silty sand.

The silty sand layer extended to a maximum depth of 7.52 m in BH3-23. Bedrock was not encountered in any of the boreholes drilled on the Phase II Property.

Borehole locations are shown on Drawing PE6048-3 – Test Hole Location Plan.

4.3 Field Screening Measurements

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

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

The maximum vapour reading measured was 2.5 ppm in the soil samples obtained. These results were not considered to be indicative of potential significant contamination from volatile compounds. Vapour readings are noted on the Soil Profile and Test Data Sheets in Appendix 1.

No visual or olfactory indications of potential contamination were identified in the soil samples.

4.4 Groundwater Monitoring Well Installation

Three monitoring wells were installed on the Phase II Property as part of the subsurface investigation. The monitoring wells consisted of 50-mm Schedule 40 threaded PVC risers and screens. Monitoring well construction details are listed in Table 2 and are also presented on the Soil Profile and Test Data Sheets provided in Appendix 1.

Borehole locations and elevations were surveyed geodetically by Paterson personnel.

TABLE 2 - Monitoring Well Construction Details						
Well ID	**Ground Surface Elevation**	**Total Depth (m BGS)**	**Screened Interval (m BGS)**	**Sand Pack (m BGS)**	**Bentonite Seal (m BGS)**	**Casing Type**
BH1-23	87.66	6.71	4.7-6.2	3.7-4.2	0-3.7	Flushmount
BH2-23	87.58	6.71	4.5-6.0	3.7-4.0	0-3.7	Flushmount
BH3-23	87.54	7.52	6.0-7.5	4.6-5.4	0-4.6	Flushmount

4.5 Field Measurement of Water Quality Parameters

Groundwater sampling was conducted on May 8, 2023. Water quality parameters were measured in the field using a multi-parameter analyzer probe. 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, the field parameters were relatively stable, or the well was dry. Stabilized field parameter values are summarized in Table 3.

Table 3: Groundwater Quality Parameters			
Well ID	**Temperature (ºC)**	**Conductivity (µs)**	**pH**
BH1-23	5.2	2012	7.41
BH2-23	5.4	1678	7.22
BH3-23	4.8	1201	7.67

4.6 Groundwater Sampling

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

4.7 Analytical Testing

Based on the guidelines outlined in the Sampling and Analysis Plan appended to this report, the following soil and groundwater samples, as well as analyzed parameters are presented in Tables 4 and 5, respectively.

TABLE 4 – Analyzed Parameters for Submitted Soil Samples

Sample ID	Sample Depth & Stratigraphic Unit	Parameter		Rationale
		BTEX	PHCs F_1-F_4	
BH1-23-SS6	3.81 – 4.42 m Fine Brown Sand	x	x	Assess potential soil impacts resulting from former off site bulk petroleum facility.
BH2-23-SS6	3.81 – 4.42 m Fine Brown Sand	X	X	Assess potential soil impacts resulting from former off site bulk petroleum facility.
BH3-23-SS8	5.3 – 5.94 m Fine Brown Sand	X	X	Assess potential soil impacts resulting from former off site bulk petroleum facility.
BH4-23-SS8 (Duplicate of BH3-23-SS8)	5.3 – 5.94 m Fine Brown Sand	X	X	QA/QC

TABLE 5 - Testing Parameters for Submitted Groundwater Samples

Sample ID	Screened Interval	Parameters Analyzed		Rationale
		VOCs	PHCs	
BH1-23-GW1	4.7-6.2 m Fine Brown Sand	X	X	Assess potential groundwater impacts resulting from former off site bulk petroleum facility.
BH2-23-GW1	4.5-6.0 m Fine Brown Sand	X	X	Assess potential groundwater impacts resulting from former off site bulk petroleum facility.
BH3-23-GW1	6.0-7.5 m Fine Brown Sand	X	X	Assess potential groundwater impacts resulting from former off site bulk petroleum facility.
DUP (DUP of BH3-23-GW1)	6.0-7.5 Fine Brown Sand	X	X	QA/QC

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

4.8 Residue Management

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

4.9 Elevation Surveying

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

4.10 Quality Assurance and Quality Control Measures

All soil and groundwater samples were handled in accordance with the Analytical Protocol with respect to holding time, preservation method, storage requirement, and container type.

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

One duplicate soil sample was submitted as part of the subsurface investigation. The duplicate sample was recovered from BH3-23-SS8 and was submitted for PHCs and BTEX. All analyzed parameters were non-detect in both the original and duplicate sample, with the exception of PHC Fraction 4 which was detected in the duplicate sample at a concentration below the selected MECP Table 2 standards.

A duplicate of groundwater sample from BH3-23-GW1 was also recovered, and both the original and duplicate sample were analysed for PHCs and VOCs. All of the analyzed parameters were non-detect in both the original and duplicate sample.

As a result of the analysed parameter concentrations being non-detect in both the original sample and duplicate, the RPD values cannot be calculated.

Based on the identical results in both the original and duplicate groundwater and soil samples, the data is considered to be of sufficient quality so as not to affect decision making.

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

5.0 REVIEW AND EVALUATION

5.1 Geology

The borehole profiles generally consist of a surficial layer of asphaltic concrete over engineered crushed stone, followed by brown silty sand. The silty sand layer extended to a maximum depth of 7.52 m in BH3-23.

Groundwater was encountered within the overburden at depths ranging from 4.92 - 5.01 m.

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

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured during the groundwater sampling event on May 8, 2023, using an electronic water level meter. Groundwater levels were recorded from the monitoring wells installed in BH1-23, BH2-23, and BH3-23. Groundwater levels are summarized below in Table 6.

TABLE 6 - Groundwater Level Measurements

Borehole Location	Ground Surface Elevation (m)	Water Level Depth (m below grade)	Water Level Elevation (m ASL)	Date of Measurement
BH1-23	87.66	4.96	82.70	May 8, 2023
BH2-23	87.58	4.92	82.66	May 8, 2023
BH3-23	87.54	5.01	82.53	May 8, 2023

Based on the groundwater elevations measured during the sampling events, groundwater contour mapping was completed. Groundwater contours are shown on Drawing PE6048-3 – Test Hole Location Plan.

Based on the contour mapping, groundwater below the Phase II Property flows to the east. It should be noted that groundwater levels are expected to fluctuate throughout the year with seasonal variations.

A horizontal hydraulic gradient of approximately 0.007 m/m was calculated.

5.3 Fine-Coarse Soil Texture

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

5.4 Soil: Field Screening

Field screening of the soil samples collected during drilling resulted in vapour readings ranging from 0.1 to 2.5 ppm. The PID readings are not considered to be indicative of contamination. The field screening results of each individual soil sample are provided on the Soil Profile and Test Data Sheets appended to this report.

5.5 Soil Quality

Based on the findings of the field screening in combination with sample depth and location, four soil samples, including one duplicate sample, were submitted for analysis of metals, PHCs (F1-F4), and BTEX. The results of the analytical testing completed on the Phase II Property are presented in Appendix 1. The laboratory Certificates of Analysis are also provided in Appendix 1.

PHCs (F_1-F_4)

All of the PHC concentrations were non-detect, with the exception of F4 in the duplicate sample, which was found to be below the standards, and therefore all results are in compliance with the selected MECP Table 3 standards. The location of samples tested for PHCs in the soil are shown on Drawing PE6048-4 – Analytical Testing Plan – Soil.

BTEX

All of the BTEX concentrations were non-detect and therefore in compliance with the selected MECP Table 3 standards. The location of samples tested for BTEX in the soil are shown on Drawing PE6048-4 – Analytical Testing Plan – Soil. The maximum parameter concentrations identified within the soil samples are listed below in Table 7.

TABLE 7: Maximum Concentrations – Soil

Parameter	Maximum Concentration (µg/g)	Soil Sample	Depth Interval (m BGS)
F4 PHCs (C34-C50)	12	BH4-23-SS8 (DUP)	5.33-5.94

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

5.6 Groundwater Quality

Four groundwater samples, including one duplicate, from monitoring wells installed in BH1-23, BH2-23, and BH3-23 were submitted for laboratory analysis

of PHCs and VOCs. The results of the analytical testing are in Appendix 1. The associated laboratory Certificates of Analysis are provided in Appendix 1.

PHCs (F_1-F_4)

All of the PHC parameters were non-detect and are therefore in compliance with the selected MECP Table 3 standards. The location of the samples tested for PHCs in the groundwater are shown on Drawing PE6048-5– Analytical Testing Plan – Groundwater.

VOCs

All of the VOC parameters were non-detect and are therefore in compliance with the selected MECP Table 3 standards. The location of the samples tested for VOC in the groundwater are shown on Drawing PE6048-5–Analytical Testing Plan – Groundwater.

5.7 Quality Assurance and Quality Control Results

All samples submitted as part of the subsurface investigation were handled in accordance with the Analytical Protocol with respect to preservation method, storage requirement, and container type. As per Subsection 47(3) of O.Reg. 153/04, as amended, under the Environmental Protection Act, a Certificate of Analysis has been received for each sample submitted for analysis and all Certificates of Analysis are appended to this report.

One duplicate soil sample was collected from BH3-23-SS8 (BH4-23-SS8) and was submitted for PHCs and BTEX.

The duplicate sample was collected with the intent of calculating the relative percent difference (RPD) between duplicate sample values, as a way of assessing the quality of the analytical test results.

A duplicate groundwater sample (DUP) was obtained from the monitoring well installed in BH3-23 and submitted for laboratory analysis of PHCs and VOCs parameters.

All of the analysed parameter concentrations were non-detect in both the original sample and duplicate, therefore, the RPD values cannot be calculated.

The quality of the field data collected during the Phase II ESA is considered to be sufficient to meet the overall objectives of the assessment.

5.8 Phase II Conceptual Site Model

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

Site Description

Potentially Contaminating Activity and Areas of Potential Environmental Concern

Based on the results of the previously completed Phase I ESA by Paterson, one PCA was considered to result in an APEC on the Phase II Property. The identified APEC on the Phase II Property is as follows:

- ❒ APEC 1: Resulting from the presence of former bulk petroleum facility (PCA #41).

Contaminants of Potential Concern

The following CPCs were identified with respect to the Phase II Property:

- ❒ Benzene, Toluene, Ethylbenzene, Xylenes (BTEX);
- ❒ Petroleum Hydrocarbons (PHCs);
- ❒ Volatile Organic Compounds (VOCs).

Subsurface Structures and Utilities

The Phase I-II Property is situated in an area serviced by the municipality. Underground utility services on the Phase II Property include natural gas, electrical, cable, and water/wastewater.

No other subsurface structures were identified at the time of the site visit.

Physical Setting

Site Stratigraphy

The stratigraphy of the Phase II Property generally consists of a surficial layer of asphaltic concrete over crushed stone followed by brown silty sand. The silty sand extended to a maximum depth of 7.52 m in BH3-23.

Groundwater was encountered within the overburden at depths ranging from 4.92 - 5.01 m.

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

- ❒ Asphaltic concrete over crushed stone; encountered at depths ranging from approximately 0.0 to 0.6 m below the existing ground surface.
- ❒ Brown silty sand was encountered to a maximum depth of 7.52 m below the existing 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

Groundwater was encountered within the overburden at depths ranging from 4.92 - 5.01 m. Based on the groundwater monitoring event, groundwater beneath the Phase II Property flows to the east with a hydraulic gradient of 0.004 m/m.

It should be noted that groundwater levels are expected to fluctuate throughout the year with seasonal variations. Groundwater contours are shown on Drawing PE6048-3– Test Hole Location Plan.

Approximate Depth to Bedrock

Bedrock was not encountered during the subsurface investigation.

Approximate Depth to Water Table

The depth to the water table at the Phase II Property varies between approximately 4.92 - 5.01 below existing grade.

Sections 41 and 43.1 of the Regulation

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

Section 43.1 of the Regulation does not apply to the subject site as bedrock is not located less than 2 m below ground surface.

Fill Placement

The only imported material encountered was the crushed stone (engineered fill) for the pavement structure.

Existing Buildings and Structures

The Phase II Property has no existing buildings or structures on the property.

Proposed Buildings and Other Structures

The proposed site development for the Phase II Property will consist of the construction of an expansion of the existing office building to the north. The proposed building will be serviced by the existing municipal service.

Areas of Natural Scientific Interest and Water Bodies

No areas of natural significance or water bodies were identified on the Phase I-II Property.

Environmental Condition

Areas Where Contaminants are Present

Based on the findings of this Phase II - ESA, no contaminants were identified above the selected MECP Table 3 standards.

Types of Contaminants

Based on the findings of this Phase II - ESA, no contaminants were identified above the selected MECP Table 3 standards.

Contaminated Media

Based on the findings of this Phase II - ESA, no contaminants were identified in the soil or groundwater, above the selected MECP Table 3 standards.

What Is Known About Areas Where Contaminants Are Present

Based on the findings of this Phase II - ESA, no contaminants were identified in the soil or groundwater, above the selected MECP Table 3 standards.

Distribution and Migration of Contaminants

No contaminated material was identified on the Phase II Property.

Discharge of Contaminants

Based on the findings of this Phase II ESA, no contaminants have been discharged on the Phase II Property.

Climatic and Meteorological Conditions

In general, climatic, and meteorological conditions have the potential to affect contaminant distribution. Two ways by which climatic and meteorological conditions may affect contaminant distribution include the downward leaching of

contaminants by means of the infiltration of precipitation, and the migration of contaminants via groundwater levels and/or flow, which may fluctuate seasonally.

Based on the findings of this Phase II ESA, climatic and meteorological conditions are not considered to have affected contaminant distribution on the Phase II Property.

Potential for Vapour Intrusion

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

6.0 CONCLUSIONS

Assessment

A Phase II ESA was conducted for the property addressed 415 West Hunt Club Road, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address potentially contaminating activities (PCAs) and their resulting areas of potential environmental concern (APECs) that were identified during a previously completed Phase I ESA.

The Phase II ESA subsurface investigation consisted of drilling three boreholes, BH1-23, BH2-23, and BH3-23, all of which were instrumented with groundwater monitoring wells to address the previously identified APEC. The boreholes were drilled to a maximum depth of 7.52 m.

Soil

A total of four soil samples (including one duplicate) were submitted for analysis of benzene, toluene, ethylbenzene xylenes (BTEX), and/or petroleum hydrocarbons (PHCs, F1-F4). All test results comply with the selected MECP Table 3 standards.

Groundwater

Groundwater samples from monitoring wells installed in BH1-23, BH2-23 and BH3-23 were collected on May 8, 2023. Four samples including one duplicate sample were submitted for laboratory analysis of VOCs and PHCs. All groundwater results were non-detect and therefore in compliance with the selected MECP Table 3 Industrial standards.

Recommendations

Based on the results of the subsurface investigation, no further testing or remedial work is required.

Groundwater

The monitoring wells must be decommissioned in accordance with O. Reg 903 if they are not required for future monitoring, and/or will be disturbed during the future development of the property.

7.0 STATEMENT OF LIMITATIONS

This Phase II - Environmental Site Assessment report has been prepared under the supervision of a Qualified Person, in general accordance with O. Reg 153/04. The conclusions presented herein are based on information gathered from a limited sampling and testing program. The test results represent conditions at specific test locations at the time of the field program.

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

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

This report was prepared for the sole use of Costco Wholesale Corporation. Notification from Costco Wholesale Corporation and Paterson Group will be required to release this report to any other party.

Paterson Group Inc.

Curtis Black, M.Eng.

Mark D'Arcy, P.Eng., Q.P.ESA

Report Distribution:

- ❒ Cosctco Wholesale Corporation
- ❒ Paterson Group

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE6048-3 – TEST HOLE LOCATION PLAN

DRAWING PE6048-4 – ANALYTICAL TESTING PLAN – SOIL

DRAWING PE6048-4A – CROSS-SECTION A – A' – SOIL

DRAWING PE6048-5 – ANALYTICAL TESTING PLAN – GROUNDWATER

DRAWING PE6048-5A – CROSS-SECTION A – A' – GROUNDWATER

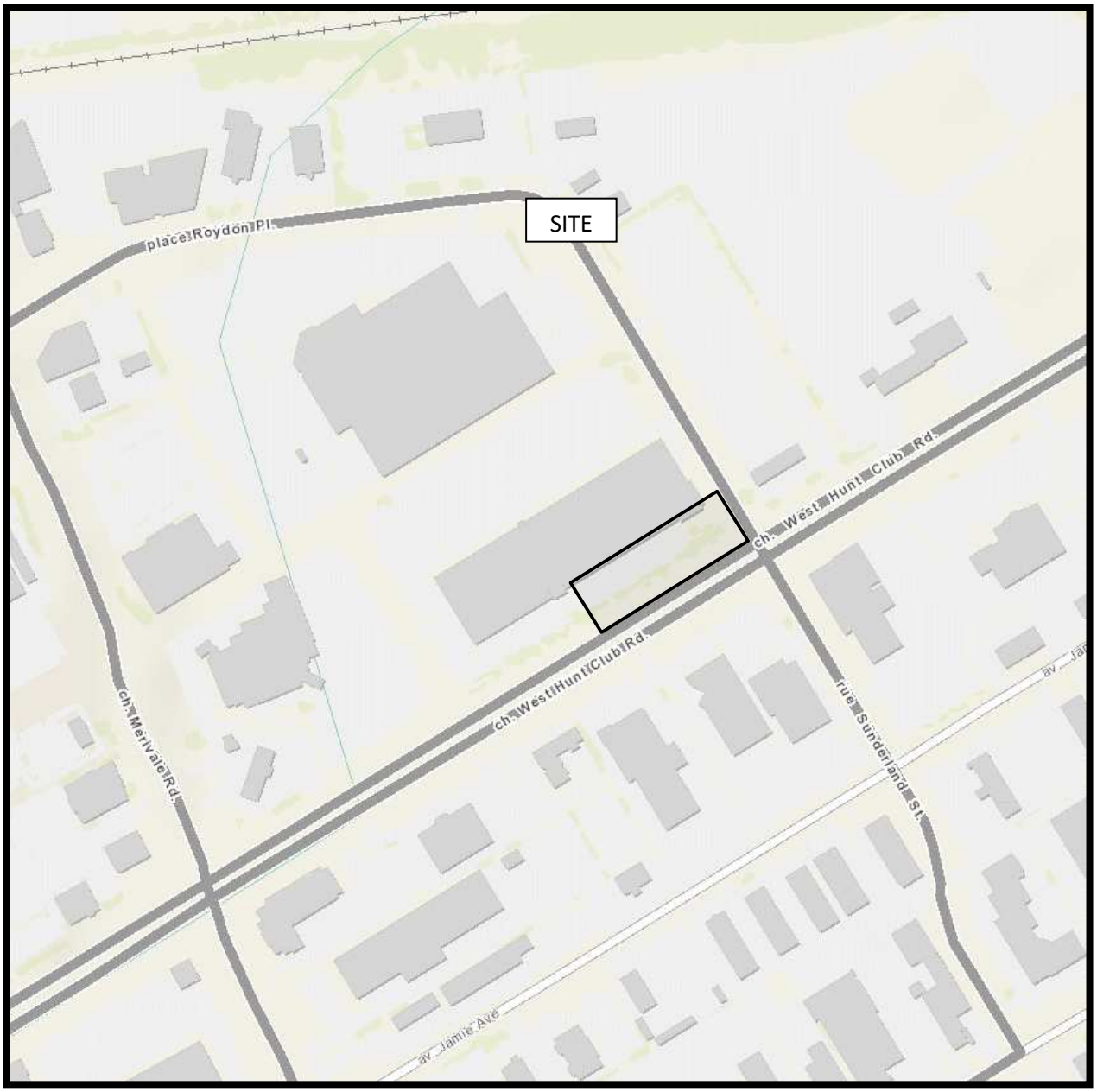
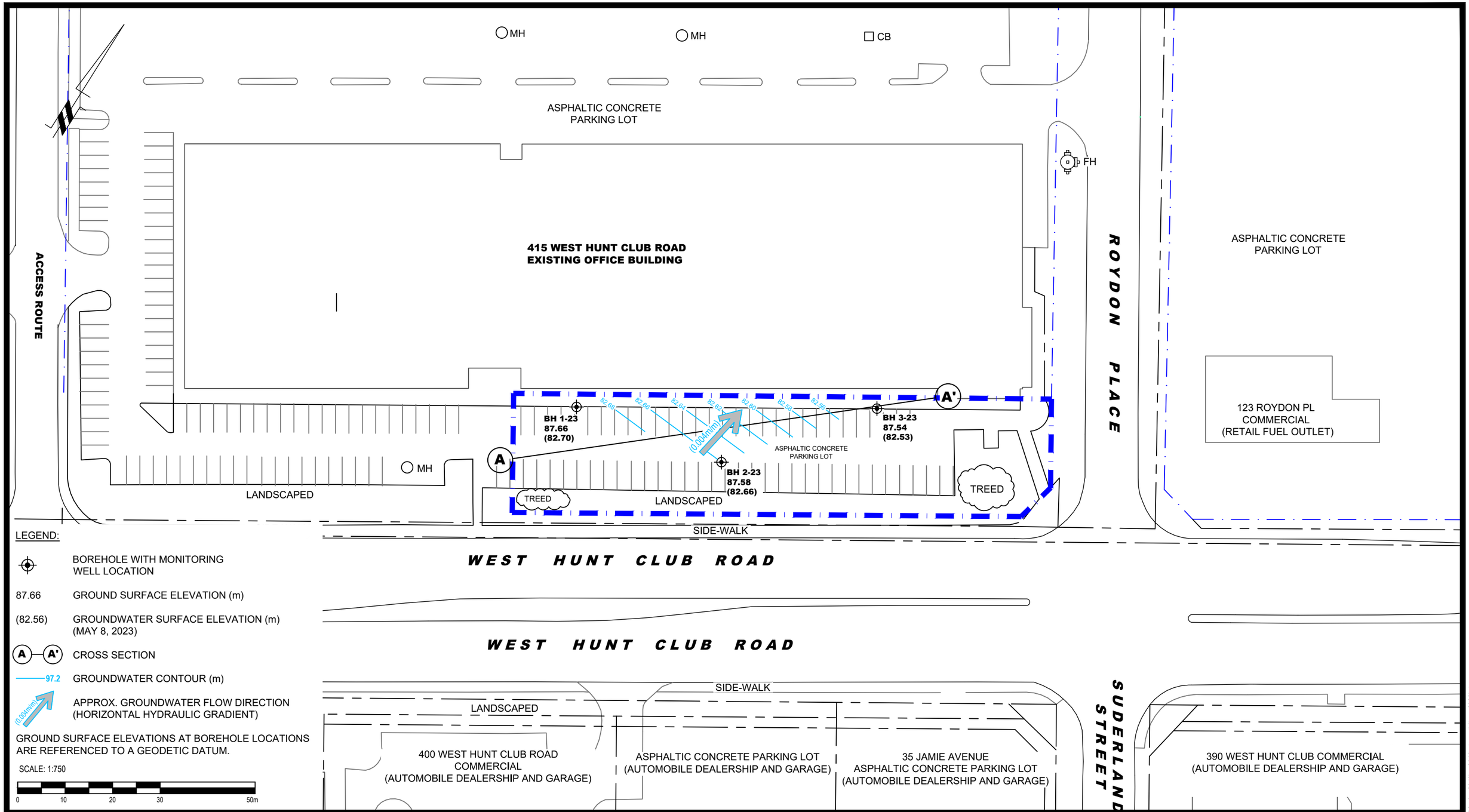


FIGURE 1

KEY PLAN



LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION
- 87.66 — GROUND SURFACE ELEVATION (m)
- (82.56) — GROUNDWATER SURFACE ELEVATION (m) (MAY 8, 2023)
- A — A' — CROSS SECTION
- 97.2 — GROUNDWATER CONTOUR (m)
- (0.004mm/m) — APPROX. GROUNDWATER FLOW DIRECTION (HORIZONTAL HYDRAULIC GRADIENT)

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

SCALE: 1:750

0 10 20 30 50m

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OTTAWA, ON
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TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL

COSTCO WHOLESALE CORPORATION.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
415 WEST HUNT CLUB ROAD

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:750	Date: 06/2023
Drawn by: GK	Report No.: PE6048-2
Checked by: CB	Dwg. No.: PE6048-3
Approved by: MSD	Revision No.:

11x17

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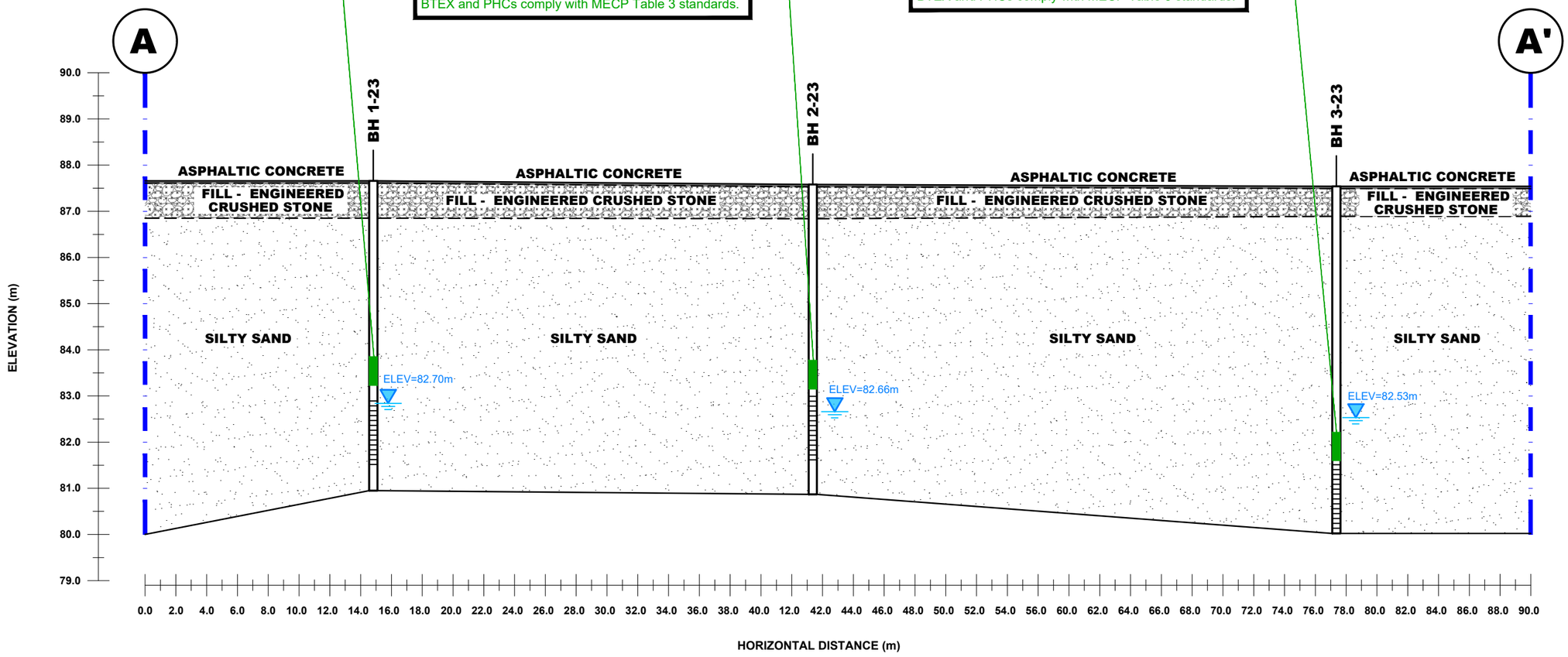
BH1-23-SS6 3.81 - 4.42m 3-MAY-2023
BTEX and PHCs comply with MECP Table 3 standards.

BH2-23-SS6 3.81 - 4.42m 3-MAY-2023
BTEX and PHCs comply with MECP Table 3 standards.

BH3-23-SS8 5.33 - 5.94m 3-MAY-2023
BTEX and PHCs comply with MECP Table 3 standards.



SOIL RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
415 WEST HUNT CLUB ROAD

OTTAWA, ONTARIO

Title:

CROSS SECTION A-A' - SOIL (BTEX AND PHCs)

Scale: AS SHOWN	Date: 06/2023
Drawn by: GK	Report No.: PE6048-2
Checked by: CB	Dwg. No.: PE6048-4A
Approved by: MSD	Revision No.:

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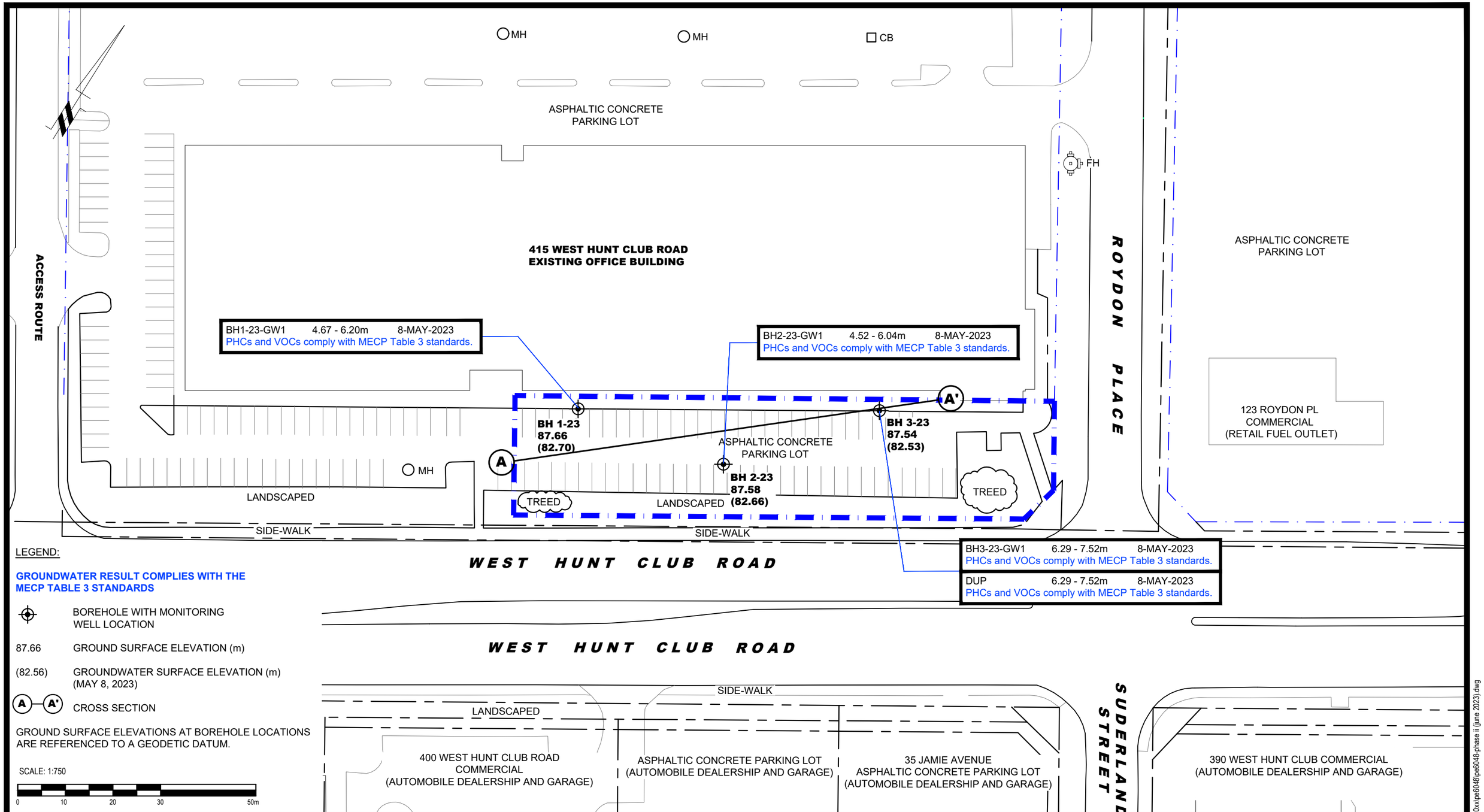

LEGEND:

GROUNDWATER RESULT COMPLIES WITH THE MECP TABLE 3 STANDARDS

- BOREHOLE WITH MONITORING WELL LOCATION
- 87.66 GROUND SURFACE ELEVATION (m)
- (82.56) GROUNDWATER SURFACE ELEVATION (m) (MAY 8, 2023)
- A — A' CROSS SECTION

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

SCALE: 1:750

0 10 20 30 50m

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NO.	REVISIONS	DATE	INITIAL

COSTCO WHOLESALE CORPORATION.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
415 WEST HUNT CLUB ROAD

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - GROUNDWATER (PHCs and VOCs)

Scale: 1:750	Date: 06/2023
Drawn by: GK	Report No.: PE6048-2
Checked by: CB	Dwg. No.: PE6048-5
Approved by: MSD	Revision No.:

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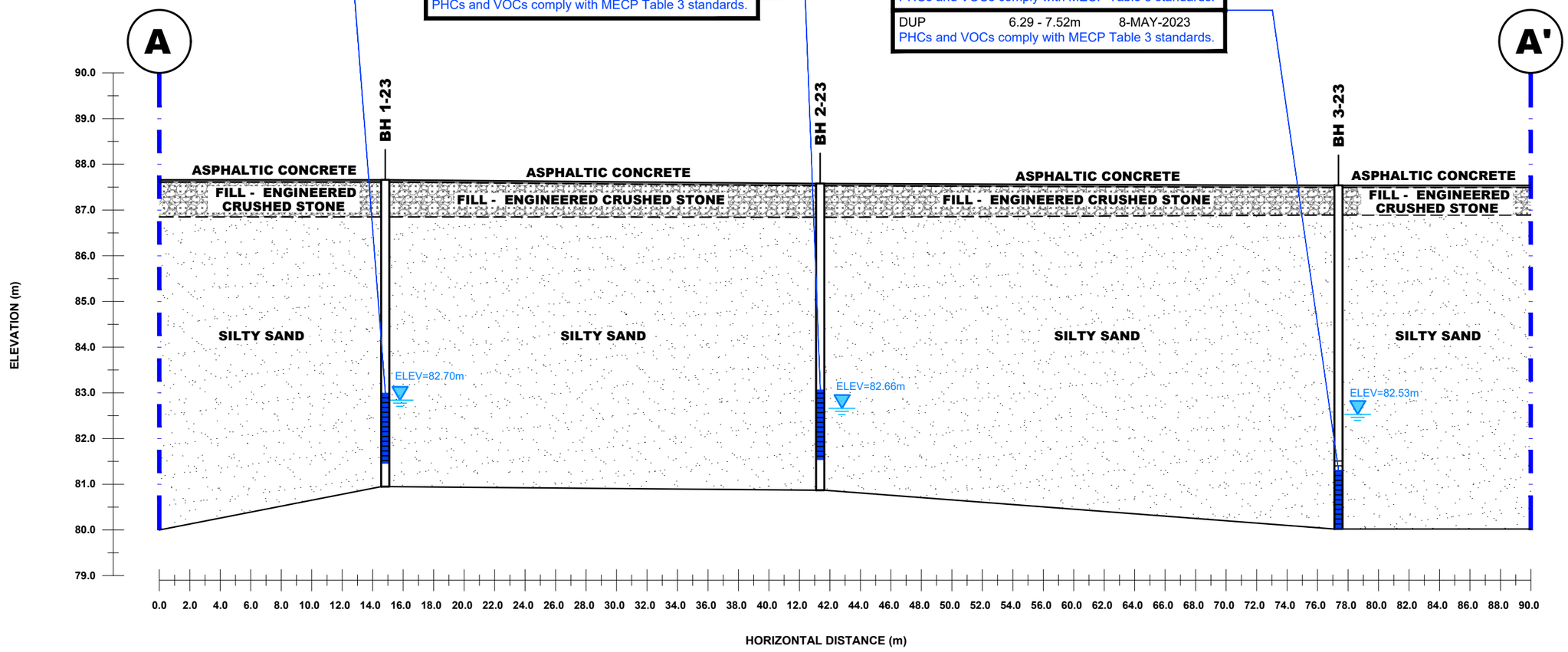
BH1-23-GW1 4.67 - 6.20m 8-MAY-2023
PHCs and VOCs comply with MECP Table 3 standards.

BH2-23-GW1 4.52 - 6.04m 8-MAY-2023
PHCs and VOCs comply with MECP Table 3 standards.

BH3-23-GW1 6.29 - 7.52m 8-MAY-2023
PHCs and VOCs comply with MECP Table 3 standards.

DUP 6.29 - 7.52m 8-MAY-2023
PHCs and VOCs comply with MECP Table 3 standards.



GROUNDWATER RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

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NO.	REVISIONS	DATE	INITIAL

COSTCO WHOLESALE CORPORATION.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
415 WEST HUNT CLUB ROAD
OTTAWA, ONTARIO

Title:
CROSS SECTION A-A' - GROUNDWATER (PHCs AND VOCs)

Scale: AS SHOWN	Date: 06/2023
Drawn by: GK	Report No.: PE6048-2
Checked by: CB	Dwg. No.: PE6048-5A
Approved by: MSD	Revision No.:

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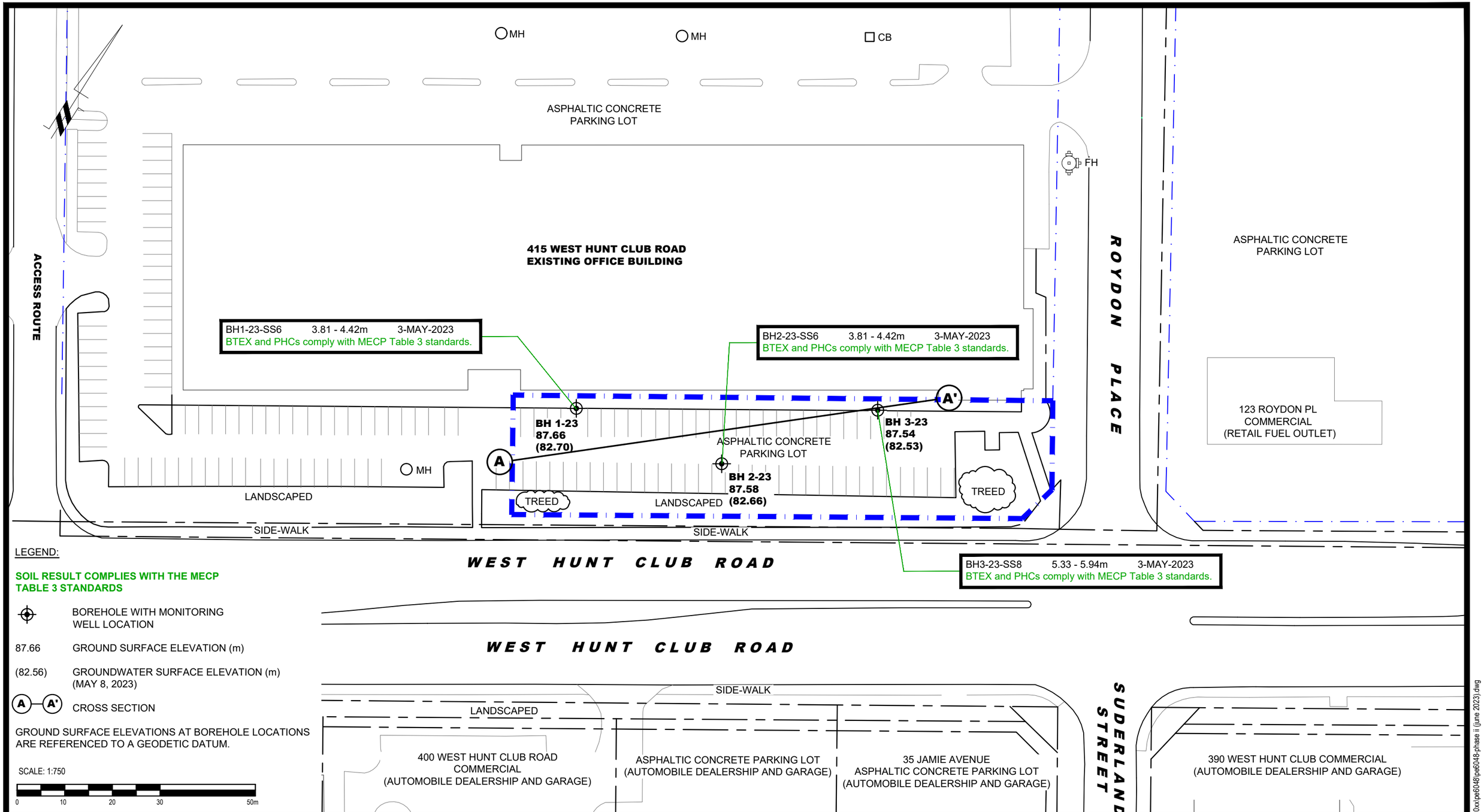

LEGEND:

SOIL RESULT COMPLIES WITH THE MECP TABLE 3 STANDARDS

- BOREHOLE WITH MONITORING WELL LOCATION
- 87.66 GROUND SURFACE ELEVATION (m)
- (82.56) GROUNDWATER SURFACE ELEVATION (m) (MAY 8, 2023)
- A — A' CROSS SECTION

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

SCALE: 1:750

0 10 20 30 50m

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NO.	REVISIONS	DATE	INITIAL

COSTCO WHOLESALE CORPORATION.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
415 WEST HUNT CLUB ROAD

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL (BTEX and PHCs)

Scale: 1:750	Date: 06/2023
Drawn by: GK	Report No.: PE6048-2
Checked by: CB	Dwg. No.: PE6048-4
Approved by: MSD	Revision No.:

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APPENDIX 1

SAMPLING AND ANALYSIS PLAN

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

ANALYTICAL TEST RESULTS

LABORATORY CERTIFICATES OF ANALYSIS

PATERSON GROUP

Sampling and Analysis Plan

Phase II Environmental Site Assessment

415 West Hunt Club Road

Ottawa, Ontario

Prepared for Costco Wholesale Corporation

Report PE6048-2 dated May 1, 2023

TABLE OF CONTENTS

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Costco Wholesale Corporation, to conduct a Phase II - Environmental Site Assessment (Phase II ESA) for the property addressed 415 West Hunt Club Road Street, Ottawa, Ontario.

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

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1-23	Western portion of subject site; to assess for potential impacts resulting from the presence of a former bulk petroleum facility.	4-7 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH2-23	South-central portion of subject site; to assess for potential impacts resulting from the presence of a former bulk petroleum facility.	4-7 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH3-23	Eastern portion of subject site; to assess for potential impacts resulting from the presence of a former bulk petroleum facility.	4-7 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.

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

Following the borehole drilling, groundwater monitoring wells will be installed in BH1-23, BH2-23 and BH3-23 for the collection of groundwater samples.

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

All borehole locations are shown on Drawing PE6048-3 Test Hole Location Plan, appended to the main report.

2.0 ANALYTICAL TESTING PROGRAM

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

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

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

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

3.0 STANDARD OPERATING PROCEDURES

3.1 Environmental Drilling Procedure

Purpose

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

Equipment

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

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

Determining Borehole Locations

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

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

Drilling Procedure

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

- ❒ Continuous split spoon samples (every 0.6 m or 2') or semi-continuous (every 0.76 m or 2'6") are required.
- ❒ Make sure samples are well sealed in plastic bags with no holes prior to screening and are kept cool but unfrozen.
- ❒ If sampling for VOCs, BTEX, or PHCs F_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.

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

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

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

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

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

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

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

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

patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Proposed Office Expansion - 415 Hunt Club Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY CME-55 Low Clearance Drill **DATE** May 3, 2023

FILE NO. PE6048

HOLE NO. BH 1-23

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.66
Asphaltic concrete 0.05							
FILL: Brown silty sand with gravel and crushed stone, trace asphalt fragments 0.76		AU	1				
		SS	2	75	24	1	86.66
		SS	3	100	34	2	85.66
Dense to compact, brown **SILTY SAND**		SS	4	83	36		
		SS	5	100	29	3	84.66
- compact by 3.7m depth		SS	6	75	14	4	83.66
		SS	7	83	14	5	82.66
		SS	8	83	11		
- some gravel by 6.6m depth		SS	9	83	11	6	81.66
6.71							
End of Borehole							
(GWL @ 4.96m - May 8, 2023)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Proposed Office Expansion - 415 Hunt Club Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY CME-55 Low Clearance Drill **DATE** May 3, 2023

FILE NO. PE6048

HOLE NO. BH 2-23

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
Asphaltic concrete 0.05						0	87.58
FILL: Brown silty sand with gravel and crushed stone, trace asphalt fragments 0.69		AU	1				
		SS	2	83	10	1	86.58
		SS	3	83	11	2	85.58
		SS	4	92	14	3	84.58
Compact, brown **SILTY SAND**		SS	5	100	12		
		SS	6	71	20	4	83.58
		SS	7	83	19	5	82.58
		SS	8	92	24		
		SS	9	75	26	6	81.58
6.71							
End of Borehole							
(GWL @ 4.92m - May 8, 2023)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Proposed Office Expansion - 415 Hunt Club Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY CME-55 Low Clearance Drill **DATE** May 3, 2023

FILE NO. PE6048

HOLE NO. BH 3-23

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.54
Asphaltic concrete 0.05							
FILL: Brown silty sand with gravel and crushed stone, trace topsoil 0.60		AU	1				
		SS	2	100	10	1	86.54
		SS	3	100	25	2	85.54
Compact to dense, brown **SILTY SAND**		SS	4	100	30	3	84.54
		SS	5	100	35		
		SS	6	100	38	4	83.54
		SS	7	83	48	5	82.54
- compact to very loose by 5.1m depth		SS	8	83	30		
		SS	9	50	2	6	81.54
7.52							
End of Borehole							
(GWL @ 5.01m - May 8, 2023)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

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

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

CONSOLIDATION TEST

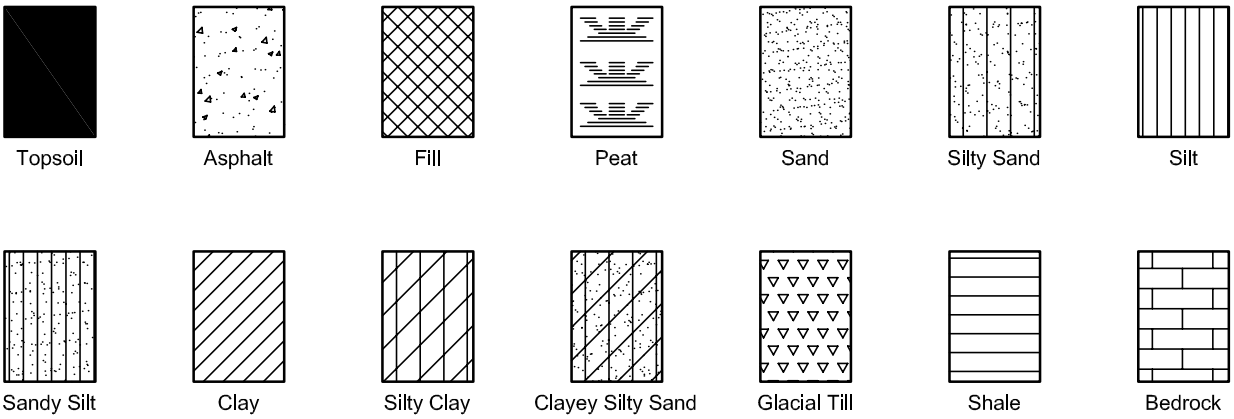
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

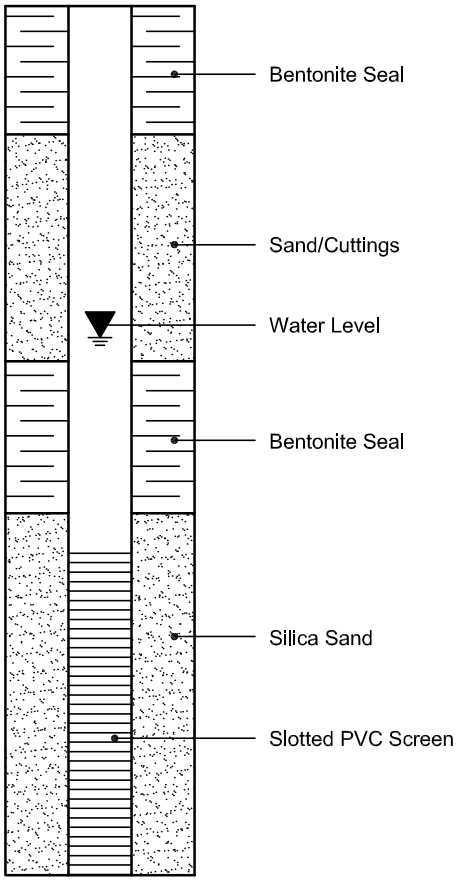
SYMBOLS AND TERMS (continued)

STRATA PLOT



MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION

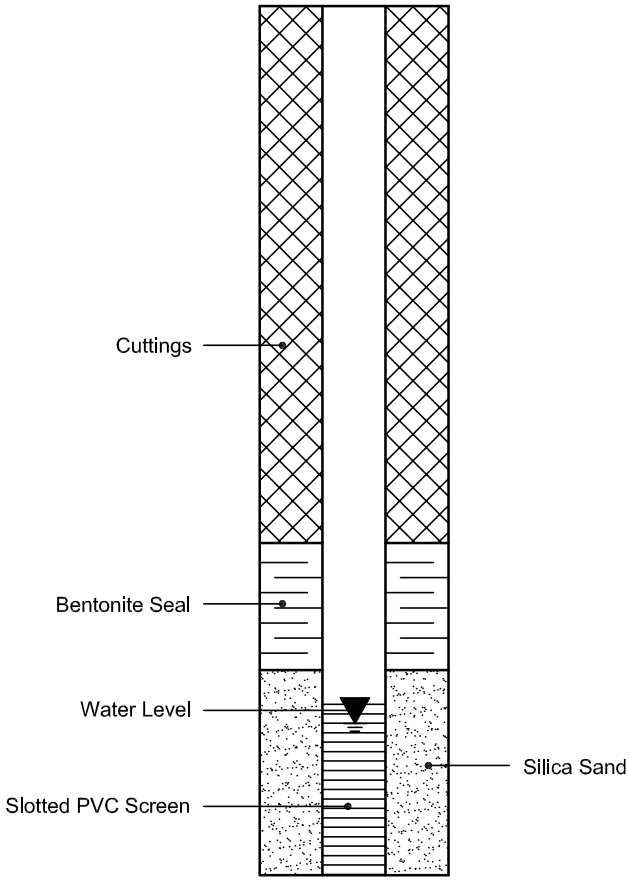


TABLE 1		CLIENT: Paterson Group Consulting Engineers				
PARACEL LABORATORIES LTD.		ATTENTION: Curtis Black				
WORKORDER: 2318373		PROJECT: PE6048				
REPORT DATE: 05/10/2023		REFERENCE: Standing Offer				

Parameter	Units	MDL	Regulation	Sample			
				BH1-23-SS6 2318373-01	BH2-23-SS6 2318373-02	BH3-23-SS8 2318373-03	BH4-23-SS8 2318373-04
Sample Date (m/d/y)			Reg 153/04 (2011)-Table 3 Industrial, coarse	05/03/2023 12:00 PM	05/03/2023 12:00 PM	05/03/2023 12:00 PM	05/03/2023 12:00 PM
Physical Characteristics							
Flashpoint	°C			>70	N/A	N/A	N/A
% Solids	% by Wt.	0.1		81.0	81.7	79.8	77.4
EPA 1311 - TCLP Leachate Inorganics							
Fluoride	mg/L	0.05		0.14	N/A	N/A	N/A
Nitrate as N	mg/L	1		ND (1)	N/A	N/A	N/A
Nitrite as N	mg/L	1		ND (1)	N/A	N/A	N/A
Cyanide, free	mg/L	0.02		ND (0.02)	N/A	N/A	N/A
EPA 1311 - TCLP Leachate Metals							
Arsenic	mg/L	0.05		ND (0.05)	N/A	N/A	N/A
Barium	mg/L	0.05		0.28	N/A	N/A	N/A
Boron	mg/L	0.10		ND (0.10)	N/A	N/A	N/A
Cadmium	mg/L	0.01		ND (0.01)	N/A	N/A	N/A
Chromium	mg/L	0.05		ND (0.05)	N/A	N/A	N/A
Lead	mg/L	0.05		ND (0.05)	N/A	N/A	N/A
Mercury	mg/L	0.005		ND (0.005)	N/A	N/A	N/A
Selenium	mg/L	0.05		ND (0.05)	N/A	N/A	N/A
Silver	mg/L	0.05		ND (0.05)	N/A	N/A	N/A
Uranium	mg/L	0.05		ND (0.05)	N/A	N/A	N/A
EPA 1311 - TCLP Leachate Volatiles							
Benzene	mg/L	0.005		ND (0.005)	N/A	N/A	N/A
EPA 1311 - TCLP Leachate Organics							
Benzo[a]pyrene	mg/L	0.0001		ND (0.0001)	N/A	N/A	N/A
Volatiles							
Benzene	ug/g dry	0.02	0.32 ug/g dry	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
Ethylbenzene	ug/g dry	0.05	9.5 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Toluene	ug/g dry	0.05	68 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
m/p-Xylene	ug/g dry	0.05		ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
o-Xylene	ug/g dry	0.05		ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Xylenes, total	ug/g dry	0.05	26 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Hydrocarbons							
F1 PHCs (C6-C10)	ug/g dry	7	55 ug/g dry	ND (7)	ND (7)	ND (7)	ND (7)
F2 PHCs (C10-C16)	ug/g dry	4	230 ug/g dry	ND (4)	ND (4)	ND (4)	ND (4)
F3 PHCs (C16-C34)	ug/g dry	8	1700 ug/g dry	ND (8)	ND (8)	ND (8)	ND (8)
F4 PHCs (C34-C50)	ug/g dry	6	3300 ug/g dry	ND (6)	ND (6)	ND (6)	12

TABLE 1		CLIENT: Paterson Group Consulting Engineers				
PARACEL LABORATORIES LTD.		ATTENTION: Mark D'Arcy				
WORKORDER: 2319092		PROJECT: PE6048				
REPORT DATE: 05/10/2023		REFERENCE: Standing Offer				

Parameter	Units	MDL	Regulation	Sample			
				BH1-23-GW1 2319092-01	BH2-23-GW1 2319092-02	BH3-23-GW1 2319092-03	DUP 2319092-04
Sample Date (m/d/y)			Reg 153/04 (2011)-Table 3 Non-Potable Groundwater, coarse	05/08/2023 09:00 AM	05/08/2023 09:00 AM	05/08/2023 09:00 AM	05/08/2023 09:00 AM
Volatiles							
Acetone	ug/L	5.0	130000 ug/L	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)
Benzene	ug/L	0.5	44 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Bromodichloromethane	ug/L	0.5	85000 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Bromoform	ug/L	0.5	380 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Bromomethane	ug/L	0.5	5.6 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Carbon Tetrachloride	ug/L	0.2	0.79 ug/L	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)
Chlorobenzene	ug/L	0.5	630 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Chloroform	ug/L	0.5	2.4 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Dibromochloromethane	ug/L	0.5	82000 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Dichlorodifluoromethane	ug/L	1.0	4400 ug/L	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
1,2-Dichlorobenzene	ug/L	0.5	4600 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
1,3-Dichlorobenzene	ug/L	0.5	9600 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
1,4-Dichlorobenzene	ug/L	0.5	8 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
1,1-Dichloroethane	ug/L	0.5	320 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
1,2-Dichloroethane	ug/L	0.5	1.6 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
1,1-Dichloroethylene	ug/L	0.5	1.6 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
cis-1,2-Dichloroethylene	ug/L	0.5	1.6 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
trans-1,2-Dichloroethylene	ug/L	0.5	1.6 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
1,2-Dichloropropane	ug/L	0.5	16 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
cis-1,3-Dichloropropylene	ug/L	0.5		ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
trans-1,3-Dichloropropylene	ug/L	0.5		ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
1,3-Dichloropropene, total	ug/L	0.5	5.2 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Ethylbenzene	ug/L	0.5	2300 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Ethylene dibromide (dibromoethane	ug/L	0.2	0.25 ug/L	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)
Hexane	ug/L	1.0	51 ug/L	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Methyl Ethyl Ketone (2-Butanone)	ug/L	5.0	470000 ug/L	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)
Methyl Isobutyl Ketone	ug/L	5.0	140000 ug/L	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)
Methyl tert-butyl ether	ug/L	2.0	190 ug/L	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)
Methylene Chloride	ug/L	5.0	610 ug/L	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)
Styrene	ug/L	0.5	1300 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
1,1,1,2-Tetrachloroethane	ug/L	0.5	3.3 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
1,1,2,2-Tetrachloroethane	ug/L	0.5	3.2 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Tetrachloroethylene	ug/L	0.5	1.6 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Toluene	ug/L	0.5	18000 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
1,1,1-Trichloroethane	ug/L	0.5	640 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
1,1,2-Trichloroethane	ug/L	0.5	4.7 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Trichloroethylene	ug/L	0.5	1.6 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Trichlorofluoromethane	ug/L	1.0	2500 ug/L	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Vinyl Chloride	ug/L	0.5	0.5 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
m/p-Xylene	ug/L	0.5		ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
o-Xylene	ug/L	0.5		ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Xylenes, total	ug/L	0.5	4200 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Hydrocarbons							
F1 PHCs (C6-C10)	ug/L	25	750 ug/L	ND (25)	ND (25)	ND (25)	ND (25)
F2 PHCs (C10-C16)	ug/L	100	150 ug/L	ND (100)	ND (100)	ND (100)	ND (100)
F3 PHCs (C16-C34)	ug/L	100	500 ug/L	ND (100)	ND (100)	ND (100)	ND (100)
F4 PHCs (C34-C50)	ug/L	100	500 ug/L	ND (100)	ND (100)	ND (100)	ND (100)

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Certificate of Analysis

Paterson Group Consulting Engineers

9 Auriga Drive
Ottawa, ON K2E 7T9
Attn: Curtis Black

Client PO: 57411
Project: PE6048
Custody:

Report Date: 10-May-2023
Order Date: 4-May-2023

Order #: 2318373

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

Paracel ID	Client ID
2318373-01	BH1-23-SS6
2318373-02	BH2-23-SS6
2318373-03	BH3-23-SS8
2318373-04	BH4-23-SS8

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 10-May-2023

Client: Paterson Group Consulting Engineers

Order Date: 4-May-2023

Client PO: 57411

Project Description: PE6048

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	5-May-23	6-May-23
Flashpoint	ASTM D93 - Pensky-Martens Closed Cup	8-May-23	8-May-23
Metals, ICP-MS	TCLP EPA 6020 - Digestion - ICP-MS	9-May-23	9-May-23
PHC F1	CWS Tier 1 - P&T GC-FID	5-May-23	6-May-23
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	5-May-23	6-May-23
REG 558 - Benzene	TCLP ZHE EPA 624 - P&T GC-MS	9-May-23	10-May-23
REG 558 - Cyanide	TCLP MOE E3015- Auto Colour	9-May-23	9-May-23
REG 558 - Fluoride	TCLP EPA 340.2 - ISE	9-May-23	10-May-23
REG 558 - Mercury by CVAA	TCLP EPA 7470A, CVAA	9-May-23	9-May-23
REG 558 - NO3/NO2	TCLP EPA 300.1 - IC	9-May-23	9-May-23
REG 558 - PAHs	TCLP EPA 625 - GC-MS	9-May-23	10-May-23
Solids, %	CWS Tier 1 - Gravimetric	5-May-23	5-May-23

Certificate of Analysis

Report Date: 10-May-2023

Client: **Paterson Group Consulting Engineers**

Order Date: 4-May-2023

Client PO: **57411**

Project Description: PE6048

	Client ID:	BH1-23-SS6	BH2-23-SS6	BH3-23-SS8	BH4-23-SS8
	Sample Date:	03-May-23 12:00	03-May-23 12:00	03-May-23 12:00	03-May-23 12:00
	Sample ID:	2318373-01	2318373-02	2318373-03	2318373-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	81.0	81.7	79.8	77.4
Flashpoint	°C	>70	-	-	-
EPA 1311 - TCLP Leachate Inorganics					
Fluoride	0.05 mg/L	0.14	-	-	-
Nitrate as N	1 mg/L	<1	-	-	-
Nitrite as N	1 mg/L	<1	-	-	-
Cyanide, free	0.02 mg/L	<0.02	-	-	-
EPA 1311 - TCLP Leachate Metals					
Arsenic	0.05 mg/L	<0.05	-	-	-
Barium	0.05 mg/L	0.28	-	-	-
Boron	0.10 mg/L	<0.10	-	-	-
Cadmium	0.01 mg/L	<0.01	-	-	-
Chromium	0.05 mg/L	<0.05	-	-	-
Lead	0.05 mg/L	<0.05	-	-	-
Mercury	0.005 mg/L	<0.005	-	-	-
Selenium	0.05 mg/L	<0.05	-	-	-
Silver	0.05 mg/L	<0.05	-	-	-
Uranium	0.05 mg/L	<0.05	-	-	-
EPA 1311 - TCLP Leachate Volatiles					
Benzene	0.005 mg/L	<0.005	-	-	-
Toluene-d8	Surrogate	110%	-	-	-
EPA 1311 - TCLP Leachate Organics					
Benzo [a] pyrene	0.0001 mg/L	<0.0001	-	-	-
Terphenyl-d14	Surrogate	122%	-	-	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene-d8	Surrogate	110%	106%	112%	109%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	<8	<8

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**

Client PO: **57411**

Report Date: 10-May-2023

Order Date: 4-May-2023

Project Description: PE6048

	Client ID:	BH1-23-SS6	BH2-23-SS6	BH3-23-SS8	BH4-23-SS8
	Sample Date:	03-May-23 12:00	03-May-23 12:00	03-May-23 12:00	03-May-23 12:00
	Sample ID:	2318373-01	2318373-02	2318373-03	2318373-04
	MDL/Units	Soil	Soil	Soil	Soil
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	12

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
EPA 1311 - TCLP Leachate Inorganics									
Fluoride	ND	0.05	mg/L						
Nitrate as N	ND	1	mg/L						
Nitrite as N	ND	1	mg/L						
Cyanide, free	ND	0.02	mg/L						
EPA 1311 - TCLP Leachate Metals									
Arsenic	ND	0.05	mg/L						
Barium	ND	0.05	mg/L						
Boron	ND	0.10	mg/L						
Cadmium	ND	0.01	mg/L						
Chromium	ND	0.05	mg/L						
Lead	ND	0.05	mg/L						
Mercury	ND	0.005	mg/L						
Selenium	ND	0.05	mg/L						
Silver	ND	0.05	mg/L						
Uranium	ND	0.05	mg/L						
EPA 1311 - TCLP Leachate Organics									
Benzo [a] pyrene	ND	0.0001	mg/L						
Surrogate: Terphenyl-d14	*0.24*		*mg/L*		*120*	*37-156*			
EPA 1311 - TCLP Leachate Volatiles									
Benzene	ND	0.005	mg/L						
Surrogate: Toluene-d8	*0.0864*		*mg/L*		*108*	*76-118*			
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*2.99*		*ug/g*		*93.3*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
EPA 1311 - TCLP Leachate Inorganics									
Fluoride	0.14	0.05	mg/L	0.14			0.8	20	
Nitrate as N	ND	1	mg/L	ND			NC	20	
Nitrite as N	ND	1	mg/L	ND			NC	20	
Cyanide, free	ND	0.02	mg/L	ND			NC	20	
EPA 1311 - TCLP Leachate Metals									
Arsenic	ND	0.05	mg/L	ND			NC	29	
Barium	0.292	0.05	mg/L	0.280			4.2	34	
Boron	ND	0.10	mg/L	ND			NC	33	
Cadmium	ND	0.01	mg/L	ND			NC	33	
Chromium	ND	0.05	mg/L	ND			NC	32	
Lead	ND	0.05	mg/L	ND			NC	32	
Mercury	ND	0.005	mg/L	ND			NC	30	
Selenium	ND	0.05	mg/L	ND			NC	28	
Silver	ND	0.05	mg/L	ND			NC	28	
Uranium	ND	0.05	mg/L	ND			NC	27	
EPA 1311 - TCLP Leachate Volatiles									
Benzene	ND	0.005	mg/L	ND			NC	25	
Surrogate: Toluene-d8	*0.0858*		*mg/L*		*107*	*76-118*			
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g	ND			NC	40	
F2 PHCs (C10-C16)	ND	4	ug/g	ND			NC	30	
F3 PHCs (C16-C34)	ND	8	ug/g	ND			NC	30	
F4 PHCs (C34-C50)	ND	6	ug/g	ND			NC	30	
Physical Characteristics									
% Solids	82.1	0.1	% by Wt.	81.0			1.3	25	
Volatiles									
Benzene	ND	0.02	ug/g	ND			NC	50	
Ethylbenzene	ND	0.05	ug/g	ND			NC	50	
Toluene	ND	0.05	ug/g	ND			NC	50	
m,p-Xylenes	ND	0.05	ug/g	ND			NC	50	
o-Xylene	ND	0.05	ug/g	ND			NC	50	
Surrogate: Toluene-d8	*3.88*		*ug/g*		*108*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
EPA 1311 - TCLP Leachate Inorganics									
Fluoride	0.66	0.05	mg/L	0.14	105	70-130			
Nitrate as N	10	1	mg/L	ND	102	81-112			
Nitrite as N	9	1	mg/L	ND	92.7	76-107			
Cyanide, free	0.040	0.02	mg/L	ND	80.5	60-140			
EPA 1311 - TCLP Leachate Metals									
Arsenic	47.8	0.05	mg/L	0.264	95.2	83-119			
Barium	74.9	0.05	mg/L	28.0	93.7	80-120			
Boron	45.5	0.10	mg/L	3.05	84.9	71-128			
Cadmium	43.8	0.01	mg/L	0.017	87.6	78-119			
Chromium	50.9	0.05	mg/L	0.154	102	80-124			
Lead	41.1	0.05	mg/L	ND	82.2	77-126			
Mercury	2.75	0.005	mg/L	ND	91.6	70-130			
Selenium	41.6	0.05	mg/L	0.676	81.8	75-125			
Silver	45.3	0.05	mg/L	ND	90.6	70-128			
Uranium	45.9	0.05	mg/L	0.056	91.7	70-131			
EPA 1311 - TCLP Leachate Organics									
Benzo [a] pyrene	0.0402	0.0001	mg/L	ND	80.3	39-123			
Surrogate: Terphenyl-d14	*0.24*		*mg/L*		*119*	*37-156*			
EPA 1311 - TCLP Leachate Volatiles									
Benzene	0.038	0.005	mg/L	ND	94.6	55-141			
Surrogate: Toluene-d8	*0.0700*		*mg/L*		*87.6*	*76-118*			
Hydrocarbons									
F1 PHCs (C6-C10)	162	7	ug/g	ND	81.2	80-120			
F2 PHCs (C10-C16)	109	4	ug/g	ND	110	60-140			
F3 PHCs (C16-C34)	271	8	ug/g	ND	112	60-140			
F4 PHCs (C34-C50)	164	6	ug/g	ND	107	60-140			
Volatiles									
Benzene	3.25	0.02	ug/g	ND	81.2	60-130			
Ethylbenzene	3.90	0.05	ug/g	ND	97.5	60-130			
Toluene	4.15	0.05	ug/g	ND	104	60-130			
m,p-Xylenes	8.03	0.05	ug/g	ND	100	60-130			
o-Xylene	4.20	0.05	ug/g	ND	105	60-130			
Surrogate: Toluene-d8	*3.23*		*ug/g*		*101*	*50-140*			

Qualifier Notes:

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

PARACEL LABORATORIES LTD.

Paracel ID: 2318373

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

Client Name: Paterson | Project Ref: PE6048 | Page 1 of 1

Contact Name: Curtis Black | Quote #:

Address: 9 Auriga Dr. | PO #: 57411

E-mail: cblack@patersongroup.ca

Telephone: 613-226-7381

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 ___ + 558 TCLP
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)	Flashpoint	Benzene (558)	PAHs (558)	Metals (558)	Inorganics (558)
1	BH1-23-S56	S		2	May 3rd.	12:00	X							X	X	X	X	X
2	BH2-23-S56	↓		↓	↓	↓	X											
3	BH3-23-S58						X											
4	BH4-23-S58	↓		↓	↓	↓	X											
5																		
6																		
7																		
8																		
9																		
10																		

Required Analysis

Comments: 1 Sample for 558 TCLP Testing.

Method of Delivery: PARACEL COURIER

Relinquished By (Sign): CBlack.	Received By Driver/Depot: H. Louise	Received at Lab:	Verified By:
Relinquished By (Print): Curtis Black	Date/Time: 04/05/23 1540	Date/Time: 04/05/23 17:30	Date/Time: May 5 2023 8:46
Date/Time: May 4th, 2023 12:00PM	Temperature: °C	Temperature: 6.2	pH Verified: ☐ By:

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 57431
Project: PE6048
Custody:

Report Date: 10-May-2023
Order Date: 8-May-2023

Order #: 2319092

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

Paracel ID	Client ID
2319092-01	BH1-23-GW1
2319092-02	BH2-23-GW1
2319092-03	BH3-23-GW1
2319092-04	DUP

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 57431

Report Date: 10-May-2023

Order Date: 8-May-2023

Project Description: PE6048

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHC F1	CWS Tier 1 - P&T GC-FID	9-May-23	9-May-23
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	9-May-23	9-May-23
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	9-May-23	9-May-23

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 57431

Report Date: 10-May-2023

Order Date: 8-May-2023

Project Description: PE6048

	Client ID:	BH1-23-GW1	BH2-23-GW1	BH3-23-GW1	DUP
	Sample Date:	08-May-23 09:00	08-May-23 09:00	08-May-23 09:00	08-May-23 09:00
	Sample ID:	2319092-01	2319092-02	2319092-03	2319092-04
	MDL/Units	Ground Water	Ground Water	Ground Water	Ground Water
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Chloroform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylene dibromide (dibromoethane, 1,2-)	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	<2.0
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5

Certificate of Analysis

Report Date: 10-May-2023

Client: Paterson Group Consulting Engineers

Order Date: 8-May-2023

Client PO: 57431

Project Description: PE6048

	Client ID:	BH1-23-GW1	BH2-23-GW1	BH3-23-GW1	DUP
	Sample Date:	08-May-23 09:00	08-May-23 09:00	08-May-23 09:00	08-May-23 09:00
	Sample ID:	2319092-01	2319092-02	2319092-03	2319092-04
	MDL/Units	Ground Water	Ground Water	Ground Water	Ground Water
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
4-Bromofluorobenzene	Surrogate	106%	106%	107%	105%
Dibromofluoromethane	Surrogate	105%	108%	108%	107%
Toluene-d8	Surrogate	109%	109%	109%	108%
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

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane, 1,2	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
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	*84.8*		*ug/L*		*106*	*50-140*			
Surrogate: Dibromofluoromethane	*88.6*		*ug/L*		*111*	*50-140*			
Surrogate: Toluene-d8	*86.2*		*ug/L*		*108*	*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	
Volatiles									
Acetone	ND	5.0	ug/L	ND			NC	30	
Benzene	ND	0.5	ug/L	ND			NC	30	
Bromodichloromethane	ND	0.5	ug/L	ND			NC	30	
Bromoform	ND	0.5	ug/L	ND			NC	30	
Bromomethane	ND	0.5	ug/L	ND			NC	30	
Carbon Tetrachloride	ND	0.2	ug/L	ND			NC	30	
Chlorobenzene	ND	0.5	ug/L	ND			NC	30	
Chloroform	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	
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	*87.3*		*ug/L*		*109*	*50-140*			
Surrogate: Dibromofluoromethane	*85.9*		*ug/L*		*107*	*50-140*			
Surrogate: Toluene-d8	*88.2*		*ug/L*		*110*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1830	25	ug/L	ND	91.6	68-117			
F2 PHCs (C10-C16)	1570	100	ug/L	ND	98.0	60-140			
F3 PHCs (C16-C34)	3960	100	ug/L	ND	101	60-140			
F4 PHCs (C34-C50)	2310	100	ug/L	ND	93.0	60-140			
Volatiles									
Acetone	102	5.0	ug/L	ND	102	50-140			
Benzene	38.5	0.5	ug/L	ND	96.3	60-130			
Bromodichloromethane	33.2	0.5	ug/L	ND	82.9	60-130			
Bromoform	48.4	0.5	ug/L	ND	121	60-130			
Bromomethane	45.0	0.5	ug/L	ND	112	50-140			
Carbon Tetrachloride	38.5	0.2	ug/L	ND	96.3	60-130			
Chlorobenzene	46.6	0.5	ug/L	ND	116	60-130			
Chloroform	32.6	0.5	ug/L	ND	81.4	60-130			
Dibromochloromethane	46.0	0.5	ug/L	ND	115	60-130			
Dichlorodifluoromethane	45.7	1.0	ug/L	ND	114	50-140			
1,2-Dichlorobenzene	44.7	0.5	ug/L	ND	112	60-130			
1,3-Dichlorobenzene	41.4	0.5	ug/L	ND	104	60-130			
1,4-Dichlorobenzene	40.9	0.5	ug/L	ND	102	60-130			
1,1-Dichloroethane	37.0	0.5	ug/L	ND	92.4	60-130			
1,2-Dichloroethane	31.8	0.5	ug/L	ND	79.4	60-130			
1,1-Dichloroethylene	41.4	0.5	ug/L	ND	104	60-130			
cis-1,2-Dichloroethylene	40.5	0.5	ug/L	ND	101	60-130			
trans-1,2-Dichloroethylene	39.6	0.5	ug/L	ND	98.9	60-130			
1,2-Dichloropropane	38.8	0.5	ug/L	ND	96.9	60-130			
cis-1,3-Dichloropropylene	44.8	0.5	ug/L	ND	112	60-130			
trans-1,3-Dichloropropylene	44.9	0.5	ug/L	ND	112	60-130			
Ethylbenzene	38.7	0.5	ug/L	ND	96.7	60-130			
Ethylene dibromide (dibromoethane, 1,2-	47.6	0.2	ug/L	ND	119	60-130			
Hexane	40.7	1.0	ug/L	ND	102	60-130			
Methyl Ethyl Ketone (2-Butanone)	80.4	5.0	ug/L	ND	80.4	50-140			
Methyl Isobutyl Ketone	76.6	5.0	ug/L	ND	76.6	50-140			
Methyl tert-butyl ether	89.2	2.0	ug/L	ND	89.2	50-140			
Methylene Chloride	42.0	5.0	ug/L	ND	105	60-130			
Styrene	42.9	0.5	ug/L	ND	107	60-130			
1,1,1,2-Tetrachloroethane	41.8	0.5	ug/L	ND	104	60-130			
1,1,2,2-Tetrachloroethane	41.7	0.5	ug/L	ND	104	60-130			
Tetrachloroethylene	47.8	0.5	ug/L	ND	119	60-130			
Toluene	43.2	0.5	ug/L	ND	108	60-130			
1,1,1-Trichloroethane	37.4	0.5	ug/L	ND	93.6	60-130			
1,1,2-Trichloroethane	41.1	0.5	ug/L	ND	103	60-130			
Trichloroethylene	38.2	0.5	ug/L	ND	95.6	60-130			
Trichlorofluoromethane	47.7	1.0	ug/L	ND	119	60-130			
Vinyl chloride	40.6	0.5	ug/L	ND	102	50-140			
m,p-Xylenes	88.4	0.5	ug/L	ND	111	60-130			
o-Xylene	37.7	0.5	ug/L	ND	94.3	60-130			
Surrogate: 4-Bromofluorobenzene	*72.0*		*ug/L*		*90.0*	*50-140*			
Surrogate: Dibromofluoromethane	*83.2*		*ug/L*		*104*	*50-140*			
Surrogate: Toluene-d8	*70.0*		*ug/L*		*87.6*	*50-140*			

Qualifier Notes:

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

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

PARACEL LABORATORIES LTD.

Paracel ID: 2319092

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2319092	

Client Name: Paterson
Contact Name: Mark D'Arcy
Address: 9 Auriga
Telephone: 613 226 7381

Project Ref: PE6048
Quote #:
PO #: 57431
E-mail: Mdarcy@Paterson.group.ca
cPaterson@Paterson.group.ca

Page __ of __

Turnaround Time
- ☐ 1 day
- ☐ 3 day
- ☐ 2 day
- ☒ Regular

Date Required:

☒ REG 153/04 ☐ REG 406/19

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

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

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

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)				
1	BH1-23-GW1	GW		3	May 8 2023		X	X									
2	BH2-23-GW1						X	X									
3	BH3-23-GW1						X	X									
4	DUP						X	X									
5																	
6																	
7																	
8																	
9																	
10																	

Comments:

Method of Delivery: PARCEL COURIER

Relinquished By (Sign):	Received By Driver/Depot:	Received at Lab:	Verified By:
GPat	M. Fenwick		Sandra Pemroke
Relinquished By (Print): Grant Paterson	Date/Time: 08/05/23 1500	Date/Time: 08/05/23 344	Date/Time: May 8, 3:49
Date/Time: May 8 2023	Temperature: °C	Temperature: 18.6	pH Verified: ☐ By: