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Phase II Environmental Site Assessment

6310 and 6320 Hazeldean Road
Ottawa, Ontario

Prepared For

4329163 Canada Inc.

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Report: PE4484-2R

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EXECUTIVE SUMMARY

Assessment

A 2018 Phase II ESA was conducted for the properties addressed 6310 and 6320 Hazeldean Road, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address potentially contaminating activities (PCAs) that were identified during the 2018 Phase I ESA prepared by McInstosh Perry Consulting Engineers Ltd., and considered to result in areas of potential environmental concern (APECs) on the subject land.

The 2018 subsurface investigation consisted of drilling 7 boreholes, 3 of which were completed with monitoring well installations.

Soil samples were obtained from the boreholes and screened using visual observations and combustible vapour measurements. A total of 4 soil samples were submitted for laboratory analysis of benzene, toluene, ethylbenzene and xylenes (BTEX) and petroleum hydrocarbons (PHCs, F_1-F_4). Concentrations of BTEX and PHC F_1 and F_2 exceeding MECP Table 3 Residential standards were identified in a sample recovered from BH7 on the central portion of the site, in the immediate vicinity of the former RV service garage.

As part of the 2018 program, groundwater samples from monitoring wells installed in BH1, BH4 and BH6 were recovered and analysed for BTEX or volatile organic compound (VOC) and PHC parameters. No BTEX, VOC or PHC concentrations were identified above the laboratory method detection limits. As such, the groundwater was determined to comply with the MECP Table 3 Residential standards.

A supplemental subsurface investigation was carried out in 2020 and consisted of placing 11 test pits across the Phase II Property, for the primary purpose of delineating the 2018 impacts. A representative sample of impacted material was also collected for leachate analysis in accordance with O.Reg. 347/558.

Soil samples were obtained from the 2020 test pits and screened using visual observations and combustible vapour measurements. A total of 5 soil samples and a duplicate were submitted for laboratory analysis of benzene, toluene, ethylbenzene and xylenes (BTEX) and petroleum hydrocarbons (PHCs, F_1-F_4). All of the soil samples analyzed complied with the MECP Table 3 Residential standards.

Recommendations

It is our understanding that the Phase II ESA Property will be redeveloped with a residential building with ground-floor commercial space and one level of underground parking that will occupy the majority of the site. Due to the change in land use to a more sensitive land use (commercial to residential), a record of site condition (RSC) will be required as per O.Reg 154/03.

Soil

It is recommended that a soil remediation be carried out in the vicinity of BH7 prior to or in conjunction with site redevelopment. It is also recommended that Paterson personnel be present to oversee the excavation and segregation of impacted soil and to collect confirmatory soil samples as required.

Any excess soil that meets site standards and requires removal for construction purposes must be handled in accordance with O. Reg. 406/19, On-Site and Excess Soil Management. Additional information regarding O.Reg. 406/19 can be provided upon request.

Monitoring Wells

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

1.0 INTRODUCTION

At the request of 4329163 Canada Inc., Paterson Group Inc. (Paterson) conducted a Phase II Environmental Site Assessment for the property addressed 6310 and 6320 Hazeldean Road in the City of Ottawa, Ontario. The purpose of this Phase II ESA was to address areas of potential environmental concern (APECs) identified on the Phase II Property, during the 2018 Phase I ESA and 2020 Phase I ESA Update.

1.1 Site Description

Address:	6310 and 6320 Hazeldean Road, Ottawa, Ontario. It should be noted that the Phase I Property also consists of a third parcel of land, with no civic address, along Hazeldean Road.
Legal Description:	Parts 1, 2, 3, 4, 5, 6 and 7, Registered Plan 4R-19395, City of Ottawa
Property Identification Number:	04753-0270, 04753-0271, and 04573-0272
Location:	The subject site is located on the south side of Hazeldean Road between Westridge Drive and Carp Road. For the purposes of this report, Hazeldean Road is assumed to travel in an east-west direction. The subject site is shown on Figure 1 - Key Plan following the body of this report.
Latitude and Longitude:	45° 15' 59" N, 75° 56' 23" W
Configuration:	Irregular
Site Area:	1.6 hectares

1.2 Property Ownership

The subject property is currently owned by 4329163 Canada Inc. Paterson was retained to complete this Phase II ESA by Mr. Marco Racine and Mr. Michael Uberti of 4329163 Canada Inc.

1.3 Current and Proposed Future Uses

The Phase II Property currently exists as vacant land. The former commercial buildings were demolished in 2020.

It is our understanding that the Phase II Property will be redeveloped with a residential development with ground floor commercial space. Due to the change in land use to a more sensitive land use (Residential to residential), a record of site condition (RSC) will be required as per O.Reg 154/03.

1.4 Applicable Site Condition Standard

The site condition standards for the property were obtained from Table 3 of the document entitled “Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act”, prepared by the Ontario Ministry of the 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;
- ❒ Non-potable groundwater conditions; and
- ❒ Residential land use.

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

Section 41 of O.Reg. 153/04 does not apply to the Phase II ESA Property, as the property is not within 30m of an environmentally sensitive area, and the pH values for surface and subsurface soils are 7.38 and 7.57, respectively.

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

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

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The Phase II Property is currently vacant land consisting of gavelled areas and partially brush-covered and/or treed areas along the south and east property boundaries.

The Phase II Property is located in an suburban area surrounded by residential subdivisions to the south and northwest (across Hazeldean Road) and commercial establishments to the north and east, and a vacant piece of land to the west.

The ground surface elevation at the Phase II Property is approximately 120m above sea level (m asl). Site topography slopes northward toward Feedmill Creek and ultimately the Carp River. The Phase II Property is at a similar grade as the adjacent properties. Site drainage consists primarily of infiltration.

The Phase II Property was formerly serviced with a potable well; the potable well was decommissioned in 2020. Surrounding properties are serviced with municipal water and sewer. As previously noted, the Phase II Property will be provided with municipal services upon redevelopment.

2.2 Past Investigations

2018 Phase I ESA

A Phase I ESA was conducted by McIntosh Perry in August of 2018. Based on the findings of the Phase I ESA, the following two (2) on-site potentially contaminating activities (PCAs) and three (3) off-site PCAs were considered to result in areas of potential environmental concern (APECs) on the Phase I Property:

- On-site aboveground fuel storage tank (AST);
- Former RV service bays on-site;
- Existing RV dealership and service centre at 1174 Carp Road, adjacent to the east of the subject property;
- Existing retail fuel outlet at 1174 Carp Road, further east of the subject property, across Carp Road; and
- Existing automotive service garage (Oil Changers) at 1189 Carp Road, further east of the subject property across Carp Road.

Based on the findings of the Phase I ESA, a Phase II ESA was recommended by MacIntosh Perry.

2018 Phase II ESA

Paterson was commissioned to complete a Phase II ESA in December 2018 to address the aforementioned APECs. Prior to carrying out the subsurface investigation, the 2018 Phase I ESA was reviewed. Based on our review of the Phase I ESA, it was our opinion that the retail fuel outlet and automotive service garage east of Carp Road did not represent APECs on the subject property based on their separation distances of over 150 m relative to the subject property, in combination with the inferred northerly groundwater flow (confirmed during the Phase II ESA).

The subsurface investigation consisted of drilling 7 boreholes to address the on-site APECs and neighbouring RV dealership, 3 of which were completed with monitoring well installations.

Soil samples were obtained from the boreholes and screened using visual observations and combustible vapour measurements.

A total of 4 soil samples were submitted for laboratory analysis of benzene, toluene, ethylbenzene and xylenes (BTEX) and petroleum hydrocarbons (PHCs, F_1-F_4). Concentrations of BTEX and PHC F_1 and F_2 exceeding the MECP Table 3 Standards selected for the site were identified in a sample recovered from BH7 on the central portion of the site, in the immediate vicinity of the former RV service bays. Soil samples analysed from BH1 and BH4, in the vicinity of the former AST (not present at the time of the subsurface investigation) and along the eastern portion of the property, complied with the MECP Table 3 standards.

Groundwater samples from monitoring wells installed in BH1, BH4 and BH6 were recovered and analysed for BTEX or volatile organic compound (VOC) and PHC parameters. No BTEX, VOC or PHC concentrations were identified above the laboratory method detection limits. The groundwater was in compliance with the MECP Table 3 standards.

2020 Phase I ESA Update

The Phase I ESA Update was completed by Paterson. Based on the review of the previous reports, and ERIS report, the Phase I Property nor the adjacent property to the east, were identify as waste generators. Given that waste generator numbers were not identified, it is considered unlikely that either the former on-site or existing adjacent RV dealership operated as full-service repair garages. It is expected that repair services provided by these establishments were limited to minor works such as appliance servicing, electrical repairs, windshield replacements and wall de-lamination repairs.

Based on the findings of the assessment, the on-site potentially contaminating activities (PCAs) resulting in areas of potential environmental concern (APECs) on the Phase I Property are presented 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 (Resulting from a former aboveground storage tank (AST)	Central portion of the Phase I Property	PCA 28 – Gasoline and Associated Products Storage in Fixed Tanks	On-site	BTEX PHCs (F_1-F_4)	Soil and Groundwater
APEC 2	Central portion of the Phase I Property	PCA 52 – Storage, maintenance, fuelling and repair of equipment, vehicles and material used to maintain transportation systems	On-site	BTEX PHCs (F_1-F_4)	Soil and Groundwater

The 2018 and 2020 subsurface programs were conducted to address the APECs and delineate the existing impacted soil identified in 2018.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

As discussed in Section 2.2, an initial subsurface investigation was conducted in conjunction with a Geotechnical Investigation on November 29 and 30, 2018. The field program consisted of drilling 7 boreholes, 3 of which were completed with monitoring well installations. Boreholes were drilled to depths ranging from approximately 3.05 to 6.12m below grade. Boreholes were terminated in the overburden.

The 2020 subsurface investigation was conducted on December 17, 2020 and consisted of placing 11 test pits (TP1-20 through TP11-20) across the Phase II Property. The test pits were placed to delineate impacted soil previously identified at BH7. The test pits were completed using a rubber-tired backhoe. Test pit locations are shown on Drawing PE4484-1R – Test Hole Location Plan, appended to this report.

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 potentially contaminating activities (PCAs) identified in the Phase I ESAs, and their associated contaminants of potential environmental concern (CPCs).

As noted in Table 1 above, contaminants of potential concern for soil and groundwater include benzene, toluene, ethylbenzene and xylenes (BTEX) or volatile organic compounds (VOCs) and petroleum hydrocarbons (PHCs, fractions F_1-F_4).

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

The Geological Survey of Canada website on the Urban Geology of the National Capital Area was consulted as part of this assessment. Based on this information, bedrock in the area of the site consists of limestone of the Bobcaygeon Formation. Overburden soils are reported to consist of glacial till with drift thickness ranging from approximately 3 to 10 m across the site. Based on the Phase II ESA, overburden soils consisted of silty sand and glacial till. Boreholes were extended to approximately 4 m below grade; bedrock was not encountered.

The Phase I Property is situated within the Mississippi River watershed. Based on a review of site geology and topography, groundwater was inferred to flow northward toward Feedmill Creek and ultimately the Carp River. Based on the findings of the Phase II ESA, the groundwater flow beneath the subject property was confirmed to flow in a northerly direction.

Buildings and Structures

The Phase I Property is occupied by three 1-storey buildings (two modular buildings and one permanent building with a concrete block foundation). No other buildings or structures are present on the Phase I Property.

Water Bodies

No water bodies are present on the Phase I Property or within the Phase I Study area.

Areas of Natural Significance

No areas of natural significance are known to exist within the Phase I Study Area.

Drinking Water Wells

A private well was present on the Phase I Property at the time of the 2018 site visit and has since been decommissioned. The property will be provided with municipal services upon redevelopment.

The MECP well mapping website was accessed to obtain well records for all drilled wells within 250m of the Phase I Property. Records for potable wells installed between 1952 and 1976, were identified for properties within the Phase I Study Area, along Carp Road. In general, the wells in the Phase I study area were installed in the grey limestone bedrock at depths generally ranging from approximately 75 to 100m below grade. These potable wells are expected to have been abandoned and are no longer in use, as the neighbouring properties are currently provided with municipal water service.

Neighbouring Land Use

Neighbouring land use in the Phase I Study Area is primarily residential with some commercial properties, as well as vacant parcels of land west of the subject property.

Potential Contaminating Activities and Areas of Potential Environmental Concern

Based on a the review of the 2018 Phase I ESA conducted by MacIntosh Perry, it was noted that the ERIS report for the property does not identify any waste generator numbers for the subject property or the adjacent property to the east. Given that waste generator numbers were not identified, it is considered unlikely that either the former on-site or existing adjacent RV dealership operated as full-service repair garages. It is expected that repair services provided by these establishments were limited to minor works such as appliance servicing, electrical repairs, windshield replacements and wall de-lamination repairs.

Despite the nature of the former repair works, due to the presence of the former service bay on-site along with a reported drain within the building, the former RV service area is considered to represent an APEC on site.

Based on the separation distance (approximately 20m) and downgradient orientation relative to the subject site in combination with the nature of the service repairs carried out, this RV dealership on the adjacent property to the east is not considered to represent an APEC on the Phase I Property.

Potentially contaminating activities (PCAs) resulting in areas of potential environmental concern (APECs) on the Phase I Property are presented 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 (Resulting from a former aboveground storage tank (AST)	Central portion of the Phase I Property	PCA 28 – Gasoline and Associated Products Storage in Fixed Tanks	On-site	BTEX PHCs (F_1-F_4)	Soil and Groundwater
APEC 2	Central portion of the Phase I Property	PCA 52 – Storage, maintenance, fuelling and repair of equipment, vehicles and material used to maintain transportation systems	On-site	BTEX PHCs (F_1-F_4)	Soil and Groundwater

Contaminants of Potential Concern

As noted in Table 1, CPCs associated with the identified APECs include BTEX and PHCs (F_1-F_4), in the soil and/or groundwater beneath the Phase I Property.

Assessment of Uncertainty and/or Absence of Information

The information available for review as part of the preparation of this Phase I ESA Update is considered to be sufficient to conclude that there are areas of potential environmental concern (APEC) on the subject site. The presence 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.

3.4 Deviations from Sampling and Analysis Plan

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

3.5 Impediments

The locations of buried services and building structures were taken into consideration when selecting borehole locations within the APECs. Otherwise, no physical impediments were encountered during the field portion of the Phase II ESA.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The initial subsurface investigation was conducted on November 29 and 30, 2018 and consisted of 7 boreholes advanced across the Phase II Property. Boreholes BH1, BH4 and BH6 were completed with groundwater monitoring well installations. The boreholes were placed to address the aforementioned areas of potential environmental concern (APECs) and to provide general coverage of the site for geotechnical purposes. The boreholes were drilled with a truck mounted CME 55 power auger drill rig, provided by George Downing Estate Drilling of Hawkesbury, Ontario.

The 2020 subsurface investigation was conducted on December 17, 2020 and consisted of placing 11 test pits (TP1-20 through TP11-20) across the Phase II Property. The test pits were placed to delineate impacted soil previously identified at BH7. The test pits were completed using a rubber-tired backhoe.

Borehole and test pit locations are shown on Drawing PE4484-1R – Test Hole Location Plan, appended to this report.

4.2 Soil Sampling

A total of 63 soil samples were obtained from the boreholes by means of grab samples or sampling directly from shallow auger flights and split spoon sampling. The depths at which auger samples and split spoon samples were obtained from the boreholes are shown as "**G", "AU**" and "**SS**" on the Soil Profile and Test Data Sheets, appended to this report.

Based on the 2018 and 2020 subsurface investigations, the site stratigraphy generally consists of crushed rock and reworked native material over a layer of topsoil and/or silty sand, underlain by sandy glacial till. The crushed rock was present from ground surface to depths ranging from 0.2 to 0.3m below grade, followed by reworked native material consisting of silty sand with some clay and/or gravel, to depths up to approximately 1.0m below grade.

All boreholes and test pits were terminated in the silty-sand or the glacial till layer at depths ranging from 0.88 to 6.12m below grade. Boreholes BH1, BH4, BH5 and BH6 were completed on practical refusal to augering on the inferred bedrock surface, at depths ranging from approximately 3.92 to 6.12m below grade. The test pits were completed in the silty sand layer at depths ranging from 0.88 to 2.30 m below grade.

Specific details of the soil stratigraphy at each test hole location are presented on the Soil Profile and Test Data Sheets provide in Appendix 1.

4.3 Field Screening Measurements

All soil samples collected were subjected to a preliminary screening procedure, which included visual screening as well as a soil vapour screening with an RKI Eagle gas detector with methane elimination and calibrated to hexane.

The soil vapours were measured by inserting the analyzer probe into the nominal headspace above the soil sample. Samples were then agitated/manipulated gently as the measurements were taken. The peak reading registered within the first 15 seconds was recorded as the vapour measurement.

The parts per million (ppm) scale is used to measure concentrations of hydrocarbon vapours that are too low to register on the Lower Explosive Limit (LEL) scale. The explosive point, 100% LEL, represents the leanest mixture which will burn (or explode) if ignited.

The combustible vapour readings from the soil samples collected from this subsurface investigation generally ranged from less than 5ppm to 45ppm and were not considered to be indicative of significant petroleum hydrocarbon compounds. Vapour readings are noted on the Soil Profile and Test Data Sheets provided in Appendix 1.

No deleterious materials were noted. Soil samples were selected based on a combination of the results of the vapour screening, visual observations, and sample depths for delineating the existing soil impact.

With the exception of samples recovered from BH7 and soil samples TP2-20-G3, TP9-20-G1 and TP11-20-G1, no visual or olfactory of potential hydrocarbons were identified in the soil samples recovered during the field programs.

4.4 Groundwater Monitoring Well Installation

Three groundwater monitoring wells were installed on the Phase II Property, at BH1, BH4 and BH6 during the initial subsurface program. The monitoring wells consisted of 51mm diameter Schedule 40 threaded PVC risers and screens. Monitoring well construction details are listed below in Table 2 and are also presented on the Soil Profile and Test Data Sheets provided in Appendix 1.

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	123.44	4.88	1.83-4.88	1.52-7.62	0.30-1.52	Flushmount
BH4	123.02	3.96	2.73-3.96	1.52-3.96	0.30-1.52	Flushmount
BH6	123.67	4.17	1.83-4.17	0.91-4.17	0.30-0.91	Flushmount

4.5 Groundwater Sampling

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

4.6 Analytical Testing

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

Table 3: Soil Samples Submitted

Sample ID	Sample Depth/ Stratigraphic Unit	Parameters Analyzed		Rationale
		BTEX	PHCs (F_1-F_4)	
November 29 and 30, 2018				
BH1-SS3	1.52-2.13; Native glacial till	X	X	Assessment of potential BTEX and PHCs based on highest vapour reading and sample location at or near inferred water table.
BH4-SS3	1.52-2.13; Native silty sand	X	X	Assessment of potential BTEX and PHCs based on highest vapour reading and sample location at or near inferred water table.
BH7-SS2	0.76-1.37; Native silty sand	X	X	Assessment of potential BTEX and PHC based on visual and olfactory evidence of potential PHCs, in combination with elevated vapour reading.
BH7-SS4	2.29-2.90; Native silty sand	X	X	Vertical delineation of impacts identified in Sample BH7-SS2.
December 17, 2020				
TP1-G2	1.3-1.95m Native silty sand	X		Delineate any potential soil impact.
TP2-G3	1.2-2.3m Native silty sand	X	X	Delineate any potential soil impact.
TP3-G1	0.87-1.04m Native silty sand	X	X	Delineate any potential soil impact.
TP9-G1	0.87-1.21m Reworked Native	X	X	Delineate any potential soil impact.
TP11-G1	0.87-1.34m Native silty sand	X	X	Delineate any potential soil impact.
DUP	0.87-1.21m Reworked Native	X	X	Duplicate sample from TP9-G1 for QA/QC purpose.

Table 4: Groundwater Samples Submitted

Sample ID	Sample Depth/ Stratigraphic Unit	Parameters Analyzed			Rationale
		BTEX	VOCs	PHCs (F_1-F_4)	
BH1-GW1	1.83-4.88; Native glacial till	X	X	X	Assessment of potential BTEX and PHCs within APEC resulting from former AST.
BH4-GW1	2.73-3.96; Native silty sand	X		X	Assessment of potential BTEX and PHCs within APEC resulting from former service garage.
BH6-GW1	1.83-4.17; Native silty sand	X		X	Delineation of potential BTEX and PHCs identified in BH1 and BH4; identification of groundwater flow direction.

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

4.7 Residue Management

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

4.8 Elevation Surveying

The monitoring well locations were selected, located and surveyed in the field by Paterson in 2018. The ground surface elevations at the monitoring well locations are referenced to a geodetic datum provided by McIntosh Perry Surveying Inc. The geodetic elevation is 125.26m above sea level (m asl). Ground surface elevations are presented on Drawing PE4484-1R - Test Hole Location Plan appended to this report.

4.9 Quality Assurance and Quality Control Measures

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

5.0 REVIEW AND EVALUATION

5.1 Geology

Site soils generally consist of crushed rock and reworked native material over topsoil and/or a native silty sand layer, followed by a sandy glacial till. Practical auger refusal on boulders or inferred bedrock was achieved at BH1, BH4, BH5 and BH6, at depths ranging from approximately 3.96 to 6.12m below grade.

Groundwater was encountered in the overburden, at depths ranging from approximately 0.9 to 1.2m below ground surface.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured during the groundwater sampling event on December 11, 2018, using an electronic water level meter. Groundwater levels are summarized below in Table 5. Based on the groundwater elevations, contour mapping was completed. Groundwater contours are shown on Drawing PE4484-1 – Test Hole Location Plan. Based on the contours, groundwater flow beneath the Phase II Property is in a northeasterly direction. A hydraulic gradient of 0.004m/m was calculated.

Table 5: Groundwater Level Measurements

Borehole Location	Ground Surface Elevation (m)	Water Level Depth (m below grade)	Water Level Elevation (m ASL)	Date of Measurement
BH1	123.44	1.03	122.41	December 11, 2018
BH4	123.02	0.92	122.10	December 11, 2018
BH6	123.67	1.17	122.50	December 11, 2018

No free product was observed in the monitoring wells sampled at the Phase II Property. No unusual visual or olfactory observations were made with regards to the groundwater, at the time of the groundwater sampling event.

5.3 Fine-Coarse Soil Texture

Based on field soil observations, fine-grained soil standards are not applicable to the Phase II Property.

5.4 Soil: Field Screening

Field screening of the soil samples collected during drilling resulted in combustible vapour readings generally ranging from 5 to 45ppm. Field screening results of each individual soil sample are provided on the Soil Profile and Test Data Sheets appended to this report. No visual or olfactory indications of potential environmental impact were identified in the soil samples.

Elevated readings, up to 2.2% LEL were identified in soil samples recovered from BH7, TP2-20, TP9-20 and TP11-20. Field screening results of each individual soil sample are provided on the Soil Profile and Test Data Sheets appended to this report.

With the exception of samples recovered from BH7 and soil samples TP2-20-G3, TP9-20-G1 and TP11-20-G1, no visual or olfactory of potential hydrocarbons were identified in the soil samples recovered during the field programs. No deleterious materials were identified in the fill.

5.5 Soil Quality

A total of 4 soil samples were submitted for analysis of BTEX and PHCs (F_1-F_4) in 2018. Five additional soil samples and a duplicate were submitted in 2020 for the BTEX and PHCs (F_1-F_4).

The results of the analytical testing from 2018 and 2020 are presented below in Tables 6A and 6B. The laboratory certificates of analysis are provided in Appendix 1.

Table 6A: Analytical Test Results – Soil (2018)
BTEX and PHCs (F1-F4)

Parameter	MDL (µg/g)	Soil Samples (µg/g)				MECP Table 3 Residential Standards (µg/g)
		Nov. 29, 2018		Nov. 30, 2018		
		BH1-SS3 (1.52-2.13m)	BH4-SS3 (1.52-2.13m)	BH7-SS2 (1.01-1.52m)	BH7-SS4 (2.29-2.90m)	
Benzene	0.02	nd	nd	**2.41**	nd[1]	0.21
Ethylbenzene	0.05	nd	nd	**134**	nd[1]	2.3
Toluene	0.05	nd	nd	**52.6**	nd[1]	2.0
Xylenes	0.05	nd	nd	**507**	nd[1]	3.1
PHC F_1	7	nd	nd	**2,280**	nd[1]	55
PHC F_2	4	nd	nd	**761**	6	98
PHC F_3	8	nd	nd	nd	74	300
PHC F_4	6	nd	nd	nd	33	2800

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **bold** – concentration exceeds MECP Table 3 standard
- 1-laboratory qualifier indicating hold time had been exceeded at time of analysis

No BTEX or PHC concentrations were identified in soil Samples BH1-SS3 or BH4-SS3. The BTEX and PHC F_1 and F_2 concentrations identified in soil Sample BH7-SS2 exceed the MECP Table 3 Residential standards, while the PHC F_3 and F_4 were not detected above the method detection limits. No BTEX or PHC F_1 parameters were identified above the method detection limits in Sample BH7-SS4; PHC F_2-F_4 parameters were identified at concentrations below the MECP Table 3 Residential standards. As noted above, the hold time for the BTEX and F_1 parameters had exceeded at the time of the analysis, however the findings of the Phase II ESA are not considered to have been affected.

Table 6B: Analytical Test Results – Soil (2020)
BTEX and PHCs (F1-F4)

Parameter	MDL (µg/g)	Soil Samples (µg/g) December 17, 2020			MECP Table 3 Residential Standards (µg/g)
		TP1-G2 (1.3-1.95m)	TP2-G3 (1.2-2.3m)	TP3-G1 (0.87-1.04m)	
Benzene	0.02	nd	nd	nd	0.21
Ethylbenzene	0.05	nd	nd	nd	2.3
Toluene	0.05	nd	nd	nd	2.0
Xylenes	0.05	nd	nd	nd	3.1
PHC F_1	7	nd	nd	nd	55
PHC F_2	4	nd	nd	nd	98
PHC F_3	8	nd	nd	nd	300
PHC F_4	6	nd	nd	nd	2800

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

Table 6B Continued: Analytical Test Results – Soil (2020)
BTEX and PHCs (F1-F4)

Parameter	MDL (µg/g)	Soil Samples (µg/g) December 17, 2020			MECP Table 3 Residential Standards (µg/g)
		TP9-G1 (0.87-1.21m)	TP11-G1 (0.87-1.34m)	DUP (0.87-1.34m)	
Benzene	0.02	0.02	nd	nd	0.21
Ethylbenzene	0.05	nd	nd	nd	2.3
Toluene	0.05	nd	nd	nd	2.0
Xylenes	0.05	0.09	0.07	0.07	3.1
PHC F_1	7	nd	nd	nd	55
PHC F_2	4	nd	nd	nd	98
PHC F_3	8	13	48	18	300
PHC F_4	6	19	37	29	2800

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

No BTEX or PHC concentrations were identified in soil SamplesTP1-G2, TP2-G3 and TP3-G1. Benzene and/or xylene, and PHC F_3 and F_4 concentrations below the selected MECP Table 3 Residential standards were identified in soil Samples TP9-G1, TP11-G1 and DUP. All of the soil samples comply with the MECP Table 3 Residential Standards.

5.6 Groundwater Quality

Groundwater samples from monitoring wells installed in BH1, BH4 and BH6 were submitted for laboratory analysis of BTEX or VOC and PHC parameters. The groundwater samples were obtained from the screened intervals noted on Table 2. The results of the analytical testing are presented below in Tables 7 and 8. The laboratory certificates of analysis are provided in Appendix 1.

Table 7: Analytical Test Results - Groundwater (2018)
BTEX and PHCs (F1-F4)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L) December 11, 2018			MECP Table 3 Standards (µg/L)
		BH1-GW1 (1.83-4.88m)	BH4-GW1 (2.73-3.96m)	BH6-GW1 (1.83-4.17m)	
Benzene	0.5	nd	nd	nd	44
Toluene	0.5	nd	nd	nd	18,000
Ethylbenzene	0.5	nd	nd	nd	2,300
Xylenes (Total)	0.5	nd	nd	nd	4,200
PHC F1	25	nd	nd	nd	750
PHC F2	100	nd	nd	nd	150
PHC F3	100	nd	nd	nd	500
PHC F4	100	nd	nd	nd	500

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

No BTEX or PHC parameters were detected above the laboratory method detection limits in any of the groundwater samples submitted for analytical testing. As such, the groundwater results are considered to comply with the MECP Table 3 standards.

It is our interpretation that the analyzed parameter concentrations do not indicate the potential presence of light non-aqueous phase liquids (LNAPLs). No free phase hydrocarbons were noted in the wells at the time of sampling.

Table 8: Analytical Test Results – Groundwater (2018)
VOCs

Parameter	MDL (µg/L)	Groundwater Samples (µg/L) December 11, 2018	MECP Table 3 Standards (µg/L)
		BH1-GW1 (1.83-4.88m)	
Acetone	5.0	nd	130,000
Benzene	0.5	nd	44
Bromodichloromethane	0.5	nd	85,000
Bromoform	0.5	nd	380
Bromomethane	0.5	nd	5.6
Carbon Tetrachloride	0.2	nd	0.79
Chlorobenzene	0.5	nd	630
Chloroform	0.5	nd	2.4
Dibromochloromethane	0.5	nd	82,000
Dichlorodifluoromethane	1.0	nd	4,400
1,2-Dichlorobenzene	0.5	nd	4,600
1,3-Dichlorobenzene	0.5	nd	9,600
1,4-Dichlorobenzene	0.5	nd	8
1,1-Dichloroethane	0.5	nd	320
1,2-Dichloroethane	0.5	nd	1.6
1,1-Dichloroethylene	0.5	nd	1.6
cis-1,2-Dichloroethylene	0.5	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	1.6
1,2-Dichloropropane	0.5	nd	16
1,3-Dichloropropene	0.5	nd	5.2
Ethylbenzene	0.5	nd	2,300
Ethylene dibromide	0.2	nd	0.25
Hexane	1.0	nd	51
Methyl Ethyl Ketone	5.0	nd	470,000
Methyl Isobutyl Ketone	5.0	nd	140,000
Methyl tert-butyl Ether	2.0	nd	190
Methylene Chloride	5.0	nd	610
Styrene	0.5	nd	1,300
1,1,1,2-Tetrachloroethane	0.5	nd	3.3
1,1,2,2-Tetrachloroethane	0.5	nd	3.2
Tetrachloroethylene	0.5	nd	1.6
Toluene	0.5	nd	18,000
1,1,1-Trichloroethane	0.5	nd	640
1,1,2-Trichloroethane	0.5	nd	4.7
Trichloroethylene	0.5	nd	1.6
Trichlorofluoromethane	1.0	nd	2,500
Vinyl Chloride	0.5	nd	0.5
Xylenes	0.5	nd	4,200

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

No VOCs were identified in groundwater Sample BH1-GW1. The groundwater results comply with the MECP Table 3 Residential Standards.

5.7 Quality Assurance and Quality Control Results

All samples submitted as part of the 2018 and 2020 sampling events 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 by O.Reg. 269/11, a Certificate of Analysis has been received for each sample submitted for analysis and all Certificates of Analysis are appended to this report.

A duplicate of soil sample (DUP) from TP11-G1 was analyzed for BTEX and PHCs(F_1-F_4). Test results for the duplicate soil and RPD calculations are provided below in Table 4.

Table 4: QA/QC Results
Soil (BTEX and PHCs)

Parameter	TP11-G1	DUP	RPD (%)	QA/QC Results
Xylenes	0.07	0.07	0	Within the acceptable range
PHC F3	48	18	91	Outside the acceptable range
PHC F4	37	29	24	Outside the acceptable range

The variance of the above parameter concentrations is associated with the RPD results outside the acceptable range. These results are due to comparing two (2) values that are either on the spectrum of very small or very large values, which in turn, will yield higher RPD values, and as such, the RPD values are not an accurate measure in these cases.

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

5.8 Phase II Conceptual Site Model

The following section has been prepared in accordance with the requirements of O.Reg. 153/04 - Record of Site Condition regulation, made under the Environmental Protection Act. Conclusions and recommendations are discussed in a subsequent section.

Site Description

Potentially Contaminating Activities and Areas of Potential Environmental Concern

As per Table 1 in the Past Investigations Section of this report, PCAs considered to result in APECs on the Phase II Property include:

- Item 28, Table 2, O.Reg. 153/04: "Gasoline and Associated Products Storage in Fixed Tanks" - this PCA was identified based on presence of a former aboveground fuel storage tank (APEC 1).
- Item 52, Table 2, O.Reg. 153/04: "Storage, maintenance, fuelling and repair of equipment, vehicles and material used to maintain transportation systems" – this PCA was identified based on the presence of a former on-site RV service repairs APEC 2).

Contaminants of Potential Concern

Contaminants of potential concern identified in association with the aforementioned APECs include BTEX and PHCs (F_1-F_4), in the soil and/or groundwater beneath the Phase II Property.

Subsurface Structures and Utilities

A potable well present on the Phase II Property at the time of the 2018 Phase I ESA has since been decommissioned. A septic system was reportedly present to the south of the former office building. Buried utilities onsite include electrical and telephone services as well as a private propane gas service line. No other subsurface structures or utilities are present on the Phase II Property.

Physical Setting

Site Stratigraphy

The site stratigraphy, as presented on Drawings PE4484-4R and 5R – Cross-Section A-A', generally consists of the following:

- Crushed rock from ground surface to depths ranging from 0.2 to 0.3m below grade. Asphaltic concrete was identified at BH7.
- Reworked native material consisting of silty sand with some clay and/or gravel, is present below the granular material at depths up to 1.0m below grade.
- A layer of topsoil was identified at BHs 3, 4, 5 and 7. This layer ranged in thickness from approximately 0.25 to 0.68m.
- Native sand or silty sand to depths ranging from 0.76 to 2.7m below grade.
- Glacial till consisting of silty sand with gravel, cobbles and possible boulders, as well as trace to some clay.
- Practical refusal to augering on boulders or inferred limestone bedrock was achieved at depths ranging from approximately 3.96 to 6.1m below grade at BH1, BH4, BH5 and BH6.

Hydrogeological Characteristics

Groundwater at the Phase II Property was encountered within the overburden. This unit is interpreted to function as a local unconfined aquifer at the subject site.

Water levels were measured at the subject site on December 11, 2018, at depths ranging from approximately 0.92 to 1.03m below grade. Based on groundwater contour mapping, the groundwater is considered to flow in a northeasterly direction.

Approximate Depth to Bedrock

Bedrock was not confirmed during this investigation. As noted above, practical refusal to augering on the inferred bedrock surface, was achieved at depths ranging from approximately 3.96 to 6.1m below grade. Based on mapping, bedrock across the site is expected to be present at depths ranging from approximately 3 to 10m below grade.

Approximate Depth to Water Table

Depth to water table at the subject site varies between approximately 0.92 and 1.17m below existing grade.

Sections 35, 41 and 43.1 of the Regulation

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

Section 41 of O.Reg. 153/04 does not apply to the Phase II ESA Property, as the property is not within 30m of an environmentally sensitive area, and the pH values for surface and subsurface soils are 7.38 and 7.57, respectively.

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

Fill Material

Crushed rock was identified in 2018 at the ground surface and extended to approximately 0.2 to 0.3m below grade. The granular material is not considered to be soil and does not represent a concern to the subject property. Reworked native material consisting of silty sand with clay and/or gravel was identified beneath the granular material to depths up to approximately 1.0m below grade. This material is not considered to represent an area of potential environmental on the Phase II Property.

Proposed Buildings and Other Structures

It is our understanding that the Phase II Property will be redeveloped with a residential building with ground floor commercial space and one level of underground parking.

Existing Buildings and Structures

The Phase II Property currently exists as vacant land. The former commercial buildings were demolished in 2020.

Water Bodies

No water bodies are present on the Phase II Property or within a 250m radius.

Areas of Natural Significance

No areas of natural significance are known to exist on or within the immediate vicinity of the Phase II Property.

Environmental Condition

Areas Where Contaminants are Present

Based on the findings of the 2018 and 2020 Phase II ESAs, BTEX and PHC F_1 and F_2 parameters exceeding the MECP Table 3 Residential Standards were identified in soil recovered from BH7, located to the north of the former RV service garage building on the central portion of the Phase II Property.

Groundwater complies with the MECP Table 3 standards.

Analytical test results are shown on Drawings PE4484-2R – Analytical Testing Plan (Soil) and PE4484-3R – Analytical Testing Plan (Groundwater).

Types of Contaminants

Based on the findings of the 2018 and 2020 Phase II ESAs, BTEX and PHC F_1 and F_2 parameters exceeding the MECP Table 3 Residential Standards were identified in the soil recovered from BH7 on the central portion of the Phase II Property, north of the former RV service garage. No other contaminants were identified on the Phase II Property.

Contaminated Media

Topsoil and/or native silty sand recovered from BH7 is impacted with BTEX and PHC F_1 and F_2 parameters exceeding MECP Table 3 Residential Standards.

Groundwater complies with MECP Table 3 standards.

What Is Known About Areas Where Contaminants Are Present

Based on the findings of the Phase II ESA, soil impacted with BTEX and PHC F_1 and F_2 parameters was identified at an approximate depth of 0.76 to 1.37m below grade, in the immediate vicinity of the former onsite RV service garage.

Distribution of Contaminants

The approximate horizontal distribution of impacted soil is shown on Drawing PE4484-2 – Analytical Testing Plan (Soil).

The impacted soil extends vertically from approximately 0.76m below grade, to a maximum depth of approximately 2.3m below grade, as shown on Drawing PE4484-4R – Cross-Section A-A' (Soil).

Discharge of Contaminants

The impact is considered to have resulted from a leak or spill to the ground surface and/or floor drain within the former garage building, as a result of minor automotive repair activities.

Migration of Contaminants

Physical transport of contaminated soil at the Phase II Property does not appear to be occurring. Significant vertical migration of contaminants is not considered to have occurred based on analytical testing, as shown on Drawing PE4484-4R – Cross-Section A-A' (Soil).

Climatic and Meteorological Conditions

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

Based on the findings of the Phase II ESA, the downward leaching of contaminants by means of the infiltration of precipitation is not considered to have significantly affected contaminant distribution. Given the clean groundwater results, migration of contaminants via groundwater levels and/or flow is not considered to have occurred on the Phase II Property.

Potential for Vapour Intrusion

Given that the Phase II Property is vacant or free of any buildings, the potential for vapour intrusion on the Phase II Property is considered to be negligible.

All impacted soil will be removed from the property prior to redevelopment and as such, there will be no potential for future vapour intrusion on the Phase II Property.

6.0 CONCLUSIONS

Assessment

A 2018 Phase II ESA was conducted for the properties addressed 6310 and 6320 Hazeldean Road, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address potentially contaminating activities (PCAs) that were identified during the 2018 Phase I ESA prepared by McInstosh Perry Consulting Engineers Ltd., and considered to result in areas of potential environmental concern (APECs) on the subject land.

The 2018 subsurface investigation consisted of drilling 7 boreholes, 3 of which were completed with monitoring well installations.

Soil samples were obtained from the boreholes and screened using visual observations and combustible vapour measurements. A total of 4 soil samples were submitted for laboratory analysis of benzene, toluene, ethylbenzene and xylenes (BTEX) and petroleum hydrocarbons (PHCs, F_1-F_4). Concentrations of BTEX and PHC F_1 and F_2 exceeding MECP Table 3 Residential standards were identified in a sample recovered from BH7 on the central portion of the site, in the immediate vicinity of the former RV service garage.

As part of the 2018 program, groundwater samples from monitoring wells installed in BH1, BH4 and BH6 were recovered and analysed for BTEX or volatile organic compound (VOC) and PHC parameters. No BTEX, VOC or PHC concentrations were identified above the laboratory method detection limits. As such, the groundwater was determined to comply with the MECP Table 3 Residential standards.

A supplemental subsurface investigation was carried out in 2020 and consisted of placing 11 test pits across the Phase II Property, for the primary purpose of delineating the 2018 impacts. A representative sample of impacted material was also collected for leachate analysis in accordance with O.Reg. 347/558.

Soil samples were obtained from the 2020 test pits and screened using visual observations and combustible vapour measurements. A total of 5 soil samples and a duplicate were submitted for laboratory analysis of benzene, toluene, ethylbenzene and xylenes (BTEX) and petroleum hydrocarbons (PHCs, F_1-F_4). All of the soil samples analyzed complied with the MECP Table 3 Residential standards.

Recommendations

It is our understanding that the Phase II ESA Property will be redeveloped with a residential building with ground-floor commercial space and one level of underground parking that will occupy the majority of the site. Due to the change in land use to a more sensitive land use (commercial to residential), a record of site condition (RSC) will be required as per O.Reg 154/03.

Soil

It is recommended that a soil remediation be carried out in the vicinity of BH7 prior to or in conjunction with site redevelopment. It is also recommended that Paterson personnel be present to oversee the excavation and segregation of impacted soil and to collect confirmatory soil samples as required.

Any excess soil that meets site standards and requires removal for construction purposes must be handled in accordance with O. Reg. 406/19, On-Site and Excess Soil Management. Additional information regarding O.Reg. 406/19 can be provided upon request.

Monitoring Wells

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

7.0 STATEMENT OF LIMITATIONS

This Phase II - Environmental Site Assessment report has been prepared under the supervision of a Qualified Person, in general accordance with O.Reg. 153/04 as amended under the Environmental Protection Act, and meets the requirements of CSA Z769-00. The conclusions presented herein are based on information gathered from a limited sampling and testing program. The test results represent conditions at specific test locations at the time of the field program.

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

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

This report was prepared for the sole use of 4329163 Canada Inc. Notification from 4329163 Canada Inc. and Paterson Group will be required to release this report to any other party.

Paterson Group Inc.

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

Karyn Munch, P.Eng., QP$_{ESA}$

Report Distribution:

- ❒ 4329163 Canada Inc.
- ❒ Paterson Group

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE4484-1R – TEST HOLE LOCATION PLAN

DRAWING PE4484-2R– ANALYTCIAL TESTING PLAN (SOIL)

DRAWING PE4484-3R– ANALYTICAL TESTING PLAN (GROUNDWATER)

DRAWING PE4484-4R – CROSS-SECTION A-A' (SOIL)

DRAWING PE4484-5R – CROSS-SECTION A-A' (GROUNDWATER)

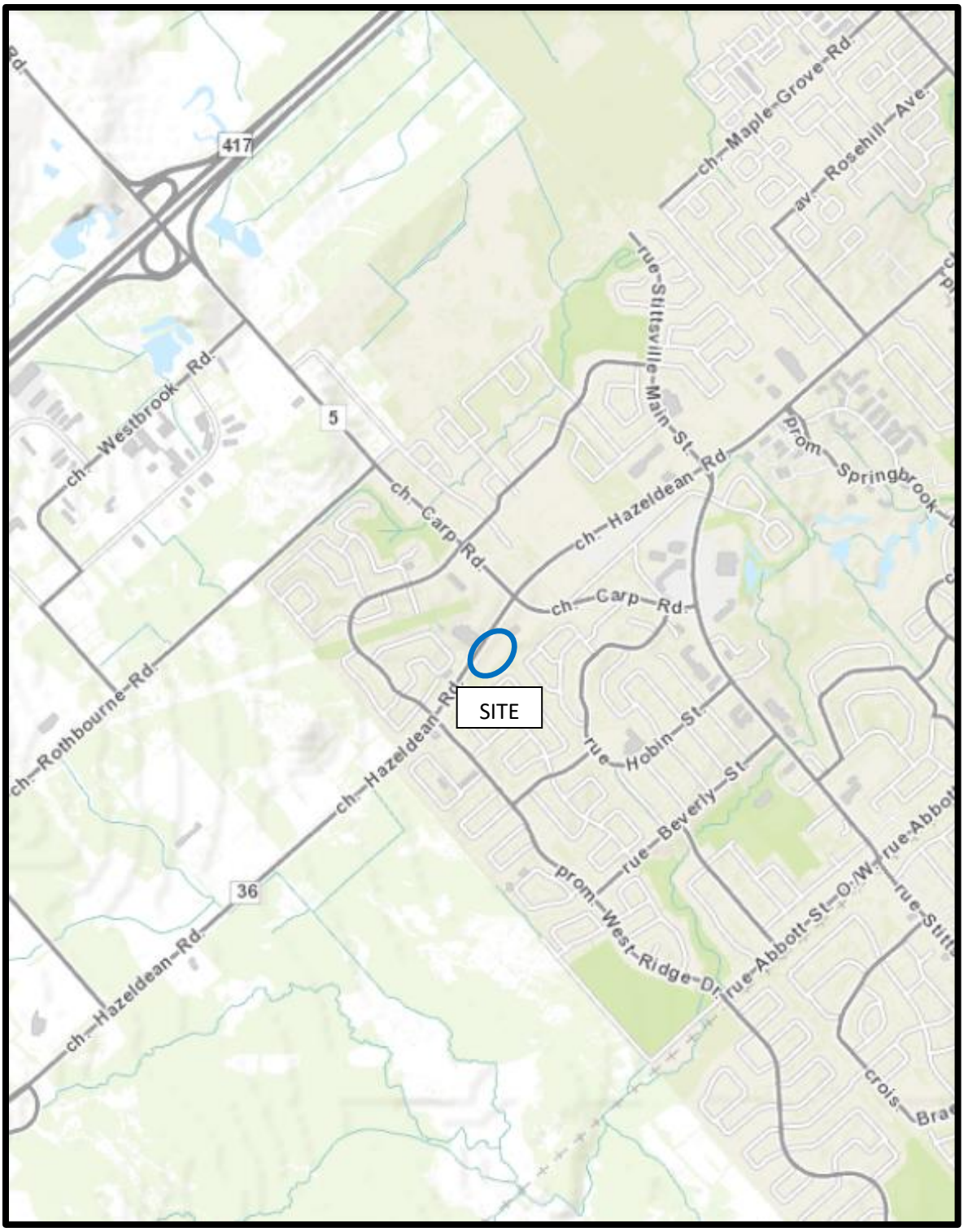
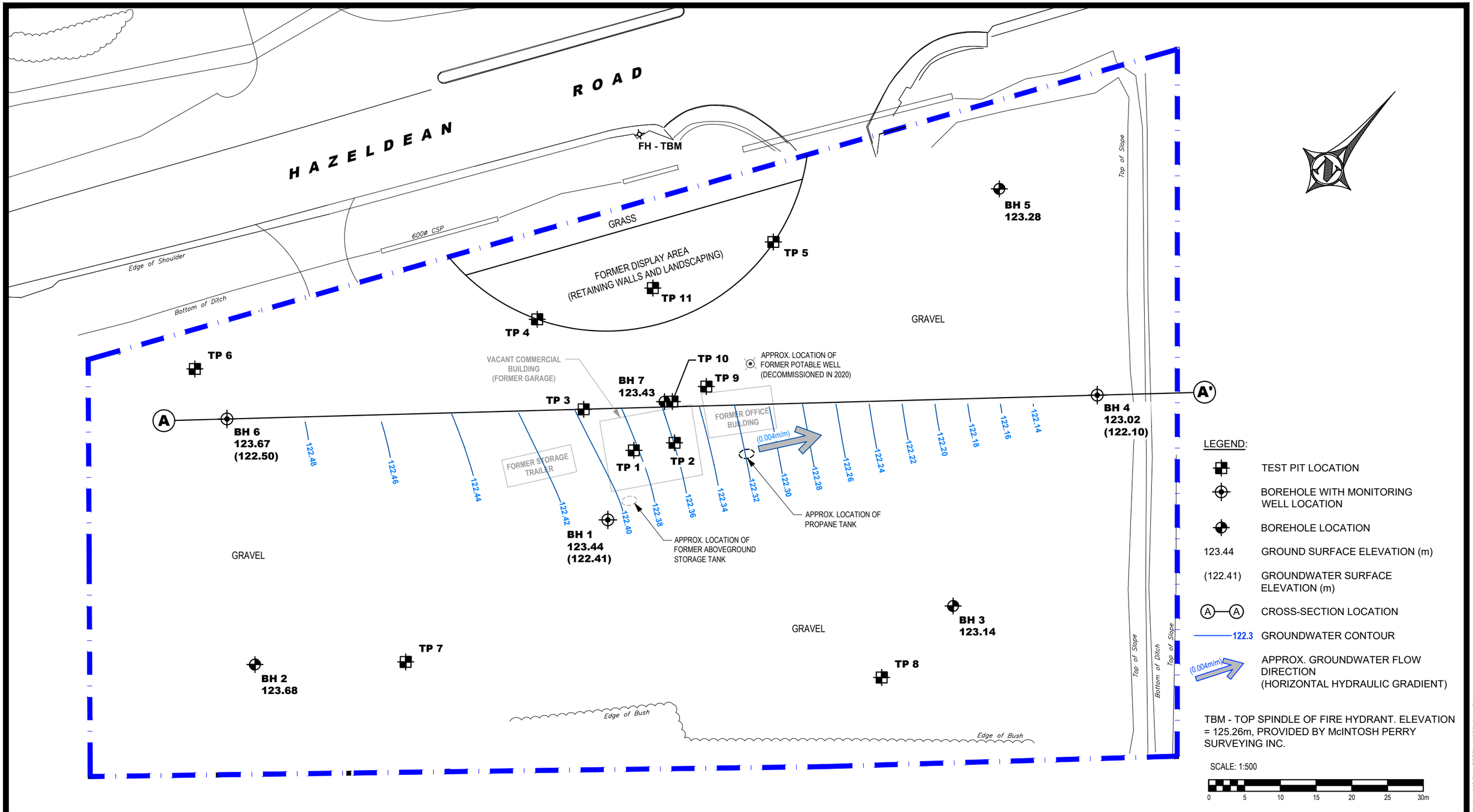


FIGURE 1

KEY PLAN



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NO.	REVISIONS	DATE	INITIAL

4329163 CANADA INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
6310 & 6320 HAZELDEAN ROAD

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:500	Date: 02/2022
Drawn by: MPG	Report No.: PE4484-2R
Checked by: MW	Dwg. No.: PE4484-1R
Approved by: KM	Revision No.:

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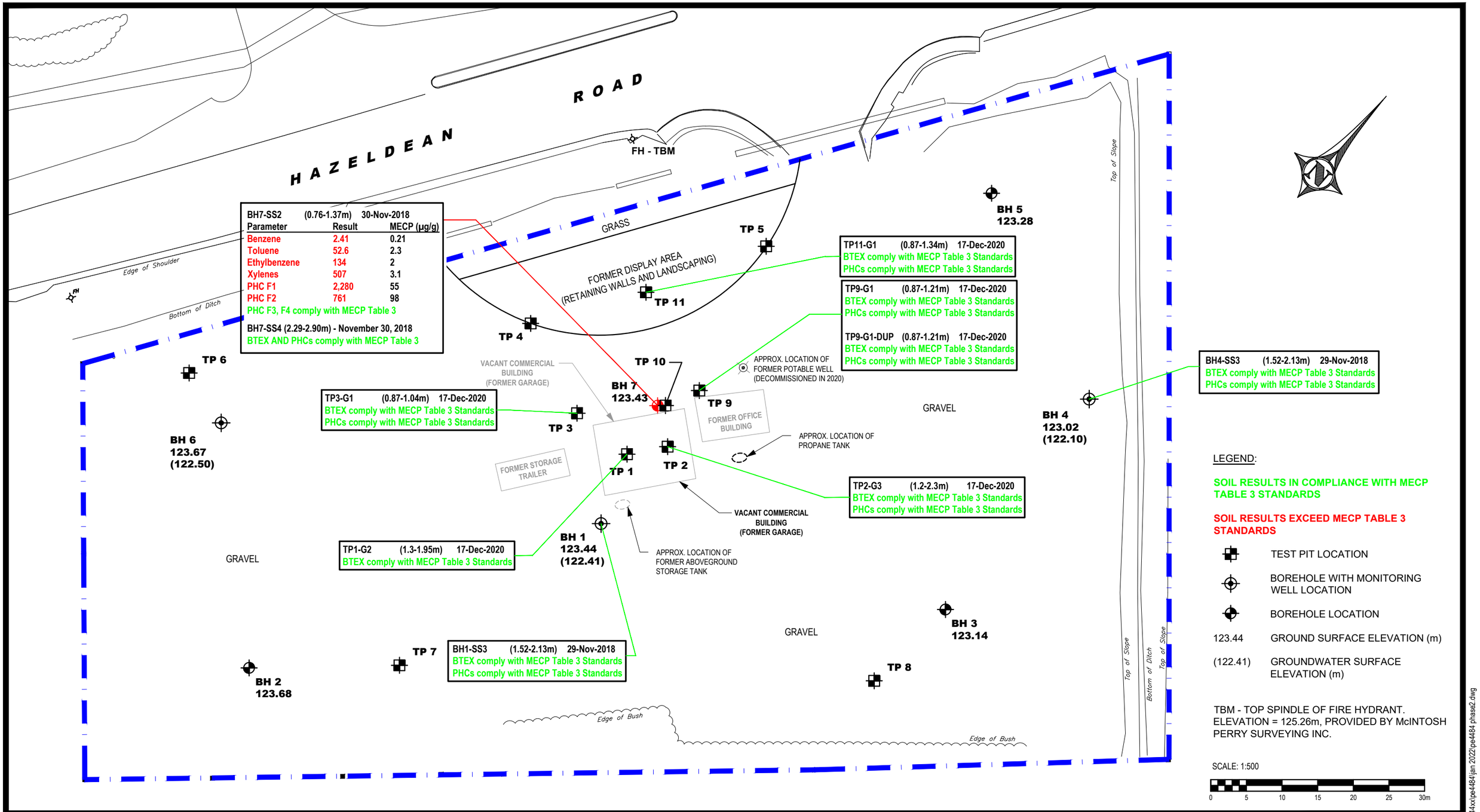

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NO.	REVISIONS	DATE	INITIAL

4329163 CANADA INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
6310 & 6320 HAZELDEAN ROAD

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING RESULTS - SOIL

Scale: 1:500	Date: 02/2022
Drawn by: MPG	Report No.: PE4484-2R
Checked by: MW	Dwg. No.: PE4484-2R
Approved by: KM	Revision No.:

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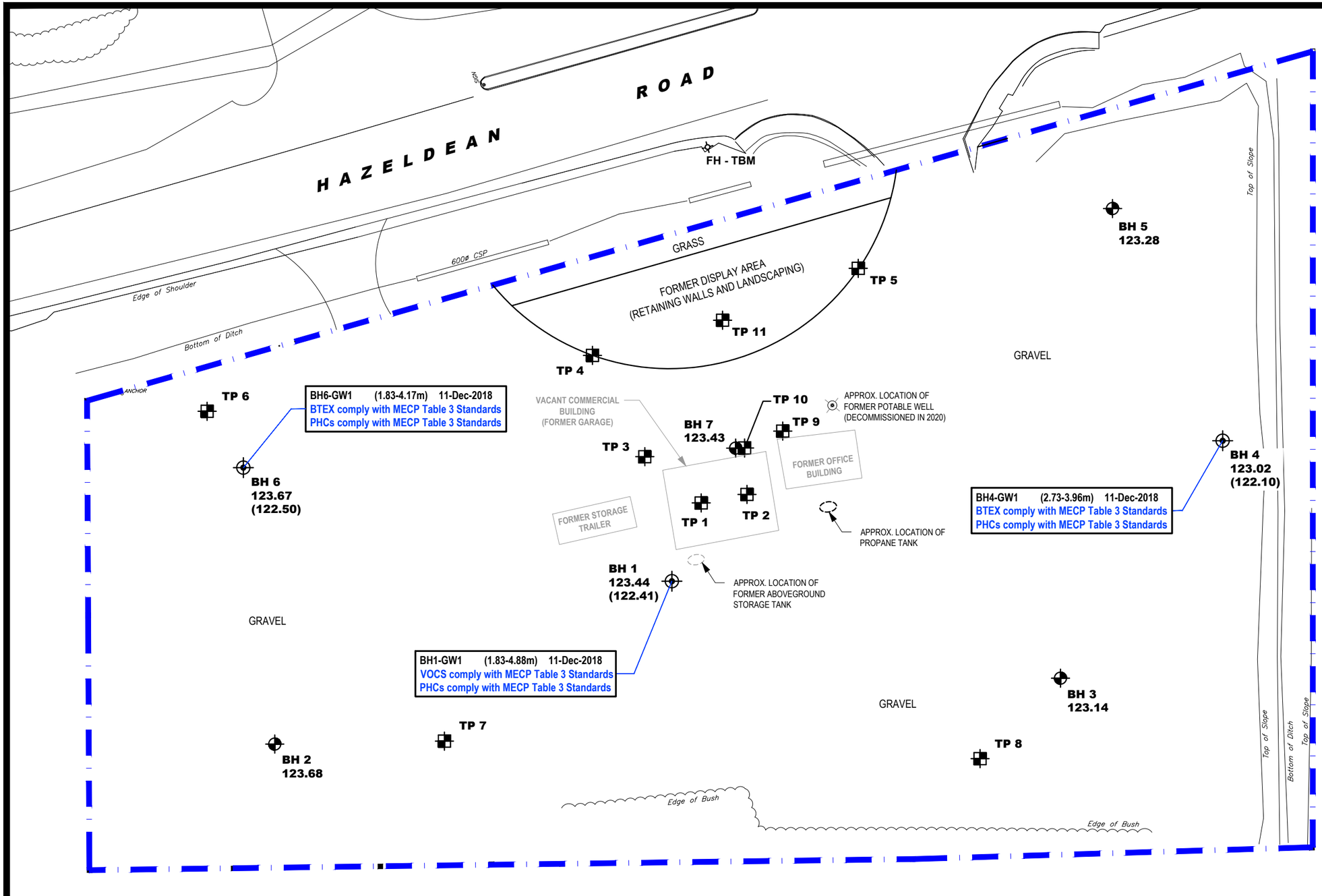

LEGEND:

GROUNDWATER RESULTS IN COMPLIANCE WITH MECP TABLE 3 STANDARDS

- TEST PIT LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- BOREHOLE LOCATION
- 123.44 GROUND SURFACE ELEVATION (m)
- (122.41) GROUNDWATER SURFACE ELEVATION (m)

TBM - TOP SPINDLE OF FIRE HYDRANT. ELEVATION = 125.26m, PROVIDED BY McINTOSH PERRY SURVEYING INC.

SCALE: 1:500

0 5 10 15 20 25 30m

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NO.	REVISIONS	DATE	INITIAL

4329163 CANADA INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
6310 & 6320 HAZELDEAN ROAD

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING RESULTS - GROUNDWATER

Scale: 1:500	Date: 02/2022
Drawn by: MPG	Report No.: PE4484-2R
Checked by: MW	Dwg. No.: PE4484-3R
Approved by: KM	Revision No.:

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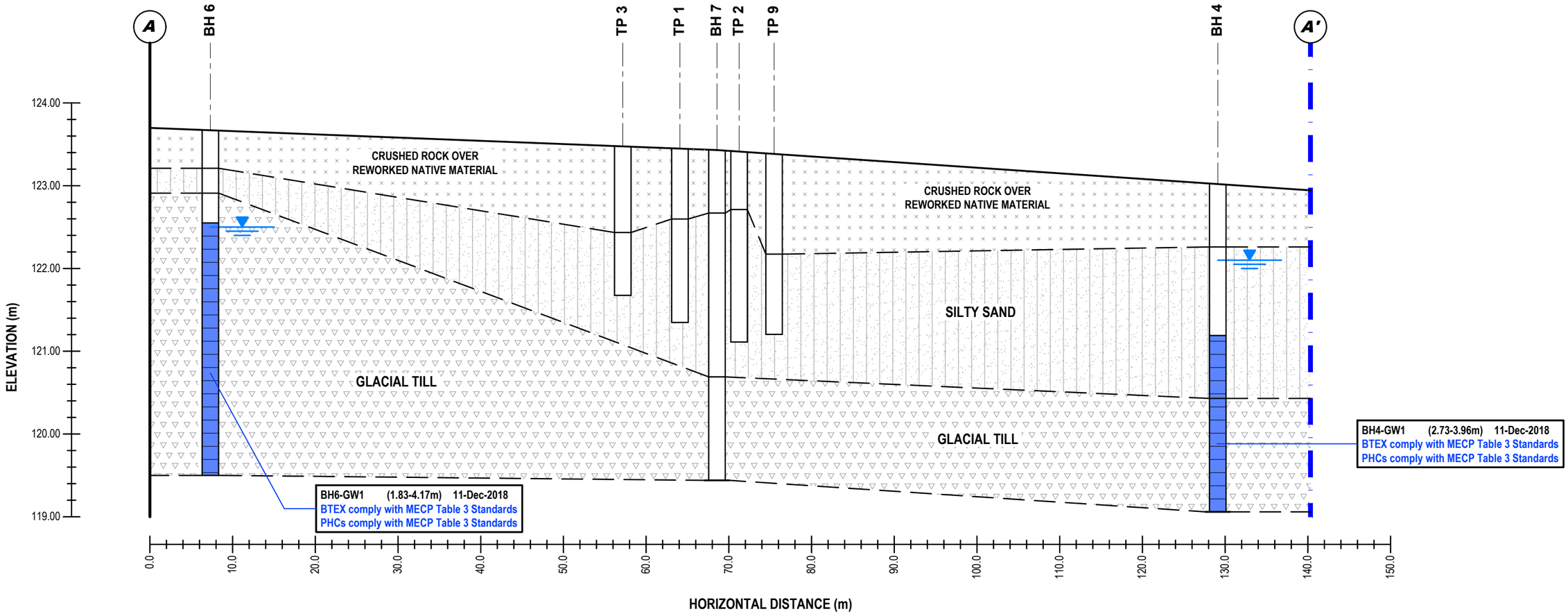

GROUNDWATER RESULTS IN COMPLIANCE WITH MECP TABLE 3 STANDARDS

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4329163 CANADA INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
6310 & 6320 HAZELDEAN ROAD

OTTAWA, ONTARIO

Title:

CROSS-SECTION A-A' - GROUNDWATER

Scale: AS SHOWN	Date: 02/2022
Drawn by: MPG	Report No.: PE4484-2R
Checked by: MW	Dwg. No.: PE4484-5R
Approved by: KM	Revision No.:

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APPENDIX 1

SAMPLING AND ANALYSIS PLAN

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

LABORATORY CERTIFICATES OF ANALYSIS

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Services

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Sampling & Analysis Plan

Phase II Environmental Site Assessment
6310 and 6320 Hazeldean Road
Ottawa, Ontario

Prepared For

BBS Construction

November 2018

Report: PE4484-SAP

Table of Contents

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by BBS Construction to conduct a Phase II Environmental Site Assessment (ESA) for the properties addressed 6310 and 6320 Hazeldean Road, in the City of Ottawa, Ontario. A subsurface investigation program consisting of borehole drilling, was developed for the property based on the findings of a Phase I ESA conducted by McIntosh Perry Consulting Engineers Ltd. in August of 2018. It should be noted that the Phase II ESA was carried out in conjunction with a Geotechnical Investigation.

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1	Place borehole in vicinity of the former aboveground storage tank (AST) to assess potential for petroleum hydrocarbon impacts in the soil and groundwater.	Sample overburden to at least 1.5m below the water table for monitoring well installation
BH2	Placed within proposed pavement structure for geotechnical purposes; provide general coverage of the site for environmental purposes.	Sample overburden to an approximate depth of 3.0m below grade.
BH3	Placed within proposed building structure for geotechnical purposes; provide general coverage of the site for environmental purposes.	Sample overburden to an approximate depth of 6.0m below grade.
BH4	Place borehole near east property line to assess potential soil and groundwater impacts from the service garage on the adjacent property to the east.	Sample overburden to at least 1.5m below the water table for monitoring well installation.
BH5	Placed within proposed building structure for geotechnical purposes; provide general coverage of the site for environmental purposes.	Sample overburden to an approximate depth of 6.0m below grade.
BH6	Placed within proposed building structure for geotechnical purposes; provide general coverage of the site for environmental purposes.	Sample overburden to an approximate depth of 6.0m below grade, or at least 1.5m below the water table for monitoring well installation.
BH7	Place borehole in the immediate vicinity of the former service garage on the central portion of the site to assess potential for shallow petroleum hydrocarbon impacts in the soil.	Sample overburden to at least 1.5m below the water table.

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

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

2.0 ANALYTICAL TESTING PROGRAM

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

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

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

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

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

3.0 STANDARD OPERATING PROCEDURES

3.1 Environmental Drilling Procedure

Purpose

The purpose of drilling 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
- ❒ trowel
- ❒ 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 geodetic benchmark.

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 or hand held sampling equipment (shovel or trowel) must be washed between samples.
- ❒ If obvious contamination is encountered, continue sampling until vertical extent of contamination is delineated.
- ❒ As a general rule, environmental boreholes should be deep enough to intercept the groundwater table (unless this is impossible/impractical - call project manager to discuss).
- ❒ If at all possible, soil samples should be submitted to a preliminary screening procedure on site, either using a RKI Eagle, PID, etc. depending on type of suspected contamination.

Spoon Washing Procedure

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

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

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

Screening Procedure

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

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

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

3.2 Monitoring Well Installation Procedure

Equipment

- ❒ 5' x 2" [1.52 m x 50 mm] threaded sections of Schedule 40 PVC slotted well screen (5' x 1 ¼" [1.52 m x 32 mm] if installing in cored hole in bedrock)
- ❒ 5' x 2" [1.52 m x 50 mm] threaded sections of Schedule 40 PVC riser pipe (5' x 1 ¼" [1.52 m x 32 mm] if installing in cored hole in bedrock)
- ❒ Threaded end-cap
- ❒ Slip-cap or J-plug
- ❒ Asphalt cold patch or concrete
- ❒ Silica Sand
- ❒ Bentonite chips (Holeplug)
- ❒ Steel flushmount casing

Procedure

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

3.3 Monitoring Well Sampling Procedure

Equipment

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

Sampling Procedure

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

4.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

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

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

5.0 DATA QUALITY OBJECTIVES

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

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

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

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

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

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

These considerations are discussed in the body of the report.

6.0 PHYSICAL IMPEDIMENTS TO SAMPLING & ANALYSIS PLAN

Physical impediments to the Sampling and Analysis plan may include:

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

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

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
6310 Hazeldean Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located in front of garage. Elevation = 125.26m.

FILE NO. PE4484

REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** November 29, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	123.44
FILL: Gravel							
0.25							
FILL: Brown silty sand, trace clay		AU	1				
0.60							
Very loose, brown **SILTY SAND,** trace clay		SS	2	75	3	1	122.44
1.52							
Compact, brown **SAND,** some silt		SS	3	83	22		
1.98						2	121.44
		SS	4	83	97		
		SS	5	100	50+	3	120.44
GLACIAL TILL: Grey silty sand with gravel, cobbles and boulders, some clay		SS	6	75	50+	4	119.44
		SS	7	100	55	5	118.44
		SS	8	100	30		
6.12		SS	9			6	117.44
End of Borehole							
Practical refusal to augering at 6.12m depth							
(GWL @ 1.03m - Dec. 11, 2018)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
6310 Hazeldean Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located in front of garage. Elevation = 125.26m.

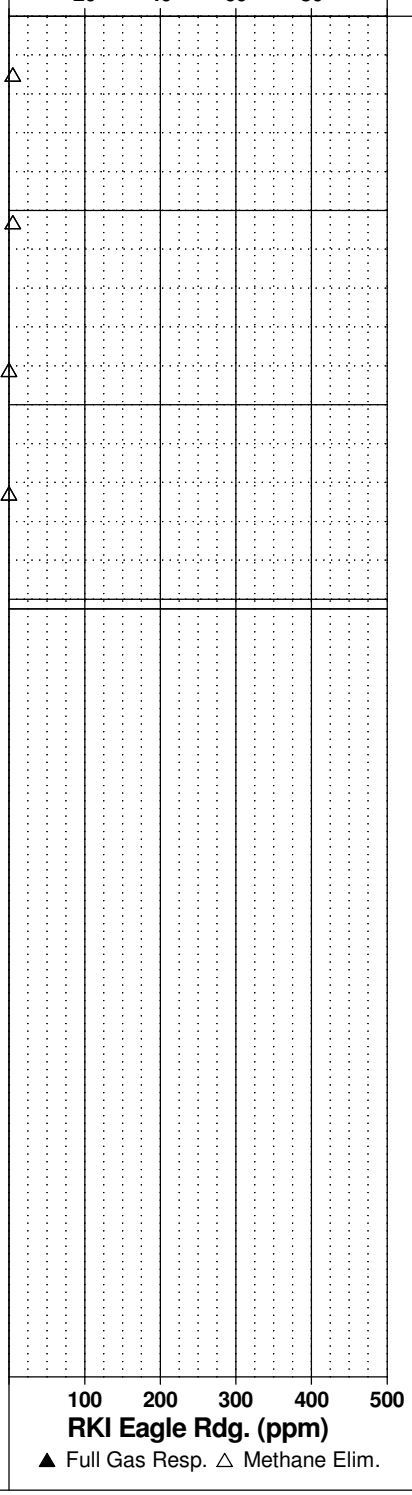
FILE NO. PE4484

REMARKS

HOLE NO. BH 2

BORINGS BY CME 55 Power Auger **DATE** November 29, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE									
FILL: Gravel									
0.30		AU	1						
Very loose, brown **SILTY SAND**									
0.76		SS	2	83	2	1	122.68		
GLACIAL TILL: Brown clayey silt with sand and gravel to sand with silt, gravel, cobbles and boulders, some clay		SS	3	92	38	2	121.68		
		SS	4	100	50+				
3.05						3	120.68		
End of Borehole									



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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
6310 Hazeldean Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located in front of garage. Elevation = 125.26m.

FILE NO. PE4484

REMARKS

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** November 29, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	123.14		
FILL: Gravel		AU	1						
0.30									
FILL: Brown silty sand, some gravel		SS	2	83	6	1	122.14		
1.00									
TOPSOIL									
1.68		SS	3	83	22	2	121.14		
Compact, brown **SAND,** some silt, trace clay									
2.13									
Compact to loose, brown **SILTY SAND,** trace clay		SS	4	58	10				
- grey by 3.4m depth		SS	5	100	9	3	120.14		
3.66									
End of Borehole									

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

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
6310 Hazeldean Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located in front of garage. Elevation = 125.26m.

FILE NO. PE4484

REMARKS

HOLE NO. BH 4

BORINGS BY CME 55 Power Auger **DATE** November 29, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	123.02
FILL: Gravel							
0.30		AU	1				
FILL: Brown silty sand, some clay and gravel							
0.76							
TOPSOIL						1	122.02
1.07		SS	2	92	14		
Compact to loose, brown **SAND,** some silt		SS	3	58	8		
						2	121.02
2.59		SS	4	83	23		
GLACIAL TILL: Compact to very dense, grey silty sand, some clay, gravel, cobbles and boulders		SS	5	100	50+	3	120.02
		SS	6	100	50+		
3.96							
End of Borehole							
Practical refusal to augering at 3.96m depth							
(GWL @ 0.92m - Dec. 11, 2018)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
6310 Hazeldean Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located in front of garage. Elevation = 125.26m.

FILE NO. PE4484

REMARKS

HOLE NO. BH 5

BORINGS BY CME 55 Power Auger **DATE** November 29, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	123.28		
FILL: Gravel									
0.30		AU	1						
FILL: Brown silty sand, some clay and gravel									
0.76									
TOPSOIL									
1.07		SS	2	75	5	1	122.28		
Loose to compact, brown **SAND,** some silt		SS	3	58	5				
						2	121.28		
2.59		SS	4	83	32				
GLACIAL TILL: Compact to very dense, grey silty sand with sand, gravel, cobbles and boulders		SS	5	67	23	3	120.28		
3.96		SS	6	100	50+				
End of Borehole						4	119.28		
Practical refusal to augering at 3.96m depth									

Lower Explosive Limit %: 20 40 60 80

RKI Eagle Rdg. (ppm): 100 200 300 400 500

▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
6310 Hazeldean Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located in front of garage. Elevation = 125.26m.

FILE NO. PE4484

REMARKS

HOLE NO. BH 6

BORINGS BY CME 55 Power Auger **DATE** November 30, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	123.67
FILL: Gravel (0.20)							
FILL: Brown sand with silt, clay and gravel (0.46)		AU	1				
Loose, brown **SILTY SAND,** some clay (0.76)							
		SS	2	92	9	1	122.67
		SS	3	100	70		
GLACIAL TILL: Brown sand to silty sand with clay, gravel, cobbles and boulders		SS	4	100	50+	2	121.67
		SS	5	100	50+	3	120.67
		SS	6	100	50+	4	119.67
(4.17)							
End of Borehole							
Practical refusal to augering at 4.17m depth							
(GWL @ 1.17m - Dec. 11, 2018)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
6310 Hazeldean Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located in front of garage. Elevation = 125.26m.

FILE NO. PE4484

REMARKS

HOLE NO. BH 7

BORINGS BY CME 55 Power Auger **DATE** November 30, 2018

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE										
Asphaltic concrete	0.05						0	123.43		
FILL: Crushed stone	0.15									
FILL: Brown silty sand, some clay and gravel	0.76		AU	1						
TOPSOIL	1.00		SS	2	83	6	1	122.43	2250	
Compact, grey **SILTY SAND**			SS	3	83	15	2	121.43		
	2.74		SS	4	92	24				
GLACIAL TILL: Compact to very dense, grey silty sand with clay, gravel, cobbles and boulders			SS	5	83	78	3	120.43		
	3.99		SS	6	86	50+				
End of Borehole										

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

Scale: 20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment Update
6310 and 6320 Hazeldean Road
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Backhoe **DATE** December 17, 2020

FILE NO. PE4484

HOLE NO. TP 1-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: ● Volatile Organic Rdg. (ppm) / ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Brown silty sand with gravel		G	1						
0.85									
Loose, brown **SILTY SAND**		G	2			1			
1.95									
GLACIAL TILL: Compact, grey silty sand, some cobbles		G	3			2			
2.10									
End of Test Pit									

Photo Ionization Detector: ○ Lower Explosive Limit % — 20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment Update
6310 and 6320 Hazeldean Road
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Backhoe **DATE** December 17, 2020

FILE NO. PE4484

HOLE NO. TP 2-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: ● Volatile Organic Rdg. (ppm) / ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Brown silty sand with organics		G	1						
0.70									
Loose, brown **SILTY SAND**		G	2			1			
- grey by 1.2m depth									
		G	3			2			
2.30									
End of Test Pit									

Photo Ionization Detector: ○ Lower Explosive Limit % — 20 40 60 80

RKI Eagle Rdg. (ppm): 100 200 300 400 500

▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment Update
6310 and 6320 Hazeldean Road
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Backhoe **DATE** December 17, 2020

FILE NO. PE4484

HOLE NO. TP 3-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
Loose, brown **SILTY SAND**		G	1						
1.04						1			
GLACIAL TILL: Compact, grey silty sand with cobbles		G	2						
1.80									
End of Test Pit									

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)
○ Lower Explosive Limit %
20 40 60 80
100 200 300 400 500
RKI Eagle Rdg. (ppm)
▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment Update
6310 and 6320 Hazeldean Road
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Backhoe **DATE** December 17, 2020

FILE NO. PE4484

HOLE NO. TP 4-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: ● Volatile Organic Rdg. (ppm) / ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
Loose to compact, brown **SILTY SAND**		G	1			1			
- grey by 1.6m depth		G	2			2			
2.13									
End of Test Pit									

Photo Ionization Detector: ○ Lower Explosive Limit % — 20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment Update
6310 and 6320 Hazeldean Road
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Backhoe **DATE** December 17, 2020

FILE NO. PE4484

HOLE NO. TP 5-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: ● Volatile Organic Rdg. (ppm) / ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0		20 40 60 80	
Loose to compact, brown **SILTY SAND**		G	1			1		△	
		G	2					△	
1.62									
End of Test Pit									

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment Update
6310 and 6320 Hazeldean Road
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Backhoe **DATE** December 17, 2020

FILE NO. PE4484

HOLE NO. TP 6-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: ● Volatile Organic Rdg. (ppm) / ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Brown silty sand, some cobbles		G	1					△	
0.61									
Loose, brown **SILTY SAND**		G	2					△	
0.88									
End of Test Pit									

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)
○ Lower Explosive Limit %
20 40 60 80
100 200 300 400 500
RKI Eagle Rdg. (ppm)
▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment Update
6310 and 6320 Hazeldean Road
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Backhoe **DATE** December 17, 2020

FILE NO. PE4484

HOLE NO. TP 7-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: ● Volatile Organic Rdg. (ppm) / ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Asphaltic concrete over gravel									
0.68									
FILL: Dark brown silty sand		G	1						
0.99						1			
Loose, brown **SILTY SAND**		G	2						
1.32									
End of Test Pit									

Photo Ionization Detector: ○ Lower Explosive Limit % — 20 40 60 80

RKI Eagle Rdg. (ppm): 100 200 300 400 500

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment Update
6310 and 6320 Hazeldean Road
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Backhoe **DATE** December 17, 2020

FILE NO. PE4484

HOLE NO. TP 8-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Asphaltic concrete over gravel									
0.41									
FILL: Brown silty sand with gravel		G	1			1			
1.21									
Loose, brown **SILTY SAND**		G	2						
1.83									
End of Test Pit									

Photo Ionization Detector: ○ Lower Explosive Limit % — 20 40 60 80

RKI Eagle Rdg. (ppm): 100 200 300 400 500

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment Update
6310 and 6320 Hazeldean Road
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Backhoe **DATE** December 17, 2020

FILE NO. PE4484

HOLE NO. TP 9-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: ● Volatile Organic Rdg. (ppm) / ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Brown silty sand, some organics and cobbles		G	1			1		△	
1.21									
Loose, brown **SILTY SAND**		G	2			2		△	
2.18									
End of Test Pit									

Photo Ionization Detector scale: 20 40 60 80

RKI Eagle Rdg. (ppm): 100 200 300 400 500

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment Update
6310 and 6320 Hazeldean Road
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Backhoe **DATE** December 17, 2020

FILE NO. PE4484

HOLE NO. TP10-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: ● Volatile Organic Rdg. (ppm) / ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0		20 40 60 80	
FILL: Dark brown silty sand		G	1			1		2900 △	
1.21									
End of Test Pit								100 200 300 400 500	

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment Update
6310 and 6320 Hazeldean Road
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Backhoe **DATE** December 17, 2020

FILE NO. PE4484

HOLE NO. TP11-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: ● Volatile Organic Rdg. (ppm) / ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Asphaltic concrete over gravel									
0.78									
Loose to compact, brown **SILTY SAND**		G	1			1		△	
- grey-brown by 1.3m depth		G	2					△	
1.52									
End of Test Pit									

Photo Ionization Detector: ○ Lower Explosive Limit % — 20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

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

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

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

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

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

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

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

SYMBOLS AND TERMS (continued)

PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

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

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

CONSOLIDATION TEST

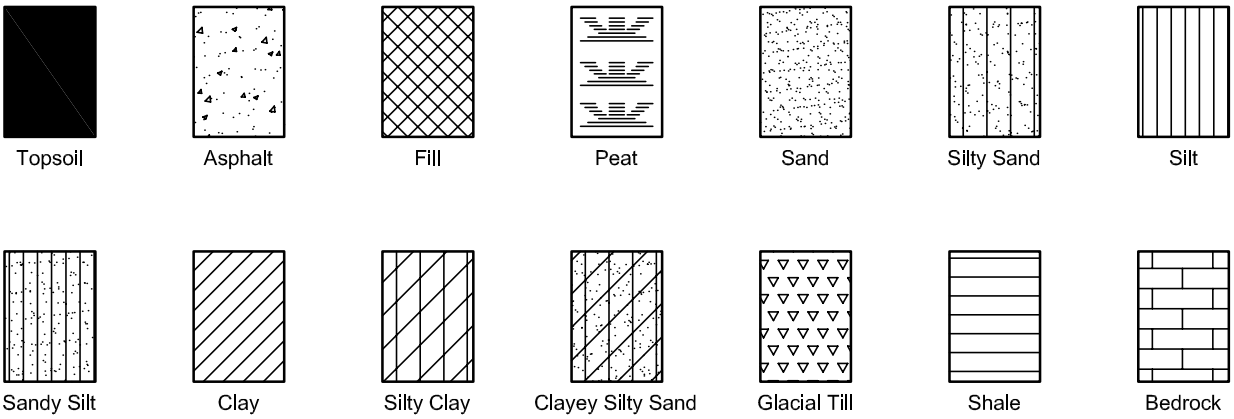
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

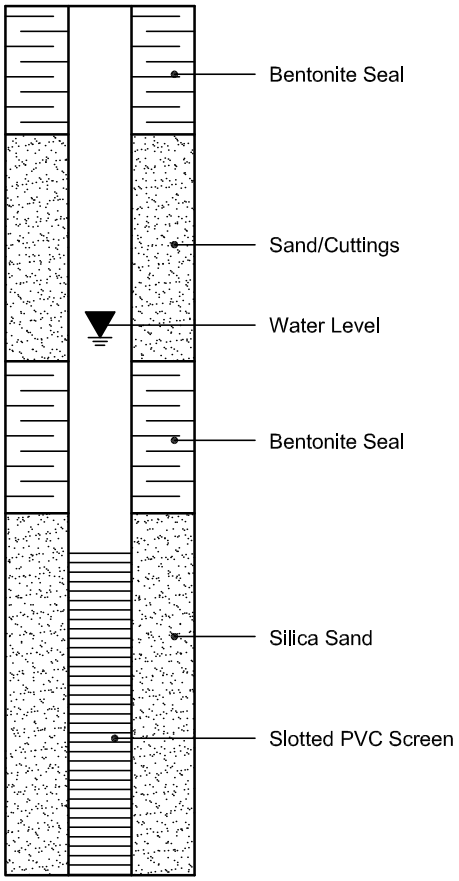
SYMBOLS AND TERMS (continued)

STRATA PLOT

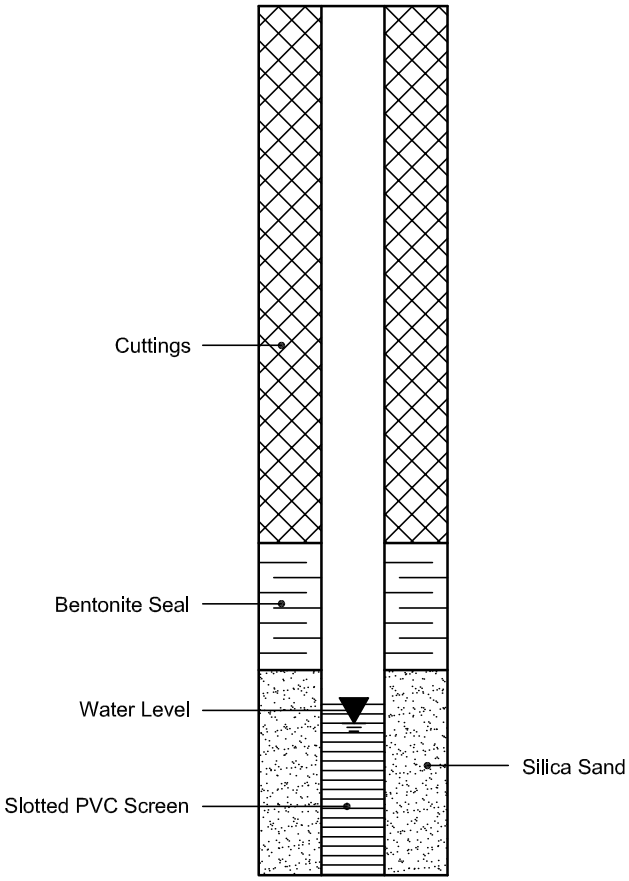


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mike Beaudoin

Client PO: 25128
Project: PE4484
Custody: 118590

Report Date: 6-Dec-2018
Order Date: 30-Nov-2018

Order #: 1848574

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

Paracel ID	Client ID
1848574-01	BH1-SS3
1848574-02	BH4-SS3
1848574-03	BH7-SS2

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25128

Report Date: 06-Dec-2018
Order Date: 30-Nov-2018
Project Description: PE4484

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	1-Dec-18	2-Dec-18
PHC F1	CWS Tier 1 - P&T GC-FID	1-Dec-18	2-Dec-18
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	3-Dec-18	6-Dec-18
Solids, %	Gravimetric, calculation	6-Dec-18	6-Dec-18

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 25128

Report Date: 06-Dec-2018

Order Date: 30-Nov-2018

Project Description: PE4484

	Client ID:	BH1-SS3	BH4-SS3	BH7-SS2	-
	Sample Date:	11/29/2018 09:00	11/29/2018 09:00	11/30/2018 09:00	-
	Sample ID:	1848574-01	1848574-02	1848574-03	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	85.3	82.4	82.5	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	2.41	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	134	-
Toluene	0.05 ug/g dry	<0.05	<0.05	52.6	-
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	383	-
o-Xylene	0.05 ug/g dry	<0.05	<0.05	124	-
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	507	-
Toluene-d8	Surrogate	103%	111%	116%	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	2280	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	761	-
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	<8	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*8.33*		*ug/g*		*104*	*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	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	8	4	ug/g dry	12			42.4	30	QR-01
F3 PHCs (C16-C34)	15	8	ug/g dry	9			54.0	30	QR-01
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND				30	
Physical Characteristics									
% Solids	86.0	0.1	% by Wt.	86.6			0.7	25	
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*8.61*		*ug/g dry*		*108*	*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)	207	7	ug/g		104	80-120			
F2 PHCs (C10-C16)	95	4	ug/g	12	91.6	60-140			
F3 PHCs (C16-C34)	251	8	ug/g	9	109	60-140			
F4 PHCs (C34-C50)	143	6	ug/g	ND	102	60-140			
Volatiles									
Benzene	2.92	0.02	ug/g		72.9	60-130			
Ethylbenzene	3.63	0.05	ug/g		90.9	60-130			
Toluene	3.11	0.05	ug/g		77.8	60-130			
m,p-Xylenes	6.67	0.05	ug/g		83.4	60-130			
o-Xylene	4.66	0.05	ug/g		117	60-130			
Surrogate: Toluene-d8	*6.37*		*ug/g*		*79.7*	*50-140*			

Qualifier Notes:

QC Qualifiers :

QR-01 : Duplicate RPD is high, however, the sample result is less than 10x the MDL.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

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Paracel ID: 1848574

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Chain of Custody
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№ 118590

Page 1 of 1

Client Name: Paterson
Contact Name: Mike Beaudoin
Address: 154 Colonnade Rd S.
Telephone: 613-226-7381

Project Reference: PE4464
Quote #
PO # 25728
Email Address: mbeaudoin@patersongroup.ca

Turnaround Time:
☐ 1 Day ☐ 3 Day
☐ 2 Day ☒ Regular
Date Required:

Criteria: ☒ O. Reg. 153/04 (As Amended) Table __ ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) Municipality: _____ ☐ Other: _____

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

Required Analyses

Paracel Order Number: 1848574

	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	BH1-553	S		2	Nov 29/18		X							120ml + vial						✓
2	BH4-553	S		2	Nov 29/18		X													✓
3	BH7-552	S		2	Nov 30/18		X													✓
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: M. Fleurie	Received at Lab:	Verified By:
Relinquished By (Print): Mike B.	Date/Time: 30/11/18 3:40 PM	Date/Time: 11/30/18 4:8[illegible]	Date/Time: NOV 30, 18 5:09
Date/Time:	Temperature: C	Temperature: 14.6 °C	pH Verified [ ] By: NA

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Karyn Munch

Client PO: 25561
Project: PE4484
Custody: 46445

Report Date: 17-Dec-2018
Order Date: 11-Dec-2018

Order #: 1850260

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

Paracel ID	Client ID
1850260-01	BH1-GW1
1850260-02	BH4-GW1
1850260-03	BH6-GW1

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25561

Report Date: 17-Dec-2018
Order Date: 11-Dec-2018
Project Description: PE4484

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	14-Dec-18	14-Dec-18
PHC F1	CWS Tier 1 - P&T GC-FID	14-Dec-18	14-Dec-18
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	12-Dec-18	12-Dec-18
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	14-Dec-18	14-Dec-18

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 25561

Report Date: 17-Dec-2018

Order Date: 11-Dec-2018

Project Description: PE4484

	Client ID:	BH1-GW1	BH4-GW1	BH6-GW1	-
	Sample Date:	12/11/2018 09:00	12/11/2018 09:00	12/11/2018 09:00	-
	Sample ID:	1850260-01	1850260-02	1850260-03	-
	MDL/Units	Water	Water	Water	-
Volatiles					
Acetone	5.0 ug/L	<5.0	-	-	-
Benzene	0.5 ug/L	<0.5	-	-	-
Bromodichloromethane	0.5 ug/L	<0.5	-	-	-
Bromoform	0.5 ug/L	<0.5	-	-	-
Bromomethane	0.5 ug/L	<0.5	-	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	-	-	-
Chlorobenzene	0.5 ug/L	<0.5	-	-	-
Chloroform	0.5 ug/L	<0.5	-	-	-
Dibromochloromethane	0.5 ug/L	<0.5	-	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	-	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	-	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	-	-	-
Ethylbenzene	0.5 ug/L	<0.5	-	-	-
Ethylene dibromide (dibromoethan	0.2 ug/L	<0.2	-	-	-
Hexane	1.0 ug/L	<1.0	-	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	-	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	-	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	-	-	-
Methylene Chloride	5.0 ug/L	<5.0	-	-	-
Styrene	0.5 ug/L	<0.5	-	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	-	-	-
Toluene	0.5 ug/L	<0.5	-	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 25561

Report Date: 17-Dec-2018

Order Date: 11-Dec-2018

Project Description: PE4484

	Client ID:	BH1-GW1	BH4-GW1	BH6-GW1	-
	Sample Date:	12/11/2018 09:00	12/11/2018 09:00	12/11/2018 09:00	-
	Sample ID:	1850260-01	1850260-02	1850260-03	-
	MDL/Units	Water	Water	Water	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	-	-	-
Trichloroethylene	0.5 ug/L	<0.5	-	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	-	-	-
Vinyl chloride	0.5 ug/L	<0.5	-	-	-
m,p-Xylenes	0.5 ug/L	<0.5	-	-	-
o-Xylene	0.5 ug/L	<0.5	-	-	-
Xylenes, total	0.5 ug/L	<0.5	-	-	-
4-Bromofluorobenzene	Surrogate	125%	-	-	-
Dibromofluoromethane	Surrogate	116%	-	-	-
Toluene-d8	Surrogate	94.5%	-	-	-
Benzene	0.5 ug/L	-	<0.5	<0.5	-
Ethylbenzene	0.5 ug/L	-	<0.5	<0.5	-
Toluene	0.5 ug/L	-	<0.5	<0.5	-
m,p-Xylenes	0.5 ug/L	-	<0.5	<0.5	-
o-Xylene	0.5 ug/L	-	<0.5	<0.5	-
Xylenes, total	0.5 ug/L	-	<0.5	<0.5	-
Toluene-d8	Surrogate	-	102%	102%	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	<25	-
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	-
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	-
F4 PHCs (C34-C50)	100 ug/L	<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	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	*86.1*		*ug/L*		*108*	*50-140*			
Surrogate: Dibromofluoromethane	*90.8*		*ug/L*		*113*	*50-140*			
Surrogate: Toluene-d8	*78.5*		*ug/L*		*98.1*	*50-140*			
Benzene	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: Toluene-d8	*78.5*		*ug/L*		*98.1*	*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				30	
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	2.16			0.0	30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	4.56	0.5	ug/L	5.28			14.6	30	
Dibromochloromethane	ND	0.5	ug/L	2.49			0.0	30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*106*		*ug/L*		*133*	*50-140*			
Surrogate: Dibromofluoromethane	*96.7*		*ug/L*		*121*	*50-140*			
Surrogate: Toluene-d8	*84.1*		*ug/L*		*105*	*50-140*			
Benzene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: Toluene-d8	*84.1*		*ug/L*		*105*	*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)	1790	25	ug/L		89.5	68-117			
F2 PHCs (C10-C16)	1430	100	ug/L		89.7	60-140			
F3 PHCs (C16-C34)	3400	100	ug/L		86.8	60-140			
F4 PHCs (C34-C50)	1930	100	ug/L		77.7	60-140			
Volatiles									
Acetone	55.8	5.0	ug/L		55.8	50-140			
Benzene	29.3	0.5	ug/L		73.3	60-130			
Bromodichloromethane	30.7	0.5	ug/L		76.8	60-130			
Bromoform	28.1	0.5	ug/L		70.3	60-130			
Bromomethane	39.4	0.5	ug/L		98.6	50-140			
Carbon Tetrachloride	31.3	0.2	ug/L		78.2	60-130			
Chlorobenzene	33.3	0.5	ug/L		83.3	60-130			
Chloroform	35.5	0.5	ug/L		88.8	60-130			
Dibromochloromethane	27.7	0.5	ug/L		69.4	60-130			
Dichlorodifluoromethane	34.2	1.0	ug/L		85.6	50-140			
1,2-Dichlorobenzene	33.4	0.5	ug/L		83.6	60-130			
1,3-Dichlorobenzene	35.9	0.5	ug/L		89.7	60-130			
1,4-Dichlorobenzene	44.9	0.5	ug/L		112	60-130			
1,1-Dichloroethane	38.1	0.5	ug/L		95.3	60-130			
1,2-Dichloroethane	29.9	0.5	ug/L		74.6	60-130			
1,1-Dichloroethylene	36.2	0.5	ug/L		90.6	60-130			
cis-1,2-Dichloroethylene	33.5	0.5	ug/L		83.8	60-130			
trans-1,2-Dichloroethylene	36.9	0.5	ug/L		92.2	60-130			
1,2-Dichloropropane	27.5	0.5	ug/L		68.7	60-130			
cis-1,3-Dichloropropylene	38.6	0.5	ug/L		96.5	60-130			
trans-1,3-Dichloropropylene	45.2	0.5	ug/L		113	60-130			
Ethylbenzene	33.2	0.5	ug/L		82.9	60-130			
Ethylene dibromide (dibromoethane	32.9	0.2	ug/L		82.3	60-130			
Hexane	29.5	1.0	ug/L		73.8	60-130			
Methyl Ethyl Ketone (2-Butanone)	77.8	5.0	ug/L		77.8	50-140			
Methyl Isobutyl Ketone	54.0	5.0	ug/L		54.0	50-140			
Methyl tert-butyl ether	69.3	2.0	ug/L		69.3	50-140			
Methylene Chloride	31.9	5.0	ug/L		79.6	60-130			
Styrene	33.4	0.5	ug/L		83.5	60-130			
1,1,1,2-Tetrachloroethane	34.3	0.5	ug/L		85.8	60-130			
1,1,2,2-Tetrachloroethane	26.7	0.5	ug/L		66.8	60-130			
Tetrachloroethylene	34.0	0.5	ug/L		85.0	60-130			
Toluene	34.4	0.5	ug/L		86.1	60-130			
1,1,1-Trichloroethane	31.4	0.5	ug/L		78.4	60-130			
1,1,2-Trichloroethane	27.1	0.5	ug/L		67.7	60-130			
Trichloroethylene	27.0	0.5	ug/L		67.4	60-130			
Trichlorofluoromethane	44.7	1.0	ug/L		112	60-130			
Vinyl chloride	45.4	0.5	ug/L		114	50-140			
m,p-Xylenes	72.3	0.5	ug/L		90.4	60-130			
o-Xylene	42.3	0.5	ug/L		106	60-130			
Surrogate: 4-Bromofluorobenzene	*67.1*		*ug/L*		*83.9*	*50-140*			
Benzene	29.3	0.5	ug/L		73.3	60-130			
Ethylbenzene	33.2	0.5	ug/L		82.9	60-130			
Toluene	34.4	0.5	ug/L		86.1	60-130			
m,p-Xylenes	72.3	0.5	ug/L		90.4	60-130			
o-Xylene	42.3	0.5	ug/L		106	60-130			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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.

Paracel ID: 1850260

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Chain of Custody
(Lab Use Only)
№ 46445

Page 1 of 1

Client Name: Paterson Group Inc.	Project Reference: PE4484
Contact Name: Karyn Munch	Quote #
Address: 154 Colonnade Rd	PO # 255561
Telephone: 613-226-7381	Email Address: kmunch@patersongroup.ca

Turnaround Time:
☐ 1 Day ☐ 3 Day
☐ 2 Day ☒ Regular
Date Required: _____

Criteria: ☒ O. Reg. 153/04 (As Amended) Table 3 ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) Municipality: _____ ☐ Other: _____

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

Required Analyses

	Paracel Order Number: 1850260 / Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	BTEX PHCs (F1-F4)									
1	BH1-GW1	GW		3	Dec.11/18	am	✓									
2	BH4-GW1	GW		3	Dec.11/18	am	✓									
3	BH6-GW1	GW		3	Dec.11/18	am	✓									
4																
5																
6																
7																
8																
9																
10																

Comments:

Method of Delivery: Paracel

Relinquished By (Sign): KMunch	Received by Driver/Depot: A. Slouse	Received at Lab: Lalu	Verified By:
Relinquished By (Print): KMunch	Date/Time: 11/12/18 4:00 PM	Date/Time: Dec 11, 18 4:37	Date/Time: Dec 11/18 3:37
Date/Time: Dec. 11, 2018	Temperature: ___ °C	Temperature: 9.7 °C	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Karyn Munch

Client PO: 25705
Project: PE4484
Custody: 46449

Report Date: 17-Dec-2018
Order Date: 13-Dec-2018

Order #: 1850483

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

Paracel ID	Client ID
1850483-01	BH7-SS2

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25705

Report Date: 17-Dec-2018
Order Date: 13-Dec-2018
Project Description: PE4484

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Flashpoint	ASTM D93 - Pensky-Martens Closed Cup	14-Dec-18	14-Dec-18
Metals, ICP-MS	EPA 6020 - Digestion - ICP-MS	14-Dec-18	14-Dec-18
REG 558 - Cyanide	MOE E3015- Auto Colour	14-Dec-18	14-Dec-18
REG 558 - Fluoride	EPA 340.2 - ISE	17-Dec-18	17-Dec-18
REG 558 - Mercury by CVAA	EPA 7470A - Cold Vapour AA	17-Dec-18	17-Dec-18
REG 558 - NO3/NO2	EPA 300.1 - IC	17-Dec-18	17-Dec-18
REG 558 - PCBs	EPA 608 - GC-ECD	14-Dec-18	14-Dec-18
REG 558 - VOCs	EPA 624 - P&T GC-MS	13-Dec-18	16-Dec-18
Solids, %	Gravimetric, calculation	13-Dec-18	14-Dec-18

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 25705

Report Date: 17-Dec-2018

Order Date: 13-Dec-2018

Project Description: PE4484

	Client ID:	BH7-SS2	-	-	-
	Sample Date:	11/30/2018 09:00	-	-	-
	Sample ID:	1850483-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	85.5	-	-	-
Flashpoint	°C	>70	-	-	-
EPA 1311 - TCLP Leachate Inorganics					
Arsenic	0.05 mg/L	<0.05	-	-	-
Barium	0.05 mg/L	0.40	-	-	-
Boron	0.05 mg/L	0.07	-	-	-
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	-	-	-
Fluoride	0.05 mg/L	0.09	-	-	-
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 Organics					
Benzene	0.005 mg/L	<0.005	-	-	-
Carbon Tetrachloride	0.005 mg/L	<0.005	-	-	-
Chlorobenzene	0.004 mg/L	<0.004	-	-	-
Chloroform	0.006 mg/L	<0.006	-	-	-
1,2-Dichlorobenzene	0.004 mg/L	<0.004	-	-	-
1,4-Dichlorobenzene	0.004 mg/L	<0.004	-	-	-
1,2-Dichloroethane	0.005 mg/L	<0.005	-	-	-
1,1-Dichloroethylene	0.006 mg/L	<0.006	-	-	-
Methyl Ethyl Ketone (2-Butanone)	0.30 mg/L	<0.30	-	-	-
Methylene Chloride	0.04 mg/L	<0.04	-	-	-
Tetrachloroethylene	0.005 mg/L	<0.005	-	-	-
Trichloroethylene	0.004 mg/L	<0.004	-	-	-
Vinyl chloride	0.005 mg/L	<0.005	-	-	-
4-Bromofluorobenzene	Surrogate	118%	-	-	-
Dibromofluoromethane	Surrogate	103%	-	-	-
Toluene-d8	Surrogate	104%	-	-	-
PCBs, total	0.003 mg/L	<0.003	-	-	-
Decachlorobiphenyl	Surrogate	115%	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
EPA 1311 - TCLP Leachate Inorganics									
Arsenic	ND	0.05	mg/L						
Barium	ND	0.05	mg/L						
Boron	ND	0.05	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						
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 Organics									
Benzene	ND	0.005	mg/L						
Carbon Tetrachloride	ND	0.005	mg/L						
Chlorobenzene	ND	0.004	mg/L						
Chloroform	ND	0.006	mg/L						
1,2-Dichlorobenzene	ND	0.004	mg/L						
1,4-Dichlorobenzene	ND	0.004	mg/L						
1,2-Dichloroethane	ND	0.005	mg/L						
1,1-Dichloroethylene	ND	0.006	mg/L						
Methyl Ethyl Ketone (2-Butanone)	ND	0.30	mg/L						
Methylene Chloride	ND	0.04	mg/L						
Tetrachloroethylene	ND	0.005	mg/L						
Trichloroethylene	ND	0.004	mg/L						
Vinyl chloride	ND	0.005	mg/L						
Surrogate: 4-Bromofluorobenzene	*0.827*		*mg/L*		*120*	*83-134*			
Surrogate: Dibromofluoromethane	*0.781*		*mg/L*		*113*	*78-124*			
Surrogate: Toluene-d8	*0.675*		*mg/L*		*98.1*	*76-118*			
PCBs, total	ND	0.003	mg/L						
Surrogate: Decachlorobiphenyl	*0.011*		*mg/L*		*110*	*62-138*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
EPA 1311 - TCLP Leachate Inorganics									
Arsenic	ND	0.05	mg/L	ND			0.0	29	
Barium	0.385	0.05	mg/L	0.395			2.7	34	
Boron	0.068	0.05	mg/L	0.071			3.9	33	
Cadmium	ND	0.01	mg/L	ND			0.0	33	
Chromium	ND	0.05	mg/L	ND			0.0	32	
Lead	ND	0.05	mg/L	ND			0.0	32	
Mercury	ND	0.005	mg/L	ND			0.0	30	
Selenium	ND	0.05	mg/L	ND			0.0	28	
Silver	ND	0.05	mg/L	ND			0.0	28	
Uranium	ND	0.05	mg/L	ND			0.0	27	
Fluoride	0.36	0.05	mg/L	0.35			1.7	20	
Nitrate as N	ND	1	mg/L	ND			0.0	20	
Nitrite as N	ND	1	mg/L	ND				20	
Cyanide, free	ND	0.02	mg/L	ND				20	
EPA 1311 - TCLP Leachate Organics									
Benzene	ND	0.005	mg/L	ND				25	
Carbon Tetrachloride	ND	0.005	mg/L	ND				25	
Chlorobenzene	ND	0.004	mg/L	ND				25	
Chloroform	ND	0.006	mg/L	ND				25	
1,2-Dichlorobenzene	ND	0.004	mg/L	ND				25	
1,4-Dichlorobenzene	ND	0.004	mg/L	ND				25	
1,2-Dichloroethane	ND	0.005	mg/L	ND				25	
1,1-Dichloroethylene	ND	0.006	mg/L	ND				25	
Methyl Ethyl Ketone (2-Butanone)	ND	0.30	mg/L	ND				25	
Methylene Chloride	ND	0.04	mg/L	ND				25	
Tetrachloroethylene	ND	0.005	mg/L	ND				25	
Trichloroethylene	ND	0.004	mg/L	ND				25	
Vinyl chloride	ND	0.005	mg/L	ND				25	
Surrogate: 4-Bromofluorobenzene	*0.770*		*mg/L*		*112*	*83-134*			
Surrogate: Dibromofluoromethane	*0.728*		*mg/L*		*106*	*78-124*			
Surrogate: Toluene-d8	*0.802*		*mg/L*		*117*	*76-118*			
PCBs, total	ND	0.003	mg/L	ND				30	
Surrogate: Decachlorobiphenyl	*0.012*		*mg/L*		*118*	*62-138*			
Physical Characteristics									
% Solids	89.3	0.1	% by Wt.	87.7			1.8	25	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
EPA 1311 - TCLP Leachate Inorganics									
Arsenic	48.0		ug/L	0.300	95.4	83-119			
Barium	85.0		ug/L	39.5	90.9	83-116			
Boron	51.2		ug/L	7.09	88.3	71-128			
Cadmium	42.3		ug/L	0.047	84.4	78-119			
Chromium	53.0		ug/L	0.696	105	80-124			
Lead	41.0		ug/L	2.74	76.6	77-126			QM-07
Mercury	0.0287	0.005	mg/L	ND	95.6	70-130			
Selenium	39.9		ug/L	0.117	79.6	81-125			QM-07
Silver	39.3		ug/L	ND	78.5	70-128			
Uranium	44.1		ug/L	ND	88.1	70-131			
Fluoride	0.98	0.05	mg/L	0.35	125	70-130			
Nitrate as N	10	1	mg/L	ND	97.6	81-112			
Nitrite as N	9	1	mg/L	ND	89.3	76-107			
Cyanide, free	0.052	0.02	mg/L	ND	104	60-136			
EPA 1311 - TCLP Leachate Organics									
Benzene	0.029	0.005	mg/L		73.3	55-141			
Carbon Tetrachloride	0.031	0.005	mg/L		78.2	49-149			
Chlorobenzene	0.033	0.004	mg/L		83.3	64-137			
Chloroform	0.036	0.006	mg/L		88.8	58-138			
1,2-Dichlorobenzene	0.033	0.004	mg/L		83.6	60-150			
1,4-Dichlorobenzene	0.045	0.004	mg/L		112	63-132			
1,2-Dichloroethane	0.030	0.005	mg/L		74.6	50-140			
1,1-Dichloroethylene	0.036	0.006	mg/L		90.6	43-153			
Methyl Ethyl Ketone (2-Butanone)	0.078	0.30	mg/L		77.8	26-153			
Methylene Chloride	0.032	0.04	mg/L		79.7	58-149			
Tetrachloroethylene	0.034	0.005	mg/L		85.0	51-145			
Trichloroethylene	0.027	0.004	mg/L		67.4	52-135			
Vinyl chloride	0.045	0.005	mg/L		114	31-159			
Surrogate: 4-Bromofluorobenzene	*0.0671*		*mg/L*		*83.9*	*83-134*			
PCBs, total	0.041	0.003	mg/L	ND	102	86-145			

Qualifier Notes:

QC Qualifiers :

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

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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.

Paracel ID: 1850483

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№ 46449

Page ___ of ___

Client Name: Paterson Group Inc.	Project Reference: PE4484	**Turnaround Time:**
Contact Name: Kaylyn Munch	Quote #	☐ 1 Day ☐ 3 Day
Address: 154 Colonnade Rd S.	PO # 25705	☐ 2 Day ☒ Regular
Telephone: 613-226-7381	Email Address: kmunch@patersongroup.ca	Date Required:

Criteria: ☐ O. Reg. 153/04 (As Amended) Table __ ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) Municipality: ☐ Other:

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

Required Analyses

Paracel Order Number: 1850483

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Flashpoint	PHC F1-F4 + BTEX	PHC F1-F4 + BTEX + naphthalene	PHC F1-F4 + BTEX + metals + inorganics	VOCs	PCBs						
1	BH7-SS2	S		2	Nov. 30/18		✓	✓		✓	✓	✓						
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9	1848574. KV																	
10																		

Comments: Sample @ lab - previously run for BTEX/PHC F1-F4
*landfill unknown. Would like to cover parameters for Navan & Springhill

Method of Delivery: Paracel

Relinquished By (Sign): KMunch	Received by Driver/Depot: M. Lecuyer	Received at Lab:	Verified By:
Relinquished By (Print): K. Munch	Date/Time: 13/12/18 2:40	Date/Time: 12/13/18 4:23pm	Date/Time: 12/13/18 4:26pm
Date/Time: Dec. 13, 2018	Temperature: °C FH.	Temperature: °C	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Karyn Munch

Client PO: 25705
Project: PE4484
Custody: 46448

Report Date: 18-Dec-2018
Order Date: 13-Dec-2018

Order #: 1850489

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

Paracel ID	Client ID
1850489-01	BH7-SS4

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25705

Report Date: 18-Dec-2018
Order Date: 13-Dec-2018
Project Description: PE4484

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	13-Dec-18	17-Dec-18
PHC F1	CWS Tier 1 - P&T GC-FID	13-Dec-18	17-Dec-18
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	13-Dec-18	17-Dec-18
Solids, %	Gravimetric, calculation	18-Dec-18	18-Dec-18

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25705

Report Date: 18-Dec-2018
Order Date: 13-Dec-2018
Project Description: PE4484

	Client ID:	BH7-SS4	-	-	-
	Sample Date:	11/30/2018 09:00	-	-	-
	Sample ID:	1850489-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	77.7	-	-	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02 [1]	-	-	-
Ethylbenzene	0.05 ug/g dry	<0.05 [1]	-	-	-
Toluene	0.05 ug/g dry	<0.05 [1]	-	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05 [1]	-	-	-
o-Xylene	0.05 ug/g dry	<0.05 [1]	-	-	-
Xylenes, total	0.05 ug/g dry	<0.05 [1]	-	-	-
Toluene-d8	Surrogate	102% [1]	-	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7 [1]	-	-	-
F2 PHCs (C10-C16)	4 ug/g dry	6	-	-	-
F3 PHCs (C16-C34)	8 ug/g dry	96	-	-	-
F4 PHCs (C34-C50)	6 ug/g dry	43	-	-	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25705

Report Date: 18-Dec-2018
Order Date: 13-Dec-2018
Project Description: PE4484

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*8.16*		*ug/g*		*102*	*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	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	9	4	ug/g dry	9			6.2	30	
F3 PHCs (C16-C34)	131	8	ug/g dry	157			18.2	30	
F4 PHCs (C34-C50)	253	6	ug/g dry	371			37.8	30	QR-04
Physical Characteristics									
% Solids	79.2	0.1	% by Wt.	87.9			10.4	25	
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*8.52*		*ug/g dry*		*96.5*	*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)	172	7	ug/g		85.9	80-120			
F2 PHCs (C10-C16)	103	4	ug/g	9	113	60-140			
F3 PHCs (C16-C34)	377	8	ug/g	157	108	60-140			
F4 PHCs (C34-C50)	123	6	ug/g		99.2	80-120			
Volatiles									
Benzene	3.87	0.02	ug/g		96.7	60-130			
Ethylbenzene	4.25	0.05	ug/g		106	60-130			
Toluene	4.15	0.05	ug/g		104	60-130			
m,p-Xylenes	8.43	0.05	ug/g		105	60-130			
o-Xylene	4.04	0.05	ug/g		101	60-130			
Surrogate: Toluene-d8	*7.50*		*ug/g*		*93.8*	*50-140*			

Qualifier Notes:

Sample Qualifiers :

1 : This analysis was conducted after the accepted holding time had been exceeded.

QC Qualifiers :

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

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

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№ 46448

Page ___ of ___

Client Name: Paterson Group Inc.	Project Reference: PE4484	**Turnaround Time:**
Contact Name: Karyn Munch	Quote #	☐ 1 Day ☐ 3 Day
Address: 154 Colonnade Rd. S.	PO # 25705	☐ 2 Day ☒ Regular
Telephone: 613.226.7381	Email Address: kmunch@patersongroup.ca	Date Required:

Criteria: ☒ O. Reg. 153/04 (As Amended) Table 2 ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) Municipality: ☐ Other:

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

Paracel Order Number: 1850489

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Required Analyses: BTEX/PHC F1-F4										
1	BH7-SS4	S		2	Nov.30/18		✓						Rom Thick				
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Comments:

Method of Delivery: Paracel

Relinquished By (Sign): KMunch	Received by Driver/Depot: A. Lalonde	Received at Lab:	Verified By:
Relinquished By (Print): KMunch.	Date/Time: 13/12/18 2:40 PM	Date/Time: Dec 13/18 4:20pm	Date/Time: Dec 13, 18
Date/Time: Dec. 13, 2018	Temperature: °C	Temperature: 17.9 °C	pH Verified ☐ By: NA

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Karyn Munch

Client PO: 31625
Project: PE4484
Custody: 55593

Report Date: 22-Dec-2020
Order Date: 18-Dec-2020

Order #: 2051641

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

Paracel ID	Client ID
2051641-01	TP1-G2
2051641-02	TP2-G3
2051641-03	TP3-G1
2051641-04	TP9-G1
2051641-05	TP11-G1
2051641-06	DUP

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 22-Dec-2020

Client: Paterson Group Consulting Engineers

Order Date: 18-Dec-2020

Client PO: 31625

Project Description: PE4484

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	21-Dec-20	21-Dec-20
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	21-Dec-20	21-Dec-20
PHC F1	CWS Tier 1 - P&T GC-FID	21-Dec-20	21-Dec-20
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	21-Dec-20	22-Dec-20
Solids, %	Gravimetric, calculation	21-Dec-20	21-Dec-20

Certificate of Analysis

Report Date: 22-Dec-2020

Client: Paterson Group Consulting Engineers

Order Date: 18-Dec-2020

Client PO: 31625

Project Description: PE4484

	Client ID:	TP1-G2	TP2-G3	TP3-G1	TP9-G1
	Sample Date:	17-Dec-20 09:00	17-Dec-20 09:00	17-Dec-20 09:00	17-Dec-20 09:00
	Sample ID:	2051641-01	2051641-02	2051641-03	2051641-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	82.0	80.9	85.5	76.8
General Inorganics					
pH	0.05 pH Units	-	7.57	7.38	-
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	0.09
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	0.09
Toluene-d8	Surrogate	108%	108%	108%	107%
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	13
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	19

	Client ID:	TP11-G1	DUP	-	-
	Sample Date:	17-Dec-20 09:00	17-Dec-20 09:00	-	-
	Sample ID:	2051641-05	2051641-06	-	-
	MDL/Units	Soil	Soil	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	81.2	78.5	-	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	-	-
Toluene	0.05 ug/g dry	<0.05	<0.05	-	-
m,p-Xylenes	0.05 ug/g dry	0.07	0.07	-	-
o-Xylene	0.05 ug/g dry	<0.05	<0.05	-	-
Xylenes, total	0.05 ug/g dry	0.07	0.07	-	-
Toluene-d8	Surrogate	109%	109%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	-	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	-	-
F3 PHCs (C16-C34)	8 ug/g dry	48	18	-	-
F4 PHCs (C34-C50)	6 ug/g dry	37	29	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*8.50*		*ug/g*		*106*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
pH	7.59	0.05	pH Units	7.70			1.4	2.3	
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND			NC	40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND			NC	30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND			NC	30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND			NC	30	
Physical Characteristics									
% Solids	92.0	0.1	% by Wt.	93.0			1.0	25	
Volatiles									
Benzene	ND	0.02	ug/g dry	ND			NC	50	
Ethylbenzene	ND	0.05	ug/g dry	ND			NC	50	
Toluene	ND	0.05	ug/g dry	ND			NC	50	
m,p-Xylenes	ND	0.05	ug/g dry	ND			NC	50	
o-Xylene	ND	0.05	ug/g dry	ND			NC	50	
Surrogate: Toluene-d8	*9.45*		*ug/g dry*		*108*	*50-140*			

Certificate of Analysis

Report Date: 22-Dec-2020

Client: Paterson Group Consulting Engineers

Order Date: 18-Dec-2020

Client PO: 31625

Project Description: PE4484

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	220	7	ug/g	ND	110	80-120			
F2 PHCs (C10-C16)	70	4	ug/g	ND	80.0	60-140			
F3 PHCs (C16-C34)	195	8	ug/g	ND	91.0	60-140			
F4 PHCs (C34-C50)	130	6	ug/g	ND	96.2	60-140			
Volatiles									
Benzene	4.37	0.02	ug/g	ND	109	60-130			
Ethylbenzene	4.08	0.05	ug/g	ND	102	60-130			
Toluene	4.09	0.05	ug/g	ND	102	60-130			
m,p-Xylenes	7.52	0.05	ug/g	ND	94.0	60-130			
o-Xylene	3.75	0.05	ug/g	ND	93.8	60-130			
Surrogate: Toluene-d8	*8.25*		*ug/g*		*103*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

PARACEL LABORATORIES LTD.

Paracel ID: 2051641

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2051641	№ 55593

Client Name: Paterson Group Inc.	Project Ref: PE4484	Page __ of __
Contact Name: Karyn Munch	Quote #:	Turnaround Time
Address: 154 Colonnade Rd S.	PO #: 31625	☐ 1 day ☐ 3 day
	E-mail: kmunch@patersongroup.ca	☐ 2 day ☒ Regular
Telephone: 613-226-7381		Date Required:

Regulation 153/04	Other Regulation
☐ Table 1 ☐ Res/Park ☐ Med/Fine	☐ REG 558 ☐ PWQO
☐ Table 2 ☐ Ind/Comm ☐ Coarse	☐ CCME ☐ MISA
☒ Table 3 ☐ Agri/Other	☐ SU - Sani ☐ SU - Storm
☐ Table ___	Mun:
For RSC: ☐ Yes ☐ No	☐ Other:

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

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Required Analysis: BTEX/PHC F-F4	Required Analysis: pH
1	TP1-G2	S		2	Dec. 17/20		✓	
2	TP2-G3	S		2			✓	✓
3	TP3-G1	S		2			✓	✓
4	TP9-G1	S		2			✓	
5	TP11-G1	S		2			✓	
6	DUP	S		2	↓		✓	
7								
8								
9								
10								

Comments:

Method of Delivery: PARACEL COURIER

Relinquished By (Sign):	Received By Driver/Depot: T. Louise	Received at Lab: BEm	Verified By: BEm
Relinquished By (Print): Joshua Dempsey	Date/Time: 18/12/20 3:30	Date/Time: Dec 18, 2020 17:00	Date/Time: Dec 18, 2020 17:57
Date/Time: Dec 18/2020	Temperature: °C PM	Temperature: 8.4 °C	pH Verified: ☐ By: