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Phase II – Environmental Site Assessment

1500 Merivale Road
Ottawa, Ontario

Prepared For

Claridge Homes

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Report: PE5066-2

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EXECUTIVE SUMMARY

Assessment

A Phase II-ESA was conducted for the property addressed 1500 Merivale Road, in the City of Ottawa, Ontario. The purpose of the Phase II-ESA was to address the potentially contaminating activities (PCAs) that were identified during the previous 2017 Phase I-ESA and were considered to result in areas of potential environmental concern (APECs) on the subject site.

The subsurface investigation was conducted between October 30 and November 4, 2020, and consisted of drilling 10 boreholes (BH1-20 – BH2-20) throughout the subject site, all of which were instrumented with groundwater monitoring well installations. The boreholes were advanced to depths ranging from approximately 6.04 m to 9.04 m below the existing grade, with the exception of BH1-20 and BH3-20 which were advanced to depths of approximately 15.14 m and 14.43 m below the existing grade, respectively. All boreholes were terminated within the underlying bedrock unit, with the exception of BH10-20, which was terminated within a layer of grey silty clay till. Six previously installed groundwater monitoring wells (MW13-55, MW13-56, and MW13-59 – MW13-62) were also located on-site and utilized as part of this investigation.

A total of 7 soil samples were submitted for laboratory analysis of either: BTEX, PHCs (F_1-F_4), VOCs, PAHs, and/or metals parameters. According to the analytical test results, several PAH parameters were detected in soil sample BH10-20-SS2/SS3 at concentrations exceeding the applicable MECP Table 7 residential standards. The remaining parameter concentrations in all other soil samples tested comply with the MECP Table 7 residential standards.

A total of 16 groundwater samples were recovered and submitted for laboratory analysis of either PHCs and/or VOCs. According to the analytical test results, several VOC parameters were detected in the groundwater samples collected from BH8-20, MW13-55, MW13-56, MW13-59, MW13-60, MW13-61, and MW13-62 at concentrations exceeding the applicable MECP Table 7 residential standards.

Recommendations

Soil

In combination with other impacted soils previously identified on the subject site, PAH impacted soil was identified in the vicinity of BH10-20, located within the southwestern portion of the subject site, requiring some remedial work. It is our understanding that the subject site is to be redeveloped for residential and mixed-use purposes in the near future. Therefore, it is our recommendation that an environmental site remedial program be completed in conjunction with site redevelopment. This will require the segregation of clean soil from impacted soil, the latter of which will require disposal at an approved waste disposal facility.

Prior to off-site disposal at a licenced landfill site, a leachate analysis of a representative sample of contaminated soil must be conducted in accordance with Ontario Regulation 347/558.

Groundwater

The groundwater within the southwestern portion of the subject site is impacted by VOCs. Although this area has not been fully vertically delineated beneath a depth of approximately 9.4 m at this time, vertical delineation of the VOC impacted groundwater will be required to determine whether a generic site remediation program is feasible, or if a risk assessment approach will be required for the redevelopment of the subject site in this localized area. Refer to the risk assessment report (PE5066-MEMO.02) for more information.

It is recommended that an additional groundwater testing event be conducted to confirm the recent test results as well as to confirm the dissipation of chloroform identified in BH1-20 and BH6-20.

Monitoring Wells

If the groundwater monitoring wells installed on-site are not going to be used in the future, or will be destroyed during future redevelopment activities, then they must be decommissioned according to Ontario Regulation Reg. 903 (Ontario Water Resources Act). The monitoring wells will be registered with the MECP under this regulation. Further information can be provided upon request in this regard.

1.0 INTRODUCTION

At the request of Mr. Jim Burghout of Claridge Homes, Paterson Group (Paterson) conducted a Phase II-Environmental Site Assessment (Phase II-ESA) for the property located at 1500 Merivale Road in the City of Ottawa. The purpose of this Phase II-ESA was to address the areas of potential environmental concern (APECs) identified on the subject site as a result the findings of the previous Phase I-ESA completed by Paterson in 2017.

1.1 Site Description

Address:	1500 Merivale Road, Ottawa. (Parcel also contains lots addressed 1490 Merivale Road, 1366 Baseline Road, and 1380 Baseline Road).
Legal Description:	Part of Lot 35, Concession A, Rideau Front; Formerly the Township of Nepean, in the City of Ottawa.
Location:	The subject site is bounded by Clyde Avenue, commercial properties to the west, commercial properties and Merivale Road to the south and east, as well as commercial properties and Baseline Road to the north. Refer to Figure 1 – Key Plan for the location of the subject site.
Latitude and Longitude:	45° 21' 39" N, 75° 44' 12" W.

Site Description:

Configuration:	Irregular.
Site Area:	6.21 hectares (approximate).
Zoning:	AM – Arterial Main Street Zone.
Current Uses:	The subject site is mostly vacant, with the exception of an automotive service garage (1380 Baseline Road) present along the northern property boundary.
Services:	The subject site is located within a municipally serviced area.

1.2 Property Ownership

The subject property is currently being purchased by Claridge Homes. Paterson was retained to complete this Phase II-ESA by Mr. Jim Burghout of Claridge Homes, whose offices are located at 210 Gladstone Avenue. Mr. Burghout can be contacted via telephone at 613-233-6030.

1.3 Current and Proposed Future Uses

The subject site is mostly vacant, with the exception of a one storey auto service garage at 1380 Baseline Road, located in the northern portion of the subject site. It is our understanding that the property is to be redeveloped for residential and mixed-use purposes.

1.4 Applicable Site Condition Standard

The site condition standards for the subject property were obtained from Table 7 of the document entitled, *"Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act"*, prepared by the Ministry of the Environment, Conservation and Parks (MECP), and dated April 15, 2011. The selected MECP standards are based on the following considerations:

- ❒ Shallow soil conditions
- ❒ Coarse-grained soil conditions
- ❒ Non-potable groundwater conditions
- ❒ Residential land use

The residential standards were selected based on the future land use of the subject site.

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

The MECP Table 1 standards for Full Depth Background Site Conditions were also selected for additional consideration to assess the on-site soil conditions prior to future off-site disposal.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The subject site is primarily vacant and covered with either asphalt or vegetation, with the exception of a one storey auto service garage, located in the northern portion of the subject site, adjacent to Baseline Road. The site topography slopes down to the south, whereas the regional topography slopes down to the southwest. Water drainage on-site occurs primarily via infiltration throughout the property or via surface run-off to catch basins located on the adjacent roads.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation was conducted between October 30 and November 4, 2020. The field program consisted of drilling 10 boreholes (BH1-20 – BH2-20) throughout the subject site, all of which were instrumented with groundwater monitoring wells. The boreholes were advanced to depths ranging from approximately 6.04 m to 9.04 m below the existing grade, with the exception of BH1-20 and BH3-20 which were advanced to depths of approximately 15.14 m and 14.43 m below the existing grade, respectively. All boreholes were terminated within the underlying bedrock unit, with the exception of BH10-20, which was terminated within a layer of grey silty clay till.

3.2 Media Investigated

During the subsurface investigation, soil and groundwater samples were obtained and submitted for laboratory analysis. The rationale for sampling and analyzing these media is based on the contaminants of potential concern identified in the 2017 Phase I-ESA.

The contaminants of potential concern for the soil and groundwater on the subject site include the following:

- Volatile Organic Compounds (VOCs)
- Petroleum Hydrocarbons, fractions 1 - 4 (PHCs F_1-F_4)
- Polycyclic Aromatic Hydrocarbons (PAHs)
- Metals (including Mercury and Hexavalent Chromium)

3.3 Phase I ESA Conceptual Site Model

Existing Buildings and Structures

The subject site is mostly vacant, with the exception of a one storey auto service garage present within the northern portion of the subject site, adjacent to Baseline Road. Two former building foundations are present within the eastern and southern portions of the subject site.

Water Bodies and Areas of Natural and Scientific Interest

No water bodies or areas of natural and scientific interest are known to exist within the Phase I study area. The nearest named water body with respect to the subject site is the Rideau River, located approximately 2.6 km to the southeast.

Geological and Hydrogeological Setting

Based on the available mapping information provided by Natural Resources Canada (NRCAN), the bedrock within the area of the subject site consists of interbedded limestone and dolomite of the Gull River Formation, whereas the surficial geology consists of glacial till plains with an overburden thickness ranging from approximately 0 to 10 m.

Based on the information obtained from previous subsurface investigations, the groundwater is anticipated to be encountered within the underlying bedrock unit and flow in a southeasterly direction towards the Rideau River.

Drinking Water Wells

The subject site is located within a municipally serviced area. Based on the available MECP water well records, no drinking water wells are expected to be present within the Phase I study area.

Neighbouring Land Use

The neighbouring lands within the Phase I study area consist primarily of residential and commercial properties, with occasional community and institutional uses.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

As per Subsection 7.1 of the 2017 Phase I-ESA report, 12 potentially contaminating activities (PCAs), resulting in areas of potential environmental concern (APECs), were identified as pertaining to the subject site. These APECs include:

- An existing automotive service garage (1380 Baseline Road), located in the northern portion of the subject site
- Fill material of unknown quality, located within the central portion of the subject site
- A former machine shop, located within the east-central portion of the subject site
- A former drycleaners and UST, located within the southeastern portion of the subject site
- A former auto service garage and retail fuel outlet, located within the southeastern portion of the subject site
- A former auto service garage and retail fuel outlet, located within the southeastern portion of the subject site
- An existing off-site auto service garage (1486 Merivale Road), located adjacent to the southern portion of the subject site
- A former auto service garage and transportation office, located within the south-central portion of the subject site
- A former retail fuel outlet and fuel oil UST, located within the southwestern portion of the subject site
- A former off-site printers (1383 Clyde Avenue), located adjacent to the western portion of the subject site
- An existing off-site auto service garage (1377 Clyde Avenue), located adjacent to the western portion of the subject site
- A former off-site auto service garage and retail fuel outlet, located adjacent to the northwestern portion of the subject site

Other off-site PCAs were identified within the Phase I study area but were deemed not to be of concern based on their separation distances as well as their down-gradient or cross-gradient orientations.

Contaminants of Potential Concern

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

- ❒ Volatile organic compounds (VOCs)
- ❒ Petroleum hydrocarbons, fractions 1 - 4 (PHCs F_1-F_4)
- ❒ Polycyclic aromatic hydrocarbons (PAHs)
- ❒ Metals (including mercury and hexavalent chromium).

These CPCs have the potential to be present in the soil matrix and/or the groundwater situated beneath the subject site.

Assessment of Uncertainty and/or Absence of Information

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

The presence of these PCAs were 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.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation was conducted between October 30 and November 4, 2020. The field program consisted of drilling 10 boreholes (BH1-20 – BH2-20) throughout the subject site, all of which were instrumented with groundwater monitoring wells. The boreholes were advanced to depths ranging from approximately 6.04 m to 9.04 m below the existing grade, with the exception of BH1-20 and BH3-20 which were advanced to deeper depths of approximately 15.14 m and 14.43 m below the existing grade, respectively. All boreholes were terminated within the underlying bedrock unit, with the exception of BH10-20, which was terminated within a layer of grey silty clay till.

Under the full-time supervision of Paterson personnel, the boreholes were drilled using a drill rig provided by George Downing Estate Drilling of Hawkesbury, Ontario. The locations of the boreholes are illustrated on Drawing PE5066-1 – Test Hole Location Plan, appended to this report.

4.2 Soil Sampling

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

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

A total of 38 soil samples were obtained from the boreholes by means of auger and split spoon sampling. The depths at which auger, split spoon, and rock core samples were obtained from the boreholes are shown as "**AU**", "**SS**", and "**RC**", respectively, on the Soil Profile and Test Data Sheets, appended to this report.

Site soils generally consist of either topsoil or asphaltic concrete, underlain by fill material (brown silty sand with crushed stone, over top of either brown silty clay and gravel till (BH4-20, BH9-20, and BH10-20) or bedrock (BH1-20, BH2-20, BH3-20, BH5-20, BH6-20, BH7-20, and BH8-20).

Bedrock, consisting of interbedded limestone and shale, was generally encountered at depths ranging from approximately 0.86 m to 2.64 m below ground surface, with the exceptions of BH4-20, where bedrock was encountered at a depth of approximately 6.58 m below ground surface, and BH10-20, where bedrock was not encountered.

4.3 Field Screening Measurements

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

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

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

4.4 Groundwater Monitoring Well Installation

A total of 10 groundwater monitoring wells were installed on the subject site as part of this Phase II-ESA investigation. These monitoring wells were constructed using either 32 mm or 50 mm diameter Schedule 40 threaded PVC risers and screens. A sand pack consisting of silica sand was placed around the screen and a bentonite seal was placed above the screen to minimize cross-contamination. A summary of the monitoring well construction details are listed below in Table 1 as well as on the Soil Profile and Test Data Sheets provided in Appendix 1.

Upon completion, the groundwater monitoring wells were developed using a dedicated inertial lift pump, with a minimum of 3 monitoring well volumes being removed from the monitoring wells at the time of installation. The monitoring wells were developed until the appearance of the water was noted to be stabilized. In addition, the ground surface elevations of each borehole were subsequently surveyed with respect to a known geodetic elevation.

Table 1
Monitoring Well Construction Details

Well ID	Ground Surface Elevation (m ASL)	Total Depth (m BGS)	Screened Interval (m BGS)	Sand Pack (m BGS)	Bentonite Seal (m BGS)	Casing Type
BH1-20	96.18	15.14	13.64-15.14	12.62-15.14	11.71-12.62	Stick-Up
BH2-20	95.71	6.04	3.04-6.04	2.13-6.04	1.52-2.13	Flushmount
BH3-20	98.86	14.43	12.93-14.43	12.50-14.43	0.00-12.50	Stick-Up
BH4-20	95.89	9.04	7.54-9.04	7.01-9.04	0.23-7.01	Flushmount
BH5-20	95.28	7.49	4.49-7.49	3.96-7.49	0.20-3.96	Flushmount
BH6-20	95.44	7.67	4.67-7.67	4.27-7.67	0.20-4.27	Flushmount
BH7-20	95.74	7.44	4.44-7.44	4.01-7.44	0.03-4.01	Flushmount
BH8-20	95.73	8.03	5.03-8.03	4.57-8.03	0.20-4.57	Flushmount
BH9-20	100.22	6.68	3.68-6.68	3.30-6.68	0.20-3.30	Stick-Up
BH10-20	94.73	6.10	3.10-6.10	2.74-6.10	0.10-2.74	Stick-Up

4.5 Field Measurement of Water Quality Parameters

Groundwater sampling was conducted at boreholes BH1-20 – BH10-20 between November 6 and November 11, 2020. No water quality parameters were measured in the field at that time.

4.6 Groundwater Sampling

Groundwater sampling protocols were followed using the MECP document entitled, *"Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario"*, dated May 1996. Standing water was purged from each monitoring well prior to the recovery of the groundwater samples using dedicated sampling equipment. The samples were then stored in coolers to reduce possible analyte volatilization during their transportation. Further details of our standard operating procedure for groundwater sampling are provided in the Sampling and Analysis Plan, appended to this report.

4.7 Analytical Testing

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

Table 2
Testing Parameters for Submitted Soil Samples

Sample ID	Sample Depth & Stratigraphic Unit	Parameters Analyzed						Rationale
		PHCs F_1-F_4	PHCs F_2-F_4	BTEX	VOCs	PAHs	Metals[1]	
BH1-20-SS3	0.76-1.37 m Fill Material					X	X	To assess for potential impacts resulting from the presence of fill material of unknown quality.
BH1-20-SS4	1.52-2.13 m Fill Material					X	X	To assess for potential impacts resulting from the presence of fill material of unknown quality.
BH2-20-AU2	0.08-0.61 m Fill Material		X			X		To assess for potential impacts resulting from the presence of fill material of unknown quality.
BH3-20-AU1	0.00-0.61 m Fill Material	X			X			To assess for potential impacts resulting from the presence of fill material of unknown quality.
BH4-20-SS3	1.52-2.13 m Silty Sand		X				X	To assess for potential impacts resulting from the presence of an existing off-site auto service garage, a former on-site auto service garage and transportation office, and a former on-site retail fuel outlet.
BH10-20-SS2/SS3	0.76-2.13 m Silty Clay		X			X		To assess for potential impacts resulting from the presence of two (2) former auto service garages.
BH10-20-SS6	3.81-4.42 m Silty Clay	X		X				To assess for potential impacts resulting from the presence of two (2) former auto service garages.

1 – Including Mercury and Hexavalent Chromium (Chromium VI)

Table 3
Testing Parameters for Submitted Groundwater Samples

Sample ID	Screened Interval & Stratigraphic Unit	Parameters Analyzed		Rationale
		PHCs F_1-F_4	VOCs	
BH1-20-GW1	13.64-15.14 m Bedrock		X	To assess for potential impacts resulting from the presence of a former on-site machine shop.
BH2-20-GW1	3.04-6.04 m Bedrock	X	X	To assess for potential impacts resulting from the presence of a former on-site retail fuel outlet.
BH3-20-GW1	12.93-14.43 m Bedrock		X	To assess for potential impacts resulting from an existing VOC impacted groundwater plume.
BH4-20-GW1	7.54-9.04 m Bedrock		X	To assess for potential impacts resulting from the presence of an existing off-site auto service garage, a former on-site auto service garage and transportation office, and a former on-site retail fuel outlet.
BH5-20-GW1	4.49-7.49 m Bedrock	X	X	To assess for potential impacts resulting from the presence of a former off-site retail fuel outlet.
BH6-20-GW1	4.67-7.67 m Bedrock		X	To assess for potential impacts resulting from the presence of a former off-site retail fuel outlet.
BH7-20-GW1	4.44-7.44 m Bedrock		X	To assess for potential impacts resulting from the presence of a former on-site retail fuel outlet.
BH8-20-GW1	5.03-8.03 m Bedrock		X	To assess for potential impacts resulting from the presence of an existing off-site auto service garage, a former on-site auto service garage and transportation office, a former off-site printers, and a former on-site retail fuel outlet.
BH9-20-GW1	3.68-6.68 m Bedrock	X	X	To assess for potential impacts resulting from the presence of a former off-site auto service garage and retail fuel outlet.
BH10-20-GW1	3.10-6.10 m Silty Clay	X	X	To assess for potential impacts resulting from the presence of a former on-site dry cleaners and two (2) former on-site auto service garages.
MW13-55	2.16-5.16 m Bedrock		X	To assess for potential impacts resulting from an existing VOC impacted groundwater plume.
MW13-56	2.12-5.12 m Bedrock		X	To assess for potential impacts resulting from an existing VOC impacted groundwater plume.
MW13-59	2.03-5.03 m Bedrock		X	To assess for potential impacts resulting from an existing VOC impacted groundwater plume.
MW13-60	6.40-9.40 m Bedrock		X	To assess for potential impacts resulting from an existing VOC impacted groundwater plume.
MW13-61	2.02-5.02 m Bedrock		X	To assess for potential impacts resulting from an existing VOC impacted groundwater plume.
ME13-62	3.28-6.28 m Bedrock		X	To assess for potential impacts resulting from an existing VOC impacted groundwater plume.

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

4.8 Residue Management

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

4.9 Elevation Surveying

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

4.10 Quality Assurance and Quality Control Measures

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

5.0 REVIEW AND EVALUATION

5.1 Geology

In general, the subsurface profile at the borehole locations consists of a thin layer of either topsoil or asphaltic concrete, underlain by fill material over top of either native brown silty clay and gravel till (BH4-20, BH9-20, and BH10-20) or over top of bedrock (BH1-20, BH2-20, BH3-20, BH5-20, BH6-20, BH7-20, and BH8-20).

The fill material was observed to consist of brown silty sand with crushed stone and was generally encountered at a depth of approximately 0.10 m below ground surface.

The bedrock, consisting of interbedded limestone and shale, was generally encountered at depths ranging from approximately 0.86 to 2.64 m below ground surface, with the exceptions of BH4-20, where bedrock was encountered at a depth of approximately 6.58 m below ground surface, and BH10-20, where bedrock was not encountered.

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

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured using an electronic water level meter at Boreholes BH1-20 to BH10-20 between November 6 and 11, 2020. The groundwater levels are summarized below in Table 4.

Table 4
Groundwater Level Measurements

Borehole Location	Ground Surface Elevation (m)	Water Level Depth (m below grade)	Water Level Elevation (m ASL)	Date of Measurement
BH1-20	96.18	3.00	93.18	November 6, 2020
BH2-20	95.71	1.98	93.73	November 11, 2020
BH3-20	98.86	4.66	94.20	November 6, 2020
BH4-20	95.89	3.13	92.76	November 9, 2020
BH5-20	95.28	2.15	93.13	November 9, 2020
BH6-20	95.44	2.14	93.30	November 9, 2020
BH7-20	95.74	2.62	93.12	November 9, 2020
BH8-20	95.73	2.52	93.21	November 9, 2020
BH9-20	100.22	4.92	95.30	November 10, 2020
BH10-20	94.73	1.87	92.86	November 10, 2020

The groundwater at the subject site was generally encountered within the bedrock unit at depths ranging from approximately 1.98 m to 4.92 m below the existing ground surface, with the exception of BH4-20 and BH10-20, where the groundwater was encountered within the overburden at depths of approximately 3.13 m and 1.87 m below ground surface, respectively.

A slight petroleum odour was identified within the groundwater recovered from BH8-20 at the time of the November 9, 2020 sampling event. No other unusual visual or olfactory observations were noted within the groundwater samples recovered from the remaining boreholes.

Using the groundwater elevations recorded during the November 2020 sampling events, groundwater contour mapping was completed as part of this assessment. According to the mapped contour data, illustrated on Drawing PE5066-1 – Test Hole Location Plan in the appendix, the localized groundwater flow on the subject site is interpreted to be in a southeasterly direction which may be due to the proximity of the underground utility trenches along Merivale Road. However, it's expected that the regional groundwater flow is towards the northeast. A horizontal hydraulic gradient of approximately 0.02 m/m was also calculated as part of this assessment.

It should be noted that groundwater levels are expected to fluctuate throughout the year with seasonal variations.

5.3 Fine/Coarse Soil Texture

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

5.4 Field Screening

Field screening of the soil samples collected during the drilling program resulted in organic vapour readings ranging from 0.0 ppm to 1.2 ppm. The organic vapour readings obtained from the field screening indicate that there is a negligible potential for the presence of volatile substances.

Field screening results of each individual soil sample are provided on the Soil Profile and Test Data Sheets appended to this report.

5.5 Soil Quality

Seven soil samples were submitted for laboratory analysis of either: BTEX, PHCs (F_1-F_4), VOCs, PAHs, and/or metals parameters. The results of the analytical testing are presented below in Tables 5 to 8, as well as on the laboratory certificates of analysis included in Appendix 1.

Table 5
Analytical Test Results – Soil
BTEX & PHCs (F_1-F_4)

Parameter	MDL (µg/g)	Soil Samples (µg/g)					MECP Table 1 Background Soil Standards (µg/g)	MECP Table 7 Residential Soil Standards (µg/g)
		Oct. 30, 2020	Nov. 2, 2020		Nov. 3, 2020			
		BH2-20-AU2	BH3-20-AU1	BH4-20-SS3	BH10-20-SS2/SS3	BH10-20-SS6		
Benzene	0.02	nt	nd	nt	nt	nd	0.02	0.21
Ethylbenzene	0.05	nt	nd	nt	nt	nd	0.05	2
Toluene	0.05	nt	nd	nt	nt	nd	0.2	2.3
Xylenes	0.05	nt	nd	nt	nt	nd	0.05	3.1
PHCs F_1	7	nt	nd	nt	nt	nd	25	55
PHCs F_2	4	nd	nd	nd	nd	nd	10	98
PHCs F_3	8	21	17	nd	27	nd	240	300
PHCs F_4	6	70	41	nd	25	nd	120	2,800

Notes:
- MDL – Method Detection Limit
- nt – not tested for this parameter
- nd – not detected above the MDL
- Underlined – Value exceeds MECP Table 1 standards
- **Bold and Underlined** – value exceeds selected MECP standards

All detected BTEX and PHC concentrations in the soil samples analysed are in compliance with the applicable MECP Table 7 standards. The results also comply with the MECP Table 1 standards.

Table 6
Analytical Test Results – Soil
VOCs

Parameter	MDL (µg/g)	Soil Samples (ug/g) November 2, 2020 BH3-20-AU1	MECP Table 1 Background Soil Standards (µg/g)	MECP Table 7 Residential Soil Standards (µg/g)
Acetone	0.50	nd	0.5	16
Benzene	0.02	nd	0.02	0.21
Bromodichloromethane	0.05	nd	0.05	13
Bromoform	0.05	nd	0.05	0.27
Bromomethane	0.05	nd	0.05	0.05
Carbon Tetrachloride	0.05	nd	0.05	0.05
Chlorobenzene	0.05	nd	0.05	2.4
Chloroform	0.05	nd	0.05	0.05
Dibromochloromethane	0.05	nd	0.05	9.4
Dichlorodifluoromethane	0.05	nd	0.05	16
1,2-Dichlorobenzene	0.05	nd	0.05	3.4
1,3-Dichlorobenzene	0.05	nd	0.05	4.8
1,4-Dichlorobenzene	0.05	nd	0.05	0.083
1,1-Dichloroethane	0.05	nd	0.05	3.5
1,2-Dichloroethane	0.05	nd	0.05	0.05
1,1-Dichloroethylene	0.05	nd	0.05	0.05
cis-1,2-Dichloroethylene	0.05	nd	0.05	3.4
trans-1,2-Dichloroethylene	0.05	nd	0.05	0.084
1,2-Dichloropropane	0.05	nd	0.05	0.05
1,3-Dichloropropene	0.05	nd	0.05	0.05
Ethylbenzene	0.05	nd	0.05	2
Ethylene Dibromide	0.05	nd	0.05	0.05
Hexane	0.05	nd	0.05	2.8
Methyl Ethyl Ketone	0.50	nd	0.5	16
Methyl Isobutyl Ketone	0.50	nd	0.5	1.7
Methyl tert-butyl ether	0.05	nd	0.05	0.75
Methylene Chloride	0.05	nd	0.05	0.1
Styrene	0.05	nd	0.05	0.7
1,1,1,2-Tetrachloroethane	0.05	nd	0.05	0.058
1,1,2,2-Tetrachloroethane	0.05	nd	0.05	0.05
Tetrachloroethylene	0.05	nd	0.05	0.28
Toluene	0.05	nd	0.2	2.3
1,1,1-Trichloroethane	0.05	nd	0.05	0.38
1,1,2-Trichloroethane	0.05	nd	0.05	0.05
Trichloroethylene	0.05	nd	0.05	0.061
Trichlorofluoromethane	0.05	nd	0.25	4
Vinyl Chloride	0.02	nd	0.02	0.02
Xylenes	0.05	nd	0.05	3.1

Notes:
- MDL – Method Detection Limit
- nt – not tested for this parameter
- nd – not detected above the MDL
- Underlined – Value exceeds MECP Table 1 standards
- **Bold and Underlined** – value exceeds selected MECP standards

No VOC parameters were detected in the soil sample analyzed. The results are in compliance with the applicable MECP Table 7 standards. The results are also in compliance with the MECP Table 1 standards.

Table 7
Analytical Test Results – Soil
PAHs

Parameter	MDL (µg/g)	Soil Samples (µg/g)				MECP Table 1 Background Soil Standards (µg/g)	MECP Table 7 Residential Soil Standards (µg/g)
		October 30, 2020			Nov. 3, 2020		
		BH1-20-SS3	BH1-20-SS4	BH2-20-AU2	BH10-20-SS2/SS3		
Acenaphthene	0.02	nd	nd	nd	1.69	0.072	7.9
Acenaphthylene	0.02	nd	nd	nd	nd	0.093	0.15
Anthracene	0.02	nd	nd	nd	**3.65**	0.16	0.67
Benzo[a]anthracene	0.02	nd	nd	nd	**3.45**	0.36	0.5
Benzo[a]pyrene	0.02	nd	nd	nd	**2.88**	0.3	0.3
Benzo[b]fluoranthene	0.02	nd	nd	nd	**2.51**	0.47	0.78
Benzo[g,h,i]perylene	0.02	nd	nd	nd	1.17	0.68	6.6
Benzo[k]fluoranthene	0.02	nd	nd	nd	**1.97**	0.48	0.78
Chrysene	0.02	nd	nd	nd	3.19	2.8	7
Dibenzo[a,h]anthracene	0.02	nd	nd	nd	**0.44**	0.1	0.1
Fluoranthene	0.02	nd	nd	nd	**8.75**	0.56	0.69
Fluorene	0.02	nd	nd	nd	2.02	0.12	62
Indeno[1,2,3-cd]pyrene	0.02	nd	nd	nd	**1.27**	0.23	0.38
1-Methylnaphthalene	0.02	nd	nd	nd	0.37	0.59	0.99
2-Methylnaphthalene	0.02	nd	nd	nd	0.67	0.59	0.99
Methylnaphthalene (1&2)	0.04	nd	nd	nd	**1.04**	0.59	0.99
Naphthalene	0.01	nd	nd	nd	**1.88**	0.09	0.6
Phenanthrene	0.02	nd	nd	nd	**9.69**	0.69	6.2
Pyrene	0.02	nd	nd	nd	6.36	1	78

Notes:
- MDL – Method Detection Limit
- nt – not tested for this parameter
- nd – not detected above the MDL
- Underlined – Value exceeds MECP Table 1 standards
- **Bold and Underlined** – value exceeds selected MECP standards

The concentrations of several PAH parameters in soil sample BH10-20-SS2/SS3 exceed the MECP Table 7 and MECP Table 1 standards.

No PAH parameter concentrations were detected in soil samples BH1-20-SS3, BH1-20-SS4, or BH2-20-AU2, and thus, this soil is considered to be in compliance with the MECP Table 7 residential standards.

Table 8
Analytical Test Results – Soil
Metals

Parameter	MDL (µg/g)	Soil Samples (µg/g)			MECP Table 1 Background Soil Standards (µg/g)	MECP Table 7 Residential Soil Standards (µg/g)
		October 30, 2020		Nov. 2, 2020		
		BH1-20-SS3	BH1-20-SS4	BH4-20-SS3		
Antimony	1.0	nd	nd	nd	1.3	7.5
Arsenic	1.0	5.0	3.8	4.3	18	18
Barium	1.0	128	126	66.6	220	390
Beryllium	0.5	0.7	0.6	nd	2.5	4
Boron	5.0	7.8	7.8	5.5	36	120
Cadmium	0.5	0.6	nd	nd	1.2	1.2
Chromium	5.0	24.6	20.3	15.6	70	160
Chromium (VI)	0.2	nd	nd	nd	0.66	8
Cobalt	1.0	8.0	6.6	5.8	21	22
Copper	5.0	25.1	15.3	8.8	92	140
Lead	1.0	37.1	23.9	5.9	120	120
Mercury	0.1	nd	nd	nd	0.27	0.27
Molybdenum	1.0	1.1	nd	nd	2	6.9
Nickel	5.0	17.5	15.1	11.1	82	100
Selenium	1.0	nd	nd	nd	1.5	2.4
Silver	0.3	nd	nd	nd	0.5	20
Thallium	1.0	nd	nd	nd	1	1
Uranium	1.0	nd	nd	nd	2.5	23
Vanadium	10.0	29.2	22.7	21.6	86	86
Zinc	20.0	59.1	51.7	23.5	290	340

Notes:
- MDL – Method Detection Limit
- nt – not tested for this parameter
- nd – not detected above the MDL
- Underlined – Value exceeds MECP Table 1 standards
- **Bold and Underlined** – value exceeds selected MECP standards

All detected metal concentrations in the soil samples analysed are in compliance with the applicable MECP Table 7 standards. The results are also in compliance with the MECP Table 1 standards.

Table 9
Maximum Concentrations – Soil

Parameter	Maximum Concentration (µg/g)	Sample ID	Depth Interval (m BGS)
PHCs F_3	27	BH10-20-SS2/SS3	0.76 – 2.13 m
PHCs F_4	70	BH2-20-AU2	0.08 – 0.61 m
Acenaphthene	1.69	BH10-20-SS2/SS3	0.76 – 2.13 m
Anthracene	**3.65**	BH10-20-SS2/SS3	0.76 – 2.13 m
Benzo[a]anthracene	**3.45**	BH10-20-SS2/SS3	0.76 – 2.13 m
Benzo[a]pyrene	**2.88**	BH10-20-SS2/SS3	0.76 – 2.13 m
Benzo[b]fluoranthene	**2.51**	BH10-20-SS2/SS3	0.76 – 2.13 m
Benzo[g,h,i]perylene	1.17	BH10-20-SS2/SS3	0.76 – 2.13 m
Benzo[k]fluoranthene	**1.97**	BH10-20-SS2/SS3	0.76 – 2.13 m
Chrysene	3.19	BH10-20-SS2/SS3	0.76 – 2.13 m
Dibenzo[a,h]anthracene	**0.44**	BH10-20-SS2/SS3	0.76 – 2.13 m
Fluoranthene	**8.75**	BH10-20-SS2/SS3	0.76 – 2.13 m
Fluorene	2.02	BH10-20-SS2/SS3	0.76 – 2.13 m
Indeno[1,2,3-cd]pyrene	**1.27**	BH10-20-SS2/SS3	0.76 – 2.13 m
1-Methylnaphthalene	0.37	BH10-20-SS2/SS3	0.76 – 2.13 m
2-Methylnaphthalene	0.67	BH10-20-SS2/SS3	0.76 – 2.13 m
Methylnaphthalene (1&2)	**1.04**	BH10-20-SS2/SS3	0.76 – 2.13 m
Naphthalene	**1.88**	BH10-20-SS2/SS3	0.76 – 2.13 m
Phenanthrene	**9.69**	BH10-20-SS2/SS3	0.76 – 2.13 m
Pyrene	6.36	BH10-20-SS2/SS3	0.76 – 2.13 m
Antimony	5.0	BH1-20-SS3	0.76 – 1.37 m
Arsenic	128	BH1-20-SS3	0.76 – 1.37 m
Beryllium	0.7	BH1-20-SS3	0.76 – 1.37 m
Boron	7.8	BH1-20-SS3 / BH1-20-SS4	0.76 – 1.37 m / 1.52 – 2.13 m
Cadmium	0.6	BH1-20-SS3	0.76 – 1.37 m
Chromium	24.6	BH1-20-SS3	0.76 – 1.37 m
Cobalt	8.0	BH1-20-SS3	0.76 – 1.37 m
Copper	25.1	BH1-20-SS3	0.76 – 1.37 m
Lead	37.1	BH1-20-SS3	0.76 – 1.37 m
Molybdenum	1.1	BH1-20-SS3	0.76 – 1.37 m
Nickel	17.5	BH1-20-SS3	0.76 – 1.37 m
Vanadium	29.2	BH1-20-SS3	0.76 – 1.37 m
Zinc	59.1	BH1-20-SS3	0.76 – 1.37 m

Notes:
- MDL – Method Detection Limit
- nt – not tested for this parameter
- nd – not detected above the MDL
- Underlined – Value exceeds MECP Table 1 standards
- **Bold and Underlined** – value exceeds selected MECP standards

All other parameter concentrations analyzed were below the laboratory detection limits. The laboratory certificates of analysis are provided in Appendix 1.

5.6 Groundwater Quality

Groundwater samples were recovered from the monitoring wells installed in boreholes BH1-20 – BH10-20, as well as existing monitoring wells MW13-55 – MW13-62, and submitted for laboratory analysis of either: PHCs (F_1-F_4) and/or VOCs. The results of the analytical testing are presented below in Tables 10 and 11, as well as on the laboratory certificates of analysis included in Appendix 1.

Table 10
Analytical Test Results – Groundwater
PHCs (F_1-F_4)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)				MECP Table 7 Residential Groundwater Standards (µg/L)
		Nov. 11, 2020	Nov. 9, 2020	Nov. 10, 2020	Nov. 11, 2020	
		BH2-20-GW1	BH5-20-GW1	BH9-20-GW1	BH10-20-GW1	
PHC F_1	25	nd	nd	53	nd	420
PHC F_2	100	nd	nd	nd	nd	150
PHC F_3	100	nd	nd	nd	nd	500
PHC F_4	100	nd	nd	nd	nd	500

Notes:
- MDL – Method Detection Limit
- nt – not tested for this parameter
- nd – not detected above the MDL
- **Bold and Underlined** – value exceeds selected MECP standards

All detected PHC parameter concentrations in the groundwater samples analyzed are in compliance with the applicable MECP Table 7 residential standards.

Table 11
Analytical Test Results – Groundwater
VOCs

Parameter	MDL (µg/L)	Groundwater Samples (ug/L)					MECP Table 7 Residential Groundwater Standards (µg/L)
		Nov. 6, 2020	Nov. 11, 2020	Nov. 6, 2020	Nov. 10, 2020	Nov. 9, 2020	
		BH1-20-GW1	BH2-20-GW1	BH3-20-GW1	BH4-20-GW1	BH5-20-GW1	
Acetone	5.0	nd	nd	nd	nd	nd	100,000
Benzene	0.5	nd	nd	nd	nd	nd	0.5
Bromodichloromethane	0.5	nd	nd	nd	nd	nd	67,000
Bromoform	0.5	nd	nd	nd	nd	nd	5
Bromomethane	0.5	nd	nd	nd	nd	nd	0.89
Carbon Tetrachloride	0.2	nd	nd	nd	nd	nd	0.2
Chlorobenzene	0.5	nd	nd	nd	nd	nd	140
Chloroform	0.5	**2.6**	nd	1.2	1.6	0.9	2
Dibromochloromethane	0.5	nd	nd	nd	nd	nd	65,000
Dichlorodifluoromethane	1.0	nd	nd	nd	nd	nd	3,500
1,2-Dichlorobenzene	0.5	nd	nd	nd	nd	nd	150
1,3-Dichlorobenzene	0.5	nd	nd	nd	nd	nd	7,600
1,4-Dichlorobenzene	0.5	nd	nd	nd	nd	nd	0.5
1,1-Dichloroethane	0.5	nd	nd	nd	nd	nd	11
1,2-Dichloroethane	0.5	nd	nd	nd	nd	nd	0.5
1,1-Dichloroethylene	0.5	nd	nd	nd	nd	nd	0.5
cis-1,2-Dichloroethylene	0.5	nd	nd	1.4	nd	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	nd	1.6
1,2-Dichloropropane	0.5	nd	nd	nd	nd	nd	0.58
1,3-Dichloropropene	0.5	nd	nd	nd	nd	nd	0.5
Ethylbenzene	0.5	nd	nd	nd	nd	nd	54
Ethylene Dibromide	0.2	nd	nd	nd	nd	nd	0.2
Hexane	1.0	nd	nd	nd	nd	nd	5
Methyl Ethyl Ketone	5.0	nd	nd	nd	nd	nd	21,000
Methyl Isobutyl Ketone	5.0	nd	nd	nd	nd	nd	5,200
Methyl tert-butyl ether	2.0	nd	nd	nd	nd	nd	15
Methylene Chloride	5.0	nd	nd	nd	nd	nd	26
Styrene	0.5	nd	nd	nd	nd	nd	43
1,1,1,2-Tetrachloroethane	0.5	nd	nd	nd	nd	nd	1.1
1,1,2,2-Tetrachloroethane	0.5	nd	nd	nd	nd	nd	0.5
Tetrachloroethylene	0.5	nd	nd	nd	nd	nd	0.5
Toluene	0.5	nd	nd	nd	nd	nd	320
1,1,1-Trichloroethane	0.5	nd	nd	nd	nd	nd	23
1,1,2-Trichloroethane	0.5	nd	nd	nd	nd	nd	0.5
Trichloroethylene	0.5	nd	nd	nd	nd	nd	0.5
Trichlorofluoromethane	1.0	nd	48.6	nd	nd	nd	2,000
Vinyl Chloride	0.5	nd	nd	nd	nd	nd	0.5
Xylenes	0.5	nd	nd	nd	nd	nd	72

Notes:

- MDL – Method Detection Limit
- nt – not tested for this parameter
- nd – not detected above the MDL
- **Bold and Underlined** – value exceeds selected MECP standards

Table 11 (Continued)
Analytical Test Results – Groundwater
VOCs

Parameter	MDL (µg/L)	Groundwater Samples (ug/L)					MECP Table 7 Residential Groundwater Standards (µg/L)
		Nov. 9, 2020	Nov. 9, 2020	Nov. 9, 2020	Nov. 10, 2020	Nov. 11, 2020	
		BH6-20-GW1	BH7-20-GW1	BH8-20-GW1	BH9-20-GW1	BH10-20-GW1	
Acetone	5.0	nd	nd	nd	nd	nd	100,000
Benzene	0.5	nd	nd	**8.8**	nd	nd	0.5
Bromodichloromethane	0.5	nd	nd	nd	nd	nd	67,000
Bromoform	0.5	nd	nd	nd	nd	nd	5
Bromomethane	0.5	nd	nd	nd	nd	nd	0.89
Carbon Tetrachloride	0.2	nd	nd	nd	nd	nd	0.2
Chlorobenzene	0.5	nd	nd	nd	nd	nd	140
Chloroform	0.5	**2.2**	1.1	0.9	0.9	nd	2
Dibromochloromethane	0.5	nd	nd	nd	nd	nd	65,000
Dichlorodifluoromethane	1.0	nd	nd	nd	nd	nd	3,500
1,2-Dichlorobenzene	0.5	nd	nd	nd	nd	nd	150
1,3-Dichlorobenzene	0.5	nd	nd	nd	nd	nd	7,600
1,4-Dichlorobenzene	0.5	nd	nd	nd	nd	nd	0.5
1,1-Dichloroethane	0.5	nd	nd	nd	nd	nd	11
1,2-Dichloroethane	0.5	nd	nd	nd	nd	nd	0.5
1,1-Dichloroethylene	0.5	nd	nd	nd	nd	nd	0.5
cis-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	nd	1.6
1,2-Dichloropropane	0.5	nd	nd	nd	nd	nd	0.58
1,3-Dichloropropene	0.5	nd	nd	nd	nd	nd	0.5
Ethylbenzene	0.5	nd	nd	19.2	3.8	nd	54
Ethylene Dibromide	0.2	nd	nd	nd	nd	nd	0.2
Hexane	1.0	nd	nd	**50.6**	nd	nd	5
Methyl Ethyl Ketone	5.0	nd	nd	nd	nd	nd	21,000
Methyl Isobutyl Ketone	5.0	nd	nd	nd	nd	nd	5,200
Methyl tert-butyl ether	2.0	nd	nd	nd	nd	nd	15
Methylene Chloride	5.0	nd	nd	nd	nd	nd	26
Styrene	0.5	nd	nd	nd	nd	nd	43
1,1,1,2-Tetrachloroethane	0.5	nd	nd	nd	nd	nd	1.1
1,1,2,2-Tetrachloroethane	0.5	nd	nd	nd	nd	nd	0.5
Tetrachloroethylene	0.5	nd	0.5	nd	nd	nd	0.5
Toluene	0.5	nd	nd	7.3	0.6	nd	320
1,1,1-Trichloroethane	0.5	nd	nd	nd	nd	nd	23
1,1,2-Trichloroethane	0.5	nd	nd	nd	nd	nd	0.5
Trichloroethylene	0.5	nd	nd	nd	nd	nd	0.5
Trichlorofluoromethane	1.0	3.4	1.6	nd	nd	nd	2,000
Vinyl Chloride	0.5	nd	nd	nd	nd	nd	0.5
Xylenes	0.5	nd	nd	47.7	2.7	nd	72

Notes:

- MDL – Method Detection Limit
- nt – not tested for this parameter
- nd – not detected above the MDL
- **Bold and Underlined** – value exceeds selected MECP standards

Table 11 (Continued)
Analytical Test Results – Groundwater
VOCs

Parameter	MDL (µg/L)	Groundwater Samples (ug/L)						MECP Table 7 Residential Groundwater Standards (µg/L)
		Nov. 11, 2020						
		MW13-55	MW13-56	MW13-59	MW13-60	MW13-61	MW13-62	
Acetone	5.0	nd	nd	nd	nd	nd	nd	100,000
Benzene	0.5	nd	nd	nd	nd	nd	nd	0.5
Bromodichloromethane	0.5	nd	nd	nd	nd	nd	nd	67,000
Bromoform	0.5	nd	nd	nd	nd	nd	nd	5
Bromomethane	0.5	nd	nd	nd	nd	nd	nd	0.89
Carbon Tetrachloride	0.2	nd	nd	nd	nd	nd	nd	0.2
Chlorobenzene	0.5	nd	nd	nd	nd	nd	nd	140
Chloroform	0.5	nd	nd	nd	nd	nd	nd	2
Dibromochloromethane	0.5	nd	nd	nd	nd	nd	nd	65,000
Dichlorodifluoromethane	1.0	nd	nd	nd	nd	nd	nd	3,500
1,2-Dichlorobenzene	0.5	nd	nd	nd	nd	nd	nd	150
1,3-Dichlorobenzene	0.5	nd	nd	nd	nd	nd	nd	7,600
1,4-Dichlorobenzene	0.5	nd	nd	nd	nd	nd	nd	0.5
1,1-Dichloroethane	0.5	nd	1.3	nd	nd	nd	nd	11
1,2-Dichloroethane	0.5	nd	nd	nd	nd	nd	nd	0.5
1,1-Dichloroethylene	0.5	nd	nd	nd	nd	nd	nd	0.5
cis-1,2-Dichloroethylene	0.5	**9.0**	**37.3**	0.8	**6.6**	nd	**22.5**	1.6
trans-1,2-Dichloroethylene	0.5	1.2	**4.9**	nd	1.4	nd	**2.0**	1.6
1,2-Dichloropropane	0.5	nd	nd	nd	nd	nd	nd	0.58
1,3-Dichloropropene	0.5	nd	nd	nd	nd	nd	nd	0.5
Ethylbenzene	0.5	nd	nd	nd	nd	nd	nd	54
Ethylene Dibromide	0.2	nd	nd	nd	nd	nd	nd	0.2
Hexane	1.0	nd	nd	nd	nd	nd	nd	5
Methyl Ethyl Ketone	5.0	nd	nd	nd	nd	nd	nd	21,000
Methyl Isobutyl Ketone	5.0	nd	nd	nd	nd	nd	nd	5,200
Methyl tert-butyl ether	2.0	nd	nd	nd	nd	nd	nd	15
Methylene Chloride	5.0	nd	nd	nd	nd	nd	nd	26
Styrene	0.5	nd	nd	nd	nd	nd	nd	43
1,1,1,2-Tetrachloroethane	0.5	nd	nd	nd	nd	nd	nd	1.1
1,1,2,2-Tetrachloroethane	0.5	nd	nd	nd	nd	nd	nd	0.5
Tetrachloroethylene	0.5	**0.6**	**2.6**	**0.8**	**1.8**	**13.3**	**47.3**	0.5
Toluene	0.5	nd	nd	nd	nd	nd	nd	320
1,1,1-Trichloroethane	0.5	nd	nd	nd	nd	nd	nd	23
1,1,2-Trichloroethane	0.5	nd	nd	nd	nd	nd	nd	0.5
Trichloroethylene	0.5	**1.8**	**7.1**	nd	**1.7**	nd	**10.9**	0.5
Trichlorofluoromethane	1.0	nd	nd	nd	nd	nd	nd	2,000
Vinyl Chloride	0.5	nd	nd	nd	nd	nd	nd	0.5
Xylenes	0.5	nd	nd	nd	nd	nd	nd	72

Notes:

- MDL – Method Detection Limit
- nt – not tested for this parameter
- nd – not detected above the MDL
- **Bold and Underlined** – value exceeds selected MECP standards

Several VOC parameters were detected in multiple groundwater samples at concentrations exceeding the applicable MECP Table 7 standards. These exceedances include the concentrations of:

- Benzene (BH8-20-GW1)
- Chloroform (BH1-20-GW1, BH6-20-GW1)
- Cis-1,2-Dichloroethylene (MW13-55, MW13-56, MW13-60, MW13-62)
- Trans-1,2-Dichloroethylene (MW13-56, MW13-62)
- Hexane (BH8-20-GW1)
- Tetrachloroethylene (MW13-55, MW13-56, MW13-59, MW13-60, MW13-61, MW13-62)
- Trichloroethylene (MW13-55, MW13-56, MW13-60, MW13-62)

It should be noted that the concentrations of chloroform detected in groundwater samples BH1-20-GW1 and BH6-20-GW1 are marginally in excess of the MECP Table 7 residential standards and in compliance with Table A from the MECP's technical bulletin. These exceedances are a result of municipal water used during the rock coring process and are expected to dissipate in the near future.

Table 12
Maximum Concentrations – Groundwater

Parameter	Maximum Concentration (µg/L)	Sample ID	Depth Interval (m BGS)
PHCs F_1	53	BH9-20-GW1	3.68 – 6.68 m
Benzene	**8.8**	BH8-20-GW1	5.03 – 8.03 m
Chloroform	**2.6**	BH8-20-GW1	5.03 – 8.03 m
Cis-1,2-Dichloroethylene	**37.3**	MW13-56	2.12 – 5.12 m
Trans-1,2-Dichloroethylene	**4.9**	MW13-56	2.12 – 5.12 m
Tetrachloroethylene	**47.3**	MW13-62	3.28 – 6.28 m
Trichloroethylene	**10.9**	MW13-62	3.28 – 6.28 m

Notes:
- MDL – Method Detection Limit
- nt – not tested for this parameter
- nd – not detected above the MDL
- **Bold and Underlined** – value exceeds selected MECP standards

All other parameter concentrations analyzed were below the laboratory detection limits. The laboratory certificates of analysis are provided in Appendix 1.

5.7 Quality Assurance and Quality Control Results

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

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

5.8 Phase II Conceptual Site Model

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

Site Description

Potentially Contaminating Activity and Areas of Potential Environmental Concern

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

- *Item 28: "Gasoline and Associated Products Storage in Fixed Tanks"*

This PCA was identified as a result of the presence of a former retail fuel outlet and UST located in the southwestern portion of the subject site, a former UST located in the southeastern portion of the subject site, as well as a former transportation office UST located within the south-central portion of the subject site.

- *Item 30: "Fill Material of Unknown Quality"*

This PCA was identified as a result of the presence of a fill material throughout the majority of the central and southern portions of the subject site.

- *Item 31: "Ink Manufacturing, Processing and Bulk Storage"*

This PCA was identified as a result of the presence of a former off-site printers located adjacent to the western portion of the subject site.

- *Item 37: "Operation of Dry-Cleaning Equipment"*

This PCA was identified as a result of the presence of a former dry cleaners located within the southeastern portion of the subject site.

- *Item 52: "Storage, Maintenance, Fuelling and Repair of Equipment, Vehicles, and Material Used to Maintain Transportation Systems"*

This PCA was identified as a result of the presence of three existing auto service garages, located within the northern portion of the subject site as well as adjacent to the western and southern portions of the subject site, as well as four historical auto service garages, located within the southeastern and south-central portions of the subject site as well as adjacent to the northwestern portion of the subject site.

- *No Item Number: "The Use of Solvents, Lubricants, and Oils"*

This PCA was identified as a result of the presence of a former machine shop located within the east-central portion of the subject site.

Contaminants of Potential Concern

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

- Volatile Organic Compounds (VOCs)
- Petroleum Hydrocarbons, fractions 1 - 4 (PHCs F_1-F_4)
- Polycyclic Aromatic Hydrocarbons (PAHs)
- Metals (including Mercury and Hexavalent Chromium)

These CPCs have the potential to be present in the soil matrix and/or the groundwater situated beneath the subject site.

Subsurface Structures and Utilities

Underground service locates were completed prior to the subsurface investigation. Underground utilities on the subject site include electrical cables, and municipal water and wastewater services.

Physical Setting

Site Stratigraphy

The stratigraphy of the subject site generally consists of:

- Asphaltic concrete encountered at ground level and extending to a depth of approximately 0.10 m below ground surface (BH2-20, BH5-20, BH6-20, BH7-20, BH8-20, and BH10-20)
- Topsoil encountered at ground level and extending to a depth of approximately 0.10 m to 0.20 m below ground surface (BH3-20, BH4-20, and BH9-20)
- Fill material, consisting of brown silty sand with crushed stone and/or gravel encountered at an average depth of approximately 0.10 m below ground surface
- Glacial till, consisting of brown silty clay matrix with gravel, encountered at depths ranging from approximately 0.05 m to 2.13 m below ground surface (BH4-20, BH9-20, and BH10-20)
- Interbedded limestone and shale bedrock; encountered at depths ranging from approximately 0.86 m to 2.64 m below ground surface (with the exceptions of BH4-20, where bedrock was encountered at a depth of approximately 6.58 m below ground surface, and BH10-20, where bedrock was not encountered)

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

Hydrogeological Characteristics

The groundwater at the subject site was generally encountered within the bedrock unit at depths ranging from approximately 1.98 m to 4.92 m below the existing ground surface, with the exceptions of BH4-20 and BH10-20, where the groundwater was encountered within the overburden at depths of approximately 3.13 m and 1.87 m below ground surface, respectively.

Based on the regional topography, in combination with information contained within our files, the groundwater is interpreted to flow in a southeasterly direction in localized areas and, from a reginal perspective, towards the northeast.

Approximate Depth to Bedrock

The bedrock, consisting of interbedded limestone and shale, was generally encountered at depths ranging from approximately 0.86 m to 2.64 m below ground surface, with the exceptions of BH4-20, where bedrock was encountered at a depth of approximately 6.58 m below ground surface, and BH10-20, where bedrock was not encountered.

Approximate Depth to Water Table

The depth to the water table is approximately 1.98 m to 4.92 m below the existing ground surface.

Sections 41 and 43.1 of Ontario Regulation 153/04

Section 41 of the Regulation does not apply to the subject site, as there are no bodies of water or areas of natural significance located on or within 30 m of the subject site. The subject site is therefore not considered to be environmentally sensitive.

Section 43.1 of the Regulation does apply to the subject site, since the bedrock is situated at a depth of less than 2 m below ground surface, and thus is considered to be a shallow soil property.

Existing Buildings and Structures

The subject site is mostly vacant, with the exception of a one storey auto service garage present within the northern portion of the subject site, adjacent to Baseline Road. Two former building foundations are present within the eastern and southern portions of the subject site.

Fill Placement

Fill material, consisting of brown silty sand with crushed stone, was identified throughout the majority of the subject site. No unusual visual or olfactory observations were noted with respect to the fill material encountered at the time of the field program.

Proposed Buildings and Other Structures

It is our understanding that the subject site is to be redeveloped for mixed-use purposes.

Water Bodies and Areas of Natural and Scientific Interest

No water bodies or areas of natural and scientific interest are known to exist within the Phase I study area. The nearest named water body with respect to the subject site is the Rideau River, located approximately 2.6 km to the southeast.

Environmental Condition

Areas Where Contaminants are Present

Based on the findings of this Phase II-ESA, PAH impacted soil was identified in the vicinity of BH10-20, located within the southeastern portion of the subject site.

Based on the findings of the previous 2014 Phase II-ESA by Pinchin Environmental: PAH impacted soil was identified in the vicinity of MW13-42 and MW13-40, located in the western and southern portions of the subject site, respectively; PAH and PHC impacted soil was identified in the vicinity of MW13-12 and MW13-13, located in the southeastern portion of the subject site; and BTEX, PHC, PAH, and metal impacted soil was identified in the vicinity of MW13-21, MW13-23, MW13-49, and MW13-51, located in the southern portion of the subject site.

VOC impacted groundwater was identified in the vicinity of boreholes BH8-20, MW13-55, MW13-56, MW13-59, MW13-60, MW13-61, and MW13-62, located within the southwestern portion of the subject site.

It should be noted that the concentrations of chloroform detected within the groundwater at BH1-20 and BH6-20 are marginally in excess of the MECP Table 7 residential standards. These exceedances are a result of municipal water used during the rock coring process and are expected to dissipate in the near future. As a result, these exceedances are not considered to be a contaminant issue for the subject site.

The analytical test results for the soil and groundwater samples tested are shown on the Analytical Testing Plans, appended to this report.

Types of Contaminants

Based on the findings of this Phase II-ESA, the contaminants of concern identified on the subject site are considered to be BTEX, PHCs, PAHs, metals, and VOCs.

Contaminated Media

As noted above, several pockets of BTEX, PHC, metal and/or PAH impacted soils were identified in the southeastern, southern, and southwestern portions of the subject site.

VOC impacted groundwater was identified within the southwestern portion of the subject site.

What Is Known About Areas Where Contaminants Are Present

According to the analytical test results, BTEX, PHC, metal, and/or PAH impacted soil impacted soil was identified within the southeastern, southern, and southwestern portions of the subject site. VOC impacted groundwater is present within the southwestern portion of the subject site.

These areas were formerly occupied by several buildings, including a former auto service garage, former dry cleaners, and former retail fuel outlets.

Distribution and Migration of Contaminants

BTEX, PHC, metal, and/or PAH impacted soil was identified within the vicinity of BH10-20, MW13-12, MW13-13, MW13-21, MW13-23, MW13-40, MW13-42, MW13-49, and MW13-51. Due to their shallow nature, and/or their absence from the groundwater at these locations, these contaminants are anticipated to be limited to the overburden soils in these areas.

VOC impacted groundwater was identified in the southwestern portion of the subject site, in the vicinity of MW13-55, MW13-56, MW13-59, MW13-60, MW13-61, and MW13-62. Based on the analytical test results, this contamination is anticipated to be limited to the southwestern portion of the subject site, in the vicinity of the former dry cleaners.

Discharge of Contaminants

The PAH impacted soil in the vicinity of BH10-20 is considered to have resulted from an unknown on-site discharge of PAHs, such as the presence of asphaltic concrete fragments in the fill matrix.

The PAH impacted soil in the vicinity of MW13-42 is considered to have resulted from an unknown on-site discharge of PAHs, such as the presence of asphaltic concrete fragments in the fill matrix.

The PAH impacted soil in the vicinity of MW13-40 is considered to have resulted from the presence of a former on-site retail fuel outlet.

The PHC and PAH impacted soil in the vicinity of MW13-12 and MW13-13 is considered to have resulted from the presence of poor-quality fill material placed in this area.

The BTEX, PHC, PAH, and metal impacted soil identified in the vicinity of MW13-21, MW13-23, MW13-49, and MW13-51 is considered to have resulted from the presence of two former on-site auto service garages.

The VOC impacted groundwater within the southwestern portion of the subject site is considered to have resulted from an unknown source.

Climatic and Meteorological Conditions

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

Downward leaching is not considered to have affected any contaminant distribution at the subject site, based on the absence of any soil contaminants within the groundwater. Fluctuations in the groundwater level and flow direction are also not considered to have affected any contaminant distribution, due to the depth of the water table within the bedrock, well below the shallow soil contamination identified on-site.

Potential for Vapour Intrusion

During redevelopment, all soil and groundwater exceeding the MECP Table 7 residential standards will be removed and disposed of off-site, or a risk assessment will be completed for the subject site. As such, there is no anticipated potential for future vapour intrusion at the subject site.

6.0 CONCLUSIONS

Assessment

A Phase II-ESA was conducted for the property addressed 1500 Merivale Road, in the City of Ottawa, Ontario. The purpose of the Phase II-ESA was to address the potentially contaminating activities (PCAs) that were identified during the previous 2017 Phase I-ESA and were considered to result in areas of potential environmental concern (APECs) on the subject site.

The subsurface investigation was conducted between October 30 and November 4, 2020, and consisted of drilling 10 boreholes (BH1-20 – BH2-20) throughout the subject site, all of which were instrumented with groundwater monitoring well installations. The boreholes were advanced to depths ranging from approximately 6.04 m to 9.04 m below the existing grade, with the exception of BH1-20 and BH3-20 which were advanced to depths of approximately 15.14 m and 14.43 m below the existing grade, respectively. All boreholes were terminated within the underlying bedrock unit, with the exception of BH10-20, which was terminated within a layer of grey silty clay till. Six previously installed groundwater monitoring wells (MW13-55, MW13-56, and MW13-59 – MW13-62) were also located on-site and utilized as part of this investigation.

A total of 7 soil samples were submitted for laboratory analysis of either: BTEX, PHCs (F_1-F_4), VOCs, PAHs, and/or metals parameters. According to the analytical test results, several PAH parameters were detected in soil sample BH10-20-SS2/SS3 at concentrations exceeding the applicable MECP Table 7 residential standards. The remaining parameter concentrations in all other soil samples tested comply with the MECP Table 7 residential standards.

A total of 16 groundwater samples were recovered and submitted for laboratory analysis of either PHCs and/or VOCs. According to the analytical test results, several VOC parameters were detected in the groundwater samples collected from BH8-20, MW13-55, MW13-56, MW13-59, MW13-60, MW13-61, and MW13-62 at concentrations exceeding the applicable MECP Table 7 residential standards.

Recommendations

Soil

In combination with other impacted soils previously identified on the subject site, PAH impacted soil was identified in the vicinity of BH10-20, located within the southwestern portion of the subject site, requiring some remedial work. It is our understanding that the subject site is to be redeveloped for residential and mixed-use purposes in the near future. Therefore, it is our recommendation that an environmental site remedial program be completed in conjunction with site redevelopment. This will require the segregation of clean soil from impacted soil, the latter of which will require disposal at an approved waste disposal facility.

Prior to off-site disposal at a licenced landfill site, a leachate analysis of a representative sample of contaminated soil must be conducted in accordance with Ontario Regulation 347/558.

Groundwater

The groundwater within the southwestern portion of the subject site is impacted by VOCs. Although this area has not been fully vertically delineated beneath a depth of approximately 9.4 m at this time, vertical delineation of the VOC impacted groundwater will be required to determine whether a generic site remediation program is feasible, or if a risk assessment approach will be required for the redevelopment of the subject site in this localized area. Refer to the risk assessment report (PE5066-MEMO.02) for more information.

It is recommended that an additional groundwater testing event be conducted to confirm the recent test results as well as to confirm the dissipation of chloroform identified in BH1-20 and BH6-20.

Monitoring Wells

If the groundwater monitoring wells installed on-site are not going to be used in the future, or will be destroyed during future redevelopment activities, then they must be decommissioned according to Ontario Regulation Reg. 903 (Ontario Water Resources Act). The monitoring wells will be registered with the MECP under this regulation. Further information can be provided upon request in this regard.

7.0 STATEMENT OF LIMITATIONS

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

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

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

This report was prepared for the sole use of Claridge Homes. Permission and notification from the Claridge Homes and Paterson Group will be required prior to the release of this report to any other party.

Paterson Group Inc.

Nick Sullivan, B.Sc.

Mark S. D'Arcy, P.Eng.

Report Distribution

- Claridge Homes
- Paterson Group Inc.

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE5066-1 – TEST HOLE LOCATION PLAN

DRAWING PE5066-2 – ANALYTICAL TESTING PLAN – SOIL (VOCs, BTEX, PHCs, METALS)

DRAWING PE5066-2A – CROSS SECTION A-A' – SOIL (VOCs, BTEX, PHCs, METALS)

DRAWING PE5066-3 – ANALYTICAL TESTING PLAN – SOIL (PAHs)

DRAWING PE5066-3A – CROSS SECTION A-A' – SOIL (PAHs)

DRAWING PE5066-4 – ANALYTICAL TESTING PLAN – GROUNDWATER (PHCs)

DRAWING PE5066-4A – CROSS SECTION A-A' – GROUNDWATER (PHCs)

DRAWING PE5066-5 – ANALYTICAL TESTING PLAN – GROUNDWATER (VOCs)

DRAWING PE5066-5A – CROSS SECTION A-A' – GROUNDWATER (VOCs)

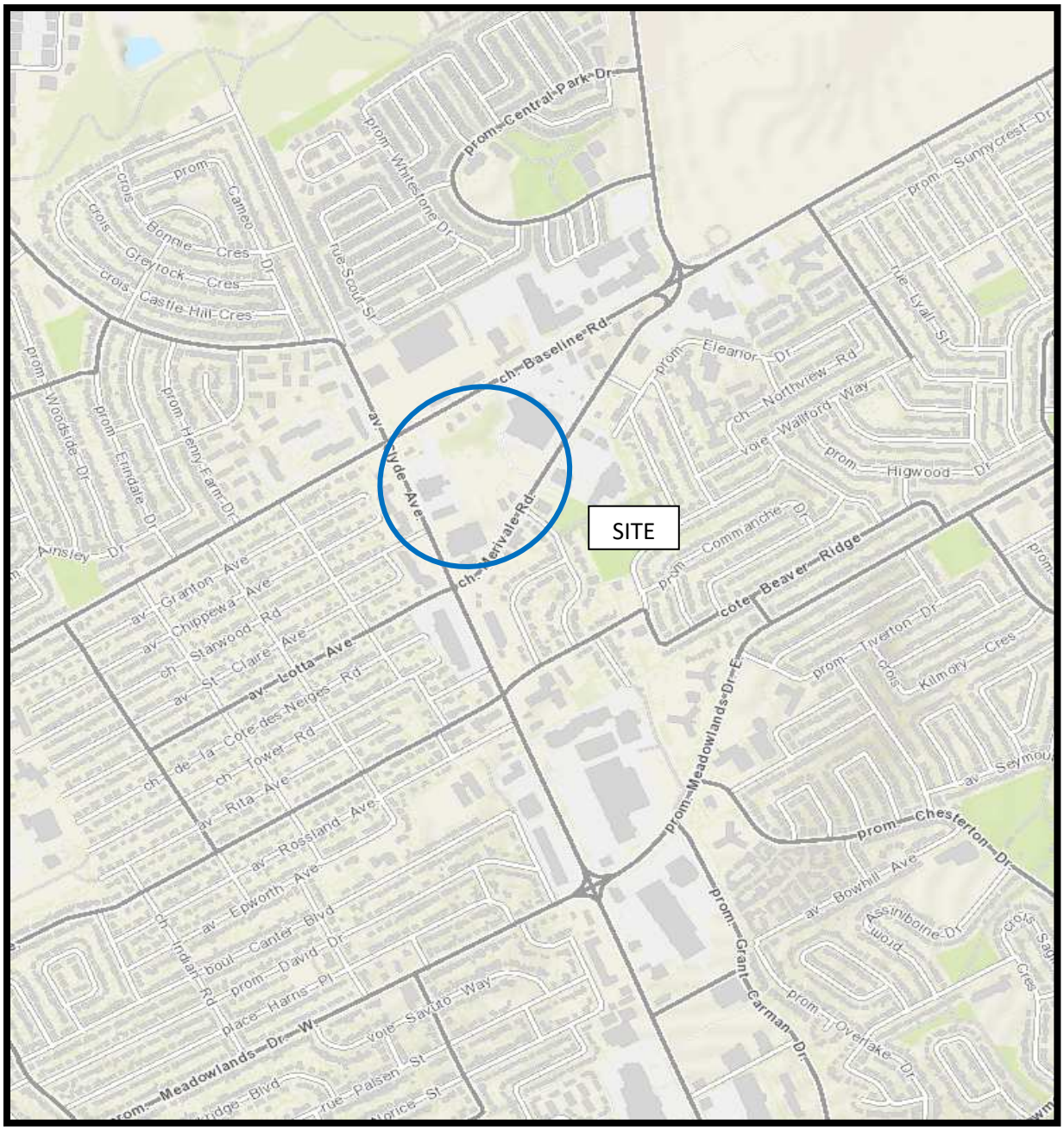
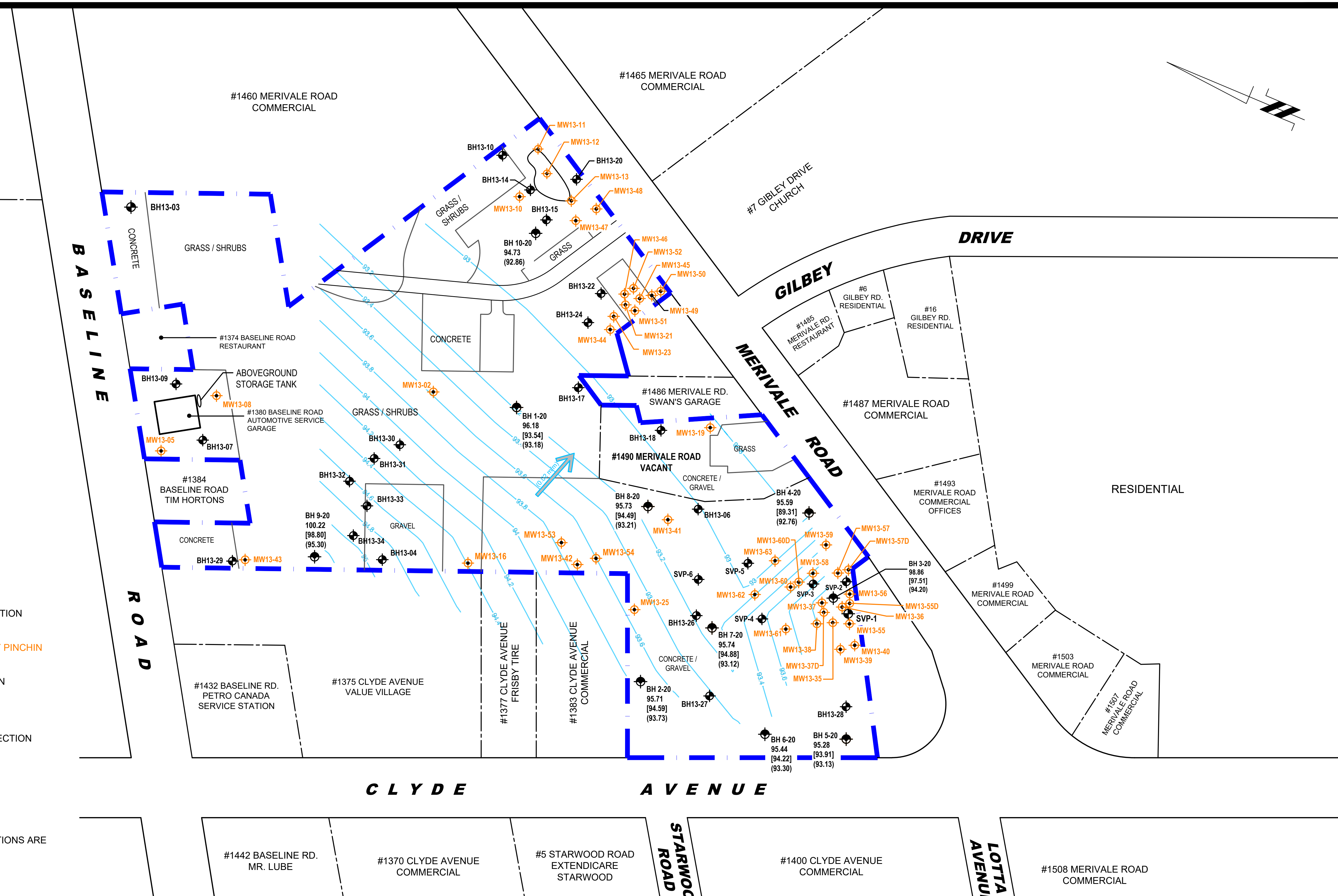


FIGURE 1

KEY PLAN



LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION (CURRENT INVESTIGATION)
- APPROX. MONITORING WELL LOCATION BY PINCHIN ENVIRONMENTAL
- APPROX. BOREHOLE LOCATION BY PINCHIN ENVIRONMENTAL
- 93.0 GROUNDWATER CONTOUR(m)
- (0.02 m/m) APPROXIMATE GROUNDWATER FLOW DIRECTION (HORIZONTAL HYDRAULIC GRADIENT)

95.71 GROUND SURFACE ELEVATION (m)

[93.54] BEDROCK SURFACE ELEVATION (m)

(93.18) GROUNDWATER SURFACE ELEVATION (m)

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

0 1 2 3 4 5 10m

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NO.	REVISIONS	DATE	INITIAL
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CLARIDGE HOMES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1500 MERIVALE ROAD

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:2000	**Date:** 01/2021
Drawn by: MPG	**Report No.:** PE5066-2
Checked by: NS	**Dwg. No.:** PE5066-1
Approved by: MSD	**Revision No.:**

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#1345 BASELINE ROAD
COMMERCIAL

#1460 MERIVALE ROAD
COMMERCIAL

#1465 MERIVALE ROAD
COMMERCIAL

#7 GIBLEY DRIVE
CHURCH

GILBEY DRIVE

BASELINE ROAD

MERIVALE ROAD

CLYDE AVENUE

STARWOOD ROAD

LOTTA AVENUE

BH10-20-SS2/SS3 (0.76-2.13 m) November 3, 2020
PHCs comply with MECP Table 7 Standards

BH10-20-SS6 (3.81-4.42 m) November 3, 2020
BTEX and PHCs comply with MECP Table 7 Standards

BH4-20-SS3 (1.52-2.13 m) November 2, 2020
Metals and PHCs comply with MECP Table 7

BH3-20-AU1 (0.00-0.61 m) November 2, 2020
VOCs, BTEX, and PHCs comply with MECP Table 7

BH1-20-SS3 (0.76-1.37 m) October 30, 2020
Metals comply with MECP Table 7 Standards

BH1-20-SS4 (1.52-2.13 m) October 30, 2020
Metals comply with MECP Table 7 Standards

BH2-20-AU2 (0.76-1.37 m) October 30, 2020
PHCs comply with MECP Table 7 Standards

BH13-03 BH13-09 BH13-07 BH13-29 BH13-30 BH13-31 BH13-32 BH13-33 BH13-34 BH13-04 BH13-10 BH13-14 BH13-20 BH13-15 BH13-22 BH13-24 BH13-17 BH13-18 BH13-06 BH13-26 BH13-27 BH13-28

MW13-11 MW13-12 MW13-13 MW13-48 MW13-10 MW13-47 MW13-46 MW13-52 MW13-45 MW13-50 MW13-49 MW13-51 MW13-21 MW13-23 MW13-44 MW13-02 MW13-08 MW13-05 MW13-19 MW13-41 MW13-43 MW13-16 MW13-53 MW13-42 MW13-54 MW13-25 MW13-57 MW13-57D MW13-59 MW13-60D MW13-63 MW13-58 MW13-60 MW13-62 MW13-56 MW13-55D MW13-36 MW13-37 MW13-61 MW13-55 MW13-38 MW13-40 MW13-39 MW13-37D MW13-35

SVP-1 SVP-2 SVP-3 SVP-4 SVP-5 SVP-6

BH 1-20 96.18 [93.54] (93.18)
BH 8-20 95.73 [94.49] (93.21)
BH 4-20 95.59 [89.31] (92.76)
BH 3-20 98.86 [97.51] (94.20)
BH 10-20 94.73 (92.86)
BH 7-20 95.74 [94.88] (93.12)
BH 2-20 95.71 [94.59] (93.73)
BH 6-20 95.44 [94.22] (93.30)
BH 5-20 95.28 [93.91] (93.13)
BH 9-20 100.22 [98.80] (95.30)

GRASS / SHRUBS
CONCRETE
GRASS
GRAVEL
CONCRETE / GRAVEL

#1374 BASELINE ROAD RESTAURANT
ABOVEGROUND STORAGE TANK
#1380 BASELINE ROAD AUTOMOTIVE SERVICE GARAGE
#1384 BASELINE ROAD TIM HORTONS
#1486 MERIVALE RD. SWAN'S GARAGE
#1490 MERIVALE ROAD VACANT
#1485 MERIVALE RD. RESTAURANT
#6 GILBEY RD. RESIDENTIAL
#16 GILBEY RD. RESIDENTIAL
#1487 MERIVALE ROAD COMMERCIAL
#1493 MERIVALE ROAD COMMERCIAL OFFICES
RESIDENTIAL
#1503 MERIVALE ROAD COMMERCIAL
#1507 MERIVALE ROAD COMMERCIAL
#1432 BASELINE RD. PETRO CANADA SERVICE STATION
#1375 CLYDE AVENUE VALUE VILLAGE
#1377 CLYDE AVENUE FRISBY TIRE
#1383 CLYDE AVENUE COMMERCIAL
#1442 BASELINE RD. MR. LUBE
#1370 CLYDE AVENUE COMMERCIAL
#5 STARWOOD ROAD EXTENDICARE STARWOOD
#1400 CLYDE AVENUE COMMERCIAL
#1508 MERIVALE ROAD COMMERCIAL

A A'

LEGEND:

- IMPACTED SOIL IDENTIFIED BY 2014 PHASE II ESA BY PINCHIN ENVIRONMENTAL
- BOREHOLE WITH MONITORING WELL LOCATION (CURRENT INVESTIGATION)
- APPROX. MONITORING WELL LOCATION BY PINCHIN ENVIRONMENTAL
- APPROX. BOREHOLE LOCATION BY PINCHIN ENVIRONMENTAL
- 95.71 GROUND SURFACE ELEVATION (m)
- [93.54] BEDROCK SURFACE ELEVATION (m)
- (93.18) GROUNDWATER SURFACE ELEVATION (m)

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

SOIL RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 7 STANDARDS

0 1 2 3 4 5 10m

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NO.	REVISIONS	DATE	INITIAL
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CLARIDGE HOMES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1500 MERIVALE ROAD

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL (VOCs,BTEX,PHCs,METALS)

Scale: 1:2000	Date: 01/2021
Drawn by: MPG	Report No.: PE5066-2
Checked by: NS	Dwg. No.: PE5066-2
Approved by: MSD	Revision No.:

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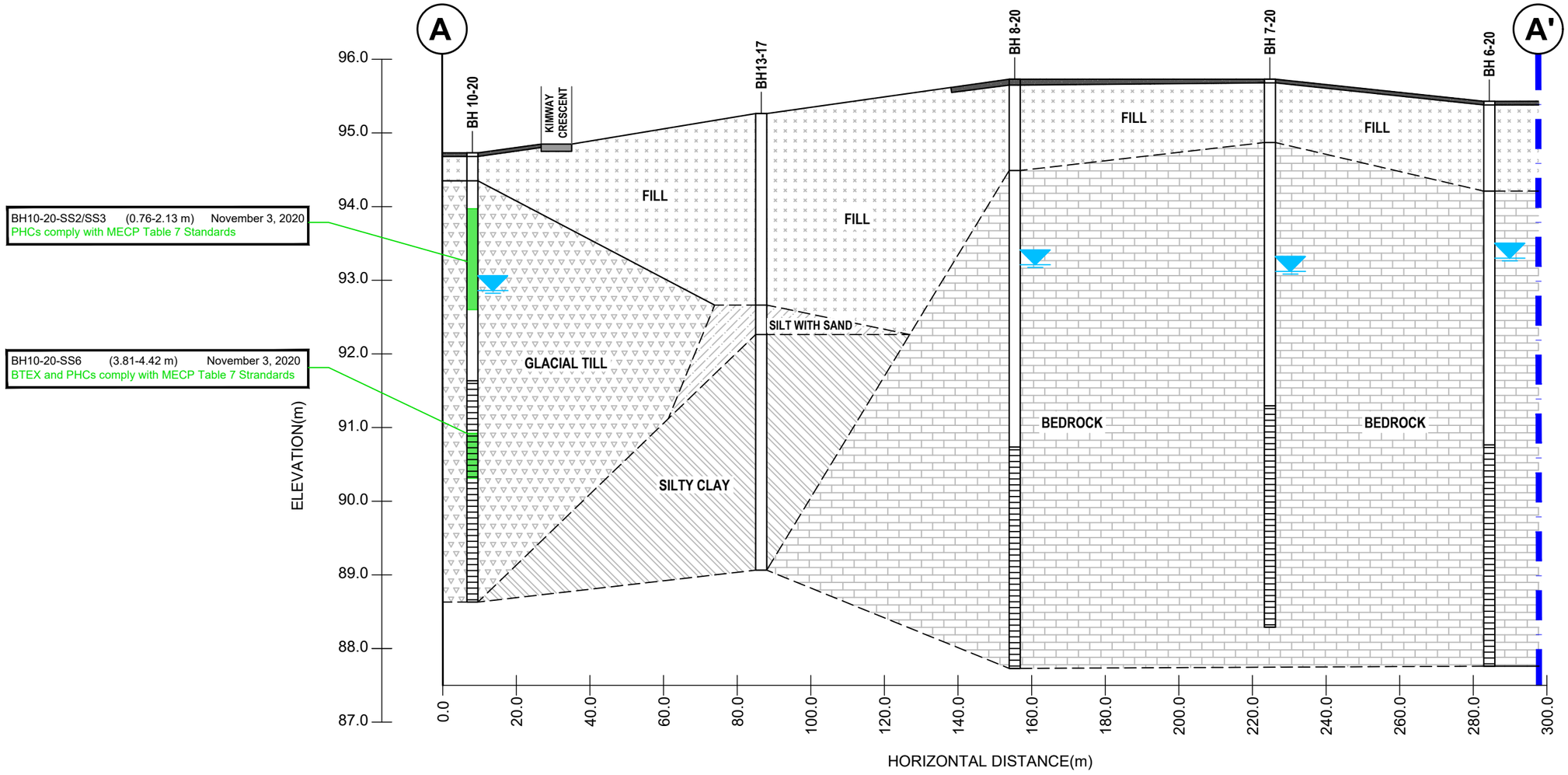

LEGEND:

SOIL RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 7 STANDARDS

0 1 2 3 4 5 10m

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NO.	REVISIONS	DATE	INITIAL
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CLARIDGE HOMES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1500 MERIVALE ROAD

OTTAWA, ONTARIO

Title:

CROSS SECTION A-A' - SOIL (VOCs,BTEX,PHCs,METALS)

Scale: AS SHOWN	Date: 01/2021
Drawn by: RCG	Report No.: PE5066-2
Checked by: NS	Dwg. No.: PE5066-2A
Approved by: MSD	Revision No.:

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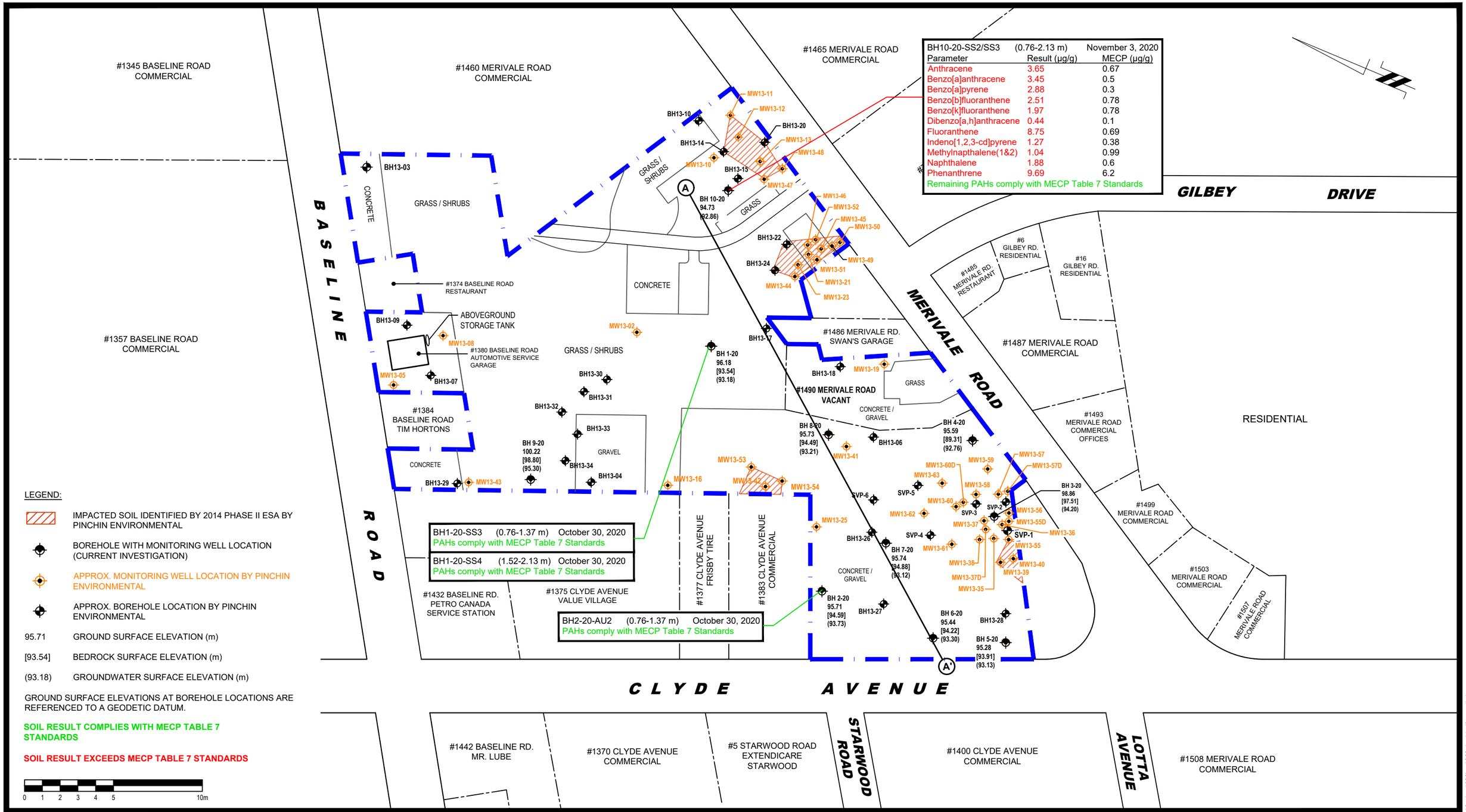

LEGEND:

- IMPACTED SOIL IDENTIFIED BY 2014 PHASE II ESA BY PINCHIN ENVIRONMENTAL
- BOREHOLE WITH MONITORING WELL LOCATION (CURRENT INVESTIGATION)
- APPROX. MONITORING WELL LOCATION BY PINCHIN ENVIRONMENTAL
- APPROX. BOREHOLE LOCATION BY PINCHIN ENVIRONMENTAL
- 95.71 GROUND SURFACE ELEVATION (m)
- [93.54] BEDROCK SURFACE ELEVATION (m)
- (93.18) GROUNDWATER SURFACE ELEVATION (m)

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

SOIL RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 7 STANDARDS

0 1 2 3 4 5 10m

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NO.	REVISIONS	DATE	INITIAL
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CLARIDGE HOMES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1500 MERIVALE ROAD

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL (PAHs)

Scale: 1:2000	Date: 01/2021
Drawn by: MPG	Report No.: PE5066-2
Checked by: NS	Dwg. No.: PE5066-3
Approved by: MSD	Revision No.:

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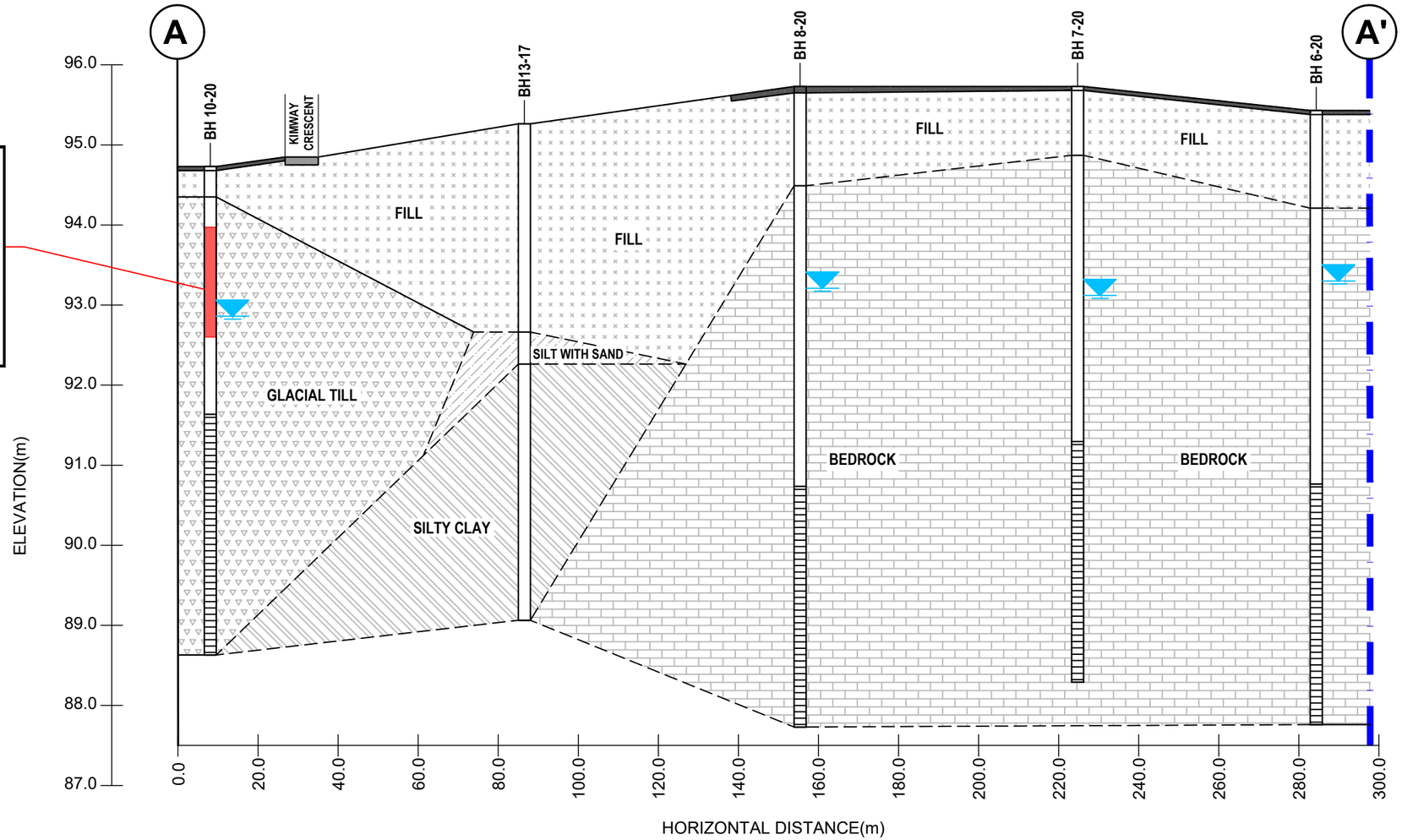
BH10-20-SS2/SS3	(0.76-2.13 m)	November 3, 2020
Parameter	Result (µg/g)	MECP (µg/g)
Anthracene	3.65	0.67
Benzo[a]anthracene	3.45	0.5
Benzo[a]pyrene	2.88	0.3
Benzo[b]fluoranthene	2.51	0.78
Benzo[k]fluoranthene	1.97	0.78
Dibenzo[a,h]anthracene	0.44	0.1
Fluoranthene	8.75	0.69
Indeno[1,2,3-cd]pyrene	1.27	0.38
Methylnapthalene(1&2)	1.04	0.99
Naphthalene	1.88	0.6
Phenanthrene	9.69	6.2
Remaining PAHs comply with MECP Table 7 Standards		



LEGEND:

SOIL RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 7 STANDARDS

0 1 2 3 4 5 10m

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL
0			

CLARIDGE HOMES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1500 MERIVALE ROAD

OTTAWA, ONTARIO

Title:

CROSS SECTION A-A' - SOIL (PAHs)

Scale: AS SHOWN	Date: 01/2021
Drawn by: RCG	Report No.: PE5066-2
Checked by: NS	Dwg. No.: PE5066-3A
Approved by: MSD	Revision No.:

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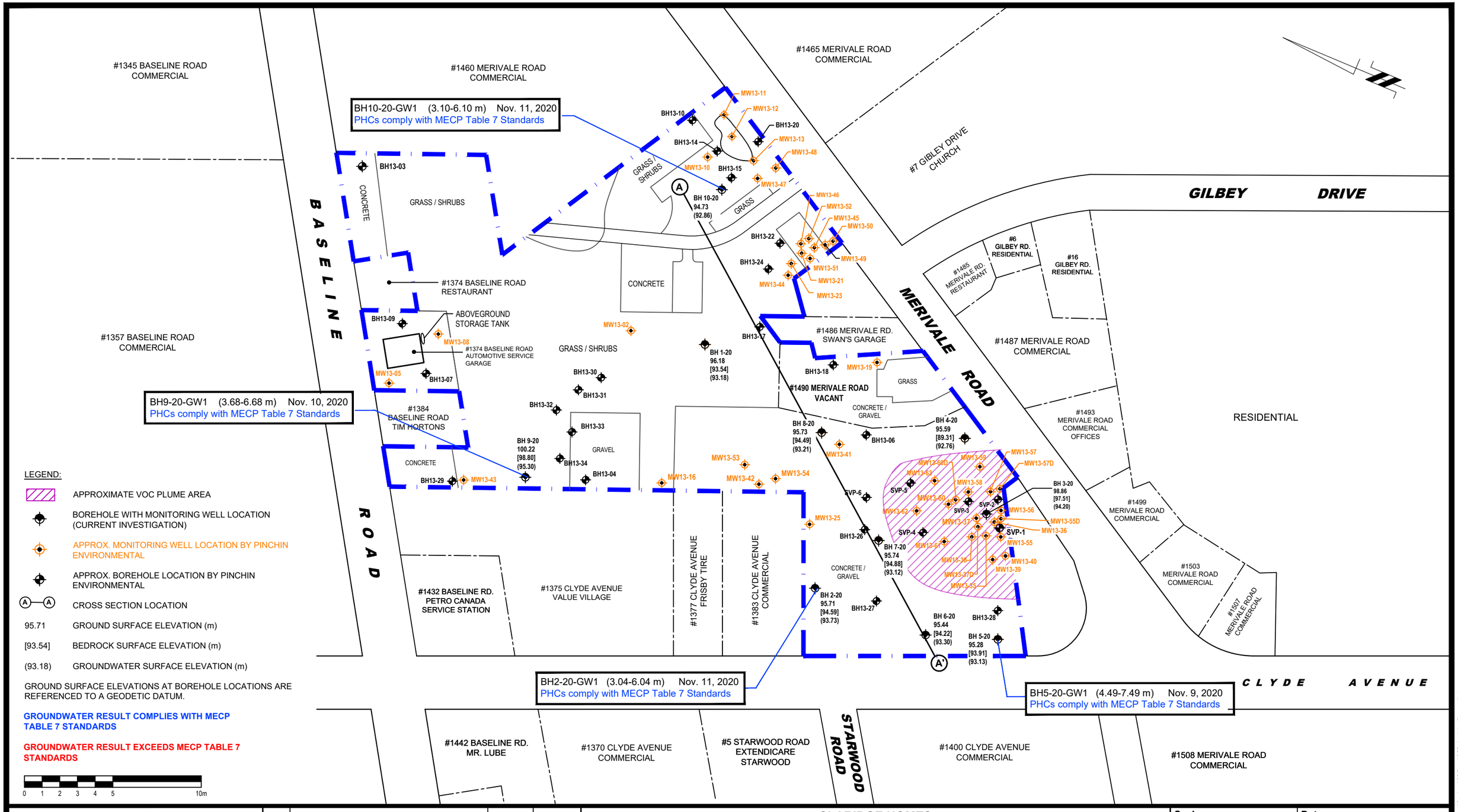

LEGEND:

- APPROXIMATE VOC PLUME AREA
- BOREHOLE WITH MONITORING WELL LOCATION (CURRENT INVESTIGATION)
- APPROX. MONITORING WELL LOCATION BY PINCHIN ENVIRONMENTAL
- APPROX. BOREHOLE LOCATION BY PINCHIN ENVIRONMENTAL
- A—A CROSS SECTION LOCATION
- 95.71 GROUND SURFACE ELEVATION (m)
- [93.54] BEDROCK SURFACE ELEVATION (m)
- (93.18) GROUNDWATER SURFACE ELEVATION (m)

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

GROUNDWATER RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

GROUNDWATER RESULT EXCEEDS MECP TABLE 7 STANDARDS

0 1 2 3 4 5 10m

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NO.	REVISIONS	DATE	INITIAL
0			

CLARIDGE HOMES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1500 MERIVALE ROAD

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - GROUNDWATER (PHCs)

Scale: 1:2000	Date: 01/2021
Drawn by: MPG	Report No.: PE5066-2
Checked by: NS	Dwg. No.: PE5066-4
Approved by: MSD	Revision No.:

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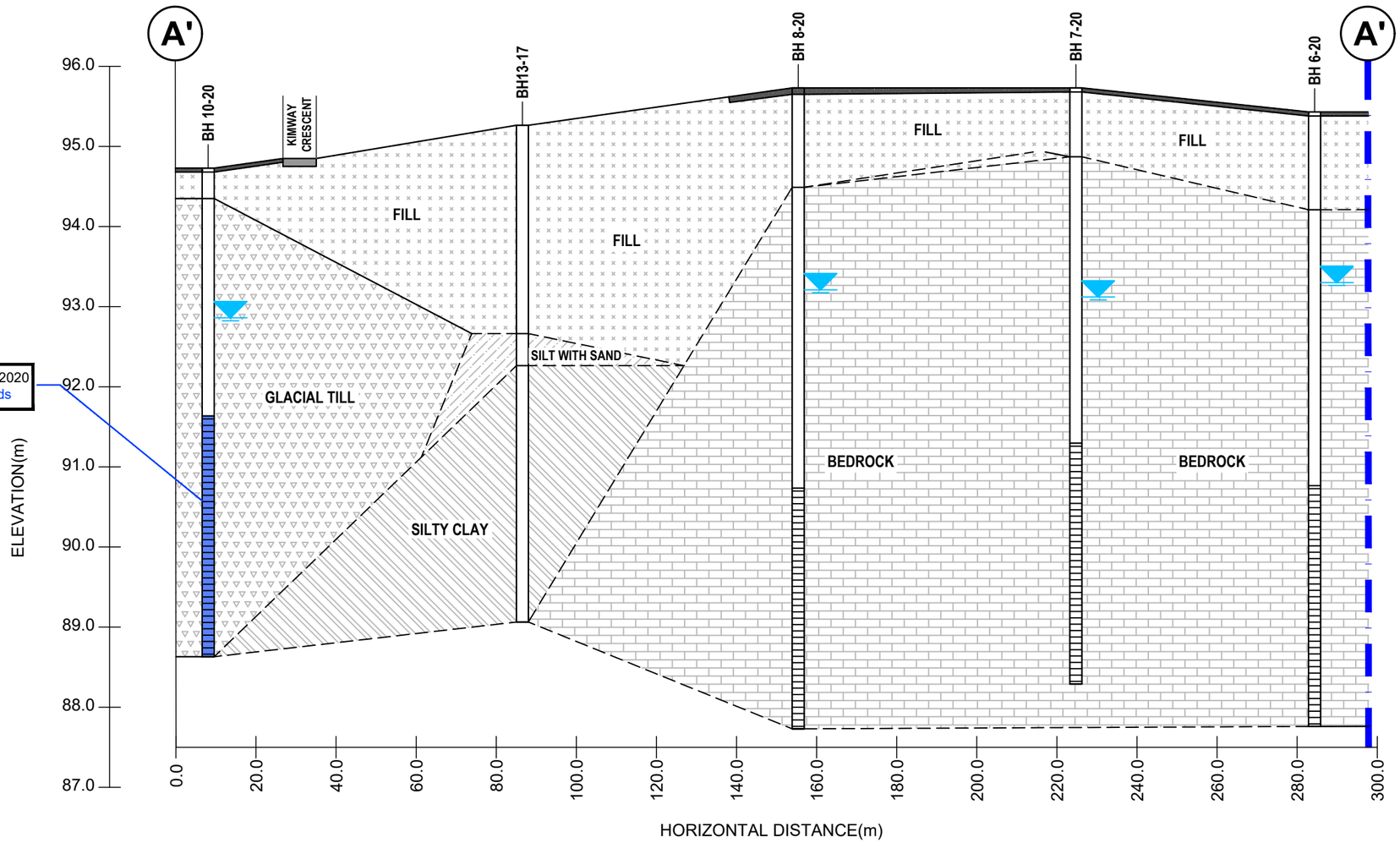

LEGEND:

GROUNDWATER RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

GROUNDWATER RESULT EXCEEDS MECP TABLE 7 STANDARDS

0 1 2 3 4 5 10m

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NO.	REVISIONS	DATE	INITIAL
0			

CLARIDGE HOMES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1500 MERIVALE ROAD

OTTAWA, ONTARIO

Title:

CROSS SECTION A-A' - GROUNDWATER (PHCs)

Scale: AS SHOWN	Date: 01/2021
Drawn by: RCG	Report No.: PE5066-2
Checked by: NS	Dwg. No.: PE5066-4A
Approved by: MSD	Revision No.:

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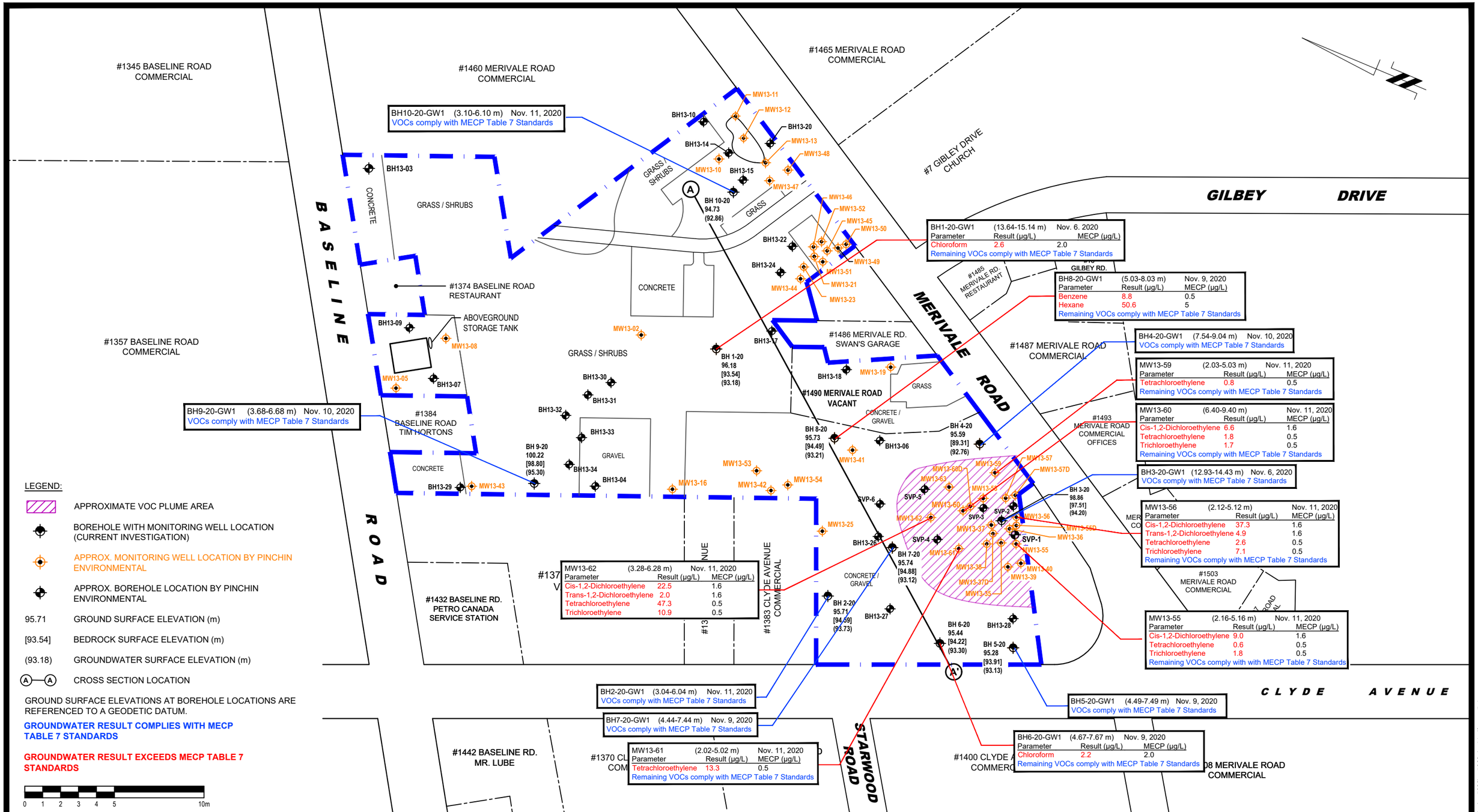

LEGEND:

- APPROXIMATE VOC PLUME AREA
- BOREHOLE WITH MONITORING WELL LOCATION (CURRENT INVESTIGATION)
- APPROX. MONITORING WELL LOCATION BY PINCHIN ENVIRONMENTAL
- APPROX. BOREHOLE LOCATION BY PINCHIN ENVIRONMENTAL
- 95.71 GROUND SURFACE ELEVATION (m)
- [93.54] BEDROCK SURFACE ELEVATION (m)
- (93.18) GROUNDWATER SURFACE ELEVATION (m)
- A—A CROSS SECTION LOCATION

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

GROUNDWATER RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

GROUNDWATER RESULT EXCEEDS MECP TABLE 7 STANDARDS

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NO.	REVISIONS	DATE	INITIAL
0			

CLARIDGE HOMES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1500 MERIVALE ROAD

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - GROUNDWATER (VOCs)

Scale:	1:2000
Drawn by:	MPG
Checked by:	NS
Approved by:	MSD
Date:	01/2021
Report No.:	PE5066-2
Dwg. No.:	PE5066-5
Revision No.:	

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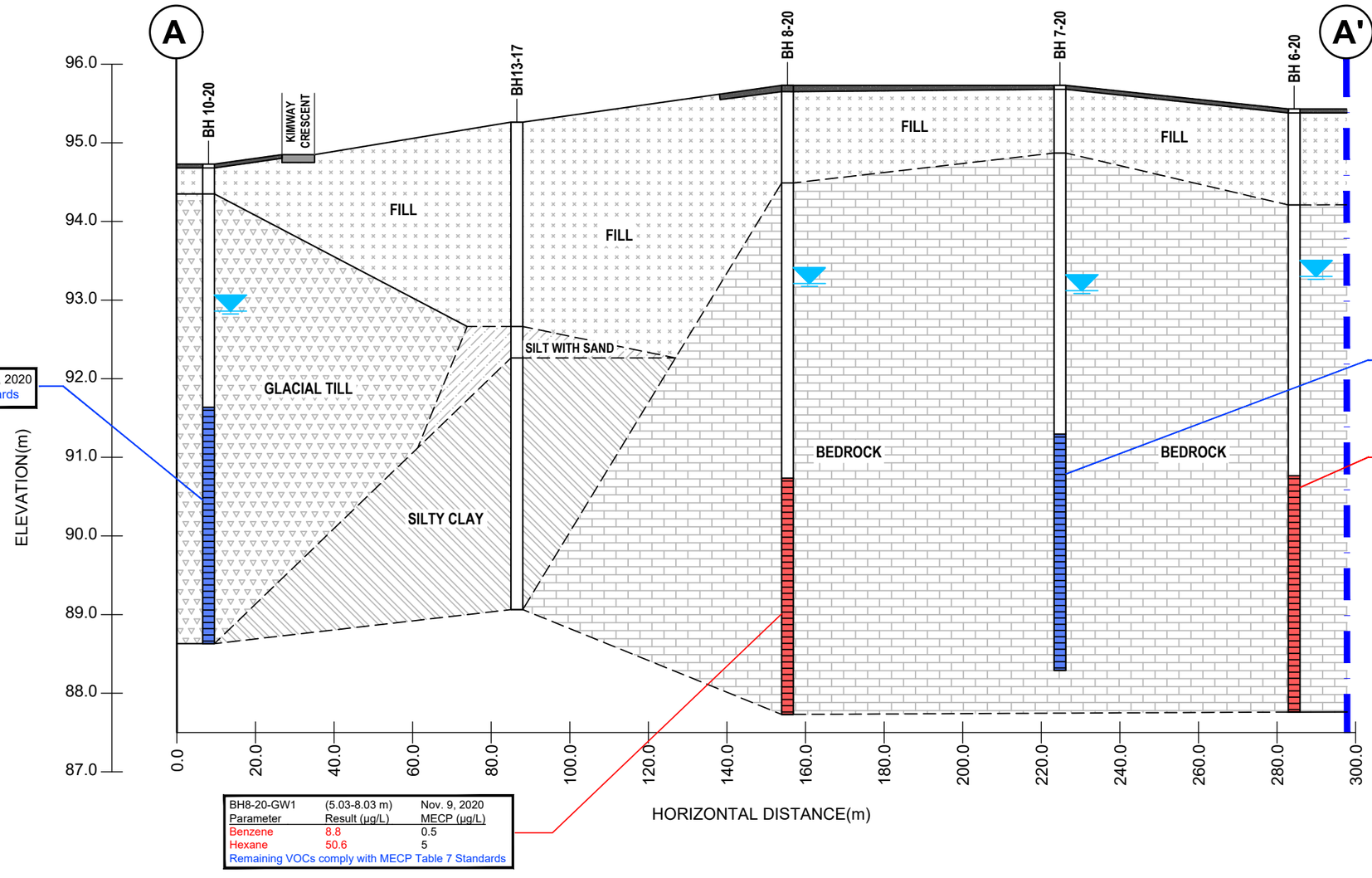

BH10-20-GW1 (3.10-6.10 m) Nov. 11, 2020
VOCs comply with MECP Table 7 Standards

BH7-20-GW1 (4.44-7.44 m) Nov. 9, 2020
VOCs comply with MECP Table 7 Standards

BH6-20-GW1 (4.67-7.67 m) Nov. 9, 2020

Parameter	Result (µg/L)	MECP (µg/L)
Chloroform	2.2	2.0

Remaining VOCs comply with MECP Table 7 Standards

BH8-20-GW1 (5.03-8.03 m) Nov. 9, 2020

Parameter	Result (µg/L)	MECP (µg/L)
Benzene	8.8	0.5
Hexane	50.6	5

Remaining VOCs comply with MECP Table 7 Standards

LEGEND:

GROUNDWATER RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

GROUNDWATER RESULT EXCEEDS MECP TABLE 7 STANDARDS

0 1 2 3 4 5 10m

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CLARIDGE HOMES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1500 MERIVALE ROAD

OTTAWA, ONTARIO

Title:

CROSS SECTION A-A' - GROUNDWATER (VOCs)

Scale: AS SHOWN	Date: 01/2021
Drawn by: RCG	Report No.: PE5066-2
Checked by: NS	Dwg. No.: PE5066-5A
Approved by: MSD	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

Paterson Group Inc.

Consulting Engineers
154 Colonnade Road South
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patersongroup

Sampling & Analysis Plan

Phase II – Environmental Site Assessment
1500 Merivale Road
Ottawa, Ontario

Prepared For

Claridge Homes

October 16, 2020

Report: PE5066-SAP

TABLE OF CONTENTS

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Claridge Homes, to conduct a Phase II – Environmental Site Assessment (Phase II ESA) for the property addressed 1500 Merivale Road, in the City of Ottawa, Ontario.

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

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1-20	Central portion of the subject site; to assess for potential impacts resulting from the presence of a former on-site machine shop.	13-16 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH2-20	Southwestern portion of subject site; to assess for potential impacts resulting from the presence of a former on-site retail fuel outlet and a former off-site printers.	6-10 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH3-20	Southwestern portion of subject site; to assess for potential impacts resulting from the presence of a former on-site retail fuel outlet.	13-16 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH4-20	Southwestern portion of subject site; to assess for potential impacts resulting from the presence of an existing off-site auto service garage, a former on-site auto service garage and transportation office, and a former on-site retail fuel outlet.	6-10 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH5-20	Southwestern portion of subject site; to assess for potential impacts resulting from the presence of a former on-site retail fuel outlet.	6-10 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH6-20	Southwestern portion of subject site; to assess for potential impacts resulting from the presence of a former on-site retail fuel outlet.	6-10 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH7-20	Southwestern portion of subject site; to assess for potential impacts resulting from the presence of a former on-site retail fuel outlet.	6-10 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH8-20	Southern portion of subject site; to assess for potential impacts resulting from the presence of an existing off-site auto service garage, a former on-site auto service garage and transportation office, a former off-site printers, and a former on-site retail fuel outlet.	6-10 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH9-20	Northwestern portion of subject site; to assess for potential impacts resulting from the presence of a former off-site auto service garage and retail fuel outlet.	6-10 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH10-20	Southeastern portion of subject site; to assess for potential impacts resulting from the presence of a former on-site dry cleaners and two (2) former on-site auto service garages.	6-10 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.

Borehole locations are shown on Drawing PE5066-1 – Test Hole Location Plan, appended to the main report. At each borehole, split-spoon samples of the overburden soils will be obtained at 0.76 m (2'6") intervals until practical refusal to augering. All soil samples will be retained, and samples will be selected for submission following a preliminary screening analysis. Following the borehole drilling, groundwater monitoring wells will be installed in all boreholes (BH1-BH10) for the collection of groundwater samples.

2.0 ANALYTICAL TESTING PROGRAM

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

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

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

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

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

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

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

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

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

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

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

3.0 STANDARD OPERATING PROCEDURES

3.1 Environmental Drilling Procedure

Purpose

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

Equipment

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

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

Determining Borehole Locations

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

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

Drilling Procedure

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

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

Spoon Washing Procedure

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

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

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

Screening Procedure

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

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

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

3.2 Monitoring Well Installation Procedure

Equipment

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

Procedure

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

3.3 Monitoring Well Sampling Procedure

Equipment

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

Sampling Procedure

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

4.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

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

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

5.0 DATA QUALITY OBJECTIVES

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

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

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

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

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

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

These considerations are discussed in the body of the report.

6.0 PHYSICAL IMPEDIMENTS

Physical impediments to the Sampling and Analysis plan may include:

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

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

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
1500 Merivale Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5066

REMARKS

HOLE NO. BH 1-20

BORINGS BY CME-55 Low Clearance Drill **DATE** October 30, 2020

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: 25mm Topsoil over brown silty sand with crushed stone		AU	1			0	96.18		
		AU	2						
		SS	3	40	50+	1	95.18		
		SS	4	57	50+	2	94.18		
2.64		SS	5	100	50+				
		RC	1	76	0	3	93.18		
		RC	2	100	66	4	92.18		
		RC	3	95	85	5	91.18		
		RC	4	100	100	6	90.18		
		RC	5	100	100	7	89.18		
BEDROCK: Very poor to excellent quality, grey limestone interbedded with shale		RC	6	100	100	8	88.18		
		RC	7	100	100	9	87.18		
		RC	8	100	97	10	86.18		
		RC	9	100	92	11	85.18		
15.14						12	84.18		
End of Borehole						13	83.18		
(GWL @ 3.00m - Nov. 6, 2020)						14	82.18		
						15	81.18		

Photo Ionization Detector: ● Volatile Organic Rdg. (ppm)

○ Lower Explosive Limit %

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
1500 Merivale Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5066

REMARKS

HOLE NO. BH 2-20

BORINGS BY CME-55 Low Clearance Drill **DATE** October 30, 2020

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							0	95.71
Asphaltic concrete	0.08		AU	1				
FILL: Brown silty sand wtih crushed stone	0.60		AU	2				
	1.12		SS	3	38	50+	1	94.71
FILL: Brown silty sand with clay, some gravel			RC	1	82	0		
			RC	2	98	50	2	93.71
BEDROCK: Very poor to excellent quality, grey limestone							3	92.71
- vertical seam from 5.2 to 5.7m depth			RC	3	100	93	4	91.71
							5	90.71
			RC	4	100	100		
	6.04						6	89.71
End of Borehole								
(GWL @ 1.98m - Nov. 11, 2020)								

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

Monitoring Well Construction

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
1500 Merivale Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5066

REMARKS

HOLE NO. BH 3-20

BORINGS BY CME-55 Low Clearance Drill **DATE** November 2, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE									
TOPSOIL 0.08		AU	1			0	98.86		
FILL: Brown silty sand, some gravel 1.35		SS	2	58	25	1	97.86		
		RC	1	100	53	2	96.86		
		RC	2	100	87	3	95.86		
		RC	3	100	73	4	94.86		
		RC	4	100	100	5	93.86		
BEDROCK: Fair to excellent quality, grey limestone interbedded with shale		RC	5	100	100	6	92.86		
		RC	6	100	100	7	91.86		
		RC	7	97	95	8	90.86		
		RC	8	100	100	9	89.86		
		RC	9	100	92	10	88.86		
14.43						11	87.86		
End of Borehole						12	86.86		
(GWL @ 4.66m - Nov. 6, 2020)						13	85.86		
						14	84.86		

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
1500 Merivale Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5066

REMARKS

HOLE NO. BH 4-20

BORINGS BY CME-55 Low Clearance Drill **DATE** November 2, 2020

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							0	95.59
TOPSOIL	0.20		AU	1				
FILL: Brown silty sand, some gravel, trace organics	1.52		SS	2	33	23	1	94.59
Compact, brown **SILTY SAND,** some gravel	2.13		SS	3	54	11	2	93.59
			SS	4	100	11	3	92.59
			SS	5	0	46		
GLACIAL TILL: Brown silty clay with gravel, some sand			SS	6	96	38	4	91.59
- grey by 3.9m depth			SS	7	42	37	5	90.59
			SS	8	64	50+		
							6	89.59
	6.58		SS	9	79	24		
			RC	1	100	100	7	88.59
BEDROCK: Excellent quality, grey limestone interbedded with shale			RC	2	100	97	8	87.59
	9.04						9	86.59
End of Borehole								
(GWL @ 3.13m - Nov. 9, 2020)								

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

Monitoring Well Construction

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
1500 Merivale Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5066

REMARKS

HOLE NO. BH 5-20

BORINGS BY CME-55 Low Clearance Drill **DATE** November 3, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	95.28
Asphaltic concrete 0.08		AU	1				
FILL: Brown silty sand with crushed stone 0.66		SS	2	45	20	1	94.28
FILL: Brown silty sand, trace clay 1.37							
		RC	1	87	32	2	93.28
						3	92.28
		RC	2	100	93	4	91.28
BEDROCK: Poor to excellent quality, grey limestone						5	90.28
		RC	3	100	100	6	89.28
		RC	4	100	93	7	88.28
7.49 End of Borehole							
(GWL @ 2.15m - Nov. 9, 2020)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

Monitoring Well Construction

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
1500 Merivale Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5066

REMARKS

HOLE NO. BH 6-20

BORINGS BY CME-55 Low Clearance Drill **DATE** November 3, 2020

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							0	95.44
Asphaltic concrete	0.08		AU	1				
FILL: Brown silty sand with crushed stone	0.66		SS	2	65		1	94.44
FILL: Brown silty sand	1.22		RC	1	100	62		
			RC	2	90	75	2	93.44
							3	92.44
BEDROCK: Fair to excellent quality, grey limestone			RC	3	100	100	4	91.44
			RC	4	100	97	5	90.44
- vertical seam from 6.1 to 6.5m depth							6	89.44
			RC	5	100	97	7	88.44
	7.67							
End of Borehole								
(GWL @ 2.14m - Nov. 9, 2020)								

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

Monitoring Well Construction

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
1500 Merivale Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5066

REMARKS

HOLE NO. BH 7-20

BORINGS BY CME-55 Low Clearance Drill **DATE** November 3, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	95.74
Asphaltic concrete 0.05		AU	1				
FILL: Brown silty sand with crushed stone 0.59		SS	2	100	50+	1	94.74
0.86		RC	1	91	45		
FILL: Brown silty sand with cobbles		RC	2	93	68	2	93.74
						3	92.74
		RC	3	100	97		
BEDROCK: Poor to excellent quality, grey limestone						4	91.74
		RC	4	100	100	5	90.74
						6	89.74
		RC	5	100	100	7	88.74
7.44							
End of Borehole							
(GWL @ 2.62m - Nov. 9, 2020)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

Monitoring Well Construction

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
1500 Merivale Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5066

REMARKS

HOLE NO. BH 8-20

BORINGS BY CME-55 Low Clearance Drill **DATE** November 4, 2020

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							0	95.73
Asphaltic concrete	0.08		AU	1				
FILL: Brown silty sand with crushed stone	0.60		SS	2	60	12	1	94.73
FILL: Brown silty sand, some gravel, trace clay	1.24		RC	1	93	28	2	93.73
							3	92.73
			RC	2	100	78	4	91.73
BEDROCK: Poor to excellent quality, grey limestone interbedded with shale			RC	3	97	90	5	90.73
			RC	4	100	90	6	89.73
			RC	5	100	68	7	88.73
End of Borehole	8.03						8	87.73
(GWL @ 2.52m - Nov. 9, 2020)								

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
1500 Merivale Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5066

REMARKS

HOLE NO. BH 9-20

BORINGS BY CME-55 Low Clearance Drill **DATE** November 4, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	100.22
TOPSOIL 0.10		AU	1				
GLACIAL TILL: Dense, brown silty sand with clay, gravel, cobbles and boulders 1.42		SS	2	80	50+	1	99.22
		RC	1	48	35	2	98.22
		RC	2	94	47	3	97.22
BEDROCK: Poor to excellent quality, grey limestone		RC	3	100	90	4	96.22
		RC	4	78	57	5	95.22
		RC	5	100	86	6	94.22
6.68							
End of Borehole							
(GWL @ 4.92m - Nov. 10, 2020)							

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
1500 Merivale Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5066

REMARKS

HOLE NO. BH10-20

BORINGS BY CME-55 Low Clearance Drill **DATE** November 4, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
Asphaltic concrete 0.05		AU	1			0	94.73
FILL: Brown silty sand with crushed stone 0.38 / 0.71		SS	2	21	6	1	93.73
FILL: Brown silty sand, some gravel		SS	3	33	3	2	92.73
GLACIAL TILL: Brown silty sand with clay, trace gravel 2.90		SS	4	58	20	3	91.73
		SS	5	62	8	4	90.73
GLACIAL TILL: Grey silty clay, some sand and gravel		SS	6	79	9	5	89.73
		SS	7	67	21	6	88.73
6.10		SS	8	71	22		
End of Borehole							
(GWL @ 1.87m - Nov. 10, 2020)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

Monitoring Well Construction

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

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

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

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

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

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

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

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

SYMBOLS AND TERMS (continued)

PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

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

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

CONSOLIDATION TEST

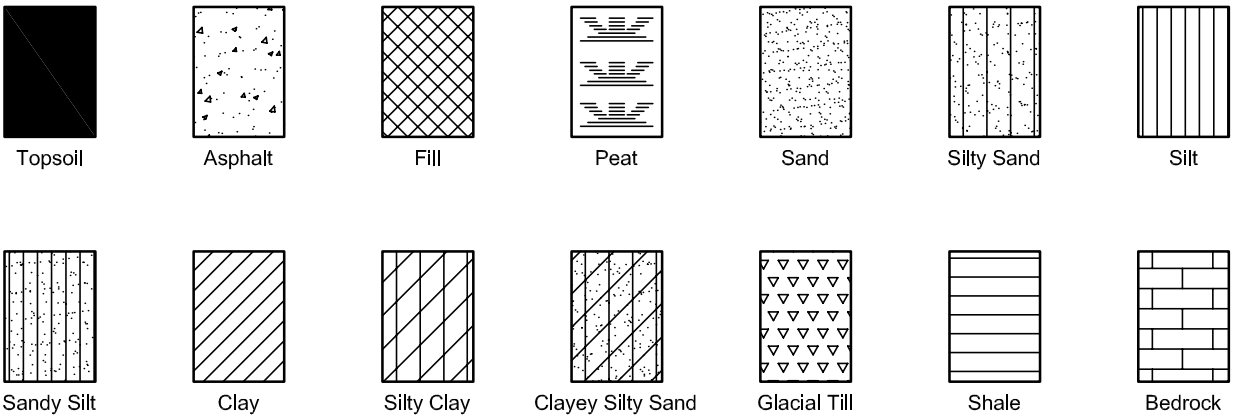
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

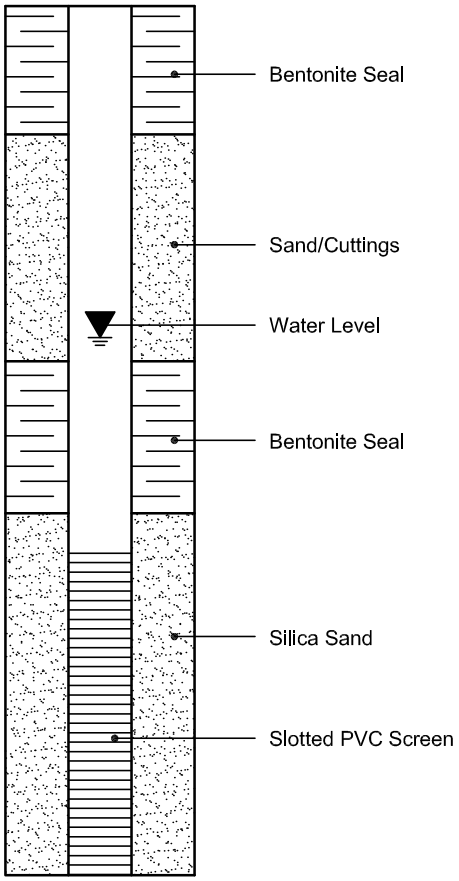
SYMBOLS AND TERMS (continued)

STRATA PLOT

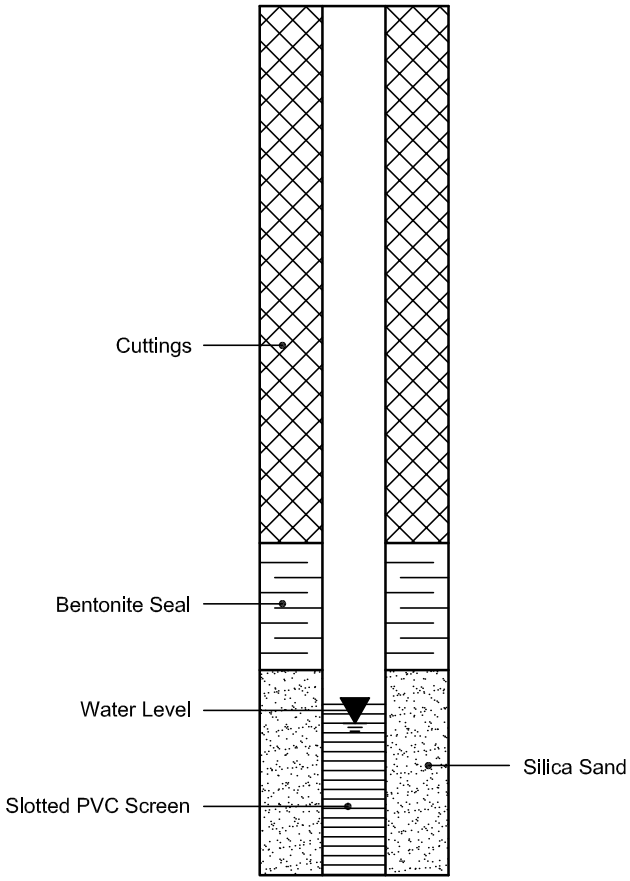


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mark D'Arcy

Client PO: 30861
Project: PE5066
Custody: 52580

Report Date: 13-Nov-2020
Order Date: 10-Nov-2020

Order #: 2046235

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

Paracel ID	Client ID
2046235-01	BH1-20-SS4
2046235-02	BH1-20-SS3
2046235-03	BH2-20-AU2
2046235-04	BH3-20-AU1
2046235-05	BH4-20-SS3
2046235-06	BH10-20-SS2/SS3
2046235-07	BH10-20-SS6

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 13-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 10-Nov-2020

Client PO: 30861

Project Description: PE5066

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	11-Nov-20	13-Nov-20
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	11-Nov-20	12-Nov-20
Mercury by CVAA	EPA 7471B - CVAA, digestion	12-Nov-20	12-Nov-20
PHC F1	CWS Tier 1 - P&T GC-FID	11-Nov-20	13-Nov-20
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	11-Nov-20	13-Nov-20
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	12-Nov-20	12-Nov-20
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	11-Nov-20	12-Nov-20
REG 153: VOCs by P&T GC/MS	EPA 8260 - P&T GC-MS	11-Nov-20	13-Nov-20
Solids, %	Gravimetric, calculation	11-Nov-20	12-Nov-20

Certificate of Analysis

Report Date: 13-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 10-Nov-2020

Client PO: 30861

Project Description: PE5066

	Client ID:	BH1-20-SS4	BH1-20-SS3	BH2-20-AU2	BH3-20-AU1
	Sample Date:	30-Oct-20 09:00	30-Oct-20 09:00	30-Oct-20 09:00	02-Nov-20 09:00
	Sample ID:	2046235-01	2046235-02	2046235-03	2046235-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	85.9	89.7	82.9	92.9
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	-	-
Arsenic	1.0 ug/g dry	3.8	5.0	-	-
Barium	1.0 ug/g dry	126	128	-	-
Beryllium	0.5 ug/g dry	0.6	0.7	-	-
Boron	5.0 ug/g dry	7.8	7.8	-	-
Cadmium	0.5 ug/g dry	<0.5	0.6	-	-
Chromium	5.0 ug/g dry	20.3	24.6	-	-
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	-	-
Cobalt	1.0 ug/g dry	6.6	8.0	-	-
Copper	5.0 ug/g dry	15.3	25.1	-	-
Lead	1.0 ug/g dry	23.9	37.1	-	-
Mercury	0.1 ug/g dry	<0.1	<0.1	-	-
Molybdenum	1.0 ug/g dry	<1.0	1.1	-	-
Nickel	5.0 ug/g dry	15.1	17.5	-	-
Selenium	1.0 ug/g dry	<1.0	<1.0	-	-
Silver	0.3 ug/g dry	<0.3	<0.3	-	-
Thallium	1.0 ug/g dry	<1.0	<1.0	-	-
Uranium	1.0 ug/g dry	<1.0	<1.0	-	-
Vanadium	10.0 ug/g dry	22.7	29.2	-	-
Zinc	20.0 ug/g dry	51.7	59.1	-	-
Volatiles					
Acetone	0.50 ug/g dry	-	-	-	<0.50
Benzene	0.02 ug/g dry	-	-	-	<0.02
Bromodichloromethane	0.05 ug/g dry	-	-	-	<0.05
Bromoform	0.05 ug/g dry	-	-	-	<0.05
Bromomethane	0.05 ug/g dry	-	-	-	<0.05
Carbon Tetrachloride	0.05 ug/g dry	-	-	-	<0.05
Chlorobenzene	0.05 ug/g dry	-	-	-	<0.05
Chloroform	0.05 ug/g dry	-	-	-	<0.05
Dibromochloromethane	0.05 ug/g dry	-	-	-	<0.05
Dichlorodifluoromethane	0.05 ug/g dry	-	-	-	<0.05
1,2-Dichlorobenzene	0.05 ug/g dry	-	-	-	<0.05
1,3-Dichlorobenzene	0.05 ug/g dry	-	-	-	<0.05

Certificate of Analysis

Report Date: 13-Nov-2020

Client: **Paterson Group Consulting Engineers**

Order Date: 10-Nov-2020

Client PO: **30861**

Project Description: PE5066

	Client ID:	BH1-20-SS4	BH1-20-SS3	BH2-20-AU2	BH3-20-AU1
	Sample Date:	30-Oct-20 09:00	30-Oct-20 09:00	30-Oct-20 09:00	02-Nov-20 09:00
	Sample ID:	2046235-01	2046235-02	2046235-03	2046235-04
	MDL/Units	Soil	Soil	Soil	Soil
1,4-Dichlorobenzene	0.05 ug/g dry	-	-	-	<0.05
1,1-Dichloroethane	0.05 ug/g dry	-	-	-	<0.05
1,2-Dichloroethane	0.05 ug/g dry	-	-	-	<0.05
1,1-Dichloroethylene	0.05 ug/g dry	-	-	-	<0.05
cis-1,2-Dichloroethylene	0.05 ug/g dry	-	-	-	<0.05
trans-1,2-Dichloroethylene	0.05 ug/g dry	-	-	-	<0.05
1,2-Dichloropropane	0.05 ug/g dry	-	-	-	<0.05
cis-1,3-Dichloropropylene	0.05 ug/g dry	-	-	-	<0.05
trans-1,3-Dichloropropylene	0.05 ug/g dry	-	-	-	<0.05
1,3-Dichloropropene, total	0.05 ug/g dry	-	-	-	<0.05
Ethylbenzene	0.05 ug/g dry	-	-	-	<0.05
Ethylene dibromide (dibromoethane, 1,2-)	0.05 ug/g dry	-	-	-	<0.05
Hexane	0.05 ug/g dry	-	-	-	<0.05
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	-	-	-	<0.50
Methyl Isobutyl Ketone	0.50 ug/g dry	-	-	-	<0.50
Methyl tert-butyl ether	0.05 ug/g dry	-	-	-	<0.05
Methylene Chloride	0.05 ug/g dry	-	-	-	<0.05
Styrene	0.05 ug/g dry	-	-	-	<0.05
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	-	-	-	<0.05
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	-	-	-	<0.05
Tetrachloroethylene	0.05 ug/g dry	-	-	-	<0.05
Toluene	0.05 ug/g dry	-	-	-	<0.05
1,1,1-Trichloroethane	0.05 ug/g dry	-	-	-	<0.05
1,1,2-Trichloroethane	0.05 ug/g dry	-	-	-	<0.05
Trichloroethylene	0.05 ug/g dry	-	-	-	<0.05
Trichlorofluoromethane	0.05 ug/g dry	-	-	-	<0.05
Vinyl chloride	0.02 ug/g dry	-	-	-	<0.02
m,p-Xylenes	0.05 ug/g dry	-	-	-	<0.05
o-Xylene	0.05 ug/g dry	-	-	-	<0.05
Xylenes, total	0.05 ug/g dry	-	-	-	<0.05
4-Bromofluorobenzene	Surrogate	-	-	-	98.5%
Dibromofluoromethane	Surrogate	-	-	-	105%
Toluene-d8	Surrogate	-	-	-	125%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	-	-	-	<7
F2 PHCs (C10-C16)	4 ug/g dry	-	-	<4	<4

Certificate of Analysis

Report Date: 13-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 10-Nov-2020

Client PO: 30861

Project Description: PE5066

	Client ID:	BH1-20-SS4	BH1-20-SS3	BH2-20-AU2	BH3-20-AU1
	Sample Date:	30-Oct-20 09:00	30-Oct-20 09:00	30-Oct-20 09:00	02-Nov-20 09:00
	Sample ID:	2046235-01	2046235-02	2046235-03	2046235-04
	MDL/Units	Soil	Soil	Soil	Soil
F3 PHCs (C16-C34)	8 ug/g dry	-	-	21	17
F4 PHCs (C34-C50)	6 ug/g dry	-	-	70	41
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Acenaphthylene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Anthracene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Benzo [a] anthracene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Benzo [a] pyrene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Benzo [b] fluoranthene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Benzo [g,h,i] perylene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Benzo [k] fluoranthene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Chrysene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Fluoranthene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Fluorene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
1-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
2-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Methylnaphthalene (1&2)	0.04 ug/g dry	<0.04	<0.04	<0.04	-
Naphthalene	0.01 ug/g dry	<0.01	<0.01	<0.01	-
Phenanthrene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Pyrene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
2-Fluorobiphenyl	Surrogate	75.2%	81.8%	73.7%	-
Terphenyl-d14	Surrogate	104%	111%	108%	-

Certificate of Analysis

Report Date: 13-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 10-Nov-2020

Client PO: 30861

Project Description: PE5066

	Client ID:	BH4-20-SS3	BH10-20-SS2/SS3	BH10-20-SS6	-
	Sample Date:	02-Nov-20 09:00	03-Nov-20 09:00	03-Nov-20 09:00	-
	Sample ID:	2046235-05	2046235-06	2046235-07	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	92.4	84.0	92.1	-
Metals					
Antimony	1.0 ug/g dry	<1.0	-	-	-
Arsenic	1.0 ug/g dry	4.3	-	-	-
Barium	1.0 ug/g dry	66.6	-	-	-
Beryllium	0.5 ug/g dry	<0.5	-	-	-
Boron	5.0 ug/g dry	5.5	-	-	-
Cadmium	0.5 ug/g dry	<0.5	-	-	-
Chromium	5.0 ug/g dry	15.6	-	-	-
Chromium (VI)	0.2 ug/g dry	<0.2	-	-	-
Cobalt	1.0 ug/g dry	5.8	-	-	-
Copper	5.0 ug/g dry	8.8	-	-	-
Lead	1.0 ug/g dry	5.9	-	-	-
Mercury	0.1 ug/g dry	<0.1	-	-	-
Molybdenum	1.0 ug/g dry	<1.0	-	-	-
Nickel	5.0 ug/g dry	11.1	-	-	-
Selenium	1.0 ug/g dry	<1.0	-	-	-
Silver	0.3 ug/g dry	<0.3	-	-	-
Thallium	1.0 ug/g dry	<1.0	-	-	-
Uranium	1.0 ug/g dry	<1.0	-	-	-
Vanadium	10.0 ug/g dry	21.6	-	-	-
Zinc	20.0 ug/g dry	23.5	-	-	-
Volatiles					
Benzene	0.02 ug/g dry	-	-	<0.02	-
Ethylbenzene	0.05 ug/g dry	-	-	<0.05	-
Toluene	0.05 ug/g dry	-	-	<0.05	-
m,p-Xylenes	0.05 ug/g dry	-	-	<0.05	-
o-Xylene	0.05 ug/g dry	-	-	<0.05	-
Xylenes, total	0.05 ug/g dry	-	-	<0.05	-
Toluene-d8	Surrogate	-	-	123%	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	-	-	<7	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	-
F3 PHCs (C16-C34)	8 ug/g dry	<8	27	<8	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	25	<6	-

Certificate of Analysis

Report Date: 13-Nov-2020

Client: **Paterson Group Consulting Engineers**

Order Date: 10-Nov-2020

Client PO: **30861**

Project Description: PE5066

	Client ID:	BH4-20-SS3	BH10-20-SS2/SS3	BH10-20-SS6	-
	Sample Date:	02-Nov-20 09:00	03-Nov-20 09:00	03-Nov-20 09:00	-
	Sample ID:	2046235-05	2046235-06	2046235-07	-
	MDL/Units	Soil	Soil	Soil	-
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	-	1.69	-	-
Acenaphthylene	0.02 ug/g dry	-	<0.02	-	-
Anthracene	0.02 ug/g dry	-	3.65	-	-
Benzo [a] anthracene	0.02 ug/g dry	-	3.45	-	-
Benzo [a] pyrene	0.02 ug/g dry	-	2.88	-	-
Benzo [b] fluoranthene	0.02 ug/g dry	-	2.51	-	-
Benzo [g,h,i] perylene	0.02 ug/g dry	-	1.17	-	-
Benzo [k] fluoranthene	0.02 ug/g dry	-	1.97	-	-
Chrysene	0.02 ug/g dry	-	3.19	-	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	-	0.44	-	-
Fluoranthene	0.02 ug/g dry	-	8.75	-	-
Fluorene	0.02 ug/g dry	-	2.02	-	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	-	1.27	-	-
1-Methylnaphthalene	0.02 ug/g dry	-	0.37	-	-
2-Methylnaphthalene	0.02 ug/g dry	-	0.67	-	-
Methylnaphthalene (1&2)	0.04 ug/g dry	-	1.04	-	-
Naphthalene	0.01 ug/g dry	-	1.88	-	-
Phenanthrene	0.02 ug/g dry	-	9.69	-	-
Pyrene	0.02 ug/g dry	-	6.36	-	-
2-Fluorobiphenyl	Surrogate	-	88.6%	-	-
Terphenyl-d14	Surrogate	-	127%	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	*0.860*		*ug/g*		*64.5*	*50-140*			
Surrogate: Terphenyl-d14	*1.41*		*ug/g*		*106*	*50-140*			
Volatiles									
Acetone	ND	0.50	ug/g						
Benzene	ND	0.02	ug/g						
Bromodichloromethane	ND	0.05	ug/g						
Bromoform	ND	0.05	ug/g						
Bromomethane	ND	0.05	ug/g						
Carbon Tetrachloride	ND	0.05	ug/g						
Chlorobenzene	ND	0.05	ug/g						
Chloroform	ND	0.05	ug/g						
Dibromochloromethane	ND	0.05	ug/g						
Dichlorodifluoromethane	ND	0.05	ug/g						

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
1,2-Dichlorobenzene	ND	0.05	ug/g						
1,3-Dichlorobenzene	ND	0.05	ug/g						
1,4-Dichlorobenzene	ND	0.05	ug/g						
1,1-Dichloroethane	ND	0.05	ug/g						
1,2-Dichloroethane	ND	0.05	ug/g						
1,1-Dichloroethylene	ND	0.05	ug/g						
cis-1,2-Dichloroethylene	ND	0.05	ug/g						
trans-1,2-Dichloroethylene	ND	0.05	ug/g						
1,2-Dichloropropane	ND	0.05	ug/g						
cis-1,3-Dichloropropylene	ND	0.05	ug/g						
trans-1,3-Dichloropropylene	ND	0.05	ug/g						
1,3-Dichloropropene, total	ND	0.05	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Ethylene dibromide (dibromoethane, 1,2	ND	0.05	ug/g						
Hexane	ND	0.05	ug/g						
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g						
Methyl Isobutyl Ketone	ND	0.50	ug/g						
Methyl tert-butyl ether	ND	0.05	ug/g						
Methylene Chloride	ND	0.05	ug/g						
Styrene	ND	0.05	ug/g						
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g						
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g						
Tetrachloroethylene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
1,1,1-Trichloroethane	ND	0.05	ug/g						
1,1,2-Trichloroethane	ND	0.05	ug/g						
Trichloroethylene	ND	0.05	ug/g						
Trichlorofluoromethane	ND	0.05	ug/g						
Vinyl chloride	ND	0.02	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: 4-Bromofluorobenzene	*8.08*		*ug/g*		*101*	*50-140*			
Surrogate: Dibromofluoromethane	*8.88*		*ug/g*		*111*	*50-140*			
Surrogate: Toluene-d8	*9.14*		*ug/g*		*114*	*50-140*			
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*9.14*		*ug/g*		*114*	*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			NC	40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND			NC	30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND			NC	30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND			NC	30	
Metals									
Antimony	ND	1.0	ug/g dry	ND			NC	30	
Arsenic	6.0	1.0	ug/g dry	6.4			7.2	30	
Barium	62.4	1.0	ug/g dry	66.5			6.3	30	
Beryllium	ND	0.5	ug/g dry	ND			NC	30	
Boron	ND	5.0	ug/g dry	ND			NC	30	
Cadmium	ND	0.5	ug/g dry	ND			NC	30	
Chromium (VI)	ND	0.2	ug/g dry	ND			NC	35	
Chromium	12.1	5.0	ug/g dry	12.3			1.6	30	
Cobalt	6.0	1.0	ug/g dry	6.1			1.8	30	
Copper	26.2	5.0	ug/g dry	26.7			1.9	30	
Lead	24.8	1.0	ug/g dry	24.9			0.2	30	
Mercury	0.104	0.1	ug/g dry	0.117			11.4	30	
Molybdenum	ND	1.0	ug/g dry	ND			NC	30	
Nickel	11.2	5.0	ug/g dry	11.7			4.7	30	
Selenium	ND	1.0	ug/g dry	ND			NC	30	
Silver	ND	0.3	ug/g dry	ND			NC	30	
Thallium	ND	1.0	ug/g dry	ND			NC	30	
Uranium	ND	1.0	ug/g dry	ND			NC	30	
Vanadium	29.3	10.0	ug/g dry	28.4			3.1	30	
Zinc	79.3	20.0	ug/g dry	78.4			1.1	30	
Physical Characteristics									
% Solids	91.5	0.1	% by Wt.	91.2			0.3	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	ND			NC	40	
Acenaphthylene	ND	0.02	ug/g dry	ND			NC	40	
Anthracene	ND	0.02	ug/g dry	ND			NC	40	
Benzo [a] anthracene	ND	0.02	ug/g dry	ND			NC	40	
Benzo [a] pyrene	ND	0.02	ug/g dry	ND			NC	40	
Benzo [b] fluoranthene	ND	0.02	ug/g dry	ND			NC	40	
Benzo [g,h,i] perylene	ND	0.02	ug/g dry	ND			NC	40	
Benzo [k] fluoranthene	ND	0.02	ug/g dry	ND			NC	40	
Chrysene	ND	0.02	ug/g dry	ND			NC	40	
Dibenzo [a,h] anthracene	ND	0.02	ug/g dry	ND			NC	40	
Fluoranthene	ND	0.02	ug/g dry	ND			NC	40	
Fluorene	ND	0.02	ug/g dry	ND			NC	40	
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g dry	ND			NC	40	
1-Methylnaphthalene	ND	0.02	ug/g dry	ND			NC	40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND			NC	40	
Naphthalene	ND	0.01	ug/g dry	ND			NC	40	
Phenanthrene	ND	0.02	ug/g dry	ND			NC	40	
Pyrene	ND	0.02	ug/g dry	ND			NC	40	
Surrogate: 2-Fluorobiphenyl	*1.01*		*ug/g dry*		*70.1*	*50-140*			
Surrogate: Terphenyl-d14	*1.51*		*ug/g dry*		*105*	*50-140*			
Volatiles									
Acetone	ND	0.50	ug/g dry	ND			NC	50	
Benzene	ND	0.02	ug/g dry	ND			NC	50	
Bromodichloromethane	ND	0.05	ug/g dry	ND			NC	50	
Bromoform	ND	0.05	ug/g dry	ND			NC	50	
Bromomethane	ND	0.05	ug/g dry	ND			NC	50	
Carbon Tetrachloride	ND	0.05	ug/g dry	ND			NC	50	
Chlorobenzene	ND	0.05	ug/g dry	ND			NC	50	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Chloroform	ND	0.05	ug/g dry	ND			NC	50	
Dibromochloromethane	ND	0.05	ug/g dry	ND			NC	50	
Dichlorodifluoromethane	ND	0.05	ug/g dry	ND			NC	50	
1,2-Dichlorobenzene	ND	0.05	ug/g dry	ND			NC	50	
1,3-Dichlorobenzene	ND	0.05	ug/g dry	ND			NC	50	
1,4-Dichlorobenzene	ND	0.05	ug/g dry	ND			NC	50	
1,1-Dichloroethane	ND	0.05	ug/g dry	ND			NC	50	
1,2-Dichloroethane	ND	0.05	ug/g dry	ND			NC	50	
1,1-Dichloroethylene	ND	0.05	ug/g dry	ND			NC	50	
cis-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND			NC	50	
trans-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND			NC	50	
1,2-Dichloropropane	ND	0.05	ug/g dry	ND			NC	50	
cis-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND			NC	50	
trans-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND			NC	50	
Ethylbenzene	ND	0.05	ug/g dry	ND			NC	50	
Ethylene dibromide (dibromoethane, 1,2	ND	0.05	ug/g dry	ND			NC	50	
Hexane	ND	0.05	ug/g dry	ND			NC	50	
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g dry	ND			NC	50	
Methyl Isobutyl Ketone	ND	0.50	ug/g dry	ND			NC	50	
Methyl tert-butyl ether	ND	0.05	ug/g dry	ND			NC	50	
Methylene Chloride	ND	0.05	ug/g dry	ND			NC	50	
Styrene	ND	0.05	ug/g dry	ND			NC	50	
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g dry	ND			NC	50	
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g dry	ND			NC	50	
Tetrachloroethylene	ND	0.05	ug/g dry	ND			NC	50	
Toluene	ND	0.05	ug/g dry	ND			NC	50	
1,1,1-Trichloroethane	ND	0.05	ug/g dry	ND			NC	50	
1,1,2-Trichloroethane	ND	0.05	ug/g dry	ND			NC	50	
Trichloroethylene	ND	0.05	ug/g dry	ND			NC	50	
Trichlorofluoromethane	ND	0.05	ug/g dry	ND			NC	50	
Vinyl chloride	ND	0.02	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: 4-Bromofluorobenzene	*9.04*		*ug/g dry*		*98.7*	*50-140*			
Surrogate: Dibromofluoromethane	*9.24*		*ug/g dry*		*101*	*50-140*			
Surrogate: Toluene-d8	*11.4*		*ug/g dry*		*125*	*50-140*			
Benzene	ND	0.02	ug/g dry	ND			NC	50	
Ethylbenzene	ND	0.05	ug/g dry	ND			NC	50	
Toluene	ND	0.05	ug/g dry	ND			NC	50	
m,p-Xylenes	ND	0.05	ug/g dry	ND			NC	50	
o-Xylene	ND	0.05	ug/g dry	ND			NC	50	
Surrogate: Toluene-d8	*11.4*		*ug/g dry*		*125*	*50-140*			

Certificate of Analysis

Report Date: 13-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 10-Nov-2020

Client PO: 30861

Project Description: PE5066

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	210	7	ug/g	ND	105	80-120			
F2 PHCs (C10-C16)	93	4	ug/g	ND	91.3	60-140			
F3 PHCs (C16-C34)	226	8	ug/g	ND	90.6	60-140			
F4 PHCs (C34-C50)	140	6	ug/g	ND	88.9	60-140			
Metals									
Antimony	49.9	1.0	ug/g	ND	99.8	70-130			
Arsenic	54.9	1.0	ug/g	2.6	105	70-130			
Barium	75.7	1.0	ug/g	26.6	98.2	70-130			
Beryllium	52.3	0.5	ug/g	ND	104	70-130			
Boron	45.6	5.0	ug/g	ND	88.1	70-130			
Cadmium	50.3	0.5	ug/g	ND	100	70-130			
Chromium (VI)	0.1	0.2	ug/g	ND	72.5	70-130			
Chromium	57.1	5.0	ug/g	ND	104	70-130			
Cobalt	52.7	1.0	ug/g	2.4	100	70-130			
Copper	58.9	5.0	ug/g	10.7	96.5	70-130			
Lead	58.8	1.0	ug/g	9.9	97.8	70-130			
Mercury	1.64	0.1	ug/g	0.117	102	70-130			
Molybdenum	49.8	1.0	ug/g	ND	99.1	70-130			
Nickel	54.1	5.0	ug/g	ND	98.8	70-130			
Selenium	48.3	1.0	ug/g	ND	96.3	70-130			
Silver	47.0	0.3	ug/g	ND	93.9	70-130			
Thallium	50.1	1.0	ug/g	ND	100	70-130			
Uranium	52.0	1.0	ug/g	ND	104	70-130			
Vanadium	63.8	10.0	ug/g	11.4	105	70-130			
Zinc	81.3	20.0	ug/g	31.4	99.9	70-130			
Semi-Volatiles									
Acenaphthene	0.146	0.02	ug/g	ND	80.8	50-140			
Acenaphthylene	0.132	0.02	ug/g	ND	73.0	50-140			
Anthracene	0.149	0.02	ug/g	ND	82.7	50-140			
Benzo [a] anthracene	0.113	0.02	ug/g	ND	62.8	50-140			
Benzo [a] pyrene	0.128	0.02	ug/g	ND	70.7	50-140			
Benzo [b] fluoranthene	0.148	0.02	ug/g	ND	82.1	50-140			
Benzo [g,h,i] perylene	0.133	0.02	ug/g	ND	73.6	50-140			
Benzo [k] fluoranthene	0.157	0.02	ug/g	ND	86.9	50-140			
Chrysene	0.134	0.02	ug/g	ND	74.2	50-140			
Dibenzo [a,h] anthracene	0.129	0.02	ug/g	ND	71.2	50-140			
Fluoranthene	0.166	0.02	ug/g	ND	91.8	50-140			
Fluorene	0.124	0.02	ug/g	ND	68.7	50-140			
Indeno [1,2,3-cd] pyrene	0.135	0.02	ug/g	ND	74.9	50-140			
1-Methylnaphthalene	0.134	0.02	ug/g	ND	74.4	50-140			
2-Methylnaphthalene	0.154	0.02	ug/g	ND	85.0	50-140			
Naphthalene	0.190	0.01	ug/g	ND	105	50-140			
Phenanthrene	0.143	0.02	ug/g	ND	79.0	50-140			
Pyrene	0.168	0.02	ug/g	ND	92.9	50-140			
Surrogate: 2-Fluorobiphenyl	*1.41*		*ug/g*		*97.5*	*50-140*			
Surrogate: Terphenyl-d14	*1.47*		*ug/g*		*102*	*50-140*			
Volatiles									
Acetone	11.6	0.50	ug/g	ND	116	50-140			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Benzene	3.19	0.02	ug/g	ND	79.6	60-130			
Bromodichloromethane	2.82	0.05	ug/g	ND	70.6	60-130			
Bromoform	4.82	0.05	ug/g	ND	120	60-130			
Bromomethane	4.17	0.05	ug/g	ND	104	50-140			
Carbon Tetrachloride	4.46	0.05	ug/g	ND	111	60-130			
Chlorobenzene	3.86	0.05	ug/g	ND	96.5	60-130			
Chloroform	3.69	0.05	ug/g	ND	92.2	60-130			
Dibromochloromethane	4.58	0.05	ug/g	ND	115	60-130			
Dichlorodifluoromethane	4.72	0.05	ug/g	ND	118	50-140			
1,2-Dichlorobenzene	3.68	0.05	ug/g	ND	92.0	60-130			
1,3-Dichlorobenzene	3.70	0.05	ug/g	ND	92.4	60-130			
1,4-Dichlorobenzene	3.71	0.05	ug/g	ND	92.8	60-130			
1,1-Dichloroethane	3.34	0.05	ug/g	ND	83.5	60-130			
1,2-Dichloroethane	4.05	0.05	ug/g	ND	101	60-130			
1,1-Dichloroethylene	3.10	0.05	ug/g	ND	77.5	60-130			
cis-1,2-Dichloroethylene	3.22	0.05	ug/g	ND	80.4	60-130			
trans-1,2-Dichloroethylene	3.16	0.05	ug/g	ND	79.0	60-130			
1,2-Dichloropropane	3.24	0.05	ug/g	ND	81.0	60-130			
cis-1,3-Dichloropropylene	3.80	0.05	ug/g	ND	94.9	60-130			
trans-1,3-Dichloropropylene	4.62	0.05	ug/g	ND	115	60-130			
Ethylbenzene	3.70	0.05	ug/g	ND	92.5	60-130			
Ethylene dibromide (dibromoethane, 1,2-	3.78	0.05	ug/g	ND	94.6	60-130			
Hexane	4.07	0.05	ug/g	ND	102	60-130			
Methyl Ethyl Ketone (2-Butanone)	10.9	0.50	ug/g	ND	109	50-140			
Methyl Isobutyl Ketone	7.79	0.50	ug/g	ND	77.9	50-140			
Methyl tert-butyl ether	8.21	0.05	ug/g	ND	82.1	50-140			
Methylene Chloride	3.79	0.05	ug/g	ND	94.7	60-130			
Styrene	3.97	0.05	ug/g	ND	99.3	60-130			
1,1,1,2-Tetrachloroethane	4.41	0.05	ug/g	ND	110	60-130			
1,1,2,2-Tetrachloroethane	4.09	0.05	ug/g	ND	102	60-130			
Tetrachloroethylene	3.80	0.05	ug/g	ND	94.9	60-130			
Toluene	3.67	0.05	ug/g	ND	91.7	60-130			
1,1,1-Trichloroethane	3.97	0.05	ug/g	ND	99.1	60-130			
1,1,2-Trichloroethane	2.99	0.05	ug/g	ND	74.7	60-130			
Trichloroethylene	3.61	0.05	ug/g	ND	90.2	60-130			
Trichlorofluoromethane	4.41	0.05	ug/g	ND	110	50-140			
Vinyl chloride	4.58	0.02	ug/g	ND	114	50-140			
m,p-Xylenes	7.64	0.05	ug/g	ND	95.5	60-130			
o-Xylene	4.03	0.05	ug/g	ND	101	60-130			
Surrogate: 4-Bromofluorobenzene	*7.59*		*ug/g*		*94.8*	*50-140*			
Surrogate: Dibromofluoromethane	*8.86*		*ug/g*		*111*	*50-140*			
Surrogate: Toluene-d8	*8.04*		*ug/g*		*101*	*50-140*			
Benzene	3.19	0.02	ug/g	ND	79.6	60-130			
Ethylbenzene	3.70	0.05	ug/g	ND	92.5	60-130			
Toluene	3.67	0.05	ug/g	ND	91.7	60-130			
m,p-Xylenes	7.64	0.05	ug/g	ND	95.5	60-130			
o-Xylene	4.03	0.05	ug/g	ND	101	60-130			
Surrogate: Toluene-d8	*8.04*		*ug/g*		*101*	*50-140*			

Qualifier Notes:

Login Qualifiers :

Container(s) - Labeled improperly/insufficient information - date labelled as Nov 3rd

Applies to samples: BH4-20-SS3

Container(s) - Labeled improperly/insufficient information - date labelled as Nov 4th

Applies to samples: BH10-20-SS2/SS3

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: 2046235

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2046235	№ 52580

Client Name: Paterson	Project Ref: PE 5066
Contact Name: Mark D'Arcy	Quote #:
Address: 154 Colonnade	PO #: 30361
Telephone: 613 226 7381	E-mail: marcy@patersongroup.ca

Page __ of __

Turnaround Time

☐ 1 day ☑ 3 day

☐ 2 day ☑ Regular

Date Required: _____

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

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

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	Metals + Hg + CrVI	PAHs	BTEX + PHCs	VOCs + PHCs	F2-F4
1	~~BH1-20-AU1~~	S		2							
2	BH1-20-553			1	Oct 30		✓	✓			
3	BH2-20-AU2			1	Oct 30			✓			✓
4	BH3-20-AU1			2	Nov 2					✓	
5	BH4-20-553			1	Nov 2		✓				✓
6	BH10-20-552/553			2	Nov 3			✓	.		✓
7	BH10-20-556			1	Nov 3				✓		
8	BH1-20-554	S		1	Oct 30		✓	✓			
9											
10											

Comments: Please report in order

Method of Delivery: PARACEL COURIER

Relinquished By (Sign): Grant	Received By Driver/Depot: M. Trevie	Received at Lab: BFan	Verified By: BFan
Relinquished By (Print): Grant Paterson	Date/Time: 10/11/20 4:14	Date/Time: NOV 10,20 16:50	Date/Time: NOV 10,2020 17:29
Date/Time: NOV 10 2020	Temperature: °C PH.	Temperature: 19.1 °C	pH Verified: ☐ By:

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mark D'Arcy

Client PO: 31213
Project: PE5066
Custody: 54890

Report Date: 13-Nov-2020
Order Date: 10-Nov-2020

Order #: 2046237

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

Paracel ID	Client ID
2046237-01	BH1-20-GW1
2046237-02	BH3-20-GW1
2046237-03	BH4-20-GW1
2046237-04	BH5-20-GW1
2046237-05	BH6-20-GW1
2046237-06	BH7-20-GW1
2046237-07	BH8-20-GW1
2046237-08	BH9-20-GW1

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 13-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 10-Nov-2020

Client PO: 31213

Project Description: PE5066

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHC F1	CWS Tier 1 - P&T GC-FID	11-Nov-20	11-Nov-20
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	12-Nov-20	13-Nov-20
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	11-Nov-20	12-Nov-20

Certificate of Analysis

Report Date: 13-Nov-2020

Client: **Paterson Group Consulting Engineers**

Order Date: 10-Nov-2020

Client PO: **31213**

Project Description: PE5066

	Client ID:	BH1-20-GW1	BH3-20-GW1	BH4-20-GW1	BH5-20-GW1
	Sample Date:	06-Nov-20 15:00	06-Nov-20 16:15	10-Nov-20 09:00	09-Nov-20 14:30
	Sample ID:	2046237-01	2046237-02	2046237-03	2046237-04
	MDL/Units	Water	Water	Water	Water
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Chloroform	0.5 ug/L	2.6	1.2	1.6	0.9
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	1.4	<0.5	<0.5
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylene dibromide (dibromoethane, 1,2-)	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	<2.0
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5

Certificate of Analysis

Report Date: 13-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 10-Nov-2020

Client PO: 31213

Project Description: PE5066

	Client ID:	BH1-20-GW1	BH3-20-GW1	BH4-20-GW1	BH5-20-GW1
	Sample Date:	06-Nov-20 15:00	06-Nov-20 16:15	10-Nov-20 09:00	09-Nov-20 14:30
	Sample ID:	2046237-01	2046237-02	2046237-03	2046237-04
	MDL/Units	Water	Water	Water	Water
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
4-Bromofluorobenzene	Surrogate	109%	102%	108%	105%
Dibromofluoromethane	Surrogate	110%	113%	111%	105%
Toluene-d8	Surrogate	118%	119%	119%	117%
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	-	-	-	<25
F2 PHCs (C10-C16)	100 ug/L	-	-	-	<100
F3 PHCs (C16-C34)	100 ug/L	-	-	-	<100
F4 PHCs (C34-C50)	100 ug/L	-	-	-	<100

Certificate of Analysis

Report Date: 13-Nov-2020

Client: **Paterson Group Consulting Engineers**

Order Date: 10-Nov-2020

Client PO: **31213**

Project Description: PE5066

	Client ID:	BH6-20-GW1	BH7-20-GW1	BH8-20-GW1	BH9-20-GW1
	Sample Date:	09-Nov-20 15:00	09-Nov-20 15:35	09-Nov-20 16:30	10-Nov-20 10:00
	Sample ID:	2046237-05	2046237-06	2046237-07	2046237-08
	MDL/Units	Water	Water	Water	Water
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Benzene	0.5 ug/L	<0.5	<0.5	8.8	<0.5
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Chloroform	0.5 ug/L	2.2	1.1	0.9	0.9
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5 ug/L	<0.5	<0.5	19.2	3.8
Ethylene dibromide (dibromoethane, 1	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Hexane	1.0 ug/L	<1.0	<1.0	50.6	<1.0
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	<2.0
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Tetrachloroethylene	0.5 ug/L	<0.5	0.5	<0.5	<0.5
Toluene	0.5 ug/L	<0.5	<0.5	7.3	0.6

Certificate of Analysis

Report Date: 13-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 10-Nov-2020

Client PO: 31213

Project Description: PE5066

	Client ID:	BH6-20-GW1	BH7-20-GW1	BH8-20-GW1	BH9-20-GW1
	Sample Date:	09-Nov-20 15:00	09-Nov-20 15:35	09-Nov-20 16:30	10-Nov-20 10:00
	Sample ID:	2046237-05	2046237-06	2046237-07	2046237-08
	MDL/Units	Water	Water	Water	Water
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane	1.0 ug/L	3.4	1.6	<1.0	<1.0
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	45.2	2.7
o-Xylene	0.5 ug/L	<0.5	<0.5	2.5	<0.5
Xylenes, total	0.5 ug/L	<0.5	<0.5	47.7	2.7
4-Bromofluorobenzene	Surrogate	107%	110%	105%	108%
Dibromofluoromethane	Surrogate	111%	111%	103%	104%
Toluene-d8	Surrogate	119%	118%	118%	118%
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	-	-	-	53
F2 PHCs (C10-C16)	100 ug/L	-	-	-	<100
F3 PHCs (C16-C34)	100 ug/L	-	-	-	<100
F4 PHCs (C34-C50)	100 ug/L	-	-	-	<100

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane, 1,2	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*84.0*		*ug/L*		*105*	*50-140*			
Surrogate: Dibromofluoromethane	*88.7*		*ug/L*		*111*	*50-140*			
Surrogate: Toluene-d8	*97.6*		*ug/L*		*122*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND			NC	30	
Volatiles									
Acetone	ND	5.0	ug/L	ND			NC	30	
Benzene	ND	0.5	ug/L	ND			NC	30	
Bromodichloromethane	ND	0.5	ug/L	ND			NC	30	
Bromoform	ND	0.5	ug/L	ND			NC	30	
Bromomethane	ND	0.5	ug/L	ND			NC	30	
Carbon Tetrachloride	ND	0.2	ug/L	ND			NC	30	
Chlorobenzene	ND	0.5	ug/L	ND			NC	30	
Chloroform	ND	0.5	ug/L	ND			NC	30	
Dibromochloromethane	ND	0.5	ug/L	ND			NC	30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND			NC	30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,1-Dichloroethane	ND	0.5	ug/L	ND			NC	30	
1,2-Dichloroethane	ND	0.5	ug/L	ND			NC	30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
1,2-Dichloropropane	ND	0.5	ug/L	ND			NC	30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND			NC	30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND			NC	30	
Ethylbenzene	ND	0.5	ug/L	ND			NC	30	
Ethylene dibromide (dibromoethane, 1,2-	ND	0.2	ug/L	ND			NC	30	
Hexane	ND	1.0	ug/L	ND			NC	30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND			NC	30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND			NC	30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND			NC	30	
Methylene Chloride	ND	5.0	ug/L	ND			NC	30	
Styrene	ND	0.5	ug/L	ND			NC	30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND			NC	30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND			NC	30	
Tetrachloroethylene	ND	0.5	ug/L	ND			NC	30	
Toluene	ND	0.5	ug/L	ND			NC	30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND			NC	30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND			NC	30	
Trichloroethylene	ND	0.5	ug/L	ND			NC	30	
Trichlorofluoromethane	ND	1.0	ug/L	ND			NC	30	
Vinyl chloride	ND	0.5	ug/L	ND			NC	30	
m,p-Xylenes	ND	0.5	ug/L	ND			NC	30	
o-Xylene	ND	0.5	ug/L	ND			NC	30	
Surrogate: 4-Bromofluorobenzene	*86.1*		*ug/L*		*108*	*50-140*			
Surrogate: Dibromofluoromethane	*88.5*		*ug/L*		*111*	*50-140*			
Surrogate: Toluene-d8	*94.8*		*ug/L*		*118*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1980	25	ug/L	ND	99.1	68-117			
F2 PHCs (C10-C16)	1510	100	ug/L	ND	94.6	60-140			
F3 PHCs (C16-C34)	3500	100	ug/L	ND	89.4	60-140			
F4 PHCs (C34-C50)	2260	100	ug/L	ND	91.1	60-140			
Volatiles									
Acetone	123	5.0	ug/L	ND	123	50-140			
Benzene	42.7	0.5	ug/L	ND	107	60-130			
Bromodichloromethane	41.5	0.5	ug/L	ND	104	60-130			
Bromoform	44.9	0.5	ug/L	ND	112	60-130			
Bromomethane	45.9	0.5	ug/L	ND	115	50-140			
Carbon Tetrachloride	39.7	0.2	ug/L	ND	99.3	60-130			
Chlorobenzene	43.3	0.5	ug/L	ND	108	60-130			
Chloroform	42.3	0.5	ug/L	ND	106	60-130			
Dibromochloromethane	46.2	0.5	ug/L	ND	115	60-130			
Dichlorodifluoromethane	40.7	1.0	ug/L	ND	102	50-140			
1,2-Dichlorobenzene	46.9	0.5	ug/L	ND	117	60-130			
1,3-Dichlorobenzene	46.5	0.5	ug/L	ND	116	60-130			
1,4-Dichlorobenzene	44.1	0.5	ug/L	ND	110	60-130			
1,1-Dichloroethane	43.7	0.5	ug/L	ND	109	60-130			
1,2-Dichloroethane	37.2	0.5	ug/L	ND	92.9	60-130			
1,1-Dichloroethylene	43.2	0.5	ug/L	ND	108	60-130			
cis-1,2-Dichloroethylene	42.0	0.5	ug/L	ND	105	60-130			
trans-1,2-Dichloroethylene	45.9	0.5	ug/L	ND	115	60-130			
1,2-Dichloropropane	45.1	0.5	ug/L	ND	113	60-130			
cis-1,3-Dichloropropylene	44.1	0.5	ug/L	ND	110	60-130			
trans-1,3-Dichloropropylene	41.1	0.5	ug/L	ND	103	60-130			
Ethylbenzene	43.2	0.5	ug/L	ND	108	60-130			
Ethylene dibromide (dibromoethane, 1,2-	44.3	0.2	ug/L	ND	111	60-130			
Hexane	48.6	1.0	ug/L	ND	121	60-130			
Methyl Ethyl Ketone (2-Butanone)	127	5.0	ug/L	ND	127	50-140			
Methyl Isobutyl Ketone	116	5.0	ug/L	ND	116	50-140			
Methyl tert-butyl ether	107	2.0	ug/L	ND	107	50-140			
Methylene Chloride	43.4	5.0	ug/L	ND	109	60-130			
Styrene	42.0	0.5	ug/L	ND	105	60-130			
1,1,1,2-Tetrachloroethane	42.0	0.5	ug/L	ND	105	60-130			
1,1,2,2-Tetrachloroethane	48.7	0.5	ug/L	ND	122	60-130			
Tetrachloroethylene	45.2	0.5	ug/L	ND	113	60-130			
Toluene	46.1	0.5	ug/L	ND	115	60-130			
1,1,1-Trichloroethane	39.4	0.5	ug/L	ND	98.4	60-130			
1,1,2-Trichloroethane	43.9	0.5	ug/L	ND	110	60-130			
Trichloroethylene	40.6	0.5	ug/L	ND	102	60-130			
Trichlorofluoromethane	41.3	1.0	ug/L	ND	103	60-130			
Vinyl chloride	40.1	0.5	ug/L	ND	100	50-140			
m,p-Xylenes	87.9	0.5	ug/L	ND	110	60-130			
o-Xylene	42.7	0.5	ug/L	ND	107	60-130			
Surrogate: 4-Bromofluorobenzene	*81.9*		*ug/L*		*102*	*50-140*			
Surrogate: Dibromofluoromethane	*84.0*		*ug/L*		*105*	*50-140*			
Surrogate: Toluene-d8	*84.8*		*ug/L*		*106*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

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

PARACEL LABORATORIES LTD

Paracel ID: 2046237

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2046237	№ 54890

Client Name: PATERSON	Project Ref: PE5066	Page 1 of 1
Contact Name: MARK D'ARCY	Quote #:	Turnaround Time
Address: 154 COLONNADE Rd. S. OTTAWA, ONT.	PO #: 31213	☐ 1 day ☐ 3 day ☒ 2 day ☐ Regular
Telephone: 613 226 7381	E-mail: MDARCY@PATERSONGROUP.CA	Date Required:

Regulation 153/04	Other Regulation
☐ Table 1 ☐ Res/Park ☐ Med/Fine	☐ REG 558 ☐ PWQO
☐ Table 2 ☐ Ind/Comm ☐ Coarse	☐ CCME ☐ MISA
☐ Table 3 ☐ Agri/Other	☐ SU - Sani ☐ SU - Storm
☑ Table 7	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: VOC's	PHC's
1	BH1-20-GW1	GW	1	2	Nov.6/20	3:00p	✓	
2	BH3-20-GW1		1	2	Nov.6/20	4:15p	✓	
3	BH4-20-GW1		1	2	Nov 9/20	9:00a	✓	
4	BH5-20-GW1		1	3	Nov 9/20	2:30p	✓	✓
5	BH6-20-GW1		1	2	Nov 9/20	3:00p	✓	
6	BH7-20-GW1		1	2	Nov 9/20	3:35p	✓	
7	BH8-20-GW1		1	2	Nov 9/20	4:30p	✓	
8	BH9-20-GW1		1	3	Nov 10/20	10:00A	✓	✓
9								
10								

Comments:

Method of Delivery: Drop Box

Relinquished By (Sign):	Received By Driver/Depot:	Received at Lab:	Verified By:
Relinquished By (Print): Dominic LANDRY	Date/Time:	Date/Time: Nov 10,20 18:30	Date/Time: Nov 10, 2020 18:43
Date/Time: Nov. 10/2020	Temperature: °C	Temperature: 14.5 °C	pH Verified: ☐ By:

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mark D'Arcy

Client PO: 31217
Project: PE5066
Custody: 54891

Report Date: 13-Nov-2020
Order Date: 11-Nov-2020

Order #: 2046301

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

Paracel ID	Client ID
2046301-01	BH2-20-GW1
2046301-02	BH10-20-GW1

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 13-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 11-Nov-2020

Client PO: 31217

Project Description: PE5066

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHC F1	CWS Tier 1 - P&T GC-FID	12-Nov-20	13-Nov-20
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	12-Nov-20	13-Nov-20
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	12-Nov-20	13-Nov-20

Certificate of Analysis

Report Date: 13-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 11-Nov-2020

Client PO: 31217

Project Description: PE5066

	Client ID:	BH2-20-GW1	BH10-20-GW1	-	-
	Sample Date:	11-Nov-20 00:00	11-Nov-20 00:00	-	-
	Sample ID:	2046301-01	2046301-02	-	-
	MDL/Units	Water	Water	-	-
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	-	-
Benzene	0.5 ug/L	<0.5	<0.5	-	-
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	-	-
Bromoform	0.5 ug/L	<0.5	<0.5	-	-
Bromomethane	0.5 ug/L	<0.5	<0.5	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	-	-
Chlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
Chloroform	0.5 ug/L	<0.5	<0.5	-	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	-	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	-	-
Ethylene dibromide (dibromoethane, 1,2-)	0.2 ug/L	<0.2	<0.2	-	-
Hexane	1.0 ug/L	<1.0	<1.0	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	-	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	-	-
Styrene	0.5 ug/L	<0.5	<0.5	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	-	-
Toluene	0.5 ug/L	<0.5	<0.5	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	-

Certificate of Analysis

Report Date: 13-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 11-Nov-2020

Client PO: 31217

Project Description: PE5066

	Client ID:	BH2-20-GW1	BH10-20-GW1	-	-
	Sample Date:	11-Nov-20 00:00	11-Nov-20 00:00	-	-
	Sample ID:	2046301-01	2046301-02	-	-
	MDL/Units	Water	Water	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	-
Trichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
Trichlorofluoromethane	1.0 ug/L	48.6	<1.0	-	-
Vinyl chloride	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	-	-
4-Bromofluorobenzene	Surrogate	106%	107%	-	-
Dibromofluoromethane	Surrogate	111%	111%	-	-
Toluene-d8	Surrogate	112%	113%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	-	-
F2 PHCs (C10-C16)	100 ug/L	<100	<100	-	-
F3 PHCs (C16-C34)	100 ug/L	<100	<100	-	-
F4 PHCs (C34-C50)	100 ug/L	<100	<100	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane, 1,2	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*84.2*		*ug/L*		*105*	*50-140*			
Surrogate: Dibromofluoromethane	*88.3*		*ug/L*		*110*	*50-140*			
Surrogate: Toluene-d8	*91.4*		*ug/L*		*114*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND			NC	30	
Volatiles									
Acetone	ND	5.0	ug/L	ND			NC	30	
Benzene	ND	0.5	ug/L	ND			NC	30	
Bromodichloromethane	ND	0.5	ug/L	ND			NC	30	
Bromoform	ND	0.5	ug/L	ND			NC	30	
Bromomethane	ND	0.5	ug/L	ND			NC	30	
Carbon Tetrachloride	ND	0.2	ug/L	ND			NC	30	
Chlorobenzene	ND	0.5	ug/L	ND			NC	30	
Chloroform	ND	0.5	ug/L	ND			NC	30	
Dibromochloromethane	ND	0.5	ug/L	ND			NC	30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND			NC	30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,1-Dichloroethane	ND	0.5	ug/L	ND			NC	30	
1,2-Dichloroethane	ND	0.5	ug/L	ND			NC	30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
1,2-Dichloropropane	ND	0.5	ug/L	ND			NC	30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND			NC	30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND			NC	30	
Ethylbenzene	ND	0.5	ug/L	ND			NC	30	
Ethylene dibromide (dibromoethane, 1,2-	ND	0.2	ug/L	ND			NC	30	
Hexane	ND	1.0	ug/L	ND			NC	30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND			NC	30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND			NC	30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND			NC	30	
Methylene Chloride	ND	5.0	ug/L	ND			NC	30	
Styrene	ND	0.5	ug/L	ND			NC	30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND			NC	30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND			NC	30	
Tetrachloroethylene	ND	0.5	ug/L	ND			NC	30	
Toluene	ND	0.5	ug/L	ND			NC	30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND			NC	30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND			NC	30	
Trichloroethylene	ND	0.5	ug/L	ND			NC	30	
Trichlorofluoromethane	ND	1.0	ug/L	ND			NC	30	
Vinyl chloride	ND	0.5	ug/L	ND			NC	30	
m,p-Xylenes	ND	0.5	ug/L	ND			NC	30	
o-Xylene	ND	0.5	ug/L	ND			NC	30	
Surrogate: 4-Bromofluorobenzene	*85.3*		*ug/L*		*107*	*50-140*			
Surrogate: Dibromofluoromethane	*88.2*		*ug/L*		*110*	*50-140*			
Surrogate: Toluene-d8	*90.8*		*ug/L*		*113*	*50-140*			

Certificate of Analysis

Report Date: 13-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 11-Nov-2020

Client PO: 31217

Project Description: PE5066

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1860	25	ug/L	ND	93.0	68-117			
F2 PHCs (C10-C16)	1510	100	ug/L	ND	94.6	60-140			
F3 PHCs (C16-C34)	3500	100	ug/L	ND	89.4	60-140			
F4 PHCs (C34-C50)	2260	100	ug/L	ND	91.1	60-140			
Volatiles									
Acetone	114	5.0	ug/L	ND	114	50-140			
Benzene	38.0	0.5	ug/L	ND	95.0	60-130			
Bromodichloromethane	34.3	0.5	ug/L	ND	85.8	60-130			
Bromoform	45.6	0.5	ug/L	ND	114	60-130			
Bromomethane	44.8	0.5	ug/L	ND	112	50-140			
Carbon Tetrachloride	46.8	0.2	ug/L	ND	117	60-130			
Chlorobenzene	46.2	0.5	ug/L	ND	115	60-130			
Chloroform	45.7	0.5	ug/L	ND	114	60-130			
Dibromochloromethane	42.5	0.5	ug/L	ND	106	60-130			
Dichlorodifluoromethane	39.5	1.0	ug/L	ND	98.7	50-140			
1,2-Dichlorobenzene	45.2	0.5	ug/L	ND	113	60-130			
1,3-Dichlorobenzene	45.5	0.5	ug/L	ND	114	60-130			
1,4-Dichlorobenzene	45.3	0.5	ug/L	ND	113	60-130			
1,1-Dichloroethane	40.5	0.5	ug/L	ND	101	60-130			
1,2-Dichloroethane	49.7	0.5	ug/L	ND	124	60-130			
1,1-Dichloroethylene	36.5	0.5	ug/L	ND	91.3	60-130			
cis-1,2-Dichloroethylene	39.4	0.5	ug/L	ND	98.5	60-130			
trans-1,2-Dichloroethylene	38.3	0.5	ug/L	ND	95.8	60-130			
1,2-Dichloropropane	38.4	0.5	ug/L	ND	96.1	60-130			
cis-1,3-Dichloropropylene	42.4	0.5	ug/L	ND	106	60-130			
trans-1,3-Dichloropropylene	49.4	0.5	ug/L	ND	124	60-130			
Ethylbenzene	44.2	0.5	ug/L	ND	111	60-130			
Ethylene dibromide (dibromoethane, 1,2-	43.4	0.2	ug/L	ND	109	60-130			
Hexane	38.4	1.0	ug/L	ND	96.0	60-130			
Methyl Ethyl Ketone (2-Butanone)	111	5.0	ug/L	ND	111	50-140			
Methyl Isobutyl Ketone	93.1	5.0	ug/L	ND	93.1	50-140			
Methyl tert-butyl ether	78.6	2.0	ug/L	ND	78.6	50-140			
Methylene Chloride	42.0	5.0	ug/L	ND	105	60-130			
Styrene	42.5	0.5	ug/L	ND	106	60-130			
1,1,1,2-Tetrachloroethane	39.3	0.5	ug/L	ND	98.3	60-130			
1,1,2,2-Tetrachloroethane	42.6	0.5	ug/L	ND	106	60-130			
Tetrachloroethylene	45.5	0.5	ug/L	ND	114	60-130			
Toluene	44.8	0.5	ug/L	ND	112	60-130			
1,1,1-Trichloroethane	49.3	0.5	ug/L	ND	123	60-130			
1,1,2-Trichloroethane	33.6	0.5	ug/L	ND	84.0	60-130			
Trichloroethylene	44.8	0.5	ug/L	ND	112	60-130			
Trichlorofluoromethane	35.2	1.0	ug/L	ND	88.1	60-130			
Vinyl chloride	45.0	0.5	ug/L	ND	113	50-140			
m,p-Xylenes	91.1	0.5	ug/L	ND	114	60-130			
o-Xylene	42.4	0.5	ug/L	ND	106	60-130			
Surrogate: 4-Bromofluorobenzene	*77.3*		*ug/L*		*96.6*	*50-140*			
Surrogate: Dibromofluoromethane	*88.1*		*ug/L*		*110*	*50-140*			
Surrogate: Toluene-d8	*71.4*		*ug/L*		*89.2*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

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

PARACEL LABORATORIES LTI

Paracel ID: 2046301

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2046301	Nº 54891

Client Name: PATERSON	Project Ref: PE5066	Page 1 of 1
Contact Name: MARK D'ARCY	Quote #:	Turnaround Time
Address: 154 COLONNADE Rd. S. OTTAWA, ONT.	PO #: 31217	☐ 1 day ☐ 3 day ☑ 2 day ☐ Regular
Telephone: (613) 226 7381	E-mail: mdarcy@PatersonGroup.ca	Date Required:

Regulation 153/04	Other Regulation
☐ Table 1 ☐ Res/Park ☐ Med/Fine	☐ REG 558 ☐ PWQO
☐ Table 2 ☐ Ind/Comm ☐ Coarse	☐ CCME ☐ MISA
☐ Table 3 ☐ Agri/Other	☐ SU - Sani ☐ SU - Storm
☑ Table 7	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	VOCs	PHCs	Required Analysis
1	BH2-20-GW1	GW	\	3	Nov. 11/2020		✓	✓	
2	BH10-20-GW1	GW	\	3	Nov. 11/2020		✓	✓	
3									
4									
5									
6									
7									
8									
9									
10									

Comments:

Method of Delivery: PARACEL COURIER

Relinquished By (Sign):	Received By Driver/Depot: M. LOUISE	Received at Lab: Shreeparm Dahmai	Verified By: BS
Relinquished By (Print): Dominic LANDRY	Date/Time: 11/11/20 2:43	Date/Time: NOV 11, 2020 04.53	Date/Time: Nov 11, 2020 18:35
Date/Time: Nov. 11/2020	Temperature: °C PM	Temperature: 10.8 °C	pH Verified: ☐ By:

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mark D'Arcy

Client PO: 31216
Project: PE5066
Custody: 54892

Report Date: 13-Nov-2020
Order Date: 11-Nov-2020

Order #: 2046298

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

Paracel ID	Client ID
2046298-01	MW13-55
2046298-02	MW13-56
2046298-03	MW13-59
2046298-04	MW13-60
2046298-05	MW13-61
2046298-06	MW13-62

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 13-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 11-Nov-2020

Client PO: 31216

Project Description: PE5066

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	12-Nov-20	13-Nov-20

Certificate of Analysis

Report Date: 13-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 11-Nov-2020

Client PO: 31216

Project Description: PE5066

	Client ID:	MW13-55	MW13-56	MW13-59	MW13-60
	Sample Date:	11-Nov-20 09:00	11-Nov-20 09:00	11-Nov-20 09:00	11-Nov-20 09:00
	Sample ID:	2046298-01	2046298-02	2046298-03	2046298-04
	MDL/Units	Water	Water	Water	Water
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Chloroform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	0.5 ug/L	<0.5	1.3	<0.5	<0.5
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,2-Dichloroethylene	0.5 ug/L	9.0	37.3	0.8	6.6
trans-1,2-Dichloroethylene	0.5 ug/L	1.2	4.9	<0.5	1.4
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylene dibromide (dibromoethane, 1,2-)	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	<2.0
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Tetrachloroethylene	0.5 ug/L	0.6	2.6	0.8	1.8
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5

Certificate of Analysis

Report Date: 13-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 11-Nov-2020

Client PO: 31216

Project Description: PE5066

	Client ID:	MW13-55	MW13-56	MW13-59	MW13-60
	Sample Date:	11-Nov-20 09:00	11-Nov-20 09:00	11-Nov-20 09:00	11-Nov-20 09:00
	Sample ID:	2046298-01	2046298-02	2046298-03	2046298-04
	MDL/Units	Water	Water	Water	Water
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichloroethylene	0.5 ug/L	1.8	7.1	<0.5	1.7
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
4-Bromofluorobenzene	Surrogate	106%	106%	105%	106%
Dibromofluoromethane	Surrogate	110%	111%	111%	111%
Toluene-d8	Surrogate	113%	117%	114%	112%

Certificate of Analysis

Report Date: 13-Nov-2020

Client: **Paterson Group Consulting Engineers**

Order Date: 11-Nov-2020

Client PO: 31216

Project Description: PE5066

	Client ID:	MW13-61	MW13-62	-	-
	Sample Date:	11-Nov-20 09:00	11-Nov-20 09:00	-	-
	Sample ID:	2046298-05	2046298-06	-	-
	MDL/Units	Water	Water	-	-
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	-	-
Benzene	0.5 ug/L	<0.5	<0.5	-	-
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	-	-
Bromoform	0.5 ug/L	<0.5	<0.5	-	-
Bromomethane	0.5 ug/L	<0.5	<0.5	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	-	-
Chlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
Chloroform	0.5 ug/L	<0.5	<0.5	-	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	22.5	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	2.0	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	-	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	-	-
Ethylene dibromide (dibromoethane, 1	0.2 ug/L	<0.2	<0.2	-	-
Hexane	1.0 ug/L	<1.0	<1.0	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	-	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	-	-
Styrene	0.5 ug/L	<0.5	<0.5	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	-
Tetrachloroethylene	0.5 ug/L	13.3	47.3	-	-
Toluene	0.5 ug/L	<0.5	<0.5	-	-

Certificate of Analysis

Report Date: 13-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 11-Nov-2020

Client PO: 31216

Project Description: PE5066

	Client ID:	MW13-61	MW13-62	-	-
	Sample Date:	11-Nov-20 09:00	11-Nov-20 09:00	-	-
	Sample ID:	2046298-05	2046298-06	-	-
	MDL/Units	Water	Water	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	-
Trichloroethylene	0.5 ug/L	<0.5	10.9	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	-	-
Vinyl chloride	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	-	-
4-Bromofluorobenzene	Surrogate	106%	106%	-	-
Dibromofluoromethane	Surrogate	110%	111%	-	-
Toluene-d8	Surrogate	114%	115%	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane, 1,2	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*84.2*		*ug/L*		*105*	*50-140*			
Surrogate: Dibromofluoromethane	*88.3*		*ug/L*		*110*	*50-140*			
Surrogate: Toluene-d8	*91.4*		*ug/L*		*114*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	ND	5.0	ug/L	ND			NC	30	
Benzene	ND	0.5	ug/L	ND			NC	30	
Bromodichloromethane	ND	0.5	ug/L	ND			NC	30	
Bromoform	ND	0.5	ug/L	ND			NC	30	
Bromomethane	ND	0.5	ug/L	ND			NC	30	
Carbon Tetrachloride	ND	0.2	ug/L	ND			NC	30	
Chlorobenzene	ND	0.5	ug/L	ND			NC	30	
Chloroform	ND	0.5	ug/L	ND			NC	30	
Dibromochloromethane	ND	0.5	ug/L	ND			NC	30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND			NC	30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,1-Dichloroethane	ND	0.5	ug/L	ND			NC	30	
1,2-Dichloroethane	ND	0.5	ug/L	ND			NC	30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
1,2-Dichloropropane	ND	0.5	ug/L	ND			NC	30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND			NC	30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND			NC	30	
Ethylbenzene	ND	0.5	ug/L	ND			NC	30	
Ethylene dibromide (dibromoethane, 1,2	ND	0.2	ug/L	ND			NC	30	
Hexane	ND	1.0	ug/L	ND			NC	30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND			NC	30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND			NC	30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND			NC	30	
Methylene Chloride	ND	5.0	ug/L	ND			NC	30	
Styrene	ND	0.5	ug/L	ND			NC	30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND			NC	30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND			NC	30	
Tetrachloroethylene	ND	0.5	ug/L	ND			NC	30	
Toluene	ND	0.5	ug/L	ND			NC	30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND			NC	30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND			NC	30	
Trichloroethylene	ND	0.5	ug/L	ND			NC	30	
Trichlorofluoromethane	ND	1.0	ug/L	ND			NC	30	
Vinyl chloride	ND	0.5	ug/L	ND			NC	30	
m,p-Xylenes	ND	0.5	ug/L	ND			NC	30	
o-Xylene	ND	0.5	ug/L	ND			NC	30	
Surrogate: 4-Bromofluorobenzene	*85.3*		*ug/L*		*107*	*50-140*			
Surrogate: Dibromofluoromethane	*88.2*		*ug/L*		*110*	*50-140*			
Surrogate: Toluene-d8	*90.8*		*ug/L*		*113*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	114	5.0	ug/L	ND	114	50-140			
Benzene	38.0	0.5	ug/L	ND	95.0	60-130			
Bromodichloromethane	34.3	0.5	ug/L	ND	85.8	60-130			
Bromoform	45.6	0.5	ug/L	ND	114	60-130			
Bromomethane	44.8	0.5	ug/L	ND	112	50-140			
Carbon Tetrachloride	46.8	0.2	ug/L	ND	117	60-130			
Chlorobenzene	46.2	0.5	ug/L	ND	115	60-130			
Chloroform	45.7	0.5	ug/L	ND	114	60-130			
Dibromochloromethane	42.5	0.5	ug/L	ND	106	60-130			
Dichlorodifluoromethane	39.5	1.0	ug/L	ND	98.7	50-140			
1,2-Dichlorobenzene	45.2	0.5	ug/L	ND	113	60-130			
1,3-Dichlorobenzene	45.5	0.5	ug/L	ND	114	60-130			
1,4-Dichlorobenzene	45.3	0.5	ug/L	ND	113	60-130			
1,1-Dichloroethane	40.5	0.5	ug/L	ND	101	60-130			
1,2-Dichloroethane	49.7	0.5	ug/L	ND	124	60-130			
1,1-Dichloroethylene	36.5	0.5	ug/L	ND	91.3	60-130			
cis-1,2-Dichloroethylene	39.4	0.5	ug/L	ND	98.5	60-130			
trans-1,2-Dichloroethylene	38.3	0.5	ug/L	ND	95.8	60-130			
1,2-Dichloropropane	38.4	0.5	ug/L	ND	96.1	60-130			
cis-1,3-Dichloropropylene	42.4	0.5	ug/L	ND	106	60-130			
trans-1,3-Dichloropropylene	49.4	0.5	ug/L	ND	124	60-130			
Ethylbenzene	44.2	0.5	ug/L	ND	111	60-130			
Ethylene dibromide (dibromoethane, 1,2-	43.4	0.2	ug/L	ND	109	60-130			
Hexane	38.4	1.0	ug/L	ND	96.0	60-130			
Methyl Ethyl Ketone (2-Butanone)	111	5.0	ug/L	ND	111	50-140			
Methyl Isobutyl Ketone	93.1	5.0	ug/L	ND	93.1	50-140			
Methyl tert-butyl ether	78.6	2.0	ug/L	ND	78.6	50-140			
Methylene Chloride	42.0	5.0	ug/L	ND	105	60-130			
Styrene	42.5	0.5	ug/L	ND	106	60-130			
1,1,1,2-Tetrachloroethane	39.3	0.5	ug/L	ND	98.3	60-130			
1,1,2,2-Tetrachloroethane	42.6	0.5	ug/L	ND	106	60-130			
Tetrachloroethylene	45.5	0.5	ug/L	ND	114	60-130			
Toluene	44.8	0.5	ug/L	ND	112	60-130			
1,1,1-Trichloroethane	49.3	0.5	ug/L	ND	123	60-130			
1,1,2-Trichloroethane	33.6	0.5	ug/L	ND	84.0	60-130			
Trichloroethylene	44.8	0.5	ug/L	ND	112	60-130			
Trichlorofluoromethane	35.2	1.0	ug/L	ND	88.1	60-130			
Vinyl chloride	45.0	0.5	ug/L	ND	113	50-140			
m,p-Xylenes	91.1	0.5	ug/L	ND	114	60-130			
o-Xylene	42.4	0.5	ug/L	ND	106	60-130			
Surrogate: 4-Bromofluorobenzene	*77.3*		*ug/L*		*96.6*	*50-140*			
Surrogate: Dibromofluoromethane	*88.1*		*ug/L*		*110*	*50-140*			
Surrogate: Toluene-d8	*71.4*		*ug/L*		*89.2*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

PARACEL LABORATORIES LT

Paracel ID: 2046298

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.com

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2046298	№ 54892

Client Name: PATERSON	Project Ref: PE5066	Page 1 of 1
Contact Name: MARK D'ARCY	Quote #:	**Turnaround Time**
Address: 154 COLONNADE Rd. S. OTTAWA, ONT.	PO #: 31216	☐ 1 day ☐ 3 day
	E-mail: mdarcy@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 7	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)

Required Analysis

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	VOC's											
1	MW13-55	GW	\	2	Nov. 11/2020	—	✓											
2	MW13-56	↓	↓	↓	↓	↓	✓											
3	MW13-59	↓	↓	↓	↓	↓	✓											
4	MW13-60	↓	↓	↓	↓	↓	✓											
5	MW13-61	↓	↓	↓	↓	↓	✓											
6	MW13-62	↓	↓	↓	↓	↓	✓											
7																		
8																		
9																		
10																		

Comments:

Method of Delivery: PARACEL COURIER

Relinquished By (Sign): [signature]	Received By Driver/Depot: [signature]	Received at Lab: [signature]	Verified By: [signature]
Relinquished By (Print): Dominic LANDRY	Date/Time: 11/11/20 2:43	Date/Time: Nov 11, 2020 04.53	Date/Time: Nov 11, 2020 18:35
Date/Time: Nov. 11/2020	Temperature: °C	Temperature: 10.8 °C	pH Verified: ☐ By: