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Phase II - Environmental Site Assessment

Vacant Commercial Land
6130 and 6150 Hazeldean Road
Ottawa, Ontario

Prepared For

2062915 Ontario Inc.
and 2073945 Ontario Inc.

March 3, 2016

Report: PE3699-2R

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EXECUTIVE SUMMARY

Assessment

Paterson Group was retained by Mr. Allan Jackson with 2062915 Ontario Inc., to conduct a Phase II - Environmental Site Assessment the properties addressed 6130 and 6150 Hazeldean Road, in the City of Ottawa, Ontario. It should be noted that the property was previously addressed 6176 Hazeldean Road (eastern half of a larger parcel). The purpose of the Phase II-ESA was to address the Areas of Potential Environmental Concern (APECs) for the subject site identified during the Phase I-ESA. The Phase II-ESA was carried out in conjunction with a geotechnical investigation and consisted of drilling six boreholes, four of which were instrumented with groundwater monitoring wells, to assess soil and groundwater quality at the subject site.

Soil samples obtained from the boreholes were screened using visual observations and vapour measurements. Soils on site generally consist of a layer of fill material over native glacial till and/or limestone bedrock. The fill material generally consisted of crushed stone and/or silty sand with clay, gravel and/or organic matter while, the fill material encountered beneath the concrete slab of the former building addressed 35 Neil Avenue consisted of brown silty sand. No deleterious materials were identified in the fill at any location on the subject property.

Based on the screening results, a soil sample from each of BHs 3, 4 and 5 were submitted for analytical testing of benzene, toluene, ethylbenzene and xylenes (BTEX) or volatile organic compounds (VOCs) and petroleum hydrocarbons (fractions F_1-F_4). The sample collected from BH3 was also submitted for analysis of sodium adsorption ratio (SAR) and electrical conductivity (EC). All detected concentrations were in compliance with the Ontario Ministry of the Environment and Climate Change (MOECC) Table 3 Standards selected for the site.

Groundwater samples were collected from the monitoring wells installed in BH1, BH3, BH4 and BH5 on December 18, 2015 and submitted for analysis of BTEX or VOC and PHC (F_1-F_4) parameters. The groundwater sample recovered from BH3 was also analysed for sodium and chloride. All detected concentrations were in compliance with the MOECC Table 3 standards.

Based on the findings of the Phase II-ESA, the soil and groundwater conditions beneath the site are considered to be in compliance with the MOECC Table 3 standards selected for the site.

Recommendations

Low concentrations of PHCs were identified in the fill material at BH3. The concentrations are in compliance with MOECC Table 3 standards however they exceed the MOECC Table 1 standards, representative of background conditions and typically used to assess soil for off-site disposal. If soil will be disposed off-site for construction purposes, additional testing of the fill material in the vicinity of BH3 is recommended.

If the monitoring wells installed are not going to be used in the future, they should be abandoned according to Ontario Regulation 903. These wells have been registered with the MOE under this regulation. Further information can be provided upon request.

1.0 INTRODUCTION

At the request of Mr. Allan Jackson with 2062915 Ontario Inc., Paterson Group (Paterson) conducted a Phase II-Environmental Site Assessment (ESA) of the properties addressed 6130 and 6150 Hazeldean Road (previously part of 6176), in the City of Ottawa, Ontario. The purpose of this Phase II-ESA was to address concerns identified in the Phase I-ESA prepared by Paterson in December of 2015.

1.1 Site Description

Address:	6130 and 6150 Hazeldean Road, Ottawa, Ontario.
Legal Description:	Parts 1, 2 and 3 on Plan 4R-21452; Part of Lot 24, Concession 12 in the Geographic Township of Goulbourn.
Property Identification Numbers:	04458-0013, 04458-0018, 04458-0015
Location:	The subject property is located on the south side of Hazeldean Road, between Carp Road and Sittsville Main Street. Refer to Figure 1 – Key Plan, following the body of this report, for the site location.
Latitude and Longitude:	45° 16' 15" N, 75° 55' 56" W.
Configuration:	Irregular.
Site Area:	1.8 hectares (approximate).

1.2 Property Ownership

The subject property is currently owned by Kavanagh Family Investments. Paterson was engaged to complete the Phase II-ESA at the subject site by Mr. Allan Jackson with 2062914 Ontario Inc., on behalf of Mr. Wit Lewandowski with 2073945 Ontario Inc. and Kavanagh Family Investments Ltd. Mr. Jackson can be reached by telephone at (613) 518-2005.

1.3 Current and Proposed Future Uses

The subject site is currently vacant, unutilized land. It is our understanding that the eastern and central portions of the site (Parts 1 and 2) will be developed with a retirement home and associated parking lot, while the western portion of the site (Part 3) will be developed at a later date.

1.4 Applicable Site Condition Standard

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

- Coarse-grained soil conditions.
- Surface soil and groundwater conditions.
- Non-potable groundwater conditions.
- Residential land use.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The subject site is a vacant, undeveloped lot located south of Hazeldean Road, between Carp Road and Stittsville Main Street. At the time of the Phase II-ESA, the western and central lots were paved with the exception of a small grassed area (location of former residence/restaurant addressed 37 Neil Avenue) and a concrete foundation (former building addressed 35 Neil Avenue). The eastern lot, situated at a significantly lower elevation than the western and central lots, was largely gravel covered. A small area on the easternmost portion of the site was vegetated with small trees.

2.2 Past Investigations

In September of 2005, Paterson supervised an environmental remediation program on the central portion of the property, previously addressed 35 Neil Avenue. A furnace oil underground storage tank (UST) on the south side of the former building was removed by a licenced contractor, along with approximately 28 metric tonnes of petroleum hydrocarbon (PHC) impacted soil. Confirmatory soil testing conducted upon the conclusion of the remediation program did not identify any benzene, toluene, ethylbenzene, and xylenes (BTEX) or PHC (F1-F4) concentration in excess of the current MOECC Table 3 standards.

Upon completion of the remediation program, a monitoring well was installed within the tank nest in order to obtain a groundwater sample for analytical testing purposes. Analytical testing of the groundwater did not identify any BTEX parameters above the method detection limits, however F2 and F3 concentrations (600 µg/L) were identified in excess of the current MOECC standards.

In May of 2006, Paterson completed a Phase I-II ESA at the subject site, as well as an additional parcel of land to the west of the subject property (1174 Carp Road). During the investigation, a borehole was advanced inside the former building located at 35 Neil Avenue, to assess potential impacts associated with the former UST noted above. Soil analytical testing conducted at that time did not identify any detectable contaminant concentrations.

In March of 2012, Paterson once again conducted a Phase I-II ESA for the subject parcel of land. Boreholes, instrumented with monitoring wells, were advanced within the former tank nest (the previous monitoring well at this location had been destroyed) and also on the northeastern portion of the site, to address the recently constructed retail fuel outlet located across Hazeldean Road. All soil and groundwater concentrations are in compliance with the current MOECC Table 3 standards.

In December of 2015, Paterson completed a Phase I-ESA in general accordance with the new MOECC regulation, Ontario Regulation (O.Reg.) 153/04, amended by O.Reg. 269/11. Based on the findings of the report, a Phase II-ESA was recommended to address several historical PCAs identified on the subject property as well as the more recent use of the aforementioned retail fuel outlet. The resulting APECs are identified in Table 1 below.

Table 1: Areas of Potential Environmental Concern

Area of Potential Environmental Concern (APEC)	Location of APEC on Phase One Property	Potential Contaminating Activities (PCA)	Location of PCA (on-site / off-site)	Contaminants of Potential Concern (CPC)	Media Potentially Impacted (Groundwater, Soil and/or Sediment)
APEC 1: Resulting from former domestic heating oil aboveground storage tank (AST) reportedly located at former residence/ restaurant (37 Neil Avenue)	Western portion of the site (PIN 04458-0013)	PCA 1 – Item 28: Gasoline and Associated Products Storage in Fixed Tanks	On-site	PHCs BTEX/PHCs	Soil Groundwater
APEC 2: Resulting from the former electronics assembly or manufacturing at 35 Neil Avenue	Central portion of site (PIN 04458-0014)	PCA 2 – Item 19: Electronic and Computer Equipment Manufacturing PCA 3 – Item 28: Gasoline and Associated Products Storage in Fixed Tanks	On-site	VOCs/PHCs None – PCA has been addressed during previous investigations	Soil and Groundwater Soil and groundwater meet MOECC Table 3 standards.
APEC 3: Resulting from former Ontario Ministry of Transportation storage shed and yard – possible salt storage	Central portion of site, east of 35 Neil Avenue (PIN 04458-0015)	PCA 4 – Item 48: Salt Manufacturing, Processing and Bulk Storage	On-site	Salt (SAR, EC, sodium and chlorides)	Soil and/or Groundwater
APEC 4: Resulting from retail fuel outlet	Northeast corner of site	PCA 6 – Item 28: Gasoline and Associated Products Storage in Fixed Tanks	Off-site	BTEX and PHCs	Groundwater

Table 1 Continued: Areas of Potential Environmental Concern

Area of Potential Environmental Concern (APEC)	Location of APEC on Phase One Property	Potential Contaminating Activities (PCA)	Location of PCA (on-site / off-site)	Contaminants of Potential Concern (CPC)	Media Potentially Impacted (Groundwater, Soil and/or Sediment)
APEC 5: Fill material of unknown quality	Eastern portion of site (PIN 04458-0015)	PCA 6 – Item 30: Importation of Fill of Material	On-site	Metals	Soil

The Phase I-ESA identified metals as a CPC associated with the fill on-site, however based on the findings of the Phase II-ESA, no deleterious materials were identified in the fill and metals were considered to be a CPC.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation conducted as a component of this Phase II-ESA, and carried out in conjunction with a Geotechnical Investigation for the proposed development, consisted of drilling six boreholes at the subject site.

With the exception of two borehole locations, the boreholes were drilled through overburden soils and cored into bedrock to a maximum depth of 7.3 m below ground surface (bgs). BH 1 and BH6 were completed upon auger refusal on the inferred bedrock surface. Groundwater monitoring wells were installed in four of the boreholes: BH1, BH3, BH4 and BH5.

3.2 Media Investigated

During the subsurface investigation, soil samples and groundwater samples were obtained and submitted for laboratory analysis. The rationale for sampling and analyzing these media is based on the Contaminants of Potential Concern (CPCs) identified in the Phase I-ESA in conjunction with the findings of the field program.

The CPCs for the soil and groundwater at the site APECs, include benzene, toluene, ethylbenzene, and xylenes (BTEX), petroleum hydrocarbons, fractions 1 through 4 (PHCs F1-F4), volatile organic compounds (VOCs), and/or salt (sodium adsorption ratio (SAR) and electrical conductivity (EC) in the soil and sodium and chlorides in the groundwater).

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

Based on the information from NRCAN, bedrock in the area of the Phase I and Phase II property consists of limestone of the Bobcaygeon formation. Overburden on the western portion of the site is reportedly negligible, while organic deposits (peat, muck and marl) are reported to exist on the eastern portion of the site at depths up to 5 m below ground surface. According to data collected during the subsurface investigation however, fill material is present at various locations over the site, underlain by glacial till and/or limestone bedrock. Overburden depths were found to range from 0.1 to 4.2 m below grade.

Contaminants of Potential Concern

Based on the APECs identified in Table 1 above, the following Contaminants of Potential Concern (CPCs) have been identified:

- Volatile Organic Compounds (VOCs), including BTEX – this suite of parameters includes chlorinated solvents and degradation products (Tetrachloroethylene, Trichloroethylene, Dichloroethylene, and Vinyl Chloride) associated with de-greasing, as well as chloroform, a by-product of chlorine disinfection of municipally-treated water. Also included with VOCs are BTEX (benzene, toluene, ethylbenzene and xylenes) which is a suite of VOCs associated in part with gasoline and diesel fuel. BTEX was selected based on the use of heating oil on-site and the retail fuel outlet located across Hazeldean Road. VOCs were selected due to the use of the building at 35 Neil Avenue for electronics assembly as it is possible that solvents and degreasing agents were associated with the manufacturing process. BTEX and VOC may be present in the soil and also dissolved in groundwater.

- Petroleum Hydrocarbon Fractions 1 through 4 (PHC F1-F4) – this suite of parameters encompasses gasoline (Fraction 1), diesel and fuel oil (Fraction 2) and heavy oils (Fractions 3 and 4). PCHs F1-F4 were selected as CPCs for grease and lubricants that may have been used in association with former on-site manufacturing, the former on-site storage of heating oil, and the retail fuel outlet located across Hazeldean Road. PHCs may be present in the soil matrix, sorbed to soil particles, as well as in free or dissolved phase in the groundwater system.

  PHCs are generally considered to be LNAPLs, light non-aqueous phase liquids, indicating that when present in sufficient concentrations above the solubility limit, they will partition into a separate phase above the water table, due to their density.

- Salt – suite of parameters including Electrical Conductivity, Sodium Adsorption Ratio, Chloride and Sodium. These parameters were selected due to the possible use of the central portion of the site, east of 35 Neil Avenue, for the bulk storage of salt. The MOECC provides standards for Electrical Conductivity and Sodium Adsorption Ratio in soil and Chloride and Sodium in groundwater.

Existing Buildings and Structures

There are currently no buildings on the subject property, however the concrete foundation of the former structure at 35 Neil Avenue remains present on site, as shown on Drawing: PE3699-3 – Test Hole Location Plan. The site plan also depicts the former locations of the residence/restaurant at 37 Neil Avenue, the former MTO storage shed east of 35 Neil Avenue and the former residential/commercial structure at 1 Neil Avenue.

The former building at 37 Neil Avenue was reported to have originally been heated with furnace oil stored in an interior aboveground storage tank (AST) removed in the early 1980's. The structure was subsequently heated with propane. The former structure at 35 Neil Avenue was originally heated with furnace oil stored in an underground storage tank (UST) adjacent to the south wall of the structure. The structure was subsequently heated with natural gas-fired equipment. The former structure at 1 Neil Avenue was heated with electric baseboard heaters.

Water Bodies

There are no bodies of water located within the 250 m Phase I study area. Poole Creek is the closest body of water, situated approximately 700 m southeast of the subject property.

Areas of Natural and Scientific Interest (ANSI)

No ANSIs were identified on the subject property or within the Phase I study area.

Drinking Water Wells

According to the Ministry of the Environment and Climate Change (MOECC) well record database, there are two well records for potable wells on the subject property, as well as 22 records for potable wells within the Phase I study area. The wells on the site serviced the former residential dwelling at 37 Neil Avenue and a workshop, considered to have been situated on the former MTO property. The wells were installed in 1957 and 1967 respectively, to depths of 23 m and 33 m within the limestone bedrock.

The remaining wells within the Phase I study area were installed for the purposes of domestic water and serviced private dwellings, with the exception of a well which serviced the service garage on the property to the south of the site (currently addressed 1224 Stittsville Main Street).

The Phase I study area has since been provided with municipal services. It is our understanding that the subject property will be provided with municipal services upon development.

Groundwater Monitoring Wells

A groundwater monitoring well is currently present on the subject property. The well (BH2) was installed during the subsurface investigation carried out in March of 2012. The well is situated within the remediation excavation adjacent to the south of the foundation at 35 Neil Avenue.

Neighbouring Land Use

Neighbouring land use in the Phase I study area was a combination of residential and commercial. A retail fuel outlet located at 6061 Hazeldean Road is considered to pose a potential concern to the subject property.

The Ottawa-Carleton District School Board Facilities Department is situated south of the subject property. A service garage has been present on the southern portion of the OCDSB property since the 1960's. Based on the distance of the garage building of over 60 m from the subject property, it is not considered to represent an APEC on the Phase I property. Neighbouring land use is depicted on Drawing: PE3699-2 – Surrounding Land Use Plan.

Fill Material

During the subsurface investigation, fill material was observed on the eastern portion of the site (BH 1-3 and BH 6), from near surface to depths ranging from 0.1 to 3 m below grade. The fill material generally consisted of granular material or silty sand with gravel and traces of clay and/or organics. Possible fill, consisting of silty sand with clay and traces of gravel was also identified at the former property addressed 37 Neil Avenue (BH 5). Based on a review of aerial photographs in combination with field observations it is considered likely that the overburden stripped from the western portion of the site and adjacent property to the west, was replaced on the easternmost portion of the site. Fill material consisting of clean sand imported for construction purposes, was identified beneath the foundation of the former building at 35 Neil Avenue (BH 4). It should be noted that no deleterious materials were identified in any of the fill material identified during the subsurface investigation.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

As per Column A of Table 2 outlined in Ontario Regulation 153/04 and amended by O.Reg. 279/11, potentially contaminating activities (PCAs) identified on the subject property and/or within the Phase I-ESA study area include the following:

- Item 28: Gasoline and Associated Products Storage in Fixed Tanks (PCAs 1,3 and 6);
- Item 19: Electronic and Computer Equipment manufacturing (PCA 2);
- Item 27: Garages (PCA 7);
- Item 30: Importation of Fill Material of Unknown quality (PCA 5); and
- Item 48: Bulk Storage of Salt (PCA 4).

Five areas of potential environmental concern (APECs) are located on the subject property and are as follows:

- APEC 1: Former heating oil AST at 37 Neil Avenue (PCA 1);
- APEC 2: Former manufacturing and former heating oil UST at 35 Neil Avenue (PCAs 2 and 3);

- APEC 3: Historical use of eastern portion of site by MTO (PCA 4);
- APEC 4: Possible impacts from off-site retail fuel outlet on northeastern portion of site (PCA 6);
- APEC 5: Importation of fill material of unknown quality on eastern portion of site (PCA 5).

As discussed in the Phase I-ESA report (PE3699-1), the former UST (PCA 3) included in APEC 2 was addressed during previous investigations carried out by Paterson and is not considered to represent a concern to the subject property.

A PCA not considered to have resulted in an APEC on the subject site is the OCDSB facilities department property located at 1224 Stittsville Main Street, south of the site across Neil Avenue. This property has historically been used for automotive service repairs (PCA 7). Based on the distance of the service building from the subject property (over 60 m) and its orientation cross-gradient to the site, it is not considered to represent an APEC on the subject property.

The above noted APECs are highlighted on Drawing PE3699-3 – Test Hole Location Plan.

3.4 Deviations from Sampling and Analysis Plan

The Sampling and Analysis Plan for this project is included in Appendix 1 of this report. Several deviations from the Sampling and Analysis Plan were made and include the following:

- The screens of the monitoring wells at BH1 and BH3 did not straddle the water table measured at the time of the groundwater sampling program.

3.5 Impediments

No physical impediments or denial of access were encountered during the Phase-II ESA.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation was conducted on December 14 and 15, 2015, and consisted of the placement of six boreholes (BH1 to BH6). The boreholes were placed to address the aforementioned APECs as well as to provide data for the concurrent Geotechnical Investigation. The drilling contractor was George Downing Estate Drilling of Hawkesbury, Ontario. Boreholes were advanced using a truck-mounted CME 55 power auger drill rig, under the full-time supervision of Paterson personnel. The borehole locations are identified on the attached Drawing PE3699-3 - Test Hole Location Plan.

4.2 Soil Sampling

A total of 20 soil samples were obtained from the boreholes by means of split spoon sampling with the sampling of shallow soils directly from auger flights. Split spoon samples were taken at approximate 0.76 to 1.52 m intervals. The depths at which split spoon and auger flight samples were obtained from the boreholes are shown as "**SS**" and "**AU**" respectively on the Soil Profile and Test Data Sheets, appended to this report.

Upon refusal of the augers, some of the boreholes were advanced into bedrock using a diamond coring system. Rock core samples were recovered and are shown as "**RC**" on the Soil Profile and Test Data Sheets.

Site soils generally consist of various fill materials over a dense, native glacial till material. Fill material at BH 1 consisted of dark brown silty fine sand with traces of gravel, clay and organic matter. Fill material encountered in BH 2, BH3 and BH 6 generally consisted of dark brown silty fine sand and gravel. Crushed stone and asphalt were identified at ground surface at BH2 and BH3 respectively. Fill material at BH 4, underlying the concrete slab of the former foundation, consisted of brown silty fine sand. Possible fill material identified at BH5 was dark brown silty fine sand with organic matter and traces of gravel. The fill material extended from ground surface to depths ranging from 0.1 to 3 m bgs. Native glacial till material consisting of a silty sand matrix, was encountered beneath the fill in all boreholes with the exception of BH 3 and BH6. Grey limestone bedrock was encountered at depths ranging from approximately 0.1 m to 4.2 m bgs.

4.3 Field Screening Measurements

All soil samples collected were submitted to a preliminary screening procedure, which included visual screening for colour and evidence of metals, as well as screening with a MiniRae photoionization detector (PID). The detection limit of the PID is 0.1 ppm, with a precision of +/- 0.1 ppm

The soil vapours were measured by inserting the analyzer probe into the nominal headspace above the soil sample. Samples were then agitated and the peak readings recorded. The PID organic vapour readings were found to range from 0.1 to 7.9 ppm. These readings are not considered to be indicative of the presence of volatile substances (such as gasoline).

The vapour results cannot be used to identify the presence of heavier petroleum hydrocarbons such as heavy oil. Please refer to the Soil Profile and Test Data sheets attached for soil sample headspace results.

Soil samples were selected for analytical testing based on visual appearance, location, and vapour readings.

4.5 Field Measurement of Water Quality Parameters

Prior to groundwater sampling, water quality parameters were measured in the field using a multi-parameter analyzer. Parameters measured in the field include temperature, electrical conductivity, pH, and total dissolved solids. Wells were purged prior to sampling until at least three well volumes had been removed or until the well was purged dry. Field parameter values prior to sampling are summarized below in Table 3.

Table 3:
Field Measurement of Water Quality Parameters

Borehole Location	Temperature (°C)	pH	Conductivity (µS/cm)	Total Dissolved Solids (ppm)	Date
BH1	7.5	7.14	1,347	678	18-Dec-2015
BH3	8.9	7.26	790	388	18-Dec-2015
BH4	9.4	7.22	694	346	18-Dec-2015
BH5	8.6	7.32	631	345	18-Dec-2015

4.4 Groundwater Monitoring Well Installation

Four groundwater monitoring wells were installed by George Downing Estate Drilling of Hawkesbury, Ontario, under full-time supervision by Paterson personnel. The monitoring wells installed within the bedrock (BH 3-5) consisted of 32 mm diameter Schedule 40 threaded PVC risers and screens. The monitoring well at BH 1, installed within the overburden, was constructed with 51 mm diameter screens and risers. 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. Monitoring well construction details are provided on the Soil Profile and Test Data Sheets in Appendix 1. A summary of monitoring well construction details is provided below in Table 2.

Table 2: Monitoring Well Construction Details

Well ID	Ground Surface Elevation	Total Depth (m BGS)	Screened Interval (m BGS)	Sand Pack (m BGS)	Bentonite Seal (m BGS)	Casing Type
BH1	114.82	4.17	2.64-4.17	2.34-4.17	0-2.34	PVC riser
BH3	115.77	5.79	2.74-5.79	2.44-5.79	0-2.44	PVC riser
BH4	117.90	5.79	2.74-5.79	2.44-5.79	0-2.44	PVC riser
BH5	119.14	7.32	4.27-7.32	3.96-7.32	0-3.96	PVC riser

4.6 Groundwater Sampling

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

4.7 Analytical Testing

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

Table 4: Soil Samples Submitted

Sample ID	Sample Depth/ Stratigraphic Unit	Parameters Analyzed				Rationale
		VOCs	BTEX	PHC (F_1-F_4)	SAR and Conductivity	
December 14-15, 2015						
BH3-AU1	0.05-0.1 m bgs; fill		X	X	X	Petroleum hydrocarbon odours identified in the field and location of possible salt storage.
BH4-SS3	1.5-2.1m bgs; glacial till	X		X		Highest vapour reading in BH4; close to water table.
BH5-SS3	1.5-2.0 m bgs; fill		X	X		Highest vapour reading in BH5; close to water table.

Table 5: Groundwater Samples Submitted

Sample ID	Sample Depth/ Stratigraphic Unit	Parameters Analyzed					Rationale
		VOCs	BTEX	PHC (F_1-F_4)	Sodium	Chlorides	
December 18, 2015							
BH1-GW1	2.64-4.17 m bgs; overburden		X	X			Assessment of groundwater quality at the subject site based on potential contaminants of concern.
BH3-GW1	2.74-5.79 m bgs; bedrock				X	X	
BH4-GW1	2.74-5.79 m bgs; bedrock	X		X			
BH5-GW1	4.27-7.32 m bgs; bedrock		X	X			

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

4.8 Residue Management

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

4.9 Elevation Surveying

Borehole locations were surveyed using a laser level. Elevations were surveyed relative to the top spindle of a fire hydrant on the south side of Neil Avenue, near the southeastern corner of the site. The Geodetic Elevation of the spindle, as provided by Stantec Geomatics Ltd., is 114.69 metres above sea level (m ASL). The location of the site benchmark is shown on Drawing PE3699-3 – Test Hole Location Plan.

4.10 Quality Assurance and Quality Control Measures

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

5.0 REVIEW AND EVALUATION

5.1 Geology

Site geology details are provided in the Soil Profile and Test Data Sheets provided in Appendix 1. Site soils generally consists of fill material over native glacial till, followed by limestone bedrock. The fill material generally consisted of granular material or silty sand with gravel and traces of clay and/or organics. Imported sand was identified beneath the foundation of the former building at 35 Neil Avenue (BH 4). No deleterious materials were noted in the fill material at any of the borehole locations.

As noted above, very shallow bedrock was identified at BH3 and BH6 at 0.1 and 0.53 m below grade. Otherwise bedrock was encountered at depths ranging from approximately 2.3 to 4.2 m below ground surface.

Groundwater was encountered in the glacial till (BH1 only) or the bedrock at depths ranging from 1.6 to 4.5 m below existing grade.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured using an electronic water level meter and are summarized below in Table 6. All elevations are relative to the top spindle of a fire hydrant on the south side of Neil Avenue, near the southeast corner of the subject site. The geodetic elevation of the spindle, 114.69 m ASL, was provided by Stantec Geomatics Ltd. It should be noted that groundwater levels are expected to fluctuate throughout the year with seasonal variations.

Table 6: Groundwater Level Measurements

Borehole Location	Ground Surface Elevation (m ASL)	Water Level Depth (m below grade)	Water Level Elevation (m ASL)	Date of Measurement
BH1	114.82	1.61	113.21	18-Dec-2015
BH3	115.77	1.62	114.15	18-Dec-2015
BH4	117.90	3.28	114.62	18-Dec-2015
BH5	119.14	4.51	114.63	18-Dec-2015

Based on the groundwater elevations recorded during the monitoring event, groundwater contour mapping was completed. Groundwater contours are shown on Drawing PE3699-6 - Groundwater Contour Plan. Based on the contour mapping, groundwater flow at the subject site appears to be towards the northeast. A horizontal hydraulic gradient of approximately 0.007 m/m

5.3 Fine-Medium Soil Texture

Based on observed soil conditions, it is our opinion that fine- to medium-grained soil standards are not applicable at the subject site. Coarse-grained soil standards have been used for the subject site. Grain size analysis was not completed.

5.4 Soil: Field Screening

Field screening of the soil samples collected during drilling resulted in soil vapour readings of 0.2 ppm to 7.9 ppm. 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

Four soil samples were submitted to Paracel Laboratories for analysis of a combination of BTEX, PHC (F_1-F_4), electrical conductivity (EC) and sodium adsorption ratio (ASR) parameters. A copy of the analytical test results is attached to this report. The results of the soil testing, as well as the results of the previous testing conducted in 2012, are presented in Tables 7, 8 and 9. The laboratory certificates of analysis are provided in Appendix 1.

Table 7: Analytical Test Results – Soil
BTEX and PHCs F_1-F_4

Parameter	MDL (µg/g)	Soil Samples (µg/g)					MOECC Table 3 Standards Residential Coarse (µg/g)
		BH2-SS2	BH3-SS3	BH3-AU1	BH4-SS3	BH5-SS3	
		22-Mar-2012		14/15-Dec-2015			
Benzene	0.02	nd[2]	nd[2]	nd	nd[2]	nd	0.21
Ethylbenzene	0.05	nd[2]	nd[2]	nd	nd[2]	nd	1.1
Toluene	0.05	nd[2]	nd[2]	nd	nd[2]	nd	6.4
Xylenes	0.05	nd[2]	nd[2]	nd	nd[2]	nd	26
PHC F_1	7	nd	nd	nd	nd	nd	55
PHC F_2	4	36	nd	<40[1]	nd	nd	230
PHC F_3	8	39	nd	105	nd	29	1,700
PHC F_4	6	nd	nd	2,090	28	45	3,300

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- [1] – elevated detection limit due to dilution required because of high target analyte concentration
- [2] – tested as part of the VOC parameter group (Table 8)

BTEX parameters were not identified above the method detection limits in any of the soil samples submitted for analytical testing. PHC fractions F2 and F3 were detected in Sample BH2-SS2 (2012) at concentrations below the MOECC Table 3 standards. No PHC fractions were identified in Sample BH3-SS3 (2012).

PHC fractions F3 and/or F4 were detected in each of the soil samples analysed during the current investigation; all detected concentrations are in compliance with the MOECC Table 3 standards. The method detection limit for the F2 parameter analysed in Sample BH3-AU1 was elevated due to dilution required because of high target analyte concentration. The detection limit, however, remains below the MOECC Table 3 standards for PHC, F2.

It should be noted that the PHC fractions identified in BH3-AU1 exceed MOECC Table 1 standards, which are typically used for classification of soil for offsite disposal purposes.

Table 8: Analytical Test Results – Soil
VOCs

Parameter	MDL (µg/g)	Soil Sample (µg/g)			MOECC Table 3 Standards Residential Coarse (µg/g)
		BH2-SS2	BH3-SS3	BH4-SS3	
		22-Mar-2012		15-Dec-2015	
Acetone	0.50	nd	nd	nd	16
Benzene	0.02	nd	nd	nd	0.21
Bromodichloromethane	0.05	nd	nd	nd	13
Bromoform	0.05	nd	nd	nd	0.27
Bromomethane	0.05	nd	nd	nd	0.05
Carbon Tetrachloride	0.05	nd	nd	nd	0.05
Chlorobenzene	0.05	nd	nd	nd	2.4
Chloroform	0.05	nd	nd	nd	0.05
Dibromochloromethane	0.05	nd	nd	nd	9.4
Dichlorodifluoromethane	0.05	nd	nd	nd	16
1,2-Dichlorobenzene	0.05	nd	nd	nd	3.4
1,3-Dichlorobenzene	0.05	nd	nd	nd	4.8
1,4-Dichlorobenzene	0.05	nd	nd	nd	0.083
1,1-Dichloroethane	0.05	nd	nd	nd	3.5
1,2-Dichloroethane	0.05	nd	nd	nd	0.05
1,1-Dichloroethylene	0.05	nd	nd	nd	0.05
cis-1,2-Dichloroethylene	0.05	nd	nd	nd	3.4
trans-1,2-Dichloroethylene	0.05	nd	nd	nd	0.084
1,2-Dichloropropane	0.05	nd	nd	nd	0.05
1,3-Dichloropropene	0.05	nd	nd	nd	0.05
1,2-Dibromoethane	0.05	nd	nd	nd	2
Ethylbenzene	0.05	nd	nd	nd	0.05
Hexane	0.05	nd	nd	nd	2.8
Methyl Ethyl Ketone	0.05	nd	nd	nd	16
Methyl Isobutyl Ketone	0.05	nd	nd	nd	1.7
Methyl tert-butyl ether	0.05	nd	nd	nd	0.75
Methylene Chloride	0.05	nd	nd	nd	0.1
Styrene	0.05	nd	nd	nd	0.7
1,1,1,2-Tetrachloroethane	0.05	nd	nd	nd	0.058
1,1,2,2-Tetrachloroethane	0.05	nd	nd	nd	0.05
Tetrachloroethylene	0.05	nd	nd	nd	0.28
Toluene	0.05	nd	nd	nd	2.3
1,1,1-Trichloroethane	0.05	nd	nd	nd	0.38
1,1,2-Trichloroethane	0.05	nd	nd	nd	0.05
Trichloroethylene	0.05	nd	nd	nd	0.061
Trichlorofluoromethane	0.05	nd	nd	nd	4
Vinyl Chloride	0.02	nd	nd	nd	0.02
Xylenes	0.05	nd	nd	nd	3.1

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

VOC parameters were not identified in Sample BH3-AU1, above the method detection limits and are therefore in compliance with MOECC Table 3 standards.

Table 9: Analytical Test Results – Soil
Sodium Adsorption Ratio and Electrical Conductivity

Parameter	MDL	Soil Sample	MOECC Table 3 Standards Residential Coarse
		BH3-AU1 (15-Dec-2015)	
Sodium Adsorption Ratio	0.01	1.18	5
Electrical Conductivity	5 µS/cm	170 µS/cm	700 µS/cm

Based on the analytical test results, sodium adsorption ratio (SAR) and electrical conductivity (EC) values for the soil Sample BH3-AU1, are in compliance with MOECC Table 3 standards.

Maximum soil concentrations identified on site are presented in Table 10 below. All other parameter concentrations were below laboratory detection limits.

Table 10: Maximum Concentrations – Soil

Parameter	Maximum Concentration	Borehole	Depth Interval (m BGS)
PHC F2	<40 (µg/g)	BH3-AU1	0.05-0.1 m bgs; fill
PHC F3	105 (µg/g)		
PHC F4	2,090 (µg/g)		
SAR	1.18		
EC	170 µS/cm		

5.6 Groundwater Quality

Groundwater samples from the monitoring wells installed in BH1, BH4 and BH5 were submitted for laboratory analysis of VOC or BTEX and PHC (F_1-F_4) parameters. The groundwater sample recovered from BH3 was submitted for analysis of sodium and chloride. The groundwater samples were obtained from the screened intervals noted on Table 2, above. The results of the analytical testing, as well as the results of the previous testing conducted in 2012, are presented below in Tables 11, 12 and 13. The laboratory certificates of analysis are provided in Appendix 1.

Table 11: Analytical Test Results – Groundwater
PHC (F_1 – F_4)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)					MOECC Table 3 Standards Residential Coarse (µg/L)
		BH2-GW1	BH3-GW1	BH1-GW1	BH4-GW1	BH5-GW1	
		28-Mar-2012		18-Dec-2015			
Benzene	0.5	nd[1]	nd[1]	nd	nd[1]	nd	44
Ethylbenzene	0.5	nd[1]	nd[1]	nd	nd[1]	nd	2,300
Toluene	0.5	nd[1]	nd[1]	nd	30.5[1]	1.2	18,000
Xylenes (total)	0.5	nd[1]	nd[1]	nd	nd[1]	nd	4,200
PHC F_1	25	nd	nd	nd	nd	nd	750
PHC F_2	100	nd	nd	nd	nd	nd	150
PHC F_3	100	nd	nd	nd	nd	nd	500
PHC F_4	100	nd	nd	nd	nd	nd	500

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- [1] – analysed as part of the VOC parameter group (Table 12)

No BTEX or PHC parameters were identified above the method detection limits, with the exception of toluene concentrations of 30.5 µg/L and 1.2 µg/L identified in the groundwater recovered from BH1 and BH5 (2015). The toluene concentrations are in compliance with the MOECC Table 3 standards.

Table 12: Analytical Test Results – Groundwater
VOCs

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)			MOECC Table 3 Standard Residential Coarse (µg/L)
		BH2-GW1	BH3-GW1	BH4-GW1	
		28-Mar-2012		18-Dec-2015	
Acetone	5.0	25.2	9.3	6.1	130,000
Benzene	0.5	nd	nd	nd	44
Bromodichloromethane	0.5	nd	nd	nd	85,000
Bromoform	0.5	nd	nd	nd	380
Bromomethane	0.5	nd	nd	nd	5.6
Carbon Tetrachloride	0.2	nd	nd	nd	0.79
Chlorobenzene	0.5	nd	nd	nd	630
Chloroform	0.5	2.4	nd	0.9	2.4
Dibromochloromethane	0.5	nd	nd	nd	82,000
Dichlorodifluoromethane	1.0	nd	nd	nd	4,400
1,2-Dichlorobenzene	0.5	nd	nd	nd	4,600
1,3-Dichlorobenzene	0.5	nd	nd	nd	9,600
1,4-Dichlorobenzene	0.5	nd	nd	nd	8
1,1-Dichloroethane	0.5	nd	nd	nd	320
1,2-Dichloroethane	0.5	nd	nd	nd	1.6
1,1-Dichloroethylene	0.5	nd	nd	nd	1.6
cis-1,2-Dichloroethylene	0.5	nd	nd	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	nd	1.6
1,2-Dichloropropane	0.5	nd	nd	nd	16
1,3-Dichloropropene	0.5	nd	nd	nd	5.2
1,2-Dibromoethane	0.2	nd	nd	nd	2,300
Ethylbenzene	0.5	nd	nd	nd	0.25
Hexane	1.0	nd	nd	nd	51
Methyl Ethyl Ketone	5.0	nd	nd	nd	470,000
Methyl Isobutyl Ketone	5.0	nd	nd	nd	140,000
Methyl tert-butyl ether	2.0	nd	nd	nd	190
Methylene Chloride	5.0	nd	nd	nd	610
Styrene	0.5	nd	nd	nd	1,300
1,1,1,2-Tetrachloroethane	0.5	nd	nd	nd	3.3
1,1,2,2-Tetrachloroethane	0.5	nd	nd	nd	3.2
Tetrachloroethylene	0.5	nd	nd	nd	1.6
Toluene	0.5	nd	nd	30.5	18,000
1,1,1-Trichloroethane	0.5	nd	nd	nd	640
1,1,2-Trichloroethane	0.5	nd	nd	nd	4.7
Trichloroethylene	0.5	nd	nd	nd	1.6
Trichlorofluoromethane	1.0	nd	nd	nd	2,500
Vinyl Chloride	0.5	nd	nd	nd	0.5
Xylenes	0.5	nd	nd	nd	4,200

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

Acetone was identified at concentrations below MOECC Table 3 standards in both groundwater samples recovered in 2012. A chloroform concentration, equivalent to and therefore in compliance with the Table 3 standard, was identified in BH2 (2012). With the exception of acetone (6.1 µg/L), chloroform (0.9 µg/L) and toluene (30.5 µg/L), VOC parameters were not identified above the method detection limits in the groundwater recovered from BH4 during the current investigation. The detected concentrations are in compliance with the MOECC Table 3 standards selected for the subject site.

Table 13: Analytical Test Results – Groundwater Sodium and Chloride

Parameter	MDL	Groundwater Sample	MOECC Table 3 Standards Residential Coarse
		BH3-GW1 (18-Dec-2015)	
Chloride	1,000 µg/L	8,000 µg/L	2,300,000 µg/L
Sodium	200 µg/L	35,100 µg/L	2,300,000 µg/L

The chloride and sodium concentrations detected in groundwater Sample BH3-GW1 are in compliance with the MOECC Table 3 standards.

The maximum final concentrations of all parameters analyzed in groundwater are summarized below.

Table 14: Maximum Concentrations – Groundwater

Parameter	Maximum Concentration (µg/L)	Borehole/Sample Location	Depth Interval (m BGS)
Acetone	6.1	BH3-GW1	2.74-5.79 m bgs; bedrock
Chloroform	0.9		
Toluene	30.5		
Chloride	8,000		
Sodium	35,100		

Maximum concentrations detected are in compliance with the MOECC Table 3 standards selected for the site. All other parameters analysed were identified at concentrations above their method detection limits.

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 Protocol with respect to holding time, preservation method, storage requirement, and container type.

As per Subsection 47(3) of O.Reg. 153/04 as amended by O.Reg. 269/11, a Certificate of Analysis has been received for each sample submitted for analysis, and all Certificates of Analysis are appended to this report.

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

5.8 Phase II Conceptual Site Model

The following section has been prepared in accordance with the requirements of O.Reg. 153/04 as amended by O.Reg. 269/11 - Record of Site Condition regulation, made under the Environmental Protection Act. Conclusions and recommendations are discussed in a subsequent section.

Site Description

Potentially Contaminating Activities

As per Column A of Table 2 outlined in Ontario Regulation 153/04 and amended by O.Reg. 279/11, potentially contaminating activities (PCAs) identified on the subject property and/or within the Phase I-ESA study area include the following:

- Item 28: Gasoline and Associated Products Storage in Fixed Tanks (PCAs 1,3 and 6);
- Item 19: Electronic and Computer Equipment manufacturing (PCA 2);
- Item 27: Garages (PCA 7);
- Item 30: Importation of Fill Material of Unknown quality (PCA 5); and
- Item 48: Bulk Storage of Salt (PCA 4).

Areas of Potential Environmental Concern

Based on the results of the Phase I ESA completed for the subject site, four Areas of Potential Environmental Concern were identified. The APECs on the subject site are summarized below:

- APEC 1: Former heating oil AST at 37 Neil Avenue (PCA 1);

- APEC 2: Former manufacturing and former heating oil UST at 35 Neil Avenue (PCAs 2 and 3);
- APEC 3: Historical use of eastern portion of the site by MTO (PCA 4);
- APEC 4: Possible impacts from off-site retail fuel outlet on northeastern portion of property(PCA 6);
- APEC 5: Importation of fill material of unknown quality on eastern portion of site (PCA 5).

As discussed in the Phase I-ESA report (PE3699-1), the former UST (PCA 3) included in APEC 2 was addressed during previous investigations carried out by Paterson.

A PCA not considered to have resulted in an APEC on the subject site is the OCDSB facilities department the property located at 1224 Stittsville Main Street, south of the site across Neil Avenue. This property has historically been used for automotive service repairs (PCA 7). Based on the distance of the service building from the subject property (over 60 m) it is not considered to represent an APEC on the subject property.

Contaminants of Potential Concern

The Phase I-ESA identified PHCs, VOCs (including BTEX), sodium, chloride, SAR and/or EC as contaminants of concern in soil and/or groundwater. The Phase I-ESA also identified metals as a CPC associated with the fill. However, based on observations made during the field program, metals were not considered to be a CPC. The fill material was however analysed for several other CPCs. Based on analytical test results, no contaminants of concern exceeding the MOECC Table 3 standards were identified in the soil or groundwater beneath the subject site.

Subsurface Structures and Utilities

The site is currently vacant, undeveloped land. The foundation of the former building addressed 35 Neil Avenue remains present on site. Otherwise, there are no subsurface structures or utilities at the subject site.

Physical Setting

Site Stratigraphy

Site stratigraphy is provided in the Soil Profile and Test Data Sheets provided in Appendix 1 and illustrated on Drawing PE3597-6 - Cross-Section A-A'. Stratigraphy consists of:

- Fill material (granular or silty sand with gravel and organic matter) was encountered at the surface at each borehole location with the exception of BH3 (asphalt) and BH 4 (concrete slab).
- Fill material generally consisting of crushed stone or dark brown silty sand with traces of clay, gravel and/or organic matter, and brown silty sand beneath the foundation at BH4, was identified at or near surface and extended to depths ranging from varied in depth from 0.1 to 3 m below grade.
- Native glacial till was encountered at a depths ranging from approximately 1.4 m to 3 m below ground surface. Native overburden was not encountered at BH 3 or BH6. The glacial till consists of dense, brown to grey silty fine sand with gravel and cobbles.
- Bedrock, consisting of grey limestone, was encountered at depths ranging from near surface to 4.2 m below grade. This is the deepest unit investigated.

Hydrogeological Characteristics

Groundwater levels were measured at the subject site on December 18, 2015. The water table at the subject site was encountered in the bedrock and overburden (fill material at BH1). Groundwater levels were measured at depths between 1.6 and 4.5 m below existing grade. It is noted that water levels fluctuate with seasonal variations.

Based on the groundwater elevations recorded during the monitoring event, groundwater contour mapping was completed. Groundwater contours are shown on Drawing PE3699-6 - Groundwater Contour Plan. Based on the contour mapping, groundwater flow at the subject site appears to be in northeast direction. Horizontal hydraulic gradients of approximately 0.005 m/m and 0.009 m/m were calculated.

Approximate Depth to Bedrock

Based on the results of the investigation the approximate depth to bedrock at the subject site varies between approximately 0.1 and 4.2 m bgs although depth to bedrock is generally greater than 2 m bgs.

Approximate Depth to Water Table

Depth to water table at the subject site varies between approximately 1.6 and 4.5 m below existing grade.

Sections 41 and 43.1 of the Regulation

Section 41 of the Regulation (Site Condition Standards, Environmentally Sensitive Areas) does not apply to the subject site.

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

Fill Placement

No significant amounts of fill material were observed on the subject property at the time of the assessment. Based on previous engineering reports, clean granular material was imported to backfill the small remedial excavation at the property formerly addressed 35 Neil Avenue. Clean granular material would have also been imported for any building and pavement construction.

Various types of fill material were identified at each borehole location during the current subsurface investigation and generally consisted of crushed stone or sand with clay, gravel and/or organic matter. Fill material encountered at BH4, beneath the concrete slab, consisted only of brown silty sand. No deleterious materials were noted in the fill material at any of the borehole locations.

Proposed Buildings and Other Structures

It is our understanding that the subject site will be redeveloped with a retirement residence with full basement level and an at-grade parking lot will be constructed on the eastern and central portions of the property (Parts 1 and 2). The western portion of the property (Part 3) will be developed at a later date.

Existing Buildings and Structures

The site is currently vacant, undeveloped land. The slab-on-grade foundation of the former building at 35 Neil Avenue remains present on the site.

Water Bodies

No bodies of water are present on the subject property or within the Phase I study area.

Areas of Natural Significance

No areas of natural significance were observed on the site or in the Phase I study area.

Environmental Condition

Areas Where Contaminants are Present

Based on screening and analytical results conducted to date, there are no areas of contamination present on the subject property.

Types of Contaminants

The Phase I-ESA identified BTEX, PHCs, VOCs and/or EC, SAR, sodium and chlorides, as contaminants of concern in soil and/or groundwater. The Phase I-ESA also identified metals as a CPCs associated with the fill. However based on the findings of the subsurface investigation, metals were not considered to be CPCs. Based on the results of the Phase II-ESA, there are no contaminants of concern exceeding the MOECC Table 3 standards, in the soil or groundwater beneath the site.

Contaminated Media

Based on the results of the Phase II-ESA, with the information available to date, the soil and groundwater beneath the site are in compliance with the MOECC Table 3 standards selected for the site.

6.0 CONCLUSIONS

Assessment

Paterson Group was retained by Mr. Allan Jackson with 2062915 Ontario Inc., to conduct a Phase II - Environmental Site Assessment of the properties addressed 6130 and 6150 Hazeldean Road, in the City of Ottawa, Ontario. The purpose of the Phase II-ESA was to address the Areas of Potential Environmental Concern (APECs) for the subject site identified during the Phase I-ESA. The Phase II-ESA was carried out in conjunction with a geotechnical investigation and consisted of drilling six boreholes, four of which were instrumented with groundwater monitoring wells, to assess soil and groundwater quality at the subject site.

Soil samples obtained from the boreholes were screened using visual observations and vapour measurements. Soils on site generally consist of a layer of fill material over native glacial till and/or limestone bedrock. The fill material generally consisted of crushed stone and/or silty sand with clay, gravel and/or organic matter while, the fill material encountered beneath the concrete slab of the former building addressed 35 Neil Avenue consisted of brown silty sand. No deleterious materials were identified in the fill at any location on the subject property.

Based on the screening results, a soil sample from each of BHs 3, 4 and 5 were submitted for analytical testing of benzene, toluene, ethylbenzene and xylenes (BTEX) or volatile organic compounds (VOCs) and petroleum hydrocarbons (fractions F_1-F_4). The sample collected from BH3 was also submitted for analysis of sodium adsorption ratio (SAR) and electrical conductivity (EC). All detected concentrations were in compliance with the Ontario Ministry of the Environment and Climate Change (MOECC) Table 3 Standards selected for the site.

Groundwater samples were collected from the monitoring wells installed in BH1, BH3, BH4 and BH5 on December 18, 2015 and submitted for analysis of BTEX or VOC and PHC (F_1-F_4) parameters. The groundwater sample recovered from BH3 was also analysed for sodium and chloride. All detected concentrations were in compliance with the MOECC Table 3 standards.

Based on the findings of the Phase II-ESA, the soil and groundwater conditions beneath the site are considered to be in compliance with the MOECC Table 3 standards selected for the site.

Recommendations

Low concentrations of PHCs were identified in the fill material at BH3. The concentrations are in compliance with MOECC Table 3 standards however they exceed the MOECC Table 1 standards, representative of background conditions and typically used to assess soil for off-site disposal. If soil will be disposed off-site for construction purposes, additional testing of the fill material in the vicinity of BH3 is recommended.

If the monitoring wells installed are not going to be used in the future, they should be abandoned according to Ontario Regulation 903. These wells have been registered with the MOE under this regulation. Further information can be provided upon request.

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 by O.Reg. 269/11, and meets the requirements of CSA Z769-00. The conclusions presented herein are based on information gathered from a limited sampling and testing program. The test results represent conditions at specific test locations at the time of the field program.

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

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

This report was prepared for the sole use of 2062915 Ontario Inc. and 2073945 Ontario Inc. Permission and notification from the clients and Paterson will be required to release this report to any other party.

Paterson Group Inc.

Karyn Munch, P.Eng., QP_{ESA}

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

Report Distribution:

- 2062915 Ontario Inc. and 2073945 Ontario Inc. (2 copies)
- Paterson Group (1 copy)

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE3699-3 – TEST HOLE LOCATION PLAN

DRAWING PE3699-4 – ANALYTICAL TESTING PLAN (SOIL)

DRAWING PE3699-5 – ANALYTICAL TESTING PLAN (GROUNDWATER)

DRAWING PE3699-6 – GROUNDWATER CONTOUR PLAN

DRAWING PE3699-7 – CROSS-SECTION A-A`

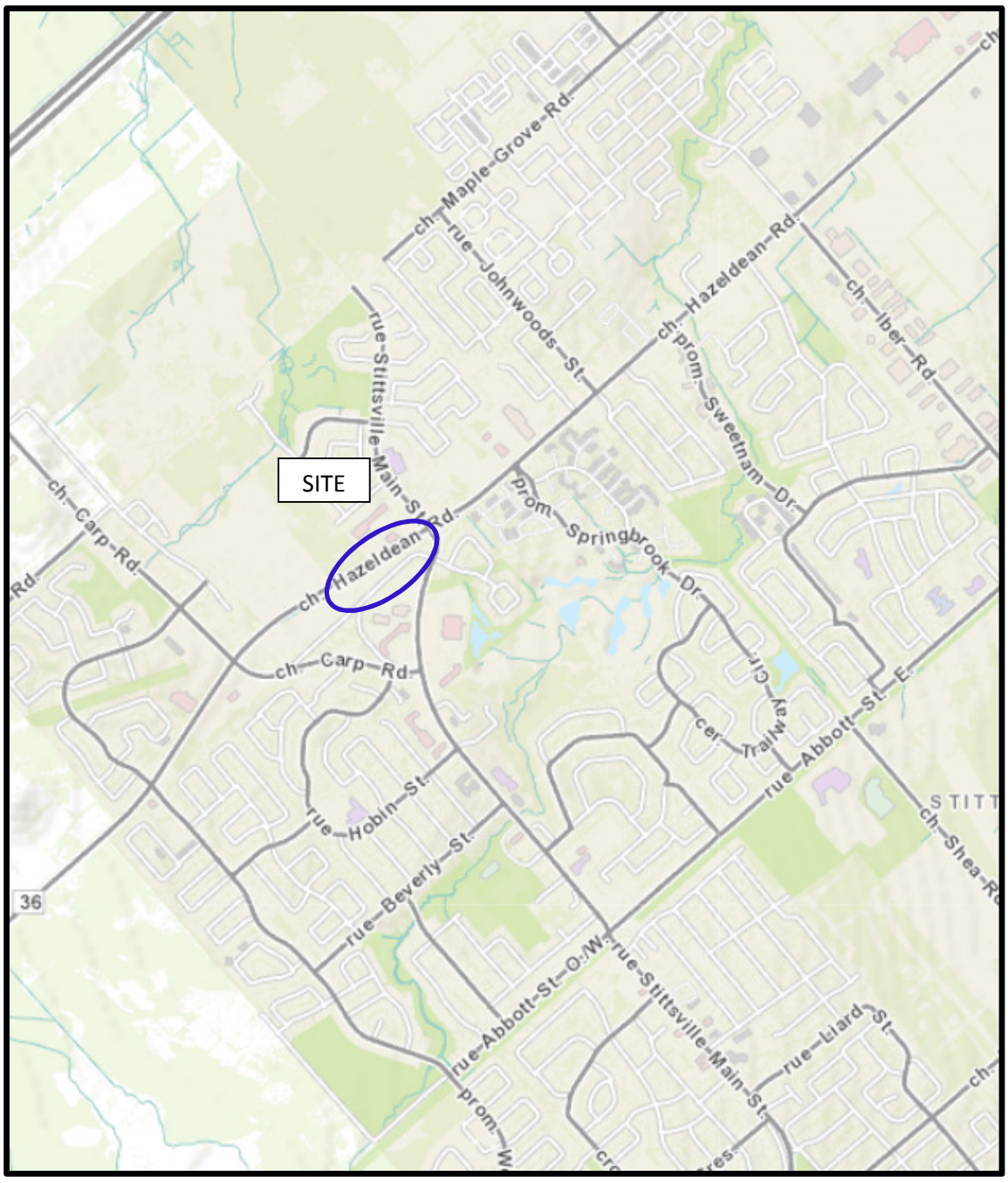


FIGURE 1

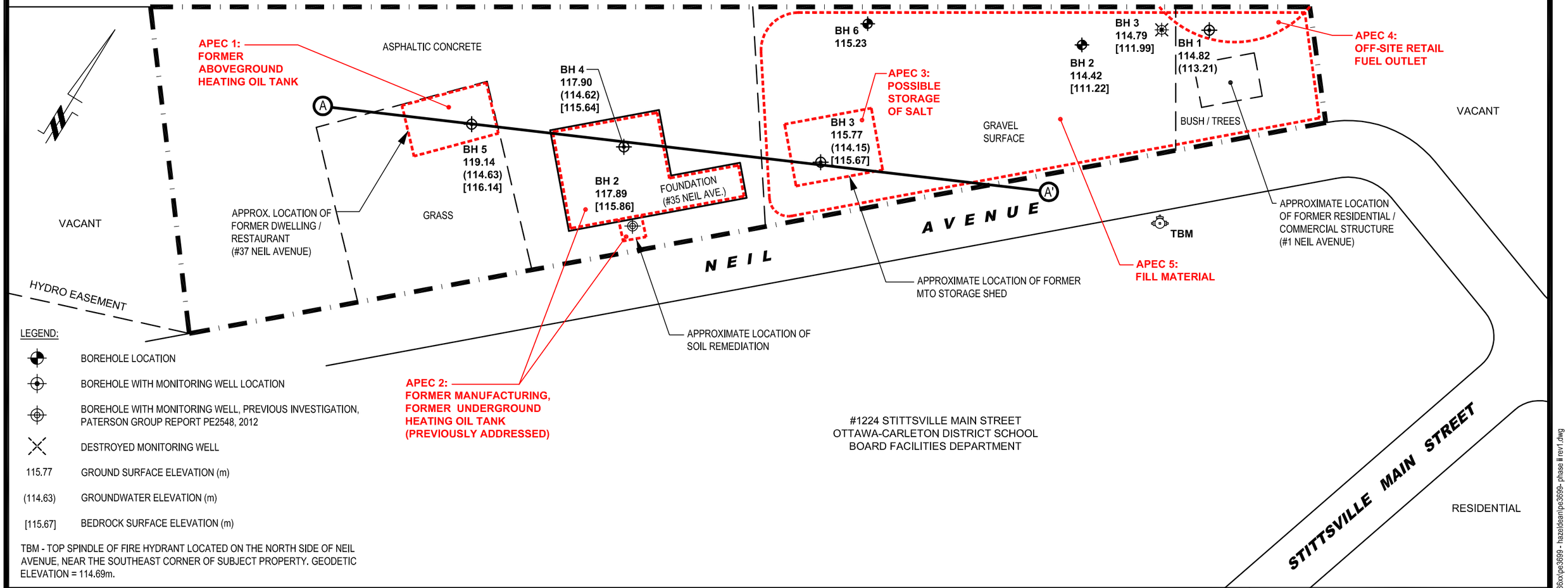
KEY PLAN

#6171
HAZELDEAN ROAD
VACANT

VACANT / TREED

#6081HAZELDEAN ROAD
COMMERCIAL

#6061 HAZELDEAN ROAD
COMMERCIAL / RETAIL FUEL OUTLET



LEGEND:

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- BOREHOLE WITH MONITORING WELL, PREVIOUS INVESTIGATION, PATERSON GROUP REPORT PE2548, 2012
- DESTROYED MONITORING WELL
- 115.77 GROUND SURFACE ELEVATION (m)
- (114.63) GROUNDWATER ELEVATION (m)
- [115.67] BEDROCK SURFACE ELEVATION (m)

TBM - TOP SPINDLE OF FIRE HYDRANT LOCATED ON THE NORTH SIDE OF NEIL AVENUE, NEAR THE SOUTHEAST CORNER OF SUBJECT PROPERTY. GEODETIC ELEVATION = 114.69m.

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NO.	REVISIONS	DATE	INITIAL
1	REVISED SITE ADDRESS	03/03/2016	KM

2062915 ONTARIO INC. & 2073945 ONTARIO INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
6130 AND 6150 HAZELDEAN ROAD

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:1000	Date: 1/2/2016
Drawn by: CPB	Report No.: PE3699-2R
Checked by: KM	Dwg. No.: PE3699-3
Approved by: MSD	Revision No.:

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#6171
HAZELDEAN ROAD
VACANT

VACANT / TREED

#6081HAZELDEAN ROAD
COMMERCIAL

#6061 HAZELDEAN ROAD
COMMERCIAL / RETAIL FUEL OUTLET

HAZELDEAN ROAD

BH4-SS3 (1.5-2.1m) - 15-Dec-15
VOCs and PHCs comply with MOECC Table 3

BH3-SS3 (2.3-2.5m) - 22-Mar-12
VOCs and PHCs comply with MOECC Table 3

BH5-SS3 (1.5-2.0 m) - 14-Dec-15
BTEX and PHCs comply with MOECC Table 3

ASPHALTIC CONCRETE

BH 6
115.23

BH 3
114.79
[111.99]

BH 2
114.42
[111.22]

BH 1
114.82
(113.21)

BH 4
117.90
(114.62)
[115.64]

APPROXIMATE LOCATION OF FORMER MTO STORAGE SHED

GRAVEL SURFACE

BUSH / TREES

VACANT

BH 5
119.14
(114.63)
[116.14]

APPROX. LOCATION OF FORMER DWELLING / RESTAURANT
(#37 NEIL AVENUE)

GRASS

BH 3
115.77
(114.15)
[115.67]

BH 2
117.89
[115.86]

FOUNDATION
(#35 NEIL AVE.)

VACANT

NEIL AVENUE

TBM

APPROXIMATE LOCATION OF FORMER RESIDENTIAL / COMMERCIAL STRUCTURE
(#1 NEIL AVENUE)

BH3-AU1 (0.05-0.1m) - 14-Dec-15
BTEX and PHCs comply with MOECC Table 3
SAR and EC comply with MOECC Table 3

APPROXIMATE LOCATION OF SOIL REMEDIATION

BH2-SS2 (1.5-1.9m) - 22-Mar-12
VOCs and PHCs comply with MOECC Table 3

#1224 STITTSVILLE MAIN STREET
OTTAWA-CARLETON DISTRICT SCHOOL
BOARD FACILITIES DEPARTMENT

STITTSVILLE MAIN STREET

RESIDENTIAL

LEGEND:

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- BOREHOLE WITH MONITORING WELL, PREVIOUS INVESTIGATION, PATERSON GROUP REPORT PE2548, 2012
- DESTROYED MONITORING WELL
- 115.77 GROUND SURFACE ELEVATION (m)
- (114.63) GROUNDWATER ELEVATION (m)
- [115.67] BEDROCK SURFACE ELEVATION (m)

TBM - TOP SPINDLE OF FIRE HYDRANT LOCATED ON THE NORTH SIDE OF NEIL AVENUE, NEAR THE SOUTHEAST CORNER OF SUBJECT PROPERTY. GEODETIC ELEVATION = 114.69m.

SOIL: Analysed parameters comply with MOECC Table 3
SOIL: Analysed parameters exceed MOECC Table 3
GROUNDWATER: Analysed parameters comply with MOECC Table 3
GROUNDWATER: Analysed parameters exceed MOECC Table 3

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NO.	REVISIONS	DATE	INITIAL
1	REVISED SITE ADDRESS	03/03/2016	KM

2062915 ONTARIO INC. & 2073945 ONTARIO INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
6130 AND 6150 HAZELDEAN ROAD

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN (SOIL)

Scale: 1:1000	Date: 1/2016
Drawn by: CPB	Report No.: PE3699-2R
Checked by: KM	Dwg. No.: PE3699-4
Approved by: MSD	Revision No.: 1

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#6171
HAZELDEAN ROAD
VACANT

VACANT / TREED

#6081HAZELDEAN ROAD
COMMERCIAL

#6061 HAZELDEAN ROAD
COMMERCIAL / RETAIL FUEL OUTLET

HAZELDEAN ROAD

BH4-GW1 (2.74-5.79m) - 18-Dec-15
VOCs and PHCs comply with MOECC Table 3

BH3-GW1 (3.99-5.51m) - 28-Mar-12
VOCs and PHCs comply with MOECC Table 3

BH1-GW1 (2.64-4.17m) - 18-Dec-15
BTEX and PHCs comply with MOECC Table 3

BH5-GW1 (4.72-7.32m) - 18-Dec-15
BTEX and PHCs comply with MOECC Table 3

ASPHALTIC CONCRETE

BH 6
115.23

BH 3
114.79
[111.99]

BH 2
114.42
[111.22]

BH 1
114.82
(113.21)

BH 4
117.90
(114.62)
[115.64]

APPROXIMATE LOCATION OF FORMER MTO STORAGE SHED

BH 3
115.77
(114.15)
[115.67]

GRAVEL SURFACE

BUSH / TREES

VACANT

BH 5
119.14
(114.63)
[116.14]

APPROX. LOCATION OF FORMER DWELLING / RESTAURANT
(#37 NEIL AVENUE)

GRASS

BH 2
117.89
[115.86]

FOUNDATION
(#35 NEIL AVE.)

VACANT

NEIL AVENUE

TBM

APPROXIMATE LOCATION OF FORMER RESIDENTIAL / COMMERCIAL STRUCTURE
(#1 NEIL AVENUE)

BH3-GW1 (2.74-5.79m) - 18-Dec-15
Sodium complies with MOECC Table 3

BH2-GW1 (3.81-6.86m) - 28-Mar-12
BTEX and PHCs comply with MOECC Table 3

APPROXIMATE LOCATION OF SOIL REMEDIATION

#1224 STITTSVILLE MAIN STREET
OTTAWA-CARLETON DISTRICT SCHOOL
BOARD FACILITIES DEPARTMENT

STITTSVILLE MAIN STREET

RESIDENTIAL

LEGEND:

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- BOREHOLE WITH MONITORING WELL, PREVIOUS INVESTIGATION, PATERSON GROUP REPORT PE2548, 2012
- DESTROYED MONITORING WELL
- 115.77 GROUND SURFACE ELEVATION (m)
- (114.63) GROUNDWATER ELEVATION (m)
- [115.67] BEDROCK SURFACE ELEVATION (m)

TBM - TOP SPINDLE OF FIRE HYDRANT LOCATED ON THE NORTH SIDE OF NEIL AVENUE, NEAR THE SOUTHEAST CORNER OF SUBJECT PROPERTY. GEODETIC ELEVATION = 114.69m.

SOIL: Analysed parameters comply with MOECC Table 3
SOIL: Analysed parameters exceed MOECC Table 3
GROUNDWATER: Analysed parameters comply with MOECC Table 3
GROUNDWATER: Analysed parameters exceed MOECC Table 3

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NO.	REVISIONS	DATE	INITIAL
1	REVISED SITE ADDRESS	03/03/2016	KM

2062915 ONTARIO INC. & 2073945 ONTARIO INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
6130 AND 6150 HAZELDEAN ROAD

OTTAWA, ONTARIO

Title:
ANALYTICAL TESTING PLAN (GROUNDWATER)

Scale: 1:1000	Date: 1/2016
Drawn by: CPB	Report No.: PE3699-2R
Checked by: KM	Dwg. No.: PE3699-5
Approved by: MSD	Revision No.: 1

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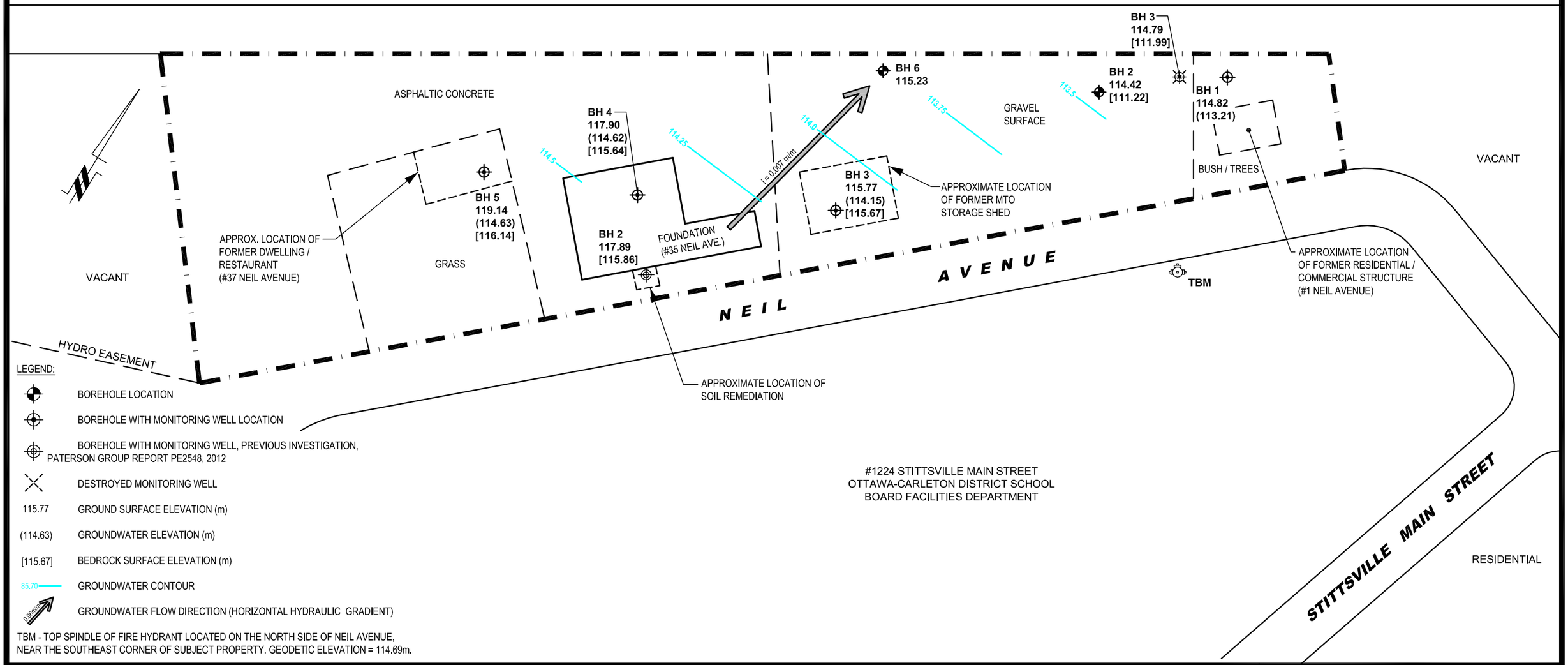
#6171
HAZELDEAN ROAD
VACANT

VACANT / TREED

#6081HAZELDEAN ROAD
COMMERCIAL

#6061 HAZELDEAN ROAD
COMMERCIAL / RETAIL FUEL OUTLET



LEGEND:

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- BOREHOLE WITH MONITORING WELL, PREVIOUS INVESTIGATION, PATERSON GROUP REPORT PE2548, 2012
- DESTROYED MONITORING WELL
- 115.77 GROUND SURFACE ELEVATION (m)
- (114.63) GROUNDWATER ELEVATION (m)
- [115.67] BEDROCK SURFACE ELEVATION (m)
- 85.70 GROUNDWATER CONTOUR
- 0.06m/m GROUNDWATER FLOW DIRECTION (HORIZONTAL HYDRAULIC GRADIENT)

TBM - TOP SPINDLE OF FIRE HYDRANT LOCATED ON THE NORTH SIDE OF NEIL AVENUE, NEAR THE SOUTHEAST CORNER OF SUBJECT PROPERTY. GEODETIC ELEVATION = 114.69m.

#1224 STITTSVILLE MAIN STREET
OTTAWA-CARLETON DISTRICT SCHOOL
BOARD FACILITIES DEPARTMENT

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consulting engineers

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NO.	REVISIONS	DATE	INITIAL
1	REVISED SITE ADDRESS	03/03/2016	KM

2062915 ONTARIO INC. & 2073945 ONTARIO INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
6130 AND 6150 HAZELDEAN ROAD

OTTAWA, ONTARIO

Title:

GROUNDWATER CONTOUR PLAN

Scale: 1:1000	Date: 1/2/2016
Drawn by: CPB	Report No.: PE3699-2R
Checked by: KM	Dwg. No.: PE3699-6
Approved by: MSD	Revision No.: 1

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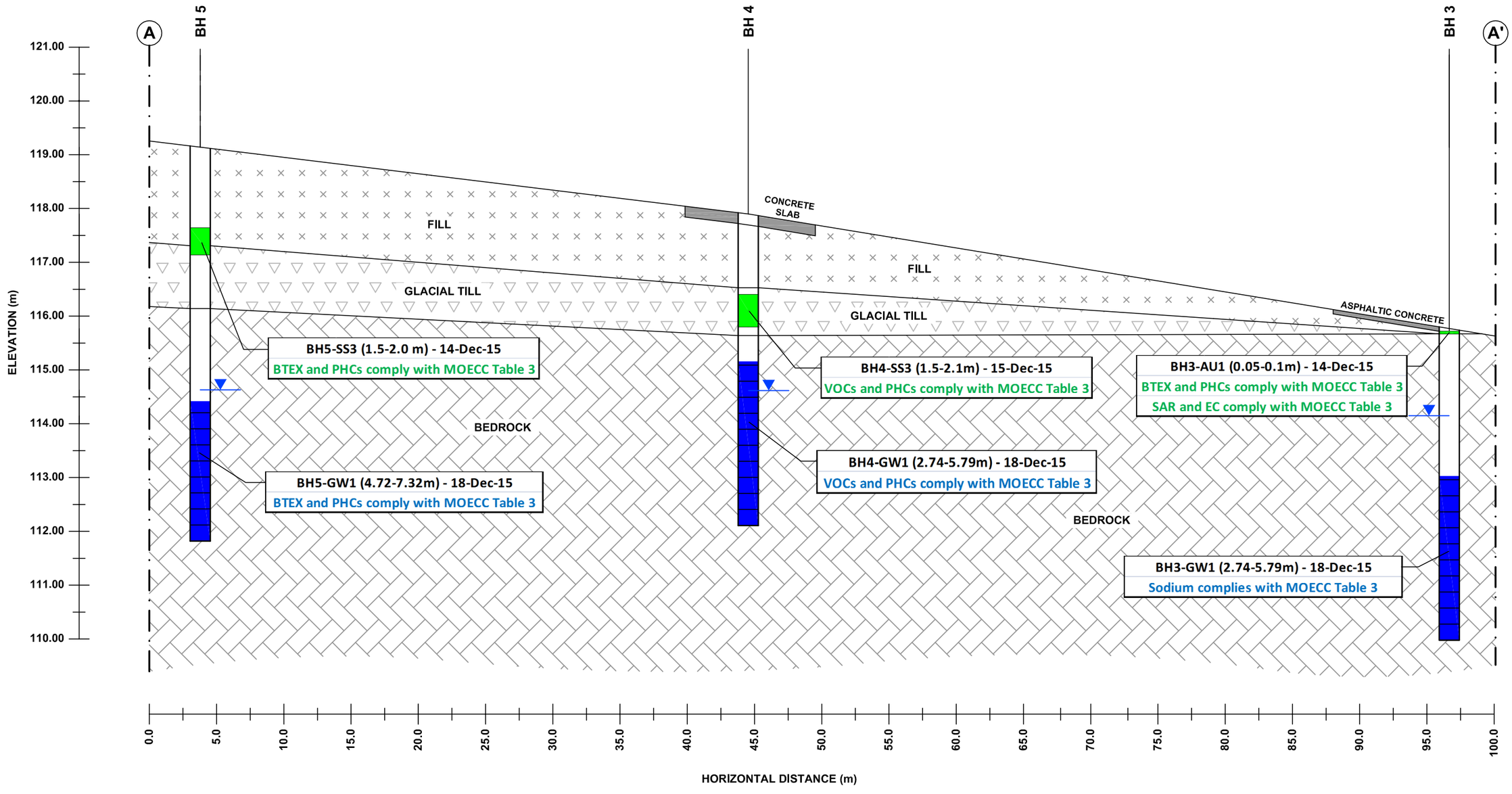

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NO.	REVISIONS	DATE	INITIAL
1	REVISED SITE ADDRESS	03/03/2016	KM

2062915 ONTARIO INC. & 2073945 ONTARIO INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
6130 AND 6150 HAZELDEAN ROAD

OTTAWA, ONTARIO

Title:

CROSS SECTION A-A'

Scale: AS SHOWN	Date: 1/2016
Drawn by: CPB	Report No.: PE3699-2R
Checked by: KM	Dwg. No.: PE3699-7
Approved by: MSD	Revision No.: 1

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APPENDIX 1

SAMPLING AND ANALYSIS PLAN

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

LABORATORY CERTIFICATES OF ANALYSIS

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Services

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Sampling & Analysis Plan

Phase II-Environmental Site Assessment,
Vacant Commercial Land
6130 and 6150 Hazeldean Road
Ottawa, Ontario

Prepared For

2062915 Ontario Inc. and
2073945 Ontario Inc.

December 11, 2015

Report: PE3699-SAP

Table of Contents

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Mr. Allan Jackson with 2062915 Ontario Inc., to conduct a Phase II-Environmental Site Assessment (ESA) for the land addressed 6130 and 6150 Hazeldean Road, Ottawa, Ontario. Based on findings from the Phase I-ESA conducted by Paterson in December of 2015, a subsurface investigation program, consisting of borehole drilling, was developed. It should be noted that the Phase II-ESA will be conducted in conjunction with a Geotechnical Investigation.

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1	Located to address potential groundwater impacts from the neighbouring retail fuel outlet to the northeast (6061 Hazeldean Road).	Intercept groundwater table for installation of monitoring well.
BH2	Located to provide coverage of proposed building footprint for geotechnical purposes.	Split spoon sample to bedrock.
BH3	Located to address potential soil and groundwater impacts in the approximate vicinity of the former MTO structure reportedly used for the storage of salt.	Core into limestone bedrock to intercept groundwater table for installation of monitoring well.
BH4	Located to address potential soil and groundwater impacts from the former manufacturing operation at 35 Neil Avenue.	Core into limestone bedrock to intercept groundwater table for installation of monitoring well.
BH5	Placed to address potential soil and groundwater impacts from a reported interior AST associated with the former dwelling/restaurant at 37 Neil Avenue.	Core into limestone bedrock to intercept groundwater table for installation of monitoring well.
BH6	Located for geotechnical reasons – to interpret bedrock elevation.	Auger to refusal on inferred bedrock.

Borehole locations are shown on the Test Hole Location Plan appended to the main report.

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

For the purposes of intercepting the groundwater table to obtain water levels and recover groundwater samples, select boreholes will be advanced into bedrock using diamond coring equipment. Following borehole drilling, monitoring wells will be installed in each borehole (as above). Rock core samples will be retained for review but not submitted for analytical testing.

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 MOECC site condition standards.
- In boreholes with evidence of contamination as described above, a sample should be submitted from the stratigraphic unit below the 'worst-case' sample to determine whether the contaminant(s) have migrated downward.
- Parameters analyzed should be consistent with the Contaminants of Potential Concern identified in the Phase I-ESA.

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

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

3.0 STANDARD OPERATING PROCEDURES

3.1 Environmental Drilling Procedure

Purpose

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

Equipment

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

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

Determining Borehole Locations

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

After drilling is completed, a plan with the borehole locations must be provided. Distances 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 F1, a soil core from each soil sample which may be analyzed must be taken and placed in the laboratory-provided methanol vial.
- Note all and any odours or discolouration of samples.
- Split spoon samplers must be washed between samples.
- If obvious contamination is encountered, continue sampling until vertical extent of contamination is delineated.
- As a general rule, environmental boreholes should be deep enough to intercept the groundwater table (unless this is impossible/impractical - call project manager to discuss).
- If at all possible, soil samples should be submitted to a preliminary screening procedure on site, either using a RKI Eagle, PID, etc. depending on type of suspected contamination.

Spoon Washing Procedure

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

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

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

Screening Procedure

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

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

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

3.2 Monitoring Well Installation Procedure

Equipment

- 1.5 m x 50 mm threaded sections of Schedule 40 PVC slotted well screen (1.5 m x 31 mm if installing in cored hole in bedrock)
- 1.5 m x 50 mm threaded sections of Schedule 40 PVC riser pipe (1.5 m x 31 mm if installing in cored hole in bedrock)
- Threaded end-cap
- Slip-cap or J-plug
- Asphalt cold patch or concrete
- Silica Sand
- Bentonite chips (Holeplug)
- Steel flushmount casing

Procedure

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

- Install flushmount casing. Seal space between flushmount and borehole annulus with concrete, cold patch, or holeplug to match surrounding ground surface.

3.3 Monitoring Well Sampling Procedure

Equipment

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

Sampling Procedure

- Locate well and use socket wrench or Allan key to open metal flush mount protector cap. Remove plastic well cap.
- Measure water level, with respect to existing ground surface, using water level meter or interface probe. If using interface probe on suspected NAPL site, measure the thickness of free product.
- Measure total depth of well.
- Clean water level tape or interface probe using methanol and water. Change gloves between wells.
- Calculate volume of standing water within well and record.
- Insert polyethylene tubing into well and attach to peristaltic pump. Turn on peristaltic pump and purge into graduated bucket. Purge at least three well volumes of water from the well. Measure and record field chemistry. Continue to purge, measuring field chemistry after every well volume purged, until appearance or field chemistry stabilizes.

- Note appearance of purge water, including colour, opacity (clear, cloudy, silty), sheen, presence of LNAPL, and odour. Note any other unusual features (particulate matter, effervescence (bubbling) of dissolved gas, etc.).
- Fill required sample bottles. If sampling for metals, attach 75-micron filter to discharge tube and filter metals sample. If sampling for VOCs, use low flow rate to ensure continuous stream of non-turbulent flow into sample bottles. Ensure no headspace is present in VOC vials.
- Replace well cap and flushmount casing cap.

4.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

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

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

5.0 DATA QUALITY OBJECTIVES

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

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

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

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

For the purpose of calculating the RPD, it is desirable to select field duplicates from samples for which parameters are present in concentrations above laboratory detection limits, i.e. samples which are expected to be contaminated. If parameters are below laboratory detection limits for selected samples or duplicates, the RPD may be calculated using a concentration equal to one half (0.5 x) the laboratory detection limit.

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

These considerations are discussed in the body of the report.

6.0 PHYSICAL IMPEDIMENTS TO SAMPLING & ANALYSIS PLAN

Physical impediments to the Sampling and Analysis plan may include:

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

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

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Vacant Commercial Land - 6176 Hazeldean Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the north side of Neil Avenue, near the southeast corner of subject property. Geodetic elevation = 114.69m.

FILE NO. PE3699

REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** December 14, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	114.82
		AU	1				
FILL: Dark brown silty sand, some clay and cobbles, trace gravel and organic matter		SS	2	58	26	1	113.82
		SS	3	54	19	2	112.82
		SS	4	25	10		
2.95						3	111.82
GLACIAL TILL: Compact to dense, grey sandy silt with gravel and cobbles		SS	5	50	19		
4.17		SS	6	4	50+	4	110.82
End of Borehole							
Practical refusal to augering at 4.17m depth							
(GWL @ 1.61m-Dec. 18, 2015)							

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
Vacant Commercial Land - 6176 Hazeldean Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the north side of Neil Avenue, near the southeast corner of subject property. Geodetic elevation = 114.69m.

FILE NO. PE3699

REMARKS

HOLE NO. BH 2

BORINGS BY CME 55 Power Auger **DATE** December 14, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	114.42
FILL: Crushed stone with sand, some silt		AU	1				
0.56							
FILL: Dark brown silty sand, trace organics		SS	2	46	11	1	113.42
		SS	3	42	10	2	112.42
2.19							
GLACIAL TILL: Dense, brown silty sand with gravel and cobbles		SS	4	79	34	3	111.42
3.20		SS	5	4	50+		
BEDROCK: Grey limestone, some shale partings and seams		RC	1	100	64	4	110.42
- 25mm mud seam at 4.0m depth						5	109.42
		RC	2	98	85		
6.12						6	108.42
End of Borehole							

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

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
Vacant Commercial Land - 6176 Hazeldean Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the north side of Neil Avenue, near the southeast corner of subject property. Geodetic elevation = 114.69m.

FILE NO. PE3699

REMARKS

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** December 14, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	115.77
Asphaltic concrete 0.05		AU	1				
FILL: Brown sand, some silt and gravel 0.10							
		SS	2	4	50+	1	114.77
		AU	3				
		RC	1	100	0	2	113.77
BEDROCK: Grey limestone with shale partings and seams						3	112.77
		RC	2	100	57		
- 25mm mud seam at 4.0m depth						4	111.77
		RC	3	98	65	5	110.77
5.79							
End of Borehole							
(GWL @ 1.62m-Dec. 18, 2015)							

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
Vacant Commercial Land - 6176 Hazeldean Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the north side of Neil Avenue, near the southeast corner of subject property. Geodetic elevation = 114.69m.

FILE NO. PE3699

REMARKS

HOLE NO. BH 4

BORINGS BY CME 55 Power Auger **DATE** December 15, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	117.90
Concrete slab 0.20		AU	1				
FILL: Brown silty sand, trace gravel and boulders		SS	2	25	60	1	116.90
1.37							
GLACIAL TILL: Dense, brown silty sand with gravel, cobbles and boulders		SS	3	54	37	2	115.90
2.26		RC	1	100	0		
BEDROCK: Grey limestone with shale partings and seams		RC	2	100	36	3	114.90
						4	113.90
		RC	3	95	61	5	112.90
5.79							
End of Borehole							
(GWL @ 3.28m-Dec. 18, 2015)							

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
Vacant Commercial Land - 6176 Hazeldean Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the north side of Neil Avenue, near the southeast corner of subject property. Geodetic elevation = 114.69m.

FILE NO. PE3699

REMARKS

HOLE NO. BH 5

BORINGS BY CME 55 Power Auger **DATE** December 14, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	119.14
FILL: Brown silty sand with gravel, occasional boulders		AU	1				
		SS	2	21	18	1	118.14
1.83		SS	3	53	14		
GLACIAL TILL: Boulders with some silt, sand and gravel		RC	1	65		2	117.14
3.00						3	116.14
		RC	2	87	35	4	115.14
BEDROCK: Grey limestone with shale partings and seams		RC	3	100	44	5	114.14
						6	113.14
		RC	4	98	52	7	112.14
7.32							
End of Borehole							
(GWL @ 4.51m-Dec. 18, 2015)							

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
Vacant Commercial Land - 6176 Hazeldean Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the north side of Neil Avenue, near the southeast corner of subject property. Geodetic elevation = 114.69m.

FILE NO. PE3699

REMARKS

HOLE NO. BH 6

BORINGS BY CME 55 Power Auger **DATE** December 15, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: ● Volatile Organic Rdg. (ppm) / ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	115.23		
FILL: Crushed stone with silt and sand		AU	1						
0.61									
End of Borehole									
Practical refusal to augering at 0.61m depth									
(BH dry upon completion)									

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.

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

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

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

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

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

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

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

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

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

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

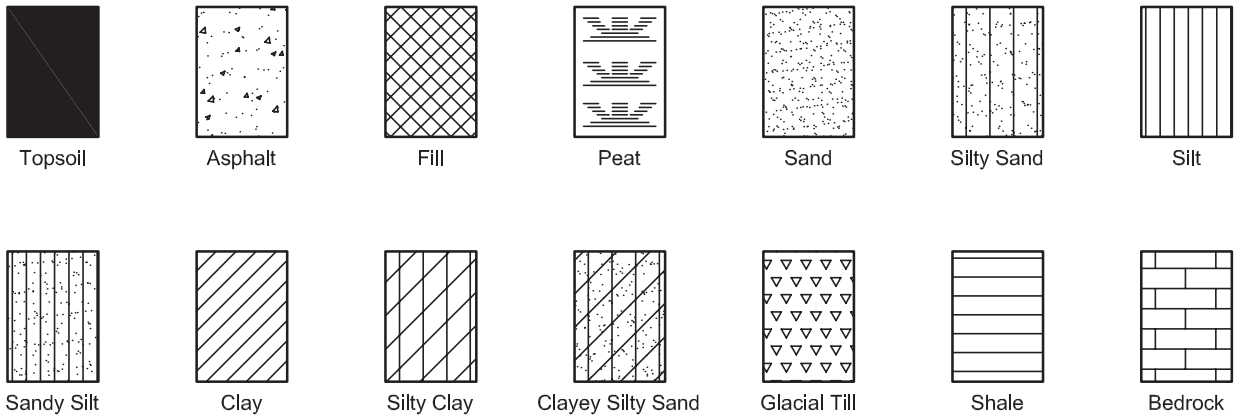
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

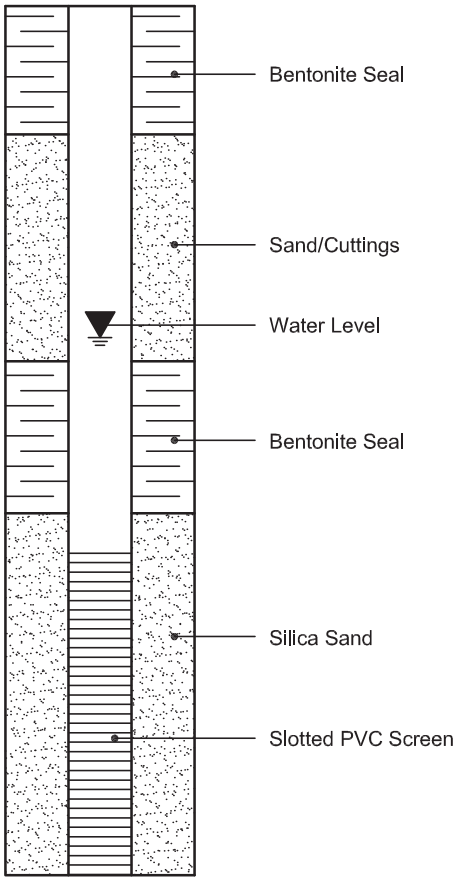
SYMBOLS AND TERMS (continued)

STRATA PLOT

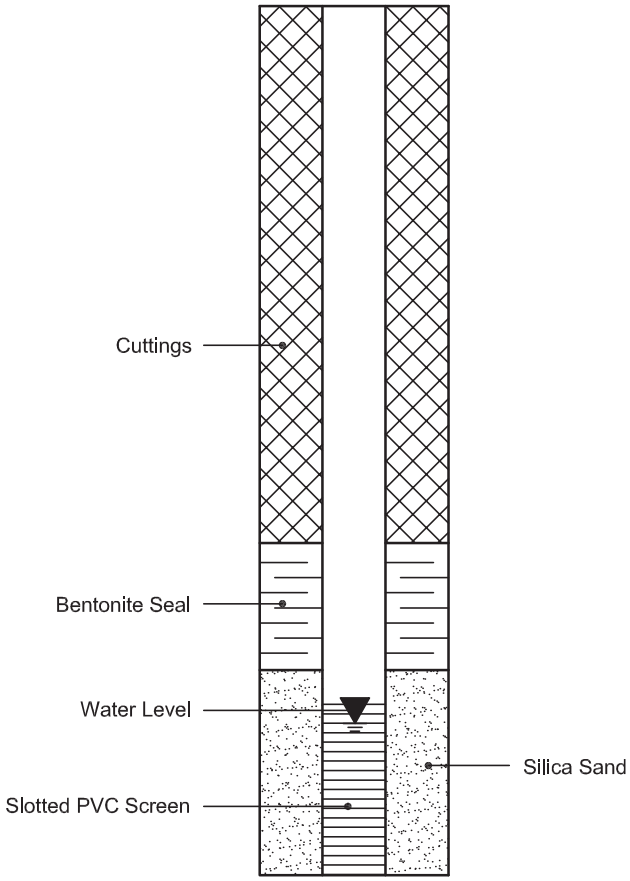


MONITORING WELL AND PIEZOMETER CONSTRUCTION

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

Phone: (613) 226-7381
Fax: (613) 226-6344

Client PO: 10203
Project: PE2548
Custody: 85625

Report Date: 28-Mar-2012
Order Date: 23-Mar-2012
Order #: 1212279

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

Paracel ID	Client ID
1212279-01	BH1-SS8
1212279-02	BH2-SS2
1212279-03	BH3-SS3

Approved By:

Mark Foto, M.Sc. For Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**

Client PO: 10203 Project Description: PE2548

Report Date: 28-Mar-2012

Order Date:23-Mar-2012

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
CCME PHC F1	CWS Tier 1 - P&T GC-FID	26-Mar-12	26-Mar-12
CCME PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	26-Mar-12	26-Mar-12
Solids, %	Gravimetric, calculation	26-Mar-12	26-Mar-12
VOCs	EPA 8260 - P&T GC-MS	26-Mar-12	26-Mar-12

Certificate of Analysis

Report Date: 28-Mar-2012

Client: **Paterson Group Consulting Engineers**

Order Date:23-Mar-2012

Client PO: 10203

Project Description: PE2548

	Client ID:	BH1-SS8	BH2-SS2	BH3-SS3	-
	Sample Date:	22-Mar-12	22-Mar-12	22-Mar-12	-
	Sample ID:	1212279-01	1212279-02	1212279-03	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	90.3	94.0	89.5	-
Volatiles					
Acetone	0.50 ug/g dry	<0.50	<0.50	<0.50	-
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Bromodichloromethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Bromoform	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Bromomethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Carbon Tetrachloride	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Chlorobenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Chloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Chloroform	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Chloromethane	0.20 ug/g dry	<0.20	<0.20	<0.20	-
Dibromochloromethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Dichlorodifluoromethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,2-Dibromoethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,2-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,3-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,4-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,1-Dichloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,2-Dichloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,1-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
cis-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
trans-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,2-Dichloroethylene, total	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,2-Dichloropropane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
cis-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
trans-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,3-Dichloropropene, total	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Hexane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	<0.50	<0.50	<0.50	-
Methyl Butyl Ketone (2-Hexanone)	2.00 ug/g dry	<2.00	<2.00	<2.00	-
Methyl Isobutyl Ketone	0.50 ug/g dry	<0.50	<0.50	<0.50	-

Certificate of Analysis

Report Date: 28-Mar-2012

Client: **Paterson Group Consulting Engineers**

Order Date:23-Mar-2012

Client PO: 10203

Project Description: PE2548

	Client ID:	BH1-SS8	BH2-SS2	BH3-SS3	-
	Sample Date:	22-Mar-12	22-Mar-12	22-Mar-12	-
	Sample ID:	1212279-01	1212279-02	1212279-03	-
	MDL/Units	Soil	Soil	Soil	-
Methyl tert-butyl ether	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Methylene Chloride	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Styrene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Tetrachloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,2,4-Trichlorobenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,1,1-Trichloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,1,2-Trichloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Trichloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Trichlorofluoromethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,3,5-Trimethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Vinyl chloride	0.02 ug/g dry	<0.02	<0.02	<0.02	-
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	-
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	-
4-Bromofluorobenzene	Surrogate	93.9%	93.3%	93.0%	-
Dibromofluoromethane	Surrogate	106%	105%	105%	-
Toluene-d8	Surrogate	106%	105%	104%	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	36	<4	-
F3 PHCs (C16-C34)	8 ug/g dry	<8	39	<8	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	-

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**

Client PO: 10203 Project Description: PE2548

Report Date: 28-Mar-2012

Order Date:23-Mar-2012

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Volatiles									
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						
Chloroethane	ND	0.05	ug/g						
Chloroform	ND	0.05	ug/g						
Chloromethane	ND	0.20	ug/g						
Dibromochloromethane	ND	0.05	ug/g						
Dichlorodifluoromethane	ND	0.05	ug/g						
1,2-Dibromoethane	ND	0.05	ug/g						
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-Dichloroethylene, total	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						
Hexane	ND	0.05	ug/g						
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g						
Methyl Butyl Ketone (2-Hexanone)	ND	2.00	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						
1,2,4-Trichlorobenzene	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						
1,3,5-Trimethylbenzene	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	*7.42*		*ug/g*		*92.7*	*50-140*			
Surrogate: Dibromofluoromethane	*8.49*		*ug/g*		*106*	*50-140*			
Surrogate: Toluene-d8	*8.11*		*ug/g*		*101*	*50-140*			

Certificate of Analysis

Report Date: 28-Mar-2012

Client: **Paterson Group Consulting Engineers**

Order Date:23-Mar-2012

Client PO: 10203 Project Description: PE2548

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND				30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND				30	
Physical Characteristics									
% Solids	85.2	0.1	% by Wt.	87.3			2.4	25	
Volatiles									
Acetone	ND	0.50	ug/g dry	ND				50	
Benzene	ND	0.02	ug/g dry	ND				50	
Bromodichloromethane	ND	0.05	ug/g dry	ND				50	
Bromoform	ND	0.05	ug/g dry	ND				50	
Bromomethane	ND	0.05	ug/g dry	ND				50	
Carbon Tetrachloride	ND	0.05	ug/g dry	ND				50	
Chlorobenzene	ND	0.05	ug/g dry	ND				50	
Chloroethane	ND	0.05	ug/g dry	ND				50	
Chloroform	ND	0.05	ug/g dry	ND				50	
Chloromethane	ND	0.20	ug/g dry	ND				50	
Dibromochloromethane	ND	0.05	ug/g dry	ND				50	
Dichlorodifluoromethane	ND	0.05	ug/g dry	ND				50	
1,2-Dibromoethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,3-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,4-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
cis-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
trans-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
1,2-Dichloropropane	ND	0.05	ug/g dry	ND				50	
cis-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
trans-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Hexane	ND	0.05	ug/g dry	ND				50	
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g dry	ND				50	
Methyl Butyl Ketone (2-Hexanone)	ND	2.00	ug/g dry	ND				50	
Methyl Isobutyl Ketone	ND	0.50	ug/g dry	ND				50	
Methyl tert-butyl ether	ND	0.05	ug/g dry	ND				50	
Methylene Chloride	ND	0.05	ug/g dry	ND				50	
Styrene	ND	0.05	ug/g dry	ND				50	
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
Tetrachloroethylene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
1,2,4-Trichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,1,1-Trichloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2-Trichloroethane	ND	0.05	ug/g dry	ND				50	
Trichloroethylene	ND	0.05	ug/g dry	ND				50	
Trichlorofluoromethane	ND	0.05	ug/g dry	ND				50	
1,3,5-Trimethylbenzene	ND	0.05	ug/g dry	ND				50	
Vinyl chloride	ND	0.02	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: 4-Bromofluorobenzene	*9.12*		*ug/g dry*	*ND*	*94.5*	*50-140*			
Surrogate: Dibromofluoromethane	*9.88*		*ug/g dry*	*ND*	*102*	*50-140*			
Surrogate: Toluene-d8	*10.2*		*ug/g dry*	*ND*	*106*	*50-140*			

Certificate of Analysis
Client: **Paterson Group Consulting Engineers**
Client PO: 10203 Project Description: PE2548

Report Date: 28-Mar-2012
Order Date:23-Mar-2012

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	187	7	ug/g	ND	93.4	80-120			
F2 PHCs (C10-C16)	96	4	ug/g	ND	86.0	60-140			
F3 PHCs (C16-C34)	241	8	ug/g	ND	86.2	60-140			
F4 PHCs (C34-C50)	147	6	ug/g	ND	87.6	60-140			
Volatiles									
Acetone	10.8	0.50	ug/g	ND	108	50-140			
Benzene	4.80	0.02	ug/g	ND	120	60-130			
Bromodichloromethane	4.88	0.05	ug/g	ND	122	60-130			
Bromoform	3.72	0.05	ug/g	ND	92.9	60-130			
Bromomethane	4.88	0.05	ug/g	ND	122	50-140			
Carbon Tetrachloride	4.61	0.05	ug/g	ND	115	60-130			
Chlorobenzene	4.04	0.05	ug/g	ND	101	60-130			
Chloroethane	4.17	0.05	ug/g	ND	104	50-140			
Chloroform	4.77	0.05	ug/g	ND	119	60-130			
Chloromethane	4.52	0.20	ug/g	ND	113	50-140			
Dibromochloromethane	4.06	0.05	ug/g	ND	102	60-130			
Dichlorodifluoromethane	4.27	0.05	ug/g	ND	107	50-140			
1,2-Dibromoethane	4.16	0.05	ug/g	ND	104	60-130			
1,2-Dichlorobenzene	3.85	0.05	ug/g	ND	96.3	60-130			
1,3-Dichlorobenzene	3.42	0.05	ug/g	ND	85.5	60-130			
1,4-Dichlorobenzene	3.76	0.05	ug/g	ND	94.1	60-130			
1,1-Dichloroethane	5.04	0.05	ug/g	ND	126	60-130			
1,2-Dichloroethane	5.06	0.05	ug/g	ND	126	60-130			
1,1-Dichloroethylene	3.71	0.05	ug/g	ND	92.8	60-130			
cis-1,2-Dichloroethylene	4.43	0.05	ug/g	ND	111	60-130			
trans-1,2-Dichloroethylene	4.84	0.05	ug/g	ND	121	60-130			
1,2-Dichloropropane	5.14	0.05	ug/g	ND	128	60-130			
cis-1,3-Dichloropropylene	4.75	0.05	ug/g	ND	119	60-130			
trans-1,3-Dichloropropylene	4.50	0.05	ug/g	ND	112	60-130			
Ethylbenzene	4.20	0.05	ug/g	ND	105	60-130			
Hexane	5.08	0.05	ug/g	ND	127	60-130			
Methyl Ethyl Ketone (2-Butanone)	10.5	0.50	ug/g	ND	105	50-140			
Methyl Butyl Ketone (2-Hexanone)	10.2	2.00	ug/g	ND	102	50-140			
Methyl Isobutyl Ketone	11.1	0.50	ug/g	ND	111	50-140			
Methyl tert-butyl ether	11.7	0.05	ug/g	ND	117	50-140			
Methylene Chloride	3.65	0.05	ug/g	ND	91.2	60-130			
Styrene	4.07	0.05	ug/g	ND	102	60-130			
1,1,1,2-Tetrachloroethane	3.62	0.05	ug/g	ND	90.6	60-130			
1,1,2,2-Tetrachloroethane	3.88	0.05	ug/g	ND	97.1	60-130			
Tetrachloroethylene	3.52	0.05	ug/g	ND	88.0	60-130			
Toluene	4.69	0.05	ug/g	ND	117	60-130			
1,2,4-Trichlorobenzene	4.42	0.05	ug/g	ND	111	60-130			
1,1,1-Trichloroethane	5.16	0.05	ug/g	ND	129	60-130			
1,1,2-Trichloroethane	4.68	0.05	ug/g	ND	117	60-130			
Trichloroethylene	4.31	0.05	ug/g	ND	108	60-130			
Trichlorofluoromethane	3.47	0.05	ug/g	ND	86.8	50-140			
1,3,5-Trimethylbenzene	4.43	0.05	ug/g	ND	111	60-130			
Vinyl chloride	3.83	0.02	ug/g	ND	95.7	50-140			
m,p-Xylenes	7.85	0.05	ug/g	ND	98.1	60-130			

Certificate of Analysis

Report Date: 28-Mar-2012

Client: **Paterson Group Consulting Engineers**

Order Date:23-Mar-2012

Client PO: 10203 Project Description: PE2548

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
o-Xylene	4.27	0.05	ug/g	ND	107	60-130			
Surrogate: 4-Bromofluorobenzene	*7.85*		*ug/g*		*98.1*	*50-140*			

Certificate of Analysis

Report Date: 28-Mar-2012

Client: **Paterson Group Consulting Engineers**

Order Date:23-Mar-2012

Client PO: 10203 Project Description: PE2548

Sample and QC Qualifiers Notes

None

Sample Data Revisions

None

Work Order Revisions/Comments:

None

Other Report Notes:

n/a: not applicable

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

Soil results are reported on a dry weight basis when the units are denoted with 'dry'.

Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

CCME PHC additional information:

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

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Nº 85625

Page __ of __

Client Name: Paterson Group	Project Reference: PE 2548	TAT: [✓] Regular
Contact Name: Mark D'Arcy	Quote #	[ ] 2 Day
Address: 154 Colonnade Rd	PO # 10203	[ ] 1 Day
	Email Address: mdarcy@patersongroup.ca	[ ] Same Day
Telephone: 613-226-7381		Date Required:

Samples Submitted Under: [ ] O. Reg. 153/04 Table __ [✓] O. Reg 511/09 Table 3 [ ] PWQO [ ] CCME [ ] Sewer Use (Storm) [ ] Sewer Use (Sanitary) [ ] Other:_____

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

Required Analyses

Paracel Order Number: 1212279

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	VOC	PHC F-F4								
1	BH1-SS8	S		2	Mar 22/12	9Am	X	X								
2	BH2-SS2	S		2	"	10Am	X	X								
3	BH3-SS3	S		2	"	11Am	X	X								
4																
5																
6																
7																
8																
9																
10																

Comments:

Method of Delivery: Paracel

Relinquished By (Print & Sign):	Received by Driver/Depot:	Received at Lab:	Verified By:
Mark D'Arcy	T. Feduse	MJC	MJC
Date/Time: March 23/12	Date/Time: 23/03/12 10:25a.m.	Date/Time: Mar 23/12 11:30	Date/Time: Mar 23/12 2:18
	Temperature: ____ °C	Temperature: 18.7 °C	pH Verified [ ] By: N/A

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Certificate of Analysis

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

Phone: (613) 226-7381
Fax: (613) 226-6344

Client PO: 10205
Project: PE2548
Custody: 85627

Report Date: 4-Apr-2012
Order Date: 29-Mar-2012
Order #: 1213155

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

Paracel ID	Client ID
1213155-01	BH1-GW1
1213155-02	BH2-GW1
1213155-03	BH3-GW1

Approved By:

Mark Foto, M.Sc. For Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 04-Apr-2012

Client: **Paterson Group Consulting Engineers**

Order Date:29-Mar-2012

Client PO: 10205 Project Description: PE2548

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
CCME PHC F1	CWS Tier 1 - P&T GC-FID	29-Mar-12	30-Mar-12
CCME PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	29-Mar-12	31-Mar-12
VOCs	EPA 624 - P&T GC-MS	29-Mar-12	29-Mar-12

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**

Client PO: 10205

Report Date: 04-Apr-2012

Order Date:29-Mar-2012

Project Description: PE2548

	Client ID:	BH1-GW1	BH2-GW1	BH3-GW1	-
	Sample Date:	28-Mar-12	28-Mar-12	28-Mar-12	-
	Sample ID:	1213155-01	1213155-02	1213155-03	-
	MDL/Units	Water	Water	Water	-
Volatiles					
Acetone	5.0 ug/L	24.0	25.2	9.3	-
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	-
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Chloroethane	1.0 ug/L	<1.0	<1.0	<1.0	-
Chloroform	0.5 ug/L	<0.5	2.4	<0.5	-
Chloromethane	3.0 ug/L	<3.0	<3.0	<3.0	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	-
1,2-Dibromoethane	0.2 ug/L	<0.2	<0.2	<0.2	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2-Dichloroethylene, total	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	-
Methyl Butyl Ketone (2-Hexanone)	10.0 ug/L	<10.0	<10.0	<10.0	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	-

Certificate of Analysis

Report Date: 04-Apr-2012

Client: **Paterson Group Consulting Engineers**

Order Date:29-Mar-2012

Client PO: 10205

Project Description: PE2548

	Client ID:	BH1-GW1	BH2-GW1	BH3-GW1	-
	Sample Date:	28-Mar-12	28-Mar-12	28-Mar-12	-
	Sample ID:	1213155-01	1213155-02	1213155-03	-
	MDL/Units	Water	Water	Water	-
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Toluene	0.5 ug/L	0.6	<0.5	<0.5	-
1,2,4-Trichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	-
1,3,5-Trimethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	-
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	-
4-Bromofluorobenzene	Surrogate	103%	105%	104%	-
Dibromofluoromethane	Surrogate	92.2%	92.9%	94.3%	-
Toluene-d8	Surrogate	104%	104%	104%	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	<25	-
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	-
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	-
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	-

Certificate of Analysis
Client: **Paterson Group Consulting Engineers**
Client PO: 10205 Project Description: PE2548

Report Date: 04-Apr-2012
Order Date:29-Mar-2012

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						
Chloroethane	ND	1.0	ug/L						
Chloroform	ND	0.5	ug/L						
Chloromethane	ND	3.0	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dibromoethane	ND	0.2	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-Dichloroethylene, total	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						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Butyl Ketone (2-Hexanone)	ND	10.0	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						
1,2,4-Trichlorobenzene	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						
1,3,5-Trimethylbenzene	ND	0.5	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	*33.4*		*ug/L*		*105*	*50-140*			
Surrogate: Dibromofluoromethane	*32.1*		*ug/L*		*100*	*50-140*			
Surrogate: Toluene-d8	*33.4*		*ug/L*		*104*	*50-140*			

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**

Client PO: 10205 Project Description: PE2548

Report Date: 04-Apr-2012

Order Date:29-Mar-2012

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Volatiles									
Acetone	ND	5.0	ug/L	8.55			0.0	30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	1.82	0.5	ug/L	ND			0.0	30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroethane	ND	1.0	ug/L	ND				30	
Chloroform	4.47	0.5	ug/L	ND			0.0	30	
Chloromethane	ND	3.0	ug/L	ND				30	
Dibromochloromethane	1.29	0.5	ug/L	ND			0.0	30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dibromoethane	ND	0.2	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Butyl Ketone (2-Hexanone)	ND	10.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,2,4-Trichlorobenzene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
1,3,5-Trimethylbenzene	ND	0.5	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*33.1*		*ug/L*	*ND*	*104*	*50-140*			
Surrogate: Dibromofluoromethane	*35.1*		*ug/L*	*ND*	*110*	*50-140*			
Surrogate: Toluene-d8	*33.4*		*ug/L*	*ND*	*104*	*50-140*			

Certificate of Analysis
Client: **Paterson Group Consulting Engineers**
Client PO: 10205 Project Description: PE2548

Report Date: 04-Apr-2012
Order Date:29-Mar-2012

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	2050	25	ug/L	ND	103	68-117			
F2 PHCs (C10-C16)	1340	100	ug/L	ND	84.0	60-140			
F3 PHCs (C16-C34)	3330	100	ug/L	ND	83.4	60-140			
F4 PHCs (C34-C50)	2310	100	ug/L	ND	96.4	60-140			
Volatiles									
Acetone	132	5.0	ug/L	ND	132	50-140			
Benzene	36.0	0.5	ug/L	4.05	79.8	50-140			
Bromodichloromethane	29.2	0.5	ug/L	ND	73.1	50-140			
Bromoform	30.3	0.5	ug/L	ND	75.6	50-140			
Bromomethane	25.7	0.5	ug/L	ND	64.2	50-140			
Carbon Tetrachloride	25.4	0.2	ug/L	ND	63.4	50-140			
Chlorobenzene	33.2	0.5	ug/L	ND	82.9	50-140			
Chloroethane	29.4	1.0	ug/L	ND	73.4	50-140			
Chloroform	30.9	0.5	ug/L	ND	77.2	50-140			
Chloromethane	34.8	3.0	ug/L	ND	86.9	50-140			
Dibromochloromethane	27.9	0.5	ug/L	ND	69.7	50-140			
Dichlorodifluoromethane	26.7	1.0	ug/L	ND	66.7	50-140			
1,2-Dibromoethane	31.5	0.2	ug/L	ND	78.8	50-140			
1,2-Dichlorobenzene	39.8	0.5	ug/L	ND	99.5	50-140			
1,3-Dichlorobenzene	39.5	0.5	ug/L	ND	98.8	50-140			
1,4-Dichlorobenzene	42.8	0.5	ug/L	ND	107	50-140			
1,1-Dichloroethane	33.8	0.5	ug/L	ND	84.4	50-140			
1,2-Dichloroethane	32.6	0.5	ug/L	ND	81.5	50-140			
1,1-Dichloroethylene	31.3	0.5	ug/L	ND	78.2	50-140			
cis-1,2-Dichloroethylene	27.8	0.5	ug/L	ND	69.4	50-140			
trans-1,2-Dichloroethylene	30.8	0.5	ug/L	ND	77.0	50-140			
1,2-Dichloropropane	30.7	0.5	ug/L	ND	76.8	50-140			
cis-1,3-Dichloropropylene	32.0	0.5	ug/L	ND	79.9	50-140			
trans-1,3-Dichloropropylene	35.2	0.5	ug/L	ND	88.1	50-140			
Ethylbenzene	32.8	0.5	ug/L	ND	82.1	50-140			
Hexane	35.7	1.0	ug/L	ND	89.3	50-140			
Methyl Ethyl Ketone (2-Butanone)	121	5.0	ug/L	ND	121	50-140			
Methyl Butyl Ketone (2-Hexanone)	139	10.0	ug/L	ND	139	50-140			
Methyl Isobutyl Ketone	140	5.0	ug/L	ND	140	50-140			
Methyl tert-butyl ether	102	2.0	ug/L	ND	102	50-140			
Methylene Chloride	33.7	5.0	ug/L	ND	84.2	50-140			
Styrene	30.6	0.5	ug/L	ND	76.4	50-140			
1,1,1,2-Tetrachloroethane	33.8	0.5	ug/L	ND	84.6	50-140			
1,1,2,2-Tetrachloroethane	37.7	0.5	ug/L	ND	94.3	50-140			
Tetrachloroethylene	32.6	0.5	ug/L	ND	81.6	50-140			
Toluene	39.2	0.5	ug/L	6.90	80.6	50-140			
1,2,4-Trichlorobenzene	39.5	0.5	ug/L	ND	98.6	50-140			
1,1,1-Trichloroethane	30.3	0.5	ug/L	ND	75.7	50-140			
1,1,2-Trichloroethane	31.2	0.5	ug/L	ND	78.0	50-140			
Trichloroethylene	29.8	0.5	ug/L	ND	74.6	50-140			
Trichlorofluoromethane	29.2	1.0	ug/L	ND	73.0	50-140			
1,3,5-Trimethylbenzene	39.4	0.5	ug/L	ND	98.4	50-140			
Vinyl chloride	31.8	0.5	ug/L	ND	79.6	50-140			
m,p-Xylenes	74.8	0.5	ug/L	7.78	83.7	50-140			

Certificate of Analysis

Report Date: 04-Apr-2012

Client: **Paterson Group Consulting Engineers**

Order Date:29-Mar-2012

Client PO: 10205 Project Description: PE2548

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
o-Xylene	35.2	0.5	ug/L	1.94	83.2	50-140			
Surrogate: 4-Bromofluorobenzene	*31.2*		*ug/L*		*97.5*	*50-140*			

Certificate of Analysis

Report Date: 04-Apr-2012

Client: **Paterson Group Consulting Engineers**

Order Date:29-Mar-2012

Client PO: 10205 Project Description: PE2548

Sample and QC Qualifiers Notes

None

Sample Data Revisions

None

Work Order Revisions/Comments:

None

Other Report Notes:

n/a: not applicable

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

CCME PHC additional information:

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

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Nº 85627

Page __ of __

Client Name: Paterson Group	Project Reference: PE 2548	TAT: ✓ Regular
Contact Name: Mark D'Arcy	Quote #	[ ] 2 Day
Address: 154 Colonnade Rd S.	PO # 10205	[ ] 1 Day
	Email Address:	[ ] Same Day
Telephone: 613-226-7381	mdarcy@patersongroup.ca.	Date Required:

Samples Submitted Under: [ ] O. Reg. 153/04 Table __ [✓] O. Reg 511/09 Table 3 [ ] PWQO [ ] CCME [ ] Sewer Use (Storm) [ ] Sewer Use (Sanitary) [ ] Other:

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

Required Analyses

Paracel Order Number:
1213155 - water
1213156 - soil

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHC F1-F4	VOC	metals (Fill) (surface)							
1	BH1-GW1	GW		3	Mar 26/12	2pm	✓	✓								
2	BH2-GW1	GW		3	↓	↓	✓	✓								
3	BH3-GW1	GW		3	↓	↓	✓	✓								
4	TP1-G2	S		1	"	10am			✓			120 ml				
5	TP4-G2	S		1	"	"			✓			↓				
6	TP9-G1	S		1	"	"			✓							
7																
8																
9																
10																

Comments:

Method of Delivery: Paracel

Relinquished By (Print & Sign):	Received by Driver/Depot:	Received at Lab:	Verified By:
Mark D'Arcy	M. Couse	MC	MC
Date/Time: March 29, 2012	Date/Time: 29/03/12 10:53AM	Date/Time: Mar 29/12 12:00	Date/Time: Mar 29/12 12:18
	Temperature: ____ °C	Temperature: 13.0 °C	pH Verified [ ] By: N/A