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Phase II-Environmental Site Assessment

Part of 2190 Halifax Drive
Ottawa, Ontario

Prepared For
Urbandale Corporation

December 13, 2024
Report: PE4234-2R

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EXECUTIVE SUMMARY

Assessment

A Phase II-ESA was conducted for a part of 2190 Halifax Drive, immediately north of Walkley Road, in Ottawa, Ontario. The purpose of the Phase II ESA was to address a former underground storage tank (UST) identified during the Phase I ESA. The former UST was considered to be a potentially contaminating activity (PCA), resulting in an area of potential environmental concern (APEC) on the Phase I and Phase II Property.

The subsurface investigation was carried out in conjunction with a Geotechnical Investigation and consisted of drilling a total of six (6) boreholes. Three (3) boreholes (BH1, BH2 and BH3) were placed to address the APEC, while the remaining boreholes (BH4, BH5 and BH6) were placed for geotechnical purposes. Two environmental boreholes (BH1 and BH2) were instrumented with a groundwater monitoring well to recover and assess the groundwater in the vicinity of the former tank nest. A third monitoring well was installed in BH5. Two additional boreholes (BH7 and BH8) were placed in conjunction with the remediation program, to the north and northwest of BH1, for delineation purposes.

Soil samples obtained from the boreholes were screened using visual observations and combustible vapour measurements. Based on the screening results, samples were selected for analysis of benzene, toluene, ethylbenzene and xylene (BTEX) and petroleum hydrocarbons, fractions 1 through 4 (PHCs F_1-F_4). The analytical results indicated that a PHC F_2 concentration exceeding the selected MECP Table 3 standard, was identified in soil Sample BH1-SS3 at a depth of approximately 1.5 to 2m below grade. The remaining PHC parameters detected in this sample were in compliance with MECP Table 3 standards. No PHC parameters were detected in the remaining soil samples submitted for analysis, nor were any BTEX concentrations detected above the laboratory method detection limits, in any of the samples analysed.

Groundwater samples obtained from BH1 and BH2 were submitted for analytical testing of BTEX and PHC (F1-F4) parameters. There were no detectable concentrations of BTEX or PHCs in the groundwater samples submitted. Based on the analytical test results, the groundwater is in compliance with the MECP Table 3 standards selected for the site.

Recommendations

Soil

A soil remediation program was recommended and has been carried out at the Phase II Property. The remediation program was successful in removing all impacted soil from the Phase II Property. A report summarizing the remedial activities is provided in Appendix 2.

Groundwater

The groundwater monitoring well at BH1 was removed from the Phase II Property during the remedial excavation, while the monitoring well at BH2 remains in place. If this groundwater monitoring well will no longer be used, it should be decommissioned by a licensed contractor in accordance with Ontario Regulation 903.

1.0 INTRODUCTION

At the request of Urbandale Corporation (Urbandale) Paterson Group conducted a Phase II Environmental Site Assessment for part of the property addressed 2190 Halifax Road, in the City of Ottawa, Ontario. The purpose of this Phase II ESA was to address potential soil and groundwater impacts associated with a former underground storage tank (UST) identified during the Phase I ESA.

1.1 Site Description

Address:	Part of 2190 Halifax Drive, in the City of Ottawa, Ontario.
Legal Description:	Part of Lot 19, Rideau Front, Junction Gore, former Township of Gloucester, now the City of Ottawa
Property Identification Number:	04176-0105
Location:	The subject site is located on the north side of Walkley Road, approximately 175m west of Halifax Drive. The property forms the southwestern corner of the larger parcel of land addressed 2190 Halifax Drive.
Latitude and Longitude:	45° 23' 12" N, 75° 37' 24" W
Configuration:	Irregular
Site Area:	0.65 hectares (approximate)

1.2 Property Ownership

The property is currently owned by Urbandale Corporation. Paterson was engaged to conduct this Phase II ESA by Mr. Roger Tuttle of Urbandale Corporation. Mr. Tuttle can be reached by telephone at (613) 731-6331.

1.3 Current and Proposed Future Uses

The Phase II Property is partially occupied by paved access lanes and parking areas while the remainder of the site consists of vacant landscaped areas. It is understood that the subject site is to be developed with a 15-storey residential building with two (2) levels of underground parking and associated access lanes and at-grade parking.

1.4 Applicable Site Condition Standard

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

- Fine-grained soil conditions;
- Full depth generic site conditions;
- Non-potable groundwater conditions; and
- Residential land use.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The Phase II Property, located on the north side of Walkley Road, approximately 140m west of Halifax Drive, is situated in an urban area surrounded by various sized residential, commercial and institutional structures. Site topography slopes down towards the north and east; the western portion of the Phase II Property is at a higher grade than the eastern portion of the subject land. Site drainage consists primarily of sheet flow to a catch basins situated onsite, with some surficial infiltration in landscaped areas. The Phase II Property is located within a municipally serviced area.

2.2 Past Investigations

A Phase I ESA was conducted by Paterson in February of 2018. Based on the findings of the Phase I ESA, an on-site PCA (former UST) was identified and considered to result in an APEC on the Phase I and Phase II Property, as presented in Table 1.

Subsequent to the initial findings of the Phase I ESA, the property owner used a private locator and hydro-vac excavation to confirm that the UST identified on a 1968 site plan, had been removed. The ends of the vent and fill pipes and supply line were identified and it was noted that the pipes had been cut and pinched closed.

Table 1
Area of Potential Environmental Concern

Area of Potential Environmental Concern	Location of Area of Potential Environmental Concern with respect to Phase I Property	Potentially Contaminating Activity	Location of PCA (on-site or off-site)	Contaminants of Potential Concern	Media Potentially Impacted (Groundwater, Soil, and/or Sediment)
APEC 1	Northeastern portion of Phase I Property	28 – Gasoline and Associated Products Storage in Fixed Tanks	On-site	BTEX and PHCs (F_1-F_4)	Soil and Groundwater

A Phase II ESA was recommended to address the aforementioned APEC.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The Phase II ESA subsurface investigation, conducted in conjunction with a Geotechnical Investigation, consisted of drilling three (3) boreholes (BH1, BH2, BH3) in the area of the former tank nest, to depths ranging from approximately 4.3m to 6.9m below grade. Monitoring wells were installed in BH1 and BH2 to access the groundwater table. Three (3) geotechnical boreholes (BH4, BH5, BH6) and one monitoring well (BH5) were placed within the proposed building footprint, further to the southwest of the environmental borehole locations and were drilled to depths ranging from approximately 15m to 15.8m below grade. An additional two (2) boreholes (BH7 and BH8) were subsequently advanced in the vicinity of the former UST for delineation purposes, in conjunction with a remediation program.

3.2 Media Investigated

During the subsurface investigation, soil samples and groundwater samples were obtained and submitted for laboratory analysis. The rationale for sampling and analyzing these media is based on the Contaminants of Potential Concern identified in the Phase I ESA. Contaminants of concern for soil and groundwater are benzene, toluene, ethylbenzene, xylenes (BTEX), and petroleum hydrocarbon fractions 1 through 4 (PHCs F1-F4).

3.3 Phase I Conceptual Site Model

Existing Buildings and Structures

The Phase I Property is a vacant parcel of land. The northern and eastern portions of the subject land are paved with a parking lot and access lane. Light standards are present on the Phase I Property however, no buildings or other above-ground structures are present, as depicted on Drawing PE4234-1 – Site Plan, in the Figures section of the Phase I ESA report.

Geological and Hydrogeological Setting

The Geological Survey of Canada website on the Urban Geology of the National Capital Area was consulted as part of this assessment. Based on this information, bedrock in the area of the site consists shale of the Carlsbad Formation. Overburden consists of offshore marine sediments, with a drift thickness of 10 to15 m.

Regional groundwater flow is expected to be in an easterly direction, towards Greens Creek, approximately 2.5km east of the Phase I Property.

Water Bodies

There are no water bodies on the Phase I Property. The closest water body is McEwen Creek, located approximately 450m to the southeast of the Phase I Property.

Areas of Natural Significance

No areas of natural significance were identified within the Phase I Study Area.

Water Wells

A search of the MECPs web site for all drilled well records within 250 m of the subject site was conducted on February 14, 2018. Based on the search results, there are no potable wells or monitoring wells present on the Phase I Property or within the Phase I Study Area.

Neighbouring Land Use

Neighbouring land use in the Phase I Study Area is currently residential, institutional or commercial (south of Walkley Road). The current uses of the neighbouring properties are not considered to pose an environmental concern to the Phase I Property.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

As per Section 6.1 of this report, a former UST was identified on the Phase I Property (PCA 28) resulting in an APEC on northeastern portion of the subject land.

Off-site PCAs (20 and 21) associated with the Federal Armoury at 2100 Walkley Road, approximately 80m southwest of the Phase I Property, were identified within the Phase I Study Area, as well as a commercial printing industry at 2204 Walkley Road, approximately 50m southeast of the Phase I Property. Based on the separation distances, these properties are not considered to represent APECs on the Phase I Property.

Contaminants of Potential Concern

Contaminants of potential concern (CPCs) identified on the Phase I Property include BTEX and PHCs (F1-F4).

Assessment of Uncertainty and/or Absence of Information

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

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

3.4 Deviations from Sampling and Analysis Plan

There were no deviations from the Sampling and Analysis Plan provided in Appendix 1.

3.5 Impediments

Physical impediments encountered during the Phase II Environmental Site Assessment include the buried utility services the immediate vicinity of the former UST location, which limited possible borehole locations. A concrete slab was encountered in BH1 within the former tank nest; the drill rig was not able to auger through the concrete slab in order to obtain a sample from the native soil beneath the slab.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation was carried out on March 12 and March 14, 2018, and consisted of drilling of three (3) boreholes (BH 4, 5 and 6) within the proposed building footprint for geotechnical purposes, and three (3) boreholes (BH1, 2 and 3) in and around the former test nest identified in the Phase I ESA. The boreholes were drilled using a truck-mounted CME 55 power auger drill rig and low clearance track-mounted drill rig operated by George Downing Estate Drilling Ltd. (Downing) of Hawkesbury, Ontario.

A supplemental drilling program was conducted July 21, 2018 and consisted of drilling two (2) boreholes (BH7 and BH8) further north and northwest of the former UST location. The boreholes were drilled using a track-mounted Geoprobe drill rig operated by Downing, under full-time supervision of Paterson personnel. Borehole locations are shown on Drawing PE4234-3R - Test Hole Location Plan, appended to this report.

4.2 Soil Sampling

As part of the subsurface investigation a total of sixty-four (64) soil samples were obtained from the environmental boreholes by means of split spoon sampling and direct sampling from auger flights. The depths at which split spoon and auger 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.

Site soils consist of a layer of topsoil, underlain by silty clay. Glacial till was identified beneath the silty clay in the Geotechnical boreholes at depths ranging from approximately 12 to 13m below grade. Fill material was identified in BH1, within the former tank nest, to a depth of approximately 4.5m below grade. The fill material consisted of a combination of grey silty clay with traces of sand and gravel. It is anticipated that the fill material consists of reworked native material. A concrete slab was encountered beneath the fill material. Native silty clay is considered to be present beneath the concrete slab.

Based on available mapping, bedrock at the subject site is interpreted to be shale of the Carlsbad Formation and present at depths ranging from 10 to 15m across the site. Practical dynamic cone penetration test (DCPT) refusal was obtained at a depth of 15.8m in BH4.

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 using an RKI Eagle gastech detector in the headspace of all soil samples recovered from the boreholes.

The technical protocol was obtained from Appendix C of the MOE document titled "Interim Guidelines for the Remediation of Petroleum Contamination at Operating Retail and Private Fuel Outlets in Ontario", dated March 1992.

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. Vapour readings were largely negligible and varied from less than 5 ppm to 50 ppm. Vapour readings are noted on the Soil Profile and Test Data Sheets in Appendix 1.

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

4.4 Groundwater Monitoring Well Installation

Three (3) groundwater monitoring wells were installed on the Phase II Property; BH1 and BH2 were installed in the area of the former tank nest, while BH5 was installed in a Geotechnical borehole. The monitoring wells consisted of 51 mm diameter Schedule 40 threaded PVC riser and screen. 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.

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	78.00	4.48	1.48-4.48	1.07-1.48	0.3-1.07	Flushmount
BH2	79.70	6.78	3.78-6.78	3.35-3.78	0.3-3.35	Flushmount
BH5	82.47	7.60	4.60-7.60	4.20-4.60	0.3-4.20	Flushmount

4.5 Field Measurement of Water Quality Parameters

Groundwater sampling was conducted at BH1 and BH2 on March 22, 2018. At this time, water quality parameters were measured in the field using a multi-parameter analyzer. Parameters measured in the field included temperature, pH, electrical conductivity, and total dissolved solids.

Field parameters were measured after each well volume purged. Wells were purged prior to sampling until at least three well volumes had been removed or the field parameters were relatively stable. Stabilized field parameter values are summarized in Table 3.

Table 3: Field Measurement of Water Quality Parameters

Parameter	BH1	BH2
Temperature (°C)	6.0	10.7
pH	7.21	7.85
Electrical Conductivity (µS/cm)	14.08	13.47

4.6 Groundwater Sampling

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

4.7 Analytical Testing

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

Table 4: Soil Samples Submitted for Analytical Testing			
Sample ID	**Sample Depth/ Stratigraphic Unit**	**Parameters Analysed**	**Rationale**
		BTEX/PHCs (F_1-F_4)	
March 14, 2018			
BH1-SS3	1.52-2.13m; Fill	X	Assessment of potential impacted soil in the area of the former UST.
BH2-SS7	4.57-5.18m; Native Silty Clay	X	Assessment of potential impacted soil in the area of the former UST.
BH3-SS5	3.05-3.66m; Native Silty Clay	X	Assessment of potential impacted soil in the area of the former UST.
BH7-SS4	1.83-2.44m; Fill	X	Delineation of impacted soil (identified in BH1) to the north of the former UST location.
BH7-SS6	3.05-3.65m; Native Silty Clay	X	
BH8-SS3	1.22-1.83m; Native Silty Clay	X	Delineation of impacted soil (identified in BH1) to the northwest of the former UST location.
BH8-SS4	1.83-2.43m; Native Silty Clay	X	
BH8-SS5	2.43-3.05m; Native Silty Clay	X	

Table 5: Groundwater Samples Submitted for Analytical Testing			
Sample ID	**Screened Interval/ Stratigraphic Unit**	**Parameters Analysed**	**Rationale**
		BTEX/PHCs (F_1-F_4)	
March 22, 2018			
BH1-GW1	1.48-4.48m; Native Silty Clay	X	Assessment of potential impacted groundwater in the area of a former UST.
BH2-GW1	3.78-6.78m; Native Silty Clay	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.

4.7 Residue Management

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

4.8 Elevation Surveying

Originally, the borehole elevations were surveyed relative to the top of a catch basin located in the parking lot to the southwest of the work area. A geodetic elevation of 81.81m above sea level (m asl) was provided. During the supplemental field program, BH7 and BH8 were surveyed with respect to a manhole situated in the access laneway to the south of the work area. A geodetic elevation of 79.39 was provided. Elevations of the boreholes are illustrated on Drawing PE4234-3R – Test Hole Location Plan.

4.9 Quality Assurance and Quality Control Measures

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

5.0 REVIEW AND EVALUATION

5.1 Geology

Site soils generally consist of a pavement structure or topsoil over native silty clay with some sand, followed by glacial till at depths ranging from approximately 12 to 13m below grade. Mapping indicates that the bedrock is shale of the Carlsbad formation and is present at depths ranging from 10 to 15m across the site. Fill material was encountered at the former tank nest location. The fill, which extends from near ground surface to approximately 4.5m below grade, consists of silty clay with some sand and gravel. The fill material may consist of reworked native material; no deleterious materials were identified within the fill. Site stratigraphy is shown on Drawing PE4234-7 - Cross-Section A-A'.

Groundwater was encountered within the native silty clay or fill (former tank nest) at depths ranging from approximately 0.77m to 2.80m below ground surface.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured during the groundwater sampling event on March 22, 2018, using an electronic water level meter. Groundwater levels are summarized in Table 6. All measurements are relative to the geodetic benchmark provided.

Table 6: Groundwater Level Measurements				
Borehole Location	**Ground Surface Elevation (m)**	**Water Level Depth (m below grade)**	**Water Level Elevation (m ASL)**	**Date of Measurement**
BH1	78.00	0.77	77.23	March 22, 2018
BH2	79.70	2.46	77.24	March 22, 2018
BH5	82.47	2.80	79.67	March 22, 2018

Based on the groundwater elevations from the most recent sampling event, groundwater contour mapping was completed. Groundwater contours are shown on Drawing PE4234-4R - Groundwater Contour Plan.

The groundwater contour mapping indicates an easterly groundwater flow direction beneath the Phase II Property. A horizontal hydraulic gradient of approximately 0.05m/m was calculated. Groundwater flow is expected to flow to the east toward Green's Creek and ultimately the Ottawa River.

No free product was observed in the monitoring wells at the subject site. No visual or olfactory indications of contamination were noted during the groundwater monitoring events.

5.3 Fine-Medium Soil Texture

Based on the observed soil conditions at the subject site, fine-medium textured soil standards are considered to apply to the subject site.

5.4 Soil: Field Screening

Field screening of the soil samples collected during drilling resulted in soil vapour readings of less than 5 ppm to 50 ppm. Field screening results of each individual soil sample are provided on the Soil Profile and Test Data Sheets appended to this report. It is noted that these readings are not considered to be indicative of significant levels of organic compounds, although higher-fraction hydrocarbons or weathered products may not be as readily detectable by the Gastech. Petroleum hydrocarbon odours were detected in Samples BH1-SS2 through BH1-SS4. Vapour readings for these soil samples ranged from 10 to 20ppm. No other visual or olfactory indications of petroleum hydrocarbons were noted in the soil samples recovered during the field program.

5.5 Soil Quality

Three (3) soil samples from the subsurface investigation were submitted for analysis of PHCs and BTEX as presented below in Table 7.

Table 7: Analytical Test Results – Soil
BTEX/PHCs (F_1-F_4)

Parameter	MDL (µg/g)	Soil Samples (µg/g) March 14, 2018			MECP Table 3 Residential Standards Fine-grained soils
		BH1-SS3 (1.52-2.13m)	BH2-SS7 (4.57-5.18m)	BH3-SS5 (3.05-3.66m)	
Benzene	0.02	nd	nd	nd	0.17
Ethylbenzene	0.05	nd	nd	nd	15
Toluene	0.05	nd	nd	nd	6
Xylenes	0.05	nd	nd	nd	25
PHCs F_1	7	nd	nd	nd	65
PHCs F_2	4	**319**	nd	nd	150
PHCs F_3	8	184	nd	nd	1,300
PHCs F_4	6	nd	nd	nd	5,600

Notes:
- **Bold and underlined** – Value exceeds selected MECP standard
- MDL – Method Detection Limit
- nd – not detected above MDL

Table 7 Continued: Analytical Test Results – Soil
BTEX/PHCs (F_1-F_4)

Parameter	MDL (µg/g)	Soil Samples (µg/g) July 21, 2018			MECP Table 3 Residential Standards Fine-grained soils
		BH7-SS4 (1.83-2.43m)	BH7-SS6 (3.05-3.66m)	BH8-SS3 (1.22-1.82m)	
Benzene	0.02	nd	nd	nd	0.17
Ethylbenzene	0.05	nd	nd	nd	15
Toluene	0.05	nd	nd	nd	6
Xylenes	0.05	nd	nd	nd	25
PHCs F_1	7	nd	nd	nd	65
PHCs F_2	4	nd	nd	nd	150
PHCs F_3	8	nd	nd	nd	1,300
PHCs F_4	6	nd	nd	nd	5,600

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

Table 7 Continued: Analytical Test Results – Soil
BTEX/PHCs (F_1-F_4)

Parameter	MDL (µg/g)	Soil Samples (µg/g) July 21, 2018		MECP Table 3 Residential Standards Fine-grained soils
		BH8-SS4 (1.83-2.43m)	BH8-SS6 (2.44-3.05m)	
Benzene	0.02	nd	nd	0.17
Ethylbenzene	0.05	nd	nd	15
Toluene	0.05	nd	nd	6
Xylenes	0.05	nd	nd	25
PHCs F_1	7	nd	nd	65
PHCs F_2	4	nd	nd	150
PHCs F_3	8	nd	nd	1,300
PHCs F_4	6	nd	nd	5,600

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

No BTEX parameters were detected above the laboratory method detection limit in any of the soil samples submitted for testing. No PHC parameters were detected above the method detection limits in samples recovered from BH2, BH3, BH7 and BH8. Concentrations of PHC F2 and F3 were identified in Sample BH1-SS3. The F3 concentration is in compliance with the MECP Table 3 standards selected for the site, while the F2 fraction exceeds the selected site standard of 150 µg/g.

The maximum concentrations of analysed parameters in the soil at the site are summarized below in Table 8. The laboratory Certificate of Analysis is provided in Appendix 1.

Table 8: Maximum Concentrations – Soil

Parameter	Maximum Concentration (µg/g)	Sample ID	Depth Interval (m BGS)
PHCs F_2	**319**	BH1-SS3	1.52-2.13
PHCs F_3	184	BH1-SS3	1.52-2.13

Notes:
- **Bold and underlined** – Value exceeds selected MECP standard
- MDL – Method Detection Limit
- nd – not detected above the MDL

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

5.6 Groundwater Quality

Groundwater samples from BH1 and BH2 were submitted for analytical testing of BTEX and PHC parameters. The results of the analytical testing are presented in Table 9. A copy of the laboratory Certificate of Analysis is provided in Appendix 1.

Table 9: Analytical Test Results – Groundwater – PHCs

Parameter	MDL (µg/L)	Groundwater Samples (µg/L) March 22, 2018		MECP Table 3 Standards
		BH1-GW1 (1.48-4.48m)	BH2-GW1 (3.78-6.78m)	
Benzene	0.5	nd	nd	44
Ethylbenzene	0.5	nd	nd	2,300
Toluene	0.5	nd	nd	18,000
Xylenes	0.5	nd	nd	4,200
PHCs F_1	25	nd	nd	420
PHCs F_2	100	nd	nd	150
PHCs F_3	100	nd	nd	500
PHCs F_4	100	nd	nd	500

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

No BTEX or PHC parameters were detected in the groundwater samples above the laboratory detection limits. The groundwater is in compliance with MECP Table 3

Sample locations and analytical results are shown on Drawings PE4234-5 and 6 – Analytical Testing Plans and PE4234-7– Cross-Section A-A'.

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 and Areas of Potential Environmental Concern

As per Table 1 in Section 2.2, PCA's considered to result in APECs on the Phase II Property include:

- Item 28: Gasoline and Associated Products Storage in Fixed Tanks, resulting in APEC 1 on the northeastern portion of the Phase II Property in the vicinity of a former UST.

Off-site PCAs identified within the Phase I Study area are not considered to have resulted in APECs on the Phase I and Phase II Property based on their separation distances.

Contaminants of Potential Concern

Contaminants of potential concern identified in association with the aforementioned APEC includes BTEX and PHCs in the soil and groundwater.

Subsurface Structures and Utilities

Subsurface structures present on the Phase I and Phase II Property include the vent and fill pipes associated with the former UST. All utility services on the subject site were located prior to the subsurface investigation, and include private water and sewers, natural gas, telecom and private electrical services.

Physical Setting

Site Stratigraphy

The site stratigraphy, from ground surface to the deepest aquifer or aquitard investigated, is provided in the Soil Profile and Test Data Sheets provided in Appendix 1 and illustrated on Drawings PE4234-6 and PE4232-7. Stratigraphy consists of:

- A layer of topsoil approximately 0.1 to 0.28m in thickness (BH1, BH2 and BH3) or a pavement structure approximately 0.38 to 0.51m in thickness (BH4, BH5 and BH6).
- A fill layer identified at BH1 within the former tank nest, consisting of a combination of silty clay and sand with some gravel, followed by a concrete slab at a depth of approximately 4.5m below grade.
- A layer of sand with silt and trace clay, approximately 0.91m thick, was identified in BH5 conducted for geotechnical purposes.
- Otherwise, native silty clay was encountered beneath the topsoil or pavement structure.
- Glacial till was encountered beneath the native silty clay at two of the geotechnical borehole locations (BH5 and BH6) at depths ranging from approximately 12 to 13m below grade.
- Practical DCPT refusal was encountered on inferred bedrock at BH5 at a depth of approximately 15.8m below grade.

Hydrogeological Characteristics

Groundwater levels from the three (3) monitoring wells were measured at the subject site on March 22, 2018. Groundwater was encountered at depths of 0.77m, 2.46m and 2.80m below grade.

The groundwater levels indicate that the local groundwater flow is in an easterly direction. A hydraulic gradient of approximately 0.05m/m was calculated. Groundwater contours are shown on Drawing PE4234-4. The regional groundwater flow is anticipated to be to the east towards Greens Creek.

Approximate Depth to Bedrock

Practical DCPT refusal was encountered on inferred bedrock at BH5, at a depth of approximately 15.8m below grade.

Approximate Depth to Water Table

Depth to the water table at the subject site is considered to vary between approximately 0.77m and 2.80m below existing grade.

Sections 41 and 43.1 of the Regulation

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

Section 43.1 of the Regulation applies to the subject site as bedrock is located less than 2 m below ground surface and thus the site is considered to have shallow soils.

Fill Placement

Fill material, consisting of granular materials was identified on the Phase II Property, associated with the pavement structure. Fill material was also identified within the former underground storage tank nest. This material consisted of a combination of silty clay with some sand and traces of gravel and may consist of reworked native material. No deleterious materials were identified in the fill and it is not considered to pose a concern to the subject land.

Proposed Buildings and Other Structures

The western portion of the Phase II Property will be developed with a multi-storey residential building, with 15 floors above ground and two levels of underground parking, as well as associated access roads and landscaped areas. The subject building will be municipally serviced.

Existing Buildings and Structures

The Phase I Property is a vacant parcel of land. A paved parking lot and access lane are present on the northwestern and eastern portions of the Phase I Property, while the remainder of the site is landscaped. Light standards are present on the Phase I Property however, no buildings or other above-ground structures are present.

Water Bodies

There are no water bodies on the Phase II Property. The closest water body is McEwen Creek, located approximately 80m to the southeast of the Phase II Property.

Areas of Natural Significance

No areas of natural significance are present on the subject site or within 250 m of the subject land.

Environmental Condition

Areas Where Contaminants are Present

Impacted soil was identified within the former underground storage tank nest on the northeastern portion of the Phase II Property. The analytical results are shown on Drawing PE4234-5 – Soil Analytical Testing Plan. The groundwater was determined to be in compliance with the MECP Table 3 standards.

Types of Contaminants

Contaminants of potential concern identified in the Phase I ESA included BTEX and PHCs in the soil and groundwater. Based on the findings of the Phase II ESA, PHC F2 was identified in the soil within the former tank nest, at a concentration exceeding the MECP Table 3 standard. Contaminants were not identified in the groundwater.

Contaminated Media

As previously noted, a concentration of PHC F2 exceeding the MECP Table 3 standard, was identified within the soil (fill material) at the location of the former UST. Groundwater was determined to be in compliance with MECP Table 3 standards.

What Is Known About Areas Where Contaminants Are Present

Impacted soil is present at the location of the former tank nest on the northeastern portion of the Phase I Property. Analytical test results exceeding the MECP Table 3 standards are presented on Drawing PE4234-5.

Distribution and Migration of Contaminants

Contaminant distribution is presented in both plan view and cross-section, on Drawings PE4234-5 and PE4234-7. Migration of hydrocarbon impacts is considered to be minimal based on the clean groundwater results as well as the impermeable nature of the native silty clay.

Discharge of Contaminants

Petroleum hydrocarbons are considered to have been directly released to the subsurface. According to Mr. Tuttle with Urbandale, the UST was not in use for a long period of time. Based on this information in combination with the location of the impacted soil, fuel may have been release to the subsurface when the tank was decommissioned and removed (the vent and fill pipes and the oil supply line remain in place and have been pinched at the ends).

Climatic and Meteorological Conditions

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

Downward leaching is not considered to have affected contaminant distribution at the Phase II Property, as the impacted soil is situated below the groundwater table. Site groundwater was in compliance with MECP standards; the fluctuation of the groundwater table was therefore considered to have a limited effect on the distribution of contaminants at the subject site.

Potential for Vapour Intrusion

Given the low combustible vapour readings, the fact that the area of impacted soil was not developed, and that a remediation program has since been carried out at the Phase II Property, there is no potential for vapour intrusion.

6.0 CONCLUSIONS

Assessment

A Phase II-ESA was conducted for a part of 2190 Halifax Drive, immediately north of Walkley Road, in Ottawa, Ontario. The purpose of the Phase II ESA was to address a former underground storage tank (UST) identified during the Phase I ESA. The former UST was considered to be a potentially contaminating activity (PCA), resulting in an area of potential environmental concern (APEC) on the Phase I and Phase II Property.

The subsurface investigation was carried out in conjunction with a Geotechnical Investigation and consisted of drilling a total of six (6) boreholes. Three (3) boreholes (BH1, BH2 and BH3) were placed to address the APEC, while the remaining boreholes (BH4, BH5 and BH6) were placed for geotechnical purposes. Two environmental boreholes (BH1 and BH2) were instrumented with a groundwater monitoring well to recover and assess the groundwater in the vicinity of the former tank nest. A third monitoring well was installed in BH5. Two additional boreholes (BH7 and BH8) were placed in conjunction with the remediation program, to the north and northwest of BH1, for delineation purposes.

Soil samples obtained from the boreholes were screened using visual observations and combustible vapour measurements. Based on the screening results, samples were selected for analysis of benzene, toluene, ethylbenzene and xylene (BTEX) and petroleum hydrocarbons, fractions 1 through 4 (PHCs F_1-F_4). The analytical results indicated that a PHC F_2 concentration exceeding the selected MECP Table 3 standard, was identified in soil Sample BH1-SS3 at a depth of approximately 1.5 to 2m below grade. The remaining PHC parameters detected in this sample were in compliance with MECP Table 3 standards. No PHC parameters were detected in the remaining soil samples submitted for analysis, nor were any BTEX concentrations detected above the laboratory method detection limits, in any of the samples analysed.

Groundwater samples obtained from BH1 and BH2 were submitted for analytical testing of BTEX and PHC (F1-F4) parameters. There were no detectable concentrations of BTEX or PHCs in the groundwater samples submitted. Based on the analytical test results, the groundwater is in compliance with the MECP Table 3 standards selected for the site.

Recommendations

Soil

A soil remediation program was recommended and has been carried out at the Phase II Property. The remediation program was successful in removing all impacted soil from the Phase II Property. A report summarizing the remedial activities is provided in Appendix 2.

Groundwater

The groundwater monitoring well at BH1 was removed from the Phase II Property during the remedial excavation, while the monitoring well at BH2 remains in place. If this groundwater monitoring well will no longer be used, it should be decommissioned by a licensed contractor in accordance with Ontario Regulation 903.

7.0 STATEMENT OF LIMITATIONS

This Phase II - Environmental Site Assessment report has been prepared in general accordance with O.Reg. 153/04 as amended 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.

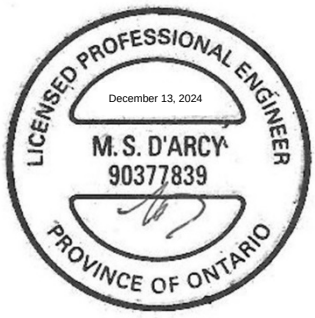
Should any conditions be encountered at the subject site and/or historical information that differ from our findings, we request that we be notified immediately in order to allow for a reassessment.

This report was prepared for the sole use of Urbandale Corporation. Permission and notification from Urbandale Corporation 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:

- ❒ Urbandale Corporation
- ❒ Paterson Group

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE4234-3R – TEST HOLE LOCATION PLAN

DRAWING PE4234-4R – GROUNDWATER CONTOUR PLAN

DRAWING PE4234-5R – SOIL ANALYTICAL TESTING PLAN

DRAWING PE4234-6R – GROUNDWATER ANALYTICAL TESTING PLAN

DRAWING PE4234-7 – CROSS-SECTION A-A'

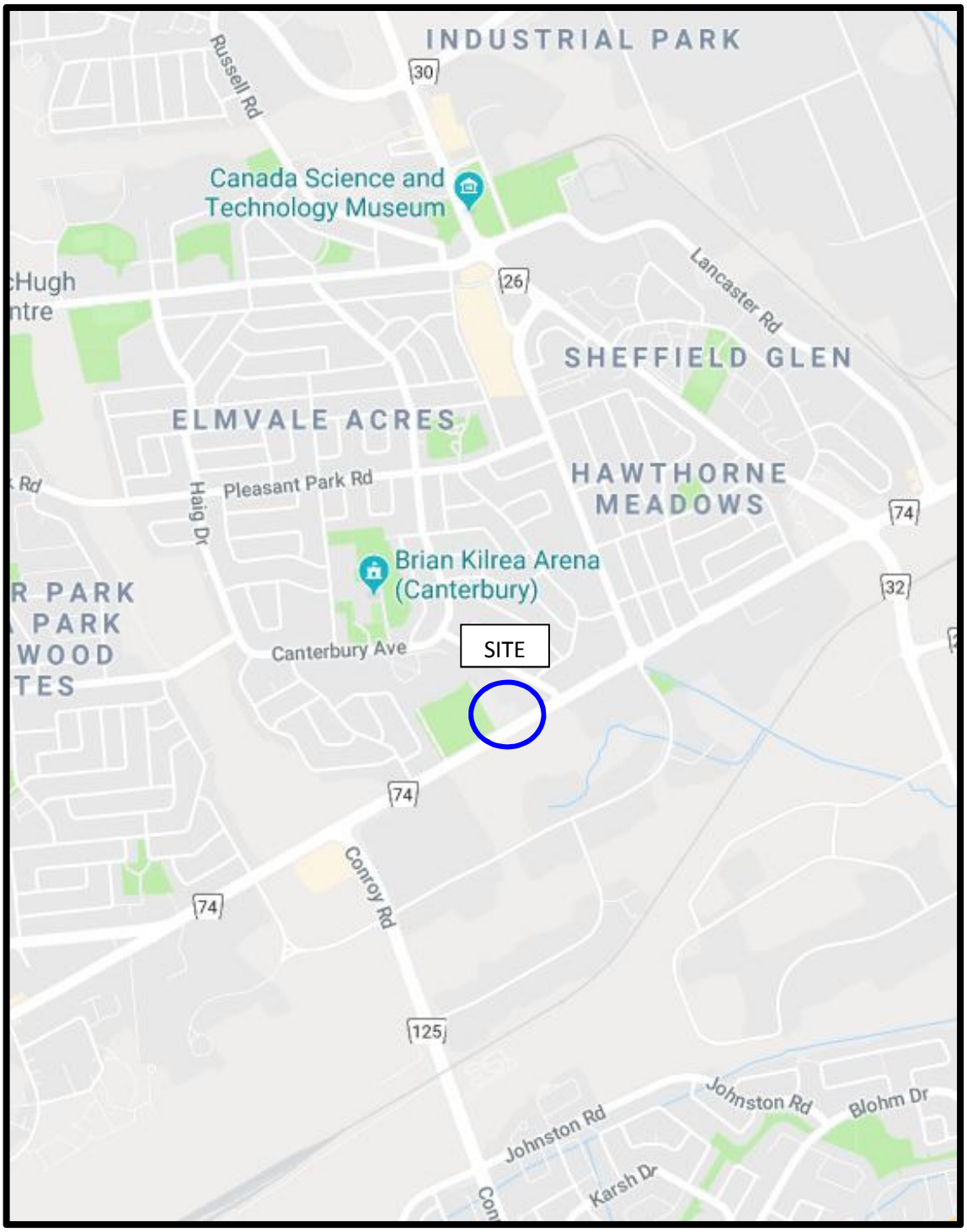
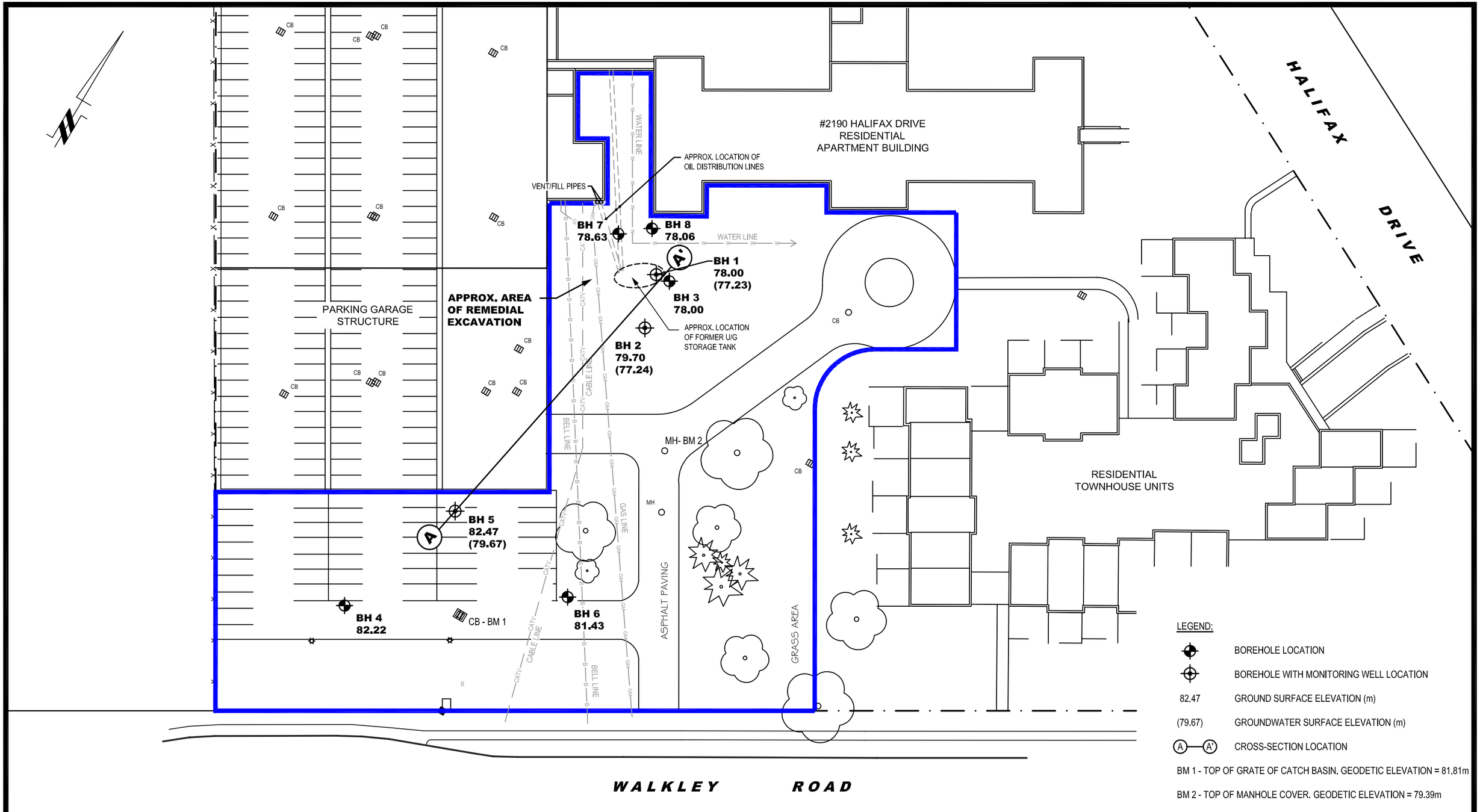


FIGURE 1

KEY PLAN



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NO.	REVISIONS	DATE	INITIAL
0			

URBANDALE CORPORATION

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
WALKLEY ROAD AT HALIFAX DRIVE

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:600	Date: 04/2018
Drawn by: MPG	Report No.: PE4234-2
Checked by: KM	Dwg. No.: PE4234-3R
Approved by: MSD	Revision No.: 0

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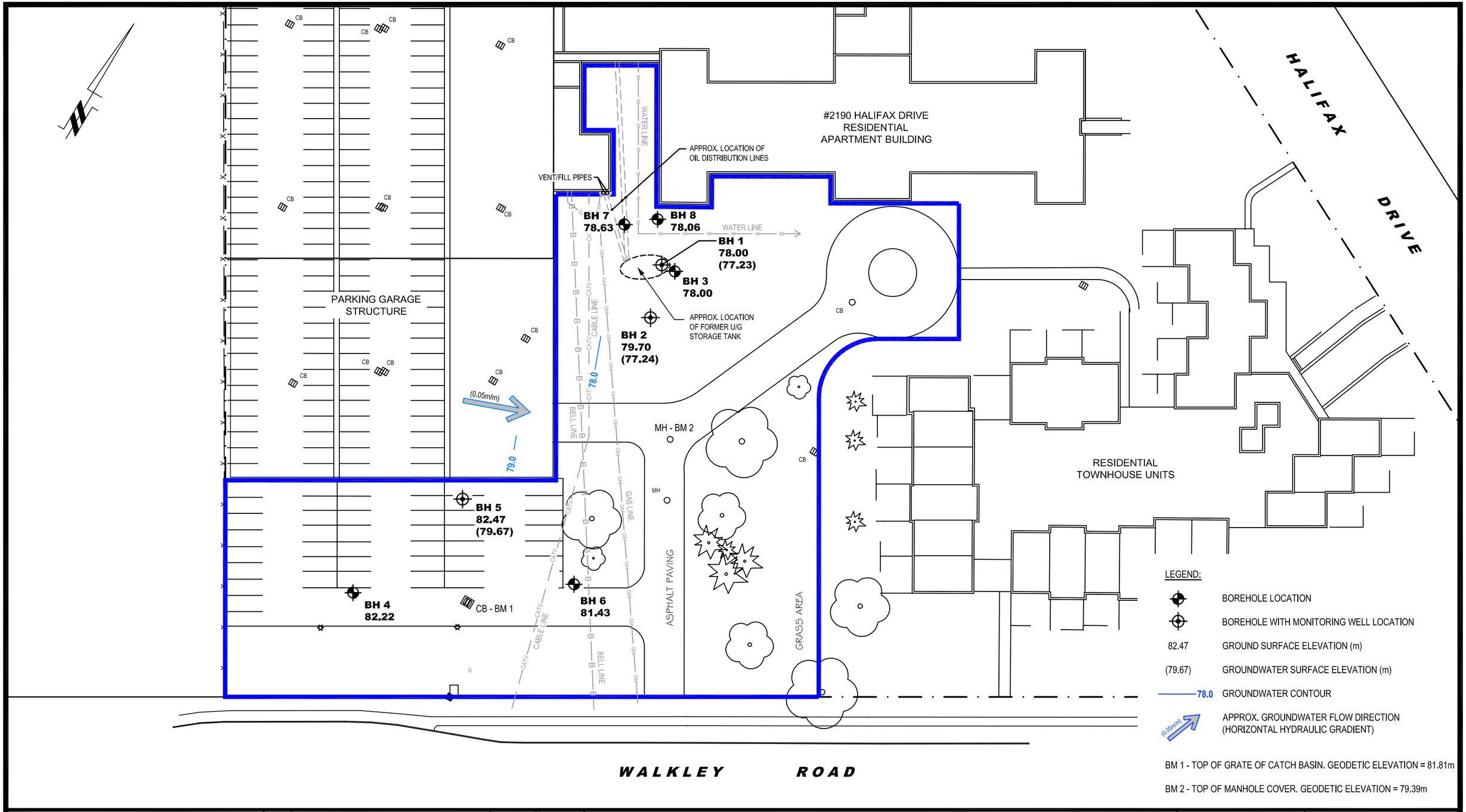

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URBANDALE CORPORATION

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
WALKLEY ROAD AT HALIFAX DRIVE

OTTAWA, ONTARIO

Title:

GROUNDWATER CONTOUR PLAN

Scale: 1:600	Date: 04/2018
Drawn by: MPG	Report No.: PE4234-2
Checked by: KM	Dwg. No.: PE4234-4
Approved by: MSD	Revision No.: 0

BH1-SS3 (1.52-2.13m) - March 14, 2018

Parameter	Result	MOECC (µg/g)
PHC F2	319	98

BTEX and PHC F1, F3, F4 comply with MOECC Table 3

BH7-SS4 (1.83-2.43m) - July 21, 2018
BTEX and PHCs comply with MOECP Table 3

BH7-SS6 (3.05-3.66m) - July 21, 2018
BTEX and PHCs comply with MOECP Table 3

BH8-SS3 (1.22-1.82m) - July 21, 2018
BTEX and PHCs comply with MOECP Table 3

BH8-SS4 (1.82-2.43m) - July 21, 2018
BTEX and PHCs comply with MOECP Table 3

BH8-SS5 (2.44-3.05m) - July 21, 2018
BTEX and PHCs comply with MOECP Table 3

BH3-SS5 (3.05-3.66m) - March 14, 2018
BTEX and PHCs comply with MOECC Table 3

BH2-SS7 (4.57-5.18m) - March 14, 2018
BTEX and PHCs comply with MOECC Table 3

#2190 HALIFAX DRIVE
RESIDENTIAL
APARTMENT BUILDING

HALIFAX DRIVE

BH 7
78.63

BH 8
78.06

BH 1
78.00
(77.23)

BH 3
78.00

BH 2
79.70
(77.24)

APPROX. LOCATION
OF FORMER U/G
STORAGE TANK

PARKING GARAGE
STRUCTURE

CB

MH - BM 2

MH

BH 5
82.47
(79.67)

BH 4
82.22

CB - BM 1

BH 6
81.43

ASPHALT PAVING

GRASS AREA

RESIDENTIAL
TOWNHOUSE UNITS

WALKLEY ROAD

LEGEND:

SOIL RESULTS IN COMPLIANCE WITH MOECC TABLE 3 STANDARDS

SOIL RESULTS EXCEED MOECC TABLE 3 STANDARDS

BOREHOLE LOCATION

BOREHOLE WITH MONITORING WELL LOCATION

82.47 GROUND SURFACE ELEVATION (m)

(79.67) GROUNDWATER SURFACE ELEVATION (m)

BM 1 - TOP OF GRATE OF CATCH BASIN. GEODETIC ELEVATION = 81.81m

BM 2 - TOP OF MANHOLE COVER. GEODETIC ELEVATION = 79.39m

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
WALKLEY ROAD AT HALIFAX DRIVE

OTTAWA, ONTARIO

Title:

SOIL ANALYTICAL TESTING PLAN

Scale: 1:600	Date: 04/2018
Drawn by: MPG	Report No.: PE4234-2
Checked by: KM	Dwg. No.: PE4234-5R
Approved by: MSD	Revision No.: 0

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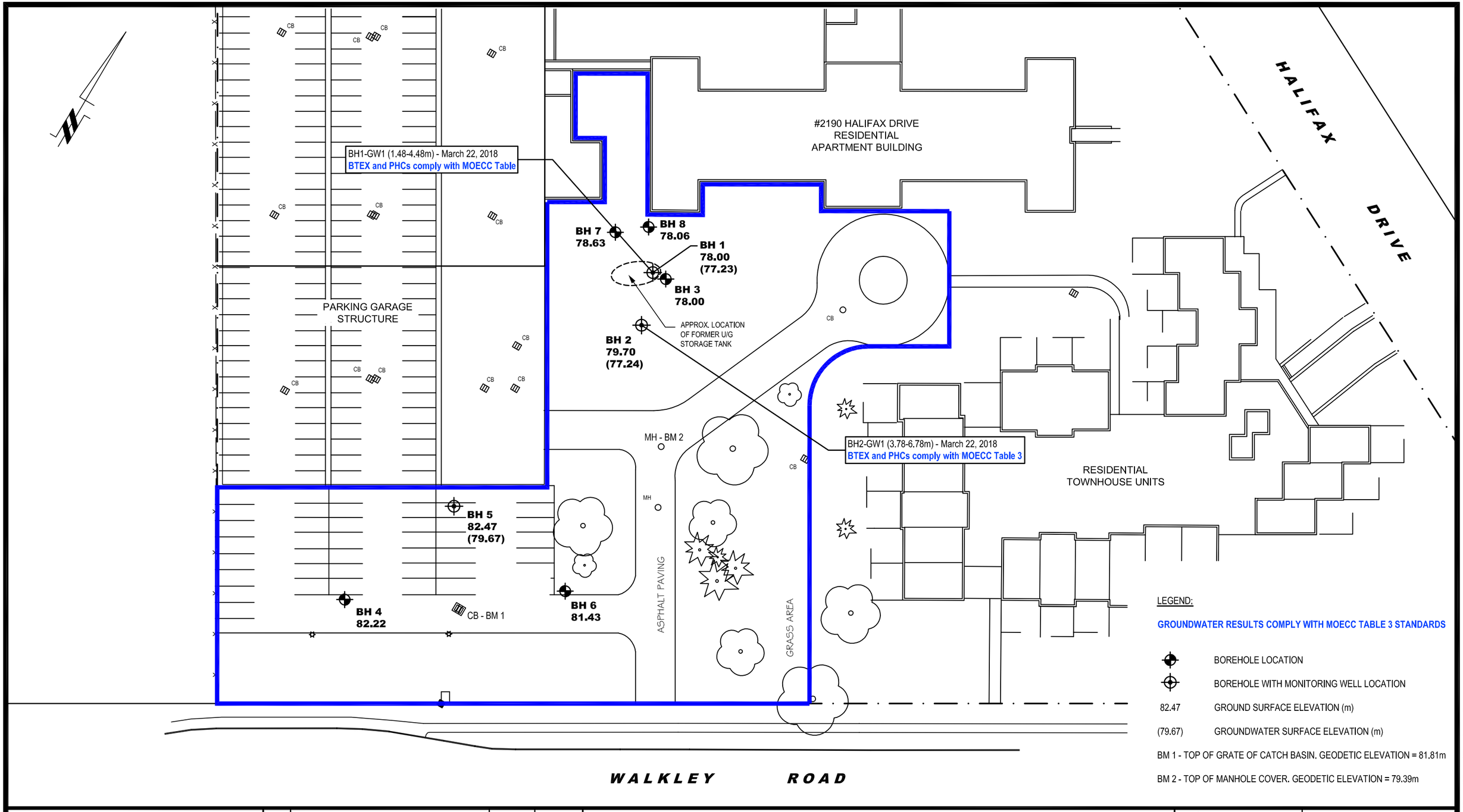

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URBANDALE CORPORATION

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
WALKLEY ROAD AT HALIFAX DRIVE
OTTAWA, ONTARIO

Title:
GROUNDWATER ANALYTICAL TESTING PLAN

Scale: 1:600	Date: 04/2018
Drawn by: MPG	Report No.: PE4234-2
Checked by: KM	Dwg. No.: PE4234-6
Approved by: MSD	Revision No.: 0

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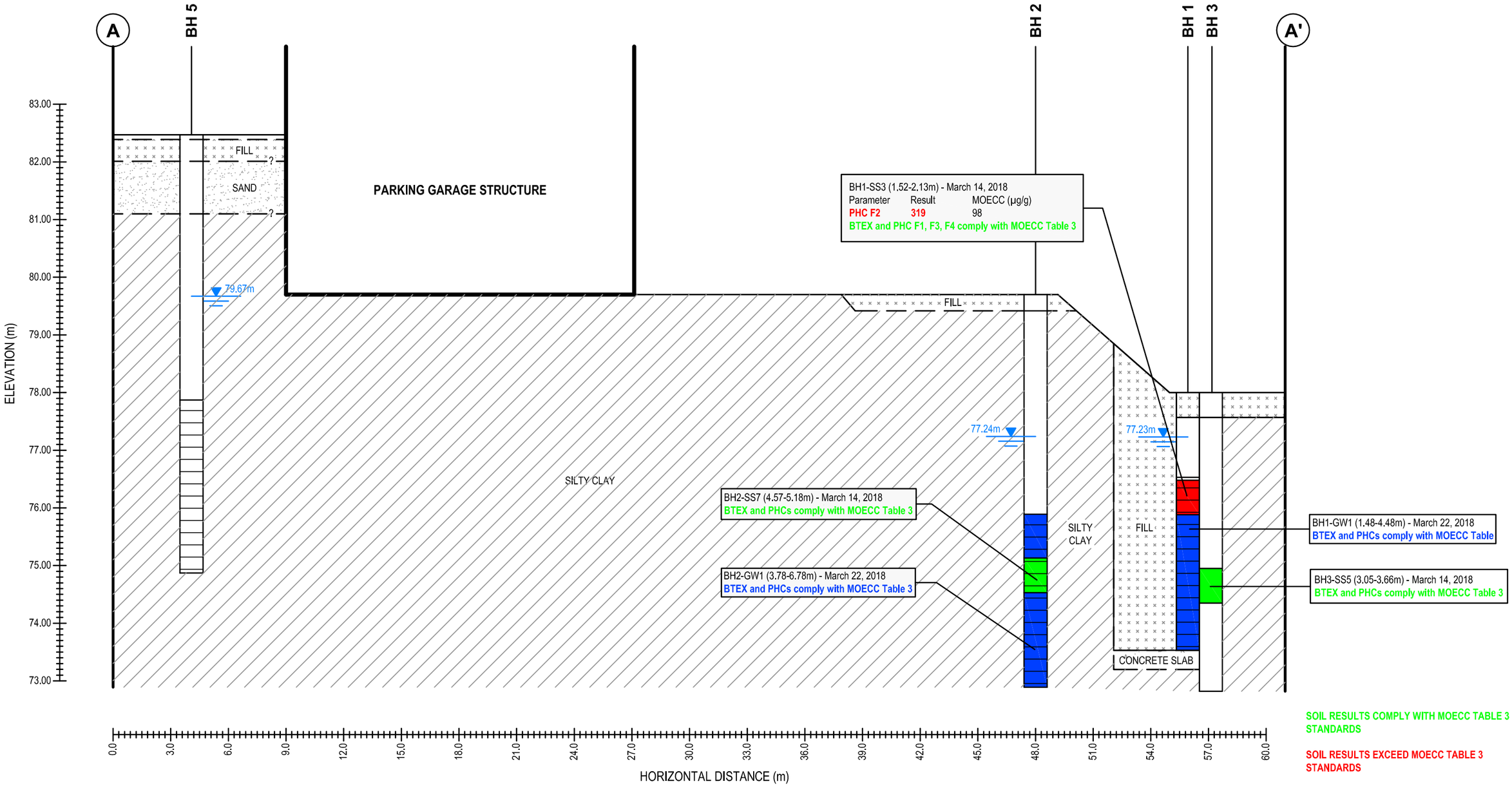

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URBANDALE CORPORATION

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
WALKLEY ROAD AT HALIFAX DRIVE

OTTAWA, ONTARIO

Title:

CROSS-SECTION A-A'

Scale: AS SHOWN	Date: 04/2018
Drawn by: MPG	Report No.: PE4234-2
Checked by: KM	Dwg. No.: PE4234-7
Approved by: MSD	Revision No.: 0

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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
Part of 2190 Halifax Drive
Ottawa, Ontario

Prepared For

Urbandale Corporation

March 2018

Report: PE4234-SAP

Table of Contents

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Urbandale Corporation (Urbandale) to conduct a Phase II Environmental Site Assessment (ESA) for part of the property addressed 2190 Halifax Drive, immediately north of Walkley Road, in the City of Ottawa, Ontario. Based on a Phase I ESA previously completed by Paterson for the subject property, a subsurface investigation program, consisting of borehole drilling, was developed. A geotechnical investigation was conducted concurrently with the environmental subsurface investigation.

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1	Placed borehole within the former underground storage tank (UST) nest.	Drill to intercept the water table for monitoring well installation.
BH2	Place borehole outside of former tank nest, where possible, given the proximity of buried utilities, for delineation purposes, should potential hydrocarbons be identified in BH1.	Drill to intercept water table for monitoring well installation.
BH3	Place borehole outside of former tank nest, where possible, given the proximity of buried utilities, for delineation purposes, should potential hydrocarbons be identified in BH1.	Drill to intercept the water table.
BH4 BH5 BH6	Place boreholes within proposed building footprint; for geotechnical purposes only.	Drill to maximum depth of 15m; install monitoring well in BH4 to triangulate groundwater flow direction.
BH7 BH8	Place boreholes to the north and northwest of BH1/the former tank nest location to delineate previously identified impacts in BH1.	Drill to depth of approximately 5 to 7m below grade, to below the depth of the slab associated with the former tank.

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.

Following borehole drilling, monitoring wells will be installed in selected boreholes (as above) for the measurement of water levels and the collection of groundwater samples.

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 the top of grate of a catch basin located east of the turn-about, with geodetic elevation of 81.81m above sea level (asl).

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

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

Procedure

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

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

3.3 Monitoring Well Sampling Procedure

Equipment

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

Sampling Procedure

- ❒ Locate well and use socket wrench or Allan key to open metal flush mount protector cap. Remove plastic well cap.
- ❒ Measure water level, with respect to existing ground surface, using water level meter or interface probe. If using interface probe on suspected NAPL site, measure the thickness of free product.
- ❒ Measure total depth of well.
- ❒ Clean water level tape or interface probe using methanol and water. Change gloves between wells.
- ❒ Calculate volume of standing water within well and record.
- ❒ Insert polyethylene tubing into well and attach to peristaltic pump. Turn on peristaltic pump and purge into graduated bucket. Purge at least three well volumes of water from the well. Measure and record field chemistry. Continue to purge, measuring field chemistry after every well volume purged, until appearance or field chemistry stabilizes.
- ❒ Note appearance of purge water, including colour, opacity (clear, cloudy, silty), sheen, presence of LNAPL, and odour. Note any other unusual features (particulate matter, effervescence (bubbling) of dissolved gas, etc.).

- ❒ Fill required sample bottles. If sampling for metals, attach 75-micron filter to discharge tube and filter metals sample. If sampling for VOCs, use low flow rate to ensure continuous stream of non-turbulent flow into sample bottles. Ensure no headspace is present in VOC vials.
- ❒ Replace well cap and flushmount casing cap.

4.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

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

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

5.0 DATA QUALITY OBJECTIVES

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

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

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

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

For the purpose of calculating the RPD, it is desirable to select field duplicates from samples for which parameters are present in concentrations above laboratory detection limits, i.e. samples which are expected to be contaminated. If parameters are below laboratory detection limits for selected samples or duplicates, the RPD may be calculated using a concentration equal to one half (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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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site AssessmenT
Walkley Road at Halifax Drive
Ottawa, Ontario

DATUM TBM - Top of grate of catch basin located near the south wall of proposed building. Geodetic elevation = 81.81m.

FILE NO. PE4234

REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** March 14, 2018

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE								
TOPSOIL	0.10		AU	1			0	78.00
FILL: Brown silty clay, some sand and organics, trace gravel	1.83		SS	2	67	4	1	77.00
FILL: Brown silty sand	2.21		SS	3	75	3	2	76.00
FILL: Grey silty clay, trace sand and gravel	2.82		SS	4	50	W		
FILL: Grey silty sand, trace gravel	3.35		SS	5	100	W	3	75.00
FILL: Grey silty clay, trace sand and gravel	4.47		SS	6	29	50+	4	74.00
End of Borehole								
(GWL @ 0.77m - March 22, 2018)								

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

Monitoring Well Construction

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site AssessmenT
Walkley Road at Halifax Drive
Ottawa, Ontario

DATUM TBM - Top of grate of catch basin located near the south wall of proposed building. Geodetic elevation = 81.81m.

FILE NO. PE4234

REMARKS

HOLE NO. BH 2

BORINGS BY CME 55 Power Auger **DATE** March 14, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	79.70
FILL: Topsoil, trace organics and gravel 0.28		AU	1				
		SS	2	58	13	1	78.70
		SS	3	100	12	2	77.70
Brown **SILTY CLAY,** trace sand		SS	4	100	7		
		SS	5	100	4	3	76.70
		SS	6	100	3	4	75.70
- grey by 4.1m depth		SS	7	100	1	5	74.70
		SS	8	100	W		
		SS	9	100	W	6	73.70
6.81							
End of Borehole							
(GWL @ 2.46m - March 22, 2018)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

Monitoring Well Construction

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site AssessmenT
Walkley Road at Halifax Drive
Ottawa, Ontario

DATUM TBM - Top of grate of catch basin located near the south wall of proposed building. Geodetic elevation = 81.81m.

FILE NO. PE4234

REMARKS

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** March 14, 2018

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE								
TOPSOIL	0.13		AU	1			0	78.00
FILL: Brown silty sand, trace gravel and cobbles	0.43		SS	2	46	3	1	77.00
Brown **SILTY CLAY,** trace sand and gravel			SS	3	58	3	2	76.00
			SS	4	100	3		
- grey by 2.3m depth			SS	5	100	W	3	75.00
			SS	6	100	W	4	74.00
			SS	7	100	W	5	73.00
End of Borehole	5.18							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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
Walkley Road at Halifax Drive
Ottawa, Ontario

DATUM TBM - Top of grate of catch basin located near the south wall of proposed building. Geodetic elevation = 81.81m.

FILE NO. PE4234

REMARKS

HOLE NO. BH 4

BORINGS BY CME 55 Power Auger **DATE** March 12, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	82.22
Asphaltic concrete 0.10		AU	1				
FILL: Crushed stone with silt and sand 0.38						1	81.22
		SS	2	100	12	2	80.22
Very stiff, brown **SILTY CLAY,** some sand						3	79.22
						4	78.22
- stiff to firm and grey by 4.6m depth						5	77.22
						6	76.22
						7	75.22
						8	74.22
						9	73.22
						10	72.22
						11	71.22
		SS	3	100	4	12	70.22
						13	69.22
						14	68.22
- trace gravel by 15.5m depth						15	67.22
15.80							
Dynamic Cone Penetration Test commenced at 15.8m depth. Practical DCPT refusal at 15.80m depth.							

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
Walkley Road at Halifax Drive
Ottawa, Ontario

DATUM TBM - Top of grate of catch basin located near the south wall of proposed building. Geodetic elevation = 81.81m.

FILE NO. PE4234

REMARKS

HOLE NO. BH 5

BORINGS BY CME 55 Power Auger **DATE** March 12, 2018

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							0	82.47
Asphaltic concrete	0.08		AU	1				
FILL: Crushed stone with silt and sand	0.46		SS	2	50	14	1	81.47
Compact, brown **SAND** with silt, trace clay	1.37						2	80.47
			SS	3	100	9	3	79.47
							4	78.47
Very stiff, brown **SILTY CLAY,** some sand							5	77.47
							6	76.47
- stiff and grey by 5.3m depth							7	75.47
							8	74.47
							9	73.47
							10	72.47
							11	71.47
							12	70.47
	12.95							
			SS	4	46	2	13	69.47
GLACIAL TILL: Grey silty clay with some sand and gravel							14	68.47
	15.09		SS	5	100	1	15	67.47
End of Borehole								
(GWL @ 2.80m - March 22, 2018)								

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

Monitoring Well Construction

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site AssessmenT
Walkley Road at Halifax Drive
Ottawa, Ontario

DATUM TBM - Top of grate of catch basin located near the south wall of proposed building. Geodetic elevation = 81.81m.

FILE NO. PE4234

REMARKS

HOLE NO. BH 6

BORINGS BY CME 55 Power Auger **DATE** March 12, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	81.43
Asphaltic concrete 0.10		AU	1				
FILL: Crushed stone with silt and sand 0.51						1	80.43
		SS	2	100	12	2	79.43
						3	78.43
Very stiff, brown **SILTY CLAY,** some sand						4	77.43
						5	76.43
- stiff and grey by 4.9m depth						6	75.43
						7	74.43
						8	73.43
						9	72.43
						10	71.43
						11	70.43
12.19						12	69.43
		SS	3	42	4		
GLACIAL TILL: Grey silty clay, some sand and gravel 13.72						13	68.43
		SS	4	71	46	14	67.43
GLACIAL TILL: Grey silty sand with gravel, trace clay 14.96		SS	5	0	50+		
End of Borehole							
Practical refusal to augering at 14.96m depth							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

SYMBOLS AND TERMS

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 x D60)
Cu	-	Uniformity coefficient = D60 / D10

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

CONSOLIDATION TEST

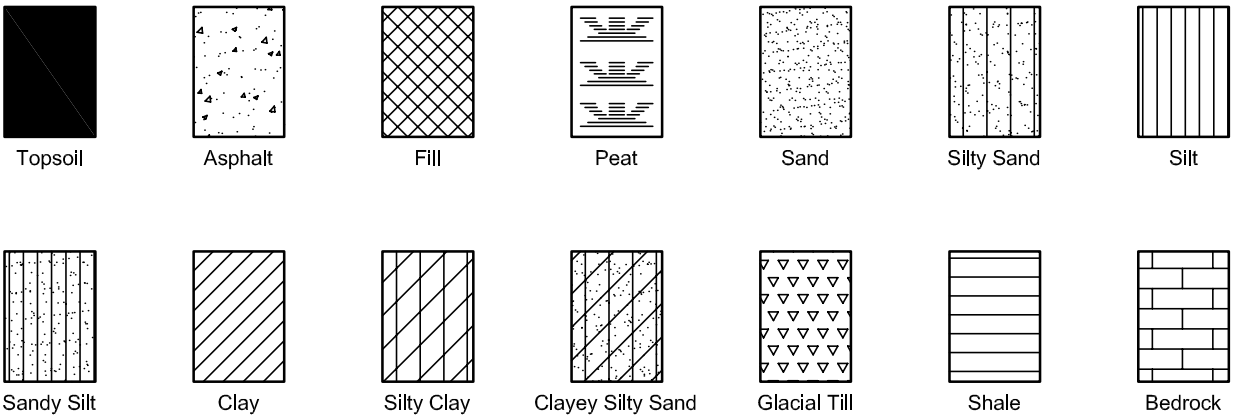
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

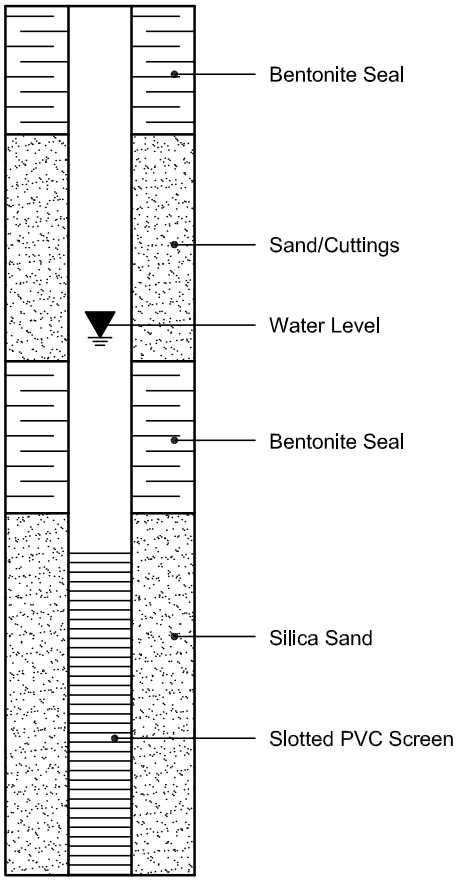
SYMBOLS AND TERMS (continued)

STRATA PLOT

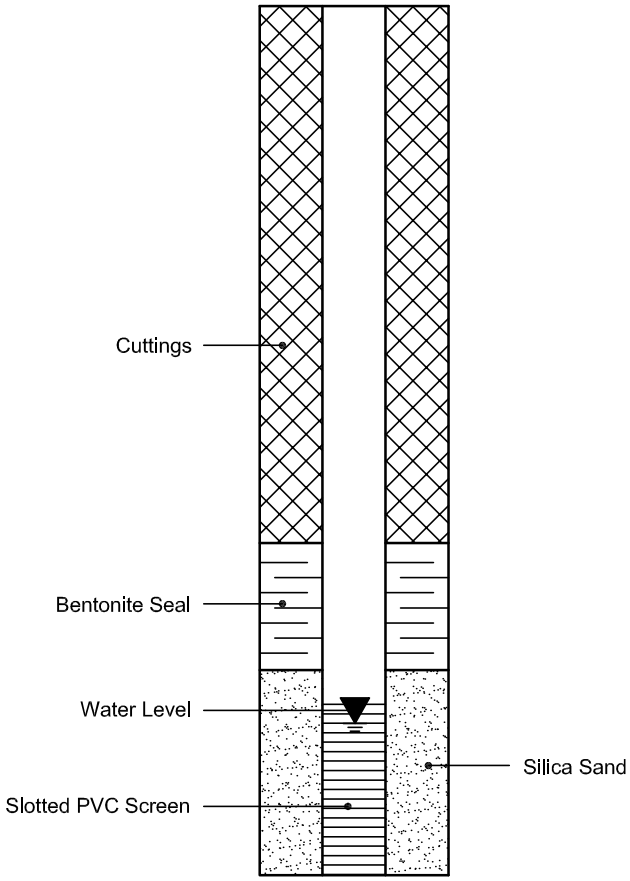


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 23637
Project: PE4234
Custody: 33441

Report Date: 21-Mar-2018
Order Date: 15-Mar-2018

Order #: 1811404

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

Paracel ID	Client ID
1811404-01	BH1-SS3
1811404-02	BH2-SS7
1811404-03	BH3-SS5

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23637

Report Date: 21-Mar-2018
Order Date: 15-Mar-2018
Project Description: PE4234

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	20-Mar-18	21-Mar-18
PHC F1	CWS Tier 1 - P&T GC-FID	20-Mar-18	21-Mar-18
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	16-Mar-18	17-Mar-18
Solids, %	Gravimetric, calculation	20-Mar-18	20-Mar-18

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 23637

Report Date: 21-Mar-2018

Order Date: 15-Mar-2018

Project Description: PE4234

	Client ID:	BH1-SS3	BH2-SS7	BH3-SS5	-
	Sample Date:	14-Mar-18	14-Mar-18	14-Mar-18	-
	Sample ID:	1811404-01	1811404-02	1811404-03	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	75.6	72.5	71.8	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
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	-
Toluene-d8	Surrogate	97.3%	96.3%	100%	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	-
F2 PHCs (C10-C16)	4 ug/g dry	319	<4	<4	-
F3 PHCs (C16-C34)	8 ug/g dry	184	<8	<8	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23637

Report Date: 21-Mar-2018
Order Date: 15-Mar-2018
Project Description: PE4234

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*3.42*		*ug/g*		*107*	*50-140*			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23637

Report Date: 21-Mar-2018
Order Date: 15-Mar-2018
Project Description: PE4234

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	85.6	0.1	% by Wt.	83.3			2.7	25	
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*3.97*		*ug/g dry*		*103*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	197	7	ug/g		98.3	80-120			
F2 PHCs (C10-C16)	117	4	ug/g	ND	107	60-140			
F3 PHCs (C16-C34)	214	8	ug/g	ND	94.5	60-140			
F4 PHCs (C34-C50)	154	6	ug/g	ND	102	60-140			
Volatiles									
Benzene	4.83	0.02	ug/g		121	60-130			
Ethylbenzene	4.12	0.05	ug/g		103	60-130			
Toluene	3.81	0.05	ug/g		95.1	60-130			
m,p-Xylenes	8.21	0.05	ug/g		103	60-130			
o-Xylene	4.12	0.05	ug/g		103	60-130			
Surrogate: Toluene-d8	*2.72*		*ug/g*		*85.1*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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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Page 1 of 1

Client Name: PATERSON GROUP	Project Reference: PE4234
Contact Name: MIKE BEAUDOIN / KARYN MUNCH	Quote #
Address: 154 COLONNADE RD. S.	PO # 23637
Telephone: 613-226-7381	Email Address: mbeaudoin@patersongroup.ca / Kmunch@patersongroup.ca

Turnaround Time:

☐ 1 Day ☐ 3 Day

☐ 2 Day ~~☐~~ Regular

Date Required: _____

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

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

Required Analyses

Paracel Order Number: 1811404

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	BTEX	PHC F1-F4									
1	BH1-SS3	S		2	Mar 14/18		✓	✓			120mL	+ vial					✓
2	BH2-SS7	S		2	↓		✓	✓				↓					✓
3	BH3-SS5	S		2	↓		✓	✓									✓
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: T. LOUISE	Received at Lab:	Verified By:
Relinquished By (Print):	Date/Time: 15/03/18 3 20	Date/Time: 03/15/18 4:30pm	Date/Time: 03/15/18 4:47pm
Date/Time:	Temperature: ___ °C FT	Temperature: 16.4 °C	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 23492
Project: PE4234
Custody: 114336

Report Date: 28-Mar-2018
Order Date: 22-Mar-2018

Order #: 1812593

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

Paracel ID	Client ID
1812593-01	BH1-GW1
1812593-02	BH2-GW1

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23492

Report Date: 28-Mar-2018
Order Date: 22-Mar-2018
Project Description: PE4234

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	25-Mar-18	25-Mar-18
PHC F1	CWS Tier 1 - P&T GC-FID	23-Mar-18	25-Mar-18
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	26-Mar-18	27-Mar-18

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 23492

Report Date: 28-Mar-2018

Order Date: 22-Mar-2018

Project Description: PE4234

	Client ID:	BH1-GW1	BH2-GW1	-	-
	Sample Date:	03/22/2018 09:00	03/22/2018 09:00	-	-
	Sample ID:	1812593-01	1812593-02	-	-
	MDL/Units	Water	Water	-	-
Volatiles					
Benzene	0.5 ug/L	<0.5	<0.5	-	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	-	-
Toluene	0.5 ug/L	<0.5	<0.5	-	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	-	-
o-Xylene	0.5 ug/L	<0.5	<0.5	-	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	-	-
Toluene-d8	Surrogate	101%	102%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	-	-
F2 PHCs (C10-C16)	100 ug/L	<100	<100	-	-
F3 PHCs (C16-C34)	100 ug/L	<100	<100	-	-
F4 PHCs (C34-C50)	100 ug/L	<100	<100	-	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23492

Report Date: 28-Mar-2018
Order Date: 22-Mar-2018
Project Description: PE4234

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									
Benzene	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: Toluene-d8	*82.9*		*ug/L*		*104*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Volatiles									
Benzene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: Toluene-d8	*83.8*		*ug/L*		*105*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1990	25	ug/L		99.5	68-117			
F2 PHCs (C10-C16)	1720	100	ug/L		95.8	60-140			
F3 PHCs (C16-C34)	2980	100	ug/L		80.0	60-140			
F4 PHCs (C34-C50)	2020	100	ug/L		81.4	60-140			
Volatiles									
Benzene	34.0	0.5	ug/L		85.0	60-130			
Ethylbenzene	44.4	0.5	ug/L		111	60-130			
Toluene	39.8	0.5	ug/L		99.6	60-130			
m,p-Xylenes	83.3	0.5	ug/L		104	60-130			
o-Xylene	42.5	0.5	ug/L		106	60-130			
Surrogate: Toluene-d8	*73.4*		*ug/L*		*91.7*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

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

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Paracel ID: 1812593

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el@paracellabs.com

Chain of Custody (Lab Use Only) № 114336

Page 1 of 1

Client Name: Patersa Grap	Project Reference: PE4234
Contact Name: Karyn Munch	Quote #
Address: 154 Colonnade Rd S.	PO # 23492
Telephone: 617-226-7381	Email Address: Kmunch@patersagrap.ca

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

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

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

Paracel Order Number: 1812593

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)							
1	BH1-GW1	GW		3	Mar 22, 2018	–	X													
2	BH2-GW2 (GW1 Report as)	↓		3	↓	–	X													
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments: 2: No. 2 sample ID on Bottle PHC + VOCs read = BH2-GW1.

Method of Delivery: Paracel

Relinquished By (Sign): [signature]	Received by Driver/Depot: A. Stouse	Received at Lab: Sunneporn Dommi	Verified By: Bloom
Relinquished By (Print): Erik Ardley	Date/Time: 22/03/18 3:10 PM	Date/Time: Mar 22, 2018 05.00	Date/Time: March 23, 18 10
Date/Time: Mar 22, 2018	Temperature: °C	Temperature: 14.1 °C	pH Verified [ ] By:

APPENDIX 2

REMEDIATION REPORT

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Studies

Paterson Group Inc.

Consulting Engineers
154 Colonnade Road South
Ottawa (Nepean), Ontario
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patersongroup

Environmental Remediation Program

Part of 2190 Halifax Drive
Ottawa, Ontario

Prepared For

Urbandale Corporation

December 13, 2024

Report: PE4234-3R

Table of Contents

List of Figures

List of Appendices

EXECUTIVE SUMMARY

Assessment

Paterson Group monitored the removal of petroleum hydrocarbon impacted soil within a former tank nest on the southwestern portion of the property addressed 2190 Halifax Drive, in the City of Ottawa, Ontario. The remedial excavation was carried out during the interim of July 3 through August 1, 2018.

Approximately 624 metric tonnes of impacted soil and 25,840L of water was removed from subject site and disposed of at the Tomlinson Environmental Services Industrial Waste Division facility, at 5555 Power Road in Ottawa, Ontario. Upon removal of all petroleum hydrocarbon impacted fill material from the former tank nest, minimal groundwater was observed to accumulate within the excavation, with no visual evidence of petroleum impacts.

A total of 71 soil samples were collected for screening purposes from the excavation. Based on field observations in combination with the results of combustible vapour screening, fifteen (15) confirmatory samples were selected for analysis of BTEX and PHCs. Based the analytical test results, the soil remaining on the Phase II Property is in compliance with MECP Table 3 standards.

Conclusion

Based on our field observations in combination with confirmatory analytical testing, it is our opinion that the remediation program was successful in removing the impacted soil from the subject property. The soil and groundwater beneath the site is considered to be in compliance with the 2011 MECP Table 3 residential standards. **No further remedial activities are required.**

1.0 INTRODUCTION

Paterson Group monitored an environmental site remediation at 2190 Halifax Drive, in the City of Ottawa. The remediation program was conducted during the interim of July 3 through August 1, 2018. The findings of the remediation program are detailed in this report.

The subject site is located on the north side of Walkley Road, approximately 175m west of Halifax Drive. The subject property forms the southwestern corner of the larger parcel of land addressed 2190 Halifax Drive. The location of the subject site is shown on Figure 1 - Key Plan, appended to the Phase II ESA report. At the time of the remediation, the subject parcel of land consisted of an undeveloped, landscaped area, situated between a residential apartment building and a parking garage structure.

1.1 Background

In April of 2018, Paterson completed a Phase I ESA for the subject property. Based on the findings of the Phase I ESA, a Phase II ESA was recommended to address potential soil and groundwater impacts resulting from a former underground oil storage tank (UST) situated on the northeastern portion of the Phase I Property. The UST had reportedly been removed, however the vent and fill pipes remained in place along the south wall of the boiler room associated with the adjacent residential apartment building to the north.

A Phase II ESA was subsequently conducted in conjunction with a Geotechnical Investigation. Three (3) boreholes (BH1, BH2 and BH3) were placed to address the APEC, while the remaining boreholes (BH4, BH5 and BH6) were placed for geotechnical purposes. Two environmental boreholes (BH1 and BH2) were instrumented with a groundwater monitoring well to recover and assess the groundwater in the vicinity of the former tank nest. A third monitoring well was installed in a geotechnical borehole (BH5), to determine the groundwater flow direction.

Soil samples obtained from the boreholes were screened using visual observations and combustible vapour measurements. Based on the screening results, samples were selected for analysis of benzene, toluene, ethylbenzene and xylene (BTEX) and petroleum hydrocarbons, fractions 1 through 4 (PHCs F_1-F_4).

The analytical results indicated that a PHC F_2 concentration exceeding the selected Ministry of the Environment, Conservation and Parks (MECP) Table 3 standard, was identified in soil Sample BH1-SS3 at a depth of approximately 1.5 to 2m below grade. The remaining PHC parameters detected in this sample were in compliance with MECP Table 3 standards. No PHC parameters were detected in the remaining soil samples submitted for analysis, nor were any BTEX concentrations detected above the laboratory method detection limits, in any of the samples analysed.

Groundwater samples obtained from BH1 and BH2 were submitted for analytical testing of BTEX and PHC (F1-F4) parameters. There were no detectable concentrations of BTEX or PHCs in the groundwater samples submitted. Based on the analytical test results, the groundwater complied with the MECP Table 3 standards selected for the site.

Based on the findings of the Phase II ESA, a soil remediation program was recommended for the Phase II Property. Paterson was subsequently commissioned to monitor a remediation program, the results of which are detailed below. It should be noted that prior to commencing the remediation program, an Ontario Regulation (O.Reg.) 347/558 analysis was conducted on the impacted soil sample obtained from BH1, as required for the disposal of impacted soil at a licenced landfill facility. A copy of the O.Reg. 347/558 laboratory certificate of analysis is attached to this report.

It should be noted that two (2) additional boreholes, BH7 and BH8 were subsequently conducted further to the north or northwest of BH1 and BH3, in conjunction with the remediation program, to determine the northern extent of the petroleum hydrocarbon impacts. Based on analytical testing, petroleum hydrocarbons were not detected in the soil at BH7 and BH8.

2.0 SOIL REMEDIATION PROGRAM

Paterson was on site on an as needed basis during the interim of July 3, 2018 through August 1, 2018, to direct the excavation and removal of impacted soil. R.W. Tomlinson Limited was retained as the excavation contractor for the remediation program.

Soils within the former tank nest consisted of topsoil over silty sand or silty clay fill material, underlain by a concrete slab, followed by native silty clay. Prior to the excavation of impacted soil, topsoil and clean fill material was stripped and stockpiled for reuse onsite.

Petroleum hydrocarbon impacted soil was identified at a depth of approximately 1.5m below grade and extended to depths ranging from approximately 3.5 to 4.5m below grade, just above the concrete slab. As it was deemed impractical to remove the concrete slab (due to the proximity of the residential apartment building as well as the buried services), the excavation continued to a depth of approximately 5.5m around the perimeter of the slab, to confirm that the hydrocarbon impacts had not extended to the native soil beyond the slab. The above-noted depths are in reference to the ground surface elevation at BH 3 along the eastern wall of the excavation, approximately 1.0m lower in elevation than the western portion of the excavation.

Clean excavation walls were identified approximately 0.5m to 1.0m further east or south of the concrete slab, while the excavation was limited to the north and west by buried water and natural gas services. The natural gas line and water service were subsequently exposed via the process of daylighting, and in the case of the natural gas service, provided with support prior to continuing excavation. Clean excavation sidewalls to the north and west were identified just beyond the northern and western limits of the concrete slab.

Approximately 612 metric tons of impacted soil were removed from the subject site and disposed of at Tomlinson's waste transfer facility at 5555 Power Road, Ottawa, Ontario. An additional 11.5 metric tonnes of soil was removed during the daylighting process, and disposed off-site as impacted material. The excavation is approximately rectangular in shape with an approximate area of 270 m^2.

Fifteen (15) final confirmatory soil samples obtained from the base and excavation sidewalls were submitted for analytical testing. The locations of the remedial excavation confirmatory samples are shown on Drawing No. PE4234-8, appended to this report.

3.0 FREE PRODUCT

Approximately 25,840 L of water was removed from the remedial excavation by Tomlinson, a contractor licenced for these works, via a pumper truck. The water was a combination of groundwater and precipitation that entered the excavation. The majority of this water was not considered to be contaminated based on its source, however, unavoidable mixing of impacted soil with this water during the excavation program resulted in the water being impacted to the extent that it had to be removed from the site as contaminated. A summary of the water volume removed is appended to this report.

Upon removal of all petroleum hydrocarbon impacted soil (fill material) from the former tank nest, minimal groundwater was observed to accumulate within the excavation, with no visual evidence of petroleum impacts.

4.0 CONFIRMATORY SAMPLING AND ANALYSIS

4.1 Confirmatory Soil Sampling Program

The soil sampling protocols followed during this remedial program were in general accordance with the MECP document entitled *"Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario"*, dated May 1996.

All of the soil samples were submitted to a preliminary screening procedure using a RKI Eagle combustible gas meter, calibrated to hexane. The combustible vapours were measured by inserting the analyzer probe into the nominal headspace above the soil sample. The sample was then agitated and the peak reading recorded. The combustible vapour readings of the final confirmatory samples were found to range from less than 5 parts per million (ppm) to 50 ppm. Visual screening was also used in conjunction with the above methodology.

Verification samples were collected from the base of the excavation and the excavation sidewalls as the excavation progressed. It should be noted that soil samples determined to exceed the MECP Table 3 standards, based on the results of interim analytical testing and/or vapour screening results, were removed (reflected in the final confirmatory sample identification numbers). Sixteen final confirmatory base and excavation sidewall samples were recovered and submitted for analytical testing.

4.2 Analytical Testing

The remediation standards selected for the site were taken from Table 3 of the document entitled *"Soil, Groundwater and Sediment Standards for Use under Part XV.I of the Environmental Protection Act"* prepared by the MECP, dated April 15, 2011. The Table 3 standards are based on the following considerations:

- ❒ Fine-grained soil conditions
- ❒ Non-potable groundwater conditions
- ❒ Residential land use.

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

Table 1
Analytical Test Results – Soil
BTEX and Petroleum Hydrocarbons

Parameter	MDL (µg/g)	Soil Samples (µg/g)						MECP Table 3 Residential Fine-Grained
		Mar.14, 2018	July 3, 2018	July 4, 2018				
		BH3-SS5[1]	E1	B1[2]	B3[2]	E4	TP1-G1	
Benzene	0.02	nd	nd	nd	nd	nd	nd	0.17
Ethylbenzene	0.05	nd	nd	nd	nd	nd	nd	15
Toluene	0.05	nd	nd	nd	nd	nd	nd	6
Xylenes	0.05	nd	nd	nd	nd	nd	nd	25
PHC F1	7	nd	nd	32	nd	nd	nd	65
PHC F2	4	nd	nd	15	nd	nd	17	150
PHC F3	8	nd	nd	34	11	nd	10	1,300
PHC F4	6	nd	nd	nd	nd	nd	nd	5,600

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- 1 – Sample BH3-SS5 analysed during the initial Phase II ESA is
- 2 – B1 and B3 were recovered from above the concrete slab and therefore are not show on Drawing PE4234-8 – Site Remediation Plan

Table 1 (Continued)
Analytical Test Results – Soil
BTEX and Petroleum Hydrocarbons

Parameter	MDL (µg/g)	Soil Samples (µg/g) July 9, 2018						MECP Table 3 Residential Fine-Grained
		B5	B7	S8	S12	W6	E6	
Benzene	0.02	nd	nd	nd	nd	nd	nd	0.17
Ethylbenzene	0.05	nd	nd	nd	nd	nd	nd	15
Toluene	0.05	nd	nd	nd	nd	nd	nd	6
Xylenes	0.05	nd	nd	nd	nd	nd	nd	25
PHC F1	7	nd	nd	nd	nd	nd	nd	65
PHC F2	4	nd	nd	nd	nd	nd	nd	150
PHC F3	8	nd	nd	nd	nd	nd	nd	1,300
PHC F4	6	nd	nd	nd	nd	nd	nd	5,600

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

Table 1 (Continued)
Analytical Test Results – Soil
BTEX and Petroleum Hydrocarbons

Parameter	MDL (µg/g)	Soil Samples (µg/g)						MECP Table 3 Residential Fine-Grained
		July 16, 2018	August 2, 2018					
		S17	W9	N11	N17	B8	B10	
Benzene	0.02	nd	nd	nd	nd	nd	nd	0.17
Ethylbenzene	0.05	nd	nd	nd	nd	nd	nd	15
Toluene	0.05	nd	nd	nd	nd	nd	nd	6
Xylenes	0.05	nd	nd	nd	nd	nd	nd	25
PHC F1	7	nd	nd	nd	nd	nd	nd	65
PHC F2	4	nd	nd	nd	nd	nd	nd	150
PHC F3	8	nd	nd	67	nd	30	nd	1,300
PHC F4	6	nd	nd	10	nd	nd	nd	5,600

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

No BTEX parameters were identified in any of the confirmatory samples submitted for analytical testing (including B1 and B3 recovered from within the fill material just above the concrete slab). With the exception of soil Samples B1, B3, B8, N11 and TP1-G1, no PHC parameters were identified in any of the confirmatory soil samples. Those petroleum parameters identified, were at concentrations well below the MECP Table 3 standards.

Copies of the laboratory Certificates of Analysis are appended to this report. It should be noted that interim sampling results are also presented on the Certificates of Analysis, while only the results of the final confirmatory samples are presented in the tables above.

4.3 Quality Assurance/Quality Control

Quality assurance and quality control (QA/QC) measures, including sampling containers, preservation, labelling, handling, and custody, equipment cleaning procedures, and field quality control measures, are detailed in the Sampling and Analysis Plan appended to the Phase II-ESA for this site.

4.4 Backfill

Once all impacted soil had been removed from the subject property, based on the results of final confirmatory analyses, the excavation was backfilled. Approximately 655mt of sand and 6mt of crushed stone was imported to the subject property from the Albion Road aggregate pit operated by Tomlinson. A summary of the quantity of imported fill material is provided in the Appendix.

5.0 ASSESSMENT AND CONCLUSION

5.1 Assessment

Paterson Group monitored the removal of petroleum hydrocarbon impacted soil within a former tank nest on the southwestern portion of the property addressed 2190 Halifax Drive, in the City of Ottawa, Ontario. The remedial excavation was carried out during the interim of July 3 through August 1, 2018.

Approximately 624 metric tonnes of impacted soil and 25,840L of water was removed from subject site and disposed of at the Tomlinson Environmental Services Industrial Waste Division facility, at 5555 Power Road in Ottawa, Ontario. Upon removal of all petroleum hydrocarbon impacted fill material from the former tank nest, minimal groundwater was observed to accumulate within the excavation, with no visual evidence of petroleum impacts.

A total of 71 soil samples were collected for screening purposes from the excavation. Based on field observations in combination with the results of combustible vapour screening, fifteen (15) confirmatory samples were selected for analysis of BTEX and PHCs. Based the analytical test results, the soil remaining on the Phase II Property is in compliance with MECP Table 3 standards.

5.2 Conclusion

Based on our field observations in combination with confirmatory analytical testing, it is our opinion that the remediation program was successful in removing the impacted soil from the subject property. The soil and groundwater beneath the site is considered to be in compliance with the 2011 MECP Table 3 residential standards. **No further remedial activities are required.**

6.0 STATEMENT OF LIMITATIONS

The results of the sampling program are based on our field observations, visual and combustible vapour survey results, and analytical test results obtained at specific test locations which can only be extrapolated to an undefined limited area around each location. The test results may not reflect conditions at other locations or areas beyond the extent of the excavation.

This report was prepared for the sole use of Urbandale Corporation. Permission from Urbandale Corporation and Paterson Group 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}

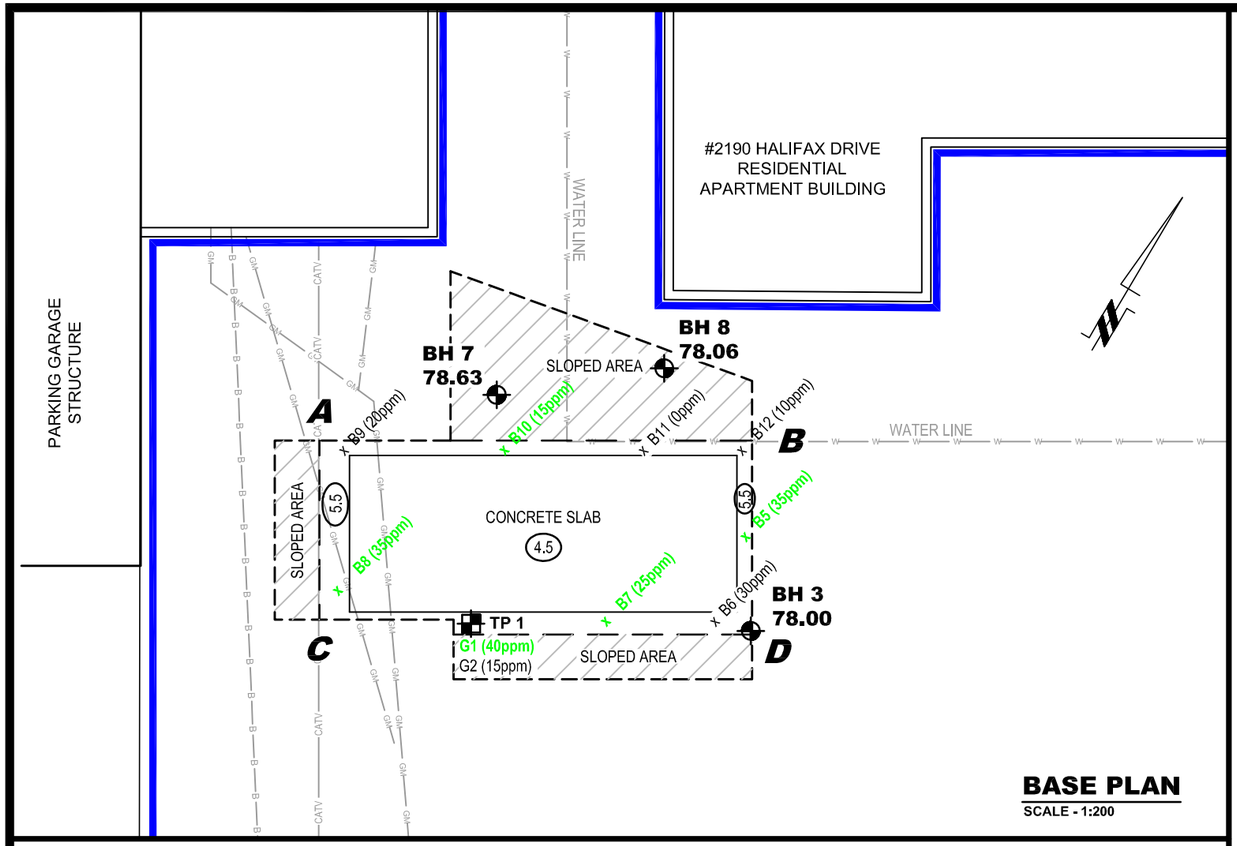
Report Distribution:

- ❒ Urbandale Corporation
- ❒ Paterson Group

December 13, 2024

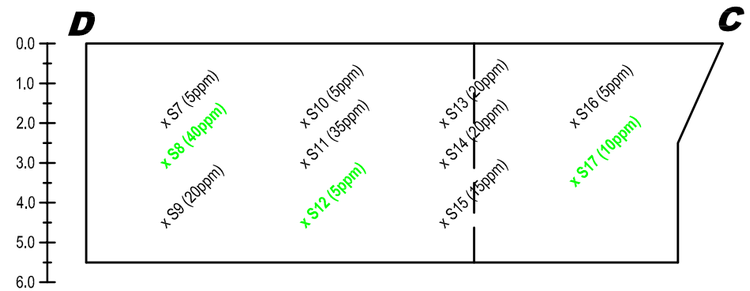
FIGURES

DRAWING PE4234-8 – SITE REMEDIATION PLAN

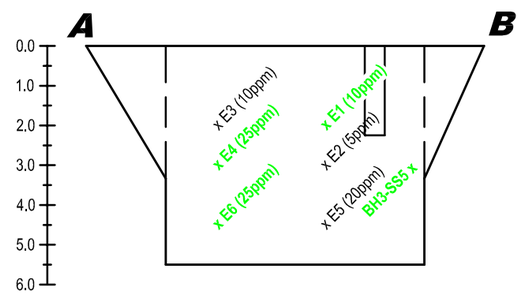


BASE PLAN
SCALE - 1:200

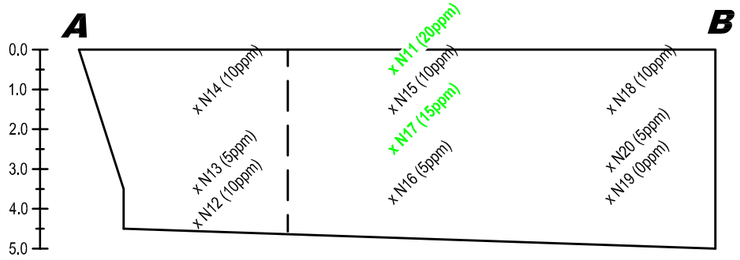
SOUTH WALL
SCALE - 1:150



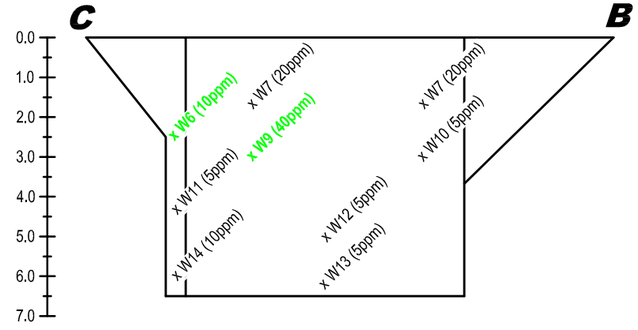
EAST WALL
SCALE - 1:150



NORTH WALL
SCALE - 1:150



WEST WALL
SCALE - 1:150



LEGEND:

x B11	SOIL SAMPLE LOCATION
x B7	ANALYZED SOIL SAMPLE COMPLIES WITH MOECP TABLE 3 STANDARDS
(35)	HEADSPACE VAPOUR READING (ppm)
5.5	DEPTH OF EXCAVATION (m)
	BOREHOLE LOCATION
	TEST PIT LOCATION
79.70	GROUND SURFACE ELEVATION(m)

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL
0			

URBANDALE CORPORATION

ENVIRONMENTAL SITE REMEDIATION
WALKLEY ROAD AT HALIFAX DRIVE

OTTAWA, ONTARIO

Title:

SITE REMEDIATION PLAN

Scale: AS SHOWN	Date: 08/2018
Drawn by: MPG	Report No.: PE4234-3
Checked by: KM	Dwg. No.: PE4234-8
Approved by: MSD	Revision No.: 0

p:\autocad drawings\environmental\pe42xx\pe4234\pe4234-8 remediation.dwg

APPENDIX 1

LABORATORY CERTIFICATES OF ANALYSIS

WEIGH SCALE SUMMARY – IMPACTED SOIL

WEIGH SCALE SUMMARY – BACKFILL MATERIAL

VOLUME SUMMARY – IMPACTED WATER

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 24588
Project: PE4234
Custody: 43300

Report Date: 4-Jul-2018
Order Date: 3-Jul-2018

Order #: 1827101

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

Paracel ID	Client ID
1827101-01	E1
1827101-02	S1
1827101-03	S6

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 24588

Report Date: 04-Jul-2018
Order Date: 3-Jul-2018
Project Description: PE4234

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	3-Jul-18	4-Jul-18
PHC F1	CWS Tier 1 - P&T GC-FID	3-Jul-18	4-Jul-18
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	4-Jul-18	4-Jul-18
Solids, %	Gravimetric, calculation	4-Jul-18	4-Jul-18

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 24588

Report Date: 04-Jul-2018
Order Date: 3-Jul-2018
Project Description: PE4234

	Client ID:	E1	S1	S6	-
	Sample Date:	07/03/2018 13:00	07/03/2018 13:00	07/03/2018 13:00	-
	Sample ID:	1827101-01	1827101-02	1827101-03	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	83.5	78.9	77.0	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
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	-
Toluene-d8	Surrogate	106%	102%	100%	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	91	84	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	357	503	-
F3 PHCs (C16-C34)	8 ug/g dry	<8	210	247	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*8.11*		*ug/g*		*101*	*50-140*			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 24588

Report Date: 04-Jul-2018
Order Date: 3-Jul-2018
Project Description: PE4234

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 wet					30	
F3 PHCs (C16-C34)	ND	8	ug/g wet					30	
F4 PHCs (C34-C50)	ND	6	ug/g wet					30	
Physical Characteristics									
% Solids	94.7	0.1	% by Wt.	94.8			0.1	25	
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*10.5*		*ug/g dry*		*107*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	188	7	ug/g		94.2	80-120			
F2 PHCs (C10-C16)	77	4	ug/g		95.9	80-120			
F3 PHCs (C16-C34)	196	8	ug/g		100	80-120			
F4 PHCs (C34-C50)	102	6	ug/g		82.2	80-120			
Volatiles									
Benzene	4.06	0.02	ug/g		102	60-130			
Ethylbenzene	4.35	0.05	ug/g		109	60-130			
Toluene	3.95	0.05	ug/g		98.7	60-130			
m,p-Xylenes	8.40	0.05	ug/g		105	60-130			
o-Xylene	4.31	0.05	ug/g		108	60-130			
Surrogate: Toluene-d8	*8.00*		*ug/g*		*100*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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.

PARACEL LABORATORIES LTD.

Paracel ID: 1827101

Office
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a, Ontario K1G 4J8
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acel@paracellabs.com

Chain of Custody
(Lab Use Only)
№ 43300

Page 1 of 1

Client Name: Paterson
Contact Name: Marek Moroz Karyn Munch
Address: 154 Colonnade Rd
Telephone:

Project Reference: PE4734
Quote #: 24518
PO #:
Email Address:

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

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

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

Required Analyses

Paracel Order Number: 1827101	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	BTEX+PHC										
1	E1	S		2	Jul 3	1300	+									250ml + 1 vial	✓
2	S[illegible]1	S		2	↓	↓	+									↓	✓
3	S6	S		2	↓	↓	+									↓	✓
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Comments: updated TAT to 1day per marek. PG

Method of Delivery: Walkin

Relinquished By (Sign):	Received by Driver/Depot:	Received at Lab:	Verified By:
Relinquished By (Print): Marek Moroz	Date/Time:	Date/Time: Jul 3/18 3:40p	Date/Time: July 3/18 5:56
Date/Time: 2018-07-03	Temperature: °C	Temperature: 24.3 °C	pH Verified ☐ By:

Chain of Custody (Blank) - Rev 0.4 Feb 2016

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E7J5
Attn: Marek Moroz

Client PO: 24117
Project: PE4234
Custody: 43303

Report Date: 5-Jul-2018
Order Date: 4-Jul-2018

Order #: 1827240

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

Paracel ID	Client ID
1827240-01	B1
1827240-02	B3
1827240-03	N1
1827240-04	N3
1827240-05	W4
1827240-06	E4
1827240-07	TP1-G1

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 24117

Report Date: 05-Jul-2018
Order Date: 4-Jul-2018
Project Description: PE4234

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	4-Jul-18	5-Jul-18
PHC F1	CWS Tier 1 - P&T GC-FID	4-Jul-18	5-Jul-18
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	4-Jul-18	5-Jul-18
Solids, %	Gravimetric, calculation	5-Jul-18	5-Jul-18

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 24117

Report Date: 05-Jul-2018
Order Date: 4-Jul-2018
Project Description: PE4234

	Client ID:	B1	B3	N1	N3
	Sample Date:	07/04/2018 15:00	07/04/2018 15:00	07/04/2018 11:00	07/04/2018 11:00
	Sample ID:	1827240-01	1827240-02	1827240-03	1827240-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	79.8	81.1	73.9	75.4
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene-d8	Surrogate	85.1%	107%	103%	102%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	32	<7	<7	16
F2 PHCs (C10-C16)	4 ug/g dry	15	<4	115	581
F3 PHCs (C16-C34)	8 ug/g dry	34	11	66	317
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	<6

	Client ID:	W4	E4	TP1-G1	-
	Sample Date:	07/04/2018 11:00	07/04/2018 11:00	07/04/2018 11:00	-
	Sample ID:	1827240-05	1827240-06	1827240-07	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	77.4	76.5	76.7	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
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	-
Toluene-d8	Surrogate	98.1%	102%	106%	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	-
F2 PHCs (C10-C16)	4 ug/g dry	121	<4	17	-
F3 PHCs (C16-C34)	8 ug/g dry	102	<8	10	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 24117

Report Date: 05-Jul-2018
Order Date: 4-Jul-2018
Project Description: PE4234

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*3.22*		*ug/g*		*101*	*50-140*			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 24117

Report Date: 05-Jul-2018
Order Date: 4-Jul-2018
Project Description: PE4234

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	
Physical Characteristics									
% Solids	96.7	0.1	% by Wt.	95.7			1.1	25	
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*3.64*		*ug/g dry*		*102*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	201	7	ug/g		100	80-120			
F2 PHCs (C10-C16)	70	4	ug/g		87.7	80-120			
F3 PHCs (C16-C34)	194	8	ug/g		99.0	80-120			
F4 PHCs (C34-C50)	114	6	ug/g		91.9	80-120			
Volatiles									
Benzene	3.40	0.02	ug/g		85.1	60-130			
Ethylbenzene	4.28	0.05	ug/g		107	60-130			
Toluene	4.22	0.05	ug/g		105	60-130			
m,p-Xylenes	7.77	0.05	ug/g		97.1	60-130			
o-Xylene	4.09	0.05	ug/g		102	60-130			
Surrogate: Toluene-d8	*3.08*		*ug/g*		*96.1*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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.

Paracel ID: 1827240

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Page 1 of 1

Client Name: Paterson	Project Reference: PE4234
Contact Name: Marek Moroz, Karyn Munch	Quote #
Address: 154 Colonnade Rd S, Ottawa, ON	PO # 24117
Telephone: 613 226 7381	Email Address:

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

Date Required:

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

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

Paracel Order Number: 1827240

Required Analyses

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	BTEX + PHCs F1-F4		Notes
1	B1	S		2	July 4	11a 3p	X		-120ml + 1 vial-
2	B3	S	↓	↓	↓	↓	↓		↓
3	N1	↓	↓	↓	↓	11a	↓		↓
4	N3	↓	↓	↓	↓	↓	↓		↓
5	W4	↓	↓	↓	↓	↓	↓		↓
6	E4	↓	↓	↓	↓	↓	↓		↓
7	TP1-G1	↓		↓	↓	↓	↓		↓
8	W3	X		X	↓	↓	X	Hold	↓
9									
10									

Comments: P.O. 24118 for Vials/Jars

Method of Delivery: Walkin

Relinquished By (Sign): [signature]	Received by Driver/Depot:	Received at Lab: [signature]	Verified By: [signature]
Relinquished By (Print): Marek Moroz	Date/Time:	Date/Time: 7/4/18 3:17	Date/Time: 07/04/18 3:39pm
Date/Time: July 4 1510	Temperature: °C	Temperature: 18.6 °C	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 24625
Project: PE4234
Custody: 43100

Report Date: 10-Jul-2018
Order Date: 9-Jul-2018

Order #: 1828115

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

Paracel ID	Client ID
1828115-01	B5
1828115-02	B7
1828115-03	N10
1828115-04	S8
1828115-05	S12
1828115-06	W6
1828115-07	E6

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 24625

Report Date: 10-Jul-2018
Order Date: 9-Jul-2018
Project Description: PE4234

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	10-Jul-18	10-Jul-18
PHC F1	CWS Tier 1 - P&T GC-FID	10-Jul-18	10-Jul-18
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	10-Jul-18	10-Jul-18
Solids, %	Gravimetric, calculation	10-Jul-18	10-Jul-18

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 24625

Report Date: 10-Jul-2018

Order Date: 9-Jul-2018

Project Description: PE4234

	Client ID:	B5	B7	N10	S8
	Sample Date:	07/09/2018 09:00	07/09/2018 12:00	07/09/2018 09:00	07/09/2018 12:00
	Sample ID:	1828115-01	1828115-02	1828115-03	1828115-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	63.3	71.8	71.4	71.8
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene-d8	Surrogate	98.5%	99.7%	101%	99.9%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	<8	<8
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	<6

	Client ID:	S12	W6	E6	-
	Sample Date:	07/09/2018 12:00	07/09/2018 12:00	07/09/2018 09:00	-
	Sample ID:	1828115-05	1828115-06	1828115-07	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	75.5	76.5	68.3	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
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	-
Toluene-d8	Surrogate	95.7%	103%	96.7%	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	-
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	<8	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 24625

Report Date: 10-Jul-2018
Order Date: 9-Jul-2018
Project Description: PE4234

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*3.19*		*ug/g*		*99.6*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
Physical Characteristics									
% Solids	84.9	0.1	% by Wt.	88.0			3.6	25	
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*3.73*		*ug/g dry*		*104*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	195	7	ug/g		97.5	80-120			
F2 PHCs (C10-C16)	70	4	ug/g		86.9	80-120			
F3 PHCs (C16-C34)	202	8	ug/g		103	80-120			
F4 PHCs (C34-C50)	123	6	ug/g		99.3	80-120			
Volatiles									
Benzene	4.18	0.02	ug/g		104	60-130			
Ethylbenzene	4.51	0.05	ug/g		113	60-130			
Toluene	4.14	0.05	ug/g		103	60-130			
m,p-Xylenes	8.41	0.05	ug/g		105	60-130			
o-Xylene	4.09	0.05	ug/g		102	60-130			
Surrogate: Toluene-d8	*2.63*		*ug/g*		*82.3*	*50-140*			

Qualifier Notes:

Login Qualifiers :

Received at temperature > 25C
Applies to samples: B5, B7, N10, S8, S12, W6, E6

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

PARACEL LABORATORIES LTD.

Paracel ID: 1828115

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cel@paracellabs.com

Chain of Custody
(Lab Use Only)
№ 43100

Page 1 of 1

Client Name: Paterson Group	Project Reference: PE4234	**Turnaround Time:**	
Contact Name: K. March M. Moroz	Quote #	☒ 1 Day	☐ 3 Day
Address: 154 Colonnade Rd S, Ottawa, ON	PO # 24025	☐ 2 Day	☐ Regular
Telephone: 613 226 7381	Email Address:	Date Required:	

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

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

Paracel Order Number: 1828115

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Required Analyses: BTEX + F1-F4 PHCs										
1	BS	S		2	July 9	AM	X							-120ml + 1 vial			
2	~~BG~~ B7					PM	X	~~Hold~~									
3	N16					AM	X										
4	S8					PM											
5	S12					↓											
6	W6					PM											
7	E6	↓		↓	↓	AM	↓	← Hold									
8																	
9	Analyze E6 per market. PBlank. July 10, 18																
10																	

Comments: Will email P.O.

Method of Delivery: Walkin

Relinquished By (Sign):	Received by Driver/Depot:	Received at Lab:	Verified By:
Relinquished By (Print): Marek Moroz	Date/Time:	Date/Time: July 9 18 3:59p	Date/Time: July 6 2018 427
Date/Time:	Temperature: °C	Temperature: 29.3 °C	☐ Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 24803
Project: PE4234
Custody: 44336

Report Date: 30-Jul-2018
Order Date: 25-Jul-2018

Order #: 1830380

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

Paracel ID	Client ID
1830380-01	S17

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 24803

Report Date: 30-Jul-2018
Order Date: 25-Jul-2018
Project Description: PE4234

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	27-Jul-18	28-Jul-18
PHC F1	CWS Tier 1 - P&T GC-FID	27-Jul-18	28-Jul-18
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	26-Jul-18	26-Jul-18
Solids, %	Gravimetric, calculation	26-Jul-18	26-Jul-18

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 24803

Report Date: 30-Jul-2018
Order Date: 25-Jul-2018
Project Description: PE4234

	Client ID:	S17	-	-	-
	Sample Date:	07/16/2018 10:00	-	-	-
	Sample ID:	1830380-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	74.2	-	-	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	-	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	-	-	-
Toluene	0.05 ug/g dry	<0.05	-	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	-	-	-
o-Xylene	0.05 ug/g dry	<0.05	-	-	-
Xylenes, total	0.05 ug/g dry	<0.05	-	-	-
Toluene-d8	Surrogate	80.9%	-	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	-	-	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	-	-	-
F3 PHCs (C16-C34)	8 ug/g dry	<8	-	-	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	-	-	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 24803

Report Date: 30-Jul-2018
Order Date: 25-Jul-2018
Project Description: PE4234

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*2.92*		*ug/g*		*91.1*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	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	83.0	0.1	% by Wt.	81.3			2.1	25	
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*3.36*		*ug/g dry*		*75.0*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	198	7	ug/g		99.2	80-120			
F2 PHCs (C10-C16)	84	4	ug/g	ND	77.9	60-140			
F3 PHCs (C16-C34)	227	8	ug/g	ND	86.0	60-140			
F4 PHCs (C34-C50)	148	6	ug/g	ND	88.8	60-140			
Volatiles									
Benzene	4.78	0.02	ug/g		120	60-130			
Ethylbenzene	4.95	0.05	ug/g		124	60-130			
Toluene	4.61	0.05	ug/g		115	60-130			
m,p-Xylenes	9.23	0.05	ug/g		115	60-130			
o-Xylene	4.64	0.05	ug/g		116	60-130			
Surrogate: Toluene-d8	*2.38*		*ug/g*		*74.5*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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.

PARACEL LABORATORIES LTD.

Paracel ID: 1830380

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№ 44336

Page 1 of 1

Client Name: Paterson Group	Project Reference: PE4223
Contact Name: K. Munch M. Moroz	Quote #
Address: 154 Colonnade Rd S, Ottawa ON	PO # 24803
Telephone:	Email Address:

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

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

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

Paracel Order Number:

Required Analyses

#	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs + BTEX										
1	S17	S		2	July 16	10a						- 120mL + 1 vial -					
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Comments: 1: Sample project on jar-vial read. → PE 4234. Report as PE4334 per Karyn

Method of Delivery: Paracel

Relinquished By (Sign): [signature]	Received by Driver/Depot: [signature]	Received at Lab: OUNEPPORN DOKMAI	Verified By: [signature]
Relinquished By (Print): Marek Moroz	Date/Time: 25/07/18 3:10	Date/Time: Jul 25, 2018 05:44	Date/Time: July 25/18 63
Date/Time: 2018-07-25	Temperature: °C	Temperature: 17.9 °C	pH Verified [ ] By:

Chain of Custody (Blank) - Rev 0.4 Feb 2016

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 24856
Project: PE4234
Custody: 44349

Report Date: 2-Aug-2018
Order Date: 2-Aug-2018

Order #: 1831349

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

Paracel ID	Client ID
1831349-01	W9
1831349-02	N11
1831349-03	N17
1831349-04	B8
1831349-05	B10

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 24856

Report Date: 02-Aug-2018
Order Date: 2-Aug-2018
Project Description: PE4234

Analysis Summary Table

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

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 24856

Report Date: 02-Aug-2018

Order Date: 2-Aug-2018

Project Description: PE4234

	Client ID:	W9	N11	N17	B8
	Sample Date:	07/31/2018 09:00	08/01/2018 09:00	08/01/2018 09:00	08/01/2018 09:00
	Sample ID:	1831349-01	1831349-02	1831349-03	1831349-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	74.9	81.1	78.4	65.8
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene-d8	Surrogate	76.7%	75.8%	73.6%	73.8%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	67	<8	30
F4 PHCs (C34-C50)	6 ug/g dry	<6	10	<6	<6

	Client ID:	B10	-	-	-
	Sample Date:	08/01/2018 09:00	-	-	-
	Sample ID:	1831349-05	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	63.2	-	-	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	-	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	-	-	-
Toluene	0.05 ug/g dry	<0.05	-	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	-	-	-
o-Xylene	0.05 ug/g dry	<0.05	-	-	-
Xylenes, total	0.05 ug/g dry	<0.05	-	-	-
Toluene-d8	Surrogate	75.3%	-	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	-	-	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	-	-	-
F3 PHCs (C16-C34)	8 ug/g dry	<8	-	-	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	-	-	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 24856

Report Date: 02-Aug-2018
Order Date: 2-Aug-2018
Project Description: PE4234

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*3.11*		*ug/g*		*97.2*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	ND	4	ug/g wet	ND				30	
F3 PHCs (C16-C34)	ND	8	ug/g wet	ND				30	
F4 PHCs (C34-C50)	ND	6	ug/g wet	ND				30	
Physical Characteristics									
% Solids	92.0	0.1	% by Wt.	93.0			1.2	25	
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*3.49*		*ug/g dry*		*93.5*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	204	7	ug/g		102	80-120			
F2 PHCs (C10-C16)	84	4	ug/g	ND	105	60-140			
F3 PHCs (C16-C34)	232	8	ug/g	ND	118	60-140			
F4 PHCs (C34-C50)	161	6	ug/g	ND	130	60-140			
Volatiles									
Benzene	3.67	0.02	ug/g		91.6	60-130			
Ethylbenzene	4.57	0.05	ug/g		114	60-130			
Toluene	4.33	0.05	ug/g		108	60-130			
m,p-Xylenes	8.56	0.05	ug/g		107	60-130			
o-Xylene	4.51	0.05	ug/g		113	60-130			
Surrogate: Toluene-d8	*2.25*		*ug/g*		*70.2*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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.

Paracel ID: 1831349

PARACEL LABORATORIES LTD.

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9 St. Laurent Blvd.
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el@paracellabs.com

Chain of Custody (Lab Use Only)

№ 44349

Page 1 of 1

Client Name: Paterson Group	Project Reference: PE4234	**Turnaround Time:**	
Contact Name: Karyn Munch	Quote #	☐ 1 Day	☐ 3 Day
Address: 154 Colonnade Rd S.	PO # 24856	☐ 2 Day	☐ Regular
Telephone: 613-226-7381	Email Address: kmunch@patersongroup.ca.	Date Required: Same day	

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

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

Paracel Order Number: 1831349

Required Analyses

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Time	BTEX	PHCs(F1-F4)									
1	W9	S		3	July 31/18		✓	✓									
2	N11	S		3	Aug 1/18		✓	✓				-	250ml + 1 vial		-		✓
3	N17	S		3	Aug 1/18		✓	✓					↓				✓
4	B8	S		3	Aug 1/18		✓	✓									✓
5	B10	S		2	Aug 1/18		✓	✓									✓
6																	
7																	
8																	
9																	
10																	

Comments: W9 is already at the lab! * can you please copy our client + my personal email: ptuttle@urbandale.com karyn.munch@gmail.com

Method of Delivery: Walkin

Relinquished By (Sign): [signature]	Received by Driver/Depot:	Received at Lab: [signature]	Verified By: [signature]
Relinquished By (Print): Philip Price	Date/Time:	Date/Time: Aug 2, 18 10 06	Date/Time: Aug 2, 18 10 15
Date/Time: 2 Aug 2018 10:06	Temperature: °C	Temperature: 84.9 °C	pH Verified [ ] By:

Summary of Non-Regulated Contaminated Soil Disposal

DATE	MATERAL	QUANTITY (MT)
03/07/2018	NR Soild Waste (soil contaminated with oil)	18.44
03/07/2018	NR Soild Waste (soil contaminated with oil)	24.83
03/07/2018	NR Soild Waste (soil contaminated with oil)	19.21
04/07/2018	NR Soild Waste (soil/debris contamined with hydrocarbon)	10.73
04/07/2018	NR Soild Waste (soil contaminated with oil)	19.29
04/07/2018	NR Soild Waste (soil contaminated with oil)	15.24
04/07/2018	NR Soild Waste (soil contaminated with oil)	12.96
09/07/2018	NR Soild Waste (soil contaminated with oil)	28.13
09/07/2018	NR Soild Waste (soil contaminated with oil)	28.13
09/07/2018	NR Soild Waste (soil contaminated with oil)	27.60
09/07/2018	NR Soild Waste (soil contaminated with oil)	16.88
12/07/2018	NR Soild Waste (hydroex material)	9.53
13/07/2018	NR Soild Waste (hydroex material)	2.00
16/07/2018	NR Soild Waste (soil contaminated with oil)	14.51
16/07/2018	NR Soild Waste (soil contaminated with oil)	11.55
16/07/2018	NR Soild Waste (soil contaminated with oil)	16.47
16/07/2018	NR Soild Waste (soil contaminated with oil)	11.52
31/07/2018	NR Soild Waste (soil contaminated with oil)	20.41
31/07/2018	NR Soild Waste (soil contaminated with oil)	13.55
31/07/2018	NR Soild Waste (soil contaminated with oil)	14.00
31/07/2018	NR Soild Waste (soil contaminated with oil)	16.76
01/08/2018	NR Soild Waste (soil contaminated with oil)	14.76
01/08/2018	NR Soild Waste (soil contaminated with oil)	16.09
01/08/2018	NR Soild Waste (soil contaminated with oil)	19.79
01/08/2018	NR Soild Waste (soil contaminated with oil)	22.61
01/08/2018	NR Soild Waste (soil contaminated with oil)	19.31
01/08/2018	NR Soild Waste (soil contaminated with oil)	22.08
01/08/2018	NR Soild Waste (soil contaminated with oil)	19.04
01/08/2018	NR Soild Waste (soil contaminated with oil)	13.53
01/08/2018	NR Soild Waste (soil contaminated with oil)	24.74
01/08/2018	NR Soild Waste (soil contaminated with oil)	16.58
01/08/2018	NR Soild Waste (soil contaminated with oil)	18.89
01/08/2018	NR Soild Waste (soil contaminated with oil)	19.48
01/08/2018	NR Soild Waste (soil contaminated with oil)	22.57
02/08/2018	NR Soild Waste (soil contaminated with oil)	22.44
TOTAL QUANTITY		**623.65**

Backfill Material

DATE	MATERIAL	QUANTITY (MT)
03/07/2018	Sand Fill	20.22
11/07/2018	Sand Fill	22.71
11/07/2018	Sand Fill	24.24
11/07/2018	Sand Fill	20.41
11/07/2018	Sand Fill	22.54
12/07/2018	Sand Fill	21.30
12/07/2018	Sand Fill	20.16
12/07/2018	Sand Fill	20.71
12/07/2018	Sand Fill	20.89
12/07/2018	Sand Fill	20.50
12/07/2018	Sand Fill	20.69
12/07/2018	Sand Fill	21.01
03/08/2018	3/4" Granular Clear	5.88
03/08/2018	Sand Fill	22.00
03/08/2018	Sand Fill	21.73
03/08/2018	Sand Fill	22.71
03/08/2018	Sand Fill	21.98
03/08/2018	Sand Fill	20.95
03/08/2018	Sand Fill	22.50
03/08/2018	Sand Fill	21.76
03/08/2018	Sand Fill	22.30
03/08/2018	Sand Fill	21.95
03/08/2018	Sand Fill	21.94
03/08/2018	Sand Fill	22.43
03/08/2018	Sand Fill	21.67
03/08/2018	Sand Fill	22.30
03/08/2018	Sand Fill	22.86
03/08/2018	Sand Fill	22.41
03/08/2018	Sand Fill	22.45
03/08/2018	Sand Fill	23.59
03/08/2018	Sand Fill	22.68
TOTAL QUANTITY		**661.47**

Non-Regulated Liquid Waste Disposal		
DATE	**MATERIAL**	**QUANTITY (L)**
04/07/2018	NR Liquid Waste (water/fuel)	2,030.00
09/07/2018	NR Liquid Waste (water/fuel)	4,860.00
11/07/2018	NR Liquid Waste (water/fuel)	920.00
31/07/2018	NR Liquid Waste (water/fuel)	12,840.00
01/08/2018	NR Liquid Waste (water/fuel)	5,190.00
TOTAL VOLUME		**25,840.00**