



## **Phase II Environmental Site Assessment**

593 Laurier Avenue West  
Ottawa, Ontario

Prepared for:

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LRL File No.: 190227

November 7, 2019



## EXECUTIVE SUMMARY

Alexander Fleck House Inc. retained LRL Associates Ltd. (LRL) to complete a Phase II Environmental Site Assessment (ESA) on 593 Laurier Avenue West in Ottawa, Ontario (herein referred to as the Site). The Phase II ESA was carried out to determine the potential impacts to the Site identified in the previously prepared Phase I ESA by LRL, dated July 15, 2019. The Phase II ESA was conducted in general accordance with Ontario Regulation (O. Reg.) 153/04, as amended, in support of a City of Ottawa site plan approval application.

The site under investigation is the residential property located at 593 Laurier Avenue West in Ottawa, Ontario. The Site is irregularly shaped with an approximate area of 1,230 m<sup>2</sup> (0.3 acres). It is developed with a three-storey residence constructed circa 1908. The residence has a footprint of approximately 335 m<sup>2</sup>. The building is serviced with municipal water and sanitary services and is heated with natural gas. The general surrounding area including the Site has a significant slope north-northwest towards the Ottawa River with elevations dropping from 80 m at the Site to 50 m at the river.

The Phase I ESA (July 2019) identified the following environmental concerns:

- The former heating oil tank located in the basement;
- The trap door in the garage over a gravel basement, purpose unknown;
- The former foundry identified east of the Site; and
- The unspecified spill on Bronson Avenue, east of the Site.

It was recommended that a Phase II ESA be conducted to determine the potential impacts from the above noted environmental concerns identified.

The purpose of a Phase II ESA is to determine if recognized potential environmental concerns have negatively impacted the quality of soil and groundwater of the subject site. Such an assessment provides information regarding the nature and extent of potential contamination to assist in making informed business decisions about the property.

Areas of potential environmental concern identified that require investigation are:

Potential Environmental Concern	Location	Comments	Contaminants of Potential Concern	Media Potentially Impacted
Former Heating Oil Tank	On-site	Historically located in the basement	PHCs and VOCs	Soil and groundwater
Trap Door Over Gravel Basement	On-site	Beneath the south end of the garage, purpose unknown.	PHCs and VOCs	Soil and groundwater
Former foundry	Approximately 20 m east of the Site	Brass foundry listed at 422 Slater in 1920-1950 in city directories, and brass foundry noted in 1922 fire insurance plan at the same location.	PHCs, VOCs, Metals and PAH	Groundwater
Spill	Bronson Avenue	Exact location, type of material and amount not specified.	PHCs and VOCs	Groundwater

Soil and groundwater conditions were evaluated with respect to the contaminants of concern in the context of the current regulations and guidelines applicable to contaminated sites. The findings and conclusions presented in this report apply only to the recognized environmental conditions assessed.

Regulatory requirements for assessing environmental conditions of a site are established by Ontario Regulation 153/04 – *Records of Site Conditions, Part XV.1 of the Environmental Protection Act* (O. Reg. 153/04). Site condition standards are set out in MECP's '*Soil, Ground Water and Sediment Standards for Use Under Part IV.1 of the Environmental Protection Act, April 15, 2011*'. The applicable site condition standard used was Table 7 Site Condition Standards for Shallow Soils in a Non-Potable Ground Water Condition, residential property use and coarse-textured soils.

The investigation involved advancing two (2) boreholes across the Site at strategic locations based on potential areas of environmental concern. The two (2) boreholes were completed as monitoring wells to assess the Site's hydrogeological conditions and facilitate groundwater sampling. The advancement of boreholes was attempted in the basement beneath the former oil tank and in the gravel pit beneath the garage, however bedrock was encountered directly beneath the concrete slab and the gravel.

The subsurface soil conditions in the area investigated on the Site generally consist of topsoil over fill. Limestone with shaly partings was encountered from depths of 0.50 and 1.65 m below ground surface (bgs) to 7.75 and 9.30 m bgs where the boreholes were terminated.

Groundwater contours could not be established due to the lack of data points. However, based on the topography of the area and the presence of the Ottawa River 550 m north of the Site, the anticipated groundwater flow direction is towards the north.

No olfactory or visual (i.e. staining or free phase) evidence of petroleum hydrocarbon impacts were observed in any of the soil samples collected. Observations were confirmed through CSV concentrations measured. CSV concentrations ranged between non-detect (<0.1 ppm) and 0.2 ppm.

In the monitoring wells, headspace VOC levels were 1.2 and 0.6 ppm in MW19-1 and MW19-2, respectively. No olfactory or visual (i.e. sheen or free phase) evidence of petroleum hydrocarbon impacts were observed.

Select soil and groundwater samples were submitted for analysis to establish if the potential environmental concerns have negatively impacted the soil and groundwater conditions. The rationale for selection of soil and groundwater samples submitted for analysis was based on the results of the sample field screening (CSVs), visual/olfactory observations and/or proximity to the water table. The potential contaminants of concern were Petroleum Hydrocarbon Compounds (PHCs), Volatile Organic Compounds (VOCs), Polycyclic Aromatic Hydrocarbons (PAHs) and metals including mercury and hexavalent chromium.

In the soil, VOC parameters analysed were not detected in the samples submitted for analysis. PHC F3 and F4 were detected in BH19-1 and BH19-2; however, levels are below the applicable Table 7 standards. Select metals parameters exceeded the applicable standards in BH19-1 and BH19-2. In the sample submitted from BH19-1, Lead (172 µg/g) and Mercury (0.3 µg/g) exceeded the applicable standards of 120 µg/g and 0.27 µg/g, respectively. The exceedances in BH19-2 are summarized as follows:

- Barium (397 µg/g), above the standard of 390 µg/g;
- Cadmium (1.7 µg/g), above the standard of 1.2 µg/g;
- Lead (842 µg/g), above the standard of 120 µg/g;

- Mercury (2.1 µg/g) above the standard of 0.27 µg/g; and
- Zinc (1020 µg/g) above the standard of 340 µg/g.

In the groundwater, VOC and PHC parameters were not detected with the exception of chloroform. It was measured in MW19-1 and MW19-2 with levels of 17.5 µg/L and 13.0 µg/L, respectively, above the applicable standard of 2 µg/L. It is anticipated that the chloroform detected is due to the use of chlorinated municipal water used during coring. Select metal and PAH parameters were detected, however levels are below the applicable standards.

Due to a limited amount of water submitted from MW19-1, the detection limit for PHC F2 was raised to 196 µg/L which is above the standard of 150 µg/L. It can therefore not be determined whether the sample meets the applicable standards for PHC F2.

Based on our observations during drilling activities complemented with sample screening and laboratory analysis, evidence of contamination was encountered in the fill material between approximately 0.5 m and 1.5 m in depth in the eastern portion of the Site. The horizontal extent of the soil contamination has not been delineated. Chloroform was detected above the applicable standard in the groundwater, however it is anticipated to be caused by the use of chlorinated municipal water during coring.

It is recommended that the horizontal extent of the soil contamination be delineated and remediated. It is recommended that groundwater be resampled from MW19-1 for PHC F2 to determine the level since the detection limit was above the applicable standard. The contamination encountered onsite presents a low risk to the building occupants.

It is recommended that if groundwater monitoring wells are not required for future monitoring purposes, they should be decommissioned in accordance with O. Reg. 903.



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**Table 1 Summary of Ground Surface and Groundwater Elevations (October 16, 2019)**

**Table 2 Summary of Soil PHC and VOC Analysis**

**Table 3 Summary of Soil Metals Analysis**

**Table 4 Summary of Groundwater PHC and VOC Analysis**

**Table 5 Summary of Groundwater PAH and Metals Analysis**

## **APPENDICES**

*(In order following Tables)*

**Appendix A Borehole Logs**

**Appendix B Laboratory Certificates of Analysis**



## 1 INTRODUCTION

Alexander Fleck House Inc. retained LRL Associates Ltd. (LRL) to complete a Phase II Environmental Site Assessment (ESA) on 593 Laurier Avenue West in Ottawa, Ontario (herein referred to as the Site). The Phase II ESA was carried out to determine the potential impacts to the Site from the former foundry east of the Site, former spill on Bronson Avenue, former heating oil tank in the basement and the trap door over gravel basement in the garage. These areas were identified as areas of potential environmental concerns in the previously prepared Phase I ESA by LRL, July 15, 2019. The Phase II ESA was conducted in general accordance with Ontario Regulation (O. Reg.) 153/04, as amended, in support of a City of Ottawa site plan approval application.

### 1.1 Site Description

#### 1.1.1 Subject Property

The site under investigation is the residential property located at 593 Laurier Avenue West in Ottawa, Ontario. The Site's location is presented in **Figure 1**. The Site is irregularly shaped with an approximate area of 1,230 m<sup>2</sup> (0.3 acres). It is developed with a three-storey residence constructed circa 1908. The residence has a footprint of approximately 335 m<sup>2</sup>. The building is serviced with municipal water and sanitary services and is heated with natural gas. The general surrounding area including the Site has a significant slope north-northwest towards the Ottawa River with elevations dropping from 80 m at the Site to 50 m at the river.

For the purpose of this report, Laurier Avenue West will be inferred as being orientated in an east-west direction.

#### 1.1.2 Surrounding Land Use

Surrounding land use is as follows:

Directions	Current Land Use	Current Occupant
North	Residential	Multi-tenant residential
South	Residential	Multi-tenant residential
East	Bronson Avenue followed parkland	Community garden
West	Residential	Multi-tenant residential

#### 1.1.3 Site Services

Potable water and sanitary services are municipal.

### 1.2 Current and Proposed Future Uses

Current property use is residential and it is understood that the proposed use would remain as residential.

### 1.3 Applicable Site Condition Standards

Regulatory requirements for assessing environmental conditions of a site are established by Ontario Regulation 153/04 – *Records of Site Conditions, Part XV.1 of the Environmental Protection Act* (O. Reg. 153/04). Site condition standards are set out in Ministry of Environment, Conservation and Parks (MECP) 'Soil, Ground Water and Sediment Standards for Use Under

*Part IV.1 of the Environmental Protection Act, April 15, 2011*. The applicable site condition standard used was Table 7 Generic Site Condition Standards for Shallow Soils in a Non-Potable Groundwater Condition.

- The Site and adjacent properties are serviced with municipal potable water;
- The subsurface conditions encountered consisted of fill therefore the coarse-textured standard was applied; and
- The Site and neighbouring properties are zoned as residential; and
- The Site is considered environmentally sensitive as there was less than 2 m of overburden overlying the bedrock.

## 2 BACKGROUND INFORMATION

### 2.1 Physical Settings

A review of the Ontario Base Map indicates that the general surrounding area including the Site has a significant slope north-northwest towards the Ottawa River with elevations dropping from 80 m at the Site to 50 m to the river.

Surficial geology consists of till with a local relief less than 5 m. Bedrock is part of the Ottawa Formation, consisting of limestone with some shaly partings and some sandstone.

### 2.2 Previous Investigation

A Phase I Environmental Site Assessment was completed at the Site in June 2019 by LRL to identify any potential areas of environmental concern associated with the Site.

<b>Report:</b>	Phase I Environmental Site Assessment, 593 Laurier Avenue West, Ottawa, Ontario
<b>Date:</b>	July 15, 2019
<b>Author:</b>	LRL Associates Ltd.
<b>Prepared for:</b>	Alexander Fleck House Inc.
<b>Description of data, analysis and findings relevant to the Phase I ESA:</b>	
Alexander Fleck House Inc. retained LRL Associates Ltd. (LRL) to complete a Phase I Environmental Site Assessment (ESA) on 593 Laurier Avenue West, Ontario. The assessment was conducted in the context of obtaining a City of Ottawa Site plan approval for proposed development.	
The Site is irregularly shaped with an approximate area of 1,230 m <sup>2</sup> (0.3 acres). It is developed with a three-storey residence constructed circa 1908. The residence has a footprint of approximately 335 m <sup>2</sup> . The building is serviced with municipal water and sanitary services and is heated with natural gas.	
A review of records obtained through Ecology Eris revealed the following:	
<ul style="list-style-type: none"><li>• Six (6) fire insurance plans dated between 1878 and 1963 were retrieved. Two (2) foundries were located within 250 m of the Site. The foundries were located 20 m east and 230 m north of the Site. The foundry located 20 m east of the Site presents a moderate to high risk for potential environmental concern.</li><li>• The City Directories revealed that adjacent properties are generally residential with</li></ul>	



some commercial. 422 Slater Street, approximately 20 m east of the Site, was listed as 422-26 Ottawa Carleton & Aircraft Ltd. Brass Foundry from 1920 through 1946, and 422-26 Casing of Ottawa Plant 2 Brass & Aluminum Foundry in 1950. The operations are considered a potentially contaminating activity with moderate to high risk for potential environmental concern.

- In January 1988, an unknown amount of suspected petroleum-based material was spilt to Bronson Road. The exact location or the amount were not specified. It presents a low to high risk for environmental concern.

During the interview it was revealed that a former heating oil tank was located in the basement. The site visit revealed a gravel pit beneath a trap door in the garage. Its purpose was unknown. The tank and gravel pit present moderate to high risks for environmental concern.

Based on the above findings it was concluded that there are potential environmental concerns associated with the current and historical use of the Site and adjacent properties. It was recommended that a Phase II Environmental Site Assessment be completed to determine any potential soil or groundwater impacts to the Site.

### 3 SCOPE OF THE INVESTIGATION

#### 3.1 Overview of Site Investigation

Purpose of this Phase II ESA is to determine if recognized potential environmental concerns associated with current and past Site activities as well as other identified areas of concern associated with neighbouring properties have negatively impacted soil and groundwater quality of the subject site. Such an assessment provides information regarding the nature and extent of potential contamination to assist in making informed business decisions about the property.

The potential environmental concerns identified that require investigation are:

Potential Environmental Concern	Location	Comments	Contaminants of Potential Concern	Media Potentially Impacted
Former Heating Oil Tank	On-site	Historically located in the basement	PHCs and VOCs	Soil and groundwater
Trap Door Over Gravel Basement	On-site	Beneath the south end of the garage, purpose unknown.	PHCs and VOCs	Soil and groundwater
Former foundry	Approximately 20 m east of the Site	Brass foundry listed at 422 Slater in 1920-1950 in city directories, and brass foundry noted in 1922 fire insurance plan at the same location.	PHCs, VOCs, Metals and PAH	Groundwater
Spill	Bronson Avenue	Exact location, type of material and amount not specified.	PHCs and VOCs	Groundwater

Findings and conclusions presented in this report apply only to these recognized environmental conditions assessed.

### 3.2 Media Investigated

The Phase II ESA will establish the Site's subsurface geology and hydrogeological conditions. Soil and groundwater conditions will be evaluated with respect to the contaminants of concern in context of the current regulations and guidelines applicable to contaminated sites.

### 3.3 Scope and Methodology

Primary objective of this Phase II ESA was to evaluate current conditions of the Site in context of the applicable legislative and regulatory requirements. LRL's scope of work was as follows:

- Review all available information provided concerning the Site. Conduct a Site visit to determine existing conditions;
- Drill four (4) boreholes at strategic locations based on potential areas of environmental concern, to allow for soil sampling;
- Complete two (2) of the boreholes as monitoring wells to assess hydrogeological conditions and facilitate groundwater sampling;
- Submit representative soil (if applicable) and groundwater samples to an accredited laboratory for analysis of suspected parameters of concern; and
- Interpret results in relation to current provincial guidelines to determine subsurface soil and groundwater quality.

This report will present results of Site activities carried out between October 15 and 17, 2019.

## 4 INVESTIGATION METHOD

### 4.1 Field Preparation

Locations of all buried and overhead services were obtained by LRL prior to initiation of any subsurface investigation.

### 4.2 Drilling

An intrusive investigation was carried out on October 15, 2019. Two (2) boreholes were advanced across the Site, both of which were completed as monitoring wells (MW):

Borehole/ Monitoring Well	Location	Rational
BH19-1 and BH19-2	East portion of the Site	To establish the potential groundwater impacts from the former foundry identified to the east of the Site and former spill on Bronson avenue east of the Site.

The advancement of boreholes was attempted in the basement beneath the former oil tank and in the gravel pit beneath the garage, however bedrock was encountered directly beneath the concrete slab and the gravel. Boreholes could not be advanced close to the property line in the southeast portion of the Site or in the northeast portion of the Site due to the presence of utilities and the reported presence of a bunker, respectively. Borehole and monitoring well locations are presented in **Figure 2**.

#### 4.2.1 Borehole Drilling

Boreholes were advanced using an LC55 track-mounted drill rig equipped with 203 mm diameter hollow stem augers and 96 mm HQ coring barrels. The drilling contractor was George Downing Estate Drilling Ltd. (Hawkesbury, Ontario) and worked under LRL field staff supervision. Overburden was encountered to depths between 0.5 and 1.5 m below ground surface (bgs), within which soil samples were collected continuously using a split spoon sampler of 0.6 m in length. Between each spoon, the sampling equipment was thoroughly cleaned. Upon refusal over bedrock, the boreholes were continued using HQ coring barrels to depths of 7.75 and 9.30 m bgs where the boreholes were terminated.

Locations of the boreholes are presented in **Figure 2**. Details of the borehole drilling are provided in the borehole logs in **Appendix A**.

#### 4.3 Soil Sampling and Field Screening

Representative soil samples from each soil stratum encountered or split sampler were collected and transferred immediately into sealed laboratory supplied glass jars and polyethylene freezer bags. Samples were examined for soil type, colour, staining/discoloration and odours. Samples were logged, labelled and stored onsite in a cooler chilled with ice to prevent evaporation of potential combustible soil vapours (CSV). Soil samples stored in bags were screened for CSV presence using a Mini Rae 2000 Photoionization Detector (PID).

#### 4.4 Monitoring Well Installation

The two (2) boreholes were completed as monitoring wells: BH19-1, BH19-2 (herein referred to as BH/MW19-1, BH/MW19-2). Monitoring wells were constructed within the 203/96 mm diameter boreholes with a 51 mm slotted PVC piezometer placed to bisect the groundwater table. Top of the screen was extended to the ground surface using a solid riser pipe. Annular space around the slotted portion of the piezometer was backfilled with pre-washed and graded silica sand up to 300 mm above the top of the screen. Bentonite was placed above the sand pack to surface. Monitoring wells were finished at the surface with a flush-mount aluminum protective cover.

Details of monitoring wells are provided in borehole logs in **Appendix A**.

#### 4.5 Elevation Surveying

Ground surface elevations and tops of all monitoring well risers were surveyed and referenced to a temporary benchmark. Subsequent measurements of water elevations were made in reference to top of well risers. This benchmark was established as the northeast upper rim of the fire hydrant south of Laurier Avenue West. It was given an arbitrary elevation of 100.00 m.

#### 4.6 Groundwater Monitoring and Sampling

Headspace vapour measurements for volatile organic compounds (VOC) were measured in each monitoring well immediately after removing the cap, prior to purging and sampling. VOC concentrations were measured by placing the combustible soil vapour nozzle at least 15 cm below the top of the casing and recording the peak VOC reading.

Newly installed wells were instrumented with dedicated LDPE tubing to facilitate well development, purging and sampling requirements. Prior to sampling, water levels were measured using an electronic water level meter and reduced to static elevations based on monitoring well survey data. Each well was purged (three well volumes) using dedicated LDPE

tubing and foot valve. Purge water was observed for colour, sheens or odour. Using a dedicated bailer or LDPE tubing, groundwater was transferred into laboratory supplied water bottles. Samples were logged, labelled and stored on site in a cooler chilled with ice.

#### 4.7 Analytical Testing

Representative soil and groundwater samples collected during the investigation were submitted for laboratory analysis. Samples were submitted to Paracel Laboratories Ltd., Ottawa, ON for the following contaminants of concern: Volatile Organic Compounds (VOC), Petroleum Hydrocarbon Compound (PHC) fractions F1 (C6 – C10), F2 (>C11 – C16), F3 (>C16 – C34), and F4 (>C34), Polycyclic Aromatic Hydrocarbons (PAH) and/or metals including mercury and hexavalent chromium.

Potential Environmental Concern	Soil		Groundwater	
	Sample No.	Analysis	Sample No.	Analysis
Former oil tank in the basement and trap door in the garage over the gravel basement.			BH/MW19-1 BH/MW19-2	PHC, VOC, PAH, Metals
Former foundry and spill east of the Site.	BH19-1-1 BH19-2-4	PHC, VOC, Metals	BH/MW19-1 BH/MW19-2	PHC, VOC, PAH, Metals

Laboratory Certificates of Analysis are included in **Appendix B**. All remaining samples not analyzed will be kept in storage for a period of one (1) month following submission of this report at which time they shall be disposed of unless a written or verbal notice is received, stating otherwise.

#### 4.8 QA/QC Protocols

Quality assurance/quality control (QA/QC) protocols were followed during the borehole drilling and sampling to ensure that representative samples were obtained. The protocols were generally performed in accordance with the following;

- MECP's "Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario", revised February 1997.
- MECP's "Guide for Completing Phase Two Environmental Site Assessments under Ontario Regulation 153/04", June 2011.

Field protocols that were employed include:

- All field-screening devices, such as a combustible gas detector, were calibrated prior to use, to ensure accuracy and reliability of readings;
- Thorough decontamination of all drilling and sampling equipment. Dedicated sampling equipment was used when possible;
- Soil and groundwater samples collected were placed in laboratory supplied glass sample jars;
- Thorough documentation of all field activities and sample handling practices including field notes, chain of custody forms, memos to files, etc.; and
- Samples were submitted to a laboratory which is certified by the Canadian Association for Laboratory Accreditation (CALA).



Due to the small number of soil and groundwater samples collected for investigation, field duplicates were not incorporated into the work program. Other QA/QC procedures conducted by LRL are outlined in the methodologies detailed above.

## 5 REVIEW & EVALUATION

### 5.1 Geology

Subsurface soil conditions in the area investigated on the Site generally consist of topsoil to 0.20 m bgs followed by fill to depths between 0.50 and 1.65 m bgs where refusal was encountered upon bedrock. Limestone with shaly partings was encountered to depths between 7.75 and 9.30 m bgs where the boreholes were terminated.

Detailed borehole logs of all borings are presented in **Appendix A**.

### 5.2 Groundwater Elevations & Flow Direction

Static groundwater elevations measured at each monitoring well are summarized in **Table 1**. Groundwater depth measurements in MW19-1 and MW19-2 were 5.04 and 3.21 m bgs, which correspond to elevations of 95.31 and 96.56 m, respectively. Groundwater contours could not be established due to the lack of data points. However, based on the topography of the area and the presence of the Ottawa River 550 m north of the Site, the anticipated groundwater flow direction is towards the north.

### 5.3 Soil: Field Screening

No olfactory or visual (i.e. staining or free phase) evidence of petroleum hydrocarbon impacts were observed in any of the soil samples collected.

Observations were confirmed through CSV concentrations measured. CSV concentrations of soil samples collected ranged between non-detect (<0.1 ppm) and 0.2 ppm. CSV measurements are summarized in the borehole logs in **Appendix A**.

### 5.4 Soil Texture

Native subsurface soil was not encountered. Fill was encountered above the bedrock which is considered coarse-grained.

### 5.5 Soil Quality

Results of soil analysis and respective MECP standards are presented in **Table 2** and **Table 3**. At least one soil sample from each borehole was submitted for chemical analysis. The Laboratory Certificate of Analysis is included in **Appendix B**.

VOC parameters analysed were not detected in soil samples submitted for analysis. PHC F3 and F4 were detected in BH19-1 and BH19-2; however, levels are below the applicable Table 7 standards.

Select metals parameters exceeded the applicable standards in BH19-1 and BH19-2. In the sample submitted from BH19-1, Lead (172 µg/g) and Mercury (0.3 µg/g) exceeded the applicable standards of 120 µg/g and 0.27 µg/g, respectively. The exceedances in BH19-2 are summarized as follows:

- Barium (397 µg/g), above the standard of 390 µg/g;
- Cadmium (1.7 µg/g), above the standard of 1.2 µg/g;



- Lead (842 µg/g), above the standard of 120 µg/g;
- Mercury (2.1 µg/g) above the standard of 0.27 µg/g; and
- Zinc (1020 µg/g) above the standard of 340 µg/g.

## 5.6 Groundwater Quality

Headspace VOC levels were 1.2 and 0.6 ppm in MW19-1 and MW19-2, respectively.

Groundwater analysis results and respective MECP standards are summarized in **Table 4** and **Table 5**. VOC and PHC parameters were not detected in the wells with the exception of chloroform. It was measured in MW19-1 and MW19-2 with levels of 17.5 µg/L and 13.0 µg/L, respectively, above the applicable standard of 2 µg/L. It is anticipated that the chloroform detected is due to the use of chlorinated municipal water during coring. Select metal and PAH parameters were detected, however levels are below the applicable standards.

Due to a limited amount of water submitted from MW19-1, the detection limit for PHC F2 was raised to 196 µg/L which is above the standard of 150 µg/L. It can therefore not be determined whether the sample meets the applicable standards for PHC F2.

## 6 CONCLUSIONS AND RECOMMENDATIONS

Based on our Site visit, results of soil and groundwater sampling and laboratory analytical programs, LRL offers the following conclusions regarding environmental conditions of the subject Site:

- The site under investigation is the residential property located at 593 Laurier Avenue West in Ottawa, Ontario. The Site's location is presented in **Figure 1**. The Site is irregularly shaped with an approximate area of 1,230 m<sup>2</sup> (0.3 acres). It is developed with a three-storey residence constructed circa 1908. The residence has a footprint of approximately 335 m<sup>2</sup>. The building is serviced with municipal water and sanitary services and is heated with natural gas. The general surrounding area including the Site has a significant slope north-northwest towards the Ottawa River with elevations dropping from 80 m at the Site to 50 m at the river.
- The Phase I ESA (July 2015) identified the following environmental concerns to be investigated:
  - The former heating oil tank located in the basement;
  - The trap door in the garage over a gravel basement, purpose unknown;
  - The former foundry identified east of the Site; and
  - The unspecified spill on Bronson Avenue, east of the Site.
- Regulatory requirements for assessing environmental conditions of a site are established by Ontario Regulation 153/04 – *Records of Site Conditions, Part XV.1 of the Environmental Protection Act* (O. Reg. 153/04). Site condition standards are set out in MECP's 'Soil, Ground Water and Sediment Standards for Use Under Part IV.1 of the Environmental Protection Act, April 15 2011'. The applicable site condition standard used was Table 7 Site Condition Standards for Shallow Soils in a Non-Potable Ground Water Condition, residential property use and coarse-textured soils;
- The investigation involved advancing two (2) boreholes across the Site at strategic locations based on potential areas of environmental concern. The two (2) boreholes were completed into monitoring wells to assess the Site's hydrogeological conditions



and facilitate groundwater sampling. The advancement of boreholes was attempted in the basement beneath the former oil tank and in the gravel pit beneath the garage, however bedrock was encountered directly beneath the concrete slab and the gravel;

- The subsurface soil conditions in the area investigated on the Site generally consist of topsoil over fill. Limestone with shaly partings was encountered from depths of 0.50 and 1.65 m bgs to 7.75 and 9.30 m bgs where the boreholes were terminated;
- Groundwater contours could not be established due to the lack of data points. However, based on the topography of the area and the presence of the Ottawa River 550 m north of the Site, the anticipated groundwater flow direction is towards the north;
- No olfactory or visual (i.e. staining or free phase) evidence of petroleum hydrocarbon impacts were observed in any of the soil samples collected. Observations were confirmed through CSV concentrations measured. CSV concentrations ranged between non-detect (<0.1 ppm) and 0.2 ppm;
- In the monitoring wells, headspace VOC levels were 1.2 and 0.6 ppm in MW19-1 and MW19-2, respectively. No olfactory or visual (i.e. sheen or free phase) evidence of petroleum hydrocarbon impacts were observed;
- Select soil and groundwater samples were submitted for analysis to establish if the potential environmental concerns have negatively impacted the soil and groundwater conditions. The rationale for selection of soil and groundwater samples submitted for analysis was based on the results of the sample field screening (CSVs), visual/olfactory observations and/or proximity to the water table. The potential contaminants of concern were PHCs, VOCs, PAHs and metals including mercury and hexavalent chromium;
- VOC parameters analysed were not detected in soil samples submitted for analysis. PHC F3 and F4 were detected in BH19-1 and BH19-2; however, levels are below the applicable Table 7 standards. Select metals parameters exceeded the applicable standards in BH19-1 and BH19-2. In the sample submitted from BH19-1, Lead (172 µg/g) and Mercury (0.3 µg/g) exceeded the applicable standards of 120 µg/g and 0.27 µg/g, respectively. The exceedances in BH19-2 are summarized as follows:
  - Barium (397 µg/g), above the standard of 390 µg/g;
  - Cadmium (1.7 µg/g), above the standard of 1.2 µg/g;
  - Lead (842 µg/g), above the standard of 120 µg/g;
  - Mercury (2.1 µg/g) above the standard of 0.27 µg/g; and
  - Zinc (1020 µg/g) above the standard of 340 µg/g.
- VOC and PHC parameters were not detected in the wells with the exception of chloroform. It was measured in MW19-1 and MW19-2 with levels of 17.5 µg/L and 13.0 µg/L, respectively, above the applicable standard of 2 µg/L. It is anticipated that the chloroform detected is due to the water used for coring. Select metal and PAH parameters were detected, however levels are below the applicable standards. Due to a limited amount of water submitted from MW19-1, the detection limit for PHC F2 was raised to 196 µg/L which is above the standard of 150 µg/L. It can therefore not be determined whether the sample meets the applicable standards for PHC F2.

Based on our observations during drilling activities complemented with sample screening and laboratory analysis, evidence of contamination was encountered in the fill material between

approximately 0.5 m and 1.5 m in depth in the eastern portion of the Site. The horizontal extent of the soil contamination has not been delineated. Chloroform was detected above the applicable standard in the groundwater, however it is anticipated to be caused by the use of chlorinated municipal water during coring.

It is recommended that the horizontal extent of the soil contamination be delineated and remediated. It is recommended that groundwater be resampled from MW19-1 for PHC F2 to determine the level since the detection limit was above the applicable standard. The contamination encountered onsite presents a low risk to the building occupants.

It is recommended that if groundwater monitoring wells are not required for future monitoring purposes, they should be decommissioned in accordance with O. Reg. 903.

## 7 LIMITATIONS AND USE OF REPORT

Results of this Phase II ESA should not be considered a warranty that the subject property is free from any and all contaminants from former and current practices, other than those noted in this report, nor that all compliance issues have been addressed.

Findings contained in this report are based on data and information collected during the Phase II ESA of the subject property conducted by LRL Associates Ltd. Conclusions and recommendations are based solely on Site conditions encountered during fieldwork completed between October 15 and 17, 2019. No assurance is made regarding changes in conditions subsequent to the time of this investigation. If additional information is discovered or obtained, LRL Associates Ltd. should be requested to re-evaluate conclusions presented in this report and to provide amendments as required.

In evaluating the subject property, LRL Associates Ltd. has relied in good faith on information provided by individuals as noted in this report. We assume that information provided is factual and accurate. We accept no responsibility for any deficiencies, misstatements or inaccuracies contained in this report as a result of omissions, misinterpretation or fraudulent acts of the persons contacted.

This report is intended for sole use of Alexander Fleck House Inc. and their authorized agents. LRL Associates Ltd. will not be responsible for any use of the information contained within this report by any third party.

In addition, LRL Associates Ltd. will not be responsible for the real or perceived decrease in property value, its saleability or ability to gain financing, through reporting of factual information.

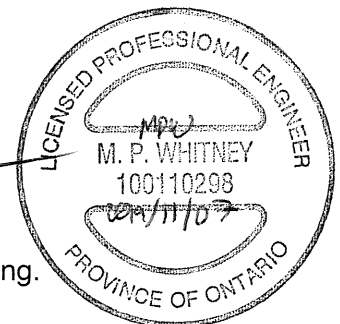
Yours truly,  
LRL Associates Ltd.



Geneviève Marcoux  
Environmental Technician



Matthew Whitney, P. Eng.





## 8 REFERENCE

Canadian Standards Association, *Phase II Environmental Site Assessment CAN/CSA-Z769-00*, March 2000.

City of Ottawa, Ottawa Maps, geoOttawa, <http://ottawa.ca/en/city-hall/get-know-your-city/maps-ottawa/maps-ottawa-geoottawa>.

LRL Associates Ltd., Phase I Environmental Site Assessment, 593 Laurier Avenue West, Ottawa, Ontario, July 15, 2019

Ontario Geological Survey 1991. Bedrock geology of Ontario, southern sheet; Ontario Geological Survey, Map 2544, scale 1: 1 000 000.

Ontario Regulation 903, made under the Water Resources Act of the Environmental Protection Act, *Wells*, R.R.O. 1990.

St-Onge, D.A. (compilation), 2009: Surficial geology, lower Ottawa valley, Ontario-Quebec; Geological Survey of Canada, Map 2140A, scale 1:125 000.



## FIGURES



**LRJ**

ENGINEERING | INGÉNIÉRIE

5430 Canotek Road | Ottawa, ON, K1J 9G2  
www.lri.ca | (613) 842-3434

PROJECT

PHASE II  
ENVIRONMENTAL SITE ASSESSMENT  
593 LAURIER AVENUE WEST  
OTTAWA, ONTARIO

DRAWING TITLE

SITE LOCATION  
(NOT TO SCALE)  
SOURCE: GeoOttawa

CLIENT

ALEXANDER FLECK HOUSE INC.

DATE

NOVEMBER 2019

PROJECT

190227

**FIGURE 1**





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PROJECT

PHASE II  
ENVIRONMENTAL SITE ASSESSMENT  
593 LAURIER AVENUE WEST  
OTTAWA, ONTARIO

DRAWING TITLE

SITE PLAN AND  
MONITORING WELL LOCATIONS

CLIENT

ALEXANDER FLECK HOUSE INC.

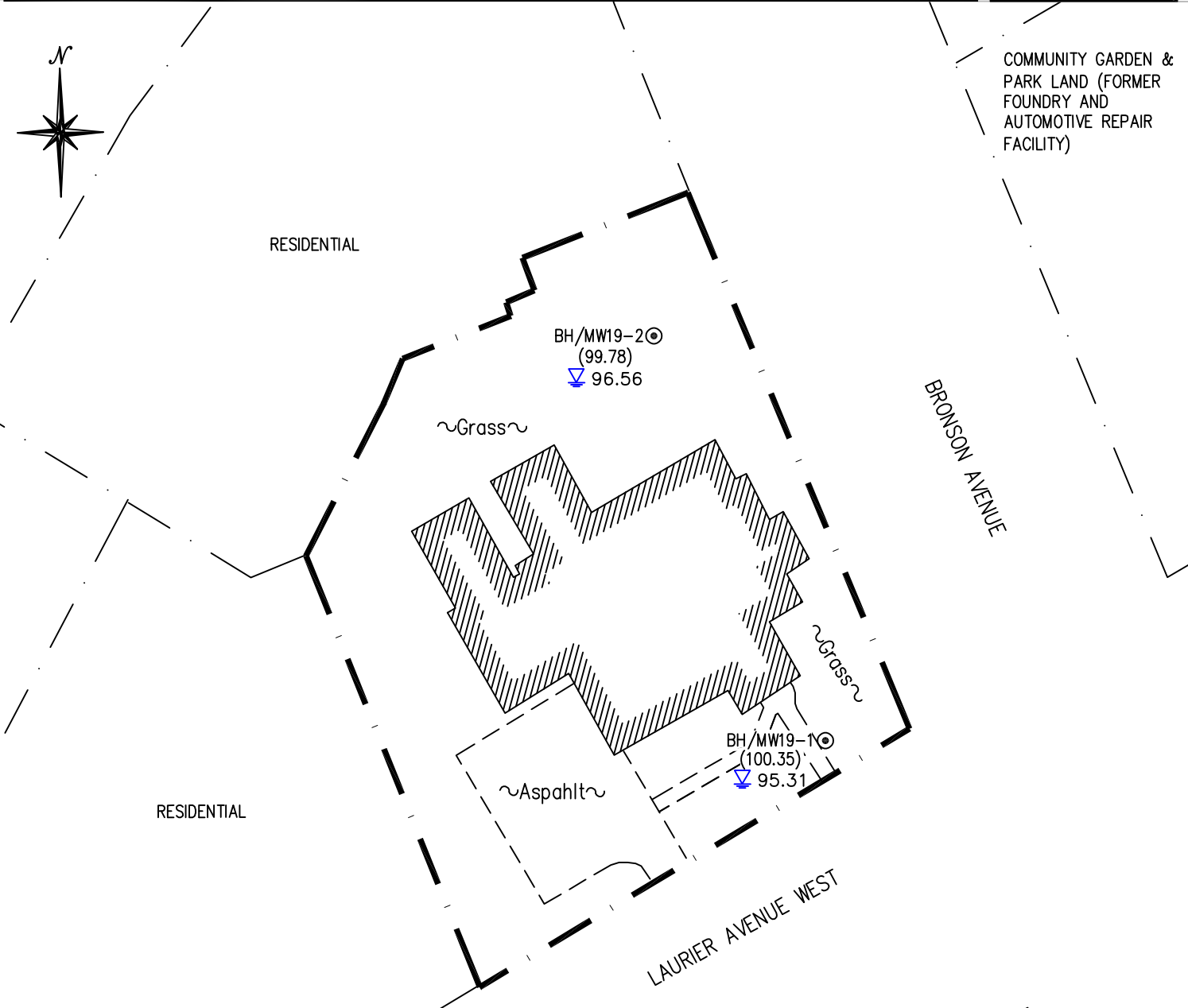
DATE

NOVEMBER 2019


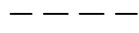
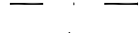
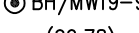
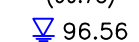
PROJECT

190227

**FIGURE 2**



**LEGEND**

-  Existing Building
-  Division between various surface materials
-  Property Line
-  BH/MW19-9  
(99.78) Monitoring Well  
Ground Surface Elevation
-  ▽ 96.56 Groundwater Elevation



SCALE: 1:400

## **TABLES**

**Table 1**  
**Summary of Ground Surface and Groundwater Elevations (October 16, 2019)**  
Phase II Environmental Site Assessment  
593 Laurier Avenue West, Ottawa, Ontario  
LRL File: 190227

Monitoring Well	Ground Surface Elevation <sup>1</sup> (m)	Reference Elevation <sup>2</sup> (m)	Depth To Water Table (m)		Groundwater Elevation (m)
			Ground Surface	Reference Point	
BH/MW19-1	100.35	100.19	5.04	4.88	95.31
BH/MW19-2	99.78	99.59	3.21	3.03	96.56

**NOTES**

<sup>1</sup> Elevations measured from the northeast on the upper rim of the hydrant south of Laurier Avenue West (100.00 m).

<sup>2</sup> Reference elevation is top of PVC riser.

**Table 2**  
**Summary of Soil PHC and VOC Analysis**  
Phase II Environmental Site Assessment  
593 Laurier Avenue West, Ottawa, Ontario  
LRL File: 190227

Parameter	Units	MDL	O. Reg. 153/04 <sup>1</sup> Table 7 <sup>2</sup> Residential Property Use Coarse Textured Soil	Sample	
				BH19-1-1	BH19-2-4
Sample Date (d/m/y)			--	15/10/19	15/10/19
Depth	m		--	0.0 - 0.4	0.6 - 1.2
CSV Readings <sup>3</sup>	ppm	5	--	0.1	0.1
<b>Physical Characteristics</b>					
% Solids	% by wt.	0.1	--	79.3	91.2
Volatile Organic Compounds (VOC)					
Acetone	µg/g dry	0.50	16	<0.50	<0.50
Benzene	µg/g dry	0.02	0.21	<0.02	<0.02
Bromodichloromethane	µg/g dry	0.05	13	<0.05	<0.05
Bromoform	µg/g dry	0.05	0.27	<0.05	<0.05
Bromomethane	µg/g dry	0.05	0.05	<0.05	<0.05
Carbon Tetrachloride	µg/g dry	0.05	0.05	<0.05	<0.05
Chlorobenzene	µg/g dry	0.05	2.4	<0.05	<0.05
Chloroform	µg/g dry	0.05	0.05	<0.05	<0.05
Dibromochloromethane	µg/g dry	0.05	9.4	<0.05	<0.05
Dichlorodifluoromethane	µg/g dry	0.05	16	<0.05	<0.05
1,2-Dichlorobenzene	µg/g dry	0.05	3.4	<0.05	<0.05
1,3-Dichlorobenzene	µg/g dry	0.05	4.8	<0.05	<0.05
1,4-Dichlorobenzene	µg/g dry	0.05	0.083	<0.05	<0.05
1,1-Dichloroethane	µg/g dry	0.05	3.5	<0.05	<0.05
1,2-Dichloroethane	µg/g dry	0.05	0.05	<0.05	<0.05
1,1-Dichloroethylene	µg/g dry	0.05	0.05	<0.05	<0.05
cis-1,2-Dichloroethylene	µg/g dry	0.05	3.4	<0.05	<0.05
trans-1,2-Dichloroethylene	µg/g dry	0.05	0.084	<0.05	<0.05
1,2-Dichloropropane	µg/g dry	0.05	0.05	<0.05	<0.05
cis-1,3-Dichloropropylene	µg/g dry	0.05	--	<0.05	<0.05
trans-1,3-Dichloropropylene	µg/g dry	0.05	--	<0.05	<0.05
1,3-Dichloropropene, total	µg/g dry	0.05	0.05	<0.05	<0.05
Ethylbenzene	µg/g dry	0.05	2	<0.05	<0.05
Ethylene dibromide (dibromoethane, 1,2-)	µg/g dry	0.05	0.05	<0.05	<0.05
Hexane	µg/g dry	0.05	2.8	<0.05	<0.05
Methyl Ethyl Ketone (2-Butanone)	µg/g dry	0.50	16	<0.50	<0.50
Methyl Isobutyl Ketone	µg/g dry	0.50	1.7	<0.50	<0.50
Methyl tert-butyl ether	µg/g dry	0.05	0.75	<0.05	<0.05
Methylene Chloride	µg/g dry	0.05	0.1	<0.05	<0.05
Styrene	µg/g dry	0.05	0.7	<0.05	<0.05
1,1,1,2-Tetrachloroethane	µg/g dry	0.05	0.058	<0.05	<0.05
1,1,1,2,2-Tetrachloroethane	µg/g dry	0.05	0.05	<0.05	<0.05
Tetrachloroethylene	µg/g dry	0.05	0.28	<0.05	<0.05
Toluene	µg/g dry	0.05	2.3	<0.05	<0.05
1,1,1-Trichloroethane	µg/g dry	0.05	0.38	<0.05	<0.05
1,1,2-Trichloroethane	µg/g dry	0.05	0.05	<0.05	<0.05
Trichloroethylene	µg/g dry	0.05	0.061	<0.05	<0.05
Trichlorofluoromethane	µg/g dry	0.05	4	<0.05	<0.05
Vinyl Chloride	µg/g dry	0.02	0.02	<0.02	<0.02
m/p-Xylene	µg/g dry	0.05	--	<0.05	<0.05
o-Xylene	µg/g dry	0.05	--	<0.05	<0.05
Xylenes, total	µg/L dry	0.05	3.1	<0.05	<0.05
<b>Petroleum Hydrocarbon Compounds (PHC)</b>					
F1 PHCs (C6-C10)	µg/g dry	7	55	<7	<7
F2 PHCs (C10-C16)	µg/g dry	4	98	<4	<4
F3 PHCs (C16-C34)	µg/g dry	8	300	28	16
F4 PHCs (C34-C50)	µg/L dry	6	2800	18	15

**NOTES:**

<sup>1</sup> MECP's *Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, April 15, 2011*

<sup>2</sup> Table 7: Generic Site Condition Standards for Shallow Soils in a Non-Potable Groundwater Condition, residential property use.

<sup>3</sup> Combustible soil vapour concentrations measured with a MiniRAE 2000 PID

MDL Method Detection Limit

-- No Value/Not Analysed

PHC Petroleum Hydrocarbon Compounds

**Table 3**  
**Summary of Soil Metals Analysis**  
Phase II Environmental Site Assessment  
593 Laurier Avenue West, Ottawa, Ontario  
LRL File: 190227

Parameter	Units	MDL	O. Reg. 153/04 <sup>1</sup>	Sample	
			Table 7 <sup>2</sup> Residential Property Use Coarse Textured Soil	BH19-1-1	BH19-2-4
Sample Date (d/m/y)			--	15/10/19	15/10/19
Depth	m		--	0.0 - 0.4	0.6 - 1.2
Metals					
Antimony	µg/g dry	1.0	7.5	1.3	<1.0
Arsenic	µg/g dry	1.0	18	7.3	11.1
Barium	µg/g dry	1.0	390	141	<b>397</b>
Beryllium	µg/g dry	0.5	4	<0.5	<0.5
Boron	µg/g dry	5.0	120	7.9	7.3
Cadmium	µg/g dry	0.5	1.2	<0.5	<b>1.7</b>
Chromium	µg/g dry	5.0	160	28.3	23.7
Chromium VI	µg/g dry	0.2	8	<0.2	<0.2
Cobalt	µg/g dry	1.0	22	5.2	5
Copper	µg/g dry	5.0	140	23.7	35.4
Lead	µg/g dry	1.0	120	<b>172</b>	<b>842</b>
Mercury	µg/g dry	0.1	0.27	<b>0.3</b>	<b>2.1</b>
Molybdenum	µg/g dry	1.0	6.9	<1.0	1.1
Nickel	µg/g dry	5.0	100	14.1	11.7
Selenium	µg/g dry	1.0	2.4	<1.0	<1.0
Silver	µg/g dry	0.3	20	<0.3	1.6
Thallium	µg/g dry	1.0	1	<1.0	<1.0
Uranium	µg/g dry	1.0	23	<1.0	<1.0
Vanadium	µg/g dry	10.0	86	31.5	21.8
Zinc	µg/g dry	20.0	340	111	<b>1020</b>

**NOTES:**

<sup>1</sup> MECP's *Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, April 15, 2011*

<sup>2</sup> Table 7: Generic Site Condition Standards for Shallow Soils in a Non-Potable Groundwater Condition, residential property use.

<sup>3</sup> Combustible soil vapour concentrations measured with a MiniRAE 2000 PID

MDL Method Detection Limit

-- No Value/Not Analysed

**BOLD** Above Table 7 Site Condition Standard



**Table 4**  
**Summary of Groundwater PHC and VOC Analysis**  
Phase II Environmental Site Assessment  
593 Laurier Avenue West, Ottawa, Ontario  
LRL File: 190227

Parameter	Units	MDL	O. Reg. 153/04 <sup>1</sup> Table 7 <sup>2</sup> Residential Property Use Coarse Textured Soil	Sample	
				MW19-1	MW19-2
Sample Date (d/m/y)				17/10/2019	17/10/2019
Headspace VOC Readings <sup>3</sup>	ppm	0.1		1.2	0.6
Evidence of free product?	--	--	4	No	No
Volatile Organic Compounds (VOC)					
Acetone	µg/L	5.0	100000	<5.0	<5.0
Benzene	µg/L	0.5	0.5	<0.5	<0.5
Bromodichloromethane	µg/L	0.5	67000	2.9	<0.5
Bromoform	µg/L	0.5	5	<0.5	<0.5
Bromomethane	µg/L	0.5	0.89	<0.5	<0.5
Carbon Tetrachloride	µg/L	0.2	0.2	<0.2	<0.2
Chlorobenzene	µg/L	0.5	140	<0.5	<0.5
Chloroform	µg/L	0.5	2	<b>17.5</b>	<b>13.0</b>
Dibromochloromethane	µg/L	0.5	65000	<0.5	<0.5
Dichlorodifluoromethane	µg/L	1.0	3500	<1.0	<1.0
1,2-Dichlorobenzene	µg/L	0.5	150	<0.5	<0.5
1,3-Dichlorobenzene	µg/L	0.5	7600	<0.5	<0.5
1,4-Dichlorobenzene	µg/L	0.5	0.5	<0.5	<0.5
1,1-Dichloroethane	µg/L	0.5	11	<0.5	<0.5
1,2-Dichloroethane	µg/L	0.5	0.5	<0.5	<0.5
1,1-Dichloroethylene	µg/L	0.5	0.5	<0.5	<0.5
cis-1,2-Dichloroethylene	µg/L	0.5	1.6	<0.5	<0.5
trans-1,2-Dichloroethylene	µg/L	0.5	1.6	<0.5	<0.5
1,2-Dichloropropane	µg/L	0.5	0.58	<0.5	<0.5
cis-1,3-Dichloropropylene	µg/L	0.5	--	<0.5	<0.5
trans-1,3-Dichloropropylene	µg/L	0.5	--	<0.5	<0.5
1,3-Dichloropropene, total	µg/L	0.5	0.5	<0.5	<0.5
Ethylbenzene	µg/L	0.5	54	<0.5	<0.5
Ethylene Dibromide (Dibromoethane, 1,2-)	µg/L	0.2	0.2	<0.2	<0.2
Hexane	µg/L	1.0	5	<1.0	<1.0
Methyl Ethyl Ketone (2-Butanone)	µg/L	5.0	21000	<5.0	<5.0
Methyl Isobutyl Ketone	µg/L	5.0	5200	<5.0	<5.0
Methyl tert-Butyl Ether (MTBE)	µg/L	2.0	15	<2.0	<2.0
Methylene Chloride	µg/L	5.0	26	<5.0	<5.0
Styrene	µg/L	0.5	43	<0.5	<0.5
1,1,1,2-Tetrachloroethane	µg/L	0.5	1.1	<0.5	<0.5
1,1,2,2-Tetrachloroethane	µg/L	0.5	0.5	<0.5	<0.5
Tetrachloroethylene	µg/L	0.5	0.5	<0.5	<0.5
Toluene	µg/L	0.5	320	<0.5	<0.5
1,1,1-Trichloroethane	µg/L	0.5	23	<0.5	<0.5
1,1,2-Trichloroethane	µg/L	0.5	0.5	<0.5	<0.5
Trichloroethylene	µg/L	0.5	0.5	<0.5	<0.5
Trichlorofluoromethane	µg/L	1.0	2000	<1.0	<1.0
Vinyl Chloride	µg/L	0.5	0.5	<0.5	<0.5
m/p-Xylene	µg/L	0.5	--	<0.5	<0.5
o-Xylene	µg/L	0.5	--	<0.5	<0.5
Xylenes, total	µg/L	0.5	72	<0.5	<0.5
Petroleum Hydrocarbon Compounds (PHC)					
F1 PHCs (C6-C10)	µg/L	25	420	<25	<25
F2 PHCs (C10-C16)	µg/L	100	150	<b>&lt;196</b>	<100
F3 PHCs (C16-C34)	µg/L	100	500	<196	<100
F4 PHCs (C34-C50)	µg/L	100	500	<196	<100

**NOTES:**

- <sup>1</sup> MECP's *Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, April 15, 2011*
  - <sup>2</sup> Table 7: Generic Site Condition Standards for Shallow Soils in a Non-Potable Groundwater Condition, residential property use.
  - <sup>3</sup> Headspace values measured with a MiniRAE 2000 PID
  - <sup>4</sup> To meet the standard there must be no evidence of free product including film or sheen.
- MDL Method Detection Limit  
 -- No Value/Not Analysed  
 PHC Petroleum Hydrocarbon Compounds  
**BOLD** Above Table 7 Site Condition Standard

**Table 5**  
**Summary of Groundwater PAH and Metals Analysis**  
Phase II Environmental Site Assessment  
593 Laurier Avenue West, Ottawa, Ontario  
LRL File: 190227

Parameter	Units	MDL	O. Reg. 153/04 <sup>1</sup>	Sample	
			Table 7 <sup>2</sup> Residential Property Use Coarse Textured Soil	MW19-1	MW19-2
Sample Date (d/m/y)			--	17/10/2019	17/10/2019
<b>Metals</b>					
Antimony	µg/L	1.0	16000	<0.5	0.5
Arsenic	µg/L	1.0	1500	<1	<1
Barium	µg/L	1.0	23000	64	79
Beryllium	µg/L	1.0	53	<0.5	<0.5
Boron	µg/L	1.0	36000	0.5	0.5
Cadmium	µg/L	0.5	2.1	<0.1	<0.1
Chromium	µg/L	1.0	640	<1	<1
Chromium VI	µg/L	10.0	110	<10	<10
Cobalt	µg/L	1.0	52	<0.5	<0.5
Copper	µg/L	1.0	69	3.0	2.7
Lead	µg/L	1.0	20	<0.01	0.2
Mercury	µg/L	0.1	0.1	<0.1	<0.1
Molybdenum	µg/L	1.0	7300	5.2	8.7
Nickel	µg/L	1.0	390	1	2
Selenium	µg/L	1.0	50	<1	1
Silver	µg/L	0.5	1.2	<0.1	<0.1
Sodium	µg/L	200	1800000	18600	26600
Thallium	µg/L	1.0	400	<0.1	<0.1
Uranium	µg/L	1.0	330	0.7	0.5
Vanadium	µg/L	1.0	200	<0.5	0.5
Zinc	µg/L	1.0	890	17	32
<b>Semi-Volatiles</b>					
Acenaphthene	µg/L	0.05	17	--	<0.05
Acenaphthylene	µg/L	0.05	1	--	<0.05
Anthracene	µg/L	0.01	1	--	<0.01
Benzo[a]anthracene	µg/L	0.01	1.8	--	<0.01
Benzo[a]pyrene	µg/L	0.01	0.81	--	<0.01
Benzo[b]fluoranthene	µg/L	0.05	0.75	--	<0.05
Benzo[g,h,i]perylene	µg/L	0.05	0.2	--	<0.05
Benzo[k]fluoranthene	µg/L	0.05	0.4	--	<0.05
Chrysene	µg/L	0.05	0.7	--	<0.05
Dibenzo[a,h]anthracene	µg/L	0.05	0.4	--	<0.05
Fluoranthene	µg/L	0.01	44	--	0.07
Fluorene	µg/L	0.05	290	--	<0.05
Indeno[1,2,3-cd]pyrene	µg/L	0.05	0.2	--	<0.05
1-Methylnaphthalene	µg/L	0.05	1500	--	<0.05
2-Methylnaphthalene	µg/L	0.05	1500	--	<0.05
Methylnaphthalene (1&2)	µg/L	0.10	1500	--	<0.10
Naphthalene	µg/L	0.05	7	--	<0.05
Phenanthrene	µg/L	0.05	380	--	<0.05
Pyrene	µg/L	0.01	5.7	--	0.06

**NOTES:**

<sup>1</sup> MECP's *Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, April 15, 2011*

<sup>2</sup> Table 7: Generic Site Condition Standards for Shallow Soils in a Non-Potable Groundwater Condition, residential property use.

<sup>3</sup> Headspace values measured with a MiniRAE 2000 PID

MDL Method Detection Limit

-- No Value/Not Analysed

**APPENDIX A**  
**Borehole Logs**



**Project No.:** 190227  
**Client:** Alexander Fleck House Inc.  
**Date:** October 15, 2019

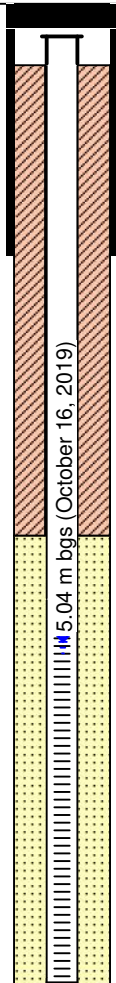
**Borehole Log: BH/MW19-1**  
**Project:** Phase II Environmental Site Assessment  
**Location:** 593 Laurier Avenue West  
**Field Personnel:** GM

**Driller:** George Downing Estate Drilling

**Drilling Equipment:** CME LC55

**Drilling Method:** HSA/HQ Coring

SUBSURFACE PROFILE		SAMPLE DATA						Combustible Soil Vapours ppm 20 40 60 80 % LEL 10 20 30 40 50 60 70 80 90	Monitoring Well Details
Depth	Soil Description	Elev./Depth (m)	Lithology	Type	Sample Number	N or RQD (%)	Recovery (%)		
0.0	Ground Surface	100.35							
0.0 - 1.0	<b>Topsoil</b> Dark brown loam, moist.	0.00 - 99.95		SS	3		50	PHC, VOC, Metals	0.1
1.0 - 2.0	<b>Fill</b> Crushed stone.	0.40 - 92.60		AU					
2.0 - 3.0	<b>Bedrock</b> Limestone with shaly partings.			R1					
3.0 - 4.0				R2					
4.0 - 5.0				R3					
5.0 - 6.0				R4					
6.0 - 7.0				R5					
7.0 - 8.0	End of Borehole	92.60 / 7.75							



**Easting:** 0444600      **Northing:** 5029290  
**Site Datum:** Northeast on the upper rim of hydrant south of Laurier Ave. W. (100.00 m)  
**Groundsurface Elevation:** 100.35 m      **Top of Riser Elev.:** 100.19 m  
**Hole Diameter:** 203 / 96 mm      **Monitoring Well Diameter:** 51 mm

**NOTES**  
 Groundwater sample collected on October 17, 2019 and submitted for Petroleum Hydrocarbons (PHC), Volatile Organic Compounds (VOC), Polycyclic Aromatic Hydrocarbons (PAH), and metals including mercury and hexavalent chromium.  
 HSA - Hollow Stem Auger  
 BGS - Below Ground Surface



**Project No.:** 190227  
**Client:** Alexander Fleck House Inc.  
**Date:** October 15, 2019

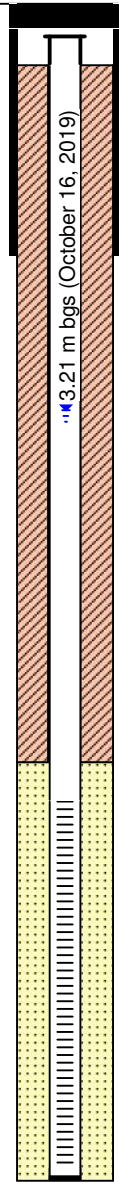
**Borehole Log: BH/MW19-2**  
**Project:** Phase II Environmental Site Assessment  
**Location:** 593 Laurier Avenue West  
**Field Personnel:** GM

**Driller:** George Downing Estate Drilling

**Drilling Equipment:** CME LC55

**Drilling Method:** HSA/HQ Coring

SUBSURFACE PROFILE			SAMPLE DATA					Combustible Soil Vapours ppm 20 40 60 80 % LEL 10 20 30 40 50 60 70 80 90	Monitoring Well Details
Depth	Soil Description	Elev./Depth (m)	Lithology	Type	Sample Number	N or RQD (%)	Recovery (%)		
0.0	Ground Surface	99.78							
0.0 - 1.0	<b>Topsoil</b> Dark brown loam, moist.	0.00			2,3	4	46		<0.1
1.0 - 3.0	<b>Fill</b> Black-brown sand, gravel and stones, some debris (brick), dry.				4	6	21	PHC, VOC, Metals	0.1
3.0 - 5.0						50+	4		0.2
5.0 - 6.0	<b>Bedrock</b> Limestone with shaly partings.	98.13							
6.0 - 8.0		1.65			R1				
8.0 - 15.0					R2				
15.0 - 25.0					R3				
25.0 - 30.0					R4				
30.0 - 31.0					R5				
31.0	End of Borehole	90.48							
		9.30							



**Easting:** 0444589      **Northing:** 5029317  
**Site Datum:** Northeast on the upper rim of hydrant south of Laurier Ave. W. (100.00 m)  
**Groundsurface Elevation:** 99.78 m      **Top of Riser Elev.:** 99.59 m  
**Hole Diameter:** 203 / 96 mm      **Monitoring Well Diameter:** 51 mm

**NOTES**  
 Groundwater sample collected on October 17, 2019 and submitted for Petroleum Hydrocarbons (PHC), Volatile Organic Compounds (VOC), Polycyclic Aromatic Hydrocarbons (PAH), and metals including mercury and hexavalent chromium.  
 HSA - Hollow Stem Auger  
 BGS - Below Ground Surface

**APPENDIX B**  
**Laboratory Certificates of Analysis**

## Certificate of Analysis

**LRL Associates Ltd.**

5430 Canotek Road  
Ottawa, ON K1J 9G2  
Attn: Genevieve Marcoux

Client PO:  
Project: 190227  
Custody: 51050

Report Date: 24-Oct-2019  
Order Date: 18-Oct-2019

**Order #: 1942535**

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

Parcel ID	Client ID
1942535-01	BH19-1-1
1942535-02	BH19-2-4

Approved By:



Mark Foto, M.Sc.  
Lab Supervisor

Certificate of Analysis  
 Client: LRL Associates Ltd.  
 Client PO:

Report Date: 24-Oct-2019  
 Order Date: 18-Oct-2019  
 Project Description: 190227

### Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	18-Oct-19	22-Oct-19
Mercury by CVAA	EPA 7471B - CVAA, digestion	22-Oct-19	22-Oct-19
PHC F1	CWS Tier 1 - P&T GC-FID	22-Oct-19	22-Oct-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	21-Oct-19	22-Oct-19
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	22-Oct-19	22-Oct-19
REG 153: VOCs by P&T GC/MS	EPA 8260 - P&T GC-MS	22-Oct-19	22-Oct-19
Solids, %	Gravimetric, calculation	21-Oct-19	21-Oct-19



Certificate of Analysis  
 Client: LRL Associates Ltd.  
 Client PO:

Report Date: 24-Oct-2019

Order Date: 18-Oct-2019

Project Description: 190227

<b>Client ID:</b>	BH19-1-1	BH19-2-4	-	-
<b>Sample Date:</b>	15-Oct-19 09:00	15-Oct-19 09:00	-	-
<b>Sample ID:</b>	1942535-01	1942535-02	-	-
<b>MDL/Units</b>	Soil	Soil	-	-

**Physical Characteristics**

% Solids	0.1 % by Wt.	79.3	91.2	-	-
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**Metals**

Antimony	1.0 ug/g dry	1.3	<1.0	-	-
Arsenic	1.0 ug/g dry	7.3	11.1	-	-
Barium	1.0 ug/g dry	141	397	-	-
Beryllium	0.5 ug/g dry	<0.5	<0.5	-	-
Boron	5.0 ug/g dry	7.9	7.3	-	-
Cadmium	0.5 ug/g dry	<0.5	1.7	-	-
Chromium	5.0 ug/g dry	28.3	23.7	-	-
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	-	-
Cobalt	1.0 ug/g dry	5.2	5.0	-	-
Copper	5.0 ug/g dry	23.7	35.4	-	-
Lead	1.0 ug/g dry	172	842	-	-
Mercury	0.1 ug/g dry	0.3	2.1	-	-
Molybdenum	1.0 ug/g dry	<1.0	1.1	-	-
Nickel	5.0 ug/g dry	14.1	11.7	-	-
Selenium	1.0 ug/g dry	<1.0	<1.0	-	-
Silver	0.3 ug/g dry	<0.3	1.6	-	-
Thallium	1.0 ug/g dry	<1.0	<1.0	-	-
Uranium	1.0 ug/g dry	<1.0	<1.0	-	-
Vanadium	10.0 ug/g dry	31.5	21.8	-	-
Zinc	20.0 ug/g dry	111	1020	-	-

**Volatiles**

Acetone	0.50 ug/g dry	<0.50	<0.50	-	-
Benzene	0.02 ug/g dry	<0.02	<0.02	-	-
Bromodichloromethane	0.05 ug/g dry	<0.05	<0.05	-	-
Bromoform	0.05 ug/g dry	<0.05	<0.05	-	-
Bromomethane	0.05 ug/g dry	<0.05	<0.05	-	-
Carbon Tetrachloride	0.05 ug/g dry	<0.05	<0.05	-	-
Chlorobenzene	0.05 ug/g dry	<0.05	<0.05	-	-
Chloroform	0.05 ug/g dry	<0.05	<0.05	-	-
Dibromochloromethane	0.05 ug/g dry	<0.05	<0.05	-	-
Dichlorodifluoromethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,2-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	-	-
1,3-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	-	-

Certificate of Analysis  
 Client: LRL Associates Ltd.  
 Client PO:

Report Date: 24-Oct-2019

Order Date: 18-Oct-2019

Project Description: 190227

	Client ID: Sample Date: Sample ID:	BH19-1-1 15-Oct-19 09:00 1942535-01	BH19-2-4 15-Oct-19 09:00 1942535-02	-	-
	MDL/Units	Soil	Soil	-	-
1,4-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	-	-
1,1-Dichloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,2-Dichloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,1-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	-	-
cis-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	-	-
trans-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	-	-
1,2-Dichloropropane	0.05 ug/g dry	<0.05	<0.05	-	-
cis-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	<0.05	-	-
trans-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	<0.05	-	-
1,3-Dichloropropene, total	0.05 ug/g dry	<0.05	<0.05	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	-	-
Ethylene dibromide (dibromoethane)	0.05 ug/g dry	<0.05	<0.05	-	-
Hexane	0.05 ug/g dry	<0.05	<0.05	-	-
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	<0.50	<0.50	-	-
Methyl Isobutyl Ketone	0.50 ug/g dry	<0.50	<0.50	-	-
Methyl tert-butyl ether	0.05 ug/g dry	<0.05	<0.05	-	-
Methylene Chloride	0.05 ug/g dry	<0.05	<0.05	-	-
Styrene	0.05 ug/g dry	<0.05	<0.05	-	-
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
Tetrachloroethylene	0.05 ug/g dry	<0.05	<0.05	-	-
Toluene	0.05 ug/g dry	<0.05	<0.05	-	-
1,1,1-Trichloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,1,2-Trichloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
Trichloroethylene	0.05 ug/g dry	<0.05	<0.05	-	-
Trichlorofluoromethane	0.05 ug/g dry	<0.05	<0.05	-	-
Vinyl chloride	0.02 ug/g dry	<0.02	<0.02	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	-	-
o-Xylene	0.05 ug/g dry	<0.05	<0.05	-	-
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	-	-
4-Bromofluorobenzene	Surrogate	101%	102%	-	-
Dibromofluoromethane	Surrogate	101%	99.9%	-	-
Toluene-d8	Surrogate	109%	106%	-	-
<b>Hydrocarbons</b>					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	-	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	-	-

Certificate of Analysis  
Client: LRL Associates Ltd.  
Client PO:

Report Date: 24-Oct-2019

Order Date: 18-Oct-2019

Project Description: 190227

	Client ID:	BH19-1-1	BH19-2-4	-	-
	Sample Date:	15-Oct-19 09:00	15-Oct-19 09:00	-	-
	Sample ID:	1942535-01	1942535-02	-	-
	MDL/Units	Soil	Soil	-	-
F3 PHCs (C16-C34)	8 ug/g dry	28	16	-	-
F4 PHCs (C34-C50)	6 ug/g dry	18	15	-	-

Certificate of Analysis  
Client: LRL Associates Ltd.  
Client PO:

Report Date: 24-Oct-2019  
Order Date: 18-Oct-2019  
Project Description: 190227

**Method Quality Control: Blank**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Hydrocarbons</b>									
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						
<b>Metals</b>									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
<b>Volatiles</b>									
Acetone	ND	0.50	ug/g						
Benzene	ND	0.02	ug/g						
Bromodichloromethane	ND	0.05	ug/g						
Bromoform	ND	0.05	ug/g						
Bromomethane	ND	0.05	ug/g						
Carbon Tetrachloride	ND	0.05	ug/g						
Chlorobenzene	ND	0.05	ug/g						
Chloroform	ND	0.05	ug/g						
Dibromochloromethane	ND	0.05	ug/g						
Dichlorodifluoromethane	ND	0.05	ug/g						
1,2-Dichlorobenzene	ND	0.05	ug/g						
1,3-Dichlorobenzene	ND	0.05	ug/g						
1,4-Dichlorobenzene	ND	0.05	ug/g						
1,1-Dichloroethane	ND	0.05	ug/g						
1,2-Dichloroethane	ND	0.05	ug/g						
1,1-Dichloroethylene	ND	0.05	ug/g						
cis-1,2-Dichloroethylene	ND	0.05	ug/g						
trans-1,2-Dichloroethylene	ND	0.05	ug/g						
1,2-Dichloropropane	ND	0.05	ug/g						
cis-1,3-Dichloropropylene	ND	0.05	ug/g						
trans-1,3-Dichloropropylene	ND	0.05	ug/g						
1,3-Dichloropropene, total	ND	0.05	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Ethylene dibromide (dibromoethane)	ND	0.05	ug/g						
Hexane	ND	0.05	ug/g						
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g						
Methyl Isobutyl Ketone	ND	0.50	ug/g						
Methyl tert-butyl ether	ND	0.05	ug/g						
Methylene Chloride	ND	0.05	ug/g						
Styrene	ND	0.05	ug/g						
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g						
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g						
Tetrachloroethylene	ND	0.05	ug/g						

Certificate of Analysis  
 Client: LRL Associates Ltd.  
 Client PO:

Report Date: 24-Oct-2019

Order Date: 18-Oct-2019

Project Description: 190227

### Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Toluene	ND	0.05	ug/g						
1,1,1-Trichloroethane	ND	0.05	ug/g						
1,1,2-Trichloroethane	ND	0.05	ug/g						
Trichloroethylene	ND	0.05	ug/g						
Trichlorofluoromethane	ND	0.05	ug/g						
Vinyl chloride	ND	0.02	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: 4-Bromofluorobenzene	8.47		ug/g		106	50-140			
Surrogate: Dibromofluoromethane	8.14		ug/g		102	50-140			
Surrogate: Toluene-d8	8.03		ug/g		100	50-140			

Certificate of Analysis  
 Client: LRL Associates Ltd.  
 Client PO:

Report Date: 24-Oct-2019  
 Order Date: 18-Oct-2019  
 Project Description: 190227

### Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Hydrocarbons</b>									
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	
<b>Metals</b>									
Antimony	2.0	1.0	ug/g dry	1.3			46.8	30	QR-01
Arsenic	7.5	1.0	ug/g dry	7.3			2.3	30	
Barium	142	1.0	ug/g dry	141			0.2	30	
Beryllium	0.5	0.5	ug/g dry	ND			0.0	30	
Boron	8.3	5.0	ug/g dry	7.9			4.8	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	29.4	5.0	ug/g dry	28.3			3.5	30	
Cobalt	5.4	1.0	ug/g dry	5.2			2.6	30	
Copper	23.9	5.0	ug/g dry	23.7			1.0	30	
Lead	173	1.0	ug/g dry	172			0.2	30	
Mercury	0.305	0.1	ug/g dry	0.276			9.9	30	
Molybdenum	1.1	1.0	ug/g dry	ND			0.0	30	
Nickel	14.3	5.0	ug/g dry	14.1			2.0	30	
Selenium	ND	1.0	ug/g dry	ND			0.0	30	
Silver	ND	0.3	ug/g dry	ND			0.0	30	
Thallium	ND	1.0	ug/g dry	ND			0.0	30	
Uranium	ND	1.0	ug/g dry	ND			0.0	30	
Vanadium	31.8	10.0	ug/g dry	31.5			1.0	30	
Zinc	113	20.0	ug/g dry	111			1.5	30	
<b>Physical Characteristics</b>									
% Solids	82.2	0.1	% by Wt.	83.6			1.6	25	
<b>Volatiles</b>									
Acetone	ND	0.50	ug/g dry	ND				50	
Benzene	ND	0.02	ug/g dry	ND				50	
Bromodichloromethane	ND	0.05	ug/g dry	ND				50	
Bromoform	ND	0.05	ug/g dry	ND				50	
Bromomethane	ND	0.05	ug/g dry	ND				50	
Carbon Tetrachloride	ND	0.05	ug/g dry	ND				50	
Chlorobenzene	ND	0.05	ug/g dry	ND				50	
Chloroform	ND	0.05	ug/g dry	ND				50	
Dibromochloromethane	ND	0.05	ug/g dry	ND				50	
Dichlorodifluoromethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,3-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,4-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
cis-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
trans-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
1,2-Dichloropropane	ND	0.05	ug/g dry	ND				50	
cis-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
trans-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Ethylene dibromide (dibromoethane)	ND	0.05	ug/g dry	ND				50	
Hexane	ND	0.05	ug/g dry	ND				50	
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g dry	ND				50	
Methyl Isobutyl Ketone	ND	0.50	ug/g dry	ND				50	
Methyl tert-butyl ether	ND	0.05	ug/g dry	ND				50	
Methylene Chloride	ND	0.05	ug/g dry	ND				50	

Certificate of Analysis  
 Client: LRL Associates Ltd.  
 Client PO:

Report Date: 24-Oct-2019

Order Date: 18-Oct-2019

Project Description: 190227

### Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Styrene	ND	0.05	ug/g dry	ND				50	
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
Tetrachloroethylene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
1,1,1-Trichloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2-Trichloroethane	ND	0.05	ug/g dry	ND				50	
Trichloroethylene	ND	0.05	ug/g dry	ND				50	
Trichlorofluoromethane	ND	0.05	ug/g dry	ND				50	
Vinyl chloride	ND	0.02	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: 4-Bromofluorobenzene	8.11		ug/g dry		50.7	50-140			
Surrogate: Dibromofluoromethane	8.17		ug/g dry		51.1	50-140			
Surrogate: Toluene-d8	8.50		ug/g dry		53.1	50-140			

Certificate of Analysis  
 Client: LRL Associates Ltd.  
 Client PO:

Report Date: 24-Oct-2019  
 Order Date: 18-Oct-2019  
 Project Description: 190227

### Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Hydrocarbons</b>									
F1 PHCs (C6-C10)	164	7	ug/g		82.1	80-120			
F2 PHCs (C10-C16)	68	4	ug/g	ND	78.0	60-140			
F3 PHCs (C16-C34)	187	8	ug/g	ND	87.7	60-140			
F4 PHCs (C34-C50)	130	6	ug/g	ND	96.7	60-140			
<b>Metals</b>									
Antimony	40.6		ug/L		81.2	70-130			
Arsenic	44.5		ug/L		89.0	70-130			
Barium	44.0		ug/L		88.0	70-130			
Beryllium	45.1		ug/L		90.2	70-130			
Boron	39.3		ug/L		78.7	70-130			
Cadmium	44.1		ug/L		88.1	70-130			
Chromium (VI)	4.6	0.2	ug/g		91.0	70-130			
Chromium	45.7		ug/L		91.3	70-130			
Cobalt	43.5		ug/L		86.9	70-130			
Copper	45.4		ug/L		90.8	70-130			
Lead	43.1		ug/L		86.1	70-130			
Mercury	1.68	0.1	ug/g	0.276	93.4	70-130			
Molybdenum	43.0		ug/L		86.0	70-130			
Nickel	44.6		ug/L		89.2	70-130			
Selenium	44.5		ug/L		88.9	70-130			
Silver	38.0		ug/L		76.1	70-130			
Thallium	40.9		ug/L		81.9	70-130			
Uranium	43.8		ug/L		87.7	70-130			
Vanadium	45.2		ug/L		90.4	70-130			
Zinc	44.8		ug/L		89.6	70-130			
<b>Volatiles</b>									
Acetone	8.63	0.50	ug/g		86.3	50-140			
Benzene	3.26	0.02	ug/g		81.5	60-130			
Bromodichloromethane	3.46	0.05	ug/g		86.5	60-130			
Bromoform	3.63	0.05	ug/g		90.7	60-130			
Bromomethane	4.52	0.05	ug/g		113	50-140			
Carbon Tetrachloride	3.57	0.05	ug/g		89.2	60-130			
Chlorobenzene	3.90	0.05	ug/g		97.4	60-130			
Chloroform	3.45	0.05	ug/g		86.2	60-130			
Dibromochloromethane	3.53	0.05	ug/g		88.1	60-130			
Dichlorodifluoromethane	4.12	0.05	ug/g		103	50-140			
1,2-Dichlorobenzene	3.75	0.05	ug/g		93.8	60-130			
1,3-Dichlorobenzene	4.09	0.05	ug/g		102	60-130			
1,4-Dichlorobenzene	3.89	0.05	ug/g		97.3	60-130			
1,1-Dichloroethane	3.63	0.05	ug/g		90.6	60-130			
1,2-Dichloroethane	3.55	0.05	ug/g		88.7	60-130			
1,1-Dichloroethylene	3.57	0.05	ug/g		89.2	60-130			
cis-1,2-Dichloroethylene	3.32	0.05	ug/g		83.1	60-130			
trans-1,2-Dichloroethylene	3.42	0.05	ug/g		85.5	60-130			
1,2-Dichloropropane	3.36	0.05	ug/g		84.1	60-130			
cis-1,3-Dichloropropylene	2.94	0.05	ug/g		73.5	60-130			
trans-1,3-Dichloropropylene	2.50	0.05	ug/g		62.4	60-130			
Ethylbenzene	4.05	0.05	ug/g		101	60-130			
Ethylene dibromide (dibromoethane)	3.26	0.05	ug/g		81.4	60-130			
Hexane	3.47	0.05	ug/g		86.8	60-130			



Certificate of Analysis  
 Client: LRL Associates Ltd.  
 Client PO:

Report Date: 24-Oct-2019

Order Date: 18-Oct-2019

**Project Description: 190227**

### Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Methyl Ethyl Ketone (2-Butanone)	8.84	0.50	ug/g		88.4	50-140			
Methyl Isobutyl Ketone	6.12	0.50	ug/g		61.2	50-140			
Methyl tert-butyl ether	7.47	0.05	ug/g		74.7	50-140			
Methylene Chloride	2.81	0.05	ug/g		70.2	60-130			
Styrene	3.99	0.05	ug/g		99.7	60-130			
1,1,1,2-Tetrachloroethane	4.08	0.05	ug/g		102	60-130			
1,1,2,2-Tetrachloroethane	3.18	0.05	ug/g		79.5	60-130			
Tetrachloroethylene	3.52	0.05	ug/g		87.9	60-130			
Toluene	4.05	0.05	ug/g		101	60-130			
1,1,1-Trichloroethane	3.35	0.05	ug/g		83.6	60-130			
1,1,2-Trichloroethane	2.54	0.05	ug/g		63.4	60-130			
Trichloroethylene	2.68	0.05	ug/g		67.0	60-130			
Trichlorofluoromethane	3.65	0.05	ug/g		91.2	50-140			
Vinyl chloride	5.02	0.02	ug/g		125	50-140			
m,p-Xylenes	7.89	0.05	ug/g		98.6	60-130			
o-Xylene	4.13	0.05	ug/g		103	60-130			
Surrogate: 4-Bromofluorobenzene	7.58		ug/g		94.8	50-140			

Certificate of Analysis  
Client: LRL Associates Ltd.  
Client PO:

Report Date: 24-Oct-2019  
Order Date: 18-Oct-2019  
Project Description: 190227

**Qualifier Notes:**

**QC Qualifiers :**

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

**Sample Data Revisions**

None

**Work Order Revisions / Comments:**

None

**Other Report Notes:**

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

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

*CCME PHC additional information:*

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

## Certificate of Analysis

**LRL Associates Ltd.**

5430 Canotek Road  
Ottawa, ON K1J 9G2  
Attn: Genevieve Marcoux

Client PO:  
Project: 190227  
Custody: 50613

Report Date: 23-Oct-2019  
Order Date: 17-Oct-2019

**Order #: 1942393**

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

<b>Parcel ID</b>	<b>Client ID</b>
1942393-01	MW19-1
1942393-02	MW19-2

Approved By:



Mark Foto, M.Sc.  
Lab Supervisor

Certificate of Analysis  
 Client: LRL Associates Ltd.  
 Client PO:

Report Date: 23-Oct-2019  
 Order Date: 17-Oct-2019  
 Project Description: 190227

### Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent - water	MOE E3056 - colourimetric	22-Oct-19	22-Oct-19
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	21-Oct-19	22-Oct-19
Metals, ICP-MS	EPA 200.8 - ICP-MS	18-Oct-19	21-Oct-19
PHC F1	CWS Tier 1 - P&T GC-FID	19-Oct-19	19-Oct-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	21-Oct-19	22-Oct-19
REG 153: PAHs by GC-MS	EPA 625 - GC-MS, extraction	21-Oct-19	21-Oct-19
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	19-Oct-19	19-Oct-19

Certificate of Analysis  
 Client: LRL Associates Ltd.  
 Client PO:

Report Date: 23-Oct-2019

Order Date: 17-Oct-2019

Project Description: 190227

<b>Client ID:</b>	MW19-1	MW19-2	-	-
<b>Sample Date:</b>	17-Oct-19 09:00	17-Oct-19 09:00	-	-
<b>Sample ID:</b>	1942393-01	1942393-02	-	-
<b>MDL/Units</b>	Water	Water	-	-

**Metals**

Mercury	0.1 ug/L	<0.1	<0.1	-	-
Antimony	0.5 ug/L	<0.5	0.5	-	-
Arsenic	1 ug/L	<1	<1	-	-
Barium	1 ug/L	64	79	-	-
Beryllium	0.5 ug/L	<0.5	<0.5	-	-
Boron	10 ug/L	63	89	-	-
Cadmium	0.1 ug/L	<0.1	<0.1	-	-
Chromium	1 ug/L	<1	<1	-	-
Chromium (VI)	10 ug/L	<10	<10	-	-
Cobalt	0.5 ug/L	<0.5	<0.5	-	-
Copper	0.5 ug/L	3.0	2.7	-	-
Lead	0.1 ug/L	<0.1	0.2	-	-
Molybdenum	0.5 ug/L	5.2	8.7	-	-
Nickel	1 ug/L	1	2	-	-
Selenium	1 ug/L	<1	1	-	-
Silver	0.1 ug/L	<0.1	<0.1	-	-
Sodium	200 ug/L	18600	26600	-	-
Thallium	0.1 ug/L	<0.1	<0.1	-	-
Uranium	0.1 ug/L	0.7	0.5	-	-
Vanadium	0.5 ug/L	<0.5	0.5	-	-
Zinc	5 ug/L	17	32	-	-

**Volatiles**

Acetone	5.0 ug/L	<5.0	<5.0	-	-
Benzene	0.5 ug/L	<0.5	<0.5	-	-
Bromodichloromethane	0.5 ug/L	2.9	<0.5	-	-
Bromoform	0.5 ug/L	<0.5	<0.5	-	-
Bromomethane	0.5 ug/L	<0.5	<0.5	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	-	-
Chlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
Chloroform	0.5 ug/L	17.5	13.0	-	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-

Certificate of Analysis  
 Client: LRL Associates Ltd.  
 Client PO:

Report Date: 23-Oct-2019

Order Date: 17-Oct-2019

Project Description: 190227

	Client ID: Sample Date: Sample ID:	MW19-1 17-Oct-19 09:00 1942393-01 Water	MW19-2 17-Oct-19 09:00 1942393-02 Water	-	-
	MDL/Units				
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	-	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	-	-
Ethylene dibromide (dibromoethane)	0.2 ug/L	<0.2	<0.2	-	-
Hexane	1.0 ug/L	<1.0	<1.0	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	-	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	-	-
Styrene	0.5 ug/L	<0.5	<0.5	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	-	-
Toluene	0.5 ug/L	<0.5	<0.5	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	-
Trichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	-	-
Vinyl chloride	0.5 ug/L	<0.5	<0.5	-	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	-	-
o-Xylene	0.5 ug/L	<0.5	<0.5	-	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	-	-
4-Bromofluorobenzene	Surrogate	105%	104%	-	-
Dibromofluoromethane	Surrogate	107%	108%	-	-
Toluene-d8	Surrogate	101%	100%	-	-

**Hydrocarbons**

F1 PHCs (C6-C10)	25 ug/L	<25	<25	-	-
F2 PHCs (C10-C16)	100 ug/L	<196 [1]	<100	-	-
F3 PHCs (C16-C34)	100 ug/L	<196 [1]	<100	-	-

Certificate of Analysis  
 Client: LRL Associates Ltd.  
 Client PO:

Report Date: 23-Oct-2019

Order Date: 17-Oct-2019

Project Description: 190227

	Client ID:	MW19-1	MW19-2	-	-
	Sample Date:	17-Oct-19 09:00	17-Oct-19 09:00	-	-
	Sample ID:	1942393-01	1942393-02	-	-
	MDL/Units	Water	Water	-	-
F4 PHCs (C34-C50)	100 ug/L	<196 [1]	<100	-	-

**Semi-Volatiles**

Acenaphthene	0.05 ug/L	-	<0.05	-	-
Acenaphthylene	0.05 ug/L	-	<0.05	-	-
Anthracene	0.01 ug/L	-	<0.01	-	-
Benzo [a] anthracene	0.01 ug/L	-	<0.01	-	-
Benzo [a] pyrene	0.01 ug/L	-	<0.01	-	-
Benzo [b] fluoranthene	0.05 ug/L	-	<0.05	-	-
Benzo [g,h,i] perylene	0.05 ug/L	-	<0.05	-	-
Benzo [k] fluoranthene	0.05 ug/L	-	<0.05	-	-
Chrysene	0.05 ug/L	-	<0.05	-	-
Dibenzo [a,h] anthracene	0.05 ug/L	-	<0.05	-	-
Fluoranthene	0.01 ug/L	-	0.07	-	-
Fluorene	0.05 ug/L	-	<0.05	-	-
Indeno [1,2,3-cd] pyrene	0.05 ug/L	-	<0.05	-	-
1-Methylnaphthalene	0.05 ug/L	-	<0.05	-	-
2-Methylnaphthalene	0.05 ug/L	-	<0.05	-	-
Methylnaphthalene (1&2)	0.10 ug/L	-	<0.10	-	-
Naphthalene	0.05 ug/L	-	<0.05	-	-
Phenanthrene	0.05 ug/L	-	<0.05	-	-
Pyrene	0.01 ug/L	-	0.06	-	-
2-Fluorobiphenyl	Surrogate	-	97.2%	-	-
Terphenyl-d14	Surrogate	-	110%	-	-

Certificate of Analysis  
Client: LRL Associates Ltd.  
Client PO:

Report Date: 23-Oct-2019

Order Date: 17-Oct-2019

Project Description: 190227

**Method Quality Control: Blank**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Hydrocarbons</b>									
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						
<b>Metals</b>									
Mercury	ND	0.1	ug/L						
Antimony	ND	0.5	ug/L						
Arsenic	ND	1	ug/L						
Barium	ND	1	ug/L						
Beryllium	ND	0.5	ug/L						
Boron	ND	10	ug/L						
Cadmium	ND	0.1	ug/L						
Chromium (VI)	ND	10	ug/L						
Chromium	ND	1	ug/L						
Cobalt	ND	0.5	ug/L						
Copper	ND	0.5	ug/L						
Lead	ND	0.1	ug/L						
Molybdenum	ND	0.5	ug/L						
Nickel	ND	1	ug/L						
Selenium	ND	1	ug/L						
Silver	ND	0.1	ug/L						
Sodium	ND	200	ug/L						
Thallium	ND	0.1	ug/L						
Uranium	ND	0.1	ug/L						
Vanadium	ND	0.5	ug/L						
Zinc	ND	5	ug/L						
<b>Semi-Volatiles</b>									
Acenaphthene	ND	0.05	ug/L						
Acenaphthylene	ND	0.05	ug/L						
Anthracene	ND	0.01	ug/L						
Benzo [a] anthracene	ND	0.01	ug/L						
Benzo [a] pyrene	ND	0.01	ug/L						
Benzo [b] fluoranthene	ND	0.05	ug/L						
Benzo [g,h,i] perylene	ND	0.05	ug/L						
Benzo [k] fluoranthene	ND	0.05	ug/L						
Chrysene	ND	0.05	ug/L						
Dibenzo [a,h] anthracene	ND	0.05	ug/L						
Fluoranthene	ND	0.01	ug/L						
Fluorene	ND	0.05	ug/L						
Indeno [1,2,3-cd] pyrene	ND	0.05	ug/L						
1-Methylnaphthalene	ND	0.05	ug/L						
2-Methylnaphthalene	ND	0.05	ug/L						
Methylnaphthalene (1&2)	ND	0.10	ug/L						
Naphthalene	ND	0.05	ug/L						
Phenanthrene	ND	0.05	ug/L						
Pyrene	ND	0.01	ug/L						
Surrogate: 2-Fluorobiphenyl	16.9		ug/L		84.5	50-140			
Surrogate: Terphenyl-d14	21.2		ug/L		106	50-140			
<b>Volatiles</b>									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						



Certificate of Analysis  
 Client: LRL Associates Ltd.  
 Client PO:

Report Date: 23-Oct-2019  
 Order Date: 17-Oct-2019  
 Project Description: 190227

### Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane)	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	81.6		ug/L		102	50-140			
Surrogate: Dibromofluoromethane	86.3		ug/L		108	50-140			
Surrogate: Toluene-d8	80.5		ug/L		101	50-140			

Certificate of Analysis  
Client: LRL Associates Ltd.  
Client PO:

Report Date: 23-Oct-2019

Order Date: 17-Oct-2019

Project Description: 190227

**Method Quality Control: Duplicate**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Hydrocarbons</b>									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
<b>Metals</b>									
Mercury	ND	0.1	ug/L	ND			0.0	20	
Antimony	0.72	0.5	ug/L	ND			0.0	20	
Arsenic	ND	1	ug/L	ND			0.0	20	
Barium	1.9	1	ug/L	1.9			2.6	20	
Beryllium	ND	0.5	ug/L	ND			0.0	20	
Boron	ND	10	ug/L	ND			0.0	20	
Cadmium	ND	0.1	ug/L	ND			0.0	20	
Chromium (VI)	ND	10	ug/L	ND				20	
Chromium	ND	1	ug/L	ND			0.0	20	
Cobalt	ND	0.5	ug/L	ND			0.0	20	
Copper	0.95	0.5	ug/L	0.86			10.6	20	
Lead	ND	0.1	ug/L	ND			0.0	20	
Molybdenum	ND	0.5	ug/L	ND			0.0	20	
Nickel	ND	1	ug/L	ND			0.0	20	
Selenium	ND	1	ug/L	ND			0.0	20	
Silver	ND	0.1	ug/L	ND			0.0	20	
Sodium	584	200	ug/L	569			2.5	20	
Thallium	ND	0.1	ug/L	ND			0.0	20	
Uranium	ND	0.1	ug/L	ND			0.0	20	
Vanadium	ND	0.5	ug/L	ND			0.0	20	
Zinc	ND	5	ug/L	ND			0.0	20	
<b>Volatiles</b>									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane)	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	

Certificate of Analysis  
 Client: LRL Associates Ltd.  
 Client PO:

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Project Description: 190227

### Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	83.8		ug/L		105	50-140			
Surrogate: Dibromofluoromethane	83.0		ug/L		104	50-140			
Surrogate: Toluene-d8	81.1		ug/L		101	50-140			

Certificate of Analysis  
 Client: LRL Associates Ltd.  
 Client PO:

Report Date: 23-Oct-2019  
 Order Date: 17-Oct-2019  
 Project Description: 190227

### Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Hydrocarbons</b>									
F1 PHCs (C6-C10)	2190	25	ug/L		110	68-117			
F2 PHCs (C10-C16)	1180	100	ug/L		73.5	60-140			
F3 PHCs (C16-C34)	2910	100	ug/L		74.3	60-140			
F4 PHCs (C34-C50)	2150	100	ug/L		86.5	60-140			
<b>Metals</b>									
Mercury	2.92	0.1	ug/L	ND	97.5	70-130			
Antimony	41.4		ug/L	ND	82.3	80-120			
Arsenic	46.7		ug/L	ND	93.0	80-120			
Barium	47.7		ug/L	1.9	91.6	80-120			
Beryllium	46.1		ug/L	ND	92.2	80-120			
Boron	41		ug/L		81.9	80-120			
Cadmium	46.9		ug/L	ND	93.7	80-120			
Chromium (VI)	166	10	ug/L	ND	83.0	70-130			
Chromium	45.9		ug/L	ND	91.8	80-120			
Cobalt	42.8		ug/L	ND	85.6	80-120			
Copper	45.4		ug/L	0.86	89.1	80-120			
Lead	41.7		ug/L	ND	83.4	80-120			
Molybdenum	41.1		ug/L	ND	82.0	80-120			
Nickel	43.8		ug/L	ND	87.5	80-120			
Selenium	46.1		ug/L	ND	92.2	80-120			
Silver	41.4		ug/L		82.8	80-120			
Sodium	9130		ug/L	569	85.6	80-120			
Thallium	41.5		ug/L	ND	83.0	80-120			
Uranium	40.4		ug/L	ND	80.8	80-120			
Vanadium	45.2		ug/L	ND	90.4	80-120			
Zinc	48		ug/L	ND	95.9	80-120			
<b>Semi-Volatiles</b>									
Acenaphthene	4.05	0.05	ug/L		81.0	50-140			
Acenaphthylene	3.75	0.05	ug/L		74.9	50-140			
Anthracene	4.01	0.01	ug/L		80.2	50-140			
Benzo [a] anthracene	4.59	0.01	ug/L		91.7	50-140			
Benzo [a] pyrene	4.11	0.01	ug/L		82.2	50-140			
Benzo [b] fluoranthene	5.85	0.05	ug/L		117	50-140			
Benzo [g,h,i] perylene	3.39	0.05	ug/L		67.8	50-140			
Benzo [k] fluoranthene	5.72	0.05	ug/L		114	50-140			
Chrysene	4.96	0.05	ug/L		99.3	50-140			
Dibenzo [a,h] anthracene	3.72	0.05	ug/L		74.5	50-140			
Fluoranthene	4.59	0.01	ug/L		91.8	50-140			
Fluorene	3.97	0.05	ug/L		79.4	50-140			
Indeno [1,2,3-cd] pyrene	3.78	0.05	ug/L		75.6	50-140			
1-Methylnaphthalene	4.09	0.05	ug/L		81.8	50-140			
2-Methylnaphthalene	4.41	0.05	ug/L		88.2	50-140			
Naphthalene	4.14	0.05	ug/L		82.7	50-140			
Phenanthrene	3.85	0.05	ug/L		76.9	50-140			
Pyrene	4.24	0.01	ug/L		84.7	50-140			
Surrogate: 2-Fluorobiphenyl	17.5		ug/L		87.7	50-140			
<b>Volatiles</b>									
Acetone	72.6	5.0	ug/L		72.6	50-140			
Benzene	51.9	0.5	ug/L		130	60-130			
Bromodichloromethane	40.1	0.5	ug/L		100	60-130			

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### Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Bromoform	39.4	0.5	ug/L		98.6	60-130			
Bromomethane	24.6	0.5	ug/L		61.5	50-140			
Carbon Tetrachloride	45.0	0.2	ug/L		112	60-130			
Chlorobenzene	35.6	0.5	ug/L		89.0	60-130			
Chloroform	38.6	0.5	ug/L		96.4	60-130			
Dibromochloromethane	38.8	0.5	ug/L		97.0	60-130			
Dichlorodifluoromethane	33.6	1.0	ug/L		84.0	50-140			
1,2-Dichlorobenzene	37.0	0.5	ug/L		92.4	60-130			
1,3-Dichlorobenzene	37.5	0.5	ug/L		93.6	60-130			
1,4-Dichlorobenzene	32.3	0.5	ug/L		80.7	60-130			
1,1-Dichloroethane	36.9	0.5	ug/L		92.2	60-130			
1,2-Dichloroethane	35.6	0.5	ug/L		89.0	60-130			
1,1-Dichloroethylene	36.1	0.5	ug/L		90.3	60-130			
cis-1,2-Dichloroethylene	38.9	0.5	ug/L		97.2	60-130			
trans-1,2-Dichloroethylene	38.9	0.5	ug/L		97.2	60-130			
1,2-Dichloropropane	38.1	0.5	ug/L		95.3	60-130			
cis-1,3-Dichloropropylene	38.7	0.5	ug/L		96.7	60-130			
trans-1,3-Dichloropropylene	37.9	0.5	ug/L		94.6	60-130			
Ethylbenzene	34.8	0.5	ug/L		87.1	60-130			
Ethylene dibromide (dibromoethane)	40.3	0.2	ug/L		101	60-130			
Hexane	27.1	1.0	ug/L		67.6	60-130			
Methyl Ethyl Ketone (2-Butanone)	82.2	5.0	ug/L		82.2	50-140			
Methyl Isobutyl Ketone	92.2	5.0	ug/L		92.2	50-140			
Methyl tert-butyl ether	91.0	2.0	ug/L		91.0	50-140			
Methylene Chloride	32.4	5.0	ug/L		81.0	60-130			
Styrene	41.1	0.5	ug/L		103	60-130			
1,1,1,2-Tetrachloroethane	37.2	0.5	ug/L		93.0	60-130			
1,1,2,2-Tetrachloroethane	35.4	0.5	ug/L		88.4	60-130			
Tetrachloroethylene	36.4	0.5	ug/L		91.1	60-130			
Toluene	34.3	0.5	ug/L		85.7	60-130			
1,1,1-Trichloroethane	47.6	0.5	ug/L		119	60-130			
1,1,2-Trichloroethane	40.8	0.5	ug/L		102	60-130			
Trichloroethylene	42.3	0.5	ug/L		106	60-130			
Trichlorofluoromethane	36.8	1.0	ug/L		91.9	60-130			
Vinyl chloride	28.8	0.5	ug/L		71.9	50-140			
m,p-Xylenes	70.0	0.5	ug/L		87.5	60-130			
o-Xylene	34.9	0.5	ug/L		87.2	60-130			

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**Qualifier Notes:**

**Sample Qualifiers :**

- 1 : Elevated Reporting Limits due to limited sample volume.
- 2 : Limited sample volume available limiting accuracy of reported result.

**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.
- When reported, data for F4G has been processed using a silica gel cleanup.