LIMITED PHASE II - ENVIRONMENTAL SITE ASSESSMENT
CLARENCE ARENA EMERGENCY EXIT STAIRS REHABILITATION
418 LEMAY STREET
CLARENCE-CREEK, ONTARIO

Prepared for

The City of Clarence-Rockland
Attn: Mr. Charles Boneau, Coordinator, Capital Projects
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By

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LASCELLES
ENGINEERING & ASSOCIATES

Lascelles File No: 190490

February 2020

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APPENDICES

1 INTRODUCTION

The City of Clarence-Rockland retained the services of Lascelles Engineering & Associates Ltd. (Lascelles) to conduct a Limited Phase II - Environmental Site Assessment (ESA) for the Clarence-Creek Arena located at 418 Lemay Street in the Village of Clarence-Creek. It is our understanding that the emergency exit stairs to the second storey of the arena will be rehabilitated/replaced in the upcoming months. As part of this project, Lascelles performed a geotechnical investigation at which time potential petroleum impacted soil and groundwater was encountered in the area of said emergency stairs.

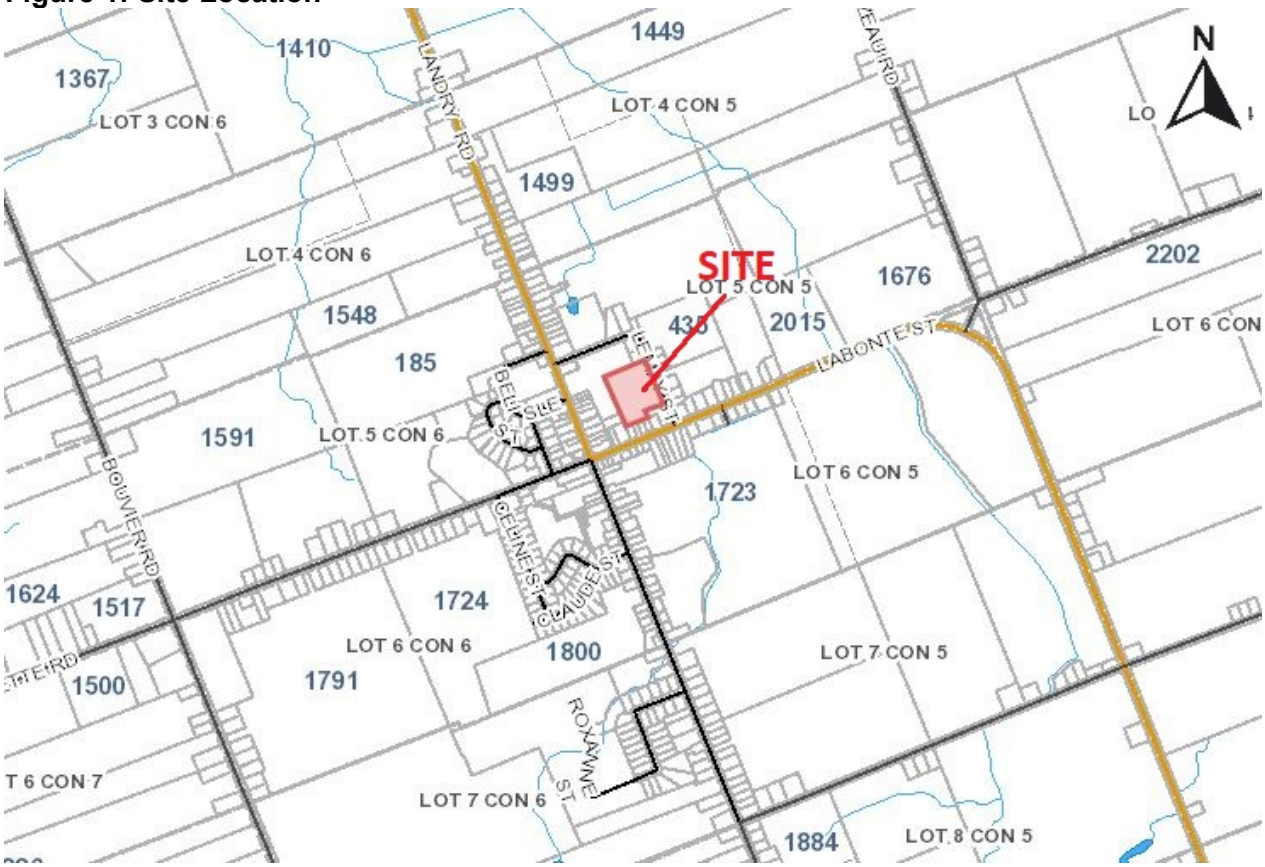
The purpose of the limited Phase II ESA was to confirm if the soil and groundwater were in fact contaminated with petroleum hydrocarbon and to what level in relation to the provincial guidelines in order to provide recommendations on handling this potential contamination during construction.

2 SITE DESCRIPTION

The Clarence-Creek arena is located within the central portion of the Village of Clarence-Creek, Ontario. The stairs to be rehabilitated are located along the north side of the building that provide emergency exit to the second storey of the building. Refer to **Figure 1** for location of the site.

It is our understanding that the project will consist in removing the existing stairs and replacing them with a new fully enclosed steel frame structure supported on concrete piers, which would be located at the same location.

Figure 1: Site Location



Ref: UCPR - GIS

3 SCOPE OF WORK

Where applicable, the Limited Phase II ESA was conducted in general accordance with Canadian Standard Association (CSA) Standard Z769 reaffirmed 2016, "Phase II Environmental Site Assessment". The fieldwork and analytical testing were conducted in general accordance with protocols as set out in the "*Guidance on Sampling and Analytical Methods for Use at Contaminate Sites in Ontario, Revised December 1996, Ministry of Environmental and Energy,* and *"Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act, March 9, 2004, amended as of July 1, 2011*".

As per our email proposal dated January 16, 2020 and subsequent discussions with the client, the area to be investigated was limited to the area of the emergency stairs. Furthermore, the targeted contamination was limited to petroleum-based contamination only. Consequently, Lascelles' mandate for this project consisted of the following:

- Using a backhoe to dig two (2) to three (3) test pits around the emergency stairs to evaluate the subsurface soil and groundwater quality from an environmental perspective;

- Soil samples will be collected from the test pits for potential subsequent laboratory testing, including ones that were located at the underside of the footing to confirm if contamination had extended underneath the footings. All recovered soil samples from the test pits will be screened for combustible soil vapours (CSVs), where the highest readings will be selected for laboratory analysis;

- If groundwater infiltration occurs in the test pits, groundwater samples will be collected for subsequent laboratory analysis;

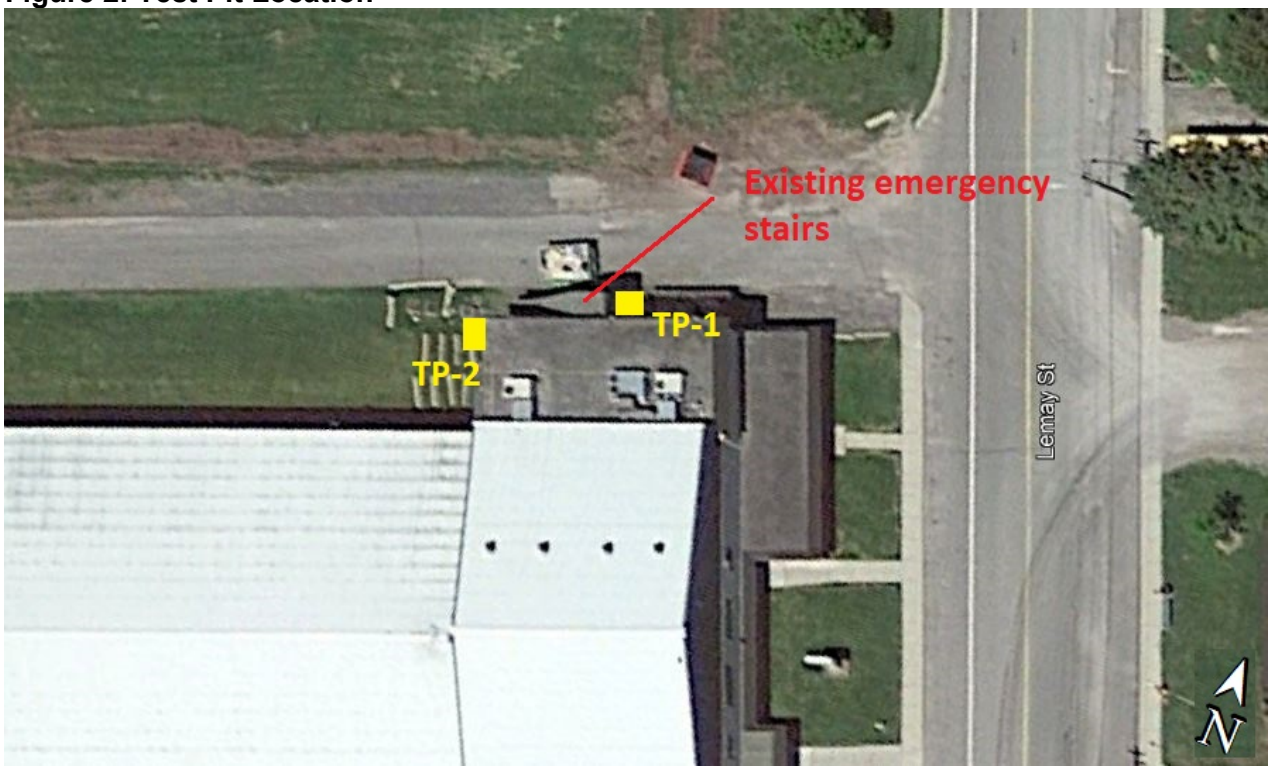
- Chemical laboratory testing will consist of six (6) soil samples analysed for PHC (F1 – F4), BTEX and PAHs, and two (2) groundwater samples analysed for PHC (F1 - F4) and BTEX.

4 PROCEDURE

The fieldwork for this investigation was carried out on January 29th, 2020 and consisted of digging two (2) test pits; one on each side of the existing stairs. It is noted that it was impossible to dig a third test pit to the north of the stair due to the presence of the gas line and watermain in the vicinity. Prior to any fieldwork, the test pit locations were cleared for the presence of any underground services and utilities. The approximate locations of test pits are shown below as part of **Figure 2**.

The test pits were completed using a backhoe supplied and operated by Poupart Excavation as well as manually digging along the foundation walls. The test pits were taken down to the underside of the footings of the existing building, which was approximately 1.4m below ground surface (bgs). In addition, a very small section of the test pit was extended manually to 0.5m below the underside of footing to collect a soil sample. Upon completion, the test pits were backfilled with excavated fill materials and lightly compacted.

Figure 2: Test Pit Location



Ref: Google Earth 2019

Sampling of the overburden materials encountered in the test pits was carried out by means of grab samples taken directly from the excavation walls or from the bucket of the backhoe. The soil samples were logged, labelled and examined in the field for visual and olfactory characteristics and any evidence of petroleum hydrocarbon impact. Representative soil samples from each test pits were collected and transferred immediately into sealed laboratory supplied glass jars and “Ziploc” freezer bags to prevent loss of moisture and soil vapours, and were stored on site in a cooler at 4°C. Furthermore, all soil samples were screened for the presence of CSV using a MiniRae 2000 Photo Ionization Detector (PID). The details of the soil samples collected, and the CSV readings are presented in **Table 1**.

A groundwater sample was collected in each test pit from the water that had infiltrated into the test pit. The water was collected using laboratory-supplied bottles and placed in a cooler in order to maintain temperature of the samples at approximately 4°C as they were delivered to the laboratory.

5 SUBSURFACE SOIL AND GROUNDWATER CONDITIONS

The two (2) test pit (TP1 and TP-2) carried out as part of this investigation were located at the same location of TP1 and TP-2 referred in the geotechnical investigation prepared for this project. Consequently, please refer to the geotechnical investigation report prepared by Lascelles, dated December 2019 for detail on the subsurface soil and groundwater conditions in the area of the emergency stairs.

6 CHEMICAL ANALYSIS RESULTS

6.1 Soils

Our observations during test pitting activities and the examination of recovered soil samples had revealed visual and olfactory evidence of petroleum hydrocarbon contamination in both test pits and especially from the groundwater entering into the test pit. All soil samples recovered were screened for CSV, where the results of the CSV readings as well as sample locations are presented in **Table 1** below.

Table 1: Sample Location and CSV Readings

Sample ID	Location	[1] Approx. depth (m)	CSV Readings (ppm)	Soil Type
TP-1				
TP-1 S1	Underside of footing	0.25 below USF	157	Native Clay
TP-1 S2	Between two east piers	0.00 at USF	289	Clay Fill
TP-1 S3	Base of test pit	0.60 below USF	185	Native Clay
TP-1 S4	Fill	0.50 above USF	45.2	Sand Fill
TP-2				
TP-2 S1	Base of test pit	0.30 below USF	123	Native Clay
TP-2 S2	South side walls	0.00 at USF	230	Sand and Clay Fill
TP-2 S3	Base of test pit	0.30 below USF	211	Native Clay
TP-2 S4	Fill	0.50 above USF	58	Sand Fill

[1] Depth measured from underside of footing (USF) of the existing building.

As outlined in our scope of work, a total of six (6) soil samples were selected and submitted to Paracel Laboratories Ltd. for the analysis of petroleum-based parameters that included Benzene, Toluene, Ethylbenzene, Xylenes (BTEX) and Petroleum Hydrocarbons (PHC) for Fraction 1 ($C_6 – C_{10}$), Fraction 2 ($>C_{11} – C_{16}$), Fraction 3 ($>C_{16} – C_{34}$) and Fraction 4 ($>C_{34}$). Two (2) samples were also analysed for Polycyclic Aromatic Hydrocarbons (PAHs). The samples selected were those that exhibited the highest CSV reading as well as shown most visual and olfactory evidence of petroleum impacts, and therefore are considered to be the worst-case scenario.

The laboratory results were compared with O. Reg. 153/04 - MOE's Soil, Groundwater and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act (April 2011). The criteria provided as part of TABLE 3 – Generic Site Conditions Standards for Use within a Non-Potable Groundwater Conditions, for Community Property Use, and for fine textured soils were used to review the laboratory results. A summary of the results is presented in **Table 2** below.

Table 2: Laboratory Results Summary - Soil

Parameters	[1] O. Reg. 153/04 Table 3	Sample No.					
		TP-1 S1	TP-1 S2	TP-1 S3	TP-2 S1	TP-2 S2	TP-2 S4
Volatile Organic Compounds							
Benzene	0.4 ug/g	ND	ND	ND	ND	ND	ND
Ethylbenzene	19 ug/g	0.43	0.45	0.10	ND	ND	ND
Toluene	78 ug/g	ND	0.09	ND)	ND	ND	ND
Xylenes, total	30 ug/g	0.34	0.72	0.17	ND	ND	ND
Petroleum Hydrocarbons							
F1 PHCs (C_6-C_{10})	65 ug/g dry	**255**	**310**	**96**	21	13	ND
F2 PHCs (C_{10}-C_{16})	250 ug/g dry	**903**	**378**	**1200**	**303**	**255**	150
F3 PHCs (C_{16}-C_{34})	2500 ug/g dry	117	62	163	59	61	65
F4 PHCs (C_{34}-C_{50})	6600 ug/g dry	ND	ND	ND	ND	ND	ND
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	96 ug/g dry	NA	0.05	NA	NA	0.09	NA
Acenaphthylene	0.15 ug/g dry	NA	0.04	NA	NA	0.04	NA
Anthracene	0.67 ug/g dry	NA	ND	NA	NA	ND	NA
Benzo[a]anthracene	0.96 ug/g dry	NA	ND	NA	NA	ND	NA
Benzo[a]pyrene	0.3 ug/g dry	NA	ND	NA	NA	ND	NA
Benzo[b]fluoranthene	0.96 ug/g dry	NA	ND	NA	NA	ND	NA
Benzo[g,h,i]perylene	9.6 ug/g dry	NA	ND	NA	NA	ND	NA
Benzo[k]fluoranthene	0.96 ug/g dry	NA	ND	NA	NA	ND	NA
Chrysene	9.6 ug/g dry	NA	ND	NA	NA	ND	NA
Dibenzo[a,h]anthracene	0.1 ug/g dry	NA	ND	NA	NA	ND	NA
Fluoranthene	9.6 ug/g dry	NA	0.02	NA	NA	0.02	NA
Fluorene	62 ug/g dry	NA	0.06	NA	NA	0.14	NA
Indeno[1,2,3-cd] pyrene	0.76 ug/g dry	NA	ND	NA	NA	ND	NA
1-Methylnaphthalene	76 ug/g dry	NA	0.11	NA	NA	0.27	NA
2-Methylnaphthalene	76 ug/g dry	NA	0.20	NA	NA	0.08	NA
Methylnaphthalene (1&2)	76 ug/g dry	NA	0.31	NA	NA	0.34	NA
Naphthalene	9.6 ug/g dry	NA	0.03	NA	NA	0.02	NA
Phenanthrene	12 ug/g dry	NA	0.05	NA	NA	0.10	NA
Pyrene	96 ug/g dry	NA	ND	NA	NA	0.02	NA

ND: Non-Detected
NA: Not Analysed
Note: Bold and shaded indicates exceedance to guidelines.
[1] TABLE 3 – Non-Potable Groundwater Conditions - Community Property Use - fine textured soils

The laboratory results revealed that all samples, except TP2 S4, have levels of petroleum hydrocarbons above the applicable guidelines. Although, Sample TP2 S4 meet the applicable guideline, it still showed some levels of petroleum hydrocarbons impacts. Considering that the contaminants falls within the range of PHC F1 to F3 with the majority being in F2 fraction, the source of this contamination likely originated from heating oils. The BTEX levels are low, which would suggest the contamination is old and not recent. Finally, the levels contamination are higher in TP1 versus TP-2, which could suggest that the source is closer. The laboratory "Certificates of Analysis" are attached in **Appendix A**.

6.2 Groundwater

The groundwater samples collected from TP-1 and TP-2 were also submitted to Paracel Laboratories Ltd. for analysis of the same parameters noted for the soil samples – minus PAHs. The laboratory results were also compared with the aforementioned TABLE 3, as referenced for the soil samples. The summary of the results is presented in **Table 3** below, while the laboratory "Certificates of Analysis" are attached in **Appendix B.**

Table 3: Laboratory Results Summary – Groundwater

Parameters	[1] O. Reg. 153/04 Table 3	Sample No.	
		TP-1	TP-2
Volatile Organic Compounds			
Benzene	430 ug/L	ND	ND
Ethylbenzene	2300 ug/L	3.3	ND
Toluene	18000 ug/L	ND	ND
Xylenes, total	4200 ug/L	6.6	ND
Petroleum Hydrocarbons			
F1 PHCs (C_6-C_{10})	750 ug/L	604	574
F2 PHCs (C_{10}-C_{16})	150 ug/L	**7,960**	**281,000**
F3 PHCs (C_{16}-C_{34})	500 ug/L	**1,250**	**40,200**
F4 PHCs (C_{34}-C_{50})	500 ug/L	ND	ND[2]

ND: Non-Detected **Note:** Bold and shaded indicates exceedance to guidelines.
Note: [1] TABLE 3 – Non-Potable Groundwater Conditions - Community Property Use - fine textured soils
[2] Elevated detection limits due to dilution required because of high target analyte concentration. diluted detection limit 1000 ug/L

The laboratory results revealed the groundwater collected in both test pit is highly contaminated with petroleum hydrocarbons – Fractions 2 and 3. The BTEX levels are low to non detectable against suggesting that the contamination is old. The level of contamination in TP-2 is more than a thousand times above the applicable guidelines. In addition, the results also show that

free products (i.e. non-aqueous phase liquid) was identified within both groundwater samples. As with the soil, the laboratory results of groundwater samples would suggest that the petroleum contamination would likely be heating oil.

7 CONCLUSIONS AND RECOMMENDATIONS

Based on the information provided herein, petroleum-based contamination was confirmed within the soil and groundwater at this property. The contamination would be located within the area of the emergency stairs and would likely extend further. The contamination is likely associated with heating oil from a former storage tank located in the vicinity. The full vertical and horizontal extent of the petroleum contamination was not established as it was beyond our mandate for the project.

Based on the findings of this investigation, the following recommendations are provided for the construction of the new emergency stairs as well as future considerations.

1. All soil samples analysed exceeded the applicable provincial guidelines for the site conditions, except for one, which still contained some levels of petroleum contamination. Therefore, it is recommended that all excavated soil within the area of the emergency stairs be treated as contaminated soil and placed in sealed containers to be hauled away to approved landfill facilities.

2. Representative soil samples shall be collected from the excavated soil and submitted for laboratory analysis for a leachate analysis. The parameters to be tested will be determined by the receiving facility.

3. Attempts and efforts should be made to remove all the petroleum impacted soil from the footprint of the new emergency stairs and in a manner that would not compromise the existing foundations of the arena building. This investigation did confirm that the soil contamination have extend below the underside of footing. However, it is not recommended to attempt to remove the petroleum contamination from underneath of the building at this time as it would require shoring techniques and would be very costly.

4. However, any excavations made adjacent to a strip or column footing of the existing building should not extend by more than 0.6m below the underside of the said footing. Furthermore, at no time should more than 1.2m of footing length remain exposed over this depth without providing lateral support or shoring. Refer to geotechnical report for recommendations with regard to structural fill, backfilling and shoring.

5. Any excavation greater than 0.6m below the underside of the footing should not occur without being at an equal distance from the edge of the footing in order to be outside of the loading influence of the said footing.

6. Prior to carrying out any backfilling operations, verification soil samples should be collected to confirm if the petroleum impaired soil was removed or to establish the level of contamination that is being left behind. The depth and location of samples as well as any impediment encountered regarding environmental clean-ups should be properly documented.

7. Any groundwater entering the excavation shall be considered contaminated and should be pumped into an approved and sealed container, which will be emptied by a licensed contractor.

8. A health and safety plan will be prepared by the general contractor working on this project in relation to petroleum impacted soil and groundwater to be encountered within the excavations.

9. Considering that the arena is a public facility owned and operated by the municipality, the Ministry of the Environment, Park and Conservation (MEPC) should be made aware of this petroleum-based contamination as well as potentially the Technical Standard and Safety Authority (TSSA).

10. It is noted that the source of the contamination was not identified, nor has it been confirmed if the storage tank has been removed from the site or is still buried on-site. The extent of the said petroleum soil and groundwater contamination has not been delineated either. Consequently, and at present time, it is impossible to assess the environmental risk associated with this contamination due to these unknowns.

11. It is noted that although some soil and groundwater remediation maybe carried out at the location of the emergency stairs, there still remains a risk of the petroleum hydrocarbon contamination migrating back into this area via the groundwater, and contaminating the material used to backfill the excavation, especially considering the source of the contamination has not been confirmed and it may still be present on site.

8 LIMITATIONS AND USE OF REPORT

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

The findings contained in this report are based on data and information collected during the Limited Phase II ESA of the subject property conducted by Lascelles Engineering & Associates Ltd. The conclusions and recommendations are based solely on in-situ site conditions encountered at the time of our fieldwork carried out on January 29, 2020. No assurance is made regarding changes in conditions subsequent to the time of this investigation. If additional information is discovered or obtained, Lascelles Engineering & Associates Ltd. should be requested to re-evaluate the conclusions presented in this report and to provide amendments as required.

This report is intended for the sole use of the City of Clarence-Rockland, and its authorized agents. Lascelles Engineering & Associates Ltd. will not be responsible for any use of the information contained within this report by any third parties.

In addition, Lascelles Engineering & Associates Ltd. will not be responsible or liable for the real or perceived decrease in the property value, obtaining financing, including direct or consequential financial effects on pending or future property transactions, or the requirements for follow-up actions and costs.

We trust this report provides sufficient information for your present purposes. If you have any questions concerning this report or if we may be of further services to you, please do not hesitate to contact our office.

Yours truly,
Lascelles Engineering & Associates Ltd.

Prepared by:

Shuang Chang, M.A.Sc., P. Eng.

Reviewed by:

Mario Elie, Project Manager

Appendix A

SOILS

Laboratory “Certificate of Analysis”

PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Lascelles Engineering Ltd.

1010 Spence Ave, Unit 1014
Hawkesbury, ON K6A 3H9
Attn: Shuang Chang

Client PO:
Project: 190490
Custody: 51372

Report Date: 5-Feb-2020
Order Date: 31-Jan-2020

Order #: 2005568

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

Paracel ID	Client ID
2005568-01	TP-1 S1
2005568-02	TP-1 S2
2005568-03	TP-1 S3
2005568-04	TP-2 S1
2005568-05	TP-2 S2
2005568-06	TP-2 S4

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 05-Feb-2020

Client: Lascelles Engineering Ltd.

Order Date: 31-Jan-2020

Client PO:

Project Description: 190490

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	3-Feb-20	4-Feb-20
PHC F1	CWS Tier 1 - P&T GC-FID	3-Feb-20	4-Feb-20
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	1-Feb-20	4-Feb-20
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	1-Feb-20	4-Feb-20
Solids, %	Gravimetric, calculation	4-Feb-20	5-Feb-20

Certificate of Analysis

Report Date: 05-Feb-2020

Client: Lascelles Engineering Ltd.

Order Date: 31-Jan-2020

Client PO:

Project Description: 190490

	Client ID:	TP-1 S1	TP-1 S2	TP-1 S3	TP-2 S1
	Sample Date:	29-Jan-20 11:30	29-Jan-20 11:30	29-Jan-20 11:30	29-Jan-20 12:30
	Sample ID:	2005568-01	2005568-02	2005568-03	2005568-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	75.4	79.4	78.0	67.8
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	0.43	0.45	0.10	<0.05
Toluene	0.05 ug/g dry	<0.05	0.09	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	0.34	0.68	0.17	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	0.34	0.72	0.17	<0.05
Toluene-d8	Surrogate	97.3%	99.8%	100%	106%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	255	310	96	21
F2 PHCs (C10-C16)	4 ug/g dry	903	378	1200	303
F3 PHCs (C16-C34)	8 ug/g dry	117	62	163	59
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	<6
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	-	0.05	-	-
Acenaphthylene	0.02 ug/g dry	-	0.04	-	-
Anthracene	0.02 ug/g dry	-	<0.02	-	-
Benzo [a] anthracene	0.02 ug/g dry	-	<0.02	-	-
Benzo [a] pyrene	0.02 ug/g dry	-	<0.02	-	-
Benzo [b] fluoranthene	0.02 ug/g dry	-	<0.02	-	-
Benzo [g,h,i] perylene	0.02 ug/g dry	-	<0.02	-	-
Benzo [k] fluoranthene	0.02 ug/g dry	-	<0.02	-	-
Chrysene	0.02 ug/g dry	-	<0.02	-	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	-	<0.02	-	-
Fluoranthene	0.02 ug/g dry	-	0.02	-	-
Fluorene	0.02 ug/g dry	-	0.06	-	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	-	<0.02	-	-
1-Methylnaphthalene	0.02 ug/g dry	-	0.11	-	-
2-Methylnaphthalene	0.02 ug/g dry	-	0.20	-	-
Methylnaphthalene (1&2)	0.04 ug/g dry	-	0.31	-	-
Naphthalene	0.01 ug/g dry	-	0.03	-	-
Phenanthrene	0.02 ug/g dry	-	0.05	-	-
Pyrene	0.02 ug/g dry	-	<0.02	-	-
2-Fluorobiphenyl	Surrogate	-	52.0%	-	-
Terphenyl-d14	Surrogate	-	65.8%	-	-

Certificate of Analysis

Report Date: 05-Feb-2020

Client: Lascelles Engineering Ltd.

Order Date: 31-Jan-2020

Client PO:

Project Description: 190490

	Client ID:	TP-2 S2	TP-2 S4	-	-
	Sample Date:	29-Jan-20 12:30	29-Jan-20 12:30	-	-
	Sample ID:	2005568-05	2005568-06	-	-
	MDL/Units	Soil	Soil	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	67.0	83.2	-	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	-	-
Toluene	0.05 ug/g dry	<0.05	<0.05	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	-	-
o-Xylene	0.05 ug/g dry	<0.05	<0.05	-	-
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	-	-
Toluene-d8	Surrogate	108%	113%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	13	<7	-	-
F2 PHCs (C10-C16)	4 ug/g dry	255	150	-	-
F3 PHCs (C16-C34)	8 ug/g dry	61	65	-	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	-	-
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	0.09	-	-	-
Acenaphthylene	0.02 ug/g dry	0.04	-	-	-
Anthracene	0.02 ug/g dry	<0.02	-	-	-
Benzo [a] anthracene	0.02 ug/g dry	<0.02	-	-	-
Benzo [a] pyrene	0.02 ug/g dry	<0.02	-	-	-
Benzo [b] fluoranthene	0.02 ug/g dry	<0.02	-	-	-
Benzo [g,h,i] perylene	0.02 ug/g dry	<0.02	-	-	-
Benzo [k] fluoranthene	0.02 ug/g dry	<0.02	-	-	-
Chrysene	0.02 ug/g dry	<0.02	-	-	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	<0.02	-	-	-
Fluoranthene	0.02 ug/g dry	0.02	-	-	-
Fluorene	0.02 ug/g dry	0.14	-	-	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	<0.02	-	-	-
1-Methylnaphthalene	0.02 ug/g dry	0.27	-	-	-
2-Methylnaphthalene	0.02 ug/g dry	0.08	-	-	-
Methylnaphthalene (1&2)	0.04 ug/g dry	0.34	-	-	-
Naphthalene	0.01 ug/g dry	0.02	-	-	-
Phenanthrene	0.02 ug/g dry	0.10	-	-	-
Pyrene	0.02 ug/g dry	0.02	-	-	-
2-Fluorobiphenyl	Surrogate	79.5%	-	-	-

Certificate of Analysis

Report Date: 05-Feb-2020

Client: Lascelles Engineering Ltd.

Order Date: 31-Jan-2020

Client PO:

Project Description: 190490

	Client ID:	TP-2 S2	TP-2 S4	-	-
	Sample Date:	29-Jan-20 12:30	29-Jan-20 12:30	-	-
	Sample ID:	2005568-05	2005568-06	-	-
	MDL/Units	Soil	Soil	-	-
Terphenyl-d14	Surrogate	99.0%	-	-	-

Certificate of Analysis

Report Date: 05-Feb-2020

Client: Lascelles Engineering Ltd.

Order Date: 31-Jan-2020

Client PO:

Project Description: 190490

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						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	*1.09*		*ug/g*		*81.4*	*50-140*			
Surrogate: Terphenyl-d14	*1.37*		*ug/g*		*103*	*50-140*			
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	*3.46*		*ug/g*		*108*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND			NC	40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND			NC	30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND			NC	30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND			NC	30	
Physical Characteristics									
% Solids	56.4	0.1	% by Wt.	55.9			0.89	25	
Semi-Volatiles									
Acenaphthene	6.43	0.40	ug/g dry	5.29			19.50	40	
Acenaphthylene	8.16	0.40	ug/g dry	7.57			7.44	40	
Anthracene	38.8	0.40	ug/g dry	34.6			11.60	40	
Benzo [a] anthracene	58.8	0.40	ug/g dry	52.8			10.70	40	
Benzo [a] pyrene	46.4	0.40	ug/g dry	40.7			13.00	40	
Benzo [b] fluoranthene	53.9	0.40	ug/g dry	45.8			16.40	40	
Benzo [g,h,i] perylene	23.0	0.40	ug/g dry	19.4			17.10	40	
Benzo [k] fluoranthene	31.9	0.40	ug/g dry	26.8			17.20	40	
Chrysene	52.2	0.40	ug/g dry	45.2			14.50	40	
Dibenzo [a,h] anthracene	7.47	0.40	ug/g dry	6.02			21.40	40	
Fluoranthene	135	0.40	ug/g dry	119			13.10	40	
Fluorene	15.2	0.40	ug/g dry	13.1			14.70	40	
Indeno [1,2,3-cd] pyrene	24.1	0.40	ug/g dry	19.3			21.90	40	
1-Methylnaphthalene	2.90	0.40	ug/g dry	2.30			23.00	40	
2-Methylnaphthalene	3.61	0.40	ug/g dry	2.95			20.10	40	
Naphthalene	4.58	0.20	ug/g dry	3.63			23.30	40	
Phenanthrene	115	0.40	ug/g dry	99.1			14.60	40	
Pyrene	98.7	0.40	ug/g dry	85.8			14.00	40	
Surrogate: 2-Fluorobiphenyl	*1.72*		*ug/g dry*		*116*	*50-140*			
Surrogate: Terphenyl-d14	*1.40*		*ug/g dry*		*94.3*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g dry	ND			NC	50	
Ethylbenzene	ND	0.05	ug/g dry	ND			NC	50	
Toluene	ND	0.05	ug/g dry	ND			NC	50	
m,p-Xylenes	ND	0.05	ug/g dry	ND			NC	50	
o-Xylene	ND	0.05	ug/g dry	ND			NC	50	
Surrogate: Toluene-d8	*3.89*		*ug/g dry*		*112*	*50-140*			

Certificate of Analysis

Report Date: 05-Feb-2020

Client: Lascelles Engineering Ltd.

Order Date: 31-Jan-2020

Client PO:

Project Description: 190490

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	223	7	ug/g	ND	112	80-120			
F2 PHCs (C10-C16)	83	4	ug/g	ND	96.0	60-140			
F3 PHCs (C16-C34)	237	8	ug/g	ND	112	60-140			
F4 PHCs (C34-C50)	154	6	ug/g	ND	115	60-140			
Semi-Volatiles									
Acenaphthene	0.175	0.02	ug/g	ND	105	50-140			
Acenaphthylene	0.147	0.02	ug/g	ND	88.4	50-140			
Anthracene	0.135	0.02	ug/g	ND	81.0	50-140			
Benzo [a] anthracene	0.138	0.02	ug/g	ND	83.0	50-140			
Benzo [a] pyrene	0.135	0.02	ug/g	ND	81.3	50-140			
Benzo [b] fluoranthene	0.193	0.02	ug/g	ND	116	50-140			
Benzo [g,h,i] perylene	0.144	0.02	ug/g	ND	86.3	50-140			
Benzo [k] fluoranthene	0.168	0.02	ug/g	ND	101	50-140			
Chrysene	0.176	0.02	ug/g	ND	106	50-140			
Dibenzo [a,h] anthracene	0.143	0.02	ug/g	ND	86.0	50-140			
Fluoranthene	0.152	0.02	ug/g	ND	91.1	50-140			
Fluorene	0.161	0.02	ug/g	ND	96.4	50-140			
Indeno [1,2,3-cd] pyrene	0.140	0.02	ug/g	ND	84.1	50-140			
1-Methylnaphthalene	0.142	0.02	ug/g	ND	84.9	50-140			
2-Methylnaphthalene	0.155	0.02	ug/g	ND	93.1	50-140			
Naphthalene	0.145	0.01	ug/g	ND	86.8	50-140			
Phenanthrene	0.155	0.02	ug/g	ND	93.2	50-140			
Pyrene	0.149	0.02	ug/g	ND	89.7	50-140			
Surrogate: 2-Fluorobiphenyl	*1.29*		*ug/g*		*96.4*	*50-140*			
Surrogate: Terphenyl-d14	*1.60*		*ug/g*		*120*	*50-140*			
Volatiles									
Benzene	2.45	0.02	ug/g	ND	61.2	60-130			
Ethylbenzene	3.95	0.05	ug/g	ND	98.7	60-130			
Toluene	3.65	0.05	ug/g	ND	91.2	60-130			
m,p-Xylenes	7.81	0.05	ug/g	ND	97.6	60-130			
o-Xylene	4.11	0.05	ug/g	ND	103	60-130			
Surrogate: Toluene-d8	*2.85*		*ug/g*		*89.1*	*50-140*			

Qualifier Notes:

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

Appendix B

GROUNDWATER

Laboratory "Certificate of Analysis"

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www.paracellabs.com

Certificate of Analysis

Lascelles Engineering Ltd.

1010 Spence Ave, Unit 1014
Hawkesbury, ON K6A 3H9
Attn: Shuang Chang

Client PO:
Project: 190490
Custody: 51372

Report Date: 6-Feb-2020
Order Date: 31-Jan-2020

Order #: 2005569

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

Paracel ID	Client ID
2005569-01	TP-1
2005569-02	TP-2

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 06-Feb-2020

Client: Lascelles Engineering Ltd.

Order Date: 31-Jan-2020

Client PO:

Project Description: 190490

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	3-Feb-20	3-Feb-20
PHC F1	CWS Tier 1 - P&T GC-FID	3-Feb-20	3-Feb-20
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	4-Feb-20	5-Feb-20

Certificate of Analysis

Report Date: 06-Feb-2020

Client: Lascelles Engineering Ltd.

Order Date: 31-Jan-2020

Client PO:

Project Description: 190490

	Client ID:	TP-1	TP-2	-	-
	Sample Date:	29-Jan-20 11:30	29-Jan-20 11:30	-	-
	Sample ID:	2005569-01	2005569-02	-	-
	MDL/Units	Water	Water	-	-
Volatiles					
Benzene	0.5 ug/L	<0.5	<0.5	-	-
Ethylbenzene	0.5 ug/L	3.3	<0.5	-	-
Toluene	0.5 ug/L	<0.5	<0.5	-	-
m,p-Xylenes	0.5 ug/L	6.6	<0.5	-	-
o-Xylene	0.5 ug/L	<0.5	<0.5	-	-
Xylenes, total	0.5 ug/L	6.6	<0.5	-	-
Toluene-d8	Surrogate	88.2%	87.7%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	604	574	-	-
F2 PHCs (C10-C16)	100 ug/L	7960 [2]	281000 [2]	-	-
F3 PHCs (C16-C34)	100 ug/L	1250 [2]	40200 [2]	-	-
F4 PHCs (C34-C50)	100 ug/L	<100 [2]	<1000 [1] [2]	-	-

Certificate of Analysis

Report Date: 06-Feb-2020

Client: Lascelles Engineering Ltd.

Order Date: 31-Jan-2020

Client PO:

Project Description: 190490

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	*80.9*		*ug/L*		*101*	*50-140*			

Certificate of Analysis

Report Date: 06-Feb-2020

Client: Lascelles Engineering Ltd.

Order Date: 31-Jan-2020

Client PO:

Project Description: 190490

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	586	25	ug/L	604			3.03	30	
Volatiles									
Benzene	ND	0.5	ug/L	ND			NC	30	
Ethylbenzene	3.38	0.5	ug/L	3.26			3.61	30	
Toluene	ND	0.5	ug/L	ND			NC	30	
m,p-Xylenes	6.92	0.5	ug/L	6.59			4.89	30	
o-Xylene	ND	0.5	ug/L	ND			NC	30	
Surrogate: Toluene-d8	*71.4*		*ug/L*		*89.2*	*50-140*			

Certificate of Analysis

Report Date: 06-Feb-2020

Client: Lascelles Engineering Ltd.

Order Date: 31-Jan-2020

Client PO:

Project Description: 190490

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1950	25	ug/L	ND	97.7	68-117			
F2 PHCs (C10-C16)	1370	100	ug/L	ND	85.9	60-140			
F3 PHCs (C16-C34)	3540	100	ug/L	ND	90.2	60-140			
F4 PHCs (C34-C50)	1900	100	ug/L	ND	76.7	60-140			
Volatiles									
Benzene	27.4	0.5	ug/L	ND	68.6	60-130			
Ethylbenzene	41.8	0.5	ug/L	ND	105	60-130			
Toluene	32.5	0.5	ug/L	ND	81.3	60-130			
m,p-Xylenes	82.8	0.5	ug/L	ND	103	60-130			
o-Xylene	41.9	0.5	ug/L	ND	105	60-130			
Surrogate: Toluene-d8	*63.9*		*ug/L*		*79.8*	*50-140*			

Qualifier Notes:

Sample Qualifiers :

1 : Elevated detection limit due to dilution required because of high target analyte concentration.

2 : Free product was observed in the sample container.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

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