September 17th, 2014 **Transmission via email**

Mr. Geoffroy Lécureur, ing.
Principal Director – Iqaluit Projet
2700 Jean-Perrin, local 350
Québec (Québec) G2C 1S9
T : 418 527-5643
C : 418 254-3043

Re: Characterisation of Soil Lay Down Area Next to Apron, Iqaluit Airport, Iqaluit, Nu

Mr. Lécureur,

You will find below the report on the characterisation of the soil lay down area that was used for hydrocarbon and arsenic impacted soils next the apron at the Iqaluit Airport.

1. Context

Hydrocarbon impacted soils from the Iqaluit Airport Land Farm Treatment Units 1 & 2 and TP-24, along with arsenic impacted soils from TP-15, were placed next to the apron to be used as intermediate fill under the apron extension. The TP numbers refer to locations identified by CRA in their Pre-Existing Contamination Management Plan dated January 2014.

2. Soil Characterization

The fieldwork included composite confirmatory sampling at the locations illustrated in Figure 1 (attached).

All sub-samples were collected by hand by Mr. Pierre Jomphe of QE. Test pits were excavated using a trowel to a depth of 6" to 12" below the surface.

Soil sampling was conducted in accordance with the procedures outlined in the MDDELCC's *Guide d'échantillonnage, Cahier 5*[(1)].

Sub-samples were collected in a Ziploc bag for homogenization. The homogenized soils were then transferred to sample jars provided by the laboratory. Latex gloves were worn during all sampling activities and gloves were changed between each test pit. A new Ziploc bag was used for each sample. The trowel was cleaned between each sample.

3. Cleaning of Sampling and Measuring Instruments

New disposable sampling equipment (Ziploc bags, latex gloves) was used for each sample collected. The trowel used for collecting the samples was covered with a new disposal plastic bag for each new sample collected to prevent cross contamination.

(1) *Guide d'échantillonnage à des fins d'analyses environnementales*, ministère du Développement durable, de l'Environnement et des Parcs du Québec, 2008. Cahier 5 : *Échantillonnage des sols,* revised 2010.

4. Sample Containers and Sample Conservation

All samples collected were placed in containers (jars and bottles) provided by the analytical laboratory. All samples were labeled and stored in coolers with ice packs also provided by the laboratory in order to maintain them at a temperature of approximately 4°C until delivery to the laboratory. Samples were stored in a walk-in cooler located at QE's hazardous waste transfer centre. Samples were shipped via First Air Cargo to Ottawa where they were collected by Exova. First Air had instructions to keep the cooler containing the samples refrigerated during transport but not to allow the cooler to freeze.

All container types and conservation and transport methods for samples were selected in accordance with the requirements of the laboratory.

5. Laboratory Analyses

5.1 Analytical Program

The analytical program of the Complementary Characterization was based on the parameters of concern identified in the soils, namely petroleum hydrocarbon (F1-F4) and arsenic. The laboratory used for the soil analysis was Exova in Ottawa.

Soil samples collected during the characterization work were delivered to Exova via air cargo. Exova is accredited by The Canadian Association for Laboratory Accreditation Inc. (CALA) for all the analyses performed and certificates of accreditation are available upon request. Furthermore, the analytical reports received are verified and signed by a member of the Association of the Chemical Profession of Ontario.

The samples selected were analyzed using the Canadian Council of Ministers of the Environment (CCME) prescribed method. The detection limits associated with each parameter analyzed are presented in Table 1.

TABLE 1: Analytical Program and Detection Methods

Matrix	Analysis	Method	Detection Limit	
Soil	F1 (C6-C10)	CCME	10	mg/kg
	F2 (C10-C16)	CCME	10	mg/kg
	F3 (C16-C34)	CCME	20	mg/kg
	F4 (C34-C50)	CCME	20	mg/kg
	Arsenic	CCME	1	mg/kg

A total of 20 soil samples were selected for laboratory analysis for each parameter.

5.2 QA/QC program

All projects completed by QE include a QA/QC program in order to verify the reliability, precision and accuracy of the fieldwork analytical results.

5.2.1 Onsite

Several precautions were taken during the course of the fieldwork in order to minimize the risk of contamination from equipment and sampling instruments and to ensure effective and representative sampling. The precautions taken, particularly during collection, transport, identification and conservation of samples, included:

- Application of standardized work procedures through ongoing training of field technicians on the various standardized methods of sample collection and management;
- Supervision of employees by management;
- Calibration of each measurement instruments according to manufacturer specifications both before and during field work;
- Use of disposable latex gloves for each sample collected;
- Adequate cleaning of equipment, containers and sampling instruments before collecting each sample;
- Careful use and protection of the appropriate sampling containers and measuring instruments during sample collection, transport and conservation;
- Accurate identification and labeling of all samples shipped to the laboratory accompanied by a completed and signed chain of custody form;
- Shipping of samples to the laboratory as promptly as possible;
- Conservation and storage of samples according to the standardized methods and best practises.

No field blanks were used during the soil sampling because no significant external sources of contamination (dust, atmospheric emissions, VOCs etc.) were identified on the Site in the vicinity of the sampling locations. No trip blanks were used as all samples were conserved in hermetically sealed containers during their transport between the Site and the laboratory.

5.2.2 At the Laboratory

Exova applies its own QA/QC in accordance with CALA requirements in order to provide analytical results of the highest possible quality and reliability. This program includes, among others, the following elements:

- Laboratory blank;
- Laboratory duplicate;
- Control/reference samples;
- Certified reference materials;
- Sample spiking;
- Surrogates (organics).

A summary of the laboratory's internal QA/QC program is available upon request.

6. Results

The analytical results of the soil samples collected are summarized in Table 2 below. The complete analytical certificates are available as an attachment.

TABLE 2: Analytical Results Hydrocarbon Impacted Soils

Parameter	Criteria (mg/kg)	Sample ID and Result (mg/kg)																				
		F1	F2	F3	F4	F5	F7	F8	P1	P2	P2-B	P3	P4	P5	P6	P7	P8	P9	P13	P14	P15	P16
F1 (C6-C10)	320	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
F2 (C10-C16)	260	180	100	<10	<10	<10	80	150	80	10	20	20	10	100	50	90	110	20	120	140	110	150
F3 (C16-C34)	1 700	260	320	<20	<20	<20	250	450	190	<20	50	130	50	180	120	190	210	60	250	580	360	520
F4 (C34-C50)	3 300	140	370	<20	<20	<20	200	300	150	<20	30	100	<20	110	80	130	90	<20	260	420	270	380

TABLE 3: Analytical Results Arsenic Impacted Soils

Parameter	Criteria (mg/kg)	Sample ID and Result (mg/kg)			
		F6	P10	P11	P12
Arsenic	12	<1	<1	<1	<1

The analytical results were compared to the CCME's *Soil Quality Guidelines for the Protection of Environmental and Human Health* and the Government of Nunavut's Department of Environment's *Environmental Guideline for Contaminated Site Remediation* quality criteria for residential/parkland land use and coarse-grained soil.

The locations of the sampling points are illustrated in Figure 1 attached.

7. Conclusions

The results indicate that all of the impacted soils have been removed from the lay down area. The walls of the excavated areas are also below criteria.

Prepared by:

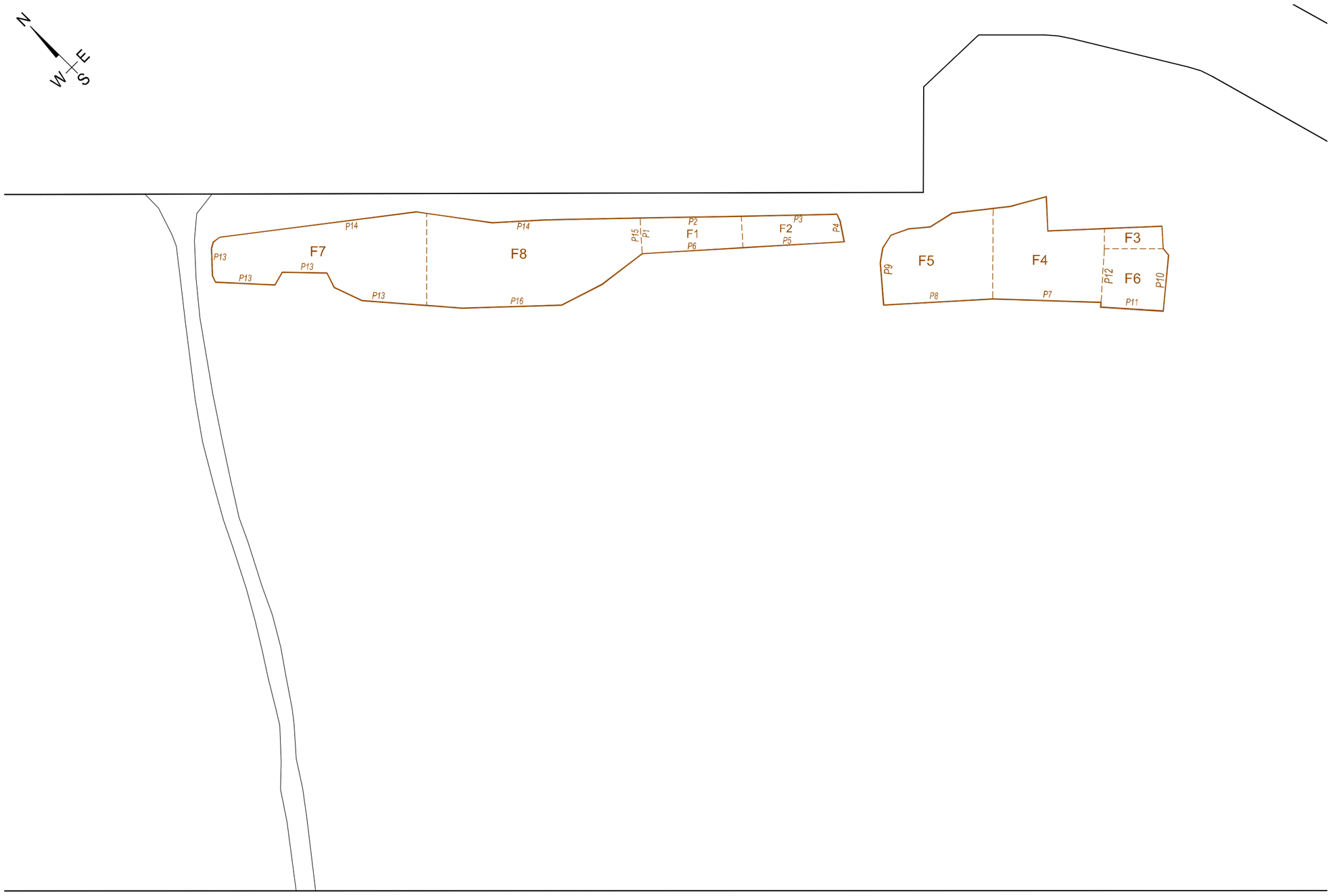
Greg Johnson, P.Eng.

Verified by:

Jan Wollenberg

Attachments:

- Figure 1 : Sampling Point Locations
- Laboratory analysis certificates (Exova)



This document shall not be used for construction, building or installation purposes.

Legend

Excavation Limit (QE, September 2014)

Note:
P14 not continous over entire length (discontinous wall sections)

Source :
• QE; Excavation limit is based on field measurements; September 2014;

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Figure 1

Site Plan and Sampling Point Locations

CHARACTERIZATION OF SOIL LAYDOWN AREA NEXT TO APRON

Presented to:

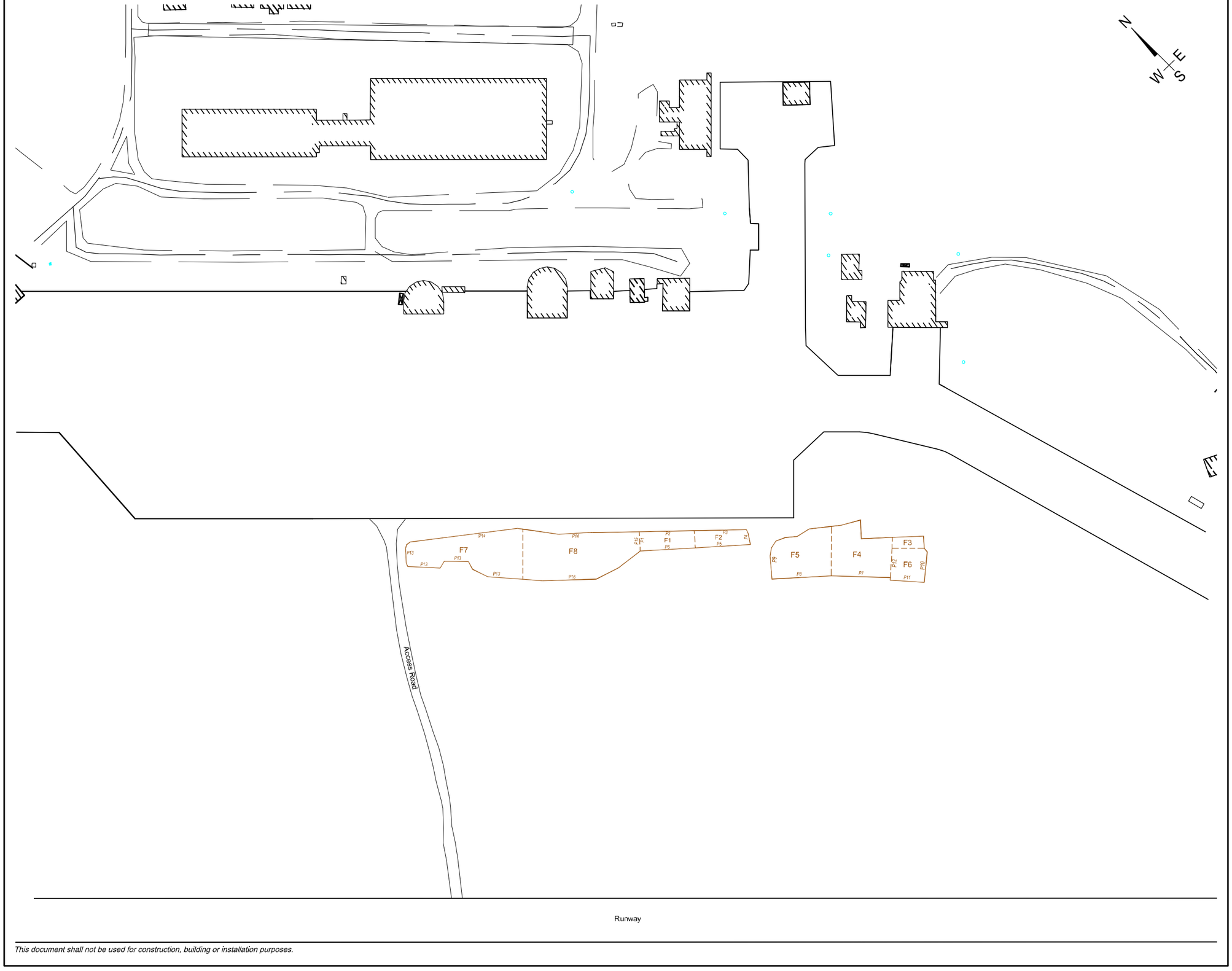
sintra INC.

Property located at:

Iqaluit Airport, Nunavut

Scale:	Design date:		Revision date:
Not to scale	2014-09-16		2014-09-16
Drawn by:	Verified by:		Approved by:
H. Longval	G. Johnson		S. Laberge
Project no.:	Drawing no.:	Layout:	Geodetic reference:
QE14-214-8	QE14-214-8-04	A	MTM/NAD83 Zone 19

Qikiqtaaluk environmental



Legend

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Source :
• QE; Excavation limit is based on field measurements; September 2014;

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Figure 2

Site Plan

CHARACTERIZATION OF SOIL LAYDOWN AREA NEXT TO APRON

Presented to:

sintra INC.

Property located at:

Iqaluit Airport, Nunavut

Scale:	Design date:	Revision date:
Not to scale	2014-09-16	2014-09-18
Drawn by:	Verified by:	Approved by:
H. Longval	G. Johnson	S. Laberge
Project no.:	Drawing no.: / Layout:	Geodetic reference:
QE14-214-8	QE14-214-8-04 / B	None / None

Qikiqtaaluk environmental

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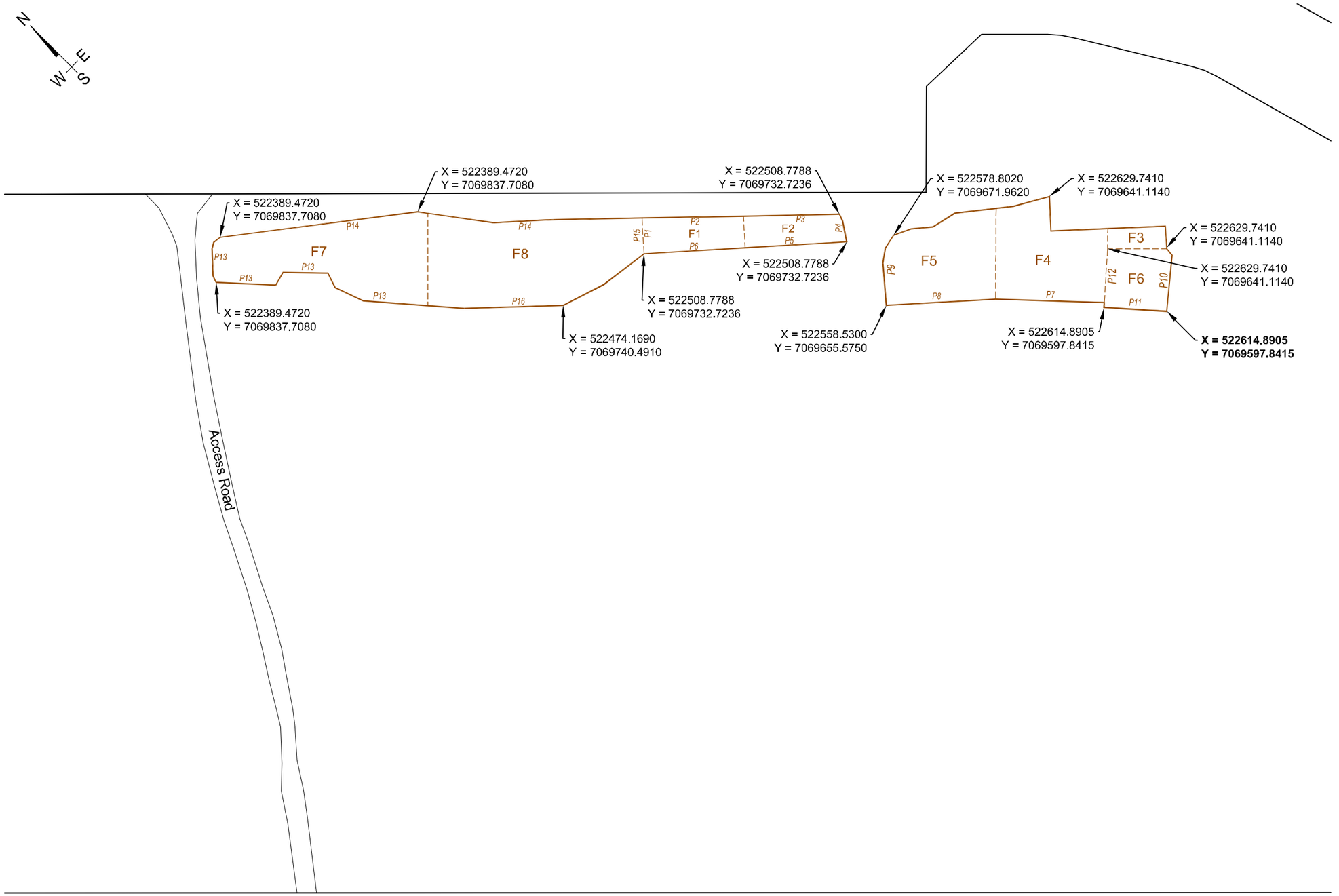

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Excavation Limit (QE, September 2014)

Note:
P14 not continous over entire length (discontinous wall sections)

Source :
- *QE; Excavation limit is based on field measurements; September 2014;*

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Figure 3

Coordonates

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Not to scale	2014-09-16		2014-09-16	
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H. Longval	G. Johnson		S. Laberge	
Project no.:	Drawing no.:	Layout:	Geodetic reference:	
QE14-214-8	QE14-214-8-04	C	MTM/NAD83	Zone 19

Qikiqtaaluk environmental

EXOVA ENVIRONMENTAL ONTARIO

Certificate of Analysis

Client: Qikiytaaluk Enviromental
9935 Av de Catania, Entrance 1 , Suite 200
Brossard, QC
J4X 3V4
Attention: Mr. Greg Johnson
PO#: RQ11-105
Invoice to: Qikiytaaluk Enviromental

Report Number: 1419581
Date Submitted: 2014-09-12
Date Reported: 2014-09-15
Project: QE14-2148
COC #: 789642

Dear Greg Johnson:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).

Report Comments:

APPROVAL: _____

Charlie (Long) Qu
Laboratory Supervisor, Organics

Exova (Ottawa) is certified and accredited for specific parameters by:
CALA, Canadian Association for Laboratory Accreditation (to ISO 17025), OMAFRA, Ontario Ministry of Agriculture, Food and Rural Affairs (for farm soils), Licensed by Ontario MOE for specific tests in drinking water.

Exova (Mississauga) is accredited for specific parameters by:
SCC, Standards Council of Canada (to ISO 17025)

Please note: Field data, where presented on the report, has been provided by the client and is presented for informational purposes only.

Guideline values listed on this report are provided for ease of use (informational purposes) only. Exova recommends consulting the official provincial or federal guideline as required.

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Group	Analyte	MRL	Units	Guideline	Lab I.D. / Sample Matrix / Sample Type / Sampling Date / Sample I.D.			
					1133047 Soil 2014-09-03 F1	1133048 Soil 2014-09-04 F2	1133049 Soil 2014-09-06 F3	1133050 Soil 2014-09-06 F4
General Chemistry	Moisture	0.1	%		8.2	4.0	0.8	1.5
Hydrocarbons	F1 (C6-C10)	10	ug/g		<10	<10	<10	<10
	F1-BTEX (C6-C10)	10	ug/g		<10	<10	<10	<10
	F2 (C10-C16)	10	ug/g		180	100	<10	<10
	F3 (C16-C34)	20	ug/g		260	320	<20	<20
	F4 (C34-C50)	20	ug/g		140	370	<20	<20
VOCs	Benzene	0.02	ug/g		<0.02	<0.02	<0.02	<0.02
	Ethylbenzene	0.05	ug/g		<0.05	<0.05	<0.05	<0.05
	m/p-xylene	0.05	ug/g		<0.05	<0.05	<0.05	<0.05
	o-xylene	0.05	ug/g		<0.05	<0.05	<0.05	<0.05
	Toluene	0.20	ug/g		<0.20	<0.20	<0.20	<0.20
	Xylene; total	0.05	ug/g		<0.05	<0.05	<0.05	<0.05
VOCs Surrogates (%	Toluene-d8	0	%		102	105	103	101

Group	Analyte	MRL	Units	Guideline	Lab I.D. / Sample Matrix / Sample Type / Sampling Date / Sample I.D.			
					1133051 Soil 2014-09-06 F5	1133052 Soil 2014-09-06 F6	1133053 Soil 2014-09-09 F7	1133054 Soil 2014-09-09 F8
General Chemistry	Moisture	0.1	%		1.4		2.4	6.7
Hydrocarbons	F1 (C6-C10)	10	ug/g		<10		<10	<10
	F1-BTEX (C6-C10)	10	ug/g		<10		<10	<10
	F2 (C10-C16)	10	ug/g		<10		80	150
	F3 (C16-C34)	20	ug/g		<20		250	450
	F4 (C34-C50)	20	ug/g		<20		200	300

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Certificate of Analysis

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9935 Av de Catania, Entrance 1 , Suite 200
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J4X 3V4
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COC #: 789642

Group	Analyte	MRL	Units	Guideline	Lab I.D. / Sample Matrix / Sample Type / Sampling Date / Sample I.D.			
					1133051 Soil 2014-09-06 F5	1133052 Soil 2014-09-06 F6	1133053 Soil 2014-09-09 F7	1133054 Soil 2014-09-09 F8
Metals	As	1	ug/g			<1		
VOCs	Benzene	0.02	ug/g		<0.02		<0.02	<0.02
	Ethylbenzene	0.05	ug/g		<0.05		<0.05	<0.05
	m/p-xylene	0.05	ug/g		<0.05		<0.05	<0.05
	o-xylene	0.05	ug/g		<0.05		<0.05	<0.05
	Toluene	0.20	ug/g		<0.20		<0.20	<0.20
	Xylene; total	0.05	ug/g		<0.05		<0.05	<0.05
VOCs Surrogates (%	Toluene-d8	0	%		102		108	107

Group	Analyte	MRL	Units	Guideline	Lab I.D. / Sample Matrix / Sample Type / Sampling Date / Sample I.D.			
					1133055 Soil 2014-09-03 P1	1133056 Soil 2014-09-03 P2	1133057 Soil 2014-09-03 P3	1133058 Soil 2014-09-03 P4
General Chemistry	Moisture	0.1	%		6.5	5.0	3.9	4.9
Hydrocarbons	F1 (C6-C10)	10	ug/g		<10	<10	<10	<10
	F1-BTEX (C6-C10)	10	ug/g		<10	<10	<10	<10
	F2 (C10-C16)	10	ug/g		80	10	20	10
	F3 (C16-C34)	20	ug/g		190	<20	130	50
	F4 (C34-C50)	20	ug/g		150	<20	100	<20
VOCs	Benzene	0.02	ug/g		<0.02	<0.02	<0.02	<0.02
	Ethylbenzene	0.05	ug/g		<0.05	<0.05	<0.05	<0.05
	m/p-xylene	0.05	ug/g		<0.05	<0.05	<0.05	<0.05
	o-xylene	0.05	ug/g		<0.05	<0.05	<0.05	<0.05
	Toluene	0.20	ug/g		<0.20	<0.20	<0.20	<0.20

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Group	Analyte	MRL	Units	Guideline	Lab I.D. / Sample Matrix / Sample Type / Sampling Date / Sample I.D.			
					1133055 Soil 2014-09-03 P1	1133056 Soil 2014-09-03 P2	1133057 Soil 2014-09-03 P3	1133058 Soil 2014-09-03 P4
VOCs	Xylene; total	0.05	ug/g		<0.05	<0.05	<0.05	<0.05
VOCs Surrogates (%	Toluene-d8	0	%		106	105	107	111

Group	Analyte	MRL	Units	Guideline	Lab I.D. / Sample Matrix / Sample Type / Sampling Date / Sample I.D.			
					1133059 Soil 2014-09-03 P5	1133060 Soil 2014-09-03 P6	1133061 Soil 2014-09-06 P7	1133062 Soil 2014-09-06 P8
General Chemistry	Moisture	0.1	%		6.1	6.2	5.6	5.4
Hydrocarbons	F1 (C6-C10)	10	ug/g		<10	<10	<10	<10
	F1-BTEX (C6-C10)	10	ug/g		<10	<10	<10	<10
	F2 (C10-C16)	10	ug/g		100	50	90	110
	F3 (C16-C34)	20	ug/g		180	120	190	210
	F4 (C34-C50)	20	ug/g		110	80	130	90
VOCs	Benzene	0.02	ug/g		<0.02	<0.02	<0.02	<0.02
	Ethylbenzene	0.05	ug/g		<0.05	<0.05	<0.05	<0.05
	m/p-xylene	0.05	ug/g		<0.05	<0.05	<0.05	<0.05
	o-xylene	0.05	ug/g		<0.05	<0.05	<0.05	<0.05
	Toluene	0.20	ug/g		<0.20	<0.20	<0.20	<0.20
	Xylene; total	0.05	ug/g		<0.05	<0.05	<0.05	<0.05
VOCs Surrogates (%	Toluene-d8	0	%		102	108	101	105

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Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1133063 Soil 2014-09-06 P9	1133064 Soil 2014-09-06 P10	1133065 Soil 2014-09-06 P11	1133066 Soil 2014-09-06 P12
General Chemistry	Moisture	0.1	%			1.8			
Hydrocarbons	F1 (C6-C10)	10	ug/g			<10			
	F1-BTEX (C6-C10)	10	ug/g			<10			
	F2 (C10-C16)	10	ug/g			20			
	F3 (C16-C34)	20	ug/g			60			
	F4 (C34-C50)	20	ug/g			<20			
Metals	As	1	ug/g				<1	<1	<1
VOCs	Benzene	0.02	ug/g			<0.02			
	Ethylbenzene	0.05	ug/g			<0.05			
	m/p-xylene	0.05	ug/g			<0.05			
	o-xylene	0.05	ug/g			<0.05			
	Toluene	0.20	ug/g			<0.20			
	Xylene; total	0.05	ug/g			<0.05			
VOCs Surrogates (%	Toluene-d8	0	%			104			

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Group	Analyte	MRL	Units	Guideline	Lab I.D. / Sample Matrix / Sample Type / Sampling Date / Sample I.D.			
					1133067 Soil 2014-09-09 P13	1133068 Soil 2014-09-09 P14	1133069 Soil 2014-09-09 P15	1133070 Soil 2014-09-09 P16
General Chemistry	Moisture	0.1	%		3.0	3.6	6.8	5.2
Hydrocarbons	F1 (C6-C10)	10	ug/g		<10	<10	<10	<10
	F1-BTEX (C6-C10)	10	ug/g		<10	<10	<10	<10
	F2 (C10-C16)	10	ug/g		120	140	110	150
	F3 (C16-C34)	20	ug/g		250	580	360	520
	F4 (C34-C50)	20	ug/g		260	420	270	380
VOCs	Benzene	0.02	ug/g		<0.02	<0.02	<0.02	<0.02
	Ethylbenzene	0.05	ug/g		<0.05	<0.05	<0.05	<0.05
	m/p-xylene	0.05	ug/g		<0.05	<0.05	<0.05	<0.05
	o-xylene	0.05	ug/g		<0.05	<0.05	<0.05	<0.05
	Toluene	0.20	ug/g		<0.20	<0.20	<0.20	<0.20
	Xylene; total	0.05	ug/g		<0.05	<0.05	<0.05	<0.05
VOCs Surrogates (%	Toluene-d8	0	%		108	104	103	104

Group	Analyte	MRL	Units	Guideline	Lab I.D. / Sample Matrix / Sample Type / Sampling Date / Sample I.D.
					1133071 Soil 2014-09-03 P2-B
General Chemistry	Moisture	0.1	%		4.0
Hydrocarbons	F1 (C6-C10)	10	ug/g		<10
	F1-BTEX (C6-C10)	10	ug/g		<10
	F2 (C10-C16)	10	ug/g		20
	F3 (C16-C34)	20	ug/g		50
	F4 (C34-C50)	20	ug/g		30

Guideline = *** = Guideline Exceedence**
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MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

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9935 Av de Catania, Entrance 1 , Suite 200
Brossard, QC
J4X 3V4
Attention: Mr. Greg Johnson
PO#: RQ11-105
Invoice to: Qikiytaaluk Enviromental

Report Number: 1419581
Date Submitted: 2014-09-12
Date Reported: 2014-09-15
Project: QE14-2148
COC #: 789642

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
					1133071 Soil 2014-09-03 P2-B
VOCs	Benzene	0.02	ug/g		<0.02
	Ethylbenzene	0.05	ug/g		<0.05
	m/p-xylene	0.05	ug/g		<0.05
	o-xylene	0.05	ug/g		<0.05
	Toluene	0.20	ug/g		<0.20
	Xylene; total	0.05	ug/g		<0.05
VOCs Surrogates (%	Toluene-d8	0	%		101

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QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 276145 **Analysis Date** 2014-09-12 **Method** CCME			
F1 (C6-C10)	<10 ug/g	97	80-120
Run No 276148 **Analysis Date** 2014-09-13 **Method** CCME			
F1 (C6-C10)	<10 ug/g	96	80-120
F1-BTEX (C6-C10)			
Run No 276149 **Analysis Date** 2014-09-12 **Method** V 8260B			
Benzene	<0.02 ug/g	91	80-120
Ethylbenzene	<0.05 ug/g	92	80-120
m/p-xylene	<0.05 ug/g	94	80-120
o-xylene	<0.05 ug/g	95	80-120
Toluene	<0.20 ug/g	93	80-120
Toluene-d8	118 %	106	
Xylene; total			
Run No 276151 **Analysis Date** 2014-09-13 **Method** C SM2540B			
Moisture	<0.1 %	100	80-120

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QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 276156 **Analysis Date** 2014-09-13 **Method** CCME			
F2 (C10-C16)	<10 ug/g	102	50-120
F3 (C16-C34)	<20 ug/g	102	50-120
F4 (C34-C50)	<20 ug/g	102	50-120
Run No 276208 **Analysis Date** 2014-09-15 **Method** EPA 200.8			
As	<1 ug/g	99	70-130

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