Bottom Ash Data

2022 Week 45

The following analytical report represents bottom ash composite results for week 45 of 2022 (November 6, 2022 to November 12, 2022).

The bottom ash meets the conditions of Metro Vancouver's 2020 Bottom Ash Management Plan and is suitable for disposal.

CERTIFICATE OF ANALYSIS

Work Order	: **VA22C7647**	Page	: 1 of 11
Client	: **Covanta Burnaby Renewable Energy, ULC**	Laboratory	: Vancouver - Environmental
Contact	: Nicole Victor	Account Manager	: Brent Mack
Address	: 5150 Riverbend Drive Burnaby BC Canada V3N 4V3	Address	: 8081 Lougheed Highway Burnaby BC Canada V5A 1W9
Telephone	: ----	Telephone	: 778-370-3279
Project	: Weekly Bottom Ash - Suite	Date Samples Received	: 15-Nov-2022 12:10
PO	: VANCO 0000051213	Date Analysis Commenced	: 16-Nov-2022
C-O-C number	: ----	Issue Date	: 21-Nov-2022 11:00
Sampler	: ----		
Site	: (includes 2:1 pH)		
Quote number	: Standing Offer (BC work)		
No. of samples received	: 12		
No. of samples analysed	: 12		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Alex Thornton	Analyst	Metals, Burnaby, British Columbia
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Organics, Burnaby, British Columbia
Ophelia Chiu	Department Manager - Organics	Organics, Burnaby, British Columbia
Owen Cheng		Metals, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances

LOR: Limit of Reporting (detection limit).

Unit	*Description*
%	percent
mg/kg	milligrams per kilogram
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical Results

Sub-Matrix: Soil/Solid
(Matrix: Soil/Solid)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	BA2245-A-1	BA2245-A-2	BA2245-A-3	BA2245-A-4	BA2245-A-5
					Client sampling date / time	09-Nov-2022 09:00	09-Nov-2022 09:00	09-Nov-2022 09:00	09-Nov-2022 09:00	09-Nov-2022 09:00
						VA22C7647-001	VA22C7647-002	VA22C7647-003	VA22C7647-004	VA22C7647-005
						Result	Result	Result	Result	Result
Physical Tests										
moisture	----	E144	0.25	%		24.5	23.6	24.4	21.9	21.8
pH (1:2 soil:water)	----	E108	0.10	pH units		11.0	11.1	11.0	11.1	10.9
Metals										
aluminum	7429-90-5	E440	50	mg/kg		39600	41700	40800	52300	58300
antimony	7440-36-0	E440	0.10	mg/kg		76.4	71.8	71.9	82.2	73.4
arsenic	7440-38-2	E440	0.10	mg/kg		19.6	18.5	14.8	18.1	18.3
barium	7440-39-3	E440	0.50	mg/kg		557	632	669	667	688
beryllium	7440-41-7	E440	0.10	mg/kg		0.27	0.26	0.31	0.34	0.33
bismuth	7440-69-9	E440	0.20	mg/kg		6.22	6.02	33.2	6.81	13.9
boron	7440-42-8	E440	5.0	mg/kg		154	125	154	169	162
cadmium	7440-43-9	E440	0.020	mg/kg		6.09	5.73	6.84	6.54	17.6
calcium	7440-70-2	E440	50	mg/kg		124000	117000	112000	126000	126000
chromium	7440-47-3	E440	0.50	mg/kg		121	6080	472	185	174
cobalt	7440-48-4	E440	0.10	mg/kg		43.5	175	166	131	62.0
copper	7440-50-8	E440	0.50	mg/kg		3470	7590	3000	6300	1520
iron	7439-89-6	E440	50	mg/kg		45100	87400	50700	75500	75300
lead	7439-92-1	E440	0.50	mg/kg		386	302	3200	294	318
lithium	7439-93-2	E440	2.0	mg/kg		21.8	18.6	21.3	21.0	19.4
magnesium	7439-95-4	E440	20	mg/kg		10200	11900	9290	11900	9440
manganese	7439-96-5	E440	1.0	mg/kg		694	1570	694	1000	988
mercury	7439-97-6	E510	0.0500	mg/kg		<0.0500	<0.0500	0.0662	<0.0500	<0.0500
molybdenum	7439-98-7	E440	0.10	mg/kg		17.0	751	21.3	37.9	22.1
nickel	7440-02-0	E440	0.50	mg/kg		108	5020	463	162	100
phosphorus	7723-14-0	E440	50	mg/kg		12100	9660	9090	10500	11300
potassium	7440-09-7	E440	100	mg/kg		4330	3950	3850	4260	4290
selenium	7782-49-2	E440	0.20	mg/kg		0.20	0.27	0.33	0.27	0.24
silver	7440-22-4	E440.Ag	0.10	mg/kg		----	----	6.14	7.31	----
silver	7440-22-4	E440	0.10	mg/kg		4.88	8.85	----	----	5.18
sodium	7440-23-5	E440	50	mg/kg		14600	14100	12500	14800	14500

Analytical Results

Sub-Matrix: Soil/Solid
(Matrix: Soil/Solid)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	BA2245-A-1	BA2245-A-2	BA2245-A-3	BA2245-A-4	BA2245-A-5
					Client sampling date / time	09-Nov-2022 09:00	09-Nov-2022 09:00	09-Nov-2022 09:00	09-Nov-2022 09:00	09-Nov-2022 09:00
						VA22C7647-001	VA22C7647-002	VA22C7647-003	VA22C7647-004	VA22C7647-005
						Result	Result	Result	Result	Result
Metals										
strontium	7440-24-6	E440	0.50	mg/kg		259	255	245	263	263
sulfur	7704-34-9	E440	1000	mg/kg		8600	7700	7700	8100	9200
thallium	7440-28-0	E440	0.050	mg/kg		<0.050	<0.050	0.093	<0.050	<0.050
tin	7440-31-5	E440	2.0	mg/kg		277	116	81.2	111	85.8
titanium	7440-32-6	E440	1.0	mg/kg		279	589	806	414	684
tungsten	7440-33-7	E440	0.50	mg/kg		35.4	75.2	208	34.8	40.4
uranium	7440-61-1	E440	0.050	mg/kg		1.98	1.99	1.79	2.15	2.00
vanadium	7440-62-2	E440	0.20	mg/kg		34.4	60.8	35.9	42.8	34.2
zinc	7440-66-6	E440	2.0	mg/kg		3760	6070	9940	2760	3090
zirconium	7440-67-7	E440	1.0	mg/kg		3.0	2.7	2.3	4.3	3.5
TCLP Metals										
pH, TCLP 1st preliminary	----	EPP444	0.010	pH units		11.5	11.5	11.5	11.5	11.5
pH, TCLP 2nd preliminary	----	EPP444	0.010	pH units		7.56	6.81	7.51	8.25	7.52
pH, TCLP extraction fluid initial	----	EPP444	0.010	pH units		2.88	2.88	2.88	2.88	2.88
pH, TCLP final	----	EPP444	0.010	pH units		6.55	6.28	6.23	6.17	6.20
antimony, TCLP	7440-36-0	E444	1.00	mg/L		<1.00	<1.00	<1.00	<1.00	<1.00
arsenic, TCLP	7440-38-2	E444	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
barium, TCLP	7440-39-3	E444	2.5	mg/L		<2.5	<2.5	<2.5	<2.5	<2.5
beryllium, TCLP	7440-41-7	E444	0.025	mg/L		<0.025	<0.025	<0.025	<0.025	<0.025
boron, TCLP	7440-42-8	E444	0.50	mg/L		2.02	1.95	1.99	2.22	2.00
cadmium, TCLP	7440-43-9	E444	0.050	mg/L		0.097	0.185	0.089	0.130	0.175
calcium, TCLP	7440-70-2	E444	10	mg/L		1850	1850	1830	1840	1860
chromium, TCLP	7440-47-3	E444	0.25	mg/L		<0.25	<0.25	<0.25	<0.25	<0.25
cobalt, TCLP	7440-48-4	E444	0.050	mg/L		1.29	0.921	1.36	1.29	1.11
copper, TCLP	7440-50-8	E444	0.050	mg/L		0.127	0.690	0.897	0.812	0.833
iron, TCLP	7439-89-6	E444	5.0	mg/L		<5.0	<5.0	<5.0	<5.0	<5.0
lead, TCLP	7439-92-1	E444	0.25	mg/L		<0.25	<0.25	<0.25	<0.25	<0.25
magnesium, TCLP	7439-95-4	E444	2.5	mg/L		120	126	123	123	121
mercury, TCLP	7439-97-6	E512	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
nickel, TCLP	7440-02-0	E444	0.25	mg/L		1.03	0.56	0.72	0.56	0.51

Analytical Results

Sub-Matrix: **Soil/Solid**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	BA2245-A-1	BA2245-A-2	BA2245-A-3	BA2245-A-4	BA2245-A-5
					Client sampling date / time	09-Nov-2022 09:00	09-Nov-2022 09:00	09-Nov-2022 09:00	09-Nov-2022 09:00	09-Nov-2022 09:00
						VA22C7647-001	VA22C7647-002	VA22C7647-003	VA22C7647-004	VA22C7647-005
						Result	Result	Result	Result	Result
TCLP Metals										
selenium, TCLP	7782-49-2	E444	0.10	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10
silver, TCLP	7440-22-4	E444	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
thallium, TCLP	7440-28-0	E444	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
uranium, TCLP	7440-61-1	E444	0.20	mg/L		<0.20	<0.20	<0.20	<0.20	<0.20
vanadium, TCLP	7440-62-2	E444	0.15	mg/L		<0.15	<0.15	<0.15	<0.15	<0.15
zinc, TCLP	7440-66-6	E444	0.50	mg/L		24.6	29.0	27.0	29.4	26.4
zirconium, TCLP	7440-67-7	E444	10	mg/L		<10	<10	<10	<10	<10

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Soil/Solid**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	BA2245-A-6	BA2245-A-7	BA2245-A-8	BA2245-A-9	BA2245-A-10
					Client sampling date / time	09-Nov-2022 09:00	09-Nov-2022 09:00	09-Nov-2022 09:00	09-Nov-2022 09:00	09-Nov-2022 09:00
						VA22C7647-006	VA22C7647-007	VA22C7647-008	VA22C7647-009	VA22C7647-010
						Result	Result	Result	Result	Result
Physical Tests										
moisture	----	E144	0.25	%		24.8	22.3	24.0	20.9	22.4
pH (1:2 soil:water)	----	E108	0.10	pH units		11.0	11.0	11.0	11.0	11.0
Metals										
aluminum	7429-90-5	E440	50	mg/kg		42600	36600	27800	34200	33600
antimony	7440-36-0	E440	0.10	mg/kg		120	93.1	91.8	74.7	104
arsenic	7440-38-2	E440	0.10	mg/kg		24.8	18.3	29.6	18.0	16.8
barium	7440-39-3	E440	0.50	mg/kg		621	556	633	458	459
beryllium	7440-41-7	E440	0.10	mg/kg		0.27	0.30	0.24	0.26	0.28
bismuth	7440-69-9	E440	0.20	mg/kg		6.83	8.21	7.60	6.74	10.6
boron	7440-42-8	E440	5.0	mg/kg		138	151	136	143	172
cadmium	7440-43-9	E440	0.020	mg/kg		6.95	14.5	5.95	9.95	6.63
calcium	7440-70-2	E440	50	mg/kg		112000	140000	120000	133000	131000
chromium	7440-47-3	E440	0.50	mg/kg		181	170	191	171	180
cobalt	7440-48-4	E440	0.10	mg/kg		72.4	84.2	58.8	73.7	50.7
copper	7440-50-8	E440	0.50	mg/kg		9170	1350	2620	1960	1770
iron	7439-89-6	E440	50	mg/kg		61300	83500	75200	59200	60600
lead	7439-92-1	E440	0.50	mg/kg		1240	354	586	336	424
lithium	7439-93-2	E440	2.0	mg/kg		18.0	21.3	23.6	18.2	21.6
magnesium	7439-95-4	E440	20	mg/kg		9560	11600	9990	11400	11100
manganese	7439-96-5	E440	1.0	mg/kg		940	1140	1030	800	968
mercury	7439-97-6	E510	0.0500	mg/kg		<0.0500	0.0520	<0.0500	0.0529	0.198
molybdenum	7439-98-7	E440	0.10	mg/kg		21.6	23.8	26.6	23.4	20.4
nickel	7440-02-0	E440	0.50	mg/kg		110	121	218	94.5	197
phosphorus	7723-14-0	E440	50	mg/kg		9850	11100	9330	12400	10200
potassium	7440-09-7	E440	100	mg/kg		3870	4180	3960	4150	4310
selenium	7782-49-2	E440	0.20	mg/kg		0.30	0.26	0.44	0.26	0.68
silver	7440-22-4	E440	0.10	mg/kg		13.6	4.72	4.58	5.25	5.57
sodium	7440-23-5	E440	50	mg/kg		13100	14200	12300	13800	13700
strontium	7440-24-6	E440	0.50	mg/kg		237	341	265	285	280
sulfur	7704-34-9	E440	1000	mg/kg		8400	10000	8000	9300	11200

Analytical Results

Sub-Matrix: Soil/Solid
(Matrix: Soil/Solid)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	BA2245-A-6	BA2245-A-7	BA2245-A-8	BA2245-A-9	BA2245-A-10
					Client sampling date / time	09-Nov-2022 09:00	09-Nov-2022 09:00	09-Nov-2022 09:00	09-Nov-2022 09:00	09-Nov-2022 09:00
						VA22C7647-006	VA22C7647-007	VA22C7647-008	VA22C7647-009	VA22C7647-010
						Result	Result	Result	Result	Result
Metals										
thallium	7440-28-0	E440	0.050	mg/kg		<0.050	<0.050	<0.050	<0.050	<0.050
tin	7440-31-5	E440	2.0	mg/kg		166	146	87.7	83.9	104
titanium	7440-32-6	E440	1.0	mg/kg		455	361	384	232	425
tungsten	7440-33-7	E440	0.50	mg/kg		51.4	38.2	44.4	39.4	56.5
uranium	7440-61-1	E440	0.050	mg/kg		1.79	2.22	2.01	2.09	2.26
vanadium	7440-62-2	E440	0.20	mg/kg		34.6	35.5	34.2	32.3	41.2
zinc	7440-66-6	E440	2.0	mg/kg		4870	3480	4760	2700	3220
zirconium	7440-67-7	E440	1.0	mg/kg		2.6	2.5	1.7	3.8	2.0
TCLP Metals										
pH, TCLP 1st preliminary	----	EPP444	0.010	pH units		11.5	11.5	11.5	11.5	11.4
pH, TCLP 2nd preliminary	----	EPP444	0.010	pH units		7.31	8.01	7.83	8.47	8.27
pH, TCLP extraction fluid initial	----	EPP444	0.010	pH units		2.88	2.88	2.88	2.88	2.88
pH, TCLP final	----	EPP444	0.010	pH units		6.17	6.19	6.18	6.12	6.23
antimony, TCLP	7440-36-0	E444	1.00	mg/L		<1.00	<1.00	<1.00	<1.00	<1.00
arsenic, TCLP	7440-38-2	E444	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
barium, TCLP	7440-39-3	E444	2.5	mg/L		<2.5	<2.5	<2.5	<2.5	<2.5
beryllium, TCLP	7440-41-7	E444	0.025	mg/L		<0.025	<0.025	<0.025	<0.025	<0.025
boron, TCLP	7440-42-8	E444	0.50	mg/L		1.98	2.06	2.03	2.04	2.15
cadmium, TCLP	7440-43-9	E444	0.050	mg/L		0.158	0.097	0.100	0.125	0.096
calcium, TCLP	7440-70-2	E444	10	mg/L		1860	1920	1880	1850	1950
chromium, TCLP	7440-47-3	E444	0.25	mg/L		<0.25	<0.25	<0.25	<0.25	<0.25
cobalt, TCLP	7440-48-4	E444	0.050	mg/L		1.93	1.33	2.30	1.01	1.10
copper, TCLP	7440-50-8	E444	0.050	mg/L		0.704	0.791	0.937	0.310	0.737
iron, TCLP	7439-89-6	E444	5.0	mg/L		<5.0	<5.0	<5.0	<5.0	<5.0
lead, TCLP	7439-92-1	E444	0.25	mg/L		<0.25	<0.25	<0.25	<0.25	<0.25
magnesium, TCLP	7439-95-4	E444	2.5	mg/L		126	123	126	122	132
mercury, TCLP	7439-97-6	E512	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
nickel, TCLP	7440-02-0	E444	0.25	mg/L		0.58	0.56	0.57	0.51	0.67
selenium, TCLP	7782-49-2	E444	0.10	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10
silver, TCLP	7440-22-4	E444	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050

Analytical Results

Sub-Matrix: **Soil/Solid**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	BA2245-A-6	BA2245-A-7	BA2245-A-8	BA2245-A-9	BA2245-A-10
					Client sampling date / time	09-Nov-2022 09:00	09-Nov-2022 09:00	09-Nov-2022 09:00	09-Nov-2022 09:00	09-Nov-2022 09:00
						VA22C7647-006	VA22C7647-007	VA22C7647-008	VA22C7647-009	VA22C7647-010
						Result	Result	Result	Result	Result
TCLP Metals										
thallium, TCLP	7440-28-0	E444	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
uranium, TCLP	7440-61-1	E444	0.20	mg/L		<0.20	<0.20	<0.20	<0.20	<0.20
vanadium, TCLP	7440-62-2	E444	0.15	mg/L		<0.15	<0.15	<0.15	<0.15	<0.15
zinc, TCLP	7440-66-6	E444	0.50	mg/L		21.9	25.0	30.3	45.8	24.4
zirconium, TCLP	7440-67-7	E444	10	mg/L		<10	<10	<10	<10	<10

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: Soil/Solid (Matrix: Soil/Solid)				Client sample ID	BA2245-A-11	BA2245-A-12	----	----	----
				Client sampling date / time	09-Nov-2022 09:00	09-Nov-2022 09:00	----	----	----
Analyte	CAS Number	Method	LOR	Unit	VA22C7647-011	VA22C7647-012	--------	--------	--------
					Result	Result	----	----	----
Physical Tests									
moisture	----	E144	0.25	%	23.1	23.4	----	----	----
pH (1:2 soil:water)	----	E108	0.10	pH units	11.0	11.0	----	----	----
Metals									
aluminum	7429-90-5	E440	50	mg/kg	33700	42200	----	----	----
antimony	7440-36-0	E440	0.10	mg/kg	117	80.6	----	----	----
arsenic	7440-38-2	E440	0.10	mg/kg	21.8	19.6	----	----	----
barium	7440-39-3	E440	0.50	mg/kg	418	602	----	----	----
beryllium	7440-41-7	E440	0.10	mg/kg	0.26	0.28	----	----	----
bismuth	7440-69-9	E440	0.20	mg/kg	17.2	7.22	----	----	----
boron	7440-42-8	E440	5.0	mg/kg	138	121	----	----	----
cadmium	7440-43-9	E440	0.020	mg/kg	97.1	7.21	----	----	----
calcium	7440-70-2	E440	50	mg/kg	140000	125000	----	----	----
chromium	7440-47-3	E440	0.50	mg/kg	203	13300	----	----	----
cobalt	7440-48-4	E440	0.10	mg/kg	60.0	154	----	----	----
copper	7440-50-8	E440	0.50	mg/kg	4710	1370	----	----	----
iron	7439-89-6	E440	50	mg/kg	80300	89300	----	----	----
lead	7439-92-1	E440	0.50	mg/kg	872	308	----	----	----
lithium	7439-93-2	E440	2.0	mg/kg	21.5	18.7	----	----	----
magnesium	7439-95-4	E440	20	mg/kg	11100	10300	----	----	----
manganese	7439-96-5	E440	1.0	mg/kg	1220	1260	----	----	----
mercury	7439-97-6	E510	0.0500	mg/kg	0.0610	<0.0500	----	----	----
molybdenum	7439-98-7	E440	0.10	mg/kg	23.6	138	----	----	----
nickel	7440-02-0	E440	0.50	mg/kg	159	11300	----	----	----
phosphorus	7723-14-0	E440	50	mg/kg	11400	11000	----	----	----
potassium	7440-09-7	E440	100	mg/kg	4190	3900	----	----	----
selenium	7782-49-2	E440	0.20	mg/kg	0.35	0.23	----	----	----
silver	7440-22-4	E440	0.10	mg/kg	6.48	3.79	----	----	----
sodium	7440-23-5	E440	50	mg/kg	12800	13600	----	----	----
strontium	7440-24-6	E440	0.50	mg/kg	321	273	----	----	----
sulfur	7704-34-9	E440	1000	mg/kg	13000	7600	----	----	----

Analytical Results

Sub-Matrix: Soil/Solid (Matrix: Soil/Solid)					Client sample ID	BA2245-A-11	BA2245-A-12	----	----	----
					Client sampling date / time	09-Nov-2022 09:00	09-Nov-2022 09:00	----	----	----
Analyte	CAS Number	Method	LOR	Unit		VA22C7647-011	VA22C7647-012	--------	--------	--------
						Result	Result	----	----	----
Metals										
thallium	7440-28-0	E440	0.050	mg/kg		0.050	0.055	----	----	----
tin	7440-31-5	E440	2.0	mg/kg		150	73.7	----	----	----
titanium	7440-32-6	E440	1.0	mg/kg		342	429	----	----	----
tungsten	7440-33-7	E440	0.50	mg/kg		63.2	42.8	----	----	----
uranium	7440-61-1	E440	0.050	mg/kg		2.46	1.89	----	----	----
vanadium	7440-62-2	E440	0.20	mg/kg		37.2	103	----	----	----
zinc	7440-66-6	E440	2.0	mg/kg		5280	2000	----	----	----
zirconium	7440-67-7	E440	1.0	mg/kg		2.5	4.9	----	----	----
TCLP Metals										
pH, TCLP 1st preliminary	----	EPP444	0.010	pH units		11.4	11.4	----	----	----
pH, TCLP 2nd preliminary	----	EPP444	0.010	pH units		8.56	8.34	----	----	----
pH, TCLP extraction fluid initial	----	EPP444	0.010	pH units		2.88	2.88	----	----	----
pH, TCLP final	----	EPP444	0.010	pH units		6.17	6.14	----	----	----
antimony, TCLP	7440-36-0	E444	1.00	mg/L		<1.00	<1.00	----	----	----
arsenic, TCLP	7440-38-2	E444	1.0	mg/L		<1.0	<1.0	----	----	----
barium, TCLP	7440-39-3	E444	2.5	mg/L		<2.5	<2.5	----	----	----
beryllium, TCLP	7440-41-7	E444	0.025	mg/L		<0.025	<0.025	----	----	----
boron, TCLP	7440-42-8	E444	0.50	mg/L		2.03	2.22	----	----	----
cadmium, TCLP	7440-43-9	E444	0.050	mg/L		0.146	0.171	----	----	----
calcium, TCLP	7440-70-2	E444	10	mg/L		1950	1930	----	----	----
chromium, TCLP	7440-47-3	E444	0.25	mg/L		<0.25	<0.25	----	----	----
cobalt, TCLP	7440-48-4	E444	0.050	mg/L		1.27	1.75	----	----	----
copper, TCLP	7440-50-8	E444	0.050	mg/L		0.718	0.327	----	----	----
iron, TCLP	7439-89-6	E444	5.0	mg/L		<5.0	<5.0	----	----	----
lead, TCLP	7439-92-1	E444	0.25	mg/L		<0.25	<0.25	----	----	----
magnesium, TCLP	7439-95-4	E444	2.5	mg/L		129	124	----	----	----
mercury, TCLP	7439-97-6	E512	0.0010	mg/L		<0.0010	<0.0010	----	----	----
nickel, TCLP	7440-02-0	E444	0.25	mg/L		0.61	0.67	----	----	----
selenium, TCLP	7782-49-2	E444	0.10	mg/L		<0.10	<0.10	----	----	----
silver, TCLP	7440-22-4	E444	0.050	mg/L		<0.050	<0.050	----	----	----

Analytical Results

Sub-Matrix: Soil/Solid (Matrix: Soil/Solid)					Client sample ID	BA2245-A-11	BA2245-A-12	----	----	----
					Client sampling date / time	09-Nov-2022 09:00	09-Nov-2022 09:00	----	----	----
Analyte	CAS Number	Method	LOR	Unit		VA22C7647-011	VA22C7647-012	--------	--------	--------
						Result	Result	----	----	----
TCLP Metals										
thallium, TCLP	7440-28-0	E444	1.0	mg/L		<1.0	<1.0	----	----	----
uranium, TCLP	7440-61-1	E444	0.20	mg/L		<0.20	<0.20	----	----	----
vanadium, TCLP	7440-62-2	E444	0.15	mg/L		<0.15	<0.15	----	----	----
zinc, TCLP	7440-66-6	E444	0.50	mg/L		26.8	28.4	----	----	----
zirconium, TCLP	7440-67-7	E444	10	mg/L		<10	<10	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

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QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **VA22C7647**	Page	: 1 of 16
Client	: **Covanta Burnaby Renewable Energy, ULC**	Laboratory	: Vancouver - Environmental
Contact	: Nicole Victor	Account Manager	: Brent Mack
Address	: 5150 Riverbend Drive Burnaby BC Canada V3N 4V3	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: 778-370-3279
Project	: Weekly Bottom Ash - Suite	Date Samples Received	: 15-Nov-2022 12:10
PO	: VANCO 0000051213	Issue Date	: 21-Nov-2022 11:00
C-O-C number	: ----		
Sampler	: ----		
Site	: (includes 2:1 pH)		
Quote number	: Standing Offer (BC work)		
No. of samples received	: 12		
No. of samples analysed	: 12		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Matrix Spike outliers occur.
- Duplicate outliers occur - please see following pages for full details.
- Laboratory Control Sample (LCS) outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Soil/Solid**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Duplicate (DUP) RPDs								
Metals	VA22C7647-001	BA2245-A-1	antimony	7440-36-0	E440	37.2 % DUP-H	30%	Duplicate RPD does not meet the DQO for this test.
Metals	VA22C7647-001	BA2245-A-1	bismuth	7440-69-9	E440	61.3 % DUP-H	30%	Duplicate RPD does not meet the DQO for this test.
Metals	VA22C7647-001	BA2245-A-1	cadmium	7440-43-9	E440	70.1 % DUP-H	30%	Duplicate RPD does not meet the DQO for this test.
Metals	VA22C7647-001	BA2245-A-1	chromium	7440-47-3	E440	30.3 % DUP-H	30%	Duplicate RPD does not meet the DQO for this test.
Metals	VA22C7647-001	BA2245-A-1	copper	7440-50-8	E440	72.2 % DUP-H	30%	Duplicate RPD does not meet the DQO for this test.
Metals	VA22C7647-001	BA2245-A-1	lead	7439-92-1	E440	49.2 % DUP-H	40%	Duplicate RPD does not meet the DQO for this test.
Metals	VA22C7647-001	BA2245-A-1	nickel	7440-02-0	E440	107 % DUP-H	30%	Duplicate RPD does not meet the DQO for this test.
Metals	VA22C7647-001	BA2245-A-1	sulfur	7704-34-9	E440	35.4 % DUP-H	30%	Duplicate RPD does not meet the DQO for this test.

Result Qualifiers

Qualifier	Description
DUP-H	*Duplicate results outside ALS DQO, due to sample heterogeneity.*

Laboratory Control Sample (LCS) Recoveries								
Metals	QC-MRG2-7453920 02	----	boron	7440-42-8	E440	79.4 % MES	80.0-120%	Recovery less than lower control limit

Result Qualifiers

Qualifier	Description
MES	*Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).*

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : High Silver in Soil/Solid by CRC ICPMS										
LDPE bag BA2245-A-3	E440.Ag	09-Nov-2022	17-Nov-2022	180 days	9 days	✓	19-Nov-2022	171 days	2 days	✓
Metals : High Silver in Soil/Solid by CRC ICPMS										
LDPE bag BA2245-A-4	E440.Ag	09-Nov-2022	17-Nov-2022	180 days	9 days	✓	19-Nov-2022	171 days	2 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
LDPE bag BA2245-A-1	E510	09-Nov-2022	16-Nov-2022	----	----		17-Nov-2022	28 days	7 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
LDPE bag BA2245-A-10	E510	09-Nov-2022	16-Nov-2022	----	----		17-Nov-2022	28 days	7 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
LDPE bag BA2245-A-11	E510	09-Nov-2022	16-Nov-2022	----	----		17-Nov-2022	28 days	7 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
LDPE bag BA2245-A-12	E510	09-Nov-2022	16-Nov-2022	----	----		17-Nov-2022	28 days	7 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
LDPE bag BA2245-A-2	E510	09-Nov-2022	16-Nov-2022	----	----		17-Nov-2022	28 days	7 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Soil/Solid by CVAAS										
LDPE bag BA2245-A-3	E510	09-Nov-2022	16-Nov-2022	----	----		17-Nov-2022	28 days	7 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
LDPE bag BA2245-A-4	E510	09-Nov-2022	16-Nov-2022	----	----		17-Nov-2022	28 days	7 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
LDPE bag BA2245-A-5	E510	09-Nov-2022	16-Nov-2022	----	----		17-Nov-2022	28 days	7 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
LDPE bag BA2245-A-6	E510	09-Nov-2022	16-Nov-2022	----	----		17-Nov-2022	28 days	7 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
LDPE bag BA2245-A-7	E510	09-Nov-2022	16-Nov-2022	----	----		17-Nov-2022	28 days	7 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
LDPE bag BA2245-A-8	E510	09-Nov-2022	16-Nov-2022	----	----		17-Nov-2022	28 days	7 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
LDPE bag BA2245-A-9	E510	09-Nov-2022	16-Nov-2022	----	----		17-Nov-2022	28 days	7 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag BA2245-A-1	E440	09-Nov-2022	16-Nov-2022	----	----		17-Nov-2022	180 days	8 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag BA2245-A-10	E440	09-Nov-2022	16-Nov-2022	----	----		17-Nov-2022	180 days	8 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag BA2245-A-11	E440	09-Nov-2022	16-Nov-2022	----	----		17-Nov-2022	180 days	8 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag BA2245-A-12	E440	09-Nov-2022	16-Nov-2022	----	----		17-Nov-2022	180 days	8 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag BA2245-A-2	E440	09-Nov-2022	16-Nov-2022	----	----		17-Nov-2022	180 days	8 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag BA2245-A-3	E440	09-Nov-2022	16-Nov-2022	----	----		17-Nov-2022	180 days	8 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag BA2245-A-4	E440	09-Nov-2022	16-Nov-2022	----	----		17-Nov-2022	180 days	8 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag BA2245-A-5	E440	09-Nov-2022	16-Nov-2022	----	----		17-Nov-2022	180 days	8 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag BA2245-A-6	E440	09-Nov-2022	16-Nov-2022	----	----		17-Nov-2022	180 days	8 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag BA2245-A-7	E440	09-Nov-2022	16-Nov-2022	----	----		17-Nov-2022	180 days	8 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag BA2245-A-8	E440	09-Nov-2022	16-Nov-2022	----	----		17-Nov-2022	180 days	8 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag BA2245-A-9	E440	09-Nov-2022	16-Nov-2022	----	----		17-Nov-2022	180 days	8 days	✓
Physical Tests : Moisture Content by Gravimetry										
LDPE bag BA2245-A-1	E144	09-Nov-2022	----	----	----		16-Nov-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
LDPE bag BA2245-A-10	E144	09-Nov-2022	----	----	----		16-Nov-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
LDPE bag BA2245-A-11	E144	09-Nov-2022	----	----	----		16-Nov-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
LDPE bag BA2245-A-12	E144	09-Nov-2022	----	----	----		16-Nov-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
LDPE bag BA2245-A-2	E144	09-Nov-2022	----	----	----		16-Nov-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
LDPE bag BA2245-A-3	E144	09-Nov-2022	----	----	----		16-Nov-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
LDPE bag BA2245-A-4	E144	09-Nov-2022	----	----	----		16-Nov-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
LDPE bag BA2245-A-5	E144	09-Nov-2022	----	----	----		16-Nov-2022	----	----	

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Moisture Content by Gravimetry										
LDPE bag BA2245-A-6	E144	09-Nov-2022	----	----	----		16-Nov-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
LDPE bag BA2245-A-7	E144	09-Nov-2022	----	----	----		16-Nov-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
LDPE bag BA2245-A-8	E144	09-Nov-2022	----	----	----		16-Nov-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
LDPE bag BA2245-A-9	E144	09-Nov-2022	----	----	----		16-Nov-2022	----	----	
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
LDPE bag BA2245-A-1	E108	09-Nov-2022	16-Nov-2022	----	----		16-Nov-2022	30 days	7 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
LDPE bag BA2245-A-10	E108	09-Nov-2022	16-Nov-2022	----	----		16-Nov-2022	30 days	7 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
LDPE bag BA2245-A-11	E108	09-Nov-2022	16-Nov-2022	----	----		16-Nov-2022	30 days	7 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
LDPE bag BA2245-A-12	E108	09-Nov-2022	16-Nov-2022	----	----		16-Nov-2022	30 days	7 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
LDPE bag BA2245-A-2	E108	09-Nov-2022	16-Nov-2022	----	----		16-Nov-2022	30 days	7 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
LDPE bag BA2245-A-3	E108	09-Nov-2022	16-Nov-2022	----	----		16-Nov-2022	30 days	7 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
LDPE bag BA2245-A-4	E108	09-Nov-2022	16-Nov-2022	----	----		16-Nov-2022	30 days	7 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
LDPE bag BA2245-A-5	E108	09-Nov-2022	16-Nov-2022	----	----		16-Nov-2022	30 days	7 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
LDPE bag BA2245-A-6	E108	09-Nov-2022	16-Nov-2022	----	----		16-Nov-2022	30 days	7 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
LDPE bag BA2245-A-7	E108	09-Nov-2022	16-Nov-2022	----	----		16-Nov-2022	30 days	7 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
LDPE bag BA2245-A-8	E108	09-Nov-2022	16-Nov-2022	----	----		16-Nov-2022	30 days	7 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
LDPE bag BA2245-A-9	E108	09-Nov-2022	16-Nov-2022	----	----		16-Nov-2022	30 days	7 days	✓
TCLP Metals : Mercury by CVAAS (TCLP)										
Glass vial - total (lab preserved) BA2245-A-1	E512	18-Nov-2022	20-Nov-2022	----	----		20-Nov-2022	28 days	11 days	✓
TCLP Metals : Mercury by CVAAS (TCLP)										
Glass vial - total (lab preserved) BA2245-A-10	E512	18-Nov-2022	20-Nov-2022	----	----		20-Nov-2022	28 days	11 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
TCLP Metals : Mercury by CVAAS (TCLP)										
Glass vial - total (lab preserved) BA2245-A-11	E512	18-Nov-2022	20-Nov-2022	----	----		20-Nov-2022	28 days	11 days	✓
TCLP Metals : Mercury by CVAAS (TCLP)										
Glass vial - total (lab preserved) BA2245-A-12	E512	18-Nov-2022	20-Nov-2022	----	----		20-Nov-2022	28 days	11 days	✓
TCLP Metals : Mercury by CVAAS (TCLP)										
Glass vial - total (lab preserved) BA2245-A-2	E512	18-Nov-2022	20-Nov-2022	----	----		20-Nov-2022	28 days	11 days	✓
TCLP Metals : Mercury by CVAAS (TCLP)										
Glass vial - total (lab preserved) BA2245-A-3	E512	18-Nov-2022	20-Nov-2022	----	----		20-Nov-2022	28 days	11 days	✓
TCLP Metals : Mercury by CVAAS (TCLP)										
Glass vial - total (lab preserved) BA2245-A-4	E512	18-Nov-2022	20-Nov-2022	----	----		20-Nov-2022	28 days	11 days	✓
TCLP Metals : Mercury by CVAAS (TCLP)										
Glass vial - total (lab preserved) BA2245-A-5	E512	18-Nov-2022	20-Nov-2022	----	----		20-Nov-2022	28 days	11 days	✓
TCLP Metals : Mercury by CVAAS (TCLP)										
Glass vial - total (lab preserved) BA2245-A-6	E512	18-Nov-2022	20-Nov-2022	----	----		20-Nov-2022	28 days	11 days	✓
TCLP Metals : Mercury by CVAAS (TCLP)										
Glass vial - total (lab preserved) BA2245-A-7	E512	18-Nov-2022	20-Nov-2022	----	----		20-Nov-2022	28 days	11 days	✓
TCLP Metals : Mercury by CVAAS (TCLP)										
Glass vial - total (lab preserved) BA2245-A-8	E512	18-Nov-2022	20-Nov-2022	----	----		20-Nov-2022	28 days	11 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
TCLP Metals : Mercury by CVAAS (TCLP)										
Glass vial - total (lab preserved) BA2245-A-9	E512	18-Nov-2022	20-Nov-2022	----	----		20-Nov-2022	28 days	11 days	✓
TCLP Metals : Metals by CRC ICPMS (TCLP)										
HDPE - total (lab preserved) BA2245-A-1	E444	18-Nov-2022	20-Nov-2022	----	----		21-Nov-2022	180 days	12 days	✓
TCLP Metals : Metals by CRC ICPMS (TCLP)										
HDPE - total (lab preserved) BA2245-A-10	E444	18-Nov-2022	20-Nov-2022	----	----		21-Nov-2022	180 days	12 days	✓
TCLP Metals : Metals by CRC ICPMS (TCLP)										
HDPE - total (lab preserved) BA2245-A-11	E444	18-Nov-2022	20-Nov-2022	----	----		21-Nov-2022	180 days	12 days	✓
TCLP Metals : Metals by CRC ICPMS (TCLP)										
HDPE - total (lab preserved) BA2245-A-12	E444	18-Nov-2022	20-Nov-2022	----	----		21-Nov-2022	180 days	12 days	✓
TCLP Metals : Metals by CRC ICPMS (TCLP)										
HDPE - total (lab preserved) BA2245-A-2	E444	18-Nov-2022	20-Nov-2022	----	----		21-Nov-2022	180 days	12 days	✓
TCLP Metals : Metals by CRC ICPMS (TCLP)										
HDPE - total (lab preserved) BA2245-A-3	E444	18-Nov-2022	20-Nov-2022	----	----		21-Nov-2022	180 days	12 days	✓
TCLP Metals : Metals by CRC ICPMS (TCLP)										
HDPE - total (lab preserved) BA2245-A-4	E444	18-Nov-2022	20-Nov-2022	----	----		21-Nov-2022	180 days	12 days	✓
TCLP Metals : Metals by CRC ICPMS (TCLP)										
HDPE - total (lab preserved) BA2245-A-5	E444	18-Nov-2022	20-Nov-2022	----	----		21-Nov-2022	180 days	12 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
TCLP Metals : Metals by CRC ICPMS (TCLP)										
HDPE - total (lab preserved) BA2245-A-6	E444	18-Nov-2022	20-Nov-2022	----	----		21-Nov-2022	180 days	12 days	✓
TCLP Metals : Metals by CRC ICPMS (TCLP)										
HDPE - total (lab preserved) BA2245-A-7	E444	18-Nov-2022	20-Nov-2022	----	----		21-Nov-2022	180 days	12 days	✓
TCLP Metals : Metals by CRC ICPMS (TCLP)										
HDPE - total (lab preserved) BA2245-A-8	E444	18-Nov-2022	20-Nov-2022	----	----		21-Nov-2022	180 days	12 days	✓
TCLP Metals : Metals by CRC ICPMS (TCLP)										
HDPE - total (lab preserved) BA2245-A-9	E444	18-Nov-2022	20-Nov-2022	----	----		21-Nov-2022	180 days	12 days	✓
TCLP Metals : TCLP Leachate Preparation (Metals, Inorganics, and SVOCs)										
Lab Split - Non-Volatile Leach: 180 Day HT (e.g. metals ex. Hg) BA2245-A-1	EPP444	09-Nov-2022	18-Nov-2022	----	----		----	----	----	
TCLP Metals : TCLP Leachate Preparation (Metals, Inorganics, and SVOCs)										
Lab Split - Non-Volatile Leach: 180 Day HT (e.g. metals ex. Hg) BA2245-A-10	EPP444	09-Nov-2022	18-Nov-2022	----	----		----	----	----	
TCLP Metals : TCLP Leachate Preparation (Metals, Inorganics, and SVOCs)										
Lab Split - Non-Volatile Leach: 180 Day HT (e.g. metals ex. Hg) BA2245-A-11	EPP444	09-Nov-2022	18-Nov-2022	----	----		----	----	----	
TCLP Metals : TCLP Leachate Preparation (Metals, Inorganics, and SVOCs)										
Lab Split - Non-Volatile Leach: 180 Day HT (e.g. metals ex. Hg) BA2245-A-12	EPP444	09-Nov-2022	18-Nov-2022	----	----		----	----	----	
TCLP Metals : TCLP Leachate Preparation (Metals, Inorganics, and SVOCs)										
Lab Split - Non-Volatile Leach: 180 Day HT (e.g. metals ex. Hg) BA2245-A-2	EPP444	09-Nov-2022	18-Nov-2022	----	----		----	----	----	

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
TCLP Metals : TCLP Leachate Preparation (Metals, Inorganics, and SVOCs)										
Lab Split - Non-Volatile Leach: 180 Day HT (e.g. metals ex. Hg) BA2245-A-3	EPP444	09-Nov-2022	18-Nov-2022	----	----		----	----	----	
TCLP Metals : TCLP Leachate Preparation (Metals, Inorganics, and SVOCs)										
Lab Split - Non-Volatile Leach: 180 Day HT (e.g. metals ex. Hg) BA2245-A-4	EPP444	09-Nov-2022	18-Nov-2022	----	----		----	----	----	
TCLP Metals : TCLP Leachate Preparation (Metals, Inorganics, and SVOCs)										
Lab Split - Non-Volatile Leach: 180 Day HT (e.g. metals ex. Hg) BA2245-A-5	EPP444	09-Nov-2022	18-Nov-2022	----	----		----	----	----	
TCLP Metals : TCLP Leachate Preparation (Metals, Inorganics, and SVOCs)										
Lab Split - Non-Volatile Leach: 180 Day HT (e.g. metals ex. Hg) BA2245-A-6	EPP444	09-Nov-2022	18-Nov-2022	----	----		----	----	----	
TCLP Metals : TCLP Leachate Preparation (Metals, Inorganics, and SVOCs)										
Lab Split - Non-Volatile Leach: 180 Day HT (e.g. metals ex. Hg) BA2245-A-7	EPP444	09-Nov-2022	18-Nov-2022	----	----		----	----	----	
TCLP Metals : TCLP Leachate Preparation (Metals, Inorganics, and SVOCs)										
Lab Split - Non-Volatile Leach: 180 Day HT (e.g. metals ex. Hg) BA2245-A-8	EPP444	09-Nov-2022	18-Nov-2022	----	----		----	----	----	
TCLP Metals : TCLP Leachate Preparation (Metals, Inorganics, and SVOCs)										
Lab Split - Non-Volatile Leach: 180 Day HT (e.g. metals ex. Hg) BA2245-A-9	EPP444	09-Nov-2022	18-Nov-2022	----	----		----	----	----	

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Soil/Solid**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Mercury in Soil/Solid by CVAAS	E510	745392	1	14	7.1	5.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	745393	1	14	7.1	5.0	✓
Moisture Content by Gravimetry	E144	745395	1	12	8.3	5.0	✓
pH by Meter (1:2 Soil:Water Extraction)	E108	745394	1	14	7.1	5.0	✓
Laboratory Control Samples (LCS)							
High Silver in Soil/Solid by CRC ICPMS	E440.Ag	748308	1	2	50.0	5.0	✓
Mercury in Soil/Solid by CVAAS	E510	745392	2	14	14.2	10.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	745393	2	14	14.2	10.0	✓
Moisture Content by Gravimetry	E144	745395	1	12	8.3	5.0	✓
pH by Meter (1:2 Soil:Water Extraction)	E108	745394	1	14	7.1	5.0	✓
Method Blanks (MB)							
High Silver in Soil/Solid by CRC ICPMS	E440.Ag	748308	1	2	50.0	5.0	✓
Mercury by CVAAS (TCLP)	E512	750268	1	12	8.3	5.0	✓
Mercury in Soil/Solid by CVAAS	E510	745392	1	14	7.1	5.0	✓
Metals by CRC ICPMS (TCLP)	E444	750266	1	12	8.3	5.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	745393	1	14	7.1	5.0	✓
Moisture Content by Gravimetry	E144	745395	1	12	8.3	5.0	✓
Matrix Spikes (MS)							
Mercury by CVAAS (TCLP)	E512	750268	1	12	8.3	5.0	✓
Metals by CRC ICPMS (TCLP)	E444	750266	1	12	8.3	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
pH by Meter (1:2 Soil:Water Extraction)	E108 Vancouver - Environmental	Soil/Solid	BC Lab Manual	pH is determined by potentiometric measurement with a pH electrode at ambient laboratory temperature (normally 20 ± 5°C), and is carried out in accordance with procedures described in the BC Lab Manual (prescriptive method). The procedure involves mixing the dried (at <60 ºC) and sieved (10mesh/2mm) sample with ultra pure water at a 1:2 ratio of sediment to water. The pH is then measured by a standard pH probe.
Moisture Content by Gravimetry	E144 Vancouver - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	Moisture is measured gravimetrically by drying the sample at 105°C. Moisture content is calculated as the weight loss (due to water) divided by the wet weight of the sample, expressed as a percentage.
Metals in Soil/Solid by CRC ICPMS	E440 Vancouver - Environmental	Soil/Solid	EPA 6020B (mod)	This method is intended to liberate metals that may be environmentally available. Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl. Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Silicate minerals are not solubilized. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. This method does not adequately recover elemental sulfur, and is unsuitable for assessment of elemental sulfur standards or guidelines. Analysis is by Collision/Reaction Cell ICPMS.
High Silver in Soil/Solid by CRC ICPMS	E440.Ag Vancouver - Environmental	Soil/Solid	EPA 6020B (mod)	Samples are sieved through a 2 mm sieve, and digested with HNO3 and HCl. This method is intended to liberate metals that may be environmentally available. Silicate minerals are not solubilized. Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. Analysis is by Collision/Reaction Cell ICPMS.
Metals by CRC ICPMS (TCLP)	E444 Vancouver - Environmental	Soil/Solid	EPA 1311/6020B (mod)	An extract produced by the Toxicity Characteristic Leachate Procedure (TCLP) as per EPA 1311 is analyzed by Collision/Reaction Cell ICPMS.
Mercury in Soil/Solid by CVAAS	E510 Vancouver - Environmental	Soil/Solid	EPA 200.2/1631 Appendix (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl, followed by CVAAS analysis.
Mercury by CVAAS (TCLP)	E512 Vancouver - Environmental	Soil/Solid	SW 846 -1311/245.1 CVAA ON TCLP LEACHATE	An extract produced by the Toxicity Characteristic Leachate Procedure (TCLP) as per EPA 1311 is analyzed by CVAAS.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Leach 1:2 Soil:Water for pH/EC	EP108 Vancouver - Environmental	Soil/Solid	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL	The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water.
Digestion for Metals and Mercury	EP440 Vancouver - Environmental	Soil/Solid	EPA 200.2 (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl. This method is intended to liberate metals that may be environmentally available.
Digestion for Silver	EP440.Ag Vancouver - Environmental	Soil/Solid	EPA 200.2 (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl. This method is intended to liberate metals that may be environmentally available.
TCLP Leachate Preparation (Metals, Inorganics, and SVOCs)	EPP444 Vancouver - Environmental	Soil/Solid	EPA 1311	Preparation of a Toxicity Characteristic Leaching Procedure (TCLP) solid sample involves particle size reduction, homogenization, then determination of appropriate extraction fluid. A measured portion of fresh subsample is placed in an extraction bottle with the appropriate extraction fluid then tumbled in a rotary extractor for 18+/- 2 hours at 23 +/- 2 C. The liquid leachate is filtered to separate from solids then bottled and prepared for analytical tests.

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QUALITY CONTROL REPORT

Work Order	: **VA22C7647**	Page	: 1 of 12
Client	: Covanta Burnaby Renewable Energy, ULC	Laboratory	: Vancouver - Environmental
Contact	: Nicole Victor	Account Manager	: Brent Mack
Address	: 5150 Riverbend Drive Burnaby BC Canada V3N 4V3	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	:	Telephone	: 778-370-3279
Project	: Weekly Bottom Ash - Suite	Date Samples Received	: 15-Nov-2022 12:10
PO	: VANCO 0000051213	Date Analysis Commenced	: 16-Nov-2022
C-O-C number	: ----	Issue Date	: 21-Nov-2022 11:00
Sampler	: ---- ----		
Site	: (includes 2:1 pH)		
Quote number	: Standing Offer (BC work)		
No. of samples received	: 12		
No. of samples analysed	: 12		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Reference Material (RM) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Alex Thornton	Analyst	Vancouver Metals, Burnaby, British Columbia
Angela Ren	Team Leader - Metals	Vancouver Metals, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Vancouver Metals, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Vancouver Organics, Burnaby, British Columbia
Ophelia Chiu	Department Manager - Organics	Vancouver Organics, Burnaby, British Columbia
Owen Cheng		Vancouver Metals, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Physical Tests (QC Lot: 745394)											
VA22C7647-001	BA2245-A-1	pH (1:2 soil:water)	----	E108	0.10	pH units	11.0	11.0	0.2%	5%	----
Physical Tests (QC Lot: 745395)											
VA22C7647-001	BA2245-A-1	moisture	----	E144	0.25	%	24.5	23.5	4.07%	20%	----
Metals (QC Lot: 745392)											
VA22C7647-001	BA2245-A-1	mercury	7439-97-6	E510	0.0500	mg/kg	<0.0500	0.0578	0.0078	Diff <2x LOR	----
Metals (QC Lot: 745393)											
VA22C7647-001	BA2245-A-1	aluminum	7429-90-5	E440	50	mg/kg	39600	29900	27.8%	40%	----
		antimony	7440-36-0	E440	0.10	mg/kg	76.4	111	37.2%	30%	DUP-H
		arsenic	7440-38-2	E440	0.10	mg/kg	19.6	22.5	13.5%	30%	----
		barium	7440-39-3	E440	0.50	mg/kg	557	399	33.1%	40%	----
		beryllium	7440-41-7	E440	0.10	mg/kg	0.27	0.33	0.06	Diff <2x LOR	----
		bismuth	7440-69-9	E440	0.20	mg/kg	6.22	11.7	61.3%	30%	DUP-H
		boron	7440-42-8	E440	5.0	mg/kg	154	152	1.18%	30%	----
		cadmium	7440-43-9	E440	0.020	mg/kg	6.09	12.7	70.1%	30%	DUP-H
		calcium	7440-70-2	E440	50	mg/kg	124000	146000	16.1%	30%	----
		chromium	7440-47-3	E440	0.50	mg/kg	121	164	30.3%	30%	DUP-H
		cobalt	7440-48-4	E440	0.10	mg/kg	43.5	58.0	28.6%	30%	----
		copper	7440-50-8	E440	0.50	mg/kg	3470	1630	72.2%	30%	DUP-H
		iron	7439-89-6	E440	50	mg/kg	45100	53000	16.1%	30%	----
		lead	7439-92-1	E440	0.50	mg/kg	386	638	49.2%	40%	DUP-H
		lithium	7439-93-2	E440	2.0	mg/kg	21.8	25.5	15.5%	30%	----
		magnesium	7439-95-4	E440	20	mg/kg	10200	11400	11.7%	30%	----
		manganese	7439-96-5	E440	1.0	mg/kg	694	827	17.4%	30%	----
		molybdenum	7439-98-7	E440	0.10	mg/kg	17.0	25.4	39.6%	40%	----
		nickel	7440-02-0	E440	0.50	mg/kg	108	357	107%	30%	DUP-H
		phosphorus	7723-14-0	E440	50	mg/kg	12100	13200	8.46%	30%	----
		potassium	7440-09-7	E440	100	mg/kg	4330	4700	8.27%	40%	----
		selenium	7782-49-2	E440	0.20	mg/kg	0.20	0.35	0.15	Diff <2x LOR	----
		silver	7440-22-4	E440	0.10	mg/kg	4.88	6.26	24.6%	40%	----
		sodium	7440-23-5	E440	50	mg/kg	14600	14400	1.26%	40%	----

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Metals (QC Lot: 745393) - continued											
VA22C7647-001	BA2245-A-1	strontium	7440-24-6	E440	0.50	mg/kg	259	316	19.6%	40%	----
		sulfur	7704-34-9	E440	1000	mg/kg	8600	12400	35.4%	30%	DUP-H
		thallium	7440-28-0	E440	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		tin	7440-31-5	E440	2.0	mg/kg	277	266	3.85%	40%	----
		titanium	7440-32-6	E440	1.0	mg/kg	279	274	2.07%	40%	----
		tungsten	7440-33-7	E440	0.50	mg/kg	35.4	47.5	29.0%	30%	----
		uranium	7440-61-1	E440	0.050	mg/kg	1.98	2.52	24.1%	30%	----
		vanadium	7440-62-2	E440	0.20	mg/kg	34.4	33.6	2.29%	30%	----
		zinc	7440-66-6	E440	2.0	mg/kg	3760	3360	11.3%	30%	----
		zirconium	7440-67-7	E440	1.0	mg/kg	3.0	1.8	1.2	Diff <2x LOR	----

Qualifiers

Qualifier	*Description*
DUP-H	*Duplicate results outside ALS DQO, due to sample heterogeneity.*

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 745395)						
moisture	----	E144	0.25	%	<0.25	----
Metals (QCLot: 745392)						
mercury	7439-97-6	E510	0.005	mg/kg	<0.0050	----
Metals (QCLot: 745393)						
aluminum	7429-90-5	E440	50	mg/kg	<50	----
antimony	7440-36-0	E440	0.1	mg/kg	<0.10	----
arsenic	7440-38-2	E440	0.1	mg/kg	<0.10	----
barium	7440-39-3	E440	0.5	mg/kg	<0.50	----
beryllium	7440-41-7	E440	0.1	mg/kg	<0.10	----
bismuth	7440-69-9	E440	0.2	mg/kg	<0.20	----
boron	7440-42-8	E440	5	mg/kg	<5.0	----
cadmium	7440-43-9	E440	0.02	mg/kg	<0.020	----
calcium	7440-70-2	E440	50	mg/kg	<50	----
chromium	7440-47-3	E440	0.5	mg/kg	<0.50	----
cobalt	7440-48-4	E440	0.1	mg/kg	<0.10	----
copper	7440-50-8	E440	0.5	mg/kg	<0.50	----
iron	7439-89-6	E440	50	mg/kg	<50	----
lead	7439-92-1	E440	0.5	mg/kg	<0.50	----
lithium	7439-93-2	E440	2	mg/kg	<2.0	----
magnesium	7439-95-4	E440	20	mg/kg	<20	----
manganese	7439-96-5	E440	1	mg/kg	<1.0	----
molybdenum	7439-98-7	E440	0.1	mg/kg	<0.10	----
nickel	7440-02-0	E440	0.5	mg/kg	<0.50	----
phosphorus	7723-14-0	E440	50	mg/kg	<50	----
potassium	7440-09-7	E440	100	mg/kg	<100	----
selenium	7782-49-2	E440	0.2	mg/kg	<0.20	----
silver	7440-22-4	E440	0.1	mg/kg	<0.10	----
sodium	7440-23-5	E440	50	mg/kg	<50	----
strontium	7440-24-6	E440	0.5	mg/kg	<0.50	----
sulfur	7704-34-9	E440	1000	mg/kg	<1000	----
thallium	7440-28-0	E440	0.05	mg/kg	<0.050	----
tin	7440-31-5	E440	2	mg/kg	<2.0	----

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Metals (QCLot: 745393) - continued						
titanium	7440-32-6	E440	1	mg/kg	<1.0	----
tungsten	7440-33-7	E440	0.5	mg/kg	<0.50	----
uranium	7440-61-1	E440	0.05	mg/kg	<0.050	----
vanadium	7440-62-2	E440	0.2	mg/kg	<0.20	----
zinc	7440-66-6	E440	2	mg/kg	<2.0	----
zirconium	7440-67-7	E440	1	mg/kg	<1.0	----
Metals (QCLot: 748308)						
silver	7440-22-4	E440.Ag	0.1	mg/kg	<0.10	----
TCLP Metals (QCLot: 750266)						
antimony, TCLP	7440-36-0	E444	0.1	mg/L	<0.10	----
arsenic, TCLP	7440-38-2	E444	1	mg/L	<1.0	----
barium, TCLP	7440-39-3	E444	2.5	mg/L	<2.5	----
beryllium, TCLP	7440-41-7	E444	0.025	mg/L	<0.025	----
boron, TCLP	7440-42-8	E444	0.5	mg/L	<0.50	----
cadmium, TCLP	7440-43-9	E444	0.05	mg/L	<0.050	----
calcium, TCLP	7440-70-2	E444	10	mg/L	<10	----
chromium, TCLP	7440-47-3	E444	0.25	mg/L	<0.25	----
cobalt, TCLP	7440-48-4	E444	0.05	mg/L	<0.050	----
copper, TCLP	7440-50-8	E444	0.05	mg/L	<0.050	----
iron, TCLP	7439-89-6	E444	5	mg/L	<5.0	----
lead, TCLP	7439-92-1	E444	0.25	mg/L	<0.25	----
magnesium, TCLP	7439-95-4	E444	2.5	mg/L	<2.5	----
nickel, TCLP	7440-02-0	E444	0.25	mg/L	<0.25	----
selenium, TCLP	7782-49-2	E444	0.1	mg/L	<0.10	----
silver, TCLP	7440-22-4	E444	0.05	mg/L	<0.050	----
thallium, TCLP	7440-28-0	E444	1	mg/L	<1.0	----
uranium, TCLP	7440-61-1	E444	0.2	mg/L	<0.20	----
vanadium, TCLP	7440-62-2	E444	0.15	mg/L	<0.15	----
zinc, TCLP	7440-66-6	E444	0.5	mg/L	<0.50	----
zirconium, TCLP	7440-67-7	E444	10	mg/L	<10	----
TCLP Metals (QCLot: 750268)						
mercury, TCLP	7439-97-6	E512	0.001	mg/L	<0.0010	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 745394)									
pH (1:2 soil:water)	----	E108	----	pH units	6 pH units	100	95.0	105	----
Physical Tests (QCLot: 745395)									
moisture	----	E144	0.25	%	50 %	101	90.0	110	----
Metals (QCLot: 745392)									
mercury	7439-97-6	E510	0.005	mg/kg	0.1 mg/kg	95.6	80.0	120	----
Metals (QCLot: 745393)									
aluminum	7429-90-5	E440	50	mg/kg	200 mg/kg	98.6	80.0	120	----
antimony	7440-36-0	E440	0.1	mg/kg	100 mg/kg	101	80.0	120	----
arsenic	7440-38-2	E440	0.1	mg/kg	100 mg/kg	99.7	80.0	120	----
barium	7440-39-3	E440	0.5	mg/kg	25 mg/kg	88.1	80.0	120	----
beryllium	7440-41-7	E440	0.1	mg/kg	10 mg/kg	82.8	80.0	120	----
bismuth	7440-69-9	E440	0.2	mg/kg	100 mg/kg	93.6	80.0	120	----
boron	7440-42-8	E440	5	mg/kg	100 mg/kg	# 79.4	80.0	120	MES
cadmium	7440-43-9	E440	0.02	mg/kg	10 mg/kg	88.8	80.0	120	----
calcium	7440-70-2	E440	50	mg/kg	5000 mg/kg	84.7	80.0	120	----
chromium	7440-47-3	E440	0.5	mg/kg	25 mg/kg	91.2	80.0	120	----
cobalt	7440-48-4	E440	0.1	mg/kg	25 mg/kg	88.8	80.0	120	----
copper	7440-50-8	E440	0.5	mg/kg	25 mg/kg	89.1	80.0	120	----
iron	7439-89-6	E440	50	mg/kg	100 mg/kg	90.6	80.0	120	----
lead	7439-92-1	E440	0.5	mg/kg	50 mg/kg	93.3	80.0	120	----
lithium	7439-93-2	E440	2	mg/kg	25 mg/kg	89.7	80.0	120	----
magnesium	7439-95-4	E440	20	mg/kg	5000 mg/kg	93.8	80.0	120	----
manganese	7439-96-5	E440	1	mg/kg	25 mg/kg	89.2	80.0	120	----
molybdenum	7439-98-7	E440	0.1	mg/kg	25 mg/kg	93.6	80.0	120	----
nickel	7440-02-0	E440	0.5	mg/kg	50 mg/kg	89.7	80.0	120	----
phosphorus	7723-14-0	E440	50	mg/kg	1000 mg/kg	98.0	80.0	120	----
potassium	7440-09-7	E440	100	mg/kg	5000 mg/kg	90.7	80.0	120	----
selenium	7782-49-2	E440	0.2	mg/kg	100 mg/kg	95.6	80.0	120	----
silver	7440-22-4	E440	0.1	mg/kg	10 mg/kg	83.0	80.0	120	----
sodium	7440-23-5	E440	50	mg/kg	5000 mg/kg	95.6	80.0	120	----
strontium	7440-24-6	E440	0.5	mg/kg	25 mg/kg	93.8	80.0	120	----
sulfur	7704-34-9	E440	1000	mg/kg	5000 mg/kg	90.5	80.0	120	----

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Metals (QCLot: 745393) - continued									
thallium	7440-28-0	E440	0.05	mg/kg	100 mg/kg	93.6	80.0	120	----
tin	7440-31-5	E440	2	mg/kg	50 mg/kg	93.2	80.0	120	----
titanium	7440-32-6	E440	1	mg/kg	25 mg/kg	88.1	80.0	120	----
tungsten	7440-33-7	E440	0.5	mg/kg	10 mg/kg	99.0	80.0	120	----
uranium	7440-61-1	E440	0.05	mg/kg	0.5 mg/kg	93.3	80.0	120	----
vanadium	7440-62-2	E440	0.2	mg/kg	50 mg/kg	90.9	80.0	120	----
zinc	7440-66-6	E440	2	mg/kg	50 mg/kg	89.3	80.0	120	----
zirconium	7440-67-7	E440	1	mg/kg	10 mg/kg	87.5	80.0	120	----
Metals (QCLot: 748308)									
silver	7440-22-4	E440.Ag	0.1	mg/kg	10 mg/kg	99.1	80.0	120	----

Qualifiers

Qualifier	Description
MES	*Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).*

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Soil/Solid**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
TCLP Metals (QCLot: 750266)										
VA22C7647-001	BA2245-A-1	antimony, TCLP	7440-36-0	E444	5.07 mg/L	5 mg/L	101	50.0	140	----
		arsenic, TCLP	7440-38-2	E444	4.9 mg/L	5 mg/L	98.9	50.0	140	----
		barium, TCLP	7440-39-3	E444	12.3 mg/L	12.5 mg/L	98.7	50.0	140	----
		beryllium, TCLP	7440-41-7	E444	0.235 mg/L	0.25 mg/L	93.8	50.0	140	----
		boron, TCLP	7440-42-8	E444	8.78 mg/L	10 mg/L	87.8	50.0	140	----
		cadmium, TCLP	7440-43-9	E444	0.246 mg/L	0.25 mg/L	98.6	50.0	140	----
		calcium, TCLP	7440-70-2	E444	ND mg/L	250 mg/L	ND	50.0	140	----
		chromium, TCLP	7440-47-3	E444	1.26 mg/L	1.25 mg/L	100	50.0	140	----
		cobalt, TCLP	7440-48-4	E444	ND mg/L	0.25 mg/L	ND	50.0	140	----
		copper, TCLP	7440-50-8	E444	2.36 mg/L	2.5 mg/L	94.2	50.0	140	----
		iron, TCLP	7439-89-6	E444	237 mg/L	250 mg/L	94.7	50.0	140	----
		lead, TCLP	7439-92-1	E444	9.77 mg/L	10 mg/L	97.7	50.0	140	----
		magnesium, TCLP	7439-95-4	E444	239 mg/L	250 mg/L	95.8	50.0	140	----
		nickel, TCLP	7440-02-0	E444	2.39 mg/L	2.5 mg/L	95.6	50.0	140	----
		selenium, TCLP	7782-49-2	E444	5.15 mg/L	5 mg/L	103	50.0	140	----
		silver, TCLP	7440-22-4	E444	0.111 mg/L	0.1 mg/L	111	50.0	140	----
		thallium, TCLP	7440-28-0	E444	4.8 mg/L	5 mg/L	96.8	50.0	140	----
		uranium, TCLP	7440-61-1	E444	4.97 mg/L	5 mg/L	99.4	50.0	150	----
		vanadium, TCLP	7440-62-2	E444	0.74 mg/L	0.75 mg/L	98.4	50.0	140	----
		zinc, TCLP	7440-66-6	E444	ND mg/L	10 mg/L	ND	50.0	140	----
		zirconium, TCLP	7440-67-7	E444	9 mg/L	10 mg/L	91.2	50.0	150	----
TCLP Metals (QCLot: 750268)										
VA22C7647-001	BA2245-A-1	mercury, TCLP	7439-97-6	E512	0.0009 mg/L	0.001 mg/L	93.0	50.0	140	----

Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix:

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Metals (QCLot: 745392)									
	SCP SS-2	mercury	7439-97-6	E510	0.059 mg/kg	95.4	70.0	130	----
Metals (QCLot: 745393)									
	SCP SS-2	aluminum	7429-90-5	E440	9817 mg/kg	100	70.0	130	----
	SCP SS-2	antimony	7440-36-0	E440	3.99 mg/kg	94.0	70.0	130	----
	SCP SS-2	arsenic	7440-38-2	E440	3.73 mg/kg	95.1	70.0	130	----
	SCP SS-2	barium	7440-39-3	E440	105 mg/kg	88.6	70.0	130	----
	SCP SS-2	beryllium	7440-41-7	E440	0.349 mg/kg	90.2	70.0	130	----
	SCP SS-2	boron	7440-42-8	E440	8.5 mg/kg	96.3	40.0	160	----
	SCP SS-2	cadmium	7440-43-9	E440	0.91 mg/kg	83.4	70.0	130	----
	SCP SS-2	calcium	7440-70-2	E440	31082 mg/kg	95.6	70.0	130	----
	SCP SS-2	chromium	7440-47-3	E440	101 mg/kg	104	70.0	130	----
	SCP SS-2	cobalt	7440-48-4	E440	6.9 mg/kg	92.7	70.0	130	----
	SCP SS-2	copper	7440-50-8	E440	123 mg/kg	93.6	70.0	130	----
	SCP SS-2	iron	7439-89-6	E440	23558 mg/kg	94.4	70.0	130	----
	SCP SS-2	lead	7439-92-1	E440	267 mg/kg	96.2	70.0	130	----
	SCP SS-2	lithium	7439-93-2	E440	9.5 mg/kg	94.6	70.0	130	----
	SCP SS-2	magnesium	7439-95-4	E440	5509 mg/kg	95.7	70.0	130	----
	SCP SS-2	manganese	7439-96-5	E440	269 mg/kg	96.8	70.0	130	----
	SCP SS-2	molybdenum	7439-98-7	E440	1.03 mg/kg	94.2	70.0	130	----
	SCP SS-2	nickel	7440-02-0	E440	26.7 mg/kg	93.6	70.0	130	----
	SCP SS-2	phosphorus	7723-14-0	E440	752 mg/kg	90.4	70.0	130	----
	SCP SS-2	potassium	7440-09-7	E440	1587 mg/kg	102	70.0	130	----
	SCP SS-2	sodium	7440-23-5	E440	797 mg/kg	98.2	70.0	130	----
	SCP SS-2	strontium	7440-24-6	E440	86.1 mg/kg	97.6	70.0	130	----
	SCP SS-2	thallium	7440-28-0	E440	0.0786 mg/kg	94.9	40.0	160	----
	SCP SS-2	tin	7440-31-5	E440	10.6 mg/kg	85.1	70.0	130	----
	SCP SS-2	titanium	7440-32-6	E440	839 mg/kg	100	70.0	130	----

Sub-Matrix:

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Metals (QCLot: 745393) - continued									
	SCP SS-2	uranium	7440-61-1	E440	0.52 mg/kg	89.6	70.0	130	----
	SCP SS-2	vanadium	7440-62-2	E440	32.7 mg/kg	96.6	70.0	130	----
	SCP SS-2	zinc	7440-66-6	E440	297 mg/kg	90.1	70.0	130	----
	SCP SS-2	zirconium	7440-67-7	E440	5.73 mg/kg	88.6	70.0	130	----

ALS Environmental

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

CC

Environmental Division
Vancouver
Work Order Reference
VA22C7647

Telephone : +1 604 253 4188

Report To			Report Format / Distribution	Service Requested (Rush for routine
Company:	Covanta Energy		☐ Standard ☐ Other	◉ Regular (Standard Turnaround Times - Busine
Contact:	Steve Mckinney / Dan Skrypnyk		☑ PDF ☐ Excel ☐ Digital ☐ Fax	○ Priority (2-4 Business Days) - 50% Surcharge
Address:	5150 Riverbend Drive		Email 1: smckinney@covanta.com	○ Emergency (1-2 Bus. Days) - 100% Surcharge
	Burnaby BC		Email 2: rjohnson4@covanta.com	○ Same Day or Weekend Emergency - Contact /
Phone:	604-521-1025	Fax: ☐ Yes ☐ No	Email 3: dskrypnyk@covanta.com	Analysis R
			brent.kirkpatrick@metrovancouver.org	
			Sarah.Wellman@metrovancouver.org	

Invoice To	Same as Report ?		Client / Project Information	Please indicate below Filtered, Preserved or both (F, P, F/P)
Hardcopy of Invoice with Report?	☐ Yes ☐ No		Job #:	
Company:			PO / AFE: PO# 46693 Weekly Bottom Ash - Suite	
Contact:			LSD: (includes 2:1 pH)	
Address:				
Phone:		Fax:	Quote #:	

Lab Work Order # (lab use only)		ALS Contact:	Sampler:

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	MET-TCLP-VA (all metals, Hg)	MOISTURE		Chrome 6		MET-CSR+FULL-VA (all metals)						Number of Containers
	BA2245-A-1	09-Nov-22	9:00	Soil	X	X				X						1
	BA2245-A-2	09-Nov-22	9:00	Soil	X	X				X						1
	BA2245-A-3	09-Nov-22	9:00	Soil	X	X				X						1
	BA2245-A-4	09-Nov-22	9:00	Soil	X	X				X						1
	BA2245-A-5	09-Nov-22	9:00	Soil	X	X				X						1
	BA2245-A-6	09-Nov-22	9:00	Soil	X	X				X						1
	BA2245-A-7	09-Nov-22	9:00	Soil	X	X				X						1
	BA2245-A-8	09-Nov-22	9:00	Soil	X	X				X						1
	BA2245-A-9	09-Nov-22	9:00	Soil	X	X				X						1
	BA2245-A-10	09-Nov-22	9:00	Soil	X	X				X						1
	BA2245-A-11	09-Nov-22	9:00	Soil	X	X				X						1
	BA2245-A-12	09-Nov-22	9:00	Soil	X	X				X						1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
	15-Nov-22	0800	JC	15Nov22	1210pm	19,20 °C				

GENF 20.00 Front