

## Bottom Ash Data

2022 Week 40

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The following analytical report represents bottom ash composite results for week 40 of 2022 (October 2, 2022 to October 8, 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** : **VA22C4412**  
**Client** : **Covanta Burnaby Renewable Energy, ULC**  
**Contact** : Nicole Victor  
**Address** : 5150 Riverbend Drive  
                   Burnaby BC Canada V3N 4V3  
**Telephone** : ----  
**Project** : Weekly Bottom Ash - Suite  
**PO** : VANCO 0000051213  
**C-O-C number** : ----  
**Sampler** : ----  
**Site** : ----  
**Quote number** : Standing Offer (BC work)  
**No. of samples received** : 12  
**No. of samples analysed** : 12

**Page** : 1 of 11  
**Laboratory** : Vancouver - Environmental  
**Account Manager** : Brent Mack  
**Address** : 8081 Lougheed Highway  
                   Burnaby BC Canada V5A 1W9  
**Telephone** : 778-370-3279  
**Date Samples Received** : 11-Oct-2022 11:20  
**Date Analysis Commenced** : 17-Oct-2022  
**Issue Date** : 21-Oct-2022 15:58

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.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Alex Thornton	Analyst	Metals, Burnaby, British Columbia
Dan Gebert	Laboratory Analyst	Metals, Burnaby, British Columbia
Janice Leung	Supervisor - Organics Instrumentation	Organics, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, 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).

<i>Unit</i>	<i>Description</i>
%	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.

## Workorder Comments

CRM failed high for Mo and qualified. CRM is known to have Occasional hotspots for Mo, so it is the material itself and not the method. LCS passed thus results are not affected



## Analytical Results

Sub-Matrix: Soil					Client sample ID	BA2240-A-1	BA2240-A-2	BA2240-A-3	BA2240-A-4	BA2240-A-5
(Matrix: Soil/Solid)										
Client sampling date / time					05-Oct-2022 09:00	05-Oct-2022 09:00	05-Oct-2022 09:00	05-Oct-2022 09:00	05-Oct-2022 09:00	
Analyte	CAS Number	Method	LOR	Unit	VA22C4412-001	VA22C4412-002	VA22C4412-003	VA22C4412-004	VA22C4412-005	
					Result	Result	Result	Result	Result	
<b>Physical Tests</b>										
moisture	----	E144	0.25	%	20.0	19.6	20.6	20.7	21.4	
pH (1:2 soil:water)	----	E108	0.10	pH units	10.2	10.4	10.3	10.2	10.2	
<b>Metals</b>										
aluminum	7429-90-5	E440	50	mg/kg	36700	37300	38400	31200	32700	
antimony	7440-36-0	E440	0.10	mg/kg	131	131	145	124	141	
arsenic	7440-38-2	E440	0.10	mg/kg	27.6	23.9	26.1	27.1	28.3	
barium	7440-39-3	E440	0.50	mg/kg	344	388	367	427	341	
beryllium	7440-41-7	E440	0.10	mg/kg	0.39	0.36	0.34	0.34	0.38	
bismuth	7440-69-9	E440	0.20	mg/kg	7.22	6.79	9.76	6.46	15.3	
boron	7440-42-8	E440	5.0	mg/kg	155	268	202	204	187	
cadmium	7440-43-9	E440	0.020	mg/kg	12.4	12.4	28.1	14.4	16.0	
calcium	7440-70-2	E440	50	mg/kg	127000	130000	129000	123000	134000	
chromium	7440-47-3	E440	0.50	mg/kg	469	164	174	416	181	
cobalt	7440-48-4	E440	0.10	mg/kg	33.2	231	86.5	222	103	
copper	7440-50-8	E440	0.50	mg/kg	3110	4560	5660	2550	8430	
iron	7439-89-6	E440	50	mg/kg	46900	66300	78800	75900	64100	
lead	7439-92-1	E440	0.50	mg/kg	584	386	510	2340	1870	
lithium	7439-93-2	E440	2.0	mg/kg	24.3	28.6	25.4	100	28.7	
magnesium	7439-95-4	E440	20	mg/kg	11200	11500	12400	10100	11400	
manganese	7439-96-5	E440	1.0	mg/kg	1430	854	929	1210	992	
mercury	7439-97-6	E510	0.0500	mg/kg	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	
molybdenum	7439-98-7	E440	0.10	mg/kg	30.5	20.2	22.7	47.4	21.7	
nickel	7440-02-0	E440	0.50	mg/kg	166	150	140	421	268	
phosphorus	7723-14-0	E440	50	mg/kg	11300	12000	10600	10600	12700	
potassium	7440-09-7	E440	100	mg/kg	6590	5840	5930	5580	6060	
selenium	7782-49-2	E440	0.20	mg/kg	0.50	0.41	0.44	0.62	0.46	
silver	7440-22-4	E440	0.10	mg/kg	6.38	8.60	10.4	4.13	7.76	
sodium	7440-23-5	E440	50	mg/kg	17700	17600	15800	15300	16500	
strontium	7440-24-6	E440	0.50	mg/kg	313	326	292	754	347	



## Analytical Results

Sub-Matrix: Soil					Client sample ID	BA2240-A-1	BA2240-A-2	BA2240-A-3	BA2240-A-4	BA2240-A-5
(Matrix: Soil/Solid)					Client sampling date / time	05-Oct-2022 09:00	05-Oct-2022 09:00	05-Oct-2022 09:00	05-Oct-2022 09:00	05-Oct-2022 09:00
Analyte	CAS Number	Method	LOR	Unit	VA22C4412-001	VA22C4412-002	VA22C4412-003	VA22C4412-004	VA22C4412-005	
					Result	Result	Result	Result	Result	
<b>Metals</b>										
sulfur	7704-34-9	E440	1000	mg/kg	14600	12900	13500	12300	13900	
thallium	7440-28-0	E440	0.050	mg/kg	0.080	0.062	0.072	0.070	0.077	
tin	7440-31-5	E440	2.0	mg/kg	104	188	138	118	174	
titanium	7440-32-6	E440	1.0	mg/kg	347	304	285	267	193	
tungsten	7440-33-7	E440	0.50	mg/kg	10.6	10.6	10.9	19.6	16.7	
uranium	7440-61-1	E440	0.050	mg/kg	5.83	5.62	5.45	5.00	5.70	
vanadium	7440-62-2	E440	0.20	mg/kg	53.6	56.1	53.4	51.1	59.7	
zinc	7440-66-6	E440	2.0	mg/kg	4770	3780	5030	3240	6210	
zirconium	7440-67-7	E440	1.0	mg/kg	2.1	1.4	2.6	1.8	1.6	
<b>TCLP Metals</b>										
pH, TCLP 1st preliminary	----	EPP444	0.010	pH units	11.4	11.4	11.4	11.4	11.3	
pH, TCLP 2nd preliminary	----	EPP444	0.010	pH units	8.93	8.48	8.71	8.70	8.85	
pH, TCLP extraction fluid initial	----	EPP444	0.010	pH units	2.87	2.87	2.87	2.87	2.87	
pH, TCLP final	----	EPP444	0.010	pH units	6.54	6.42	6.44	6.51	6.48	
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	2.24	2.22	2.24	2.34	2.31	
cadmium, TCLP	7440-43-9	E444	0.050	mg/L	0.169	0.170	1.84	0.187	0.162	
calcium, TCLP	7440-70-2	E444	10	mg/L	2130	2170	2150	2180	2190	
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	0.774	0.864	0.984	2.15	1.15	
copper, TCLP	7440-50-8	E444	0.050	mg/L	0.648	0.728	0.567	0.672	0.591	
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	124	132	130	127	128	
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	0.47	0.56	0.58	0.48	0.42	
selenium, TCLP	7782-49-2	E444	0.10	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	



## Analytical Results

Sub-Matrix: Soil (Matrix: Soil/Solid)					Client sample ID	BA2240-A-1	BA2240-A-2	BA2240-A-3	BA2240-A-4	BA2240-A-5
Client sampling date / time					05-Oct-2022 09:00	05-Oct-2022 09:00	05-Oct-2022 09:00	05-Oct-2022 09:00	05-Oct-2022 09:00	05-Oct-2022 09:00
Analyte	CAS Number	Method	LOR	Unit	VA22C4412-001	VA22C4412-002	VA22C4412-003	VA22C4412-004	VA22C4412-005	
					Result	Result	Result	Result	Result	
<b>TCLP Metals</b>										
silver, TCLP	7440-22-4	E444	0.050	mg/L	<0.050	<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	<1.0
uranium, TCLP	7440-61-1	E444	0.20	mg/L	<0.20	<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	<0.15
zinc, TCLP	7440-66-6	E444	0.50	mg/L	26.4	23.5	20.8	17.1	31.6	31.6
zirconium, TCLP	7440-67-7	E444	10	mg/L	<10	<10	<10	<10	<10	<10

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



## Analytical Results

Sub-Matrix: Soil					Client sample ID	BA2240-A-6	BA2240-A-7	BA2240-A-8	BA2240-A-9	BA2240-A-10
(Matrix: Soil/Solid)					Client sampling date / time	05-Oct-2022 09:00	05-Oct-2022 09:00	05-Oct-2022 09:00	05-Oct-2022 09:00	05-Oct-2022 09:00
Analyte	CAS Number	Method	LOR	Unit	VA22C4412-006	VA22C4412-007	VA22C4412-008	VA22C4412-009	VA22C4412-010	
					Result	Result	Result	Result	Result	
<b>Physical Tests</b>										
moisture	----	E144	0.25	%	20.4	20.4	19.1	19.0	20.6	
pH (1:2 soil:water)	----	E108	0.10	pH units	10.4	10.3	10.5	10.2	10.3	
<b>Metals</b>										
aluminum	7429-90-5	E440	50	mg/kg	36300	46700	41000	40600	41400	
antimony	7440-36-0	E440	0.10	mg/kg	117	122	132	133	134	
arsenic	7440-38-2	E440	0.10	mg/kg	24.7	28.0	23.8	31.1	27.9	
barium	7440-39-3	E440	0.50	mg/kg	488	437	476	319	334	
beryllium	7440-41-7	E440	0.10	mg/kg	0.37	0.35	0.33	0.36	0.37	
bismuth	7440-69-9	E440	0.20	mg/kg	8.10	12.6	5.54	6.94	7.58	
boron	7440-42-8	E440	5.0	mg/kg	182	181	163	159	179	
cadmium	7440-43-9	E440	0.020	mg/kg	10.8	12.0	11.0	14.8	12.4	
calcium	7440-70-2	E440	50	mg/kg	122000	125000	118000	133000	122000	
chromium	7440-47-3	E440	0.50	mg/kg	160	269	567	142	730	
cobalt	7440-48-4	E440	0.10	mg/kg	86.0	144	318	43.1	77.7	
copper	7440-50-8	E440	0.50	mg/kg	2360	3740	5710	3000	4540	
iron	7439-89-6	E440	50	mg/kg	69000	74900	76200	45600	67700	
lead	7439-92-1	E440	0.50	mg/kg	974	434	679	375	464	
lithium	7439-93-2	E440	2.0	mg/kg	31.3	23.7	49.1	25.3	28.9	
magnesium	7439-95-4	E440	20	mg/kg	10200	11300	10000	10400	9710	
manganese	7439-96-5	E440	1.0	mg/kg	875	2730	1010	1790	2800	
mercury	7439-97-6	E510	0.0500	mg/kg	<0.0500	<0.0500	<0.0500	<0.0500	0.0548	
molybdenum	7439-98-7	E440	0.10	mg/kg	23.6	18.8	22.9	23.0	19.2	
nickel	7440-02-0	E440	0.50	mg/kg	236	146	473	128	389	
phosphorus	7723-14-0	E440	50	mg/kg	10100	11000	12000	11600	11000	
potassium	7440-09-7	E440	100	mg/kg	5620	5970	5130	6030	6180	
selenium	7782-49-2	E440	0.20	mg/kg	0.37	0.43	0.38	0.47	0.41	
silver	7440-22-4	E440	0.10	mg/kg	5.39	8.61	3.61	4.34	5.17	
sodium	7440-23-5	E440	50	mg/kg	16200	16100	15500	16800	16400	
strontium	7440-24-6	E440	0.50	mg/kg	296	704	294	300	368	
sulfur	7704-34-9	E440	1000	mg/kg	12200	12800	12100	13900	14000	



## Analytical Results

Sub-Matrix: Soil					Client sample ID	BA2240-A-6	BA2240-A-7	BA2240-A-8	BA2240-A-9	BA2240-A-10
(Matrix: Soil/Solid)					Client sampling date / time	05-Oct-2022 09:00	05-Oct-2022 09:00	05-Oct-2022 09:00	05-Oct-2022 09:00	05-Oct-2022 09:00
Analyte	CAS Number	Method	LOR	Unit	VA22C4412-006	VA22C4412-007	VA22C4412-008	VA22C4412-009	VA22C4412-010	
					Result	Result	Result	Result	Result	
<b>Metals</b>										
thallium	7440-28-0	E440	0.050	mg/kg	0.071	0.071	0.057	0.067	0.069	
tin	7440-31-5	E440	2.0	mg/kg	118	129	107	123	131	
titanium	7440-32-6	E440	1.0	mg/kg	254	347	366	250	340	
tungsten	7440-33-7	E440	0.50	mg/kg	9.14	12.6	11.5	10.8	10.6	
uranium	7440-61-1	E440	0.050	mg/kg	5.11	5.26	4.81	5.69	5.28	
vanadium	7440-62-2	E440	0.20	mg/kg	56.4	59.3	53.5	57.2	54.9	
zinc	7440-66-6	E440	2.0	mg/kg	4540	4290	3160	4510	4950	
zirconium	7440-67-7	E440	1.0	mg/kg	1.6	2.0	1.6	3.1	2.4	
<b>TCLP Metals</b>										
pH, TCLP 1st preliminary	----	EPP444	0.010	pH units	11.3	11.4	11.3	11.4	11.4	
pH, TCLP 2nd preliminary	----	EPP444	0.010	pH units	8.80	8.76	8.65	9.15	8.62	
pH, TCLP extraction fluid initial	----	EPP444	0.010	pH units	2.87	2.87	2.87	2.87	2.87	
pH, TCLP final	----	EPP444	0.010	pH units	6.49	6.52	6.39	6.40	6.52	
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	2.20	2.24	2.23	2.18	2.22	
cadmium, TCLP	7440-43-9	E444	0.050	mg/L	0.193	1.08	0.200	0.179	0.416	
calcium, TCLP	7440-70-2	E444	10	mg/L	2140	2110	2130	2110	2080	
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	1.62	1.96	0.858	1.49	0.904	
copper, TCLP	7440-50-8	E444	0.050	mg/L	0.635	0.617	0.766	0.818	0.710	
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	129	126	129	127	128	
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	0.48	0.53	0.55	0.54	0.59	
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 (Matrix: Soil/Solid)					Client sample ID	BA2240-A-6	BA2240-A-7	BA2240-A-8	BA2240-A-9	BA2240-A-10
Client sampling date / time					05-Oct-2022 09:00	05-Oct-2022 09:00	05-Oct-2022 09:00	05-Oct-2022 09:00	05-Oct-2022 09:00	05-Oct-2022 09:00
Analyte	CAS Number	Method	LOR	Unit	VA22C4412-006	VA22C4412-007	VA22C4412-008	VA22C4412-009	VA22C4412-010	
TCLP Metals					Result	Result	Result	Result	Result	
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	23.8	24.2	24.6	28.7	20.4	
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					Client sample ID	BA2240-A-11	BA2240-A-12	----	----	----
(Matrix: Soil/Solid)					Client sampling date / time	05-Oct-2022 09:00	05-Oct-2022 09:00	----	----	----
Analyte	CAS Number	Method	LOR	Unit	VA22C4412-011	VA22C4412-012	-----	-----	-----	
					Result	Result	----	----	----	
<b>Physical Tests</b>										
moisture	----	E144	0.25	%	20.0	18.0	----	----	----	
pH (1:2 soil:water)	----	E108	0.10	pH units	10.2	10.3	----	----	----	
<b>Metals</b>										
aluminum	7429-90-5	E440	50	mg/kg	49600	37400	----	----	----	
antimony	7440-36-0	E440	0.10	mg/kg	119	154	----	----	----	
arsenic	7440-38-2	E440	0.10	mg/kg	25.4	30.8	----	----	----	
barium	7440-39-3	E440	0.50	mg/kg	328	305	----	----	----	
beryllium	7440-41-7	E440	0.10	mg/kg	0.34	0.40	----	----	----	
bismuth	7440-69-9	E440	0.20	mg/kg	10.6	7.43	----	----	----	
boron	7440-42-8	E440	5.0	mg/kg	239	153	----	----	----	
cadmium	7440-43-9	E440	0.020	mg/kg	15.5	13.2	----	----	----	
calcium	7440-70-2	E440	50	mg/kg	128000	136000	----	----	----	
chromium	7440-47-3	E440	0.50	mg/kg	151	183	----	----	----	
cobalt	7440-48-4	E440	0.10	mg/kg	162	53.3	----	----	----	
copper	7440-50-8	E440	0.50	mg/kg	3110	1980	----	----	----	
iron	7439-89-6	E440	50	mg/kg	60800	60600	----	----	----	
lead	7439-92-1	E440	0.50	mg/kg	321	1010	----	----	----	
lithium	7439-93-2	E440	2.0	mg/kg	30.0	27.6	----	----	----	
magnesium	7439-95-4	E440	20	mg/kg	10900	11600	----	----	----	
manganese	7439-96-5	E440	1.0	mg/kg	887	992	----	----	----	
mercury	7439-97-6	E510	0.0500	mg/kg	<0.0500	0.0719	----	----	----	
molybdenum	7439-98-7	E440	0.10	mg/kg	32.2	22.7	----	----	----	
nickel	7440-02-0	E440	0.50	mg/kg	153	261	----	----	----	
phosphorus	7723-14-0	E440	50	mg/kg	11800	11700	----	----	----	
potassium	7440-09-7	E440	100	mg/kg	6080	6180	----	----	----	
selenium	7782-49-2	E440	0.20	mg/kg	0.42	0.40	----	----	----	
silver	7440-22-4	E440	0.10	mg/kg	4.22	5.02	----	----	----	
sodium	7440-23-5	E440	50	mg/kg	16500	16600	----	----	----	
strontium	7440-24-6	E440	0.50	mg/kg	363	327	----	----	----	
sulfur	7704-34-9	E440	1000	mg/kg	13000	14200	----	----	----	



## Analytical Results

Sub-Matrix: Soil					Client sample ID	BA2240-A-11	BA2240-A-12	----	----	----
(Matrix: Soil/Solid)					Client sampling date / time	05-Oct-2022 09:00	05-Oct-2022 09:00	----	----	----
Analyte	CAS Number	Method	LOR	Unit	VA22C4412-011	VA22C4412-012	-----	-----	-----	
					Result	Result	----	----	----	
<b>Metals</b>										
thallium	7440-28-0	E440	0.050	mg/kg	0.059	0.071	----	----	----	
tin	7440-31-5	E440	2.0	mg/kg	114	274	----	----	----	
titanium	7440-32-6	E440	1.0	mg/kg	296	249	----	----	----	
tungsten	7440-33-7	E440	0.50	mg/kg	10.0	11.7	----	----	----	
uranium	7440-61-1	E440	0.050	mg/kg	5.23	6.01	----	----	----	
vanadium	7440-62-2	E440	0.20	mg/kg	56.4	56.5	----	----	----	
zinc	7440-66-6	E440	2.0	mg/kg	3770	4600	----	----	----	
zirconium	7440-67-7	E440	1.0	mg/kg	4.4	1.6	----	----	----	
<b>TCLP Metals</b>										
pH, TCLP 1st preliminary	----	EPP444	0.010	pH units	11.4	11.4	----	----	----	
pH, TCLP 2nd preliminary	----	EPP444	0.010	pH units	8.57	8.91	----	----	----	
pH, TCLP extraction fluid initial	----	EPP444	0.010	pH units	2.87	2.87	----	----	----	
pH, TCLP final	----	EPP444	0.010	pH units	6.46	6.39	----	----	----	
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	2.17	2.25	----	----	----	
cadmium, TCLP	7440-43-9	E444	0.050	mg/L	0.234	0.187	----	----	----	
calcium, TCLP	7440-70-2	E444	10	mg/L	2100	2010	----	----	----	
chromium, TCLP	7440-47-3	E444	0.25	mg/L	<0.25	<0.25	----	----	----	
cobalt, TCLP	7440-48-4	E444	0.050	mg/L	1.14	2.80	----	----	----	
copper, TCLP	7440-50-8	E444	0.050	mg/L	0.703	0.577	----	----	----	
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	130	127	----	----	----	
mercury, TCLP	7439-97-6	E512	0.0010	mg/L	<0.0010	<0.0010	----	----	----	
nickel, TCLP	7440-02-0	E444	0.25	mg/L	0.46	0.51	----	----	----	
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					Client sample ID		BA2240-A-11	BA2240-A-12	----	----	----
(Matrix: Soil/Solid)					Client sampling date / time		05-Oct-2022 09:00	05-Oct-2022 09:00	----	----	----
Analyte	CAS Number	Method	LOR	Unit	VA22C4412-011	VA22C4412-012	-----	-----	-----	-----	-----
TCLP Metals					Result	Result	---	---	---	---	---
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	29.4	28.3	---	---	---	---	---
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

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<p><b>Work Order</b> : <b>VA22C4412</b></p> <p><b>Client</b> : <b>Covanta Burnaby Renewable Energy, ULC</b></p> <p><b>Contact</b> : Nicole Victor</p> <p><b>Address</b> : 5150 Riverbend Drive Burnaby BC Canada V3N 4V3</p> <p><b>Telephone</b> : ----</p> <p><b>Project</b> : Weekly Bottom Ash - Suite</p> <p><b>PO</b> : VANCO 0000051213</p> <p><b>C-O-C number</b> : ----</p> <p><b>Sampler</b> : ----</p> <p><b>Site</b> : ----</p> <p><b>Quote number</b> : Standing Offer (BC work)</p> <p><b>No. of samples received</b> : 12</p> <p><b>No. of samples analysed</b> : 12</p>	<p><b>Page</b> : 1 of 16</p> <p><b>Laboratory</b> : Vancouver - Environmental</p> <p><b>Account Manager</b> : Brent Mack</p> <p><b>Address</b> : 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9</p> <p><b>Telephone</b> : 778-370-3279</p> <p><b>Date Samples Received</b> : 11-Oct-2022 11:20</p> <p><b>Issue Date</b> : 21-Oct-2022 15:58</p>
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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.
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### ***Workorder Comments***

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

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### ***Summary of Outliers***

#### ***Outliers : Quality Control Samples***

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

#### ***Outliers: Reference Material (RM) Samples***

- Reference Material (RM) Sample outliers occur - please see the following pages for full details.

***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
<b>Duplicate (DUP) RPDs</b>								
Metals	VA22C4412-001	BA2240-A-1	bismuth	7440-69-9	E440	41.7 % DUP-H	30%	Duplicate RPD does not meet the DQO for this test.
Metals	VA22C4412-001	BA2240-A-1	chromium	7440-47-3	E440	91.2 % DUP-H	30%	Duplicate RPD does not meet the DQO for this test.
Metals	VA22C4412-001	BA2240-A-1	iron	7439-89-6	E440	42.4 % DUP-H	30%	Duplicate RPD does not meet the DQO for this test.
Metals	VA22C4412-001	BA2240-A-1	manganese	7439-96-5	E440	42.2 % DUP-H	30%	Duplicate RPD does not meet the DQO for this test.
Metals	VA22C4412-001	BA2240-A-1	molybdenum	7439-98-7	E440	41.0 % DUP-H	40%	Duplicate RPD does not meet the DQO for this test.
Metals	VA22C4412-001	BA2240-A-1	titanium	7440-32-6	E440	53.6 % DUP-H	40%	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.

Reference Material (RM) Sample								
Metals	QC-MRG2-7002970 03	----	molybdenum	7439-98-7	E440	146 % RRQC	70.0-130%	Recovery greater than upper control limit

**Result Qualifiers**

Qualifier	Description
RRQC	Refer to report comments for information regarding this QC result.



## 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		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
LDPE bag BA2240-A-1	E510	05-Oct-2022	18-Oct-2022	----	----		19-Oct-2022	28 days	13 days	✓
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
LDPE bag BA2240-A-10	E510	05-Oct-2022	18-Oct-2022	----	----		19-Oct-2022	28 days	13 days	✓
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
LDPE bag BA2240-A-11	E510	05-Oct-2022	18-Oct-2022	----	----		19-Oct-2022	28 days	13 days	✓
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
LDPE bag BA2240-A-12	E510	05-Oct-2022	18-Oct-2022	----	----		19-Oct-2022	28 days	13 days	✓
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
LDPE bag BA2240-A-2	E510	05-Oct-2022	18-Oct-2022	----	----		19-Oct-2022	28 days	13 days	✓
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
LDPE bag BA2240-A-3	E510	05-Oct-2022	18-Oct-2022	----	----		19-Oct-2022	28 days	13 days	✓
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
LDPE bag BA2240-A-4	E510	05-Oct-2022	18-Oct-2022	----	----		19-Oct-2022	28 days	13 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		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Metals : Mercury in Soil/Solid by CVAAS</b>											
LDPE bag BA2240-A-5	E510	05-Oct-2022	18-Oct-2022	----	----		19-Oct-2022	28 days	13 days	✔	
<b>Metals : Mercury in Soil/Solid by CVAAS</b>											
LDPE bag BA2240-A-6	E510	05-Oct-2022	18-Oct-2022	----	----		19-Oct-2022	28 days	13 days	✔	
<b>Metals : Mercury in Soil/Solid by CVAAS</b>											
LDPE bag BA2240-A-7	E510	05-Oct-2022	18-Oct-2022	----	----		19-Oct-2022	28 days	13 days	✔	
<b>Metals : Mercury in Soil/Solid by CVAAS</b>											
LDPE bag BA2240-A-8	E510	05-Oct-2022	18-Oct-2022	----	----		19-Oct-2022	28 days	13 days	✔	
<b>Metals : Mercury in Soil/Solid by CVAAS</b>											
LDPE bag BA2240-A-9	E510	05-Oct-2022	18-Oct-2022	----	----		19-Oct-2022	28 days	13 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
LDPE bag BA2240-A-1	E440	05-Oct-2022	18-Oct-2022	----	----		19-Oct-2022	180 days	13 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
LDPE bag BA2240-A-10	E440	05-Oct-2022	18-Oct-2022	----	----		19-Oct-2022	180 days	13 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
LDPE bag BA2240-A-11	E440	05-Oct-2022	18-Oct-2022	----	----		19-Oct-2022	180 days	13 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
LDPE bag BA2240-A-12	E440	05-Oct-2022	18-Oct-2022	----	----		19-Oct-2022	180 days	13 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		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Metals : Metals in Soil/Solid by CRC ICMS</b>											
LDPE bag BA2240-A-2	E440	05-Oct-2022	18-Oct-2022	----	----		19-Oct-2022	180 days	13 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICMS</b>											
LDPE bag BA2240-A-3	E440	05-Oct-2022	18-Oct-2022	----	----		19-Oct-2022	180 days	13 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICMS</b>											
LDPE bag BA2240-A-4	E440	05-Oct-2022	18-Oct-2022	----	----		19-Oct-2022	180 days	13 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICMS</b>											
LDPE bag BA2240-A-5	E440	05-Oct-2022	18-Oct-2022	----	----		19-Oct-2022	180 days	13 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICMS</b>											
LDPE bag BA2240-A-6	E440	05-Oct-2022	18-Oct-2022	----	----		19-Oct-2022	180 days	13 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICMS</b>											
LDPE bag BA2240-A-7	E440	05-Oct-2022	18-Oct-2022	----	----		19-Oct-2022	180 days	13 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICMS</b>											
LDPE bag BA2240-A-8	E440	05-Oct-2022	18-Oct-2022	----	----		19-Oct-2022	180 days	13 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICMS</b>											
LDPE bag BA2240-A-9	E440	05-Oct-2022	18-Oct-2022	----	----		19-Oct-2022	180 days	13 days	✔	
<b>Physical Tests : Moisture Content by Gravimetry</b>											
LDPE bag BA2240-A-1	E144	05-Oct-2022	----	----	----		17-Oct-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		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Physical Tests : Moisture Content by Gravimetry</b>										
LDPE bag BA2240-A-10	E144	05-Oct-2022	----	----	----		17-Oct-2022	----	----	
<b>Physical Tests : Moisture Content by Gravimetry</b>										
LDPE bag BA2240-A-11	E144	05-Oct-2022	----	----	----		17-Oct-2022	----	----	
<b>Physical Tests : Moisture Content by Gravimetry</b>										
LDPE bag BA2240-A-12	E144	05-Oct-2022	----	----	----		17-Oct-2022	----	----	
<b>Physical Tests : Moisture Content by Gravimetry</b>										
LDPE bag BA2240-A-2	E144	05-Oct-2022	----	----	----		17-Oct-2022	----	----	
<b>Physical Tests : Moisture Content by Gravimetry</b>										
LDPE bag BA2240-A-3	E144	05-Oct-2022	----	----	----		17-Oct-2022	----	----	
<b>Physical Tests : Moisture Content by Gravimetry</b>										
LDPE bag BA2240-A-4	E144	05-Oct-2022	----	----	----		17-Oct-2022	----	----	
<b>Physical Tests : Moisture Content by Gravimetry</b>										
LDPE bag BA2240-A-5	E144	05-Oct-2022	----	----	----		17-Oct-2022	----	----	
<b>Physical Tests : Moisture Content by Gravimetry</b>										
LDPE bag BA2240-A-6	E144	05-Oct-2022	----	----	----		17-Oct-2022	----	----	
<b>Physical Tests : Moisture Content by Gravimetry</b>										
LDPE bag BA2240-A-7	E144	05-Oct-2022	----	----	----		17-Oct-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		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Physical Tests : Moisture Content by Gravimetry</b>											
LDPE bag BA2240-A-8	E144	05-Oct-2022	----	----	----		17-Oct-2022	----	----		
<b>Physical Tests : Moisture Content by Gravimetry</b>											
LDPE bag BA2240-A-9	E144	05-Oct-2022	----	----	----		17-Oct-2022	----	----		
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>											
LDPE bag BA2240-A-1	E108	05-Oct-2022	18-Oct-2022	----	----		18-Oct-2022	30 days	13 days	✔	
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>											
LDPE bag BA2240-A-10	E108	05-Oct-2022	18-Oct-2022	----	----		18-Oct-2022	30 days	13 days	✔	
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>											
LDPE bag BA2240-A-11	E108	05-Oct-2022	18-Oct-2022	----	----		18-Oct-2022	30 days	13 days	✔	
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>											
LDPE bag BA2240-A-12	E108	05-Oct-2022	18-Oct-2022	----	----		18-Oct-2022	30 days	13 days	✔	
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>											
LDPE bag BA2240-A-2	E108	05-Oct-2022	18-Oct-2022	----	----		18-Oct-2022	30 days	13 days	✔	
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>											
LDPE bag BA2240-A-3	E108	05-Oct-2022	18-Oct-2022	----	----		18-Oct-2022	30 days	13 days	✔	
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>											
LDPE bag BA2240-A-4	E108	05-Oct-2022	18-Oct-2022	----	----		18-Oct-2022	30 days	13 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		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>											
LDPE bag BA2240-A-5	E108	05-Oct-2022	18-Oct-2022	----	----		18-Oct-2022	30 days	13 days	✔	
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>											
LDPE bag BA2240-A-6	E108	05-Oct-2022	18-Oct-2022	----	----		18-Oct-2022	30 days	13 days	✔	
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>											
LDPE bag BA2240-A-7	E108	05-Oct-2022	18-Oct-2022	----	----		18-Oct-2022	30 days	13 days	✔	
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>											
LDPE bag BA2240-A-8	E108	05-Oct-2022	18-Oct-2022	----	----		18-Oct-2022	30 days	13 days	✔	
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>											
LDPE bag BA2240-A-9	E108	05-Oct-2022	18-Oct-2022	----	----		18-Oct-2022	30 days	13 days	✔	
<b>TCLP Metals : Mercury by CVAAS (TCLP)</b>											
Glass vial - total (lab preserved) BA2240-A-1	E512	18-Oct-2022	20-Oct-2022	----	----		20-Oct-2022	28 days	15 days	✔	
<b>TCLP Metals : Mercury by CVAAS (TCLP)</b>											
Glass vial - total (lab preserved) BA2240-A-10	E512	18-Oct-2022	20-Oct-2022	----	----		20-Oct-2022	28 days	15 days	✔	
<b>TCLP Metals : Mercury by CVAAS (TCLP)</b>											
Glass vial - total (lab preserved) BA2240-A-11	E512	18-Oct-2022	20-Oct-2022	----	----		20-Oct-2022	28 days	15 days	✔	
<b>TCLP Metals : Mercury by CVAAS (TCLP)</b>											
Glass vial - total (lab preserved) BA2240-A-12	E512	18-Oct-2022	20-Oct-2022	----	----		20-Oct-2022	28 days	15 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		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>TCLP Metals : Mercury by CVAAS (TCLP)</b>											
Glass vial - total (lab preserved) BA2240-A-2	E512	18-Oct-2022	20-Oct-2022	----	----		20-Oct-2022	28 days	15 days	✔	
<b>TCLP Metals : Mercury by CVAAS (TCLP)</b>											
Glass vial - total (lab preserved) BA2240-A-3	E512	18-Oct-2022	20-Oct-2022	----	----		20-Oct-2022	28 days	15 days	✔	
<b>TCLP Metals : Mercury by CVAAS (TCLP)</b>											
Glass vial - total (lab preserved) BA2240-A-4	E512	18-Oct-2022	20-Oct-2022	----	----		20-Oct-2022	28 days	15 days	✔	
<b>TCLP Metals : Mercury by CVAAS (TCLP)</b>											
Glass vial - total (lab preserved) BA2240-A-5	E512	18-Oct-2022	20-Oct-2022	----	----		20-Oct-2022	28 days	15 days	✔	
<b>TCLP Metals : Mercury by CVAAS (TCLP)</b>											
Glass vial - total (lab preserved) BA2240-A-6	E512	18-Oct-2022	20-Oct-2022	----	----		20-Oct-2022	28 days	15 days	✔	
<b>TCLP Metals : Mercury by CVAAS (TCLP)</b>											
Glass vial - total (lab preserved) BA2240-A-7	E512	18-Oct-2022	20-Oct-2022	----	----		20-Oct-2022	28 days	15 days	✔	
<b>TCLP Metals : Mercury by CVAAS (TCLP)</b>											
Glass vial - total (lab preserved) BA2240-A-8	E512	18-Oct-2022	20-Oct-2022	----	----		20-Oct-2022	28 days	15 days	✔	
<b>TCLP Metals : Mercury by CVAAS (TCLP)</b>											
Glass vial - total (lab preserved) BA2240-A-9	E512	18-Oct-2022	20-Oct-2022	----	----		20-Oct-2022	28 days	15 days	✔	
<b>TCLP Metals : Metals by CRC ICPMS (TCLP)</b>											
HDPE - total (lab preserved) BA2240-A-1	E444	18-Oct-2022	20-Oct-2022	----	----		20-Oct-2022	180 days	15 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		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>TCLP Metals : Metals by CRC ICPMS (TCLP)</b>											
HDPE - total (lab preserved) BA2240-A-10	E444	18-Oct-2022	20-Oct-2022	----	----		20-Oct-2022	180 days	15 days	✔	
<b>TCLP Metals : Metals by CRC ICPMS (TCLP)</b>											
HDPE - total (lab preserved) BA2240-A-11	E444	18-Oct-2022	20-Oct-2022	----	----		20-Oct-2022	180 days	15 days	✔	
<b>TCLP Metals : Metals by CRC ICPMS (TCLP)</b>											
HDPE - total (lab preserved) BA2240-A-12	E444	18-Oct-2022	20-Oct-2022	----	----		20-Oct-2022	180 days	15 days	✔	
<b>TCLP Metals : Metals by CRC ICPMS (TCLP)</b>											
HDPE - total (lab preserved) BA2240-A-2	E444	18-Oct-2022	20-Oct-2022	----	----		20-Oct-2022	180 days	15 days	✔	
<b>TCLP Metals : Metals by CRC ICPMS (TCLP)</b>											
HDPE - total (lab preserved) BA2240-A-3	E444	18-Oct-2022	20-Oct-2022	----	----		20-Oct-2022	180 days	15 days	✔	
<b>TCLP Metals : Metals by CRC ICPMS (TCLP)</b>											
HDPE - total (lab preserved) BA2240-A-4	E444	18-Oct-2022	20-Oct-2022	----	----		20-Oct-2022	180 days	15 days	✔	
<b>TCLP Metals : Metals by CRC ICPMS (TCLP)</b>											
HDPE - total (lab preserved) BA2240-A-5	E444	18-Oct-2022	20-Oct-2022	----	----		20-Oct-2022	180 days	15 days	✔	
<b>TCLP Metals : Metals by CRC ICPMS (TCLP)</b>											
HDPE - total (lab preserved) BA2240-A-6	E444	18-Oct-2022	20-Oct-2022	----	----		20-Oct-2022	180 days	15 days	✔	
<b>TCLP Metals : Metals by CRC ICPMS (TCLP)</b>											
HDPE - total (lab preserved) BA2240-A-7	E444	18-Oct-2022	20-Oct-2022	----	----		20-Oct-2022	180 days	15 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		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>TCLP Metals : Metals by CRC ICPMS (TCLP)</b>										
HDPE - total (lab preserved) BA2240-A-8	E444	18-Oct-2022	20-Oct-2022	----	----		20-Oct-2022	180 days	15 days	✔
<b>TCLP Metals : Metals by CRC ICPMS (TCLP)</b>										
HDPE - total (lab preserved) BA2240-A-9	E444	18-Oct-2022	20-Oct-2022	----	----		20-Oct-2022	180 days	15 days	✔
<b>TCLP Metals : TCLP Leachate Preparation (Metals, Inorganics, and SVOCs)</b>										
Lab Split - Non-Volatile Leach: 28 day HT (e.g. Hg, CrVI) BA2240-A-1	EPP444	05-Oct-2022	18-Oct-2022	----	----		----	----	----	
<b>TCLP Metals : TCLP Leachate Preparation (Metals, Inorganics, and SVOCs)</b>										
Lab Split - Non-Volatile Leach: 28 day HT (e.g. Hg, CrVI) BA2240-A-10	EPP444	05-Oct-2022	18-Oct-2022	----	----		----	----	----	
<b>TCLP Metals : TCLP Leachate Preparation (Metals, Inorganics, and SVOCs)</b>										
Lab Split - Non-Volatile Leach: 28 day HT (e.g. Hg, CrVI) BA2240-A-11	EPP444	05-Oct-2022	18-Oct-2022	----	----		----	----	----	
<b>TCLP Metals : TCLP Leachate Preparation (Metals, Inorganics, and SVOCs)</b>										
Lab Split - Non-Volatile Leach: 28 day HT (e.g. Hg, CrVI) BA2240-A-12	EPP444	05-Oct-2022	18-Oct-2022	----	----		----	----	----	
<b>TCLP Metals : TCLP Leachate Preparation (Metals, Inorganics, and SVOCs)</b>										
Lab Split - Non-Volatile Leach: 28 day HT (e.g. Hg, CrVI) BA2240-A-2	EPP444	05-Oct-2022	18-Oct-2022	----	----		----	----	----	
<b>TCLP Metals : TCLP Leachate Preparation (Metals, Inorganics, and SVOCs)</b>										
Lab Split - Non-Volatile Leach: 28 day HT (e.g. Hg, CrVI) BA2240-A-3	EPP444	05-Oct-2022	18-Oct-2022	----	----		----	----	----	
<b>TCLP Metals : TCLP Leachate Preparation (Metals, Inorganics, and SVOCs)</b>										
Lab Split - Non-Volatile Leach: 28 day HT (e.g. Hg, CrVI) BA2240-A-4	EPP444	05-Oct-2022	18-Oct-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		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>TCLP Metals : TCLP Leachate Preparation (Metals, Inorganics, and SVOCs)</b>										
Lab Split - Non-Volatile Leach: 28 day HT (e.g. Hg, CrVI) BA2240-A-5	EPP444	05-Oct-2022	18-Oct-2022	----	----		----	----	----	
<b>TCLP Metals : TCLP Leachate Preparation (Metals, Inorganics, and SVOCs)</b>										
Lab Split - Non-Volatile Leach: 28 day HT (e.g. Hg, CrVI) BA2240-A-6	EPP444	05-Oct-2022	18-Oct-2022	----	----		----	----	----	
<b>TCLP Metals : TCLP Leachate Preparation (Metals, Inorganics, and SVOCs)</b>										
Lab Split - Non-Volatile Leach: 28 day HT (e.g. Hg, CrVI) BA2240-A-7	EPP444	05-Oct-2022	18-Oct-2022	----	----		----	----	----	
<b>TCLP Metals : TCLP Leachate Preparation (Metals, Inorganics, and SVOCs)</b>										
Lab Split - Non-Volatile Leach: 28 day HT (e.g. Hg, CrVI) BA2240-A-8	EPP444	05-Oct-2022	18-Oct-2022	----	----		----	----	----	
<b>TCLP Metals : TCLP Leachate Preparation (Metals, Inorganics, and SVOCs)</b>										
Lab Split - Non-Volatile Leach: 28 day HT (e.g. Hg, CrVI) BA2240-A-9	EPP444	05-Oct-2022	18-Oct-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	Method	QC Lot #	Count		Frequency (%)		
			QC	Regular	Actual	Expected	Evaluation
<b>Analytical Methods</b>							
<b>Laboratory Duplicates (DUP)</b>							
Mercury in Soil/Solid by CVAAS	E510	700298	1	17	5.8	5.0	✔
Metals in Soil/Solid by CRC ICPMS	E440	700297	1	17	5.8	5.0	✔
Moisture Content by Gravimetry	E144	700302	1	17	5.8	5.0	✔
pH by Meter (1:2 Soil:Water Extraction)	E108	700299	1	17	5.8	5.0	✔
<b>Laboratory Control Samples (LCS)</b>							
Mercury in Soil/Solid by CVAAS	E510	700298	2	17	11.7	10.0	✔
Metals in Soil/Solid by CRC ICPMS	E440	700297	2	17	11.7	10.0	✔
Moisture Content by Gravimetry	E144	700302	1	17	5.8	5.0	✔
pH by Meter (1:2 Soil:Water Extraction)	E108	700299	1	17	5.8	5.0	✔
<b>Method Blanks (MB)</b>							
Mercury by CVAAS (TCLP)	E512	705923	1	12	8.3	5.0	✔
Mercury in Soil/Solid by CVAAS	E510	700298	1	17	5.8	5.0	✔
Metals by CRC ICPMS (TCLP)	E444	705924	1	12	8.3	5.0	✔
Metals in Soil/Solid by CRC ICPMS	E440	700297	1	17	5.8	5.0	✔
Moisture Content by Gravimetry	E144	700302	1	17	5.8	5.0	✔
<b>Matrix Spikes (MS)</b>							
Mercury by CVAAS (TCLP)	E512	705923	1	12	8.3	5.0	✔
Metals by CRC ICPMS (TCLP)	E444	705924	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 $20 \pm 5^{\circ}\text{C}$ ), and is carried out in accordance with procedures described in the BC Lab Manual (prescriptive method). The procedure involves mixing the dried (at $<60^{\circ}\text{C}$ ) 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 $105^{\circ}\text{C}$ . 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 $\text{HNO}_3$ and $\text{HCl}$ .  Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, 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.
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 $\text{HNO}_3$ and $\text{HCl}$ , 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
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 $<60^{\circ}\text{C}$ ) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water.

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 Work Order : VA22C4412  
 Client : Covanta Burnaby Renewable Energy, ULC  
 Project : Weekly Bottom Ash - Suite



<i>Preparation Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
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 HNO <sub>3</sub> 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.

## QUALITY CONTROL REPORT

<b>Work Order</b>	: <b>VA22C4412</b>	<b>Page</b>	: 1 of 11
<b>Client</b>	: Covanta Burnaby Renewable Energy, ULC	<b>Laboratory</b>	: Vancouver - Environmental
<b>Contact</b>	: Nicole Victor	<b>Account Manager</b>	: Brent Mack
<b>Address</b>	: 5150 Riverbend Drive Burnaby BC Canada V3N 4V3	<b>Address</b>	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
<b>Telephone</b>	:	<b>Telephone</b>	: 778-370-3279
<b>Project</b>	: Weekly Bottom Ash - Suite	<b>Date Samples Received</b>	: 11-Oct-2022 11:20
<b>PO</b>	: VANCO 0000051213	<b>Date Analysis Commenced</b>	: 17-Oct-2022
<b>C-O-C number</b>	: ----	<b>Issue Date</b>	: 21-Oct-2022 15:58
<b>Sampler</b>	: ----        ----		
<b>Site</b>	: ----		
<b>Quote number</b>	: Standing Offer (BC work)		
<b>No. of samples received</b>	: 12		
<b>No. of samples analysed</b>	: 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.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Alex Thornton	Analyst	Vancouver Metals, Burnaby, British Columbia
Dan Gebert	Laboratory Analyst	Vancouver Metals, Burnaby, British Columbia
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Kim Jensen	Department Manager - Metals	Vancouver Metals, Burnaby, British Columbia
Owen Cheng		Vancouver Metals, Burnaby, British Columbia

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Work Order : VA22C4412  
Client : Covanta Burnaby Renewable Energy, ULC  
Project : Weekly Bottom Ash - Suite

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## **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**

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

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### 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
<b>Physical Tests (QC Lot: 700299)</b>											
VA22C4412-001	BA2240-A-1	pH (1:2 soil:water)	----	E108	0.10	pH units	10.2	10.3	0.2%	5%	----
<b>Physical Tests (QC Lot: 700302)</b>											
VA22C4412-001	BA2240-A-1	moisture	----	E144	0.25	%	20.0	20.9	4.18%	20%	----
<b>Metals (QC Lot: 700297)</b>											
VA22C4412-001	BA2240-A-1	aluminum	7429-90-5	E440	50	mg/kg	36700	34800	5.46%	40%	----
		antimony	7440-36-0	E440	0.10	mg/kg	131	132	0.855%	30%	----
		arsenic	7440-38-2	E440	0.10	mg/kg	27.6	27.2	1.78%	30%	----
		barium	7440-39-3	E440	0.50	mg/kg	344	336	2.35%	40%	----
		beryllium	7440-41-7	E440	0.10	mg/kg	0.39	0.57	0.18	Diff <2x LOR	----
		bismuth	7440-69-9	E440	0.20	mg/kg	7.22	11.0	41.7%	30%	DUP-H
		boron	7440-42-8	E440	5.0	mg/kg	155	172	10.5%	30%	----
		cadmium	7440-43-9	E440	0.020	mg/kg	12.4	15.0	18.7%	30%	----
		calcium	7440-70-2	E440	50	mg/kg	127000	130000	2.17%	30%	----
		chromium	7440-47-3	E440	0.50	mg/kg	469	175	91.2%	30%	DUP-H
		cobalt	7440-48-4	E440	0.10	mg/kg	33.2	42.2	23.8%	30%	----
		copper	7440-50-8	E440	0.50	mg/kg	3110	2800	10.4%	30%	----
		iron	7439-89-6	E440	50	mg/kg	46900	72100	42.4%	30%	DUP-H
		lead	7439-92-1	E440	0.50	mg/kg	584	594	1.59%	40%	----
		lithium	7439-93-2	E440	2.0	mg/kg	24.3	25.8	6.29%	30%	----
		magnesium	7439-95-4	E440	20	mg/kg	11200	11200	0.762%	30%	----
		manganese	7439-96-5	E440	1.0	mg/kg	1430	929	42.2%	30%	DUP-H
		molybdenum	7439-98-7	E440	0.10	mg/kg	30.5	20.1	41.0%	40%	DUP-H
		nickel	7440-02-0	E440	0.50	mg/kg	166	162	2.63%	30%	----
		phosphorus	7723-14-0	E440	50	mg/kg	11300	11400	1.05%	30%	----
		potassium	7440-09-7	E440	100	mg/kg	6590	6100	7.58%	40%	----
		selenium	7782-49-2	E440	0.20	mg/kg	0.50	0.43	0.06	Diff <2x LOR	----
		silver	7440-22-4	E440	0.10	mg/kg	6.38	6.96	8.72%	40%	----
		sodium	7440-23-5	E440	50	mg/kg	17700	16600	6.51%	40%	----
		strontium	7440-24-6	E440	0.50	mg/kg	313	330	5.42%	40%	----
		sulfur	7704-34-9	E440	1000	mg/kg	14600	13800	5.30%	30%	----



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
<b>Metals (QC Lot: 700297) - continued</b>											
VA22C4412-001	BA2240-A-1	thallium	7440-28-0	E440	0.050	mg/kg	0.080	0.077	0.003	Diff <2x LOR	----
		tin	7440-31-5	E440	2.0	mg/kg	104	141	30.2%	40%	----
		titanium	7440-32-6	E440	1.0	mg/kg	347	200	53.6%	40%	DUP-H
		tungsten	7440-33-7	E440	0.50	mg/kg	10.6	11.1	4.59%	30%	----
		uranium	7440-61-1	E440	0.050	mg/kg	5.83	5.84	0.261%	30%	----
		vanadium	7440-62-2	E440	0.20	mg/kg	53.6	59.3	9.95%	30%	----
		zinc	7440-66-6	E440	2.0	mg/kg	4770	5740	18.5%	30%	----
		zirconium	7440-67-7	E440	1.0	mg/kg	2.1	1.8	0.4	Diff <2x LOR	----
<b>Metals (QC Lot: 700298)</b>											
VA22C4412-001	BA2240-A-1	mercury	7439-97-6	E510	0.0500	mg/kg	<0.0500	<0.0500	0	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
<b>Physical Tests (QCLot: 700302)</b>						
moisture	---	E144	0.25	%	<0.25	---
<b>Metals (QCLot: 700297)</b>						
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	---
titanium	7440-32-6	E440	1	mg/kg	<1.0	---
tungsten	7440-33-7	E440	0.5	mg/kg	<0.50	---



Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Metals (QCLot: 700297) - continued</b>						
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	----
<b>Metals (QCLot: 700298)</b>						
mercury	7439-97-6	E510	0.005	mg/kg	<0.0050	----
<b>TCLP Metals (QCLot: 705923)</b>						
mercury, TCLP	7439-97-6	E512	0.001	mg/L	<0.0010	----
<b>TCLP Metals (QCLot: 705924)</b>						
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	----



## 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
<b>Physical Tests (QCLot: 700299)</b>									
pH (1:2 soil:water)	----	E108	----	pH units	6 pH units	99.3	95.0	105	----
<b>Physical Tests (QCLot: 700302)</b>									
moisture	----	E144	0.25	%	50 %	100	90.0	110	----
<b>Metals (QCLot: 700297)</b>									
aluminum	7429-90-5	E440	50	mg/kg	200 mg/kg	98.4	80.0	120	----
antimony	7440-36-0	E440	0.1	mg/kg	100 mg/kg	108	80.0	120	----
arsenic	7440-38-2	E440	0.1	mg/kg	100 mg/kg	102	80.0	120	----
barium	7440-39-3	E440	0.5	mg/kg	25 mg/kg	96.1	80.0	120	----
beryllium	7440-41-7	E440	0.1	mg/kg	10 mg/kg	99.2	80.0	120	----
bismuth	7440-69-9	E440	0.2	mg/kg	100 mg/kg	103	80.0	120	----
boron	7440-42-8	E440	5	mg/kg	100 mg/kg	91.3	80.0	120	----
cadmium	7440-43-9	E440	0.02	mg/kg	10 mg/kg	99.9	80.0	120	----
calcium	7440-70-2	E440	50	mg/kg	5000 mg/kg	94.7	80.0	120	----
chromium	7440-47-3	E440	0.5	mg/kg	25 mg/kg	98.0	80.0	120	----
cobalt	7440-48-4	E440	0.1	mg/kg	25 mg/kg	98.5	80.0	120	----
copper	7440-50-8	E440	0.5	mg/kg	25 mg/kg	96.3	80.0	120	----
iron	7439-89-6	E440	50	mg/kg	100 mg/kg	94.2	80.0	120	----
lead	7439-92-1	E440	0.5	mg/kg	50 mg/kg	100	80.0	120	----
lithium	7439-93-2	E440	2	mg/kg	25 mg/kg	101	80.0	120	----
magnesium	7439-95-4	E440	20	mg/kg	5000 mg/kg	99.1	80.0	120	----
manganese	7439-96-5	E440	1	mg/kg	25 mg/kg	100	80.0	120	----
molybdenum	7439-98-7	E440	0.1	mg/kg	25 mg/kg	102	80.0	120	----
nickel	7440-02-0	E440	0.5	mg/kg	50 mg/kg	99.2	80.0	120	----
phosphorus	7723-14-0	E440	50	mg/kg	1000 mg/kg	101	80.0	120	----
potassium	7440-09-7	E440	100	mg/kg	5000 mg/kg	98.7	80.0	120	----
selenium	7782-49-2	E440	0.2	mg/kg	100 mg/kg	98.8	80.0	120	----
silver	7440-22-4	E440	0.1	mg/kg	10 mg/kg	92.9	80.0	120	----
sodium	7440-23-5	E440	50	mg/kg	5000 mg/kg	98.2	80.0	120	----
strontium	7440-24-6	E440	0.5	mg/kg	25 mg/kg	98.8	80.0	120	----
sulfur	7704-34-9	E440	1000	mg/kg	5000 mg/kg	95.9	80.0	120	----
thallium	7440-28-0	E440	0.05	mg/kg	100 mg/kg	99.4	80.0	120	----
tin	7440-31-5	E440	2	mg/kg	50 mg/kg	101	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
<b>Metals (QCLot: 700297) - continued</b>									
titanium	7440-32-6	E440	1	mg/kg	25 mg/kg	93.1	80.0	120	----
tungsten	7440-33-7	E440	0.5	mg/kg	10 mg/kg	93.0	80.0	120	----
uranium	7440-61-1	E440	0.05	mg/kg	0.5 mg/kg	100	80.0	120	----
vanadium	7440-62-2	E440	0.2	mg/kg	50 mg/kg	102	80.0	120	----
zinc	7440-66-6	E440	2	mg/kg	50 mg/kg	99.0	80.0	120	----
zirconium	7440-67-7	E440	1	mg/kg	10 mg/kg	98.8	80.0	120	----
<b>Metals (QCLot: 700298)</b>									
mercury	7439-97-6	E510	0.005	mg/kg	0.1 mg/kg	102	80.0	120	----



### 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
<b>TCLP Metals (QCLot: 705923)</b>										
VA22C4412-001	BA2240-A-1	mercury, TCLP	7439-97-6	E512	0.0009 mg/L	0.001 mg/L	93.0	50.0	140	----
<b>TCLP Metals (QCLot: 705924)</b>										
VA22C4412-001	BA2240-A-1	antimony, TCLP	7440-36-0	E444	5.35 mg/L	5 mg/L	107	50.0	140	----
		arsenic, TCLP	7440-38-2	E444	4.8 mg/L	5 mg/L	95.0	50.0	140	----
		barium, TCLP	7440-39-3	E444	11.5 mg/L	12.5 mg/L	92.3	50.0	140	----
		beryllium, TCLP	7440-41-7	E444	0.233 mg/L	0.25 mg/L	93.3	50.0	140	----
		boron, TCLP	7440-42-8	E444	8.67 mg/L	10 mg/L	86.7	50.0	140	----
		cadmium, TCLP	7440-43-9	E444	0.244 mg/L	0.25 mg/L	97.7	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	1.15 mg/L	1.25 mg/L	91.8	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	2.22 mg/L	2.5 mg/L	89.0	50.0	140	----
		iron, TCLP	7439-89-6	E444	228 mg/L	250 mg/L	91.3	50.0	140	----
		lead, TCLP	7439-92-1	E444	9.86 mg/L	10 mg/L	98.6	50.0	140	----
		magnesium, TCLP	7439-95-4	E444	225 mg/L	250 mg/L	90.0	50.0	140	----
		nickel, TCLP	7440-02-0	E444	2.28 mg/L	2.5 mg/L	91.3	50.0	140	----
		selenium, TCLP	7782-49-2	E444	4.73 mg/L	5 mg/L	94.6	50.0	140	----
		silver, TCLP	7440-22-4	E444	0.109 mg/L	0.1 mg/L	109	50.0	140	----
		thallium, TCLP	7440-28-0	E444	4.9 mg/L	5 mg/L	98.9	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	0.68 mg/L	0.75 mg/L	90.3	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	91.8	50.0	150	----



## 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:

Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Reference Material (RM) Report				
					RM Target Concentration	Recovery (%) RM	Recovery Limits (%)		Qualifier
							Low	High	
<b>Metals (QCLot: 700297)</b>									
	SCP SS-2	aluminum	7429-90-5	E440	9817 mg/kg	101	70.0	130	----
	SCP SS-2	antimony	7440-36-0	E440	3.99 mg/kg	97.4	70.0	130	----
	SCP SS-2	arsenic	7440-38-2	E440	3.73 mg/kg	93.2	70.0	130	----
	SCP SS-2	barium	7440-39-3	E440	105 mg/kg	93.7	70.0	130	----
	SCP SS-2	beryllium	7440-41-7	E440	0.349 mg/kg	103	70.0	130	----
	SCP SS-2	boron	7440-42-8	E440	8.5 mg/kg	106	40.0	160	----
	SCP SS-2	cadmium	7440-43-9	E440	0.91 mg/kg	92.6	70.0	130	----
	SCP SS-2	calcium	7440-70-2	E440	31082 mg/kg	92.6	70.0	130	----
	SCP SS-2	chromium	7440-47-3	E440	101 mg/kg	112	70.0	130	----
	SCP SS-2	cobalt	7440-48-4	E440	6.9 mg/kg	96.5	70.0	130	----
	SCP SS-2	copper	7440-50-8	E440	123 mg/kg	96.4	70.0	130	----
	SCP SS-2	iron	7439-89-6	E440	23558 mg/kg	97.4	70.0	130	----
	SCP SS-2	lead	7439-92-1	E440	267 mg/kg	97.9	70.0	130	----
	SCP SS-2	lithium	7439-93-2	E440	9.5 mg/kg	105	70.0	130	----
	SCP SS-2	magnesium	7439-95-4	E440	5509 mg/kg	98.7	70.0	130	----
	SCP SS-2	manganese	7439-96-5	E440	269 mg/kg	104	70.0	130	----
	SCP SS-2	molybdenum	7439-98-7	E440	1.03 mg/kg	# 146	70.0	130	RRQC
	SCP SS-2	nickel	7440-02-0	E440	26.7 mg/kg	108	70.0	130	----
	SCP SS-2	phosphorus	7723-14-0	E440	752 mg/kg	89.6	70.0	130	----
	SCP SS-2	potassium	7440-09-7	E440	1587 mg/kg	112	70.0	130	----
	SCP SS-2	sodium	7440-23-5	E440	797 mg/kg	99.5	70.0	130	----
	SCP SS-2	strontium	7440-24-6	E440	86.1 mg/kg	97.7	70.0	130	----
	SCP SS-2	thallium	7440-28-0	E440	0.0786 mg/kg	106	40.0	160	----
	SCP SS-2	tin	7440-31-5	E440	10.6 mg/kg	93.2	70.0	130	----
	SCP SS-2	titanium	7440-32-6	E440	839 mg/kg	112	70.0	130	----
	SCP SS-2	uranium	7440-61-1	E440	0.52 mg/kg	104	70.0	130	----
	SCP SS-2	vanadium	7440-62-2	E440	32.7 mg/kg	103	70.0	130	----



Sub-Matrix:

Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Reference Material (RM) Report				
					RM Target Concentration	Recovery (%) RM	Recovery Limits (%)		Qualifier
							Low	High	
<b>Metals (QCLot: 700297) - continued</b>									
	SCP SS-2	zinc	7440-66-6	E440	297 mg/kg	93.7	70.0	130	----
	SCP SS-2	zirconium	7440-67-7	E440	5.73 mg/kg	95.9	70.0	130	----
<b>Metals (QCLot: 700298)</b>									
	SCP SS-2	mercury	7439-97-6	E510	0.059 mg/kg	104	70.0	130	----

**Qualifiers**

Qualifier	Description
RRQC	Refer to report comments for information regarding this QC result.

