

## Bottom Ash Data

2018 Week 49

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The following analytical report was sent to the Ministry of Environment and Climate Change Strategy on December 20, 2018. The data represents bottom ash composite results for week 49 of 2018 (December 2, 2018 to December 8, 2018).

The bottom ash meets the requirements of Metro Vancouver's Bottom Ash Management Plan and is suitable for beneficial use during Coquitlam Landfill closure works.



Covanta Burnaby R.E., ULC  
ATTN: Steve McKinney  
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Burnaby BC V3N 4V3

Date Received: 11-DEC-18  
Report Date: 19-DEC-18 12:22 (MT)  
Version: FINAL

Client Phone: 604-521-1025

## Certificate of Analysis

Lab Work Order #: L2208787  
Project P.O. #: VANCO-0000047506  
Job Reference:  
C of C Numbers:  
Legal Site Desc: Includes 2 : 1 PH

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Brent Mack, B.Sc.  
Account Manager

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## ALS ENVIRONMENTAL ANALYTICAL REPORT

| Sample ID<br>Description<br>Sampled Date<br>Sampled Time<br>Client ID | L2208787-1<br>Soil<br>05-DEC-18<br>09:00<br>BA1849-A-1 | L2208787-2<br>Soil<br>05-DEC-18<br>09:00<br>BA1849-A-2 | L2208787-3<br>Soil<br>05-DEC-18<br>09:00<br>BA1849-A-3 | L2208787-4<br>Soil<br>05-DEC-18<br>09:00<br>BA1849-A-4 | L2208787-5<br>Soil<br>05-DEC-18<br>09:00<br>BA1849-A-5 |        |
|---|--|--|--|--|--|--------|
| Grouping  | Analyte  |  |  |  |  |        |
| <b>SOIL</b>   |  |  |  |  |  |        |
| <b>Physical Tests</b>   | Moisture (%)   | 20.8   | 21.3   | 19.6   | 18.4   | 19.7   |
|   | pH (1:2 soil:water) (pH)                               | 12.36  | 12.27  | 12.31  | 12.33  | 12.29  |
| <b>Metals</b>   | Aluminum (Al) (mg/kg)                                  | 34200  | 36400  | 34800  | 34300  | 32600  |
|   | Antimony (Sb) (mg/kg)                                  | 129  | 155  | 116  | 162  | 146    |
|   | Arsenic (As) (mg/kg)                                   | 24.3   | 28.0   | 21.5   | 23.0   | 28.9   |
|   | Barium (Ba) (mg/kg)                                    | 521  | 631  | 585  | 620  | 546    |
|   | Beryllium (Be) (mg/kg)                                 | 0.36   | 0.37   | 0.36   | 0.41   | 0.42   |
|   | Bismuth (Bi) (mg/kg)                                   | 10.8   | 7.94   | 5.37   | 8.44   | 7.72   |
|   | Boron (B) (mg/kg)                                      | 249  | 245  | 207  | 311  | 223    |
|   | Cadmium (Cd) (mg/kg)                                   | 14.8   | 9.08   | 14.1   | 10.0   | 10.4   |
|   | Calcium (Ca) (mg/kg)                                   | 131000   | 126000   | 120000   | 130000   | 129000 |
|   | Chromium (Cr) (mg/kg)                                  | 196  | 170  | 151  | 151  | 187    |
|   | Cobalt (Co) (mg/kg)                                    | 29.8   | 69.0   | 23.7   | 45.7   | 66.6   |
|   | Copper (Cu) (mg/kg)                                    | 3880   | 6300   | 2740   | 7770   | 8360   |
|   | Iron (Fe) (mg/kg)                                      | 70000  | 58100  | 67700  | 59400  | 57300  |
|   | Lead (Pb) (mg/kg)                                      | 11700  | 779  | 373  | 617  | 6150   |
|   | Lithium (Li) (mg/kg)                                   | 17.6   | 17.9   | 16.6   | 59.9   | 20.2   |
|   | Magnesium (Mg) (mg/kg)                                 | 12000  | 11600  | 11200  | 11600  | 11500  |
|   | Manganese (Mn) (mg/kg)                                 | 1180   | 824  | 876  | 1000   | 1470   |
|   | Mercury (Hg) (mg/kg)                                   | <0.050   | 0.575  | <0.050   | <0.050   | <0.050 |
|   | Molybdenum (Mo) (mg/kg)                                | 445  | 81.0   | 95.1   | 97.5   | 102    |
|   | Nickel (Ni) (mg/kg)                                    | 175  | 104  | 182  | 300  | 222    |
|   | Phosphorus (P) (mg/kg)                                 | 9550   | 10800  | 8780   | 11200  | 10100  |
|   | Potassium (K) (mg/kg)                                  | 5160   | 4860   | 4650   | 4890   | 5160   |
|   | Selenium (Se) (mg/kg)                                  | 0.40   | 0.37   | 0.32   | 0.48   | 0.39   |
|   | Silver (Ag) (mg/kg)                                    | 4.11   | 4.08   | 3.13   | 4.79   | 3.34   |
|   | Sodium (Na) (mg/kg)                                    | 13800  | 13500  | 13700  | 13700  | 13800  |
|   | Strontium (Sr) (mg/kg)                                 | 326  | 316  | 316  | 293  | 304    |
|   | Sulfur (S) (mg/kg)                                     | 13900  | 11900  | 11600  | 12200  | 12800  |
|   | Thallium (Tl) (mg/kg)                                  | 0.067  | 0.062  | 0.061  | 0.066  | 0.086  |
|   | Tin (Sn) (mg/kg)                                       | 156  | 213  | 109  | 110  | 140    |
|   | Titanium (Ti) (mg/kg)                                  | 627  | 591  | 704  | 824  | 683    |
|   | Tungsten (W) (mg/kg)                                   | 5.56   | 5.22   | 4.55   | 5.80   | 5.52   |
|   | Uranium (U) (mg/kg)                                    | 4.47   | 3.95   | 3.97   | 4.24   | 4.35   |
|   | Vanadium (V) (mg/kg)                                   | 41.0   | 40.9   | 39.1   | 51.0   | 43.1   |
|   | Zinc (Zn) (mg/kg)                                      | 8450   | 3850   | 3310   | 3310   | 5390   |
|   | Zirconium (Zr) (mg/kg)                                 | 1.3  | 1.2  | 1.1  | 1.2  | 1.1    |

\* Please refer to the Reference Information section for an explanation of any qualifiers detected.

## ALS ENVIRONMENTAL ANALYTICAL REPORT

| Sample ID<br>Description<br>Sampled Date<br>Sampled Time<br>Client ID | L2208787-6<br>Soil<br>05-DEC-18<br>09:00<br>BA1849-A-6 | L2208787-7<br>Soil<br>05-DEC-18<br>09:00<br>BA1849-A-7 | L2208787-8<br>Soil<br>05-DEC-18<br>09:00<br>BA1849-A-8 | L2208787-9<br>Soil<br>05-DEC-18<br>09:00<br>BA1849-A-9 | L2208787-10<br>Soil<br>05-DEC-18<br>09:00<br>BA1849-A-10 |        |
|---|--|--|--|--|--|--------|
| Grouping  | Analyte  |  |  |  |  |        |
| <b>SOIL</b>   |  |  |  |  |  |        |
| <b>Physical Tests</b>   | Moisture (%)   | 20.2   | 19.0   | 20.4   | 21.2   | 19.8   |
|   | pH (1:2 soil:water) (pH)                               | 12.30  | 12.27  | 12.36  | 12.36  | 12.33  |
| <b>Metals</b>   | Aluminum (Al) (mg/kg)                                  | 34300  | 41700  | 39700  | 36000  | 33600  |
|   | Antimony (Sb) (mg/kg)                                  | 137  | 122  | 134  | 139  | 187    |
|   | Arsenic (As) (mg/kg)                                   | 26.7   | 25.4   | 35.2   | 33.2   | 27.2   |
|   | Barium (Ba) (mg/kg)                                    | 446  | 582  | 605  | 618  | 729    |
|   | Beryllium (Be) (mg/kg)                                 | 0.71   | 0.48   | 0.41   | 0.46   | 0.45   |
|   | Bismuth (Bi) (mg/kg)                                   | 9.03   | 8.20   | 9.25   | 7.65   | 7.30   |
|   | Boron (B) (mg/kg)                                      | 202  | 217  | 198  | 197  | 219    |
|   | Cadmium (Cd) (mg/kg)                                   | 1060   | 9.06   | 10.8   | 11.2   | 11.5   |
|   | Calcium (Ca) (mg/kg)                                   | 127000   | 134000   | 136000   | 124000   | 132000 |
|   | Chromium (Cr) (mg/kg)                                  | 214  | 157  | 184  | 155  | 160    |
|   | Cobalt (Co) (mg/kg)                                    | 31.0   | 271  | 145  | 23.6   | 33.5   |
|   | Copper (Cu) (mg/kg)                                    | 12300  | 1360   | 4080   | 4900   | 2480   |
|   | Iron (Fe) (mg/kg)                                      | 56800  | 48700  | 74300  | 69700  | 55400  |
|   | Lead (Pb) (mg/kg)                                      | 557  | 1690   | 543  | 1240   | 4160   |
|   | Lithium (Li) (mg/kg)                                   | 30.7   | 34.1   | 21.0   | 17.5   | 20.5   |
|   | Magnesium (Mg) (mg/kg)                                 | 11600  | 12000  | 13600  | 12500  | 12000  |
|   | Manganese (Mn) (mg/kg)                                 | 874  | 850  | 1100   | 1010   | 1090   |
|   | Mercury (Hg) (mg/kg)                                   | <0.050   | <0.050   | <0.050   | 0.052  | <0.050 |
|   | Molybdenum (Mo) (mg/kg)                                | 83.7   | 122  | 79.5   | 121  | 109    |
|   | Nickel (Ni) (mg/kg)                                    | 142  | 106  | 181  | 107  | 255    |
|   | Phosphorus (P) (mg/kg)                                 | 10600  | 10300  | 10000  | 9760   | 9490   |
|   | Potassium (K) (mg/kg)                                  | 5230   | 5320   | 5560   | 4890   | 5470   |
|   | Selenium (Se) (mg/kg)                                  | 0.38   | 0.38   | 0.44   | 0.42   | 0.37   |
|   | Silver (Ag) (mg/kg)                                    | 4.30   | 3.30   | 3.54   | 3.92   | 4.30   |
|   | Sodium (Na) (mg/kg)                                    | 12700  | 14700  | 15100  | 12900  | 14900  |
|   | Strontium (Sr) (mg/kg)                                 | 312  | 326  | 364  | 302  | 626    |
|   | Sulfur (S) (mg/kg)                                     | 12600  | 12900  | 13400  | 12300  | 12900  |
|   | Thallium (Tl) (mg/kg)                                  | 0.079  | 0.067  | 0.081  | 0.073  | 0.086  |
|   | Tin (Sn) (mg/kg)                                       | 147  | 126  | 107  | 135  | 108    |
|   | Titanium (Ti) (mg/kg)                                  | 595  | 1050   | 1040   | 798  | 817    |
|   | Tungsten (W) (mg/kg)                                   | 5.63   | 5.28   | 7.49   | 8.13   | 6.93   |
|   | Uranium (U) (mg/kg)                                    | 4.44   | 4.38   | 4.45   | 4.58   | 4.64   |
|   | Vanadium (V) (mg/kg)                                   | 42.1   | 45.2   | 51.9   | 44.2   | 43.1   |
|   | Zinc (Zn) (mg/kg)                                      | 6260   | 3100   | 11700  | 3680   | 4140   |
|   | Zirconium (Zr) (mg/kg)                                 | 1.6  | 2.0  | 1.9  | 1.3  | 1.1    |

\* Please refer to the Reference Information section for an explanation of any qualifiers detected.

## ALS ENVIRONMENTAL ANALYTICAL REPORT

|                        |                          | Sample ID    | L2208787-11 | L2208787-12 |  |  |
|------------------------|--------------------------|--------------|-------------|-------------|--|--|
|                        |                          | Description  | Soil        | Soil        |  |  |
|                        |                          | Sampled Date | 05-DEC-18   | 05-DEC-18   |  |  |
|                        |                          | Sampled Time | 09:00       | 09:00       |  |  |
|                        |                          | Client ID    | BA1849-A-11 | BA1849-A-12 |  |  |
| Grouping               | Analyte                  |              |             |             |  |  |
| <b>SOIL</b>            |                          |              |             |             |  |  |
| <b>Physical Tests</b>  | Moisture (%)             | 20.7         | 18.6        |             |  |  |
|                        | pH (1:2 soil:water) (pH) | 12.36        | 12.35       |             |  |  |
| <b>Metals</b>          | Aluminum (Al) (mg/kg)    | 39900        | 30800       |             |  |  |
|                        | Antimony (Sb) (mg/kg)    | 212          | 139         |             |  |  |
|                        | Arsenic (As) (mg/kg)     | 29.0         | 36.4        |             |  |  |
|                        | Barium (Ba) (mg/kg)      | 644          | 567         |             |  |  |
|                        | Beryllium (Be) (mg/kg)   | 0.39         | 0.37        |             |  |  |
|                        | Bismuth (Bi) (mg/kg)     | 12.4         | 14.1        |             |  |  |
|                        | Boron (B) (mg/kg)        | 292          | 224         |             |  |  |
|                        | Cadmium (Cd) (mg/kg)     | 9.88         | 19.2        |             |  |  |
|                        | Calcium (Ca) (mg/kg)     | 142000       | 131000      |             |  |  |
|                        | Chromium (Cr) (mg/kg)    | 174          | 181         |             |  |  |
|                        | Cobalt (Co) (mg/kg)      | 107          | 149         |             |  |  |
|                        | Copper (Cu) (mg/kg)      | 9120         | 8390        |             |  |  |
|                        | Iron (Fe) (mg/kg)        | 50800        | 74600       |             |  |  |
|                        | Lead (Pb) (mg/kg)        | 3150         | 691         |             |  |  |
|                        | Lithium (Li) (mg/kg)     | 18.1         | 19.3        |             |  |  |
|                        | Magnesium (Mg) (mg/kg)   | 13500        | 13000       |             |  |  |
|                        | Manganese (Mn) (mg/kg)   | 1020         | 1240        |             |  |  |
|                        | Mercury (Hg) (mg/kg)     | <0.050       | <0.050      |             |  |  |
|                        | Molybdenum (Mo) (mg/kg)  | 110          | 130         |             |  |  |
|                        | Nickel (Ni) (mg/kg)      | 110          | 291         |             |  |  |
|                        | Phosphorus (P) (mg/kg)   | 10100        | 9770        |             |  |  |
|                        | Potassium (K) (mg/kg)    | 5620         | 4620        |             |  |  |
|                        | Selenium (Se) (mg/kg)    | 0.41         | 0.36        |             |  |  |
|                        | Silver (Ag) (mg/kg)      | 3.74         | 8.21        |             |  |  |
|                        | Sodium (Na) (mg/kg)      | 15000        | 12900       |             |  |  |
|                        | Strontium (Sr) (mg/kg)   | 363          | 340         |             |  |  |
|                        | Sulfur (S) (mg/kg)       | 13600        | 12100       |             |  |  |
|                        | Thallium (Tl) (mg/kg)    | 0.071        | 0.075       |             |  |  |
|                        | Tin (Sn) (mg/kg)         | 153          | 113         |             |  |  |
|                        | Titanium (Ti) (mg/kg)    | 1010         | 536         |             |  |  |
|                        | Tungsten (W) (mg/kg)     | 6.68         | 6.13        |             |  |  |
|                        | Uranium (U) (mg/kg)      | 4.62         | 4.52        |             |  |  |
| Vanadium (V) (mg/kg)   | 46.9                     | 44.2         |             |             |  |  |
| Zinc (Zn) (mg/kg)      | 3400                     | 3770         |             |             |  |  |
| Zirconium (Zr) (mg/kg) | 1.1                      | 1.1          |             |             |  |  |

\* Please refer to the Reference Information section for an explanation of any qualifiers detected.

## ALS ENVIRONMENTAL ANALYTICAL REPORT

|                    |                                     | Sample ID    | L2208787-1 | L2208787-2 | L2208787-3 | L2208787-4 | L2208787-5 |
|--------------------|-------------------------------------|--------------|------------|------------|------------|------------|------------|
|                    |                                     | Description  | Soil       | Soil       | Soil       | Soil       | Soil       |
|                    |                                     | Sampled Date | 05-DEC-18  | 05-DEC-18  | 05-DEC-18  | 05-DEC-18  | 05-DEC-18  |
|                    |                                     | Sampled Time | 09:00      | 09:00      | 09:00      | 09:00      | 09:00      |
|                    |                                     | Client ID    | BA1849-A-1 | BA1849-A-2 | BA1849-A-3 | BA1849-A-4 | BA1849-A-5 |
| Grouping           | Analyte                             |              |            |            |            |            |            |
| <b>SOIL</b>        |                                     |              |            |            |            |            |            |
| <b>TCLP Metals</b> | 1st Preliminary pH (pH)             |              | 11.70      | 11.65      | 11.99      | 11.79      | 11.53      |
|                    | 2nd Preliminary pH (pH)             |              | 9.76       | 9.59       | 11.15      | 10.31      | 9.13       |
|                    | Final pH (pH)                       |              | 6.00       | 6.15       | 6.09       | 6.06       | 6.02       |
|                    | Extraction Solution Initial pH (pH) |              | 2.88       | 2.88       | 2.88       | 2.88       | 2.88       |
|                    | Antimony (Sb)-Leachable (mg/L)      |              | <1.0       | <1.0       | <1.0       | <1.0       | <1.0       |
|                    | Arsenic (As)-Leachable (mg/L)       |              | <1.0       | <1.0       | <1.0       | <1.0       | <1.0       |
|                    | Barium (Ba)-Leachable (mg/L)        |              | <2.5       | <2.5       | <2.5       | <2.5       | <2.5       |
|                    | Beryllium (Be)-Leachable (mg/L)     |              | <0.025     | <0.025     | <0.025     | <0.025     | <0.025     |
|                    | Boron (B)-Leachable (mg/L)          |              | 2.05       | 2.14       | 2.58       | 2.12       | 2.40       |
|                    | Cadmium (Cd)-Leachable (mg/L)       |              | 0.382      | 0.163      | 0.132      | 0.119      | 0.234      |
|                    | Calcium (Ca)-Leachable (mg/L)       |              | 1910       | 1930       | 1980       | 1890       | 1880       |
|                    | Chromium (Cr)-Leachable (mg/L)      |              | <0.25      | <0.25      | <0.25      | <0.25      | <0.25      |
|                    | Cobalt (Co)-Leachable (mg/L)        |              | 0.287      | 1.49       | 0.502      | 0.438      | 0.484      |
|                    | Copper (Cu)-Leachable (mg/L)        |              | 1.42       | 1.12       | 0.868      | 1.20       | 0.975      |
|                    | Iron (Fe)-Leachable (mg/L)          |              | <5.0       | <5.0       | <5.0       | <5.0       | <5.0       |
|                    | Lead (Pb)-Leachable (mg/L)          |              | 0.55       | <0.25      | <0.25      | <0.25      | <0.25      |
|                    | Magnesium (Mg)-Leachable (mg/L)     |              | 127        | 124        | 133        | 131        | 124        |
|                    | Mercury (Hg)-Leachable (mg/L)       |              | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                    | Nickel (Ni)-Leachable (mg/L)        |              | 0.40       | 0.38       | 0.33       | 0.40       | 0.36       |
|                    | Selenium (Se)-Leachable (mg/L)      |              | <1.0       | <1.0       | <1.0       | <1.0       | <1.0       |
|                    | Silver (Ag)-Leachable (mg/L)        |              | <0.050     | <0.050     | <0.050     | <0.050     | <0.050     |
|                    | Thallium (Tl)-Leachable (mg/L)      |              | <1.0       | <1.0       | <1.0       | <1.0       | <1.0       |
|                    | Vanadium (V)-Leachable (mg/L)       |              | <0.15      | <0.15      | <0.15      | <0.15      | <0.15      |
|                    | Zinc (Zn)-Leachable (mg/L)          |              | 49.8       | 36.1       | 54.7       | 49.9       | 50.0       |

\* Please refer to the Reference Information section for an explanation of any qualifiers detected.

## ALS ENVIRONMENTAL ANALYTICAL REPORT

|                    |                                     | Sample ID    | L2208787-6 | L2208787-7 | L2208787-8 | L2208787-9 | L2208787-10 |
|--------------------|-------------------------------------|--------------|------------|------------|------------|------------|-------------|
|                    |                                     | Description  | Soil       | Soil       | Soil       | Soil       | Soil        |
|                    |                                     | Sampled Date | 05-DEC-18  | 05-DEC-18  | 05-DEC-18  | 05-DEC-18  | 05-DEC-18   |
|                    |                                     | Sampled Time | 09:00      | 09:00      | 09:00      | 09:00      | 09:00       |
|                    |                                     | Client ID    | BA1849-A-6 | BA1849-A-7 | BA1849-A-8 | BA1849-A-9 | BA1849-A-10 |
| Grouping           | Analyte                             |              |            |            |            |            |             |
| <b>SOIL</b>        |                                     |              |            |            |            |            |             |
| <b>TCLP Metals</b> | 1st Preliminary pH (pH)             |              | 11.62      | 11.38      | 11.69      | 11.80      | 11.78       |
|                    | 2nd Preliminary pH (pH)             |              | 9.32       | 8.65       | 9.28       | 10.13      | 9.62        |
|                    | Final pH (pH)                       |              | 6.16       | 6.00       | 6.10       | 6.06       | 5.99        |
|                    | Extraction Solution Initial pH (pH) |              | 2.88       | 2.88       | 2.88       | 2.88       | 2.88        |
|                    | Antimony (Sb)-Leachable (mg/L)      |              | <1.0       | <1.0       | <1.0       | <1.0       | <1.0        |
|                    | Arsenic (As)-Leachable (mg/L)       |              | <1.0       | <1.0       | <1.0       | <1.0       | <1.0        |
|                    | Barium (Ba)-Leachable (mg/L)        |              | <2.5       | <2.5       | <2.5       | <2.5       | <2.5        |
|                    | Beryllium (Be)-Leachable (mg/L)     |              | <0.025     | <0.025     | <0.025     | <0.025     | <0.025      |
|                    | Boron (B)-Leachable (mg/L)          |              | 2.07       | 1.93       | 2.10       | 2.00       | 2.05        |
|                    | Cadmium (Cd)-Leachable (mg/L)       |              | 0.153      | 0.154      | 0.152      | 0.208      | 0.129       |
|                    | Calcium (Ca)-Leachable (mg/L)       |              | 1880       | 1770       | 1890       | 1810       | 1860        |
|                    | Chromium (Cr)-Leachable (mg/L)      |              | <0.25      | <0.25      | <0.25      | <0.25      | <0.25       |
|                    | Cobalt (Co)-Leachable (mg/L)        |              | 0.979      | 1.58       | 0.580      | 0.397      | 0.528       |
|                    | Copper (Cu)-Leachable (mg/L)        |              | 1.45       | 0.915      | 0.687      | 1.04       | 1.26        |
|                    | Iron (Fe)-Leachable (mg/L)          |              | <5.0       | <5.0       | <5.0       | <5.0       | <5.0        |
|                    | Lead (Pb)-Leachable (mg/L)          |              | <0.25      | 0.27       | 0.36       | <0.25      | 0.41        |
|                    | Magnesium (Mg)-Leachable (mg/L)     |              | 126        | 112        | 122        | 123        | 123         |
|                    | Mercury (Hg)-Leachable (mg/L)       |              | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010     |
|                    | Nickel (Ni)-Leachable (mg/L)        |              | 0.31       | 0.45       | 0.44       | 0.36       | 0.41        |
|                    | Selenium (Se)-Leachable (mg/L)      |              | <1.0       | <1.0       | <1.0       | <1.0       | <1.0        |
|                    | Silver (Ag)-Leachable (mg/L)        |              | <0.050     | <0.050     | <0.050     | <0.050     | <0.050      |
|                    | Thallium (Tl)-Leachable (mg/L)      |              | <1.0       | <1.0       | <1.0       | <1.0       | <1.0        |
|                    | Vanadium (V)-Leachable (mg/L)       |              | <0.15      | <0.15      | <0.15      | <0.15      | <0.15       |
|                    | Zinc (Zn)-Leachable (mg/L)          |              | 41.3       | 43.2       | 41.5       | 42.2       | 41.8        |

\* Please refer to the Reference Information section for an explanation of any qualifiers detected.

# ALS ENVIRONMENTAL ANALYTICAL REPORT

|                    | Sample ID<br>Description<br>Sampled Date<br>Sampled Time<br>Client ID | L2208787-11<br>Soil<br>05-DEC-18<br>09:00<br>BA1849-A-11 | L2208787-12<br>Soil<br>05-DEC-18<br>09:00<br>BA1849-A-12 |  |  |
|--------------------|---|--|--|--|--|
| Grouping           | Analyte   |  |  |  |  |
| <b>SOIL</b>        |   |  |  |  |  |
| <b>TCLP Metals</b> | 1st Preliminary pH (pH)   | 11.75  | 11.83  |  |  |
|                    | 2nd Preliminary pH (pH)   | 9.90   | 9.92   |  |  |
|                    | Final pH (pH)   | 6.15   | 6.10   |  |  |
|                    | Extraction Solution Initial pH (pH)                                   | 2.88   | 2.88   |  |  |
|                    | Antimony (Sb)-Leachable (mg/L)  | <1.0   | <1.0   |  |  |
|                    | Arsenic (As)-Leachable (mg/L)   | <1.0   | <1.0   |  |  |
|                    | Barium (Ba)-Leachable (mg/L)  | <2.5   | <2.5   |  |  |
|                    | Beryllium (Be)-Leachable (mg/L)                                       | <0.025   | <0.025   |  |  |
|                    | Boron (B)-Leachable (mg/L)  | 2.22   | 2.37   |  |  |
|                    | Cadmium (Cd)-Leachable (mg/L)   | 0.131  | 0.141  |  |  |
|                    | Calcium (Ca)-Leachable (mg/L)   | 1920   | 1920   |  |  |
|                    | Chromium (Cr)-Leachable (mg/L)  | <0.25  | <0.25  |  |  |
|                    | Cobalt (Co)-Leachable (mg/L)  | 0.296  | 0.602  |  |  |
|                    | Copper (Cu)-Leachable (mg/L)  | 1.61   | 1.62   |  |  |
|                    | Iron (Fe)-Leachable (mg/L)  | <5.0   | <5.0   |  |  |
|                    | Lead (Pb)-Leachable (mg/L)  | <0.25  | <0.25  |  |  |
|                    | Magnesium (Mg)-Leachable (mg/L)                                       | 123  | 133  |  |  |
|                    | Mercury (Hg)-Leachable (mg/L)   | <0.0010  | <0.0010  |  |  |
|                    | Nickel (Ni)-Leachable (mg/L)  | 0.33   | 0.32   |  |  |
|                    | Selenium (Se)-Leachable (mg/L)  | <1.0   | <1.0   |  |  |
|                    | Silver (Ag)-Leachable (mg/L)  | <0.050   | <0.050   |  |  |
|                    | Thallium (Tl)-Leachable (mg/L)  | <1.0   | <1.0   |  |  |
|                    | Vanadium (V)-Leachable (mg/L)   | <0.15  | <0.15  |  |  |
|                    | Zinc (Zn)-Leachable (mg/L)  | 36.0   | 50.4   |  |  |

\* Please refer to the Reference Information section for an explanation of any qualifiers detected.



## Reference Information

### QC Samples with Qualifiers & Comments:

| QC Type Description | Parameter              | Qualifier | Applies to Sample Number(s)                               |
|---------------------|------------------------|-----------|---|
| Duplicate           | Arsenic (As)           | DUP-H     | L2208787-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9 |
| Duplicate           | Beryllium (Be)         | DUP-H     | L2208787-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9 |
| Duplicate           | Iron (Fe)              | DUP-H     | L2208787-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9 |
| Duplicate           | Lithium (Li)           | DUP-H     | L2208787-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9 |
| Duplicate           | Manganese (Mn)         | DUP-H     | L2208787-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9 |
| Duplicate           | Silver (Ag)            | DUP-H     | L2208787-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9 |
| Duplicate           | Tin (Sn)               | DUP-H     | L2208787-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9 |
| Duplicate           | Titanium (Ti)          | DUP-H     | L2208787-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9 |
| Duplicate           | Zinc (Zn)              | DUP-H     | L2208787-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9 |
| Matrix Spike        | Calcium (Ca)-Leachable | MS-B      | L2208787-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9 |
| Matrix Spike        | Cobalt (Co)-Leachable  | MS-B      | L2208787-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9 |
| Matrix Spike        | Zinc (Zn)-Leachable    | MS-B      | L2208787-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9 |

### Qualifiers for Individual Parameters Listed:

| Qualifier | Description  |
|-----------|--|
| DUP-H     | Duplicate results outside ALS DQO, due to sample heterogeneity.                                    |
| MS-B      | Matrix Spike recovery could not be accurately calculated due to high analyte background in sample. |

### Test Method References:

| ALS Test Code             | Matrix | Test Description   | Method Reference**                      |
|---------------------------|--------|--|---|
| <b>AG-200.2-A-CCMS-VA</b> | Soil   | Elevated Ag in Soil by CRC ICPMS   | EPA 200.2/6020A                         |
|                           |        | Soil/sediment is dried, disaggregated, and sieved (2 mm). Strong Acid Leachable Metals in the <2mm fraction are solubilized by heated digestion with nitric and hydrochloric acids. Instrumental analysis is by Collision / Reaction Cell ICPMS.   |   |
| <b>HG-200.2-CVAF-VA</b>   | Soil   | Mercury in Soil by CVAAS   | EPA 200.2/1631E (mod)                   |
|                           |        | Soil samples are digested with hot nitric and hydrochloric acids, followed by CVAAS analysis. This method is fully compliant with the BC SALM strong acid leachable metals digestion method.   |   |
| <b>HG-TCLP-CVAFS-VA</b>   | Soil   | Mercury by CVAAS (TCLP)  | EPA 1311/245.7                          |
|                           |        | This analysis is carried out in accordance with the extraction procedure outlined in "Test Methods for Evaluating Solid Waste - Physical/Chemical Methods Volume 1C" SW-846 EPA Method 1311, published by the United States Environmental Protection Agency (EPA). In summary, the sample is extracted at a 20:1 liquid to solids ratio for 16 to 20 hours using either extraction fluid #1 (glacial acetic acid, water and sodium hydroxide) or extraction fluid #2 (glacial acetic acid), depending on the pH of the original sample. The extract is then filtered through a 0.6 to 0.8 micron glass fibre filter and analysed using atomic absorption spectrophotometry (EPA 245.7).                                    |   |
| <b>MET-200.2-CCMS-VA</b>  | Soil   | Metals in Soil by CRC ICPMS  | EPA 200.2/6020A (mod)                   |
|                           |        | Soil/sediment is dried, disaggregated, and sieved (2 mm). Strong Acid Leachable Metals in the <2mm fraction are solubilized by heated digestion with nitric and hydrochloric acids. Instrumental analysis is by Collision / Reaction Cell ICPMS.   |   |
|                           |        | Limitations: This method is intended to liberate environmentally available metals. Silicate minerals are not solubilized. Some metals may be only partially recovered (matrix dependent), including Al, Ba, Be, Cr, S, Sr, Ti, V, W, and Zr. Elemental Sulfur may be poorly recovered by this method. Volatile forms of sulfur (e.g. sulfide, H <sub>2</sub> S) may be excluded if lost during sampling, storage, or digestion.  |   |
| <b>MET-TCLP-ICP-VA</b>    | Soil   | Metals by ICPOES (TCLP)  | EPA 1311/6010B                          |
|                           |        | This analysis is carried out in accordance with the extraction procedure outlined in "Test Methods for Evaluating Solid Waste - Physical/Chemical Methods Volume 1C" SW-846 EPA Method 1311, published by the United States Environmental Protection Agency (EPA). In summary, the sample is extracted at a 20:1 liquid to solids ratio for 16 to 20 hours using either extraction fluid #1 (glacial acetic acid, water and sodium hydroxide) or extraction fluid #2 (glacial acetic acid), depending on the pH of the original sample. The extract is then filtered through a 0.6 to 0.8 micron glass fibre filter and analysed using inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B). |   |
| <b>MOISTURE-VA</b>        | Soil   | Moisture content   | CCME PHC in Soil - Tier 1 (mod)         |
|                           |        | This analysis is carried out gravimetrically by drying the sample at 105 C for a minimum of two hours.   |   |
| <b>PH-1:2-VA</b>          | Soil   | pH in Soil (1:2 Soil:Water Extraction)   | BC WLAP METHOD: PH, ELECTROMETRIC, SOIL |
|                           |        | This analysis is carried out in accordance with procedures described in the pH, Electrometric in Soil and Sediment method - Section B Physical/Inorganic and Misc. Constituents, BC Environmental Laboratory Manual 2007. 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. The pH of the solution is then measured using a standard pH probe.   |   |

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

*The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:*

## Reference Information

**Laboratory Definition Code**      **Laboratory Location**

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VA                                      ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

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**Chain of Custody Numbers:**

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**GLOSSARY OF REPORT TERMS**

*Surrogate - A compound that is similar in behaviour 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.*

*mg/kg - milligrams per kilogram based on dry weight of sample.*

*mg/kg wwt - milligrams per kilogram based on wet weight of sample.*

*mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.*

*mg/L - milligrams per litre.*

*< - Less than.*

*D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).*

*N/A - Result not available. Refer to qualifier code and definition for explanation.*

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

*UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.*

*Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.*



COC # \_\_\_\_\_

Page \_\_\_\_ of \_\_\_\_

|                  |  |   |                                     |  |  |
|------------------|--|---|-------------------------------------|--|--|
| <b>Report To</b> |  | <b>Report Format / Distribution</b>     |                                     | <b>Service Requested (Rush for routine analysis subject to availability)</b>         |  |
| Company:         | Covanta Energy   | <input type="checkbox"/> Standard       | <input type="checkbox"/> Other      | <input checked="" type="radio"/> Regular (Standard Turnaround Times - Business Days) |  |
| Contact:         | Steve Mckinney / Dan Skrypnik                            | <input checked="" type="checkbox"/> PDF | <input type="checkbox"/> Excel      | <input type="checkbox"/> Digital   | <input type="checkbox"/> Fax   |
| Address:         | 5150 Riverbend Drive<br>Burnaby BC                       | Email 1:                                | smckinney@covanta.com               |  | <input type="checkbox"/> Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT |
| Phone:           | 604-521-1025   | Email 2:                                | rjohnson4@covanta.com               |  | <input type="checkbox"/> Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT   |
| Fax:             | <input type="checkbox"/> Yes <input type="checkbox"/> No | Email 3:                                | dskrypnik@covanta.com               |  | <input type="checkbox"/> Same Day or Weekend Emergency - Contact ALS to Confirm TAT                |
|                  |  |   | brent.kirkpatrick@metrovancover.org |  |  |
|                  |  |   | Sarah.Wellman@metrovancover.org     |  |  |

|   |  |   |  |   |  |
|---|--|---|--|---|--|
| <b>Invoice To</b>   |  | <b>Client / Project Information</b>           |  | <b>Analysis Request</b>                                       |  |
| Same as Report ? <input type="checkbox"/> Yes <input type="checkbox"/> No                 |  | Job #:  |  | Please indicate below Filtered, Preserved or both (F, P, F/P) |  |
| Hardcopy of Invoice with Report? <input type="checkbox"/> Yes <input type="checkbox"/> No |  | PO / AFE: PO# 46693 Weekly Bottom Ash - Suite |  |   |  |
| Company:  |  | LSD: (includes 2:1 pH)                        |  |   |  |
| Contact:  |  | Quote #:                                      |  |   |  |
| Address:  |  | ALS Contact:                                  |  |   |  |
| Phone:  |  | Sampler:                                      |  |   |  |
| Lab Work Order # (lab use only)   |  |   |  |   |  |

| Sample #    | Sample Identification<br>(This description will appear on the report) | Date<br>(dd-mmm-yy) | Time<br>(hh:mm) | Sample Type | MET-TCLP-VA (all metals, Hg) | MOISTURE | Chrome 6 | MET-CSR+FULL-VA (all metals) | Number of Containers |
|-------------|---|---------------------|-----------------|-------------|------------------------------|----------|----------|------------------------------|----------------------|
| BA1849-A-1  |   | 05-Dec-18           | 9:00            | Soil        | X                            | X        |          | X                            | 1                    |
| BA1849-A-2  |   | 05-Dec-18           | 9:00            | Soil        | X                            | X        |          | X                            | 1                    |
| BA1849-A-3  |   | 05-Dec-18           | 9:00            | Soil        | X                            | X        |          | X                            | 1                    |
| BA1849-A-4  |   | 05-Dec-18           | 9:00            | Soil        | X                            | X        |          | X                            | 1                    |
| BA1849-A-5  |   | 05-Dec-18           | 9:00            | Soil        | X                            | X        |          | X                            | 1                    |
| BA1849-A-6  |   | 05-Dec-18           | 9:00            | Soil        | X                            | X        |          | X                            | 1                    |
| BA1849-A-7  |   | 05-Dec-18           | 9:00            | Soil        | X                            | X        |          | X                            | 1                    |
| BA1849-A-8  |   | 05-Dec-18           | 9:00            | Soil        | X                            | X        |          | X                            | 1                    |
| BA1849-A-9  |   | 05-Dec-18           | 9:00            | Soil        | X                            | X        |          | X                            | 1                    |
| BA1849-A-10 |   | 05-Dec-18           | 9:00            | Soil        | X                            | X        |          | X                            | 1                    |
| BA1849-A-11 |   | 05-Dec-18           | 9:00            | Soil        | X                            | X        |          | X                            | 1                    |
| BA1849-A-12 |   | 05-Dec-18           | 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.

|                                      |                  |              |  |       |        |              |   |       |       |   |
|--------------------------------------|------------------|--------------|--|-------|--------|--------------|---|-------|-------|---|
| <b>SHIPMENT RELEASE (client use)</b> |                  |              | <b>SHIPMENT RECEPTION (lab use only)</b> |       |        |              | <b>SHIPMENT VERIFICATION (lab use only)</b> |       |       |   |
| Released by:                         | Date (dd-mmm-yy) | Time (hh:mm) | Received by:                             | Date: | Time:  | Temperature: | Verified by:                                | Date: | Time: | Observations:<br>Yes / No ?<br>If Yes add SIF |
| <i>[Signature]</i>                   | 11-Dec-18        | 08:00        | HA                                       | 12/11 | 12:44p | 18 °C        |   |       |       |   |