

January 20, 2016

Mr. Dan LaMontagne, P.E.  
Solid Waste Director  
720 Renaissance Drive  
Pittsboro, North Carolina 27312

**RE: Ambient Air Monitoring Report  
Chatham County Coal Ash Disposal Site  
Pittsboro, North Carolina**

Dear Mr. LaMontagne:

As requested, Smith Gardner, Inc. (S+G) has this report of ambient air sampling activities at the Charah Brickhaven coal ash disposal site located in Chatham County, NC. The purpose of this sampling event was to evaluate changes to ambient air conditions along the side of Moncure Flatwood Road occurred during coal ash disposal activities, from the baseline sample collected before coal ash disposal activities occurred. Three (3) separate sampling events were performed over 8-hour periods, including:

- October 21, 2015, baseline prior to the site receiving coal ash;
- November 12, 2015, during coal ash disposal; and
- December 21, 2015, during coal ash disposal.

The sampling activities and their results for the December 21, 2015 event are summarized below. Results of sampling that occurred on October 21, 2015 and November 12, 2015 were previously reported<sup>1</sup>.

## **SAMPLING EQUIPMENT**

Sampling was performed using the frame-mounted Tisch Environmental TE-5170V High Volume Sampler. This Volumetric Flow Controlled sampler operated at a consistent flow rate throughout both sampling events, as controlled by a critical orifice plate. The sampler was calibrated using the Tisch TE-5028A calibrator, in accordance with the operations manual<sup>2</sup>. Calibration results are included in **Attachment 1**.

Total suspended particulate was sampled, with no filtration to limit particulate size. Samples were collected on pre-weighed filter paper provided by the laboratory. General comments regarding the condition of the filter paper as received by the laboratory are included in the analytical report.

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<sup>1</sup> Ambient Air Monitoring Report Letter to Dan LaMontagne from S+G dated December 9, 2015.

<sup>2</sup> Operations Manual, TE-5170V Volumetric Flow Controlled Total Suspended Particulate High Volume Sampler, downloaded from <https://tisch-env.com/wp-content/uploads/2015/08/TE-5170V-Manual.pdf>

## SAMPLING COLLECTION AND CONDITIONS

On December 21, 2015, sampling began following calibration at 8:15 a.m. and lasted until 4:15 p.m. Temperature rose from 38°F to 53°F during this time, with light wind out of the east. Conditions were sunny with no noted precipitation. During the morning, truck traffic consisted of approximately 20 to 30 trucks bringing dirt and gravel to the site per hour. Truck traffic increased in the afternoon to approximately 35-45 trucks per hour. The first coal delivery was noted around 12:00 p.m., continuing until approximately 4:00 p.m. In total, there were approximately 20-25 trucks observed hauling coal. Noticeable dust was observed periodically throughout the day from untarped trucks hauling dirt or gravel. All coal trucks were observed to be tarped.

Total flow was calculated from field conditions recorded during the sampling events, including:

- Temperature (°F);
- Barometric pressure (inches Hg);
- Filter pressure (inches H<sub>2</sub>O).

## ANALYTICAL PROCEDURES

Following all sampling events, the filter paper was placed in the envelope provided by the laboratory, sealed in an air tight zip-loc bag, and shipped overnight to the lab for analysis using the following EPA methods:

- EPA 6010C m, Total Metals on Hi-Vol Filter (6010Cmod)<sup>3</sup>; and
- EPA 5/315/NJATM1 m, Total Suspended Particulate on Filter (Method IO-3.1)<sup>4</sup>.

Total suspended particulate was sampled instead of smaller size PM<sub>10</sub> (10 micron or smaller diameter) or PM<sub>2.5</sub>, in order to maximize collection of metals. Metals and inorganic compounds included in the analysis are listed and discussed below.

## ANALYTICAL RESULTS

Sample results and comparison to available standards, as well as previous sample event results, are summarized in **Attachment 2**. Complete analytical lab reports are included in **Attachment 3**, and reported in units of total mass collected on the filter paper in milligrams (mg) or micrograms (µg). Total flow, calculated in cubic meters (m<sup>3</sup>) during each sampling event, was then used to calculate ambient air concentrations of each constituent in units of µg/m<sup>3</sup>. Constituents detected above “reportable detection limits” are summarized in **Attachment 2**, and include:

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<sup>3</sup> Download at <http://www3.epa.gov/epawaste/hazard/testmethods/sw846/pdfs/6010d.pdf>

<sup>4</sup> Download at <http://www2.epa.gov/sites/production/files/2015-07/documents/epa-io-3.1.pdf>

- Particulate Weight;
- Aluminum (Al);
- Barium (Ba);
- Calcium (Ca);
- Chromium (Cr);
- Cobalt (Co);
- Copper (Cu);
- Iron (Fe);
- Lead (Pb);
- Magnesium (Mg);
- Manganese (Mn);
- Nickel (Ni);
- Phosphorus (P);
- Potassium (K);
- Silicon (Si);
- Sodium (Na);
- Strontium (Sr);
- Sulphur (S);
- Titanium (Ti);
- Vanadium (V); and
- Zinc (Zn).

Constituents included in the analysis but **not** detected above “reportable detection limits” include:

- Antimony (Sb);
- Arsenic (As);
- Beryllium (Be);
- Bismuth (Bi);
- Boron (B);
- Cadmium (Cd);
- Molybdenum (Mo);
- Selenium (Se);
- Silver (Ag);
- Thallium (Tl);
- Tin (Sn); and
- Zirconium (Zr).

The “reportable detection limit” refers to the level at which the lab is able to report results with a reasonable degree of certainty, and is not to be confused with regulatory limits, which are discussed below.

## EVALUATION OF RESULTS

The analytical results shown in **Attachment 2** increase in concentration from the October 21 (background) sample to the December 21 sample for all constituents. For instance, particulate weight increased from 222  $\mu\text{g}/\text{m}^3$  to 548  $\mu\text{g}/\text{m}^3$ . There were additional constituents, Cobalt (Co) and Vanadium (V), detected during the December 21 sampling event which were not previously detected.

It is noted that there are few environmental health and safety standards related to airborne metal particulates. The standards referenced in this report include:

- EPA – National Ambient Air Quality Standards (NAAQS);
- OSHA Permissible Exposure Limits over an 8-hour day (PEL); and
- NIOSH Recommended Exposure Limits over a 10-hour day (REL).

The NIOSH REL is more restrictive than the OSHA PEL in all cases for detected constituents. The EPA NAAQS have standards for  $\text{PM}_{10}$ , but not total particulate as sampled in this project. The NAAQS for lead is 0.15  $\mu\text{g}/\text{m}^3$  over a 3-month rolling average. The highest lead result from this project was 0.054  $\mu\text{g}/\text{m}^3$ , or less than 40% of the NAAQS.

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Of the remaining metals detected, RELs and PELs exist for the following:

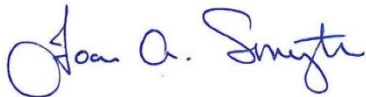
- Chromium (Cr);
- Copper (Cu);
- Manganese; and
- Nickel.

Of these, the highest analyzed copper results were less than 15% of the REL. Chromium was less than 6% of the REL, and manganese and nickel results were less than 1% of the REL.

**Although an increase in concentrations was detected between the background sample and the disposal sample, none of the reported constituents from either sampling event exceed NAAQS, REL, or PEL standards.**

If you have questions, or require additional information, please contact us at your earliest convenience at 919-828-0577 or by e-mail below.

Sincerely,  
**SMITH GARDNER, INC.**



Joan A. Smyth, P.G.  
Senior Hydrogeologist  
[joan@smithgardnerinc.com](mailto:joan@smithgardnerinc.com)



Matthew S. Lamb  
Senior Scientist  
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Attachments

cc: File

H:\Projects\Chatham County (NC)\CHATHAM-15-1 (Charah Site Sampling)\Report\12-21-15 Sampling Event\12-21-15 SAMPLING REPORT - Coal Ash Air Sampling.docx

## **Attachment 1**

### **Field Logs, Calibration Results, and Flow Rate Lookup Table**

**Ambient Air Monitoring Report  
Chatham County Coal Ash Disposal Site  
Pittsboro, NC**

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PROJECT CHATHAM-15-1

SUBJECT Ambient air sampling

SITE NAME/LOCATION Charah Coal Ash Facility

SHEET /  
JOB # CHATHAM-15-1  
DATE 12/21/2015  
SAMPLED BY SWH

**WEATHER CONDITIONS**

**Ambient Air Sampling:**

Equipment Required:

- High Volume air sampler with manual
- Calibrator
- Filter paper
- Camera
- Generator with full gas can
- Extension cord
- Clean cloths/paper towels

**Leak Check and Calibration Procedure:**

Refer to the Operations Manual "TE-5170V TSP VFC High Volume Sampler, pp. 16-18.

Calculations are performed using the spreadsheet titled "TE-5170V Sampler Calibration Worksheet"

**Sampler Setup:**

- Locate sampler as directed by site contact, and sketch below
- Locate generator away from and downwind of sampler
- Perform calibration as instructed in the manual
- Load filter paper and chart recorder paper as instructed in the pp. 28-31 of the manual

**Sampling Procedure:**

Load filter paper, prepare chart recorder and timer as instructed in the Operations Manual, pp. 28-29.

**Actual Sampler Air Flow Calculation**

Determine sampled flow rate from lookup tables using the procedure from the Operations Manual, pp. 25-27, and recorded temperature, barometric pressure, and clean (start), and pickup (end) filter pressures.

Record the following information every hour during the sampling period

- Time (HH:MM):
- Temperature (°F)\*
- Baro. Pressure ("Hg)\*
- Sampler Pressure ("H2O)

Time	Temp. (°F)	Baro. Press. ("Hg)	Filter Press. ("H2O)
8:15	38	30.40	15.60
8:45	39	30.42	15.50
9:15	40	30.41	15.80
9:45	42	30.40	15.80
10:15	43	30.39	15.90
10:45	46	30.37	16.00
11:15	47	30.37	16.10
11:45	48	30.37	16.20
12:15	49	30.35	16.20
12:45	50	30.34	16.30
13:15	51	30.32	16.50
13:45	52	30.31	16.60
14:15	43	30.31	16.60
14:45	54	30.28	16.70
15:15	54	30.28	16.80
15:45	54	30.26	16.80
16:15	53	30.25	16.90
AVERAGE	47	30.34	16.25

Sketch sampling site, showing North arrow, relevant site features (roads, particulate sources, etc.), sampler location, generator location, wind direction/speed. Document with photos



\* [Sanford-Lee County Regional Airport](http://w1.weather.gov/data/obhistory/KTTA.html)  
<http://w1.weather.gov/data/obhistory/KTTA.html>

**ADDITIONAL NOTES:**

Determine total sampled flow from lookup table, using average temperature ( $T_{avg}$ ), atmospheric pressure ( $P_a$ ), and filter pressure differential ( $P_f$ ).

- $T_{avg}$  = 47.2 °F
- $P_a$  = 30.3 "Hg
- $P_f$  = 16.3 "H2O
- $P_f$  = 30.3 mmHg

$$P_o/P_a = 1 - (P_f/P_a)$$

$$P_o/P_a = 0.961$$

- total sampled flow rate = 44 cubic feet per minute (actual, extrapolated from lookup table)  
1.25 cubic meters per minute (actual)
- total sampled flow = 21120 cubic feet (actual)  
598 cubic meters (actual)



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## TE-5170V Calibration Worksheet

### Site Information

Location: Monure, NC	Site ID: 145	Date: 21-Dec-15
Sampler: TE-5170V	Serial No: P6283 TSP	Tech: Spencer Hollomon

### Site Conditions

Temp (deg F): 37.0	Barometric Press (in Hg): 30.40
Ta (deg K): 276	Pa (mm Hg): 772
Ta (deg C): 3	

### Calibration Orifice

Make: Tisch	Qa Slope: 1.02152
Model: TE-5028A	Qa Intercept: -0.01421
Serial#: W98	Calibration Due Date: 24-Oct-15

### Calibration Data

Run Number	Orifice "H2O	Qa (m3/min)	Sampler "H2O	Pf (mm Hg)	Po/Pa	Look Up (m3/min)	% Diff
1	4.50	1.255	9.70	18.103	0.977	1.258	0.24
2	4.30	1.227	11.80	22.022	0.971	1.250	1.87
3	4.30	1.227	18.40	34.339	0.956	1.229	0.16
4	4.30	1.227	19.00	35.459	0.954	1.227	0.00
5	4.10	1.199	23.70	44.231	0.943	1.212	1.08

### Calculations

Calibrator Flow (Qa) = 1/Slope\*(SQRT(H2O\*(Ta/Pa))-Intercept)

Pressure Ratio (Po/Pa) = 1-Pf/Pa

% Difference = (Look Up Flow-Calibrator Flow)/Calibrator Flow\*100

NOTE: Ensure calibration orifice has been certified within 12 months of use

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TEMPERATURE °F Flow rate ft<sup>3</sup>/min (actual)

Po/Pa	18	22	26	30	34	38	42	46	50	54	58	62	66	Po/Pa
0.930	41.43	41.59	41.74	41.90	42.05	42.20	42.36	42.51	42.66	42.81	42.96	43.11	43.26	0.930
0.931	41.48	41.63	41.79	41.94	42.10	42.25	42.40	42.56	42.71	42.86	43.01	43.16	43.31	0.931
0.932	41.52	41.68	41.84	41.99	42.14	42.30	42.45	42.60	42.75	42.91	43.06	43.21	43.36	0.932
0.933	41.57	41.73	41.88	42.04	42.19	42.35	42.50	42.65	42.80	42.95	43.10	43.25	43.40	0.933
0.934	41.62	41.77	41.93	42.09	42.24	42.39	42.55	42.70	42.85	43.00	43.15	43.30	43.45	0.934
0.935	41.67	41.82	41.98	42.13	42.29	42.44	42.59	42.75	42.90	43.05	43.20	43.35	43.50	0.935
0.936	41.71	41.87	42.02	42.18	42.33	42.49	42.64	42.79	42.95	43.10	43.25	43.40	43.55	0.936
0.937	41.76	41.92	42.07	42.23	42.38	42.54	42.69	42.84	43.00	43.15	43.30	43.45	43.60	0.937
0.938	41.81	41.96	42.12	42.27	42.43	42.58	42.74	42.89	43.04	43.20	43.35	43.50	43.65	0.938
0.939	41.85	42.01	42.17	42.32	42.48	42.63	42.79	42.94	43.09	43.24	43.40	43.55	43.70	0.939
0.940	41.90	42.06	42.21	42.37	42.52	42.68	42.83	42.99	43.14	43.29	43.44	43.59	43.75	0.940
0.941	41.95	42.10	42.26	42.42	42.57	42.73	42.88	43.03	43.19	43.34	43.49	43.64	43.79	0.941
0.942	41.99	42.15	42.31	42.46	42.62	42.77	42.93	43.08	43.24	43.39	43.54	43.69	43.84	0.942
0.943	42.04	42.20	42.35	42.51	42.67	42.82	42.98	43.13	43.28	43.44	43.59	43.74	43.89	0.943
0.944	42.09	42.24	42.40	42.56	42.71	42.87	43.02	43.18	43.33	43.49	43.64	43.79	43.94	0.944
0.945	42.13	42.29	42.45	42.61	42.76	42.92	43.07	43.23	43.38	43.53	43.69	43.84	43.99	0.945
0.946	42.18	42.34	42.50	42.65	42.81	42.96	43.12	43.27	43.43	43.58	43.73	43.89	44.04	0.946
0.947	42.23	42.38	42.54	42.70	42.86	43.01	43.17	43.32	43.48	43.63	43.78	43.94	44.09	0.947
0.948	42.27	42.43	42.59	42.75	42.90	43.06	43.22	43.37	43.52	43.68	43.83	43.98	44.14	0.948
0.949	42.32	42.48	42.64	42.79	42.95	43.11	43.26	43.42	43.57	43.73	43.88	44.03	44.18	0.949
0.950	42.37	42.53	42.68	42.84	43.00	43.16	43.31	43.47	43.62	43.78	43.93	44.08	44.23	0.950
0.951	42.41	42.57	42.73	42.89	43.05	43.20	43.36	43.51	43.67	43.82	43.98	44.13	44.28	0.951
0.952	42.46	42.62	42.78	42.94	43.09	43.25	43.41	43.56	43.72	43.87	44.03	44.18	44.33	0.952
0.953	42.51	42.67	42.83	42.98	43.14	43.30	43.45	43.61	43.77	43.92	44.07	44.23	44.38	0.953
0.954	42.55	42.71	42.87	43.03	43.19	43.35	43.50	43.66	43.81	43.97	44.12	44.28	44.43	0.954
0.955	42.60	42.76	42.92	43.08	43.24	43.39	43.55	43.71	43.86	44.02	44.17	44.32	44.48	0.955
0.956	42.65	42.81	42.97	43.13	43.28	43.44	43.60	43.75	43.91	44.07	44.22	44.37	44.53	0.956
0.957	42.69	42.85	43.01	43.17	43.33	43.49	43.65	43.80	43.96	44.11	44.27	44.42	44.58	0.957
0.958	42.74	42.90	43.06	43.22	43.38	43.54	43.69	43.85	44.01	44.16	44.32	44.47	44.62	0.958
0.959	42.79	42.95	43.11	43.27	43.43	43.58	43.74	43.90	44.05	44.21	44.37	44.52	44.67	0.959
0.960	42.83	43.00	43.16	43.31	43.47	43.63	43.79	43.95	44.10	44.26	44.41	44.57	44.72	0.960
0.961	42.88	43.04	43.20	43.36	43.52	43.68	43.84	43.99	44.15	44.31	44.46	44.62	44.77	0.961
0.962	42.93	43.09	43.25	43.41	43.57	43.73	43.89	44.04	44.20	44.36	44.51	44.67	44.82	0.962
0.963	42.97	43.14	43.30	43.46	43.62	43.77	43.93	44.09	44.25	44.40	44.56	44.71	44.87	0.963
0.964	43.02	43.18	43.34	43.50	43.66	43.82	43.98	44.14	44.30	44.45	44.61	44.76	44.92	0.964
0.965	43.07	43.23	43.39	43.55	43.71	43.87	44.03	44.19	44.34	44.50	44.66	44.81	44.97	0.965
0.966	43.12	43.28	43.44	43.60	43.76	43.92	44.08	44.23	44.39	44.55	44.70	44.86	45.02	0.966
0.967	43.16	43.32	43.49	43.65	43.81	43.97	44.12	44.28	44.44	44.60	44.75	44.91	45.06	0.967
0.968	43.21	43.37	43.53	43.69	43.85	44.01	44.17	44.33	44.49	44.65	44.80	44.96	45.11	0.968
0.969	43.26	43.42	43.58	43.74	43.90	44.06	44.22	44.38	44.54	44.69	44.85	45.01	45.16	0.969
0.970	43.30	43.47	43.63	43.79	43.95	44.11	44.27	44.43	44.58	44.74	44.90	45.06	45.21	0.970
0.971	43.35	43.51	43.67	43.84	44.00	44.16	44.32	44.47	44.63	44.79	44.95	45.10	45.26	0.971
0.972	43.40	43.56	43.72	43.88	44.04	44.20	44.36	44.52	44.68	44.84	45.00	45.15	45.31	0.972
0.973	43.44	43.61	43.77	43.93	44.09	44.25	44.41	44.57	44.73	44.89	45.04	45.20	45.36	0.973
0.974	43.49	43.65	43.81	43.98	44.14	44.30	44.46	44.62	44.78	44.94	45.09	45.25	45.41	0.974
0.975	43.54	43.70	43.86	44.02	44.19	44.35	44.51	44.67	44.83	44.98	45.14	45.30	45.46	0.975
0.976	43.58	43.75	43.91	44.07	44.23	44.39	44.56	44.71	44.87	45.03	45.19	45.35	45.50	0.976
0.977	43.63	43.79	43.96	44.12	44.28	44.44	44.60	44.76	44.92	45.08	45.24	45.40	45.55	0.977
0.978	43.68	43.84	44.00	44.17	44.33	44.49	44.65	44.81	44.97	45.13	45.29	45.45	45.60	0.978
0.979	43.72	43.89	44.05	44.21	44.38	44.54	44.70	44.86	45.02	45.18	45.34	45.49	45.65	0.979

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## **Attachment 2**

### **Comparison of Ambient Air Sampling Results**

**Ambient Air Monitoring Report  
Chatham County Coal Ash Disposal Site  
Pittsboro, NC**

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PROJECT CHATHAM-15-1SUBJECT Comparison of ambient air sampling resultsSITE NAME/LOCATION Charah Coal Ash FacilitySHEET  
JOB # CHATHAM-15-1DATE 1/19/2016CALCULATED BY: SWH

CHECKED BY: \_\_\_\_\_

**OBJECTIVE:** To compare results of ambient air samples take before (10/21/15) and after (12/21/15) coal ash deliveries.

**REFERENCE:** EPA Method 6010Cm (total metals on Hi-Vol filter (6010Cmod)  
EPA Method 5/315/NJATM1 m, Particulates on Filter (Method 10-3.1)  
Sample date field logs to record weather conditions, and sampling duration. These data are used to determine total sample event flow rate using lookup tables provided by the sampling device manufacturer

**ANALYSIS:** Determine sampled concentration by dividing total mass of constituent reported by the laboratory by the total sampled flow.

The percent (%) change in constituent concentration is compared from the sampling event prior to coal ash deliveries to the site, and during deliveries.

Comparison of results from both events to available regulatory standards are performed.

10/21/15 total sampled flow 609 m<sup>3</sup> (actual)

12/21/15 total sampled flow 598 m<sup>3</sup> (actual)

Constituent	10/21/2015 Results	Concentration	12/21/2015 Results	Concentration	% Change
Particulate Weight	135 mg	221.853 µg/m <sup>3</sup>	328 mg	548.495 µg/m <sup>3</sup>	147%
Aluminum (Al)	1340 µg	2.202 µg/m <sup>3</sup>	4580 µg	7.659 µg/m <sup>3</sup>	248%
Barium (Ba)	40.5 µg	0.067 µg/m <sup>3</sup>	64 µg	0.107 µg/m <sup>3</sup>	61%
Calcium (Ca)	1010 µg	1.660 µg/m <sup>3</sup>	4580 µg	7.659 µg/m <sup>3</sup>	361%
Chromium (Cr)	<6.7 µg	below RDL	16 µg	0.027 µg/m <sup>3</sup>	>145%
Cobalt (Co)	<2.7 µg	below RDL	4.6 µg	0.008 µg/m <sup>3</sup>	>80%
Copper (Cu)	49.2 µg	0.081 µg/m <sup>3</sup>	74.2 µg	0.124 µg/m <sup>3</sup>	53%
Iron (Fe)	2630 µg	4.322 µg/m <sup>3</sup>	9510 µg	15.903 µg/m <sup>3</sup>	268%
Lead (Pb)	17.2 µg	0.028 µg/m <sup>3</sup>	32.1 µg	0.054 µg/m <sup>3</sup>	90%
Magnesium (Mg)	697 µg	1.145 µg/m <sup>3</sup>	3300 µg	5.518 µg/m <sup>3</sup>	382%
Manganese (Mn)	114 µg	0.187 µg/m <sup>3</sup>	311 µg	0.520 µg/m <sup>3</sup>	178%
Nickel (Ni)	5.3 µg	0.009 µg/m <sup>3</sup>	13.6 µg	0.023 µg/m <sup>3</sup>	161%
Phosphorus (P)	77 µg	0.127 µg/m <sup>3</sup>	239 µg	0.400 µg/m <sup>3</sup>	216%
Potassium (K)	269 µg	0.442 µg/m <sup>3</sup>	1360 µg	2.274 µg/m <sup>3</sup>	414%
Silicon (Si)	173 µg	0.284 µg/m <sup>3</sup>	692 µg	1.157 µg/m <sup>3</sup>	307%
Sodium (Na)	176 µg	0.289 µg/m <sup>3</sup>	959 µg	1.604 µg/m <sup>3</sup>	454%
Strontium (Sr)	4.5 µg	0.007 µg/m <sup>3</sup>	16.1 µg	0.027 µg/m <sup>3</sup>	264%
Sulphur (S)	401 µg	0.659 µg/m <sup>3</sup>	839 µg	1.403 µg/m <sup>3</sup>	113%
Titanium (Ti)	73 µg	0.120 µg/m <sup>3</sup>	295 µg	0.493 µg/m <sup>3</sup>	311%
Vanadium (V)	<6.7 µg	below RDL	14.6 µg	0.024 µg/m <sup>3</sup>	>118%
Zinc (Zn)	88.4 µg	0.145 µg/m <sup>3</sup>	118 µg	0.197 µg/m <sup>3</sup>	36%

Results Comparison to Standards in µg/m<sup>3</sup> including EPA National Ambient Air Quality Standards (NAAQS), NIOSH Recommended Exposure Limit (REL) over a 10-hour time weighted average (TWA), and OSHA Permissible Exposure Limit (PEL) over an 8-hour TWA.

Constituent	EPA NAAQS	NIOSH REL	OSHA PEL	10/21/2015	12/21/2015
Chromium (Cr)	---	0.5	1	<RDL*	0.027
Copper (Cu)	---	1	1	0.081	0.124
Lead	0.15**	50	50	0.028	0.054
Manganese (Mn)	---	1000	5000	0.188	0.520
Nickel (Ni)	---	15	1000	0.009	0.023

\*Contituent was not detected at or above the reportable detection limit.

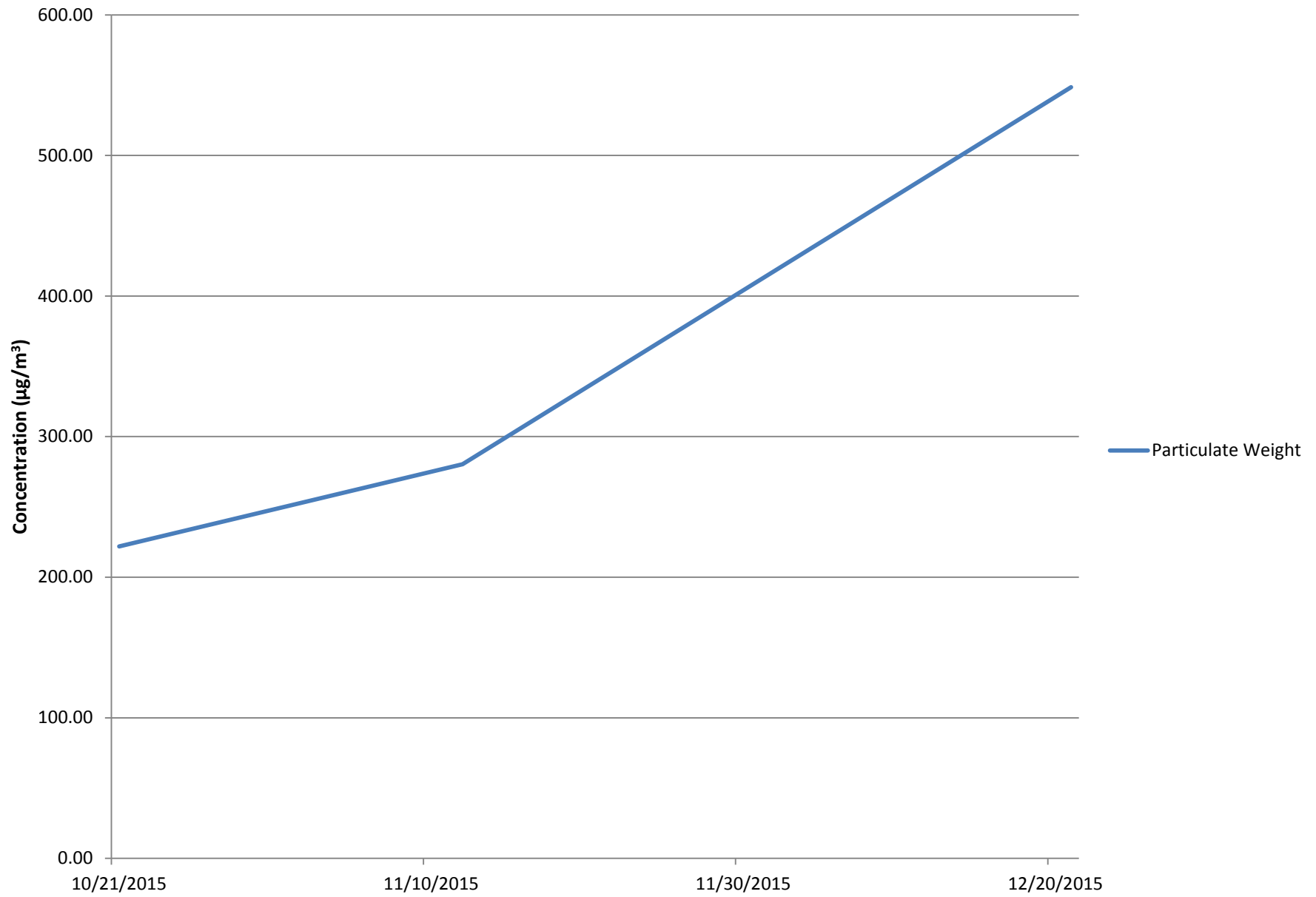
\*\* The standard is over a rolling 3-month average.

SMITH+GARDNER

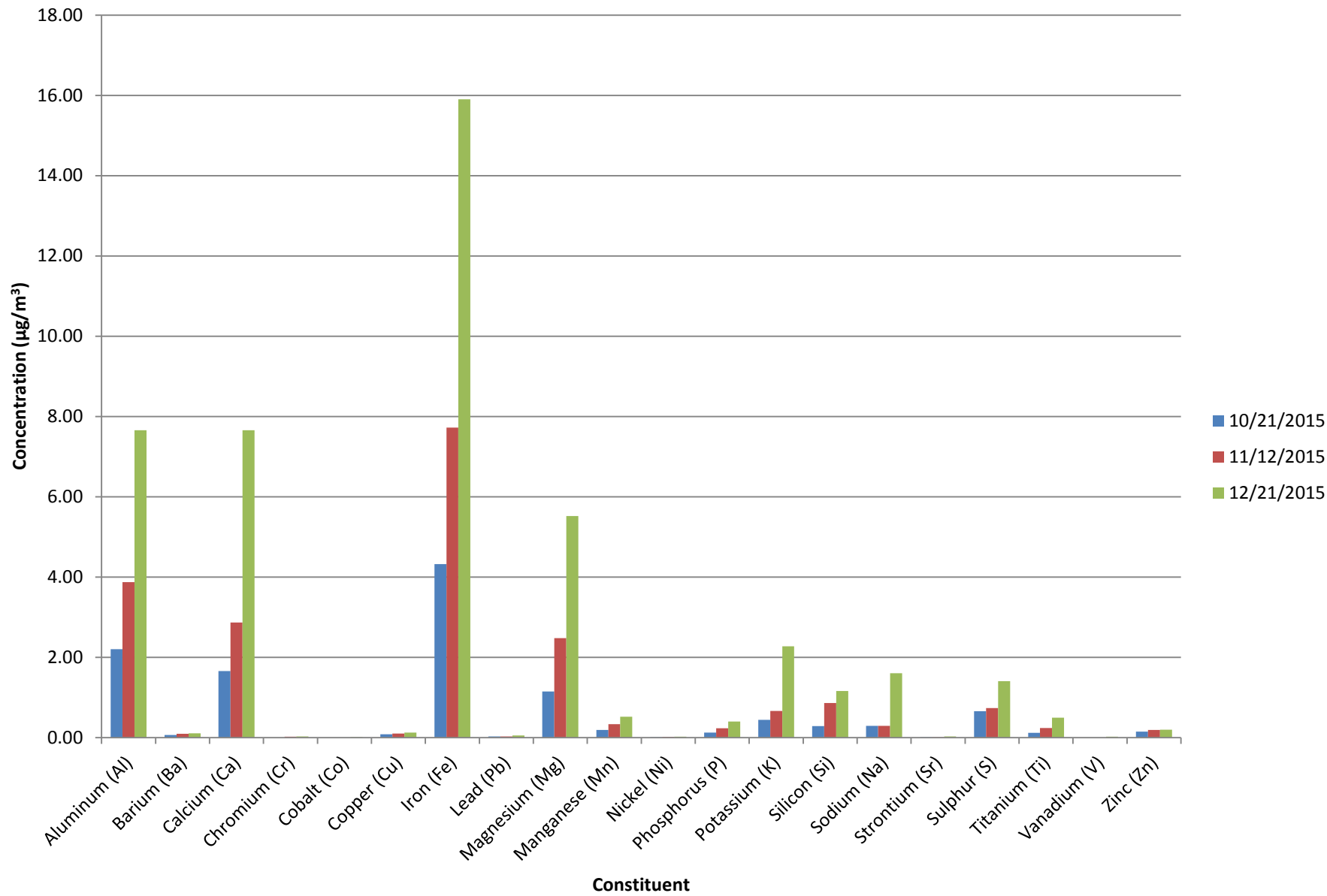
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# Particulate Weight



# Constituent Concentrations



**Attachment 3**

**Laboratory Analytical Results**

**Ambient Air Monitoring Report  
Chatham County Coal Ash Disposal Site  
Pittsboro, NC**

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Your P.O. #: 15869  
Your Project #: CHATHAM-15-1  
Site Location: SMITH GARDNER, INC.  
Your C.O.C. #: na

**Attention: Lorri L White**

Keika Ventures  
Chapel Hill  
500 Nickel Creek Circle  
Durham, NC  
USA 27713

**Report Date: 2016/01/11**  
Report #: R3846720  
Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

**MAXXAM JOB #: B5Q5289**  
**Received: 2015/12/24, 12:15**

Sample Matrix: Filter  
# Samples Received: 1

Analyses	Quantity	Date	Date	Laboratory Method	Reference
		Extracted	Analyzed		
Total Metals on Hi-Vol Filter (6010Cmod)	1	2016/01/08	2016/01/08	CAM SOP-00408	EPA 6010C m
Particulates on Filter (Method IO-3.1)	1	2016/01/08	2016/01/08	CAM SOP-00942	EPA 5/315/NJATM1 m

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.  
\* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

**Encryption Key**

Please direct all questions regarding this Certificate of Analysis to your Project Manager.  
Tarifur Rahman, Project Manager - Air Toxics, Source Evaluation  
Email: TRahman@maxxam.ca  
Phone# (905) 817-5700

=====  
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.  
Maxxam Analytics International Corporation is a NELAP accredited laboratory. Certificates #04012 and #4079-001. This certificate shall not be reproduced except in full, without the written approval of Maxxam.

**RESULTS OF ANALYSES OF FILTER**

Maxxam ID		BOV140		
Sampling Date		2015/12/21		
COC Number		na		
	<b>UNITS</b>	<b>SAMPLE 1</b>	<b>RDL</b>	<b>QC Batch</b>
Particulate Weight on Filter	mg	328	5.0	4338068
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				

**ELEMENTS BY ICP-AES (FILTER)**

Maxxam ID		BOV140		
Sampling Date		2015/12/21		
COC Number		na		
	<b>UNITS</b>	<b>SAMPLE 1</b>	<b>RDL</b>	<b>QC Batch</b>
Aluminum (Al)	ug	4580	67	4338562
Antimony (Sb)	ug	<13	13	4338562
Arsenic (As)	ug	<8.0	8.0	4338562
Barium (Ba)	ug	64.0	1.3	4338562
Beryllium (Be)	ug	<1.3	1.3	4338562
Bismuth (Bi)	ug	<8.0	8.0	4338562
Boron (B)	ug	<8.0	8.0	4338562
Cadmium (Cd)	ug	<2.7	2.7	4338562
Calcium (Ca)	ug	4580	67	4338562
Chromium (Cr)	ug	16.0	6.7	4338562
Cobalt (Co)	ug	4.6	2.7	4338562
Copper (Cu)	ug	74.2	6.7	4338562
Iron (Fe)	ug	9510	67	4338562
Lead (Pb)	ug	32.1	4.0	4338562
Magnesium (Mg)	ug	3300	67	4338562
Manganese (Mn)	ug	311	1.3	4338562
Molybdenum (Mo)	ug	<4.0	4.0	4338562
Nickel (Ni)	ug	13.6	4.0	4338562
Phosphorus (P)	ug	239	33	4338562
Potassium (K)	ug	1360	130	4338562
Selenium (Se)	ug	<13	13	4338562
Silicon (Si)	ug	692	13	4338562
Silver (Ag)	ug	<6.7	6.7	4338562
Sodium (Na)	ug	959	67	4338562
Strontium (Sr)	ug	16.1	1.3	4338562
Sulphur (S)	ug	839	33	4338562
Thallium (Tl)	ug	<13	13	4338562
Tin (Sn)	ug	<13	13	4338562
Titanium (Ti)	ug	295	13	4338562
Vanadium (V)	ug	14.6	6.7	4338562
Zinc (Zn)	ug	118	6.7	4338562
Zirconium (Zr)	ug	<6.7	6.7	4338562
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				

### GENERAL COMMENTS

BOV140-01R \*WSU\*\*LPC\*\*DE\*

FE = Filter ID did not match envelope ID  
DE =Edge of the filter frayed  
FT =Filter torn  
LFT =Loose filter material  
LPC =Loose particulate material in the filter container  
WSU =Wrong side of the filter used  
FNF = Filter not folded

**Results relate only to the items tested.**



**QUALITY ASSURANCE REPORT**

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4338562	SUK	Matrix Spike	Aluminum (Al)	2016/01/08		98	%	75 - 125
			Antimony (Sb)	2016/01/08		99	%	75 - 125
			Arsenic (As)	2016/01/08		101	%	75 - 125
			Barium (Ba)	2016/01/08		100	%	75 - 125
			Beryllium (Be)	2016/01/08		99	%	75 - 125
			Bismuth (Bi)	2016/01/08		102	%	75 - 125
			Boron (B)	2016/01/08		97	%	75 - 125
			Cadmium (Cd)	2016/01/08		103	%	75 - 125
			Calcium (Ca)	2016/01/08		97	%	75 - 125
			Chromium (Cr)	2016/01/08		97	%	75 - 125
			Cobalt (Co)	2016/01/08		102	%	75 - 125
			Copper (Cu)	2016/01/08		99	%	75 - 125
			Iron (Fe)	2016/01/08		97	%	75 - 125
			Lead (Pb)	2016/01/08		100	%	75 - 125
			Magnesium (Mg)	2016/01/08		98	%	75 - 125
			Manganese (Mn)	2016/01/08		97	%	75 - 125
			Molybdenum (Mo)	2016/01/08		100	%	75 - 125
			Nickel (Ni)	2016/01/08		98	%	75 - 125
			Phosphorus (P)	2016/01/08		103	%	75 - 125
			Potassium (K)	2016/01/08		96	%	75 - 125
			Selenium (Se)	2016/01/08		102	%	75 - 125
			Silicon (Si)	2016/01/08		NC	%	75 - 125
			Silver (Ag)	2016/01/08		100	%	75 - 125
			Sodium (Na)	2016/01/08		97	%	75 - 125
			Strontium (Sr)	2016/01/08		98	%	75 - 125
			Sulphur (S)	2016/01/08		105	%	75 - 125
			Thallium (Tl)	2016/01/08		103	%	75 - 125
			Tin (Sn)	2016/01/08		101	%	75 - 125
			Titanium (Ti)	2016/01/08		97	%	75 - 125
			Vanadium (V)	2016/01/08		96	%	75 - 125
			Zinc (Zn)	2016/01/08		99	%	75 - 125
			Zirconium (Zr)	2016/01/08		95	%	75 - 125
4338562	SUK	RPD	Aluminum (Al)	2016/01/08	NC		%	20
			Antimony (Sb)	2016/01/08	3.7		%	20
			Arsenic (As)	2016/01/08	1.3		%	20
			Barium (Ba)	2016/01/08	1.7		%	20
			Beryllium (Be)	2016/01/08	1.3		%	20
			Bismuth (Bi)	2016/01/08	0.88		%	20
			Boron (B)	2016/01/08	1.8		%	20
			Cadmium (Cd)	2016/01/08	1.4		%	20
			Calcium (Ca)	2016/01/08	NC		%	20
			Chromium (Cr)	2016/01/08	2.3		%	20
			Cobalt (Co)	2016/01/08	1.6		%	20
			Copper (Cu)	2016/01/08	13		%	20
			Iron (Fe)	2016/01/08	NC		%	20
			Lead (Pb)	2016/01/08	1.5		%	20
			Magnesium (Mg)	2016/01/08	NC		%	20
			Manganese (Mn)	2016/01/08	1.7		%	20
			Molybdenum (Mo)	2016/01/08	2.1		%	20
			Nickel (Ni)	2016/01/08	1.6		%	20
			Phosphorus (P)	2016/01/08	NC		%	20
			Potassium (K)	2016/01/08	NC		%	20

**QUALITY ASSURANCE REPORT(CONT'D)**

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Selenium (Se)	2016/01/08	0.49		%	20
			Silicon (Si)	2016/01/08	NC		%	20
			Silver (Ag)	2016/01/08	2.6		%	20
			Sodium (Na)	2016/01/08	NC		%	20
			Strontium (Sr)	2016/01/08	1.3		%	20
			Sulphur (S)	2016/01/08	NC		%	20
			Thallium (Tl)	2016/01/08	1.3		%	20
			Tin (Sn)	2016/01/08	2.4		%	20
			Titanium (Ti)	2016/01/08	4.1		%	20
			Vanadium (V)	2016/01/08	0		%	20
			Zinc (Zn)	2016/01/08	1.5		%	20
			Zirconium (Zr)	2016/01/08	3.2		%	20
			Aluminum (Al)	2016/01/08	NC		%	20
			Antimony (Sb)	2016/01/08	4.8		%	20
			Arsenic (As)	2016/01/08	0.60		%	20
			Barium (Ba)	2016/01/08	0.80		%	20
			Beryllium (Be)	2016/01/08	0.60		%	20
			Bismuth (Bi)	2016/01/08	1.2		%	20
			Boron (B)	2016/01/08	2.0		%	20
			Cadmium (Cd)	2016/01/08	1.4		%	20
			Calcium (Ca)	2016/01/08	NC		%	20
			Chromium (Cr)	2016/01/08	1.2		%	20
			Cobalt (Co)	2016/01/08	1.2		%	20
			Copper (Cu)	2016/01/08	1.4		%	20
			Iron (Fe)	2016/01/08	NC		%	20
			Lead (Pb)	2016/01/08	1.0		%	20
			Magnesium (Mg)	2016/01/08	NC		%	20
			Manganese (Mn)	2016/01/08	1.1		%	20
			Molybdenum (Mo)	2016/01/08	0.49		%	20
			Nickel (Ni)	2016/01/08	1.0		%	20
			Phosphorus (P)	2016/01/08	NC		%	20
			Potassium (K)	2016/01/08	NC		%	20
			Selenium (Se)	2016/01/08	0.29		%	20
			Silicon (Si)	2016/01/08	0.10		%	20
			Silver (Ag)	2016/01/08	0.69		%	20
			Sodium (Na)	2016/01/08	NC		%	20
			Strontium (Sr)	2016/01/08	0.10		%	20
			Sulphur (S)	2016/01/08	NC		%	20
			Thallium (Tl)	2016/01/08	0.77		%	20
			Tin (Sn)	2016/01/08	1.1		%	20
			Titanium (Ti)	2016/01/08	0.81		%	20
			Vanadium (V)	2016/01/08	1.3		%	20
			Zinc (Zn)	2016/01/08	1.1		%	20
			Zirconium (Zr)	2016/01/08	0.31		%	20
			Antimony (Sb)	2016/01/08	NC		%	20
			Arsenic (As)	2016/01/08	NC		%	20
			Iron (Fe)	2016/01/08	NC		%	20
			Lead (Pb)	2016/01/08	NC		%	20
			Nickel (Ni)	2016/01/08	NC		%	20
4338562	SUK	Spiked Blank	Aluminum (Al)	2016/01/08		99	%	85 - 115
			Antimony (Sb)	2016/01/08		90	%	85 - 115
			Arsenic (As)	2016/01/08		101	%	85 - 115

**QUALITY ASSURANCE REPORT(CONT'D)**

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Barium (Ba)	2016/01/08		101	%	85 - 115
			Beryllium (Be)	2016/01/08		99	%	85 - 115
			Bismuth (Bi)	2016/01/08		104	%	85 - 115
			Boron (B)	2016/01/08		98	%	85 - 115
			Cadmium (Cd)	2016/01/08		104	%	85 - 115
			Calcium (Ca)	2016/01/08		97	%	85 - 115
			Chromium (Cr)	2016/01/08		98	%	85 - 115
			Cobalt (Co)	2016/01/08		103	%	85 - 115
			Copper (Cu)	2016/01/08		99	%	85 - 115
			Iron (Fe)	2016/01/08		99	%	85 - 115
			Lead (Pb)	2016/01/08		101	%	85 - 115
			Magnesium (Mg)	2016/01/08		100	%	85 - 115
			Manganese (Mn)	2016/01/08		99	%	85 - 115
			Molybdenum (Mo)	2016/01/08		103	%	85 - 115
			Nickel (Ni)	2016/01/08		100	%	85 - 115
			Phosphorus (P)	2016/01/08		105	%	85 - 115
			Potassium (K)	2016/01/08		97	%	85 - 115
			Selenium (Se)	2016/01/08		104	%	85 - 115
			Silicon (Si)	2016/01/08		98	%	85 - 115
			Silver (Ag)	2016/01/08		102	%	85 - 115
			Sodium (Na)	2016/01/08		99	%	85 - 115
			Strontium (Sr)	2016/01/08		98	%	85 - 115
			Sulphur (S)	2016/01/08		106	%	85 - 115
			Thallium (Tl)	2016/01/08		104	%	85 - 115
			Tin (Sn)	2016/01/08		103	%	85 - 115
			Titanium (Ti)	2016/01/08		99	%	85 - 115
			Vanadium (V)	2016/01/08		97	%	85 - 115
			Zinc (Zn)	2016/01/08		100	%	85 - 115
			Zirconium (Zr)	2016/01/08		98	%	85 - 115
4338562	SUK	Method Blank	Aluminum (Al)	2016/01/08	<50		ug	
			Antimony (Sb)	2016/01/08	<10		ug	
			Arsenic (As)	2016/01/08	<6.0		ug	
			Barium (Ba)	2016/01/08	<1.0		ug	
			Beryllium (Be)	2016/01/08	<1.0		ug	
			Bismuth (Bi)	2016/01/08	<6.0		ug	
			Boron (B)	2016/01/08	<6.0		ug	
			Cadmium (Cd)	2016/01/08	<2.0		ug	
			Calcium (Ca)	2016/01/08	<50		ug	
			Chromium (Cr)	2016/01/08	<5.0		ug	
			Cobalt (Co)	2016/01/08	<2.0		ug	
			Copper (Cu)	2016/01/08	<5.0		ug	
			Iron (Fe)	2016/01/08	<50		ug	
			Lead (Pb)	2016/01/08	<3.0		ug	
			Magnesium (Mg)	2016/01/08	<50		ug	
			Manganese (Mn)	2016/01/08	<1.0		ug	
			Molybdenum (Mo)	2016/01/08	<3.0		ug	
			Nickel (Ni)	2016/01/08	<3.0		ug	
			Phosphorus (P)	2016/01/08	<25		ug	
			Potassium (K)	2016/01/08	<100		ug	
			Selenium (Se)	2016/01/08	<10		ug	
			Silicon (Si)	2016/01/08	<10		ug	
			Silver (Ag)	2016/01/08	<5.0		ug	

**QUALITY ASSURANCE REPORT(CONT'D)**

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Sodium (Na)	2016/01/08	<50		ug	
			Strontium (Sr)	2016/01/08	<1.0		ug	
			Sulphur (S)	2016/01/08	<25		ug	
			Thallium (Tl)	2016/01/08	<10		ug	
			Tin (Sn)	2016/01/08	<10		ug	
			Titanium (Ti)	2016/01/08	<10		ug	
			Vanadium (V)	2016/01/08	<5.0		ug	
			Zinc (Zn)	2016/01/08	<5.0		ug	
			Zirconium (Zr)	2016/01/08	<5.0		ug	

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

### VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

*Brenda Moore*

---

Brenda Moore, Team Lead

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

KeikaVentures, LLC  
SAMPLE CHAIN-OF-CUSTODY RECORD

Phone: (919) 933-9569; FAX: (919) 928-5173

Company: Smith Gardner, Inc.

Project Contact: Matt Lamb

P. O. Number: CHATHAM-15-1

Project Name: CHATHAM-15-1

Country: US

Job Number: CHATHAM-15-1

Date:

22-Dec

Turnaround: Standard

Page: 1 of 1

Sample Identification Number	Date	Time	Matrix	Preservative & No. Bottles	Analyses Requested											Notes		
					IO2.1 PM	IO3.5 METALS												
Sample 1	12/21/15				X	X												FULL LIST OF METALS

24-Dec-15 12:15  
Tarifur Rahman  
B5Q5289  
HGR AIR-RmTmp

Relinquished By	Date	Time	Received By	Date	Time	Temp. (°C)	Shipper & Air Waybill #
			<i>[Signature]</i>	2015/12/24	12:15	N/A	