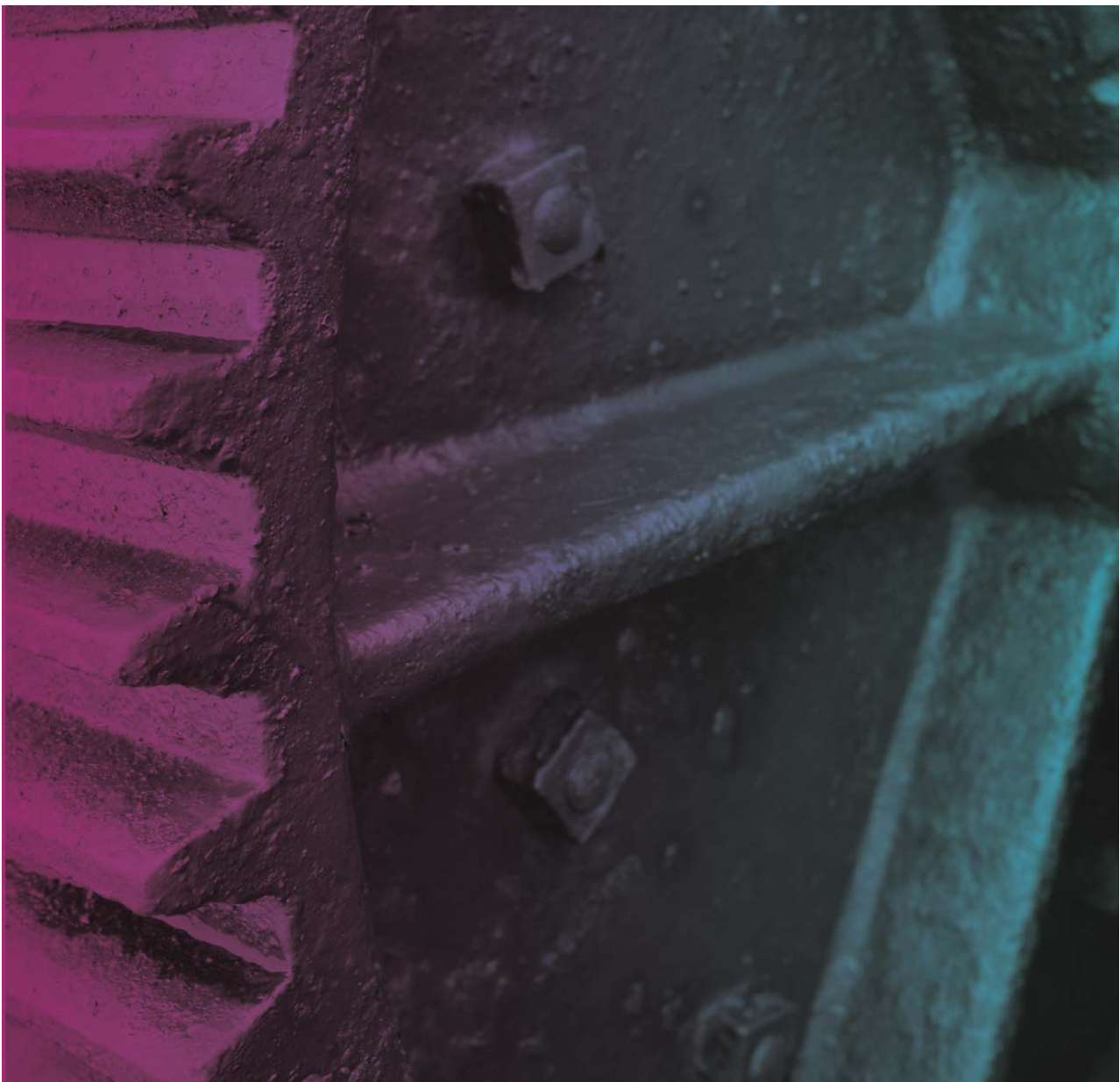


3rd Quarter Emissions Testing Report 2016

OneSteel Recycling Hexham



NATA ACCREDITATION No. 2778 (14391)

Accredited for compliance with ISO/IEC 17025 - Testing

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards

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3rd Quarter Emissions Testing Report 2016

OneSteel Recycling Hexham

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Quality Information

Document 3rd Quarter Emissions Testing Report 2016

Ref 60493017


Date 09-Sep-2016

Prepared by Vilai Kelemete-Manua

Reviewed by Chad Whitburn Approved Signatory



Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
0	09-Sep-2016	Report for Issue	Chad Whitburn Associate Director - Compliance Services	

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1.0 Introduction

AECOM was appointed by OneSteel Recycling Pty Ltd to conduct a series of measurements to determine air emissions from the Shredder Bag house Stack (EPL Point 1) at the Hexham facility. Measurements were required for NSW EPA licence compliance (EPL No. 5345).

Testing was undertaken on 30 August 2016 to investigate emission concentrations for the following parameters:

- Fine Particulates (PM₁₀);
- Total Particulate (TP); and
- Hazardous Substances (Metals) including Lead and Mercury.

Laboratory analysis was undertaken by the following laboratories which hold NATA accreditation for the specified tests:

- Steel River Testing, laboratory NATA accreditation number 18079, performed the following analysis detailed in report number 11959-0-M & 11959-0-P:
 - Total Particulate (TP);
 - Fine Particulates (PM₁₀); and
 - Moisture.
- SGS Leeder Consulting laboratory NATA accreditation number 14429, performed the following analysis detailed in report number M161806:
 - Hazardous Substances (Metals).

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2.0 Sampling Plane Requirements

The criteria for sampling planes are specified in AS 4323.1-1995 (R2014).

Table 1 Criteria for Selection of Sampling Planes (AS 4323.1)

Type of flow disturbance	Minimum distance upstream from disturbance, diameters (D)	Minimum distance downstream from disturbance, diameters (D)
Bend, connection, junction, direction change	>2D	>6D
Louvre, butterfly damper (partially closed or closed)	>3D	>6D
Axial fan	>3D	>8D (see Note)
Centrifugal fan	>3D	>6D

NOTE: The plane should be selected as far as practicable from a fan. Flow straighteners may be required to ensure the position chosen meets the check criteria listed in Items (a) to (f) below.

- a. *The gas flow is basically in the same direction at all points along each sampling traverse;*
- b. *The gas velocity at all sampling points is greater than 3 m/s;*
- c. *The gas flow profile at the sampling plane shall be steady, evenly distributed and not have a cyclonic component which exceeds an angle of 15° to the duct axis, when measured near the periphery of a circular sampling plane;*
- d. *The temperature difference between adjacent points of the survey along each sampling traverse is less than 10% of the absolute temperature, and the temperature at any point differs by less than 10% from the mean;*
- e. *The ratio of the highest to lowest pitot pressure difference shall not exceed 9:1 and the ratio of highest to lowest gas velocities shall not exceed 3:1. For isokinetic testing with the use of impingers, the gas velocity ratio across the sampling plane should not exceed 1.6:1; and*
- f. *The gas temperature at the sampling plane should preferably be above the dewpoint.*

With the exception of point 'b', the sampling plane was in accordance with AS4323.1. The gas stream velocities at each sampling point were found to be 2.4 m/s. Please note that the bag house was not running at full capacity at the time of testing.

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3.0 Methodology

3.1 NATA Accredited Methods

The following methods are accredited with the National Association of Testing Authorities (NATA) (accreditation number 2778 (14391)) and are approved for the sampling and analysis of gases. Specific details of the methods are available on request.

All sampling and analysis is conducted according to the methods in **Table 2**.

Table 2 AECOM NATA Endorsed Methods

NSW EPA Approved Methods	USEPA Methods	Method Title
AS4323.1 (NSW EPA TM-1)	USEPA (2000) Method 1	Selection of sampling positions
AS4323.2 (NSW EPA TM-15)	USEPA (2000) Method 5 under approved circumstances	Determination of total particulate matter – isokinetic manual sampling – gravimetric method
NSW EPA TM-2	USEPA (2000) Method 2 or 2C or USEPA (1999) Method 2F or 2G or 2H (as appropriate)	Determination of stack gas velocity and volumetric flow rate (type s pitot tube)
NSW EPA TM-22	USEPA (2000) Method 4	Determination of moisture content in stack gases
NSW EPA TM-23	USEPA (2000) Method 3	Gas analysis for the determination of dry molecular weight
NSW EPA OM-5	USEPA (1997) Method 201 or 201A (as appropriate)	Determination of PM ₁₀ emissions
NSW EPA TM-12,13 and 14	USEPA Method 29	Determination of metal emissions from stationary sources

All parameters are reported adjusted to 0°C at 1 atmosphere and dry gas.

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4.0 Sampling Location

4.1 Sampling Location Summary

Table 3 provides a summary of the location sampled by AECOM on 30 August 2016.

Table 3 Sampling Location Summary

Discharge Description	Shredder Baghouse Stack (EPL Point 1)
Duct Shape	Circular
Construction Material	Metal
Duct Diameter (mm)	760
Minimum No. Sampling Points	12
Sampling Ports	2
Min. Points/Traverse	6
Disturbance	No
Distance from Upstream Disturbance	6.6D
Type of Disturbance	Bend
Distance from Downstream Disturbance	2.6D
Type of Disturbance	Stack Exit
Ideal Sampling Location	Yes ²
Correction Factors Applied	No
Total No. Points Sampled	12
Points/Traverse	6
Sampling Performed to Standard ¹	Yes ²

¹ AS 4323.1 Section 4.1

² The sampling location was ideal in terms of flow disturbances, but did not comply with AS 4323.1 point b) as the corrected velocity of the gas at all sampling points was found to be 2.4 m/s (minimum 3m/s).

D = Diameters

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5.0 Equipment Calibration

AECOM has a calibration schedule to ensure the emission testing equipment is maintained in good order and with known calibration. Equipment used in this project was calibrated according to the procedures and frequency identified in the AECOM calibration schedule. Details of the schedule and the calibration calculations are available on request.

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6.0 Results

A summary of air emission test results is shown in **Table 4**. Detailed results along with gas stream properties during the testing period can be found in **Table 5**. Speciated Hazardous Substances (Metals) results are presented in **Table 6**. Emission concentrations are converted to standard conditions of 0°C, dry gas and 1 atm pressure for comparison with regulatory limits.

Field sheets and final calculations recorded during the project are attached as **Appendix A**. Laboratory reports can be referred to in **Appendix B**.

AECOM has a calculated limit of uncertainty in regards to results. The estimation of measurement uncertainty in source testing is conducted to provide an indication of the precision of the measurement result and a degree of confidence in the range of values the reported result may represent. The measurement of uncertainty has been calculated at $\pm 13.6\%$.

Table 4 Shredder Baghouse Emission Results Summary, 30 August 2016

Parameter	Emission Concentration (EPL Point 1)	Emission Concentration Limit
Total Particulate (TP) (mg/m ³)	1.9	100
Fine Particulate (PM ₁₀) (mg/m ³)	<0.22	NA
Lead (mg/m ³)	0.0042	5.0
Mercury (mg/m ³)	<0.00042	1.0
Total Hazardous Substances (Metals) (mg/m ³)	0.012	NA

Results from testing conducted on EPL Point 1 on 30 August 2016 are below the regulatory limits listed in EPL 5345.

Table 5 Fine Particulate (PM₁₀), Total Particulate and Hazardous Substance (Metals) Results, 30 August 2016

Sampling Conditions:		
Stack internal diameter at test location	760 mm	
Stack gas temperature (average)	17.0 °C	290.2 K
Stack pressure (average)	1026 hPa	
Stack gas velocity (average, stack conditions)	2.4 m/s	
Stack gas flowrate (stack conditions)	1.1 m ³ /s	
Stack gas flowrate (0°C, dry gas, 1 atm pressure)	1 m ³ /s	
Fine Particulate (PM₁₀) Testing		
Test Period	10:15 -	11:31
Fine Particulate (PM ₁₀) Mass	<0.2 mg	
Gas Volume Sampled	0.912 m ³	
Fine Particulate (PM ₁₀) Emission* ¹	<0.22 mg/m ³	
Fine Particulate (PM ₁₀) Mass Emission Rate* ²	<0.22 mg/s	
Regulatory Limit	NA	
Total Particulate Testing		
Test Period	10:15 -	11:31
Total Particulate Mass	1.7 mg	
Gas Volume Sampled	0.904 m ³	
Total Particulate Emission* ¹	1.9 mg/m ³	
Total Particulate Mass Emission Rate* ²	1.9 mg/s	
Regulatory Limit	100 mg/m ³	
Hazardous Substances (Metals) Testing		
Test Period	10:15 -	11:31
Hazardous Substances (Metals) Mass	0.014 mg	
Gas Volume Sampled	1.19 m ³	
Hazardous Substances (Metals) Emission* ¹	0.012 mg/m ³	
Hazardous Substances (Metals) Mass Emission Rate* ²	0.012 mg/s	
Regulatory Limit	NA	
Moisture Content (%)	1.7	
Gas Density (dry at 1 atmosphere)	1.29 kg/m³	
Dry Molecular Weight	28.8 g/g-mole	

Notes *1 Emission concentration at Standard conditions of 0°C, 1 atm, dry gas

*2 Mass emission rate determined from pre and post-test sampling flow measurements and the respective test moisture content. See Q_{std} in field sheets and final calculations "Stack Analysis - Final Calculations" for each test.

Table 6 Hazardous Substances (Metals) Elemental Analysis Results, 30 August 2016

Sample	Total Particulate Metals (mg)	Total Particulate Metals (mg/m ³)	Total Gaseous Metals (mg)	Total Gaseous Metals (mg/m ³)	Total Oxidisable Mercury (mg)	Total Oxidisable Mercury (mg/m ³)	Total (mg)	Total (mg/m ³)	Mass Emission Rate (mg/s)
Antimony	<0.0002	<0.00017	<0.0001	<0.000084			<0.0002	<0.00017	<0.00017
Arsenic	<0.0002	<0.00017	<0.0001	<0.000084			<0.0002	<0.00017	<0.00017
Beryllium	<0.0002	<0.00017	<0.0001	<0.000084			<0.0002	<0.00017	<0.00017
Cadmium	0.0007	0.00059	0.00015	0.00013			0.0009	0.00076	0.00077
Chromium	<0.0014	<0.0012	0.00045	0.00038			0.00045	0.00038	0.00039
Cobalt	<0.0002	<0.00017	<0.0001	<0.000084			<0.0002	<0.00017	<0.00017
Copper	0.0005	0.00042	<0.0001	<0.000084			0.0005	0.00042	0.00043
Lead	0.0048	0.004	0.00025	0.00021			0.005	0.0042	0.0043
Magnesium	<0.0563	<0.047	0.0012	0.001			0.0012	0.001	0.001
Manganese	0.0052	0.0044	0.0015	0.0013			0.007	0.0059	0.006
Mercury	<0.0002	<0.00017	<0.0001	<0.000084	<0.0005	<0.00042	<0.0005	<0.00042	<0.00043
Nickel	0.0006	0.00051	<0.0001	<0.000084			0.0006	0.00051	0.00052
Selenium	<0.0002	<0.00017	<0.0001	<0.000084			<0.0002	<0.00017	<0.00017
Thallium	<0.0002	<0.00017	<0.0001	<0.000084			<0.0002	<0.00017	<0.00017
Tin	<0.0002	<0.00017	<0.0001	<0.000084			<0.0002	<0.00017	<0.00017
Vanadium	<0.0013	<0.0011	<0.0001	<0.000084			<0.0002	<0.00017	<0.00017
Zinc	<0.9403	<0.79	0.0023	0.0019			0.0023	0.0019	0.0019
Total Hazardous Metals*	0.011	0.0095	0.0024	0.002	<0.0005	<0.00042	0.014	0.012	0.012
Total Metals	0.012	0.0099	0.0059	0.0049			0.018	0.015	0.015

* Total does not include Copper, Magnesium and Zinc as they are classed non-hazardous

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Appendix A

Field Sheets (17 pages)

Appendix A Field Sheets (17 pages)

Emission Measurement Calculations Spreadsheet**OneSteel Hexham**

AECOM's Project Number: 60493017



Emission Source: Shredder Stack

Date Sampled: 30-Aug-16

ANALYTE(S)	METHOD
Fine Particulate (PM10)	NSW EPA OM - 5
Total Particulate	NSW EPA TM - 15
Hazardous Substances (Metals)	NSW EPA TM - 12, 13 & 14

Observations made during testing period:

Sampling Performed By:


James Lang
For Dylan Turnbull

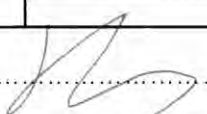

ANZ

Emission Measurement Calculations Spreadsheet

Q4AN(EV)-332-FM31

STACK ANALYSIS - PRE-SAMPLING

Date: 30-Aug-16
 Client: OneSteel Hexham
 AECOM's Project No: 60493017
 Stack/Duct Description: Shredder Stack
 Test 1: Fine Particulate (PM10)
 Test 2: Total Particulate
 Test 3: Hazardous Substances (Metals)

Measurement/Observations				
Stack Internal Dimensions:				
Diameter	760 mm		Cross Sectional Area : 0.45 m ²	
OR	Length	Width		
Length/Width (mm)			Minimum No. of	
Equivalent Diameter	N/A	mm	sampling points= 12	
Distance from sampling plane to nearest disturbances:			Total No. of sampling points = 12	
Upstream (m) =	5		PM2.5/10= 12	
No. Diameters =	6.6		No. of sampling traverses/ports sampled = 2	
Type of Upstream Disturbance:	Fan Entry		PM2.5/10= 2	
Downstream (m) =	2		No. of sampling points on each traverse/port = 6	
No. Diameters =	2.6		PM2.5/10= 6	
Type of Down Stream Disturbance: Stack Exit				
Position of each sampling point, for each traverse:			Exclusion of any sample point numbers - comments:	
	A	B	PM10/2.5 A	PM2.5/10 B
No.	Distance from wall	S-type Pitot distances	Distance from wall	S-Type Pitot distances
1	33	3	33	3
2	111	81	111	81
3	225	195	225	195
4	535	505	535	505
5	649	619	649	619
6	727	697	727	697
7				
8				
9				
10			Check of total points against minimum, (yes/no) - comments:	
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			General Comments:	
Signed: 			Checked: 	

STACK ANALYSIS - GAS COMPOSITION AND DENSITY PRE-SAMPLING

Date: 30-Aug-16
 Client: OneSteel Hexham
 AECOM's Project No: 60493017
 Stack/Duct Description: Shredder Stack
 Test 1: Fine Particulate (PM10)
 Test 2: Total Particulate
 Test 3: Hazardous Substances (Metals)

Sampling time start: 10:08		Sampling port No.: 1		
Measurement No.	Time sampled	CO (ppm), (dry)	O ₂ (%), (dry)	CO ₂ (%), (dry)
1	10:08	0	20.9	0.0
2	10:09	0	20.9	0.0
3	10:10	0	20.9	0.0
4	10:11	0	20.9	0.0
5	10:12	0	20.9	0.0
6	10:13	0	20.9	0.0
7	10:14	0	20.9	0.0
8	10:15	0	20.9	0.0
Averages:		0.0 ppm	20.9 %	0.0 %

Moisture content (M3): 0.99
 Moisture percentage (M2): 1.50 %

Measurements

CO: 0.0000 %,(dry)	N ₂ : 79.1 %,(dry)
CO ₂ : 0.0 %,(dry)	O ₂ : 20.9 %,(dry)
Gas Compositions converted to wet basis:	
CO: 0.0000 %,(wet)	N ₂ : 77.9 %,(wet)
CO ₂ : 0.0 %,(wet)	O ₂ : 20.6 %,(wet)
H ₂ O: 1.50 % (=M2)	
Therefore, stack gas density (GD) =	1.28 kg/m ³ (0°C, wet, 1 atm pressure)
Therefore, stack gas density (GD) =	1.29 kg/m ³ (0°C, dry, 1 atm pressure)

STACK ANALYSIS - GAS COMPOSITION AND DENSITY POST-SAMPLING

Date: 30-Aug-16
 Client: OneSteel Hexham
 AECOM's Project No: 60493017
 Stack/Duct Description: Shredder Stack
 Test 1: Fine Particulate (PM10)
 Test 2: Total Particulate
 Test 3: Hazardous Substances (Metals)

Sampling time start: 11:24		Sampling port No.: 1		
Measurement No.	Time sampled	CO (ppm), (dry)	O ₂ (%), (dry)	CO ₂ (%), (dry)
1	11:24	0	20.9	0.0
2	11:25	0	20.9	0.0
3	11:26	0	20.9	0.0
4	11:27	0	20.9	0.0
5	11:28	0	20.9	0.0
6	11:29	0	20.9	0.0
7	11:30	0	20.9	0.0
8	11:31	0	20.9	0.0
Averages:		0.0 ppm	20.9 %	0.0 %

Moisture content (M3): 0.98
 Moisture percentage (M2): 1.71 %

Measurements

CO: 0.0000 %,(dry)	N ₂ : 79.1 %,(dry)
CO ₂ : 0.0 %,(dry)	O ₂ : 20.9 %,(dry)
Gas Compositions converted to wet basis:	
CO: 0.0000 %,(wet)	N ₂ : 77.7 %,(wet)
CO ₂ : 0.0 %,(wet)	O ₂ : 20.5 %,(wet)
H ₂ O: 1.71 % (=M2)	
Therefore, stack gas density (GD) =	1.28 kg/m ³ (0°C, wet, 1 atm pressure)
Therefore, stack gas density (GD) =	1.29 kg/m ³ (0°C, dry, 1 atm pressure)

Emission Measurement Calculations Spreadsheet

Stack Analysis - Pre Sampling Pitot Tube and Temperature Traverses

Date: 30-Aug-16
Client: OneSteel Hexham
AECOM's Project No: 60493017
Stack/Duct Description: Shredder Stack
Test 1: Fine Particulate (PM10)
Test 2: Total Particulate
Test 3: Hazardous Substances (Metals)

Table with 6 columns: Sampling Position No., Distance from far wall (mm), Max. Differential Pressure ΔP, kilo Pascals, Max Temp. °C, Max Temp. (Ts) K, Corrected Velocity (Vs) m/s. Includes data for positions 1/1 to 2/6 and an average row.

Static Pressure (Dwyer) (Pa): kPa
Static Pressure (U-tube, if required) : -0.5 mm
Absolute pressure in stack (hPa) : 1025.95 hPa

Emission Measurement Calculations Spreadsheet

STACK ANALYSIS

SAMPLING OF HAZARDOUS SUBSTANCES (METALS)

Date: 30-Aug-16
Client: OneSteel Hexham
AECOM's Project No: 60493017
Stack Description No.: Shredder Stack
Sample Nozzle No.: G12
Sampling Port No.: 1 to 2
Page No: 1 of 1
Sample Nozzle Area (An): 11.31 x 10^-5 m^2
Thimble No: 0
Blank thimble No:

Leak Check (Pre-Sampling)

Meter start: 117.1540 Meter finish: 117.1540
Time start: 10:08 Time finish: 10:09

Leak Check (Post Sampling)

Meter start: 118.4244 Meter finish: 118.4244
Time start: 11:36 Time finish: 11:37

Therefore, leakage rate = no leak L/min

(>0.1 l/min. is unacceptable)

(>0.1 l/min. is unacceptable)

Repeat:
Comments:

Repeat:
Comments:

Sampling Record Table

Barometric Pressure: 1026 hPa (start); 1026 hPa (finish)
Meter start: 117.1556 Time start: 10:15
Meter correction factor (GMF) : 1.0000

Table with 8 columns: Sampling Position No., Stopwatch Time at Sampling Position, Distance from far wall (mm), Isokinetic Flowrate (L/min), Meter Inlet Temp. (°C), Meter Outlet Temp. (°C), Impinger Train Outlet Temp (°C), Flowrate Attained (Y/N). Rows include 1/1-1/6 and 2/1-2/6, plus an Averages row.

Meter Finish: 118.4210 Time Finish: 11:31
Total Condensate collected: 7 ml Silica gel No(s) used: M301

Emission Measurement Calculations Spreadsheet

Stack Analysis - Hazardous Substances Elemental Analysis Results

Date: 30-Aug-16 Client: OneSteel Hexham
 AECOM's Project No: 60493017 Stack/Duct Description: Shredder Stack

Metal	Particulate Metals Results	Gaseous Metals Results	Oxidisable Mercury Results		
	Front Half, Filter, Acetone Rinses and Acid Rinses (mg). Containers 1, 2 and 3	Back Half, Impingers + Acid Rinses (mg) Container 4	KO Impinger + Acid Rinses (mg) (5A)	KMnO ₄ /H ₂ SO ₄ + Rinses (mg) (5B)	Residue Rinse 8N HCl (mg) (If Required) (5C)
Antimony	<0.0002	<0.0001			
Arsenic	<0.0002	<0.0001			
Beryllium	<0.0002	<0.0001			
Cadmium	0.0007	0.00015			
Chromium	<0.0014	0.00045			
Cobalt	<0.0002	<0.0001			
Copper	0.0005	<0.0001			
Lead	0.0048	0.00025			
Magnesium	<0.0563	0.0012			
Manganese	0.0052	0.0015			
Mercury	<0.0002	<0.0001	<0.0001	<0.0005	<0.0001
Nickel	0.0006	<0.0001			
Selenium	<0.0002	<0.0001			
Thallium	<0.0002	<0.0001			
Tin	<0.0002	<0.0001			
Vanadium	<0.0013	<0.0001			
Zinc	<0.9403	0.0023			

Note: Where the blank has returned a less than value, half of this value was subtracted from the sample result as a blank correction ie for a blank value of <0.0005, 0.00025 was subtracted from the sample result.

* Total does not include Copper, Magnesium and Zinc as they are classed non-hazardous

Stack Analysis - Hazardous Substances Elemental Analysis Results Continued

Date: 30-Aug-16 Client: OneSteel Hexham
 AECOM's Project No: 60493017 Stack/Duct Description: Shredder Stack

Sample	Total Particulate Metals (mg)	Total Particulate Metals (mg/m ³)	Total Gaseous Metals (mg)	Total Gaseous Metals (mg/m ³)	Total Oxidisable Mercury (mg)	Total Oxidisable Mercury (mg/m ³)	Total (mg)	Total (mg/m ³)	Mass Emission Rate (mg/s)
Antimony	<0.0002	<0.00017	<0.0001	<0.000084			<0.0002	<0.00017	<0.00017
Arsenic	<0.0002	<0.00017	<0.0001	<0.000084			<0.0002	<0.00017	<0.00017
Beryllium	<0.0002	<0.00017	<0.0001	<0.000084			<0.0002	<0.00017	<0.00017
Cadmium	0.0007	0.00059	0.00015	0.00013			0.0009	0.00076	0.00077
Chromium	<0.0014	<0.0012	0.00045	0.00038			0.00045	0.00038	0.00039
Cobalt	<0.0002	<0.00017	<0.0001	<0.000084			<0.0002	<0.00017	<0.00017
Copper	0.0005	0.00042	<0.0001	<0.000084			0.0005	0.00042	0.00043
Lead	0.0048	0.004	0.00025	0.00021			0.005	0.0042	0.0043
Magnesium	<0.0563	<0.047	0.0012	0.001			0.0012	0.001	0.001
Manganese	0.0052	0.0044	0.0015	0.0013			0.007	0.0059	0.006
Mercury	<0.0002	<0.00017	<0.0001	<0.000084	<0.0005	<0.00042	<0.0005	<0.00042	<0.00043
Nickel	0.0006	0.00051	<0.0001	<0.000084			0.0006	0.00051	0.00052
Selenium	<0.0002	<0.00017	<0.0001	<0.000084			<0.0002	<0.00017	<0.00017
Thallium	<0.0002	<0.00017	<0.0001	<0.000084			<0.0002	<0.00017	<0.00017
Tin	<0.0002	<0.00017	<0.0001	<0.000084			<0.0002	<0.00017	<0.00017
Vanadium	<0.0013	<0.0011	<0.0001	<0.000084			<0.0002	<0.00017	<0.00017
Zinc	<0.9403	<0.79	0.0023	0.0019			0.0023	0.0019	0.0019
Total Hazardous Metals*	0.011	0.0095	0.0024	0.002	<0.0005	<0.00042	0.014	0.012	0.012
Total Metals	0.012	0.0099	0.0059	0.0049			0.018	0.015	0.015

* Total does not include Copper, Magnesium and Zinc as they are classed non-hazardous

STACK ANALYSIS - PM10 CALCULATIONS

Date: 30-Aug-16 Client: OneSteel Hexham
 AECOM's Project No: 60493017 Stack/Duct Description: Shredder Stack

1. Gas Analysis

	%		
%CO ₂	0.0		
%O ₂	20.9		
%N ₂ +%CO	79.1		
Fraction Moisture Content, Bws	0.02	M _s =	0.98

2. Molecular Weight of Stack Gas (Dry Basis)

Mol. Wt. of Stack Gas (dry)	28.84
Mol. Wt. of Stack Gas (wet)	28.67

3. Absolute Stack Pressure

	Pascals	in. Hg
Barometric Pressure (Pbar)	102600	30.29
Stack Static Pressure (Pg)	102595	30.29

Absolute Stack Pressure	30.29
-------------------------	-------

4. Viscosity of Stack Gas

	°C	°F
Average Stack Temp.	18.0	64.4
Average Meter Temperature:	25.1	
Stack Gas Viscosity		178.8

5. Cyclone Flow Rate

	ft ³ /min	m ³ /min	L/min	L/s
Cyclone Flow Rate	0.44	0.0154	15.43	0.26

6. Nozzle Velocity, Rmin and Rmax

Nozzle Number	Nozzle Diameter (inches)	Nozzle Velocity		Rmin	Rmax	Vmin	Vmin	Vmax	Vmax
		ft/sec	m/s	[-]	[-]	ft/sec	m/s	ft/sec	m/s
0	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
1	0.130	79.13	26.05	0.759	1.228	60.06	19.70	97.20	31.89
2	0.146	62.94	20.72	0.741	1.240	46.66	15.31	78.04	25.60
3	0.159	52.53	17.29	0.722	1.252	37.90	12.44	65.76	21.58
4	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	0.193	35.89	11.81	0.651	1.290	23.36	7.66	46.28	15.18
6	0.221	27.38	9.01	0.550	1.331	15.05	4.94	36.44	11.96
7	0.232	24.84	8.18	0.486	1.350	12.42	4.07	33.53	11.00
8	0.261	19.66	6.47	#NUM!	1.406	9.83	3.23	27.64	9.07
9	0.296	15.28	5.03	#NUM!	1.487	7.64	2.51	22.72	7.45
10	0.337	11.79	3.88	#NUM!	1.599	5.89	1.93	17.68	5.80
11	0.389	8.83	2.91	#NUM!	1.766	4.41	1.45	13.24	4.34
	Nozzle Diameter	Nozzle Diameter	Nozzle Area	Sample Rate					
Selected Nozzle	(inches)	(m)	(m ²)	(L/min)					
10	0.337	0.009	0.000057	13					

STACK ANALYSIS - FINAL CALCULATIONS

Fine Particulate (PM10)

(Calculations performed in accordance with relevant test method as defined on cover page)

Date: 30-Aug-16 Client: OneSteel Hexham
 AECOM's Project No: 60493017 Stack/Duct Description: Shredder Stack

(A) Sample gas volume at standard conditions

Metered volume (MV ₃):	0.9838 m ³	Average barometric pressure (P _{BARO}):	1026 hPa
Average gas meter temp. (T _{M,2}):	25.1 °C	Average pressure at meter (P _{M,2}):	1026.00 hPa
	298.3 K		
Sample gas volume (MV ₄); (0°C, dry gas, 1 atm pressure):	0.9124 m ³		

(B) PM10 concentration at standard conditions

Blank thimble No.:	0	Blank weight:	g
Thimble No. used:	T442	PM10 Weight:	<0.0002 g
Final PM10 Weight (Mp1):	<0.0002 g		
PM10 Concentration (C1):	=M _{p1} /MV ₄ =		<0.00022 g/m ³ (0°C, dry gas, 1atm pressure)

;and C₂ = <0.22 mg/m³ (0°C, dry gas, 1atm pressure)

CO ₂ Basis	12 %
Average CO ₂ %:	0.0 %

Therefore, C_c: = C_a x 12/CO₂% = <0.00022 g/m³ (0°C, dry gas, 1atm pressure, 12% CO₂)

;and C_{c1} = <0.22 mg/m³ (0°C, dry gas, 1atm pressure, 12% CO₂)

O ₂ Basis	7 %
Average O ₂ %:	20.9 %

Therefore, C_b: =C_a x (21 - O_{2ref}%)/(21 - O_{2mea}%) <0.031 g/m³ (0°C, dry gas, 1atm pressure, 7% O₂)

;and C_{b1} = <31 mg/m³ (0°C, dry gas, 1atm pressure, 7% O₂)

(C) Moisture content

Silica Gel Number:	F25	V _v =	8.5 g (from laboratory report)	V _w =	4 mL (=grams) (recorded on Laboratory Form 108)
Volume of Water Vapour Condensed (V _{wc(std)}):			0.0053		
Volume of Water Vapour Condensed (V _{wsg(std)}):			0.0113		

Therefore, B_{ws} = $\frac{(V_{wc(std)}+V_{wsg(std)})}{(V_{wc(std)}+V_{wsg(std)}+V_{m(std)})}$

B_{ws} = 1.80 %

Emission Measurement Calculations Spreadsheet

STACK ANALYSIS - FINAL CALCULATIONS CONTINUED

Fine Particulate (PM10)

(D) Gas Composition and Density (Re-calculation)

- (i) Initial gas density for sampling: 1.28 kg/m³ (from Laboratory Form 107)
- (ii) Re-calculated gas density based on moisture content in (c):
 - 1.28 kg/m³ (0°C, wet, 1 atm pressure)
 - 1.29 kg/m³ (0°C, dry, 1 atm pressure)
- (iii) Gas density at stack conditions = (ii) x $\frac{(273.2)}{(273.2+T_s)} \times \frac{(P_s)}{(1013.25)}$
 - = 1.220 kg/m³ (stack conditions, wet)

(E) Gas Velocities

- (i) Average of pre-sampling velocities: 2.40 m/s
 - (ii) Average of post-sampling velocities: 2.40 m/s
 - (iii) Average of while-sampling velocities: N/A m/s
 - (iv) Overall average of pre-sampling and post-sampling velocities (Vs):
 - 2.40 m/s (stack conditions, wet)
 - N/A m/s (stack conditions, wet)
- (Note: (Vs) is from all individual data, not from (i) and (ii) alone.)**

(F) Volumetric Flowrates (Reference Method US-EPA Method 2, NSW-EPA TM-2)

Q_{stack} = V_s x A = 1.09 m³/s (stack conditions)

Q_{std} = Q_{stack} x $\frac{P_s}{P_{std}} \times \frac{(T_{std})}{(T_s)} \times \frac{(100 - B_w)}{100}$

Q_{std} = 1.0 m³/s (0°C, dry gas, 1 atm pressure)

(G) Mass Emission Rate

R_m = C_{1a} x Q_{std} = <0.00022 g/s (0°C, dry gas, 1 atm pressure)

= <0.22 mg/s (0°C, dry gas, 1 atm pressure)

C_{1a} x Q_{std} = <0.00022 g/s (0°C, dry gas, 1 atm pressure 12% CO₂)

= <0.22 mg/s (0°C, dry gas, 1 atm pressure 12% CO₂)

C_{1a} x Q_{std} = <0.031 g/s (0°C, dry gas, 1 atm pressure 7% O₂)

= <31 mg/s (0°C, dry gas, 1 atm pressure 7% O₂)

STACK ANALYSIS - FINAL CALCULATIONS

Total Particulate

(Calculations performed in accordance with relevant test method as defined on cover page)

Date: 30-Aug-16 Client: OneSteel Hexham
 AECOM's Project No: 60493017 Stack/Duct Description: Shredder Stack

(A) Sample gas volume at standard conditions

Metered volume (MV ₃):	0.9775 m ³	Average barometric pressure (P _{BARO}):	1026 hPa
Average gas meter temp. (T _{M,2}):	25.9 °C	Average pressure at meter (P _{M,2}):	1026.00 hPa
	299.1 K		

Sample gas volume (MV₄); (0°C, dry gas, 1 atm pressure): 0.9041 m³

(B) Total Particulate concentration at standard conditions

Blank thimble No.:		Blank weight:	g
Thimble No. used:	T445	Total Particulate Weight:	0.0017 g
Final Total Particulate Weight (Mp1):	0.00170 g		
Total Particulate Concentration (C1):	=M _{p1} /MV ₄ =		0.0019 g/m ³ (0°C, dry gas, 1atm pressure)

CO₂ Basis 12 % ;and C₂ = 1.9 mg/m³ (0°C, dry gas, 1atm pressure)
 Average CO₂%: 0.0 %

Therefore, C_c: = C_a x 12/CO₂% = 0.0019 g/m³ (0°C, dry gas, 1atm pressure, 12% CO₂)
 ;and C_{c1} = 1.9 mg/m³ (0°C, dry gas, 1atm pressure, 12% CO₂)

O₂ Basis 7 %
 Average O₂%: 20.9 %

Therefore, C_b: =C_a x (21 - O_{2ref}%)/(21 - O_{2mea}%) = 0.27 g/m³ (0°C, dry gas, 1atm pressure, 7% O₂)
 ;and C_{b1} = 270 mg/m³ (0°C, dry gas, 1atm pressure, 7% O₂)

(C) Moisture content

Silica Gel Number: C19
 V_v = 5.3 g (from laboratory report) V_w = 4 mL (=grams) (recorded on Laboratory Form 108)
 Volume of Water Vapour Condensed (V_{wc(std)}) = 0.0053
 Volume of Water Vapour Condensed (V_{wsg(std)}) = 0.0071

Therefore, B_{ws} = $\frac{(V_{wc(std)}+V_{wsg(std)})}{(V_{wc(std)}+V_{wsg(std)}+V_{m(std)})}$

B_{ws} = 1.35 %

STACK ANALYSIS - FINAL CALCULATIONS CONTINUED

Total Particulate

(D) Gas Composition and Density (Re-calculation)

- (i) Initial gas density for sampling: 1.28 kg/m³ (from Laboratory Form 107)
- (ii) Re-calculated gas density based on moisture content in (c):
 - 1.28 kg/m³ (0°C, wet, 1 atm pressure)
 - 1.29 kg/m³ (0°C, dry, 1 atm pressure)
- (iii) Gas density at stack conditions =

$$(ii) \times \frac{(273.2)}{(273.2+T_s)} \times \frac{(P_s)}{(1013.25)}$$

= 1.220 kg/m³ (stack conditions, wet)

(E) Gas Velocities

- (i) Average of pre-sampling velocities: 2.40 m/s
- (ii) Average of post-sampling velocities: 2.40 m/s
- (iii) Average of while-sampling velocities: N/A m/s
- (iv) Overall average of pre-sampling and post-sampling velocities (Vs):
 - 2.40 m/s (stack conditions, wet)
 - N/A m/s (stack conditions, wet)

(Note: (Vs) is from all individual data, not from (i) and (ii) alone.)

(F) Volumetric Flowrates (Reference Method US-EPA Method 2, NSW-EPA TM-2)

Q_{stack} = V_s x A = 1.09 m³/s (stack conditions)

$$Q_{std} = Q_{stack} \times \frac{P_s}{(P_{std})} \times \frac{(T_{std})}{(T_s)} \times \frac{(100 - B_w)}{100}$$

Q_{std} = 1.0 m³/s (0°C, dry gas, 1 atm pressure)

(G) Mass Emission Rate

R _m =	C _{1a} x Q _{std} =	0.0019	g/s (0°C, dry gas, 1 atm pressure)		
	=	1.9	mg/s (0°C, dry gas, 1 atm pressure)		
	C _{1a} x Q _{std} =	0.0019	g/s (0°C, dry gas, 1 atm pressure	12%	CO ₂)
	=	1.9	mg/s (0°C, dry gas, 1 atm pressure	12%	CO ₂)
	C _{1a} x Q _{std} =	0.27	g/s (0°C, dry gas, 1 atm pressure	7%	O ₂)
	=	270	mg/s (0°C, dry gas, 1 atm pressure	7%	O ₂)

STACK ANALYSIS - FINAL CALCULATIONS

Hazardous Substances (Metals)

(Calculations performed in accordance with relevant test method as defined on cover page)

Date: 30-Aug-16 Client: OneSteel Hexham
 AECOM's Project No: 60493017 Stack/Duct Description: Shredder Stack

(A) Sample gas volume at standard conditions

Metered volume (MV₃): 1.2654 m³ Average barometric pressure (P_{BARO}) 1026 hPa
 Average gas meter temp. (T_{M,2}): 21.8 °C
 295.0 K Average pressure at meter (P_{M,2}) 1026.00 hPa
 Sample gas volume (MV₄); (0°C, dry gas, 1 atm pressure): 1.1866 m³

(B) Metals concentration at standard conditions

Blank thimble No.: Blank weight: g
 Thimble No. used: 0 Metals Weight: 0.000014 g
 Final Metals Weight (Mp1): 0.00001 g
 Metals Concentration (C1): =M_{p1}/MV₄= 0.000012 g/m³ (0°C, dry gas, 1atm pressure)
 ;and C₂ = 0.012 mg/m³ (0°C, dry gas, 1atm pressure)
 CO₂ Basis 12 %
 Average CO₂%: 0.0 %

Therefore, C_c: = C_a x 12/CO₂% = 0.000012 g/m³ (0°C, dry gas, 1atm pressure, 12% CO₂)
 ;and C_{c1} = 0.012 mg/m³ (0°C, dry gas, 1atm pressure, 12% CO₂)

O₂ Basis 7 %
 Average O₂%: 20.9 %
 Therefore, C_b: =C_a x (21 - O_{2ref}%)/(21 - O_{2mea}%) 0.0017 g/m³ (0°C, dry gas, 1atm pressure, 7% O₂)
 ;and C_{b1} = 1.7 mg/m³ (0°C, dry gas, 1atm pressure, 7% O₂)

(C) Moisture content

Silica Gel Number: M301
 V_v = 11.1 g (from laboratory report) V_w = 7 mL (=grams) (recorded on Laboratory Form 108)
 Volume of Water Vapour Condensed (V_{wc(std)}) = 0.0093
 Volume of Water Vapour Condensed (V_{wsg(std)}) = 0.0148
 Therefore, B_{ws} = $\frac{(V_{wc(std)}+V_{wsg(std)})}{(V_{wc(std)}+V_{wsg(std)}+V_{m(std)})}$
 B_{ws} = 1.99 %

Emission Measurement Calculations Spreadsheet

STACK ANALYSIS - FINAL CALCULATIONS CONTINUED

Hazardous Substances (Metals)

(D) Gas Composition and Density (Re-calculation)

- (i) Initial gas density for sampling: 1.28 kg/m³ (from Laboratory Form 107)
- (ii) Re-calculated gas density based on moisture content in (c):
 - 1.28 kg/m³ (0°C, wet, 1 atm pressure)
 - 1.29 kg/m³ (0°C, dry, 1 atm pressure)
- (iii) Gas density at stack conditions = (ii) x $\frac{(273.2)}{(273.2+T_s)} \times \frac{(P_s)}{(1013.25)}$
 - = 1.220 kg/m³ (stack conditions, wet)

(E) Gas Velocities

- (i) Average of pre-sampling velocities: 2.40 m/s
 - (ii) Average of post-sampling velocities: 2.40 m/s
 - (iii) Average of while-sampling velocities: N/A m/s
 - (iv) Overall average of pre-sampling and post-sampling velocities (Vs):
 - 2.40 m/s (stack conditions, wet)
 - N/A m/s (stack conditions, wet)
- (Note: (Vs) is from all individual data, not from (i) and (ii) alone.)**

(F) Volumetric Flowrates (Reference Method US-EPA Method 2, NSW-EPA TM-2)

Q_{stack} = V_s x A = 1.09 m³/s (stack conditions)

Q_{std} = Q_{stack} x $\frac{P_s}{P_{std}} \times \frac{(T_{std})}{(T_s)} \times \frac{(100 - B_w)}{100}$

Q_{std} = 1.0 m³/s (0°C, dry gas, 1 atm pressure)

(G) Mass Emission Rate

R_m = C_{1a} x Q_{std} = 0.000012 g/s (0°C, dry gas, 1 atm pressure)

= 0.012 mg/s (0°C, dry gas, 1 atm pressure)

C_{1a} x Q_{std} = 0.000012 g/s (0°C, dry gas, 1 atm pressure 12% CO₂)

= 0.012 mg/s (0°C, dry gas, 1 atm pressure 12% CO₂)

C_{1a} x Q_{std} = 0.0017 g/s (0°C, dry gas, 1 atm pressure 7% O₂)

= 1.7 mg/s (0°C, dry gas, 1 atm pressure 7% O₂)

EMISSION MONITORING RESULTS, SHREDDER STACK ONESTEEL HEXHAM 30-Aug-16 FINE PARTICULATE (PM10) TOTAL PARTICULATE HAZARDOUS SUBSTANCES (METALS)		
Sampling Conditions:		
Stack internal diameter at test location	760 mm	
Stack gas temperature (average)	17.0 °C	290.2 K
Stack pressure (average)	1026 hPa	
Stack gas velocity (average, stack conditions)	2.4 m/s	
Stack gas flowrate (stack conditions)	1.1 m ³ /s	
Stack gas flowrate (0°C, dry gas, 1 atm pressure)	1 m ³ /s	
Fine Particulate (PM10) Testing		
Test Period	10:15	- 11:31
Fine Particulate (PM10) Mass	<0.2 mg	
Gas Volume Sampled	0.912 m ³	
Fine Particulate (PM10) Emission*1	<0.22 mg/m ³	
Fine Particulate (PM10) Mass Emission Rate*2	<0.22 mg/s	
Regulatory Limit	NA	
Total Particulate Testing		
Test Period	10:15	- 11:31
Total Particulate Mass	1.7 mg	
Gas Volume Sampled	0.904 m ³	
Total Particulate Emission*1	1.9 mg/m ³	
Total Particulate Mass Emission Rate*2	1.9 mg/s	
Regulatory Limit	100 mg/m ³	
Hazardous Substances (Metals) Testing		
Test Period	10:15	- 11:31
Hazardous Substances (Metals) Mass	0.014 mg	
Gas Volume Sampled	1.19 m ³	
Hazardous Substances (Metals) Emission*1	0.012 mg/m ³	
Hazardous Substances (Metals) Mass Emission Rate*2	0.012 mg/s	
Regulatory Limit	NA	
Moisture Content (%)	1.7	
Gas Density (dry at 1 atmosphere)	1.29 kg/m ³	
Dry Molecular Weight	28.8 g/g-mole	

Notes *1 Emission concentration at Standard conditions of 0°C, 1 atm, dry gas

*2 Mass emission rate determined from pre and post test sampling flow measurements and the respective test moisture content. See Q_{std} in field sheets and final calculations "Stack Analysis - Final Calculations" for each test.

Appendix B

Laboratory Results (11 pages)

Appendix B Laboratory Results (11 pages)

Steel River Testing

5/11 McIntosh Drive, Mayfield West, NSW 2304
Phone: 02 49677880

STACK EMISSION - MOISTURE REPORT

Origin: AECOM - Newcastle
Project: 60493017

Report : 11959-0-M Page 1 of 1

Description : Stack Emission Samples
Received: 31-Aug-16

Date : 07-Sep-16

Report To : Cye Buckland
17 Warabrook Blvd, Warabrook NSW 2304

Copy to: FILE

Jar ID	Moisture (g)
C19	5.3
F25	8.5
M301	11.1



NATA Accredited Laboratory 18079
Accredited for compliance with
ISO/IEC 17025

Reported By: 

Robert Dawson

Determined in Accordance With:
Moisture content in stack gases by gravimetric
using in-house M301

Steel River Testing

5/11 McIntosh Drive, Mayfield West, NSW 2304

Phone: 02 49677880

STACK EMISSION - PARTICULATES REPORT

Origin: AECOM - Newcastle
Project: 60493017

Report : 11959-0-P Page 1 of 1

Description : Stack Emission Samples
Received: 31-Aug-16

Date : 07-Sep-16

Report To : Cye Buckland
17 Warabrook Blvd, Warabrook NSW 2304


Copy to: FILE

Thimble ID		Volume (mL)	Total Particulate Matter (g)
T442	Filter	-	<0.0002
T445	Filter	-	0.0017



NATA Accredited Laboratory 18079
Accredited for compliance with
ISO/IEC 17025

Note : Sampled by Client

Reported By: 

Robert Dawson

Determined in Accordance With:
Particulate matter - total in stack gases by
gravimetric using in-house M300;
Acetone/Water Rinse using AS4323.2

Chartered Chemists
6-Sep-2016

REPORT NUMBER: M161806
Site/Client Ref: 60493017/1.1
Order No: 60493017/1.1

AECOM
17 Warabrook Bvde
Warabrook

NSW 2304
Attention: Cye Buckland

CERTIFICATE OF ANALYSIS

SAMPLES: Twelve samples were received for analysis

DATE RECEIVED: 1-Sep-2016

DATE COMMENCED: 1-Sep-2016

METHODS: See Attached Results

RESULTS: Please refer to attached pages for results.

Note: Results are based on samples as received at SGS laboratories

REPORTED BY:



Ming Dai
Senior Chemist



NATA Accredited Laboratory Number: 14429

Accredited for compliance
with ISO/IEC 17025.

ANALYTICAL RESULTS

Matrix: Filter

Method: USEPA M29 (Analysis only) - MA-1400.FL.M29.02

Sample units are expressed in µg total

Test Started: 2/09/2016

	Leeder ID	2016023014	2016023015	2016023016
	Client ID	Metals 1	Metals 12	Method
Analyte Name	Sampled Date	30/08/2016	30/08/2016	
	PQL			Blank
Sb	0.2	nd	nd	nd
As	0.2	0.2	0.2	nd
Be	0.2	nd	nd	nd
Cd	0.2	0.2	nd	nd
Cr	0.2	0.2	1.4	nd
Co	0.2	nd	nd	nd
Cu	0.2	0.5	0.5	nd
Pb	0.2	0.9	0.3	nd
Mg	2	48	55	nd
Mn	0.2	1.8	0.2	nd
Hg	0.2	nd	nd	nd
Ni	0.2	0.6	0.6	nd
Se	0.2	nd	nd	nd
Tl	0.2	nd	nd	nd
Sn	0.2	nd	nd	nd
V	0.2	1.3	1.3	nd
Zn	0.2	740	940	nd

ANALYTICAL RESULTS

Matrix: Impinger Solution

Method: USEPA M29 (Analysis only) - MA-1400.IMP.M29.06 Metals in Impingers (ug total)

Sample units are expressed in µg total

Test Started: 2/09/2016

	Leeder ID	2016023017	2016023018	2016023019
	Client ID	Metals 3	Metals 4	Metals 8A
Analyte Name	Sampled Date	30/08/2016	30/08/2016	30/08/2016
	PQL			
Sb	0.1	nd	nd	nd
As	0.1	nd	nd	nd
Be	0.1	nd	nd	nd
Cd	0.1	0.6	0.2	nd
Cr	0.1	1.1	0.5	nd
Co	0.1	nd	nd	nd
Cu	0.1	0.5	nd	nd
Pb	0.1	4.2	0.3	nd
Mg	0.1	7.9	3.5	1.3
Mn	0.1	3.6	1.6	nd
Hg	0.1	nd	nd	nd
Ni	0.1	0.6	nd	nd
Se	0.1	nd	nd	nd
Tl	0.1	nd	nd	nd
Sn	0.1	nd	nd	nd
V	0.1	nd	nd	nd
Zn	0.1	51	3.0	0.3
Sample Volume (mL)		90	310	310

ANALYTICAL RESULTS

Matrix: Impinger Solution

Method: USEPA M29 (Analysis only) - MA-1400.IMP.M29.06 Metals in Impingers (ug total)

Sample units are expressed in µg total

Test Started: 2/09/2016

	Leeder ID	2016023020	2016023021	2016023022	2016023023	2016023024	2016023025
	Client ID	Metals 9	Metals 5A	Metals 5C	Metals 8B	Metals 11	Method
Analyte Name	Sampled Date	30/08/2016	30/08/2016	30/08/2016	30/08/2016	30/08/2016	
	PQL						Blank
Sb	0.1	nd					nd
As	0.1	nd					nd
Be	0.1	nd					nd
Cd	0.1	nd					nd
Cr	0.1	nd					nd
Co	0.1	nd					nd
Cu	0.1	nd					nd
Pb	0.1	nd					nd
Mg	0.1	0.9					nd
Mn	0.1	nd					nd
Hg	0.1	nd	nd	nd	nd	nd	nd
Ni	0.1	nd					nd
Se	0.1	nd					nd
Tl	0.1	nd					nd
Sn	0.1	nd					nd
V	0.1	nd					nd
Zn	0.1	0.4					nd
Sample Volume (mL)		200	100	250	100	280	

Matrix: KMnO4

Method: USEPA M29 (Analysis only) - MA-1400.IMP.M29.04 Mercury in Impingers (ug total)

Sample units are expressed in µg total

Test Started:

	Leeder ID	2016023026	2016023027	2016023028
	Client ID	Metals 5B	Metals 10	Method
Analyte Name	Sampled Date	30/08/2016	30/08/2016	
	PQL			Blank
Hg	0.5	nd	nd	nd
Sample Volume (mL)		420	120	

QA/QC RESULTS

Matrix: Filter

Method: USEPA M29 (Analysis only) - MA-1400.FL.M29.02

Quality Control Results are expressed in Percent Recovery of expected result

Test Started: 2/09/2016

Analyte Name	Sampled Date PQL	Leeder ID	2016023029	2016023030
		Client ID	Matrix	Matrix
			Spike	Spike Dup
Sb			87	90
As			92	94
Be			93	93
Cd			90	90
Cr			100	100
Co			89	91
Cu			96	97
Pb			93	95
Mg			104	107
Mn			95	96
Hg			95	100
Ni			92	91
Se			88	84
Tl			95	97
Sn			95	96
V			98	96
Zn			U	U

QA/QC RESULTS

Matrix: Impinger Solution

Method: USEPA M29 (Analysis only) - MA-1400.IMP.M29.06 Metals in Impingers (ug total)

Quality Control Results are expressed in Percent Recovery of expected result

Test Started: 2/09/2016

Analyte Name	Sampled Date PQL	Leeder ID	2016023032
		Client ID	Matrix
		2016023031	2016023032
		Matrix	Matrix
		Spike	Spike Dup
Sb		94	94
As		94	94
Be		86	91
Cd		92	94
Cr		96	94
Co		93	92
Cu		95	94
Pb		96	99
Mg		102	102
Mn		98	98
Hg		96	99
Ni		93	92
Se		93	93
Tl		98	100
Sn		93	94
V		120	119
Zn		118	117

Matrix: KMnO4

Method: USEPA M29 (Analysis only) - MA-1400.IMP.M29.04 Mercury in Impingers (ug total)

Quality Control Results are expressed in Percent Recovery of expected result

Test Started: 2/09/2016

Analyte Name	Sampled Date PQL	Leeder ID	2016023034
		Client ID	Matrix
		2016023033	2016023034
		Matrix	Matrix
		Spike	Spike Dup
Hg		100	98

QUALIFIERS / NOTES FOR REPORTED RESULTS

- PQL Practical Quantitation Limit
- nd Not Detected – The analyte was not detected above the reported PQL.
- is Insufficient Sample to perform this analysis.
- T Tentative identification based on computer library search of mass spectra.
- NC Not calculated and/or Results below PQL
- NV No Vacuum, Canister received above standard atmospheric pressure
- nr Not Requested for analysis.
- R Rejected Result – results for this analysis failed QC checks.
- SQ Semi-Quantitative result – quantitation based on a generic response factor for this class of analyte.
- IM Inappropriate method of analysis for this compound
- U Unable to provide Quality Control data – high levels of compounds in sample interfered with analysis of QC results.
- UF Unable to provide Quality Control data- Surrogates failed QC checks due to sample matrix effects
- L Analyte detected at a level above the linear response of calibration curve.
- E Estimated result. NATA accreditation does not cover estimated results.
- C1 These compounds co-elute.
- Parameter Not Determined
- CT Elevated concentration. Results reported from carbon tube analysis
- ** Sample shows non-petroleum hydrocarbon profile

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APPENDIX ONE.

CHAIN OF CUSTODY DOCUMENT

**Chain of Custody Record -
SGS Leeder Consulting**

Dispatch samples to: Unit 5/18 Redland Drive, Mitcham, VIC, 3132

Sheet 1 of 1

Attn: Lyndall Stevens - Contact Ph: (03) 9874 1988 Fax: (03) 9874 1933 Email: au.samplereceipt.mitcham@sgs.com

CLIENT NAME: AECOM			CONTACT PHONE No: 02 4911 4900			Sample Disposal (Please X) After: 4 Weeks () 6 Weeks ()									
CLIENT ADDRESS: 17 Warabrook I			CONTACT FAX No: 02 4911 4999												
Warabrook NSW 2304			RESULTS REQUIRED BY: Standard			Analyses Required (Analyte + Method Code)									
CONTACT: Cye Buckland			EMAIL REPORT TO: cye.buckland@aecom.com												
SAMPLED BY: DT JL			LAB QUOTE NUMBER:			Metals - USEPA Method 29*									
PROJECT REF. / ORDER No: 60493017/1.1			Containers/Preservation (please tick) (G=glass, P=plastic)												
Client Sample ID	Date Sampled	Matrix			0.1-1L Jar(G)	0.1-1.0 litre(G)	0.1-1.0 litre(P)	40ml Vial(G)	40ml Vial(G)	0.1-1L (P)	125mL (P)	125mL (P)	125mL (P)	125mL (P)	Mercury
		Filter	Impinger	KMnO4	n.a.	Nat.	Nat.	Nat.	H2SO4	H2SO4	HCl acid washed	Zn Ace. NaOH	Filtered Yes/No	HNO3	
Metals 1	30/08/16	x			x										x
Metals 3	30/08/16		x				x								x
Metals 4	30/08/16		x				x								x
Metals 5A	30/08/16		x				x								x
Metals 5B	30/08/16			x		x									x
Metals 5C	30/08/16		x				x								x
Metals 8A	30/08/16		x				x								x
Metals 8B	30/08/16		x				x								x
Metals 9	30/08/16		x				x								x
Metals 10	30/08/16			x		x									x
Metals 11	30/08/16		x				x								x
Metals 12	30/08/16	x			x										x
----- Totals:		2	8	2	2	2	8								6
CHAIN OF CUSTODY RECORD															
RELEASED BY: (Name) Dylan Turnbull			(Signature) DT			(Date / Time) 31/08/16			Custody Seals Intact? <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No			Please Note: Dissolved metals require filtering in the field. Please indicate whether the HNO3 acidified sample has been filtered. Comments: (eg. Highly contaminated samples, reporting requirements etc)			
RECEIVED BY: (Name) <i>Benedict Robinson</i>			(Signature) <i>[Signature]</i>			(Date / Time) 1/9/16 11:00am			Samples Received Chilled? <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No 198						
*Sb, As, Be, Cd, Cr, Co, Cu, Pb, Mg, Mn, Hg, Ni, Se, Tl, Sn, V, Zn															

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