Boral Cement Limited
Berrima Works

Non-Standard Fuels Pollutant Tracking
Second Half Year Report

April 2024

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1. Introduction

In July 2015, Boral sought approval to modify the consent for the Berrima Cement Works to enable the use of Solid Waste Derived Fuel (SWDF) as an energy source. Modification 9 to the consent DA 401-11-2002 was subsequently approved which included a number of additional monitoring and management conditions covering the use of these alternative fuels. The consent also separated the use of standard fuels, being traditional coal and coal derivatives along with diesel for start-up and non-standard fuels being derived from waste. Non-Standard Fuels (NSF) is the broad term now used to cover the various waste derived fuels approved to be used in the cement plant.

Boral commenced using two types of NSF in August 2018, including Wood Waste (WW) and Refuse Derived Fuels (RDF) known as Solid Waste Derived Fuels (SWDF). Both materials have undergone separation and screening processes to remove contaminants such as, glass and metals. Product specifications have been established and Quality Assurance/Quality Control (QA/QC) procedures implemented.

As per condition 3.22 of the DA, Boral are required to implement a tracking program to undertake:

a) Batch analysis of non-standard fuels received at the development as provided by suppliers and the results of any check analysis carried out by the applicant as part of the quality control management procedures
b) A mass inventory of each pollutant entering the process in raw materials, conventional fuels and non-standard fuels, with particular attention to, but not limited to chlorine, mercury cadmium and chromium.
c) Calculate emission factors for each pollutant based on inputs, outputs and measured air emissions and a variance in the emission factors from period to period.
d) Any adjustments that may be necessary to non-standard fuel specifications from the tracking analysis.

The initial period of use of SWDF was part of a Proof of Performance Trial which included the submission of monthly reports and a Proof of Performance Trial Consolidated Six Month Report for Solid Waste Derived Fuels on 28 February 2019. On the 23 April 2019 the Department of Planning and Environment approved the ongoing use of SWDF following consultation with the EPA subject to:

a) Limiting the amount of SWDF to be fired in Kiln 6 to 40%, as a percentage of total fuel
b) Periodic stack testing being undertaken every three months for the first 12 months of use of SWDF. The monitored pollutants must be consistent with the requirements of the Environment Protection Licence (EPL 1698)
c) Provision of a monitoring report that outlines the results of quarterly stack testing required in (a) and provides an assessment of compliance against the air emissions limits for the facility, to the satisfaction of the Secretary
d) Periodic measurements of hydrogen chloride (HCL) taken every 3 months until such time the Secretary agrees the accuracy of the HCL CEMS is confirmed through successful calibration audits undertaken in accordance with USEPA Performance Specification 18.

BERRIMA WORKS
Non-Standard Fuels Pollutant Tracking

Condition 3.23 of the DA required Boral Cement to submit a report that assesses the results of the tracking program every 3 months in the first year of operating non-standard fuels under this consent to be synchronised with stack testing and every six months thereafter.

The following report is covering detailed findings from the non-standard fuels Pollutant Tracking Program for the biannual testing following the approval for continual use of SWDF. This report incorporates the requirements of Condition 3.23.

As part of the tracking program we consolidate all raw material and fuel specification testing against quantities used and compare this to actual stack testing to determine an emission factor by unit of input by chemical.

1.1 Stack Testing Result

On the 30th April and 1st May 2024 stack testing undertaken at Berrima Cement was compliant with the licence limits as summaries in Table 1 below. A copy of the full report numbered R016899-1 is attached. Metals and Chlorine are outlined in the pollutant tracking discussion. Emissions were in compliance with the Environment Protection Licence 1698.

Parameter	Unit	Limits	30 April & 1 May 24 R016899-1
Mercury	mg/m3	0.05	<0.02
Type 1 and type 2 substances	mg/m3	0.5	<0.008
Solid particles	mg/m3	50	30
Nitrogen oxides	mg/m3	1250	750
Cadmium and Thallium	mg/m3	0.05	<0.005
Chlorine	mg/m3	50	0.49
Dioxine and Furans (I-TEQ middle bound)	ng/m3	0.1	0.0033
Hydrogen chloride (HCl)*	mg/m3	10	0.96
Hydrogen fluoride	mg/m3	1	<0.004
Sulfur dioxide	mg/m3	50	<0.031
Sulfuric acid mist and sulfur trioxide	mg/m3	50	0.064
Volatiles organic compounds	mg/m3	40	1.9

*Note that HCl is well below the limit of 10mg/m3.

1.2 Raw Material Inputs

The raw materials used within Kiln 6 include Limestone, Yellow Shale, Blue Shale, Steel Slag and Granulated Blast Furnace Slag. Table 2 summaries the percentage of each raw material input used, the chemical properties of each of the raw material inputs, and the total chemical properties of the raw feed combined in use during the stack testing in October 2023.

Table 2 – Raw Material Input Quantities and Chemical Properties

Raw Material - Input

Chemical Properties		Feed Source1 Limestone	Feed Source2 Yellow Shale	Feed Source3 Blue Shale	Feed Source4 GYP	Feed Source5 Steel Slag	Feed Source3.1 GBFS	Final Feed
	Set Point %	81.50%	3.70%	9.00%	0.00%	2.00%	5.00%	101.20%
Arsenic	As (mg/kg)	5.6	14.2	10.2		1.8	1.0	6.09
Beryllium	Be (mg/kg)	0.1	1.0	0.9		0.3	6.4	0.53
Cadmium	Cd (mg/kg)	0.2	0.3	0.1		0.1	0.1	0.19
Chromium	Cr (mg/kg)	4.6	52.2	23.8		1580	45.7	41.71
Cobalt	Co (mg/kg)	1.9	9.7	14.2		1.9	0.3	3.24
Copper	Cu (mg/kg)	2.7	17.4	34.9		30.1	1.4	6.66
Mercury	Hg (mg/kg)	0.1	0.1	0.1		0.1	0.1	0.10
Manganese	Mn (mg/kg)	173	517	943		23000	3150	862.49
Nickel	Ni (mg/kg)	4.2	19.8	21.9		11.5	0.9	6.40
Lead	Pb (mg/kg)	3.2	24.3	15.7		1.4	0.3	4.96
Antimony	Sb (mg/kg)	0.4	0.7	0.2		0.2	0.1	0.38
Selenium	Se (mg/kg)	1	1	1		1	2	1.06
Tin	Sn (mg/kg)	0.1	1.4	0.4		1.7	0.1	0.21
Vanadium	V (mg/kg)	5	53	49		3940	137	96.10
Thallium	Th (mg/kg)	0.1	0.2	0.1		0.1	0.1	0.10
Chlorine	Cl (mg/kg)	20	20	20		10	410	39.540
kg mat/kg clinker								1.55

To interpret the table, 81.50% of the raw material is limestone. Within limestone there is 5.6 mg/kg of Arsenic (As), while yellow shale used at 3.70% contained 14.2 mg/kg of As. Combined with the other raw materials of blue shale, steel slag and granulated blast furnace slag, the total As of raw feed is 6.09 mg/kg.

To produce 1 kg of clinker, 1.55 kg of raw materials are required.

1.3 Kiln Fuel Inputs

The fuel in use at Berrima during normal operating conditions i.e. excluding start-up conditions includes Coal and Solid Waste Derived fuels Wood Waste and Refuse Derived Fuel.

Table 3 – Kiln Fuel Input Quantities and Chemical Properties

		Kiln Fuel - Input				
Chemical Properties		Fuel Source Coal	Fuel Source 2 Wood Benedic	Fuel Source RDF Bingo	Fuel Source 4 Wood Brandown	Final Fuel – Kiln
	Set Point %	66.98%	12.97%	16.66%	3.39%	100.00%
Arsenic	As (mg/kg)	0.4	124	37	16	23.1
Beryllium	Be (mg/kg)	0.7	1	1	1	0.8
Cadmium	Cd (mg/kg)	0.1	1	1	1	0.4
Chromium	Cr (mg/kg)	1.1	166	61	37	33.7
Cobalt	Co (mg/kg)	0.6	1	2	1	0.9
Copper	Cu (mg/kg)	10.9	95	43	22	27.5
Mercury	Hg (mg/kg)	0.1	0.05	0.05	0.05	0.1
Manganese	Mn (mg/kg)	153	36	42	61	116.2
Nickel	Ni (mg/kg)	0.4	1	2	2	0.8
Lead	Pb (mg/kg)	13.1	25	45	6	19.7
Antimony	Sb (mg/kg)	0.2	3	44	2	7.9
Selenium	Se (mg/kg)	1	1	1	1	1.0
Tin	Sn (mg/kg)	0.4	1	1	2	0.6
Vanadium	V (mg/kg)	4	1	2	3	3.2
Thallium	Th (mg/kg)	0.1	1	1	1	0.4
Chlorine	Cl (mg/kg)	10	0.04	0.1	0.29	6.730
kg fuel/kg clinker		0.1126	0.0218	0.028	0.0057	0.168

Table 3 details the inventory of fuel input and the percentage of each fuel used. As can be seen 66.98% of the fuel in use was coal, with SWDF accounting for 33.02% total fuel, split between RDF and Wood.

Taking As as an example, coal contains 0.4 mg/kg and RDF 37 mg/kg. As makes up 23.1 mg/kg in the total fuel.

To produce 1kg of Clinker a total of 0.168 kg of fuel is consumed.

1.4 Total Fuel Inputs and Associated Emission Factors

Table 4 collates the raw material and fuel inputs comparing to stack emissions to calculate an emission factor per unit of chemical input.

Table 4 – Emissions Factors per unit of input for raw materials and fuel

	Raw material + Fuel			
	Total Input	**Stack Emissions**		**Emission factor**
	Raw material + Fuel			
	mg/kg clk	mg/Nm3	mg/kg clk	from input
Arsenic	13.32	0.002	0.00523	0.00039
Beryllium	0.95	0.0006	0.00157	0.00165
Cadmium	0.36	0.00074	0.00193	0.00535
Chromium	70.31	0.0018	0.00471	0.00007
Cobalt	5.17	0.0008	0.00209	0.00040
Copper	14.95	0.0015	0.00392	0.00026
Mercury	0.17	0.02	0.05229	0.30598
Manganese	1356.40	0.0078	0.02039	0.00002
Nickel	10.06	0.0019	0.00497	0.00049
Lead	11.01	0.0019	0.00497	0.00045
Antimony	1.92	0.005	0.01307	0.00681
Selenium	1.81	0.0076	0.01987	0.01095
Tin	0.43	0.002	0.00523	0.01219
Vanadium	149.49	0.001	0.00261	0.00002
Thallium	0.23	0.002	0.00523	0.02280
Chlorine	62.418	0.33	0.86279	0.01382

Taking As as an example, the total As concentration for inputs into the kiln per kg of clinker produced is calculated by (raw material chemical/kg X kg materials/kg clinker) + (Kiln fuel chemical/kg X kiln fuel kg/kg clinker).

(6.09*1.55) + (23.1*0.168) = 13.32 mg/kg clinker

The emission factor per unit of input for As is calculated by dividing the calculated emissions per kg of clinker by the total As input.

0.00523/13.32 = 0.00039

Table 5 is similar to Table 4 but calculates an emission factor based on the fuel only.

Table 5 – Emissions Factor fuel only

	Total Input	Stack Emissions		Emission factor
	Fuel only			
	mg/kg clk	mg/Nm3	mg/kg clk	from input
Arsenic	3.88	0.002	0.00523	0.00135
Beryllium	0.13	0.0006	0.00157	0.01168
Cadmium	0.07	0.00074	0.00193	0.02898
Chromium	5.66	0.0018	0.00471	0.00083
Cobalt	0.15	0.0008	0.00209	0.01385
Copper	4.63	0.0015	0.00392	0.00085
Mercury	0.01	0.02	0.05229	3.72572
Manganese	19.54	0.0078	0.02039	0.00104
Nickel	0.13	0.0019	0.00497	0.03701
Lead	3.31	0.0019	0.00497	0.00150
Antimony	1.33	0.005	0.01307	0.00982
Selenium	0.17	0.0076	0.01987	0.11821
Tin	0.11	0.002	0.00523	0.04922
Vanadium	0.55	0.001	0.00261	0.00479
Thallium	0.07	0.002	0.00523	0.07833
Chlorine	1.131	0.33	0.86279	0.76264

Any variance to the Emissions Factors in Table 4 & Table 5 can be used to determine the contribution from either raw materials, standard and non-standard fuels.

1.5 Alternate Fuel Inputs and Total Inputs Raw Material and Fuel

Table 6 show the Alternate Fuel inputs against the total raw material and fuel inputs per unit of clinker produced.

Table 6 – Alternate Fuels inputs compared to total inputs from Raw materials and Fuels

	Input		
	Total Input		
	Raw material + Fuel	Alternative Fuels	
	mg/kg clk	mg/kg clk	% input from AF
Arsenic	13.32	3.83	28.76%
Beryllium	0.95	0.06	5.85%
Cadmium	0.36	0.06	15.36%
Chromium	70.31	5.54	7.88%
Cobalt	5.17	0.08	1.61%
Copper	14.95	3.40	22.75%
Mercury	0.17	0.00	1.62%
Manganese	1356.40	2.31	0.17%
Nickel	10.06	0.09	0.89%
Lead	11.01	1.84	16.71%
Antimony	1.92	1.31	68.22%
Selenium	1.81	0.06	3.06%
Tin	0.43	0.06	14.26%
Vanadium	149.49	0.09	0.06%
Thallium	0.23	0.06	24.20%
Chlorine	62.42	0.01	0.01%

Taking As as an example, the total As concentration for inputs into the kiln per kg of clinker produced is 13.32 mg/kg clinker (see calculation for table 4)

The total As concentration for inputs from Alternate fuel is 3.83 mg/kg clinker. This represents 28.76% of the total As input in the process.

3.83/13.32 *100 = 28.76%

Ektimo

Boral Cement Ltd, Berrima

Half-Yearly Emission Testing Compliance Report

Report R016899-1[DRAFT]

Accredited for compliance with ISO/IEC 17025 - Testing. NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, calibration, and inspection reports.

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Document Information

Client Name:	Boral Cement Ltd (Berrima)
Report Number:	R016899-1[DRAFT]
Date of Issue:	17 June 2024
Attention:	Gabriel Paicu
Address:	Taylor Avenue New Berrima NSW 2577
Testing Laboratory:	Ektimo Pty Ltd, ABN 86 600 381 413

Report Authorisation

Adnan Latif
Air Monitoring Consultant

NATA Accredited Laboratory
No. 14601

Aaron Davis
Ektimo Signatory

Please note that only numerical results pertaining to measurements conducted directly by Ektimo are covered by Ektimo terms of NATA accreditation as described in the Test Methods table. This does not include calculations that use data supplied by third-parties, comments, conclusions, or recommendations based upon the results. Refer to Test Methods section for full details of testing covered by NATA accreditation.

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1 Executive Summary

1.1 Background

Ektimo was engaged by Boral Cement Ltd (Berrima) to perform emission testing as requested.

1.2 Project Objective & Overview

The objective of the project was to conduct a monitoring programme to quantify emissions from EPA ID 2 – No. 6 Kiln Stack to determine compliance with Boral Cement Ltd's Environmental Protection Licence, 1698.

Monitoring was performed as follows:

Location	Test Date	Test Parameters*
EPA ID 2 – No. 6 Kiln Stack	30 April 2024	Solid particles Sulfuric acid mist and sulfur trioxide (as SO_3), sulfur dioxide Speciated volatile organic compounds (VOCs) Type 1 & 2 substances in aggregate (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, Sn, V) plus thallium
	1 May 2024	Dioxins & furans (PCDD & PCDF) Hexavalent chromium Nitrogen oxides (NO_x), carbon monoxide (CO), carbon dioxide (CO_2), oxygen (O_2) Total fluoride Hydrogen chloride, chlorine

* Flow rate, velocity, temperature, and moisture were also determined.

All results are reported on a dry basis at STP.

Plant operating conditions have been noted in this report.

1.3 Licence Comparison

The following licence comparison table shows all analytes are within the licence limit set by the NSW EPA as per licence 1698 (last amended on 29 April 2024).

EPA	Parameter	Units	Licence limit	Detected values	Detected values (corrected to 10% O_2)
EPA 2 - Kiln Stack No. 6	Mercury	mg/m^3	0.05	<0.02	<0.02
	Type 1 and Type 2 substances in aggregate	mg/m^3	0.5	<0.08	<0.08
	Solid particles	mg/m^3	50	29	30
	Nitrogen oxides	mg/m^3	1250	810	750
	Cadmium + Thallium	mg/m^3	0.05	≤0.005	≤0.005
	Chlorine	mg/m^3	50	0.47	0.49
	Dioxins & furans (I-TEQ middle bound)	ng/m^3	0.1	0.0034	0.0033
	Hydrogen chloride	mg/m^3	10	0.93	0.96
	Hydrogen fluoride	mg/m^3	1	<0.04	<0.04
	Sulfur dioxide	mg/m^3	50	≤0.03	≤0.031
	Sulfuric acid mist and sulfur trioxide (as SO_3)	mg/m^3	50	0.062	0.064
	Volatile organic compounds	mg/m^3	40	1.9	1.9

Please note that the measurement uncertainty associated with the test results was not considered when determining whether the results were compliant or non-compliant.

2 Results

2.1 EPA ID 2 – No. 6 Kiln Stack

Date	1/05/2024	**Client**	Boral Cement Ltd
Report	R016899	**Stack ID**	EPA 2: No.6 Kiln Stack
Licence No.	1698	**Location**	New Berrima
Ektimo Staff	Adnan Latif / James Cullen	**State**	NSW
Process Conditions	Please refer to client records.		*240424*

Stack Parameters		
Moisture content, %v/v	14	
Gas molecular weight, g/g mole	29.6 (wet)	31.5 (dry)
Gas density at STP, kg/m³	1.32 (wet)	1.41 (dry)
Gas density at discharge conditions, kg/m³	0.84	
% Oxygen correction & Factor	10 %	0.99
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	1044 & 1334	
Temperature, °C	127	
Temperature, K	401	
Velocity at sampling plane, m/s	28	
Volumetric flow rate, actual, m³/s	200	
Volumetric flow rate (wet STP), m³/s	130	
Volumetric flow rate (dry STP), m³/s	110	
Mass flow rate (wet basis), kg/h	600000	

Gas Analyser Results	Average	Minimum	Maximum
Sampling time	1055 - 1257	1055 - 1257	1055 - 1257
	Concentration % v/v	Concentration % v/v	Concentration % v/v
Carbon dioxide	18.7	16.3	19.8
Oxygen	9.9	9.3	10.9

Dioxins & Furans (PCDDs & PCDFs)	Average			Test 1			Test 2		
Sampling time				1055 - 1258			1055 - 1257		
	Concentration ng/m³	Corrected to 10% O2 ng/m³	Mass Rate ng/min	Concentration ng/m³	Corrected to 10% O2 ng/m³	Mass Rate ng/min	Concentration ng/m³	Corrected to 10% O2 ng/m³	Mass Rate ng/min
2,3,7,8-TCDF	0.0014	0.0014	9.1	0.0013	0.0012	8.2	0.0016	0.0015	10
2,3,7,8-TCDD	<0.001	<0.001	<7	<0.001	<0.001	<7	<0.001	<0.001	<6
1,2,3,7,8-PeCDF	≤0.00016	≤0.00016	≤1	<0.0001	<0.0001	<0.9	0.00017	0.00017	1.1
2,3,4,7,8-PeCDF	<0.001	<0.001	<7	<0.0009	<0.0008	<6	<0.001	<0.001	<8
1,2,3,7,8-PeCDD	<0.0007	<0.0007	<4	<0.0009	<0.0008	<6	<0.0005	<0.0005	<3
1,2,3,4,7,8-HxCDF	<0.00008	<0.00008	<0.5	<0.0001	<0.0001	<0.7	<0.00005	<0.00005	<0.3
1,2,3,6,7,8-HxCDF	≤0.000097	≤0.000096	≤0.63	<0.0001	<0.0001	<0.7	0.000081	0.00008	0.52
2,3,4,6,7,8-HxCDF	<0.00005	<0.00005	<0.3	<0.00006	<0.00006	<0.4	<0.00005	<0.00005	<0.3
1,2,3,7,8,9-HxCDF	<0.0001	<0.0001	<0.7	<0.0001	<0.0001	<0.7	<0.0001	<0.0001	<0.6
1,2,3,4,7,8-HxCDD	<0.0001	<0.0001	<0.9	<0.0002	<0.0002	<1	<0.0001	<0.0001	<0.6
1,2,3,6,7,8-HxCDD	<0.0001	<0.0001	<0.7	<0.0001	<0.0001	<0.7	<0.0001	<0.0001	<0.6
1,2,3,7,8,9-HxCDD	<0.0001	<0.0001	<0.9	<0.0002	<0.0002	<1	<0.0001	<0.0001	<0.6
1,2,3,4,6,7,8-HpCDF	≤0.000016	≤0.000016	≤0.11	<0.00002	<0.00002	<0.1	0.000016	0.000015	0.1
1,2,3,4,7,8,9-HpCDF	<0.00001	<0.00001	<0.07	<0.00001	<0.00001	<0.07	<0.00001	<0.00001	<0.06
1,2,3,4,6,7,8-HpCDD	≤0.000026	≤0.000025	≤0.17	<0.00002	<0.00002	<0.1	0.000034	0.000034	0.22
OCDF	≤0.0000013	≤0.0000013	≤0.0084	<0.000001	<0.000001	<0.007	0.0000015	0.0000014	0.0094
OCDD	0.00001	0.00001	0.067	0.0000092	0.0000091	0.06	0.000012	0.000011	0.075
Total TCDF isomers	1.7	1.7	11000	1.6	1.6	11000	1.8	1.8	12000
Total TCDD isomers	0.0031	0.0031	20	0.0033	0.0032	21	0.003	0.0029	19
Total PeCDF isomers	0.059	0.059	380	0.053	0.053	350	0.065	0.065	420
Total PeCDD isomers	<0.008	<0.008	<50	<0.01	<0.01	<70	<0.005	<0.005	<30
Total HxCDF isomers	0.0043	0.0043	28	0.0021	0.002	13	0.0065	0.0065	42
Total HxCDD isomers	0.0082	0.0082	53	0.0074	0.0074	48	0.0091	0.009	58
Total HpCDF isomers	≤0.0023	≤0.0023	≤15	<0.003	<0.003	<20	0.0018	0.0018	12
Total HpCDD isomers	0.0048	0.0047	31	0.0025	0.0025	16	0.007	0.007	45
Total PCDDs + PCDFs	1.8	1.8	12000	1.7	1.7	11000	2	1.9	13000
I-TEQ									
Lower Bound	0.0016	0.0016	10	0.0013	0.0013	8.3	0.0019	0.0019	12
Middle Bound	0.0034	0.0033	22	0.0032	0.0032	21	0.0035	0.0035	23
Upper Bound	0.0052	0.0051	33	0.0052	0.0051	34	0.0052	0.0051	33

Abbreviations and definitions	
I-TEQ	International toxic equivalents for dioxins and furans
Lower Bound	Defines values reported below detection as equal to zero.
Middle Bound	Defines values reported below detection are equal to half the detection limit.
Upper Bound	Defines values reported below detection are equal to the detection limit.

TEQs are calculated by multiplying the quantified result for each toxic compound by its corresponding toxic equivalency factor.

Isokinetic Sampling Parameters		Test 1	Test 2
PAHs, Dioxins & Furans			
Sampling time, min		120	120
Isokinetic rate, %		98%	98%

Ektimo

Date	30/04/2024	**Client**	Boral Cement Ltd
Report	R016899	**Stack ID**	EPA 2: No.6 Kiln Stack
Licence No.	1698	**Location**	New Berrima
Ektimo Staff	Mohamed Trabelsi/ Scott Woods	**State**	NSW
Process Conditions	Please refer to client records.		*240424*

Stack Parameters		
Moisture content, %v/v	15	
Gas molecular weight, g/g mole	29.5 (wet)	31.4 (dry)
Gas density at STP, kg/m³	1.32 (wet)	1.40 (dry)
Gas density at discharge conditions, kg/m³	0.86	
% Oxygen correction & Factor	10 %	1.01
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	1215 & 1350	
Temperature, °C	112	
Temperature, K	385	
Velocity at sampling plane, m/s	28	
Volumetric flow rate, actual, m³/s	200	
Volumetric flow rate (wet STP), m³/s	130	
Volumetric flow rate (dry STP), m³/s	110	
Mass flow rate (wet basis), kg/h	620000	

Gas Analyser Results	Average	Minimum	Maximum
Sampling time	1245 - 1343	1245 - 1343	1245 - 1343
	Concentration % v/v	Concentration % v/v	Concentration % v/v
Carbon dioxide	18.2	15.1	18.9
Oxygen	10.1	9.4	12

Isokinetic Results	Average			Test 1			Test 2		
Sampling time				1242-1344			1242-1344		
	Concentration mg/m³	Corrected to 10% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 10% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 10% O2 mg/m³	Mass Rate g/min
Antimony	<0.007	<0.007	<0.05	<0.007	<0.007	<0.05	<0.007	<0.007	<0.04
Arsenic	<0.004	<0.004	<0.03	<0.004	<0.004	<0.03	<0.004	<0.004	<0.03
Barium	<0.003	<0.003	<0.02	<0.003	<0.003	<0.02	<0.003	<0.003	<0.02
Beryllium	<0.001	<0.001	<0.01	<0.002	<0.002	<0.01	<0.001	<0.001	<0.009
Cadmium	<0.0007	<0.0007	<0.005	<0.0008	<0.0008	<0.006	<0.0007	<0.0007	<0.004
Chromium	<0.003	<0.003	<0.02	<0.003	<0.003	<0.02	<0.003	<0.003	<0.02
Cobalt	<0.002	<0.002	<0.02	<0.003	<0.003	<0.02	<0.002	<0.002	<0.02
Lead	<0.003	<0.003	<0.02	<0.003	<0.003	<0.02	<0.003	<0.003	<0.02
Manganese	**≤0.014**	**≤0.014**	**≤0.092**	**<0.01**	**<0.01**	**<0.1**	**0.013**	**0.013**	**0.087**
Mercury	<0.02	<0.02	<0.2	<0.02	<0.02	<0.2	<0.02	<0.02	<0.2
Nickel	<0.003	<0.003	<0.02	<0.003	<0.003	<0.02	<0.003	<0.003	<0.02
Selenium	<0.007	<0.007	<0.05	<0.007	<0.007	<0.05	<0.007	<0.007	<0.04
Thallium	<0.004	<0.004	<0.03	<0.004	<0.004	<0.03	<0.004	<0.004	<0.03
Tin	<0.004	<0.004	<0.03	<0.004	<0.004	<0.03	<0.004	<0.004	<0.03
Vanadium	<0.003	<0.003	<0.02	<0.003	<0.003	<0.02	<0.003	<0.003	<0.02
Type 1 & 2 Substances									
Upper Bound									
Total Type 1 Substances	<0.04	<0.04	<0.3	<0.04	<0.04	<0.3	<0.04	<0.04	<0.2
Total Type 2 Substances	<0.04	<0.04	<0.2	<0.04	<0.04	<0.3	≤0.036	≤0.036	≤0.24
Total Type 1 & 2 Substances	<0.08	<0.08	<0.5	<0.08	<0.08	<0.5	≤0.072	≤0.073	≤0.48
Isokinetic Sampling Parameters									
Sampling time, min					60			60	
Isokinetic rate, %					100			100	
Gravimetric analysis date (total particulate)					05-06-2024			05-06-2024	

Ektimo

Date	1/05/2024	**Client**	Boral Cement Ltd
Report	R016899	**Stack ID**	EPA 2: No.6 Kiln Stack
Licence No.	1698	**Location**	New Berrima
Ektimo Staff	Adnan Latif / James Cullen	**State**	NSW
Process Conditions	Please refer to client records.		*240424*

Stack Parameters		
Moisture content, %v/v	15	
Gas molecular weight, g/g mole	29.4 (wet)	31.4 (dry)
Gas density at STP, kg/m³	1.31 (wet)	1.40 (dry)
Gas density at discharge conditions, kg/m³	0.83	
% Oxygen correction & Factor	10 %	1.03
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	1334 & 1458	
Temperature, °C	125	
Temperature, K	398	
Velocity at sampling plane, m/s	29	
Volumetric flow rate, actual, m³/s	200	
Volumetric flow rate (wet STP), m³/s	130	
Volumetric flow rate (dry STP), m³/s	110	
Mass flow rate (wet basis), kg/h	610000	

Gas Analyser Results	Average	Minimum	Maximum
Sampling time	1345 - 1447	1345 - 1447	1345 - 1447
	Concentration % v/v	Concentration % v/v	Concentration % v/v
Carbon dioxide	17.8	17.4	18.3
Oxygen	10.3	9.8	10.7

Halides & Halogens e.g HCl, Cl2, HF	Average			Test 1			Test 2		
Sampling time				1345-1445			1345-1445		
	Concentration mg/m³	Corrected to 10% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 10% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 10% O2 mg/m³	Mass Rate g/min
Chloride (as HCl)	0.93	0.96	6.2	1.5	1.5	9.8	0.38	0.39	2.5
Chlorine	0.47	0.49	3.1	0.57	0.59	3.8	0.38	0.39	2.5

Isokinetic Results	Average			Test 1			Test 2		
Sampling time				1345-1447			1345-1447		
	Concentration mg/m³	Corrected to 10% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 10% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 10% O2 mg/m³	Mass Rate g/min
Total fluoride (as HF)	<0.04	<0.04	<0.3	<0.04	<0.04	<0.3	<0.04	<0.04	<0.2
Isokinetic Sampling Parameters									
Sampling time, min					60			60	
Isokinetic rate, %					101			100	

Ektimo

Date	1/05/2024	**Client**	Boral Cement Ltd
Report	R016899	**Stack ID**	EPA 2: No.6 Kiln Stack
Licence No.	1698	**Location**	New Berrima
Ektimo Staff	Adnan Latif / James Cullen	**State**	NSW
Process Conditions	Please refer to client records.		240424

Stack Parameters		
Moisture content, %v/v	16	
Gas molecular weight, g/g mole	29.5 (wet)	31.6 (dry)
Gas density at STP, kg/m³	1.32 (wet)	1.41 (dry)
Gas density at discharge conditions, kg/m³	0.83	
% Oxygen correction & Factor	10 %	0.92
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	0915 & 1044	
Temperature, °C	128	
Temperature, K	401	
Velocity at sampling plane, m/s	28	
Volumetric flow rate, actual, m³/s	200	
Volumetric flow rate (wet STP), m³/s	120	
Volumetric flow rate (dry STP), m³/s	100	
Mass flow rate (wet basis), kg/h	590000	

Gas Analyser Results	Average			Minimum			Maximum		
Sampling time	0926 - 1026			0926 - 1026			0926 - 1026		
	Concentration mg/m³	Corrected to 10% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 10% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 10% O2 mg/m³	Mass Rate g/min
Combustion Gases									
Nitrogen oxides (as NO_2)	810	750	5100	740	680	4600	910	840	5700
Carbon monoxide	380	350	2400	340	320	2200	450	420	2800
	Concentration % v/v			Concentration % v/v			Concentration % v/v		
Carbon dioxide	19.7			18.9			20.5		
Oxygen	9.1			8.6			9.9		

Isokinetic Results	Average			Test 1			Test 2		
Sampling time				0926-1028			0926-1028		
	Concentration mg/m³	Corrected to 10% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 10% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 10% O2 mg/m³	Mass Rate g/min
Hexavalent chromium	≤0.024	≤0.022	≤0.15	0.044	0.041	0.28	<0.003	<0.003	<0.02
Isokinetic Sampling Parameters									
Sampling time, min					60			60	
Isokinetic rate, %					102			101	

Ektimo

Date	30/04/2024	**Client**	Boral Cement Ltd
Report	R016899	**Stack ID**	EPA 2: No.6 Kiln Stack
Licence No.	1698	**Location**	New Berrima
Ektimo Staff	Mohamed Trabelsi/ Scott Woods/ James Cullen	**State**	NSW
Process Conditions	Please refer to client records.		*240424*

Stack Parameters		
Moisture content, %v/v	14	
Gas molecular weight, g/g mole	29.5 (wet)	31.4 (dry)
Gas density at STP, kg/m³	1.32 (wet)	1.40 (dry)
Gas density at discharge conditions, kg/m³	0.87	
% Oxygen correction & Factor	10 %	1.03
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	0915, 1035 & 1215	
Temperature, °C	111	
Temperature, K	384	
Velocity at sampling plane, m/s	28	
Volumetric flow rate, actual, m³/s	200	
Volumetric flow rate (wet STP), m³/s	130	
Volumetric flow rate (dry STP), m³/s	110	
Mass flow rate (wet basis), kg/h	620000	

Gas Analyser Results	Average	Minimum	Maximum
Sampling time	0926 - 1202	0926 - 1202	0926 - 1202
	Concentration % v/v	Concentration % v/v	Concentration % v/v
Carbon dioxide	18	17.3	18.5
Oxygen	10.3	9.9	10.8

Isokinetic Results	Average			Test 1			Test 2		
Sampling time				0922-1024			1101-1203		
	Concentration mg/m³	Corrected to 10% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 10% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 10% O2 mg/m³	Mass Rate g/min
Solid Particles	29	30	200	25	26	170	33	34	230
Sulfur dioxide	≤0.03	≤0.031	≤0.2	<0.02	<0.03	<0.2	0.035	0.036	0.24
Sulfur trioxide and/or Sulfuric acid (as SO3)	0.062	0.064	0.42	0.081	0.083	0.53	0.044	0.045	0.3
Isokinetic Sampling Parameters				Isokinetic			Isokinetic		
Sampling time, min				60			60		
Isokinetic rate, %				100			104		
Gravimetric analysis date (total particulate)					05-06-2024			05-06-2024	

Total VOCs (as n-Propane)	Average			Test 1			Test 2		
	Concentration mg/m³	Corrected to 10% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 10% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 10% O2 mg/m³	Mass Rate g/min
Total	1.9	1.9	13	1.9	1.9	13	1.9	1.9	13

VOC (speciated)	Average			Test 1			Test 2		
Sampling time				0944-1044			0944-1044		
	Concentration mg/m³	Corrected to 10% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 10% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 10% O2 mg/m³	Mass Rate g/min
Detection limit[1]	<0.08	<0.08	<0.5	<0.07	<0.07	<0.5	<0.09	<0.09	<0.6
Acrylonitrile	0.16	0.16	1.1	0.15	0.16	1	0.16	0.17	1.1
Benzene	1.7	1.7	11	1.6	1.7	11	1.7	1.8	12
Methylcyclohexane	0.12	0.12	0.77	0.11	0.11	0.74	0.12	0.12	0.81
Toluene	0.25	0.26	1.7	0.24	0.25	1.6	0.26	0.27	1.7
Octane	0.12	0.13	0.84	0.14	0.14	0.92	0.11	0.12	0.75
m + p-Xylene	0.084	0.087	0.57	0.082	0.085	0.55	0.086	0.089	0.58
Residuals as Toluene	1.1	1.1	7.4	1.2	1.2	7.8	1	1.1	

(1) Unless otherwise reported, the following target compounds were found to be below detection:
Ethanol, Acetone, Isopropanol, Pentane, 1,1-Dichloroethene, Dichloromethane, trans-1,2-Dichloroethene, Methyl ethyl ketone, n-Hexane, cis-1,2-Dichloroethene, Ethyl acetate, Chloroform, 1,1,1 Trichloroethane, 1,2-Dichloroethane, Cyclohexane, Carbon tetrachloride, Butanol, Isopropyl acetate, 2-Methylhexane, 2,3-Dimethylpentane, 1-Methoxy-2-propanol, 3-Methylhexane, Heptane, Trichloroethylene, Ethyl acrylate, Methyl methacrylate, Propyl acetate, Methyl Isobutyl Ketone, 1,1,2-Trichloroethane,2-Hexanone, Tetrachloroethene, Butyl acetate, Chlorobenzene, Ethylbenzene, 1-Methoxy-2-propyl acetate, Styrene, o-Xylene, Butyl acrylate, Nonane, 2-Butoxyethanol, Cellosolve acetate, 1,1,2,2-Tetrachloroethane,Isopropylbenzene, alpha-Pinene, Propylbenzene, 1,3,5-Trimethylbenzene,beta-Pinene, tert-Butylbenzene, 1,2,4-Trimethylbenzene, Decane, 3-Carene, 1,2,3-Trimethylbenzene, D-Limonene, Undecane, Dodecane, Tridecane, Tetradecane

3 Sample Plane Compliance

3.1 EPA ID 2 – No. 6 Kiln Stack

Sampling Plane Details	
Source tested	Kiln
Pollution control equipment	Electrostatic precipitator - dry
Sampling plane dimensions	3000 mm
Sampling plane area	7.07 m²
Sampling port size, number	6" Flange (x2)
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit 8 D
Upstream disturbance	Junction 8 D
No. traverses & points sampled	2 12
Sample plane conformance to USEPA Method	Conforming

The sampling plane is deemed to be non-ideal due to the following reasons:
The sampling plane is too near to the upstream disturbance but is greater than or equal to 2D

4 Plant Operating Conditions

See Boral Cement Ltd (Berrima) records for complete process conditions.

Based on information received from Boral Cement Ltd personnel, it is our understanding that samples were collected during typical plant operations.

5 Test Methods

All sampling and analysis was performed by Ektimo unless otherwise specified. Specific details of the methods are available upon request.

Parameter	Sampling method	Analysis method	Uncertainty*	NATA accredited Sampling	NATA accredited Analysis
Sampling points - Selection	NSW EPA TM-1 (USEPA Method 1)	NA	NA	✓	NA
Flow rate, temperature & velocity	NSW EPA TM-2 (USEPA Method 2)	NSW EPA TM-2 (USEPA Method 2)	8%, 2%, 7%	NA	✓
Moisture content	NSW EPA TM-22 (USEPA Method 4)	NSW EPA TM-22 (USEPA Method 4)	8%	✓	✓
Molecular weight	NA	NSW EPA TM-23 (USEPA Method 3)	not specified	NA	✓
Dry gas density	NA	NSW EPA TM-23 (USEPA Method 3)	not specified	NA	✓
Carbon dioxide	NSW EPA TM-24 (USEPA Method 3A)	NSW EPA TM-24 (USEPA Method 3A)	13%	✓	✓
Carbon monoxide	NSW EPA TM-32 (USEPA Method 10)	NSW EPA TM-32 (USEPA Method 10)	12%	✓	✓
Nitrogen oxides	NSW EPA TM-11 (USEPA Method 7E)	NSW EPA TM-11 (USEPA Method 7E)	12%	✓	✓
Oxygen	NSW EPA TM-25 (USEPA Method 3A)	NSW EPA TM-25 (USEPA Method 3A)	13%	✓	✓
Sulfur dioxide	NSW EPA TM-4 (USEPA Method 8)	Ektimo 235	16%	✓	✓[†k]
Speciated volatile organic compounds (VOCs)	NSW EPA TM-34[d] (USEPA Method 18)	Ektimo 344	19%	✓	✓[†]
Solid particles (total)	NSW EPA TM-15 (AS 4323.2)	NSW EPA TM-15 (AS 4323.2)	3%	✓	✓[††]
Total (gaseous & particulate) metals & metallic compounds	NSW EPA TM-12, NSW EPA TM-13, NSW EPA TM-14 (USEPA Method 29)	Envirolab in-house methods Metals-020/021/022	15%	✓	✓[‡]
Type 1 substances (As, Cd, Hg, Pb, Sb)	NSW EPA TM-12 (USEPA Method 29)	Envirolab in-house methods Metals-020/021/022	15%	✓	✓[‡]
Type 2 substances (Be, Cr, Co, Mn, Ni, Se, Sn, V)	NSW EPA TM-13 (USEPA Method 29)	Envirolab in-house methods Metals-020/021/022	15%	✓	✓[‡]
Total & hexavalent chromium	NSW EPA OM-4 (CARB 425)	Envirolab in-house method Metals-022 & Inorg-024	16%	✓	✓[‡]
Dioxins & furans (PCDDs & PCDFs)	NSW EPA TM-18 (USEPA Method 23)	NMI in-house method AUTL_MET_02	16%	✓	✓[¶]
Fluorine & fluorine compounds[1]	NSW EPA TM-9 (USEPA Method 13B)	Ektimo 235	25%	✓	✓[†]
Hydrogen chloride	NSW EPA TM-8 (USEPA Method 26)	Ektimo 235	14%	✓	✓[†i]
Chlorine	NSW EPA TM-7 (USEPA Method 26)	Ektimo 235	14%	✓	✓[†i]
Sulfuric acid mist and/or sulfur trioxide	NSW EPA TM-3 (USEPA Method 8)	Ektimo 235	16%	✓	✓[†m]

270324

Please refer to the next page for Laboratory Analysis Footnotes.

* Uncertainties cited in this table are estimated using typical values and are calculated at the 95% confidence level (coverage factor = 2).

¶ Analysis performed by Australian Government National Measurement Institute, NATA accreditation number 198. Results were reported to Ektimo on 7 June 2024 in report RN1430789.

† Analysis performed by Ektimo. Results were reported to Ektimo on:

- 10 May 2024 in report LV-005740.
- 14 May 2024 in report LV-005755.
- 23 May 2024 in report LV-005786.
- 3 June 2024 in report LV-005863.
- 3 June 2024 in report LV-005865.

†† Gravimetric analysis conducted at the Ektimo NSW laboratory.

‡ Analysis performed by Envirolab, NATA accreditation number 2901. Results were reported to Ektimo on 17 May 2024 in report 350913.

d Excludes recovery study as specified in section 8.4.3 of USEPA Test Method 18.

i Includes analysis of chlorine/chloride by Ektimo 235 which uses the same principle as USEPA Method 26/26A.

[1] Sampling follows USEPA Method 13B and analysis follows Ektimo 235 (ion chromatography which uses the same principle as the NSW EPA approved alternative analysis method USEPA SW-846 Method 9056A).

[k] Includes analysis of SO2 by Ektimo 235 which uses the same principle as USEPA SW-846 Method 9056A which is an approved alternative to the analytical procedure of USEPA Method 6/8.

[m] Includes analysis of SO_3/H_2SO_4 by Ektimo 235 which uses the same principle as USEPA SW-846 Method 9056A which is an approved alternative to the analytical procedure of USEPA Method 8.

6 Deviations to Test Methods

TM-34 VOLATILE ORGANIC COMPOUNDS

Ektimo notes that the sampling and analysis of Volatile Organic Compounds (VOCs), per USEPA Method 18 has excluded the recovery study as specified in Section 8.4.3. Performing the recovery study described in Section 8.4.3 of USEPA Method 18 for analytes present at low levels is problematic. Given this, Ektimo applies a threshold of 50µg as a lower-bound mass, below which the 'spiking' of specific volatile organic compounds is not performed. For the purposes of this round of monitoring, the following compounds were present above the detection limit (0.1 µg) but were below 50µg. Therefore, recovery studies for the following analytes were not performed:

Test 1

- Acrylonitrile (2.2 µg)
- Benzene (24 µg)
- Methylcyclohexane (1.6 µg)
- Toluene (3.5 µg)
- Octane (2 µg)
- m + p-Xylene (1.2 µg)

Test 2

- Acrylonitrile (1.9 µg)
- Benzene (20 µg)
- Methylcyclohexane (1.4 µg)
- Toluene (3 µg)
- Octane (1.3 µg)
- m + p-Xylene (1 µg)

NSW TM-12, 13 TYPE 1 & 2 SUBSTANCES

Thallium has been sampled and analysed according to USEPA Method 29. Although not listed analyte under the Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (NSW EPA) (2022) TM-12 (Type 1 Substances) or TM-13 (Type 2 Substances) it is approved analyte listed within USEPA Method 29.

TM-9 FLUORINE

Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (NSW EPA) (2022) specifies TM-9 (USEPA 13B) for measurement of total fluoride emissions.

Ektimo conducts sampling according to USEPA Method 13B and analysis follows Ektimo 235 (ion chromatography which uses the same principle as the NSW EPA approved alternative analysis method USEPA SW-846 Method 9056A).

7 Quality Assurance/Quality Control Information

Ektimo is accredited by the National Association of Testing Authorities (NATA) for the sampling and analysis of air pollutants from industrial sources. Unless otherwise stated test methods used are accredited with the National Association of Testing Authorities. For full details, search for Ektimo at NATA's website www.nata.com.au.

Ektimo is accredited by NATA to ISO/IEC 17025 - Testing. ISO/IEC 17025 - Testing requires that a laboratory have adequate equipment to perform the testing, as well as laboratory personnel with the competence to perform the testing. This quality assurance system is administered and maintained by the Quality Director.

NATA is a member of APAC (Asia Pacific Accreditation Co-operation) and of ILAC (International Laboratory Accreditation Co-operation). Through mutual recognition arrangements with these organisations, NATA accreditation is recognised worldwide.

Unless specifically noted, all samples were collected and handled in accordance with Ektimo's QA/QC standards.

8 Definitions

The following symbols and abbreviations may be used in this test report:

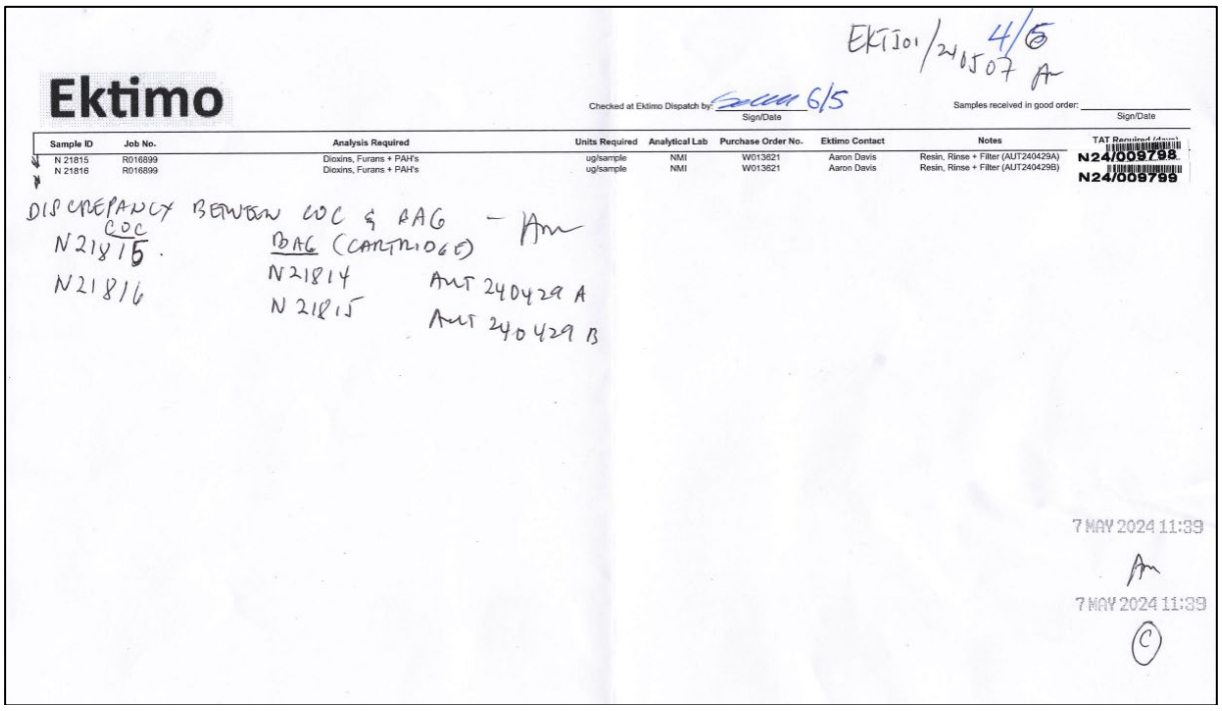
% v/v	Volume to volume ratio
~	Approximately
<	Less than
>	Greater than
≥	Greater than or equal to
APHA	American Public Health Association, Standard Methods for the Examination of Water and Waste Water
AS	Australian Standard
BaP-TEQ	Benzo(a)pyrene toxic equivalents
BSP	British standard pipe
CEM/CEMS	Continuous emission monitoring/Continuous emission monitoring system
CTM	Conditional test method
D	Duct diameter or equivalent duct diameter for rectangular ducts
D_{50}	'Cut size' of a cyclone is defined as the particle diameter at which the cyclone achieves a 50% collection efficiency i.e. half of the particles are retained by the cyclone and half pass through it. The D_{50} method simplifies the capture efficiency distribution by assuming that a given cyclone stage captures all of the particles with a diameter equal to or greater than the D_{50} of that cyclone and less than the D_{50} of the preceding cyclone.
DECC	Department of Environment & Climate Change (NSW)
Disturbance	A flow obstruction or instability in the direction of the flow which may impede accurate flow determination. This includes centrifugal fans, axial fans, partially closed or closed dampers, louvres, bends, connections, junctions, direction changes or changes in pipe diameter.
EPA	Environment Protection Authority
FTIR	Fourier transform infra-red
ISC	Intersociety Committee, Methods of Air Sampling and Analysis
ISO	International Organisation for Standardisation
ITE	Individual threshold estimate
I-TEQ	International toxic equivalents
Lower bound	When an analyte is not present above the detection limit, the result is assumed to be equal to zero.
Medium bound	When an analyte is not present above the detection limit, the result is assumed to be equal to half of the detection limit.
NA	Not applicable
NATA	National Association of Testing Authorities
NIOSH	National Institute of Occupational Safety and Health
NT	Not tested or results not required
OM	Other approved method
OU	Odour unit. One OU is that concentration of odorant(s) at standard conditions that elicits a physiological response from a panel equivalent to that elicited by one Reference Odour Mass (ROM), evaporated in one cubic metre of neutral gas at standard conditions.
PM_{10}	Particulate matter having an equivalent aerodynamic diameter less than or equal to 10 microns (µm).
$PM_{2.5}$	Particulate matter having an equivalent aerodynamic diameter less than or equal to 2.5 microns (µm).
PSA	Particle size analysis. PSA provides a distribution of geometric diameters, for a given sample, determined using laser diffraction.
RATA	Relative accuracy test audit
Semi-quantified VOCs	Unknown VOCs (those for which an analytical standard is not available), are identified by matching the mass spectrum of the chromatographic peak to the NIST Standard Reference Database (version 14.0), with a match quality exceeding 70%. An estimated concentration is determined by matching the area of the peak with the nearest suitable compound in the analytical calibration standard mixture.
STP	Standard temperature and pressure. Gas volumes and concentrations are expressed on a dry basis at 0 °C, at discharge oxygen concentration and an absolute pressure of 101.325 kPa.
TM	Test method
TOC	Total organic carbon. This is the sum of all compounds of carbon which contain at least one carbon-to-carbon bond, plus methane and its derivatives.
USEPA	United States Environmental Protection Agency
Velocity difference	The percentage difference between the average of initial flows and after flows.
VOC	Volatile organic compound. A carbon-based chemical compound with a vapour pressure of at least 0.010 kPa at 25°C or having a corresponding volatility under the given conditions of use. VOCs may contain oxygen, nitrogen and other elements. VOCs do not include carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonate salts.
WHO05-TEQ	World Health Organisation toxic equivalents
XRD	X-ray diffractometry
Upper bound	When an analyte is not present above the detection limit, the result is assumed to be equal to the detection limit.
95% confidence interval	Range of values that contains the true result with 95% certainty. This means there is a 5% risk that the true result is outside this range.

9 Appendices

Appendix A: Site Images

Image 1. EPA 2 – No.6 Kiln Stack

Appendix B: Chains of Custody



Ektimo

EKTI01/240507 4/5 A

Checked at Ektimo Dispatch by: 6/5 Sign/Date

Samples received in good order: Sign/Date

Sample ID	Job No.	Analysis Required	Units Required	Analytical Lab	Purchase Order No.	Ektimo Contact	Notes	TAT Required (days)
N 21815	R016899	Dioxins, Furans + PAH's	ug/sample	NMI	W013621	Aaron Davis	Resin, Rinse + Filter (AUT240429A)	N24/009798
N 21816	R016899	Dioxins, Furans + PAH's	ug/sample	NMI	W013621	Aaron Davis	Resin, Rinse + Filter (AUT240429B)	N24/009799

DISCREPANCY BETWEEN COC & BAG – Am

COC
N21815.
N21816

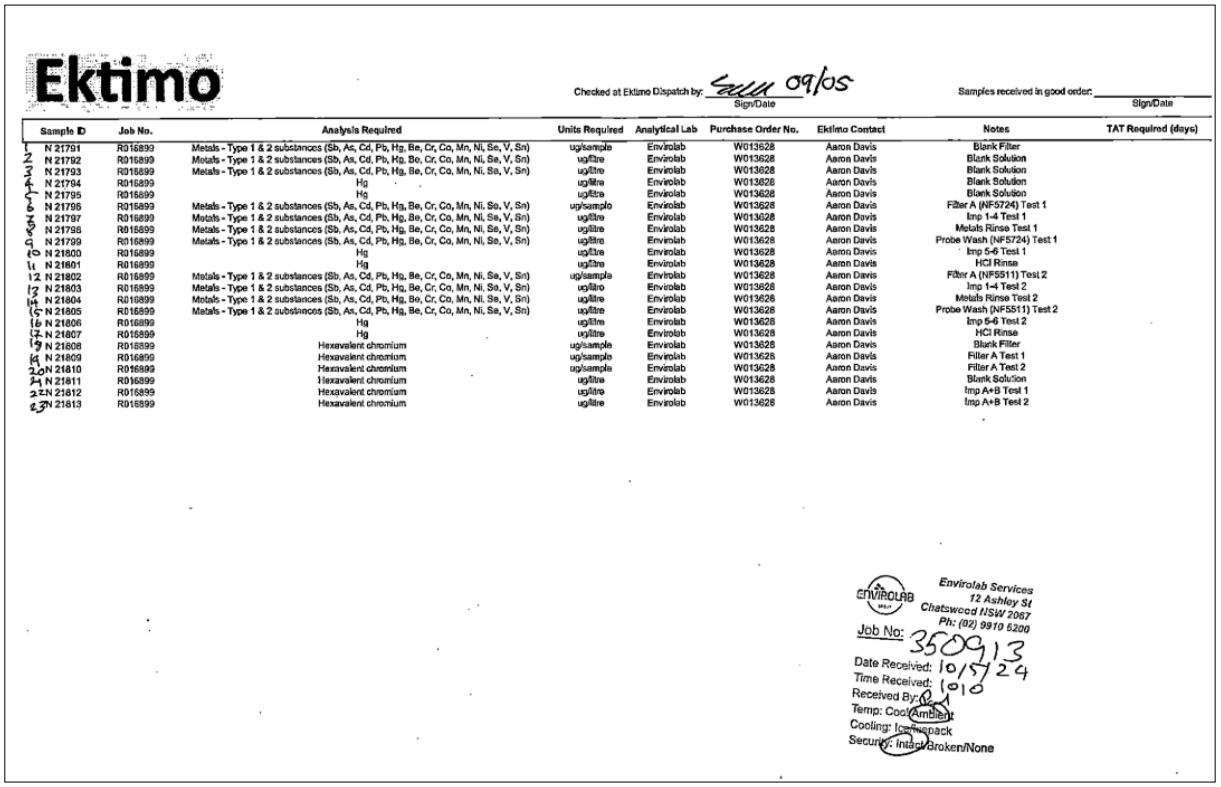
BAG (CARTRIDGE)
N21814 AUT 240429 A
N21815 AUT 240429 B

7 MAY 2024 11:39

Am

7 MAY 2024 11:39

(C)



Ektimo

Checked at Ektimo Dispatch by: 09/05 Sign/Date

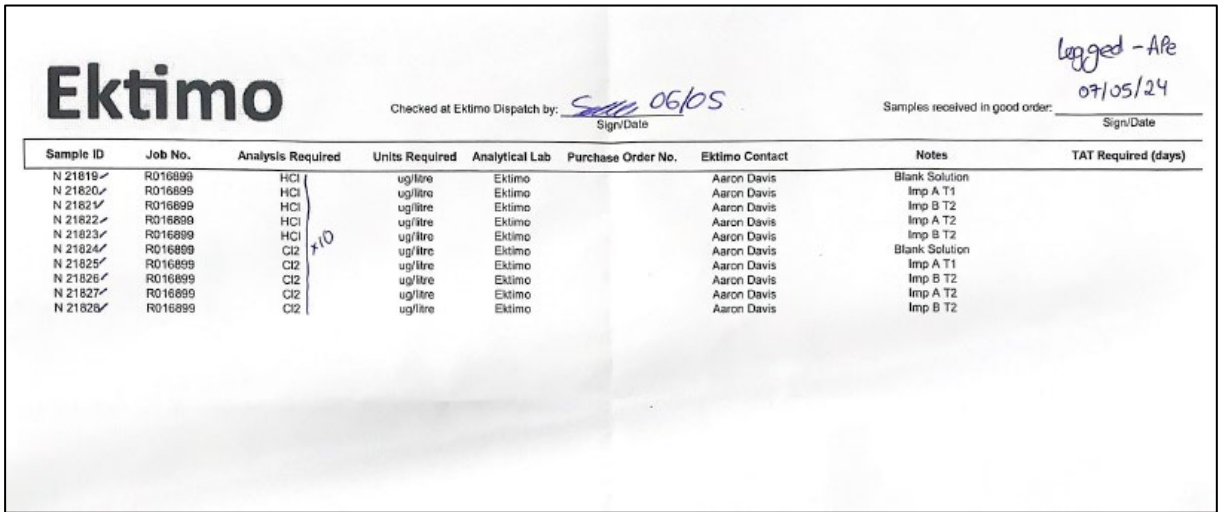
Samples received in good order: Sign/Date

	Sample ID	Job No.	Analysis Required	Units Required	Analytical Lab	Purchase Order No.	Ektimo Contact	Notes	TAT Required (days)
1	N 21791	R016899	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn)	ug/sample	Envirolab	W013628	Aaron Davis	Blank Filter	
2	N 21792	R016899	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn)	ug/litre	Envirolab	W013628	Aaron Davis	Blank Solution	
3	N 21793	R016899	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn)	ug/litre	Envirolab	W013628	Aaron Davis	Blank Solution	
4	N 21794	R016899	Hg	ug/litre	Envirolab	W013628	Aaron Davis	Blank Solution	
5	N 21795	R016899	Hg	ug/litre	Envirolab	W013628	Aaron Davis	Blank Solution	
6	N 21796	R016899	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn)	ug/sample	Envirolab	W013628	Aaron Davis	Filter A (NF5724) Test 1	
7	N 21797	R016899	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn)	ug/litre	Envirolab	W013628	Aaron Davis	Imp 1-4 Test 1	
8	N 21798	R016899	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn)	ug/litre	Envirolab	W013628	Aaron Davis	Metals Rinse Test 1	
9	N 21799	R016899	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn)	ug/litre	Envirolab	W013628	Aaron Davis	Probe Wash (NF5724) Test 1	
10	N 21800	R016899	Hg	ug/litre	Envirolab	W013628	Aaron Davis	Imp 5-6 Test 1	
11	N 21801	R016899	Hg	ug/litre	Envirolab	W013628	Aaron Davis	HCl Rinse	
12	N 21802	R016899	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn)	ug/sample	Envirolab	W013628	Aaron Davis	Filter A (NF5511) Test 2	
13	N 21803	R016899	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn)	ug/litre	Envirolab	W013628	Aaron Davis	Imp 1-4 Test 2	
14	N 21804	R016899	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn)	ug/litre	Envirolab	W013628	Aaron Davis	Metals Rinse Test 2	
15	N 21805	R016899	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn)	ug/litre	Envirolab	W013628	Aaron Davis	Probe Wash (NF5511) Test 2	
16	N 21806	R016899	Hg	ug/litre	Envirolab	W013628	Aaron Davis	Imp 5-6 Test 2	
17	N 21807	R016899	Hg	ug/litre	Envirolab	W013628	Aaron Davis	HCl Rinse	
18	N 21808	R016899	Hexavalent chromium	ug/sample	Envirolab	W013628	Aaron Davis	Blank Filter	
19	N 21809	R016899	Hexavalent chromium	ug/sample	Envirolab	W013628	Aaron Davis	Filter A Test 1	
20	N 21810	R016899	Hexavalent chromium	ug/sample	Envirolab	W013628	Aaron Davis	Filter A Test 2	
21	N 21811	R016899	Hexavalent chromium	ug/litre	Envirolab	W013628	Aaron Davis	Blank Solution	
22	N 21812	R016899	Hexavalent chromium	ug/litre	Envirolab	W013628	Aaron Davis	Imp A+B Test 1	
23	N 21813	R016899	Hexavalent chromium	ug/litre	Envirolab	W013628	Aaron Davis	Imp A+B Test 2	

ENVIROLAB

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 350913
Date Received: 10/5/24
Time Received: 1010
Received By:
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

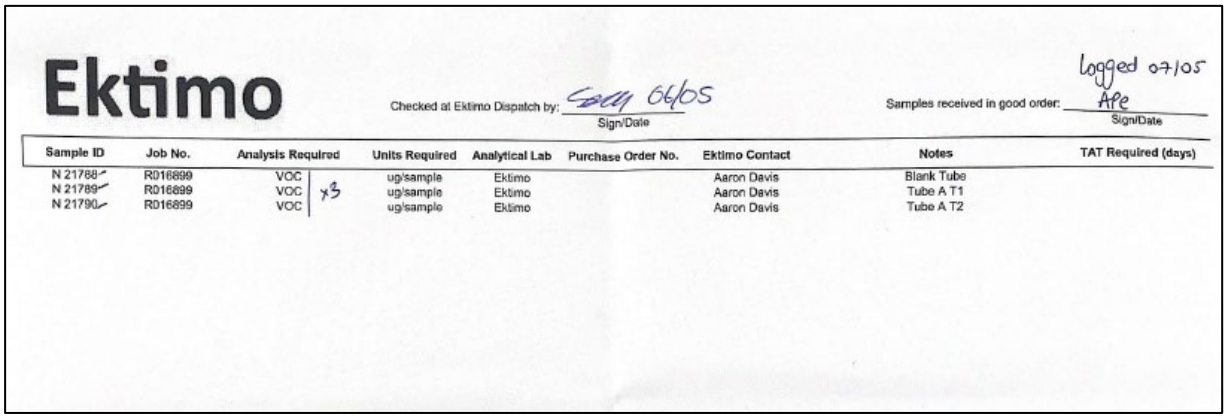


Ektimo

Checked at Ektimo Dispatch by: Sally 06/05 (Sign/Date)

Samples received in good order: Logged - Ape 07/05/24 (Sign/Date)

Sample ID	Job No.	Analysis Required		Units Required	Analytical Lab	Purchase Order No.	Ektimo Contact	Notes	TAT Required (days)
N 21819	R016899	HCl		ug/litre	Ektimo		Aaron Davis	Blank Solution	
N 21820	R016899	HCl		ug/litre	Ektimo		Aaron Davis	Imp A T1	
N 21821	R016899	HCl		ug/litre	Ektimo		Aaron Davis	Imp B T2	
N 21822	R016899	HCl		ug/litre	Ektimo		Aaron Davis	Imp A T2	
N 21823	R016899	HCl	x10	ug/litre	Ektimo		Aaron Davis	Imp B T2	
N 21824	R016899	Cl2		ug/litre	Ektimo		Aaron Davis	Blank Solution	
N 21825	R016899	Cl2		ug/litre	Ektimo		Aaron Davis	Imp A T1	
N 21826	R016899	Cl2		ug/litre	Ektimo		Aaron Davis	Imp B T2	
N 21827	R016899	Cl2		ug/litre	Ektimo		Aaron Davis	Imp A T2	
N 21828	R016899	Cl2		ug/litre	Ektimo		Aaron Davis	Imp B T2	



Ektimo

Checked at Ektimo Dispatch by: Sally 06/05 (Sign/Date)

Samples received in good order: Logged 07/05 Ape (Sign/Date)

Sample ID	Job No.	Analysis Required		Units Required	Analytical Lab	Purchase Order No.	Ektimo Contact	Notes	TAT Required (days)
N 21788	R016899	VOC		ug/sample	Ektimo		Aaron Davis	Blank Tube	
N 21789	R016899	VOC	x3	ug/sample	Ektimo		Aaron Davis	Tube A T1	
N 21790	R016899	VOC		ug/sample	Ektimo		Aaron Davis	Tube A T2	

Appendix C: Laboratory Results

Ektimo

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CERTIFICATE OF ANALYSIS

Testing Laboratory:	Ektimo 26 Redland Drive Mitcham, VIC 3132
Report Number:	LV-005740
Job Number:	R016899
Date of Issue:	10/05/2024
Attention:	Boral Berima
Address:	Taylor Avenue, New Berrima NSW 2577
Date samples received:	7/05/2024
Number of samples received:	3
Date samples analysed:	10/05/2024
No of samples analysed:	3
Test method(s) used:	Ektimo 344

Comments

QC Acceptance Criteria:

Parameter	Criteria	Pass/Fail
Standard Curve	$R^2 > 0.99$	Pass
Range	All samples <110% of highest standard	Pass
Repeat samples	Between 80% - 120%	Pass
Method Blanks	All method blanks < PQL	Pass
QC sample	2 standard deviations of theoretical	Pass
Chemical Expiry	All chemicals within expiry date	Pass

This report supersedes any previous report(s) with this reference. Sample(s) have been analysed as received.

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REPORT AUTHORISATION

Version 231130

Matthew Cook
Laboratory Manager

Cappi Tuffery
Laboratory Chemist

NATA Accredited Laboratory 14601

Accredited for compliance with ISO/IEC 17025. NATA is a signatory to the ILAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports

Ektimo

Analytical Results

Report No. LV-005740

Job No. R016899

Client Name: Boral Berima

Parameter	Units	N21788 R016899	N21789 R016899	N21790 R016899
	PQL	1.0	1.0	1.0
Ethanol	µg	<1	<1	<1
Acetone	µg	<1	<1	<1
Isopropanol	µg	<1	<1	<1
Pentane	µg	<1	<1	<1
1,1-Dichloroethene	µg	<1	<1	<1
Acrylonitrile	µg	<1	2.2	1.9
Dichloromethane	µg	<1	<1	<1
trans-1,2-Dichloroethene	µg	<1	<1	<1
Methyl ethyl ketone	µg	<1	<1	<1
n-Hexane	µg	<1	<1	<1
cis-1,2-Dichloroethene	µg	<1	<1	<1
Ethyl acetate	µg	<1	<1	<1
Chloroform	µg	<1	<1	<1
1,1,1-Trichloroethane	µg	<1	<1	<1
1,2-Dichloroethane	µg	<1	<1	<1
Cyclohexane	µg	<1	<1	<1
Benzene	µg	<1	24	20
Carbon tetrachloride	µg	<1	<1	<1
Butanol	µg	<1	<1	<1
Isopropyl acetate	µg	<1	<1	<1
2-Methylhexane	µg	<1	<1	<1
2,3-Dimethylpentane	µg	<1	<1	<1
1-Methoxy-2-propanol	µg	<1	<1	<1
3-Methylhexane	µg	<1	<1	<1
Heptane	µg	<1	<1	<1
Trichloroethylene	µg	<1	<1	<1
Ethyl acrylate	µg	<1	<1	<1
Methyl methacrylate	µg	<1	<1	<1
Propyl acetate	µg	<1	<1	<1
Methylcyclohexane	µg	<1	1.6	1.4
Methyl Isobutyl Ketone	µg	<1	<1	<1
Toluene	µg	<1	3.5	3
1,1,2-Trichloroethane	µg	<1	<1	<1
2-Hexanone	µg	<1	<1	<1
Octane	µg	<1	2	1.3
Tetrachloroethene	µg	<1	<1	<1
Butyl acetate	µg	<1	<1	<1
Chlorobenzene	µg	<1	<1	<1
Ethylbenzene	µg	<1	<1	<1
m + p-Xylene	µg	<1	1.2	1
1-Methoxy-2-propyl acetate	µg	<1	<1	<1
Styrene	µg	<1	<1	<1
o-Xylene	µg	<1	<1	<1
Butyl acrylate	µg	<1	<1	<1
Nonane	µg	<1	<1	<1

* Results marked with an asterisk are outside the acceptable calibration range of the instrument.

ilac-MRA NATA

NATA Accredited Laboratory 14601

Ektimo

Analytical Results

Report No. LV-005740

Job No. R016899

Client Name: Boral Berima

Parameter	Units	N21788 R016899	N21789 R016899	N21790 R016899
	PQL	1.0	1.0	1.0
2-Butoxyethanol	µg	<1	<1	<1
Cellosolve acetate	µg	<1	<1	<1
1,1,2,2-Tetrachloroethane	µg	<1	<1	<1
Isopropylbenzene	µg	<1	<1	<1
alpha-Pinene	µg	<1	<1	<1
Propylbenzene	µg	<1	<1	<1
1,3,5-Trimethylbenzene	µg	<1	<1	<1
beta-Pinene	µg	<1	<1	<1
tert-Butylbenzene	µg	<1	<1	<1
1,2,4-Trimethylbenzene	µg	<1	<1	<1
Decane	µg	<1	<1	<1
3-Carene	µg	<1	<1	<1
1,2,3-Trimethylbenzene	µg	<1	<1	<1
D-Limonene	µg	<1	<1	<1
Undecane	µg	<1	<1	<1
Dodecane	µg	<1	<1	<1
Tridecane	µg	<1	<1	<1
Tetradecane	µg	<1	<1	<1
Residuals as Toluene	µg	<1	17	12

* Results marked with an asterisk are outside the acceptable calibration range of the instrument.

NATA Accredited Laboratory 14601

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CERTIFICATE OF ANALYSIS

Testing Laboratory:	Ektimo 26 Redland Drive Mitcham, VIC 3132
Report Number:	LV-005786
Job Number:	R016899
Date of Issue:	23/05/2024
Attention:	Boral Berrima
Address:	Taylor Avenue, New Berrima NSW 2577
Date samples received:	7/05/2024
Number of samples received:	10
Date samples analysed:	17/05/2024
No of samples analysed:	10
Test method(s) used:	Ektimo 235

Comments

QC Acceptance Criteria:

Parameter	Criteria	Pass/Fail
Standard Curve	$R^2 > 0.99$	Pass
Range	All samples <110% of highest standard	Pass
Repeat samples	Between 80% - 120%	Pass
Method Blanks	All method blanks < PQL	Pass
QC sample	2 standard deviations of theoretical	Pass
Chemical Expiry	All chemicals within expiry date	Pass

This report supersedes any previous report(s) with this reference. Sample(s) have been analysed as received.

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REPORT AUTHORISATION

Version 231130

Cappi Tuffery
Laboratory Chemist

Matthew Cook
Laboratory Manager

NATA Accredited Laboratory 14601

Accredited for compliance with ISO/IEC 17025. NATA is a signatory to the ILAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports

Ektimo

Analytical Results

Report No. LV-005786
Job No. R016899
Client Name: Boral Berrima

Parameter	Analyte	Units	N 21819 Boral Berrima EPA 2 Kiln Blank Solution (HCl)	N 21820 Boral Berrima EPA 2 Kiln Imp A T1	N 21821 Boral Berrima EPA 2 Kiln Imp B T2	N 21822 Boral Berrima EPA 2 Kiln Imp A T2	N 21823 Boral Berrima EPA 2 Kiln Imp B T2	N 21824 Boral Berrima EPA 2 Kiln Blank Solution (Cl2)	N 21825 Boral Berrima EPA 2 Kiln Imp A T1	N 21826 Boral Berrima EPA 2 Kiln Imp B T2
Sample Volume		mL	25	20	11.5	12.5	14.5	25	10.5	14
Hydrogen chloride (HCl)	Cl^-	mg/L	<0.1	3.77	2.00	0.93	1.15			
Chlorine (Cl_2)	Cl^-	mg/L						<0.1	0.65	0.90
PQL	<	mg/L	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

Parameter	Analyte	Units	N 21827 Boral Berrima EPA 2 Kiln Imp A T2	N 21828 Boral Berrima EPA 2 Kiln Imp B T2
Sample Volume		mL	13	11.5
Chlorine (Cl_2)	Cl^-	mg/L	0.78	0.38
PQL	<	mg/L	0.1	0.1

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CERTIFICATE OF ANALYSIS

Testing Laboratory:	Ektimo 26 Redland Drive Mitcham, VIC 3132
Report Number:	LV-005755
Job Number:	R016899
Date of Issue:	14/05/2024
Attention:	Boral Berrima
Address:	Taylor Avenue, New Berrima NSW 2577
Date samples received:	7/05/2024
Number of samples received:	6
Date samples analysed:	10/05/2024
No of samples analysed:	6
Test method(s) used:	Ektimo 235

Comments

QC Acceptance Criteria:

Parameter	Criteria	Pass/Fail
Standard Curve	$R^2 > 0.99$	Pass
Range	All samples <110% of highest standard	Pass
Repeat samples	Between 80% - 120%	Pass
Method Blanks	All method blanks < PQL	Pass
QC sample	2 standard deviations of theoretical	Pass
Chemical Expiry	All chemicals within expiry date	Pass

This report supersedes any previous report(s) with this reference. Sample(s) have been analysed as received.

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REPORT AUTHORISATION

Version 231130

Cappi Tuffery
Laboratory Chemist

Matthew Cook
Laboratory Manager

NATA Accredited Laboratory 14601

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Ektimo

Analytical Results

Report No. LV-005755
Job No. R016899
Client Name: Boral Berrima

Parameter	Analyte	Units	N 21783 Boral Berrima All Locations Blank Solution (SO2)	N 21785 Boral Berrima EPA 2 Kiln Imp B Test 1	N 21787 Boral Berrima EPA 2 Kiln Imp B Test 2	N 21782 Boral Berrima All Locations Blank Solution (SO3)	N 21784 Boral Berrima EPA 2 Kiln Imp A Test 1	N 21786 Boral Berrima EPA 2 Kiln Imp A Test 2
Sample Volume		mL	174	232	210	186	162	175
Sulfur dioxide (SO_2)	SO_4^{2-}	mg/L	0.28	0.36	0.49			
Sulfur trioxide (SO_3)	SO_4^{2-}	mg/L				0.24	0.83	0.56
PQL	<	mg/L	0.2	0.2	0.2	0.2	0.2	0.2

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CERTIFICATE OF ANALYSIS

Testing Laboratory:	Ektimo 26 Redland Drive Mitcham, VIC 3132
Report Number:	LV-005865
Job Number:	R016899
Date of Issue:	3/06/2024
Attention:	Boral Berrima
Address:	Taylor Avenue, New Berrima NSW 2577
Date samples received:	17/05/2024
Number of samples received:	3
Date samples analysed:	31/05/2024
No of samples analysed:	3
Test method(s) used:	Ektimo 235

Comments

QC Acceptance Criteria:

Parameter	Criteria	Pass/Fail
Standard Curve	$R^2 > 0.99$	Pass
Range	All samples <110% of highest standard	Pass
Repeat samples	Between 80% - 120%	Pass
Method Blanks	All method blanks < PQL	Pass
QC sample	2 standard deviations of theoretical	Pass
Chemical Expiry	All chemicals within expiry date	Pass

This report supersedes any previous report(s) with this reference. Sample(s) have been analysed as received.

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REPORT AUTHORISATION

Version 231130

Cappi Tuffery
Laboratory Chemist

Daniel Balaam
Senior Laboratory Chemist

NATA Accredited Laboratory 14601

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Ektimo

Analytical Results

Report No. LV-005865
Job No. R016899
Client Name: Boral Berrima

Parameter	Analyte	Units	N 21816 Boral Berrima All Locations Blank Filter	N 21817 Boral Berrima EPA 2 Kiln Filter A Test 1	N 21818 Boral Berrima EPA 2 Kiln Filter A Test 2
Sample Volume		mL	40	40	40
Hydrogen fluoride (HF)	F^-	µg/sample	<4	<4	<4
PQL	<	µg/sample	4	4	4

Ektimo

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CERTIFICATE OF ANALYSIS

Testing Laboratory:	Ektimo 26 Redland Drive Mitcham, VIC 3132
Report Number:	LV-005863
Job Number:	R016899
Date of Issue:	3/06/2024
Attention:	Boral Berrima
Address:	Taylor Avenue, New Berrima NSW 2577
Date samples received:	17/05/2024
Number of samples received:	3
Date samples analysed:	31/05/2024
No of samples analysed:	3
Test method(s) used:	Ektimo 235

Comments

QC Acceptance Criteria:

Parameter	Criteria	Pass/Fail
Standard Curve	$R^2 > 0.99$	Pass
Range	All samples <110% of highest standard	Pass
Repeat samples	Between 80% - 120%	Pass
Method Blanks	All method blanks < PQL	Pass
QC sample	2 standard deviations of theoretical	Pass
Chemical Expiry	All chemicals within expiry date	Pass

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Ektimo is accredited by the National Association of Testing Authorities (NATA) for the sampling and analysis of air pollutants from industrial sources. Unless otherwise stated test methods used are accredited with the National Association of Testing Authorities. For full details, search for Ektimo at NATA's website www.nata.com.au.
Ektimo is accredited by NATA (National Association of Testing Authorities) to ISO/IEC 17025 - Testing. ISO/IEC 17025 - Testing requires that a laboratory have adequate equipment to perform the testing, as well as laboratory personnel with the competence to perform the testing. This quality assurance system is administered and maintained by the Quality Director.

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A formal Quality Control program is in place at Ektimo to monitor analyses performed in the laboratory and sampling conducted in the field. The program is designed to check where appropriate; the sampling reproducibility, analytical method, accuracy, precision and the performance of the analyst. The Laboratory Manager is responsible for the administration and maintenance of this program.

REPORT AUTHORISATION

Version 231130

Cappi Tuffery
Laboratory Chemist

Daniel Balaam
Senior Laboratory Chemist

NATA Accredited Laboratory 14601

Accredited for compliance with ISO/IEC 17025. NATA is a signatory to the ILAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports

Ektimo

Analytical Results

Report No. LV-005863
Job No. R016899
Client Name: Boral Berrima

Parameter	Analyte	Units	N 21829 Boral Berrima All Locations Blank Solution (HF)	N 21830 Boral Berrima EPA 2 Kiln Imp A+B Test 1	N 21831 Boral Berrima EPA 2 Kiln Imp A+B Test 2
Sample Volume		mL	200	345	325
Hydrogen fluoride (HF)	F^-	mg/L	<0.1	<0.1	<0.1
PQL	<	mg/L	0.1	0.1	0.1

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CERTIFICATE OF ANALYSIS 350913

Client Details

Client	Ektimo (Unanderra)
Attention	Administration Email
Address	1/251 Princes Hwy, Unanderra, NSW, 2526

Sample Details

Your Reference	**R016899**
Number of Samples	6 Filter, 17 Water
Date samples received	10/05/2024
Date completed instructions received	10/05/2024

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	17/05/2024
Date of Issue	17/05/2024

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Results Approved By
Loren Bardwell, Development Chemist
Priya Samarawickrama, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

Metals on filters				
Our Reference		350913-1	350913-6	350913-12
Your Reference	UNITS	N21791	N21796	N21802
Type of sample		Filter	Filter	Filter
Date prepared	-	17/05/2024	17/05/2024	17/05/2024
Date analysed	-	17/05/2024	17/05/2024	17/05/2024
Antimony	µg/filter	<5	<5	<5
Arsenic	µg/filter	<2	<2	<2
Cadmium	µg/filter	<0.5	<0.5	<0.5
Lead	µg/filter	<1	<1	<1
Mercury	µg/filter	<0.2	<0.2	<0.2
Beryllium	µg/filter	<0.5	<0.5	<0.5
Chromium	µg/filter	1	0.8	2
Cobalt	µg/filter	<0.5	<0.5	<0.5
Manganese	µg/filter	<0.5	4	5.9
Nickel	µg/filter	<1	<1	<1
Selenium	µg/filter	<5	<5	<5
Vanadium	µg/filter	<1	<1	<1
Tin	µg/filter	<2	<2	<2
Barium	µg/filter	<1	<1	1
Copper	µg/filter	<0.5	<0.5	<0.5
Phosphorus	µg/filter	<2	3	3
Silver	µg/filter	<0.5	<0.5	<0.5
Thallium	µg/filter	<2	<2	<2
Zinc	µg/filter	2	3	1

Metals in water - mass units						
Our Reference		350913-2	350913-3	350913-4	350913-5	350913-7
Your Reference	UNITS	N21792	N21793	N21794	N21795	N21797
Type of sample		Water	Water	Water	Water	Water
Volume	mL	228	197	424	221	308
Antimony	µg	<0.5	<0.5	[NA]	[NA]	<0.5
Arsenic	µg	<0.5	<0.5	[NA]	[NA]	<0.5
Cadmium	µg	<0.05	<0.05	[NA]	[NA]	<0.05
Lead	µg	<0.5	<0.5	[NA]	[NA]	0.5
Mercury	µg	<10	<10	<1	<0.5	<10
Beryllium	µg	<0.5	<0.5	[NA]	[NA]	<0.5
Chromium	µg	0.6	<0.5	[NA]	[NA]	0.6
Cobalt	µg	<0.5	<0.5	[NA]	[NA]	<0.5
Manganese	µg	<3	<3	[NA]	[NA]	<3
Nickel	µg	<0.5	<0.5	[NA]	[NA]	0.6
Selenium	µg	<0.5	<0.5	[NA]	[NA]	<0.5
Vanadium	µg	<0.5	<0.5	[NA]	[NA]	<0.5
Tin	µg	<0.5	<0.5	[NA]	[NA]	<0.5
Barium	µg	<0.5	<0.5	[NA]	[NA]	<0.5
Copper	µg	<0.5	<0.5	[NA]	[NA]	0.8
Silver	µg	<0.5	<0.5	[NA]	[NA]	<0.5
Thallium	µg	<0.5	<0.5	[NA]	[NA]	<0.5
Zinc	µg	0.8	<0.5	[NA]	[NA]	3
Date prepared	-	15/05/2024	15/05/2024	15/05/2024	15/05/2024	15/05/2024
Date analysed	-	15/05/2024	15/05/2024	15/05/2024	15/05/2024	15/05/2024
Antimony-Dissolved	µg/L	<1	<1	[NA]	[NA]	<1
Arsenic-Dissolved	µg/L	<1	<1	[NA]	[NA]	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	[NA]	[NA]	0.1
Lead-Dissolved	µg/L	<1	<1	[NA]	[NA]	2
Mercury-Dissolved	µg/L	<1	<1	<0.1	<0.05	<1
Beryllium-Dissolved	µg/L	<0.5	<0.5	[NA]	[NA]	<0.5
Chromium-Dissolved	µg/L	3	<1	[NA]	[NA]	2
Cobalt-Dissolved	µg/L	<1	<1	[NA]	[NA]	<1
Manganese-Dissolved	µg/L	<5	<5	[NA]	[NA]	<5
Nickel-Dissolved	µg/L	1	<1	[NA]	[NA]	2
Selenium-Dissolved	µg/L	<1	<1	[NA]	[NA]	<1
Vanadium-Dissolved	µg/L	<1	<1	[NA]	[NA]	<1
Tin-Dissolved	µg/L	<1	<1	[NA]	[NA]	<1
Barium-Dissolved	µg/L	<1	<1	[NA]	[NA]	<1
Copper-Dissolved	µg/L	<1	<1	[NA]	[NA]	3
Silver-Dissolved	µg/L	<1	<1	[NA]	[NA]	<1

Metals in water - mass units						
Our Reference		350913-2	350913-3	350913-4	350913-5	350913-7
Your Reference	UNITS	N21792	N21793	N21794	N21795	N21797
Type of sample		Water	Water	Water	Water	Water
Thallium-Dissolved	µg/L	<1	<1	[NA]	[NA]	<1
Zinc-Dissolved	µg/L	4	<1	[NA]	[NA]	10

Metals in water - mass units						
Our Reference		350913-8	350913-9	350913-10	350913-11	350913-13
Your Reference	UNITS	N21798	N21799	N21800	N21801	N21803
Type of sample		Water	Water	Water	Water	Water
Volume	mL	112	36	406	220	329
Antimony	µg	<0.5	<0.5	[NA]	[NA]	<0.5
Arsenic	µg	<0.5	<0.5	[NA]	[NA]	<0.5
Cadmium	µg	<0.05	0.2	[NA]	[NA]	<0.05
Lead	µg	<0.5	<0.5	[NA]	[NA]	<0.5
Mercury	µg	<10	<10	3	<0.5	<10
Beryllium	µg	<0.5	<0.5	[NA]	[NA]	<0.5
Chromium	µg	<0.5	<0.5	[NA]	[NA]	0.8
Cobalt	µg	<0.5	<0.5	[NA]	[NA]	<0.5
Manganese	µg	<3	<3	[NA]	[NA]	<3
Nickel	µg	<0.5	<0.5	[NA]	[NA]	0.9
Selenium	µg	<0.5	<0.5	[NA]	[NA]	<0.5
Vanadium	µg	<0.5	<0.5	[NA]	[NA]	<0.5
Tin	µg	<0.5	<0.5	[NA]	[NA]	<0.5
Barium	µg	<0.5	<0.5	[NA]	[NA]	0.6
Copper	µg	<0.5	<0.5	[NA]	[NA]	3
Silver	µg	<0.5	<0.5	[NA]	[NA]	<0.5
Thallium	µg	<0.5	<0.5	[NA]	[NA]	<0.5
Zinc	µg	3	1	[NA]	[NA]	5
Date prepared	-	15/05/2024	15/05/2024	15/05/2024	15/05/2024	15/05/2024
Date analysed	-	15/05/2024	15/05/2024	15/05/2024	15/05/2024	15/05/2024
Antimony-Dissolved	µg/L	<1	<1	[NA]	[NA]	<1
Arsenic-Dissolved	µg/L	<1	<1	[NA]	[NA]	<1
Cadmium-Dissolved	µg/L	<0.1	6.1	[NA]	[NA]	0.1
Lead-Dissolved	µg/L	<1	5	[NA]	[NA]	1
Mercury-Dissolved	µg/L	<1	<1	7.1	0.3	<1
Beryllium-Dissolved	µg/L	<0.5	<0.5	[NA]	[NA]	<0.5
Chromium-Dissolved	µg/L	<1	12	[NA]	[NA]	2
Cobalt-Dissolved	µg/L	<1	<1	[NA]	[NA]	<1
Manganese-Dissolved	µg/L	<5	82	[NA]	[NA]	6
Nickel-Dissolved	µg/L	1	11	[NA]	[NA]	3
Selenium-Dissolved	µg/L	<1	<1	[NA]	[NA]	<1
Vanadium-Dissolved	µg/L	<1	9	[NA]	[NA]	<1
Tin-Dissolved	µg/L	<1	<1	[NA]	[NA]	<1
Barium-Dissolved	µg/L	<1	10	[NA]	[NA]	2
Copper-Dissolved	µg/L	1	8	[NA]	[NA]	9
Silver-Dissolved	µg/L	<1	<1	[NA]	[NA]	<1

Metals in water - mass units						
Our Reference		350913-8	350913-9	350913-10	350913-11	350913-13
Your Reference	UNITS	N21798	N21799	N21800	N21801	N21803
Type of sample		Water	Water	Water	Water	Water
Thallium-Dissolved	µg/L	<1	5	[NA]	[NA]	<1
Zinc-Dissolved	µg/L	22	36	[NA]	[NA]	14

Metals in water - mass units					
Our Reference		350913-14	350913-15	350913-16	350913-17
Your Reference	UNITS	N21804	N21805	N21806	N21807
Type of sample		Water	Water	Water	Water
Volume	mL	93	38	440	218
Antimony	µg	<0.5	<0.5	[NA]	[NA]
Arsenic	µg	<0.5	<0.5	[NA]	[NA]
Cadmium	µg	<0.05	<0.05	[NA]	[NA]
Lead	µg	<0.5	<0.5	[NA]	[NA]
Mercury	µg	<10	<10	4	<0.5
Beryllium	µg	<0.5	<0.5	[NA]	[NA]
Chromium	µg	<0.5	<0.5	[NA]	[NA]
Cobalt	µg	<0.5	<0.5	[NA]	[NA]
Manganese	µg	8	<3	[NA]	[NA]
Nickel	µg	<0.5	<0.5	[NA]	[NA]
Selenium	µg	<0.5	<0.5	[NA]	[NA]
Vanadium	µg	<0.5	<0.5	[NA]	[NA]
Tin	µg	<0.5	<0.5	[NA]	[NA]
Barium	µg	<0.5	<0.5	[NA]	[NA]
Copper	µg	<0.5	<0.5	[NA]	[NA]
Silver	µg	<0.5	<0.5	[NA]	[NA]
Thallium	µg	<0.5	<0.5	[NA]	[NA]
Zinc	µg	2	0.7	[NA]	[NA]
Date prepared	-	15/05/2024	15/05/2024	15/05/2024	15/05/2024
Date analysed	-	15/05/2024	15/05/2024	15/05/2024	15/05/2024
Antimony-Dissolved	µg/L	<1	<1	[NA]	[NA]
Arsenic-Dissolved	µg/L	<1	<1	[NA]	[NA]
Cadmium-Dissolved	µg/L	0.2	1.1	[NA]	[NA]
Lead-Dissolved	µg/L	2	7	[NA]	[NA]
Mercury-Dissolved	µg/L	<1	<1	9.2	<0.05
Beryllium-Dissolved	µg/L	<0.5	<0.5	[NA]	[NA]
Chromium-Dissolved	µg/L	<1	4	[NA]	[NA]
Cobalt-Dissolved	µg/L	<1	<1	[NA]	[NA]
Manganese-Dissolved	µg/L	81	73	[NA]	[NA]
Nickel-Dissolved	µg/L	2	3	[NA]	[NA]
Selenium-Dissolved	µg/L	<1	<1	[NA]	[NA]
Vanadium-Dissolved	µg/L	<1	9	[NA]	[NA]
Tin-Dissolved	µg/L	<1	<1	[NA]	[NA]
Barium-Dissolved	µg/L	<1	12	[NA]	[NA]
Copper-Dissolved	µg/L	2	11	[NA]	[NA]
Silver-Dissolved	µg/L	<1	1	[NA]	[NA]

Metals in water - mass units					
Our Reference		350913-14	350913-15	350913-16	350913-17
Your Reference	UNITS	N21804	N21805	N21806	N21807
Type of sample		Water	Water	Water	Water
Thallium-Dissolved	µg/L	<1	6	[NA]	[NA]
Zinc-Dissolved	µg/L	25	19	[NA]	[NA]

Metals in Waters - mass units						
Our Reference		350913-2	350913-3	350913-7	350913-8	350913-9
Your Reference	UNITS	N21792	N21793	N21797	N21798	N21799
Type of sample		Water	Water	Water	Water	Water
Date digested	-	17/05/2024	17/05/2024	17/05/2024	17/05/2024	17/05/2024
Date analysed	-	17/05/2024	17/05/2024	17/05/2024	17/05/2024	17/05/2024
Phosphorus	mg	0.08	<0.05	0.07	<0.05	<0.05
Phosphorus - Dissolved	mg/L	0.4	<0.05	0.2	<0.05	<0.05

Metals in Waters - mass units				
Our Reference		350913-13	350913-14	350913-15
Your Reference	UNITS	N21803	N21804	N21805
Type of sample		Water	Water	Water
Date digested	-	17/05/2024	17/05/2024	17/05/2024
Date analysed	-	17/05/2024	17/05/2024	17/05/2024
Phosphorus	mg	0.07	<0.05	<0.05
Phosphorus - Dissolved	mg/L	0.2	<0.05	<0.05

Inorganics in Wipes				
Our Reference		350913-18	350913-19	350913-20
Your Reference	UNITS	N21808	N21809	N21810
Type of sample		Filter	Filter	Filter
Date prepared	-	15/05/2024	15/05/2024	15/05/2024
Date analysed	-	15/05/2024	15/05/2024	15/05/2024
Hexavalent Cr in filter	µg/filter	1.2	1.2	2.2

Miscellaneous Inorganics				
Our Reference	UNITS	350913-21	350913-22	350913-23
Your Reference		N21811	N21812	N21813
Type of sample		Water	Water	Water
Date prepared	-	15/05/2024	15/05/2024	15/05/2024
Date analysed	-	15/05/2024	15/05/2024	15/05/2024
Volume	mL	200	340	350
Hexavalent Chromium, Cr^{6+} (dissolved)	mg/L	<0.005	0.12	<0.005
Hexavalent Chromium, Cr^{6+}	µg/sample	<5	40	<5

Method ID	Methodology Summary
Inorg-118	Hexavalent Chromium (Cr6+) - determined firstly by separation using ion chromatography followed by the colourimetric analytical finish. Water samples are ideally field filtered into alkali preserved containers prior to receipt for dissolved Cr6+ analysis. Unfiltered water samples into alkali preserved containers (or pH adjusted to pH 8-9 on receipt) can be classified as Total (unfiltered) Cr6+. Please note, for 'Total/Unfiltered' Trivalent Chromium in waters [calculated], these results may be exaggerated due to the digestive limitation of 'Total/Unfiltered' Hexavalent Chromium in NaOH at pH 8-9 compared to more comprehensive digestion for Total Chromium using the mineral acids HNO3 and HCl. Solid (includes soils, filters, paints, swabs for example) samples are extracted in a buffered catalysed solution prior to the analytical finish above. Water extractable options are available (e.g. as an option for filters) on request. Impingers may need pH adjusting to pH 8-9 prior to IC-colourimetric analytical finish.
Metals-020	Determination of various metals by ICP-AES.
Metals-020/021/022	Determination of various metals on filters by ICP-AES/MS and or CV/AAS. Note - air volume measurements are not covered by Envirolab's NATA accreditation.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS. Please note for Bromine and Iodine, any forms of these elements that are present are included together in the one result reported for each of these two elements. Salt forms (e.g. FeO, PbO, ZnO) are determined stoichiometrically from the base metal concentration.

QUALITY CONTROL: Metals on filters						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			17/05/2024	[NT]	[NT]	[NT]	[NT]	17/05/2024	[NT]
Date analysed	-			17/05/2024	[NT]	[NT]	[NT]	[NT]	17/05/2024	[NT]
Antimony	µg/filter	5	Metals-020/021/022	<5	[NT]	[NT]	[NT]	[NT]	109	[NT]
Arsenic	µg/filter	2	Metals-020/021/022	<2	[NT]	[NT]	[NT]	[NT]	117	[NT]
Cadmium	µg/filter	0.5	Metals-020/021/022	<0.5	[NT]	[NT]	[NT]	[NT]	112	[NT]
Lead	µg/filter	1	Metals-020/021/022	<1	[NT]	[NT]	[NT]	[NT]	109	[NT]
Mercury	µg/filter	0.2	Metals-020/021/022	<0.2	[NT]	[NT]	[NT]	[NT]	88	[NT]
Beryllium	µg/filter	0.5	Metals-020/021/022	<0.5	[NT]	[NT]	[NT]	[NT]	118	[NT]
Chromium	µg/filter	0.5	Metals-020/021/022	<0.5	[NT]	[NT]	[NT]	[NT]	114	[NT]
Cobalt	µg/filter	0.5	Metals-020/021/022	<0.5	[NT]	[NT]	[NT]	[NT]	115	[NT]
Manganese	µg/filter	0.5	Metals-020/021/022	<0.5	[NT]	[NT]	[NT]	[NT]	116	[NT]
Nickel	µg/filter	1	Metals-020/021/022	<1	[NT]	[NT]	[NT]	[NT]	113	[NT]
Selenium	µg/filter	5	Metals-020/021/022	<5	[NT]	[NT]	[NT]	[NT]	111	[NT]
Vanadium	µg/filter	1	Metals-020/021/022	<1	[NT]	[NT]	[NT]	[NT]	117	[NT]
Tin	µg/filter	2	Metals-020/021/022	<2	[NT]	[NT]	[NT]	[NT]	113	[NT]
Barium	µg/filter	1	Metals-020/021/022	<1	[NT]	[NT]	[NT]	[NT]	114	[NT]
Copper	µg/filter	0.5	Metals-020/021/022	<0.5	[NT]	[NT]	[NT]	[NT]	113	[NT]
Phosphorus	µg/filter	2	Metals-020/021/022	<2	[NT]	[NT]	[NT]	[NT]	112	[NT]
Silver	µg/filter	0.5	Metals-020/021/022	<0.5	[NT]	[NT]	[NT]	[NT]	120	[NT]
Thallium	µg/filter	2	Metals-020/021/022	<2	[NT]	[NT]	[NT]	[NT]	113	[NT]
Zinc	µg/filter	1	Metals-020/021/022	<1	[NT]	[NT]	[NT]	[NT]	115	[NT]

QUALITY CONTROL: Metals in water - mass units						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W6	350913-3
Antimony	µg	0.5	Metals-022	<0.5	2	<0.5	[NT]		[NT]	[NT]
Arsenic	µg	0.5	Metals-022	<0.5	2	<0.5	[NT]		[NT]	[NT]
Cadmium	µg	0.05	Metals-022	<0.05	2	<0.05	[NT]		[NT]	[NT]
Lead	µg	0.5	Metals-022	<0.5	2	<0.5	[NT]		[NT]	[NT]
Mercury	µg	0.5	Metals-021	<0.5	2	<10	<10	0	[NT]	[NT]
Beryllium	µg	0.5	Metals-022	<0.5	2	<0.5	[NT]		[NT]	[NT]
Chromium	µg	0.5	Metals-022	<0.5	2	0.6	[NT]		[NT]	[NT]
Cobalt	µg	0.5	Metals-022	<0.5	2	<0.5	[NT]		[NT]	[NT]
Manganese	µg	3	Metals-022	<3	2	<3	[NT]		[NT]	[NT]
Nickel	µg	0.5	Metals-022	<0.5	2	<0.5	[NT]		[NT]	[NT]
Selenium	µg	0.5	Metals-022	<0.5	2	<0.5	[NT]		[NT]	[NT]
Vanadium	µg	0.5	Metals-022	<0.5	2	<0.5	[NT]		[NT]	[NT]
Tin	µg	0.5	Metals-022	<0.5	2	<0.5	[NT]		[NT]	[NT]
Barium	µg	0.5	Metals-022	<0.5	2	<0.5	[NT]		[NT]	[NT]
Copper	µg	0.5	Metals-022	<0.5	2	<0.5	[NT]		[NT]	[NT]
Silver	µg	0.5	Metals-022	<0.5	2	<0.5	[NT]		[NT]	[NT]
Thallium	µg	0.5	Metals-022	<0.5	2	<0.5	[NT]		[NT]	[NT]
Zinc	µg	0.5	Metals-022	<0.5	2	0.8	[NT]		[NT]	[NT]
Date prepared	-			15/05/2024	2	15/05/2024	15/05/2024		15/05/2024	15/05/2024
Date analysed	-			15/05/2024	2	15/05/2024	15/05/2024		15/05/2024	15/05/2024
Antimony-Dissolved	µg/L	1	Metals-022	<1	2	<1	[NT]		96	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	<1	2	<1	[NT]		94	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	2	<0.1	[NT]		96	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	2	<1	[NT]		105	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	2	<1	<1	0	111	105
Beryllium-Dissolved	µg/L	0.5	Metals-022	<0.5	2	<0.5	[NT]		108	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	<1	2	3	[NT]		93	[NT]
Cobalt-Dissolved	µg/L	1	Metals-022	<1	2	<1	[NT]		96	[NT]
Manganese-Dissolved	µg/L	5	Metals-022	<5	2	<5	[NT]		93	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	<1	2	1	[NT]		94	[NT]
Selenium-Dissolved	µg/L	1	Metals-022	<1	2	<1	[NT]		99	[NT]
Vanadium-Dissolved	µg/L	1	Metals-022	<1	2	<1	[NT]		94	[NT]
Tin-Dissolved	µg/L	1	Metals-022	<1	2	<1	[NT]		97	[NT]
Barium-Dissolved	µg/L	1	Metals-022	<1	2	<1	[NT]		99	[NT]
Copper-Dissolved	µg/L	1	Metals-022	<1	2	<1	[NT]		94	[NT]
Silver-Dissolved	µg/L	1	Metals-022	<1	2	<1	[NT]		92	[NT]
Thallium-Dissolved	µg/L	1	Metals-022	<1	2	<1	[NT]		103	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	<1	2	4	[NT]		98	[NT]

QUALITY CONTROL: Metals in water - mass units						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	350913-8
Antimony	µg	0.5	Metals-022	[NT]	7	<0.5	<0.5	0	[NT]	[NT]
Arsenic	µg	0.5	Metals-022	[NT]	7	<0.5	<0.5	0	[NT]	[NT]
Cadmium	µg	0.05	Metals-022	[NT]	7	<0.05	<0.05	0	[NT]	[NT]
Lead	µg	0.5	Metals-022	[NT]	7	0.5	0.6	18	[NT]	[NT]
Mercury	µg	0.5	Metals-021	[NT]	7	<10	[NT]		[NT]	[NT]
Beryllium	µg	0.5	Metals-022	[NT]	7	<0.5	<0.5	0	[NT]	[NT]
Chromium	µg	0.5	Metals-022	[NT]	7	0.6	0.7	15	[NT]	[NT]
Cobalt	µg	0.5	Metals-022	[NT]	7	<0.5	<0.5	0	[NT]	[NT]
Manganese	µg	3	Metals-022	[NT]	7	<3	<3	0	[NT]	[NT]
Nickel	µg	0.5	Metals-022	[NT]	7	0.6	0.6	0	[NT]	[NT]
Selenium	µg	0.5	Metals-022	[NT]	7	<0.5	<0.5	0	[NT]	[NT]
Vanadium	µg	0.5	Metals-022	[NT]	7	<0.5	<0.5	0	[NT]	[NT]
Tin	µg	0.5	Metals-022	[NT]	7	<0.5	<0.5	0	[NT]	[NT]
Barium	µg	0.5	Metals-022	[NT]	7	<0.5	<0.5	0	[NT]	[NT]
Copper	µg	0.5	Metals-022	[NT]	7	0.8	0.9	12	[NT]	[NT]
Silver	µg	0.5	Metals-022	[NT]	7	<0.5	<0.5	0	[NT]	[NT]
Thallium	µg	0.5	Metals-022	[NT]	7	<0.5	<0.5	0	[NT]	[NT]
Zinc	µg	0.5	Metals-022	[NT]	7	3	3	0	[NT]	[NT]
Date prepared	-			[NT]	7	15/05/2024	15/05/2024		[NT]	15/05/2024
Date analysed	-			[NT]	7	15/05/2024	15/05/2024		[NT]	15/05/2024
Antimony-Dissolved	µg/L	1	Metals-022	[NT]	7	<1	<1	0	[NT]	96
Arsenic-Dissolved	µg/L	1	Metals-022	[NT]	7	<1	<1	0	[NT]	100
Cadmium-Dissolved	µg/L	0.1	Metals-022	[NT]	7	0.1	0.1	0	[NT]	103
Lead-Dissolved	µg/L	1	Metals-022	[NT]	7	2	2	0	[NT]	93
Mercury-Dissolved	µg/L	0.05	Metals-021	[NT]	7	<1	[NT]		[NT]	[NT]
Beryllium-Dissolved	µg/L	0.5	Metals-022	[NT]	7	<0.5	<0.5	0	[NT]	109
Chromium-Dissolved	µg/L	1	Metals-022	[NT]	7	2	2	0	[NT]	99
Cobalt-Dissolved	µg/L	1	Metals-022	[NT]	7	<1	<1	0	[NT]	102
Manganese-Dissolved	µg/L	5	Metals-022	[NT]	7	<5	<5	0	[NT]	100
Nickel-Dissolved	µg/L	1	Metals-022	[NT]	7	2	2	0	[NT]	101
Selenium-Dissolved	µg/L	1	Metals-022	[NT]	7	<1	<1	0	[NT]	112
Vanadium-Dissolved	µg/L	1	Metals-022	[NT]	7	<1	<1	0	[NT]	102
Tin-Dissolved	µg/L	1	Metals-022	[NT]	7	<1	<1	0	[NT]	102
Barium-Dissolved	µg/L	1	Metals-022	[NT]	7	<1	1	0	[NT]	101
Copper-Dissolved	µg/L	1	Metals-022	[NT]	7	3	3	0	[NT]	102
Silver-Dissolved	µg/L	1	Metals-022	[NT]	7	<1	<1	0	[NT]	90
Thallium-Dissolved	µg/L	1	Metals-022	[NT]	7	<1	<1	0	[NT]	92
Zinc-Dissolved	µg/L	1	Metals-022	[NT]	7	10	10	0	[NT]	102

QUALITY CONTROL: Metals in water - mass units					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Antimony	µg	0.5	Metals-022	[NT]	15	<0.5	[NT]		[NT]	[NT]
Arsenic	µg	0.5	Metals-022	[NT]	15	<0.5	[NT]		[NT]	[NT]
Cadmium	µg	0.05	Metals-022	[NT]	15	<0.05	[NT]		[NT]	[NT]
Lead	µg	0.5	Metals-022	[NT]	15	<0.5	[NT]		[NT]	[NT]
Mercury	µg	0.5	Metals-021	[NT]	15	<10	<10	0	[NT]	[NT]
Beryllium	µg	0.5	Metals-022	[NT]	15	<0.5	[NT]		[NT]	[NT]
Chromium	µg	0.5	Metals-022	[NT]	15	<0.5	[NT]		[NT]	[NT]
Cobalt	µg	0.5	Metals-022	[NT]	15	<0.5	[NT]		[NT]	[NT]
Manganese	µg	3	Metals-022	[NT]	15	<3	[NT]		[NT]	[NT]
Nickel	µg	0.5	Metals-022	[NT]	15	<0.5	[NT]		[NT]	[NT]
Selenium	µg	0.5	Metals-022	[NT]	15	<0.5	[NT]		[NT]	[NT]
Vanadium	µg	0.5	Metals-022	[NT]	15	<0.5	[NT]		[NT]	[NT]
Tin	µg	0.5	Metals-022	[NT]	15	<0.5	[NT]		[NT]	[NT]
Barium	µg	0.5	Metals-022	[NT]	15	<0.5	[NT]		[NT]	[NT]
Copper	µg	0.5	Metals-022	[NT]	15	<0.5	[NT]		[NT]	[NT]
Silver	µg	0.5	Metals-022	[NT]	15	<0.5	[NT]		[NT]	[NT]
Thallium	µg	0.5	Metals-022	[NT]	15	<0.5	[NT]		[NT]	[NT]
Zinc	µg	0.5	Metals-022	[NT]	15	0.7	[NT]		[NT]	[NT]
Date prepared	-			[NT]	15	15/05/2024	15/05/2024		[NT]	[NT]
Date analysed	-			[NT]	15	15/05/2024	15/05/2024		[NT]	[NT]
Antimony-Dissolved	µg/L	1	Metals-022	[NT]	15	<1	[NT]		[NT]	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	[NT]	15	<1	[NT]		[NT]	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	[NT]	15	1.1	[NT]		[NT]	[NT]
Lead-Dissolved	µg/L	1	Metals-022	[NT]	15	7	[NT]		[NT]	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	[NT]	15	<1	<1	0	[NT]	[NT]
Beryllium-Dissolved	µg/L	0.5	Metals-022	[NT]	15	<0.5	[NT]		[NT]	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	[NT]	15	4	[NT]		[NT]	[NT]
Cobalt-Dissolved	µg/L	1	Metals-022	[NT]	15	<1	[NT]		[NT]	[NT]
Manganese-Dissolved	µg/L	5	Metals-022	[NT]	15	73	[NT]		[NT]	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	[NT]	15	3	[NT]		[NT]	[NT]
Selenium-Dissolved	µg/L	1	Metals-022	[NT]	15	<1	[NT]		[NT]	[NT]
Vanadium-Dissolved	µg/L	1	Metals-022	[NT]	15	9	[NT]		[NT]	[NT]
Tin-Dissolved	µg/L	1	Metals-022	[NT]	15	<1	[NT]		[NT]	[NT]
Barium-Dissolved	µg/L	1	Metals-022	[NT]	15	12	[NT]		[NT]	[NT]
Copper-Dissolved	µg/L	1	Metals-022	[NT]	15	11	[NT]		[NT]	[NT]
Silver-Dissolved	µg/L	1	Metals-022	[NT]	15	1	[NT]		[NT]	[NT]
Thallium-Dissolved	µg/L	1	Metals-022	[NT]	15	6	[NT]		[NT]	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	[NT]	15	19	[NT]		[NT]	[NT]

QUALITY CONTROL: Metals in Waters - mass units						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	350913-13
Date digested	-			17/05/2024	7	17/05/2024	17/05/2024		17/05/2024	17/05/2024
Date analysed	-			17/05/2024	7	17/05/2024	17/05/2024		17/05/2024	17/05/2024
Phosphorus	mg	0.05	Metals-020	[NT]	7	0.07	0.07	0	[NT]	[NT]
Phosphorus - Dissolved	mg/L	0.05	Metals-020	<0.05	7	0.2	0.2	0	98	86

QUALITY CONTROL: Inorganics in Wipes					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			15/05/2024	[NT]	[NT]	[NT]	[NT]	15/05/2024	[NT]
Date analysed	-			15/05/2024	[NT]	[NT]	[NT]	[NT]	15/05/2024	[NT]
Hexavalent Cr in filter	µg/filter	0.1	Inorg-118	<0.1	[NT]	[NT]	[NT]	[NT]	96	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W6	[NT]
Date prepared	-			15/05/2024	[NT]	[NT]	[NT]	[NT]	15/05/2024	[NT]
Date analysed	-			15/05/2024	[NT]	[NT]	[NT]	[NT]	15/05/2024	[NT]
Hexavalent Chromium, Cr^{6+} (dissolved)	mg/L	0.005	Inorg-118	<0.005	[NT]	[NT]	[NT]	[NT]	98	[NT]
Hexavalent Chromium, Cr^{6+}	µg/sample	5	Inorg-118	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Metals in water - mass units - The PQL has been raised for Hg due to the sample matrix requiring dilution.

INTERIM REPORT OF ANALYSIS

Report No. RN1430789

Client	: EKTIMO PTY LTD	**Job No.**	: EKTI01/240507
	52 COOPER ROAD	**Quote No.**	: QT-02257
	COCKBURN CENTRAL WA 6164	**Order No.**	: W013621
		Date Received	: 7-MAY-2024
Attention	: AARON DAVIS	**Sampled By**	: CLIENT
Project Name	:		
Your Client Services Manager	: Tim Reddan	**Phone**	: 03 9644 4854

Lab Reg No.	Sample Ref	Sample Description
N24/009798	AUT240429A	FILTER RESIN RINSE N21814 JOB NO. R016899
N24/009799	AUT240429B	FILTER RESIN RINSE N21815 JOB NO. R016899

Lab Reg No.		N24/009798	N24/009799			
Date Sampled		Not Provided	Not Provided			
Sample Reference		AUT240429A	AUT240429B			
	Units					Method
Components						
Cartridge Preparation Charge		AUT240429A	AUT240429B			
Dioxin/Furan International Toxic Equivalency (iTEQ)						
Lower bound iTEQDF	pg	2.2	3.7			AUT_MET002
Middle bound iTEQDF	pg	5.6	7.0			AUT_MET002
Upper bound iTEQDF	pg	9.0	10			AUT_MET002
Dioxin and Furan Toxic congeners						
2378-TCDF (51207-31-9)	pg	22	31			AUT_MET002
2378-TCDD (1746-01-6)	pg	<2	<2			AUT_MET002
12378-PeCDF (57117-41-6)	pg	<5	6.9			AUT_MET002
23478-PeCDF (57117-31-4)	pg	<3	<5			AUT_MET002
12378-PeCDD (40321-76-4)	pg	<3	<2			AUT_MET002
123478-HxCDF (70648-26-9)	pg	<2	<1			AUT_MET002
123678-HxCDF (57117-44-9)	pg	<2	1.6			AUT_MET002
234678-HxCDF (60851-34-5)	pg	<1	<1			AUT_MET002
123789-HxCDF (72918-21-9)	pg	<2	<2			AUT_MET002
123478-HxCDD (39227-28-6)	pg	<3	<2			AUT_MET002
123678-HxCDD (57653-85-7)	pg	<2	<2			AUT_MET002
123789-HxCDD (19408-74-3)	pg	<3	<2			AUT_MET002
1234678-HpCDF (67562-39-4)	pg	<3	3.1			AUT_MET002
1234789-HpCDF (55673-89-7)	pg	<2	<2			AUT_MET002
1234678-HpCDD (35822-46-9)	pg	<3	6.8			AUT_MET002
OCDF (39001-02-0)	pg	<2	2.9			AUT_MET002
OCDD (3268-87-9)	pg	16	23			AUT_MET002
Total homologue groups						
Total TCDF isomers	pg	2820	3670			AUT_MET002
Total TCDD isomers	pg	5.7	5.9			AUT_MET002
Total PeCDF isomers	pg	93	130			AUT_MET002
Total PeCDD isomers	pg	<20	<10			AUT_MET002
Total HxCDF isomers	pg	3.6	13			AUT_MET002

INTERIM REPORT OF ANALYSIS

Lab Reg No.	Units	N24/009798	N24/009799			Method
Date Sampled		Not Provided	Not Provided			
Sample Reference		AUT240429A	AUT240429B			
Total homologue groups						
Total HxCDD isomers	pg	13	18			AUT_MET002
Total HpCDF isomers	pg	<5	3.6			AUT_MET002
Total HpCDD isomers	pg	4.4	14			AUT_MET002
Labelled Field Surrogate Recoveries						
23478-PeCDF (13C12) (116843-02-8)	%	104	125			AUT_MET002
123478-HxCDF (13C12) (114423-98-2)	%	103	114			AUT_MET002
123478-HxCDD (13C12) (109719-80-4)	%	114	125			AUT_MET002
1234789-HpCDF (13C12) (109719-94-0)	%	102	114			AUT_MET002
Labelled Internal Standard Recoveries						
2378-TCDF (13C12) (89059-46-1)	%	67	54			AUT_MET002
2378-TCDD (13C12) (76523-40-5)	%	63	50			AUT_MET002
12378-PeCDF (13C12) (109719-77-9)	%	73	61			AUT_MET002
12378-PeCDD (13C12) (109719-79-1)	%	78	67			AUT_MET002
123678-HxCDF (13C12) (116843-03-9)	%	85	81			AUT_MET002
123678-HxCDD (13C12) (109719-81-5)	%	80	73			AUT_MET002
1234678-HpCDF (13C12) (109719-84-8)	%	90	83			AUT_MET002
1234678-HpCDD (13C12) (109719-83-7)	%	86	83			AUT_MET002
OCDD (13C12) (114423-97-1)	%	67	63			AUT_MET002
Extraction						
Pressurised Solvent Extraction		16-MAY-2024	16-MAY-2024			AUT_MET_01
Purification						
Acid Partioning		22-May-24	22-May-24			AUT_MET_01
Automated column chromatography DF		22-May-24	22-May-24			AUT_MET_01
Dioxin/Furan International Toxic Equivalency Factors (iTEF)						
iTEF 2378-TCDF		0.1	0.1			AUT_MET002
iTEF 2378-TCDD		1	1			AUT_MET002
iTEF 12378-PeCDF		0.05	0.05			AUT_MET002
iTEF 23478-PeCDF		0.5	0.5			AUT_MET002
iTEF 12378-PeCDD		0.5	0.5			AUT_MET002
iTEF 123478-HxCDF		0.1	0.1			AUT_MET002
iTEF 123678-HxCDF		0.1	0.1			AUT_MET002
iTEF 234678-HxCDF		0.1	0.1			AUT_MET002
iTEF 123789-HxCDF		0.1	0.1			AUT_MET002
iTEF 123478-HxCDD		0.1	0.1			AUT_MET002
iTEF 123678-HxCDD		0.1	0.1			AUT_MET002
iTEF 123789-HxCDD		0.1	0.1			AUT_MET002
iTEF 1234678-HpCDF		0.01	0.01			AUT_MET002
iTEF 1234789-HpCDF		0.01	0.01			AUT_MET002
iTEF 1234678-HpCDD		0.01	0.01			AUT_MET002
iTEF OCDF		0.001	0.001			AUT_MET002
iTEF OCDD		0.001	0.001			AUT_MET002

INTERIM REPORT OF ANALYSIS

Lab Reg No.	Units	N24/009798	N24/009799			Method
Date Sampled		Not Provided	Not Provided			
Sample Reference		AUT240429A	AUT240429B			
Analysis Dates						
Emission Extracted Dioxin		16-MAY-2024	16-MAY-2024			AUT_MET002
Emission HRMS Dioxin analysis		31-MAY-2024	31-MAY-2024			AUT_MET002
Emission Confirmation Dioxin analysis		1-JUN-2024	1-JUN-2024			AUT_MET002
Emission Holding times		Extract/Ana	Extract/Ana			AUT_MET002

All results are expressed on an as received weight basis. iTEF defined in USEPA publication EPA/625/3-89/016 (1989), WHO TEFs defined by Van den Berg et al., Toxicol. Sci. 93(2), pp. 223241 (2006).
Labelled surrogates acceptance criteria: 70-130% for field - 40-130% for Tetra/Penta/Hexa - 25-130% for Hepta/Octa - 40-120% for PCB congeners.

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06-JUN-2024

NATA
WORLD RECOGNISED
ACCREDITATION

Accredited for compliance with ISO/IEC 17025 - Testing.
This report shall not be reproduced except in full.
Results relate only to the sample(s) as received and tested.

* Denotes the analyte or test method is not within our ISO/IEC 17025 scope of accreditation.

Measurement Uncertainty is available upon request.

Note: Sampling date(s) have been provided by the client.

Note: Where sampling dates are not provided NMI is unable to determine compliance to any applicable Holding Time requirements

INTERIM REPORT OF ANALYSIS

The testing was undertaken at: 105 Delhi Road, North Ryde, NSW, 2113

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