



Ektimo

REPORT NUMBER R010935

**Emission Testing Report
Ingal Civil Products, Minto Plant**

Document Information

Template Version; 230621

Client Name: Ingal Civil Products
Report Number: R010935
Date of Issue: 28 July 2021
Attention: Amit Gupta
Address: 57-65 Airds Road
Minto NSW 2566
Testing Laboratory: Ektimo Pty Ltd, ABN 86 600 381 413

Report Authorisation



NATA Accredited Laboratory
No. 14601

Graham Edwards
Client Manager

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Please note that only numerical results pertaining to measurements conducted directly by Ektimo are covered by Ektimo's terms of NATA accreditation. This does not include comments, conclusions or recommendations based upon the results. Refer to 'Test Methods' for full details of testing covered by NATA accreditation.

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1 EXECUTIVE SUMMARY

1.1 Background

Ektimo was engaged by Ingal Civil Products to perform emission monitoring as part of the annual requirement stipulated in their NSW EPA Environment Protection Licence (12593).

1.2 Project Objectives

The objectives of the project were to conduct a monitoring programme to quantify emissions from two discharge points to determine compliance with Ingal Civil Products' Environmental Licence.

Monitoring was performed as follows:

Location	Test Date	Test Parameters*
EPA 1 – Baghouse Stack	6 July 2021	Solid particles Hydrogen chloride Metals (type 1 & 2 substances including cadmium) + zinc Ammonia x 2 Odour x 2
EPA 2 – Galvanising Area Boiler	14 July 2021	Solid particles Nitrogen oxides (NO _x as NO ₂), oxygen (O ₂)

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

All results are reported on a dry basis at STP (except odour wet – STP).

Plant operating conditions have been noted in the report.

1.3 Results Summary

The following licence comparison table shows that all analytes highlighted in green are within the licence limit set by the NSW EPA as per licence 12593 (last amended on 1 February 2021).

EPA	Parameter	Units	Licence limit	Detected values	Detected values (corrected to 3% O ₂)
EPA 1 - Baghouse Stack	Type 1 & 2 substances in aggregate	mg/m ³	0.08	≤0.027	-
	Ammonia and ammonium compounds (Run 1)	mg/m ³	10	5.5	-
	Ammonia and ammonium compounds (Run 2)	mg/m ³	10	4.7	-
	Odour	odour units	520	180	-
	Zinc and zinc compounds	mg/m ³	5	0.026	-
	Hydrogen chloride	mg/m ³	5	<0.04	-
	Cadmium	mg/m ³	0.04	<0.0005	-
	Solid particles	mg/m ³	5	2.4	-
EPA 2 - Galvanising Area Boiler	Solid particles	mg/m ³	11	<2	<5
	Nitrogen oxides	mg/m ³	170	65	140

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

Refer to the Test Methods table for the measurement uncertainties.

2 RESULTS

2.1 EPA 1 – Baghouse Stack

Date	6/07/2021	Client	Ingal Civil Products
Report	R010935	Stack ID	EPA 1 - Baghouse Stack
Licence No.	12593	Location	Minto
Ektimo Staff	Graham Edwards, Scott Woods, Harrison Handicott	State	NSW
Process Conditions	Routine galvanising operations		2/06/16

Sampling Plane Details	
Sampling plane dimensions	1200 mm
Sampling plane area	1.13 m ²
Sampling port size, number	2" BSP (x2)
Access & height of ports	Elevated work platform 10 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit >2 D
Upstream disturbance	Bend >6 D
No. traverses & points sampled	2 12
Sample plane compliance to AS4323.1	Ideal

Stack Parameters		
Moisture content, %v/v	0.49	
Gas molecular weight, g/g mole	29.0 (wet)	29.0 (dry)
Gas density at STP, kg/m ³	1.29 (wet)	1.29 (dry)
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	0936 & 1120	
Temperature, °C	28	
Temperature, K	301	
Velocity at sampling plane, m/s	9.8	
Volumetric flow rate, actual, m ³ /s	11	
Volumetric flow rate (wet STP), m ³ /s	10	
Volumetric flow rate (dry STP), m ³ /s	10	
Mass flow rate (wet basis), kg/hour	47000	

Isokinetic Results	Sampling time	Results	
		1006-1110	
		Concentration mg/m ³	Mass Rate g/min
Solid Particles		2.4	1.5
Chloride (as HCl)		<0.04	<0.03
Isokinetic Sampling Parameters			
Sampling time, min		60	
Isokinetic rate, %		100	
Velocity difference, %		<1	

Date	6/07/2021	Client	Ingal Civil Products
Report	R010935	Stack ID	EPA 1 - Baghouse Stack
Licence No.	12593	Location	Minto
Ektimo Staff	Graham Edwards, Scott Woods, Harrison Handicott	State	NSW
Process Conditions	Routine galvanising operations		210616

Sampling Plane Details	
Sampling plane dimensions	1200 mm
Sampling plane area	1.13 m ²
Sampling port size, number	2" BSP (x2)
Access & height of ports	Elevated work platform 10 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit >2 D
Upstream disturbance	Bend >6 D
No. traverses & points sampled	2 12
Sample plane compliance to AS4323.1	Ideal

Stack Parameters		
Moisture content, %v/v	<0.4	
Gas molecular weight, g/g mole	29.0 (wet)	29.0 (dry)
Gas density at STP, kg/m ³	1.29 (wet)	1.30 (dry)
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	1120 & 1250	
Temperature, °C	31	
Temperature, K	304	
Velocity at sampling plane, m/s	9.9	
Volumetric flow rate, actual, m ³ /s	11	
Volumetric flow rate (wet STP), m ³ /s	10	
Volumetric flow rate (dry STP), m ³ /s	10	
Mass flow rate (wet basis), kg/hour	47000	

Isokinetic Results	Sampling time	Results	
		1141-1244	
		Concentration mg/m ³	Mass Rate g/min
Antimony		<0.005	<0.003
Arsenic		<0.002	<0.001
Beryllium		<0.0007	<0.0004
Cadmium		<0.0005	<0.0003
Chromium		0.0011	0.00069
Cobalt		<0.0009	<0.0005
Lead		<0.002	<0.001
Manganese		<0.002	<0.002
Mercury		<0.0006	<0.0004
Nickel		<0.001	<0.0008
Selenium		<0.005	<0.003
Tin		<0.002	<0.001
Vanadium		<0.001	<0.0008
Zinc		0.026	0.016
Type 1 & 2 Substances			
Upper Bound			
Total Type 1 Substances		<0.01	<0.007
Total Type 2 Substances		≤0.016	≤0.0096
Total Type 1 & 2 Substances		≤0.027	≤0.016
Isokinetic Sampling Parameters			
Sampling time, min		60	
Isokinetic rate, %		99	
Velocity difference, %		3	

Date	6/07/2021	Client	Ingal Civil Products
Report	R010935	Stack ID	EPA 1 - Baghouse Stack
Licence No.	12593	Location	Minto
Ektimo Staff	Graham Edwards, Scott Woods, Harrison Handicott	State	NSW
Process Conditions	Routine galvanising operations		

2 106 16

Sampling Plane Details	
Sampling plane dimensions	1200 mm
Sampling plane area	1.13 m ²
Sampling port size, number	2" BSP (x2)
Access & height of ports	Elevated work platform 10 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit >2 D
Upstream disturbance	Bend >6 D
No. traverses & points sampled	2 12
Sample plane compliance to AS4323.1	Ideal

Stack Parameters		
Moisture content, %v/v	0.52	
Gas molecular weight, g/g mole	29.0 (wet)	29.0 (dry)
Gas density at STP, kg/m ³	1.29 (wet)	1.30 (dry)
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	1250 & 1420	
Temperature, °C	32	
Temperature, K	305	
Velocity at sampling plane, m/s	9.4	
Volumetric flow rate, actual, m ³ /s	11	
Volumetric flow rate (wet STP), m ³ /s	9.6	
Volumetric flow rate (dry STP), m ³ /s	9.6	
Mass flow rate (wet basis), kg/hour	45000	

Isokinetic Results	Sampling time	Test 1	
		1310-1412	
		Concentration mg/m ³	Mass Rate g/min
Ammonia		5.5	3.1
Isokinetic Sampling Parameters			
Sampling time, min		60	
Isokinetic rate, %		102	
Velocity difference, %		-9	

Date	6/07/2021	Client	Ingal Civil Products
Report	R010935	Stack ID	EPA 1 - Baghouse Stack
Licence No.	12593	Location	Minto
Ektimo Staff	Graham Edwards, Scott Woods, Harrison Handicott	State	NSW
Process Conditions	Routine galvanising operations		2/06/16

Sampling Plane Details	
Sampling plane dimensions	1200 mm
Sampling plane area	1.13 m ²
Sampling port size, number	2" BSP (x2)
Access & height of ports	Elevated work platform 10 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit >2 D
Upstream disturbance	Bend >6 D
No. traverses & points sampled	2 12
Sample plane compliance to AS4323.1	Ideal

Stack Parameters		
Moisture content, %v/v	0.59	
Gas molecular weight, g/g mole	29.0 (wet)	29.0 (dry)
Gas density at STP, kg/m ³	1.29 (wet)	1.29 (dry)

Gas Flow Parameters	
Flow measurement time(s) (hhmm)	1420 & 1540
Temperature, °C	30
Temperature, K	303
Velocity at sampling plane, m/s	8.7
Volumetric flow rate, actual, m ³ /s	9.9
Volumetric flow rate (wet STP), m ³ /s	8.9
Volumetric flow rate (dry STP), m ³ /s	8.9
Mass flow rate (wet basis), kg/hour	42000

Odour	Sampling time	Average		Test 1 1433 - 1453		Test 2 1455 - 1515	
		Concentration ou	Mass Rate oum ³ /min	Concentration ou	Mass Rate oum ³ /min	Concentration ou	Mass Rate oum ³ /min
Results		180	96000	190	100000	160	87000
Lower uncertainty limit		140		140		110	
Upper uncertainty limit		230		280		230	
Hedonic tone				mildly unpleasant		mildly unpleasant	
Odour character				Paint, Metal, Sulfur		Paint, Metal, Sulfur	
Analysis date & time				07/07/21, 0930-1030		07/07/21, 0930-1030	
Holding time				18 hours		18 hours	
Dilution factor				1		1	
Bag material				Teflon™		Teflon™	
Butanol threshold (ppb)		56					
Laboratory temp (°C)		23					
Last calibration date		October 2020					

Isokinetic Results	Sampling time	Test 2 1429-1532	
		Concentration mg/m ³	Mass Rate g/min
Ammonia		4.7	2.5

Isokinetic Sampling Parameters	
Sampling time, min	60
Isokinetic rate, %	99
Velocity difference, %	-6

2.2 EPA 2 – Galvanising Area Boiler

Date	14/07/2021	Client	Ingal Civil Products
Report	R010935	Stack ID	EPA 2 - Galvanising Area Boiler
Licence No.	12593	Location	Minto
Ektimo Staff	Graham Edwards, Scott Woods	State	NSW
Process Conditions	Boiler operating normally		

2/10/16

Sampling Plane Details	
Sampling plane dimensions	260 mm
Sampling plane area	0.0531 m ²
Sampling port size, number	4" BSP (x2)
Access & height of ports	Elevated work platform 4 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit >2 D
Upstream disturbance	Bend >6 D
No. traverses & points sampled	2 4
Sample plane compliance to AS4323.1	Ideal

Stack Parameters		
Moisture content, %v/v	4.7	
Gas molecular weight, g/g mole	28.9 (wet)	29.4 (dry)
Gas density at STP, kg/m ³	1.29 (wet)	1.31 (dry)
% Oxygen correction & Factor	3 %	2.13
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	1049 & 1230	
Temperature, °C	155	
Temperature, K	428	
Velocity at sampling plane, m/s	4.3	
Volumetric flow rate, actual, m ³ /s	0.23	
Volumetric flow rate (wet STP), m ³ /s	0.14	
Volumetric flow rate (dry STP), m ³ /s	0.14	
Mass flow rate (wet basis), kg/hour	670	

Gas Analyser Results	Sampling time	Average			Minimum			Maximum		
		Concentration	Corrected to 3% O ₂	Mass Rate	Concentration	Corrected to 3% O ₂	Mass Rate	Concentration	Corrected to 3% O ₂	Mass Rate
Combustion Gases		mg/m ³	mg/m ³	g/min	mg/m ³	mg/m ³	g/min	mg/m ³	mg/m ³	g/min
Nitrogen oxides (as NO ₂)		65	140	0.54	4.5	9.6	0.037	110	230	0.88
		Concentration %v/v			Concentration %v/v			Concentration %v/v		
Oxygen		12.5			4.3			21.1		

Isokinetic Results	Sampling time	Results		
		Concentration	Corrected to 3% O ₂	Mass Rate
Solid Particles		mg/m ³	mg/m ³	g/min
		<2	<5	<0.02
Isokinetic Sampling Parameters				
Sampling time, min		60		
Isokinetic rate, %		103		
Velocity difference, %		8		

3 PLANT OPERATING CONDITIONS

See Ingal Civil Products records for complete process conditions.

4 TEST METHODS

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

Parameter	Sampling Method	Analysis Method	Uncertainty*	NATA Accredited	
				Sampling	Analysis
Sample plane criteria	NSW TM-1	NA	NA	✓	NA
Flow rate, temperature and velocity	NSW TM-2	NSW TM-2	8%, 2%, 7%	NA	✓
Moisture content	NSW TM-22	NSW TM-22	8%	✓	✓
Molecular weight	NA	NSW TM-23	not specified	NA	✓
Dry gas density	NA	NSW TM-23	not specified	NA	✓
Carbon dioxide	NSW TM-24	NSW TM-24	13%	✓	✓
Nitrogen oxides	NSW TM-11	NSW TM-11	12%	✓	✓
Oxygen	NSW TM-25	NSW TM-25	13%	✓	✓
Ammonia	USEPA CTM 027	Envirolab Inorg-093 & Inorg-057	18%	✓	✓ [‡]
Hydrogen chloride	NSW TM-8	Ektimo 235	14%	✓	✓ [†]
Solid particles (total)	NSW TM-15	NSW TM-15 ^{††}	3%	✓	✓
Total (gaseous and particulate) metals and metallic compounds	NSW TM-12, NSW TM-13, NSW TM-14	Envirolab inhouse Metals-006, Metals-022, Metals-021	15%	✓	✓ [‡]
Type 1 substances (Sb, As, Cd, Pb, Hg)	NSW TM-12	Envirolab inhouse Metals-006, Metals-022, Metals-021	15%	✓	✓ [‡]
Type 2 substances (Be, Cr, Co, Mn, Ni, Se, Sn, V)	NSW TM-13	Envirolab inhouse Metals-006, Metals-022	15%	✓	✓ [‡]
Odour	NSW OM-7	NSW OM-7 [‡]	Refer to results	✓	✓
Odour Characterisation	NA	direct observation	NA	NA	✗

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* Uncertainty values cited in this table are calculated at the 95% confidence level (coverage factor = 2)

[†] Analysis conducted at the Ektimo Mitcham, VIC laboratory, NATA accreditation number 14601. Results were reported on: 23 July 2021 in report LV-001747.

^{††} Gravimetric analysis conducted at the Ektimo Unanderra, NSW laboratory, NATA accreditation number 14601.

[‡] Odour analysis conducted at the Unanderra, NSW laboratory by forced choice olfactometry, NATA accreditation number 14601. Results were reported on 7 July 2021 in report ON-00085.

[‡] Analysis performed by Envirolab, NATA accreditation number 2901. Results were reported to Ektimo on 20 July 2021 in report 273939.

5 DEVIATIONS TO TEST METHODS

Deviation from analytical method (Odour): Due to COVID-19 social distancing requirements, the minimum number of panellists stipulated in AS4323.3 of four (4) cannot be adhered to. Three (3) panellists were used and the number of dilution series for each sample was increased to achieve comparable calculated uncertainty and meet the minimum ITE requirement (8) of the method.

6 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 (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.

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.

7 DEFINITIONS

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

% v/v	Volume to volume ratio, dry or wet basis
~	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
BSP	British standard pipe
CARB	Californian Air Resources Board
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.
DWER	Department of Water and Environmental Regulation (WA)
DEHP	Department of Environment and Heritage Protection (QLD)
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
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	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 10 microns (µm).
PM _{2.5}	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 2.5 microns (µm).
PSA	Particle size analysis
RATA	Relative accuracy test audit
Semi-quantified VOCs	Unknown VOCs (those not matching a standard compound), 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, unless otherwise specified.
TM	Test method
TOC	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
VDI	Verein Deutscher Ingenieure (Association of German Engineers)
Velocity difference	The percentage difference between the average of initial flows and after flows.
Vic EPA	Victorian Environment Protection Authority
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.
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.

8 APPENDIX 1: SITE PHOTOS



Figure 1 – EPA 1 – Baghouse Stack



Figure 2 – EPA 2 – Galvanising Area Boiler

9 APPENDIX 2: ENVIROLABS METALS/AMMONIA REPORT 273939.

<i>EKTIMO REFERENCE</i>	<i>DATE TESTED</i>	<i>INGAL LOCATION</i>	<i>EKTIMO LAB DESCRIPTION</i>
N 13882	6/07/2021	EPA 1	Blank Solution
N 13883	6/07/2021	EPA 1	Blank Filter
N 13884	6/07/2021	EPA 1	Blank Solution
N 13885	6/07/2021	EPA 1	Filter
N 13886	6/07/2021	EPA 1	Probe Wash
N 13887	6/07/2021	EPA 1	Impinger A + B
N 13888	6/07/2021	EPA 1	Impinger C+ D
N 13889	6/07/2021	EPA 1	Blank
N 13890	6/07/2021	EPA 1	Test 1 P/W
N 13891	6/07/2021	EPA 1	Test 1 Imp A
N 13892	6/07/2021	EPA 1	Test 1 Imp B
N 13893	6/07/2021	EPA 1	Test 2 P/W
N 13894	6/07/2021	EPA 1	Test 2 Imp A
N 13895	6/07/2021	EPA 1	Test 2 Imp B



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CERTIFICATE OF ANALYSIS 273939

Client Details

Client	Ektimo (Unanderra)
Attention	Graham Edwards
Address	1/251 Princes Hwy, Unanderra, NSW, 2526

Sample Details

Your Reference	R010935
Number of Samples	12 Liquid, 2 Filter
Date samples received	13/07/2021
Date completed instructions received	13/07/2021

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 20/07/2021

Date of Issue 20/07/2021

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Results Approved By

Giovanni Agosti, Group Technical Manager

Priya Samarawickrama, Senior Chemist

Authorised By

Nancy Zhang, Laboratory Manager

Metals on filters			
Our Reference		273939-2	273939-4
Your Reference	UNITS	N 13883	N 13885
Type of sample		Filter	Filter
Date prepared	-	15/07/2021	15/07/2021
Date analysed	-	15/07/2021	15/07/2021
Antimony	µg/filter	<5	<5
Arsenic	µg/filter	<2	<2
Cadmium	µg/filter	<0.5	<0.5
Lead	µg/filter	<1	<1
Mercury	µg/filter	<0.2	<0.2
Beryllium	µg/filter	<0.5	<0.5
Chromium	µg/filter	<0.5	0.7
Cobalt	µg/filter	<0.5	<0.5
Manganese	µg/filter	<0.5	<0.5
Nickel	µg/filter	14	5
Selenium	µg/filter	<5	<5
Vanadium	µg/filter	<1	<1
Tin	µg/filter	<2	<2
Zinc	µg/filter	<1	3

Metals in water - mass units						
Our Reference		273939-1	273939-3	273939-5	273939-6	273939-7
Your Reference	UNITS	N 13882	N 13884	N 13886	N 13887	N 13888
Type of sample		Liquid	Liquid	Liquid	Liquid	Liquid
Volume	mL	160	185	88	310	277
Antimony	µg	<0.5	[NA]	<0.5	<0.5	[NA]
Arsenic	µg	<0.5	[NA]	<0.5	<0.5	[NA]
Cadmium	µg	<0.05	[NA]	<0.05	<0.05	[NA]
Lead	µg	<0.5	[NA]	<0.5	0.9	[NA]
Mercury	µg	<10	<1	<10	<10	<1
Beryllium	µg	<0.5	[NA]	<0.5	<0.5	[NA]
Chromium	µg	0.8	[NA]	<0.5	1	[NA]
Cobalt	µg	<0.5	[NA]	<0.5	<0.5	[NA]
Manganese	µg	<3	[NA]	<3	<3	[NA]
Nickel	µg	<0.5	[NA]	<0.5	0.6	[NA]
Selenium	µg	<0.5	[NA]	<0.5	<0.5	[NA]
Vanadium	µg	<0.5	[NA]	<0.5	<0.5	[NA]
Zinc	µg	1	[NA]	5	21	[NA]
Tin	µg	<0.5	[NA]	<0.5	<0.5	[NA]
Date prepared	-	15/07/2021	15/07/2021	15/07/2021	15/07/2021	15/07/2021
Date analysed	-	15/07/2021	15/07/2021	15/07/2021	15/07/2021	15/07/2021
Antimony-Dissolved	µg/L	<1	[NA]	<1	<1	[NA]
Arsenic-Dissolved	µg/L	<1	[NA]	<1	<1	[NA]
Cadmium-Dissolved	µg/L	<0.1	[NA]	<0.1	<0.1	[NA]
Lead-Dissolved	µg/L	<1	[NA]	5	3	[NA]
Mercury-Dissolved	µg/L	<1	<0.1	<1	<1	<0.1
Beryllium-Dissolved	µg/L	<0.5	[NA]	<0.5	<0.5	[NA]
Chromium-Dissolved	µg/L	5	[NA]	<1	4	[NA]
Cobalt-Dissolved	µg/L	<1	[NA]	<1	<1	[NA]
Manganese-Dissolved	µg/L	<5	[NA]	<5	<5	[NA]
Nickel-Dissolved	µg/L	2	[NA]	<1	2	[NA]
Selenium-Dissolved	µg/L	<1	[NA]	<1	<1	[NA]
Vanadium-Dissolved	µg/L	<1	[NA]	<1	<1	[NA]
Tin-Dissolved	µg/L	<1	[NA]	<1	<1	[NA]
Zinc-Dissolved	µg/L	8	[NA]	53	68	[NA]

Miscellaneous Inorganics						
Our Reference		273939-8	273939-9	273939-10	273939-11	273939-12
Your Reference	UNITS	N 13889	N 13890	N 13891	N 13892	N 13893
Type of sample		Liquid	Liquid	Liquid	Liquid	Liquid
Date prepared	-	14/07/2021	14/07/2021	14/07/2021	14/07/2021	14/07/2021
Date analysed	-	14/07/2021	14/07/2021	14/07/2021	14/07/2021	14/07/2021
Volume	mL	134	63	85	91	46
Ammonia as N in impinger	mg	<0.01	0.20	4.1	0.27	0.24
Ammonia as N in water	mg/L	<0.005	3.1	49	2.9	5.3

Miscellaneous Inorganics			
Our Reference		273939-13	273939-14
Your Reference	UNITS	N 13894	N 13895
Type of sample		Liquid	Liquid
Date prepared	-	14/07/2021	14/07/2021
Date analysed	-	14/07/2021	14/07/2021
Volume	mL	125	141
Ammonia as N in impinger	mg	3.2	0.04
Ammonia as N in water	mg/L	26	0.28

Method ID	Methodology Summary
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Inorg-093	Ammonia in impingers/filter pads using Discrete Analyser.
Metals-020/021/022	Determination of various metals on filters by ICP-AES/MS and or CV/AAS.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS.

QUALITY CONTROL: Metals on filters				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date prepared	-			15/07/2021	[NT]	[NT]	[NT]	[NT]	15/07/2021	[NT]
Date analysed	-			15/07/2021	[NT]	[NT]	[NT]	[NT]	15/07/2021	[NT]
Antimony	µg/filter	5	Metals-020/021/022	<5	[NT]	[NT]	[NT]	[NT]	87	[NT]
Arsenic	µg/filter	2	Metals-020/021/022	<2	[NT]	[NT]	[NT]	[NT]	84	[NT]
Cadmium	µg/filter	0.5	Metals-020/021/022	<0.5	[NT]	[NT]	[NT]	[NT]	78	[NT]
Lead	µg/filter	1	Metals-020/021/022	<1	[NT]	[NT]	[NT]	[NT]	92	[NT]
Mercury	µg/filter	0.2	Metals-020/021/022	<0.2	[NT]	[NT]	[NT]	[NT]	110	[NT]
Beryllium	µg/filter	0.5	Metals-020/021/022	<0.5	[NT]	[NT]	[NT]	[NT]	73	[NT]
Chromium	µg/filter	0.5	Metals-020/021/022	<0.5	[NT]	[NT]	[NT]	[NT]	82	[NT]
Cobalt	µg/filter	0.5	Metals-020/021/022	<0.5	[NT]	[NT]	[NT]	[NT]	85	[NT]
Manganese	µg/filter	0.5	Metals-020/021/022	<0.5	[NT]	[NT]	[NT]	[NT]	78	[NT]
Nickel	µg/filter	1	Metals-020/021/022	<1	[NT]	[NT]	[NT]	[NT]	85	[NT]
Selenium	µg/filter	5	Metals-020/021/022	<5	[NT]	[NT]	[NT]	[NT]	84	[NT]
Vanadium	µg/filter	1	Metals-020/021/022	<1	[NT]	[NT]	[NT]	[NT]	82	[NT]
Tin	µg/filter	2	Metals-020/021/022	<2	[NT]	[NT]	[NT]	[NT]	79	[NT]
Zinc	µg/filter	1	Metals-020/021/022	<1	[NT]	[NT]	[NT]	[NT]	85	[NT]

Client Reference: R010935

QUALITY CONTROL: Metals in water - mass units				Duplicate			Spike Recovery %			
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	273939-6
Antimony	µg	0.5	Metals-022	[NT]	5	<0.5	[NT]		[NT]	[NT]
Arsenic	µg	0.5	Metals-022	[NT]	5	<0.5	[NT]		[NT]	[NT]
Cadmium	µg	0.05	Metals-022	[NT]	5	<0.05	[NT]		[NT]	[NT]
Lead	µg	0.5	Metals-022	[NT]	5	<0.5	[NT]		[NT]	[NT]
Mercury	µg	0.5	Metals-021	[NT]	5	<10	[NT]		[NT]	[NT]
Beryllium	µg	0.5	Metals-022	[NT]	5	<0.5	[NT]		[NT]	[NT]
Chromium	µg	0.5	Metals-022	[NT]	5	<0.5	[NT]		[NT]	[NT]
Cobalt	µg	0.5	Metals-022	[NT]	5	<0.5	[NT]		[NT]	[NT]
Manganese	µg	3	Metals-022	[NT]	5	<3	[NT]		[NT]	[NT]
Nickel	µg	0.5	Metals-022	[NT]	5	<0.5	[NT]		[NT]	[NT]
Selenium	µg	0.5	Metals-022	[NT]	5	<0.5	[NT]		[NT]	[NT]
Vanadium	µg	0.5	Metals-022	[NT]	5	<0.5	[NT]		[NT]	[NT]
Zinc	µg	0.5	Metals-022	[NT]	5	5	[NT]		[NT]	[NT]
Tin	µg	0.5	Metals-022	[NT]	5	<0.5	[NT]		[NT]	[NT]
Date prepared	-			15/07/2021	5	15/07/2021	15/07/2021		15/07/2021	15/07/2021
Date analysed	-			15/07/2021	5	15/07/2021	15/07/2021		15/07/2021	15/07/2021
Antimony-Dissolved	µg/L	1	Metals-022	<1	5	<1	<1	0	90	96
Arsenic-Dissolved	µg/L	1	Metals-022	<1	5	<1	<1	0	91	89
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	5	<0.1	<0.1	0	87	81
Lead-Dissolved	µg/L	1	Metals-022	<1	5	5	4	22	92	97
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	5	<1	[NT]		100	[NT]
Beryllium-Dissolved	µg/L	0.5	Metals-022	<0.5	5	<0.5	<0.5	0	90	101
Chromium-Dissolved	µg/L	1	Metals-022	<1	5	<1	<1	0	92	89
Cobalt-Dissolved	µg/L	1	Metals-022	<1	5	<1	<1	0	90	88
Manganese-Dissolved	µg/L	5	Metals-022	<5	5	<5	<5	0	90	89
Nickel-Dissolved	µg/L	1	Metals-022	<1	5	<1	<1	0	91	88
Selenium-Dissolved	µg/L	1	Metals-022	<1	5	<1	<1	0	86	91
Vanadium-Dissolved	µg/L	1	Metals-022	<1	5	<1	<1	0	91	91
Tin-Dissolved	µg/L	1	Metals-022	<1	5	<1	<1	0	87	83
Zinc-Dissolved	µg/L	1	Metals-022	<1	5	53	50	6	89	99

Client Reference: R010935

QUALITY CONTROL: Metals in water - mass units				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date prepared	-			[NT]	[NT]	[NT]	[NT]	[NT]	15/07/2021	[NT]
Date analysed	-			[NT]	[NT]	[NT]	[NT]	[NT]	15/07/2021	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	[NT]	[NT]	[NT]	[NT]	[NT]	111	[NT]

Client Reference: R010935

QUALITY CONTROL: Miscellaneous Inorganics				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			14/07/2021	8	14/07/2021	14/07/2021		14/07/2021	[NT]
Date analysed	-			14/07/2021	8	14/07/2021	14/07/2021		14/07/2021	[NT]
Ammonia as N in impinger	mg	0.01	Inorg-093	<0.01	8	<0.01	<0.01	0	[NT]	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	8	<0.005	<0.005	0	112	[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.

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

The PQL has been raised due to the sample matrix requiring dilution.

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