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**Report Number R007467**

**Emission Testing Report**

**Ingal Civil Products, Minto Plant**

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## Document Information

Client Name: Ingal Civil Products  
Report Number: R007467  
Date of Issue: 26 September 2019  
Attention: Amit Gupta  
Address: 57-65 Airs Road  
Minto NSW 2566  
Testing Laboratory: Ektimo Pty Ltd, ABN 86 600 381 413

## Report Status

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Preliminary Report	-	-	-	-	-
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Final Report	R007467	26/09/2019	ADo/JWe	ZPa	ADa
Amend Report	-	-	-	-	-

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## Amendment Record

Document Number	Initiator	Report Date	Section	Reason
Nil	-	-	-	-

## Report Authorisation



**Aaron Davis**  
Client Manager

NATA Accredited Laboratory  
No. 14601

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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## 1 EXECUTIVE SUMMARY

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

Monitoring was performed as follows:

Location	Test Date	Test Parameters*
EPA 1 - Baghouse Stack	21 May 2018	Solid particles Hydrogen chloride Metals (type 1 & 2 substances including cadmium) plus zinc Odour
	21 August 2019	Ammonia
EPA 2 - Galvanising Area Boiler	21 May 2019	Solid particles, nitrogen oxides, oxygen
EPA 3 - Kettle Stack		Nitrogen oxides, oxygen

\* 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.

## 2 RESULTS SUMMARY

The following licence comparison table shows that all analytes highlighted in green are below the licence limit set by the NSW EPA as per licence 12593 (last amended on 1 March 2019).

EPA	Parameter	Units	Licence limit	Detected values	Detected values (corrected to 3% O <sub>2</sub> )
EPA 1 - Baghouse Stack	Type 1 & 2 substances in aggregate	mg/m <sup>3</sup>	0.08	<0.02	-
	Ammonia and ammonium compounds (Run 1)	mg/m <sup>3</sup>	2	2.2	-
	Ammonia and ammonium compounds (Run 2)	mg/m <sup>3</sup>	2	3.2	-
	Odour	odour units	520	34	-
	Zinc and zinc compounds	mg/m <sup>3</sup>	5	0.0059	-
	Hydrogen chloride	mg/m <sup>3</sup>	5	<0.02	-
	Cadmium	mg/m <sup>3</sup>	0.04	<0.0009	-
	Solid particles	mg/m <sup>3</sup>	5	4.8	-
EPA 2 - Galvanising Area Boiler	Solid particles	mg/m <sup>3</sup>	11		<2
	Nitrogen oxides	mg/m <sup>3</sup>	170		120
EPA 3 - Kettle Stack	Nitrogen oxides	mg/m <sup>3</sup>	150		98

### 3 RESULTS

#### 3.1 EPA 1 – Baghouse Stack

Date	21/05/2019	Client	Ingal Civil Products
Report	R007467	Stack ID	EPA 1 - Baghouse Stack
Licence No.	12593	Location	Minto
Ektimo Staff	Zoe Parker & Scott Woods	State	NSW
Process Conditions	Please refer to client records.		

190520

<b>Sampling Plane Details</b>		
Sampling plane dimensions	1200 mm	
Sampling plane area	1.13 m <sup>2</sup>	
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	



#### Comments

The discharge is assumed to be composed of dry air and moisture

<b>Stack Parameters</b>	
Moisture content, %v/v	<0.4
Gas molecular weight, g/g mole	28.9 (wet)      29.0 (dry)
Gas density at STP, kg/m <sup>3</sup>	1.29 (wet)      1.29 (dry)
<b>Gas Flow Parameters</b>	
Flow measurement time(s) (hhmm)	0940 & 1055
Temperature, °C	33
Velocity at sampling plane, m/s	10
Volumetric flow rate, actual, m <sup>3</sup> /s	12
Volumetric flow rate (wet STP), m <sup>3</sup> /s	11
Volumetric flow rate (dry STP), m <sup>3</sup> /s	11
Mass flow rate (wet basis), kg/hour	49000

<b>Odour</b>	Sampling time	<b>Results</b>	
		1000 - 1020	
		Concentration	Mass Rate
		ou	oum <sup>3</sup> /min
<b>Results</b>		34	22000
Lower uncertainty limit		16	
Upper uncertainty limit		75	
Hedonic tone		Neutral	
Odour character		No discernable odour	
Analysis date & time		21/05/19, 1532	
Holding time		5 hours	
Dilution factor		1	
Bag material		Nalophan	
Butanol threshold (ppb)		411	
Laboratory temp (°C)		22.35	
Last calibration date		July 2018	

<b>Isokinetic Results</b>	Sampling time	<b>Results</b>	
		0945-1053	
		Concentration	Mass Rate
		mg/m <sup>3</sup>	g/min
Solid Particles		4.8	3
Chloride (as HCl)		<0.02	<0.01
<b>Isokinetic Sampling Parameters</b>			
Sampling time, min		60	
Isokinetic rate, %		99	
Velocity difference, %		3	

Date	21/05/2019	Client	Ingal Civil Products
Report	R007467	Stack ID	EPA 1 - Baghouse Stack
Licence No.	12593	Location	Minto
Ektime Staff	Zoe Parker & Scott Woods	State	NSW
Process Conditions	Please refer to client records.		

190520

**Sampling Plane Details**

Sampling plane dimensions	1200 mm
Sampling plane area	1.13 m <sup>2</sup>
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

**Comments**

The discharge is assumed to be composed of dry air and moisture

**Stack Parameters**

Moisture content, %v/v	0.98	
Gas molecular weight, g/g mole	28.9 (wet)	29.0 (dry)
Gas density at STP, kg/m <sup>3</sup>	1.29 (wet)	1.29 (dry)

**Gas Flow Parameters**

Flow measurement time(s) (hhmm)	1055 & 1201
Temperature, °C	35
Velocity at sampling plane, m/s	11
Volumetric flow rate, actual, m <sup>3</sup> /s	12
Volumetric flow rate (wet STP), m <sup>3</sup> /s	11
Volumetric flow rate (dry STP), m <sup>3</sup> /s	11
Mass flow rate (wet basis), kg/hour	50000

Isokinetic Results	Sampling time	Results	
		1056-1159	
		Concentration mg/m <sup>3</sup>	Mass Rate g/min
Antimony		<0.005	<0.003
Arsenic		<0.002	<0.001
Beryllium		<0.0006	<0.0004
Cadmium		<0.0009	<0.0005
Chromium		<0.001	<0.0006
Cobalt		<0.0007	<0.0005
Lead		<0.001	<0.0009
Manganese		<0.002	<0.001
Mercury		<0.0008	<0.0005
Nickel		<0.001	<0.0009
Selenium		<0.005	<0.003
Tin		<0.002	<0.001
Vanadium		<0.001	<0.0008
Zinc		0.0059	0.0038
<b>Type 1 &amp; 2 Substances</b>			
<b>Upper Bound</b>			
Total Type 1 Substances		<0.01	<0.007
Total Type 2 Substances		<0.01	<0.009
Total Type 1 & 2 Substances		<0.02	<0.02
<b>Isokinetic Sampling Parameters</b>			
Sampling time, min		60	
Isokinetic rate, %		100	
Velocity difference, %		<1	

Date	21/08/2019	Client	Ingal Civil Products
Report	R007467	Stack ID	EPA 1 - Baghouse Stack
Licence No.	12593	Location	Minto
Ektime Staff	Aaron Davis / Scott Woods	State	NSW
Process Conditions	Please refer to client records.		

190815

**Sampling Plane Details**

Sampling plane dimensions	1200 mm
Sampling plane area	1.13 m <sup>2</sup>
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

**Comments**

The discharge is assumed to be composed of dry air and moisture

**Stack Parameters**

Moisture content, %v/v	1.6	
Gas molecular weight, g/g mole	28.8 (wet)	29.0 (dry)
Gas density at STP, kg/m <sup>3</sup>	1.28 (wet)	1.29 (dry)

**Gas Flow Parameters**

Flow measurement time(s) (hhmm)	0955 & 1105
Temperature, °C	31
Temperature, K	304
Velocity at sampling plane, m/s	12
Volumetric flow rate, actual, m <sup>3</sup> /s	13
Volumetric flow rate (wet STP), m <sup>3</sup> /s	12
Volumetric flow rate (dry STP), m <sup>3</sup> /s	12
Mass flow rate (wet basis), kg/hour	55000

**Isokinetic Results**

Sampling time	Results	
	Concentration mg/m <sup>3</sup>	Mass Rate g/min
Ammonia	2.2	1.6
<b>Isokinetic Sampling Parameters</b>		
Sampling time, min	60	
Isokinetic rate, %	99	
Velocity difference, %	-4	

Date	21/08/2019	Client	Ingal Civil Products
Report	R007467	Stack ID	EPA 1 - Baghouse Stack
Licence No.	12593	Location	Minto
Ektime Staff	Aaron Davis / Scott Woods	State	NSW
Process Conditions	Please refer to client records.		

190815

**Sampling Plane Details**

Sampling plane dimensions	1200 mm
Sampling plane area	1.13 m <sup>2</sup>
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

**Comments**

The discharge is assumed to be composed of dry air and moisture

**Stack Parameters**

Moisture content, %v/v	1.7	
Gas molecular weight, g/g mole	28.8 (wet)	29.0 (dry)
Gas density at STP, kg/m <sup>3</sup>	1.28 (wet)	1.29 (dry)

**Gas Flow Parameters**

Flow measurement time(s) (hhmm)	1105 & 1225
Temperature, °C	33
Temperature, K	306
Velocity at sampling plane, m/s	12
Volumetric flow rate, actual, m <sup>3</sup> /s	13
Volumetric flow rate (wet STP), m <sup>3</sup> /s	12
Volumetric flow rate (dry STP), m <sup>3</sup> /s	11
Mass flow rate (wet basis), kg/hour	54000

**Isokinetic Results**

Sampling time	Results	
	Concentration mg/m <sup>3</sup>	Mass Rate g/min
Ammonia	3.2	2.2
<b>Isokinetic Sampling Parameters</b>		
Sampling time, min	60	
Isokinetic rate, %	99	
Velocity difference, %	1	



### 3.2 EPA 2 – Galvanising Area Boiler

Date	21/05/2019	Client	Ingal Civil Products
Report	R007467	Stack ID	EPA 2 - Galvanising Area Boiler
Licence No.	12593	Location	Minto
Ektime Staff	Zoe Parker & Scott Woods	State	NSW
Process Conditions	Please refer to client records.		

19/05/2019

#### Sampling Plane Details

Sampling plane dimensions	260 mm
Sampling plane area	0.0531 m <sup>2</sup>
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

Stack Parameters		
Moisture content, %v/v	6	
Gas molecular weight, g/g mole	29.0 (wet)	29.7 (dry)
Gas density at STP, kg/m <sup>3</sup>	1.29 (wet)	1.32 (dry)
% Oxygen correction & Factor	3 %	1.19

#### Gas Flow Parameters

Flow measurement time(s) (hhmm)	1230 & 1340
Temperature, °C	111
Velocity at sampling plane, m/s	5.1
Volumetric flow rate, actual, m <sup>3</sup> /s	0.27
Volumetric flow rate (wet STP), m <sup>3</sup> /s	0.19
Volumetric flow rate (dry STP), m <sup>3</sup> /s	0.18
Mass flow rate (wet basis), kg/hour	900

#### Gas Analyser Results

Sampling time	Average		
	1235 - 1334		
Combustion Gases	Corrected to 3%		
	Concentration mg/m <sup>3</sup>	O <sub>2</sub> mg/m <sup>3</sup>	Mass Rate g/min
	99	120	1.1
Oxygen	Concentration %		
	5.9		

#### Isokinetic Results

Sampling time	Results		
	1235-1337		
Solid Particles	Corrected to 3%		
	Concentration mg/m <sup>3</sup>	O <sub>2</sub> mg/m <sup>3</sup>	Mass Rate g/min
	<2	<2	<0.02
Isokinetic Sampling Parameters			
Sampling time, min	60		
Isokinetic rate, %	99		
Velocity difference, %	<1		

### 3.3 EPA 3 – Kettle Stack

Date	21/05/2019	Client	Ingal Civil Products
Report	R007467	Stack ID	EPA 3 - Kettle Stack
Licence No.	12593	Location	Minto
Ektime Staff	Zoe Parker & Scott Woods	State	NSW
Process Conditions	Please refer to client records.		

90520

<b>Sampling Plane Details</b>	
Sampling plane dimensions	450 mm
Sampling plane area	0.159 m <sup>2</sup>
Sampling port size, number	1" BSP (x2)
Access & height of ports	Elevated work platform 5 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit >2 D
Upstream disturbance	Bend >6 D
No. traverses & points sampled	2 8
Sample plane compliance to AS4323.1	Compliant but non-ideal

<b>Comments</b>
The sampling plane is deemed to be non-ideal due to the following reasons: The gas velocity at some or all sampling points is less than 3 m/s

Stack Parameters		
Moisture content, %v/v	3.6	
Gas molecular weight, g/g mole	29.4 (wet)	29.8 (dry)
Gas density at STP, kg/m³	1.31 (wet)	1.33 (dry)
% Oxygen correction & Factor	3 %	0.99
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	1110 & 1231	
Temperature, °C	169	
Velocity at sampling plane, m/s	<2	
Volumetric flow rate, actual, m³/s	<0.3	
Volumetric flow rate (wet STP), m³/s	<0.2	
Volumetric flow rate (dry STP), m³/s	<0.2	
Mass flow rate (wet basis), kg/hour	<900	
Velocity difference, %	<1	

Gas Analyser Results		Average 1115 - 1215	
	Sampling time	Corrected to	
Combustion Gases		Concentration mg/m³	3% O2 mg/m³
Nitrogen oxides (as NO₂)		99	Mass Rate g/min
		Concentration %	98
Oxygen		2.8	<1

## 4 PLANT OPERATING CONDITIONS

Unless otherwise stated, the plant operating conditions were normal at the time of testing. See Ingal Civil Products's records for complete process conditions.

## 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	Analysis
Sample plane criteria	NSW TM-1	NA	NA	✓	NA
Flow rate, temperature and velocity	NA	NSW TM-2	8%, 2%, 7%	NA	✓
Moisture content	NSW TM-22	NSW TM-22	8%	✓	✓
Nitrogen oxides	NSW TM-11	NSW TM-11	12%	✓	✓
Oxygen	NSW TM-25	NSW TM-25	13%	✓	✓
Ammonia	USEPA CTM 027	EnviroLab Inorg-093	18%	✓	✓ <sup>†</sup>
Hydrogen chloride	NSW TM-8	Ektimo 235	14%	✓	✓ <sup>†</sup>
Solid particles (total)	NSW TM-15	NSW TM-15	5%	✓	✓
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%	✓	✓ <sup>†</sup>
Type 1 substances (Sb, As, Cd, Pb, Hg)	NSW TM-12	EnviroLab inhouse Metals-006, Metals-022, Metals-021	15%	✓	✓ <sup>†</sup>
Type 2 substances (Be, Cr, Co, Mn, Ni, Se, Sn, V)	NSW TM-13	EnviroLab inhouse Metals-006, Metals-022	15%	✓	✓ <sup>†</sup>
Odour	NSW OM-7	NSW OM-7 <sup>‡</sup>	Refer to results	✓	✓

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

<sup>†</sup> Analysis performed by Ektimo, NATA accreditation number 14601. Laboratory analytical results were reported on 29 May 2019 in report number R007467-Halides\_Halogens.

<sup>‡</sup> Analysis performed by EnviroLab, NATA accreditation number 2901. Results were reported to Ektimo on 3 June 2019 in report number 218229 and 29 August 2019 in report number 224595.

<sup>‡</sup> Odour analysis conducted at the Ektimo NSW laboratory by forced choice olfactometry.

## 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](http://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 APLAC (Asia Pacific Laboratory Accreditation Co-operation) and of ILAC (International Laboratory Accreditation Co-operation). Through the mutual recognition arrangements with both of 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	Continuous Emission Monitoring
CEMS	Continuous Emission Monitoring System
CTM	Conditional test method
D	Duct diameter or equivalent duct diameter for rectangular ducts
D <sub>50</sub>	'Cut size' of a cyclone defined as the particle diameter at which the cyclone achieves a 50% collection efficiency ie. half of the particles are retained by the cyclone and half are not and pass through it to the next stage. The D <sub>50</sub> 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 <sub>50</sub> of that cyclone and less than the D <sub>50</sub> 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, louvers, 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
Lower Bound	Defines values reported below detection as equal to zero.
Medium Bound	Defines values reported below detection are equal to half 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	The number of odour units per unit of volume. The numerical value of the odour concentration is equal to the number of dilutions to arrive at the odour threshold (50% panel response).
PM <sub>10</sub>	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 10 microns (µm).
PM <sub>2.5</sub>	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 will be determined by matching the integrated 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)
Vic EPA	Victorian Environment Protection Authority
VOC	Any chemical compound based on carbon with a vapour pressure of at least 0.010 kPa at 25°C or having a corresponding volatility under the particular conditions of use. These compounds may contain oxygen, nitrogen and other elements, but specifically excluded are carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonate salts.
XRD	X-ray Diffractometry
Upper Bound	Defines values reported below detection are equal to the detection limit.