



## Stephenson

Environmental Management Australia

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### EMISSION TEST REPORT (ETR) No. 7253/S25969/22

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#### STYRENE SCRUBBER EMISSION MONITORING

ROCBOLT RESINS PTY LIMITED

SMEATON GRANGE, NSW 2567

PROJECT No.: 7253/S25969/22

DATE OF SURVEY: 13 OCTOBER 2022

DATE OF ISSUE: 2 NOVEMBER 2022

**EMISSION TEST REPORT NO. 7253/S25969/22**

	<b>The sampling and analysis was commissioned by:</b>	
<b>Client</b>	Organisation:	Rocbolt Resins Pty Limited
	Contact:	Andrew Sykes
	Address:	40-44 Anzac Avenue, Smeaton Grange NSW 2567
	Telephone:	02 4647 8388
	Email:	<a href="mailto:asykes@rocboltresins.com.au">asykes@rocboltresins.com.au</a>
	Project Number:	7253/S25969/22
	Test Date:	13 October 2022
	Production Conditions:	Normal operating conditions during testing
	Analysis Requested:	Dry gas density, volumetric flowrate, velocity, temperature, moisture, molecular weight of stack gases, nitrogen oxides, particulate matter less than 10 microns, volatile organic compounds including styrene and benzene
	Sample Locations:	Styrene dry scrubber exhaust stack
	Sample ID Nos.:	See attachment A
	Identification	The samples are labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time and whether further analysis is required.

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<i>Test</i>	<i>Test Method Number for Sampling &amp; Analysis</i>	<i>Laboratory Analysis &amp; Report No.</i>
Dry Gas Density	NSW TM-23, USEPA M3	
Moisture	NSW TM-22, USEPA M4	
Molecular Weight of Stack Gases	NSW TM-23, USEPA M3	
Oxides of Nitrogen	NSW TM-11, USEPA M7E	Air Noise Environment;
Particulate Matter less than 10 microns	NSW OM-5, USEPA M201A	NATA Accreditation No. 15841; Report No. 227402.0034
Stack Pressure & Volumetric Flow	NSW TM-2, USEPA M2	
Stack Temperature	NSW TM-2, USEPA M2	
Velocity	NSW TM-2, USEPA M2	
Volatile Organic Compounds (styrene, benzene, total as n-Propane)	NSW TM-34, USEPA M18	TestSafe Australia, NATA Accreditation No. 3726, Report No. 2022-4224

**Deviations from Test Methods** Nil

**Sampling Times** NSW - As per Test Method requirements or if not specified in the Test Method then as per Protection of the Environment Operations (Clean Air) Regulations Part 2.

**Reference Conditions** NSW - As per  
(1) Environment Protection Licence conditions, or  
(2) Part 3 of the Protection of the Environment Operations (Clean Air) Regulations

All associated NATA endorsed Test Reports/Certificates of Analysis are provided in Attachment A.

Issue date: 2 November 2022



P W Stephenson  
Managing Director

## 1.1 SCOPE OF WORK

The scope of work undertaken at Rocbolt Resins, Smeaton Grange, on October 13, 2022 is tabled below. Rocbolt Resins holds Environment Protection Licence (EPL) No. 20944.

Parameter	Styrene Scrubber Exhaust Stack	Units of Measure	NSW Approved Test Method
VOCs including Styrene and Benzene	2 samples	mg/m <sup>3</sup> or g/s	OM-2, TM-34
Particulate matter less than 10 microns	1 sample	mg/m <sup>3</sup>	OM-5, USEPA 201A
Nitrogen Oxides	Continuous	mg/m <sup>3</sup>	TM-11
Dry Gas Density	✓	kg/m <sup>2</sup>	TM-23
Moisture	✓	%	TM-22
Molecular weight of stack gases	✓	g.g-mole	TM-23
Temperature	✓	K	TM-2
Velocity	✓	m/s	TM-2
Volumetric flowrate	✓	m <sup>3</sup> /s	TM-2

### Key:

kg/m <sup>3</sup>	=	kilograms per cubic metre
mg/m <sup>3</sup>	=	milligrams per cubic metre at 0°C and 101.3 kilopascals (kPa)
g/s	=	grams per second
%	=	percentage
g.g-mole	=	grams per gram mole
g/s	=	grams per second
°C	=	degrees Celsius
TM	=	test method
m/s	=	metres per second
m <sup>3</sup> /s	=	dry cubic metre per second 0°C and 101.3 kilopascals (kPa)
AS	=	Australian Standard
hr	=	hour
*	=	method agreed to by Chris Kelly, NSW EPA. Refer Benbow Environmental.

## 1.2 PRODUCTION AND SAMPLING CONDITIONS

Rocbolt Resins personnel considered the manufacturing facility was operating under typical conditions on the day of testing. Details of production conditions are available on request.

The following description of the process was supplied by Rocbolt Resins,

*Rocbolt Resins manufactures resin capsules used as reinforcement for rocks/strata in the mining industry in conjunction with steel bolts and cables.*

*The capsules are a 2 part capsule, an outer plastic skin, sealed at both ends with clips and a separate inner compartment. The larger compartment consists of a highly viscous polyester resin mastic paste comprising approximately 20% polyester resin (contains Styrene monomer) & 80% inert limestone fillers. The smaller compartment consists of catalyst containing inert limestone fillers, benzoyl peroxide paste and oil or water as the carrier. The ratio of the two compartment ranges from 80:20 to 93:7 by weight.*

### 1.3 SUMMARY OF EMISSION TEST RESULTS – 13 OCTOBER 2022

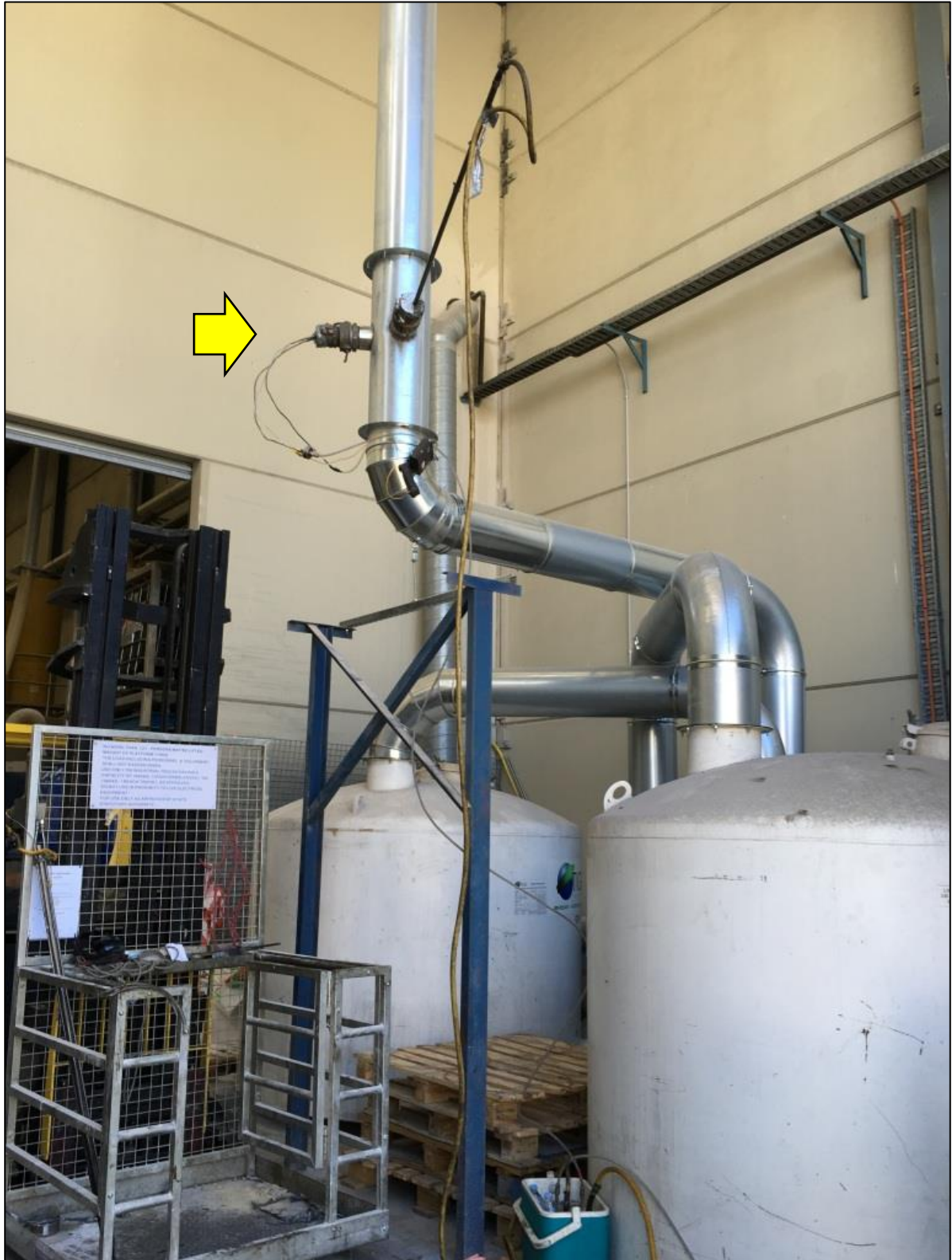
Parameter		Unit of measure	Average Measured Concentrations 13 October 2022 Exhaust Stack	EPL Licence 20944 Limit
Styrene	(as Styrene)	mg/m <sup>3</sup>	11.9	220
	MER (as Styrene)	g/s	0.21	--
Benzene	(as Benzene)	mg/m <sup>3</sup>	<0.18	--
	MER (as Benzene)	g/s	<6.9 X 10 <sup>-5</sup>	--
VOC (total)	(as n- propane)	mg/m <sup>3</sup>	8.75	--
PM <sub>10</sub>	concentration	mg/m <sup>3</sup>	0.36	--
	MER	g/s	0.00014	--
Oxides of nitrogen	concentration	mg/m <sup>3</sup>	<0.21	--
	MER	g/s	<0.00008	--
Stack temperature		°C	20	--
Velocity		m/s	6.0	--
Volumetric flow		m <sup>3</sup> /s	0.38	--
Moisture		%	1.7	--
Molecular weight dry stack gas		g/g mole	28.85	--
Gas Density		kg/m <sup>3</sup>	1.29	--
Stack pressure		kPa	101.7	--

Key:

EPL	=	Environment Protection Licence
MER	=	Mass Emission Rate
VOC	=	Volatile organic compounds
mg/m <sup>3</sup>	=	milligrams per cubic metre at 0°C and 101.3 kilopascals (kPa)
g/s	=	grams per second
°C	=	degrees Celsius
m/s	=	metres per second
m <sup>3</sup> /s	=	dry cubic metre per second 0°C and 101.3 kilopascals (kPa)
%	=	percentage
<	=	less than
g/g mole	=	grams per gram mole
kg/m <sup>3</sup>	=	Kilograms per cubic metre
kPa	=	Kilo Pascals
--	=	not specified in EPL 20944

## 1.4 DRY SCRUBBER SAMPLING LOCATIONS

PHOTOGRAPH 1 DRY CARBON SCRUBBERS AND OUTLET SAMPLE PORTS



**PHOTOGRAPH 2 VARIABLE SPEED FAN EXTRACTING AIR FROM WITHIN PLANT TO SCRUBBER TOWERS IN SERIES**





PHOTOGRAPH 3 DRY SCRUBBER MANUFACTURER'S DETAILS



## VAPOR PHASE UNIT

INSTALLATION/OPERATING INSTRUCTIONS ATTACHED TO UNIT

MODEL	Maximum Operating		Media			
	Press. psig	Temp. °F	<input type="checkbox"/> Activated Carbon	<input type="checkbox"/> FIBER	<input type="checkbox"/> MMS	<input type="checkbox"/> SAFE
<b>NIXTOX™</b>						
<input type="checkbox"/> N400XP		Atm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> N20XP <input type="checkbox"/> N50XP <input type="checkbox"/> N100XP		130	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> N250		3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> N50 <input type="checkbox"/> N100 <input type="checkbox"/> N150		6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> N1200PHD <input type="checkbox"/> N2000PHD <input type="checkbox"/> N4000PHD		6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> N750PDB <input type="checkbox"/> N1200PDB <input type="checkbox"/> N1800PDB		3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> N2500PDB <input type="checkbox"/> N4000PDB <input type="checkbox"/> N5000PDB		15	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> NB15 <input type="checkbox"/> NB20		15	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>ECONOSORB™</b>						
<input type="checkbox"/> Econo V		6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> EVP1000 <input type="checkbox"/> EVP2000		1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> EV1000 <input type="checkbox"/> EV2000 <input type="checkbox"/> EV3000 <input type="checkbox"/> EV5000		1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> OTHER		1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**CAUTION:** Wet activated carbon can reduce oxygen in confined spaces. Use low oxygen safety procedures when entering activated vessels containing activated carbon.

**CAUTION:** Unless unit has designated lifting legs, handle/hoist from bottom only.

**Technical or commercial inquiries:** TIGG Corporation, 1 Wilcox Avenue, Oakdale, PA 15071, 800-925-0011 or 724-753-3001, email: info@tigg.com

**Manufacture and shipping point:** TIGG Corporation, 2540 Pangum Road, Huber Springs, AR 72543, 301-362-8652, Fax: 301-362-3870

**WARRANTY:** TIGG Corporation warrants this assembly to be in accordance with its published specifications. Due to the wide variety of potential applications and conditions of use, no other express or implied warranty is made for performance, safety or suitability for a particular purpose.

**CAUTION:** Activated carbon can react with oxidizing or acidic volatile agents such as ozone, chlorine, nitrous, high oxygen concentrations and other oxidants to form heat. An exothermic reaction can occur if not recommended with these materials.

**CAUTION:** High concentrations of volatile hydrocarbons and olefins will react with activated carbon to form heat. This heat may be removed by spraying the carbon with water. This is accomplished by flooding and draining the unit with water.

**CAUTION:** If tanks, vessels, pipes or other equipment is to be used in conjunction with this unit, the design and construction of the system must be such that it will not be subjected to pressures in excess of the design pressure of the system. Check the carbon bed for any signs of excessive heat. Observe the carbon bed for any signs of excessive heat. Observe the carbon bed for any signs of excessive heat.

**CAUTION:** In the event the unit is connected to a storage tank or other source of compressed gas, it may be necessary to install a flame arrester in the connecting line. This arrester should be designed to the specifications of the tank or source of compressed gas.

**CAUTION:** When using this unit under vacuum, the discharge is an absolute vacuum. A large quantity of liquid may be drawn into the unit and cause damage to the unit. The unit should be designed to handle this liquid.

**CAUTION:** Make sure the unit is properly grounded. Grounding should be made to a suitable ground. Grounding should be made to a suitable ground.

800-925-0011

## 1.5 CONCLUSIONS

Emissions were monitored on the discharge side of the two dry carbon scrubbing units connected in series, at the Rocbolt Resins manufacturing facility with the following results:

- The average Styrene emission concentration (reported as Styrene) was 11.9 mg/m<sup>3</sup> which was compliant with the EPL limit of 220 mg/m<sup>3</sup>. The styrene mass emission rate (MER) was less than 0.21 grams per second (g/s).
- The average benzene MER (reported as benzene) was less than 6.9 X 10<sup>-5</sup> g/s;
- The average total VOC MER (reported as n-propane) was 0.0033 g/s;
- The average emission concentration of Oxides of Nitrogen (NO<sub>x</sub>) (expressed as nitrogen dioxide (NO<sub>2</sub>)) was <0.21 mg/m<sup>3</sup>. The NO<sub>x</sub> MER was <0.00008 g/s.
- The average PM<sub>10</sub> emission concentration was 0.36 mg/m<sup>3</sup>. The PM<sub>10</sub> MER was 0.0001 g/s.
- Rocbolt Resins advised that the variable speed extraction fan serving the scrubber system was running at its normal set point (20 Hertz) during the system efficiency testing. This is of the order of 50% of total flow;
- However, the fan speed is variable depending on demand for extraction within the plant. Rocbolt Resins advise that this is both an energy conservation and scrubber efficiency optimisation policy.

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**ATTACHMENT A – NATA CERTIFICATES OF ANALYSIS**

**TESTSAFE NSW – REPORT NO. 2022-4224**

**ANE - REPORT NO. 227402.0034**

**SEMA - CHAIN OF CUSTODY S25969**



Peter Stephenson  
 Stephenson Environmental Management Australia  
 PO Box 6398  
 SILVERWATER NSW 1811

**Lab. Reference:** 2022-4224

Samples analysed as received

**SAMPLE ORIGIN:** Project No: 7253

**DATE OF INVESTIGATION:** 13/10/2022

**DATE RECEIVED:** 14/10/22

**ANALYSIS REQUIRED:** Volatile Organic Compound

**REPORT OF ANALYSIS OFFICIAL: Sensitive – Personal**

See attached sheet(s) for sample description and test results.

The results of this report have been approved by the signatory whose signature appears below.

For all administrative or account details please contact the Laboratory.

Increment and total pagination can be seen on the following pages.

Martin Mazereeuw  
 Manager

**Date:** 20/10/22

**TestSafe Australia – Chemical Analysis Branch**  
 Level 2, Building 1, 9-15 Chilvers Road, Thornleigh, NSW 2120, Australia  
 T: +61 2 9473 4000 E: [lab@safework.nsw.gov.au](mailto:lab@safework.nsw.gov.au) W: [testsafe.com.au](http://testsafe.com.au)  
 ABN 81 913 830 179



Accreditation No. 3726

Accredited for compliance with ISO/IEC 17025 - Testing



SafeWork NSW



**Analysis of Volatile Organic Compounds in Workplace Air by GC/MS**

Client: Stephenson  
Sample ID: 728363

Date Sampled: 13/10/2022  
Date Analysed: 18/10/2022  
Reference Number: 2022-4224-1

No	Compounds	CAS No	Front	Back	No	Compounds	CAS No	Front	Back
			µg/section					µg/section	
<b>Aliphatic hydrocarbons</b> (LOQ = 1µg/c; A18 - A2) = 5µg/c)			<b>Aromatic hydrocarbons</b> (LOQ = 1µg/compound/section)						
1	2-Methylbutane	78-78-4	<LOQ	<LOQ	39	Benzene	71-43-2	<LOQ	<LOQ
2	n-Pentane	109-66-0	<LOQ	<LOQ	40	Ethylbenzene	100-41-4	<LOQ	<LOQ
3	2-Methylpentane	107-82-5	<LOQ	<LOQ	41	Isopropylbenzene	98-82-8	<LOQ	<LOQ
4	3-Methylpentane	96-14-0	<LOQ	<LOQ	42	1,2,3-Trimethylbenzene	526-73-8	<LOQ	<LOQ
5	Cyclopentane	287-92-3	<LOQ	<LOQ	43	1,2,4-Trimethylbenzene	95-63-6	<LOQ	<LOQ
6	Methylcyclopentane	96-37-7	<LOQ	<LOQ	44	1,3,5-Trimethylbenzene	108-67-8	<LOQ	<LOQ
7	2,3-Dimethylpentane	363-39-3	<LOQ	<LOQ	45	Styrene	100-42-5	100	<LOQ
8	n-Hexane	110-54-3	<LOQ	<LOQ	46	Toluene	108-88-3	3	<LOQ
9	3-Methylhexane	589-34-4	<LOQ	<LOQ	47	p-Xylene &/or m-Xylene	106-48-6 106-95-1	<LOQ	<LOQ
10	Cyclohexane	110-82-7	<LOQ	<LOQ	48	o-Xylene	95-47-6	<LOQ	<LOQ
11	Methylcyclohexane	108-87-2	<LOQ	<LOQ	<b>Ketones</b> (LOQ = 1µg/c; LOQ #49, #53 = 10µg/c; #50, #51 = 50µg/c)				
12	2,2,4-Trimethylpentane	540-84-1	<LOQ	<LOQ	49	Acetone	67-64-1	35	<LOQ
13	n-Heptane	142-82-5	<LOQ	<LOQ	50	Acetone	313-86-0	<LOQ	<LOQ
14	n-Octane	111-65-9	<LOQ	<LOQ	51	Diacetone alcohol	123-42-2	<LOQ	<LOQ
15	n-Nonane	111-84-2	<LOQ	<LOQ	52	Cyclohexanone	108-94-1	<LOQ	<LOQ
16	n-Decane	124-18-5	<LOQ	<LOQ	53	Isophorone	78-59-1	<LOQ	<LOQ
17	n-Undecane	1120-21-4	<LOQ	<LOQ	54	Methyl ethyl ketone (MEK)	78-93-3	<LOQ	<LOQ
18	n-Dodecane	112-40-3	<LOQ	<LOQ	55	Methyl isobutyl ketone (MIBK)	108-10-1	<LOQ	<LOQ
19	n-Tridecane	629-30-3	<LOQ	<LOQ	<b>Alcohols</b> (LOQ = 1µg/c; #56, #57, #58, #59 = 10µg/c)				
20	n-Tetradecane	629-59-4	<LOQ	<LOQ	56	Ethyl alcohol	64-17-5	<LOQ	<LOQ
21	α-Pinene	80-36-8	<LOQ	<LOQ	57	n-Butyl alcohol	71-36-3	<LOQ	<LOQ
22	β-Pinene	127-91-3	<LOQ	<LOQ	58	Isobutyl alcohol	78-83-1	<LOQ	<LOQ
23	D-Limonene	118-86-3	<LOQ	<LOQ	59	Isopropyl alcohol	67-63-0	<LOQ	<LOQ
<b>Chlorinated hydrocarbons</b> (LOQ = 1µg/compound/sample)			60 2-Ethyl hexanol 104-76-7 <LOQ <LOQ						
24	Dichloromethane	75-09-2	<LOQ	<LOQ	61	Cyclohexanol	108-93-0	<LOQ	<LOQ
25	1,1-Dichloroethane	75-34-3	<LOQ	<LOQ	<b>Acetates</b> (LOQ = 1µg/c; #62 = 10µg/c)				
26	1,2-Dichloroethane	107-06-2	<LOQ	<LOQ	62	Ethyl acetate	141-78-6	<LOQ	<LOQ
27	Chloroform	67-66-3	<LOQ	<LOQ	63	n-Propyl acetate	109-60-4	<LOQ	<LOQ
28	1,1,1-Trichloroethane	71-55-6	<LOQ	<LOQ	64	n-Butyl acetate	123-86-4	<LOQ	<LOQ
29	1,1,2-Trichloroethane	79-00-3	<LOQ	<LOQ	65	Isobutyl acetate	110-19-0	<LOQ	<LOQ
30	Trichloroethylene	79-01-6	<LOQ	<LOQ	<b>Ethers</b> (LOQ = 1µg/c; #66 = 10µg/c)				
31	Carbon tetrachloride	56-23-3	<LOQ	<LOQ	66	Ethyl ether	60-29-7	<LOQ	<LOQ
32	Perchloroethylene	127-18-4	<LOQ	<LOQ	67	tert-Butyl methyl ether (tBME)	1634-01-4	<LOQ	<LOQ
33	1,1,2,2-Tetrachloroethane	79-34-5	<LOQ	<LOQ	68	Tetrahydrofuran (THF)	109-99-9	<LOQ	<LOQ
34	Chlorobenzene	108-90-7	<LOQ	<LOQ	<b>Glycols</b> (LOQ = 1µg/c; #69, #73 = 50µg/c)				
35	1,2-Dichlorobenzene	95-50-1	<LOQ	<LOQ	69	PGME	107-98-2	<LOQ	<LOQ
36	1,4-Dichlorobenzene	106-46-7	<LOQ	<LOQ	70	Ethylene glycol diethyl ether	629-14-1	<LOQ	<LOQ
<b>Miscellaneous</b> (LOQ #37 = 10µg & #38 = 5µg/compound/sample)			71 PGMEA 108-63-6 <LOQ <LOQ						
37	Acetonitrile	75-05-8	<LOQ	<LOQ	72	Cellosolve acetate	111-13-9	<LOQ	<LOQ
38	n-Vinyl-2-pyrrolidone	88-12-0	<LOQ	<LOQ	73	DGMEA	112-15-2	<LOQ	<LOQ
<b>Extra compound</b> (LOQ = 10µg/compound/sample)			<b>Extra compound</b> (LOQ = 5µg/compound/sample)						
74	Bromopropane *	106-94-5	<LOQ	<LOQ	75	Naphthalene *	91-20-3	<LOQ	<LOQ
<b>Total VOCs</b> (LOQ = 50µg/compound/section)			139	<LOQ	Worksheet check				

2022-4224

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TestSafe Australia – Chemical Analysis Branch  
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Telephone +61 2 9473 4000 Email lab@safework.nsw.gov.au Website testsafe.com.au



Accreditation No. 3726

Accredited for compliance with ISO/IEC 17025 - Testing

SW08051 0817



SafeWork NSW



**Analysis of Volatile Organic Compounds in Workplace Air by GC/MS**

Client: Stephenson  
Sample ID: 728364

Date Sampled : 13/10/2022  
Date Analysed : 18/10/2022  
Reference Number : 2022-4224-2

No	Compounds	CAS No	Front	Back	No	Compounds	CAS No	Front	Back
			µg/section					µg/section	
<b>Aliphatic hydrocarbons</b> (LOQ = 5µg/c; 418 - 423 = 5µg/c)			<b>Aromatic hydrocarbons</b> (LOQ = 1µg/compound)						
1	2-Methylbutane	78-78-4	<LOQ	<LOQ	39	Benzene	71-43-2	<LOQ	<LOQ
2	n-Pentane	109-66-0	<LOQ	<LOQ	40	Ethylbenzene	100-41-4	<LOQ	<LOQ
3	2-Methylpentane	107-83-5	<LOQ	<LOQ	41	Isopropylbenzene	98-82-8	<LOQ	<LOQ
4	3-Methylpentane	96-14-0	<LOQ	<LOQ	42	1,2,3-Trimethylbenzene	526-73-8	<LOQ	<LOQ
5	Cyclopentane	287-92-3	<LOQ	<LOQ	43	1,2,4-Trimethylbenzene	95-63-6	<LOQ	<LOQ
6	Methylcyclopentane	96-37-7	<LOQ	<LOQ	44	1,3,5-Trimethylbenzene	108-67-8	<LOQ	<LOQ
7	2,3-Dimethylpentane	565-59-3	<LOQ	<LOQ	45	Styrene	100-42-5	31	<LOQ
8	n-Hexane	110-54-3	<LOQ	<LOQ	46	Toluene	108-88-3	9	<LOQ
9	3-Methylhexane	589-34-4	<LOQ	<LOQ	47	p-Xylene &/or m-Xylene	106-48-6 95-93-4	<LOQ	<LOQ
10	Cyclohexane	110-82-7	<LOQ	<LOQ	48	o-Xylene	95-47-6	<LOQ	<LOQ
11	Methylcyclohexane	108-87-2	<LOQ	<LOQ	<b>Ketones</b> (LOQ = 1µg/c; LOQ 449, 453 = 10µg/c; 450, 451 = 50µg/c)				
12	2,2,4-Trimethylpentane	540-84-1	<LOQ	<LOQ	49	Acetone	67-64-1	12	<LOQ
13	n-Heptane	142-82-5	<LOQ	<LOQ	50	Acetoin	513-86-0	<LOQ	<LOQ
14	n-Octane	111-65-9	<LOQ	<LOQ	51	Diacetone alcohol	123-42-2	<LOQ	<LOQ
15	n-Nonane	111-84-2	<LOQ	<LOQ	52	Cyclohexanone	108-94-1	<LOQ	<LOQ
16	n-Decane	124-18-5	<LOQ	<LOQ	53	Isophorone	78-59-1	<LOQ	<LOQ
17	n-Undecane	1120-21-4	<LOQ	<LOQ	54	Methyl ethyl ketone (MEK)	78-93-3	<LOQ	<LOQ
18	n-Dodecane	112-40-3	<LOQ	<LOQ	55	Methyl isobutyl ketone (MIBK)	108-10-1	<LOQ	<LOQ
19	n-Tridecane	629-30-5	<LOQ	<LOQ	<b>Alcohols</b> (LOQ = 1µg/c; 456, 457, 458, 460 = 10µg/c)				
20	n-Tetradecane	629-59-4	<LOQ	<LOQ	56	Ethyl alcohol	64-17-5	<LOQ	<LOQ
21	α-Pinene	80-56-8	<LOQ	<LOQ	57	n-Butyl alcohol	71-36-3	<LOQ	<LOQ
22	β-Pinene	127-91-3	<LOQ	<LOQ	58	Isobutyl alcohol	78-83-1	<LOQ	<LOQ
23	D-Limonene	138-86-3	<LOQ	<LOQ	59	Isopropyl alcohol	67-63-0	<LOQ	<LOQ
<b>Chlorinated hydrocarbons</b> (LOQ = 1µg/compound/sample)			60 2-Ethyl hexanol 104-76-7 <LOQ <LOQ						
24	Dichloromethane	75-09-2	<LOQ	<LOQ	61	Cyclohexanol	108-93-0	<LOQ	<LOQ
25	1,1-Dichloroethane	75-34-3	<LOQ	<LOQ	<b>Acetates</b> (LOQ = 1µg/c; 462 = 10µg/c)				
26	1,2-Dichloroethane	107-06-2	<LOQ	<LOQ	62	Ethyl acetate	141-78-6	<LOQ	<LOQ
27	Chloroform	67-66-3	<LOQ	<LOQ	63	n-Propyl acetate	109-60-4	<LOQ	<LOQ
28	1,1,1-Trichloroethane	71-55-6	<LOQ	<LOQ	64	n-Butyl acetate	123-86-4	<LOQ	<LOQ
29	1,1,2-Trichloroethane	79-00-5	<LOQ	<LOQ	65	Isobutyl acetate	110-19-0	<LOQ	<LOQ
30	Trichloroethylene	79-01-6	<LOQ	<LOQ	<b>Ethers</b> (LOQ = 1µg/c; 466 = 10µg/c)				
31	Carbon tetrachloride	56-23-5	<LOQ	<LOQ	66	Ethyl ether	60-29-7	<LOQ	<LOQ
32	Perchloroethylene	127-18-4	<LOQ	<LOQ	67	tert-Butyl methyl ether (tBME)	1634-04-4	<LOQ	<LOQ
33	1,1,2,2-Tetrachloroethane	79-34-5	<LOQ	<LOQ	68	Tetrahydrofuran (THF)	109-99-9	<LOQ	<LOQ
34	Chlorobenzene	108-90-7	<LOQ	<LOQ	<b>Glycols</b> (LOQ = 1µg/c; 469, 473 = 50µg/c)				
35	1,2-Dichlorobenzene	95-50-1	<LOQ	<LOQ	69	PGME	107-98-2	<LOQ	<LOQ
36	1,4-Dichlorobenzene	106-46-7	<LOQ	<LOQ	70	Ethylene glycol diethyl ether	629-14-1	<LOQ	<LOQ
<b>Miscellaneous</b> (LOQ 437 = 10µg & 438 = 50µg/compound/sample)			71 PGMEA 108-65-6 <LOQ <LOQ						
37	Acetonitrile	75-05-8	<LOQ	<LOQ	72	Cellosolve acetate	111-15-9	<LOQ	<LOQ
38	n-Vinyl-2-pyrrolidone	88-12-0	<LOQ	<LOQ	73	DGMEA	112-13-2	<LOQ	<LOQ
<b>Extra compound</b> (LOQ = 10µg/compound/sample)			<b>Extra compound</b> (LOQ = 50µg/compound/sample)						
74	Bromopropane *	106-94-5	<LOQ	<LOQ	75	Naphthalene *	91-20-3	<LOQ	<LOQ
<b>Total VOCs</b> (LOQ = 5µg/compound/section)			52	<LOQ	Worksheet check				

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Accreditation No. 3726

Accredited for compliance with ISO/IEC 17025 - Testing

SW08051 0817





SafeWork NSW



**Analysis of Volatile Organic Compounds in Workplace Air by GC/MS**

All compounds (numbered 1-73) that are reported in the analysis are covered within the scope of NATA accreditation. Any additional compounds denoted with \* are not covered by NATA accreditation.

Method : WCA.207 Analysis of Volatile Organic Compounds in Workplace Air by Gas Chromatography/Mass Spectrometry

Limit of Quantitation (LOQ) : 1 µg/sample except n-Dodecane, n-Tridecane, n-Tetradecane, α-Pinene, β-Pinene and Limonene at 5 µg/sample; 10 µg/sample for Acetonitrile, Acetone, Isophorone, Ethanol, n-Butyl alcohol, Isobutyl alcohol, 2-Ethyl hexanol, Ethyl acetate, Ethyl ether and Bromopropane; 50 µg/sample for α-Vinyl-2-pyrrolidone, Acetoin, Diacetone alcohol, PGME, DGMEA and Naphthalene.

Method Description : Volatile organic compounds were trapped from the workplace air onto charcoal tubes by the use of a personal air monitoring pump. The volatile organic compounds were desorbed from the charcoal in the laboratory with CS<sub>2</sub>. An aliquot of the desorbant was analysed by gas chromatography with mass spectrometry detection.

PGME: Propylene Glycol Monomethyl Ether  
 PGMEA: Propylene Glycol Monomethyl Ether Acetate  
 DGMEA: Diethylene Glycol Monoethyl Ether Acetate

Measurement Uncertainty : The measurement uncertainty is an estimate that characterises the range of values within which the true value is asserted to lie. The uncertainty estimate is an expanded uncertainty using a coverage factor of 2, which gives a level of confidence of approximately 95%. The estimate is compliant with the "ISO Guide to the Expression of Uncertainty in Measurement" and is a full estimate based on in-house method validation and quality control data. The measurement uncertainty relates to the analysis of the analyte on the sampling device and does not take into consideration the sampling parameters such as pump flowrate, time, temperature and pressure. The measurement of uncertainty estimates are available upon request.

2022-4224

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Accreditation No. 3726

Accredited for compliance with ISO/IEC 17025 - Testing

SW0051 0817



**Air Noise Environment**  
Environmental Monitoring and Assessment

# Styrene Scrubber Exhaust Emission Monitoring - October 2022

## Rocbolt Resins PTY LTD

Rocbolt Resins Pty Ltd  
40-44 Anzac Avenue  
Smeaton Grange  
NSW 2567

Sampling Date: 13 October 2022

Issued: 3 November 2022

Prepared by:  
**Air Noise Environment**  
ABN: 13 081 834 513



*Accredited for Compliance with ISO/IEC 17025 - Testing*







NATA Accreditation Number: 15841

Accredited for compliance with ISO/IEC 17025 - Testing

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01.1	3/11/2022	Gary Hall	<i>Gary Hall</i>	Added NOx and VOC (as n-propane)
01.2				

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The validity and comprehensiveness of supplied information has not been independently verified and, for the purposes of this report, it is assumed that the information provided to Air Noise Environment Pty Ltd for the purposes of this project is both complete and accurate.





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## Executive Summary

Stack Emission testing for VOC's, NO<sub>x</sub> and Particulate matter less than 10 microns (PM<sub>10</sub>) was conducted at the Rocbolt Resins Pty Ltd site in Smeaton Grange, NSW. The emission testing from the Dry Scrubber Exhaust Stack was completed on 13 October 2022. A summary of the results are included in Table 1 below.

Table 1: Summary of Results for the Rocbolt Resins Dry Scrubber Exhaust Stack.

Parameter	Results	Units	EPL Licence 20944 Limit
Particulate Matter (PM <sub>10</sub> )	0.36	mg/Nm <sup>3</sup>	-
Styrene	11.9	mg/Nm <sup>3</sup>	220
TVOC (as n-propane)	8.75	mg/Nm <sup>3</sup>	-
Nitrogen Oxides (expressed as NO <sub>2</sub> )	<0.21	mg/Nm <sup>3</sup>	-
Benzene	<0.18	mg/Nm <sup>3</sup>	-
Velocity	6.0	m/s	-
Temperature	27	°C	-
Molecular weight	28.85	g/g-mole	-
Volumetric flow	0.38	Nm <sup>3</sup> /s	-
Moisture	1.7	%	-
Oxygen	21.03	%	-





# 1 Introduction

Stephenson Environmental Management Australia (SEMA) commissioned Air Noise Environment Pty Ltd to assist with conducting monitoring of air emissions from the Rocbolt Resins Pty Ltd site in Smeaton Grange NSW. The emission testing from the Dry Scrubber Exhaust stack was completed on 13 October 2022.

The objectives of the emission testing were to meet the annual monitoring requirements for the stack under the site's Environmental Protection Licence (EPL) 20944 to determine if the concentration limits specified in the EPL were met.

Table 1-1 details the monitoring locations and the monitoring performed at each location. The monitoring was completed on 13 October 2022.

Table 1-1: Monitoring Locations and Parameters

Parameter	Styrene Scrubber Exhaust stack	Units of Measure	NSW Approved Test Method	EPL Licence 20944 Limit
VOC's including Styrene	2 Samples	mg/Nm <sup>3</sup>	OM-2, TM-34	220 (Styrene)
Particulate matter less than 10 microns	1 sample	mg/Nm <sup>3</sup>	OM-5 USEPA 201A	-
Nitrogen Oxides	Continuous	mg/Nm <sup>3</sup>	TM-11	-
Oxygen	✓	%	TM-25	-
Moisture	✓	%	TM-22	-
Molecular weight of stack gases	✓	g/g-mole	TM-23	-
Temperature	✓	°C	TM-2	-
Velocity	✓	m/s	TM-2	-
Volumetric flow rate	✓	m <sup>3</sup> /s	TM-2	-

The monitoring of air emissions at the Rocbolt Resins facility was completed during normal operating conditions. Any factors that may have affected the monitoring results were not observed by or brought to the notice of Air Noise Environment (ANE) staff except where noted in this report.



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 I:\Projects\Roads\Sharepoint\Sem\Site\Stephensonenvironmental\Shared Documents\Smeaton Grange\227402.0034 - Rocbolt Stack Testing\Out\227402.0034Report01.1.Docx  
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## 2 Methodology

### 2.1 Emission Testing

Table 2-1 below lists the Methods used when undertaking emission monitoring at the Rocbolt Resins Pty Ltd site.

All air quality monitoring undertaken by Air Noise Environment (ANE) has been undertaken in accordance with the methods identified in Table 2-1 below unless as specified in Section 3.3.

Table 2-1: Summary of Emission Monitoring Methods

Measurement Parameter	Method Equivalency
Temperature	TM-2 (USEPA Method 2 Determination of Stack Gas Velocity and Flow Rate)
Dry Gas Density	TM23 (USEPA Method 3 Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources)
Flow	TM-2 (USEPA Method 2 Determination of Stack Gas Velocity and Flow Rate)
Moisture Content	TM-22 (USEPA Method 4 Determination of Moisture Content in Stack Gases)
Molecular Weight	TM23 (USEPA Method 3 Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources)
NO <sub>x</sub>	TM-11 (US EPA Method 7E Determination of Nitrous Oxide emissions from stationary sources.)
Oxygen	TM23 (USEPA Method 3a Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources)
Particulate Matter less than 10microns (PM <sub>10</sub> )	OM-5 USEPA 201A Determination of PM10 and PM2.5 Emissions from Stationary Sources.
VOC's (including Styrene, Benzene, Toluene, Acetone)	TM-34/USEPA Method 18 Measurement of Gaseous Organic Compounds by Gas Chromatography.

### 2.2 Laboratory Analysis

Table 2-2 Provides a list of the NATA accredited laboratories that performed the applicable analysis, NATA accreditation number, and report number.

Table 2-2: Table of NATA Accredited Laboratories with NATA Accreditation Number

Measurement Parameter	NATA Accreditation Number	Report Number
VOC's (including Styrene, Benzene, Toluene, Acetone)	SafeWork NSW TestSafe Australia 3726	2022-4224

### 2.3 Deviation from the methods.

Post sampling, VOC sample tubes were provided to SEMA who submitted the samples to Test Safe Laboratories for analysis.





## 3 Results

### 3.1 Production Conditions

On the day of testing, the plant operating procedures and production rate was considered typical by Rocbolt Resins Pty Ltd personnel.

### 3.2 Dry Scrubber Exhaust Stack

#### 3.2.1 Monitoring Results

Results of emissions monitoring for the Dry Scrubber Exhaust Stack are provided in Table 3-1 below for emissions monitoring completed on 13 October 2022.

Table 3-1: Flow and Sample Characteristics for the Dry Scrubber Exhaust Stack

Parameter	Units of Measure	Average Measured Concentration	EPL Licence 20944 Limit
Styrene	mg/Nm <sup>3</sup>	11.9	220
Styrene	g/s	0.21	-
TVOC (as n-propane)	mg/Nm <sup>3</sup>	8.75	-
TVOC (as n-propane)	g/s	0.0033	-
Benzene	mg/Nm <sup>3</sup>	<0.18	-
Benzene	g/s	<0.000069	-
NO <sub>x</sub> (expressed as NO <sub>2</sub> )	mg/Nm <sup>3</sup>	<0.21	-
NO <sub>x</sub> (expressed as NO <sub>2</sub> )	g/s	<0.00008	-
Particulate Matter (PM <sub>10</sub> )	mg/Nm <sup>3</sup>	0.36	-
Particulate Matter (PM <sub>10</sub> )	g/s	0.00014	-
Stack Temperature	°C	20	-
Velocity	m/s	6.0	-
Volumetric flow	Nm <sup>3</sup> /s	0.38	-
Moisture	%	1.7	-
Molecular weight	g/g-mole	28.85	-





Parameter	Units of Measure	Average Measured Concentration	EPL Licence 20944 Limit
Average Oxygen	%	21.03	-







### 3.3 Accuracy of Monitoring Results

Tables 3-2 presents a summary of the estimated method uncertainties for each of the monitoring parameters.

Table 3-2: Flow and Sample Characteristics for the Dry Scrubber Exhaust Stack

Measurement Parameter	Method	% Uncertainty	Uncertainty	Units
Oxygen	USEPA Method 3A	2.00	0.42	%
Particulates	M201A	10.00	0.96	mg/Nm <sup>3</sup>
NO <sub>x</sub>	US EPA Method 7E	5.00	- <sup>a</sup>	mg/Nm <sup>3</sup>
VOC	(USEPA Method 18)	5.98	1.46	mg/Nm <sup>3</sup>

# Uncertainty values cited are calculated at the 95% confidence level, with a coverage factor of 2.

\* NO<sub>x</sub> results less than detection limits.





## Appendix A – Glossary of Terms





### APPENDIX A: GLOSSARY OF TERMS

<	The analytes tested for was not detected, the value stated is the reportable limit of detection
µg	Micrograms (10 <sup>-6</sup> grams)
AS	Australian Standard
dscm	dry standard cubic meters (at 0°C and 1 atmosphere)
g	grams
kg	kilograms
m	metres
m <sup>3</sup>	Cubic Metres, actual gas volume in cubic metres as measured.
mg	Milligrams
min	Minute
mg/m <sup>3</sup>	Milligrams (10 <sup>-3</sup> ) per cubic metre.
mmH <sub>2</sub> O	Millimetres of water
Mole	<p>The mole, symbol mol, is the SI unit of amount of substance. One mole contains exactly 6.022 140 76 × 10<sup>23</sup> elementary entities. This number is the fixed numerical value of the Avogadro constant, N<sub>A</sub>, when expressed in the unit mol<sup>-1</sup> and is called the Avogadro number.</p> <p>The amount of substance, symbol n, of a system is a measure of the number of specified elementary entities. An elementary entity may be an atom, a molecule, an ion, an electron, any other particle or specified group of particles.</p> <p>This definition implies the exact relation N<sub>A</sub> = 6.022 140 76 × 10<sup>23</sup> mol<sup>-1</sup>. Inverting this relation gives an exact expression for the mole in terms of the defining constant N<sub>A</sub>:</p> $1 \text{ mol} = \left( \frac{6.022\,140\,76 \times 10^{23}}{N_A} \right)$ <p>The effect of this definition is that the mole is the amount of substance of a system that contains 6.022 140 76 × 10<sup>23</sup> specified elementary entities.</p>
N/A	Not Applicable
ng	Nanograms (10 <sup>-9</sup> grams)
Nm <sup>3</sup>	Normalised Cubic Metres - Gas volume in dry cubic metres at standard temperature and pressure (0°C and 101.3 kPa).
ou	Odour Units
°C	Degrees Celsius
µg/m <sup>3</sup>	Micrograms (10 <sup>-6</sup> ) per cubic metre. Conversions from µg/m <sup>3</sup> to parts per





#### APPENDIX A: GLOSSARY OF TERMS

	volume concentrations (ie, ppb) are calculated at 25 °c.
ppb / ppm	Parts per billion / million.
PM	Particulate Matter.
PM <sub>10</sub> , PM <sub>2.5</sub> , PM <sub>1</sub>	Fine particulate matter with an equivalent aerodynamic diameter of less than 10, 2.5 or 1 micrometres respectively. Fine particulates are predominantly sourced from combustion processes. Vehicle emissions are a key source in urban environments.
sec	Second
Sm <sup>3</sup>	Standardised Cubic Metres - Gas volume in dry cubic metres at standard temperature and pressure (0°C and 101.3 kPa) and corrected to a standardised value (e.g. 7% O <sub>2</sub> ).
STP	Standard Temperature and Pressure (0°C and 101.3 kPa).
TVOC	Total Volatile Organic Compounds. These compounds can be both toxic and odorous.
USEPA	United States Environmental Protection Agency





**Stephenson**  
Environmental Management Australia

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Document No: 525969 \_\_\_\_\_  
Project No: 7253 \_\_\_\_\_  
Purchase Order No.: 5244 \_\_\_\_\_  
Purchase Results Required By: Normal \_\_\_\_\_  
Lab Name: Workcover Testsafe Australia \_\_\_\_\_  
Lab Telephone: (02) 9473 4000 \_\_\_\_\_  
Lab Contact Name: Martin \_\_\_\_\_  
Lab Facsimile: (02) 9980 6849 \_\_\_\_\_

Location	Sampling Date	Sample ID	Lab Sample ID	Parameter	NSW Test Method	Workcover Method	Temperature Chilled/ Ambient
ACS Stack R1	13/10/2022	728363		VOC Screen	TM-34	WCA.207	
ACS Stack R2	13/10/2022	728364		VOC Screen	TM-34	WCA.207	
Relinquished By: peter stephenson	Date/Time: 14/10/2022 @ 10:30		Received By:		Date/Time: / / @		
Samples Sent Intact: YES / NO			Samples Received Intact: YES / NO				
Comments: <b>Please contact us immediately should you have any questions with regards to the samples or analysis or if there will be any delays with the reporting.</b>							