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Attention: Kieren McDermott

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Subject: **Flare Emission Testing Report**
Tullamarine Closed Landfill

1. INTRODUCTION

Kleinfelder Australia (Kleinfelder) was commissioned by Transpacific Cleanaway Pty Ltd to report the results of emission testing undertaken at Tullamarine Closed Landfill located at the western end of Western Avenue, Westmeadows, Victoria (the site). Ektimo (EML) conducted the testing of the flare stack at the site which included laboratory analysis of the gas stream post combustion to determine emissions to air as part of exhaust gas composition. The following presents the results of the testing; screening of detectable analyte concentrations against applicable assessment criteria; and assessment of quality assurance / quality control parameters, commenting on the reliability of the data as supplied by Ektimo.

2. EMISSION TESTING

Emission testing was undertaken by Ektimo in 2015 to determine emissions to air, comprising testing at the flare stack, flare outlet and inlet line. It is noted that for the purposes of this report, only results from the flare stack/flare outlet have been considered.

Two tests were undertaken per day on 2 February 2015, 3 February 2015, 4 February 2015, 5 February 2015 and 11 February 2015, with each test running for 120 minutes. Analytical parameters for each day of testing are presented in **Table 1** below:

Table 1: Analytical Parameters

Location	Test Date	Analytes
Flare Stack	2 February 2015	Dioxins and furans (PCDD and PCDF), polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), organochlorine (OC), nitrogen oxides, carbon dioxide, carbon monoxide and oxygen.
	3 February 2015	Halides, halogens, amines, aldehydes, ammonia
	4 February 2015	Total particulate matter, metals, speciated volatile organic compounds (VOCs)
Flare Outlet	5 February 2015	Sulphuric acid, sulphur dioxide, sulphur trioxide
Flare Outlet	11 February 2015	C1-C4 hydrocarbons, sulphur gases

All sampling and analysis, with the exception of analysis of PCDDs and PCDFs, PAHs, metals and ammonia, was undertaken by Ektimo using methods as per requirements given in EPA Publication 440.1 *A Guide to the Sampling and Analysis of Air Emissions and Air Quality*. Analysis of PCDDs, PCDFs, PCBs and PAHs was undertaken by the Australian National Measurement Institute (ANMI) and analysis of metals and ammonia was undertaken by Envirolab.

Results of sample analysis including NATA accredited analytical reports are presented in the Ektimo (2015) *Emission Testing Report*, *Transpacific Cleanaway Landfills Ltd – Tullamarine* (Report Number R000541) provided as **Attachment B**.

3. QUALITY ASSURANCE/QUALITY CONTROL

All testing was undertaken using National Association of Testing Authorities (NATA) methods. A review of the appropriateness of testing methods and QA/QC program adopted by Ektimo was made by Kleinfelder with reference to EPA Publication 440.1. In general, testing by Ektimo is considered to be appropriate given that the testing program consisted of two test runs per pollutant (the minimum number of test runs required) with minimum sampling time of 120 minutes (greater than those specified for the pollutants in Table 1 of EPA Publication 440.1). Additionally, gas velocity, gas temperature, gas density, moisture and volumetric flow rate parameters were measured in accordance with EPA Publication 440.1.

Overall, Kleinfelder considered the testing methods to be appropriate and the data to be acceptable for assessment purposes.

4. REGULATORY FRAMEWORK

The State Environment Protection Policy (SEPP), Air Quality Management (AQM) (2001) and SEPP Ambient Air Quality (1999) form the framework for managing air emissions in the State of Victoria. The SEPP (Air Quality Management) establishes the framework for managing emissions of air pollutants into the air environment, such that the air quality objectives outlined in SEPP (Ambient Air Quality) are met.

The SEPP (Ambient Air Quality) also adopts the requirements of the National Environment Protection (Ambient Air Quality) Measure (NEPM). This NEPM sets standards, goals, monitoring and reporting protocols for six common pollutants: carbon monoxide (CO), nitrogen dioxide (NO_2), photochemical oxidants (as ozone), sulphur dioxide (SO_2), lead and particulate matter smaller than 10 micrometres (µm) in diameter (PM10). However, the intent of the NEPM is to be applied in a manor "*such that [monitoring contributes] to obtaining a representative measure of the air quality likely to be experienced by the general population in the region or subregion.*" Given monitoring for this assessment was completed directly at the flare outlet, application of NEPM standards and goals is not considered directly applicable to this assessment.

5. ADOPTED ASSESSMENT CRITERIA

According to the SEPPs, the following beneficial uses are to be protected throughout Victoria:

- Life, health and well-being of humans;
- Life, health and well-being of other forms of life, including the protection of ecosystems and biodiversity;
- Local amenity and aesthetic enjoyment;
- Visibility;
- The useful life and aesthetic appearance of buildings, structures, property and materials; and
- Climate systems that are consistent with human development, the life, health and well-being of humans, and the protection of ecosystems and biodiversity.

In order to protect the beneficial uses outlined in the SEPPs, air quality indicators have been defined into the following Classes:

- ***Class 1***: Indicators which are designated in the SEPP (*Air Quality Management*) as common air pollutants and includes nitrogen dioxide, sulphur dioxide, carbon monoxide, PM10 and lead. These pollutants are identified in the SEPP (*Ambient Air Quality*), have many sources and are widespread in the air environment.

- ***Class 2****:* Hazardous substances that may threaten the beneficial uses of the air environment by virtue of their toxicity, bioaccumulation or odour characteristics. Commonly known as air toxics, they are generally source specific. Like the Class 1 indicators, these may be widespread and therefore of regional concern, but may also be of local concern as a result of emissions from industrial sources.;

- ***Class 3****:* Extremely hazardous substances that are carcinogenic, mutagenic, teratogenic, highly toxic or highly persistent, and which may threaten the beneficial uses of the air environment. The distinction between Class 2 and 3 indicators is based on the level of toxicity and enables the appropriate level of control to be applied according to the seriousness of the possible adverse effects. Class 2 and 3 indicators are usually (but not always) of concern at a local level.; and

- ***Unclassified****:* Indicators of the beneficial uses of local amenity and aesthetic enjoyment, namely odour and total suspended particles (nuisance dust).

It is noted that many pollutants are both odorous and have toxic properties. Criteria have been set to protect against adverse health effects however, where a pollutant is highly odorous it may be offensive to people at relatively low concentrations where adverse health effects would not be expected. Therefore, criteria in these cases are based on the prevention of offensive odours but human health would also be protected as a consequence.

For the purposes of this assessment, Kleinfelder has screened the results obtained by Ektimo against the Environmental Quality Objectives provided in the SEPP Ambient Air Quality and the Design Criteria provided in the SEPP Air Quality Management. It should be noted that an exceedance of the SEPP criteria does not necessarily indicate an unacceptable health risk, however further assessment may be required.

It should be noted that for mixtures of chemicals (within the same chemical family), assessment is completed by calculating the toxicity equivalence (TEQ) of the mixture and screening this value against an appropriate criteria. The TEQ is calculated by multiplying the analytical result of individual chemicals within the chemical family with a toxicity weighting, or

toxicity equivalence factor (TEF). The TEF is an established value, determined for each chemical based on its individual toxicity, expressed as a ratio to the most toxic chemical in the family. For instance, for the TEQ applicable to Polycyclic Aromatic Hydrocarbons (PAHs): benzo(a)pyrene is identified as the most toxic and has a TEF of 1.0; bonzo(a)anthracene is less toxic and therefore as a TEF of 0.1. TEQs have been developed for two chemical families included as analytes within this assessment: Dioxins and Furans (I-TEQ); and PAHs (BaP-TEQ).

Table 2 below presents the applicable assessment criteria, noting that the criteria adopted are air quality, rather than air emissions criteria:

Table 2: Applicable Assessment Criteria

Analyte	SEPP (AQM) Odour (mg/m^3)	SEPP (AQM) Toxicity (mg/m^3)
Dioxins and Furans: I-TEQ (lower[1], middle[2] and upper[3] bound)	-	0.0037 (ng/m^3)
PAHs: BaP-TEQ (lower[1], middle[2] and upper[3] bound)	-	730 (ng/m^3)
Carbon monoxide	-	29
Total particulate matter	-	0.05
Hydrogen chloride	-	0.25
Fluoride	-	0.0029
Chlorine	-	0.1
Diethylamine	0.017	0.59
Triethylamine	0.36	0.39
Formaldehyde	-	0.4
Acetaldehyde	0.076	5.9
Acrolein	-	0.00077
Arsenic	-	0.00017
Chromium	-	0.017
Mercury	-	0.00033
Chloromethane	-	3.4
Vinyl chloride	-	0.043
Chloroethane	-	87
Bromoform	-	0.17
Sulphuric acid	-	0.033
Sulphur dioxide	-	0.45
Ethanol	3.8	63
Chloroform	-	1.6
1,1,1-Trichloroethane	-	23
1,2-Dichloroethane	-	0.13
Benzene	-	0.053

Analyte	SEPP (AQM) Odour (mg/m^3)	SEPP (AQM) Toxicity (mg/m^3)
Carbon tetrachloride	-	0.021
Butanol	0.9	5.1
Trichloroethene	-	0.9
Toluene	0.65	12
1,1,2-trichloroethane	-	1.8
Tetrachloroethene	6.3	11
Chlorobenzene	0.2	1.5
Ethylbenzene	-	15
m + p-Xylene	0.35	11
Cyclohexanol	-	6.9
Styrene	0.21	6.97
o-Xylene	0.35	11
Isopropylbenzene	0.039	8.1
1,3,5-trimethylbenzene	-	4.0
1,2,4-trimethylbenzene	-	4.0
1,2,3-trimethylbenzene	-	4.0
Acetone	-	40
Pentane	-	60
Hexane	-	5.9
Methyl ethyl ketone	5.9	16
Ethyl acetate	22	24
Cyclohexane	-	35
MIBK	0.41	6.7
2-Hexanone	-	3.3
Butyl acetate	1.85	24
Cyclohexanone	0.48	3.2

Notes:
mg/m^3 – milligrams per cubic metre
ng/m^3 – nanograms per cubic metre
TEQ – Toxic Equivalent, calculated by summing applicable constituent concentrations assuming less than laboratory limit or reporting (LOR) concentrations are 1) zero; 2) half the LOR value; or 3) full LOR value.
MIBK – methyl isobutyl ketone.

6. RESULTS

Results from the emissions tests which exceed the adopted criteria for air quality are summarised in **Table 3** below.

Table 3: Results Exceeding Adopted Criteria

Analyte	Class	Criteria (mg/m^3)	Concentration (mg/m^3)	
			Test 1 (120 min)	Test 2 (120 mins)
Acetaldehyde (only odour criteria exceeded)	Class 2 (odour based)	0.0076	0.16	0.18
Chromium	Class 2	0.017	0.015	0.051
Chlorine	Class 2	0.1	0.12	0.1
Total particulate matter	Unclassified	0.05	2.6	5.8
Sulphur dioxide	Class 1	0.45	<0.2	1.7
Sulphuric acid	Class 2	0.033	2.1	1.6

The following were detected above the laboratory limit of reporting however below applicable TEQ criteria:

- Dioxins & furans: 1,2,3,4,6,7,8-HpCDF; 1,2,3,4,6,7,8-HpCDD; OCDD; Total TCDF isomers; Total PeCDF isomers; Total HxCDF isomers; Total HxCDD isomers; Total HpCDD isomers.
- PAHs: Naphthalene; Phenanthrene; Fluoranthene; Pyrene.

Dioxins & furans and PAHs are considered adequately assessed (through screening of the relevant TEQs).

The following analytes were detected above the laboratory limit of reporting however no applicable criteria were available for screening:

- Gases: Nitrogen oxides (as NO_2); Carbon dioxide; Oxygen;
- Hydrogen fluoride;
- Aldehydes & Ketones: Propionaldehyde; n-Butraldehyde;
- Total VOCs; and
- Sulphur trioxide.

It is understood the above will be assessed in future ambient air monitoring conducted at the site. All emission test results are presented in **Attachment B**.

7. CONCLUSIONS

Emission samples collected from the flare stack/outlet at the Tullamarine Close Landfill indicate concentrations of Acetaldehyde (odour), chromium, chlorine, total particulate matter, sulphur dioxide and sulphuric acid were detected above sensitive screening criteria adopted for air quality. All other analytes were reported below assessment criteria, below laboratory detection limit or no assessment criteria are available. Exceedances of the assessment criteria may require further assessment, Kleinfelder understands fate and transport modelling of flare emissions is currently being undertaken at the site; and ambient air quality sampling is proposed to be completed on 'Buffer Land' located adjacent to the east of the site.

If you require additional information or clarification, please contact the undersigned at (03) 9907 6000.

Sincerely,

Kleinfelder Australia Pty Ltd

Rebekah Fynnaart
Environmental Scientist

Tim Russell
Senior Principal

ATTACHMENTS

Attachment A: Emissions Testing Analytical Results

Attachment B: Ektimo (2015) *Emission Testing Report Transpacific Cleanaway Landfills Ltd – Tullamarine*

Attachment C: Limitations

ATTACHMENT A: EMISSIONS TESTING ANALYTICAL RESULTS

Attachment A
Emissions Testing Analytical Results
Closed Tullamarine Landfill, Western Avenue, Westmeadows

Analyte		Units	SEPP (AQM) Odour	SEPP (AQM) Toxicity	averaging time	Test 1	Test 2
						Jan-2015	Jan-2015
Isokinetic	HCB	mg/m3	--	--	--	< 0.00009	< 0.00009
	Heptachlor	mg/m3	--	--	--	< 0.00009	< 0.00009
	Heptachlor expoxide	mg/m3	--	--	--	< 0.00009	< 0.00009
	Aldrin	mg/m3	--	--	--	< 0.00009	< 0.00009
	gamma-BHC (Lindane)	mg/m3	--	--	--	< 0.00009	< 0.00009
	alpha-BHC	mg/m3	--	--	--	< 0.00009	< 0.00009
	beta-BHC	mg/m3	--	--	--	< 0.00009	< 0.00009
	delta-BHC	mg/m3	--	--	--	< 0.00009	< 0.00009
	trans-Chlordane	mg/m3	--	--	--	< 0.00009	< 0.00009
	cis-Chlordane	mg/m3	--	--	--	< 0.00009	< 0.00009
	Oxychlordane	mg/m3	--	--	--	< 0.00009	< 0.00009
	Dieldrin	mg/m3	--	--	--	< 0.00009	< 0.00009
	pp-DDE	mg/m3	--	--	--	< 0.00009	< 0.00009
	pp-DDD	mg/m3	--	--	--	< 0.00009	< 0.00009
	pp-DDt	mg/m3	--	--	--	< 0.00009	< 0.00009
	Endrin	mg/m3	--	--	--	< 0.00009	< 0.00009
	Endrin Aldehyde	mg/m3	--	--	--	< 0.00009	< 0.00009
	Endrin Ketone	mg/m3	--	--	--	< 0.00009	< 0.00009
	Alpha-Endosulfan	mg/m3	--	--	--	< 0.00009	< 0.00009
	beta-Endosulfan	mg/m3	--	--	--	< 0.00009	< 0.00009
	Endosulfun Sulfate	mg/m3	--	--	--	< 0.00009	< 0.00009
	Methoxychlor	mg/m3	--	--	--	< 0.00009	< 0.00009
Metals	Arsenic	mg/m3	--	0.00017	3m	< 0.002	< 0.002
	Chromium	mg/m3	--	0.017	3m	**0.015**	**0.051**
	Mercury	mg/m3	--	0.00033	3m	< 0.0002	< 0.0002
Sulfur Compounds	Sulfuric acid	mg/m3	--	0.033	3m	**2.1**	**1.6**
	Sulfur trioxide	mg/m3	--	--	--	**1.2**	**1.1**
	Sulfur dioxide	mg/m3	--	0.45	1h	< 0.2	**1.7**
Dioxins & Furans	2,3,7,8-TCDF	ng/m3	--	--	--	< 0.0002	< 0.00009
	2,3,7,8-TCDD	ng/m3	--	--	--	< 0.0007	< 0.002
	1,2,3,7,8-PeCDF	ng/m3	--	--	--	< 0.00004	< 0.00009
	2,3,4,7,8-PeCDF	ng/m3	--	--	--	< 0.0004	< 0.0004
	1,2,3,7,8-PeCDD	ng/m3	--	--	--	< 0.0009	< 0.0004
	1,2,3,4,7,8-HxCDF	ng/m3	--	--	--	< 0.00007	< 0.0002
	1,2,3,6,7,8-HxCDF	ng/m3	--	--	--	< 0.00003	< 0.00009
	2,3,4,6,7,8-HxCDF	ng/m3	--	--	--	< 0.00004	< 0.00008
	1,2,3,7,8,9-HxCDF	ng/m3	--	--	--	< 0.00003	< 0.00003
	1,2,3,4,7,8-HxCDD	ng/m3	--	--	--	< 0.00009	< 0.00009
	1,2,3,6,7,8-HxCDD	ng/m3	--	--	--	< 0.00007	< 0.00008
	1,2,3,7,8,9-HxCDD	ng/m3	--	--	--	< 0.00007	< 0.00007
	1,2,3,4,6,7,8-HpCDF	ng/m3	--	--	--	< 0.000009	**0.000023**
	1,2,3,4,7,8,9-HpCDF	ng/m3	--	--	--	< 0.00002	< 0.00003
	1,2,3,4,6,7,8-HpCDD	ng/m3	--	--	--	**0.000018**	**0.000015**
	OCDF	ng/m3	--	--	--	< 0.0000009	< 0.0000007
	OCDD	ng/m3	--	--	--	**0.000008**	**0.000009**
	Total TCDF isomers	ng/m3	--	--	--	**0.029**	**0.032**
	Total TCDD isomers	ng/m3	--	--	--	**0.0018**	**0.0041**
	Total PeCDF isomers	ng/m3	--	--	--	< 0.006	**0.0081**
	Total PeCDD isomers	ng/m3	--	--	--	< 0.009	< 0.005
	Total HxCDF isomers	ng/m3	--	--	--	< 0.005	**0.0081**
	Total HxCDD isomers	ng/m3	--	--	--	< 0.003	**0.0027**
	Total HpCDF isomers	ng/m3	--	--	--	< 0.003	**0.0025**
	Total HpCDD isomers	ng/m3	--	--	--	**0.0036**	**0.0032**
	Total PCDD + PCDF's	ng/m3	--	--	--	**0.042**	**0.07**
	I-TEQ (Lower Bound)	ng/m3	--	0.0037	3m	**0.000026**	**0.000047**
	I-TEQ (Middle Bound)	ng/m3	--	0.0037	3m	**0.0013**	**0.0017**
	I-TEQ (Upper Bound)	ng/m3	--	0.0037	3m	**0.0026**	**0.0034**
PAH's	Naphthalene	ng/m3	--	--	--	**2,300**	**2,700**
	2-Methylnaphthalene	ng/m3	--	--	--	< 300	< 300
	Acenaphthylene	ng/m3	--	--	--	< 580	< 590
	Acenaphthene	ng/m3	--	--	--	< 30	< 30
	Fluorene	ng/m3	--	--	--	< 59	< 60
	Phenanthrene	ng/m3	--	--	--	**58**	**73**
	Anthracene	ng/m3	--	--	--	< 17	< 17
	Fluoranthene	ng/m3	--	--	--	**44**	**80**
	Pyrene	ng/m3	--	--	--	**36**	**70**
	Benz(a)anthracene	ng/m3	--	--	--	< 17	< 17
	Chrysene	ng/m3	--	--	--	< 17	< 17
	Benzo(b)fluoranthene	ng/m3	--	--	--	< 17	< 17
	Benzo(k)fluoranthene	ng/m3	--	--	--	< 17	< 17
	Benzo(e)pyrene	ng/m3	--	--	--	< 17	< 17
	Benzo(a)pyrene	ng/m3	--	--	--	< 17	< 17
	Perylene	ng/m3	--	--	--	< 17	< 17
	Indeno(1,2,3-cd)pyrene	ng/m3	--	--	--	< 17	< 17
	Dibenz(ah)anthracene	ng/m3	--	--	--	< 17	< 17
	Benzo(ghi)perylene	ng/m3	--	--	--	< 17	< 17
	Total 16 PAH's	ng/m3	--	--	3m	**140**	**220**
	Total 19 PAH's	ng/m3	--	--	3m	**2,400**	**3,000**
	BaP-TEQ (Lower Bound)	ng/m3	--	730	--	**0.0**	**0.0**
	BaP-TEQ (Middle Bound)	ng/m3	--	730	--	**15**	**15**
	BaP-TEQ (Upper Bound)	ng/m3	--	730	--	**31**	**31**
Gases	Nitrogen oxides (as NO2)	mg/m3	--	--	--	**38**	**53**
	Carbon monoxide	mg/m3	--	29	1h	< 2.5	< 2.5
	Carbon dioxide	%	--	--	--	**6.7**	**7.9**
	Oxygen	%	--	--	--	**9.8**	**12**
Halides & Halogens	Total particulate matter	mg/m3	--	0.05	1h	**2.6**	**5.8**
	Hydrogen fluoride	mg/m3	--	--	--	< 0.02	**0.034**
	Hydrogen chloride	mg/m3	--	0.25	3m	< 0.02	**0.056**
	Hydrogen bromide	mg/m3	--	--	--	< 0.02	< 0.02
	Fluoride	mg/m3	--	0.0029	24h	< 0.02	< 0.01
	Chlorine	mg/m3	--	0.1	3m	**0.12**	**0.1**
	Bromine	mg/m3	--	--	--	< 0.02	< 0.01

Attachment A
Emissions Testing Analytical Results
Closed Tullamarine Landfill, Western Avenue, Westmeadows

Analyte		Units	SEPP (AQM) Odour	SEPP (AQM) Toxicity	averaging time	Test 1	Test 2
						Jan-2015	Jan-2015
Amines	n-Butylamine	mg/m3	--	--	--	< 1.9	< 1.9
	Cyclohexylamine	mg/m3	--	--	--	< 1.9	< 1.9
	Dibutylamine	mg/m3	--	--	--	< 1.9	< 1.9
	Diethylamine	mg/m3	0.017	0.59	3m	< 1.9	< 1.9
	Dimethylamine	mg/m3	--	--	--	< 1.9	< 1.9
	Dipropylamine	mg/m3	--	--	--	< 1.9	< 1.9
	n-Heptylamine	mg/m3	--	--	--	< 1.9	< 1.9
	n-Hexylamine	mg/m3	--	--	--	< 1.9	< 1.9
	Monoisopropylamine	mg/m3	--	--	--	< 1.9	< 1.9
	n-Propylamine	mg/m3	--	--	--	< 1.9	< 1.9
	Triethylamine	mg/m3	0.36	0.39	3m	< 3.7	< 3.7
Aldehydes & Ketones	Formaldehyde	mg/m3	--	0.4	3m	< 0.07	**0.19**
	Acetaldehyde	mg/m3	0.076	5.9	3m	**0.16**	**0.18**
	Acrolein	mg/m3	--	0.00077	3m	< 0.07	< 0.08
	Propionaldehyde	mg/m3	--	--	--	**0.17**	**0.36**
	n-Butraldehyde	mg/m3	--	--	--	< 0.07	**0.37**
	Valeraldehyde	mg/m3	--	--	--	< 0.07	< 0.08
	Hexanal	mg/m3	--	--	--	< 0.07	< 0.08
VOC's [TO-15]	Chloromethane	mg/m3	--	3.4	3m	< 0.001	< 0.001
	Vinyl chloride	mg/m3	--	0.043	3m	< 0.0008	< 0.0006
	Naphthalene	mg/m3	--	--	--	**0.017**	< 0.01
	Bromomethane	mg/m3	--	--	--	< 0.009	< 0.01
	Chloroethane	mg/m3	--	87	3m	< 0.0006	< 0.0006
	trans-1,2-Dichloroethene	mg/m3	--	--	--	< 0.4	< 0.4
	1,1-Dichloroethane	mg/m3	--	--	--	< 0.0009	< 0.0009
	cis-1,2-Dichloroethene	mg/m3	--	--	--	< 0.4	< 0.4
	Bromodichloromethane	mg/m3	--	--	--	< 0.002	< 0.002
	cis-1,3-Dichloropropen	mg/m3	--	--	--	< 0.0010	< 0.0010
	trans-1,3-Dichloroprop	mg/m3	--	--	--	< 0.0010	< 0.0010
	Dibromochloromethane	mg/m3	--	--	--	< 0.002	< 0.002
	1,2-Dibromoethane	mg/m3	--	--	--	< 0.002	< 0.002
	Bromoform	mg/m3	--	0.17	3m	< 0.002	< 0.002
	1,3-Dichlorobenzene	mg/m3	--	--	--	< 0.001	< 0.003
	1,2-Dichlorobenzene	mg/m3	--	--	--	< 0.001	< 0.001
	1,2,4-Trichlorobenzene	mg/m3	--	--	--	< 0.002	< 0.003
	Hexachlorobutadiene	mg/m3	--	--	--	< 0.002	< 0.002
VOC's (speciated)	Ethanol	mg/m3	3.8	63	3m	< 0.4	< 0.4
	Isopropanol	mg/m3	--	--	--	< 0.4	< 0.4
	1,1-Dichloroethene	mg/m3	--	--	--	< 0.4	< 0.4
	Dichloromethane	mg/m3	--	--	--	< 0.4	< 0.4
	Chloroform	mg/m3	--	1.6	3m	< 0.4	< 0.4
	Isobutanol	mg/m3	--	--	--	< 0.4	< 0.4
	1,1,1-Trichloroethane	mg/m3	--	23	3m	< 0.4	< 0.4
	1,2-Dichloroethane	mg/m3	--	0.13	3m	< 0.4	< 0.4
	Benzene	mg/m3	--	0.053	3m	< 0.4	< 0.4
	Carbon tetrachloride	mg/m3	--	0.021	3m	< 0.4	< 0.4
	Butanol	mg/m3	0.9	5.1	3m	< 0.4	< 0.4
	1-Methoxy-2-propanol	mg/m3	--	--	--	< 0.4	< 0.4
	Trichloroethene	mg/m3	--	0.9	3m	< 0.4	< 0.4
	Toluene	mg/m3	0.65	12	3m	< 0.4	< 0.4
	1,1,2-trichloroethane	mg/m3	--	1.8	3m	< 0.4	< 0.4
	Tetrachloroethene	mg/m3	6.3	11	3m	< 0.4	< 0.4
	Chlorobenzene	mg/m3	0.2	1.5	3m	< 0.4	< 0.4
	Ethylbenzene	mg/m3	--	15	3m	< 0.4	< 0.4
	m + p-Xylene	mg/m3	0.35	11	3m	< 0.4	< 0.4
	Cyclohexanol	mg/m3	--	6.9	3m	< 0.4	< 0.4
	Styrene	mg/m3	0.21	6.97	3m	< 0.4	< 0.4
	o-Xylene	mg/m3	0.35	11	3m	< 0.4	< 0.4
	2-Butoxyethanol	mg/m3	--	--	--	< 0.4	< 0.4
	1,1,2,2-Tetrachloroethane	mg/m3	--	--	--	< 0.4	< 0.4
	Isopropylbenzene	mg/m3	0.039	8.1	3m	< 0.4	< 0.4
	Propylbenzene	mg/m3	--	--	--	< 0.4	< 0.4
	1,3,5-trimethylbenzene	mg/m3	--	4.0	3m	< 0.4	< 0.4
	alpha-Methylstyrene	mg/m3	--	--	--	< 0.4	< 0.4
	tert-Butylbenzene	mg/m3	--	--	--	< 0.4	< 0.4
	1,2,4-trimethylbenzene	mg/m3	--	4.0	3m	< 0.4	< 0.4
	1,2,3-trimethylbenzene	mg/m3	--	4.0	3m	< 0.4	< 0.4
	m-Diethylbenzene	mg/m3	--	--	--	< 0.4	< 0.4
	p-Diethylbenzene	mg/m3	--	--	--	< 0.4	< 0.4
	o-Diethylbenzene	mg/m3	--	--	--	< 0.4	< 0.4
	Acetone	mg/m3	--	40	3m	< 0.4	< 0.4
	Pentane	mg/m3	--	60	3m	< 0.4	< 0.4
	Hexane	mg/m3	--	5.9	3m	< 0.4	< 0.4
	Methyl ethyl ketone	mg/m3	5.9	16	3m	< 0.4	< 0.4
	Ethyl acetate	mg/m3	22	24	3m	< 0.4	< 0.4
	Cyclohexane	mg/m3	--	35	3m	< 0.4	< 0.4
	2-Methylhexane	mg/m3	--	--	--	< 0.4	< 0.4
	2,3-Dimethylpentane	mg/m3	--	--	--	< 0.4	< 0.4
	Isopropyl acetate	mg/m3	--	--	--	< 0.4	< 0.4
	3-Methylhexane	mg/m3	--	--	--	< 0.4	< 0.4
	Isooctane	mg/m3	--	--	--	< 0.4	< 0.4
	Heptane	mg/m3	--	--	--	< 0.4	< 0.4
	Propyl acetate	mg/m3	--	--	--	< 0.4	< 0.4
	Methylcyclohexane	mg/m3	--	--	--	< 0.4	< 0.4
	MIBK	mg/m3	0.41	6.7	3m	< 0.4	< 0.4
	2-Hexanone	mg/m3	--	3.3	3m	< 0.4	< 0.4
	Octane	mg/m3	--	--	--	< 0.4	< 0.4
	Butyl acetate	mg/m3	1.85	24	3m	< 0.4	< 0.4
	1-methoxy-2-propyl acetate	mg/m3	--	--	--	< 0.4	< 0.4
	Cyclohexanone	mg/m3	0.48	3.2	3m	< 0.4	< 0.4
	Nonane	mg/m3	--	--	--	< 0.4	< 0.4
	Cellosolve acetate	mg/m3	--	--	--	< 0.4	< 0.4
	alpha-Pinene	mg/m3	--	--	--	< 0.4	< 0.4
	beta-Pinene	mg/m3	--	--	--	< 0.4	< 0.4
	Decane	mg/m3	--	--	--	< 0.4	< 0.4
	3-Carene	mg/m3	--	--	--	< 0.4	< 0.4
	D-Limonene	mg/m3	--	--	--	< 0.4	< 0.4
	2-Butoxyethyl acetate	mg/m3	--	--	--	< 0.4	< 0.4
	Undecane	mg/m3	--	--	--	< 0.4	< 0.4
	Isophorone	mg/m3	--	--	--	< 0.4	< 0.4
	Ethyl diglycol acetate	mg/m3	--	--	--	< 0.4	< 0.4
	Dodecane	mg/m3	--	--	--	< 0.4	< 0.4
	Tridecane	mg/m3	--	--	--	< 0.4	< 0.4
	Tetradecane	mg/m3	--	--	--	< 0.4	< 0.4
	Residuals as Toluene	mg/m3	--	--	--	< 0.4	< 0.4
Total VOC's	VOCs [TO-15 Canisters]	mg/m3	--	--	--	**0.017**	< 0.01
	Sorbent tubes	mg/m3	--	--	--	< 0.4	< 0.4
	Total	mg/m3	--	--	--	**0.017**	< 0.4

ATTACHMENT B: EKTIMO (2015) *EMISSION TESTING REPORT TRANSPACIFIC CLEANAWAY LANDFILLS LTD – TULLAMARINE*

Ektimo

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Report Number R000541

Emission Testing Report
Transpacific Cleanaway Landfills Ltd - Tullamarine

Document Information

Client Name:	Transpacific Cleanaway Landfills Ltd - Tullamarine
Report Number:	R000541
Report Title:	Emission Testing Report
Date of Issue:	27 May 2015
Attention:	Kieren McDermott
Address:	Western Avenue TULLAMARINE VIC 3043

Sampling Information

Sampling Date:	February and March 2015
Sampling Team:	GS/JS/MH
Testing Laboratory:	Ektimo (EML) ABN 98 006 878 342

Report Status

Format	Document Number	Report Date	Prepared By	Reviewed By (1)	Reviewed By (2)
Preliminary Report	-	-	-	-	-
Draft Report	R000541draft	26 March 2015	JW/AD	GS	MR
Draft Report 2	R000541draft2	29 April 2015	JW/AD	GS	MR
Final Report	R000541	27 May 2015	JW/AD	GS	MR
Amend Report	-	-	-	-	-

Amendment Record

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

Report Authorisation

Client Manager
Greg Sceneay

NATA Accredited Laboratory
No. 2732

Compliance Manager
Melissa Reddan BAppSc

Table of Contents

List of Tables

Appendices

1 EXECUTIVE SUMMARY

Tests were performed at the request of Transpacific Cleanaway Landfills Ltd (Tullamarine) to determine emissions to air as detailed below;

Testing Summary

Location	Test Date	Test Parameters*
Flare Outlet	2 February 2015	Dioxins and furans (PCDD & PCDF), polycyclic aromatic hydrocarbons (PAH's), organochlorine (OC), nitrogen oxides, carbon dioxide, carbon monoxide, oxygen
	3 February 2015	Halides, halogens, amines, aldehydes, ammonia,
	4 February 2015	Total particulate matter, metals, speciated volatile organic compounds (VOC's),
	5 February 2015	Sulfuric acid, sulfur dioxide, sulfur trioxide
	31 March 2015	C_1-C_4 Hydrocarbons, sulfur gases
Inlet Line	4 February 2015	Speciated volatile organic compounds (VOC's)
	31 March 2015	C_1-C_4 Hydrocarbons, sulfur gases

* Flow rate, velocity, temperature and moisture were determined unless otherwise stated.

2 RESULTS

Flare Outlet - Test Results

Date	2/02/2015	**Client**	Transpacific Cleanaway		
Report	R000541	**Stack ID**	Flare Outlet		
Licence No.	-	**Location**	Tullamarine	**State**	VIC
Ektimo Staff	JS/MH/GS				
Process Conditions	Normal operation @ 180 sm3/hr				
Reason for testing:	Client requested testing to determine emissions to air				

Sampling Plane Details		
Sampling plane dimensions (mm) & area	800	0.503 m²
Sampling port size, number & depth	4" Flange (x2)	300 mm
Access & height of ports	Fixed ladder	8 m
Duct orientation & shape	Vertical	Circular
Downstream disturbance	Exit	2 D
Upstream disturbance	Connection	6 D
No. traverses & points sampled	2	12
Traverse method & compliance	AS4323.1	Satisfactory

Comments
All results reported on a dry basis at NTP

Stack Parameters		
Moisture content, %v/v	10	
Gas molecular weight, g/g mole	28.5 (wet)	29.7 (dry)
Gas density at NTP, kg/m³	1.27 (wet)	1.33 (dry)
	Test 1	Test 2
Gas Flow Parameters		
Temperature, °C	1025	1025
Velocity at sampling plane, m/s	6.5	6.5
Volumetric flow rate, discharge, m³/min	200	200
Volumetric flow rate (wet NTP), m³/min	42	42
Volumetric flow rate (dry NTP), m³/min	37	37
Mass flow rate (wet basis), kg/hour	3200	3200
Sampling time, min	120	120
Isokinetic rate, %	110	109
Velocity difference, %	4	4

Isokinetic	Average		Test 1		Test 2	
Sampling time			1346-1550		1346-1550	
	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min
HCB	<0.000085	<3.2 E-06	<0.000085	<3.2 E-06	<0.000086	<3.2 E-06
Heptachlor	<0.000085	<3.2 E-06	<0.000085	<3.2 E-06	<0.000086	<3.2 E-06
Heptachlor expoxide	<0.000085	<3.2 E-06	<0.000085	<3.2 E-06	<0.000086	<3.2 E-06
Aldrin	<0.000085	<3.2 E-06	<0.000085	<3.2 E-06	<0.000086	<3.2 E-06
gamma-BHC (Lindane)	<0.000085	<3.2 E-06	<0.000085	<3.2 E-06	<0.000086	<3.2 E-06
alpha-BHC	<0.000085	<3.2 E-06	<0.000085	<3.2 E-06	<0.000086	<3.2 E-06
beta-BHC	<0.000085	<3.2 E-06	<0.000085	<3.2 E-06	<0.000086	<3.2 E-06
delta-BHC	<0.000085	<3.2 E-06	<0.000085	<3.2 E-06	<0.000086	<3.2 E-06
trans-Chlordane	<0.000085	<3.2 E-06	<0.000085	<3.2 E-06	<0.000086	<3.2 E-06
cis-Chlordane	<0.000085	<3.2 E-06	<0.000085	<3.2 E-06	<0.000086	<3.2 E-06
Oxychlordane	<0.000085	<3.2 E-06	<0.000085	<3.2 E-06	<0.000086	<3.2 E-06
Dieldrin	<0.000085	<3.2 E-06	<0.000085	<3.2 E-06	<0.000086	<3.2 E-06
pp-DDE	<0.000085	<3.2 E-06	<0.000085	<3.2 E-06	<0.000086	<3.2 E-06
pp-DDD	<0.000085	<3.2 E-06	<0.000085	<3.2 E-06	<0.000086	<3.2 E-06
pp-DDt	<0.000085	<3.2 E-06	<0.000085	<3.2 E-06	<0.000086	<3.2 E-06
Endrin	<0.000085	<3.2 E-06	<0.000085	<3.2 E-06	<0.000086	<3.2 E-06
Endrin Aldehyde	<0.000085	<3.2 E-06	<0.000085	<3.2 E-06	<0.000086	<3.2 E-06
Endrin Ketone	<0.000085	<3.2 E-06	<0.000085	<3.2 E-06	<0.000086	<3.2 E-06
Alpha-Endosulfan	<0.000085	<3.2 E-06	<0.000085	<3.2 E-06	<0.000086	<3.2 E-06
beta-Endosulfan	<0.000085	<3.2 E-06	<0.000085	<3.2 E-06	<0.000086	<3.2 E-06
Endosulfun Sulfate	<0.000085	<3.2 E-06	<0.000085	<3.2 E-06	<0.000086	<3.2 E-06
Methoxychlor	<0.000085	<3.2 E-06	<0.000085	<3.2 E-06	<0.000086	<3.2 E-06

Date	2/02/2015	**Client**	Transpacific Cleanaway		
Report	R000541	**Stack ID**	Flare Outlet		
Licence No.	-	**Location**	Tullamarine	**State**	VIC
Ektimo Staff	JS/MH/GS				
Process Conditions	Normal operation @ 180 sm3/hr				
Reason for testing:	Client requested testing to determine emissions to air				

Dioxins & Furans	Average		Test 1		Test 2	
Sampling time			1346-1550		1346-1550	
	Concentration ng/m³	Mass Rate ng/min	Concentration ng/m³	Mass Rate ng/min	Concentration ng/m³	Mass Rate ng/min
2,3,7,8-TCDF	<0.00013	<0.0048	<0.00017	<0.0063	<0.000086	<0.0032
2,3,7,8-TCDD	<0.0012	<0.045	<0.00068	<0.025	<0.0017	<0.064
1,2,3,7,8-PeCDF	<0.000064	<0.0024	<0.000042	<0.0016	<0.000086	<0.0032
2,3,4,7,8-PeCDF	<0.00043	<0.016	<0.00042	<0.016	<0.00043	<0.016
1,2,3,7,8-PeCDD	<0.00064	<0.024	<0.00085	<0.032	<0.00043	<0.016
1,2,3,4,7,8-HxCDF	<0.00012	<0.0045	<0.000068	<0.0025	<0.00017	<0.0064
1,2,3,6,7,8-HxCDF	<0.00006	<0.0022	<0.000034	<0.0013	<0.000086	<0.0032
2,3,4,6,7,8-HxCDF	<0.00006	<0.0022	<0.000042	<0.0016	<0.000077	<0.0029
1,2,3,7,8,9-HxCDF	<0.000034	<0.0013	<0.000034	<0.0013	<0.000034	<0.0013
1,2,3,4,7,8-HxCDD	<0.000085	<0.0032	<0.000085	<0.0032	<0.000086	<0.0032
1,2,3,6,7,8-HxCDD	<0.000072	<0.0027	<0.000068	<0.0025	<0.000077	<0.0029
1,2,3,7,8,9-HxCDD	<0.000068	<0.0025	<0.000068	<0.0025	<0.000068	<0.0026
1,2,3,4,6,7,8-HpCDF	<0.000016	<0.00059	<8.5 E-06	<0.00032	0.000023	0.00086
1,2,3,4,7,8,9-HpCDF	<0.000026	<0.00095	<0.000017	<0.00063	<0.000034	<0.0013
1,2,3,4,6,7,8-HpCDD	0.000016	0.0006	0.000018	0.00066	0.000015	0.00054
OCDF	<7.7 E-07	<0.000029	<8.5 E-07	<0.000032	<6.8 E-07	<0.000026
OCDD	8.8 E-06	0.00033	8.2 E-06	0.00031	9.4 E-06	0.00035
Total TCDF isomers	0.03	1.1	0.029	1.1	0.032	1.2
Total TCDD isomers	0.0029	0.11	0.0018	0.066	0.0041	0.15
Total PeCDF isomers	<0.007	<0.26	<0.0059	<0.22	0.0081	0.3
Total PeCDD isomers	<0.0068	<0.25	<0.0085	<0.32	<0.0051	<0.19
Total HxCDF isomers	<0.0066	<0.25	<0.0051	<0.19	0.0081	0.3
Total HxCDD isomers	<0.0026	<0.099	<0.0025	<0.095	0.0027	0.1
Total HpCDF isomers	<0.0025	<0.094	<0.0025	<0.095	0.0025	0.093
Total HpCDD isomers	0.0034	0.13	0.0036	0.14	0.0032	0.12
Total PCDD + PCDF's	0.056	2.1	0.042	1.6	0.07	2.6
I-TEQ						
Lower Bound	0.000037	0.0014	0.000026	0.00097	0.000047	0.0018
Middle Bound	0.0015	0.057	0.0013	0.049	0.0017	0.065
Upper Bound	0.003	0.11	0.0026	0.097	0.0034	0.13

Date	2/02/2015	**Client**	Transpacific Cleanaway		
Report	R000541	**Stack ID**	Flare Outlet		
Licence No.	-	**Location**	Tullamarine	**State**	VIC
Ektimo Staff	JS/MH/GS				
Process Conditions	Normal operation @ 180 sm3/hr				
Reason for testing:	Client requested testing to determine emissions to air				

PAH's	Average		Test 1		Test 2	
Sampling time			1346-1550		1346-1550	
	Concentration ng/m³	Mass Rate ng/min	Concentration ng/m³	Mass Rate ng/min	Concentration ng/m³	Mass Rate ng/min
Naphthalene	2500	94000	2300	85000	2700	1.0 E+05
2-Methylnaphthalene	<300	<11000	<300	<11000	<300	<11000
Acenaphthylene	<590	<22000	<580	<22000	<590	<22000
Acenaphthene	<30	<1100	<30	<1100	<30	<1100
Fluorene	<60	<2200	<59	<2200	<60	<2200
Phenanthrene	65	2400	58	2100	73	2700
Anthracene	<17	<640	<17	<630	<17	<640
Fluoranthene	62	2300	44	1600	80	3000
Pyrene	53	2000	36	1400	70	2600
Benz(a)anthracene	<17	<640	<17	<630	<17	<640
Chrysene	<17	<640	<17	<630	<17	<640
Benzo(b)fluoranthene	<17	<640	<17	<630	<17	<640
Benzo(k)fluoranthene	<17	<640	<17	<630	<17	<640
Benzo(e)pyrene	<17	<640	<17	<630	<17	<640
Benzo(a)pyrene	<17	<640	<17	<630	<17	<640
Perylene	<17	<640	<17	<630	<17	<640
Indeno(1,2,3-cd)pyrene	<17	<640	<17	<630	<17	<640
Dibenz(ah)anthracene	<17	<640	<17	<630	<17	<640
Benzo(ghi)perylene	<17	<640	<17	<630	<17	<640
Total 16 PAH's	180	6700	140	5100	220	8300
Total 19 PAH's	2700	1.0 E+05	2400	90000	3000	1.1 E+05
BaP-TEQ						
Lower Bound	0	0	0	0	0	0
Middle Bound	15	580	15	570	15	580
Upper Bound	31	1200	31	1100	31	1200

Gases	Average		Minimum		Maximum	
Sampling time	1353-1452		1353-1452		1353-1452	
	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min
Nitrogen oxides (as NO^2)	48	1.8	38	1.4	53	2
Carbon monoxide	<2.5	<0.093	<2.5	<0.093	<2.5	<0.093
	Concentration %		Concentration %		Concentration %	
Carbon dioxide	7.6		6.7		7.9	
Oxygen	10.2		9.8		11.5	

Date	3/02/2015	**Client**	Transpacific Cleanaway		
Report	R000541	**Stack ID**	Flare Outlet		
Licence No.	-	**Location**	Tullamarine	**State**	VIC
Ektimo Staff	JS/MH/GS				
Process Conditions	Normal operation @ 180 sm3/hr				
Reason for testing:	Client requested testing to determine emissions to air				

Sampling Plane Details		
Sampling plane dimensions (mm) & area	800	0.503 m²
Sampling port size, number & depth	4" Flange (x2)	200 mm
Access & height of ports	Fixed ladder	8 m
Duct orientation & shape	Vertical	Circular
Downstream disturbance	Exit	2 D
Upstream disturbance	Connection	6 D
No. traverses & points sampled	2	12
Traverse method & compliance	AS4323.1	Non-compliant

Comments

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

All results reported on a dry basis at NTP

Stack Parameters		
Moisture content, %v/v	10	
Gas molecular weight, g/g mole	28.5 (wet)	29.7 (dry)
Gas density at NTP, kg/m³	1.27 (wet)	1.33 (dry)
	Test 1	Test 2
Gas Flow Parameters		
Temperature, °C	1052	1052
Velocity at sampling plane, m/s	7.1	7.1
Volumetric flow rate, discharge, m³/min	210	210
Volumetric flow rate (wet NTP), m³/min	44	44
Volumetric flow rate (dry NTP), m³/min	40	40
Mass flow rate (wet basis), kg/hour	3400	3400
Sampling time, min	96	96
Isokinetic rate, %	100	100
Velocity difference, %	3	3

Halides & Halogens	Average		Test 1		Test 2	
Sampling time			1218-1354		1218-1354	
	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min
Total particulate matter	5.9	0.23	4.8	0.19	7.1	0.28
Hydrogen fluoride	<0.026	<0.0011	<0.019	<0.00075	0.034	0.0014
Hydrogen chloride	<0.037	<0.0015	<0.018	<0.00073	0.056	0.0022
Hydrogen bromide	<0.019	<0.00075	<0.018	<0.00072	<0.02	<0.00078
Fluoride	<0.015	<0.00058	<0.016	<0.00064	<0.013	<0.00053
Chlorine	0.11	0.0044	0.12	0.0047	0.1	0.0041
Bromine	<0.015	<0.00058	<0.016	<0.00064	<0.013	<0.00053

Non-isokinetics	Average		Test 1		Test 2	
Sampling time			1230-1305		1230-1305	
	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min
Ammonia	0.073	0.0029	0.093	0.0037	0.054	0.0021

Date	3/02/2015	**Client**	Transpacific Cleanaway		
Report	R000541	**Stack ID**	Flare Outlet		
Licence No.	-	**Location**	Tullamarine	**State**	VIC
Ektimo Staff	JS/MH/GS				
Process Conditions	Normal operation @ 180 sm3/hr				
Reason for testing:	Client requested testing to determine emissions to air				

Amines	Average		Test 1		Test 2	
Sampling time			1334-1349		1334-1349	
	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min
n-Butylamine	<1.9	<0.074	<1.9	<0.074	<1.9	<0.074
Cyclohexylamine	<1.9	<0.074	<1.9	<0.074	<1.9	<0.074
Dibutylamine	<1.9	<0.074	<1.9	<0.074	<1.9	<0.074
Diethylamine	<1.9	<0.074	<1.9	<0.074	<1.9	<0.074
Dimethylamine	<1.9	<0.074	<1.9	<0.074	<1.9	<0.074
Dipropylamine	<1.9	<0.074	<1.9	<0.074	<1.9	<0.074
n-Heptylamine	<1.9	<0.074	<1.9	<0.074	<1.9	<0.074
n-Hexylamine	<1.9	<0.074	<1.9	<0.074	<1.9	<0.074
Monoisopropylamine	<1.9	<0.074	<1.9	<0.074	<1.9	<0.074
n-Propylamine	<1.9	<0.074	<1.9	<0.074	<1.9	<0.074
Triethylamine	<3.7	<0.15	<3.7	<0.15	<3.7	<0.15

Aldehydes & Ketones	Average		Test 1		Test 2	
Sampling time			1358-1415		1358-1415	
	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min
Formaldehyde	<0.13	<0.0053	<0.074	<0.003	0.19	0.0077
Acetaldehyde	0.17	0.0067	0.16	0.0065	0.18	0.007
Acrolein	<0.074	<0.003	<0.074	<0.003	<0.075	<0.003
Propionaldehyde	0.26	0.011	0.17	0.0066	0.36	0.014
n-Butraldehyde	<0.22	<0.0087	<0.074	<0.003	0.37	0.015
Valeraldehyde	<0.074	<0.003	<0.074	<0.003	<0.075	<0.003
Hexanal	<0.074	<0.003	<0.074	<0.003	<0.075	<0.003

Date	4/02/2015	**Client**	Transpacific Cleanaway		
Report	R000541	**Stack ID**	Flare Outlet		
Licence No.	-	**Location**	Tullamarine	**State**	VIC
Ektimo Staff	JS/MH/GS				
Process Conditions	Normal operation @ 183 sm3/hr				
Reason for testing:	Client requested testing to determine emissions to air				

Sampling Plane Details		
Sampling plane dimensions (mm) & area	800	0.503 m²
Sampling port size, number & depth	4" Flange (x2)	200 mm
Access & height of ports	Fixed ladder	8 m
Duct orientation & shape	Vertical	Circular
Downstream disturbance	Exit	2 D
Upstream disturbance	Connection	6 D
No. traverses & points sampled	2	12
Traverse method & compliance	AS4323.1	Satisfactory

Comments

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

All results reported on a dry basis at NTP

Stack Parameters		
Moisture content, %v/v	10	
Gas molecular weight, g/g mole	28.5 (wet)	29.7 (dry)
Gas density at NTP, kg/m³	1.27 (wet)	1.33 (dry)
	Test 1	Test 2
Gas Flow Parameters		
Temperature, °C	1014	1014
Velocity at sampling plane, m/s	7.2	7.2
Volumetric flow rate, discharge, m³/min	220	220
Volumetric flow rate (wet NTP), m³/min	46	46
Volumetric flow rate (dry NTP), m³/min	41	41
Mass flow rate (wet basis), kg/hour	3500	3500
Sampling time, min	120	120
Isokinetic rate, %	100	109
Velocity difference, %	3	3

Isokinetic	Average		Test 1		Test 2	
Sampling time			1145-1347		1145-1347	
	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min
Total particulate matter	4.2	0.18	2.6	0.11	5.8	0.24
Arsenic	<0.0016	<0.000066	<0.0017	<0.000068	<0.0015	<0.000063
Chromium	0.033	0.0014	0.015	0.0006	0.051	0.0021
Mercury	<0.00018	<7.3 E-06	<0.00017	<6.8 E-06	<0.00019	<7.8 E-06

Date	4/02/2015	**Client**	Transpacific Cleanaway		
Report	R000541	**Stack ID**	Flare Outlet		
Licence No.	-	**Location**	Tullamarine	**State**	VIC
Ektimo Staff	JS/MH/GS				
Process Conditions	Normal operation @ 183 sm3/hr				
Reason for testing:	Client requested testing to determine emissions to air				

VOC's [TO-15]	Average		Test 1		Test 2	
Sampling time			1216-1321		1216-1321	
	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min
Chloromethane	<0.0012	<0.000051	<0.0011	<0.000047	<0.0014	<0.000056
Vinyl chloride	<0.0007	<0.000029	<0.00084	<0.000035	<0.00056	<0.000023
Bromomethane	<0.011	<0.00044	<0.0085	<0.00035	<0.013	<0.00053
Chloroethane	<0.00058	<0.000024	<0.00058	<0.000024	<0.00058	<0.000024
trans-1,2-Dichloroethene	<0.00087	<0.000036	<0.00087	<0.000036	<0.00087	<0.000036
1,1-Dichloroethane	<0.00088	<0.000037	<0.00088	<0.000037	<0.00088	<0.000037
cis-1,2-Dichloroethene	<0.00087	<0.000036	<0.00087	<0.000036	<0.00087	<0.000036
Bromodichloromethane	<0.0015	<0.000061	<0.0015	<0.000061	<0.0015	<0.000061
cis-1,3-Dichloropropen	<0.00099	<0.000041	<0.00099	<0.000041	<0.00099	<0.000041
trans-1,3-Dichloroprop	<0.00099	<0.000041	<0.00099	<0.000041	<0.00099	<0.000041
Dibromochloromethane	<0.0019	<0.000077	<0.0019	<0.000077	<0.0019	<0.000077
1,2-Dibromoethane	<0.0017	<0.000069	<0.0017	<0.000069	<0.0017	<0.000069
Bromoform	<0.0023	<0.000093	<0.0023	<0.000093	<0.0023	<0.000093
1,3-Dichlorobenzene	<0.002	<0.000081	<0.0013	<0.000054	<0.0026	<0.00011
1,2-Dichlorobenzene	<0.0013	<0.000054	<0.0013	<0.000054	<0.0013	<0.000054
1,2,4-Trichlorobenzene	<0.0028	<0.00012	<0.0024	<0.0001	<0.0032	<0.00013
Hexachlorobutadiene	<0.0023	<0.000096	<0.0023	<0.000096	<0.0023	<0.000096
Naphthalene	-	-	0.017	0.00071	<0.011	<0.00047

VOC's (speciated)	Average		Test 1		Test 2	
Sampling time			1308-1321		1323-1344	
	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min
Detection limit (1)	<0.36	<0.015	<0.36	<0.015	<0.36	<0.015

(1) Unless otherwise reported, the following target compounds were found to be below detection:

Ethanol, Isopropanol, Isobutanol, Butanol, 1-Methoxy-2-propanol, Cyclohexanol, 2-Butoxyethanol

Pentane, Hexane, Heptane, Octane, Nonane, Decane, Undecane, Dodecane, Tridecane, Tetradecane

Cyclohexane, 2-Methylhexane, 2,3-Dimethylpentane, 3-Methylhexane, Isooctane, Methylcyclohexane, alpha-Pinene, beta-Pinene, d-Limonene, 3-

Acetone, Methyl ethyl ketone, Ethyl acetate, Isopropyl acetate, Propyl acetate, MIBK, 2-Hexanone, Butyl acetate, 1-Methoxy-2-propyl acetate, Cyclohexanone, Cellosolve acetate, 2-Butoxyethyl acetate, Ethyldiglycol acetate, Diacetone alcohol, Isophorone

Benzene, Toluene, Ethylbenzene, m+p-Xylene, Styrene, o-Xylene, Isopropylbenzene, Propylbenzene, 1,3,5-Trimethylbenzene, alpha-Methylstyrene, tert-Butylbenzene, 1,2,4-Trimethylbenzene, 1,2,3-Trimethylbenzene, m-Diethylbenzene, o-Diethylbenzene, p-Diethylbenzene

Dichloromethane, Chloroform, 1,1,1-Trichloroethane, 1,2-Dichloroethane, Carbon tetrachloride, 1,1-Dichloroethene, cis-1,2-Dichloroethene, trans-1,2-Dichloroethene, Trichloroethene, Tetrachloroethene, 1,1,2-Trichloroethane, 1,1,2,2-Tetrachloroethane, Chlorobenzene, Fluorobenzene

Date	5/02/2015	**Client**	Transpacific Cleanaway		
Report	R000541	**Stack ID**	Flare Outlet		
Licence No.	-	**Location**	Tullamarine	**State**	VIC
EML Staff	JS/MH/GS				
Process Conditions	Normal operation @ 180 sm3/hr				
Reason for testing:	Client requested testing to determine emissions to air				

Sampling Plane Details		
Sampling plane dimensions (mm) & area	800	0.503 m²
Sampling port size, number & depth	4" Flange (x2)	200 mm
Access & height of ports	Fixed ladder	8 m
Duct orientation & shape	Vertical	Circular
Downstream disturbance	Exit	2 D
Upstream disturbance	Connection	6 D
No. traverses & points sampled	2	12
Traverse method & compliance	AS4323.1	Satisfactory

Comments

The discharge is assumed to be composed of dry air and moisture
All results reported on a dry basis at NTP

Stack Parameters		
Moisture content, %v/v	10	
Gas molecular weight, g/g mole	28.5 (wet)	29.7 (dry)
Gas density at NTP, kg/m³	1.27 (wet)	1.33 (dry)
	Test 1	Test 2
Gas Flow Parameters		
Temperature, °C	1060	1060
Velocity at sampling plane, m/s	6.4	6.4
Volumetric flow rate, discharge, m³/min	190	190
Volumetric flow rate (wet NTP), m³/min	40	40
Volumetric flow rate (dry NTP), m³/min	36	36
Mass flow rate (wet basis), kg/hour	3000	3000
Sampling time, min	96	96
Isokinetic rate, %	101	107
Velocity difference, %	2	2

Isokinetic	Average		Test 1		Test 2	
Sampling time			1236-1408		1236-1408	
	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min
Sulfuric acid	1.8	0.065	2.1	0.074	1.6	0.057
Sulfur dioxide	-	-	<0.2	<0.0072	1.7	0.06

Date	31/03/2015	**Client**	Transpacific Cleanaway		
Report	R000541	**Stack ID**	Flare Outlet		
Licence No.	-	**Location**	Tullamarine	**State**	VIC
Ektimo Staff	GS				
Process Conditions	Normal operation @ 190 sm3/hr				
Reason for testing:	Client requested testing to determine emissions to air				

Sampling Plane Details		
Sampling plane dimensions (mm) & area	800	0.503 m²
Sampling port size, number & depth	4" Flange (x2)	200 mm
Access & height of ports	Fixed ladder	8 m
Duct orientation & shape	Vertical	Circular
Downstream disturbance	Exit	2 D
Upstream disturbance	Connection	6 D
No. traverses & points sampled	2	12
Traverse method & compliance	AS4323.1	Satisfactory

Comments

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

All results reported on a dry basis at NTP

Stack Parameters		
Moisture content, %v/v	10	
Gas molecular weight, g/g mole	28.5 (wet)	29.7 (dry)
Gas density at NTP, kg/m³	1.27 (wet)	1.33 (dry)

Gas Flow Parameters	
Temperature, °C	996
Velocity at sampling plane, m/s	7.7
Volumetric flow rate, discharge, m³/min	230
Volumetric flow rate (wet NTP), m³/min	50
Volumetric flow rate (dry NTP), m³/min	45
Mass flow rate (wet basis), kg/hour	3800
Velocity difference, %	3

VOC's C_1-C_4	Average		Test 1		Test 2	
Sampling time			1152-1207		1207-1222	
	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min
Methane	2500	110	3800	170	1200	55

Date	31/03/2015	**Client**	Transpacific Cleanaway		
Report	R000541	**Stack ID**	Flare Outlet		
Licence No.	-	**Location**	Tullamarine	**State**	VIC
Ektimo Staff	GS				
Process Conditions	Normal operation @ 190 sm3/hr				
Reason for testing:	Client requested testing to determine emissions to air				

Sampling Plane Details		
Sampling plane dimensions (mm) & area	800	0.503 m²
Sampling port size, number & depth	4" Flange (x2)	200 mm
Access & height of ports	Fixed ladder	8 m
Duct orientation & shape	Vertical	Circular
Downstream disturbance	Exit	2 D
Upstream disturbance	Connection	6 D
No. traverses & points sampled	2	12
Traverse method & compliance	AS4323.1	Satisfactory

Comments

The discharge is assumed to be composed of dry air and moisture
All results reported on a dry basis at NTP

Stack Parameters		
Moisture content, %v/v	10	
Gas molecular weight, g/g mole	28.5 (wet)	29.7 (dry)
Gas density at NTP, kg/m³	1.27 (wet)	1.33 (dry)
Gas Flow Parameters		
Temperature, °C	996	
Velocity at sampling plane, m/s	7.7	
Volumetric flow rate, discharge, m³/min	230	
Volumetric flow rate (wet NTP), m³/min	50	
Volumetric flow rate (dry NTP), m³/min	45	
Mass flow rate (wet basis), kg/hour	3800	
Velocity difference, %	3	

Reduced Sulfur Gases	Average		Test 1		Test 2	
Sampling time			1152-1207		1207-1222	
	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min
Carbonyl sulfide	<0.27	<0.012	<0.27	<0.012	<0.27	<0.012
Methyl mercaptan	<0.21	<0.0097	<0.21	<0.0097	<0.21	<0.0097
Ethyl mercaptan	<0.28	<0.013	<0.28	<0.013	<0.28	<0.013
Dimethyl sulfide	<0.28	<0.013	<0.28	<0.013	<0.28	<0.013
Propyl mercaptan	<0.34	<0.015	<0.34	<0.015	<0.34	<0.015
Butyl mercaptan	<0.4	<0.018	<0.4	<0.018	<0.4	<0.018
Hydrogen sulfide	<0.15	<0.0069	<0.15	<0.0069	<0.15	<0.0069

Inlet Line - Test Results

Date	4/02/2015	**Client**	Transpacific Cleanaway		
Report	R000541	**Stack ID**	Inlet Line		
Licence No.	-	**Location**	Tullamarine	**State**	VIC
Ektimo Staff	JS/MH/GS				
Process Conditions	Normal operation @ 180 sm3/hr				
Reason for testing:	Client requested testing to determine emissions to air				

Sampling Plane Details		
Sampling port size, number & depth	Standpipe with valve 1" ID (x1)	
Access & height of ports	Ground level	
Duct orientation & shape	Horizontal	
Downstream disturbance	Bend	2 D
Upstream disturbance	Bend	2 D

Comments

Inlet Line settings
1) both valves opened fully at 1000 hrs to equilibrate sample line, vacuum about -3700 Pa
2) both valves to just open before testing, vacuum about -2700 Pa

VOCs [TO-15 Canisters]	Average	Test 1	Test 2
Sampling time		1216-1321	1216-1321
	Concentration mg/m³	Concentration mg/m³	Concentration mg/m³
Chloromethane	<0.068	<0.068	<0.068
Vinyl chloride	2.6	2.8	2.4
Bromomethane	<0.085	<0.085	<0.085
Chloroethane	0.27	0.29	0.26
trans-1,2-Dichloroethene	<0.043	<0.043	<0.043
1,1-Dichloroethane	0.6	0.66	0.53
cis-1,2-Dichloroethene	2.2	2.5	2
Bromodichloromethane	<0.037	<0.037	<0.037
cis-1,3-Dichloropropen	<0.025	<0.025	<0.025
trans-1,3-Dichloroprop	<0.025	<0.025	<0.025
Dibromochloromethane	<0.046	<0.046	<0.046
1,2-Dibromoethane	<0.042	<0.042	<0.042
Bromoform	<0.056	<0.056	<0.056
1,3-Dichlorobenzene	<0.033	<0.033	<0.033
1,2-Dichlorobenzene	<0.049	<0.066	<0.033
1,2,4-Trichlorobenzene	<0.073	<0.081	<0.065
Hexachlorobutadiene	<0.058	<0.058	<0.058
Naphthalene	<0.4	0.74	<0.057

VOC's (speciated)	Average	Test 1	Test 2
Sampling time		1308-1321	1323-1344
	Concentration mg/m³	Concentration mg/m³	Concentration mg/m³
Detection limit (1)	<0.53	<0.53	<0.53

(1) Unless otherwise reported, the following target compounds were found to be below detection:
Ethanol, Isopropanol, Isobutanol, Butanol, 1-Methoxy-2-propanol, Cyclohexanol, 2-Butoxyethanol
Pentane, Hexane, Heptane, Octane, Nonane, Decane, Undecane, Dodecane, Tridecane, Tetradecane
Cyclohexane, 2-Methylhexane, 2,3-Dimethylpentane, 3-Methylhexane, Isooctane, Methylcyclohexane, alpha-Pinene, beta-Pinene, d-Limonene, 3-Carene
Acetone, Methyl ethyl ketone, Ethyl acetate, Isopropyl acetate, Propyl acetate, MIBK, 2-Hexanone, Butyl acetate, 1-Methoxy-2-propyl acetate, Cyclohexanone, Cellosolve acetate, 2-Butoxyethyl acetate, Ethyldiglycol acetate, Diacetone alcohol, Isophorone
Benzene, Toluene, Ethylbenzene, m+p-Xylene, Styrene, o-Xylene, Isopropylbenzene, Propylbenzene, 1,3,5-Trimethylbenzene, alpha-Methylstyrene, tert-Butylbenzene, 1,2,4-Trimethylbenzene, 1,2,3-Trimethylbenzene, m-Diethylbenzene, o-Diethylbenzene, p-Diethylbenzene
Dichloromethane, Chloroform, 1,1,1-Trichloroethane, 1,2-Dichloroethane, Carbon tetrachloride, 1,1-Dichloroethene, cis-1,2-Dichloroethene, trans-1,2-Dichloroethene, Trichloroethene, Tetrachloroethene, 1,1,2-Trichloroethane, 1,1,2,2-Tetrachloroethane, Chlorobenzene, Fluorobenzene

Date	31/03/2015	**Client**	Transpacific Cleanaway		
Report	R000541	**Stack ID**	Inlet Line		
Licence No.	-	**Location**	Tullamarine	**State**	VIC
Ektimo Staff	GS				
Process Conditions	Normal operation @ 190 sm3/hr				
Reason for testing:	Client requested testing to determine emissions to air				

Sampling Plane Details			
Sampling port size, number & depth	Standpipe with valve 1" ID (x1)		
Access & height of ports	Ground level		
Duct orientation & shape	Horizontal		
Downstream disturbance	Bend	2 D	
Upstream disturbance	Bend	2 D	

VOC's C_1-C_4	Average	Test 1	Test 2
Sampling time		1104-1119	1119-1134
	Concentration mg/m³	Concentration mg/m³	Concentration mg/m³
Methane	3.5 E+05	3.5 E+05	3.5 E+05

Date	31/03/2015	**Client**	Transpacific Cleanaway		
Report	R000541	**Stack ID**	Inlet Line		
Licence No.	-	**Location**	Tullamarine	**State**	VIC
Ektimo Staff	GS				
Process Conditions	Normal operation @ 190 sm3/hr				
Reason for testing:	Client requested testing to determine emissions to air				

Sampling Plane Details		
Sampling port size, number & depth	Standpipe with valve 1" ID (x1)	
Access & height of ports	Ground level	
Duct orientation & shape	Horizontal	
Downstream disturbance	Bend	2 D
Upstream disturbance	Bend	2 D

Reduced Sulfur Gases	Average	Test 1	Test 2
Sampling time		1104-1119	1119-1134
	Concentration mg/m³	Concentration mg/m³	Concentration mg/m³
Carbonyl sulfide	<0.27	<0.27	<0.27
Methyl mercaptan	<0.21	<0.21	<0.21
Ethyl mercaptan	<0.28	<0.28	<0.28
Dimethyl sulfide	<0.28	<0.28	<0.28
Propyl mercaptan	<0.34	<0.34	<0.34
Butyl mercaptan	<0.4	<0.4	<0.4
Hydrogen sulfide	24	24	23

3 PLANT OPERATING CONDITIONS

Unless otherwise stated, the plant operating conditions were normal at the time of testing. See Transpacific Cleanaway Landfills Ltd (Tullamarine)'s records for complete process conditions.

4 TEST METHODS

Unless otherwise stated, the following methods meet the requirements of the Victorian Environment Protection Authority (as specified in *A Guide to Sampling and Analysis of Air Emissions and Air Quality, December 2002*).

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

Test Method Table

Parameter	Test Method	Method Detection Limit	Uncertainty*	NATA Accredited	
				Sampling	Analysis
Sample Plane Criteria	AS 4323.1	-	-	✓	NA
Traverse Points	USEPA 1	-	-	✓	NA
Velocity	Ektimo (EML Air) 100	$2ms^{-1}$	7%	✓	NA
Temperature	Ektimo (EML Air) 100	0°C	2%	✓	NA
Flow rate	Ektimo (EML Air) 100	Location specific	8%	✓	NA
Moisture	Ektimo (EML Air) 105	0.4%	6%	✓	✓
Total particulate matter	AS 4323.2	$1mg/m^3$	5%	✓	
Sulfur trioxide and/or sulfuric acid mists and sulfur dioxide	USEPA 8	$0.01mg/m^3$	16%	✓	✓
Dioxins and Furans (PCDD's and PCDF's)	USEPA SW-846 0023A	Analyte specific	16%	✓	✓[3]
Polycyclic aromatic hydrocarbons (PAH's)	USEPA SW-846 0010	Analyte specific	21%	✓	✓[4]
Total (gaseous and particulate) Metals	EML Air 280	Analyte specific	15%	✓	✓[1]
Carbon monoxide	EML Air 200	$2.5mg/m^3$	12%	✓	✓
Carbon dioxide	EML Air 200	0.1%	13%	✓	✓
Oxygen	USEPA 3A	0.1%	13%	✓	✓
Nitrogen oxides	USEPA 7E	$4mg/m^3$	12%	✓	✓
C_1-C_4 Hydrocarbons	EML Air 340	Analyte specific	19%	✓	✓
Ammonia and ammonium compounds	EML Air 260	$0.002mg/m^3$	18%	✓	✓[2]
Speciated volatile organic compounds	EML Air 344	$0.33mg/m^3$	19%	✓	✓
Hydrogen halide and halide emissions	USEPA 26A	10mg/m3	14%	✓	✓

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

1. Analysis was performed by Envirolab, NATA accreditation number 2901. Results were reported to Ektimo on26 February 2015 in report number 123418.
2. Analysis was performed by Envirolab, NATA accreditation number 2901. Results were reported to Ektimo on 26 February 2015 in report number 123418.
3. Analysis was performed by Australian Government National Measurement Institute, NATA accreditation number 198. Results were reported to Ektimo on 3 March 2015 in report number DAU15_035.
4. Analysis was performed by Australian Government National Measurement Institute, NATA accreditation number 198. Results were reported to Ektimo on 16 March 2015 in report number ORG15_085.

5 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.asn.au.

Ektimo is accredited by NATA (National Association of Testing Authorities) to Australian Standard 17025 – General Requirements for the Competence of Testing and Calibration Laboratories. Australian Standard 17025 requires that a laboratory have a quality system similar to ISO 9002. More importantly it also 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 Assurance Manager.

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 world –wide.

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.

6 DEFINITIONS

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

NTP	Normal 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.
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.
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.
TOC	The sum of all compounds of carbon which contain at least one carbon to carbon bond, plus methane and its derivatives.
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).
$PM_{2.5}$	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 2.5 microns (µm).
PM_{10}	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 10 microns (µm).
BSP	British standard pipe
NT	Not tested or results not required
NA	Not applicable
D_{50}	'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_{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.
D	Duct diameter or equivalent duct diameter for rectangular ducts
<	Less than
>	Greater than
≥	Greater than or equal to
~	Approximately
CEM	Continuous Emission Monitoring
CEMS	Continuous Emission Monitoring System
DER	WA Department of Environment & Regulation
DECC	Department of Environment & Climate Change (NSW)
EPA	Environment Protection Authority
FTIR	Fourier Transform Infra Red
NATA	National Association of Testing Authorities
RATA	Relative Accuracy Test Audit
AS	Australian Standard
USEPA	United States Environmental Protection Agency
Vic EPA	Victorian Environment Protection Authority
ISC	Intersociety committee, Methods of Air Sampling and Analysis
ISO	International Organisation for Standardisation
APHA	American public health association, Standard Methods for the Examination of Water and Waste Water
CARB	Californian Air Resources Board
TM	Test Method
OM	Other approved method
CTM	Conditional test method
VDI	Verein Deutscher Ingenieure (Association of German Engineers)
NIOSH	National Institute of Occupational Safety and Health
XRD	X-ray Diffractometry

ATTACHMENT C: LIMITATIONS

LIMITATIONS

The findings and conclusions contained within this Flare Emission Testing Report are made following a review of information, reports, correspondence and data previously reported by third parties. Kleinfelder does not provide guarantees or assurances regarding the accuracy and validity of information and data obtained by third parties in previously commissioned investigations. The conclusions presented in this report are relevant to the conditions of the site and the state of legislation currently enacted as at the date of this report.

Kleinfelder has used a degree of skill and care ordinarily exercised by reputable members of our profession practicing in the same or similar locality.

Kleinfelder does not make any representation or warranty that the conclusions in this report will be applicable in the future as there may be changes in the condition of the site, applicable legislation or other factors that would affect the conclusions contained in this report.

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