Ektimo

Address (Head Office)
427 Canterbury Road
SURREY HILLS VIC 3127

Postal Address
Unit 13, 9 Ambitious Link
BIBRA LAKE WA 6163

Office Locations
VIC NSW WA QLD

Freecall: 1300 364 005
www.ektimo.com.au
ABN: 86 600 381 413

Report Number R003007

Emission Testing Report

EPA 7 – Bitumen Combustor

Terminals Pty Ltd, Port Botany

Document Information

Client Name:	Terminals Pty Ltd
Report Number:	R003007
Date of Issue:	14 September 2016
Attention:	Peter Leven
Address:	Gate 38B, 45 Friendship Rd PORT BOTANY NSW 2036
Testing Laboratory:	Ektimo (ETC) ABN 74 474 273 172

Report Status

Format	Document Number	Report Date	Prepared By	Reviewed By (1)	Reviewed By (2)
Preliminary Report	-	-	-	-	-
Draft Report	-	-	-	-	-
Final Report	R003007	14/09/2016	JWe	ADa	SCo
Amend Report	-	-	-	-	-

Template Version: 160728

Amendment Record

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

Report Authorisation

Steven Cooper
Client Manager

NATA Accredited Laboratory
No. 14601

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

Table of Contents

1 EXECUTIVE SUMMARY

Ektimo was engaged by Terminals Pty Ltd to perform annual emission monitoring as required by NSW EPA Environment Protection Licence 1048.

Monitoring was performed as follows:

Location	Test Date	Test Parameters*
EPA 7 – Bitumen Combustor	30 August 2016	Hydrogen sulfide, volatile organic compounds (VOC's) as n-propane, oxygen, carbon dioxide, nitrogen oxides

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

The sampling methodologies chosen by Ektimo are those recommended by the NSW Office of Environment and Heritage (as specified in the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales, January 2007*).

All results are reported on a dry basis at STP. Unless otherwise indicated, the methods cited in this report have been performed without deviation.

Plant operating conditions have been noted in the report.

2 RESULTS SUMMARY

The following licence comparison table shows that all analytes highlighted in green are below the licence limit set by the NSW EPA as per licence 1048 (last amended on 23 February 2016).

Results have also been corrected to 3% Oxygen as stipulated in Schedule 5 of the Protection of the Environment Operations (Clean Air) Regulation, (NSW) 2010.

EPA No.	Location Description	Parameter	Units	Licence limit	Detected values 30/08/2016	Detected values (corrected to 3% O2) 30/08/2016
7	Bitumen Combustor	Nitrogen oxide (as NO_2)	mg/m^3	350	110	240
		Volatile organic compounds (VOCs)	mg/m^3	40	<0.1	<0.3

3 RESULTS

3.1 EPA 7 – Bitumen Combustor

Date	30/08/2016	**Client**	Terminals Pty Ltd		
Report	R003007	**Stack ID**	EPA 7 - Bitumen Combustor		
Licence No.	1048	**Location**	Port Botany	**State**	NSW
Ektimo Staff	Scott Woods/Ryan Collins				
Process Conditions	Please refer to client records.				

Sampling Plane Details		
Sampling plane dimensions	980 mm	
Sampling plane area	0.754 m²	
Sampling port size, number	4" Flange (x2)	
Access & height of ports	Fixed ladder	12 m
Duct orientation & shape	Vertical	Circular
Downstream disturbance	Exit	2 D
Upstream disturbance	Bend	6 D
No. traverses & points sampled	2	12
Compliance of sample plane to AS4323.1	Satisfactory	

Stack Parameters		
Moisture content, %v/v	9.1	
Gas molecular weight, g/g mole	28.3 (wet)	29.3 (dry)
Gas density at STP, kg/m³	1.26 (wet)	1.31 (dry)
% Oxygen correction & Factor	3 %	2.13
Gas Flow Parameters		
Measurement time (hhmm)	1044	
Temperature, °C	844	
Velocity at sampling plane, m/s	4.9	
Volumetric flow rate, discharge, m³/s	3.7	
Volumetric flow rate (wet STP), m³/s	0.91	
Volumetric flow rate (dry STP), m³/s	0.82	
Mass flow rate (wet basis), kg/hour	4100	
Velocity difference, %	<1	

Hydrogen Sulfide	Results		
Sampling time	1045-1145		
	Concentration mg/m³	Corrected to 3% O2 mg/m³	Mass Rate g/min
Hydrogen sulfide	0.015	0.032	0.00074

Gases	Average			Minimum			Maximum		
Sampling time	1053-1159			1053-1159			1053-1159		
	Concentration mg/m³	Corrected to 3% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 3% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 3% O2 mg/m³	Mass Rate g/min
Nitrogen oxides (as NO_2)	110	240	5.6	100	220	5.1	130	280	6.6
	Concentration %			Concentration %			Concentration %		
Carbon dioxide	4.4			4.3			4.6		
Oxygen	12.5			12			13		

Date	30/08/2016	**Client**	Terminals Pty Ltd		
Report	R003007	**Stack ID**	EPA 7 - Bitumen Combustor		
Licence No.	1048	**Location**	Port Botany	**State**	NSW
Ektimo Staff	Scott Woods/Ryan Collins				
Process Conditions	Please refer to client records.				

Total VOCs* (as n-Propane)	Results		
Sampling time	1050-1150		
	Concentration mg/m³	Corrected to 3% O2 mg/m³	Mass Rate g/min
Total	<0.1	<0.3	<0.006

*Total VOCs does not include methane

VOC's Speciated	Results		
Sampling time	1050-1150		
	Concentration mg/m³	Corrected to 3% O2 mg/m³	Mass Rate g/min
Detection limit[(1)]	<0.1	<0.3	<0.006

(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, TetradecaneTetradecane, Cyclohexane, 2-Methylhexane, 2,3-Dimethylpentane, 3-Methylhexane, Isooctane, Methylcyclohexane, alpha-Pinene, beta-Pinene, d-Limonene, 3-Carene3-Carene, Acetone, Methyl ethyl ketone, Ethyl acetate, Isopropyl acetate, Propyl acetate, MIBK, 2-Hexanone, Butyl acetate, 1-Methoxy-2-propyl acetate, Cyclohexanone, 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, 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, Tetrachloroethene, 1,1,2-Trichloroethane, 1,1,2,2-Tetrachloroethane, Chlorobenzene, Fluorobenzene

4 PLANT OPERATING CONDITIONS

Unless otherwise stated, the plant operating conditions were normal at the time of testing. See Terminals Pty Ltd's records for complete process conditions.

5 TEST METHODS

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

Parameter	Sampling Method	Analysis Method	Method Detection Limit	Uncertainty*	NATA Accredited	
					Sampling	Analysis
Sample plane criteria	NSW TM-1	NA	NA	-	✓	NA
Moisture content	NSW TM-22	NSW TM-22	0.4%	19%	✓	✓
Temperature	NSW TM-2	NA	0°C	2%	✓	NA
Flow rate	NSW TM-2	NA	Location specific	8%	✓	NA
Velocity	NSW TM-2	NA	$2ms^{-2}$	7%	✓	NA
Nitrogen oxides (NO_x)	NSW TM-11	NSW TM-11	$4mg/m^3$	12%	✓	✓
Carbon monoxide	NSW TM-32	NSW TM-32	$0.0025g/m^3$	12%	✓	✓
Carbon dioxide	NSW TM-24	NSW TM-24	0.1%	13%	✓	✓
Oxygen	NSW TM-25	NSW TM-25	0.1%	13%	✓	✓
Speciated volatile organic compounds (VOC's)	NSW TM-34	USEPA SW-846 8260	$0.33mg/m^3$	19%	✓	✓[1]

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

1. Analysis performed by Ektimo (EML Air), NATA accreditation number 2732. Results were reported to Ektimo on 14 September 2016 in report number R003007_VOCs

6 QUALITY ASSURANCE/ QUALITY CONTROL INFORMATION

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

Ektimo (EML) and Ektimo (ETC) are accredited by NATA (National Association of Testing Authorities) to ISO/IEC 17025. – General Requirements for the Competence of Testing and Calibration Laboratories. ISO/IEC 17025 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 Compliance 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.

7 DEFINITIONS

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

STP	Standard temperature and pressure. Gas volumes and concentrations are expressed on a dry basis at 0°C, at discharge oxygen concentration and an absolute pressure of 101.325 kPa, unless otherwise specified.
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