Ektimo

# Bituminous Products Pty Ltd, Revesby

# Emission Testing Report

# Report Number R013121a

## Document Information

*Template Version 190722*

| | |
|---|---|
| Client Name: | Bituminous Products Pty Ltd |
| Report Number: | R013121a |
| Date of Issue: | 25 October 2022 |
| Attention: | Roger Rich |
| Address: | 33 Violet St<br>Revesby NSW 2212 |
| Testing Laboratory: | Ektimo Pty Ltd, ABN 86 600 381 413 |

## Amendment Record

| Original Document Number | Initiator | Original Report Date | Section (s) | Reason for revision |
|---|---|---|---|---|
| R013121 | Client (RRi) | 5/10/22 | Page 4, Project objectives table | Date of testing amended (year corrected) |

## Report Authorisation

**Steven Cooper**
**Senior Air Monitoring Consultant**

NATA Accredited Laboratory
No. 14601

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



*Please note that only numerical results pertaining to measurements conducted directly by Ektimo are covered by Ektimo's terms of NATA accreditation as described in the Test Methods table. This does not include calculations that use data supplied by third-parties, comments, conclusions, or recommendations based upon the results. Refer to 'Test Methods' for full details of testing covered by NATA accreditation.*

## Table of Contents

# 1 Executive Summary

## 1.1 Background

Ektimo was engaged by Bituminous Products Pty Ltd to perform emission testing at their Revesby plant. Testing was carried out in accordance with Environment Protection Licence 5267.

## 1.2 Project Objective

The objective of the project was to conduct a monitoring programme to quantify emissions from two (2) discharge points to determine compliance with Bituminous Products Pty Ltd's Environmental Licence.

Monitoring was performed as follows:

| Location | Test Date | Test Parameters* |
|---|---|---|
| EPA 1 – Thermal Oxidiser | 2 September 2022 | Nitrogen oxides (as $NO_2$), oxygen, carbon dioxide<br>Total solid particles<br>Sulfuric acid mist & sulfur trioxide (as $SO_3$)<br>Total organic compounds (TOC) |
| EPA 2 - Vapour Scrubber Stack | 28 August 2022 | Total solid particles<br>Total organic compounds (TOC)<br>Odour (x2) |

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

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

Plant operating conditions have been noted in the report.

## 1.3 Licence Comparison

The following licence comparison table shows that all analytes highlighted in green are within the licence limit set by the NSW EPA as per licence 5267 (last amended on 26 September 2022).

| EPA No. | Location Description | Pollutant | Units | Licence Limit | Detected Values | Detected Values (corrected to 3% $O_2$) |
|---|---|---|---|---|---|---|
| 1 | Thermal Oxidiser | Solid particles | $mg/m^3$ | 50 | 17 | 25 |
| | | Volatile organic compounds (VOCs) | $mg/m^3$ | 40 | <3 | <5 |
| | | Sulfuric acid mist and sulfur trioxide (as $SO_3$) | $mg/m^3$ | 100 | 14 | 20 |
| | | Nitrogen oxides (as $NO_2$) | $mg/m^3$ | 350 | 120 | 170 |
| 2 | Vapour Scrubber Stack | Solid particles | $mg/m^3$ | 50 | <2 | NA |
| | | Volatile organic compounds (VOCs) | $mg/m^3$ | 40 | <3 | NA |

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

*Refer to the Test Methods table for the measurement uncertainties.*

# 2 Results

## *2.1 EPA 1 – Thermal Oxidiser*

| | | | |
|---|---|---|---|
| **Date** | 2/09/2022 | **Client** | Bituminous Products |
| **Report** | R013121 | **Stack ID** | EPA 1 - Thermal Oxidiser |
| **Licence No.** | 5267 | **Location** | Revesby |
| **Ektimo Staff** | Steven Cooper & Ahmad Ramiz | **State** | NSW |
| **Process Conditions** | Please refer to Plant Operating Conditions. | | *220818* |

| **Sampling Plane Details** | |
|---|---|
| Sampling plane dimensions | 300 mm |
| Sampling plane area | 0.0707 m² |
| Sampling port size, number & depth | 4" BSP (x2), 90 mm |
| Duct orientation & shape | Vertical Circular |
| Downstream disturbance | Exit >6 D |
| Upstream disturbance | Change in diameter 6 D |
| No. traverses & points sampled | 2 4 |
| Sample plane conformance to AS 4323.1 | Conforming but non-ideal |

**The sampling plane is deemed to be non-ideal due to the following reasons:**
The sampling plane is too near to the upstream disturbance but is greater than or equal to 2D

| **Stack Parameters** | | |
|---|---|---|
| Moisture content, %v/v | 5.8 | |
| Gas molecular weight, g/g mole | 29.2 (wet) | 29.9 (dry) |
| Gas density at STP, kg/m³ | 1.30 (wet) | 1.33 (dry) |
| Gas density at discharge conditions, kg/m³ | 0.40 | |
| % Oxygen correction & Factor | 3 % | 1.44 |
| | | |
| **Gas Flow Parameters** | | |
| Flow measurement time(s) (hhmm) | 1150 & 1310 | |
| Temperature, °C | 619 | |
| Temperature, K | 892 | |
| Velocity at sampling plane, m/s | 8.1 | |
| Volumetric flow rate, actual, m³/s | 0.57 | |
| Volumetric flow rate (wet STP), m³/s | 0.18 | |
| Volumetric flow rate (dry STP), m³/s | 0.17 | |
| Mass flow rate (wet basis), kg/hour | 830 | |

| **Gas Analyser Results** | Average | | |
|---|---|---|---|
| Sampling time | 1158 - 1259 | | |
| | | Corrected to | |
| | Concentration | 3% O2 | Mass Rate |
| | mg/m³ | mg/m³ | g/min |
| **Combustion Gases** | | | |
| Nitrogen oxides (as $NO_2$) | 120 | 170 | 1.2 |
| | | Concentration | |
| | | %v/v | |
| Carbon dioxide | | 8.7 | |
| Oxygen | | 8.5 | |

| **Total Organic Compounds (TOC)** | Average | | |
|---|---|---|---|
| Sampling time | 1158 - 1259 | | |
| | | Corrected to | |
| | Concentration | 3% O2 | Mass Rate |
| | mg/m³ | mg/m³ | g/min |
| TOC (as Propane) | <3 | <5 | <0.03 |

| | | | |
|---|---|---|---|
| **Date** | 2/09/2022 | **Client** | Bituminous Products |
| **Report** | R013121 | **Stack ID** | EPA 1 - Thermal Oxidiser |
| **Licence No.** | 5267 | **Location** | Revesby |
| **Ektimo Staff** | Steven Cooper & Ahmad Ramiz | **State** | NSW |
| **Process Conditions** | Please refer to Plant Operating Conditions. | | *220818* |

| **Isokinetic Results** | Results | | |
|---|---|---|---|
| Sampling time | 1153-1255 | | |
| | Concentration mg/m³ | Corrected to 3% O2 mg/m³ | Mass Rate g/min |
| Solid Particles | 17 | 25 | 0.17 |
| Sulfur trioxide and/or Sulfuric acid (as SO3) | 14 | 20 | 0.14 |
| | | | |
| **Isokinetic Sampling Parameters** | | | |
| Sampling time, min | | 60 | |
| Isokinetic rate, % | | 96 | |
| Gravimetric analysis date (total particulate) | | 16-09-2022 | |

## 2.2 EPA 2 - Vapour Scrubber Stack

| | | | |
|---|---|---|---|
| **Date** | 28/08/2022 | **Client** | Bituminous Products |
| **Report** | R013121 | **Stack ID** | EPA 2 - Vapour Scrubber Stack |
| **Licence No.** | 5267 | **Location** | Revesby |
| **Ektimo Staff** | Steven Cooper & Ish Alam | **State** | NSW |
| **Process Conditions** | Please refer to client records. | | *220818* |

| **Sampling Plane Details** | |
|---|---|
| Sampling plane dimensions | 345 mm |
| Sampling plane area | 0.0935 m² |
| Sampling port size, number | 3" Flange (x2) |
| Duct orientation & shape | Vertical Circular |
| Downstream disturbance | Exit >6 D |
| Upstream disturbance | Junction 3 D |
| No. traverses & points sampled | 2 8 |
| Sample plane conformance to AS 4323.1 | Conforming but non-ideal |

**The sampling plane is deemed to be non-ideal due to the following reasons:**
The sampling plane is too near to the upstream disturbance but is greater than or equal to 2D

| **Stack Parameters** | | |
|---|---|---|
| Moisture content, %v/v | <0.4 | |
| Gas molecular weight, g/g mole | 29.0 (wet) | 29.0 (dry) |
| Gas density at STP, kg/m³ | 1.29 (wet) | 1.29 (dry) |
| Gas density at discharge conditions, kg/m³ | 1.23 | |
| **Gas Flow Parameters** | | |
| Flow measurement time(s) (hhmm) | 0921 & 1040 | |
| Temperature, °C | 19 | |
| Temperature, K | 292 | |
| Velocity at sampling plane, m/s | 2.5 | |
| Volumetric flow rate, actual, m³/s | 0.24 | |
| Volumetric flow rate (wet STP), m³/s | 0.23 | |
| Volumetric flow rate (dry STP), m³/s | 0.23 | |
| Mass flow rate (wet basis), kg/hour | 1100 | |

| **Total Organic Compounds (TOC)** | Average | |
|---|---|---|
| Sampling time | 0917 - 1018 | |
| | Concentration mg/m³ | Mass Rate g/min |
| TOC (as Propane) | <3 | <0.04 |

| | | | |
|---|---|---|---|
| **Date** | 28/08/2022 | **Client** | Bituminous Products |
| **Report** | R013121 | **Stack ID** | EPA 2 - Vapour Scrubber Stack |
| **Licence No.** | 5267 | **Location** | Revesby |
| **Ektimo Staff** | Steven Cooper & Ish Alam | **State** | NSW |
| **Process Conditions** | Please refer to client records. | | *220818* |

| **Odour** | Average | | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Sampling time | | | 0943 - 0956 | | 0958 - 1011 | |
| | Concentration ou | Odourant Flow Rate oum³/min | Concentration ou | Odourant Flow Rate oum³/min | Concentration ou | Odourant Flow Rate oum³/min |
| **Results** | 6400 | 86000 | 6400 | 86000 | 6400 | 86000 |
| Lower uncertainty limit | 5000 | | 4500 | | 4500 | |
| Upper uncertainty limit | 8100 | | 8900 | | 8900 | |
| Hedonic tone | | | mildly unpleasant | | mildly unpleasant | |
| Odour character | | | Bitumen | | Bitumen | |
| Analysis date & time | | | 29/08/22, 1000 - 1030 | | 29/08/22, 1000 - 1030 | |
| Holding time | | | 24 hours | | 24 hours | |
| Dilution factor | | | 1 | | 1 | |
| Bag material | | | Nalophan | | Nalophan | |
| Butanol threshold (ppb) | 48 | | | | | |
| Laboratory temp (°C) | 22 | | | | | |
| Last calibration date | October 2021 | | | | | |

| **Isokinetic Results** | Results | |
|---|---|---|
| Sampling time | 0933-1038 | |
| | Concentration mg/m³ | Mass Rate g/min |
| Solid Particles | <2 | <0.02 |
| **Isokinetic Sampling Parameters** | | |
| Sampling time, min | 64 | |
| Isokinetic rate, % | 104 | |
| Gravimetric analysis date (total particulate) | 05-09-2022 | |

## 3 Plant Operating Conditions

The below plant operating conditions have been supplied by Bituminous Products' personnel

| Locations | Operating Conditions |
|---|---|
| **EPA 1 - Thermal Oxidiser** | Combustion Temperature > 760 °C |
| **EPA 2 - Vapour Scrubber Stack** | Fed from Mixer 1 Polymer A15E, Mixer 2 C170 and Mixer 3 Polymer A15E, Tank 24 C170, Tank 5 C170, Tank 22 A10E Polymer with Wax and Tank 23 A15E Polymer |

## 4 Test Methods

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

| Parameter | Sampling method | Analysis method | Uncertainty* | NATA accredited Sampling | NATA accredited Analysis |
|---|---|---|---|---|---|
| Sampling points - Selection | NSW EPA TM-1 (AS 4323.1) | NA | NA | ✓ | NA |
| Flow rate, temperature & velocity | NSW EPA TM-2 (USEPA Method 2) | NSW EPA TM-2 (USEPA Method 2) | 8%, 2%, 7% | NA | ✓ |
| Moisture content | NSW EPA TM-22 (USEPA Method 4) | NSW EPA TM-22 (USEPA Method 4) | 8% | ✓ | ✓ |
| Molecular weight | NA | NSW EPA TM-23 (USEPA Method 3) | not specified | NA | ✓ |
| Dry gas density | NA | NSW EPA TM-23 (USEPA Method 3) | not specified | NA | ✓ |
| Carbon dioxide | NSW EPA TM-24 (USEPA Method 3A) | NSW EPA TM-24 (USEPA Method 3A) | 13% | ✓ | ✓ |
| Nitrogen oxides | NSW EPA TM-11 (USEPA Method 7E) | NSW EPA TM-11 (USEPA Method 7E) | 12% | ✓ | ✓ |
| Oxygen | NSW EPA TM-25 (USEPA Method 3A) | NSW EPA TM-25 (USEPA Method 3A) | 13% | ✓ | ✓ |
| Volatile organic compounds | NSW EPA TM-34 (USEPA Method 25B) | NSW EPA TM-34 (USEPA Method 25B) | not specified | ✓ | ✓ |
| Solid particles (total) | NSW EPA TM-15 (AS 4323.2) | NSW EPA TM-15 (AS 4323.2) | 3% | ✓ | ✓††† |
| Sulfuric acid mist and/or sulfur trioxide | NSW EPA TM-3 (USEPA Method 8) | Ektimo 235 | 16% | ✓ | ✓† |
| Odour | NSW EPA OM-7 (AS 4323.3) | NSW EPA OM-7 (AS 4323.3) | refer to results | ✓ | ✓¥ |
| Odour characterisation | NA | direct observation | NA | NA | × |

*220920*

* Uncertainties cited in this table are estimated using typical values and are calculated at the 95% confidence level (coverage factor = 2).

† Analysis conducted at the Ektimo Mitcham, VIC laboratory, NATA accreditation number 14601. Result was reported on 26 September 2022 in report LV-003357.

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

¥ Odour analysis conducted at the Unanderra, NSW laboratory by forced choice olfactometry, NATA accreditation number 14601. Result was reported on 29 August 2022 in report ON-00157.

## 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.com.au.

Ektimo is accredited by NATA to ISO/IEC 17025 - Testing. ISO/IEC 17025 - Testing requires that a laboratory have adequate equipment to perform the testing, as well as laboratory personnel with the competence to perform the testing. This quality assurance system is administered and maintained by the Quality Director.

NATA is a member of APAC (Asia Pacific Accreditation Co-operation) and of ILAC (International Laboratory Accreditation Co-operation). Through mutual recognition arrangements with these organisations, NATA accreditation is recognised worldwide.

## 6 Definitions

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

| | |
|---|---|
| % v/v | Volume to volume ratio, dry or wet basis |
| ~ | Approximately |
| < | Less than |
| > | Greater than |
| ≥ | Greater than or equal to |
| APHA | American Public Health Association, Standard Methods for the Examination of Water and Waste Water |
| AS | Australian Standard |
| BSP | British standard pipe |
| CARB | Californian Air Resources Board |
| CEM/CEMS | Continuous emission monitoring/Continuous emission monitoring system |
| CTM | Conditional test method |
| D | Duct diameter or equivalent duct diameter for rectangular ducts |
| $D_{50}$ | 'Cut size' of a cyclone is defined as the particle diameter at which the cyclone achieves a 50% collection efficiency i.e. half of the particles are retained by the cyclone and half pass through it. The $D_{50}$ method simplifies the capture efficiency distribution by assuming that a given cyclone stage captures all of the particles with a diameter equal to or greater than the $D_{50}$ of that cyclone and less than the $D_{50}$ of the preceding cyclone. |
| DECC | Department of Environment & Climate Change (NSW) |
| Disturbance | A flow obstruction or instability in the direction of the flow which may impede accurate flow determination. This includes centrifugal fans, axial fans, partially closed or closed dampers, louvres, bends, connections, junctions, direction changes or changes in pipe diameter. |
| DWER | Department of Water and Environmental Regulation (WA) |
| DEHP | Department of Environment and Heritage Protection (QLD) |
| EPA | Environment Protection Authority |
| FTIR | Fourier transform infra-red |
| ISC | Intersociety Committee, Methods of Air Sampling and Analysis |
| ISO | International Organisation for Standardisation |
| ITE | Individual threshold estimate |
| Lower bound | When an analyte is not present above the detection limit, the result is assumed to be equal to zero. |
| Medium bound | When an analyte is not present above the detection limit, the result is assumed to be equal to half of the detection limit. |
| NA | Not applicable |
| NATA | National Association of Testing Authorities |
| NIOSH | National Institute of Occupational Safety and Health |
| NT | Not tested or results not required |
| OM | Other approved method |
| OU | Odour unit. One OU is that concentration of odorant(s) at standard conditions that elicits a physiological response from a panel equivalent to that elicited by one Reference Odour Mass (ROM), evaporated in one cubic metre of neutral gas at standard conditions. |
| $PM_{10}$ | Particulate matter having an equivalent aerodynamic diameter less than or equal to 10 microns (µm). |
| $PM_{2.5}$ | Particulate matter having an equivalent aerodynamic diameter less than or equal to 2.5 microns (µm). |
| PSA | Particle size analysis. PSA provides a distribution of geometric diameters, for a given sample, determined using laser diffraction. |
| RATA | Relative accuracy test audit |
| Semi-quantified VOCs | Unknown VOCs (those for which an analytical standard is not available), are identified by matching the mass spectrum of the chromatographic peak to the NIST Standard Reference Database (version 14.0), with a match quality exceeding 70%. An estimated concentration is determined by matching the area of the peak with the nearest suitable compound in the analytical calibration standard mixture. |
| STP | Standard temperature and pressure. Gas volumes and concentrations are expressed on a dry basis at 0 °C, at discharge oxygen concentration and an absolute pressure of 101.325 kPa. |
| TM | Test method |
| TOC | Total organic carbon. This is the sum of all compounds of carbon which contain at least one carbon-to-carbon bond, plus methane and its derivatives. |
| USEPA | United States Environmental Protection Agency |
| VDI | Verein Deutscher Ingenieure (Association of German Engineers) |
| Velocity difference | The percentage difference between the average of initial flows and after flows. |
| Vic EPA | Victorian Environment Protection Authority |
| VOC | Volatile organic compound. A carbon-based chemical compound with a vapour pressure of at least 0.010 kPa at 25°C or having a corresponding volatility under the given conditions of use. VOCs may contain oxygen, nitrogen and other elements. VOCs do not include carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonate salts. |
| XRD | X-ray diffractometry |
| Upper bound | When an analyte is not present above the detection limit, the result is assumed to be equal to the detection limit. |
| 95% confidence interval | Range of values that contains the true result with 95% certainty. This means there is a 5% risk that the true result is outside this range. |

## 7 Appendix 1: Site Photos

**Figure 1 –** EPA 1 Thermal Oxidiser

**Figure 2 –** Vapour Scrubber Stack

# Ektimo

ektimo.com.au
1300 364 005

**MELBOURNE** (Head Office)
26 Redland Drive
Mitcham
VIC 3132
AUSTRALIA

**SYDNEY**
6/78 Reserve Road
Artarmon
NSW 2064
AUSTRALIA

**WOLLONGONG**
1/251 Princes Highway
Unanderra
NSW 2526
AUSTRALIA

**PERTH**
52 Cooper Road
Cockburn Central
WA 6164
AUSTRALIA

**BRISBANE**
3/109 Riverside Place
Morningside
QLD 4170
AUSTRALIA