



REPORT NUMBER R009932

**Emission Testing Report
CPE Mascot Pty Ltd, Mascot**

Document Information

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Report Authorisation



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

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Please note that only numerical results pertaining to measurements conducted directly by Ektimo are covered by Ektimo's terms of NATA accreditation. This does not include comments, conclusions or recommendations based upon the results. Refer to 'Test Methods' for full details of testing covered by NATA accreditation.

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1 EXECUTIVE SUMMARY

1.1 Background

Ektimo was engaged by CPE Mascot Pty Ltd to perform emission testing at the trigeneration facility located at Mascot NSW to satisfy conditions within NSW Environment Protection licence 20246.

1.2 Project Objectives

The objectives of the project were to conduct a monitoring programme to quantify emissions from two discharge points to determine compliance with CPE Mascot Pty Ltd 's Environment Protection Licence.

Monitoring was performed as follows:

| Location | Test Date | Test Parameters* |
|--------------|---------------|--|
| DP1 – Unit 1 | 26 March 2021 | Nitrogen oxides, oxygen |
| DP2 – Unit 2 | | Volatile organic compounds (VOC's) includes n-propane equivalent |

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

All results are reported on a dry basis at STP.

Plant operating conditions have been noted in the report.

1.3 Licence Summary

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 20246 (last amended on 14 November 2017).

| EPA No. | Pollutant | Units | Licence limit | Detected values (Corrected to 3% O ₂) |
|---------|---|-------------------|---------------|--|
| 1 | Nitrogen Oxides | mg/m ³ | 250 | 230 |
| | Volatile Organic Compounds (as n-propane) | mg/m ³ | 40 | <0.1 |
| 2 | Nitrogen Oxides | mg/m ³ | 250 | 240 |
| | Volatile Organic Compounds (as n-propane) | mg/m ³ | 40 | <0.1 |

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 DP1 – Unit 1

| | | | |
|--------------------|---------------------------|----------|--------------------|
| Date | 26/03/2021 | Client | CPE Mascot Pty Ltd |
| Report | R009932 | Stack ID | DP 1 - Unit 1 |
| Licence No. | 20246 | Location | Mascot |
| Ektimo Staff | Hamish Proust | State | NSW |
| Process Conditions | Load: 3.8MW, Chiller: Off | | |

200928

| Sampling Plane Details | |
|-------------------------------------|-------------------------|
| Sampling plane dimensions | 900 mm |
| Sampling plane area | 0.636 m ² |
| Sampling port size, number | 2" BSP (x2) |
| Access & height of ports | Stairs 25 m |
| Duct orientation & shape | Vertical Circular |
| Downstream disturbance | Exit 10 D |
| Upstream disturbance | Junction 2 D |
| No. traverses & points sampled | 2 16 |
| Sample plane compliance to AS4323.1 | Compliant but non-ideal |

Comments
 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 | 14 | | |
| Gas molecular weight, g/g mole | 27.9 (wet) | | 29.5 (dry) |
| Gas density at STP, kg/m ³ | 1.24 (wet) | | 1.32 (dry) |
| % Oxygen correction & Factor | 3% | | 1.67 |

| Gas Flow Parameters | | | |
|---|-------------|--|--|
| Flow measurement time(s) (hhmm) | 0713 & 0816 | | |
| Temperature, °C | 412 | | |
| Temperature, K | 685 | | |
| Velocity at sampling plane, m/s | 18 | | |
| Volumetric flow rate, actual, m ³ /s | 11 | | |
| Volumetric flow rate (wet STP), m ³ /s | 4.5 | | |
| Volumetric flow rate (dry STP), m ³ /s | 3.9 | | |
| Mass flow rate (wet basis), kg/hour | 20000 | | |
| Velocity difference, % | -3 | | |

| Gas Analyser Results | Sampling time | Average | | | Minimum | | | Maximum | | |
|---------------------------------------|---------------|-------------------|-------------------|-----------|-------------------|-------------------|-----------|-------------------|-------------------|-----------|
| | | 0714 - 0814 | | | 0714 - 0814 | | | 0714 - 0814 | | |
| | | Corrected to | | | Corrected to | | | Corrected to | | |
| Combustion Gases | | Concentration | 3% O ₂ | Mass Rate | Concentration | 3% O ₂ | Mass Rate | Concentration | 3% O ₂ | Mass Rate |
| | | mg/m ³ | mg/m ³ | g/min | mg/m ³ | mg/m ³ | g/min | mg/m ³ | mg/m ³ | g/min |
| Nitrogen oxides (as NO ₂) | | 140 | 230 | 32 | 99 | 170 | 23 | 180 | 290 | 41 |
| | | Concentration | | | Concentration | | | Concentration | | |
| | | %v/v | | | %v/v | | | %v/v | | |
| Oxygen | | 10.2 | | | 10.2 | | | 10.3 | | |

| Total VOCs (as n-Propane) | Sampling time | Results | | |
|---------------------------|---------------|-------------------|-------------------|-----------|
| | | 0714-0814 | | |
| | | Corrected to | | |
| | | Concentration | 3% O ₂ | Mass Rate |
| | | mg/m ³ | mg/m ³ | g/min |
| Total | | <0.07 | <0.1 | <0.02 |

| VOC (speciated) | Sampling time | Results | | |
|--------------------------------|---------------|-------------------|-------------------|-----------|
| | | 0714-0814 | | |
| | | Corrected to | | |
| | | Concentration | 3% O ₂ | Mass Rate |
| | | mg/m ³ | mg/m ³ | g/min |
| Detection limit ⁽¹⁾ | | <0.07 | <0.1 | <0.02 |

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

Dichloromethane, Ethanol, Isopropanol, 1,1-Dichloroethene, trans-1,2-Dichloroethene, cis-1,2-Dichloroethene, Chloroform, 1,1-Trichloroethane, 1,2-Dichloroethane, Benzene, Carbon tetrachloride, Butanol, 1-Methoxy-2-propanol, Trichloroethylene, Toluene, 1,1,2-Trichloroethane, Tetrachloroethene, Chlorobenzene, Ethylbenzene, m+p-Xylene, Styrene, o-Xylene, 2-Butoxyethanol, 1,1,2,2-Tetrachloroethane, Isopropylbenzene, Propylbenzene, 1,3,5-Trimethylbenzene, tert-Butylbenzene, 1,2,4-Trimethylbenzene, 1,2,3-Trimethylbenzene, Acetone, Pentane, Acrylonitrile, Methyl ethyl ketone, n-Hexane, Ethyl acetate, Cyclohexane, 2-Methylhexane, Isopropyl acetate, 2,3-Dimethylpentane, 3-Methylhexane, Heptane, Ethyl acrylate, Methyl methacrylate, Propyl acetate, Methylcyclohexane, Methyl Isobutyl Ketone, 2-Hexanone, Octane, Butyl acetate, 1-Methoxy-2-propyl acetate, Butyl acrylate, Nonane, Cellosolve acetate, alpha-Pinene, beta-Pinene, Decane, 3-Carene, D-Limonene, Undecane, Dodecane, Tridecane, Tetradecane

2.2 DP2 – Unit 2

| | | | |
|--------------------|-------------------------------|----------|--------------------|
| Date | 26/03/2021 | Client | CPE Mascot Pty Ltd |
| Report | R009932 | Stack ID | DP 2 - Unit 2 |
| Licence No. | 20246 | Location | Mascot |
| Ektimo Staff | Hamish Proust | State | NSW |
| Process Conditions | Load: 3.1-3.2MW, Chiller: Off | | |

| Sampling Plane Details | |
|-------------------------------------|-------------------------|
| Sampling plane dimensions | 900 mm |
| Sampling plane area | 0.636 m ² |
| Sampling port size, number | 2" BSP (x2) |
| Access & height of ports | Stairs 25 m |
| Duct orientation & shape | Vertical Circular |
| Downstream disturbance | Exit 10 D |
| Upstream disturbance | Junction 2 D |
| No. traverses & points sampled | 2 16 |
| Sample plane compliance to AS4323.1 | Compliant but non-ideal |

Comments
 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 | 11 |
| Gas molecular weight, g/g mole | 28.1 (wet) 29.3 (dry) |
| Gas density at STP, kg/m ³ | 1.25 (wet) 1.31 (dry) |
| % Oxygen correction & Factor | 3 % 1.70 |

| Gas Flow Parameters | |
|---|-------------|
| Flow measurement time(s) (hhmm) | 0605 & 0712 |
| Temperature, °C | 399 |
| Temperature, K | 672 |
| Velocity at sampling plane, m/s | 18 |
| Volumetric flow rate, actual, m ³ /s | 11 |
| Volumetric flow rate (wet STP), m ³ /s | 4.5 |
| Volumetric flow rate (dry STP), m ³ /s | 4 |
| Mass flow rate (wet basis), kg/hour | 20000 |
| Velocity difference, % | 1 |

| Gas Analyser Results | Sampling time | Average 0609 - 0710 | | | Minimum 0609 - 0710 | | | Maximum 0609 - 0710 | | |
|---------------------------------------|------------------------------------|----------------------------|--------------------|--------------------|------------------------------------|----------------------------|--------------------|------------------------|------------------------------------|--------------------|
| | | Corrected to | | Mass Rate g/min | Corrected to | | Mass Rate g/min | Corrected to | | Mass Rate g/min |
| Combustion Gases | Concentration mg/m ³ | 3% O2 mg/m ³ | Mass Rate g/min | | Concentration mg/m ³ | 3% O2 mg/m ³ | | Mass Rate g/min | Concentration mg/m ³ | |
| Nitrogen oxides (as NO ₂) | | 140 | 240 | 34 | 110 | 190 | 27 | 170 | 290 | 42 |
| Oxygen | | Concentration %v/v | | | Concentration %v/v | | | Concentration %v/v | | |
| | | 10.4 | | | 9.4 | | | 10.6 | | |

| Total VOCs (as n-Propane) | Sampling time | Results 0610-0709 | | |
|---------------------------|---------------|------------------------------------|----------------------------|--------------------|
| | | Corrected to | | Mass Rate g/min |
| | | Concentration mg/m ³ | 3% O2 mg/m ³ | |
| Total | | <0.07 | <0.1 | <0.02 |

| VOC (speciated) | Sampling time | Results 0610-0709 | | |
|--------------------------------|---------------|------------------------------------|----------------------------|--------------------|
| | | Corrected to | | Mass Rate g/min |
| | | Concentration mg/m ³ | 3% O2 mg/m ³ | |
| Detection limit ⁽¹⁾ | | <0.07 | <0.1 | <0.02 |

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

Dichloromethane, Ethanol, Isopropanol, 1,1-Dichloroethene, trans-1,2-Dichloroethene, cis-1,2-Dichloroethene, Chloroform, 1,1,1-Trichloroethane, 1,2-Dichloroethane, Benzene, Carbon tetrachloride, Butanol, 1-Methoxy-2-propanol, Trichloroethylene, Toluene, 1,1,2-Trichloroethane, Tetrachloroethene, Chlorobenzene, Ethylbenzene, m + p-Xylene, Styrene, o-Xylene, 2-Butoxyethanol, 1,1,2,2-Tetrachloroethane, Isopropylbenzene, Propylbenzene, 1,3,5-Trimethylbenzene, tert-Butylbenzene, 1,2,4-Trimethylbenzene, 1,2,3-Trimethylbenzene, Acetone, Pentane, Acrylonitrile, Methyl ethyl ketone, n-Hexane, Ethyl acetate, Cyclohexane, 2-Methylhexane, Isopropyl acetate, 2,3-Dimethylpentane, 3-Methylhexane, Heptane, Ethyl acrylate, Methyl methacrylate, Propyl acetate, Methylcyclohexane, Methyl Isobutyl Ketone, 2-Hexanone, Octane, Butyl acetate, 1-Methoxy-2-propyl acetate, Butyl acrylate, Nonane, Cellosolve acetate, alpha-Pinene, beta-Pinene, Decane, 3-Carene, D-Limonene, Undecane, Dodecane, Tridecane, Tetradecane

3 PLANT OPERATING CONDITIONS

Testing was conducted on DP1 - Unit 1 under 3.8MW load, chilling unit off and DP 2 - Unit 2 under 3.1-3.2MW load, chilling unit off.

See CPE Mascot Pty Ltd records for complete process conditions.

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 | Analysis |
| Sample plane criteria | NSW TM-1 | NA | NA | ✓ | NA |
| Flow rate, temperature and velocity | NSW TM-2 | NSW TM-2 | 8%, 2%, 7% | NA | ✓ |
| Moisture content | NSW TM-22 | NSW TM-22 | 19% | ✓ | ✓ |
| Nitrogen oxides | NSW TM-11 | NSW TM-11 | 12% | ✓ | ✓ |
| Oxygen | NSW TM-25 | NSW TM-25 | 13% | ✓ | ✓ |
| Speciated volatile organic compounds (VOC's) | NSW TM-34 ^d | Ektimo 344 | 19% | ✓ | ✓ [†] |

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

† Analysis conducted at the Ektimo Mitcham, VIC laboratory, NATA accreditation number 14601. Results were reported on 8 April 2021 in report number LV-001279.

d Excludes recovery study as specified in section 8.4.3 of USEPA Test Method 18.

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 (National Association of Testing Authorities) to ISO/IEC 17025 - Testing. ISO/IEC 17025 - Testing requires that a laboratory have adequate equipment to perform the testing, as well as laboratory personnel with the competence to perform the testing. This quality assurance system is administered and maintained by the Quality Director.

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

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 | Continuous Emission Monitoring |
| CEMS | 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 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. |
| 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 |
| Lower Bound | Defines values reported below detection as equal to zero. |
| Medium Bound | Defines values reported below detection are equal to half the detection limit. |
| NA | Not applicable |
| NATA | National Association of Testing Authorities |
| NIOSH | National Institute of Occupational Safety and Health |
| NT | Not tested or results not required |
| OM | Other approved method |
| OU | The number of odour units per unit of volume. The numerical value of the odour concentration is equal to the number of dilutions to arrive at the odour threshold (50% panel response). |
| PM ₁₀ | Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 10 microns (µm). |
| PM _{2.5} | Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 2.5 microns (µm). |
| PSA | Particle size analysis |
| RATA | Relative Accuracy Test Audit |
| Semi-quantified VOCs | Unknown VOCs (those not matching a standard compound), are identified by matching the mass spectrum of the chromatographic peak to the NIST Standard Reference Database (version 14.0), with a match quality exceeding 70%. An estimated concentration will be determined by matching the integrated area of the peak with the nearest suitable compound in the analytical calibration standard mixture. |
| STP | Standard temperature and pressure. Gas volumes and concentrations are expressed on a dry basis at 0°C, at discharge oxygen concentration and an absolute pressure of 101.325 kPa, unless otherwise specified. |
| TM | Test Method |
| TOC | The sum of all compounds of carbon which contain at least one carbon to carbon bond, plus methane and its derivatives. |
| USEPA | United States Environmental Protection Agency |
| VDI | Verein Deutscher Ingenieure (Association of German Engineers) |
| Velocity Difference | The percentage difference between the average of initial flows and afterflows. |
| Vic EPA | Victorian Environment Protection Authority |
| VOC | Any chemical compound based on carbon with a vapour pressure of at least 0.010 kPa at 25°C or having a corresponding volatility under the particular conditions of use. These compounds may contain oxygen, nitrogen and other elements, but specifically excluded are carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonate salts. |
| XRD | X-ray Diffractometry |
| Upper Bound | Defines values reported below detection are equal to the detection limit. |
| 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. |

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