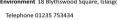




CERTIFICATE OF CALIBRATION

Ricardo Energy & Environment 18 Blythswood Square, Glasgow, G2 4BG





Page 1 of 3

| Approved Signatories: | | S. Eaton D Hector N Rand B Davies | □ B Stacey□ S Stratton☑ S Telfer□ S Gray | | | | |
|--|--|---|---|--|--|--|--|
| Signed: | Stelker | | | | | | |
| Date of issue: | 24 March 2023 | | | | | | |
| Certificate Number: | 6196 | | | | | | |
| Customer Name and Address: | | Scottish Government Water, Air, Soils and Flooding Division Environmental Quality Directorate Scottish Government Victoria Quay Edinburgh EH6 6QQ | | | | | |
| Description: | | Calibration factors for the air monitoring station(s) at East Ayrshire Council | | | | | |
| Ricardo Energy & Environment ID: | | ED11194/6196 | | | | | |
| The reported expanded uncertainties are based on a standard unclevel of confidence of approximately 95% The uncertainty evaluati requirements. This certificate is issued in accordance with the laboratory accredit Service. It provides traceability of measurement to the SI system o National Physical Laboratory or other recognised national metrolo than in full, except with the prior written approval of the issuing la | on has been carried out ation requirements of the funits and/or to units of gy institutes. This certific | in accordance with UKAS The United Kingdom Accreditation The assurement realised at the | | | | | |
| Ricardo Energy & Environment 18 Blythswood Square (2 nd Floor), Glasgow, G2 4BG Tel: 01235 753205 | Registered office Shoreham Technica Shoreham-by-Sea West Sussex BM3 5FG Registered in Engl. 08229264 VAT Registration N GB 212 8365 24 | and No. | | | | | |

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Page 2 of 3

Date of issue: 24 March 2023

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East Ayrshire Council

NOx analysers

| Station | Date of Audit | Species | Analyser Serial no | Zero Response ¹ | Zero uncertainty nmol/mol | Calibration Factor ² | Factor uncertainty % | Converter eff. (%) ³ |
|--|------------------|---------|-----------------------|-------------------------------|---------------------------------|------------------------------------|----------------------------|---------------------------------|
| East Ayrshire Kilmarnock St Marnock Street | 15 December 2022 | NOx | 2361 | 1.7 | 2.5 | 1.0293 | 3.50 | 95.6 (257nmol/mol) |
| | | NO | | -0.2 | 2.5 | 1.0288 | 3.50 | 94.1 (133nmol/mol) |

FIDAS analysers

| Station | Date of audit | Analyser Serial no | Calculated ko⁵ | Uncertainty % | Total flow⁴ | Uncertainty % | Main flow | Uncertainty % |
|--|------------------|--------------------|-------------------|------------------|-------------|------------------|-----------|---------------|
| East Ayrshire Kilmarnock St Marnock Street | 15 December 2022 | 7476 | | | 4.97 | 2.2 | | 2.2 |

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CERTIFICATE OF CALIBRATION



Page 3 of 3

Date of issue: 24 March 2023

Certificate Number: 6196

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The gaseous ambient analysers listed above have been tested for zero response, calibration factor, linearity and converter efficiency (NOx analysers) by documented methods. The factors have been calculated using certified gas standards. The particulate analysers listed above have been tested for sample flow rates and k0 (where appropriate) by documented methods. Note that the test results are valid on the day of test only, as analyser drift over time cannot be quantified. All results for gaseous species are reported in concentration units of nmol/mol or µmol/mol.

Concentration = F(Output - Zero Response)

Where F = Calibration Factor provided on this certificate

Output = Reading on the data logging system of the analyser

Zero Response = Zero Response provided on this certificate

The calibration results shaded are those that fall within our scope of accreditation, all other results on this certificate are not UKAS accredited, but have been included for completeness.

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¹ The zero response is the zero reading on the data logging system of the analyser when audit zero gas was introduced to the analysers under test.

 $^{^2}$ The calibration factor is the multiplying factor required to scale the reading on the data logging system of the analyser into reported concentration units (nmol/mol for NO, NOx, SO2, O3 and μ mol/mol for CO). It should be used in conjunction with the zero response. A corrected concentration is calculated using the following equation:

³ Converter eff. is the measured efficiency of the NO₂ to NO converter within the oxides of nitrogen analyser under test.

⁴ The measured main flow rate (where this is applicable) is the flow rate through the sensor unit of the TEOM particulate analyser under test. The measured aux flow rate (where this is applicable) is the flow rate through the bypass tubing of the TEOM particulate analyser under test. The measured total flow rate is the total flow rate through the particulate analyser under test. Units of flow are I.min-1, reported at prevailing ambient conditions unless otherwise specified. Where flow rates are highlighted in bold, it indicates that measurements were not made at the analyser sample inlet. These measurements therefore may not accurately reflect analyser performance in normal operation.

⁵ The calculated ko value (specifically for TEOM analysers) is the calculated ko spring constant based on tests undertaken with filters of known weight. The % deviation indicates the closeness of the calculated result to the manufacturer's specified value of ko.