



## QA/QC Operational Report for the Automatic Urban and Rural Network, October-December 2018

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## Executive summary

Ricardo Energy & Environment carries out the quality assurance and quality control (QA/QC) activities for the Automatic Urban and Rural Monitoring Network (AURN) on behalf of the Environment Agency, the UK Department for Environment, Food and Rural Affairs (Defra), the Scottish Government, Welsh Government and Department of Agriculture, Environment and Rural Affairs (DAERA) in Northern Ireland.

This quarterly report summarises the QAQC activities carried out over the period 1<sup>st</sup> October 2018 to 31<sup>st</sup> December 2018. It presents the key data capture and data quality statistics and highlights any issues that have been identified relating to the monitoring stations and their apparatus.

The number of AURN monitoring stations in operation during part or all of this period was 171. During this quarter, the autumn 2018 ozone intercalibration exercise was carried out, involving comprehensive performance tests on every ozone analyser in the network. This allows the accuracy of the measured results to be determined, and a measurement uncertainty for each analyser to be calculated, as required by the Data Quality Objectives of the European Union's Air Quality Directive (2008/50/EC).

Data ratification for the quarter was completed by the deadline of 31<sup>th</sup> March 2019. The mean data capture for ratified hourly average data was 94.63% (averaged over all pollutants O<sub>3</sub>, NO<sub>2</sub>, SO<sub>2</sub>, CO, PM<sub>10</sub> and PM<sub>2.5</sub>), for the three-month reporting period October to December 2018.

The data capture target of the Air Quality Directive is 90% excluding periods of planned maintenance e.g. calibrations, audits and servicing). An allowance of 5% is made for this, hence a target of 85%. Mean data captures for individual pollutants were as follows: CO 99.08%, NO<sub>2</sub> 94.40%, O<sub>3</sub> 96.79%, SO<sub>2</sub> 84.16%, PM<sub>10</sub> 94.87%, and PM<sub>2.5</sub> 95.82%. Hence, the mean data captures for all pollutants except SO<sub>2</sub> met this target in Quarter 4 (Q4) of 2018. Principal reasons for data loss are given here for pollutants and stations which failed to make the 85% data capture target for the quarter.

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# 1 Introduction

## 1.1 Background

The UK Automatic Urban and Rural Network (AURN) has been established to provide information on air quality concentrations throughout the UK for a range of pollutants. The primary function of the AURN is to provide data in compliance with the Air Quality Directive 2008/50/EC. In addition, the data and information from the AURN are required by scientists, policy makers and planners to enable them to make informed decisions on managing and improving air quality for the benefit of health and the natural environment.

Dissemination of the data from the AURN via UK-AIR (the UK online Air Information Resource, <http://uk-air.defra.gov.uk>) and other media such as social media and freephone services, is undertaken by the Data Dissemination Unit (DDU). A summary report of the data is also published annually in the “*Air Pollution in the UK*” series of reports, which can be found at <https://uk-air.defra.gov.uk/library/annualreport/index>.

A total of 171 monitoring stations at 169 locations in the AURN operated during this quarter. The total of 171 includes two stations (London Marylebone Road and Port Talbot Margam) where Partisol gravimetric particulate samplers are co-located with automatic particulate analysers. For data processing purposes the gravimetric sampler is treated as a separate station; and they are shown, and counted, separately in the data capture tables in section 3.

## 1.2 What This Report Covers

This report covers the three-month period October to December 2018, or “Quarter 4” of the year. This report covers the main QA/QC activities; the relevant CMCU reports should be consulted for more detail on station operational issues. As it is the final quarterly report of the year, it also includes a summary of usage statistics for the AURN Hub, and (as Appendix 1) an inventory of Environment Agency-owned equipment held by the QA/QC Unit in connection with this work.

This report is one of a series of four quarterly operational reports prepared for the Environment Agency. A summary of the whole year is given in the Annual Review, a public-facing report which will be published on the Defra UK Air Information Resource (UK-AIR) at <https://uk-air.defra.gov.uk/>.

## 1.3 Changes to Network

During Q4, the Environment Agency continued its ongoing programme of replacing FDMS PM<sub>10</sub> and PM<sub>2.5</sub> instruments (which were reaching the ends of their useful lives) with new Fidas 200 or Beta Attenuation Monitors. The following changes were made to the network during Q4 2018:

- Introduction of automatic PM<sub>10</sub> and PM<sub>2.5</sub> analysers at Wrexham, replacing the Partisol gravimetric samplers previously at this site. The new instruments went live to the network on 1<sup>st</sup> October 2018
- Introduction of the replacement PM<sub>10</sub> particulate analyser at Scunthorpe Town; this went live to the network on 8<sup>th</sup> October 2018.
- Introduction of the replacement PM<sub>10</sub> particulate analyser at Nottingham Western Boulevard; this went live to the network on 15<sup>th</sup> October 2018.

- Introduction of the replacement PM<sub>10</sub> and PM<sub>2.5</sub> particulate analyser at Glasgow Townhead; this went live to the network on 4<sup>th</sup> October 2018.
- Introduction of the replacement PM<sub>2.5</sub> particulate analyser at Stockton on Tees A1305 Roadside; this went live to the network on 19<sup>th</sup> October 2018.
- Introduction of the replacement PM<sub>10</sub> and PM<sub>2.5</sub> particulate analysers at York Fishergate; these went live to the network on 17<sup>th</sup> October 2018.
- Introduction of the replacement PM<sub>10</sub> particulate analyser at Stoke on Trent A50 Roadside; this went live to the network on 6<sup>th</sup> November 2018.
- Introduction of the replacement PM<sub>10</sub> particulate analyser at Bury Whitefield Roadside; this went live to the network on 17<sup>th</sup> December 2018.
- Introduction of the replacement PM<sub>10</sub> particulate analyser at Thurrock; this went live to the network on 5<sup>th</sup> November 2018.
- Introduction of the replacement PM<sub>10</sub> and PM<sub>2.5</sub> particulate analysers at Glasgow High Street; these went live to the network on 5<sup>th</sup> November 2018.
- Introduction of the replacement PM<sub>10</sub> and PM<sub>2.5</sub> particulate analysers at Carlisle Roadside; these went live to the network on 3<sup>rd</sup> December 2018.
- Introduction of the replacement PM<sub>10</sub> and PM<sub>2.5</sub> particulate analysers at Warrington went live to the network on 3<sup>rd</sup> December 2018.

Where a single FDMS analyser is replaced by a Fidas (which measures several particle size fractions), both PM<sub>10</sub> and PM<sub>2.5</sub> will be formally reported. (However, this was not the case at any of the above sites).

## 2 Methodology

### 2.1 Overview of QA/QC Activities

The QA/QC activities consist of the following key parts:

- QA/QC audits of all analysers in the network every six months (three months for ozone).
- Ratification of the data on a three-monthly basis, and delivery of ratified data to the Data Dissemination Unit for dissemination via UK-AIR and other routes.
- Assessment of new station locations in conjunction with the CMCU, and assessment of compliance with the siting criteria in the Directive.
- Investigation of instances of suspected poor-quality data.

### 2.2 Ozone Calibrations

During this Quarter, the Autumn 2018 ozone intercalibration exercise was conducted. Every ozone analyser in the network was calibrated against a traceable ozone photometer.



## 3 Data Ratification and results

### 3.1 Data Capture

The overall data capture for the period October-December 2018 is given in Table 3.1. Ratified hourly average (daily average for Partisols) data capture for the network averaged 94.63% for all pollutants (O<sub>3</sub>, NO<sub>2</sub>, SO<sub>2</sub>, CO, PM<sub>10</sub> and PM<sub>2.5</sub>) during the three-month reporting period October-December 2018. Data capture statistics are calculated using the actual data capture as hourly averages (daily for Partisol) against the total number of hours (or days) in the relevant period; service and maintenance are counted as lost data. It is permissible to discount routine service and calibration from achievable data capture targets, but this is not calculated. For stations starting or closing during the period, the data capture is based on the actual date starting or closing. All pollutants except SO<sub>2</sub> achieved 85% or higher data capture on average. The data capture target for the purposes of monitoring compliance with the EU Air Quality Directive (Directive 2008/50/EC) is 90% excluding planned servicing and maintenance. For practical purposes in the AURN, planned maintenance is assumed to be 5% so a target of 85% data capture is used.

#### 3.1.1 Overall Data Capture

**Table 3.1 Overall Data Capture Q4**

Name	CO	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub>	PM <sub>25</sub>	SO <sub>2</sub>	Average
Number of Stations	7	158	76	77	81	28	171
Number of stations < 85 %	0	14	3	7	7	6	13
Number of stations < 90%	0	15	3	10	11	6	17
Average	99.08	94.40	96.79	94.87	95.82	84.16	94.61

#### 3.1.2 Generic Data Quality Issues

The QA/QC audits continued to identify high particle analyser baselines and some data were deleted as a result. These zero tests, along with regional volatile comparisons, continue to provide evidence for poor FDMS drier performance. However, the results of zero baseline tests are now being used to apply correction to data where high baselines have been identified.

In some cases, the ESU may choose to avoid significant data loss by removing an instrument for workshop repair and install a temporary loan instrument in station. This is termed a “hot spare” analyser. This may not be of the same type of analyser, which has implications for LSO calibration procedures, and also for the reporting of instrument types in the annual data submission.

The following generic data quality issues have been identified in 2018:

- The use of obsolete mass transducer filters on FDMS analysers, resulting in high analyser noise. These are being removed from stations during QA/QC audits.
- The use of mass transducer filters of a certain mass, which give erroneous k0 values at QA/QC audits and may well have affected measured concentrations over some years. This matter has been taken up with the UK distributor and the manufacturer in the US.

- Poor performance of some analysers, particularly older SO<sub>2</sub> analysers. A number of the SO<sub>2</sub> analysers reached the end of their useful lives during Q4, impacting upon data capture. The Environment Agency has since purchased seven replacement SO<sub>2</sub> analysers which are being installed at present.

## 3.2 Data Capture and Station-Specific Issues - England (Excluding Greater London)

**Table 3.4 Data Capture October-December 2018, England**

Name	CO	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub>	PM <sub>25</sub>	SO <sub>2</sub>	Average
Barnsley Gawber		99.82	99.73			99.82	99.79
Barnstaple A39				96.38	93.57		94.97
Bath Roadside		99.95					99.95
Billingham		91.39					91.39
Birkenhead Borough Road		100.00					100.00
Birmingham A4540 Roadside		99.50	99.86	99.68	99.46		99.63
Birmingham Acocks Green		99.91	99.91		100.00		99.94
Birmingham Ladywood				88.59	99.91		94.25
Blackburn Accrington Road		99.73					99.73
Blackpool Marton		83.11	83.02		64.22		76.78
Borehamwood Meadow Park		100.00					100.00
Bournemouth		99.41	99.82		97.33		98.85
Bradford Mayo Avenue		99.68					99.68
Brighton Preston Park		99.82	99.86		100.00		99.89
Bristol St Paul's		99.95	99.95	99.68	99.82		99.85
Bristol Temple Way		99.82		99.05			99.43
Burton-on-Trent Horninglow		99.91					99.91
Bury Whitefield Roadside		99.50		98.28			98.89
Cambridge Roadside		99.82					99.82
Cannock A5190 Roadside		65.53					65.53
Canterbury		97.15	99.91				98.53



Name	CO	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub>	PM <sub>25</sub>	SO <sub>2</sub>	Average
Carlisle Roadside		93.48		91.85	91.80		92.38
Charlton Mackrell		99.95	99.82				99.89
Chatham Roadside		99.73		99.32	99.32		99.46
Chesterfield Loundsley Green		99.00		98.14	98.87		98.67
Chesterfield Roadside		97.78		84.15	97.51		93.15
Chilbolton Observatory		98.73	98.82	98.96	98.96	98.69	98.83
Christchurch Barrack Road		99.77			99.32		99.55
Coventry Allesley		99.68	99.86		88.04		95.86
Coventry Binley Road		99.82		99.64			99.73
Derby St Alkmund's Way		99.82					99.82
Dewsbury Ashworth Grove		99.00					99.00
Doncaster A630 Cleveland Street		99.55					99.55
Eastbourne		100.00			98.41		99.21
Exeter Roadside		97.28	97.96				97.62
Glazebury		92.75	92.89				92.82
Hartlepool St Abbs Walk		99.91					99.91
High Muffles		87.68	93.98				90.83
Honiton		99.77					99.77
Horley		99.41					99.41
Hull Freetown		99.23	99.14		100.00	99.68	99.51
Hull Holderness Road		99.73		91.17			95.45
Immingham Woodlands Avenue		99.91					99.91
Ladybower		71.11	94.38			97.01	87.50
Leamington Spa		97.92	99.86	99.91	99.95		99.41
Leamington Spa Rugby Road		99.73		92.26	98.96		96.98
Leeds Centre	99.77	99.73	99.55	99.95	99.64	99.50	99.69
Leeds Headingley Kerbside		99.86		96.01	99.73		98.54
Leicester A594 Roadside		99.82		99.68			99.75

Name	CO	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub>	PM <sub>25</sub>	SO <sub>2</sub>	Average
Leicester University		99.91	99.91		99.91		99.91
Leominster		99.64	99.95				99.80
Lincoln Canwick Road		99.68					99.68
Liverpool Speke		99.68	99.41	92.03	96.24	51.54	87.78
Lullington Heath		99.59	99.86			99.86	99.77
Luton A505 Roadside		99.77					99.77
Manchester Piccadilly		99.82	99.14		99.68	92.84	97.87
Manchester Sharston		96.20	96.20				96.20
Market Harborough		96.97	98.64				97.80
Middlesbrough		99.55	99.59	98.19	84.83	99.59	96.35
Newcastle Centre		70.97	99.77	99.77	99.91		92.61
Newcastle Cradlewell Roadside		99.86		93.70			96.78
Northampton Spring Park		99.64	99.86		99.82		99.77
Norwich Lakenfields		99.82	99.91	99.55	99.95		99.81
Nottingham Centre		95.02	96.24	96.01	96.24	95.92	95.89
Nottingham Western Boulevard		96.06		82.79			89.42
Oldbury Birmingham Road		0.00					0.00
Oxford Centre Roadside		95.20					95.20
Oxford St Ebbes		99.64		97.96	99.32		98.97
Plymouth Centre		99.77	99.91	99.95	91.21		97.71
Plymouth Tavistock Road		99.86					99.86
Portsmouth		99.95	99.91	76.59	70.06		86.63
Portsmouth Anglesea Road		99.41		98.01			98.71
Preston		99.77	99.73		99.91		99.80
Reading London Road		99.82		93.75			96.78
Reading New Town		99.86	99.91	98.41	99.64		99.46
Rochester Stoke		99.55	99.73	99.73	99.73	99.64	99.67

Name	CO	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub>	PM <sub>25</sub>	SO <sub>2</sub>	Average
Salford Eccles		99.46		100.00	100.00		99.82
Saltash Callington Road				94.34	94.20		94.27
Sandy Roadside		90.13		99.09	96.74		95.32
Scunthorpe Town		99.55		91.76		99.09	96.80
Shaw Crompton Way		93.75					93.75
Sheffield Barnsley Road		99.77			97.55		98.66
Sheffield Devonshire Green		99.41	99.86	98.55	83.06		95.22
Sheffield Tinsley		95.56					95.56
Sibton			99.00				99.00
Southampton A33		98.82		97.74			98.28
Southampton Centre		99.73	99.28	69.79	99.91	99.68	93.68
Southend-on-Sea		58.92	94.61		88.22		80.59
St Helens Linkway		92.48		88.50			90.49
St Osyth		99.23	99.86				99.55
Stanford-le-Hope Roadside		98.64		99.00	99.28		98.97
Stockton-on-Tees A1305 Roadside		99.77			93.30		96.54
Stockton-on-Tees Eaglescliffe		98.28		76.54	98.91		91.24
Stoke-on-Trent A50 Roadside		99.68		92.84			96.26
Stoke-on-Trent Centre		98.55	98.14		98.10		98.26
Storrington Roadside		99.82					99.82
Sunderland Silksworth		99.18	56.16		83.20		79.51
Sunderland Wessington Way		49.32					49.32
Swindon Walcot		99.95					99.95
Telford Hollinswood		99.41					99.41
Thurrock		99.73	94.43	95.24		99.28	97.17
Walsall Woodlands		99.73	99.64				99.68
Warrington		99.73		95.02	94.07		96.27
Weybourne			99.86				99.86
Wicken Fen		99.91	99.86			99.28	99.68

Name	CO	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	Average
Widnes Milton Road		0.00					0.00
Wigan Centre		99.46	99.82		84.96		94.75
Wirral Tranmere		99.86	99.82		99.50		99.73
Worthing A27 Roadside		93.25			99.32		96.29
Yarner Wood		97.28	99.73				98.51
York Bootham		97.64		97.42	96.97		97.34
York Fishergate		99.32		90.35	89.99		93.22
<b>Number of Stations</b>	<b>1</b>	<b>107</b>	<b>49</b>	<b>47</b>	<b>53</b>	<b>15</b>	<b>112</b>
<b>Number of stations &lt; 85 %</b>	<b>0</b>	<b>8</b>	<b>2</b>	<b>5</b>	<b>6</b>	<b>1</b>	<b>7</b>
<b>Number of stations &lt; 90%</b>	<b>0</b>	<b>9</b>	<b>2</b>	<b>7</b>	<b>9</b>	<b>1</b>	<b>11</b>
<b>Average</b>	<b>99.77</b>	<b>95.00</b>	<b>97.68</b>	<b>94.58</b>	<b>95.44</b>	<b>95.43</b>	<b>94.50</b>

Station-specific issues:

#### **Birmingham Ladywood**

Although the station was installed, and the pre-commissioning audit undertaken in August 2018, problems with communications delayed the start of gaseous pollutants being reported. Both FDMS analysers were operational from 23<sup>rd</sup> August. Problems with the PM<sub>10</sub> FDMS in September resulted in a hotspare being installed, but the performance of this was poor, and data from 29<sup>th</sup> October to 6<sup>th</sup> November have been deleted.

#### **Blackpool Marton**

Problems with the performance of the PM<sub>2.5</sub> FDMS continued from the previous quarter, and the unit was ultimately replaced with a hotspare on 2<sup>nd</sup> October. This also performed poorly, and numerous ESU visits occurred, resulting in further data loss. An electrical fault developed with the station on 17 December and the station remained switched off until 17<sup>th</sup> January.

#### **Cannock A5190 Roadside**

The aircon failed on 2<sup>nd</sup> August and the station was switched off. On repair on 22<sup>nd</sup> October, the NO<sub>x</sub> analyser was found to have an unspecified fault and was removed for workshop repair.

#### **Chesterfield Roadside**

The PM<sub>10</sub> FDMS performed poorly during the quarter, with intermittent periods of data loss. The valve block was found to be contaminated on 30<sup>th</sup> November, and the engineer noted a fault with the motor. The motor failed on 19<sup>th</sup> December resulting in data loss up to 3<sup>rd</sup> January.

#### **Coventry Allesley**

The PM<sub>2.5</sub> FDMS lost its firmware on 18<sup>th</sup> October; this was reinstalled on 22<sup>nd</sup> October, and a further short period of spurious data were deleted following repair.

#### **High Muffles**

Following a power cut on 1<sup>st</sup> December, the NO<sub>x</sub> analyser failed to restart and required workshop repair; it was reinstalled on 12<sup>th</sup> December.

**Ladybower**

The NO<sub>x</sub> analyser appeared to have some sort of sampling fault from 5<sup>th</sup> December, continuing into 2019. No specific information on this is available.

**Liverpool Speke**

The SO<sub>2</sub> analyser showed rapid and continual drift of the baseline during the quarter, and a significant quantity of data were deleted during ratification.

**Middlesbrough**

There was a main valve fault on the PM<sub>2.5</sub> FDMS resulting in the loss of data from 29<sup>th</sup> October to 12<sup>th</sup> November.

**Newcastle Centre**

The NO<sub>x</sub> analyser developed a cooler fault on 12<sup>th</sup> October and was removed for workshop repair. A hotspare analyser was installed on 31<sup>st</sup> October, but that was also faulty. The fault was repaired on 7<sup>th</sup> November.

**Nottingham Western Boulevard**

The PM<sub>10</sub> FDMS was replaced by a BAM on 3<sup>rd</sup> October. The commissioning audit identified a fault with the flow setup, with the flow being too low. Data have been deleted to the LSO visit on 15<sup>th</sup> October.

**Oldbury Birmingham Road**

The summer 2018 and winter 2018 audits found the NO<sub>x</sub> converter efficiency to be 130%. Although the ESU had been informed, no remedial action was taken until 12<sup>th</sup> February, where the NO<sub>x</sub> converter coefficient on the analyser was found to be set to 0.77 rather than 1.0. It was not possible to rescale the data, and data have been deleted from the last ESU intervention on 3<sup>rd</sup> May 2018 to the end of 2018. Further data will be lost in 2019.

**Portsmouth**

Following temperature related faults in Q3, both PM<sub>2.5</sub> and PM<sub>10</sub> data were deleted to 14<sup>th</sup> October (PM<sub>2.5</sub>) and 22<sup>nd</sup> October (PM<sub>10</sub>). The performance of the PM<sub>2.5</sub> analyser continued to be particularly poor with further data deletions in November.

**Sheffield Devonshire Green**

The PM<sub>2.5</sub> FDMS became very noisy on 26<sup>th</sup> October, and despite ESU attention, was removed for workshop repair. A hotspare was installed on 13<sup>th</sup> November.

**St Helens Linkway**

Following installation of a BAM in place of the FDMS in September, an extended zero test from 9<sup>th</sup> to 16<sup>th</sup> October. A further short period of data loss occurred from 24<sup>th</sup> to 17<sup>th</sup> November, no reason has been given.

**Stockton-on-Tees Eaglescliffe**

The power supply unit in the PM<sub>10</sub> BAM failed on 28<sup>th</sup> September following a power cut, and the analyser was removed for workshop repair and was reinstalled on 2<sup>nd</sup> October.

**Southampton Centre**

The volatile PM<sub>10</sub> concentrations were found to be a regional outlier from 9<sup>th</sup> November to 6<sup>th</sup> December and these data have been deleted.

### Southend-on-Sea

There was considerable data loss at this station until replacement of the air conditioning unit on 4<sup>th</sup> October. Prior to the aircon unit replacement there were concerns over the NO<sub>x</sub> instrument response stability; these concerns continued post installation and on 8<sup>th</sup> October, the engineer reported an analyser cooler fault and the instrument was removed from site for workshop attention. There then followed a chain of events surrounding hot spare replacement, its associated communication issue and subsequent discovery of its pump failure. Following a series of intense correspondence and liaison with the ESU the original repaired analyser was reinstalled on 6<sup>th</sup> November and monitoring was finally restored. CMCU deleted the period of data 1<sup>st</sup> to 8<sup>th</sup> October due to the response instability referred to and no further data were available until 6 November. Some PM<sub>2.5</sub> data were also lost at the beginning of the quarter.

### Sunderland Wessington Way

A step change in the data profile was observed following the LSO calibration on 15<sup>th</sup> November up to the winter audit on 6<sup>th</sup> February. This looks like a sampling fault of some sort, and data up to the end of December have been deleted. This will continue into 2019.

### Widnes Milton Road

Following an extended period of data loss due to an analyser fault, a hotspare analyser was installed on 25<sup>th</sup> October. However, the span cylinder had become oxidised, making calibrations unreliable. In addition, at some point prior to the winter audit the tubing to the zero cylinder had been broken allowing the analyser to sample cabin air.

### Wigan Centre

A period of PM<sub>2.5</sub> data were deleted from 26<sup>th</sup> October to 5<sup>th</sup> November due to excessive signal noise, this may have been caused by vibration from the pump.

### York Fishergate

The FDMS analysers were replaced by BAM analysers on 10<sup>th</sup> October. Following the commissioning audit, a zero test took place from 11<sup>th</sup> to 17<sup>th</sup> October. Another small period of data from both analysers were lost following the LSO visit on 24<sup>th</sup> October.

## 3.3 Data Capture and Station-Specific Issues - London

**Table 3.5 Data Capture October-December 2018, London**

Name	CO	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub>	PM <sub>25</sub>	SO <sub>2</sub>	Average
Camden Kerbside		99.77		99.09	91.03		96.63
Ealing Horn Lane				99.28			99.28
Haringey Roadside		99.91					99.91
London Bexley		99.73			98.64		99.18
London Bloomsbury		98.96	96.92	70.79	86.46	60.78	82.78
London Eltham		97.10	99.59		98.73		98.48
London Haringey Priory Park South		97.10	99.86				98.48
London Harlington		99.73	99.68	98.87	98.87		99.29
London Hillingdon		83.65	99.00				91.33



Name	CO	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub>	PM <sub>25</sub>	SO <sub>2</sub>	Average
London Marylebone Road	99.32	99.64	99.59	98.37	97.74	83.97	96.44
London Marylebone Road Partisol				92.39	94.57		93.48
London N. Kensington	99.77	99.77	99.68	100.00	100.00	91.03	98.38
London Teddington Bushy Park					96.47		96.47
London Westminster		98.96			97.74		98.35
Southwark A2 Old Kent Road		98.14		97.96			98.05
Tower Hamlets Roadside		92.12					92.12
<b>Number of Stations</b>	<b>2</b>	<b>13</b>	<b>7</b>	<b>8</b>	<b>10</b>	<b>3</b>	<b>16</b>
<b>Number of stations &lt; 85 %</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>2</b>	<b>1</b>
<b>Number of stations &lt; 90%</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>1</b>
<b>Average</b>	<b>99.55</b>	<b>97.28</b>	<b>99.19</b>	<b>94.59</b>	<b>96.02</b>	<b>78.59</b>	<b>96.16</b>

### London Bloomsbury

The station air conditioning was not working properly, and performance of the FDMS analysers was affected. The PM<sub>10</sub> data were deleted from 12<sup>th</sup> to 31<sup>st</sup> December, plus small periods from both analysers. The SO<sub>2</sub> analyser also proved unreliable, and a hotspare was installed on 27<sup>th</sup> November. This also performed poorly and much of the data to reinstallation of the original analyser on 13<sup>th</sup> December have been deleted.

### London Hillingdon

A fault with the detector on 21<sup>st</sup> December resulted in unstable readings, and the analyser was removed for workshop repair. A hotspare was installed on 24<sup>th</sup> December, but there appears to have been a fault with this analyser and data have been deleted 24<sup>th</sup> to 31<sup>st</sup> December.

## 3.4 Data Capture and Station-specific Issues-Scotland

**Table 3.6 Data Capture October-December 2018, Scotland**

Name	CO	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub>	PM <sub>25</sub>	SO <sub>2</sub>	Average
Aberdeen		99.82	100.00	98.51	100.00		99.58
Aberdeen Union Street Roadside		100.00					100.00
Aberdeen Wellington Road		99.95					99.95
Auchencorth Moss			99.55	99.50	99.50		99.52
Bush Estate		99.91	99.91				99.91

Name	CO	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub>	PM <sub>25</sub>	SO <sub>2</sub>	Average
Dumbarton Roadside		95.38					95.38
Dumfries		99.50					99.50
Dundee Mains Loan		75.09					75.09
Edinburgh Nicolson Street		99.82					99.82
Edinburgh St Leonards	99.86	99.82	99.77	98.69	99.95	98.64	99.46
Eskdalemuir		99.50	94.70				97.10
Fort William		99.73	99.00				99.37
Glasgow Great Western Road		99.86					99.86
Glasgow High Street		99.82		98.60	98.60		99.01
Glasgow Kerbside		99.59					99.59
Glasgow Townhead		99.95	99.86	98.50	98.10		99.10
Grangemouth		93.30		97.87	99.14	93.70	96.00
Grangemouth Moray		83.74					83.74
Greenock A8 Roadside		99.77		99.91	99.91		99.86
Inverness		99.73		100.00	100.00		99.91
Lerwick			96.97				96.97
Peebles		99.86	99.82				99.84
Strathvaich			99.77				99.77
<b>Number of Stations</b>	<b>1</b>	<b>20</b>	<b>10</b>	<b>8</b>	<b>8</b>	<b>2</b>	<b>23</b>
<b>Number of stations &lt; 85 %</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>
<b>Number of stations &lt; 90%</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>
<b>Average</b>	<b>99.86</b>	<b>97.21</b>	<b>98.94</b>	<b>98.95</b>	<b>99.40</b>	<b>96.17</b>	<b>97.32</b>

#### Dundee Mains Loan

The analyser developed an unspecified fault on 2nd October, data have been deleted up to 25th October when a hotspare was installed.

#### Grangemouth Moray

The NO<sub>x</sub> analyser suffered pump failure on 23rd October (three days lost) and was removed for workshop repair for an unspecified fault on 15th November. A hotspare was installed on 22nd November.

## 3.5 Data Capture and Station-specific Issues-Wales

**Table 3.7 Data Capture October-December 2018, Wales**

Name	CO	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub>	PM <sub>25</sub>	SO <sub>2</sub>	Average
Aston Hill		94.07	99.28				96.67
Cardiff Centre	99.95	2.54	99.68	81.75	99.86	12.86	66.11
Cardiff Newport Road		99.41		95.43			97.42
Chepstow A48		95.56		99.59	96.69		97.28
Cwmbran		99.77	99.86				99.82
Hafod-yr-ynys Roadside		99.73					99.73
Narberth		99.09	99.68	99.73	99.73	99.73	99.59
Newport		99.64		100.00	100.00		99.88
Port Talbot Margam PARTISOL				94.57			94.57
Port Talbot Margam	98.51	95.20	99.86	99.41	98.32	99.77	98.51
Swansea Roadside		98.51		97.87	95.43		97.27
Wrexham		57.97		61.50	61.46	0.00	45.23
<b>Number of Stations</b>	<b>2</b>	<b>11</b>	<b>5</b>	<b>9</b>	<b>7</b>	<b>4</b>	<b>12</b>
<b>Number of stations &lt; 85 %</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>2</b>
<b>Number of stations &lt; 90%</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>2</b>
<b>Average</b>	<b>99.23</b>	<b>85.59</b>	<b>99.67</b>	<b>92.21</b>	<b>93.07</b>	<b>53.09</b>	<b>91.01</b>

### Cardiff Centre

Following workshop repair, the NO<sub>x</sub> analyser was reinstalled on site on 3<sup>rd</sup> October; however, the data profile suggests some sort of sampling fault occurred; data to 31<sup>st</sup> December have been deleted. The SO<sub>2</sub> analyser, having also been for workshop repair, failed again on 3<sup>rd</sup> October. A hotspare was installed on 5<sup>th</sup> November; however, no data from this analyser are available. The PM<sub>10</sub> FDMS also suffered problems, with high volatile concentrations; data between 4<sup>th</sup> and 17<sup>th</sup> October have been deleted.

### Wrexham

The NO<sub>x</sub> analyser was found to be internal sampling on 27<sup>th</sup> October; data have been deleted back to 23<sup>rd</sup> October. A water leak was found in the cabin roof on 27<sup>th</sup> November, and it was decided to shut the station down pending cabin replacement.

## 3.6 Data Capture and Station-specific Issues- Northern Ireland (and Mace Head, Republic of Ireland)

**Table 3.8 Data Capture October-December 2018, Ireland & Northern Ireland**

Name	CO	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub>	PM <sub>25</sub>	SO <sub>2</sub>	Average
Mace Head			96.60				96.60
Armagh Roadside		95.56		99.91			97.74
Ballymena Antrim Road		99.95					99.95
Ballymena Ballykeel		99.82				90.31	95.06
Belfast Centre	96.47	93.80	98.51	94.16	94.16	94.07	95.19
Belfast Stockman's Lane		99.28		90.22			94.75
Derry Rosemount		99.95	91.03	95.15	99.86	99.59	97.12
Lough Navar			98.78	100.00	100.00		99.59
<b>Number of Stations</b>	<b>1</b>	<b>6</b>	<b>4</b>	<b>5</b>	<b>3</b>	<b>3</b>	<b>8</b>
<b>Number of stations &lt; 85 %</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Number of stations &lt; 90%</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Average</b>	<b>96.47</b>	<b>98.06</b>	<b>96.23</b>	<b>95.89</b>	<b>98.01</b>	<b>94.66</b>	<b>97.00</b>

## 4 Conclusions

### Conclusions for Quarter 4 of 2018

1. During Quarter 4 of 2018 a total of 171 monitoring stations at 169 locations were in operation. The total of 171 includes two stations where Partisol gravimetric particulate samplers are co-located with automatic particulate analysers.
2. Data ratification for the quarter was completed by the deadline of 31<sup>st</sup> March 2019.
3. The mean data capture for ratified hourly average data was 94.63% (averaged over all pollutants O<sub>3</sub>, NO<sub>2</sub>, SO<sub>2</sub>, CO, PM<sub>10</sub> and PM<sub>2.5</sub>), for the three-month reporting period October – December 2018.
4. Mean data captures for individual pollutants were as follows: CO, 99.08%; NO<sub>2</sub>, 94.40%; O<sub>3</sub>, 96.79%; SO<sub>2</sub>, 84.16%; PM<sub>10</sub>, 94.87% and PM<sub>2.5</sub>, 95.82%. The data capture target of the Air Quality Directive is 90% excluding periods of planned maintenance e.g. calibrations, audits and servicing). An allowance of 5% is made for this, hence a target of 85%. The mean data captures for all pollutants except SO<sub>2</sub> met this target in Q4 of 2018.



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