QA/QC Data Ratification Report for the Automatic Urban and Rural Network, April-June 2013

Report for Department for Environment, Food and Rural Affairs, The Scottish Government, The Welsh Government, The Northern Ireland Department of Environment

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Executive summary

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

Ratified hourly average data capture for the network averaged 93.5% for all pollutants (O_3, NO_2, SO_2, CO, PM_{10} and $PM_{2.5}$) during the 3-month reporting period April-June 2013. Data capture for all pollutants were above 90%. There were 21 sites with data capture less than 90% for the period and 16 less than 85%.

A total of 133 monitoring sites in the AURN operated during this quarter, of which 74 are Local Authority owned sites affiliated to the national network. Some are co-located and separately named gravimetric particulate analysers at sites with automatic analysers. Many affiliated sites have additional Defra-funded analysers installed on site.

The main reasons for data loss at the sites have been provided and these were predominantly due to instrument faults, response instability or problems associated with the replacement of analysers and infrastructure. A summary of recommendations to help improve network performance is given in Appendix 1.

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Section A Data Ratification Report, April-June 2013

Appendices

1 Introduction

This quarterly report covers the Quality Assurance and Control (QA/QC) activities undertaken by Ricardo-AEA to ratify automatic monitoring data from Defra and the Devolved Administrations' urban and rural air quality monitoring network (AURN) for the period 1 January-31 March 2013. During this quarter there were a total of 133 operational monitoring sites in the Network of which there were 98 urban sites, 27 rural sites and a further 8 sites in the London Air Quality Monitoring Network (LAQN) which are affiliated into the national network. There were 61 Defra-funded sites and 72 affiliate sites, although many affiliate sites have fully-funded PM_{10} and/or $PM_{2.5}$ analysers. Eleven sites have non-automatic particulate samplers (Partisols); some of these are co-located with FDMS analysers at Auchencorth Moss, Harwell, London North Kensington and Marylebone Road for both PM_{10} and $PM_{2.5}$.

1.1 Overview of Network Performance

Ratified hourly average (daily average for Partisols) data capture for the network averaged 93.5% for all pollutants (O_3, NO_2, SO_2, CO, PM_{10} and $PM_{2.5}$) during the 3 month reporting period April-June 2013 (see Table 1.1). All species except PM_{10} achieved 90% or higher data capture on average. Data capture rates 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 yet calculated. For sites starting or closing during the period, the data capture is based on the actual date starting or closing.

Table 1.1: AURN Ratified Data Capture (%) by Quarter, January-December 2013

	CO	PM_{10}	$PM_{2.5}$	NO_2	O_3	SO_2	Mean
Q1 2013	95.6	91.6	94.3	92.9	93.9	92.9	92.8
Q2 2013	95.1	84.3	90.1	96.9	96.5	93.5	93.5

Overall, 324 out of the 378 analysers (86%) achieved data capture levels above the required 90% target during this reporting period. Table 1.2 shows the number of analysers which did not meet the target.

Table 1.2: Number of Analysers with Data Capture below 90%

Total Number Of Analysers		Q1 Jan-Mar 2013 (No. below 90%)	Q2 Apr-Jun 2013 (No. below 90%)
CO	7	1	1
NO_2	115	16	9
O_3	81	10	4
PM_{10}[1]	68	15	24
$PM_{2.5}$[1]	78	13	14
SO_2	29	4	2
Total <90%		59	54

[1] Includes FDMS, BAM and Partisol analysers.

In total, 21 out of the 133 operational network sites in the quarter (16%) had an average data capture rate below the required 90% level for the April-June 2013 period. Of these, 16 were below 85%.

1.2 Changes to Ratified Data

The following data from previous quarters have been changed as a result of the ratification process for this quarter:

None.

2 Changes in the Network for Directive Compliance

No new sites were commissioned during this period.

3 Generic Data Quality Issues

3.1 FDMS Performance Issues

At the time of writing, there are a number of FDMS performance issues being investigated by the QA/QC unit. Most significant is the apparent baseline offset, which can result in data being higher or lower than might be expected. In order to determine this, zero checks are being carried out by placing a filter over the inlet and leaving for several days. This method does allow the determination of the analyser “zero” but requires a visit by QA/QC staff and the LSO, and therefore it will take time to complete all sites. The findings and implications of these tests are described in Section 5.

4 Site Specific Issues

In this section, we now discuss in turn specific site issues for sites in the following geographic groupings – London, England (excluding London), Scotland, Northern Ireland and Wales. Where analysers were commissioned during the period, the stated data capture for these instruments is calculated from the date of commissioning. Further details on individual analyser performance issues are given in the relevant CMCU reports.

4.1 London

4.1.1 Data Capture

The data capture for sites in London (within the M25) for the period April-June 2013 is given in Table 4.1:

Table 4.1 Data Capture for London, April-June 2013

Name	CO	PM_{10}	PM_{25}	NO_2	O_3	SO_2	Average
Camden Kerbside		99.73	99.63	99.82			99.73
Haringey Roadside		97.89	99.04	99.95			98.96
London Bexley			99.95	99.82		47.53	82.43
London Bloomsbury		99.86	77.20	99.95	100.00	92.99	94.00
London Eltham			99.31	99.86	99.82		99.66
London Harlington		99.18	99.22	52.52	99.31		87.56
London Harrow Stanmore			99.82				99.82
London Hillingdon				99.91	99.27		99.59
London Marylebone Road	99.95	94.41	98.81	99.77	97.57	99.86	98.40
London Marylebone Road (Partisol)		100.00	100.00				100.00
London N. Kensington	99.68	16.48	93.18	99.77	95.47	92.72	82.88
London N. Kensington (Partisol)		92.31	92.31				92.31
London Teddington			99.82	99.95	82.92		94.23
London Westminster			100.00	99.63	99.77		99.71
Southwark A2 Old Kent Road		25.27		94.23			59.75
Tower Hamlets Roadside				96.84			96.84
No of Sites	**2**	**9**	**13**	**13**	**8**	**4**	**16**
No <90%	**0**	**2**	**1**	**1**	**1**	**1**	**4**
No <85%	**0**	**2**	**1**	**1**	**1**	**1**	**3**
Average	**99.8**	**80.6**	**96.8**	**95.5**	**96.8**	**83.3**	**92.9**

4.1.2 Site Specific Issues

London Bexley

The SO_2 analyser developed a fault resulting in a noisy drifting baseline; data from much of April and May have been deleted. The fault was finally repaired on 10 June.

London Harlington

A problem with the power supply in the NOx analyser resulted in the loss of NOx data from 1 April to 11 May.

London North Kensington

The PM_{10} FDMS was identified as having a high baseline when compared to the collocated $PM_{2.5}$. Data from 15 April up to the end of the quarter have been deleted. The drier was replaced on 27 August so further deletions are likely in the next quarter.

Southwark A2 Old Kent Road

The PM_{10} data were very noisy and have been deleted from 15 April to 21June. A drier fault was reported in June and this was subsequently replaced.

4.2 England (excluding London)

4.2.1 Data Capture

The data capture for sites in England for the period April-June 2013 is given in Table 4.2:

Table 4.2 Data Capture for England, April-June 2013

Name	CO	PM_{10}	PM_{25}	NO_2	O_3	SO_2	Average
Barnsley Gawber				99.5	99.7	97.8	99.0
Bath Roadside				98.7			98.7
Billingham				100.0			100.0
Birmingham Acocks Green			92.6	100.0	100.0		97.5
Birmingham Tyburn		99.4	49.5	98.6	98.8	98.7	89.0
Birmingham Tyburn Roadside		92.6	96.7	98.8	100.0		97.0
Blackburn Darwen Roadside				100.0			100.0
Blackpool Marton			53.3	95.3	100.0		82.8
Bottesford					99.6		99.6
Bournemouth			98.9	99.2	100.0		99.6
Brighton Preston Park			100.0	99.8	99.9		99.8
Bristol St Paul's		99.9	100.0	100.0	100.0		100.0
Cambridge Roadside				99.9			99.9
Canterbury				97.6	99.8		98.7
Carlisle Roadside		99.9	99.7	100.0			99.8

Name	CO	PM_{10}	PM_{25}	NO_2	O_3	SO_2	Average
Charlton Mackrell				95.3	100.0		97.6
Chatham Centre Roadside		99.7	99.7	99.5			99.6
Chesterfield		87.5	95.4	89.9			90.9
Chesterfield Roadside		96.2	96.5	83.1			91.9
Coventry Memorial Park			79.7	97.8	97.8		91.8
Eastbourne		99.5	100.0	92.1			97.2
Exeter Roadside				99.7	100.0		99.8
Glazebury				99.0	99.1		99.1
Great Dun Fell					97.2		97.2
Harwell		12.1	12.1	89.0	97.3	97.4	61.6
Harwell		94.5	100.0				97.3
High Muffles				100.0	100.0		100.0
Honiton				100.0			100.0
Horley				99.9			99.9
Hull Freetown		99.5	99.8	99.7	100.0	99.9	99.8
Ladybower				99.9	99.9	99.7	99.8
Leamington Spa		31.7	32.9	99.9	99.9		66.1
Leamington Spa Rugby Road		83.9	99.7	98.7			94.1
Leeds Centre	99.91	0.0	0.0	99.9	99.9	99.9	66.6
Leeds Headingley Kerbside		99.9	0.0	100.0			66.6
Leicester Centre		77.4	98.5	99.9	100.0		93.9
Leominster				33.4	96.0		64.7
Lincoln Canwick Road				98.8			98.8
Liverpool Queen's Drive Roadside				99.8			99.8
Liverpool Speke		99.5	99.8	96.1	99.8	99.4	98.9
London Haringey Priory Park South				99.5	99.7		99.6
Lullington Heath				99.9	99.9	100.0	99.9
Manchester Piccadilly			46.8	99.9	100.0	99.9	86.6
Manchester South				99.9	99.9		99.9
Market Harborough				81.0	34.0		57.5

Name	CO	PM_{10}	PM_{25}	NO_2	O_3	SO_2	Average
Middlesbrough		98.9	100.0	99.6	99.8	99.8	99.6
Newcastle Centre		94.9	100.0	99.9	99.9		98.7
Newcastle Cradlewell Roadside				99.9			99.9
Northampton Kingsthorpe			96.7	99.1	100.0		99.5
Norwich Lakenfields		63.1	99.6	99.3	100.0		90.5
Nottingham Centre		89.7	99.7	99.5	99.6	99.6	97.6
Oxford Centre Roadside				95.4			95.4
Oxford St Ebbes		99.9	93.7	99.8			97.8
Plymouth Centre		100.0	93.9	100.0	99.9		98.4
Portsmouth		66.4	99.7	87.5	99.7		88.3
Preston			98.6	93.7	99.9		97.4
Reading New Town		99.4	88.4	99.8	99.8		96.8
Rochester Stoke		99.7	98.5	58.0	81.8	99.6	87.5
Salford Eccles		99.0	99.8	98.7	99.9		99.3
Saltash Callington Road		63.6	99.3				81.4
Sandy Roadside		50.0	98.6	99.4			82.7
Scunthorpe Town		96.3		99.5		99.6	98.5
Sheffield Centre		99.8	94.2	100.0	99.9		98.5
Sheffield Tinsley				100.0			100.0
Sibton					99.7		99.7
Southampton Centre		98.2	97.8	99.8	99.8	99.9	99.1
Southend-on-Sea			83.1	96.5	96.5		92.0
St Osyth				94.5	99.2		96.8
Stanford-le-Hope Roadside		82.3	94.0	97.8			91.3
Stockton-on-Tees Eaglescliffe		99.9	99.9	100.0			99.9
Stoke-on-Trent Centre		97.2	94.3	96.2	97.4		96.3
Storrington Roadside		95.1	98.8	99.9			98.0
Sunderland Silksworth			92.4	95.3	99.8		95.8
Thurrock		99.1		99.8	99.9	100.0	99.7
Walsall Woodlands				100.0	100.0		100.0
Warrington		98.3	99.2	94.8			97.4
Weybourne					100.0		100.0
Wicken Fen				99.3	100.0	0.0	66.4
Wigan Centre			91.9	100.0	99.4		97.1

Name	CO	PM_{10}	PM_{25}	NO_2	O_3	SO_2	Average
Wirral Tranmere			99.8	99.6	99.6		99.7
Yarner Wood				91.9	98.7		95.3
York Bootham		85.3	100.0				92.7
York Fishergate		97.9	99.7	98.2			98.6
No of Sites	**1**	**40**	**50**	**76**	**54**	**16**	**83**
No <90%	**0**	**13**	**10**	**7**	**2**	**1**	**14**
No <85%	**0**	**10**	**9**	**4**	**2**	**1**	**10**
Average	**99.9**	**86.2**	**87.3**	**96.5**	**97.9**	**93.2**	**94.0**

4.2.2 Site Specific Issues

Birmingham Tyburn

The $PM_{2.5}$ analyser had an unacceptably high baseline in July, necessitating a replacement drier. Data from 15 May to the end of June (and onwards into July) have been deleted.

Blackpool Marton

The $PM_{2.5}$ data continued to be suspiciously low and was identified as a regional outlier from 20 April to the end of the quarter; these data have been deleted. Investigations into the poor quality data have continued in the third quarter.

Harwell

Both PM_{10} and $PM_{2.5}$ analysers were found to have unacceptably high baselines in July, requiring new driers; all data for both $PM_{2.5}$ and PM_{10} have been deleted from 12 April to the end of the quarter. In addition, the NOx analyser software locked up resulting in the loss of data from 1-8 April.

Leamington Spa

Both PM_{10} and $PM_{2.5}$ analysers were found to have unacceptably high baselines in July, requiring new driers; all data for both $PM_{2.5}$ and PM_{10} have been deleted from 1 May to the drier replacement in July.

Leeds Centre

Both PM_{10} and $PM_{2.5}$ analysers were found to have unacceptably high baselines in July, requiring new driers. The April-June $PM_{2.5}$ data was often higher than the PM_{10}, and all data for both $PM_{2.5}$ and PM_{10} have been deleted.

Leeds Headingly Kerbside

The $PM_{2.5}$ analyser had an unacceptably high baseline in July; all April-June data have been deleted.

Leominster

The NOx analyser suffered a blocked sample valve, resulting in the loss of data from 2 May to 2 July.

Manchester Piccadilly

Much of the volatile $PM_{2.5}$ data were noisy and negative, and have been deleted. Water ingress may have been a contributory factor.

Market Harborough

As reported in the January-March report, elevated levels of NO_2 were noticed going back some time. Investigations on site revealed that the sample tubes had slipped down inside the

inlet pipe allowing partial sampling of cabin air. Unfortunately, it is likely that both the NO_2 and ozone sampling had been compromised and both datasets have been deleted since 2010 up to the repair in June 2013.

Portsmouth

A faulty FDMS cooler was responsible for loss of PM_{10} data from 1-11 April. In addition, the logger used for recording the PM_{10} and NOx data developed two faults, resulting in loss of these channels from 17-28 May and 18-27 June. The ESU appointed by the site owner, Portsmouth City Council is responsible for the maintenance of the PM_{10}, NOx and associated logger.

Rochester Stoke

There was a fault with the ozone analyser pump which resulted in the loss of data from 1-11 April. A further display fault found at audit caused loss of data from 2-8 May. The NOx data from 1 April-13 May were of poor quality; at the engineer callout on 13 May four split tubes were found in the analyser.

Saltash Callington Road

The PM_{10} data were identified as being a regional outlier in April and June, and data between 11 and 27 April, and 6 and 21 June have been deleted.

Sandy Roadside

The PM_{10} analyser at Sandy Roadside had a very low baseline (-4.1ug/m^3) which may well explain why $PM_{2.5}$ concentrations were frequently higher than the PM_{10}. The PM_{10} data have been deleted between 20 May and 30 June. A new drier was fitted on 10 June, but this failed to improve performance; several more callouts were issued to rectify the fault.

Wicken Fen

Poor quality SO_2 data continued to be observed following on from December 2012. As of 30 June the fault had not been rectified, and hence all SO_2 data have been deleted for the quarter. This fault persists into the third quarter of 2013, when the lamp and filter holder faults were finally rectified in July.

4.3 Scotland

4.3.1 Data Capture

The data capture for sites in Scotland for the period April-June 2013 is given in Table 4.3.

Table 4.3 Data Capture for Scotland, April-June 2013

Name	CO	PM_{10}	PM_{25}	NO_2	O_3	SO_2	Average
Aberdeen		100.0	94.7	87.5	99.8		95.5
Aberdeen Union Street Roadside				100.0			100.0
Auchencorth Moss (Partisol)		47.3	100.0		99.8		97.8
Auchencorth Moss (FDMS)		50.6	76.9				63.8
Bush Estate				98.0	99.9		98.9
Dumbarton Roadside				99.8			99.8

Name	CO	PM_{10}	PM_{25}	NO_2	O_3	SO_2	Average
Dumfries				99.6			99.6
Edinburgh St Leonards	79.1	90.2	99.5	100.0	100.0	98.2	94.5
Eskdalemuir				99.9	100.0		99.9
Fort William				99.9	99.9		99.9
Glasgow Kerbside		85.0	70.8	98.1			84.6
Grangemouth		99.5	100.0	99.9		100.0	99.8
Grangemouth Moray				99.2			99.2
Inverness		81.3	100.0	99.7			99.0
Lerwick					100.0		100.0
Peebles				98.6	99.9		99.2
Strath Vaich					100.0		100.0
No of Sites	**1**	**7**	**7**	**13**	**9**	**2**	**17**
No <90%	**1**	**4**	**2**	**1**	**0**	**0**	**2**
No <85%	**1**	**3**	**2**	**0**	**0**	**0**	**2**
Average	**79.1**	**79.1**	**91.7**	**98.5**	**99.9**	**99.1**	**96.0**

4.3.2 Site Specific Issues

.**Auchencorth Moss**

The problems with instrument stability continued. The PM_{10} and $PM_{2.5}$ data was identified as a regional outlier and much of the data have been deleted. The site suffered with consider able problems in Q3 ($PM_{2.5}$-air conditioning and PM_{10}-failed chiller) which may have been related to the poor data in Q2.

Glasgow Kerbside

The site suffered from poor air conditioning performance during the quarter. There was also periods of considerable spiking in the $PM_{2.5}$ data, which may be related.

4.4 Wales

4.4.1 Data Capture

The data capture for sites in Wales for April-June 2013 is given in Table 4.4.

Table 4.4 Data Capture for Wales, April-June 2013

Name	CO	PM_{10}	PM_{25}	NO_2	O_3	SO_2	Average
Aston Hill				99.9	100.0		99.9
Cardiff Centre	91.6	99.9	100.0	99.9	98.4	100.0	98.3
Chepstow A48		84.6	99.9	99.5			94.7
Cwmbran				99.9	100.0		99.9
Mold				93.5	98.5		96.0
Narberth		67.0		100.0	99.9	99.3	91.5
Newport		24.1	89.4	99.4			71.0

Port Talbot Margam (Partisol)		97.8					97.8
Port Talbot Margam	99.5	99.6	98.0	99.5	58.7	99.6	92.5
Swansea Roadside		99.1	97.8	100.0			99.0
Wrexham		94.5	90.1	97.3		97.3	97.1
No of Sites	**2**	**8**	**6**	**10**	**6**	**4**	**11**
No <90%	**0**	**3**	**1**	**0**	**1**	**0**	**1**
No <85%	**0**	**3**	**0**	**0**	**1**	**0**	**1**
Average	**95.6**	**83.3**	**95.9**	**98.9**	**92.6**	**99.0**	**94.3**

Shaded boxes are for data capture < 90%

4.4.2 Site Specific Issues

Newport

A fault occurred with the air conditioning resulting in instability of the PM_{10} FDMS instrument. There was significant delay in effecting a repair and a considerable amount of data were deleted by the CMCU and during ratification. Some $PM_{2.5}$ data were also lost

4.5 Northern Ireland (including Mace Head)

4.5.1 Data Capture

The data capture for sites in Northern Ireland (including Mace Head in the Republic of Ireland) for the period April-June 2013 is given in Table 4.5.

Table 4.5 Data Capture for Ireland, April-June 2013

Name	CO	PM_{10}	PM_{25}	NO_2	O_3	SO_2	Average
Armagh Roadside		99.6		100.0			99.8
Ballymena Ballykeel						100.0	100.0
Belfast Centre	96.2	67.0	99.6	99.8	99.9	99.8	93.7
Derry		77.2	91.3	99.0	99.7	93.0	92.1
Lough Navar		95.0			97.1		96.1
Mace Head					100.0		100.0
No of Sites	**1**	**4**	**2**	**3**	**4**	**3**	**6**
No <90%	**0**	**2**	**0**	**0**	**0**	**0**	**0**
No <85%	**0**	**2**	**0**	**0**	**0**	**0**	**0**
Average	**96.2**	**84.7**	**95.5**	**99.6**	**99.2**	**97.6**	**96.9**

4.5.2 Site Specific Issues

4.6 Overall Data Capture

Overall data capture for each pollutant across the network for the quarter is given in Table 4.6.

Table 4.6 Overall Data Capture, April-June 2013

Site	CO	PM_{10}	PM_{25}	NO_2	O_3	SO_2	Site Average
Number of sites	**7**	**68**	**78**	**115**	**81**	**29**	**133**
Number of sites < 90%	**1**	**24**	**14**	**9**	**4**	**2**	**21**
Number of sites < 85%	**1**	**20**	**12**	**5**	**4**	**2**	**16**
Network Mean (%)	**95.1**	**84.3**	**90.1**	**96.9**	**96.5**	**93.5**	**93.5**

5 FDMS Baseline Checks

As part of the QA/QC remit for continuous improvement, an ad hoc study of PM analyser baseline response has been undertaken for the past 2 years. This study has been coordinated following investigations of issues identified both by CMCU during routine operation and by QA/QC unit during the ratification process.

The study initially concentrated on FDMS analysers, examining the baseline profile of the reference channels and the relationship with other neighbouring monitoring stations. It has become clear that, on a daily mean basis, regional reference PM concentrations regularly reach a minimum value that approaches 0 μgm^{-3}.

With this information, sites where this observation was not true were “zero calibrated” using high efficiency scrubbers installed on the sample inlets. The results of these calibrations have been used to compare against the analyser baseline responses and, in all comparisons, calibration and baseline show excellent agreement.

The detection limit is calculated by multiplying the standard deviation of the zero calibration by 3.3. Typical results show that a healthy FDMS should have a detection limit of less than 5 μgm^{-3}.

Recent European guidance (CEN TS16450) provides a recommendation that zero tests on PM analysers should yield a result no higher than 3 μgm^{-3}, which provides the AURN with a robust performance limit for data ratification.

As the zero calibration and baseline correlation is so strong, QA/QC are setting up a mechanism for calibration of PM analysers, to coincide with the routine 6 month service exercise. This process was introduced around the summer 2013 audit and service round.

Appendices

Appendix 1 - Recommendations for Upgrade or Replacement of Equipment

As requested by Defra, QA/QC Unit has provided a list of suggestions for equipment that may need replacing or upgrading in the network. The following provides a summary of the outstanding issues to date. Recommendations have been prioritised as follows:

Priority	Definition	Time-scale
High*	Immediate action necessary to avoid compromising data capture/quality or safety.	Within 2 weeks
Medium	Essential but not immediate	3-6 months
Low	Desirable but not essential	As appropriate

*Note – QA/QC Unit's practice is to notify CMCU immediately of any high priority issues at the time of the event.

Table A1 Recommendations.

Recommendations February 2012	Priority	Action
ESUs are reminded of the importance of supplying service records for Partisol samplers to QA/QC Unit.	High	ESU
Zero air scrubbers to be changed for zero air cylinders at all sites (where possible).	Medium	QA/QC ESU
Recommendations August 2008	**Priority**	**Action**
Many sites require modifications to permit safe roof access for measuring PM analyser flows.	High	CMCU
Recommendations January 2008	**Priority**	**Action**
It is recommended that LSOs continue to pay particular attention to the NO_2 calibration results, to see whether the NO response is significantly higher (>10ppb) than that obtained for the zero calibration. These observations should be reported to CMCU as soon as possible.	High	LSO
It is strongly recommended that ESUs clean all NOx analyser switching valves during servicing, and ensure the valve is leak checked afterwards. Suspect leaking valves are highlighted by the QA/QC Unit during audits.	High	ESU
Recommendations January 2007		
ESUs to ensure all NOx converter software settings to be 100%.	High	ESUs to check at service

Appendix 2

Partisol Data: April-June 2013

Table A2: Principal Reasons for Data Loss (below 90%), Partisols

Site	PM_{10}	PM_{25}	Reason
Auchencorth Moss	47%	100%	Power interruption wiped memory, also leak through failed seal
Inverness	81%	100%	Filter exchange faults

Appendix 3

Site Details

Details of all site locations can be found at http://uk-air.defra.gov.uk/interactive-map

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