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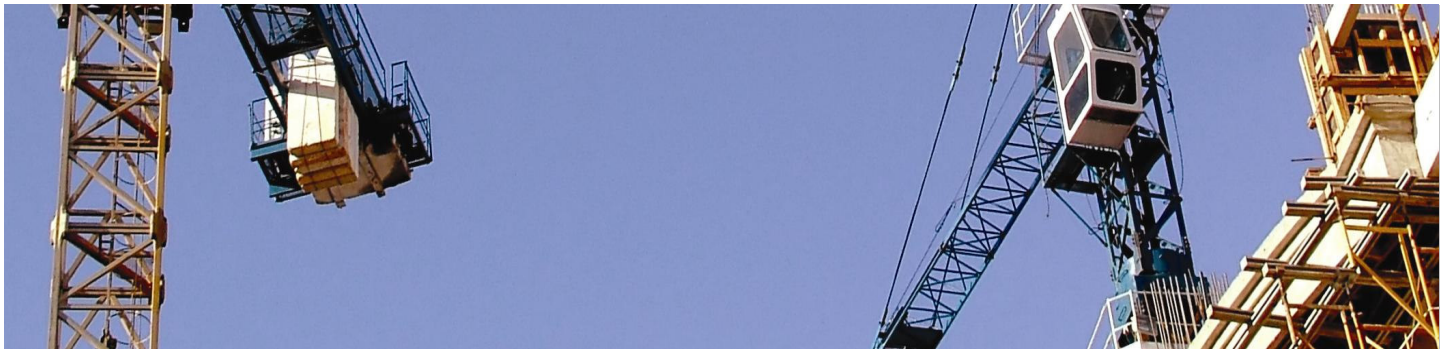

QA/QC Data Ratification Report for the Automatic Urban and Rural Network, October-December 2007, and Annual Review for 2007

Report produced for the Department for Environment, Food and Rural Affairs, Scottish Government, Welsh Assembly Government and the DoE in Northern Ireland

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Executive Summary

Part A Data Ratification for Oct – Dec 2007

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 Assembly Government and DoE in Northern Ireland.

Ratified hourly average data capture for the network averaged 94% for all pollutants (O_3, NO_2, SO_2, CO, PM_{10} and $PM_{2.5}$) during the 3-month reporting period October-December 2007. Data capture rates for all pollutants were above 90%. There were 15 sites with data capture less than 90% for the period.

The number of monitoring sites in the AURN during this quarter was 111, of which 50 are Local Authority owned sites affiliated to the national network.

-The main reasons for data loss at these sites have been provided and these were predominantly due to instrument faults, response instability or sites out of service for relocation or refurbishment. A summary of recommendations given in this report to help improve network performance is given in Appendix A4.

Substantial changes have been made to the AURN network from the end of September, and these are summarised in this report. The changes are necessary to ensure compliance with the new European Air Quality Directive. Considerable progress has been made in implementing these changes though they will still take some time to complete.

Part B Annual Review 2007

The network has undergone significant changes since it was first established in 1992. Site numbers have increased to a maximum of 134 sites although several sites have been closed during 2007-see below.

The overall data capture for 2007 was 92.5%. The annual average data capture for all species were all above 90%. There were a total of 29 sites for which data capture was below 90%

The most significant development in the AURN during 2007 was the review of the network in light of the requirements of the new European Air Quality Directive. This requires many additional sites and analysers (in particular for $PM_{2.5}$). In order to meet this requirement many sites will be fitted with additional analysers and some new sites will be affiliated into the network. The opportunity has also been taken to close sites and individual analysers where these are no longer needed for Directive compliance, background modelling or other requirements.

Although overall network data capture was reasonably high at 92.5%, there were a number of critical site/analysers that missed the 90% threshold. The main reasons for data loss at these sites have been provided and these were predominantly due to instrument faults, response instability or sites out of service for relocation or refurbishment. A summary of recommendations given in this report to help improve network performance is given in Appendix A4.

The rollout of upgrades to TEOM analysers to TEOM FDMS analysers has progressed well during 2007, with 28 operational analysers at the end of the year (two sites with FDMS have closed during the year).

QA/QC Unit continues to maintain a watching brief on new methodologies and technical advances in air quality measurement in order to keep pace with any changes that may be required in the coming years, particularly in view of the recently published European CEN standards. Procedures used in the UK network intercomparison now fully conform to the CEN requirements. In addition, the QA/QC Unit has undertaken a series of meetings with the Equipment Support Units (ESUs) to discuss data quality issues and to highlight changes required to fully implement CEN procedures.

This report provides a review of the QA/QC Unit's activities during 2007. Further details are given in

the individual quarterly data ratification reports already issued for 2007.

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PART A Data Ratification Report October-December 2007

PART B Annual Review 2007

PART A – Data Ratification Report Oct – Dec 2007

1 Introduction

Part A of this quarterly report covers the Quality Assurance and Control (QA/QC) activities undertaken by AEA to ratify automatic monitoring data from Defra and the Devolved Administrations' urban and rural air quality monitoring network (AURN) for the period October-December 2007. During this period there were 111 monitoring sites in the Network of which there are 77 urban sites, 26 rural sites and a further 8 sites in the London Air Quality Monitoring Network (LAQN) which are affiliated into the national network. There are currently 61 Defra-funded sites and 50 affiliate sites. Two sites (Wrexham PM_{10} and Brighton Roadside PM_{10}) measure PM_{10} only and are included as individual sites in the total of 111, although Wrexham PM_{10} is located with the Wrexham AURN site, and Brighton Roadside PM_{10} is close to the Brighton Roadside AURN site. Auchencorth Moss has both Partisol and FDMS analysers for both PM_{10} and PM_{25}; the FDMS instruments are listed as a separate site (Auchencorth Moss PM_{10} PM_{25}).

1.1 Recent Changes in the Network

This section gives an overview of the main changes that have taken place in the network during this quarter, including site closures, relocations or the addition of any new sites to the network. A summary of changes in the AURN for the period is given in Table 1.1. Major changes to the network at the end of September are described in Section 2.

Table 1.1 Changes in the Network, October-December 2007

Site	Date closed	Date commissioned	Comments
Horley		21 Nov 2007	Affiliated
London Haringey		29 Nov 2007	NOx analyser affiliated
Stewartby		26 Nov 2007	Affiliated

The QA/QC unit has also liased closely with the CMCU to update the LSO manual for Partisol and FDMS analysers and LSOs with these analysers at their sites should now follow these new procedures.

Further details of these network changes, which are undertaken in close co-operation with Bureau Veritas and the relevant Local Authorities, are given in the following sections.

A full description of the ratification procedures for FDMS data is given in the 2006 QA/QC Annual Report.

1.2 Overview of Network Performance

Ratified hourly average data capture for the network averaged 94 % for all pollutants (O_3, NO_2, SO_2, CO, PM_{10} and $PM_{2.5}$) during the 3-month reporting period October-December 2007 (see Table 1.4 below). All pollutants were 90% or higher data capture.

Table 1.4 AURN Ratified Data Capture (%) by Quarter, 2007 (Using the start date of any new site)

Data Capture (%)	CO	NO_2	O_3	PM_{10}	$PM_{2.5}$	SO_2	Network Average
Q1 Jan-Mar 2007	92.7	88.6	92.7	91.7	95.2	88.3	90.7
Q2 Apr-June 2007	93.2	93.5	96.4	94.8	95.6	91.6	94.0
Q3 Jul-Sept 2007	90.2	91.2	94.7	91.6	88.9	91.2	92.0
Q4 Oct-Dec 2007	93.4	92.9	95.9	94.9	92.3	96.5	94.0

Overall, 409 out of the 441 analysers (93%) achieved data capture levels above the required 90% target during this reporting period (See Table 1.5).

Table 1.5 Number of Analysers with Data Capture below 90%

Total Number Of Analysers[1]		Q1 Jan-Mar 2007 (No. below 90%)	Q2 Apr-Jun 2007 (No. below 90%)	Q3 July-Sept 2007 (No. below 90%)	Q4 Oct-Dec 2007 (No. below 90%)
CO	78	16	14	19	2
NO_2	112	23	16	22	13
O_3	92	13	6	12	6
PM_{10}	76[2]	15	10	14	7
$PM_{2.5}$	6[2]	1	1	2	1
SO_2	77	25	13	18	3
Total <90%	441	93	60	87	32

1. Figures up to 30 September; network reorganised
2. Includes TEOM, TEOM FDMS, BAM and Partisol analysers

In total, 12 out of the 111 operational network sites in the quarter (13%) had an average data capture rate below the required 90% level for the October-December 2007 period. These sites are listed in Table 1.6. The main site operational and QA/QC issues giving rise to data capture below the required 90% level are summarised in Section 4. A summary of the main recommendations made in this report to help improve network performance is given in Appendix A4.

Table 1.6 Sites with Average Data Capture < 90%, October-December 2007

Site	Owner	Site Average	Principal Reason for Data Loss
England			
Bolton	Affiliate	66.2	NOx converter software setting incorrect
Ladybower	DEFRA	66.5	Anomalously low NOx data from temporary analyser
Liverpool Speke	DEFRA	79.8	CO data deleted due to high noise
Manchester Piccadilly	DEFRA	87.9	Ozone flow fault
Salford Eccles	Affiliate	79.5	Various NOx, SO2 and sampling faults
Sheffield Tinsley	DEFRA	0.0	NOx converter fault
Southwark Roadside	Affiliate	0.0	Site closed
St Osyth	DEFRA	84.1	NOx analyser faults following power cut
Wicken Fen	DEFRA	67.3	Ozone analyser faults
Scotland			
Fort William	DEFRA	85.1	Manifold and logger faults
Lerwick	DEFRA	66.1	Analyser damaged by water in manifold
Wales			
Aston Hill	DEFRA	84.6	Unstable response

A number of historically poor performing analysers have been removed from the network as a result of the reorganisation carried out from 1 October 2007-see Section 2.

1.3 LSO Manual

As noted in Section 1.1, the LSO Manual has been updated to include a section on the TEOM FDMS analysers. In addition, the Partisol section of the manual has been updated. LSOs with these analysers at their site should now use the new version of the manual.

Copies of the new TEOM FDMS and Partisol sections will be distributed to the relevant LSOs as these analysers are installed into the network. If LSOs have not received a copy of the manual or further copies are required please contact Andy.Cook@aeat.co.uk. The manual, including the new TEOM and FDMS sections is available electronically on the following web sites:
AURN Hub http://www.aeat.co.uk/com/AURNHUB/lsoman.html
Air Quality Archive http://www.aeat.co.uk/netcen/airqual/reports/lsoman/lsoman.html

1.4 AURN Hub Updates

The AURN project information hub website is located at[1]:
http://www.aeat.co.uk/com/AURNHUB/index.html.

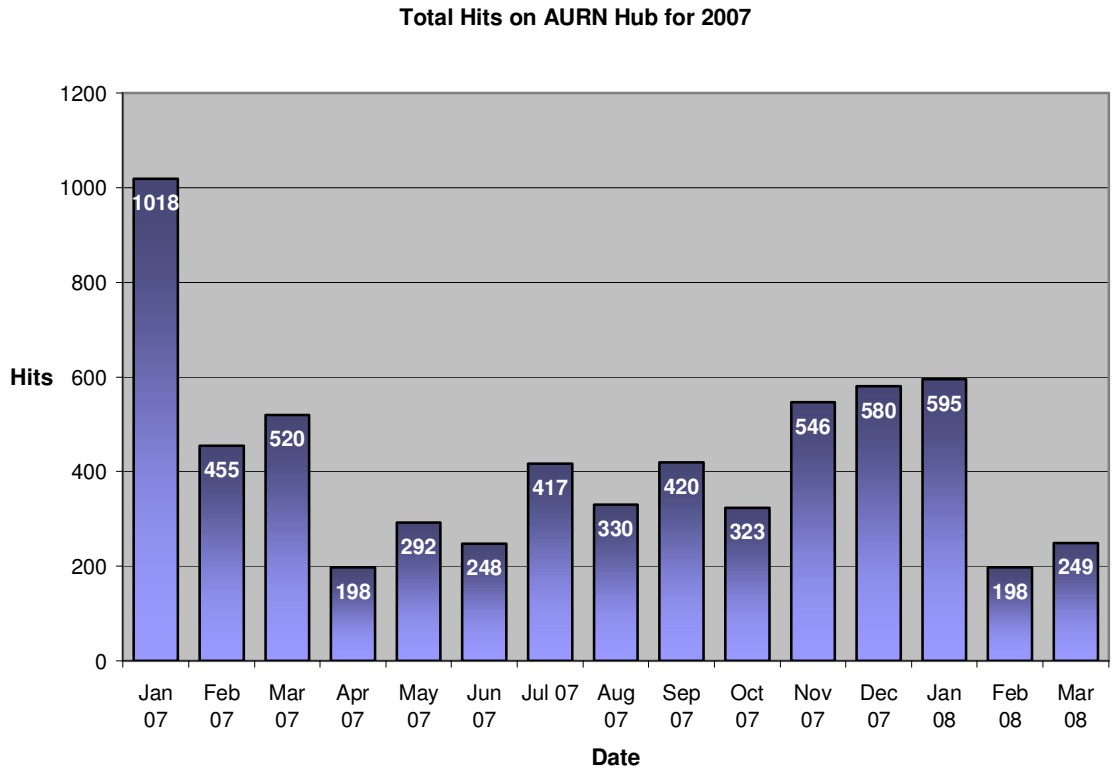
The site is regularly up-dated and some of the more recent information includes:

- Up-dated site lists and critical site list (September 2007)
- Monthly PM_{10} (Gravimetric) exceedences up to September 2007
- QA/QC Unit's Data Ratification and Intercalibration Report, July-September 2007
- Recent Management Unit reports (October-December 2007)
- Updated version of the LSO manual

The Hub has continued to provide a valuable source of information for interested organisations-see Figure 1.4

[1] Password protected site: username and password available from stephen.bird@aeat.co.uk

Figure 1.4 AURN Hub Monthly Usage Statistics January 2007-March 2008



2 Changes to the Network for Directive Compliance

The QA/QC Unit and the CMCU Unit in conjunction with Defra and the DAs have carried out a major review of the monitoring network. This was necessary to ensure the network is compliant with the European Directive. There is a requirement for a minimum level of monitoring in each agglomeration and zone, and there is a need to measure $PM_{2.5}$ at many sites. The need for additional monitoring has been met by affiliating suitable sites from other organisations, adding additional analysers at existing sites, or in a small number of cases, installing new sites. Note that as a result of these changes, the concept of critical sites is no longer meaningful and will be discontinued after this reporting period.

Sites that are no longer necessary for compliance have, in a number of cases, been closed down, or individual analysers at sites have been de-affiliated. Table 2.1 shows the sites commissioned as part of the review.

Table 2.1 Sites Added to the AURN Since 1 October 2007

Site Name	Pollutants	Zone	Start
Horley	NO_2	South East	21/11/2007
Stewartby	SO_2	Eastern	26/11/2007
York Bootham	PM10	Yorkshire & Humberside	01/01/2008
York Fishergate	NO_2 PM_{10}	Yorkshire & Humberside	01/01/2008
Oxford St Ebbes	NO_2 PM_{10}	South East	01/01/2008
Newport	NO_2 PM_{10}	South Wales	01/01/2008
Chepstow A48	NO_2 PM_{10}	South Wales	01/01/2008
Stanford-le-Hope Roadside	NO_2 PM_{10} SO_2	Eastern	22/01/2008
Carlisle Roadside	NO_2 PM_{10}	North West & Merseyside	14/02/2008

Site Name	Pollutants	Zone	Start
Leeds Headingley Kerbside	NO_2 PM_{10}	West Yorkshire	17/02/2008
Newcastle Cradlewell Roadside	NO2 NO_2 PM_{10}	Tyneside	10/03/2008
Chesterfield	NO_2 PM_{10}	Midlands	13/03/2008
Chesterfield Roadside	NO_2 PM_{10}	Midlands	11/03/2008
Aberdeen Union Street R/S	NO_2	Scotland	01/01/2008

Full details of site locations, are given in Appendix A6

Table 2.2 lists sites that were closed or deaffiliated from the network on 1 October 2007, though some continued to operate for some time:

Table 2.2 Sites removed from AURN on 1 October 2007

London Brent	Manchester Town Hall defra
London Bromley	Stockport Shaw Heath
London Hackney	Bradford Centre defra
London Lewisham	Rotherham
London Southwark	Brighton Roadside PM_{10}
London Wandsworth	Hove Roadside
West London defra	Redcar
Brentford Roadside	Belfast East defra
London A3 Roadside defra	Belfast Clara Street
Walsall Alumwell defra	Norwich Centre Roadside
Wolverhampton Centre defra	Sunderland defra
Bolton	

In addition, many analysers have been removed or deaffiiated from existing sites as of 1 October 2007. These are given in Table 2.3.

Table 2.3 Analysers removed from network at existing sites

CO Deaffiliated	SO_2 Deaffiliated	PM_{10} Deaffiliated	O_3 Deaffiliated
			London Bexley
	London Eltham	London Eltham*	
London Hillingdon	London Hillingdon	London Hillingdon	
		London Westminster*	
Southwark Roadside	Southwark Roadside		
Birmingham Centre	Birmingham Centre		
Birmingham Tyburn		Birmingham Tyburn*	
Sandwell W Brom			
	Bury Roadside		Bury Roadside
Manchester Picadilly	Manchester Picadilly		
	Manchester South		
Sheffield Tinsley			
Nottingham Centre			
Brighton Roadside		Brighton Roadside	
Portsmouth	Portsmouth		
Stoke on Trent	Stoke on Trent		
Bournemouth	Bournemouth	Bournemouth*	
Reading New Town	Reading New Town		
Coventry	Coventry		
Wirral Tranmere	Wirral Tranmere	Wirral Tranmere*	
Southend on Sea	Southend on Sea	Southend on Sea*	

CO Deaffiliated	SO_2 Deaffiliated	PM_{10} Deaffiliated	O_3 Deaffiliated
Blackpool Marton	Blackpool Marton	Blackpool Marton*	
Preston	Preston	Preston*	
		Glasgow Centre*	
Glasgow Kerbside			
Glasgow City Chambers			
		Edinburgh*	
Swansea Roadside	Swansea Roadside		Swansea Roadside
Norwich Centre			
Thurrock			
Bath Roadside			
Exeter Roadside	Exeter Roadside		
Plymouth Centre	Plymouth Centre		
		Canterbury	
Oxford Centre R/S	Oxford Centre R/S		
Northampton		Northampton*	
Wigan Centre	Wigan Centre	Wigan Centre*	
Barnsley Gawber			
Leamington Spa			
Stockton on Tees Yarm			
Grangemouth			
Aberdeen	Aberdeen		
Inverness Roadside			
Dumfries		Dumfries	
Cwmbran	Cwmbran	Cwmbran	
Wrexham			
Derry			

* PM_{10} analyser to be converted to $PM_{2.5}$ (see Table 2.4)

A full description of the changes necessary for compliance with the Directive is given in Part B Section 8.

3 Generic Data Quality Issues

3.1 Gravimetric PM_{10} and $PM_{2.5}$ Data Ratification

Eight Gravimetric PM_{10} analysers (Partisols) are currently located at seven sites in the network (Bournemouth, Wrexham, Dumfries, Inverness, London Westminster, Auchencorth Moss (PM_{10} and $PM_{2.5}$) and Brighton Roadside PM_{10}). Northampton PM_{10} has been removed pending conversion to $PM_{2.5}$

Data capture for the gravimetric PM_{10} (Partisol) analysers for the period October-December 2007 is given in Table 2.4. Three of the gravimetric analysers for which data are available did not reach the 90% data capture target in this quarter, but the average data capture over all eight analysers of 93%.

Table 2.4 Gravimetric PM_{10} Data Capture (%) October-December 2007

Site	3-months Data Capture October-December 2007
Auchencorth Moss PM_{10}	88%
Auchencorth Moss $PM_{2.5}$	84%
Bournemouth	100%
Brighton Roadside PM_{10}	91%
London Westminster	88%
Dumfries	100%
Inverness	98%
Wrexham	98%

The reasons for data loss in the gravimetric analysers are given in Appendix A5. Bureau Veritas has supplied the measured data, undertaken the filter weighing and calculated the particulate concentrations; AEA has ratified the results.

3.2 Auto-Calibration Run-ons

Autocalibration "run-on" is a generic problem affecting many analysers in the network and is due to autocalibration gas leaking into the sampling system during the ambient measurement period immediately after the autocalibration cycle. The problem can be identified by examining the diurnal variation of pollutant concentrations for the individual sites. Invalid measurements (usually between 01:30 and 02:00) have been removed during data ratification. This can be a serious source of data loss resulting in one hour out of twenty four being deleted, which is 4% of the annual data capture. At some sites significantly more data are being lost resulting in data capture below the 90% data capture target for the period.

The ESUs have investigated the autocalibration run-ons at many of the sites and tried different ways to resolve the problem including thorough cleaning of the solenoid valves and installation of Permapure or silica gel driers. In most cases this has improved the situation but it has not always eliminated the problem completely.

The 20 sites (21 analysers) showing continuing problems with the autocalibration run-on during October-December 2007 are given in Table 2.5. Any autocalibration run-on data that look visibly significant have been deleted from these data sets during ratification.

There has been a notable improvement in the number of sites adversely affected by autocalibration faults during this quarter, and the efforts of the ESUs to achieve this are acknowledged.

Table 2.5 Estimate of Spike or Dip due to Auto-calibration Run-on: October-December

Site	Pollutant	Run-On Conc	Autocal Conc	Hours lost	Months
Aston Hill	NO_2	5	50	2	Oct-Dec
Barnsley Gawber	NO_2	1	200	1	Dec
Bournemouth	NO_2	4	600	1	Oct-Dec
Bush Estate	NO_2	3.2	450	2	Nov-Dec
Fort William	NO_2	2	350	2	Oct-Nov
Harwell	NO_2	1.4	200	1	Oct-Dec
Hull Freetown	NO_2	3	200	1	Oct-Dec
Leominster	NO_2	2	500	1	Nov-Dec
Lullington Heath	NO_2	1.4	300	1	Oct-Dec
Newcastle Centre	NO_2	3	300	1	Oct-Dec
Oxford Centre Roadside	NO_2	6	200	1	Oct-Dec
Rochester Stoke	NO_2	1.7	200	1	Oct-Dec

Site	Pollutant	Run-On Conc	Autocal Conc	Hours lost	Months
Wicken Fen	NO_2	2.3	280	2	Dec
Wrexham	NO_2	2	200	1	Oct-Nov
Yarner Wood	NO_2	2.1	200	2	Oct & Dec
				3	Nov
Manchester Piccadilly	O_3	-1	350	1	Non-Dec
Stoke-on-Trent Centre	O_3	-2	1000	1	Oct-Dec
Barnsley Gawber	SO_2	0	250	1	Oct
Derry	SO_2	1	500	1	Oct-Dec
Edinburgh St Leonards	SO_2	0	550	1	Oct-Nov
London Westminster	SO_2	0	450	1	Oct & Dec

Recommendations

ESU to investigate and minimise effect where possible, especially at sites with large autocalibration run-ons or where data loss is in excess of 1 hour.
QA/QC Unit and CMCU have held meetings with the Equipment Support Units to discuss the autocalibration run-ons and to identify ways to resolve the problem. Solutions to the problems have been identified in many cases, and the necessary hardware upgrades are being installed either at routine services, or through call-outs.

In the meantime, we recommend that the autocalibration devices be adjusted at the problem sites to reduce the concentration of the span gas. It is strongly advised that NO_2 autocalibration span concentrations of less than 200ppb (urban sites) and 100ppb (rural sites) are used throughout the network.

The CMCU is asked to specifically instruct ESUs to address these autocalibration faults at the earliest opportunity

4 Site Specific Issues

In this section, we now discuss in turn specific site issues for sites in the following geographic groupings – London, England (except London), Scotland, N. Ireland and Wales.

4.1 London

The data capture for sites in London (within the M25) for the period October-December is given in Table 4.1:

Table 4.1: Data capture for London: October-December 2007

Site	Owner	CO	PM_{10}	PM_{25}	NO_2	O_3	SO_2	Site Average
Camden Kerbside	Affiliate	-	99.4	-	96.4	-	-	97.9
Haringey Roadside	Affiliate	-	99.7	-	99.6	-	-	99.7
London Bexley	Affiliate	99.8	99.8	-	99.7	-	99.2	99.6
London Bloomsbury	DEFRA	99.7	99.8	96.6	99.7	99.8	99.3	99.2
London Cromwell Road 2	DEFRA	93.2	-	-	93.2	-	92.5	92.9

Site	Owner	CO	PM_{10}	PM_{25}	NO_2	O_3	SO_2	Site Average
London Eltham	Affiliate	-	-	-	97.4	99.6	-	98.5
London Haringey	Affiliate	-	-	-	99.5	99.8	-	99.6
London Harlington	Affiliate	100.0	83.8	-	99.9	95.7	-	94.9
London Hillingdon	DEFRA	-	-	-	99.7	99.9	-	99.8
London Marylebone Road	Affiliate	98.1	99.2	99.6	96.6	97.4	97.8	98.1
London N. Kensington	Affiliate	97.9	98.3	-	98.3	98.4	98.3	98.2
London Teddington	Affiliate	-	-	-	87.1	94.0	-	90.6
London Westminster	DEFRA	97.5	57.6	-	91.6	93.2	94.5	86.9
Southwark Roadside	Affiliate	-	-	-	0.0	-	-	0.0
Tower Hamlets Roadside	Affiliate	90.7	-	-	99.7	-	-	95.2
Number of sites		8	8	2	15	9	6	15
Number of sites < 90%		0	2	0	2	0	0	2
Region Mean (%)		97.1	92.2	98.1	90.6	97.5	96.9	90.1

4.2 England (except London)

4.2.1 Data Capture

The data capture for sites in England for the period October-December is given in Table 4.2:

Table 4.2: Data capture for England: October-December 2007

Site	Owner	CO	PM_{10}	PM_{25}	NO_2	O_3	SO_2	Site Average
Barnsley 12	DEFRA	-	-	-	-	-	99.5	99.5
Barnsley Gawber	Affiliate	-	-	-	92.8	94.7	91.5	93.0
Bath Roadside	Affiliate	-	-	-	99.5	-	-	99.5
Billingham	DEFRA	-	-	-	99.9	-	-	99.9
Birmingham Centre	DEFRA	-	99.8	-	81.9	99.5	-	93.7
Birmingham Tyburn	Affiliate	-	97.5	-	98.6	99.8	99.8	98.9
Blackpool Marton	DEFRA	-	99.5	-	97.5	99.6	-	98.9
Bolton	Affiliate	-	99.3	-	0.0	99.2	-	66.2
Bottesford	Affiliate	-	-	-	-	99.5	-	99.5
Bournemouth	Affiliate	-	100.0	-	94.6	99.8	-	98.1
Brighton Preston Park	DEFRA	-	-	-	99.7	99.8	-	99.8
Brighton Roadside	Affiliate	-	-	-	99.4	-	-	99.4
Brighton Roadside PM_{10}	Affiliate	-	91.3	-	-	-	-	91.3
Bristol Old Market	Affiliate	99.8	-	-	99.6	-	-	99.7
Bristol St Paul's	DEFRA	99.9	99.0	-	99.6	99.9	99.8	99.6
Bury Roadside	Affiliate	99.0	96.7	-	99.5	-	99.7	98.7
Cambridge Roadside	Affiliate	-	-	-	99.6	-	-	99.6
Canterbury	Affiliate	-	-	-	99.5	-	-	99.5
Coventry Memorial Park	DEFRA	-	99.5	-	99.7	99.9	-	99.7
Exeter Roadside	Affiliate	-	-	-	99.5	99.5	-	99.5

Site	Owner	CO	PM_{10}	PM_{25}	NO_2	O_3	SO_2	Site Average
Glazebury	DEFRA	-	-	-	99.8	99.8	-	99.8
Great Dun Fell	DEFRA	-	-	-	-	99.3	-	99.3
Harwell	DEFRA	-	95.9	95.3	92.1	96.2	87.9	93.5
High Muffles	DEFRA	-	-	-	99.8	99.8	-	99.8
Horley	Affiliate	-	-	-	98.3	-	-	98.3
Hull Freetown	DEFRA	99.9	99.6	-	95.7	99.5	99.9	98.9
Ladybower	DEFRA	-	-	-	34.2	99.8	65.4	66.5
Leamington Spa	Affiliate	-	99.7	-	99.3	99.6	99.4	99.5
Leeds Centre	DEFRA	99.7	99.3	-	99.7	99.7	99.8	99.7
Leicester Centre	DEFRA	99.7	99.0	-	99.8	99.8	99.7	99.6
Leominster	DEFRA	-	-	-	97.0	99.8	-	98.4
Liverpool Speke	DEFRA	0.0	99.6	-	99.8	99.7	99.8	79.8
Lullington Heath	DEFRA	-	-	-	95.0	99.1	98.8	97.6
Manchester Piccadilly	DEFRA	-	98.3	-	99.6	65.9	-	87.9
Manchester South	Affiliate	-	-	-	92.0	98.3	-	95.2
Market Harborough	DEFRA	99.9	-	-	99.8	99.9	-	99.8
Middlesbrough	Affiliate	96.4	98.4	-	98.9	99.1	99.1	98.4
Newcastle Centre	DEFRA	99.8	86.4	-	76.2	99.8	99.7	92.4
Northampton	Affiliate	-	99.8	-	98.4	94.6	99.8	98.1
Norwich Centre	DEFRA	-	97.7	-	99.8	99.6	99.7	99.2
Nottingham Centre	DEFRA	-	99.5	-	99.7	99.7	99.7	99.6
Oxford Centre Roadside	Affiliate	-	-	-	95.5	-	-	95.5
Plymouth Centre	DEFRA	-	97.6	-	99.8	96.0	-	97.8
Portsmouth	Affiliate	-	96.3	-	99.9	99.9	-	98.7
Preston	DEFRA	-	98.3	-	99.9	99.9	-	99.3
Reading New Town	DEFRA	-	93.8	-	96.7	96.8	-	95.8
Rochester Stoke	Affiliate	-	99.6	99.9	95.5	99.5	99.7	98.8
Salford Eccles	Affiliate	91.6	81.8	-	75.0	91.0	58.3	79.5
Sandwell West Bromwich	Affiliate	-	-	-	99.9	99.9	99.8	99.8
Scunthorpe Town	Affiliate	-	96.2	-	-	-	96.0	96.1
Sheffield Centre	DEFRA	99.7	99.3	-	99.6	99.7	99.7	99.6
Sheffield Tinsley	DEFRA	-	-	-	0.0	-	-	0.0
Sibton	DEFRA	-	-	-	-	99.9	-	99.9
Somerton	Affiliate	-	-	-	97.0	96.9	-	96.9
Southampton Centre	DEFRA	97.1	99.5	-	92.3	99.5	99.5	97.6
Southend-on-Sea	DEFRA	-	99.5	-	99.7	99.5	-	99.6
St Osyth	DEFRA	71.1	-	-	81.8	99.5	-	84.1
Stewartby	Affiliate	-	-	-	-	-	98.0	98.0
Stockton-on-Tees Yarm	Affiliate	-	97.4	-	99.0	-	-	98.2
Stoke-on-Trent Centre	DEFRA	-	99.6	-	93.5	93.0	-	95.4
Sunderland Silksworth	Affiliate	-	-	-	88.0	92.7	-	90.3
Thurrock	Affiliate	-	99.7	-	99.5	94.2	99.1	98.1
Walsall Willenhall	Affiliate	-	-	-	95.4	-	-	95.4
Weybourne	Affiliate	-	-	-	-	99.0	-	99.0
Wicken Fen	DEFRA	-	-	-	96.9	5.1	99.7	67.3
Wigan Centre	Affiliate	-	-	-	99.9	99.8	-	99.8
Wirral Tranmere	DEFRA	-	98.2	-	99.6	99.9	-	99.2
Yarner Wood	DEFRA	-	-	-	87.3	97.3	-	92.3
Number of sites		14	35	2	60	52	27	68
Number of sites <		2	2	0	9	2	3	8

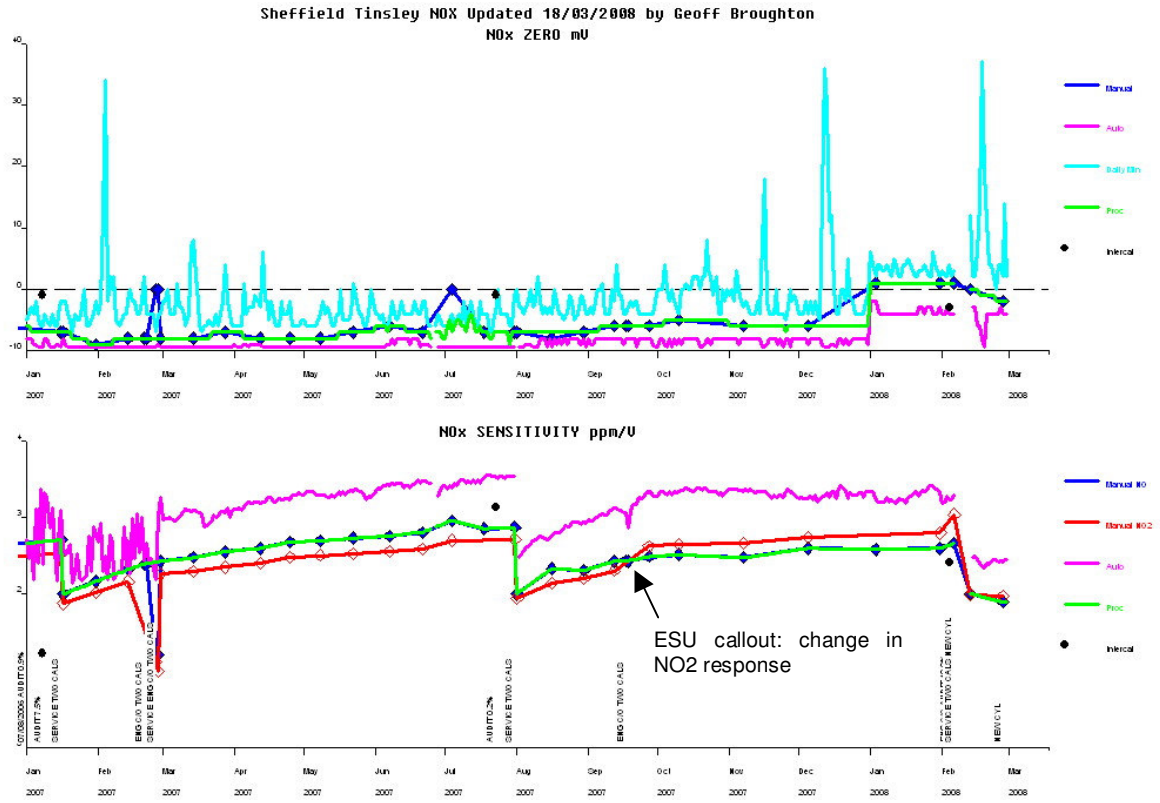
Site	Owner	CO	PM_{10}	PM_{25}	NO_2	O_3	SO_2	Site Average
90%								
Region Mean (%)		89.5	97.5	97.6	92.1	96.1	95.9	94.2

4.2.2 Site Specific Issues

Sheffield Tinsley

The NOx converter at Sheffield Tinsley was found to be 80% at the winter 2008 audit. Closer inspection of service records showed an ESU callout on 17 September for a PMT fault. The calibration plots show a step change in the analyser response to NO_2 gas (see Figure 4.1), which remains until the converter fault was identified and repaired on 6 February. As a result, all NO_2 data between these dates have been deleted.

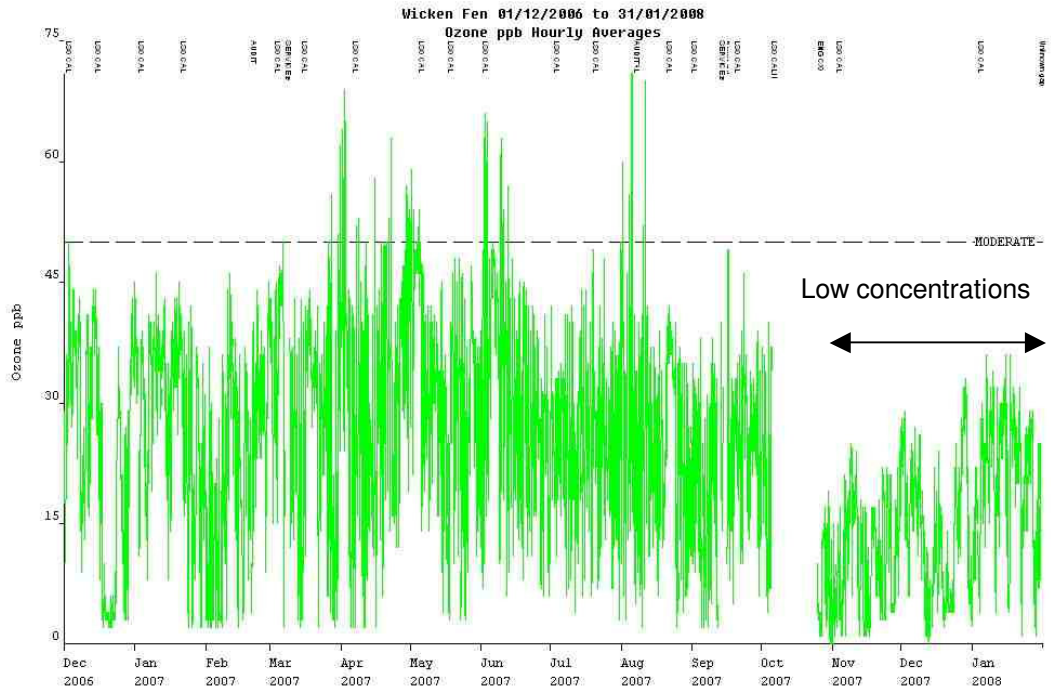
Figure 4.1: Calibration Plot for Sheffield Tinsley NOx



Wicken Fen

At an ESU callout in 1 February 2008, the main switching valve in the analyser was found to be faulty. The pre-service calibration showed a significant under-read, and as a result, the data have been deleted back to a pump repair on 25 October. Figure 4.2 shows the effect of the faulty valve on measured concentrations. The effect of switching valve faults is not always constant, and so it is not possible to effectively rescale the data in the event of this type of fault.

Figure 4.2: Wicken Fen Ozone-December 2006-February 2008



4.3 Scotland

4.3.1 Data Capture

The data capture for sites in Scotland for the period October-December is given in Table 4.3:

Table 4.3: Data capture for Scotland: October-December 2007

Site	Owner	CO	PM_{10}	PM_{25}	NO_2	O_3	SO_2	Site Average
Aberdeen	Affiliate	-	99.9	-	99.7	98.2	-	99.2
Auchencorth Moss	DEFRA	-	56.5	56.5	-	99.5	-	70.8
Auchencorth Moss PM_{10} PM_{25} (FDMS)	DEFRA	-	98.5	99.0	-	-	-	98.7
Bush Estate	DEFRA	-	-	-	86.2	98.9	-	92.5
Dumfries	DEFRA	-	100.0	-	99.7	-	-	99.8
Edinburgh St Leonards	DEFRA	99.7	85.9	-	99.7	99.5	98.1	96.6
Eskdalemuir	DEFRA	-	-	-	99.7	99.7	-	99.7
Fort William	DEFRA	-	-	-	82.6	87.5	-	85.1
Glasgow Centre	DEFRA	99.8	99.6	-	99.8	99.6	99.8	99.7
Glasgow City Chambers	DEFRA	-	-	-	99.9	-	-	99.9
Glasgow Kerbside	DEFRA	-	99.5	-	95.9	-	-	97.7
Grangemouth	Affiliate	-	99.7	-	99.5	-	99.5	99.6
Inverness	DEFRA	-	97.8	-	99.6	-	-	98.7
Inverness PM_{10}	DEFRA	-	96.8	-	-	-	-	96.8
Lerwick	DEFRA	-	-	-	-	66.1	-	66.1
Strath Vaich	DEFRA	-	-	-	-	90.7	-	90.7
Number of sites		2	10	2	11	9	3	16
Number of sites <		0	2	1	2	2	0	3

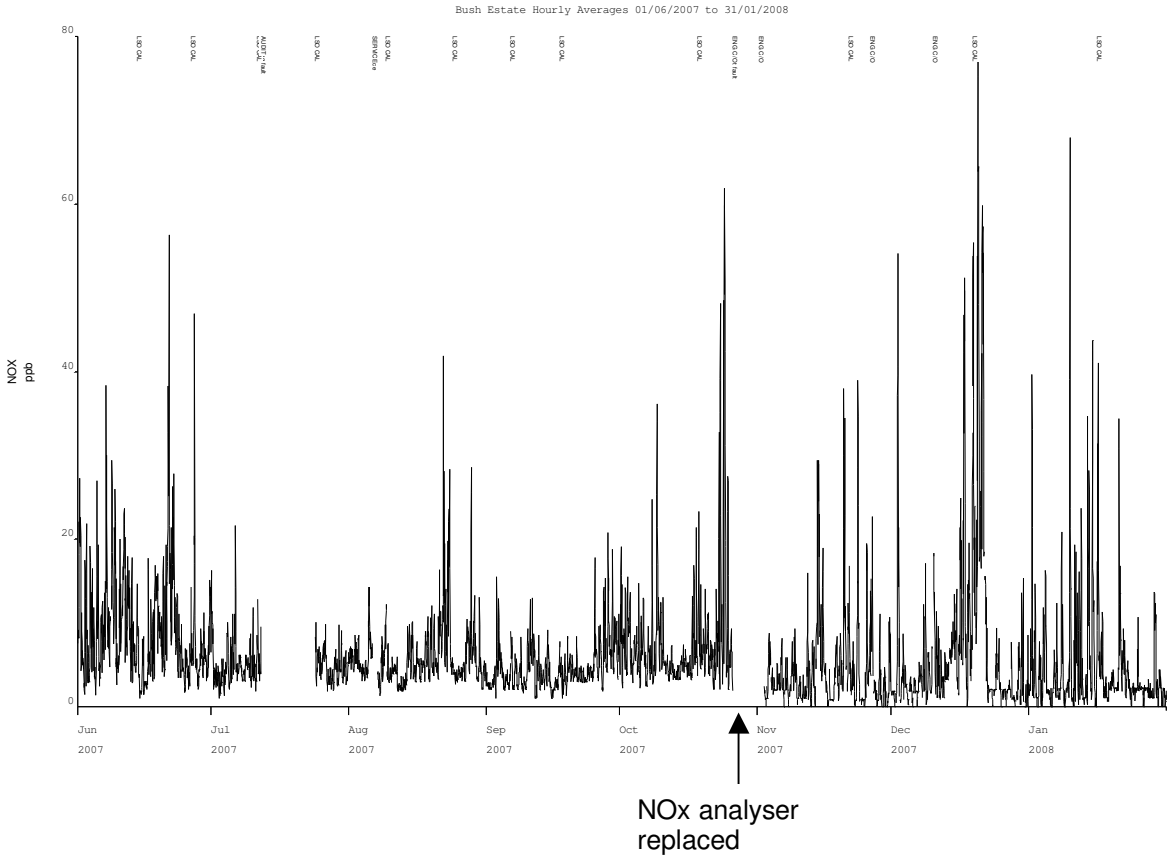
Site	Owner	CO	PM_{10}	PM_{25}	NO_2	O_3	SO_2	Site Average
90%								
Region Mean (%)		99.8	93.4	77.8	96.6	93.3	99.1	93.2

4.3.2 Site Specific Issues

Bush NOx

The Bush NOx analyser has a history of faults, and loan replacement analysers have been installed on several occasions. The loan analyser, which had been on site for some time, was replaced with the original site analyser on 26 October. This resulted in a significant change of the NOx channel readings. This can be seen in Figure 4.3

Figure 4.3 Bush NOx Concentrations



In light of the history of this site analyser, it is recommended that it be replaced permanently as soon as possible.

Recommendation

The Bush NOx analyser exhibits poor performance and should be considered for replacement

4.4 Northern Ireland

4.4.1 Data Capture

The data capture for sites in Northern Ireland for the period October-December is given in Table 4.4:

Table 4.4 Data Capture for Northern Ireland: October-December 2007

Site	Owner	CO	PM_{10}	$PM_{2.5}$	NO_2	O_3	SO_2	Site Average
Belfast Centre	DEFRA	99.7	99.6	-	91.4	99.7	99.7	98.0
Derry	Affiliate	-	98.4	-	98.5	98.6	94.4	97.5
Lough Navar	DEFRA	-	97.5	-	-	98.0	-	97.8
Number of sites		1	3	0	2	3	2	3
Number of sites < 90%		0	0	0	0	0	0	0
Region Mean (%)		99.7	98.5	-	95.0	98.8	97.0	97.7

4.4.2 Site Specific Issues

Belfast Centre Ozone

The Belfast Centre Ozone analyser was found to under-read by 52% at the winter 2008 audit. Unfortunately, no photometer calibration was carried out by the ESU at service. ESU's should be reminded that photometer calibrations need to be carried out where such problems have been identified by the QA/QC Unit. Subsequent investigation showed no fault existed with the analyser, and the data have not been rescaled, and none was lost as a result, but correct procedures should be observed in future.

4.5 Wales

4.5.1 Data Capture

The data capture for sites in Wales for the period October-December is given in Table 4.5:

Table 4.5: Data capture for Wales: October-December 2007

Site	Owner	CO	PM_{10}	PM_{25}	NO_2	O_3	SO_2	Site Average
Aston Hill	DEFRA	-	-	-	91.2	78.1	-	84.6
Cardiff Centre	DEFRA	99.8	87.3	-	99.8	99.8	99.3	97.2
Cwmbran	Affiliate	-	-	-	99.8	99.9	-	99.8
Narberth	DEFRA	-	97.4	-	98.8	86.5	93.3	94.0
Port Talbot Margam	Affiliate	-	99.4	-	99.4	99.3	99.3	99.3
Swansea Roadside	Affiliate	-	99.2	99.1	99.6	-	-	99.3
Wrexham	DEFRA	-	97.8	-	96.9	-	99.5	98.1

Wrexham PM_{10}	DEFRA	-	99.9	-	-	-	-	99.9
Number of sites		1	6	1	7	5	4	8
Number of sites < 90%		0	1	0	0	2	0	1
Region Mean (%)		99.8	96.8	99.1	97.9	92.7	97.9	96.5

4.5.2 Site Specific Issues

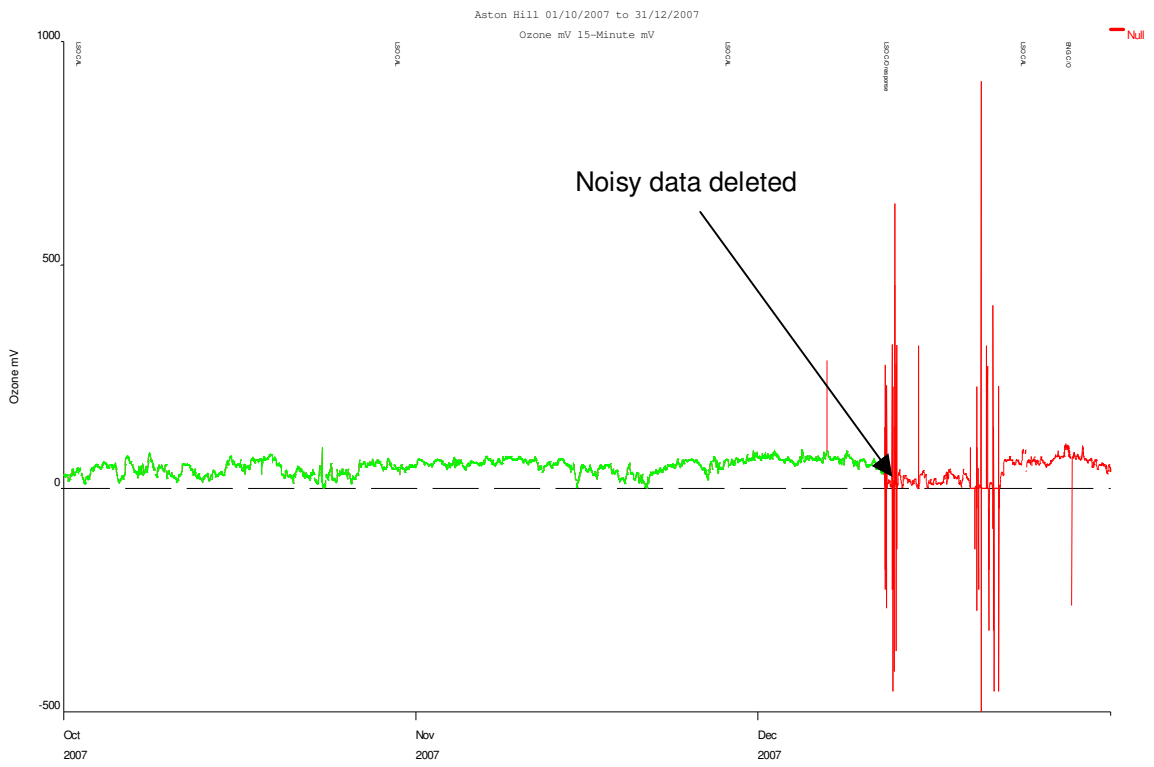
Cwmbran

There is a recurring problem with the NO calibration cylinder at Cwmbran. It appears that the cylinder becomes contaminated with oxygen, which causes the NO to become partially oxidised to NO_2. This makes reliable calibration of the NO channel difficult. The use of small L10 cylinders and automatic cylinder concentrations mean frequent cylinder changes. The last three NO cylinders have been affected by this. The ESU has been asked to attend with the LSO to see if the reason for this can be established.

Aston Hill

There have been persistent problems with the ozone analyser during the period October-December. The problems persist into 2008; further details will be given in the report for the first quarter of 2008. The unstable response can be seen in Figure 4.4

Figure 4.4: Aston Hill Ozone



4.6 Sites highlighted in previous reports

Several analysers have been highlighted recently as being of concern to the QA/QC unit. An update is given in Table 3.3.

Table 3.3 Status of Analysers Highlighted in Previous Reports

Site	Analyser	Fault	Current status
Swansea Roadside	PM_{10}		Now fixed
Fort William	All		Fault identified and rectified
Auchencorth Moss	PM_{10}		FDMS data now received
Bolton	NOx and SO_2	Various faults	Site removed from network
Weybourne	O_3	No manual calibrations or IZS	No progress reported
Rural CO analysers	CO	Baseline drift	Drift still evident
Various	Rural ozone analysers	Temporary instruments installed some of which have no autocals	Two analysers have been upgraded by the manufacturer and are currently under test by the ESU.

Recommendation

QA/QC Unit would like to seek clarification from the Equipment Support Unit/manufacturer as to the current situation regarding the reason for the problems and what plans are in place to resolve them. We recommend that immediate attention is given to the outstanding issues as the majority of these instruments are located at critical sites.

5 Sites with Data Capture Below 90%

5.1 Sites with Low Data Capture

A summary of the main site analyser operational problems, which have resulted in data capture below the required 90% level during the reporting period October-December 2007 is given in Appendix 2. The number of days and hours of data lost for each cause is also given. In some cases the data gap extends beyond this three-month reporting period. The table lists all gaps of 6 hours or more for each pollutant.

6 Ratified Data Capture Statistics

Table 6.1 provides the ratified data capture figures for each site for the 3-month period October-December 2007. Data capture values below 90% are shown in the shaded boxes.

Table 6.1 Ratified Network Data Statistics: October-December 2007

Site	Owner	CO	PM_{10}	PM_{25}	NO_2	O_3	SO_2	Site Average
England								
Barnsley 12	DEFRA	-	-	-	-	-	99.5	99.5
Barnsley Gawber	Affiliate	-	-	-	92.8	94.7	91.5	93.0
Bath Roadside	Affiliate	-	-	-	99.5	-	-	99.5
Billingham	DEFRA	-	-	-	99.9	-	-	99.9
Birmingham Centre	DEFRA	-	99.8	-	81.9	99.5	-	93.7
Birmingham Tyburn	Affiliate	-	97.5	-	98.6	99.8	99.8	98.9
Blackpool Marton	DEFRA	-	99.5	-	97.5	99.6	-	98.9
Bottesford	Affiliate	-	-	-	-	99.5	-	99.5
Bournemouth	Affiliate	-	100.0	-	94.6	99.8	-	98.1
Brighton Preston Park	DEFRA	-	-	-	99.7	99.8	-	99.8
Brighton Roadside	Affiliate	-	-	-	99.4	-	-	99.4
Brighton Roadside PM_{10}	Affiliate	-	91.3	-	-	-	-	91.3
Bristol Old Market	Affiliate	99.8	-	-	99.6	-	-	99.7
Bristol St Paul's	DEFRA	99.9	99.0	-	99.6	99.9	99.8	99.6
Bury Roadside	Affiliate	99.0	96.7	-	99.5	-	99.7	98.7
Cambridge Roadside	Affiliate	-	-	-	99.6	-	-	99.6
Camden Kerbside	Affiliate	-	99.4	-	96.4	-	-	97.9
Canterbury	Affiliate	-	-	-	99.5	-	-	99.5
Coventry Memorial Park	DEFRA	-	99.5	-	99.7	99.9	-	99.7
Exeter Roadside	Affiliate	-	-	-	99.5	99.5	-	99.5
Glazebury	DEFRA	-	-	-	99.8	99.8	-	99.8
Great Dun Fell	DEFRA	-	-	-	-	99.3	-	99.3
Haringey Roadside	Affiliate	-	99.7	-	99.6	-	-	99.7
Harwell	DEFRA	-	95.9	95.3	92.1	96.2	87.9	93.5
High Muffles	DEFRA	-	-	-	99.8	99.8	-	99.8
Horley	Affiliate	-	-	-	98.3	-	-	98.3
Hull Freetown	DEFRA	99.9	99.6	-	95.7	99.5	99.9	98.9
Ladybower	DEFRA	-	-	-	34.2	99.8	65.4	66.5
Leamington Spa	Affiliate	-	99.7	-	99.3	99.6	99.4	99.5
Leeds Centre	DEFRA	99.7	99.3	-	99.7	99.7	99.8	99.7
Leicester Centre	DEFRA	99.7	99.0	-	99.8	99.8	99.7	99.6
Leominster	DEFRA	-	-	-	97.0	99.8	-	98.4
Liverpool Speke	DEFRA	0.0	99.6	-	99.8	99.7	99.8	79.8
London Bexley	Affiliate	99.8	99.8	-	99.7	-	99.2	99.6
London Bloomsbury	DEFRA	99.7	99.8	96.6	99.7	99.8	99.3	99.2
London Cromwell Road 2	DEFRA	93.2	-	-	93.2	-	92.5	92.9
London Eltham	Affiliate	-	-	-	97.4	99.6	-	98.5
London Haringey	Affiliate	-	-	-	99.5	99.8	-	99.6
London Harlington	Affiliate	100.0	83.8	-	99.9	95.7	-	94.9

Site	Owner	CO	PM_{10}	PM_{25}	NO_2	O_3	SO_2	Site Average
London Hillingdon	DEFRA	-	-	-	99.7	99.9	-	99.8
London Marylebone Road	Affiliate	98.1	99.2	99.6	96.6	97.4	97.8	98.1
London N. Kensington	Affiliate	97.9	98.3	-	98.3	98.4	98.3	98.2
London Teddington	Affiliate	-	-	-	87.1	94.0	-	90.6
London Westminster	DEFRA	97.5	88.0	-	91.6	93.2	94.5	93.0
Lullington Heath	DEFRA	-	-	-	95.0	99.1	98.8	97.6
Manchester Piccadilly	DEFRA	-	98.3	-	99.6	65.9	-	87.9
Manchester South	Affiliate	-	-	-	92.0	98.3	-	95.2
Market Harborough	DEFRA	99.9	-	-	99.8	99.9	-	99.8
Middlesbrough	Affiliate	96.4	98.4	-	98.9	99.1	99.1	98.4
Newcastle Centre	DEFRA	99.8	86.4	-	76.2	99.8	99.7	92.4
Northampton	Affiliate	-	99.8	-	98.4	94.6	99.8	98.1
Norwich Centre	DEFRA	-	97.7	-	99.8	99.6	99.7	99.2
Nottingham Centre	DEFRA	-	99.5	-	99.7	99.7	99.7	99.6
Oxford Centre Roadside	Affiliate	-	-	-	95.5	-	-	95.5
Plymouth Centre	DEFRA	-	97.6	-	99.8	96.0	-	97.8
Portsmouth	Affiliate	-	96.3	-	99.9	99.9	-	98.7
Preston	DEFRA	-	98.3	-	99.9	99.9	-	99.3
Reading New Town	DEFRA	-	93.8	-	96.7	96.8	-	95.8
Rochester Stoke	Affiliate	-	99.6	99.9	95.5	99.5	99.7	98.8
Salford Eccles	Affiliate	91.6	81.8	-	75.0	91.0	58.3	79.5
Sandwell West Bromwich	Affiliate	-	-	-	99.9	99.9	99.8	99.8
Scunthorpe Town	Affiliate	-	96.2	-	-	-	96.0	96.1
Sheffield Centre	DEFRA	99.7	99.3	-	99.6	99.7	99.7	99.6
Sheffield Tinsley	DEFRA	-	-	-	0.0	-	-	0.0
Sibton	DEFRA	-	-	-	-	99.9	-	99.9
Somerton	Affiliate	-	-	-	97.0	96.9	-	96.9
Southampton Centre	DEFRA	97.1	99.5	-	92.3	99.5	99.5	97.6
Southend-on-Sea	DEFRA	-	99.5	-	99.7	99.5	-	99.6
Southwark Roadside	Affiliate	-	-	-	0.0	-	-	0.0
St Osyth	DEFRA	71.1	-	-	81.8	99.5	-	84.1
Stewartby	Affiliate	-	-	-	-	-	98.0	98.0
Stockton-on-Tees Yarm	Affiliate	-	97.4	-	99.0	-	-	98.2
Stoke-on-Trent Centre	DEFRA	-	99.6	-	93.5	93.0	-	95.4
Sunderland Silksworth	Affiliate	-	-	-	88.0	92.7	-	90.3
Thurrock	Affiliate	-	99.7	-	99.5	94.2	99.1	98.1
Tower Hamlets Roadside	Affiliate	90.7	-	-	99.7	-	-	95.2
Walsall Willenhall	Affiliate	-	-	-	95.4	-	-	95.4
Weybourne	Affiliate	-	-	-	-	99.0	-	99.0
Wicken Fen	DEFRA	-	-	-	96.9	5.1	99.7	67.3
Wigan Centre	Affiliate	-	-	-	99.9	99.8	-	99.8
Wirral Tranmere	DEFRA	-	98.2	-	99.6	99.9	-	99.2
Yarner Wood	DEFRA	-	-	-	87.3	97.3	-	92.3
Ireland								
Mace Head	Affiliate	-	-	-	-	99.2	-	99.2
N Ireland								
Belfast Centre	DEFRA	99.7	99.6	-	91.4	99.7	99.7	98.0
Derry	Affiliate	-	98.4	-	98.5	98.6	94.4	97.5

Site	Owner	CO	PM_{10}	PM_{25}	NO_2	O_3	SO_2	Site Average
Lough Navar	DEFRA	-	97.5	-	-	98.0	-	97.8
Scotland								
Aberdeen	Affiliate	-	99.9	-	99.7	98.2	-	99.2
Auchencorth Moss	DEFRA	-	89.1	83.7	-	99.5	-	90.8
Auchencorth Moss PM_{10} PM_{25} (FDMS)	DEFRA	-	98.5	99.0	-	-	-	98.7
Bush Estate	DEFRA	-	-	-	86.2	98.9	-	92.5
Dumfries	DEFRA	-	100.0	-	99.7	-	-	99.8
Edinburgh St Leonards	DEFRA	99.7	85.9	-	99.7	99.5	98.1	96.6
Eskdalemuir	DEFRA	-	-	-	99.7	99.7	-	99.7
Fort William	DEFRA	-	-	-	82.6	87.5	-	85.1
Glasgow Centre	DEFRA	99.8	99.6	-	99.8	99.6	99.8	99.7
Glasgow City Chambers	DEFRA	-	-	-	99.9	-	-	99.9
Glasgow Kerbside	DEFRA	-	99.5	-	95.9	-	-	97.7
Grangemouth	Affiliate	-	99.7	-	99.5	-	99.5	99.6
Inverness	DEFRA	-	97.8	-	99.6	-	-	98.7
Inverness PM_{10}	DEFRA	-	96.8	-	-	-	-	96.8
Lerwick	DEFRA	-	-	-	-	66.1	-	66.1
Strath Vaich	DEFRA	-	-	-	-	90.7	-	90.7
Wales								
Aston Hill	DEFRA	-	-	-	91.2	78.1	-	84.6
Cardiff Centre	DEFRA	99.8	87.3	-	99.8	99.8	99.3	97.2
Cwmbran	Affiliate	-	-	-	99.8	99.9	-	99.8
Narberth	DEFRA	-	97.4	-	98.8	86.5	93.3	94.0
Port Talbot Margam	Affiliate	-	99.4	-	99.4	99.3	99.3	99.3
Swansea Roadside	Affiliate	-	99.2	99.1	99.6	-	-	99.3
Wrexham	DEFRA	-	97.8	-	96.9	-	99.5	98.1
Wrexham PM_{10}	DEFRA	-	99.9	-	-	-	-	99.9
Number of sites		26	62	7	95	79	42	111
Number of sites < 90%		2	7	1	13	6	3	13
Network Mean (%)		93.4	96.7	96.2	92.9	95.9	96.5	94.0

Shaded boxes are for data capture < 90%

Table 6.2 Ratified Network Data Statistics: January-December 2007

Site	Owner	CO	PM_{10}	PM_{25}	NO_2	O_3	SO_2	Site Aver.
England								
Barnsley 12	DEFRA	-	-	-	-	-	95.1	95.1
Barnsley Gawber	Affiliate	92.3	-	-	91.1	94.5	90.1	92.0
Bath Roadside	Affiliate	94.1	-	-	98.4	-	-	96.3
Billingham	DEFRA	-	-	-	96.4	-	-	96.4
Birmingham Centre	DEFRA	97.4	98.0	-	85.4	96.5	87.0	92.9
Birmingham Tyburn	Affiliate	94.8	98.0	-	98.6	98.8	95.1	97.1
Blackpool Marton	DEFRA	95.9	95.4	-	97.0	98.0	90.2	95.3
Bolton	Affiliate	72.9	79.2	-	0.0	79.7	54.4	57.3
Bottesford	Affiliate	-	-	-	-	99.5	-	99.5

Site	Owner	CO	PM_{10}	PM_{25}	NO_2	O_3	SO_2	Site Aver.
Bournemouth	Affiliate	98.2	96.4	-	93.7	98.8	84.7	94.4
Bradford Centre	DEFRA	94.0	94.2	-	79.0	95.2	86.4	89.7
Brentford Roadside	Affiliate	69.3	-	-	98.4	-	-	83.9
Brighton Preston Park	DEFRA	-	-	-	96.7	96.7	-	96.7
Brighton Roadside	Affiliate	98.3	-	-	98.4	-	-	98.3
Brighton Roadside PM10	Affiliate	-	93.7	-	-	-	-	93.7
Bristol Old Market	Affiliate	98.6	-	-	97.8	-	-	98.2
Bristol St Paul's	DEFRA	97.5	97.4	-	93.1	98.2	98.2	96.9
Bury Roadside	Affiliate	82.4	77.7	-	81.1	76.4	61.4	75.8
Cambridge Roadside	Affiliate	-	-	-	97.2	-	-	97.2
Camden Kerbside	Affiliate	-	99.4	-	97.3	-	-	98.4
Canterbury	Affiliate	-	98.7	-	98.9	-	-	98.8
Coventry Memorial Park	DEFRA	98.7	99.0	-	98.9	99.3	94.1	98.0
Exeter Roadside	Affiliate	99.0	-	-	99.0	99.1	99.0	99.0
Glazebury	DEFRA	-	-	-	97.1	72.9	-	85.0
Great Dun Fell	DEFRA	-	-	-	-	86.5	-	86.5
Haringey Roadside	Affiliate	-	74.6	-	96.0	-	-	85.3
Harwell	DEFRA	-	96.7	96.6	90.7	82.4	87.5	90.8
High Muffles	DEFRA	-	-	-	97.8	98.5	-	98.2
Horley	Affiliate	-	-	-	98.3	-	-	98.3
Hove Roadside	Affiliate	99.0	-	-	95.7	-	98.9	97.9
Hull Freetown	DEFRA	91.8	98.4	-	94.7	98.2	97.7	96.2
Ladybower	DEFRA	-	-	-	73.3	98.5	81.9	84.5
Leamington Spa	Affiliate	95.6	97.2	-	71.2	96.1	96.3	91.3
Leeds Centre	DEFRA	98.9	99.2	-	99.0	99.1	99.0	99.0
Leicester Centre	DEFRA	99.1	74.3	-	99.1	99.1	99.2	94.2
Leominster	DEFRA	-	-	-	94.0	98.8	-	96.4
Liverpool Speke	DEFRA	70.4	98.2	-	96.1	98.2	98.2	92.2
London A3 Roadside	DEFRA	97.0	98.0	-	96.6	-	-	97.2
London Bexley	Affiliate	97.3	98.2	-	95.5	98.9	98.6	97.7
London Bloomsbury	DEFRA	84.1	89.7	88.2	78.4	85.4	82.4	84.7
London Brent	Affiliate	98.4	96.1	-	94.6	98.8	94.2	96.4
London Bromley	Affiliate	-	-	-	96.1	-	-	96.1
London Cromwell Road 2	DEFRA	95.9	-	-	95.5	-	93.8	95.0
London Eltham	Affiliate	-	70.6	-	96.5	98.1	90.1	88.8
London Hackney	Affiliate	99.5	-	-	99.5	99.4	-	99.5
London Haringey	Affiliate	-	-	-	99.5	81.4	-	90.4
London Harlington	Affiliate	96.5	77.2	-	93.9	89.4	-	89.2
London Hillingdon	DEFRA	92.3	97.8	-	97.9	98.3	97.2	96.7
London Lewisham	Affiliate	-	-	-	92.3	99.5	98.4	96.7
London Marylebone Road	Affiliate	95.9	97.8	95.7	98.0	98.6	98.7	97.4
London N. Kensington	Affiliate	97.8	98.4	-	99.0	96.8	96.2	97.6
London Southwark	Affiliate	84.3	-	-	98.8	98.9	83.7	91.4
London Teddington	Affiliate	-	-	-	94.8	96.7	86.5	92.7
London Wandsworth	Affiliate	-	-	-	92.4	99.3	-	95.9
London Westminster	DEFRA	91.8	92.1	-	77.3	95.6	91.4	89.6
Lullington Heath	DEFRA	-	-	-	94.3	96.3	96.9	95.8
Manchester Piccadilly	DEFRA	94.9	98.4	-	96.2	88.0	94.3	94.3
Manchester South	Affiliate	-	-	-	85.5	94.8	97.5	92.6

Site	Owner	CO	PM_{10}	PM_{25}	NO_2	O_3	SO_2	Site Aver.
Manchester Town Hall	DEFRA	86.6	-	-	95.7	-	-	91.2
Market Harborough	DEFRA	96.3	-	-	98.2	96.9	-	97.1
Middlesbrough	Affiliate	95.7	97.4	-	98.8	98.4	98.8	97.8
Newcastle Centre	DEFRA	97.6	87.3	-	86.4	97.8	96.9	93.2
Northampton	Affiliate	98.8	78.1	-	97.4	97.2	99.1	94.1
Northampton PM_{10}	Affiliate	-	84.2	-	-	-	-	84.2
Norwich Centre	DEFRA	99.0	98.1	-	99.1	99.1	90.8	97.2
Norwich Forum Roadside	Affiliate	-	-	-	95.6	-	-	95.6
Nottingham Centre	DEFRA	97.6	95.3	-	96.7	98.3	98.3	97.2
Oxford Centre Roadside	Affiliate	80.6	-	-	95.2	-	95.9	90.5
Plymouth Centre	DEFRA	73.7	86.9	-	84.6	87.3	83.0	83.1
Portsmouth	Affiliate	98.8	97.7	-	99.0	99.1	96.5	98.2
Preston	DEFRA	92.2	98.6	-	95.8	95.7	95.0	95.5
Reading New Town	DEFRA	93.9	94.1	-	95.8	96.7	91.1	94.3
Redcar	Affiliate	55.5	84.4	-	87.0	83.0	83.8	78.7
Rochester Stoke	Affiliate	-	98.3	99.1	97.4	98.4	98.4	98.3
Rotherham Centre	Affiliate	-	-	-	89.7	93.9	94.1	92.6
Salford Eccles	Affiliate	94.6	90.1	-	91.0	94.2	77.1	89.4
Sandwell West Bromwich	Affiliate	95.4	-	-	98.8	97.1	98.7	97.5
Scunthorpe Town	Affiliate	-	98.0	-	-	-	96.9	97.4
Sheffield Centre	DEFRA	95.4	98.6	-	94.5	95.6	94.6	95.7
Sheffield Tinsley	DEFRA	97.8	-	-	69.0	-	-	83.4
Sibton	DEFRA	-	-	-	-	95.4	-	95.4
Somerton	Affiliate	-	-	-	93.1	94.5	-	93.8
Southampton Centre	DEFRA	96.9	98.3	-	77.6	97.3	98.1	93.7
Southend-on-Sea	DEFRA	98.7	94.9	-	98.9	98.8	97.9	97.9
Southwark Roadside	Affiliate	0.0	-	-	0.0	-	0.0	0.0
St Osyth	DEFRA	91.6	-	-	92.3	98.4	-	94.1
Stewartby	Affiliate	-	-	-	-	-	98.0	98.0
Stockport Shaw Heath	Affiliate	96.0	98.2	-	79.3	-	98.8	93.1
Stockton-on-Tees Yarm	Affiliate	98.0	97.6	-	99.3	-	-	98.3
Stoke-on-Trent Centre	DEFRA	97.7	97.6	-	96.5	94.6	95.2	96.3
Sunderland	DEFRA	-	-	-	-	-	94.2	94.2
Sunderland Silksworth	Affiliate	-	-	-	87.5	96.3	-	91.9
Thurrock	Affiliate	90.3	99.2	-	87.3	96.6	97.7	94.2
Tower Hamlets Roadside	Affiliate	84.7	-	-	84.7	-	-	84.7
Walsall Alumwell	DEFRA	-	-	-	97.3	-	-	97.3
Walsall Willenhall	Affiliate	-	-	-	94.7	-	-	94.7
West London	DEFRA	89.0	-	-	97.7	-	-	93.3
Weybourne	Affiliate	-	-	-	-	98.2	-	98.2
Wicken Fen	DEFRA	-	-	-	86.0	74.3	97.8	86.0
Wigan Centre	Affiliate	97.9	98.7	-	96.1	98.0	97.2	97.6
Wirral Tranmere	DEFRA	91.1	97.4	-	96.9	97.0	67.1	89.9
Wolverhampton Centre	DEFRA	90.9	97.5	-	97.3	97.7	97.7	96.2
Yarner Wood	DEFRA	-	-	-	90.9	95.2	-	93.0
Ireland								
Mace Head	Affiliate	-	-	-	-	98.1	-	98.1

Site	Owner	CO	PM_{10}	PM_{25}	NO_2	O_3	SO_2	Site Aver.
N Ireland								
Belfast Centre	DEFRA	94.9	94.6	-	91.0	95.0	87.9	92.7
Belfast Clara St	Affiliate	-	99.3	-	-	-	-	99.3
Belfast East	DEFRA	-	-	-	-	-	99.1	99.1
Derry	Affiliate	92.5	96.6	-	89.2	96.7	74.3	89.9
Lough Navar	DEFRA	-	97.7	-	-	97.9	-	97.8
Scotland								
Aberdeen	Affiliate	98.7	98.7	-	95.4	98.5	97.0	97.6
Auchencorth Moss	DEFRA	-	35.6	92.3	-	99.5	-	75.8
Auchencorth Moss PM_{10} PM_{25} (FDMS)	DEFRA	-	96.8	96.7	-	-	-	96.8
Bush Estate	DEFRA	-	-	-	90.5	98.7	-	94.6
Dumfries	DEFRA	89.5	95.3	-	98.7	-	-	94.5
Edinburgh St Leonards	DEFRA	97.4	75.5	-	97.2	97.6	96.9	92.9
Eskdalemuir	DEFRA	-	-	-	78.2	98.6	-	88.4
Fort William	DEFRA	-	-	-	84.8	78.5	-	81.6
Glasgow Centre	DEFRA	98.4	98.0	-	92.0	98.0	96.3	96.5
Glasgow City Chambers	DEFRA	98.9	-	-	97.3	-	-	98.1
Glasgow Kerbside	DEFRA	98.5	94.5	-	91.9	-	-	95.0
Grangemouth	Affiliate	97.4	98.3	-	98.2	-	98.3	98.1
Inverness	DEFRA	98.4	87.7	-	98.0	-	-	94.7
Inverness PM_{10}	DEFRA	-	92.8	-	-	-	-	92.8
Lerwick	DEFRA	-	-	-	-	86.9	-	86.9
Strath Vaich	DEFRA	-	-	-	-	87.9	-	87.9
Wales								
Aston Hill	DEFRA	-	-	-	91.8	91.9	-	91.8
Cardiff Centre	DEFRA	96.9	89.7	-	98.2	98.5	97.2	96.1
Cwmbran	Affiliate	81.2	99.0	-	82.4	99.5	47.5	81.9
Narberth	DEFRA	-	89.0	-	89.4	86.8	88.6	88.4
Port Talbot	Affiliate	-	96.1	-	97.7	97.7	95.5	96.8
Port Talbot Margam	Affiliate	-	96.7	-	94.2	94.3	94.3	94.9
Swansea Roadside	Affiliate	98.0	82.4	91.7	98.4	97.6	97.8	94.3
Wrexham	DEFRA	94.3	95.1	-	91.9	-	95.1	94.1
Wrexham PM_{10}	DEFRA	-	93.1	-	-	-	-	93.1
Number of sites		78	76	7	114	92	78	134
Number of sites < 90%		15	19	2	26	16	19	29
Network Mean (%)		91.9	92.5	93.3	91.6	94.9	90.9	92.5

PART B – Annual Review 2007

7 Introduction

The QA/QC Unit has produced detailed quarterly reports giving an overview of network performance, reasons for data losses and data capture statistics.

Recommendations for equipment and site upgrades and replacements have also been made. A list of the reports for 2007 is given in Table 7.1.

Table 7.1 QA/QC Data Ratification and Intercalibration Reports, 2007

	Type	Report Title	Reference
1	Ratification and Intercalibration	QA/QC Data Ratification and Intercalibration Report for the Automatic Urban and Rural Network, January-March 2007	AEAT/ENV/R/2488
2	Ratification	QA/QC Data Ratification Report for the Automatic Urban and Rural Network, April-June 2007	AEAT/ENV/R/2516
3	Ratification and Intercalibration	QA/QC Data Ratification and Intercalibration Report for the Automatic Urban and Rural Network July-September 2007	AEAT/ENV/R/2551
4	Ratification and Annual Review	QA/QC Data Ratification Report for the Automatic Urban and Rural Network October-December 2007 and Annual Review for 2007.	AEAT/ENV/R/2589

All reports are available on the Air Quality Information Archive (www.airquality.co.uk) and on the AURN Hub.

8 Network Review

The QA/QC Unit and the CMCU Unit in conjunction with Defra and the DAs have carried out a major review of the monitoring network. This was necessary to ensure the network is compliant with the new European Air Quality Directive. There is a requirement for a minimum level of monitoring in each agglomeration and zone, and there is a need to measure $PM_{2.5}$ at many sites. The need for additional monitoring has been met by affiliating suitable sites from other organisations, adding additional analysers at existing sites, or in a small number of cases, installing new sites.

Sites that are no longer necessary for compliance have, in a number of cases, been closed down, or individual analysers at sites have been de-affiliated.

Table 8.1 Additional sites to be added to network

Zone/Agglomeration	Additional Requirement	Action (definite in bold)
London	$PM_{2.5}$ background site	**Harrow ($PM_{2.5}$ only)**
West Midlands UA	NOx, PM_{10}, $PM_{2.5}$ roadside	**Move Birmingham Centre to Tyburn Roadside**,

West Yorks UA	NOx, PM_{10}, $PM_{2.5}$ roadside	**Affiliate Leeds Roadside (Headingley)**
Tyneside UA	NOx roadside	
Liverpool UA	NOx roadside	**Liverpool Queens Drive**
Eastern zone	NOx, PM_{10}, $PM_{2.5}$ roadside x2 SO_2 sites x2	**Stewartby (SO_2)**
South-west zone	NOx background PM_{10}, $PM_{2.5}$ roadside x2	
South-east zone	NOx, PM_{10}, $PM_{2.5}$ roadside NOx, PM_{10}, $PM_{2.5}$ roadside PM_{10}, $PM_{2.5}$ roadside NOx	Eastbourne **Oxford St Ebbes** **Horley U/B**
East-midlands zone	NOx, PM_{10}, $PM_{2.5}$ background NOx, PM_{10}, $PM_{2.5}$ roadside NOx roadside	**Chesterfield** **Chesterfield Roadside**
North-west & Merseyside zone	Nox, PM_{10}, $PM_{2.5}$ background NOx, PM_{10}, $PM_{2.5}$ roadside NOx roadside	**Carlisle Paddy's Market**
Yorks & Humberside zone	Nox, PM_{10}, $PM_{2.5}$ background NOx, PM_{10}, $PM_{2.5}$ roadside NOx	**York Bootham** **York Fishergate** **Affiliate Scunthorpe**
West-Midlands zone	Nox, PM_{10}, $PM_{2.5}$ roadside SO_2	**Install SO_2 at Leominster**

Central Scotland zone	Nox roadside NOx Urban Background	**Fife Dunfermline R/S** **Grangemouth Municipal Chambers**
North-east Scotland zone	Nox roadside	**Aberdeen Union Street**
Highland zone	None	-
Scottish Borders zone	Nox, O3 suburban	New site required
South Wales zone	Nox, PM_{10}, $PM_{2.5}$ background NOx, PM_{10}, $PM_{2.5}$ roadside	**Newport St Julians** **Chepstow A48**
North Wales zone	Nox, O_3 suburban	New site required
Northern Ireland zone	Nox, PM_{10}, $PM_{2.5}$ roadside SO_2	**Armagh R/S** **Ballymena (DoE NI action)**

AGREED REQUIREMENTS FOR NEW SITES: (for modelling and Directive compliance (ANNEX 3))

ROADSIDE: Must be on A road - preferably with "simple" layout. Traffic-orientated sampling probes shall be at least 25 m from the edge of major junctions and no more than 10 m from the kerbside. The flow around the inlet sampling probe shall be unrestricted (free in an arc of at least 270m) without any obstructions affecting the airflow in the vicinity of the sampler, normally some metres away from buildings, balconies, trees and other obstacles and at least 0,5 m from the nearest building in the case of sampling points (representing air quality at the building line).

URBAN BACKGROUND: Locations shall be located so that their pollution level is influenced by the integrated contribution from all sources upwind of the station. The pollution level should not be dominated by a single source unless such a situation is typical for a larger urban area. Those sampling points shall, as a general rule, be representative for several square kilometres.

For the purposes of deciding where new sites are to be located, the Directive is interpreted as requiring that $PM_{2.5}$ exposure reduction sites in zones should be in conurbations (pop. 100,000 - 250,000)- but there is no explicit requirement for this.

Several sites will receive a FDMS of $PM_{2.5}$ in addition to the PM_{10} analyser already installed. These are given in Table 8.2

Table 8.2 Sites to receive an additional $PM_{2.5}$ analyser

Leeds Centre	Plymouth Centre	London Teddington
Newcastle Centre	Stoke on Trent	Camden R/S
Liverpool Speke	Reading Newtown	Haringey R/S
Sheffield Centre	Coventry M Park	Bury R/S
Nottingham Centre	Hull Freetown	Portsmouth
Bristol St Pauls	Southampton Centre	Glasgow Centre*
Leicester Centre	Cardiff Centre	Glasgow Kerbside
N Kensington	Middlesbrough	Leamington Spa
Southwark Roadside	Belfast Centre	Grangemouth
Sandwell W Bromwich	Norwich Centre	Aberdeen
Salford Eccles		Wrexham (Partisol)

In addition to the above changes, the need for increased $PM_{2.5}$ monitoring can be met by the conversion of existing PM_{10} analysers to $PM_{2.5}$.

Table 8.3: Changes to Existing PM analysers

Zone/Agglomeration	Site	Owner	Add
London	London Eltham L. Westminster	Affiliate Defra	Change PM_{10} to $PM_{2.5}$ * Change PM_{10} to $PM_{2.5}$
West Midlands UA	B. Tyburn Sandwell W Bromwich	Affiliate Affiliate	Change PM_{10} to $PM_{2.5}$ * Move PM_{10} from W'hampton
Manchester UA	M. Piccadilly	Defra	Change PM_{10} to $PM_{2.5}$
Bournemouth UA	Bournemouth	Affiliate	Change PM_{10} to $PM_{2.5}$ *
Birkenhead UA	Wirral Tranmere	Defra	Change PM_{10} to $PM_{2.5}$
Southend UA	Southend on Sea	Defra	Change PM_{10} to $PM_{2.5}$
Blackpool UA	Blackpool Marton	Defra	Change PM_{10} to $PM_{2.5}$
Preston UA	Preston Centre	Defra	Change PM_{10} to $PM_{2.5}$
Glasgow UA	Glasgow Centre	Defra	Change PM_{10} to $PM_{2.5}$
Edinburgh UA	Edinburgh St Leon.	Defra	Change PM_{10} to $PM_{2.5}$ (not till end 2007)

* Where sites are affiliated, agreement from the owning authority will be sought to change to $PM_{2.5}$. Where retention of PM_{10} is required, a new $PM_{2.5}$ analyser will be installed.

There are several sites at which particular analysers are not now required for compliance with the Directive, and many have been removed from the network as of 1 October 2007. Many of these may continue to operate outside of the network. There were a total of 134 sites in operation during 2007.

9 Network Intercalibrations

Two complete network intercomparisons were carried out at 6-monthly intervals during 2007. These are an important part of the overall QA/QC programme for the AURN network. The purpose of these intercomparisons is to determine the network measurement accuracy, consistency and intercomparability across the entire network. The latest exercise covered 111 sites (except Southwark Roadside, which has been closed for some time, and those closed for relocation/refurbishment at the time). The procedures used, and a summary of the results obtained, are provided in the January-March and July-September QA/QC reports.

A summary of the number of analysers in the network found to be providing provisional data outwith the defined accuracy limits (the "outlier" sites) is given in Figure 9.1. A full definition of what constitutes

an outlier site for the different pollutants is given in the appropriate Quarterly Reports (see Table 7.1). Note also that, for the vast majority of these outlier sites, the data will have been fully corrected as part of the subsequent data ratification process.

Figure 9.1 Outliers identified during 2007 intercalibration exercises.

Analyser	Winter 2007 intercalibration			Summer 2007 intercalibration		
	No in network	No. of outliers	%	No in network	No. of outliers	%
NOx	109	31	28%	109	29	27%
CO	77	5	6%	77	2	2%
SO_2	75	8	11%	75	14	18%
Ozone	89	25	28%	90	25	28%
TEOM & BAM articles	69 TEOM PM_{10} 1 FDMS PM_{10} 1 BAM PM_{10} 4 TEOM $PM_{2.5}$ 1 FDMS $PM_{2.5}$	4 flow	5%	48 TEOM PM_{10} 22 FDMS PM_{10} 2 BAM PM_{10} 4 TEOM $PM_{2.5}$ 1 FDMS $PM_{2.5}$	1 Ko 1 flow	5%
Gravimetric particles	7 PM_{10} 2 $PM_{2.5}$	2	22%	8 PM_{10} 1 $PM_{2.5}$	0	0%

The overall fraction of outliers has remained fairly constant during 2007.

In addition, there were 21 (out of 377) site cylinders used for data scaling (ie not NO_2) were identified as outliers in the winter 2007 intercomparison, and 20 in the summer exercise.

Sites which have been commissioned, recommissioned in new locations or have had new analysers installed have been audited by the QA/QC Unit prior to the publication of the data from the site.

The intercalibration visits are also used to ensure information about network sites and analysers are correct and up to date-see Appendix A6. For example, at recent network intercalibration exercises, information has been gathered on the sample manifold systems used at all sites, the detailed set-up parameters for the TEOM particle analysers, and how site locations compare to the requirements listed in the EC Directives.

10 ESU, CMCU, LSO and QA/QC Meetings

During 2007, the QA/QC Unit continued to liase closely with the ESUs to ensure optimal performance of the network through service and maintenance arrangements. These meetings were held to discuss specific data quality issues, and to highlight changes in ESU procedures that may result from the adoption of CEN standards-see Section 14. The QA/QC Unit have provided the ESUs with spreadsheets to calculate various analyser performance parameters (eg converter efficiency, linearity) in line with the CEN requirements; ESUs have been requested to integrate the principles into their routine site tests.

All parties were in agreement that work undertaken by the ESUs is a vitally important part of the overall data quality management process for the network, and it is planned to repeat the meetings at regular intervals.

The QA/QC Unit has attended the AURN LSO meetings, and presented network updates as appropriate. These presentations are available on the AURN Hub.

11 International Intercomparisons

The QA/QC Unit attended a measurement intercomparison at JRC in Ispra, Italy on 4-7 June 2007. Representatives from 7 other European countries attended the intercomparison: Bulgaria, Czech Republic (2 delegations), Estonia, Ireland, Poland, Slovenia and Spain. Delegates from the GAW EMEP station, based in Ispra, were also present.

The intercomparison assessed a range of concentrations of NO, NO_2, CO, SO_2 and O_3, which were measured by the participants as well as the JRC reference laboratory.

The results obtained by AEA were in good agreement with JRC's assigned concentrations. The results of the intercomparison demonstrated excellent agreement of UK measurements with the host and other European Laboratories. The differences in the AEA and JRC results were well within the uncertainties of the AEA measurement methodologies.

At Limit Value concentrations, the results obtained by AEA were well within the ±15% uncertainty requirement EC Data Quality Objectives, providing confidence in air quality measurements made in the UK. The results close to the relevant Limit values are summarised in Table 11.1

Table 11.1 Summary of intercomparison results close to Limit Values

Pollutant	Assigned Conc (ppb)	AEA value (ppb)	Std. Deviation	% from Assigned Conc
O_3	59.9	61.5	0.1	**+2.7%**
NO_2	101.1	101.8	0.3	**+0.7%**
SO_2	132.5	135.0	0.1	**+1.9%**
CO	8.52	8.61	0.00	**+1.2%**

A full analysis of the results will be published in a separate report.

12 TEOM Upgrades to FDMS

The initial upgrade programme for TEOMs has been completed, and there are now 28 operational FDMS analysers at the end of 2007. Three of these units (as at April 2008) are configured for $PM_{2.5}$. The average data capture for these analysers was 94%. FDMS units have been installed at the sites listed in Table 12.1. Port Talbot was subsequently relocated to Port Talbot Margam and Wolverhampton was closed.

Table 12.1 Installation Dates for AURN FDMS Units

Sitename	Pollutant	Start date
Auchencorth Moss PM10 PM25	PM_{10}	17/12/2006
Auchencorth Moss PM10 PM25	PM_{25}	01/12/2006
Birmingham Centre	PM_{10}	08/03/2007
Blackpool Marton	PM_{10}	05/06/2007
Bristol St Paul's	PM_{10}	13/02/2007
Cardiff Centre	PM_{10}	19/02/2007
Coventry Memorial Park	PM_{10}	07/03/2007
Derry	PM_{10}	21/02/2008
Derry	PM_{25}	21/02/2008
Edinburgh St Leonards	PM_{10}	10/07/2007
Hull Freetown	PM_{10}	20/02/2007
Leicester Centre	PM_{10}	28/03/2007

Sitename	Pollutant	Start date
Liverpool Speke	PM_{10}	14/03/2007
Manchester Piccadilly	PM_{10}	15/03/2007
Newcastle Centre	PM_{10}	21/02/2007
Nottingham Centre	PM_{10}	27/03/2007
Plymouth Centre	PM_{10}	01/03/2007
Preston	PM_{10}	05/06/2007
Port Talbot	PM_{10}	09/02/2007
Port Talbot Margam	PM_{10}	24/07/2007
Reading New Town	PM_{10}	06/03/2007
Southend-on-Sea	PM_{10}	04/04/2007
Sheffield Centre	PM_{10}	19/06/2007
Sheffield Centre	PM_{10}	19/06/2007
Southampton Centre	PM_{10}	02/04/2007
Stoke-on-Trent Centre	PM_{10}	12/06/2007
Swansea Roadside	PM_{10}	20/09/2006
Swansea Roadside	PM_{25}	20/09/2006
Wirral Tranmere	PM_{10}	16/07/2007
Wolverhampton Centre	PM_{10}	13/06/2007

The upgrade programme was generally very good, with only one site (Edinburgh St Leonards) having prolonged analyser problems following installation resulting in significant data loss.

13 Network Data Capture

The overall network data capture for 2007 was 92.4%, which is above the 90% target level. However, inevitably, not all sites achieved >90% and a table of data capture for the 28 sites with less than 90% capture is given in Table 13.1.

Table 13.1 Sites with Annual Average Data Capture Below 90%for 2007

Site	Owner	Site Average
England		
Bolton	Affiliate	57.3
Bradford Centre	DEFRA	89.7
Brentford Roadside	Affiliate	83.9
Bury Roadside	Affiliate	75.8
Glazebury	DEFRA	85.0
Great Dun Fell	DEFRA	86.5
Haringey Roadside	Affiliate	85.3
Ladybower	DEFRA	84.5
London Bloomsbury	DEFRA	84.7
London Eltham	Affiliate	88.8
London Harlington	Affiliate	89.2
London Westminster	DEFRA	88.1
Northampton PM_{10}	Affiliate	84.2
Plymouth Centre	DEFRA	83.1
Redcar	Affiliate	78.7
Salford Eccles	Affiliate	89.4
Sheffield Tinsley	DEFRA	83.4
Southwark Roadside	Affiliate	0.0
Tower Hamlets Roadside	Affiliate	84.7
Wicken Fen	DEFRA	86.0

Site	Owner	Site Average
Wirral Tranmere	DEFRA	89.9
Ireland		
N Ireland		
Derry	Affiliate	89.9
Scotland		
Auchencorth Moss	DEFRA	75.8
Eskdalemuir	DEFRA	88.4
Fort William	DEFRA	81.6
Lerwick	DEFRA	86.9
Strath Vaich	DEFRA	87.9
Wales		
Cwmbran	Affiliate	81.9
Narberth	DEFRA	88.4

A summary of data capture by pollutant for the year 2007 is given in Table 13.2

Table 13.2 Summary of data capture by pollutant, 2007

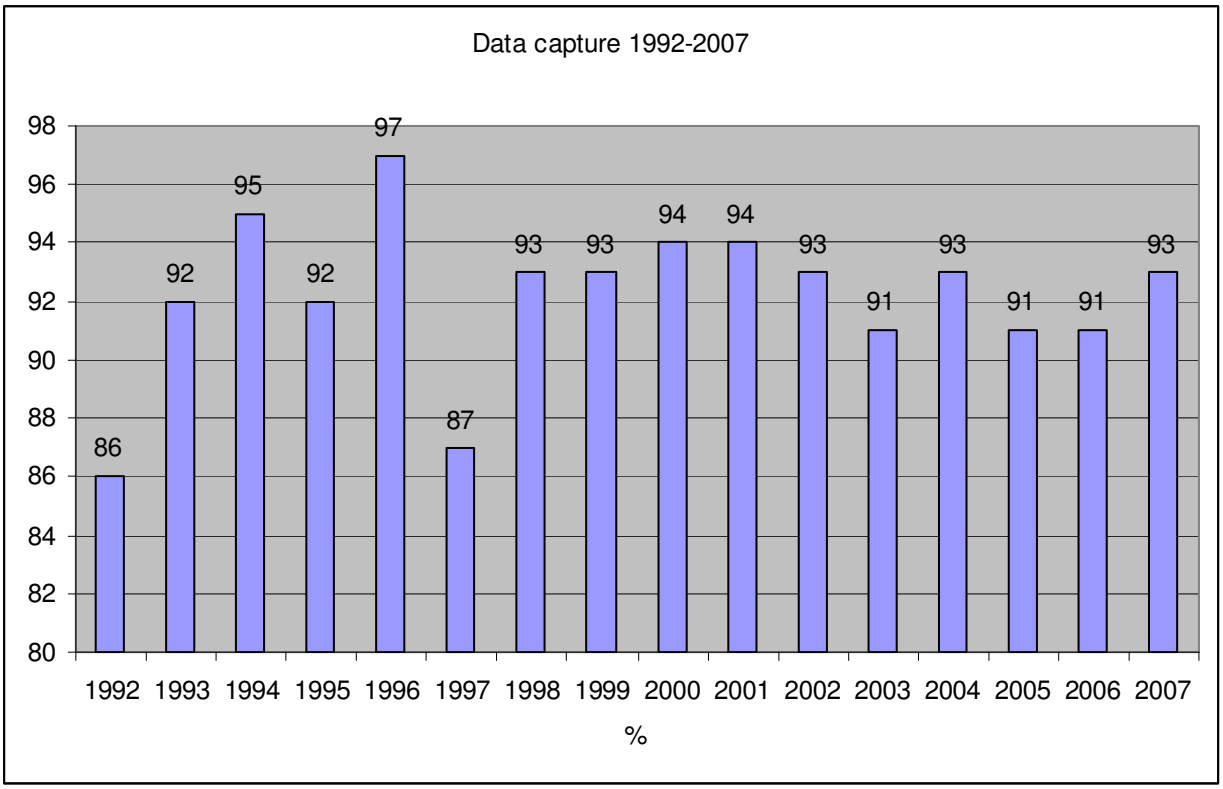
	CO	NO_2	O_3	PM_{10}	$PM_{2.5}$	SO_2
Number of sites	78	114	92	76	7	78
Number of sites < 90%	15	26	16	19	2	19
Network Mean (%)	91.9%	91.6%	94.9%	92.5%	93.3%	90.9%

These figures include data capture from sites and analysers closed in the network review up to the date of closure (mainly 1 October).

For these sites, pollution statistics calculated for analysers with data capture above 75% or modelled data have to be used. However, neither of these approaches is entirely satisfactory. Hence, the QA/QC unit continues to make the recommendation that greater attention needs to be paid to minimising data loss from all sites.

The network annual average data capture of 92.4% is close to the previous year. The network is clearly operating in a steady-state level of operation, despite some ageing analysers and sites closed, sometimes for extended periods, for relocation or refurbishment. Figure 13.1 shows the annual network data capture since the start of the AURN in 1992.

Figure 12.1 Annual Average Data Capture 1992-2006



13.1 Investigation of Spurious Data

The data ratification process involves checking many millions of 15-minute average concentrations every year. Although the majority of analysers operate satisfactorily, there are inevitably some problems that require more detailed investigation by the QA/QC unit during the ratification process. The QA/QC Unit works closely with the LSOs, the ESUs and the CMCU in order to resolve these issues and process the data accordingly. All parties involved are encouraged to provide sufficient information to streamline this process as much as possible. Unfortunately, there are still instances where instruments faults remain undetected and large quantities of data are lost. Summaries of the more common reasons for data loss are discussed below.

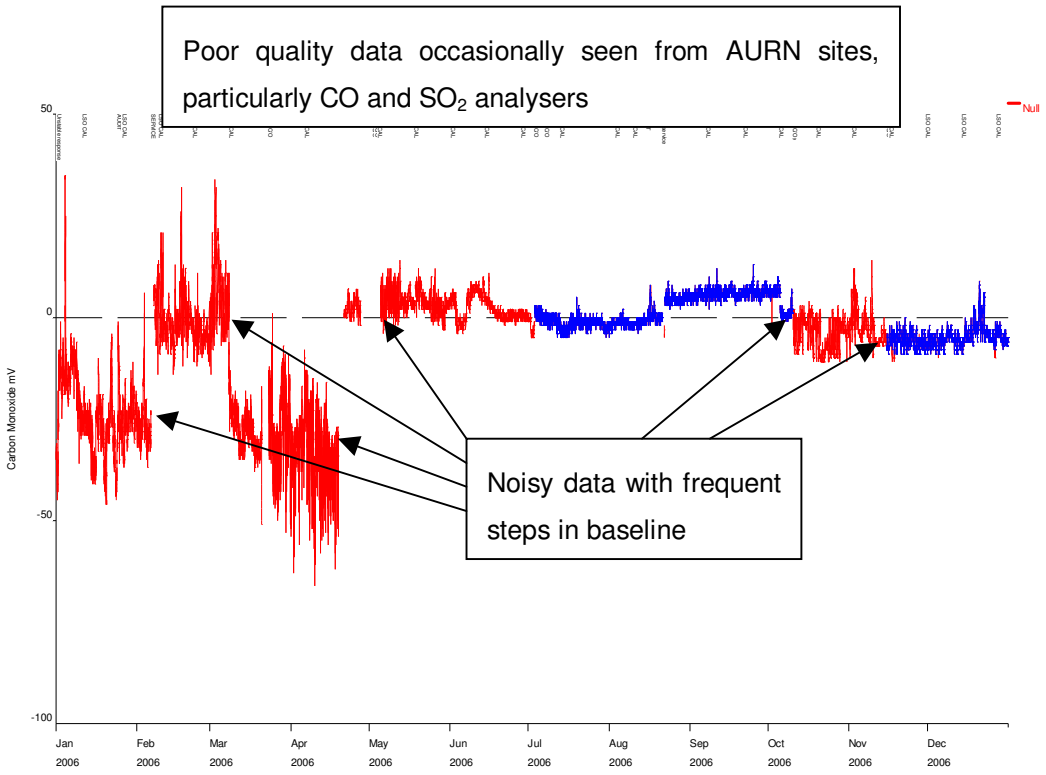
NOx converters
At each QA/QC intercomparison, a small number of NOx converters are found to be less than the required 95% efficient. Where this is the case, the information from ESU service and repairs are checked to try to find the last date at which an acceptable converter test result has been obtained, or to identify an event which may indicate when the fault actually occurred (eg substitution of a replacement analyser). In some cases, no relevant information is available, and in the worst-case situation, data will be rejected back to the previous service visit (often 6 months previous). To minimise the risk of this, the QA/QC Unit has repeatedly requested that ESU's carry out converter tests at all service visits, and at relevant repair call-outs.

In a limited number of cases, the analyser software has been altered by the ESU to correct the NO_2 output where the measured converter efficiency is less than 100%. This does not correctly scale both NOx and NO channels, and could potentially lead to erroneous data which cannot be corrected. ESU's have been asked to ensure settings (where adjustable) are set to 100%. A considerable amount of data from Bolton was lost in 2007 as a result of this.

Noisy analyser outputs
There are several analysers on the network that produce very noisy signal outputs. Many of these

have been highlighted in previous reports, and ESUs have been made aware of them. The most common offenders are CO and SO_2 analysers. An example is shown in Figure 13.2

Figure 13.2 Example of Poor Quality Data



Rapid drifts or erratic changes in zero or calibration factor
Some analysers have a tendancy to drift over time. In most cases, these can be accommodated using manual calibration values, assisted by daily autocalibration data. However, some drift so rapidly that it is difficult to establish where the signal baseline actually lies. Figure 13.2 also shows erratic changes in baseline, both step-changes and baseline drift.

Leaks
Both gaseous and particle analysers are susceptible to leaks. The analysers are tested for this at 6-month QA/QC visits, and at ESU visits. Where leaks are identified, information is sought as to when this might have occurred, and an assessment is made of the likely effect on data quality. Small leaks are unlikely to have a major effect on measured data; where the leak is more substantial, the effect is often visible in the measured data, particularly when compared with data from other nearby sites.

Leaks in the bypass flow on a TEOM analyser may affect the particle size fraction of the analyser inlet.

Air conditioning faults
Most of the sites have air conditioning units to control internal temperature. If these units fail, the internal temperature may rise significantly, or may vary by an unacceptable degree. Varying temperatures often cause analysers output signal to change, and the reliability of analysers is significantly reduced when exposed to elevated temperatures. CO analysers in particular suffer from signal drift when the temperature is not well controlled. The particularly hot spell in June and July 2006 caused many sites to malfunction through overheating, or were switched off to prevent damage. In other cases, the failure of the air conditioning unit causes frequent or prolonged disruption to the site power supply.

Automatic calibration run-on
As described in Section 2.4, there have been persistent problems across the network with the daily

span checks for NO_2 (and less so for SO_2) causing run-on into the ambient data. This only occurs where the span check is provided by a permeation tube, and commonly results in the loss of up to one hour's data each day. This problem has been raised with the ESUs, and considerable progress has been made to reduce the problem. In many cases, the run-on is reduced to acceptable levels by reducing the concentration of the span check gas, and several ESUs are now installing permeation tubes with lower permeation rates.

13.2 Site calibration cylinders

The site cylinder concentrations are reassessed at each QA/QC audit. Any outliers (>10% from certified value) are investigated and where necessary, replaced. If the recalculated concentration casts doubt on the validity of the calibrations, the cylinders may be returned to the QA/QC Unit for recertification; alternatively, the site audit may be repeated. Not all outliers are due to cylinder drift; noisy or faulty analysers can give results which cast doubt on cylinder concentrations. In extreme cases, reanalysis of the cylinder is the only reliable way to confirm the nature of the problem.

Following the summer 2007 intercalibration exercise, 3 cylinders (2 NO and 1 SO_2) were returned to AEA for recalibration. Unfortunately, several more cylinders were already empty before recertification could take place.

Although many NO_2 cylinders are identified as outliers during the intercalibration exercise, these are not recalibrated as the concentrations are not used directly for data scaling purposes.

14 CEN

The European Committee for Normalisation (CEN) have prepared a series of documents prescribing how analysers must be operated, to produce datasets that conform to the Data Quality Objectives of the EC Directives. The CEN documents for operation of air pollution analysers; BS EN14211 (NOx), BS EN14212 (SO_2), BS EN14626 (CO) and BS EN14625 (O_3) set out a series of performance criteria for analysers which must be achieved, both in the field and under laboratory conditions.

By way of example, the performance of an analyser in the field must pass a number of tests, including:

- Linearity – the analyser must have a maximum error at any point of less than 6% of the predicted value. AEA now reports maximum residuals from linearity tests, to evaluate the performance of current analysers against these tougher requirements.

- NOx converter efficiency must be better than 95%. Data must be rescaled for efficiencies between 95 and 99.9%, but rejected if below 95%. Again, this is tighter than currently, where we accept "borderline" failures.In addition, specific procedures for undertaking converter efficiencies tests have been prescribed; AEA already use the CEN method for undertaking converter tests.

- The sampling system that delivers air to the analyser must remove no more than 2% of the pollutant to be analysed. AEA continue to evaluate systems to calibrate sampling systems, but this is not currently undertaken on a routine basis in the UK.
  A report on the evaluation of methodologies to test losses of gases to sampling manifolds has been completed by QA/QC Unit and this is available on the AURN Hub and Air Quality Archive.

- The concentration of the site cylinders will need to be determined every six months, and the revised values used to scale ambient data. This is a change to our current procedures, where no action is taken until a cylinder deviates from its stated value by more than 10%. AEA have introduced a new procedure for handling drifting cylinder concentrations. In future, the uncertainty of these calculations will need to be substantially lower than the current 10% limit

(in the order of 4-5% maximum).

- The determination of an SO_2 analyser response to meta xylene will not be required for ongoing field tests. For the AURN, AEA will continue to assess the performance of the hydrocarbon kickers, but action will not be recommended unless the result is very high (greater than 50ppb response to a 1ppm m xylene cylinder), indicating that the kicker has failed completely.

The CEN operating methodologies are now finalised and published and are, at present, being incorporated into the requirements of the Framework and Daughter Directives. Member States will have 2 years to ensure their monitoring networks are compliant. AEA have taken steps to ensure the procedures used in the UK comply with the requirements ahead of any imposed deadlines. To this end, the procedures used for the network intercomparison were fully compliant with the CEN protocols. ESU's have also been instructed to ensure pre and post service tests are compliant with the procedure; AEA have supplied them with spreadsheets to ensure the correct data are recorded.

15 Site Closures, Refurbishments and Infrastructural Repairs

During 2007, a significant amount of data were lost through site closures for relocation or refurbishment. The sites worst affected are given in Table 15.1

Table 15.1 Sites Subject to Closure or Relocation, 2007

Site	Monitoring stopped	Monitoring restarted	Reason	Days lost
Southwark Roadside	21 Feb 06	-	Site expected to be re-commissioned with NOx only	-

Whilst some degree of data loss was inevitable in these cases, all possible efforts should be made in future to minimise the data loss due to site closures.

16 Changes to the Network

There have been several changes to network sites during 2007. Most of these were as a result of the network review (see Section 8). Other changes are listed in Table 16.1

Table 16.1 Significant Changes to the Network, 2007

Site	Monitoring started	Monitoring stopped	Reason
Wrexham PM_{10} (Partisol)	21/3/2007	3/12/2007	Considered unnecessary as part of network review
Inverness PM_{10} (Partisol)	1/5/2007	2/12/2007	Considered unnecessary as part of network review
Port Talbot		23/07/2007	Site closed due to redevelopment
Port Talbot Margam	24/7/2007	-	Relocated from Port Talbot site

17 ISO17025 Accreditation

The QA/QC Unit has maintained its ISO17025 accreditation for 6-monthly site calibrations and calibration of ambient gas mixtures. A copy of the schedule can be found at http://www.ukas.org.uk/calibration/lab_detail.asp?lab_id=902&vMenuOption=3

A total of four surveillance and assessment visits were carried out by UKAS- two at monitoring sites, one at Harwell and one at Glengarnock.

18 Usage of AURN Data

The primary aims and objectives of the AURN are listed as follows:

- Meeting statutory requirements (e.g. EC Directives)
- Informing the public about air quality
- Providing information for local air quality review and assessment
- Identifying long term trends
- Assessment of policy effectiveness

The data collected from the AURN sites in 2007 have now been fully ratified and quality assured. – this ensures that the data are of high quality and reliable and hence can be used to fulfil these objectives.

The data will be assessed in relation to the EC Air Quality Directives to determine any areas of exceedence of limit values etc, which will be reported to the European Commission in September 2008, as required by the Directives. In addition, the full dataset for 2007 will be uploaded to the European Air Quality database http://airbase.eionet.eu.int/

The public has been kept informed of air quality concentrations through direct access to the AURN data via the UK Air Quality Information website (www.airquality.co.uk). Provisional data are updated onto this website every hour and the ratified data are uploaded every 3-months following the quarterly ratification cycle described in these Data Ratification reports. A full annual summary of the data for 2007 will also be published later in 2008 as part of the "Air Pollution in the UK" series of reports.

The data are widely used by Local Authorities as part of their review and assessment process. Data from individual stations are used in the specific local area and the full AURN dataset is used within the preparation of the Pollution Climate maps of the UK which provide background concentration maps for the whole of the UK.

Long-term trend analysis is included in the Air Pollution in the UK series of reports and the AURN data are also used to calculate the UK Air Quality Indicator for Sustainable Development. The indicators based on the final dataset for 2007 are available at http://www.defra.gov.uk/news/2007/070501a.htm .

Previous years AURN data were extensively used in the development and current updating of the UK Air Quality Strategy. In addition, AURN data, along with other UK data sets, have been extensively used by the UK Air Quality Expert Group (AQEG) in the development of a series of reports –
Trends in primary nitrogen dioxide in the UK - December 2007
Air quality and climate change: a UK perspective - April 2007
Particulate Matter in the UK – 2005
Nitrogen Dioxide in the UK – 2004

AQEG is current preparing a further report on Ozone in the UK and this will also make extensive use of AURN data.

19 Safety

Safety is clearly an important aspect of network operation. AEA undertakes regular extensive risk assessments of all its activities on-site, to ensure that its staff are not exposed to unsafe practices while working. Any items deemed to pose an unacceptable risk are brought to the attention of the site owner or the CMCU.

There are no issues identified that presented significant risk during the winter 2008 intercalibration exercise. The issue of safe roof access, to audit PM_{10} analyser flow rates has largely been worked around. This has been achieved either by installing ladder securing points on the outside of the huts, or by auditing flow rates inside the monitoring station. However, performing flow measurements inside means that we are unable to perform satisfactory leak tests on the entire sampling systems of these analysers.

It is important that safe access to the TEOM head is possible where FDMS TEOMs are employed, as it is not possible to fully leak check the system from inside the monitoring enclosure. As at April 2008, there are a number of sites where this is not the case. The access to roof-mounted equipment should be considered when acquiring or upgrading monitoring stations.

Recommendation

Safe roof access to the TEOM head should be provided at sites where FDMS units are deployed

The Gas Supply Contractor undertakes regular inspection and maintenance of the gas regulators on site to ensure compliance with the relevant pressure systems regulations.

Appendices

Appendix A1: Recommendations for Upgrade or Replacement of Equipment

Appendix A2: Data gaps listing: October-December 2007

Appendix A3: Inventory of Defra-Owned Equipment

Appendix A4: Summary of Recommendations

Appendix A5: Partisol Data Ratification Report

Appendix A6: Site Information for new Sites

Appendix A1
Recommendations for Upgrade or Replacement of Equipment

As requested by the Department, 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 since July 2005. Recommendations have been prioritised as follows:

Priority	Definition	Time-scale
High*	Immediate action necessary to avoid compromising data capture/quality or safety. Critical sites should be treated as high priority.	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.

	Recommendations January 2008	Priority	Action
26	It is recommended that the Bush NOx analyser be replaced.	High	CMCU
25	It is recommended that LSO's 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
24	It is strongly recommended that ESU's clean all NOx analyser switching valves during servicing, and ensure the valve is leak checked afterwards.	High	ESU
	Recommendations August 2007		
	None		
	Recommendations April 2007		
22	Safe roof access needs to be provided for sites where FDMS TEOMs are to be deployed	High	ESU/CMCU
	Recommendations January 2007		
22	ESUs to ensure all NOx converter software settings to be 100%. The Bolton NOx analyser was found to be set to 90% in September 2007	High	ESUs to check at service
	Recommendations July 2006		
19	Weybourne O_3 analyser should be upgraded to allow monthly LSO calibrations and daily autocalibrations	Medium	ESU to provide CMCU with quotation for necessary work
	Recommendations April 2006		
	None		
	Recommendations January 2006		
17	The performance of CO analysers needs close attention by all parties, and poorly performing analysers replaced or upgraded	High	LSOs and CMCU to check performance carefully; ESU's to action repairs promptly
	Recommendations July 2005		
13	Continuing problems with some autocal run-ons causing loss of up to 2 hours per day-see Section 3.2 **CMCU to ensure ESUs are asked to attend to offending sites (Action May 2008)**	High	Many sites now cured, but some need attention at next ESU visit

Appendix A2
Gaps Listing October-December 2007

01/10/2007 to 31/12/2007 Gaps in 15-minute able >= 6 hours and data capture

<= 90%

Pollutant	Data Capture (%)	Start date	End date	Reason	Comments	Number of days	Number of hours
England							
Birmingham Centre							
NO2	81.90%	09-Sep-07	17-Oct-07	Instrument fault	Photo multiplier fault. Analyser replaced	38.5	924
Ladybower							
NO2	34.20%	01-Nov-07	17-Jan-08	Unstable response	NO2 data of unacceptable quality	77.1	1851
SO2	65.40%	20-Sep-07	01-Nov-07	Unstable response	Unstable data - UV lamp fault	42.1	1010
Liverpool Speke							
CO	0.00%	21-Sep-07	03-Jan-08	High noise	Noisy until lines redrawn on correlation wheel	105	2510
London Teddington							
NO2	87.10%	09-Oct-07	14-Oct-07	No mV data collected	No mV data collected	4.8	116
		30-Nov-07	06-Dec-07	Instrument fault	Ozone generator fault	6.5	157
		16-Dec-07	16-Dec-07	No mV data collected	No mV data collected.	0.3	8
Manchester Piccadilly							
O3	65.90%	24-Sep-07	29-Oct-07	Low flow rate	Low response due to flow fault	35.2	845
Newcastle Centre							
NO2	76.20%	14-Oct-07	01-Nov-07	Logger fault	NOx channel unstable then not recorded	18.7	448
Salford Eccles							
NO2	75.00%	16-Oct-07	06-Nov-07	Instrument fault	Eng C/O on 24.10 flow fault and leak in ozone generator.	21.1	507
SO2	58.30%	31-Aug-07	05-Nov-07	Manifold fault	ENG C/O Could not get SO2 working. Needs hot spare	65.8	1578
Sheffield Tinsley							
NO2	0.00%	16-Sep-07	01-Jan-08	NO2 converter fault	Converter failure	107	2568
Southwark Roadside							
NO2	0.00%	01-Dec-06	07-Mar-08		Site closed	463	11112
St Osyth							
NO2	81.80%	19-Nov-07	06-Dec-07	Instrument fault	Various analyser faults following power cut	16.6	399
Sunderland Silksworth							
NO2	88.00%	29-Sep-07	01-Oct-07	No mV data collected	Lso c/o logger issue	1.8	43

		03-Oct-07	08-Oct-07	Power cut	RCD failure	4.7	113
		05-Nov-07	06-Nov-07	ESU service		1	25
		27-Dec-07	31-Dec-07	Instrument fault	Possible software or converter issue	3.9	94
Wicken Fen							
O3	5.10%	05-Oct-07	02-Feb-08	Pump fault	Sample pump fault then leaking valve	120	2881
Yarner Wood							
NO2	87.30%	26-Oct-07	26-Oct-07	Power cut		0.4	9
		17-Nov-07	19-Nov-07	Power cut	Suspected powercut prior to ENG C/O re: NOx	2.2	52
		11-Dec-07	11-Dec-07	Instrument fault	ENG C/O fixed IZS	0.3	6
Scotland							
Bush Estate							
NO2	86.20%	26-Oct-07	02-Nov-07	Instrument fault	Incorrectly setup by eng + no cals	7.1	170
Fort William							
NO2	82.60%	02-Dec-07	12-Dec-07	Manifold fault	Manifold was not working correctly throughout this period	10.5	253
O3	87.50%	02-Dec-07	12-Dec-07	Manifold fault	Manifold failed. Internal Sampling	10.6	254
		21-Dec-07	22-Dec-07	No mV data collected	No mV data after LSO cal. Possible logger fault	0.5	11
Lerwick							
O3	66.10%	06-Nov-07	22-Nov-07	Instrument fault	Water ingress during gales.	16.2	389
		27-Nov-07	28-Nov-07	Operator error	Likely left out of service at LSO cal	0.9	21
		02-Dec-07	14-Dec-07	Instrument fault	very patchy data could be data flag until replaced	11.8	284
		17-Dec-07	18-Dec-07	Operator error	Data resumed after a/cal following a site visit	0.5	11
Wales							
Aston Hill							
O3	78.10%	12-Dec-07	01-Jan-08	Unstable response	Spurious data deleted;	20	479
Narberth							
O3	86.50%	01-Nov-07	13-Nov-07	Instrument fault	Multiple faults & UV lamp	12.1	291

Appendix A3
Inventory of Defra owned Equipment

An up-to-date inventory of Department-owned equipment used by the QA/QC Unit is provided below:

QA/QC Unit's inventory of Department-owned equipment, August 2007

Computer software	The HIS (Heuristic Information System) software suite used for all data management. A few specific capabilities of HIS were developed in order to meet specific Department deliverables or requirements (examples include software for annual report analysis/compilation, for formatting/transmitting network data to archive or DDU and for reporting Directive compliance data to the EC).
Field support equipment	Field support equipment: 1 intercalibration equipment set (includes mass flow controllers and read-out unit) A second intercalibration (commissioned January 2001) UV photometers: API model M401 s/n 123- purchased April 1999 API model 401 s/n 151 - purchased October 2000 API model 401 s/n 176 – purchased December 2002 API model 401 s/n 290 – purchased May 2004 API model 401 s/n 291 – purchased May 2004 API model 401 s/n 292 purchased May 2004 API model 401 s/n 293 purchased May 2004 Mass flow controllers - purchased April 2002 (incorporated into existing audit dilution apparatus) 3 Drycal flow meters - purchased September 2002 1 Mass flow controller read-out unit to be incorporated in the audit dilution apparatus – purchased September 2002. A third intercalibration kit (commissioned May 2004) Drycal flow meter – purchased March 2004 Sabio 2010 dilution calibrator – purchased February 2005 Sabio 2020 zero air generator – purchased February 2005 Sabio 2030 ozone photometer – purchased February 2005 Sabio 2010 dilution calibrator – purchased June 2006 Sabio 2020 zero air generator – purchased June 2006 Sabio 2030 ozone photometer – purchased June 2006 Sabio 2020 zero air generator – purchased March 2008 Sabio 2030 ozone photometer – purchased March 2008
Zero air pumps	6 spare zero air pumps for routine maintenance/repair of zero air generators in the AURN.
Analysers	AC31 dual chamber NO_x analyser TEI 43C SO_2 analyser TEI 48C CO analyser M265 chemiluminescent ozone analyser (All of the above purchased on behalf of Defra by Casella Stanger in March 2003 and transferred to QA/QC Unit)

Appendix A4

Summary of recommendations

This appendix provides a summary of all the recommendations given in this report.

	Need	Recommendation	Section	FAO
1	Autocalibration run-on	ESU to investigate and minimise effect where possible, especially at sites with large autocalibration run-ons or where data loss is in excess of 1 hour. In the meantime, we recommend that the autocalibration devices be adjusted at the problem sites to reduce the concentration of the span gas. It is strongly advised that NO_2 autocalibration span concentrations of less than 200ppb (urban sites) and 100ppb (rural sites) are used throughout the network.	3.2	ESUs
2	Bush NOx	It is recommended that the site NOx analyser be replaced in light of the poor reliability over several years	4.3.2	CMCU
3	Poor performance of analysers-see Section 3.6	QA/QC Unit would like to seek clarification from the Equipment Support Unit/manufacturer as to the current situation regarding the reason for the problems and what plans are in place to resolve them. We recommend that immediate attention is given to this issue as the majority of these instruments are located at critical sites.	4.6	ESU
4	Safe working	Safe roof access to the TEOM head should be provided at sites where FDMS units are deployed	19	CMCU

Appendix A5

Partisol Data Ratification October-December 2007

Partisol data were ratified for the following sites and measurement periods.

Site	Start date	End date	Ratified Data Capture, %
Auchencorth Moss PM_{10}	1st October	31st December	88
Auchencorth Moss $PM_{2.5}$	1st October	31st December	84
Bournemouth PM_{10}	1st October	31st December	100
Brighton Roadside PM_{10}	1st October	31st December	91
Dumfries PM_{10}	1st October	31st December	100
Inverness PM_{10}	1st October	31st December	98
London Westminster	1st October	31st December	88
Wrexham	1st October	31st December	98

Measured data and ambient concentrations are supplied by Bureau Veritas. Data are now ratified using the Foxpro-based HIS system. The ratification process includes checking of BV's calculated ambient PM_{10} concentration. It is noted that BV now carry out more detailed checks on the data, including checking for matching of filter numbers, dates and weights, also comparison of data with that from other nearby sites.

(Note: a possible weighing anomaly is currently under investigation. This appears to have affected blank weighings, leading to over-estimation of PM concentration.)

One site (Northampton PM_{10}) formerly included has now been closed.

Data Rejection
Data codes are recorded during ambient measurement, and filter faults are recorded during filter weighings. Some codes indicate a fatal fault and are used to automatically reject data during ratification.

Measurement codes are shown below.

The measurement codes reported by BV are as follows:

New Code	Meaning	Reject
0	OK	No
8	Power Failure	Yes
4	System re-set	Only if < 18h data.
10	Flow 1out of range	Yes
20	Flow 2 out of range	Yes
40	Flow 3 out of range	Yes
2000	Difference between ambient T and filter T > $\pm 5^{o}C$	No
10000	Elapsed sample period out of range/out of filters	Reject if < 18h data.
40000	Coefficient of variation of average flow too high (i.e. too much variation in flow)	If not caused by "audit" status e.g. inlet cleaning. Or if < 18h data.
100000	Elapsed Sample Period out of range (< 23 hours or >25 hours).	Reject if < 18h data.
102000	Difference between ambient T and filter T > $\pm 5^{o}C$, causing Elapsed Sample Period out of range (< 23 hours or >25 hours).	Reject only if < 18h valid data or vol < 18 m3.
100008	Elapsed Sample Period out of range (< 23 hours	Yes (power failure)

	or >25 hours), *and* Power Failure.	

The following faults should also be recorded during filter weighings and should be indicated by BV in their spreadsheet under "Lab Comments". All are fatal except "filter inverted".

Filter faults

Filter exposed inverted
Filter cut inside edge
Filter damaged some missing
Filter appears unexposed
Filter not returned
Filter inverted and in reverse order in canister

Auchencorth Moss

PM_{10}: Data capture was 88% for this quarter. Data losses as follows:
13th Oct: rejected by BV as $PM_{2.5}$ >> PM_{10}
8th – 14th Nov. Power off for site work.
22nd, 27th Nov: power interruptions
28th Nov – clock corrected: < 18h data capture.
7th Dec – rejected by BV as very high.

$PM_{2.5}$: Data capture was 84% for this quarter.
13th Oct: rejected by BV as $PM_{2.5}$ >> PM_{10}.
8th – 14th Nov. Power off for site work.
28th Nov – clock corrected: < 18h data capture.
11th-12th Dec: errors in initial weighing
13th – 14th Dec: < 18h sampling.
26th –27th Dec: filter exchange failure.

Bournemouth
Data capture in this quarter was 100%.

Brighton Roadside
Data capture in this quarter was 91%. Data losses:
2nd – 5th Nov delayed filter changeovers. (This appears to be a common problem with this site: there were 3 occasions in the last quarter when it happened).
20th Nov – missing filter
31st Dec filter not returned.

Dumfries
PM_{10}: Data capture was 100%.
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Inverness
PM_{10}
Data capture = 98% Data losses:
18th Dec: filter exchange failure
24th Dec: unidentified.

London Westminster
Data capture = 88%. Data losses:
1st – 2nd Oct power interruption
3rd – 5th Nov, 11th -13th Nov, 12th, 17th & 24th Dec filter exchange failures.
Also noted: 16th & 27th Nov dark particulate matter on filter.

Wrexham
Data capture was 98%. Data losses:
13th – 14th Nov - filter cleaning and power interruption.

Appendix A6

Site Details for New Sites

Site Name	Pollutants		Grid	East	North	Latitude	Longtitude	Altitude m	Sample Ht m
Horley	NO_2	SE England	TQ 28203 42431	528203	142431	51 09 57N	00 10 04W	57	3
Stewartby	SO_2	East Anglia	TL 02165 42570	502165	242570	52 04 19N	00 30 40W	38	3
York Bootham	PM_{10}	NE England	SE 59974 52278	459974	452278	53 57 47N	1 5 14W	11	3
York Fishergate	NO_2 PM_{10}	NE England	SE 60744 51133	460744	451133	53 57 07N	1 4 33W	11	3
Oxford St Ebbes	NO_2 PM_{10}	Midlands	SP 51200 05400	451200	205400			--	--
Newport	NO_2 PM_{10}	Wales	ST 32471 89615	332471	189615	51 36 04N	02 58 37W	24	3
Chepstow A48	NO_2 PM_{10}	Wales	ST 53126 93461	353126	193461	51 38 17N	02 40 43W	67	--
Aberdeen Union Street Roadside	NO2	Scotland	NJ 93660 05947	393660	805947	57 08 40N	02 06 23W	26	2
Stanford-le-Hope Roadside	NO_2 PM_{10} SO_2	SE England	TQ 69400 82710	569400	182710	51 31 5N	00 26 22E	18	3
Carlisle Roadside	NO_2 PM_{10}	NW England	NY 39442 55956	339442	555956	54 53 41N	02 56 45W	11	3
Leeds Headingley Kerbside	NO_2 PM_{10}	NE England	SE 27991 36071	427991	436071	53 49 12N	01 34 35W	85	3
Newcastle Cradlewell Roadside	NO_2	NE England	NZ 25989 65850	425989	565850	54 59 11N	01 35 55W	42	3
Chesterfield Roadside	NO_2 PM_{10}	Midlands	SK 36349 70657	436349	370657			--	--
Chesterfield	NO_2 PM_{10}	Midlands	SK 37909 70545	437909	370545			--	--