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QA/QC Data Ratification and Intercalibration Report for the Automatic Urban and Rural Network, July-September 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

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 92.0% for all pollutants (O_3, NO_2, SO_2, CO, PM_{10} and $PM_{2.5}$) during the 3-month reporting period July-September 2007. Data capture rates for all pollutants were above 90%, except $PM_{2.5}$ at 88.9%. There were 26 sites with data capture less than 90% for the period, of which 13 are classified as critical for the First, Second or Third Daughter Directives.

The number of monitoring sites in the AURN during this quarter was 132 , of which 63 are Local Authority owned sites affiliated to the national network.

Although overall network data capture was reasonably high at 92.0%, 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.

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 forthcoming new European Directive. The installation and affiliation of new sites will take some time to complete.

Part B Intercalibration Report, Summer 2007

A total of 128 sites in the AURN were calibrated by AEA during July-September 2007 Network Intercalibration exercise. One site was not operational. The results show that the majority of the network analysers are working satisfactorily and that data are generally of high quality. A total of 75 out of 435 analysers deviated by more than the appropriate acceptance criteria (see Section 7), and a further 3 NOx converters were found to be unacceptably inefficient. The concentrations of the on-site calibration gas cylinders were also checked. The certificate of calibration for the AURN is provided in Appendix B1.

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PART A – Ratification Report, July to Sept 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 July-September 2007. During this period there were 132 monitoring sites in the Network of which there are 93 urban sites, 26 rural sites and a further 13 sites in the London Air Quality Monitoring Network (LAQN) which are affiliated into the national network. There are currently 67 Defra-funded sites and 63 affiliate sites. Four sites (Belfast Clara Street, Northampton $PM_{10,}$ Wrexham PM_{10} and Brighton Roadside PM_{10}) measure PM_{10} only and are included as individual sites in the total of 132, although Northampton PM_{10} is co-located with the Northampton AURN site, Wrexham PM_{10} with the Wrexham AURN site, and Brighton Roadside PM_{10} is close to the Brighton Roadside AURN site.

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, July-September 2007

Site	Date closed	Date commissioned	Comments
Auchencorth Moss FDMS PM_{10}	-	17/12/06	Data received by QA/QC unit during Q3 2007
Auchencorth Moss FDMS $PM_{2.5}$	-	1/12/06	Data received by QA/QC unit during Q3 2007
Port Talbot Margam	-	24/7/07	Replacement for Port Talbot site

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 92.0% for all pollutants (O_3, NO_2, SO_2, CO, PM_{10} and $PM_{2.5}$) during the 3-month reporting period July-September 2007 (see Table 1.4 below). All pollutants were 90% or higher data capture, except $PM_{2.5}$ at 88.9%.

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

Overall, 354 out of the 441 analysers (80%) 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		Q1 Jan-Mar 2007 (No. below 90%)	Q2 Apr-Jun 2007 (No. below 90%)	Q3 July-Sept 2007 (No. below 90%)
CO	78	16	14	19
NO_2	112	23	16	22
O_3	92	13	6	12
PM_{10}	76*	15	10	14
$PM_{2.5}$	6*	1	1	2
SO_2	77	25	13	18
Total	**441**	**93**	**60**	**87**

*Includes TEOM, TEOM FDMS, BAM and Partisol analysers

In total, 26 out of the 132 operational network sites in the quarter (15%) had an average data capture rate below the required 90% level for the July-September 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%, July-September 2007 (Data capture calculated from site start date)

Site	Owner	Site Average
England		
Bolton	Affiliate	44.6
Brentford Roadside	Affiliate	54.5
Brighton Roadside PM_{10}	Affiliate	85.9
Bury Roadside	Affiliate	82.3
Great Dun Fell	DEFRA	56.7
Haringey Roadside	Affiliate	70.7
Leamington Spa	Affiliate	89.8
London Bloomsbury	DEFRA	60.0
London Haringey	Affiliate	85.2
Newcastle Centre	DEFRA	86.1
Northampton	Affiliate	80.7
Redcar	Affiliate	86.5
Rotherham Centre	Affiliate	83.2
Salford Eccles	Affiliate	86.8
Sibton	DEFRA	89.8
Somerton	Affiliate	83.5
Southampton Centre	DEFRA	84.7
Southwark Roadside	Affiliate	0.0
Tower Hamlets Roadside	Affiliate	81.5
N Ireland		
Belfast Centre	DEFRA	87.2
Derry	Affiliate	80.7
Scotland		
Auchencorth Moss	DEFRA	76.0
Edinburgh St Leonards	DEFRA	80.6
Fort William	DEFRA	76.0
Wales		
Cwmbran	Affiliate	75.5
Port Talbot Margam	Affiliate	88.9

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 original Local Site Operator's manual on disc (CD) were distributed to the network participants at the annual LSO meeting in December 2004. 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

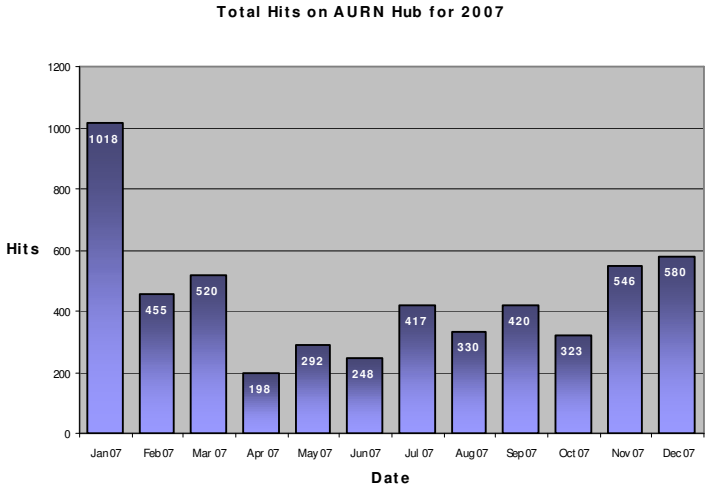
The AURN project information hub website is located at[1]:
http://www.aeat.co.uk/com/AURNHUB/index.html.

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, January-March 2007
- Recent Management Unit reports (July-September 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

Figure 1.4 AURN Hub Monthly Usage Statistics January-September 2007



2 Changes to the Network for Directive

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

Compliance

The QA/QC Unit and the CMCU Units in conjunction with Defra and the Devolved Administrations have carried out a major review of the monitoring network. This was necessary to ensure the network will be compliant with the new European Air Quality Directive which will come into force during 2008. Within this 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 will be 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 2.1 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 Forum Roadside
Wolverhampton Centre defra	Sunderland defra
Bolton	

Table 2.2 details the requirements for new sites within the network and lists those sites which have already been fully affiliated and where site data are available on the Air Quality Archive website. A number of other sites have been selected and are in the process of incorporation. For other areas, the process of site selection is ongoing.

Table 2.2 Additional sites to be added to network

Zone/Agglomeration	**Additional Requirement**	**Sites Affiliated (as of March 2008)**
London	$PM_{2.5}$ background site NO_2 background site	London Haringey
West Midlands UA	NOx, PM_{10}, $PM_{2.5}$ roadside	,
West Yorks UA	NOx, PM_{10}, $PM_{2.5}$ roadside	Leeds Headingley Kerbside
Tyneside UA	NOx roadside	
Liverpool UA	NOx roadside	
Eastern zone	NOx, PM_{10}, $PM_{2.5}$ roadside x2 SO_2 sites x2	Stanford le Hope Roadside (inc SO_2) Stewartby (SO_2)
South-west zone	NOx background PM_{10}, $PM_{2.5}$ roadside x2	

South-east zone	NOx, PM_{10}, $PM_{2.5}$ background x2 NOx, PM_{10}, $PM_{2.5}$ roadside PM_{10}, $PM_{2.5}$ roadside NOx backgound	Oxford St Ebbs Horley

East-midlands zone	NOx, PM_{10}, $PM_{2.5}$ background NOx, PM_{10}, $PM_{2.5}$ roadside NOx roadside	
North-west & Merseyside zone	NOx, PM_{10}, $PM_{2.5}$ background NOx, PM_{10}, $PM_{2.5}$ roadside NOx roadside	Carlisle Roadside
Yorks & Humberside zone	NOx, PM_{10}, $PM_{2.5}$ background NOx, PM_{10}, $PM_{2.5}$ roadside	York Bootham York Fishergate
West-Midlands zone	NOx, PM_{10}, $PM_{2.5}$ roadside SO_2	

Central Scotland zone	NOx roadside NOx Urban Background	
North-east Scotland zone	NOx roadside	
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 Chepstow A48
North Wales zone	NOx, O_3 suburban	New site required
Northern Ireland zone	NOx, PM_{10}, roadside SO_2 $PM_{2.5}$ background	Derry

The agreed requirements for the new sites are as follows:
(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, defra and the DAs interpret the Directive 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 existing sites will receive a $PM_{2.5}$ analyser in addition to the PM_{10} analyser already installed. These are given in Table 2.3. In addition, a number of PM_{10} analysers will be changed to $PM_{2.5}$ analysers (Table 2.4) and PM2.5 monitoring will also be undertaken at many of the new sites still to be affiliated into the network.

Table 2.3 Sites to receive $PM_{2.5}$ 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)

* Not yet confirmed
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 2.4: 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 $PM_{2.5}$
Brighton/Worthing/Littleh ampton	Brighton Roadside PM_{10}	Defra	Move analyser to Brighton Preston Park
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		Change PM_{10} to $PM_{2.5}$
Edinburgh UA	Edinburgh St Leon.	Defra	Change PM_{10} to $PM_{2.5}$ (not till end 2007)
East Midlands	Northampton PM_{10}	Defra	Change PM_{10} to $PM_{2.5}$
N West & Merseyside	Wigan Centre	Affiliate	Add $PM_{2.5}$

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 (see table 2.5). However, many of these may continue to operate outside of the network.

Table 2.5 Analysers removed from network at existing sites

CO	SO_2	PM_{10}	O_3
		London Bexley	London Bexley
	London Teddington		
	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*	
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		Inverness R/S Partisol	
Dumfries		Dumfries Partisol	
Cwmbran	Cwmbran	Cwmbran	

CO	SO_2	PM_{10}	O_3
Wrexham			
Derry			

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

3 Generic Data Quality Issues

3.1 Data Capture for Critical Sites in Zones and Agglomerations

In order to meet the requirements of the Daughter Directives, any zone or agglomeration[2] with an exceedence of the limit value must be formally reported to the Commission. The critical sites are those which, if data capture falls below 90%, there will be insufficient data for the whole zone or agglomeration. In most cases the critical sites are those where there is only one site in the zone or agglomeration. However, for some pollutants (especially ozone) monitoring is required at several sites in each zone or agglomeration and hence these may all need to be classified as critical sites for that pollutant. The list of the critical sites in the Network necessary to meet the requirements of the first, second and third Daughter Directives is given in Appendix A2. In total 63 sites (195 analysers) have been identified as critical for DD1, DD2 or DD3 (25 sites in agglomerations and 37 in zones).

Data capture for all 63 of the critical sites during the 3-month period July-September 2007 is given in Section 5, Table 5.2. The critical sites with less than 90% total data capture and the main reasons for data loss at these sites are given in Table 3.1 below. In total, 37 out of the 196 critical site analysers (19%) did not meet the required 90% data capture during the period July-September 2007. Note that some critical sites also measure other pollutants, which are not themselves critical.

Table 3.1 Critical sites with <90% data capture, July-September 2007

Site	Owner	CO	PM_{10}	NO_2	O_3	SO_2	Site Average
England							
Brighton Roadside PM_{10}	Affiliate	-	**85.9**	-	-	-	**85.9**
Great Dun Fell	DEFRA	-	-	-	**56.7**	-	**56.7**
Leamington Spa	Affiliate	**89.8**	**90.8**	**89.8**	**88.8**	**89.8**	**89.8**
Newcastle Centre	DEFRA	**94.3**	**68.9**	**81.4**	**94.4**	**91.5**	**86.1**
Northampton	Affiliate	**97.2**	**20.0**	**92.2**	**96.5**	**97.6**	**80.7**
Sibton	DEFRA	-	-	-	**89.8**	-	**89.8**
Somerton	Affiliate	-	-	**83.5**	**83.6**	-	**83.5**
Southampton Centre	DEFRA	**93.7**	**98.6**	**38.4**	**96.6**	**96.2**	**84.7**
N Ireland							
Belfast Centre	DEFRA	**88.5**	88.5	**82.0**	**88.6**	88.5	**87.2**
Derry	Affiliate	**85.2**	**95.5**	**95.2**	**95.7**	**32.1**	**80.7**
Scotland							
Edinburgh St Leonards	DEFRA	**92.7**	**22.7**	**97.2**	**97.5**	**92.8**	**80.6**
Fort William	DEFRA	-	-	**79.7**	**72.2**	-	**76.0**
Wales							
Cwmbran	Affiliate	**45.7**	**98.7**	**35.1**	**99.6**	**98.7**	**75.5**

[2] A definition of zones and agglomerations can be found under "Article 5 Assessment Zones and Agglomerations Monitoring Maps" at http://www.defra.gov.uk/environment/airquality/index.htm

Recommendation

Every effort should be made to ensure that data capture is maximised for the critical sites. LSOs and ESUs should undertake call-outs and repairs as soon as possible to avoid unnecessary data loss at these sites.

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

Gravimetric PM_{10} analysers (Partisols) are located at eight sites in the network (Bournemouth, Northampton, Wrexham, Dumfries, Inverness, London Westminster, Auchencorth Moss (PM_{10} and $PM_{2.5}$) and Brighton Roadside PM_{10}).

Data capture for the gravimetric PM_{10} (Partisol) analysers for the period July-September 2007 is given in Table 2.3. Eight of the nine sites for which data are available reached or exceeded the 90% data capture target in this quarter, with average data capture over all eight analysers of 96%.

Table 2.3 Gravimetric PM_{10} Data Capture (%) July-September 2007

Site	3-months Data Capture July-September 2007
Auchencorth Moss PM_{10}	52%
Auchencorth Moss $PM_{2.5}$	95%
Bournemouth	89%
Brighton Roadside PM_{10}	86%
London Westminster	95%
Northampton PM_{10}	92%
Dumfries	93%
Inverness	82%
Wrexham	99%

The reasons for data loss in the gravimetric analysers are given in Appendix A5. Auchencorth Moss PM_{10} was erroneously configured to measure $PM_{2.5}$ at installation in 2006 – this was corrected on 13 Aug 2007..

3.3 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 28 sites (30 analysers) showing continuing problems with the autocalibration run-on during July-September 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: July-September

(concentrations are ppm for CO and ppb for other pollutants)

Site	Pollutant	Run-On Conc	Autocal Conc	Hours lost	Months	
Bradford Centre	CO	-0.1	40	1	Aug-Sept	Zero run-on. Timing issue. Site decomissioned
Brighton Roadside	CO	0	30	1	Aug-Sept	
London Southwark	CO	-0.1		5	July	Manifold problem. Deaffiliated
				1	Aug-Sept	
Aston Hill	NO_2	2.7	50	3	July-Sept	
Barnsley Gawber	NO_2	2	200	1	July-Aug	
Belfast Centre	NO_2	4	300	1	July-Sept	
Birmingham Centre	NO_2	1	450	2	July	
Bolton	NO_2	5	600	1	Aug-Sept	
Bournemouth	NO_2	4	600	1	July-Sept	
Bury Roadside	NO_2	3	350	1	July-Sept	
Fort William	NO_2	2	350	2	July-Sept	
Harwell	NO_2	1.2	200	3	Juy	
				2	Aug	
				1	Sept	
Hove Roadside	NO_2	2	450	1	July-Aug	
Hull Freetown	NO_2	4	200	1	July-Sept	
Leominster	NO_2	1	500	2	July-Sept	
Liverpool Speke	NO_2	2	250	1	July-Sept	
London Wandsworth	NO_2	4		2	July-Sept	Site deaffiliated
London Westminster	NO_2	5	412	1	July-Sept	
Lullington Heath	NO_2	2.4	300	1	July-Sept	
Newcastle Centre	NO_2	4	300	1	July-Sept	
Stockport Shaw Heath	NO_2	3	1100	1	July-Sept	
Walsall Willenhall	NO_2	2	250	1	July-Sept	
Wrexham	NO_2	1	350	1	July-Sept	
Stoke-on-Trent Centre	O_3	-3	1000	1	July-Sept	Zero run-on. Timing issue.
Barnsley Gawber	SO_2	-1	250	1	July-Sept	Zero run-on. Timing issue
Blackpool Marton	SO_2	0	250	1	July-Sept	
Bradford Centre	SO_2	-1	250	1	July-Sept	Zero run-on. Timing issue. Site decommissioned

Cardiff Centre	SO_2	0	550	1	July-Sept	
London Southwark	SO_2	-1		5	July	Manifold problem. Site deaffiliated
				3	Aug	
				1	Sept	
Plymouth	SO_2	0.5		1	July-Sept	
Scunthorpe Town	SO_2	1	500	1	July-Sept	

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.

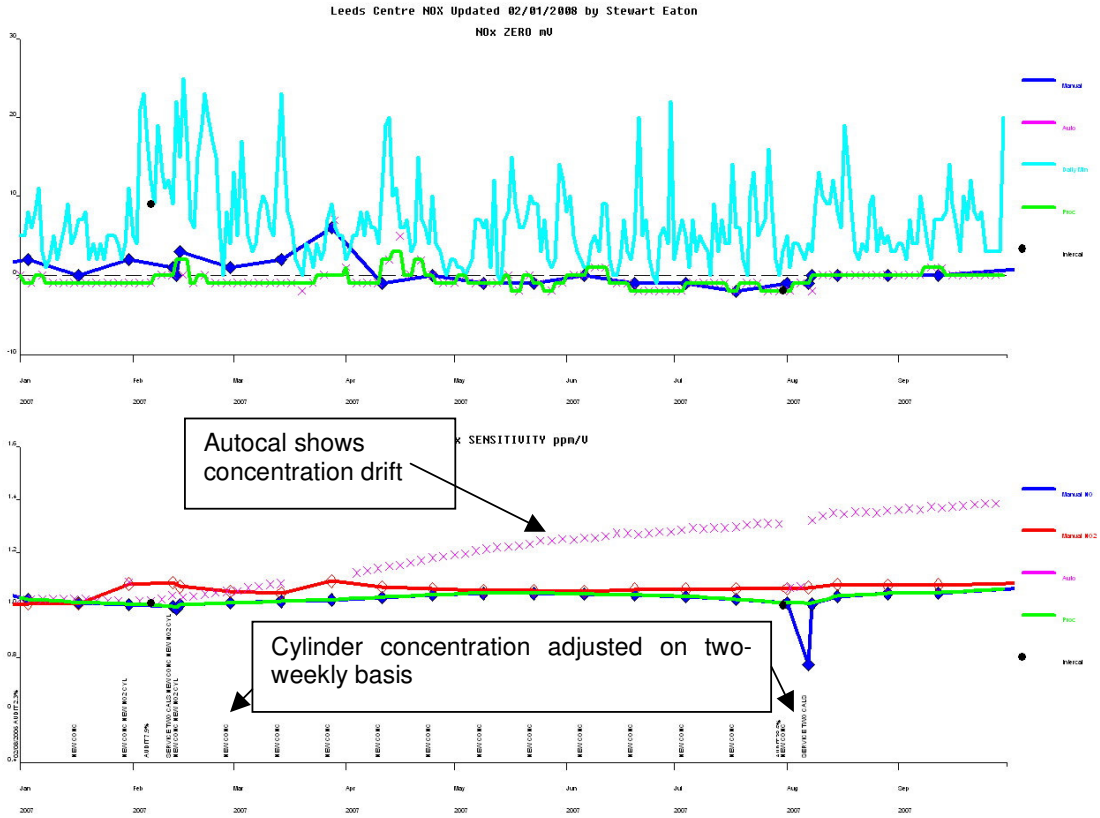
In the meantime, we recommend that the autocalibration devices be adjusted at the problem sites to reduce the concentration of the span gas. It is strongly advised that NO_2 autocalibration span concentrations of less than 200ppb (urban sites) and 100ppb (rural sites) are used throughout the network.

4 Site Specific Issues

4.1 Leeds and Cwmbran NO

The Leeds NO cylinder 107981has been suspected of being unstable between installation in January 2007 and the summer 2007 intercalibration. The cylinder was removed for reanalysis at AEA. The concentration was found to have decreased from 486ppb NOx, 482ppb NO in October 2006 to 337ppb NOx, 328ppb in December 2007. The calibration plot shows that the change in concentration has been consistent and gradual, and the data have been scaled accordingly-see Figure 4.1.

Figure 4.1 NOx Calibration Plot for Leeds



This site uses the NO cylinder for 3-day autocalibrations and hence, the cylinder is left with the main valve permanently open. There is a risk of contamination of the gas mixture if the regulator is not properly flushed through on installation.

A similar effect was also noticed at Cwmbran, and the ESU has agreed to investigate in conjunction with the LSO. Much of this quarter's NOx data has been lost due to an analyser fault. A request has been issued for the cylinder to be returned to AEA for recalibration.

4.2 Other Analysers Highlighted in Recent 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	Poor data capture in Q2 and Q3. NOx converter setting in software incorrect; data deleted to September 2007.
Weybourne	O_3	No manual calibrations or IZS	No progress reported
Rural CO analysers	CO	Baseline drift	Drift still evident
Narberth	O_3	Leak	Fixed early 2007

Site	Analyser	Fault	Current status
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

The following section provides a summary of the main site analyser operational problems, which have resulted in data capture below the required 90% level during the reporting period July-September 2007 (Table 4.1). 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.

Table 4.1 Sites with data capture below 90% July-September 2007
(Using the start date of any new site or end date of site closed)
01/07/2007 to 30/09/2007 Gaps in 15-minute table >= 6 hours and data capture <= 90%

Pollutant	Data Capture (%)	Start date	End date	Reason	Comments	Number of days	Number of hours
England							
Barnsley Gawber							
SO2	89.10%	07-Aug-07	09-Aug-07	ESU service		2	49
		24-Sep-07	28-Sep-07	Instrument fault	ENG C/O SO2 pump failure.	4	95
Birmingham Centre							
NO2	70.40%	06-Aug-07	08-Aug-07	ESU service		2.2	53
		09-Sep-07	03-Oct-07	Instrument fault	Analyser fault. Data is unstable	24.5	589
Blackpool Marton							
SO2	87.20%	06-Jul-07	11-Jul-07	Pump fault	ENG C/O Replaced split SO2 sample pump diaphragm.	4.8	115
		20-Aug-07	22-Aug-07	ESU service		1.9	45
		30-Sep-07	30-Nov-07	High noise	ulling of high data prior to removal of analyser	62	1488
Bolton							
CO	56.10%	02-Jun-07	09-Aug-07	No mV data collected	PC Logger u/s site off	68.7	1648
		20-Sep-07	20-Sep-07	ESU service		0.3	6
NO2	0.00%	18-Dec-06	30-Nov-07	Unstable response	Very unstable	348	8351
O3	56.30%	03-Jun-07	09-Aug-07	No mV data collected	PC Logger u/s site off	67.4	1618
		20-Sep-07	20-Sep-07	ESU service		0.3	6
PM10	54.30%	03-Jun-07	09-Aug-07	No mV data collected	PC Logger u/s site off	67.5	1620

Pollutant	Data Capture (%)	Start date	End date	Reason	Comments	Number of days	Number of hours
		12-Aug-07	12-Aug-07	Unstable response	Data was below -4	0.3	6
		10-Sep-07	11-Sep-07	Unstable response	Following LSO visit TEOM went below -4µg/m3	1.1	27
		20-Sep-07	20-Sep-07	ESU service		0.3	6
SO2	56.40%	03-Jun-07	09-Aug-07	No mV data collected	PC Logger u/s site off	67.4	1618
		20-Sep-07	20-Sep-07	ESU service		0.3	6
Bournemouth							
SO2	84.40%	22-Jun-07	12-Jul-07	Flat response		21	504
		13-Aug-07	15-Aug-07	ESU service		2.1	50
Bradford Centre							
SO2	88.50%	27-Jul-07	01-Aug-07	Unstable response	Unstable data until LSO cal	4.8	114
		13-Aug-07	15-Aug-07	ESU service		2	49
Brentford Roadside							
CO	10.30%	10-Jul-07	30-Nov-07	ESU service		144	3445
Bury Roadside							
CO	88.20%	14-May-07	08-Jul-07	Communication fault	Severe problems with the PC system	55.3	1327
		09-Jul-07	09-Jul-07	Communication fault	Severe problems with the PC system	0.4	9
		25-Jul-07	28-Jul-07	Unstable response	Unstable baseline	2.6	62
NO2	86.60%	13-May-07	08-Jul-07	Communication fault	Severe problems with the PC system	55.6	1335
		09-Jul-07	09-Jul-07	Communication fault	Severe problems with the PC system	0.4	9
		10-Jul-07	10-Jul-07	Communication fault	Severe problems with the PC system	0.4	9
PM10	89.90%	25-Apr-07	08-Jul-07	High noise	Noisy data 10.45 to 16.45 on 10 May	74.3	1782
		09-Jul-07	09-Jul-07	No mV data collected	No data collected comms trouble?	0.4	9
SO2	56.10%	24-Mar-07	04-Aug-07	Unstable response	Unstable baseline	134	3206
		30-Aug-07	31-Aug-07	Unstable response	Unstable baseline	0.4	10
		03-Sep-07	07-Sep-07	Logger fault	Site software issues	4.6	110
Great Dun Fell							
O3	56.70%	02-Aug-07	10-Sep-07	Sampling fault	Sample line full of water	39.3	942
Haringey Roadside							
PM10	43.80%	08-Jun-07	21-Aug-07	Unstable response	LSO C/O Visit to change noisy TEOM filter.	74	1776
Harwell							
NO2	79.90%	05-Jul-07	05-Jul-07	QAQC audit		0.3	7
		10-Jul-07	12-Jul-07	ESU service		2.2	53
		20-Sep-07	28-Sep-07	Unstable response	Unstable data - IZS fault - PMT replaced	8.5	204
Ladybower							
SO2	87.30%	19-Jul-07	19-Jul-07	High noise	Deleted noisy period	0.3	7
		20-Sep-07	01-Nov-07	Unstable response	Unstable data - UV lamp fault	42.1	1010

Pollutant	Data Capture (%)	Start date	End date	Reason	Comments	Number of days	Number of hours
Leamington Spa							
CO	89.80%	07-Aug-07	16-Aug-07	Logger fault	Service followed by a logger fault	8.8	210
NO2	89.80%	07-Aug-07	16-Aug-07	Logger fault	Service followed by a logger fault	8.8	210
O3	88.80%	06-Aug-07	16-Aug-07	Logger fault	Service followed by a logger fault	9.6	230
SO2	89.80%	07-Aug-07	16-Aug-07	Logger fault	Service followed by a logger fault	8.8	210
Liverpool Speke							
CO	86.20%	21-Aug-07	23-Aug-07	ESU service		1.9	46
		21-Sep-07	30-Sep-07	Unstable response	Baseline unstable.	10	239
London Bloomsbury							
CO	66.00%	28-Jun-07	31-Jul-07	Monitoring suspended	ENG C/O Decommisioned site for hut replacement. No cals	33.6	806
NO2	35.10%	28-Jun-07	29-Aug-07	Instrument fault	O3 generator fault	62	1489
O3	63.30%	28-Jun-07	03-Aug-07	Monitoring suspended	ENG C/O Decommisioned site for hut replacement. No cals	36.1	867
PM10	66.00%	28-Jun-07	31-Jul-07	Monitoring suspended	ENG C/O Decommisioned site for hut replacement. No cals	33.6	806
PM25	63.50%	28-Jun-07	02-Aug-07	Monitoring suspended	ENG C/O Decommisioned site for hut replacement. No cals	35.3	848
		05-Sep-07	05-Sep-07	ESU service		0.5	11
SO2	66.00%	28-Jun-07	31-Jul-07	Monitoring suspended	ENG C/O Decommisioned site for hut replacement. No cals	33.6	806
London Haringey							
O3	85.20%	30-Aug-07	11-Sep-07	High noise	ENG C/O Fixed zero pump	12	289
London Hillingdon							
CO	82.40%	03-Jul-07	18-Jul-07	ESU service	erratic data followed by SERVICE	15.5	371
		12-Sep-07	12-Sep-07	Unstable response	Unstable after LSO calibration	0.3	6
London Marylebone Road							
PM25	85.70%	01-Jul-07	02-Jul-07	Power cut		0.8	18
		30-Aug-07	11-Sep-07	Sampling fault	Low sample flow	12.1	290
London Southwark							
London Wandsworth							
NO2	87.30%	09-Jul-07	12-Jul-07	Instrument fault	Pump problem	3.6	86
London Westminster							
CO	87.70%	18-Aug-07	21-Aug-07	Air Conditioning or Temp fault	ENG C/O Flow warning. Pump diaphragm replaced	3	73
		08-Sep-07	13-Sep-07	Air Conditioning or Temp fault	Call out: A/C unit failure	5.4	130
		24-Sep-07	25-Sep-07	ESU service		1.2	28
		30-Sep-07	02-Oct-07	Power cut	Changed fuse	2.6	62
NO2	88.10%	08-Sep-07	13-Sep-07	Air Conditioning or Temp fault	Call out: A/C unit failure	4.6	110
		24-Sep-07	25-Sep-07	ESU service		1.2	28
		30-Sep-07	02-Oct-07	Power cut	Blown fuse	2.6	62
Manchester Piccadilly							

Pollutant	Data Capture (%)	Start date	End date	Reason	Comments	Number of days	Number of hours
O3	90.00%	06-Aug-07	08-Aug-07	ESU service		1.9	46
		24-Sep-07	29-Oct-07	Low flow rate	Low response due to flow fault	35.2	845
Manchester South							
NO2	84.20%	26-Jun-07	11-Jul-07	No calibrations	Rapidly drifting data	15	360
		06-Aug-07	07-Aug-07	ESU service		1.3	30
		26-Sep-07	28-Sep-07	Power cut	Engineer cut through power supply	2.2	52
Newcastle Centre							
NO2	81.40%	09-Jul-07	09-Jul-07	Power cut	Eng c/o	0.5	12
		10-Jul-07	11-Jul-07	Power cut	Eng c/o	0.9	21
		26-Aug-07	31-Aug-07	High noise	HIS nulling of erratic data	5.4	130
		05-Sep-07	10-Sep-07	ESU service		5.3	126
		12-Sep-07	13-Sep-07	Logger fault	ENG C/O Replaced fault in Odessa logger	1	24
PM10	68.90%	09-Jul-07	09-Jul-07	Power cut		0.4	10
		10-Jul-07	12-Jul-07	Power cut	ENG C/O Rack tripping because of fan fault. To be replaced at service	1.9	45
		13-Aug-07	13-Aug-07	QAQC audit		0.3	8
		05-Sep-07	12-Oct-07	High noise	Noisy signal after service	37.1	890
Northampton							
PM10	20.00%	28-Jun-07	12-Sep-07	Instrument fault	ESU attended to the TEOM but spurious output continued	76.1	1827
Preston							
CO	86.50%	30-Jul-07	07-Aug-07	Instrument fault	Faulty source	8.2	197
		21-Aug-07	23-Aug-07	Sampling fault		2.2	52
		20-Sep-07	22-Sep-07	Instrument fault	Baseline drifting	1.5	35
Reading New Town							
CO	88.50%	13-Aug-07	15-Aug-07	ESU service		2.1	50
		27-Aug-07	27-Aug-07	Unknown	mV data missing for all pollutants except PM10 unknown reason why	0.4	9
		28-Aug-07	30-Aug-07	Sampling fault	ENG C/O CO analyser flatlining & displaying master fault	1.8	44
		07-Sep-07	07-Sep-07	Unknown	Data missing for all pollutants except PM10	0.3	6
		25-Sep-07	30-Nov-07	Instrument fault	Poor quality data	66.6	1599
SO2	87.20%	11-Jul-07	19-Jul-07	Instrument fault	Faulty lamp	8.5	204
		13-Aug-07	15-Aug-07	ESU service		2.1	50
		27-Aug-07	27-Aug-07	Unknown	mV data missing for all pollutants except PM10	0.4	9
		07-Sep-07	07-Sep-07	No mV data collected	ENG C/O	0.4	9
Redcar							
CO	53.70%	20-Aug-07	30-Nov-07	Unstable response	Noise and drifting	103	2463
SO2	90.00%	01-Jul-07	02-Jul-07	No mV data collected	Comms fault	0.6	15
		20-Aug-07	28-Aug-07	ESU service		8.2	196
Rotherham Centre							
NO2	74.60%	08-Jul-07	08-Jul-07	No mV data collected	no data collected - comms trouble	0.5	13

Pollutant	Data Capture (%)	Start date	End date	Reason	Comments	Number of days	Number of hours
		09-Jul-07	09-Jul-07	No mV data collected	no data collected - comms trouble	0.3	6
		18-Jul-07	01-Aug-07	Instrument fault	no faults mentioned at the following service.	13.9	334
		09-Aug-07	17-Aug-07	Logger fault	ENG C/O datalogger fault-removed for repair	8.4	201
O3	87.30%	08-Jul-07	08-Jul-07	No mV data collected	no data collected - comms trouble	0.5	13
		09-Jul-07	09-Jul-07	No mV data collected	no data collected - comms trouble	0.3	6
		30-Jul-07	01-Aug-07	ESU service		1.9	46
		09-Aug-07	17-Aug-07	Logger fault	ENG C/O datalogger fault-removed for repair	8.4	201
SO2	87.60%	08-Jul-07	08-Jul-07	No mV data collected	no data collected - comms trouble	0.5	13
		09-Jul-07	09-Jul-07	No mV data collected	no data collected - comms trouble	0.3	6
		30-Jul-07	01-Aug-07	ESU service		1.9	46
		09-Aug-07	17-Aug-07	Logger fault	ENG C/O datalogger fault-removed for repair	8.4	201
Salford Eccles							
SO2	62.00%	02-Jul-07	03-Jul-07	Instrument fault	ENG C/O Data stepping. No fault found. Peaked lamp	1.1	27
		02-Aug-07	03-Aug-07	Instrument fault	analyser fault	1.2	28
		31-Aug-07	31-Aug-07	Instrument fault	analyser fault	0.6	14
		31-Aug-07	05-Nov-07	Manifold fault	ENG C/O Could not get SO2 working. Needs hot spare	65.8	1578
Sibton							
O3	89.80%	20-Aug-07	29-Aug-07	Communication fault	Logger on wrong baud rate	9.3	222
Somerton							
NO2	83.50%	31-Jul-07	01-Aug-07	ESU service	SERVICE 31/07/2007: Recorded pre-test data. Performed as found ga	1.1	27
		30-Aug-07	12-Sep-07	Power cut	Extensive power faults - intermittent data nulled	13.4	322
O3	83.60%	31-Jul-07	01-Aug-07	ESU service	SERVICE 31/07/2007: Recorded pre-test data. Performed as found ga	1.1	27
		30-Aug-07	12-Sep-07	Power cut	Extensive power faults - intermittent data nulled	13.4	322
Southampton Centre							
NO2	38.40%	26-Jun-07	23-Aug-07	Instrument fault	rejected post QA/QC meeeting.	58	1392
		04-Sep-07	05-Sep-07	Communication fault	no data collected.	1	24
		11-Sep-07	13-Sep-07	ESU service		2.1	50
Southwark Roadside							
CO	0.00%	01-Dec-06	01-Oct-07		Site closed	365	8760
NO2	0.00%	01-Dec-06	04-Jan-08		Site closed	400	9600
SO2	0.00%	01-Dec-06	01-Oct-07		Site closed	365	8760
Thurrock							
CO	87.30%	27-Jun-07	06-Jul-07	Instrument fault	Analyser fault caused by high temperature	8.4	202
		15-Aug-07	16-Aug-07	ESU service		1.1	26
		07-Sep-07	12-Sep-07	Instrument fault	ENG C/O Low flow. Replaced crushed tubing	4.7	113

Pollutant	Data Capture (%)	Start date	End date	Reason	Comments	Number of days	Number of hours
Tower Hamlets Roadside							
CO	63.50%	18-Jun-07	02-Aug-07	High noise	Noisy data nulled faulty rectifier	45.5	1092
Wolverhampton Centre							
CO	79.40%	06-Aug-07	08-Aug-07	ESU service		2.4	57
		21-Aug-07	06-Sep-07	Sampling fault	sampling fault found	16	385
Yarner Wood							
NO2	89.80%	03-Jul-07	03-Jul-07	Power cut		0.3	7
		08-Aug-07	09-Aug-07	Power cut		1.3	30
		06-Sep-07	11-Sep-07	Unstable response	ENG C/O Fixed aircon	5.4	130
		17-Sep-07	19-Sep-07	ESU service		2.1	50
N Ireland							
Belfast Centre							
CO	88.50%	17-Jul-07	24-Jul-07	Communication fault	Logger fault-locked up	7.1	171
		20-Aug-07	22-Aug-07	Flat response	Comms Fault service and flat data.	2.1	51
		31-Aug-07	01-Sep-07	Communication fault	Comms fault	0.8	19
NO2	82.00%	17-Jul-07	24-Jul-07	Communication fault	Logger fault-locked up	7.1	171
		20-Aug-07	22-Aug-07	ESU service		2.1	51
		31-Aug-07	01-Sep-07	Communication fault	Comms fault.	0.8	19
		28-Sep-07	08-Oct-07	Flat response	Flat data deleted.	10.1	243
O3	88.60%	17-Jul-07	24-Jul-07	Communication fault	Logger fault-locked up	7.1	171
		20-Aug-07	22-Aug-07	ESU service		2.1	51
		31-Aug-07	01-Sep-07	Communication fault	Comms fault.	0.8	19
PM10	88.50%	17-Jul-07	24-Jul-07	Communication fault	Logger fault-locked up	7.1	171
		20-Aug-07	22-Aug-07	ESU service		2.1	51
		31-Aug-07	01-Sep-07	Communication fault	Comms fault	0.8	19
SO2	88.50%	17-Jul-07	24-Jul-07	Communication fault	Logger fault-locked up	7.1	171
		20-Aug-07	22-Aug-07	ESU service		2.1	51
		31-Aug-07	01-Sep-07	Communication fault	Comms fault	0.8	19
Derry							
CO	85.20%	11-Jul-07	11-Jul-07	No mV data collected	No data collected. - site off	0.5	12
		01-Sep-07	13-Sep-07	ESU service	Service-followed by noisy data	12.4	297
SO2	32.10%	12-Jun-07	03-Aug-07	Flat response	Possible analyser fault.	52.4	1258
		21-Aug-07	18-Sep-07	Flat response	Flat and noisy data following service.	29	695
Scotland							
Bush Estate							
NO2	85.20%	12-Jul-07	24-Jul-07	Sampling fault	NOx inlet not connected to manifold since audit.	12.2	292
		06-Aug-07	07-Aug-07	ESU service		1	25

Pollutant	Data Capture (%)	Start date	End date	Reason	Comments	Number of days	Number of hours
Dumfries							
CO	84.10%	31-Jul-07	14-Aug-07	Instrument fault	ENG C/O Very nosy. Wheel and motor cleaned	14.2	340
Edinburgh St Leonards							
PM10	22.70%	06-Jul-07	07-Jul-07	High noise	Spurious data deleted.	0.6	15
		10-Jul-07	18-Sep-07	Instrument fault	FDMS fault and service	70.5	1691
Eskdalemuir							
NO2	88.90%	08-Aug-07	09-Aug-07	ESU service		1.1	27
		20-Aug-07	28-Aug-07	Sampling fault	Eng C/O replaced pump.	8.6	206
Fort William							
NO2	79.70%	04-Jul-07	12-Jul-07	Sampling fault	fault and power faults prior to service	8.8	211
		15-Jul-07	15-Jul-07	Power cut		0.3	8
		22-Aug-07	23-Aug-07	Power cut		1	25
		10-Sep-07	11-Sep-07	Power cut		0.8	19
O3	72.20%	11-Jul-07	12-Jul-07	ESU service		1.4	34
		15-Jul-07	15-Jul-07	Power cut		0.3	6
		15-Aug-07	23-Aug-07	Instrument fault	Analyser locking up	8.2	196
		03-Sep-07	17-Sep-07	Instrument fault	Analyser locking up	14.1	339
Glasgow Kerbside							
PM10	88.00%	25-Jun-07	11-Jul-07	Instrument fault	flow fault main flow fitting broken	15.5	371
Wales							
Aston Hill							
NO2	88.50%	18-Sep-07	19-Sep-07	ESU service		1.1	27
Cardiff Centre							
PM10	88.50%	11-Jul-07	18-Jul-07	ESU service		7	169
		12-Aug-07	15-Aug-07	Instrument fault	PM10 head was stolen	3.4	82
Cwmbran							
CO	45.70%	12-Aug-07	30-Nov-07	ESU callout	Instrument removed for repair	110	2651
NO2	35.10%	28-Jun-07	29-Aug-07	ESU service	Removed for repair	62	1489
Port Talbot							
NO2	23.90%	23-Jul-07	30-Nov-07	Monitoring suspended	Site finished	131	3136
O3	23.90%	23-Jul-07	30-Nov-07	Monitoring suspended	Site finished	131	3136
PM10	24.20%	23-Jul-07	30-Nov-07	Switched out-of-service	Site finished	131	3133
SO2	23.90%	23-Jul-07	30-Nov-07	Monitoring suspended	Site finished	131	3136
Port Talbot Margam							
NO2	87.20%	01-Dec-06	31-Jul-07	ESU service	Relocated Port Talbot site	243	5832
O3	87.60%	01-Dec-06	31-Jul-07	ESU service	Relocated Port Talbot site	243	5832
SO2	87.70%	01-Dec-06	31-Jul-07	ESU service	Relocated Port Talbot site	243	5832

6 Ratified Data Capture Statistics

Table 5.1 provides the ratified data capture figures for each site for the 3-month period July-September 2007. Data capture values below 90% are shown in the shaded boxes.

Table 5.1 Ratified Network Data Statistics: July-September 2007
Network Data Capture for 01/07/2007 to 30/09/2007 from start date of any new site

Site	Owner	CO	PM_{10}	NO_2	O_3	PM_{25}	SO_2	Site Average
England								
Barnsley 12	DEFRA	-	-	-	-	-	95.9	95.9
Barnsley Gawber	Affiliate	**95.0**	-	**93.3**	**96.2**	-	89.1	**93.4**
Bath Roadside	Affiliate	98.3	-	98.3	-	-	-	98.3
Billingham	DEFRA	-	-	92.9	-	-	-	92.9
Birmingham Centre	DEFRA	97.1	98.1	70.4	93.8	-	92.4	90.3
Birmingham Tyburn	Affiliate	98.1	97.9	98.1	98.1	-	98.1	98.1
Blackpool Marton	DEFRA	**92.5**	**99.8**	**97.3**	**97.6**	-	**87.2**	**94.9**
Bolton	Affiliate	56.1	54.3	0.0	56.3	-	56.4	44.6
Bottesford	Affiliate	-	-	-	99.5	-	-	99.5
Bournemouth	Affiliate	**97.4**	**89.1**	**91.8**	**97.6**	-	**84.4**	**92.0**
Bradford Centre	DEFRA	93.3	97.3	96.1	97.4	-	88.5	94.5
Brentford Roadside	Affiliate	10.3	-	98.6	-	-	-	54.5
Brighton Preston Park	DEFRA	-	-	**98.5**	**98.5**	-	-	**98.5**
Brighton Roadside	Affiliate	96.6	-	99.3	-	-	-	98.0
Brighton Roadside PM_{10}	Affiliate	-	**85.9**	-	-	-	-	**85.9**
Bristol Old Market	Affiliate	98.7	-	98.6	-	-	-	98.7
Bristol St Paul's	DEFRA	94.3	97.3	96.9	97.1	-	97.0	96.5
Bury Roadside	Affiliate	88.2	89.9	86.6	90.9	-	56.1	82.3
Cambridge Roadside	Affiliate	-	-	98.3	-	-	-	98.3
Camden Kerbside	Affiliate	-	99.3	99.4	-	-	-	99.3
Canterbury	Affiliate	-	**98.4**	98.2	-	-	-	**98.3**
Coventry Memorial Park	DEFRA	**97.2**	**98.4**	**97.1**	**98.3**	-	**97.1**	**97.6**
Exeter Roadside	Affiliate	99.4	-	99.0	99.3	-	99.2	99.2
Glazebury	DEFRA	-	-	**98.1**	**95.5**	-	-	**96.8**
Great Dun Fell	DEFRA	-	-	-	**56.7**	-	-	**56.7**
Haringey Roadside	Affiliate	-	43.8	97.6	-	-	-	70.7
Harwell	DEFRA	-	97.0	79.9	96.9	96.9	96.7	93.5
High Muffles	DEFRA	-	-	**97.1**	**97.1**	-	-	**97.1**
Hove Roadside	Affiliate	98.2	-	95.3	-	-	**98.3**	**97.3**
Hull Freetown	DEFRA	**96.6**	**98.6**	**92.9**	**96.4**	-	**97.0**	**96.3**
Ladybower	DEFRA	-	-	97.9	98.4	-	87.3	94.6
Leamington Spa	Affiliate	**89.8**	**90.8**	**89.8**	**88.8**	-	**89.8**	**89.8**

Site	Owner	CO	PM_{10}	NO_2	O_3	PM_{25}	SO_2	Site Average
Leeds Centre	DEFRA	99.1	99.4	99.2	99.1	-	99.1	99.2
Leicester Centre	DEFRA	**98.3**	**99.7**	**98.4**	**98.2**	-	**98.3**	**98.6**
Leominster	DEFRA	-	-	**91.7**	**97.5**	-	-	**94.6**
Liverpool Speke	DEFRA	**86.2**	**99.3**	**92.5**	**96.9**	-	**97.0**	**94.4**
London A3 Roadside	DEFRA	97.8	98.2	97.7	-	-	-	97.9
London Bexley	Affiliate	91.6	97.4	94.2	98.5	-	97.5	95.9
London Bloomsbury	DEFRA	66.0	66.0	35.1	63.3	63.5	66.0	60.0
London Brent	Affiliate	97.4	98.6	94.3	98.4	-	93.0	96.4
London Bromley	Affiliate	-	-	99.5	-	-	-	99.5
London Cromwell Road 2	DEFRA	97.9	-	98.2	-	-	95.8	97.3
London Eltham	Affiliate	-	95.5	99.2	99.5	-	96.2	97.6
London Hackney	Affiliate	99.5	-	99.4	99.4	-	-	99.4
London Haringey	Affiliate	-	-	-	85.2	-	-	85.2
London Harlington	Affiliate	97.9	93.0	97.1	91.9	-	-	95.0
London Hillingdon	DEFRA	82.4	97.2	97.1	97.1	-	97.1	94.2
London Lewisham	Affiliate	-	-	99.4	99.5	-	99.6	99.5
London Marylebone Road	Affiliate	98.6	95.8	97.9	98.6	85.7	98.7	95.9
London N. Kensington	Affiliate	94.7	99.1	99.0	99.1	-	98.9	98.2
London Southwark	Affiliate	91.0	-	99.3	99.5	-	89.5	94.8
London Teddington	Affiliate	-	-	95.6	94.9	-	95.5	95.3
London Wandsworth	Affiliate	-	-	87.3	99.5	-	-	93.4
London Westminster	DEFRA	87.7	96.7	88.1	92.1	-	92.0	91.3
Lullington Heath	DEFRA	-	-	93.9	94.2	-	98.0	95.4
Manchester Piccadilly	DEFRA	92.1	99.5	92.8	90.0	-	92.2	93.3
Manchester South	Affiliate	-	-	84.2	97.6	-	98.0	93.3
Manchester Town Hall	DEFRA	97.5	-	98.1	-	-	-	97.8
Market Harborough	DEFRA	90.3	-	97.9	92.4	-	-	93.5
Middlesbrough	Affiliate	98.6	93.7	98.6	98.8	-	98.5	97.6
Newcastle Centre	DEFRA	**94.3**	**68.9**	**81.4**	**94.4**	-	**91.5**	**86.1**
Northampton	Affiliate	**97.2**	**20.0**	**92.2**	**96.5**	-	**97.6**	**80.7**
Northampton PM10	Affiliate	-	**92.4**	-	-	-	-	**92.4**
Norwich Centre	DEFRA	98.4	97.6	**98.4**	**98.3**	-	98.4	**98.2**
Norwich Forum	Affiliate	-	-	98.1	-	-	-	98.1

Site	Owner	CO	PM_{10}	NO_2	O_3	PM_{25}	SO_2	Site Average
Roadside								
Nottingham Centre	DEFRA	**96.9**	**98.5**	**92.3**	**97.0**	-	**96.9**	**96.3**
Oxford Centre Roadside	Affiliate	**91.5**	-	91.3	-	-	**91.5**	**91.5**
Plymouth Centre	DEFRA	97.1	**96.7**	97.2	97.3	-	93.2	**96.3**
Portsmouth	Affiliate	**99.1**	**99.3**	**99.5**	**99.3**	-	**92.6**	**98.0**
Preston	DEFRA	**86.5**	**99.7**	**93.7**	**97.1**	-	**96.8**	**94.8**
Reading New Town	DEFRA	**88.5**	**97.4**	**94.0**	**96.7**	-	**87.2**	**92.8**
Redcar	Affiliate	53.7	96.7	97.5	94.4	-	90.0	86.5
Rochester Stoke	Affiliate	-	97.8	97.9	97.9	99.3	97.8	98.2
Rotherham Centre	Affiliate	-	-	74.6	87.3	-	87.6	83.2
Salford Eccles	Affiliate	95.3	90.3	94.9	91.4	-	62.0	86.8
Sandwell West Bromwich	Affiliate	99.6	-	99.5	94.8	-	99.4	98.3
Scunthorpe Town	Affiliate	-	**98.2**	-	-	-	94.1	**96.2**
Sheffield Centre	DEFRA	97.5	**99.9**	97.5	97.5	-	97.5	**98.0**
Sheffield Tinsley	DEFRA	97.5	-	97.2	-	-	-	97.4
Sibton	DEFRA	-	-	-	**89.8**	-	-	**89.8**
Somerton	Affiliate	-	-	**83.5**	**83.6**	-	-	**83.5**
Southampton Centre	DEFRA	**93.7**	**98.6**	**38.4**	**96.6**	-	**96.2**	**84.7**
Southend-on-Sea	DEFRA	**97.9**	**99.4**	**97.8**	**97.8**	-	**95.5**	**97.7**
Southwark Roadside	Affiliate	0.0	-	0.0	-	-	0.0	0.0
St Osyth	DEFRA	97.8	-	**94.0**	**98.4**	-	-	**96.8**
Stockport Shaw Heath	Affiliate	95.3	98.6	93.9	-	-	98.5	96.6
Stockton-on-Tees Yarm	Affiliate	**99.1**	**97.7**	**99.9**	-	-	-	**98.9**
Stoke-on-Trent Centre	DEFRA	**97.4**	**96.1**	**97.1**	**93.3**	-	**97.3**	**96.2**
Sunderland	DEFRA	-	-	-	-	-	**96.9**	**96.9**
Sunderland Silksworth	Affiliate	-	-	**90.1**	**98.5**	-	-	**94.3**
Thurrock	Affiliate	87.3	99.3	**98.1**	**96.8**	-	98.1	**95.9**
Tower Hamlets Roadside	Affiliate	63.5	-	99.5	-	-	-	81.5
Walsall Alumwell	DEFRA	-	-	93.8	-	-	-	93.8
Walsall Willenhall	Affiliate	-	-	95.4	-	-	-	95.4
West London	DEFRA	96.8	-	96.8	-	-	-	96.8
Weybourne	Affiliate	-	-	-	99.9	-	-	99.9
Wicken Fen	DEFRA	-	-	**96.4**	**96.4**	-	96.4	**96.4**
Wigan Centre	Affiliate	**98.3**	**97.3**	**98.5**	**98.4**	-	**98.6**	**98.2**
Wirral Tranmere	DEFRA	**97.4**	**96.7**	**95.5**	**97.6**	-	**96.8**	**96.8**
Wolverhampton Centre	DEFRA	79.4	99.5	95.7	96.8	-	96.8	93.6

Site	Owner	CO	PM_{10}	NO_2	O_3	PM_{25}	SO_2	Site Average
Yarner Wood	DEFRA	-	-	**89.8**	**94.7**	-	-	**92.2**
Ireland								
Mace Head	Affiliate	-	-	-	99.1	-	-	99.1
N Ireland								
Belfast Centre	DEFRA	**88.5**	88.5	**82.0**	**88.6**	-	88.5	**87.2**
Belfast Clara St	Affiliate	-	99.6	-	-	-	-	99.6
Belfast East	DEFRA	-	-	-	-	-	99.1	99.1
Derry	Affiliate	**85.2**	**95.5**	**95.2**	**95.7**	-	**32.1**	**80.7**
Lough Navar	DEFRA	-	97.8	-	**98.1**	-	-	**97.9**
Scotland								
Aberdeen	Affiliate	**98.4**	**98.4**	**91.6**	**98.1**	-	**96.3**	**96.6**
Auchencorth Moss	DEFRA	-	52.2	-	99.8	-	-	76.0
Auchencorth Moss PM_{10} PM_{25} (FDMS)	DEFRA	-	92.4	-	-	91.2	-	91.8
Bush Estate	DEFRA	-	-	**85.2**	**99.0**	-	-	**92.1**
Dumfries	DEFRA	**84.1**	**93.5**	**98.1**	-	-	-	**91.9**
Edinburgh St Leonards	DEFRA	**92.7**	**22.7**	**97.2**	**97.5**	-	**92.8**	**80.6**
Eskdalemuir	DEFRA	-	-	**88.9**	**98.2**	-	-	**93.6**
Fort William	DEFRA	-	-	**79.7**	**72.2**	-	-	**76.0**
Glasgow Centre	DEFRA	97.0	97.2	**97.1**	**95.9**	-	**97.1**	**96.9**
Glasgow City Chambers	DEFRA	98.5	-	92.3	-	-	-	95.4
Glasgow Kerbside	DEFRA	97.8	88.0	90.8	-	-	-	92.2
Grangemouth	Affiliate	**96.1**	**97.2**	**97.1**	-	-	**97.2**	**96.9**
Inverness	DEFRA	98.3	**80.4**	**98.3**	-	-	-	**92.3**
Inverness PM_{10}	DEFRA	-	**92.6**	-	-	-	-	**92.6**
Lerwick	DEFRA	-	-	-	98.8	-	-	98.8
Strath Vaich	DEFRA	-	-	-	**97.0**	-	-	**97.0**
Wales								
Aston Hill	DEFRA	-	-	**88.5**	**97.9**	-	-	**93.2**
Cardiff Centre	DEFRA	**97.3**	**88.5**	**97.2**	**97.1**	-	**93.2**	**94.7**
Cwmbran	Affiliate	**45.7**	**98.7**	**35.1**	**99.6**	-	**98.7**	**75.5**
Narberth	DEFRA	-	92.7	90.4	**92.5**	-	92.5	**92.0**
Port Talbot	Affiliate	-	96.9	95.7	95.7	-	95.7	96.0
Port Talbot Margam	Affiliate	-	93.3	87.2	87.6	-	87.7	88.9
Swansea Roadside	Affiliate	**97.3**	97.7	97.3	97.3	97.1	96.9	**97.3**
Wrexham	DEFRA	**98.0**	**96.7**	**94.1**	-	-	**97.4**	**96.5**
Wrexham PM_{10}	DEFRA	-	**96.2**	-	-	-	-	**96.2**
Number of sites		78	76	112	92	6	77	132
Number of sites < 90%		19	14	22	12	2	18	26
Network Mean (%)		90.2	91.6	91.2	94.7	88.9	91.2	92.0

Shaded boxes are for data capture < 90%
Bold data captures are for critical instruments and sites

Table 5.2 shows the ratified data capture figures for the 9-month period January-September 2007.

Table 5.2 Ratified Network Data Statistics: January-September 2007

Site	Owner	CO	PM_{10}	NO_2	O_3	PM_{25}	SO_2	Site Average
England								
Barnsley 12	DEFRA	-	-	-	-	-	93.7	93.7
Barnsley Gawber	Affiliate	**92.3**	-	**90.6**	**94.5**	-	89.6	**91.7**
Bath Roadside	Affiliate	94.1	-	98.0	-	-	-	96.1
Billingham	DEFRA	-	-	95.2	-	-	-	95.2
Birmingham Centre	DEFRA	97.4	97.5	86.6	95.5	-	87.0	92.8
Birmingham Tyburn	Affiliate	94.8	98.2	98.6	98.4	-	93.5	96.7
Blackpool Marton	DEFRA	**95.9**	**94.0**	**96.9**	**97.4**	-	**90.2**	**94.9**
Bolton	Affiliate	71.9	72.5	0.0	73.2	-	54.4	54.4
Bottesford	Affiliate	-	-	-	99.5	-	-	99.5
Bournemouth	Affiliate	**98.2**	**95.2**	**93.9**	**98.4**	-	**84.7**	**94.1**
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	-	-	**95.7**	**95.7**	-	-	**95.7**
Brighton Roadside	Affiliate	98.3	-	98.5	-	-	-	98.4
Brighton Roadside PM_{10}	Affiliate	-	**94.5**	-	-	-	-	**94.5**
Bristol Old Market	Affiliate	98.1	-	97.1	-	-	-	97.6
Bristol St Paul's	DEFRA	96.7	97.0	91.1	97.6	-	97.7	96.0
Bury Roadside	Affiliate	76.8	71.3	75.4	76.4	-	48.5	69.7
Cambridge Roadside	Affiliate	-	-	96.4	-	-	-	96.4
Camden Kerbside	Affiliate	-	99.4	97.6	-	-	-	98.5
Canterbury	Affiliate	-	**98.7**	98.7	-	-	-	**98.7**
Coventry Memorial Park	DEFRA	**98.7**	**98.9**	**98.7**	**99.1**	-	**98.7**	**98.8**
Exeter Roadside	Affiliate	99.0	-	98.9	99.0	-	99.0	99.0
Glazebury	DEFRA	-	-	**96.2**	**63.8**	-	-	**80.0**
Great Dun Fell	DEFRA	-	-	-	**82.2**	-	-	**82.2**
Haringey Roadside	Affiliate	-	66.1	94.8	-	-	-	80.4
Harwell	DEFRA	-	97.0	90.2	77.7	97.0	87.4	89.9
High Muffles	DEFRA	-	-	**97.3**	**98.1**	-	-	**97.7**
Hove Roadside	Affiliate	99.0	-	95.7	-	-	**98.9**	**97.9**
Hull Freetown	DEFRA	**91.5**	**98.4**	**94.4**	**97.8**	-	**97.0**	**95.8**
Ladybower	DEFRA	-	-	86.4	98.0	-	87.4	90.6
Leamington Spa	Affiliate	**95.6**	**96.4**	**61.8**	**94.9**	-	**95.2**	**88.8**
Leeds Centre	DEFRA	98.6	99.1	98.7	98.9	-	98.7	98.8
Leicester Centre	DEFRA	**98.9**	**84.6**	**98.9**	**98.8**	-	**99.0**	**96.0**

Site	Owner	CO	PM_{10}	NO_2	O_3	PM_{25}	SO_2	Site Average
Leominster	DEFRA	-	-	**93.0**	**98.5**	-	-	**95.7**
Liverpool Speke	DEFRA	**94.1**	**98.1**	**94.8**	**97.8**	-	**97.7**	**96.5**
London A3 Roadside	DEFRA	97.0	98.0	96.6	-	-	-	97.2
London Bexley	Affiliate	96.4	97.7	94.1	98.9	-	98.4	97.1
London Bloomsbury	DEFRA	79.0	86.3	71.2	80.5	85.4	76.7	79.9
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	96.8	-	96.3	-	-	94.2	95.8
London Eltham	Affiliate	-	70.6	96.2	97.6	-	90.1	88.6
London Hackney	Affiliate	99.5	-	99.5	99.5	-	-	99.5
London Haringey	Affiliate	-	-	-	75.2	-	-	75.2
London Harlington	Affiliate	95.3	75.0	91.8	87.3	-	-	87.3
London Hillingdon	DEFRA	92.3	97.8	97.3	97.7	-	97.2	96.4
London Lewisham	Affiliate	-	-	92.3	99.5	-	98.4	96.7
London Marylebone Road	Affiliate	95.2	97.4	98.5	99.0	94.3	99.0	97.2
London N. Kensington	Affiliate	97.7	98.5	99.3	96.3	-	95.5	97.4
London Southwark	Affiliate	84.3	-	98.8	98.9	-	83.7	91.4
London Teddington	Affiliate	-	-	97.4	97.6	-	86.5	93.8
London Wandsworth	Affiliate	-	-	92.4	99.3	-	-	95.9
London Westminster	DEFRA	89.9	93.4	72.5	96.5	-	90.4	88.5
Lullington Heath	DEFRA	-	-	94.1	95.4	-	96.3	95.2
Manchester Piccadilly	DEFRA	94.9	98.5	95.0	95.4	-	95.0	95.8
Manchester South	Affiliate	-	-	83.3	93.6	-	97.5	91.5
Manchester Town Hall	DEFRA	86.6	-	95.7	-	-	-	91.2
Market Harborough	DEFRA	95.1	-	97.6	95.9	-	-	96.2
Middlesbrough	Affiliate	95.4	97.0	98.7	98.2	-	98.7	97.6
Newcastle Centre	DEFRA	**96.9**	**88.9**	**89.9**	**97.1**	-	**96.0**	**93.7**
Northampton	Affiliate	**98.8**	**70.8**	**97.1**	**98.1**	-	**98.9**	**92.7**
Northampton PM_{10}	Affiliate	-	**84.2**	-	-	-	-	**84.2**
Norwich Centre	DEFRA	99.0	98.2	**98.9**	**98.9**	-	87.8	**96.6**
Norwich Forum Roadside	Affiliate	-	-	95.6	-	-	-	95.6
Nottingham Centre	DEFRA	**97.6**	**94.0**	**95.7**	**97.9**	-	**97.8**	**96.6**

Site	Owner	CO	PM_{10}	NO_2	O_3	PM_{25}	SO_2	Site Average
Oxford Centre Roadside	Affiliate	**80.6**	-	95.4	-	-	**95.9**	**90.6**
Plymouth Centre	DEFRA	73.7	**84.0**	79.5	84.4	-	83.0	**80.9**
Portsmouth	Affiliate	**98.9**	**98.2**	**98.7**	**98.9**	-	**96.5**	**98.2**
Preston	DEFRA	**92.2**	**98.7**	**94.6**	**94.3**	-	**95.0**	**95.0**
Reading New Town	DEFRA	**93.9**	**94.4**	**95.5**	**96.7**	-	**91.1**	**94.3**
Redcar	Affiliate	55.5	84.4	87.5	83.0	-	83.8	78.8
Rochester Stoke	Affiliate	-	97.8	98.0	98.0	98.9	98.0	98.2
Rotherham Centre	Affiliate	-	-	89.7	93.9	-	94.1	92.6
Salford Eccles	Affiliate	95.7	92.9	96.4	95.2	-	83.4	92.7
Sandwell West Bromwich	Affiliate	95.5	-	98.4	96.2	-	98.3	97.1
Scunthorpe Town	Affiliate	-	**98.6**	-	-	-	97.2	**97.9**
Sheffield Centre	DEFRA	94.0	**98.5**	92.7	94.3	-	92.8	**94.5**
Sheffield Tinsley	DEFRA	97.8	-	97.6	-	-	-	97.7
Sibton	DEFRA	-	-	-	**93.9**	-	-	**93.9**
Somerton	Affiliate	-	-	**91.8**	**93.7**	-	-	**92.8**
Southampton Centre	DEFRA	**96.8**	**98.3**	**72.7**	**96.6**	-	**97.6**	**92.4**
Southend-on-Sea	DEFRA	**98.7**	**99.0**	**98.6**	**98.6**	-	**97.9**	**98.6**
Southwark Roadside	Affiliate	0.0	-	0.0	-	-	0.0	0.0
St Osyth	DEFRA	98.6	-	**95.9**	**98.0**	-	-	**97.5**
Stockport Shaw Heath	Affiliate	96.0	98.2	79.3	-	-	98.8	93.1
Stockton-on-Tees Yarm	Affiliate	**98.0**	**97.7**	**99.4**	-	-	-	**98.4**
Stoke-on-Trent Centre	DEFRA	**97.7**	**97.5**	**97.5**	**95.1**	-	**95.2**	**96.6**
Sunderland	DEFRA	-	-	-	-	-	**94.2**	**94.2**
Sunderland Silksworth	Affiliate	-	-	**87.3**	**97.5**	-	-	**92.4**
Thurrock	Affiliate	90.3	99.1	**83.2**	**97.4**	-	97.2	**93.4**
Tower Hamlets Roadside	Affiliate	82.6	-	79.6	-	-	-	81.1
Walsall Alumwell	DEFRA	-	-	97.3	-	-	-	97.3
Walsall Willenhall	Affiliate	-	-	94.4	-	-	-	94.4
West London	DEFRA	89.0	-	97.7	-	-	-	93.3
Weybourne	Affiliate	-	-	-	97.9	-	-	97.9
Wicken Fen	DEFRA	-	-	**82.7**	**97.6**	-	97.5	**92.6**
Wigan Centre	Affiliate	**97.9**	**98.7**	**94.9**	**97.4**	-	**97.2**	**97.2**
Wirral Tranmere	DEFRA	**91.1**	**97.3**	**96.0**	**96.0**	-	**67.1**	**89.5**
Wolverhampton Centre	DEFRA	90.9	97.5	97.3	97.7	-	97.7	96.2
Yarner Wood	DEFRA	-	-	**92.1**	**94.5**	-	-	**93.3**
Ireland								
Mace Head	Affiliate	-	-	-	97.8	-	-	97.8

Site	Owner	CO	PM_{10}	NO_2	O_3	PM_{25}	SO_2	Site Average
N Ireland								
Belfast Centre	DEFRA	**93.3**	93.0	**90.8**	**93.4**	-	83.9	**90.9**
Belfast Clara St	Affiliate	-	99.3	-	-	-	-	99.3
Belfast East	DEFRA	-	-	-	-	-	99.1	99.1
Derry	Affiliate	**92.5**	**96.0**	**86.1**	**96.1**	-	**67.6**	**87.7**
Lough Navar	DEFRA	-	97.7	-	**97.8**	-	-	**97.8**
Scotland								
Aberdeen	Affiliate	**98.7**	**98.3**	**94.0**	**98.6**	-	**97.0**	**97.3**
Auchencorth Moss	DEFRA	-	17.6	-	99.5	-	-	58.5
Auchencorth Moss PM_{10} PM_{25}	DEFRA	-	96.3	-	-	95.9	-	96.1
Bush Estate	DEFRA	-	-	**92.0**	**98.6**	-	-	**95.3**
Dumfries	DEFRA	**89.5**	**93.8**	**98.4**	-	-	-	**93.9**
Edinburgh St Leonards	DEFRA	**96.6**	**72.0**	**96.4**	**97.0**	-	**96.5**	**91.7**
Eskdalemuir	DEFRA	-	-	**72.8**	**98.3**	-	-	**85.6**
Fort William	DEFRA	-	-	**85.5**	**75.4**	-	-	**80.5**
Glasgow Centre	DEFRA	97.9	97.5	**89.4**	**97.5**	-	**95.1**	**95.5**
Glasgow City Chambers	DEFRA	98.9	-	96.4	-	-	-	97.7
Glasgow Kerbside	DEFRA	98.6	92.9	90.6	-	-	-	94.0
Grangemouth	Affiliate	**97.4**	**97.9**	**97.8**	-	-	**97.9**	**97.8**
Inverness	DEFRA	98.4	**84.2**	**97.5**	-	-	-	**93.4**
Inverness PM_{10}	DEFRA	-	**91.1**	-	-	-	-	**91.1**
Lerwick	DEFRA	-	-	-	93.9	-	-	93.9
Strath Vaich	DEFRA	-	-	-	**86.9**	-	-	**86.9**
Wales								
Aston Hill	DEFRA	-	-	**92.5**	**96.5**	-	-	**94.5**
Cardiff Centre	DEFRA	**95.9**	**90.9**	**97.7**	**98.0**	-	**96.6**	**95.8**
Cwmbran	Affiliate	**81.2**	**99.0**	**76.6**	**99.4**	-	**47.5**	**80.7**
Narberth	DEFRA	-	86.2	86.2	**86.9**	-	87.0	**86.6**
Port Talbot	Affiliate	-	96.2	97.7	97.7	-	95.5	96.8
Port Talbot Margam	Affiliate	-	93.3	87.2	87.6	-	87.7	88.9
Swansea Roadside	Affiliate	**98.0**	77.1	97.9	97.6	89.8	97.8	**93.0**
Wrexham	DEFRA	**94.3**	**94.1**	**90.2**	-	-	**93.6**	**93.0**
Wrexham PM_{10}	DEFRA	-	**89.9**	-	-	-	-	**89.9**
Number of sites		78	76	112	92	6	77	132
Number of sites < 90%		15	18	27	14	2	22	29
Network Mean (%)		92.0	91.8	91.0	94.6	93.5	90.2	92.0

Table 5.3 shows the ratified AURN data capture for the 63 operational **critical sites** in the network for the 6-month period January-September 2007. Sites with less than 90% data capture are shaded. This table contains the overall data capture for 6 months, regardless of when sites started or finished monitoring. A total of 13 critical sites had a data capture of less than 90%.

Table 5.3 AURN Ratified Data Capture (%) for Critical Sites January to September 2007

Site	Owner	CO	PM_{10}	NO_2	O_3	SO_2	Site Avg.
England							
Barnsley Gawber	Affiliate	**92.3**	-	**90.6**	**94.5**	89.6	**91.7**
Blackpool Marton	DEFRA	**95.9**	**94.0**	**96.9**	**97.4**	**90.2**	**94.9**
Bournemouth	Affiliate	**98.2**	**95.2**	**93.9**	**98.4**	**84.7**	**94.1**
Brighton Preston Park	DEFRA	-	-	**95.7**	**95.7**	-	**95.7**
Brighton Roadside PM10	Affiliate	-	**94.5**	-	-	-	**94.5**
Canterbury	Affiliate	-	**98.7**	98.7	-	-	**98.7**
Coventry Memorial Park	DEFRA	**98.7**	**98.9**	**98.7**	**99.1**	**98.7**	**98.8**
Glazebury	DEFRA	-	-	**96.2**	**63.8**	-	**80.0**
Great Dun Fell	DEFRA	-	-	-	**82.2**	-	**82.2**
High Muffles	DEFRA	-	-	**97.3**	**98.1**	-	**97.7**
Hove Roadside	Affiliate	99.0	-	95.7	-	**98.9**	**97.9**
Hull Freetown	DEFRA	**91.5**	**98.4**	**94.4**	**97.8**	**97.0**	**95.8**
Leamington Spa	Affiliate	**95.6**	**96.4**	**61.8**	**94.9**	**95.2**	**88.8**
Leicester Centre	DEFRA	**98.9**	**84.6**	**98.9**	**98.8**	**99.0**	**96.0**
Leominster	DEFRA	-	-	**93.0**	**98.5**	-	**95.7**
Liverpool Speke	DEFRA	**94.1**	**98.1**	**94.8**	**97.8**	**97.7**	**96.5**
Newcastle Centre	DEFRA	**96.9**	**88.9**	**89.9**	**97.1**	**96.0**	**93.7**
Northampton	Affiliate	**98.8**	**70.8**	**97.1**	**98.1**	**98.9**	**92.7**
Northampton PM10	Affiliate	-	**84.2**	-	-	-	**84.2**
Norwich Centre	DEFRA	99.0	98.2	**98.9**	**98.9**	87.8	**96.6**
Nottingham Centre	DEFRA	**97.6**	**94.0**	**95.7**	**97.9**	**97.8**	**96.6**
Oxford Centre Roadside	Affiliate	**80.6**	-	95.4	-	**95.9**	**90.6**
Plymouth Centre	DEFRA	73.7	**84.0**	79.5	84.4	83.0	**80.9**
Portsmouth	Affiliate	**98.9**	**98.2**	**98.7**	**98.9**	**96.5**	**98.2**
Preston	DEFRA	**92.2**	**98.7**	**94.6**	**94.3**	**95.0**	**95.0**
Reading New Town	DEFRA	**93.9**	**94.4**	**95.5**	**96.7**	**91.1**	**94.3**
Scunthorpe Town	Affiliate	-	**98.6**	-	-	97.2	**97.9**
Sheffield Centre	DEFRA	94.0	**98.5**	92.7	94.3	92.8	**94.5**
Sibton	DEFRA	-	-	-	**93.9**	-	**93.9**
Somerton	Affiliate	-	-	**91.8**	**93.7**	-	**92.8**
Southampton Centre	DEFRA	**96.8**	**98.3**	**72.7**	**96.6**	**97.6**	**92.4**
Southend-on-Sea	DEFRA	**98.7**	**99.0**	**98.6**	**98.6**	**97.9**	**98.6**
St Osyth	DEFRA	98.6	-	**95.9**	**98.0**	-	**97.5**
Stockton-on-Tees Yarm	Affiliate	**98.0**	**97.7**	**99.4**	-	-	**98.4**
Stoke-on-Trent Centre	DEFRA	**97.7**	**97.5**	**97.5**	**95.1**	**95.2**	**96.6**
Sunderland	DEFRA	-	-	-	-	**94.2**	**94.2**
Sunderland Silksworth	Affiliate	-	-	**87.3**	**97.5**	-	**92.4**
Thurrock	Affiliate	90.3	99.1	**83.2**	**97.4**	97.2	**93.4**
Wicken Fen	DEFRA	-	-	**82.7**	**97.6**	97.5	**92.6**
Wigan Centre	Affiliate	**97.9**	**98.7**	**94.9**	**97.4**	**97.2**	**97.2**

Site	Owner	CO	PM_{10}	NO_2	O_3	SO_2	Site Avg.
Wirral Tranmere	DEFRA	**91.1**	**97.3**	**96.0**	**96.0**	**67.1**	**89.5**
Yarner Wood	DEFRA	-	-	**92.1**	**94.5**	-	**93.3**
N Ireland							
Belfast Centre	DEFRA	**93.3**	93.0	**90.8**	**93.4**	83.9	**90.9**
Derry	Affiliate	**92.5**	**96.0**	**86.1**	**96.1**	**67.6**	**87.7**
Lough Navar	DEFRA	-	97.7	-	**97.8**	-	**97.8**
Scotland							
Aberdeen	Affiliate	**98.7**	**98.3**	**94.0**	**98.6**	**97.0**	**97.3**
Bush Estate	DEFRA	-	-	**92.0**	**98.6**	-	**95.3**
Dumfries	DEFRA	**89.5**	**93.8**	**98.4**	-	-	**93.9**
Edinburgh St Leonards	DEFRA	**96.6**	**72.0**	**96.4**	**97.0**	**96.5**	**91.7**
Eskdalemuir	DEFRA	-	-	**72.8**	**98.3**	-	**85.6**
Fort William	DEFRA	-	-	**85.5**	**75.4**	-	**80.5**
Glasgow Centre	DEFRA	97.9	97.5	**89.4**	**97.5**	**95.1**	**95.5**
Grangemouth	Affiliate	**97.4**	**97.9**	**97.8**	-	**97.9**	**97.8**
Inverness	DEFRA	98.4	**84.2**	**97.5**	-	-	**93.4**
Inverness PM_{10}	DEFRA	-	**91.1**	-	-	-	**91.1**
Strath Vaich	DEFRA	-	-	-	**86.9**	-	**86.9**
Wales							
Aston Hill	DEFRA	-	-	**92.5**	**96.5**	-	**94.5**
Cardiff Centre	DEFRA	**95.9**	**90.9**	**97.7**	**98.0**	**96.6**	**95.8**
Cwmbran	Affiliate	**81.2**	**99.0**	**76.6**	**99.4**	**47.5**	**80.7**
Narberth	DEFRA	-	86.2	86.2	**86.9**	87.0	**86.6**
Swansea Roadside	Affiliate	**98.0**	77.1	97.9	97.6	97.8	**93.0**
Wrexham	DEFRA	**94.3**	**94.1**	**90.2**	-	**93.6**	**93.0**
Wrexham PM_{10}	DEFRA	-	**89.9**	-	-	-	**89.9**

Shaded boxes are for data capture < 90%
Bold data captures are for critical instruments and sites

RECOMMENDATION
Every effort should be made to ensure that data capture is maximised for the critical sites. LSOs and ESUs should undertake call-outs and repairs as soon as possible to avoid unnecessary data loss at these sites.

PART B - Intercalibration Report, January to March 2007

7 Introduction

In July and August 2007, AEA Energy and Environment undertook an intercalibration of the 129 monitoring stations in operation in the Defra and the Devolved Administrations Automatic Urban and Rural Monitoring Network. This has allowed data from all of the analysers in the network to be harmonised to a single set of audit standards, thereby improving confidence in the accuracy, consistency and traceability of air pollution measurements made in the UK.

The tests were undertaken to cross-reference the individual data sets to common traceable calibration standards. This enabled the consistency of measurements throughout the network to be determined. The following major checks are made:

1. Analyser accuracy and precision, as a basic check to ensure reliable datasets from the analysers.
2. Instrument linearity, to check that doubling a concentration of gas to the analyser results in a doubling of the analyser signal response. If an analyser is not linear, data cannot be reliably scaled into concentrations.
3. Instrument signal noise, to check for a stable analyser response to calibration gases.
4. Analyser response time, to check that the analyser responds quickly to a change in gas concentrations.
5. Leak and flow checks, to ensure that ambient air reaches the analysers, without being compromised in any way.
6. NOx analyser converter efficiency, to ensure reliable operation. This is the device that allows the measurement of NO_2 to be undertaken, so it must work correctly.
7. TEOM ko evaluation. The analyser uses this factor to calculate mass concentrations, so the value is calculated to determine its accuracy.
8. Particulate analyser flow rate checks, to ensure that the flow rates through critical parts of the analyser are within specified limits.
9. SO_2 analyser hydrocarbon interference, as certain hydrocarbons are known to interfere with the SO_2 detector.
10. Evaluation of site cylinder concentrations, using a set of AEA certified cylinders that are taken to all the sites. The concentrations of the site cylinders are used to scale pollution datasets, so it is important to ensure that the concentration of gas in the cylinder does not change.
11. Competence of Local Site Operators (LSO) in undertaking calibrations. As it is the calibrations by the LSO's that are used to scale pollution datasets, it is important to check that these are undertaken competently.

In addition to the above tests, a "Network Intercomparison" is conducted. This exercise utilises audit gas cylinders transported to each site in the Network. These cylinders have been recently calibrated by the Calibration Laboratory at AEA, and allow us to examine how different site analysers respond when they are supplied with the same gas used at other sites. For ozone analysers, the calibration is undertaken with recently calibrated ozone photometers.

The technique used to process the intercomparison results is broadly as follows:

- The analyser responses to audit gas are converted into concentrations, using provisional calibration factors obtained on the day of the intercalibration. These factors are also used for the provisional data supplied to the web/teletext.
- These individual results are tabulated, and statistical analyses undertaken (e.g. network average result, network standard deviation, deviation of individual sites from the network mean etc.).

These results are then used to pick out problem sites, or "outliers", which are investigated further to

determine reasons and investigate possible remedies for the outliers. The definition of an outlier is a site result that falls outside the following limits:

- ±10% of the network average for NOx, CO and SO_2 analysers,
- ±5% of the reference standard photometer for Ozone analysers,
- ±2.5 % of the stated ko value for TEOM analysers,
- ±10% for particulate analyser flow rates,
- ±10% for the recalculation of site cylinder concentrations.

Thus, the intercalibration investigates the quality of provisional data output by the Management Units for use in forecasting, teletext and the web. It also provides input into the ratification process by highlighting sites where close scrutiny of datasets is likely to be required.

As stated earlier, any outliers that are identified are rigorously checked to determine the cause, and corrective action taken, if necessary. There are a number of likely main causes for outlier results, as discussed below:

- Drift of an analyser between scheduled LSO calibrations. This is by far the most common cause of an outlier result, and one that is simply corrected for during ratification of data.
- Drift of site cylinder concentrations between intercalibrations. Site cylinders can sometimes become unstable, especially at low pressures. All site cylinder concentrations are checked every six months, and are replaced as necessary.
- Erroneous calibration factors. It can occasionally happen that an analyser calibration is unsuccessful, and results in unsuitable scaling factors being used to produce pollution datasets. These are identified and corrected during ratification.
- Pressurisation of the sampling system at the audit. Occasionally, an analyser can be very sensitive to small changes in applied flow rates of calibration gas. This is more difficult to identify and correct, and may have consequences for data quality.
- Leaks, sample switching valves, etc. Outliers can be generated if an analyser is not sampling ambient air properly. It is likely that if a leaking analyser is identified, data losses will result.

The procedures used to determine network performance are documented in AEA Work Instructions. These methods are regularly updated and improved and have been evaluated by the United Kingdom Accreditation Service (UKAS). AEA holds ISO17025 accreditation for the on-site calibration of all the analyser types (NOx, CO, SO_2, O_3) and for the determination of the TEOM ko factor and particulate analyser flow rates used in the network. An ISO17025 certificate of calibration (Calibration Laboratory number 0401) for the analysers in the AURN is appended to this report.

A total of 128 sites were audited in this exercise; Southwark Roadside was not audited due to site redevelopment plans.

The following sections of this report identify analysers that did not meet performance standards, investigates the possible causes of these results and recommends any remedial action required.

8 Results Summary

The results of the intercalibration are summarised in Table 7.1 below:

Table 7.1 – Summary of audited analyser performance

Parameter	Number of outliers	Number in network	% outliers in total
NOx analyser	29	109	27%
CO analyser	2	77	2%
SO_2 analyser	14	75	18%
Ozone analyser	25	90	28%
TEOM and BAM analysers	1 k_0, 3 flow	48 TEOM PM_{10} 22 FDMS PM_{10} 2 BAM PM_{10} 4 TEOM $PM_{2.5}$ 1 FDMS $PM_{2.5}$	5%
Gravimetric PM analysers	0	8 PM_{10} 1 $PM_{2.5}$	0%
Total	74	437	17%

An outlier is defined as an analyser that shows a deviation from the network mean of greater than 10% for NOx, CO and SO_2 and 5% from the standard photometer for O_3. For PM_{10} and $PM_{2.5}$ analysers, the flow rates must be within 10% of the specified limits and the TEOM ko factor must be within 2.5% of the stated value.

In addition to these results, 20 of the 370 site cylinders (~5%) used to scale instrument data into concentrations appeared to have drifted by more than 10% from their certificated values.

One NOx converter was found to be outside than the ±5% acceptance limit.

The number of analyser outliers identified is similar to the previous exercise. At the summer 2006 intercalibration 17% of the analysers in use were identified as outliers.

Table 7.2 below presents a summary of all results, on a site-by-site basis:

Table 7.2 – Summary of results for AURN intercalibration, Jul - Aug 2007

SITE	Date visited	NO_x	CO	SO_2	O_3	PM_{10}	$PM_{2.5}$
ENGLAND							
Barnsley 12	25/07			OK			
Barnsley Gawber	24/07	Outlier – 30%	OK	Outlier +21%	OK		
Bath Roadside	28/08	OK	OK				
Billingham	14/08	OK					
Birmingham Centre	30/07	Outlier – 12%	OK	OK	OK	OK	
Birmingham Tyburn	21/08	OK	OK	OK	Outlier +12%	Main flow +15%	
Blackpool Marton	09/08	OK	OK	OK	OK	OK	
Bolton	12/09	Outlier	OK	OK	Outlier +9%	OK	

SITE	Date visited	NO_x	CO	SO_2	O_3	PM_{10}	$PM_{2.5}$
		+18% Converter 111%					
Bottesford	30/07				OK		
Bournemouth	08/08	OK	OK	OK	OK	OK	
Bradford Centre	30/07	OK	OK	OK	OK	OK	
Brentford Roadside	09/08	OK	OK				
Brighton Preston Park	15/08	Outlier +20%			OK		
Brighton Roadside	15/08	OK	OK			OK	
Bristol Old Market	20/07	OK	OK	OK	OK	OK	
Bristol St Paul's	17/07	OK	OK				
Bury Roadside	18/07	Outlier +26%	OK	Outlier – 16%	Outlier –8%	OK	
Cambridge Roadside	06/08	OK					
Camden Kerbside	31/07	OK				OK	
Canterbury	14/08	OK				OK	
Coventry Memorial Park	14/08	OK	OK	Outlier +12%	OK	OK	
Exeter Roadside	18/07	OK	Outlier +15%	OK	OK		
Glazebury	17/07	OK			Outlier +16%		
Great Dun Fell	24/07				OK		
Haringey Roadside	12/07	Outlier +17%				Main/Aux – 20%	
Harwell	05/07	OK		OK	Outlier +8%	OK	OK
High Muffles	26/07	OK			Outlier –8%		
Hove Roadside	15/08	OK	OK	OK			
Hull Freetown	31/07	Outlier - 32%	OK	OK	Outlier +21%	OK	
Ladybower	04/09	OK		Outlier +27%	OK		
Leamington Spa	01/08	OK	OK	OK	OK	OK	
Leeds Centre	31/07	Outlier +38%	OK	OK	OK	OK	
Leicester Centre	07/08	Outlier +11%	OK	OK	OK	OK	
Leominster	20/08	OK			OK	OK	
Liverpool Speke	07/08	OK	OK	OK	OK	OK	
London A3 Roadside	03/09	Outlier	OK			OK	

SITE	Date visited	NO_x	CO	SO_2	O_3	PM_{10}	$PM_{2.5}$
		+23%					
London Bexley	28/08	OK	OK	Outlier +17%	OK	OK	
London Bloomsbury	27/06	Outlier +26%	OK	Outlier +20%	OK	OK	OK
London Brent	16/07	OK	OK	OK	OK	OK	
London Bromley	30/08	Outlier -18%	OK				
London Cromwell Road 2	11/10	Outlier -25%	OK	Outlier +24%	OK		
London Eltham	01/08	OK		OK	OK	OK	
London Hackney	11/07	OK	OK		Outlier +7%		
London Haringey	12/07				OK		
London Harlington	05/09	OK			OK	OK	
London Hillingdon	10/07	OK	OK	OK	Outlier +11%	OK	
London Lewisham	21/08	Outlier -13%		OK	Outlier –6%		
London Marylebone Road	30/08	OK	OK	OK	OK	OK	OK
London N. Kensington	26/07	OK	OK	OK	OK	OK	
London Southwark	05/09	OK	OK	OK	OK		
London Teddington	04/07	Outlier -18%		Outlier –14%	Outlier +7%		
London Wandsworth	17/07	OK			Outlier –12%		
London Westminster	06/09	Outlier -15%	OK	OK	OK	OK	
Lullington Heath	03/09	OK		Outlier +15%	OK		
Manchester Piccadilly	23/07	OK	OK	OK	Outlier +6%	OK	
Manchester South	23/07	OK		OK	OK		
Manchester Town Hall	24/07	OK	OK				
Market Harborough	09/07	OK	OK		OK		
Middlesbrough	15/08	OK	Outlier +23%	OK	OK	OK	
Newcastle Centre	13/08	OK	OK	OK	Outlier +7%	OK	
Northampton	15/08	Outlier -12%	OK	Outlier +35%	Outlier +13%	OK	

SITE	Date visited	NO_x	CO	SO_2	O_3	PM_{10}	$PM_{2.5}$
Northampton PM_{10} (Grav)	15/08					OK	
Norwich Centre	22/08	OK	OK	OK	OK	OK	
Norwich Forum Roadside	21/08	OK					
Nottingham Centre	30/07	Outlier +18%	OK	OK	OK	OK	
Oxford Centre Roadside	10/09	OK	OK	OK			
Plymouth Centre	19/07	OK	OK	OK	Outlier –8%	OK	
Portsmouth	03/09	OK	OK	OK	OK	OK	
Preston	09/08	Outlier +22%	OK	OK	OK	OK	
Reading New Town	02/08	OK	OK	OK	Outlier – 20%	OK	
Redcar	14/08	OK	OK	OK	OK	OK	
Rochester Stoke	14/08	OK		OK	OK	OK	OK
Rotherham Centre	25/07	Outlier - 26%		OK	Outlier – 10%		
Salford Eccles	24/07	OK	OK	Not tested	OK	OK	
Sandwell West Bromwich	16/07	OK	OK	OK	OK		
Scunthorpe Town	25/06			OK		OK	
Sheffield Centre	25/07	OK	OK	OK	OK	OK	
Sheffield Tinsley	23/07	Outlier +12%	OK				
Sibton	21/08				OK		
Somerton	19/07	OK			OK		
Southampton Centre	23/08	Outlier +29%	OK	OK	OK	OK	
Southend-on-Sea	13/08	OK	OK	OK	Outlier +28%	OK	
Southwark Roadside	Not tested						
St Osyth	23/08	OK	OK		OK		
Stockport Shaw Heath	25/07	OK	OK	Not tested		k_0 +3.1%	
Stockton-on-Tees Yarm	14/08	OK	OK			OK	
Stoke-on-Trent Centre	09/07	Outlier - 13%	OK	OK	Outlier – 16%	OK	
Sunderland	15/08			OK			

SITE	Date visited	NO_x	CO	SO_2	O_3	PM_{10}	$PM_{2.5}$
Sunderland Silksworth	15/08	OK			OK		
Thurrock	07/08	OK	OK	OK	OK	OK	
Tower Hamlets Roadside	22/08	OK	OK				
Walsall Alumwell	27/09	OK					
Walsall Willenhall	29/08	OK					
West London	04/09	Outlier +13%	OK				
Weybourne	21/08				OK		
Wicken Fen	06/08	OK		Outlier +13%	Outlier –6%		
Wigan Centre	17/07	OK	OK	OK	OK	OK	
Wirral Tranmere	08/08	OK	OK	OK	OK	OK	
Wolverhampton Centre	02/08	OK	OK	OK	Outlier +17%	OK	
Yarner Wood	06/09	OK			OK		
NORTHERN IRELAND							
Belfast Centre	07/08	OK	OK	OK	Outlier +17%	OK	
Belfast Clara St	07/08					OK	
Belfast East	07/08			OK			
Derry	21/08	OK	OK	OK	OK	OK	
Lough Navar	14/08				OK	OK	
SCOTLAND							
Aberdeen	17/07	OK	OK	OK	OK	OK	
Auchencorth Moss	12/07				OK	OK	OK
Auchencorth Moss Partisols	12/07					OK	OK
Bush Estate	12/07	OK			OK		
Dumfries	24/07	OK	OK			OK	
Edinburgh St Leonards	11/07	Outlier +15%	OK	OK	OK	OK	
Eskdalemuir	25/07	OK			OK		
Fort William	04/07	OK			OK		
Glasgow Centre	02/07	OK	OK	OK	Outlier – 18%	OK	
Glasgow City Chambers	06/07	OK	OK				

SITE	Date visited	NO_x	CO	SO_2	O_3	PM_{10}	$PM_{2.5}$
Glasgow Kerbside	02/07	OK	OK			OK	
Grangemouth	11/07	Outlier +16%	OK	Outlier +14%	OK	Main Flow –11%	
Inverness	18/07	OK	OK			OK	
Lerwick	31/07				Outlier – 11%		
Strath Vaich	19/07				OK		
WALES							
Aston Hill	05/09	OK			Outlier –7%		
Cardiff Centre	11/07	Outlier - 14%	OK	OK	OK	OK	
Cwmbran	11/07	OK	OK	OK	OK	OK	
Narberth	09/07	Outlier +22%		OK	OK	OK	
Port Talbot	10/07	Outlier - 12%		OK	OK	OK	
Swansea Roadside	10/07	OK	OK	OK	OK	OK	OK
Wrexham	06/08	OK	OK	OK		OK	
Wrexham BAM	06/08					OK	
IRELAND							
Mace Head	15/08				OK		

The following sections look at each pollutant in turn and investigate causes for outliers.

9 Oxides of Nitrogen

9.1 Intercalibration Outliers

The intercalibration highlighted that the results from 29 sites were outside the ±10% acceptance limit from the network mean. This result is slightly better than the winter 2007 exercise, when 31 analysers were identified as outliers.

8 outliers can be attributed to significant changes in the site cylinder concentrations, as listed below:

1. Brighton Preston Park
2. London Bloomsbury (outlier at previous intercal)
3. Edinburgh St Leonards (outlier at previous intercal)
4. Leeds Centre
5. Leicester Centre
6. Southampton Centre
7. Grangemouth
8. Narberth

A further 5 outliers arose as a result of minor changes in site cylinder concentrations:

1. Northampton
2. Preston (minor outlier at previous intercal)
3. Rotherham Centre
4. Sunderland Silksworth
5. Glasgow Centre

The actions arising as a result of cylinder outliers are described in Section 14.

Data from all the affected sites has been carefully examined and rescaled as needed. No data have been lost as a result of the rescaling.

The outliers at Bolton and London A3 were proved to be due to poor analyser performance, resulting in data rejection at these sites.

The outliers at three sites; Barnsley Gawber, Hull and Nottingham appear to be due to poorly performing analysers on the day of the audit. Data from all of these sites have been carefully examined during ratification, no rejection was required.

The remaining 10 outliers can be attributed to drifts in calibration factors between LSO calibrations and no data will be lost as a result of these findings.

Using the methodology detailed in Section 6, comparison of the network averages to audit cylinder concentrations showed that the network measures concentrations of NOx, NO and NO_2 to within 1.2% of the network standards. The percentage standard deviations of these results, which are an indication of how close the results are grouped together, were less than 5% in all cases. These are excellent results, and demonstrate that raw data from the vast majority of NOx analysers are accurate, harmonised and traceable to national metrology standards.

9.2 Leaking switching valves

This phenomenon has been observed as a significant cause of outliers in NOx analysers. When NO_2 gas is used for calibration, some analysers have been seen to produce a significant NO signal. This gives cause for concern, because a cylinder of NO_2 will be virtually 100% NO_2, very little NO will be present in the mixture.

Analysers that exhibit this behaviour could be underestimating concentrations of NO_2, as highlighted by the following three analysers:

1. Hove Roadside – measured 25 ppb NO in an NO_2 cylinder ® (not outlier)
2. London Wandsworth - measured 42 ppb NO in an NO_2 cylinder (not outlier)
3. Dumfries - measured 13 ppb NO in an NO_2 cylinder (not outlier)

® denotes a repeat offender

These results are better than those found at the winter exercise where 6 analysers were seen to have this response.

The most likely cause for this observation is a leaking switching valve inside the analyser. The valves cycle the analysers between sampling NOx, NO and, on some models, reference gases, and any leaks within these systems appear to manifest themselves when calibrating the analysers with NO_2 gas. In many ways, this phenomenon is similar to the leaking main valve faults common to ozone analysers. Unfortunately, as the valves are inside the analysers, it is not possible for LSO's or QA/QC to leak check these valves.

Recommendation

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.

These faults were highlighted to the ESU's in the weekly report emails during the intercalibration, to ensure that particular attention was paid to servicing and cleaning these switching valves during services, to try to minimise the occurrence of these outliers. Through rapid identification and close cooperation with ESUs, occurrences of this phenomenon have seen significant reductions since it was first observed.

Recommendation

It is strongly recommended that ESU's clean all NOx analyser switching valves during servicing, and ensure the valve is leak checked afterwards.

AEA will continue to monitor these results at audit visits.

9.3 Converter Tests

Just one converter was found to be outside the ±5% acceptance limit: Bolton (111%). As noted earlier, significant data rejection has resulted from this result.

10 Carbon Monoxide

The intercalibration showed that the results from two analysers were outside the ±10% acceptance criterion. This result is better than the winter intercalibration, when five analysers were outside the required performance standards.

The outlier at Middlesbrough appears to be due to poorly performing analysers on the day of the audit. This result has been carefully examined during ratification and data have been rescaled as necessary with no rejection required.

The outlier at Cwmbran was caused by instrument drift between calibrations: no data will be lost as a result of the audit findings.

Comparison of the network average to the audit cylinder concentration showed that the network measures CO concentrations to within 1% of the reference standard. The percentage standard deviation was less than 4%.

These are excellent results, and demonstrate that data from the CO analysers are accurate, harmonised and traceable to national metrology standards.

11 Sulphur Dioxide

11.1 Intercalibration Outliers

The intercalibration showed that the results from 14 analysers were outside the ±10% acceptance criterion. This is worse than the winter intercalibration, when 8 analysers were identified as outliers.

10 outliers can be attributed to changes in the site cylinder concentrations, as listed below:

1. Barnsley Gawber

2. Ladybower
3. Bexley
4. London Bloomsbury
5. London Teddington
6. Lullington Heath
7. Wicken Fen
8. Narberth
9. Bristol St Paul's
10. Middlesbrough

Actions arising from cylinder outliers are described in Section 14. Data from all the affected sites has been carefully examined and rescaled as needed. No data have been lost as a result of the rescaling.

Three outliers can be attributed to drifts in calibration factors between LSO calibrations, and no data were lost as a result of this.

The outlier at Rotherham arose as a result of problems encountered at the audits. No data were lost as a result of these investigations.

Comparison of the network average to the audit cylinder concentration showed that the network measures SO_2 concentrations to within 2% of the reference standard. The percentage standard deviation was less than 5%. These are good results, and demonstrate that data from the SO_2 analysers are accurate, harmonised and traceable to national metrology standards.

11.2 m-Xylene tests

The efficiency of the hydrocarbon "kicker" was evaluated with a 1 ppm m-xylene cylinder. The kicker selectively removes hydrocarbons from the sample inlet prior to analysis. This is an important test, because m-xylene behaves in a similar manner to SO_2 when exposed to UV light within the analyser, and could therefore interfere with the analyser response, if the kicker does not function properly.

To pass the test, the analyser must not respond by more than 1% (10 ppb) of the m-xylene cylinder concentration. However, it should be noted that this particular test is very demanding; typical ambient hourly maximum concentrations of this pollutant rarely exceed 50 ppb, and annual concentrations rarely exceed 5 ppb. In future, there will be no formal requirement for analysers in the field to pass this test, once type approval has been granted. For these reasons, the acceptance criteria have been relaxed to allow a maximum response of 50ppb.

There were no outliers identified during this intercalibration: the maximum m-xylene response observed for any analyser was 40ppb (at Norwich Centre)

12 Ozone

Calibration of the network analysers against the AEA reference photometers showed that 25 analysers were outside the ±5% acceptance criterion. This is better than the previous exercise, where 35 analysers tested were identified as outliers.

Of the 25 analysers, 12 had responses within 10% of the reference photometers; ratification of these datasets was straightforward, with no loss of data.

11 of the remaining analysers had responses between 10 and 20% of the reference photometers. Ratification of the data from these analysers has been more complex, to ensure that suitable scaling of the data could be applied, but no losses of data were necessary.

The other 2 analysers were more than 20% from the reference photometers. Detailed investigations have shown that data from Hull and Southend-on-Sea can be successfully rescaled with no loss of data.

These results are better than the winter intercalibration, when 4 analysers were found to be more than 20% from the reference photometer. The number of severe outliers continues to decrease, a direct result of the corrective actions described below:

During this intercalibration, AEA continued the follow-up programme to identify root causes for these outliers. This involved a multi-staged approach, as described below:

- ESU's were promptly informed of any ozone analysers identified as gross outliers.
- The ESU was asked to confirm this result pre-service before commencing with the service. If the QA/QC and ESU results were in good agreement, no further action in the field was required.

- If the two results disagreed, further investigations were undertaken; either by QA/QC undertaking a repeat site audit or by the ESU returning their photometers to Harwell to determine their stability.

As a result of these findings and subsequent investigations, the calibrations by QA/QC were found to be valid for both of the gross outliers, which are investigated below:

1. The analyser at Southend-on-Sea was found to have been set up incorrectly by the ESU.
2. The data from Hull Freetown was rescaled and the analyser reset correctly at the ESU service

The programme continues to be successful, both in terms of improving data quality from site analysers and in improving the performance of ESU's and their photometers. We will continue to use this tool to ensure high quality ozone data in future intercalibration exercises.

13 Particulate analysers

13.1 TEOM Ko

There was a single outlier for TEOM ko identified, at Stockport Shaw Heath, during this intercalibration. The previous exercise found all analysers tested were within the required 2.5% limit.

13.2 Analyser Flow Rates

The flow rates of the analysers at three sites were found to be outside the ±10% acceptance limit:

1.	Birmingham Tyburn	(Main Flow +15%)
2.	Grangemouth	(Main Flow -11%)
3.	Haringey Roadside	(Main Flow -12%, Aux Flow -12%)

The analysers at Bolton, Bury Roadside, Leamington Spa, London Eltham, London Hillingdon and London Harlington also failed the leak tests.

The analyser datasets have been carefully examined, and the data from all these instruments have been rescaled accordingly, with no data rejection required.

13.3 New PM Analysers

For this intercalibration exercise, twenty-one new and upgraded FDMS analysers were audited – as part of a programme of PM analyser replacement to compliant monitoring techniques. These

analysers were all found to be operating satisfactorily.

14 Site Cylinder Concentrations

During the intercalibration, the concentrations of the on-site cylinders were evaluated using the audit cylinder standards. The calculated results showed that 20 of the 370 cylinders (~5%) used to scale analyser data into concentrations (NO, CO and SO_2) were outside the ±10% acceptance criterion. This is slightly worse than the winter 2007 exercise, where 16 cylinders were outside the acceptance limits.

During this exercise, the following poorly performing site cylinders were replaced:

1. Edinburgh St Leonards NO
2. Southampton Centre NO
3. London Bexley SO_2

The outlier identified at Bexley was caused by a problems encountered at the audit. A replacement cylinder was installed at the site, but the original cylinder was within specification. As a result of this investigation, no data rescaling was required and no data rejection necessary.

In determining which cylinders should be replaced or reanalysed, the analyser and audit performance is taken into account, as well as previous audit results for each cylinder. The NO cylinders from Edinburgh and Southampton were returned to AEA for reanalysis to assist in the data ratification process. The remaining 17 cylinders were retained at site and their performance reassessed at the Winter 2008 intercalibration.

In addition, the concentrations of 35 NO_2 cylinders appear to have drifted by more than 10%. NO_2 cylinders are not used for the scaling of data and so will not be replaced at this time. Hence, a total of 55 of the 377 cylinders were outside the acceptance limits. This is slightly worse than the previous intercalibration, where 49 of the cylinders were found to be out of specification.

The site cylinder evaluations are performed by calibrating the analysers with site and audit cylinder gas through the same inlet system, and using the conditioned site cylinder regulators, thus minimising any possible errors due to contaminated tubing or regulators.

15 Site Information

We have compiled additional information about the monitoring stations in the network, including the types of sampling systems deployed on site. This database has been made available to Management Units and can be emailed to other parties, on request. During this intercalibration exercise, QA/QC unit have made considerable effort in ensuring that site locations are accurate on the new Google Earth site information and AQ archive pages. All future additions to the AURN will include accurate positioning using Google Earth.

16 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 (SO2), 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. 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 uncertainty of the site cylinder concentrations is, by and large, the largest single component of the entire measurement uncertainty budget. Recent intercalibrations have been used to evaluate a new methodology for calculating site cylinder concentrations and uncertainties. Unfortunately, it was discovered that analyser performance could not be relied upon to allow the scaling of cylinder concentrations with sufficient accuracy, particularly so for NOx analysers. It is likely that site environmental conditions (for example temperature variations) significantly affected these assessments. QA/QC are currently investigating alternative methodologies and will report on these in the future.

- The determination of an SO_2 analyser response to meta-xylene will not be required for ongoing field tests. For the AURN, QA/QC 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)

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 up to 5 years after enactment of the Directive to ensure their monitoring networks are compliant. AEA are taking 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 intercomparisons have been fully compliant with the CEN protocols since January 2006.

17 Safety

AEA undertakes regular extensive risk assessments of all its activities on-site, to ensure that it’s staff are not exposed to unsafe practices while working.

The most significant risk to field operators remains safe access to PM sample inlets to perform flow tests. This gains increased importance with FDMS analysers, where meaningful flow tests are impossible if access to the sample inlet cannot be achieved. It is not possible to measure flows at the sample inlet at the following sites:

Table 16.1 Actions Required for Safe Roof Access

Site	Action required
Camden Kerbside	Needs ladder restraints
Haringey Roadside	Needs ladder restraints
London Brent	Roof access required, needs barrier
London Harlington	Needs ladder restraints
London North Kensington	Needs ladder restraints
London Westminster (Partisol)	Needs ladder restraints
Teddington	Will need ladder restraints
Birmingham Centre	Needs ladder restraints
Sandwell	Needs ladder restraints

Site	Action required
Bolton	Roof access required, needs barrier
Bury Roadside	Needs ladder restraints
Manchester Piccadilly	Needs roof access
Salford Eccles	Needs restraints
Liverpool Speke	Has half barrier - needs full barrier
Bristol St Paul's	Needs ladder restraints
Middlesborough	Roof access required, needs barrier
Bournemouth (Partisol)	Needs ladder restraints
Coventry Memorial Park	Sloping roof - access not possible
Hull Freetown	Needs ladder restraints
Southampton Centre	Needs ladder restraints
Southend on Sea	Sloping roof - access not possible
Glasgow Kerbside	needs new ladder support or railings
Port Talbot	Needs restraints
Swansea Roadside (FDMS TEOM)	Needs restraints
Belfast Clara Street	Sloping roof - needs ladder securing or railings
Thurrock	Sloping roof - access not possible
Plymouth Centre	Roof access required, needs barrier
Northampton (TEOM + Partisol)	Needs ladder restraints
Scunthorpe Town	Needs ladder restraints
Leamington Spa	Needs ladder restraints
Sunderland Silksworth	Needs ladder restraints
Grangemouth	needs ladder supports or railings
Aberdeen	needs ladder supports or railings
Cwmbran	Needs ladder restraints
Wrexham (Partisol)	Use stepladder for Partisol, need restraints for BAM

It is recommended that roof access at these sites is investigated, to determine whether safe access can be achieved.

18 Certification

The Network Certificate of Calibration is presented in Appendix B1. This certificate presents the results of the individual analyser scaling factors on the day of the audit, as calculated by AEA using the audit cylinder standards, in accordance with our ISO17025 accreditation.

19 Summary

The intercalibration exercise has demonstrated its value as an effective tool in determining overall site performance and assessing the reliability and traceability of air quality measurements from a large scale network. The results from this intercalibration have been used to assess data quality during the ratification of the network datasets for the period April to September 2007.

Appendices

Appendix A1: Recommendations for Upgrade or Replacement of Equipment

Appendix A2: Critical Sites in the AURN (January 2007)

Appendix A3: Inventory of Defra-Owned Equipment

Appendix A4: Summary of Recommendations

Appendix A5: Partisol Data Ratification Report

Appendix B1: Certificate of Calibration

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		
	None		
	Recommendations August 2007	**Priority**	**Action**
	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 October 2006		
20	The poorly performing analyser at Bolton (NOx) should be repaired or replaced at the earliest opportunity-see Action 22	High	ESUs to repair or replace as appropriate
	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 2.4	High	Many sites now cured, but some need attention at next ESU visit

Appendix A2

Critical Sites In The AURN (September 2007)

Table A1 Critical Sites in Agglomerations

Site Name	Agglomeration	Critical Pollutants		
		DD1	DD2[7]	DD3
Belfast Centre	Belfast Urban Area	NO_2	CO	NO_2 O_3
Blackpool Marton	Blackpool Urban Area	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Bournemouth+	Bournemouth Urban Area	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Brighton Preston Park	Brighton/Worthing/Littlehampton			NO_2 O_3
Brighton Roadside PM_{10}	Brighton/Worthing/Littlehampton	PM_{10}		
Bristol St Pauls	Bristol Urban Area	PM_{10} SO_2		NO_2 O_3
Cardiff Centre	Cardiff Urban Area	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Coventry Memorial Park+	Coventry/Bedworth	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Edinburgh St Leonards	Edinburgh Urban Area	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Glasgow Centre	Glasgow Urban Area	SO_2		NO_2 O_3
Hove Roadside+	Brighton/Worthing/Littlehampton	SO_2		
Hull Freetown	Kingston upon Hull	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Leicester Centre	Leicester Urban Area	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Liverpool Speke	Liverpool Urban Area	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Newcastle Centre	Tyneside	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Nottingham Centre	Nottingham Urban Area	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Portsmouth+	Portsmouth Urban Area	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Preston	Preston Urban Area	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Reading New Town	Reading/Wokingham Urban Area	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Sheffield Centre	Sheffield Urban Area	PM_{10}		
Southampton Centre	Southampton Urban Area	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Southend-on-Sea	Southend Urban Area	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Stoke-on-Trent Centre	The Potteries	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Swansea Roadside+	Swansea Urban Area		CO	
Wirral Tranmere	Birkenhead Urban Area	NO_2 PM_{10} SO_2	CO	NO_2 O_3

"+ indicates Affiliate site"

Note 7: Addresses CO, Benzene not included here

Table A2 Critical Sites in Zones

Site Name	Zone	Critical Pollutant		
		DD1	DD2[7]	DD3
Aberdeen+	North East Scotland	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Aston Hill	North Wales			NO_2 O_3
Barnsley Gawber+	Yorkshire & Humberside	NO_2	CO	NO_2 O_3
Bush Estate	Central Scotland			NO_2 O_3
Canterbury+	South East	PM_{10}		
Cwmbran+	South Wales	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Derry+	Northern Ireland	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Dumfries	Scottish Borders	NO_2 PM_{10}	CO	
Eskdalemuir	Scottish Borders			NO_2 O_3
Fort William	Highland			NO_2 O_3
Glazebury	North West & Merseyside			NO_2 O_3
Grangemouth+	Central Scotland	NO_2 PM_{10} SO_2	CO	
Great Dun Fell	North West & Merseyside			O_3[3]
High Muffles	Yorkshire & Humberside			NO_2 O_3
Inverness	Highland	NO_2 PM_{10}		
Leamington Spa+	West Midlands	PM_{10} SO_2	CO	NO_2 O_3
Leominster	West Midlands			NO_2 O_3
Lough Navar	Northern Ireland			O_3[3]
Narberth	South Wales			O_3[3]
Northampton+	East Midlands	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Northampton PM_{10}	East Midlands	PM_{10}		
Norwich Centre	Eastern			NO_2 O_3
Oxford Centre Roadside+	South East	SO_2	CO	
Plymouth Centre	South West	PM_{10}		
Scunthorpe Town+	Yorkshire & Humberside	PM_{10}		
Sibton	Eastern			O_3[3]
Somerton	South West			NO_2 O_3
St Osyth	Eastern			NO_2 O_3
Stockton-on-Tees Yarm+	North East	NO_2 PM_{10}	CO	
Strath Vaich	Highland			O_3[3]
Sunderland	North East	SO_2		
Sunderland Silkworth+	North East			NO_2 O_3
Thurrock	Eastern			NO_2 O_3
Wicken Fen	Eastern			NO_2 O_3
Wigan Centre+	North West & Merseyside	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Wrexham	North Wales	NO_2 PM_{10} SO_2	CO	
Yarner Wood	South West			NO_2 O_3

Total of 62 Critical Sites (25 in Agglomerations and 37 in Zones)
51% of network stations critical under one or more Daughter Directives
"+ indicates Affiliate site"

Note 3: DD3 Critical as Rural Background station
Note 7: Addresses CO, Benzene not included here

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
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	Improve data capture at critical sites	LSOs and ESUs should undertake call-outs as soon as possible at these sites	3.1 and 5	LSOs and ESUs
2	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 .3	ESUs
3	Poor performance of analysers-see Section 4	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.	4.2	ESU
4		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.	9.2	
5		It is strongly recommended that ESU's clean all NOx analyser switching valves during servicing, and ensure the valve is leak checked afterwards.	9.2	

Appendix A5

Partisol Data Ratification

DD1 Partisol Data Ratification: July-September 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 July	30th September	52% (100% from 14th Aug)
Auchencorth Moss $PM_{2.5}$	1st July	30th September	95%
Bournemouth PM_{10}	1st July	30th September	89%
Brighton Roadside PM_{10}	1st July	30th September	86%
Dumfries PM_{10}	1st July	30th September	93%
Inverness PM_{10}	1st July	30th September	82%
London Westminster	1st July	30th September	95%
Northampton	1st July	30th September	92%
Wrexham	1st July	30th September	99%

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.

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.

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 >	Reject only if < 18h

	$\pm$5°C, causing Elapsed Sample Period out of range (< 23 hours or >25 hours).	valid data or vol < 18 m3.
100008	Elapsed Sample Period out of range (< 23 hours or >25 hours), *and* Power Failure.	Yes (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

All sites are now on telemetry.

Auchencorth Moss

Note: There has been a major problem with this site. Ratification highlighted numerous days when $PM_{2.5}$> PM_{10}, which in theory should not be the case. Further investigation showed that both partisols had been fitted with $PM_{2.5}$ heads by mistake. This was corrected on 13th August. Since then, one Partisol has been monitoring PM_{10} and one $PM_{2.5}$ as originally planned.

PM_{10}: Data capture was 52% for this quarter, as PM_{10} sampling only started on 14th Aug.

$PM_{2.5}$: Data capture 95%.

Data losses:

- Upto 14th Aug: all PM_{10} data rejected as sampler was monitoring $PM_{2.5}$.
- 7th – 13th August: $PM_{2.5}$ filter exchange failure.

Bournemouth

Data capture in this quarter was 89%. Data losses as follows:

- 18th July – suspiciously high value of 138 µg m^{-3}: rejected.
- 16th – 20th Aug – delayed filter change
- 4th – 6th Sep – delayed filter change
- 7th Sep: filter change failure

Brighton Roadside

Data capture in this quarter was 86%. Data losses:

- Delayed filter changeovers on 5th – 6th Jul, 31st Jul – 7th Aug, 21st Sep
- Filter exchange failure 22nd – 23rd Aug.

Dumfries

Data capture was 93%. Data losses:

- 14th – 16th Jul: filter exchange failure
- 3rd Aug: delayed filter changeover
- 8th Aug routine service, < 18h sampling
- 13th Aug filter exchange failure

Inverness
Data capture = 82%. Data losses:

- 25th July – less than 18h sampling
- 8th – 16th Aug – delayed filter change
- 12th – 19th Sep – delayed filter change

This Partisol continues to have a lot of P & R1 status codes, although none cause data loss. Two delayed filter changes caused significant data loss.

London Westminster
Data capture = 95%. Data losses:

- 23rd – 24th Aug – delayed filter change
- 28th – 30th Sep – power failure.

Northampton
Data capture was 92%. Data losses –

- 6th – 8th Aug: pump failure
- 7th Sep: value appears too low (3 µg m^{-3}) rejected by BV.
- 8th – 10th Sep: filter exchange failure.

Note: for the 4th consecutive quarter, filter exchange failures are a problem at this site

Wrexham
Data capture was 99%. 1 day's data was lost:

- 18th Sep: filter exchange failure

Appendix B1

Certificate of Calibration

AEA Energy & Environment
From the AEA group

CERTIFICATE OF CALIBRATION

551.11, Harwell, Didcot, Oxfordshire OX11 0QJ. Telephone 0870 1906465 Fax 0870 1906377

UKAS CALIBRATION
0401

Certificate Number: 1903
AEA Identification Number: ED45077030

Approved Signatories: K. Stevenson
S. Eaton ✓

Signed: Date:

Date of issue: 31 March 2008

Customer Name and Address: Dr Janet Dixon
AEQ Division
Department for Environment, Food and Rural Affairs
Ashdown House (Zone E14)
123 Victoria Street
London SW1E 6DE

Description: Calibration factors for monitoring stations in the Automatic Urban Monitoring Network

1. Carbon Monoxide

Date Year =2007	Site	Analyser number	[1]Zero output	Uncertainty (ppm)	[2]Calibration Factor	Uncertainty (%)	*Maximum Residual (%)
	Scottish Sites						
17/07	Aberdeen	614	0	0.3	0.995	3	3.9
24/07	Dumfries	1498	-2	0.3	1.031	3	3.2
11/07	Edinburgh St Leonards	240	0	0.3	0.997	3	2.6
02/07	Glasgow Centre	0410-009	-58	0.3	0.051	3	1.1
06/07	Glasgow City Chambers	721	0	0.3	0.984	3	1.8
02/07	Glasgow Kerbside	h-ar-002	-2	0.3	0.052	3	1.2
11/07	Grangemouth	1710	1	0.3	1.010	3	1.5
18/07	Inverness	1500	-0.1	0.3	1.013	3	4.1
	Welsh Sites						
11/07	Cardiff Centre	14333	0	0.3	0.985	3	1.4
11/07	Cwmbran	103006	0	0.3	1.349	3	0.9
10/07	Swansea Roadside	16696	-1	0.3	1.005	3	4.0
06/08	Wrexham	12556	0	0.3	1.012	3	0.8
	N.Irish Sites						
07/08	Belfast Centre	1811-m491	42	0.3	0.050	3	2.2
21/08	Derry	j-ar-009	3	0.3	0.053	3	2.7

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95% The uncertainty evaluation has been carried out in accordance with UKAS requirements.

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Certificate Number: 1903
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Date Year =2007	Site	Analyser number	[1]Zero output	Uncertainty (ppm)	[2]Calibration Factor	Uncertainty (%)	*Maximum Residual (%)
	English Sites						
24/07	Barnsley Gawber		0	0.3	0.045	3	2.2
28/08	Bath Roadside	16904	-25	0.3	0.045	3	1.0
30/07	Birmingham Centre	258	3	0.3	0.051	3	1.2
21/08	Birmingham Tyburn	106006	1	0.3	1.067	3	2.9
09/08	Blackpool Marton	l-ar-010	1	0.3	0.047	3	1.6
12/09	Bolton	440	4	0.3	0.923	3	0.3
08/08	Bournemouth	1501	0	0.3	1.045	3	3.2
30/07	Bradford Centre		0	0.3	0.053	3	2.7
15/08	Brighton Roadside	1434	2	0.3	1.132	3	2.8
20/07	Bristol Old Market	10429	-1	0.3	0.954	3	3.0
17/07	Bristol St Paul's	14417	1	0.3	1.032	3	1.3
18/07	Bury Roadside	1581	0	0.3	1.023	3	1.9
14/08	Coventry Memorial Park		0	0.3	1.146	3	1.8
18/07	Exeter Roadside	70s	-2	0.3	1.072	3	3.8
15/08	Hove Roadside	1433	1	0.3	1.030	3.1	2.9
31/07	Hull Freetown	M489	52	0.3	0.051	3	2.0
01/08	Leamington Spa	2198	20	0.3	0.050	3	2.2
31/07	Leeds Centre	207003	0	0.3	1.052	3	2.2
07/08	Leicester Centre	207004	0	0.3	1.036	3	1.3
07/08	Liverpool Speke	m-487	51	0.3	0.049	3	0.6
03/09	London A3 Roadside		-3	0.3	0.050	3	1.2
28/08	London Bexley	443	0	0.3	0.990	3	0.9
27/06	London Bloomsbury	14330	8	0.3	0.051	3	7.4
16/07	London Brent	339	21	0.3	0.050	3	1.0
11/10	London Cromwell Rd2	868	9	0.3	0.051	3	0.5
11/07	London Hackney	546	0	0.3	1.123	3	4.4
05/09	London Harlington	11492	1	0.3	1.001	3	1.1
10/07	London Hillingdon	Gra04-055	24	0.3	0.050	4.3	13.9
30/08	London Marylebone Road	10073	1	0.3	0.999	3	0.9
26/07	London N. Kensington	360	1	0.3	1.042	5.2	4.8
05/09	London Southwark	843	0	0.3	0.936	3	3.5
06/09	London Westminster	867	15	0.3	0.049	3	2.0
24/07	Manchester Town Hall	720	0	0.3	1.042	3	1.7
09/07	Market Harborough	60983	157	0.3	0.005	20.1	2.0
15/08	Middlesbrough	14202	0	0.3	0.980	3	4.8
13/08	Newcastle Centre	M488	54	0.3	0.051	3	0.5
15/08	Northampton	8905410102	0	0.3	1.005	3	0.9
22/08	Norwich Centre	207002	0	0.3	1.005	3	0.3
30/07	Nottingham Centre	grao470010	4	0.3	0.048	3	6.9
10/09	Oxford Centre Roadside	127	106	0.3	0.050	3	2.2
19/07	Plymouth Centre	0410-007	0	0.3	0.962	3	2.5
03/09	Portsmouth	902015	0	0.3	1.179	3.1	0.5
09/08	Preston	l-ar-013	8	0.3	0.051	3	2.7

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k = 2 , providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

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Certificate Number: 1903
AEA Identification Number: ED45077030

Date Year =2007	Site	Analyser number	[1]Zero output	Uncertainty (ppm)	[2]Calibration Factor	Uncertainty (%)	*Maximum Residual (%)
02/08	Reading New Town		7	0.3	0.043	3	2.4
14/08	Redcar	10194	-9	0.3	0.041	3.3	3.1
24/07	Salford Eccles	2386	0	0.3	1.005	3	0.7
16/07	Sandwell West Bromwich		0	0.3	1.229	3	1.5
25/07	Sheffield Centre	gra910006	2	0.3	0.061	10.5	2.3
23/07	Sheffield Tinsley	95487	8	0.3	0.048	10.4	0.7
23/08	Southampton Centre	m490	43	0.3	0.050	3	1
13/08	Southend-on-Sea		0	0.3	1.017	3	2
23/08	St Osyth	60872	0	0.3	0.898	29.4	5.3
25/07	Stockport Shaw Heath	M340	19	0.3	0.050	3.4	2.4
14/08	Stockton-on-Tees Yarm	3c002rh	1	0.3	1.059	3	3.7
09/07	Stoke-on-Trent Centre		10	0.3	0.055	3	3.1
07/08	Thurrock	262	10	0.3	0.050	3	1.8
22/08	Tower Hamlets Roadside	272	5	0.3	1.056	3	0.2
04/09	West London	828	2	0.3	0.052	3	2.8
17/07	Wigan Centre	6011	0	0.3	1.042	3	0.8
08/08	Wirral Tranmere		0	0.3	0.051	3	1.5
02/08	Wolverhampton Centre	410	-8	0.3	0.046	3	3.8

2. Sulphur Dioxide

Date Year =2007	Site	Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max Residual (%)	*m-xylene interference (ppb)
	Scottish Sites							
17/07	Aberdeen	1180	0	4.2	1.016	5.6	2.5	18.4
11/07	Edinburgh St Leonards	71	3	4.2	1.015	7.4	4.4	23.3
02/07	Glasgow Centre	43c 1400	9	4.1	0.207	5.5	2.2	1.3
11/07	Grangemouth	703b-274	2	4.3	1.031	6.4	2.3	17.8
	Welsh Sites							
11/07	Cardiff Centre	14319	4	4.2	1.072	6	5.5	3.2
11/07	Cwmbran	408001	-12	4.2	1.009	5	2.5	0
09/07	Narberth	Rag 4580	33	4.1	0.674	5.7	2.1	6.7
10/07	Port Talbot	11669	0	4.2	1.025	5	1.5	0
10/07	Swansea Roadside	16694	0	4.4	1.657	5	0.5	5.0
06/08	Wrexham	12183	6	4.4	1.199	5	2.8	16.2
	N.Irish Sites							
07/08	Belfast Centre	1637-m637	193	4	0.211	5.4	1.1	21.1
07/08	Belfast East	703	0	4.2	1.133	5	0.3	17.1
21/08	Derry	j-ar-009	27	4.4	1.820	8.5	2.8	9.1
	English Sites							
25/07	Barnsley 12	10781	5	4.2	0.962	5	1.9	26.0
24/07	Barnsley Gawber		97	4.2	1.087	5	1.4	26.1
30/07	Birmingham Centre	85	5	4.1	0.739	5.5	4.7	20.7
21/08	Birmingham Tyburn	301002	1	4.1	0.929	5	1.5	16.7

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k = 2 , providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

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UKAS CALIBRATION
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Certificate Number: 1903
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Date Year =2007	Site	Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max Residual (%)	*m-xylene interference (ppb)
12/09	Bolton	760	-1	4.2	1.034	5	1.6	14.5
08/08	Bournemouth	1179	0	4.2	1.037	5	0.9	10.3
30/07	Bradford Centre		61	5.1	1.454	6.6	4.1	24.4
17/07	Bristol St Paul's	14322	2	4.2	1.093	5.3	2.0	10.9
18/07	Bury Roadside	1357	-2	4.3	0.948	5	2.0	3.3
14/08	Coventry Memorial Park		2	4.3	1.051	5.6	1.9	0.5
18/07	Exeter Roadside	F1s	1	4.2	0.981	5.1	1.9	21.6
05/07	Harwell	83	7	4.1	0.509	5	0.3	5.9
15/08	Hove Roadside	1178	-3	4.2	1.085	7.1	2.1	15.2
31/07	Hull Freetown	M686	238	4	0.177	8.3	5.7	20.3
04/09	Ladybower	84	-18	4.1	0.615	5	1.0	0
01/08	Leamington Spa	1793	21	4.2	1.021	5	1.2	18.4
31/07	Leeds Centre	214004	0	4.2	1.018	5.6	2.7	2.0
07/08	Leicester Centre	215001	5	4.2	1.146	6	2.5	1.8
07/08	Liverpool Speke	m-626	237	4.1	0.443	5	2.4	13.3
28/08	London Bexley	318	2	4.2	1.256	5.2	1.6	21.7
27/06	London Bloomsbury	14323	-25	4	0.219	7.9	5.8	10.9
16/07	London Brent	633	20	4.2	1.066	7.1	3.2	8.5
11/10	London Cromwell Road 2	704	-11	4.2	1.018	5	1.1	5.1
01/08	London Eltham	822	18	4.2	1.158	5.5	1.5	33.6
10/07	London Hillingdon	77580-386	8	4	0.202	5	0.9	6.1
21/08	London Lewisham	498	1	4.2	0.993	7	5.3	15.9
30/08	London Marylebone Road	10071	3	4.2	0.952	7.9	4.3	11.6
26/07	London N. Kensington	1020	72	4.2	0.964	5	0.8	21.2
05/09	London Southwark	535	2	4.2	0.966	5.3	2.5	13.5
04/07	London Teddington	735	0	4.2	0.878	5	2.3	21.7
06/09	London Westminster	705	-4	4.2	1.229	5	0.8	18.4
03/09	Lullington Heath	m690	100	4.1	0.889	5.2	1.9	21.3
23/07	Manchester South	1497	0	4.2	1.097	6.4	1.3	9.9
15/08	Middlesbrough	14166	9	4.1	0.828	6.5	4.5	6.6
13/08	Newcastle Centre		300	4	0.222	7.5	5.9	-3.8
15/08	Northampton	890563033	2	4.1	0.834	6.3	4.4	0.8
22/08	Norwich Centre	214005	2	4.2	0.988	5.3	4.8	40.5
30/07	Nottingham Centre		5	4	0.203	5	1.1	3
10/09	Oxford Centre Roadside	161	101	4.2	1.067	6.9	3.9	19.2
19/07	Plymouth Centre	7751-386	0	4.2	1.015	5.1	1.7	32.5
03/09	Portsmouth	578323093	2	4.1	0.879	5.6	2.2	1.6
09/08	Preston	l-ar-013	83	4.4	1.236	5	1.9	17.6
02/08	Reading New Town		195	4.1	0.527	5.6	1.9	8.3
14/08	Redcar	10355	5	4.1	0.906	5	2.3	23.6
14/08	Rochester Stoke	414	5	4.4	1.087	6.4	3.3	3.8
25/07	Rotherham Centre	16	4	4.3	1.347	6.1	3.6	17.5
24/07	Salford Eccles	2346	Not	Tested				
16/07	Sandwell West Bromwich	93082	0	4.2	0.979	5	2.5	0.1

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k = 2 , providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

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UKAS CALIBRATION
0401

Certificate Number: 1903
AEA Identification Number: ED45077030

Date Year =2007	Site	Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max Residual (%)	*Max Residual (%)
25/06	Scunthorpe Town	468	2	4.2	0.990	5.3	2.9	11.9
25/07	Sheffield Centre	gra0477015	75	4	0.232	11	11.3	10.7
23/08	Southampton Centre	m676	215	4.1	0.210	5.4	1.3	20
13/08	Southend-on-Sea		0	4.2	0.997	5	1.4	3.0
25/07	Stockport Shaw Heath	742	26	0	0	0	3.0	0
09/07	Stoke-on-Trent Centre		67	4.4	0.842	5.1	2.1	22.1
15/08	Sunderland	14321	2	4.2	1.030	9.2	5.4	22.7
07/08	Thurrock	555	5	4.2	1.040	5.9	3.0	11.4
06/08	Wicken Fen	82	6	4.1	0.837	5	0.2	-4.2
17/07	Wigan Centre	57674025	1	4.1	0.937	5	2.3	0.9
08/08	Wirral Tranmere		16	4.2	1.300	5	1.0	9.1
02/08	Wolverhampton Centre	4307756-3386	10	4	0.188	5.4	2.5	1.9

3. Ozone

Date Year =2007	Site	Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max Residual (%)
	Scottish Sites						
17/07	Aberdeen	800	1	5	0.998	3.3	1.1
12/07	Auchencorth Moss	721	0	5	0.989	3.1	0.2
12/07	Bush Estate	77087-385	15	5	0.495	3.1	1.8
11/07	Edinburgh St Leonards	136	1	5	0.963	3.1	1.3
25/07	Eskdalemuir	145	4	5	0.516	3.1	0.7
04/07	Fort William	437	1	5	1.007	3	0.6
02/07	Glasgow Centre	gra 427-013	8	5	0.245	3.8	1.8
31/07	Lerwick	841B-176	1	5	1.122	3.2	0.7
19/07	Strath Vaich	m2759-m512	2	5	1.022	3.1	0.8
	Welsh Sites						
05/09	Aston Hill	144	-7	5	0.537	3.2	0.4
11/07	Cardiff Centre	14348	1	5	0.987	3.1	1.0
11/07	Cwmbran	205004	-1	5	0.966	3.1	1.4
09/07	Narberth	RAG4580	0	5	0.963	3.2	2.5
10/07	Port Talbot	94754	4	5	0.514	3.5	3.3
10/07	Swansea Roadside	16697	1	5	1.022	3.4	1.7
	N.Irish Sites						
07/08	Belfast Centre	m1626-m335	251	5	0.086	3.2	0.8
21/08	Derry	j-ar-009	0	5	1.004	3.3	3.9
14/08	Lough Navar	337	-2	5	0.542	3.1	1.4
15/08	Mace Head	77086-385	1	5	1.004	3.1	0.5
	English Sites						
24/07	Barnsley Gawber	0	1	5	1.057	3.1	2.2
30/07	Birmingham Centre	154	5	5	0.100	3.1	1.0
21/08	Birmingham Tyburn	301002	2	5	0.892	3.1	0.7
09/08	Blackpool Marton	l-ar-010	0	5	0.969	3.2	1.4
12/09	Bolton	196	2	5	0.921	3.4	1.6
30/07	Bottesford	EA357	3	5	1.025	3.2	0.3
08/08	Bournemouth	824	2	5	1.039	3.1	1.5

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UKAS CALIBRATION
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Certificate Number: 1903
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Date Year =2007	Site	Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max Residual (%)
30/07	Bradford Centre		3	5	1.001	3.9	5.8
15/08	Brighton Preston Park	542	2	5	0.492	3.3	2.1
17/07	Bristol St Paul's	14358	0	5	1.029	3.1	0.5
18/07	Bury Roadside	1453	0	5	1.078	4.9	5.9
14/08	Coventry Memorial Park		0	5	1.011	3.1	0.6
18/07	Exeter Roadside	EOS	0	5	0.954	3.1	2.1
17/07	Glazebury	138	21	5	0.433	3.2	0.5
24/07	Great Dun Fell	176	-5	5	0.500	3.1	0.9
05/07	Harwell	199	2	5	0.476	3.1	0.2
26/07	High Muffles	346	10	5	0.552	3.1	0.8
31/07	Hull Freetown	M356	253	5	0.082	3.2	2.1
04/09	Ladybower	125b-101	50	5	0.486	3.1	0.6
01/08	Leamington Spa	1469	21	5	1.011	3.2	1.2
31/07	Leeds Centre	206003	2	5	0.991	3.1	0.1
07/08	Leicester Centre	205006	-2	5	1.041	3.2	1.2
20/08	Leominster	170	0	5	1.030	3.1	0.3
07/08	Liverpool Speke	m-331	224	5	0.100	3.1	1.2
28/08	London Bexley	403	1	5	0.958	3.8	2.6
27/06	London Bloomsbury	14907	0	5	0.099	3	0.9
16/07	London Brent	1508	21	5	1.001	3.5	2.5
01/08	London Eltham	375	8	5	1.026	3.1	0.8
11/07	London Hackney	382	1	5	0.935	3.1	1.2
12/07	London Haringey	558	10	5	1.031	3.1	1.3
05/09	London Harlington	14309	-1	5	0.970	4.3	1.2
10/07	London Hillingdon	g-ra0427-012	-15	5	0.090	3.6	1.9
21/08	London Lewisham	187	2	5	1.071	3.2	2.0
30/08	London Marylebone Road	10074	1	5	0.961	3.6	0.7
26/07	London N. Kensington	497	10	5	0.998	3.4	2.1
05/09	London Southwark	5776	8	5	1.030	3.3	2.5
04/07	London Teddington	58811-320	0	5	0.247	3.1	0.3
17/07	London Wandsworth	491	10	5	1.125	3.7	1.3
06/09	London Westminster	879	8	5	0.527	3.1	0.9
03/09	Lullington Heath	m337	100	5	0.514	3.3	1.1
23/07	Manchester South	1317	0	5	0.997	3.5	0.5
09/07	Market Harborough	60894	2	5	0.479	3.1	1.5
15/08	Middlesbrough	14203	1	5	0.948	3.3	4.9
13/08	Newcastle Centre	M357	245	5	0.092	3.3	2.0
15/08	Northampton	8905240110	2	5	0.890	3.2	2.1
22/08	Norwich Centre	206002	0	5	0.993	3.1	0.6
30/07	Nottingham Centre	gra0427011	10	5	0.100	3.5	2.2
19/07	Plymouth Centre	35925-251	1	5	1.087	3.2	4.0
03/09	Portsmouth	205002	1	5	0.973	3.6	0.2
09/08	Preston	l-ar-013	0	5	1.042	3.1	1.8
02/08	Reading New Town		3	5	1.334	4.4	14.7
14/08	Redcar	10195	6	5	0.495	3.1	0.8
14/08	Rochester Stoke	378	1	5	0.962	3.2	0.3
25/07	Rotherham Centre	d4270106	1	5	1.025	5.4	21.3
24/07	Salford Eccles	2363	0	5	1.053	3.3	1.6
16/07	Sandwell West Bromwich	93083	1	5	0.953	3.2	1.6
25/07	Sheffield Centre	gra937010	112	5	0.100	3.2	4.3
21/08	Sibton	93254	27	5	0.523	3.1	2.0

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Date Year =2007	Site	Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max Residual (%)
19/07	Somerton	95249	0	5	0.514	3.1	0.6
23/08	Southampton Centre	M354	245	5	0.105	3.2	0.2
13/08	Southend-on-Sea		1	5	0.783	3.1	0.3
23/08	St Osyth	60569	-1	5	0.985	3.2	3.5
09/07	Stoke-on-Trent Centre		6	5	1.217	3.2	2.4
15/08	Sunderland Silksworth	14908	-1	5	0.969	3.1	0.6
07/08	Thurrock	1050	0	5	0.485	3.1	2.9
21/08	Weybourne	70532-366	0	5	0.994	3.2	1.8
06/08	Wicken Fen	165	-4	5	0.532	3.2	1.0
17/07	Wigan Centre	4009	0	5	0.999	3.1	0.4
08/08	Wirral Tranmere		0	5	0.995	3.1	2.0
02/08	Wolverhampton Centre	9	3	5	0.086	3.3	3.7
06/09	Yarner Wood	437	-20	5	0.482	3.5	2.1

4. Oxides of Nitrogen

Date Year =2007	Site		Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max residual (%)	*Converter efficiency (%)
	Scottish Sites								
17/07	Aberdeen	NO NOx	519	1 1	5 5.4	1.438 1.439	5 5	1.1 1.2	98.7
12/07	Bush Estate	NO NOx	1756	100 101	5 5.4	1.015 1.003	5 5	3.0 0.8	95.2
24/07	Dumfries	NO NOx	1494	-2 -1	5 5.3	0.970 0.958	6.5 7.7	1.0 0.9	98.3
11/07	Edinburgh St Leonards	NO NOx	73	1 1	5 5.3	1.137 1.127	5 5.4	1.7 1.8	97.1
25/07	Eskdalemuir	NO NOx	347	0 1	5 5.3	1.059 1.022	6.6 7.8	1.3 1.1	100.9
04/07	Fort William	NO NOx	344	0 -2	5 5.3	1.119 1.081	5 5.5	1.4 3.6	97.2
02/07	Glasgow Centre	NO NOx	Gra447	0 -8	5 5.4	0.395 0.375	5.9 7.7	2.6 2.1	96.0
06/07	Glasgow City Chambers	NO NOx	575	-1 0	5 5.4	1.281 1.300	5 5	0.3 0.2	98.3
02/07	Glasgow Kerbside	NO NOx	h-ar-002	-25 -27	5.3 7.1	2.488 2.500	5 5.2	0.9 0.9	96.7
11/07	Grangemouth	NO NOx	700b-312	0 2	5 5.4	0.929 0.892	5 5	1.6 2.2	98.5
18/07	Inverness	NO NOx	468	0 0	5 5.3	1.005 1.000	5 5	0.7 0.7	97.0
	Welsh Sites								
05/09	Aston Hill	NO NOx	m853	102 102	5 5.3	1.106 1.108	5 5	2.2 2.4	100.5
11/07	Cardiff Centre	NO NOx	14325	0 0	5 5.4	1.533 1.519	5 5	2.3 0.8	98.7
09/07	Narberth	NO NOx	RAG4580	42 42	5 5.3	0.978 0.973	5 7.2	4.0 3.9	Not Tested
10/07	Port Talbot	NO NOx	94617	-1 0	5 5.3	1.212 1.235	5 5	1.2 0.7	101

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Date Year =2007	Site		Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max residual (%)	*Converter efficiency (%)
10/07	Swansea Roadside	NO NOx	16695	1 -1	5 5.3	1.22. 1.206	5 5	1.7 1.5	96.8
06/08	Wrexham	NO NOx	12185	1 2	5 5.4	1.053 1.03.	7.4 9	1.1 1.4	99.2
	N.Irish Sites								
07/08	Belfast Centre	NO NOx	m1804-m733	248 250	5 5.2	0.406 0.423	5 5	0.5 2.2	100.4
21/08	Derry	NO NOx	j-ar-009	40 40	5 5.7	2.276 2.323	5 5	1.9 2.3	99
	English Sites								
24/07	Barnsley Gawber	NO NOx	0	12 12	5 6.1	3.231 3.189	6.5 7.7	1.0 1.0	99.1
28/08	Bath Roadside	NO NOx	12758	20 19	5 5.3	1.121 1.116	5 5	3.4 3.2	97.5
14/08	Billingham	NO NOx	10440	1 1	5 5.4	1.556 1.550	6.0 6.3	1.1 1.0	98.5
30/07	Birmingham Centre	NO NOx	68	0 3	5 5.2	0.464 0.462	7.4 9.1	0.3 0.5	99.4
21/08	Birmingham Tyburn	NO NOx	209006	0 0	5 5.3	1.032 1.038	5 5	1.7 1.5	99.6
09/08	Blackpool Marton	NO NOx	Ambirak 10	35 36	5 6	2.987 2.991	8.6 9.7	2.5 1.5	95.4
12/09	Bolton	NO NOx	433	-1 3	5 5.6	1.417 1.415	5 5	1.4 3.4	111.0
08/08	Bournemouth	NO NOx	522	1 1	5 5.3	1.137 1.106	5 5	1.2 1.6	98.1
30/07	Bradford Centre	NO NOx	bradford	20 20	5 5.5	1.170 1.210	5 5	2.4 1.5	95.7
09/08	Brentford Roadside	NO NOx	m1759-m712	-1 0	5 5.4	1.294 1.342	5 5	1.1 1.1	101.6
15/08	Brighton Preston Park	NO NOx	2222	-1 0	5 5.3	1.270 1.259	5 5	1.9 1.8	100.0
15/08	Brighton Roadside	NO NOx	1225	5 6	5 5.6	1.325 1.333	5 5	0.5 1.1	102.3
20/07	Bristol Old Market	NO NOx	10510	-1 -1	5 5.3	1.063 1.057	5 5.8	1.4 2.2	98.6
17/07	Bristol St Paul's	NO NOx	143543	0 -2	5 5.6	2.051 2.023	5 5.4	1.4 1.0	98.2
18/07	Bury Roadside	NO NOx	1710	1 1	5 5.4	1.351 1.365	5 5	1.1 0.8	95.1
06/08	Cambridge Roadside	NO NOx	42c-55355-303	-2 -3	0 0	1.080 1.073	0 0	1.4 1.6	100.5
31/07	Camden Kerbside	NO NOx	623	2 3	5 5.4	1.639 1.476	7.5 9	0.6 0.6	96.9
14/08	Canterbury	NO NOx	11666	1 -1	5 5.3	1.220 1.201	5 5	1.0 0.9	100.5
14/08	Coventry Memorial Park	NO NOx		0 0	5 5.3	1.049 1.046	5 5	1.0 0.8	97.8
18/07	Exeter Roadside	NO NOx	D1s	0 0	5 5.3	1.084 1.104	5 5.4	0.8 1.6	100.0
17/07	Glazebury	NO NOx	78	4 2	5 5.3	0.891 0.880	5 5	1.0 1.0	98.6

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Date Year =2007	Site		Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max residual (%)	*Converter efficiency (%)
12/07	Haringey Roadside	NO NOx	397	3 3	5 5.4	0.806 0.989	5 5	3.9 4.0	 99.6
05/07	Harwell	NO NOx	79	4 4	5 5.3	1.225 1.183	5.3 5	1.4 0.2	 97.0
26/07	High Muffles	NO NOx	1783	7 6	5 5.2	0.548 0.555	7.6 7.7	2.5 2.0	 96.3
15/08	Hove Roadside	NO NOx	199	2 6	5 5.3	0.994 1.005	5 6.4	1.6 2.5	 100.0
31/07	Hull Freetown	NO NOx	M732	242 243	5 5.5	0.402 0.410	5 5.8	3.0 3.6	 101.9
04/09	Ladybower	NO NOx	184	51 51	5 5.3	1.137 1.134	5 5	0.7 1.0	 98.5
01/08	Leamington Spa	NO NOx	1705	20 20	5 5.3	1.090 1.095	5 5	1.4 2.2	 97.7
31/07	Leeds Centre	NO NOx	210005	0 -2	5 5.3	1.010 0.996	5 5	1.5 1.8	 98.3
07/08	Leicester Centre	NO NOx	210004	0 0	5 5.3	1.025 1.025	5 5	1.1 1.1	 97.0
20/08	Leominster	NO NOx	346	1 2	5 5.3	0.786 0.834	5 5	0.7 2.3	 99.6
07/08	Liverpool Speke	NO NOx	m-734	246 246	5 5.2	0.490 0.486	7.5 9.1	0.3 0.4	 99.0
03/09	London A3 Roadside	NO NOx		60 62	5 6.3	2.237 2.286	5 5	1.6 1.5	 102.5
28/08	London Bexley	NO NOx	327	-1 0	5 5.3	0.971 0.969	5 5	2.1 1.8	 100.4
27/06	London Bloomsbury	NO NOx	14328	18 10	5 5.2	0.441 0.442	5 5	1.3 0.7	 95.8
16/07	London Brent	NO NOx	1852	24 28	5 5.8	2.449 2.477	5 5	2.1 1.7	 99.0
30/08	London Bromley	NO NOx	1956	1 2	5 5.4	1.461 1.426	5 5	0.7 0.3	 96.8
11/10	London Cromwell Road 2	NO NOx	844	0 -1	5 5.9	2.846 2.792	5 5	3.5 1.7	 103.2
01/08	London Eltham	NO NOx	307	2 2	5 5.3	1.116 1.164	5 5	2.2 1.8	 100.4
11/07	London Hackney	NO NOx	234	1 2	5 5.3	1.054 1.087	5 5	1.5 2.4	 98.0
05/09	London Harlington	NO NOx	11491	3 3	5 5.6	1.537 1.543	5 5	2.7 2.6	 99.3
10/07	London Hillingdon	NO NOx	gra0447-010	15 15	5 5.2	0.461 0.474	5 5	3.2 3.3	 95.7
21/08	London Lewisham	NO NOx	530	1 2	5 5.3	1.230 1.262	5 5	1.8 1.2	 98.9
30/08	London Marylebone Road	NO NOx	10072	1 -2	5 5.5	1.788 1.739	5 5	3.7 4.9	 97.4
26/07	London N. Kensington	NO NOx	459	4 9	5 5.3	1.094 1.203	9.1 9.8	2.7 1.8	 96.5
05/09	London Southwark	NO NOx	197	1 2	5 5.3	1.025 1.014	5 5	1.7 2.5	 99.1
04/07	London Teddington	NO NOx	287	1 0	5 6	2.105 2.088	5 5	2.3 2.4	 99.1
17/07	London	NO	378	3	5	1.303	5	1.3	

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	Wandsworth	NOx		7	5.3	1.124	5	1.8	96.4
06/09	London Westminster	NO	573	-3	5	3.398	5	0.9	
		NOx		-5	7.7	3.702	5	4.2	98.5
03/09	Lullington Heath	NO	m675	102	5	0.977	5	0.6	
		NOx		104	5.3	0.954	5	1.4	98.8
23/07	Manchester South	NO	292	0	5	1.039	7.3	2.3	
		NOx		0	5.3	1.020	5.6	1.3	97.4
24/07	Manchester Town Hall	NO	846	0	5	1.166	5	0.6	
		NOx		0	5.3	1.163	5	0.8	99.0
09/07	Market Harborough	NO	61963	0	5	0.525	5.7	1.1	
		NOx		1	5.2	0.531	6.2	0.9	98.7
15/08	Middlesbrough	NO	13160	-1	5	1.151	7.8	2.7	
		NOx		-11	5.3	1.101	6.5	1.4	95.9
13/08	Newcastle Centre	NO	M730	275	5	0.436	6.5	3.5	
		NOx		283	5.2	0.448	9.4	5.9	96.7
15/08	Northampton	NO	8513180611	1	5	0.963	5	0.5	
		NOx		1	5.4	0.971	5	1.1	95.5
22/08	Norwich Centre	NO	210001	0	5	1.170	5	2.0	
		NOx		-1	5.3	1.161	5	1.6	101.7
21/08	Norwich Forum Roadside	NO	12627	0	5	1.312	5	1.7	
		NOx		0	5.4	1.277	5	2.2	100.5
30/07	Nottingham Centre	NO	gra0447009	20	5	0.402	5	0.8	
		NOx		18	5.2	0.400	5	2.3	100.0
10/09	Oxford Centre Roadside	NO	947	102	5	1.126	5	0.4	
		NOx		108	5.5	1.173	5	0.2	102.5
19/07	Plymouth Centre	NO		0	5	1.036	5	1.0	
		NOx		-1	5.3	1.195	5.3	1.1	100.4
03/09	Portsmouth	NO	903005	0	5	1.064	5	0.2	
		NOx		2	5.4	1.051	5	0.8	98.7
09/08	Preston	NO	Ambirak 13	65	5	2.765	7.8	0.9	
		NOx		66	5.9	2.877	9.4	2.4	100.0
02/08	Reading New Town	NO		20	5	0.888	7.7	2.0	
		NOx		22	5.3	0.911	9.2	2.2	103.0
14/08	Redcar	NO	10196	5	5	1.155	5.6	2.1	
		NOx		4	5.3	1.168	6.3	2.1	98.9
14/08	Rochester Stoke	NO	473	0	5	1.159	5	1.1	
		NOx		-1	5.3	1.171	5	1.5	100.5
25/07	Rotherham Centre	NO	qra0447001	2	5	1.302	6.2	3.0	
		NOx		3	5.4	1.331	8.3	2.9	95.2
24/07	Salford Eccles	NO	2381	2	5	1.108	5	0.4	
		NOx		2	5.3	1.118	5	0.5	98.6
16/07	Sandwell West Bromwich	NO	93081	0	5	1.194	5	1.8	
		NOx		0	5.3	1.192	5.1	2.1	100.8
25/07	Sheffield Centre	NO	gra0447008	8	5	0.491	5.7	1.5	
		NOx		3	5.2	0.486	6.3	1.3	100.0
23/07	Sheffield Tinsley	NO	10772	-1	5.3	3.140	7.1	2.1	
		NOx		-1	6.1	3.130	8.4	2.4	99.0
19/07	Somerton	NO	12895	5	5	0.510	5.4	1.8	
		NOx		4	5.2	0.489	5.2	0.3	95.1
23/08	Southampton Centre	NO	hsp00037	506	5	0.350	5	1.1	
		NOx		507	5.5	0.345	5	0.1	98.9
13/08	Southend-on-Sea	NO		0	5	0.980	5	1.0	
		NOx		0	5.3	0.990	5	1.4	96.3

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k = 2 , providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

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Date Year =2007	Site		Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	[*]Max residual (%)	Converter efficiency (%)
23/08	St Osyth	NO	60988	-2	5	0.908	5	1.3	
		NOx		-2	5.3	0.9	5	0.5	98.0
25/07	Stockport Shaw Heath	NO		19	5	2.299	7.1	2.3	
		NOx		18	5.7	2.309	8.5	2.9	101.0
14/08	Stockton-on-Tees Yarm	NO	80299rh	3	5	1.282	10.0	2.9	
		NOx		5	5.4	1.328	8.7	2.2	104.8
09/07	Stoke-on-Trent Centre	NO		40	5	1.176	5	3.8	
		NOx		40	5.5	1.270	5	3.7	101.5
15/08	Sunderland Silksworth	NO	80299h	3	5	1.128	6.1	1.0	
		NOx		2	5.3	1.127	6.3	0.3	96.6
07/08	Thurrock	NO	290	1	5	1.244	5	1.0	
		NOx		1	5.5	1.237	5	1.5	99.0
22/08	Tower Hamlets Roadside	NO	306	1	5	0.998	5	2.9	
		NOx		1	5.3	0.961	5	1.6	99.2
27/09	Walsall Alumwell	NO	848	-1	5	1.176	5	2.8	
		NOx		0	5.5	1.163	5	3.0	101.6
29/08	Walsall Willenhall	NO	1337	-1	5	1.059	5	1.8	
		NOx		0	5.3	1.066	5	1.7	98.6
04/09	West London	NO	845	-1	5	1.193	5	2.2	
		NOx		0	5.3	1.205	5	2.2	98.0
06/08	Wicken Fen	NO	2223	22	5	0.492	5	0.3	
		NOx		21	5.2	0.519	5	1.8	100.8
17/07	Wigan Centre	NO	805005	0	5	1.023	5	2.4	
		NOx		0	5.3	1.045	5.2	2.6	100.9
08/08	Wirral Tranmere	NO		20	5	2.383	7.9	2.0	
		NOx		19	6.2	2.355	9.5	2.2	99.0
02/08	Wolverhampton Centre	NO	7	4	5	0.468	5	1.3	
		NOx		-7	5.5	0.463	5	1.0	100.0
06/09	Yarner Wood	NO	1784	24	5	1.282	5	2.8	
		NOx		21	5.3	1.261	5	1.5	95.4

5. Particulate Analysers

Date Year =2007	Site	Analyser number	Calculated Spring Constant k_0	Uncertainty (%)	[4]k_0 accuracy (%)	[3]Measured Main Flow (l/min)	Uncertainty (%)	[3]Measured Total Flow **Aux Flow** (l/min)	Uncertainty (%)
	Scottish Sites								
17/07	Aberdeen	24427	11740	1	1.5	**2.91**	**2.2**	**13.09**	**2.2**
12/07	Auchencorth Moss Partisol PM_{10}	2025B215 500112							
12/07	Auchencorth Moss Partisol $PM_{2.5}$	2025b2154 80112							
12/07	Auchencorth Moss FDMS PM_{10}	26039	13006	1	-1.4	2.90	2.2	15.08	2.2
12/07	Auchencorth Moss FDMS $PM_{2.5}$	26033	13779	1	-1.7		2.2	15.27	2.2
24/07	Dumfries							16.38	2.2
11/07	Edinburgh St Leonards	21308	12957	1	1.1	3.08	2.2	15.51	2.2
02/07	Glasgow Centre	22980	13114	1	-0.2	2.06	2.2	16.00	2.2
02/07	Glasgow Kerbside	21264	12560	1	-0.5	**1.84**	**2.2**	**14.40**	**2.2**

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Date Year =2007	Site	Analyser number	Calculated Spring Constant k_0	Uncertainty (%)	[4]k_0 accuracy (%)	[3]Measured Main Flow (l/min)	Uncertainty (%)	[3]Measured Total Flow **Aux Flow** (l/min)	Uncertainty (%)
11/07	Grangemouth	22763	12420	1	-1.8	**2.68**	**2.2**	**13.94**	**2.2**
18/07	Inverness	21255						17.02	2.2
18/07	Inverness	D1429						16.82	2.2
	Welsh Sites								
11/07	Cardiff Centre	24449	14393	1	0.6	**2.83**	**2.2**	**12.34**	**2.2**
11/07	Cwmbran	21557	12762	1	1.8	**3.07**	**2.2**	not	tested
09/07	Narberth	21143	12628	1	1.1	**3.16**	**2.2**	**14.27**	**2.2**
10/07	Port Talbot	22588	14664	1	1.2	**3.03**	**2.2**	**13.03**	**2.2**
10/07	Swansea Roadside FDMS PM_{10}	26293	15532	1	-0.4	**2.99**	**2.2**	**12.95**	**2.2**
10/07	Swansea Roadside FDMS $PM_{2.5}$	26292	14349	1	-0.6	**2.95**	**2.2**	**13.10**	**2.2**
06/08	Wrexham	22124001						15.80	2.2
	N.Irish Sites								
07/08	Belfast Centre	24423	14303	1	0.8	2.13	2.2	16.28	2.2
07/08	Belfast Clara St	25456	11883	1	-0.1	**2.08**	**2.2**	**14.79**	**2.2**
21/08	Derry	49608	10996	1	1	**2.13**	**2.2**	**15.26**	**2.2**
14/08	Lough Navar	21196	12915	1	0.8	3.14	2.2	17.09	2.2
	English Sites								
30/07	Birmingham Centre	26034	12092	1	-2.3	3.07	2.2	16.88	2.2
21/08	Birmingham Tyburn	24637	13839	1	0.5	3.49	2.2	17.78	2.2
09/08	Blackpool Marton	24424	12912	1	0.1	3.00	2.2	16.44	2.2
12/09	Bolton	21197	15266	1	0.7	**2.99**	**2.2**	**12.78**	**2.2**
08/08	Bournemouth	2025a2125 70003						16.41	2.2
30/07	Bradford Centre	21494	11451	1	0.9	2.17	2.2	16.81	2.2
15/08	Brighton Roadside	21220						16.43	2.2
17/07	Bristol St Paul's		13441	1	2	**3.01**	**2.2**	**13.68**	**2.2**
18/07	Bury Roadside	698	11778	1	1.6	**2.06**	**2.2**	**15.03**	**2.2**
31/07	Camden Kerbside	21152	16454	1	0.2	**3.12**	**2.2**	**13.88**	**2.2**
14/08	Canterbury	20931	14086	1	0.4	**3.12**	**2.2**	**13.64**	**2.2**
14/08	Coventry Memorial Park		13282	1	0.7	**3.11**	**2.2**	Not	Tested
12/07	Haringey Roadside	9407	11447	1	-0.1	2.60	2.2	14.40	2.2
05/07	Harwell PM_{10}		14780	1	-0.9	3/08	2.2	16.80	2.2
	Harwell $PM_{2.5}$		11105	1	2.0	3.05	2.2	16.70	2.2
31/07	Hull Freetown	24445	14224	1	0.8	3.07	2.2	16.53	2.2
01/08	Leamington Spa	2075	11103	1	1.5	**3.06**	**2.2**	**13.85**	**2.2**
31/07	Leeds Centre	24451	13423	1	0.2	**3.23**	**2.2**	**14.35**	**2.2**
07/08	Leicester Centre	24442	14380	1	-0.5	3.09	2.2	15.58	2.2
07/08	Liverpool Speke	24450	15713	1	-0.6	**3.11**	**2.2**	**13.99**	**2.2**
03/09	London A3 Roadside	24425	12465	1	0.3	2.04	2.2	16.35	2.2
28/08	London Bexley	2000	10623	1	1.5	2.12	2.2	16.16	2.2
27/06	London Bloomsbury PM_{10}	24446	13935	1	1.4	**2.97**	**2.2**	**12.92**	**2.2**
27/06	London Bloomsbury $PM_{2.5}$	21492	10467	1	0.8	3.14	**2.2**	13.83	**2.2**

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16/07	London Brent	21145	17778	1	1.5	**2.90**	**2.2**	**13.08**	**2.2**
01/08	London Eltham	5144	8338	1	1.7	**3.04**	**2.2**	**13.80**	**2.2**
05/09	London Harlington	22835	14257	1	0.4	2.05	2.2	16.29	2.2
10/07	London Hillingdon	24422	14197	1	-0.3	2.01	2.2	15.81	2.2
30/08	London Marylebone Road PM_{10}	21306	13586	1	1.9	3.04	2.2	16.59	2.2
30/08	London Marylebone Road $PM_{2.5}$	21493	14928	1	-2.4	3.16	2.2	9.51	2.2
26/07	London N. Kensington	20715	10981	1	1.5	**2.99**	**2.2**	**13.18**	**2.2**
06/09	London Westminster							16.10	2.2
23/07	Manchester Piccadilly	26038	12952	1	-1.0	**3.08**	**2.2**	**Not**	**Tested**
15/08	Middlesbrough	24325	14096	1	-0.3	**2.00**	**2.2**	**14.29**	**2.2**
13/08	Newcastle Centre	24448	13975	1	1.1	3.11	2.2	17.25	2.2
15/08	Northampton	21621	11242	1	0.8	3.26	2.2	16.83	2.2
15/08	Northampton Partisol	2025a2101 39902						16.63	2.2
22/08	Norwich Centre	21495	14336	1	1.6	**2.02**	**2.2**	**15.21**	**2.2**
30/07	Nottingham Centre		12259	1	0.6	3.01	2.2	17.23	2.2
19/07	Plymouth Centre	24428	13162	1	1.7	2.99	2.2	15.32	2.2
03/09	Portsmouth	21578	10533	1	-0.4	**3.29**	**2.2**	**12.83**	**2.2**
09/08	Preston	22881	12786	1	-1.3	3.06	2.2	16.77	2.2
02/08	Reading New Town	21315	13242	1	0.3	3.08	2.2	16.77	2.2
14/08	Redcar		12035	1	2.1	2.97	2.2	16.90	2.2
14/08	Rochester Stoke PM_{10}	24381	12083	1	0.3	**3.12**	**2.2**	**13.61**	**2.2**
14/08	Rochester Stoke $PM_{2.5}$	21491	13081	1	-1	**3.10**	**2.2**	**13.63**	**2.2**
24/07	Salford Eccles		14725	1	2.2	**2.11**	**2.2**	**14.17**	**2.2**
25/06	Scunthorpe Town	2000	12557	1	-0.8	**3.08**	**2.2**	**14.04**	**2.2**
25/07	Sheffield Centre	25024	12332	1	0.7		2.2	16.98	2.2
23/08	Southampton Centre	24448	14127	1	1.8	**3.00**	**2.2**	**13.08**	**2.2**
13/08	Southend-on-Sea	22927	13455	1	0.5	**3.08**	**2.2**	**13.77**	**2.2**
25/07	Stockport Shaw Heath		10744	1	3.1	**3.10**	**2.2**	**Not**	**Tested**
14/08	Stockton-on-Tees Yarm		14403	1	0.8	**2.99**	**2.2**	**13.74**	**2.2**
09/07	Stoke-on-Trent Centre	25028	12423	1	-0.6	3.06	2.2	16.11	2.2
07/08	Thurrock	25039	13093	1	0.9	3.22	2.2		
17/07	Wigan Centre	22015	12236	1	1.4	3.19	2.2	16.56	2.2
08/08	Wirral Tranmere	22883	13181	1	-0.8	3.07	2.2	16.85	2.2
02/08	Wolverhampton Centre	25023	12403	1	-0.2	3.05	2.2	15.96	2.2

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k = 2 , providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

The above factors have been calculated using certified standards. The analysers listed above have been tested for zero response, calibration factor, linearity, converter efficiency (NOx analysers), m-xylene interference (SO_2 analysers), k_0 / main flow rate (for TEOM analysers) and total flow rate (for particulate analysers), by documented methods. Note that the test results are valid on the day of test only, as analyser drift over time cannot be quantified.

The calibration results for NOx, NO, CO, SO_2, O_3 and Particulates are those that fall within our scope of accreditation. Results marked with an asterisk (*) on this certificate fall outside our accreditation, but have been included for completeness.

[1] The zero response is the zero reading on the logging system of the analyser when audit zero gas was introduced to the analysers under test.
[2] The calibration factor is the multiplying factor required to scale the reading on the data logging system into concentration units (ppb for NO, NOx and SO_2, ppm for CO – 1ppm = 1000 ppb). It should be used in conjunction with the analyser output and the zero response, according to the following equation:

Concentration = (output – zero response) x Calibration factor

The scaling factor for gaseous analysers is calculated using mole fraction concentrations.

[3] The measured main flow rate (where this is applicable) is the flow rate through the sensor unit of a TEOM analyser. The measured aux flow rate (where this is applicable) is the flow rate through the bypass tubing of the TEOM particulate analyser under test. The measured total flow rate is the total flow rate through the particulate analyser under test. Units of flow are $l.min^{-1}$. Measurements shown in **bold** are not made at the normal sample inlet and may not therefore accurately represent the actual flow through the inlet.
[4] The k_0 accuracy value (specifically for TEOM analysers) indicates the closeness of the calculated result to the manufacturer's specified value of k_0.

* The maximum residual is the percentage maximum deviation of the worst linearity point from the line of best fit
* R^2 is the correlation coefficient of linearity
* Converter is the measured efficiency of the NO_2 to NO converter in the Nitrogen Oxides analyser
* meta-xylene interference is the response of the SO_2 analyser when supplied with approx 1ppm meta-xylene.

This certificate is an electronic representation of a certificate signed by Stewart Eaton on 8 October 2007 and held by AEA at the above address. Hard copies are available on request.