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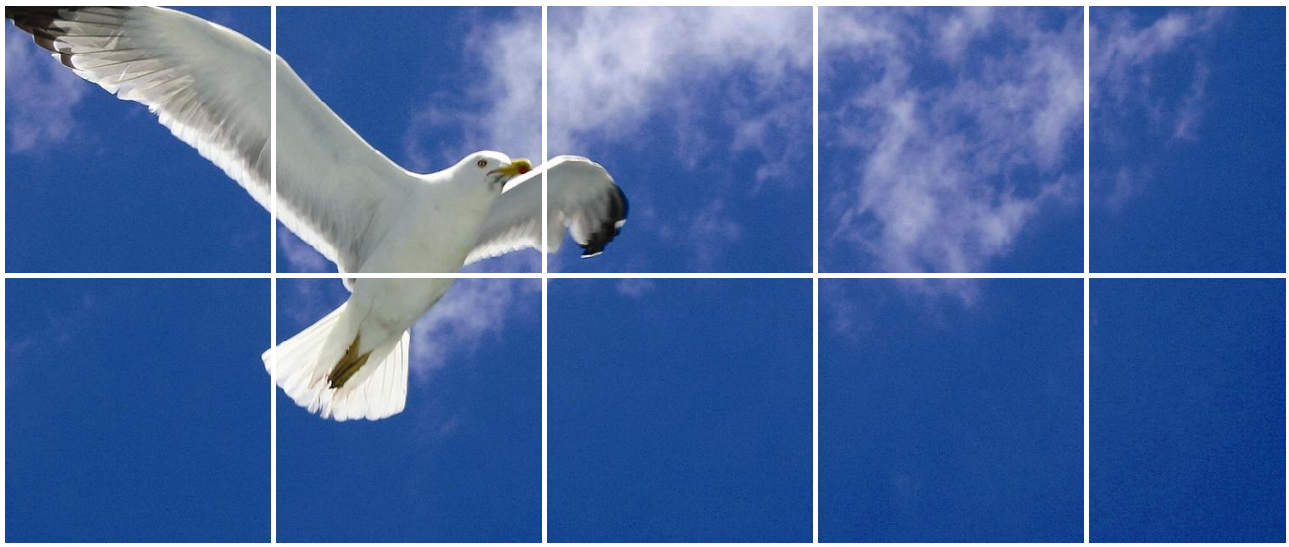

QA/QC Data Ratification and Intercalibration Report for the Automatic Urban and Rural Network, July-September 2006

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

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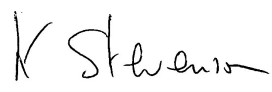
	Signature	
	Date	26 March 2007

Executive Summary

This report is in 2 parts – Part A is the data ratification report for July – Sepember 2006 and Part B is a report on the Intercalibration exercise in summer 2006.

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 Executive, Welsh Assembly Government and the DoE in Northern Ireland . .

Ratified hourly average data capture for the network averaged 90.3% for all pollutants (O_3, NO_2, SO_2, CO, PM_{10} and $PM_{2.5}$) during the 3-month reporting period July-September 2006. For the pollutants CO, NO_2 and SO_2 the data capture was just below, but very close to 90%. $PM_{2.5}$ data capture was only 81.1%, but this was mainly due to some problems with the newly installed analyser in Swansea Roadside.

Some sites were affected by relocation or temporary closure, which resulted in reduced data capture. A considerable amount of data were lost during July and August due to high ambient temperatures causing analysers to overheat, and several air conditioning units have failed during this period.

The first two TEOM FDMS analysers have been introduced into the network during this period. The QA/QC unit has developed new software to handle and ratify data from these analysers. In addition, a new section to the LSO manual has been published to cover these instruments. The Partisol LSO manual has also been updated.

During the summer 2006 intercalibration exercise, 128 sites were audited by the QA/QC Unit. The detailed results are given in Section B of this report. A total of 77 of the 441 analysers tested were identified as outliers.

A total of 8 cylinders used to scale data were identified as having drifted in concentration by more than 10% from the certified value. These were requested (where not empty) to be returned to the QA/QC unit for recalibration.

One NOx analyser was found to have a software converter efficiency correction factor set to a value different from 100%. ESUs are reminded that software settings should not be used to correct for converter inefficiency.

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Part A

Data Ratification Report July-September 2006

PART A – Data Ratification Report for the Automatic Urban and Rural Network, July-September 2006

1 Introduction

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 2006. During this period there were 128 monitoring sites in the Network of which there are 90 urban sites, 24 rural sites and a further 14 sites in the London Air Quality Monitoring Network (LAQN) which are affiliated into the national network. There are currently 64 Defra-funded sites and 64 affiliate sites. Three sites (Belfast Clara Street, Northampton PM_{10} and Brighton Roadside PM_{10}) measure PM_{10} only and are included as individual sites in the total of 128, although Northampton PM_{10} is co-located with the Northampton 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 recently taken place in the network, 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.

Table 1.1 Changes in the Network, July-September 2006

Site	Date closed	Date commissioned	Comments
Exeter Roadside		10 July 2006	Replacement NOx analyser installed
Swansea Roadside	-	20 Sept 06	Relocated Swansea site. $PM_{2.5}$ analyser also installed and incorporated into the network

The monitoring site at Swansea Roadside contains the first two TEOM FDMS (PM_{10} and $PM_{2.5}$) analysers to be deployed in the AURN.

The QA/QC unit has developed new software techniques to handle and ratify data from TEOM FDMS analysers and has provided a new section of the LSO manual detailing LSO procedures for these anlaysers.

The QA/QC unit has also liaised closely with the CMCU to update the LSO manual for Partisol analysers and LSOs with Partisol 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.

1.1.1 Exeter Roadside

The temporary analysers at Exeter Roadside were replaced with new, permanent analysers on 7 June (except for NOx, which was replaced on 10 July). The site was audited by the QA/QC unit on 18 July, which serves as a commissioning audit.

1.1.2 Swansea Roadside

The Swansea monitoring site was closed on 7 August, and has been relocated to a nearby roadside location, Swansea Roadside. This has the addition of a $PM_{2.5}$ analyser. Both the $PM_{2.5}$ and the PM_{10} analysers are FDMS TEOMs, the first of these analysers to be introduced into the network. The site location is

Carmarthen Road (A483)
SS653945 183ft above sea level, 5m from kerbside.
Grid reference 265341 194458

1.2 Overview of Network Performance

Ratified hourly average data capture for the network averaged 90.3% for all pollutants (O_3, NO_2, SO_2, CO, PM_{10} and $PM_{2.5}$) during the 3-month reporting period July-September 2006 (see Table 1.2 below). For the pollutants CO, NO_2 and SO_2 the data capture was just below, but very close to 90%. $PM_{2.5}$ data capture was only 81.1%, but this was mainly due to some problems with the newly installed analyser in Swansea Roadside. For comparison, the annual average network data capture for the calendar year 2005 was 91%.

Table 1.2 AURN Ratified Data Capture (%) by Quarter, 2006 (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 2006	90.1	89.9	91.0	94.7	98.1	90.9	90.4
Q2 Apr-June 2006	90.7	91.9	94.0	96.0	96.4	93.3	92.3
Q3 July-Sept 2006	89.5	89.5	93.6	90.4	81.1	89.2	90.3

Overall, 326 out of the 424 analysers (77%) achieved data capture levels above the required 90% target during this reporting period (See Table 1.3).

Table 1.3 Number of Analysers with Data Capture below 90%

Total Number Of Analysers		Q1 Jan-Mar 2006	Q2 Apr-June 2006	Q3 July-Sept 2006
CO	77	17	15	15
NO_2	109	20	23	29
O_3	87	14	9	13
PM_{10}	70*	8	8	16
$PM_{2.5}$	6*	0	0	1
SO_2	75	16	15	24
Total <90%	424	75	70	98

*Includes TEOM, TEOM FDMS and Partisol analysers

In total, 39 out of the 128 operational network sites (21%) had an average data capture rate below the required 90% level for the July-September 2006 period. These sites are listed in Table 1.4. 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 1.4 Sites with Average Data Capture < 90%, July-September 2006 (Data capture calculated from site start date)

Network Data Capture for 01/07/2006 to 30/09/2006 from start date of any new site

Site	Owner	Site Average
England		
Barnsley 12	DEFRA	69.9
Blackpool Marton	DEFRA	86.5
Brentford Roadside	Affiliate	83.5
Bury Roadside	Affiliate	76.8
Cambridge Roadside	Affiliate	76.9
Camden Kerbside	Affiliate	78.4
Ladybower	DEFRA	75.1
Liverpool Speke	Affiliate	86.4
London Bexley	Affiliate	89.2
London Bromley	Affiliate	26.5
London Hackney	Affiliate	48.2
London Marylebone Road	Affiliate	83.9
London Southwark	Affiliate	80.4
London Westminster	DEFRA	77.9
Northampton PM10	Affiliate	85.9
Norwich Centre	DEFRA	79.6
Norwich Forum Roadside	Affiliate	74.1
Plymouth Centre	DEFRA	73.8
Reading New Town	DEFRA	88.5
Rotherham Centre	Affiliate	62.1
Salford Eccles	Affiliate	85.6
Sheffield Centre	DEFRA	83.5
Somerton	Affiliate	89.3
Southampton Centre	DEFRA	71.2
Southwark Roadside	Affiliate	0.0
Wigan Centre	Affiliate	89.6
Wirral Tranmere	DEFRA	86.1
Yarner Wood	DEFRA	85.6
N Ireland		
Belfast Centre	DEFRA	88.1
Scotland		
Bush Estate	DEFRA	85.4
Dumfries	DEFRA	87.7
Fort William	DEFRA	77.3
Glasgow Centre	DEFRA	87.2
Glasgow Kerbside	DEFRA	87.8
Lerwick	DEFRA	89.8
Wales		
Cwmbran	Affiliate	83.5
Narberth	Affiliate	87.1
Swansea	Affiliate	75.1
Swansea Roadside	Affiliate	67.7

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 shortly. 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

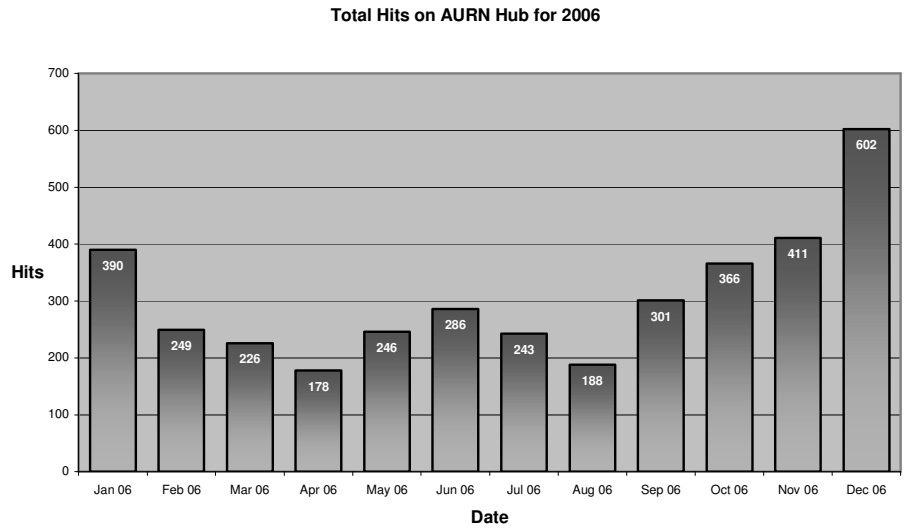
The AURN project information hub website is located at[1]:
http://www.aeat.co.uk/com/AURNHUB/index.html.

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

- Up-dated site lists (July 2006) and critical site list (July 2006)
- Monthly PM_{10} (Gravimetric) exceedences up to December 2006
- QA/QC Unit's data ratification and intercalibration report, April-June 2006
- Recent Management Unit reports (July-September 2006)
- Updated version of the LSO manual

The Hub has continued to provide a valuable source of information for interested organisations-see Figure 1.1

Figure 1.1 AURN Hub Monthly Usage Statistics January-December 2006



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

As is often observed, most interest in the hub seems to be around the time of the annual LSO meeting in December.

2 Generic Data Quality Issues

2.1 Progress on Monitoring Requirements of the EU Daughter Directives

Installation of all of the additional NO_x and O_3 analysers at existing sites required to comply with the third Daughter Directive (DD3) has now been completed. Further details on the third Daughter Directive can be found at:
http://www.defra.gov.uk/environment/consult/air-23daughter/index.htm

2.2 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 62 sites (195 analysers) have been identified as critical for DD1, DD2 or DD3 (25 sites in agglomerations and 36 in zones).

Data capture for all 62 of the critical sites during the 3-month period July-September 2006 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 2.1 below. In total, 32 out of the 187 critical site analysers (17%) did not meet the required 90% data capture during the period July-September 2006. Note that some critical sites also measure other pollutants, which are not themselves critical.

Table 2.1 Critical sites with <90% data capture, July-September 2006

Site	CO	PM_{10}	NO_2	O_3	PM_{25}	SO_2	Site Average	Principle reason for loss
England								
Blackpool Marton	**88.5**	**93.7**	**86.0**	**93.8**	-	**70.7**	**86.5**	Various equipment faults
Liverpool Speke	**94.0**	**89.5**	**77.0**	**94.0**	-	**77.6**	**86.4**	Numerous gaps; temperature problems
Northampton PM_{10}	-	**85.9**	-	-	-	-	**85.9**	Power and filter change failures
Norwich Centre	99.5	0.0	**99.5**	**99.5**	-	99.6	**79.6**	TEOM Ko 8% out; poor quality data
Plymouth	90.5	**24.8**	96.4	63.1	-	94.3	**73.8**	Noisy PM_{10} data, O3

[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

Site	CO	PM_{10}	NO_2	O_3	PM_{25}	SO_2	Site Average	Principle reason for loss
Centre								main valve fault
Reading New Town	**90.4**	**89.1**	**83.6**	**90.9**	-	**88.5**	**88.5**	Excessive hut temperature
Sheffield Centre	95.9	**96.0**	40.7	95.9	-	89.1	**83.5**	NOx converter fault
Somerton	-	-	**88.7**	**89.9**	-	-	**89.3**	
Southampton Centre	**52.1**	**94.1**	**83.0**	**89.9**	-	**36.9**	**71.2**	Various analyser faults and poor quality data
Wigan Centre	**91.4**	**85.5**	**92.8**	**91.3**	-	**87.1**	**89.6**	Gaps in data, suspected logger fault
Wirral Tranmere	**90.6**	**86.1**	**84.9**	**81.5**	-	**87.7**	**86.1**	Air con caused numerous power cuts
Yarner Wood	-	-	**75.3**	**96.0**	-	-	**85.6**	Struck by lightning, damaging logger
N Ireland								
Belfast Centre	**88.9**	88.3	**85.3**	**89.1**	-	89.1	**88.1**	Sample manifold vandalised
Scotland								
Bush Estate	-	-	**72.3**	**98.6**	-	-	**85.4**	NOx analyser flow fault
Dumfries	**94.6**	**75.0**	**93.4**	-	-	-	**87.7**	PM_{10} problems- see Section 2.3
Fort William	-	-	**66.3**	**88.4**	-	-	**77.3**	O_3 analyser fault; spurious NO_2 baseline
Glasgow Centre	68.0	93.1	**97.4**	**97.4**	-	**80.1**	**87.2**	CO and SO_2 analysers unstable
Wales								
Cwmbran	**99.6**	**98.0**	**99.3**	**99.6**	-	**20.7**	**83.5**	Poor quality SO_2 data- probably temperature related
Narberth	-	82.4	90.8	**89.7**	-	85.4	**87.1**	Temperature related faults
Swansea	**75.2**	75.3	75.0	75.2	-	74.9	**75.1**	Site relocated
Swansea Roadside	**95.1**	12.9	95.1	95.1	12.9	95.1	**67.7**	Problems with particle analysers, new site

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

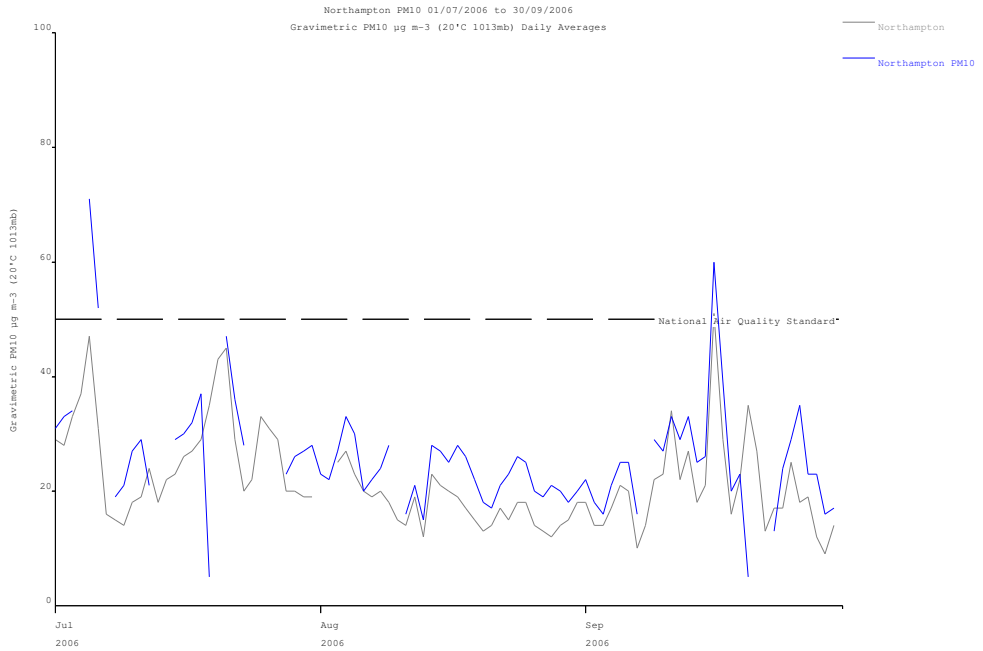
Recommendation

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.

2.3 Gravimetric PM_{10} 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}). The gravimetric PM_{10} analyser at Northampton is also co-located with a TEOM analyser, which provides a comparison of data from the two techniques. Gravimetric PM_{10} concentrations and the daily mean TEOM scaled by 1.3 at Northampton for the 3-month period July-September 2006 are shown in Figure 2.1. Throughout the period, the Partisol consistently overrread the TEOMx1.3 data.

Figure 2.1 Partisol and TEOM (x1.3) Concentrations at Northampton (January-September 2006)



Data capture for the gravimetric PM_{10} (Partisol) analysers for the period July-September 2006 is given in Table 2.3. Six of the eight sites for which data are available exceeded the 90% data capture target in this quarter, with average data capture over all eight analysers of 92.9%.

Table 2.3 Gravimetric PM_{10} Data Capture (%) 2006

Site	3-months Data Capture (%) July-September 2006
Auchencorth Moss	94.6
Bournemouth	100
Brighton Roadside PM_{10}	93.5
London Westminster	97.8
Northampton	85.9
Dumfries	75
Inverness	98.9
Wrexham	97.8

The reasons for data loss in the gravimetric analysers are reported elsewhere, but the major sources of data loss for sites below 90% data capture are given as follows:

Dumfries: Flow faults, 13 July to 7 August
Northampton: Power failure 4 July; Filter change failures (8 days); delayed filter change (2 days)

Bureau Veritas has supplied the measured data, undertaken the filter weighing and calculated the particulate concentrations; AEA has ratified the results.

2.4 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 42 sites (47 analysers) showing continuing problems with the autocalibration run-on during July-September 2006 are given in Table 2.5. Any autocalibration run-on data that look visibly significant have been deleted from these data sets during ratification.

Table 2.5 Estimate of Spike or Dip due to Auto-calibration Run-on: July-September 2006

Site	Pollutant	Run-On Conc	Autocal Conc	Hours lost	Period
Blackpool Marton	CO	0	40	1	July and Sept
London Hillingdon	CO	0.1	35	1	July to Sept
London Southwark	CO	-1	48	4	July to Sept
Stockport Shaw Heath	NO	3	0	2	July to Sept
Aberdeen	NO_2	4	200	1	July and Sept

Aston Hill	NO_2	0.6	300	1	Sept
Belfast Centre	NO_2	6	300	1	July to Sept
Birmingham Centre	NO_2	4	750	1	July to Sept
Blackpool Marton	NO_2	1	100	1	July to Aug
Bournemouth	NO_2	4	600	2	July to Sept
Bury Roadside	NO_2	12	350	1	July to Sept
Derry	NO_2	1	300	1	July to Sept
Dumfries	NO_2	6	400	2	Aug
Edinburgh St Leonards	NO_2	2	500	2	July to Sept
Eskdalemuir	NO_2	2.3	500	3	July to Sept
Fort William	NO_2	1	350	2	July and Sept
Harwell	NO_2	1.4	200	2	July to Aug
Hull Freetown	NO_2	4	200	1	July to Sept
Leominster	NO_2	3	500	2	July to Sept
London Bloomsbury	NO_2	6	700	1	July to Sept
London Wandsworth	NO_2	1	185	1	July to Sept
Lullington Heath	NO_2	2.5	300	1	July to Sept
Newcastle Centre	NO_2	4	300	1	July to Sept
Oxford Centre Roadside	NO_2	4	250	1	July to Sept
Preston	NO_2	3	500	1	July to Sept
Southampton Centre	NO_2	5	850	1	July to Sept
St Osyth	NO_2	2.9	300	2	July to Sept
Thurrock	NO_2	11	400	1	July to Sept
West London	NO_2	4	650	1	July and Aug
Wirral Tranmere	NO_2	3	300	1	July to Sept
Wrexham	NO_2	6	350	1	July to Sept
Derry	O_3	-3	1000	1	July to Sept
Stoke-on-Trent	O_3	-3	1000	1	July to Sept
Wirral Tranmere	O_3	-5	600	1	July to Sept
Derry	SO_2	0	200	1	July and Aug
London Brent	SO_2	1	900	1	July and Aug
London Marylebone Road	SO_2	1	375	1	July to Sept
London Southwark	SO_2	-1	800	4	July to Sept
London Teddington	SO_2	0.2	425	1	Sept
Narberth	SO_2	1.1	500	2	July to Sept
Plymouth Centre	SO_2	0	800	1	July and Aug
Wirral Tranmere	SO_2	-1	450	1	Aug and Sept

Eskdalemuir NOx and London Southwark CO and SO_2 should be prioritised as several hours per day are being lost at these sites. Eskdalemuir was highlighted as a problem in both the January-March and April to June QA/QC reports. Several sites continue to have autocalibration span concentrations set too high (eg Southampton Centre and Birmingham Centre-NO_2 and London Brent, London Southwark and Plymouth Centre-SO_2). These should be adjusted, where possible, at the next opportunity.

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.

Stockport Shaw Heath, Bournemouth, Dumfries, Edinburgh, Eskdalemuir, Fort William, Harwell, St Osyth and Leominster (all NO_2), London Southwark (CO and SO_2), Narberth (SO_2) should be prioritised as at least 2 hours per day are being lost at these sites. Eskdalemuir and Leominster have been highlighted as a priority in previous reports.

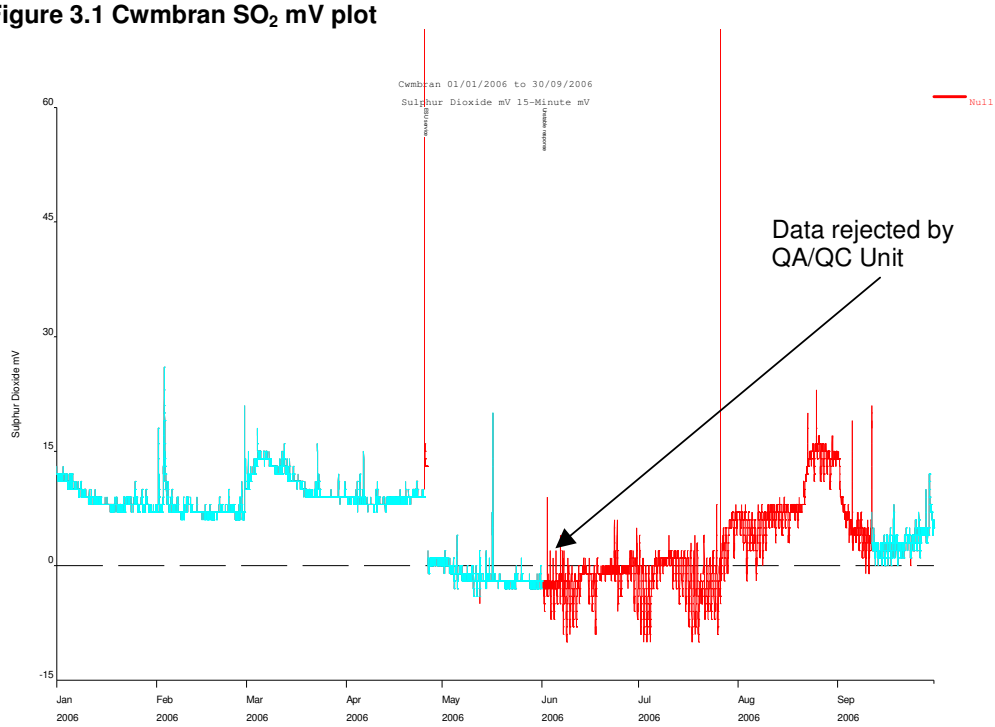
In the meantime, we recommend that the autocalibration devices be adjusted at the problem sites to reduce the concentration of the span gas. It is strongly advised that NO_2 autocalibration span concentrations of less than 200ppb (urban sites) and 100ppb (rural sites) are used throughout the network.

3 Site Specific Issues

3.1 Cwmbran SO_2

The SO_2 analyser at Cwmbran has showed an unstable and erratic response since early summer 2006. This is shown in Figure 3.1.

Figure 3.1 Cwmbran SO_2 mV plot



The air conditioning unit has been reported as blowing warm air by the ESU on 26 July, and it is likely that excessive temperature contributed to the unstable response.

Recommendation

The air conditioning unit at the Cwmbran site should be repaired or replaced as soon as possible, and in any case before the onset of warmer weather.

3.2 Bolton NOx

The Bolton NOx analyser converter efficiency was measured as 104.6% at the summer 2006 QA/QC audit, and 93% by the ESU in September. It is possible that the converter efficiency setting in the analyser software was set to a value other than 100%, which would mean the analyser was incorrectly scaling the data. Although the dataset was not entirely deleted in this case, ESUs should ensure that all converter settings in analyser software must be set to 100%.

Recommendation

ESUs to ensure software settings (where applicable) for converter efficiencies to be set at 100%

3.3 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 3.2

Table 3.2 Status of Analysers Highlighted in Previous Reports

Site	Analyser	Fault	Current status
Glazebury	O_3	Analyser drift	Appears to be repaired; will be checked at next audit
Bolton	NOx	Various	See Section 3.2 above
London Westminster	CO	Unstable response	Continued poor quality data deleted up to 20 September
Reading New Town	NO_2	PMT cooler	Now OK
Weybourne	O_3	No manual calibrations or IZS	No progress reported
Salford Eccles	CO	Constant zero baseline	No progress reported
Rural CO analysers	CO	Baseline drift	Drift still evident
Wicken Fen	O_3	Flow	Now fixed
Norwich Centre	SO_2	Large step change between old and replacement analysers	Situation is being closely monitored
Bush	NOx	Succession of analyser faults	Poor performing analyser failed again on 6 July (24.8 days lost).
Narberth	O_3	Leak	Quality of O_3 data still uncertain; significant outlier at summer 2006 audit. Installation of duplicate analyser still awaited.
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 this issue as the majority of these instruments are located at critical sites.

4 Sites with Data Capture Below 90%

4.1 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 2006 (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 2006
(Using the start date of any new site or end date of site closed)

Pollutant	Data Capture (%)	Start date	End date	Reason	Comments	Number of days	Number of hours
England							
Barnsley 12							
SO2	69.90%	27-Jun-06	27-Jul-06	Unstable response	poor analyser performance	30	721
		16-Aug-06	17-Aug-06	ESU service		1	23
Blackpool Marton							
CO	88.50%	14-Aug-06	17-Aug-06	Instrument fault	Ambirak power failure. Replaced power supply and cooling fan	3.3	78
		5-Sep-06	7-Sep-06	Sampling fault	ENG C/O Replaced pump	2.4	57
		19-Sep-06	21-Sep-06	ESU service		2	49
NO2	86.00%	14-Aug-06	21-Aug-06	Instrument fault	ENG C/O Ambirak power failure. Replaced power supply and cooling fan	6.8	164
		27-Aug-06	27-Aug-06	Data gap		0.3	7
		19-Sep-06	22-Sep-06	ESU service		2.6	63
SO2	70.70%	14-Aug-06	7-Sep-06	Air Conditioning fault	Unstable response	24.3	582
		19-Sep-06	21-Sep-06	ESU service		2	49
Bolton							
NO2	77.50%	10-Sep-06	30-Sep-06	ESU service		20	481
SO2	83.90%	20-Jul-06	20-Jul-06	Data gap		0.3	6
		20-Jul-06	21-Jul-06	Data gap		0.9	21
		21-Jul-06	22-Jul-06	Data gap		1.1	27
		23-Jul-06	23-Jul-06	Data gap		0.3	6
		25-Jul-06	27-Jul-06	Data gap		1.7	41
		29-Jul-06	31-Jul-06	Switched out-of-service	ENG C/O Cooler fault	2	47
		23-Aug-06	25-Aug-06	Data gap		1.4	34
		25-Aug-06	28-Aug-06	Data gap		3.8	90
		21-Sep-06	22-Sep-06	ESU service		1	25
Bradford Centre							
SO2	84.40%	18-Jul-06	26-Jul-06	Air Conditioning fault	Call out: A/C unit failed	8	192
		16-Aug-06	18-Aug-06	ESU service		2.4	57
		3-Sep-06	6-Sep-06	Low flow rate	ENG C/O Replaced pump diaphragm	3.4	81
Brentford Roadside							

Pollutant	Data Capture (%)	Start date	End date	Reason	Comments	Number of days	Number of hours
CO	87.60%	12-Jun-06	5-Jul-06	Air Conditioning fault	site turned off	23	553
		21-Jul-06	24-Jul-06	Flat response	LSO reset at calibration.	3.1	75
		6-Aug-06	7-Aug-06	Flat response	LSO reset at calibration.	1	25
		18-Sep-06	20-Sep-06	Flat response	LSO reset at calibration.	2	49
NO2	79.40%	3-Jun-06	5-Jul-06	Air Conditioning fault	site turned off because of air conditioning fault.	32.4	778
		20-Jul-06	3-Aug-06	Instrument fault	instrument step change + ozone pre heater required.	14	337
Bury Roadside							
CO	28.80%	27-Jul-06	23-Oct-06	Unstable output	Poor data	88.5	2123
NO2	87.80%	8-Aug-06	9-Aug-06	ESU service		1.1	26
		15-Aug-06	17-Aug-06	Power cut	Power supply interuption	1.9	46
		5-Sep-06	7-Sep-06	Logger fault	PC not logging site data	1.7	40
		28-Sep-06	23-Oct-06	Logger fault	PC failure	25.7	616
O3	84.30%	24-Jul-06	31-Jul-06	Instrument fault	Faulty UV lamp	6.8	163
		8-Aug-06	9-Aug-06	ESU service	Service - lamp board replaced	1.1	26
		15-Aug-06	17-Aug-06	Power cut	Power supply interuption	1.9	46
		5-Sep-06	7-Sep-06	Logger fault	PC not logging site data	1.6	39
		28-Sep-06	23-Oct-06	Logger fault	PC failure	25.7	616
Cambridge Roadside							
NO2	76.90%	4-Jul-06	6-Jul-06	Monitoring suspended	LSO turned off power due to water leak.	1.9	45
		2-Aug-06	21-Aug-06	Sampling fault	Internal sampling between cals	19	457
Camden Kerbside							
PM10	63.90%	22-Jul-06	28-Jul-06	Sampling fault	ENG C/O Water ingress into analyser. Recalibrated	6.3	151
		24-Aug-06	19-Sep-06	High noise	Eng C/O All connector & boards removed & refitted.	26.4	634
Haringey Roadside							
PM10	81.80%	13-Sep-06	29-Sep-06	Sampling fault	PM10 main and total flows out by -13% failed both leak tests at audit	16.2	388
Hove Roadside							
NO2	71.70%	5-Sep-06	3-Oct-06	Instrument fault	unknown instrument fault.	28.4	681
Hull Freetown							
CO	87.90%	23-Jul-06	26-Jul-06	Instrument fault	Optical bench fault	3.1	74
		21-Sep-06	28-Sep-06	Instrument fault	Faulty power supply	7.4	177
Ladybower							
NO2	36.70%	25-May-06	24-Aug-06	Logger fault	Logger channel corrupt	91.1	2187
		27-Sep-06	20-Oct-06	ESU service		23.2	556
Leamington Spa							
SO2	63.00%	4-Jul-06	5-Jul-06	Flat response	Data deleted	0.3	8
		3-Aug-06	4-Aug-06	ESU service		1.1	27
		30-Aug-06	11-Oct-06	Instrument fault	ENG C/O UV lamp not lit - suspect Lamp driver board.	42.4	1018
Leominster							

Pollutant	Data Capture (%)	Start date	End date	Reason	Comments	Number of days	Number of hours
NO2	90.00%	1-Aug-06	2-Aug-06	Power cut		1.1	26
		7-Aug-06	8-Aug-06	Power cut		0.6	15
		21-Sep-06	22-Sep-06	Logger fault	No data collected	0.7	16
Liverpool Speke							
NO2	77.00%	2-Jul-06	7-Jul-06	Air Conditioning fault		4.4	106
		14-Jul-06	26-Jul-06	Air Conditioning fault		11.3	271
		17-Aug-06	19-Aug-06	Data gap		2.7	64
		12-Sep-06	12-Sep-06	QA/QC audit		0.3	7
		26-Sep-06	28-Sep-06	ESU service		2	49
PM10	89.50%	30-Jun-06	3-Jul-06	Flat response		2.9	69
		2-Aug-06	3-Aug-06	Instrument fault	ENG C/O Fixed locking up TEOM	1.5	37
		17-Aug-06	19-Aug-06	Data gap		2.5	61
		12-Sep-06	12-Sep-06	QA/QC audit		0.3	7
		26-Sep-06	28-Sep-06	ESU service		2	49
SO2	77.60%	14-Aug-06	19-Aug-06	Air Conditioning fault		5.8	138
		12-Sep-06	12-Sep-06	QA/QC audit		0.3	7
		14-Sep-06	28-Sep-06	Instrument fault	ENG C/O Replaced UV lamp	14	337
London Bexley							
NO2	77.60%	1-Jul-06	5-Jul-06	Data gap	Possible air conditioning fault.	3.9	94
		3-Aug-06	16-Aug-06	Pump fault	Eng C/O serviced pump + audit findings.	13.5	325
		30-Aug-06	1-Sep-06	ESU service		2.1	50
London Bromley							
NO2	26.50%	19-Apr-06	6-Sep-06	Instrument removed for repair		141	3372
London Cromwell Road 2							
SO2	83.70%	2-Jul-06	15-Jul-06	Air Conditioning fault	ENG C/O SO2 Data flagged bad.UV lamp adjusted	12.5	300
		26-Sep-06	27-Sep-06	Power cut		0.8	18
		30-Sep-06	17-Oct-06	Instrument fault	Eng C/O flow fault and service	17.3	414
London Hackney							
CO	71.00%	13-Aug-06	22-Aug-06	Power cut		8.5	203
		13-Sep-06	2-Oct-06	Power cut		19.6	470
NO2	73.60%	2-Jul-06	2-Jul-06	Air Conditioning fault		0.4	9
		3-Jul-06	3-Jul-06	Air Conditioning fault		0.3	7
		17-Jul-06	30-Jul-06	Air Conditioning fault		13.7	329
		13-Aug-06	22-Aug-06	Power cut	Power fault	8.5	203
O3	0.00%	1-Jan-06	2-Oct-06	Instrument fault		275	6591
London Hillingdon							
NO2	87.90%	6-Jul-06	6-Jul-06	QAQC audit	Calibration + AUDIT	0.3	6
		24-Jul-06	3-Aug-06	Instrument fault	zero step change follows follows service - reset at Eng C/O	10.2	245
London Marylebone Road							
CO	26.70%	4-Jul-06	5-Jul-06	Instrument fault	ENG C/O Replaced Moleculite zero scrubbing material replaced	0.7	16

Pollutant	Data Capture (%)	Start date	End date	Reason	Comments	Number of days	Number of hours
		26-Jul-06	18-Oct-06	Instrument fault	ENG C/O Zero problem.	84.1	2019
London Southwark							
CO	73.10%	18-Jul-06	31-Jul-06	Air Conditioning fault	LSO turned pump off as ambient temp was too hot	13.3	319
		4-Sep-06	5-Sep-06	ESU service		1.1	27
O3	64.60%	1-Jan-06	31-Jul-06	ESU service		212	5088
		4-Sep-06	5-Sep-06	ESU service		1.1	27
SO2	85.70%	4-Sep-06	5-Sep-06	ESU service		1.1	27
London Westminster							
CO	11.30%	26-Feb-06	20-Sep-06	High noise	Noisy response	207	4958
SO2	87.90%	20-Jul-06	25-Jul-06	Pump fault	Call out: SO2 flow fault.	5.8	139
		9-Sep-06	11-Sep-06	Low flow rate	ENG C/O Cleaned sample/cal valves - flow and pressure now OK	2	49
		18-Sep-06	20-Sep-06	ESU service		2.2	52
Manchester Piccadilly							
SO2	88.10%	21-Aug-06	31-Aug-06	Air Conditioning fault		9.7	232
Norwich Centre							
PM10	0.00%	18-Jun-06	9-Oct-06	Ko 8% out at audit; poor quality data deleted		113	2716
Norwich Forum Roadside							
NO2	74.10%	14-Jul-06	18-Jul-06	Logger fault		4.2	101
		4-Aug-06	10-Aug-06	Logger fault	Logger replaced	6	144
		1-Sep-06	13-Sep-06	Instrument fault	PSU problem fragmented data	12.5	301
Plymouth Centre							
O3	63.10%	20-Feb-06	3-Aug-06	ESU service		164	3937
PM10	24.80%	5-Jul-06	6-Jul-06	High noise	Bad filter change 15.15 to 11.30 on 6 Jul	0.9	22
		22-Jul-06	28-Sep-06	Instrument fault	Data rejected by QA/QC to 28th September.	68	1633
Preston							
NO2	81.80%	1-Jul-06	6-Jul-06	Unstable response	Unstable baseline deleted	5	121
		25-Jul-06	26-Jul-06	Unstable response	Unstable baseline deleted	0.5	13
		21-Sep-06	22-Sep-06	Unstable response	Unstable baseline deleted	0.5	12
		25-Sep-06	5-Oct-06	ESU service		10.2	244
Reading New Town							
NO2	83.60%	4-Jul-06	5-Jul-06	Power cut		1	23
		11-Jul-06	11-Jul-06	QAQC audit		0.3	6
		16-Jul-06	28-Jul-06	ESU service		11.5	276
		9-Sep-06	10-Sep-06	Logger fault	possible logger fault	1.8	44
PM10	89.10%	4-Jul-06	5-Jul-06	Power cut	Probable power cut.	1	24
		11-Jul-06	11-Jul-06	QAQC audit		0.3	6
		17-Jul-06	21-Jul-06	ESU service		4.1	98
		1-Aug-06	3-Aug-06	Unstable response	TEOM response fault after LSO routine cal.	2	47
		9-Sep-06	10-Sep-06	Logger fault	possible logger fault	1.8	44
SO2	88.50%	4-Jul-06	5-Jul-06	Power cut	possible power cut	0.9	22
		17-Jul-06	22-Jul-06	ESU service		6	143

Pollutant	Data Capture (%)	Start date	End date	Reason	Comments	Number of days	Number of hours
		27-Jul-06	28-Jul-06	ESU service		1.1	26
		9-Sep-06	10-Sep-06	Logger fault	possible logger fault	1.9	45
Redcar							
PM10	81.60%	15-Jul-06	16-Jul-06	Air Conditioning fault	Site power tripping due to a/c fault	0.9	21
		17-Aug-06	18-Aug-06	Air Conditioning fault	Site power tripping due to a/c fault	1	24
		9-Sep-06	22-Sep-06	ESU service		13.3	318
		29-Sep-06	2-Oct-06	Air Conditioning fault	Site power tripping due to a/c fault	2.6	62
Rotherham Centre							
NO2	49.00%	3-Jun-06	16-Aug-06	Air Conditioning fault	Data rejected up to service	74.6	1790
SO2	40.40%	3-Jun-06	24-Aug-06	ESU service		82.5	1979
		12-Sep-06	12-Sep-06	Instrument fault	ENG C/O Reduced Signal Ref. & PMT High Volts	0.3	7
Salford Eccles							
CO	63.60%	26-Jul-06	27-Jul-06	Data gap	No data collected	1.2	28
		30-Aug-06	9-Oct-06	ESU service		40.2	964
O3	82.70%	21-Jul-06	4-Aug-06	Instrument fault	Leak in internal inline filter	14.1	338
		30-Aug-06	31-Aug-06	ESU service		1.1	26
Sheffield Centre							
NO2	40.70%	1-May-06	24-Aug-06	Rapid zero or sensitivity drift	rejected as QA/QC P3 action ENG C/O Replaced Air Con.	115	2770
SO2	89.10%	1-Jul-06	7-Jul-06	Unstable response	spurious data	5.6	135
		12-Jul-06	13-Jul-06	Unstable response	spurious data	0.4	10
		22-Jul-06	23-Jul-06	Data gap		1.3	30
		22-Aug-06	24-Aug-06	ESU service		2.1	51
Somerton							
NO2	88.70%	17-Jul-06	25-Jul-06	Logger fault	ENG C/O Logger comms Fault.	8.6	206
		29-Jul-06	29-Jul-06	Power cut		0.3	7
		10-Aug-06	11-Aug-06	Switched out-of-service	out of service after LSO cal	1	25
O3	89.90%	17-Jul-06	25-Jul-06	Logger fault	ENG C/O Logger comms Fault.	8.5	204
		29-Jul-06	29-Jul-06	Power cut		0.3	7
Southampton Centre							
CO	52.10%	11-Jul-06	22-Aug-06	Baseline truncated	possible truncation and flow fault	41.7	1001
		29-Aug-06	31-Aug-06	ESU service		2.1	50
NO2	83.00%	22-Aug-06	3-Sep-06	Instrument fault	O3 gen failure	11.9	286
O3	89.90%	29-Aug-06	7-Sep-06	ESU service		8.7	208
SO2	36.90%	10-Jul-06	6-Sep-06	Rapid zero or sensitivity drift	ENG C/O Investigated slow response. Replaced sample filter	58	1392
Southwark Roadside							
CO	0.00%	9-Feb-06	31-Dec-06		Site closed	326	7812
NO2	0.00%	21-Feb-06	4-Jan-07		Site closed	317	7617
SO2	0.00%	8-Feb-06	31-Dec-06		Site closed	327	7846

Pollutant	Data Capture (%)	Start date	End date	Reason	Comments	Number of days	Number of hours
Wigan Centre							
PM10	85.50%	3-Jul-06	3-Jul-06	Logger fault	Intermittent data loss - suspect logger fault	0.3	7
		4-Jul-06	4-Jul-06	Logger fault	Intermittent data loss - suspect logger fault	0.3	6
		17-Jul-06	17-Jul-06	Logger fault	Intermittent data loss - suspect logger fault	0.3	7
		31-Jul-06	3-Aug-06	Logger fault	Intermittent data loss - suspect logger fault	2.9	69
		4-Aug-06	5-Aug-06	Logger fault	Intermittent data loss - suspect logger fault	0.8	20
		10-Aug-06	16-Aug-06	Logger fault	Missing data 10/8-14/8 Service 14/8-16/8	6.1	147
SO2	87.10%	23-Jun-06	5-Jul-06	Instrument fault	UV Lamp fault and loose mirror	12.5	300
		10-Aug-06	16-Aug-06	Logger fault	Missing data 10/8-14/8 Service 14/8-16/8	6.1	147
Wirral Tranmere							
NO2	84.90%	2-Jul-06	3-Jul-06	Air Conditioning fault		0.9	22
		15-Jul-06	15-Jul-06	Air Conditioning fault		0.3	6
		16-Jul-06	16-Jul-06	Air Conditioning fault		0.3	7
		18-Jul-06	20-Jul-06	Air Conditioning fault	Call out: Recurring power trip out due to A/C fault.	1.9	45
		25-Jul-06	28-Jul-06	Air Conditioning fault	ENG C/O Fixed air con	2.8	66
		31-Jul-06	31-Jul-06	Air Conditioning fault	power out due to faulty aircon	0.4	10
		7-Sep-06	8-Sep-06	Instrument fault	Unstable response-data deleted	0.9	22
		18-Sep-06	20-Sep-06	ESU service		2	47
O3	81.50%	2-Jul-06	3-Jul-06	Air Conditioning fault	power out due to aircon	0.8	18
		18-Jul-06	19-Jul-06	Air Conditioning fault	power out due to aircon	0.7	17
		19-Jul-06	20-Jul-06	Air Conditioning fault	Call out: Recurring power trip out due to A/C fault.	1.1	27
		25-Jul-06	2-Aug-06	Air Conditioning fault	ENG C/O Fixed air con	7.8	188
		7-Sep-06	8-Sep-06	Data gap		0.5	12
		18-Sep-06	20-Sep-06	ESU service		2	47
PM10	86.10%	1-Jul-06	5-Jul-06	Instrument fault	ENG C/O Serviced the mass flow controllers	3.9	93
		8-Jul-06	9-Jul-06	High noise	Noisy rsponse	0.5	12
		18-Jul-06	20-Jul-06	Air Conditioning fault		1.9	45
		25-Jul-06	27-Jul-06	Air Conditioning fault	ENG C/O Fixed air con	1.8	44
		23-Aug-06	24-Aug-06	Air Conditioning fault	power out due to aircon	1.3	30
		7-Sep-06	8-Sep-06	Air Conditioning fault	power out due to aircon	0.9	21
		18-Sep-06	20-Sep-06	ESU service		2	47
SO2	87.70%	2-Jul-06	3-Jul-06	Air Conditioning fault	power out due to aircon	0.7	17
		18-Jul-06	19-Jul-06	Air Conditioning fault	power out due to aircon	0.7	17
		19-Jul-06	20-Jul-06	Air Conditioning fault	Call out: Recurring power trip out due to A/C fault.	1.1	27
		25-Jul-06	28-Jul-06	Air Conditioning fault	ENG C/O Fixed air con	2.8	67
		7-Sep-06	8-Sep-06	Data gap		0.5	12
		18-Sep-06	20-Sep-06	ESU service		2	47
Wolverhampton Centre							
CO	88.40%	4-Sep-06	12-Sep-06	ESU service		8.1	195
		29-Sep-06	2-Oct-06	Sampling fault	Call out: CO chopper failure	3.5	83
Yarner Wood							
NO2	75.30%	2-Jul-06	24-Jul-06	Logger fault	Erratic data following lightning strike - logger damaged	22.3	534

Pollutant	Data Capture (%)	Start date	End date	Reason	Comments	Number of days	Number of hours
N Ireland							
Belfast Centre							
CO	88.90%	3-Sep-06	13-Sep-06	Sampling fault	Broken manifold (3/9-11/9) & Service (11/9-13/9)	9.6	230
NO2	85.30%	3-Sep-06	13-Sep-06	Sampling fault	Broken manifold (3/9-11/9) & Service (11/9-13/9)	9.6	230
O3	89.10%	3-Sep-06	13-Sep-06	Sampling fault	Broken manifold (3/9-11/9) & Service (11/9-13/9)	9.6	230
PM10	88.30%	3-Sep-06	13-Sep-06	Sampling fault	Broken manifold (3/9-11/9) & Service (11/9-13/9)	9.6	230
SO2	89.10%	3-Sep-06	13-Sep-06	Sampling fault	Broken manifold (3/9-11/9) & Service (11/9-13/9)	9.6	230
Scotland							
Bush Estate							
NO2	72.30%	6-Jul-06	31-Jul-06	Low flow rate	Flow fault	24.8	596
Eskdalemuir							
NO2	86.80%	4-Aug-06	6-Aug-06	ESU service		1.7	41
Fort William							
NO2	66.30%	2-Aug-06	16-Aug-06	Spurious data	Spurious NO2 baseline	14	336
		23-Aug-06	5-Sep-06	Spurious data	Spurious NO2 baseline	12.9	309
O3	88.40%	20-Sep-06	13-Oct-06	Unstable response	Relay board fault	22.9	549
Glasgow Centre							
CO	68.00%	10-Jul-06	8-Aug-06	Unstable response	Unstable response	29	696
SO2	80.10%	10-Jul-06	12-Jul-06	ESU service		1.9	46
		8-Aug-06	24-Aug-06	Sampling fault	Sample flow fault between cals 8/8 & 24/8	16.1	386
Glasgow Kerbside							
NO2	86.00%	1-Jul-06	1-Jul-06	Instrument fault	Negative data	0.4	9
		5-Jul-06	12-Jul-06	ESU service	Rapid baseline drift following service	6.9	165
		17-Aug-06	22-Aug-06	Instrument fault	transducer switch and O3 Gen replaced	4.9	117
PM10	80.00%	1-Jul-06	7-Jul-06	Unstable response	TEOM response instability	6.5	157
		10-Jul-06	12-Jul-06	ESU service		2	49
		8-Aug-06	17-Aug-06	Instrument fault	ENG C/O Replaced mass transducer microswitch	9.3	224
Lerwick							
O3	89.80%	8-Aug-06	9-Aug-06	Power cut		1	23
		21-Aug-06	29-Aug-06	Low flow rate	zero flow due to blocked internal sinter filter	8.4	201
Wales							
Cardiff Centre							
SO2	88.30%	17-Jul-06	19-Jul-06	ESU service		2.2	52
		22-Aug-06	29-Aug-06	Air Conditioning fault	Unstable data	7.5	180
Cwmbran							

Pollutant	Data Capture (%)	Start date	End date	Reason	Comments	Number of days	Number of hours
SO2	20.70%	1-Jun-06	11-Sep-06	Air conditioning fault	Very unstable data deleted	103	2465
Narberth							
O3	89.70%	1-Jul-06	4-Jul-06	Air conditioning fault		2.5	61
		16-Jul-06	20-Jul-06	Air conditioning fault	ENG C/O Call out: Replaced faulty AC	4	97
		24-Jul-06	26-Jul-06	ESU service		2	49
PM10	82.40%	1-Jul-06	7-Jul-06	Air conditioning fault		5.8	140
		16-Jul-06	26-Jul-06	Air conditioning fault	Replaced faulty aircon	9.8	235
SO2	85.40%	1-Jul-06	3-Jul-06	Air conditioning fault		2.1	50
		16-Jul-06	20-Jul-06	Air conditioning fault	ENG C/O Call out: Replaced faulty AC	3.9	93
		24-Jul-06	26-Jul-06	ESU service		2	49
Swansea							
CO	31.10%	17-Jul-06	19-Jul-06	Power cut		2.1	51
		7-Aug-06		Site closed	Relocated to Swansea Roadside	122	2928
NO2	31.00%	17-Jul-06	19-Jul-06	Power cut		2.1	51
		7-Aug-06		Site closed	Relocated to Swansea Roadside	122	2928
O3	31.10%	17-Jul-06	19-Jul-06	Power cut		2.1	51
		7-Aug-06		Site closed	Relocated to Swansea Roadside	122	2928
PM10	31.10%	17-Jul-06	19-Jul-06	Power cut		2.1	51
		7-Aug-06		Site closed	Relocated to Swansea Roadside	122	2928
SO2	30.90%	17-Jul-06	19-Jul-06	Power cut		2.2	53
		7-Aug-06		Site closed	Relocated to Swansea Roadside	122	2928
Swansea Roadside							
PM10	12.90%		29-Sep-06		Site commissioned	272	6518
PM25	12.90%		29-Sep-06		Site commissioned	272	6518
Wrexham							
SO2	88.60%	21-Sep-06	30-Sep-06	ESU service		9.7	233

5 Ratified Data Capture Statistics

Table 5.1 provides the ratified data capture figures for each site for the 3-month period July-September 2006. Data capture values below 90% are shown in the shaded boxes.

Table 5.1 Ratified Network Data Statistics: July-September 2006
(Using the start date of any new site or end date of site closed)

Network Data Capture for 01/07/2006 to 30/09/2006 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	-	-	-	-	-	69.9	69.9
Barnsley Gawber	Affiliate	**90.8**	-	**92.7**	**94.9**	-	94.4	**93.2**
Bath Roadside	Affiliate	95.0	-	97.6	-	-	-	96.3
Billingham	DEFRA	-	-	93.6	-	-	-	93.6

Site	Owner	CO	PM_{10}	NO_2	O_3	PM_{25}	SO_2	Site Average
Birmingham Centre	DEFRA	94.0	94.2	90.2	94.1	-	91.9	92.9
Birmingham Tyburn	Affiliate	98.2	98.2	91.5	98.2	-	98.2	96.9
Blackpool Marton	DEFRA	**88.5**	**93.7**	**86.0**	**93.8**	-	**70.7**	**86.5**
Bolton	Affiliate	98.3	96.9	77.5	98.0	-	83.9	90.9
Bottesford	Affiliate	-	-	-	99.7	-	-	99.7
Bournemouth	Affiliate	**95.5**	**100.0**	**90.4**	**97.6**	-	**97.4**	**96.2**
Bradford Centre	DEFRA	93.6	90.9	92.9	93.7	-	84.4	91.1
Brentford Roadside	Affiliate	87.6	-	79.4	-	-	-	83.5
Brighton Preston Park	DEFRA	-	-	**99.5**	**92.7**	-	-	**96.1**
Brighton Roadside	Affiliate	99.4	-	99.4	-	-	-	99.4
Brighton Roadside PM10	Affiliate	-	**93.5**	-	-	-	-	**93.5**
Bristol Old Market	Affiliate	98.4	-	98.4	-	-	-	98.4
Bristol St Paul's	DEFRA	97.2	94.2	97.0	97.2	-	97.2	96.6
Bury Roadside	Affiliate	28.8	91.6	87.8	84.3	-	91.6	76.8
Cambridge Roadside	Affiliate	-	-	76.9	-	-	-	76.9
Camden Kerbside	Affiliate	-	63.9	93.0	-	-	-	78.4
Canterbury	Affiliate	-	**99.5**	99.4	-	-	-	**99.4**
Coventry Memorial Park	DEFRA	**98.1**	**97.7**	**98.6**	**97.5**	-	**98.2**	**98.0**
Exeter Roadside	Affiliate	99.3	-	98.7	92.3	-	99.3	97.4
Glazebury	DEFRA	-	-	**96.9**	**97.2**	-	-	**97.1**
Great Dun Fell	DEFRA	-	-	-	**98.4**	-	-	**98.4**
Haringey Roadside	Affiliate	-	81.8	99.2	-	-	-	90.5
Harwell	DEFRA	-	97.8	91.4	97.8	97.9	97.4	96.5
High Muffles	DEFRA	-	-	**96.7**	**93.5**	-	-	**95.1**
Hove Roadside	Affiliate	99.3	-	71.7	-	-	**99.3**	**90.1**
Hull Freetown	DEFRA	**87.9**	**98.9**	**95.1**	**99.4**	-	**99.3**	**96.1**
Ladybower	DEFRA	-	-	36.7	97.0	-	91.6	75.1
Leamington Spa	Affiliate	**97.6**	**97.6**	**97.6**	**97.6**	-	**63.0**	**90.7**
Leeds Centre	DEFRA	98.0	99.8	94.3	99.2	-	99.2	98.1
Leicester Centre	DEFRA	**98.3**	**97.7**	**98.1**	**98.2**	-	**98.3**	**98.1**
Leominster	DEFRA	-	-	**90.0**	**95.0**	-	-	**92.5**
Liverpool Speke	Affiliate	**94.0**	**89.5**	**77.0**	**94.0**	-	**77.6**	**86.4**
London A3 Roadside	DEFRA	98.0	98.3	97.4	-	-	-	97.9
London Bexley	Affiliate	92.2	92.1	77.6	92.4	-	91.7	89.2
London Bloomsbury	DEFRA	97.2	99.5	95.0	98.8	99.4	99.4	98.2
London Brent	Affiliate	98.2	99.1	98.0	98.6	-	92.5	97.3
London Bromley	Affiliate	-	-	26.5	-	-	-	26.5
London Cromwell Road 2	DEFRA	90.1	-	97.6	-	-	83.7	90.4
London Eltham	Affiliate	-	92.1	99.3	99.1	-	98.6	97.3
London Hackney	Affiliate	71.0	-	73.6	0.0	-	-	48.2
London Haringey	Affiliate	-	-	-	99.5	-	-	99.5
London Harlington	Affiliate	99.4	96.9	99.3	96.5	-	-	98.0
London Hillingdon	DEFRA	91.7	96.8	87.9	96.2	-	96.3	93.8
London Lewisham	Affiliate	-	-	90.5	99.5	-	99.5	96.5
London Marylebone Road	Affiliate	26.7	95.9	98.3	91.5	96.9	94.3	83.9
London N. Kensington	Affiliate	98.9	98.9	99.1	97.0	-	99.0	98.6
London Southwark	Affiliate	73.1	-	98.0	64.6	-	85.7	80.4
London Teddington	Affiliate	-	-	99.3	99.4	-	97.9	98.9

Site	Owner	CO	PM_{10}	NO_2	O_3	PM_{25}	SO_2	Site Average
London Wandsworth	Affiliate	-	-	93.0	99.2	-	-	96.1
London Westminster	DEFRA	11.3	97.8	96.4	96.2	-	87.9	77.9
Lullington Heath	DEFRA	-	-	95.1	99.4	-	95.5	96.7
Manchester Piccadilly	DEFRA	95.7	94.7	94.5	95.6	-	88.1	93.8
Manchester South	Affiliate	-	-	95.7	96.5	-	96.4	96.2
Manchester Town Hall	DEFRA	95.7	-	98.6	-	-	-	97.1
Market Harborough	DEFRA	98.0	-	93.3	98.1	-	-	96.4
Middlesbrough	Affiliate	94.2	95.5	92.6	93.2	-	95.9	94.3
Newcastle Centre	DEFRA	**99.3**	**99.2**	**95.0**	**99.3**	-	**99.3**	**98.4**
Northampton	Affiliate	**98.4**	**98.2**	**95.2**	**91.8**	-	**95.8**	**95.9**
Northampton PM10	Affiliate	-	**85.9**	-	-	-	-	**85.9**
Norwich Centre	DEFRA	99.5	0.0	**99.5**	**99.5**	-	99.6	**79.6**
Norwich Forum Roadside	Affiliate	-	-	74.1	-	-	-	74.1
Nottingham Centre	DEFRA	**97.0**	**97.1**	**96.8**	**97.0**	-	**95.5**	**96.7**
Oxford Centre Roadside	Affiliate	**97.3**	-	94.6	-	-	**97.5**	**96.5**
Plymouth Centre	DEFRA	90.5	**24.8**	96.4	63.1	-	94.3	**73.8**
Portsmouth	Affiliate	**98.4**	**96.8**	**98.4**	**98.3**	-	**98.5**	**98.1**
Preston	DEFRA	**97.0**	**95.9**	**81.8**	**97.1**	-	**97.0**	**93.8**
Reading New Town	DEFRA	**90.4**	**89.1**	**83.6**	**90.9**	-	**88.5**	**88.5**
Redcar	Affiliate	92.9	81.6	92.7	93.0	-	90.9	90.2
Rochester	Affiliate	-	98.1	98.6	98.6	98.5	91.4	97.0
Rotherham Centre	Affiliate	-	-	49.0	96.8	-	40.4	62.1
Salford Eccles	Affiliate	63.6	93.8	91.3	82.7	-	96.6	85.6
Sandwell West Bromwich	Affiliate	95.3	-	94.8	96.2	-	96.4	95.7
Scunthorpe Town	Affiliate	-	**95.8**	-	-	-	99.0	**97.4**
Sheffield Centre	DEFRA	95.9	**96.0**	40.7	95.9	-	89.1	**83.5**
Sheffield Tinsley	DEFRA	93.5	-	98.1	-	-	-	95.8
Sibton	DEFRA	-	-	-	**98.7**	-	-	**98.7**
Somerton	Affiliate	-	-	**88.7**	**89.9**	-	-	**89.3**
Southampton Centre	DEFRA	**52.1**	**94.1**	**83.0**	**89.9**	-	**36.9**	**71.2**
Southend-on-Sea	DEFRA	**98.3**	**94.9**	**93.6**	**98.3**	-	**98.2**	**96.6**
Southwark Roadside	Affiliate	0.0	-	0.0	-	-	0.0	0.0
St Osyth	DEFRA	97.1	-	**91.6**	**94.7**	-	-	**94.5**
Stockport Shaw Heath	Affiliate	98.6	98.5	92.9	-	-	98.7	97.2
Stockton-on-Tees Yarm	Affiliate	**96.3**	**99.4**	**99.5**	-	-	-	**98.4**
Stoke-on-Trent Centre	DEFRA	**94.9**	**95.2**	**94.9**	**91.0**	-	**94.8**	**94.2**
Sunderland	DEFRA	-	-	-	-	-	**97.9**	**97.9**
Sunderland Silksworth	Affiliate	-	-	**97.5**	**98.5**	-	-	**98.0**
Thurrock	Affiliate	95.4	96.2	**90.1**	**96.0**	-	95.8	**94.7**
Tower Hamlets Roadside	Affiliate	91.2	-	99.2	-	-	-	95.2
Walsall Alumwell	DEFRA	-	-	96.1	-	-	-	96.1
Walsall Willenhall	Affiliate	-	-	90.2	-	-	-	90.2
West London	DEFRA	99.7	-	96.9	-	-	-	98.3
Weybourne	Affiliate	-	-	-	99.9	-	-	99.9
Wicken Fen	DEFRA	-	-	**98.9**	**91.4**	-	94.0	**94.8**
Wigan Centre	Affiliate	**91.4**	**85.5**	**92.8**	**91.3**	-	**87.1**	**89.6**

Site	Owner	CO	PM_{10}	NO_2	O_3	PM_{25}	SO_2	Site Average
Wirral Tranmere	DEFRA	**90.6**	**86.1**	**84.9**	**81.5**	-	**87.7**	**86.1**
Wolverhampton Centre	DEFRA	88.4	97.0	93.2	97.2	-	97.2	94.6
Yarner Wood	DEFRA	-	-	**75.3**	**96.0**	-	-	**85.6**
N Ireland								
Belfast Centre	DEFRA	**88.9**	88.3	**85.3**	**89.1**	-	89.1	**88.1**
Belfast Clara St	Affiliate	-	99.2	-	-	-	-	99.2
Belfast East	DEFRA	-	-	-	-	-	99.4	99.4
Derry	Affiliate	**95.1**	**94.7**	**90.9**	**91.1**	-	**92.1**	**92.8**
Lough Navar	DEFRA	-	98.3	-	**98.8**	-	-	**98.6**
Scotland								
Aberdeen	Affiliate	**97.6**	**97.4**	**94.0**	**97.4**	-	**97.5**	**96.8**
Auchencorth Moss	DEFRA	-	94.6	-	-	94.6	-	94.6
Bush Estate	DEFRA	-	-	**72.3**	**98.6**	-	-	**85.4**
Dumfries	DEFRA	**94.6**	**75.0**	**93.4**	-	-	-	**87.7**
Edinburgh St Leonards	DEFRA	**97.5**	**97.8**	**91.9**	**97.5**	-	**97.5**	**96.4**
Eskdalemuir	DEFRA	-	-	**86.8**	**97.9**	-	-	**92.4**
Fort William	DEFRA	-	-	**66.3**	**88.4**	-	-	**77.3**
Glasgow Centre	DEFRA	68.0	93.1	**97.4**	**97.4**	-	**80.1**	**87.2**
Glasgow City Chambers	DEFRA	98.4	-	98.1	-	-	-	98.2
Glasgow Kerbside	DEFRA	97.4	80.0	86.0	-	-	-	87.8
Grangemouth	Affiliate	**98.2**	**98.3**	**98.2**	-	-	**98.0**	**98.2**
Inverness	DEFRA	99.0	**98.9**	**98.5**	-	-	-	**98.8**
Lerwick	DEFRA	-	-	-	89.8	-	-	89.8
Strath Vaich	DEFRA	-	-	-	**98.6**	-	-	**98.6**
Wales								
Aston Hill	DEFRA	-	-	**92.0**	**98.2**	-	-	**95.1**
Cardiff Centre	DEFRA	**97.2**	**91.3**	**97.1**	**97.3**	-	**88.3**	**94.2**
Cwmbran	Affiliate	**99.6**	**98.0**	**99.3**	**99.6**	-	**20.7**	**83.5**
Narberth	Affiliate	-	82.4	90.8	**89.7**	-	85.4	**87.1**
Port Talbot	Affiliate	-	91.9	96.9	96.9	-	97.1	95.7
Swansea	Affiliate	**75.2**	75.3	75.0	75.2	-	74.9	**75.1**
Swansea Roadside	Affiliate	**95.1**	12.9	95.1	95.1	12.9	95.1	**67.7**
Wrexham	DEFRA	**96.1**	**97.8**	**94.2**	-	-	**88.6**	**94.2**
Number of sites		79	73	112	90	6	77	128
Number of sites < 90%		15	16	29	13	1	24	39
Number of critical sites		32	34	46	46	0	29	62
Number of critical sites < 90%		5	7	13	6	0	11	21
Network Mean (%)		89.5	90.4	89.5	93.6	81.1	89.2	90.3

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

Table 5.2 shows the ratified data capture statistics for each site for the 9-month period January-September 2006

Table 5.2 Ratified Network data Capture Statistics : January to September 2006

Network Data Capture for 01/01/2006 to 30/09/2006 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	-	-	-	-	-	87.8	87.8
Barnsley Gawber	Affiliate	**95.4**	-	**73.9**	**95.9**	-	96.1	**90.3**
Bath Roadside	Affiliate	77.7	-	97.8	-	-	-	87.8
Billingham	DEFRA	-	-	97.5	-	-	-	97.5
Birmingham Centre	DEFRA	95.8	96.9	93.2	96.8	-	96.2	95.8
Birmingham Tyburn	Affiliate	98.4	95.0	82.9	98.3	-	98.4	94.6
Blackpool Marton	DEFRA	**91.4**	**94.6**	**92.8**	**93.8**	-	**82.9**	**91.1**
Bolton	Affiliate	98.0	97.6	64.4	98.0	-	85.1	88.6
Bottesford	Affiliate	-	-	-	99.6	-	-	99.6
Bournemouth	Affiliate	**96.5**	**98.5**	**92.9**	**98.3**	-	**98.1**	**96.9**
Bradford Centre	DEFRA	93.3	93.8	93.0	91.3	-	89.2	92.1
Brentford Roadside	Affiliate	60.6	-	82.1	-	-	-	71.3
Brighton Preston Park	DEFRA	-	-	**98.7**	**96.2**	-	-	**97.4**
Brighton Roadside	Affiliate	97.5	-	98.9	-	-	-	98.2
Brighton Roadside PM_{10}	Affiliate	-	**97.4**	-	-	-	-	**97.4**
Bristol Old Market	Affiliate	96.4	-	98.8	-	-	-	97.6
Bristol St Paul's	DEFRA	97.1	94.4	96.3	97.1	-	96.9	96.4
Bury Roadside	Affiliate	34.4	91.4	84.6	88.6	-	89.1	77.6
Cambridge Roadside	Affiliate	-	-	87.2	-	-	-	87.2
Camden Kerbside	Affiliate	-	81.4	96.1	-	-	-	88.7
Canterbury	Affiliate	-	**99.1**	98.7	-	-	-	**98.9**
Coventry Memorial Park	DEFRA	**99.0**	**99.0**	**99.2**	**98.7**	-	**93.8**	**97.9**
Exeter Roadside	Affiliate	98.5	-	96.7	96.2	-	88.3	94.9
Glazebury	DEFRA	-	-	**97.3**	**98.4**	-	-	**97.8**
Great Dun Fell	DEFRA	-	-	-	**98.9**	-	-	**98.9**
Haringey Roadside	Affiliate	-	82.3	95.5	-	-	-	88.9
Harwell	DEFRA	-	97.4	91.7	91.6	97.3	95.7	94.8
High Muffles	DEFRA	-	-	**85.7**	**88.1**	-	-	**86.9**
Hove Roadside	Affiliate	99.3	-	86.7	-	-	**99.4**	**95.1**
Hull Freetown	DEFRA	**92.4**	**98.3**	**84.0**	**98.5**	-	**98.4**	**94.3**
Ladybower	DEFRA	-	-	62.1	95.8	-	93.8	83.9
Leamington Spa	Affiliate	**98.7**	**98.9**	**95.9**	**98.4**	-	**87.1**	**95.8**
Leeds Centre	DEFRA	93.5	99.2	88.8	99.0	-	99.0	95.9
Leicester Centre	DEFRA	**98.1**	**97.9**	**98.0**	**98.3**	-	**98.3**	**98.1**
Leominster	DEFRA	-	-	**91.2**	**95.2**	-	-	**93.2**
Liverpool Speke	Affiliate	**92.4**	**94.9**	**90.9**	**96.5**	-	**90.3**	**93.0**
London A3 Roadside	DEFRA	96.9	98.1	97.4	-	-	-	97.5
London Bexley	Affiliate	96.5	88.3	90.0	95.7	-	96.3	93.4
London Bloomsbury	DEFRA	95.7	97.5	92.2	94.9	97.3	93.0	95.1
London Brent	Affiliate	98.6	99.0	98.0	98.7	-	94.3	97.7
London Bromley	Affiliate	-	-	46.6	-	-	-	46.6
London Cromwell Road 2	DEFRA	95.1	-	89.6	-	-	91.9	92.2
London Eltham	Affiliate	-	96.5	99.0	96.7	-	96.7	97.2
London Hackney	Affiliate	89.7	-	78.2	0.0	-	-	56.0

Site	Owner	CO	PM_{10}	NO_2	O_3	PM_{25}	SO_2	Site Average
London Haringey	Affiliate	-	-	-	62.5	-	-	62.5
London Harlington	Affiliate	99.5	98.7	99.2	89.8	-	-	96.8
London Hillingdon	DEFRA	94.8	97.3	92.8	97.5	-	97.5	96.0
London Lewisham	Affiliate	-	-	92.0	99.5	-	97.3	96.3
London Marylebone Road	Affiliate	61.7	96.7	96.9	94.9	97.3	89.4	89.5
London N. Kensington	Affiliate	95.7	99.0	99.2	93.3	-	98.6	97.1
London Southwark	Affiliate	64.6	-	82.0	21.8	-	73.3	60.4
London Teddington	Affiliate	-	-	98.8	99.1	-	98.6	98.8
London Wandsworth	Affiliate	-	-	97.2	99.3	-	-	98.3
London Westminster	DEFRA	21.9	96.3	96.4	96.5	-	85.1	79.2
Lullington Heath	DEFRA	-	-	83.4	87.1	-	77.6	82.7
Manchester Piccadilly	DEFRA	93.5	95.9	96.7	88.2	-	94.5	93.8
Manchester South	Affiliate	-	-	84.4	97.7	-	96.0	92.7
Manchester Town Hall	DEFRA	32.2	-	83.6	-	-	-	57.9
Market Harborough	DEFRA	97.8	-	94.5	93.8	-	-	95.4
Middlesbrough	Affiliate	92.3	97.5	95.2	96.9	-	97.7	95.9
Newcastle Centre	DEFRA	**98.5**	**98.1**	**89.3**	**98.4**	-	**98.6**	**96.6**
Northampton	Affiliate	**99.2**	**95.4**	**98.0**	**96.5**	-	**98.3**	**97.5**
Northampton PM_{10}	Affiliate	-	**91.9**	-	-	-	-	**91.9**
Norwich Centre	DEFRA	99.6	57.3	**99.6**	**99.6**	-	99.6	**91.1**
Norwich Forum Roadside	Affiliate	-	-	90.0	-	-	-	90.0
Nottingham Centre	DEFRA	**97.8**	**97.9**	**97.7**	**97.8**	-	**93.8**	**97.0**
Oxford Centre Roadside	Affiliate	**98.6**	-	96.8	-	-	**98.5**	**98.0**
Plymouth Centre	DEFRA	95.7	**60.9**	80.7	39.7	-	91.8	**73.7**
Portsmouth	Affiliate	**98.8**	**98.3**	**98.9**	**98.8**	-	**97.7**	**98.5**
Preston	DEFRA	**96.6**	**97.5**	**88.8**	**94.2**	-	**97.5**	**94.9**
Reading New Town	DEFRA	**95.6**	**92.9**	**70.9**	**93.2**	-	**93.2**	**89.2**
Redcar	Affiliate	94.4	88.8	93.0	92.5	-	90.6	91.9
Rochester	Affiliate	-	91.3	91.2	98.7	98.3	96.1	95.1
Rotherham Centre	Affiliate	-	-	70.5	89.0	-	27.6	62.4
Salford Eccles	Affiliate	86.5	95.4	95.8	93.0	-	97.1	93.6
Sandwell West Bromwich	Affiliate	97.4	-	97.5	97.6	-	97.5	97.5
Scunthorpe Town	Affiliate	-	**97.1**	-	-	-	92.7	**94.9**
Sheffield Centre	DEFRA	97.5	**96.5**	38.2	97.4	-	92.0	**84.3**
Sheffield Tinsley	DEFRA	90.9	-	98.6	-	-	-	94.7
Sibton	DEFRA	-	-	-	**99.3**	-	-	**99.3**
Somerton	Affiliate	-	-	**74.3**	**89.7**	-	-	**82.0**
Southampton Centre	DEFRA	**73.1**	**94.0**	**88.2**	**93.1**	-	**73.6**	**84.4**
Southend-on-Sea	DEFRA	**98.8**	**95.7**	**97.2**	**98.8**	-	**98.8**	**97.9**
Southwark Roadside	Affiliate	14.3	-	18.8	-	-	13.9	15.7
St Osyth	DEFRA	89.7	-	**93.4**	**97.5**	-	-	**93.6**
Stockport Shaw Heath	Affiliate	98.7	98.6	95.3	-	-	98.8	97.8
Stockton-on-Tees Yarm	Affiliate	**98.0**	**98.9**	**99.1**	-	-	-	**98.7**
Stoke-on-Trent Centre	DEFRA	**93.8**	**95.6**	**91.7**	**92.7**	-	**94.6**	**93.7**
Sunderland	DEFRA	-	-	-	-	-	**97.3**	**97.3**
Sunderland	Affiliate	-	-	**96.8**	**93.8**	-	-	**95.3**

Site	Owner	CO	PM_{10}	NO_2	O_3	PM_{25}	SO_2	Site Average
Silksworth								
Thurrock	Affiliate	97.6	97.7	**93.0**	**97.9**	-	97.8	**96.8**
Tower Hamlets Roadside	Affiliate	89.0	-	99.5	-	-	-	94.2
Walsall Alumwell	DEFRA	-	-	97.3	-	-	-	97.3
Walsall Willenhall	Affiliate	-	-	85.8	-	-	-	85.8
West London	DEFRA	81.2	-	95.4	-	-	-	88.3
Weybourne	Affiliate	-	-	-	85.1	-	-	85.1
Wicken Fen	DEFRA	-	-	**96.9**	**83.6**	-	90.5	**90.3**
Wigan Centre	Affiliate	**95.5**	**93.4**	**96.7**	**95.2**	-	**92.2**	**94.6**
Wirral Tranmere	DEFRA	**94.6**	**92.6**	**91.5**	**89.0**	-	**78.8**	**89.3**
Wolverhampton Centre	DEFRA	91.6	97.3	95.6	97.3	-	97.2	95.8
Yarner Wood	DEFRA	-	-	**87.8**	**98.0**	-	-	**92.9**
N Ireland								
Belfast Centre	DEFRA	**80.5**	93.5	**89.8**	**93.7**	-	92.6	**90.0**
Belfast Clara St	Affiliate	-	99.2	-	-	-	-	99.2
Belfast East	DEFRA	-	-	-	-	-	98.9	98.9
Derry	Affiliate	**94.2**	**96.3**	**84.8**	**76.1**	-	**90.9**	**88.5**
Lough Navar	DEFRA	-	98.2	-	**98.5**	-	-	**98.4**
Scotland								
Aberdeen	Affiliate	**98.7**	**93.2**	**96.2**	**98.7**	-	**98.4**	**97.0**
Auchencorth Moss	DEFRA	-	87.9	-	-	87.9	-	87.9
Bush Estate	DEFRA	-	-	**82.9**	**97.7**	-	-	**90.3**
Dumfries	DEFRA	**96.2**	**84.6**	**92.9**	-	-	-	**91.2**
Edinburgh St Leonards	DEFRA	**98.4**	**98.4**	**92.9**	**98.2**	-	**98.4**	**97.2**
Eskdalemuir	DEFRA	-	-	**88.9**	**98.6**	-	-	**93.7**
Fort William	DEFRA	-	-	**68.4**	**88.9**	-	-	**78.7**
Glasgow Centre	DEFRA	88.0	91.0	**97.8**	**98.0**	-	**92.1**	**93.4**
Glasgow City Chambers	DEFRA	98.7	-	97.9	-	-	-	98.3
Glasgow Kerbside	DEFRA	94.7	83.3	90.3	-	-	-	89.4
Grangemouth	Affiliate	**95.6**	**96.3**	**97.8**	-	-	**97.9**	**96.9**
Inverness	DEFRA	99.1	**89.7**	**98.8**	-	-	-	**95.9**
Lerwick	DEFRA	-	-	-	95.7	-	-	95.7
Strath Vaich	DEFRA	-	-	-	**96.8**	-	-	**96.8**
Wales								
Aston Hill	DEFRA	-	-	**67.7**	**92.0**	-	-	**79.8**
Cardiff Centre	DEFRA	**98.0**	**94.0**	**96.3**	**97.7**	-	**94.6**	**96.1**
Cwmbran	Affiliate	**99.1**	**98.2**	**94.1**	**99.3**	-	**61.7**	**90.5**
Narberth	Affiliate	-	90.3	95.0	**91.9**	-	78.6	**89.0**
Port Talbot	Affiliate	-	90.4	96.5	97.9	-	96.0	95.2
Swansea	Affiliate	**86.3**	93.3	90.8	93.1	-	86.1	**89.9**
Swansea Roadside	Affiliate	**95.1**	12.9	95.1	95.1	12.9	95.1	**67.7**
Wrexham	DEFRA	**97.6**	**95.2**	**94.1**	-	-	**92.1**	**94.7**
Number of sites		79	73	112	90	6	77	128
Number of sites < 90%		17	11	37	16	1	18	38
Network Mean (%)		90.1	92.9	90.0	92.4	80.6	91.1	90.6

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

Table 5.3 shows the ratified AURN data capture for the 62 operational **critical sites** in the network for the 9-month period January to September 2006. Sites with less than 90% data capture are shaded. This table contains the overall data capture for 9 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 2006

Network Data Capture for 01/01/2006 to 30/09/2006 from start date of any new site

Site	Owner	CO	PM_{10}	NO_2	O_3	SO_2	Site Average
England							
Barnsley Gawber	Affiliate	**95.4**	-	**73.9**	**95.9**	96.1	**90.3**
Blackpool Marton	DEFRA	**91.4**	**94.6**	**92.8**	**93.8**	**82.9**	**91.1**
Bournemouth	Affiliate	**96.5**	**98.5**	**92.9**	**98.3**	**98.1**	**96.9**
Brighton Preston Park	DEFRA	-	-	**98.7**	**96.2**	-	**97.4**
Brighton Roadside PM_{10}	Affiliate	-	**97.4**	-	-	-	**97.4**
Canterbury	Affiliate	-	**99.1**	98.7	-	-	**98.9**
Coventry Memorial Park	DEFRA	**99.0**	**99.0**	**99.2**	**98.7**	**93.8**	**97.9**
Glazebury	DEFRA	-	-	**97.3**	**98.4**	-	**97.8**
Great Dun Fell	DEFRA	-	-	-	**98.9**	-	**98.9**
High Muffles	DEFRA	-	-	**85.7**	**88.1**	-	**86.9**
Hove Roadside	Affiliate	99.3	-	86.7	-	**99.4**	**95.1**
Hull Freetown	DEFRA	**92.4**	**98.3**	**84.0**	**98.5**	**98.4**	**94.3**
Leamington Spa	Affiliate	**98.7**	**98.9**	**95.9**	**98.4**	**87.1**	**95.8**
Leicester Centre	DEFRA	**98.1**	**97.9**	**98.0**	**98.3**	**98.3**	**98.1**
Leominster	DEFRA	-	-	**91.2**	**95.2**	-	**93.2**
Liverpool Speke	Affiliate	**92.4**	**94.9**	**90.9**	**96.5**	**90.3**	**93.0**
Newcastle Centre	DEFRA	**98.5**	**98.1**	**89.3**	**98.4**	**98.6**	**96.6**
Northampton	Affiliate	**99.2**	**95.4**	**98.0**	**96.5**	**98.3**	**97.5**
Northampton PM_{10}	Affiliate	-	**91.9**	-	-	-	**91.9**
Norwich Centre	DEFRA	99.6	57.3	**99.6**	**99.6**	99.6	**91.1**
Nottingham Centre	DEFRA	**97.8**	**97.9**	**97.7**	**97.8**	**93.8**	**97.0**
Oxford Centre Roadside	Affiliate	**98.6**	-	96.8	-	**98.5**	**98.0**
Plymouth Centre	DEFRA	95.7	**60.9**	80.7	39.7	91.8	**73.7**
Portsmouth	Affiliate	**98.8**	**98.3**	**98.9**	**98.8**	**97.7**	**98.5**
Preston	DEFRA	**96.6**	**97.5**	**88.8**	**94.2**	**97.5**	**94.9**
Reading New Town	DEFRA	**95.6**	**92.9**	**70.9**	**93.2**	**93.2**	**89.2**
Scunthorpe Town	Affiliate	-	**97.1**	-	-	92.7	**94.9**
Sheffield Centre	DEFRA	97.5	**96.5**	38.2	97.4	92.0	**84.3**
Sibton	DEFRA	-	-	-	**99.3**	-	**99.3**
Somerton	Affiliate	-	-	**74.3**	**89.7**	-	**82.0**
Southampton Centre	DEFRA	**73.1**	**94.0**	**88.2**	**93.1**	**73.6**	**84.4**
Southend-on-Sea	DEFRA	**98.8**	**95.7**	**97.2**	**98.8**	**98.8**	**97.9**
St Osyth	DEFRA	89.7	-	**93.4**	**97.5**	-	**93.6**
Stockton-on-Tees Yarm	Affiliate	**98.0**	**98.9**	**99.1**	-	-	**98.7**
Stoke-on-Trent	DEFRA	**93.8**	**95.6**	**91.7**	**92.7**	**94.6**	**93.7**

Site	Owner	CO	PM_{10}	NO_2	O_3	SO_2	Site Average
Centre							
Sunderland	DEFRA	-	-	-	-	**97.3**	**97.3**
Sunderland Silksworth	Affiliate	-	-	**96.8**	**93.8**	-	**95.3**
Thurrock	Affiliate	97.6	97.7	**93.0**	**97.9**	97.8	**96.8**
Wicken Fen	DEFRA	-	-	**96.9**	**83.6**	90.5	**90.3**
Wigan Centre	Affiliate	**95.5**	**93.4**	**96.7**	**95.2**	**92.2**	**94.6**
Wirral Tranmere	DEFRA	**94.6**	**92.6**	**91.5**	**89.0**	**78.8**	**89.3**
Yarner Wood	DEFRA	-	-	**87.8**	**98.0**	-	**92.9**
N Ireland							
Belfast Centre	DEFRA	**80.5**	93.5	**89.8**	**93.7**	92.6	**90.0**
Derry	Affiliate	**94.2**	**96.3**	**84.8**	**76.1**	**90.9**	**88.5**
Lough Navar	DEFRA	-	98.2	-	**98.5**	-	**98.4**
Scotland							
Aberdeen	Affiliate	**98.7**	**93.2**	**96.2**	**98.7**	**98.4**	**97.0**
Bush Estate	DEFRA	-	-	**82.9**	**97.7**	-	**90.3**
Dumfries	DEFRA	**96.2**	**84.6**	**92.9**	-	-	**91.2**
Edinburgh St Leonards	DEFRA	**98.4**	**98.4**	**92.9**	**98.2**	**98.4**	**97.2**
Eskdalemuir	DEFRA	-	-	**88.9**	**98.6**	-	**93.7**
Fort William	DEFRA	-	-	**68.4**	**88.9**	-	**78.7**
Glasgow Centre	DEFRA	88.0	91.0	**97.8**	**98.0**	**92.1**	**93.4**
Grangemouth	Affiliate	**95.6**	**96.3**	**97.8**	-	**97.9**	**96.9**
Inverness	DEFRA	99.1	**89.7**	**98.8**	-	-	**95.9**
Strath Vaich	DEFRA	-	-	-	**96.8**	-	**96.8**
Wales							
Aston Hill	DEFRA	-	-	**67.7**	**92.0**	-	**79.8**
Cardiff Centre	DEFRA	**98.0**	**94.0**	**96.3**	**97.7**	**94.6**	**96.1**
Cwmbran	Affiliate	**99.1**	**98.2**	**94.1**	**99.3**	**61.7**	**90.5**
Narberth	Affiliate	-	90.3	95.0	**91.9**	78.6	**89.0**
Swansea	Affiliate	**86.3**	93.3	90.8	93.1	86.1	**89.9**
Swansea Roadside	Affiliate	**95.1**	12.9	95.1	95.1	95.1	**78.6**
Wrexham	DEFRA	**97.6**	**95.2**	**94.1**	-	**92.1**	**94.7**
Number of sites		40	42	54	50	40	62
Number of sites < 90%		5	5	18	7	7	13
Number of critical sites		32	34	46	46	29	62
Number of critical sites < 90%		3	3	15	6	5	13

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.

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 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 2007	Priority	Action
21	The air conditioning unit at Cwmbran should be repaired or replaced as soon as possible, and in any case before the onset of warmer weather.	High	ESU to repair air conditioning
22	ESUs to ensure all NOx converter software settings to be 100%	High	ESUs to check at service
	Recommendations October 2006		
20	The noisy analysers at Bolton (NOx) and London Westminster (CO) should be repaired or replaced at the earliest opportunity	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		
14	Several analysers still exhibit poor performance	High	Repair/replacement to be actioned by ESUs
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 (January 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}[2] 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 2006

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 (on temporary loan to Siemens) API model 401 s/n 151 - purchased October 2000 API model 401 s/n 176 – purchased December 2002 (on temporary loan to Horiba) 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	2.2 +5	LSOs and ESUs
2	Autocalibration run-on	Investigate problem of autocalibration run on at sites given in Table 2.5. Stockport Shaw Heath, Bournemouth, Dumfries, Edinburgh, Eskdalemuir, Fort William, Harwell, St Osyth and Leominster (all NO_2), London Southwark (CO and SO_2), Narberth (SO_2) should be prioritised as at least 2 hours per day are being lost at these sites. Eskdalemuir and Leominster have been highlighted as a priority in previous reports. Autocalibration span concentrations to be <200ppb for urban sites and <100ppb for rural sites.	2.4	ESUs
3	Poor performance of Cwmbran SO_2 analyser (NB other sites also have air con problems)	The Cwmbran air conditioning unit needs repair or replacement	3.1	ESU
4	Bolton NOx	ESUs to ensure software settings for converter efficiencies to be set at 100%	3.2	ESU
5	Poor performance of analysers-see Section 3.6	QA/QC Unit would like to seek clarification from the Equipment Support Unit/manufacturer as to the current situation regarding the reason for the problems and what plans are in place to resolve them. We recommend that immediate attention is given to this issue as the majority of these instruments are located at critical sites.	3.6	ESU
6	Leakage of NOx switching valves	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	8.2	LSO
7	Leakage of NOx switching valves	It is strongly recommended that ESU's clean all NOx analyser switching valves during servicing, and ensure the valve is leak checked afterwards. The Stockport Shaw Heath analyser should be repaired as soon as possible	8.2	ESU

PART B - Intercalibration Report for the Automatic Urban and Rural Network, July-September 2006

6 Introduction

In July to September 2006, AEA Energy and Environment undertook an intercalibration of the 128 monitoring stations in operation in the Defra and the Devolved Administrations sponsored Urban and Rural Monitoring Network. This has allowed data from all of the analysers in the networks 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 k_o 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. This factor is 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 k_0 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 k_0 factor and particulate analyser flow rates used in the network. An ISO17025 certificate of calibration for the AURN is appended to this report.

A total of 126 sites out of the 128 that operated during the period were audited in this exercise; Southwark Roadside was not audited due to site redevelopment plans. Also, during this period, a new site was established at Swansea Roadside, replacing the Swansea Centre site. Though both these sites were operational in the reporting period, only the Swansea Roadside could be audited.

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.

7 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	24	109	22%
CO analyser	2	77	3%
SO_2 analyser	10	75	13%
Ozone analyser	35	88	40%
TEOM and BAM analysers	3 k_0, 3 flow	70 TEOM PM_{10} 1 BAM* 5 $PM_{2.5}$	8%
Gravimetric PM_{10} analysers	0	8 PM_{10} 2 $PM_{2.5}$	0%
Total	77	441	17%

* The BAM analyser is operational at Belfast Clara Street as a duplicate instrument, but is no longer formally part of the AURN.

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 k_0 factor must be within 2.5% of the stated value.

In addition to these results, 8 of the 377 site cylinders (~2%) used to scale instrument data into concentrations appeared to have drifted by more than 10% from their certificated values.

One NO_x converter was found to be lower than the 95% acceptance limit, while a further converter was found to be higher than 105%.

The number of analyser outliers identified is slightly higher than the previous exercise. At the winter 2006 intercalibration 16% of the analysers in use were identified as outliers.

Table 7.2 below presents a breakdown of the outliers identified, on a site-by-site basis:

Table 7.2 – Performance Breakdown

SITE	Date visited	NO_x	CO	SO_2	O_3	PM_{10}	$PM_{2.5}$
ENGLAND							
Barnsley 12	7-Aug			Outlier -11%			
Barnsley Gawber	8-Aug	OK	OK	OK	Outlier -19%		
Bath Roadside	7-Sep	Outlier +20%	OK				
Billingham	12-Sep	Outlier +11% Converter 111%					
Birmingham Centre	9-Aug	OK	OK	OK	OK	OK	
Birmingham Tyburn	6-Sep	OK	OK	OK	OK	k_0 outlier -3.3%	
Blackpool Marton	13-Sep	Outlier +66%	OK	OK	OK	OK	
Bolton	1-Aug	OK	OK	OK	Outlier +12%	OK	
Bottesford	21-Jul				OK		
Bournemouth	23-Aug	OK	OK	OK	OK	OK	
Bradford Centre	31-Jul	OK	OK	OK	OK	OK	
Brentford Roadside	12-Jul	OK	OK				
Brighton Preston Park	18-Sep	OK			OK		
Brighton Roadside	18-Sep	OK	OK				
Brighton Roadside PM_{10}	18-Sep					OK	
Bristol St Paul's	17-Jul	OK	OK	OK	OK	OK	
Bristol Old Market	17-Jul	OK	OK				
Bury Roadside	2-Aug	OK	OK	Outlier +11%	OK	OK	
Cambridge Roadside	4-Sep	OK					
Camden Kerbside	15-Aug	OK				OK	
Canterbury	28-Sep	OK				OK	
Coventry Memorial Park	2-Aug	OK	OK	OK	Outlier +12%	OK	
Exeter Roadside	18-Jul	OK	OK	OK	OK		
Glazebury	16-Aug	OK			Outlier -30%		
Great Dun Fell	25-Jul				OK		
Haringey Roadside	13-Sep	OK				Flow outlier	
Harwell	13-Jul	Outlier +12%		OK	OK	OK	OK
High Muffles	25-Jul	OK			Outlier +12%		
Hove Roadside	19-Sep	Outlier +26%	OK	OK			
Hull Freetown	1-Aug	OK	OK	OK	Outlier +8%	OK	
Ladybower	27-Sep	Outlier -12%		OK	Outlier +11%		
Leamington Spa	23-Aug	OK	OK	OK	Outlier +21%	OK	
Leeds Centre	2-Aug	Outlier +24%	OK	OK	OK	OK	
Leicester Centre	22-Aug	Outlier +12%	OK	OK	Outlier +6%	OK	
Leominster	24-Jul	OK			OK	OK	
Liverpool Speke	12-Sep	OK	OK	Outlier +14%	OK	OK	
London A3 Roadside	6-Jul	OK	OK			OK	
London Bexley	21-Aug	Outlier +27%	OK	OK	OK	OK	
London Bloomsbury	19-Jul	OK	OK	OK	OK	OK	OK
London Brent	4-Jul	OK	OK	OK	OK	OK	
London Bromley	5-Jul	OK	OK				
London Cromwell Road 2	9-Oct	OK	OK	OK	OK		
London Eltham	21-Aug	OK		OK	Outlier -11%	OK	
London Hackney	5-Jul	OK	OK		Outlier +10%		
London Haringey	13-Sep				Outlier +6%		

SITE	Date visited	NO_x	CO	SO_2	O_3	PM_{10}	$PM_{2.5}$
London Harlington	31-Aug	OK	OK		OK	OK	
London Hillingdon	6-Jul	Outlier +20%	OK	OK	OK	OK	
London Lewisham	12-Sep	OK		OK	Outlier +12%		
London Marylebone Road	5-Sep	OK	OK	OK	OK	OK	OK
London N. Kensington	20-Jul	OK	OK	OK	OK	OK	
London Southwark	14-Aug	OK	OK	OK	OK		
London Teddington	31-Jul	OK		Outlier +24%	OK		
London Wandsworth	31-Aug	OK			OK		
London Westminster	14-Sep	Outlier -14%	OK	OK	OK	OK	
Lullington Heath	25-Sep	OK		Outlier +15%	Outlier +10%		
Manchester Piccadilly	15-Aug	Outlier +15%	OK	OK	Outlier -6%	OK	
Manchester South	14-Aug	Outlier +12%		OK	OK		
Manchester Town Hall	15-Aug	OK	Outlier -11%				
Market Harborough	18-Jul	OK	OK		OK		
Middlesbrough	13-Sep	OK	OK	OK	Outlier -28%	OK	
Newcastle Centre	11-Sep	OK	OK	OK	Outlier +11%	OK	
Northampton	26-Jul	OK	OK	OK	OK	OK	
Northampton PM_{10} (Grav)	26-Jul					OK	
Norwich Centre	25-Sep	Outlier +12%	OK	Outlier -11%	Outlier +13%	k_0 outlier -8%	
Norwich Forum Roadside	26-Sep	OK					
Nottingham Centre	17-Jul	OK	OK	OK	OK	OK	
Oxford Centre Roadside	4-Jul	OK	OK	OK			
Plymouth Centre	19-Jul	OK	OK	OK	Outlier -37%	OK	
Portsmouth	8-Aug	OK	OK	OK	OK	OK	
Preston	13-Sep	Outlier +16%	OK	OK	OK	OK	
Reading New Town	11-Jul	OK	OK	OK	OK	OK	
Redcar	13-Sep	OK	OK	OK	Outlier +10%	Flow outlier	
Rochester	13-Oct	OK		OK	Outlier -8%	OK	OK
Rotherham Centre	9-Aug	OK		Outlier +53%	OK		
Salford Eccles	15-Aug	OK	OK	OK	OK	OK	
Sandwell West Bromwich	25-Jul	Outlier +16%	OK	OK	OK		
Scunthorpe Town	1-Aug			OK		OK	
Sheffield Centre	7-Aug	Converter 92%	OK	OK	OK	OK	
Sheffield Tinsley	7-Aug	OK	OK				
Sibton	5-Sep				Outlier +10%		
Somerton	20-Jul	OK			Outlier +6%		
Southampton Centre	22-Aug	OK	OK	OK	Outlier +8%	OK	
Southend-on-Sea	5-Oct	Outlier +12%	OK	OK	Outlier +38%	OK	
Southwark Roadside		Site	not	operational			
St Osyth	5-Oct	OK	OK		Outlier -12%		
Stockport Shaw Heath	2-Aug	OK	OK	Outlier+12%		OK	
Stockton-on-Tees Yarm	12-Sep	Outlier +14%	OK			OK	
Stoke-on-Trent Centre	14-Aug	OK	OK		Outlier -18%	OK	
Sunderland	14-Sep			Outlier -12%			
Sunderland Silksworth	14-Sep	Outlier +11%			OK		
Thurrock	6-Sep	OK	OK		Outlier +7%	OK	
Tower Hamlets Roadside	31-Jul	OK	OK				
Walsall Alumwell	10-Jul	Outlier -13%					

SITE	Date visited	NO_x	CO	SO_2	O_3	PM_{10}	$PM_{2.5}$
Walsall Willenhall	24-Aug	OK					
West London	9-Oct	OK	OK				
Weybourne	5-Sep				OK		
Wicken Fen	27-Sep	OK		OK	OK		
Wigan Centre	1-Aug	OK	OK	OK	OK	OK	
Wirral Tranmere	12-Sep	OK	OK	OK	OK	OK	
Wolverhampton Centre	30-Aug	OK	OK	OK	OK	OK	
Yarner Wood	28-Sep	OK			Outlier +6%		
NORTHERN IRELAND							
Belfast Centre	14-Aug	OK	OK	OK	OK	OK	
Belfast Clara St	16-Aug					OK	
Belfast East	14-Aug			OK			
Derry	30-Aug	OK	OK	OK	OK	OK	
Lough Navar	22-Aug				OK	OK	
SCOTLAND							
Aberdeen	18-Jul	Outlier +14%	OK	OK	Outlier +9%	OK	
Auchencorth Moss	5-Oct				Not available	OK	OK
Bush Estate	12-Jul	OK			Outlier +6%		
Dumfries	24-Jul	OK	OK			OK	
Edinburgh St Leonards	12-Jul	OK	OK	Outlier -18%	Outlier +9%	OK	
Eskdalemuir	24-Jul	OK			OK		
Fort William	5-Jul	OK			OK		
Glasgow Centre	4-Jul	Outlier -11%	OK	OK	OK	OK	
Glasgow City Chambers	6-Jul	OK	OK				
Glasgow Kerbside	4-Jul	OK	OK			OK	
Grangemouth	14-Jul	OK	OK	OK	OK	Flow outlier	
Inverness	19-Jul	OK	OK			OK	
Lerwick	26-Oct				Outlier +23%		
Strath Vaich	20-Jul				OK		
WALES							
Aston Hill	26-Sep	OK			OK		
Cardiff Centre	12-Jul	OK	OK	OK	OK	OK	
Cwmbran	11-Jul	Outlier +52%	Outlier +13%	OK	Outlier +10%	OK	
Narberth	13-Jul	Outlier -13%		OK	Outlier -21%	k_0 outlier +3.6%	
Port Talbot	10-Jul	OK		OK	OK	OK	
Swansea	-	Site	Closed				
Swansea Roadside	10-Jul	OK	OK	OK	OK	Leak test fail	OK
Wrexham	11-Sep	OK	OK	OK		OK	

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

8 Oxides of Nitrogen

8.1 Intercalibration Outliers

The intercalibration highlighted that the results from 24 sites were outside the ±10% acceptance limit from the network mean. This result is better than the winter exercise, when 33 analysers were identified as outliers.

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

1. Blackpool Marton
2. Leeds Centre
3. London Hillingdon
4. Cwmbran

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

1. Ladybower
2. London Westminster
3. Norwich Centre
4. Preston
5. Southend

The actions arising as a result of cylinder outliers are described in Section 13.

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 Billingham outlier was caused by a poor converter test result.

The remaining 14 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 3% 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 very good results, and demonstrate that data from the vast majority of NOx analysers are accurate, harmonised and traceable to national metrology standards.

8.2 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 nine analysers:

1. Ladybower - measured 13 ppb NO in an NO_2 cylinder (outlier)
2. Leamington Spa – measured 22 ppb NO in an NO_2 cylinder ® (not outlier)
3. Somerton - measured 18 ppb NO in an NO_2 cylinder ® (not outlier)
4. Stockport Shaw Heath - measured 29 ppb NO in an NO_2 cylinder 2x® (not outlier)
5. West London - measured 12 ppb NO in an NO_2 cylinder ® (not outlier)
6. Glasgow Kerbside – measured 17 ppb NO in an NO_2 cylinder ® (not outlier)

® denotes a repeat offender

These results are better than those found at the winter 2006 exercise where 9 analysers were seen to have this response.

The analyser at Stockport Shaw Heath has now caused outliers to be identified on three occasions – it is therefore strongly recommended that the ESU takes urgent action to remedy this fault.

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.

Recommendation

It is strongly recommended that ESU's clean all NOx analyser switching valves during servicing, and ensure the valve is leak checked afterwards. The Stockport Shaw Heath analyser should be repaired as soon as possible.

AEA will continue to monitor these results at audit visits.

8.3 Converter Tests

The converter at Sheffield Centre was found to be 92% efficient.
The converter at Billingham was found to be 111% efficient.

As a result of these findings some data have been rejected from these sites in the third quarter of 2006.

The Bolton NOx analyser was found to have a converter efficiency of 104.6% at the intercalibration. This was found to be due to the software settings on the analyser. This may cause incorrect scaling of the data, and the analyser converter setting must be set to 100%.

9 Carbon Monoxide

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

Both outliers were 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 3%.

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

10 Sulphur Dioxide

10.1 Intercalibration Outliers

The intercalibration showed that the results from 10 analysers were outside the ±10% acceptance criterion. This is similar to the winter intercalibration, when 9 analysers were identified as outliers.

Seven 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 Lullington Heath arose as a result of a significant change in the site cylinder concentration.

The outliers at London Teddington and Norwich Centre arose as a result of minor changes in site cylinder concentrations.

Actions arising from cylinder outliers are described in Section 13.

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.

Comparison of the network average to the audit cylinder concentration showed that the network measures SO_2 concentrations to within 1% 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.

10.2 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 two sites: Rotherham and London Eltham)

11 Ozone

Calibration of the network analysers against the AEA reference photometers showed that 35 analysers were outside the ±5% acceptance criterion. This is significantly worse than the previous exercise, where 23 analysers tested were identified as outliers.

Of the 35 analysers, 17 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 7 analysers were more than 20% from the reference photometers. Detailed investigations have shown that data from 6 of the sites are recoverable, but owing to a main valve leak, 5 months data have been rejected from the Plymouth Centre analyser.

These results are worse than the winter intercalibration, when 3 analysers were found to be more than 20% from the reference photometer.

During this intercalibration, AEA initiated a 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 all 7 gross outliers. The exercise identified two generic explanations for outliers or discrepancies between results, as follows:

1. Site instrument faults (genuine drift or leaking main valves)
2. Faulty ESU photometers

The programme has been very 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.

12 Particulate analysers

12.1 TEOM k_0

There were three outliers for TEOM k_0 during this intercalibration:

1. Birmingham Tyburn +3.3%
2. Norwich Centre -8%
3. Narberth +3.6%

Data from these analysers have been carefully examined and rescaled as necessary, with the exception of Norwich Centre The data from this site were of poor quality and were deleted from this site for all of this period.

All other analyser calibration factors were calculated to be within 2.5% of their stated values.

It appears that ESU's, on occasion, swap Sensor Units in and out of sites without either replacing the associated Control Unit or updating the k_0 factor on the existing Control Unit. As it is the Control Unit that performs calculations to determine mass concentrations, ESU's are strongly reminded of the importance of ensuring that k_0 values are matched on the two parts of a TEOM

12.2 Analyser Flow Rates

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

1. Haringey Roadside (Main Flow and Aux Flow -13%)
2. Redcar (Main Flow -79%, Aux Flow -27%)
3. Grangemouth (Main Flow +11%)

The analysers at Redcar and Haringey Roadside also failed the leak tests.

Careful examination of the analyser datasets, and the circumstances surrounding the faults, has resulted in two weeks of data rejection from Haringey Roadside and Redcar; no loss of data was necessary at Grangemouth.

13 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 8 of the 377 cylinders (~2.1%) used to scale analyser data into concentrations (NO, CO and SO_2) appear to be outside the ±10% acceptance criterion. This is similar to the Winter 2006 roadshow, where 10 cylinders were outside the acceptance limits.

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

1. Newcastle Centre CO
2. Leeds CentreNO
3. Southampton Centre NO
4. Blackpool Marton NO
5. Hillingdon NO
6. Cwmbran NO
7. Exeter Roadside NO
8. Preston NO

In addition, the concentrations of 27 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 35 of the 377 cylinders were outside the acceptance limits. This is slightly worse than the previous intercalibration, where 33 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.

14 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.

The table below presents information about the sampling systems deployed at new sites, together with accurate, validated grid references. It should be noted that while the measurements are stated to within 1 metre, the uncertainty of the GPS system used is typically the order of ±10 metres.

The following Table presents the information collated at sites established since July 2006: Auchencorth Moss was established at the start of 2006, but data have only recently been supplied to the QA/QC Unit. So far, only gravimetric particle (PM_{10} and $PM_{2.5}$) data are available from this site.

Table x.1 – Site Information

Site Name	Manifold type	Grid Reference	6 figure easting	6 figure northing	Longitude	Latitude	Altitude (m)
Auchencorth Moss	N/a	NT222561	322227	656143	55° 47' 32"N	3° 14' 31"W	270
Swansea Roadside	Glass	SS653945	265341	194458	51° 37' 58"N	3° 56' 51"W	54

The grid references quoted in the above table are obtained from GPS measurements, confirmed by reference to Ordnance Survey 1:25000 maps and internet mapping services. The 6 figure easting and northing references are obtained from GPS measurements, quoted to 1 metre accuracy, and also referenced to internet street mapping services. It should be noted that these figures are likely to carry a maximum uncertainty of ±10 metres.

It is suggested that Management Units check the accuracy of their databases and websites against these data, and provide feedback or update accordingly.

15 CEN

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

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

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

- NOx Converter efficiency must be better than 95%. Data must be rescaled for efficiencies between 95 and 99.9%, but rejected if below 95%. Again, this is tighter than currently, where we accept “borderline” failures. 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. It is likely that Member States will have until 1 January 2008 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.

16 Safety

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

There are no significant issues identified that presented significant risk during this intercalibration exercise. A complete risk assessment updating exercise will be undertaken at all AURN sites during the Winter 2007 audit.

17 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.

18 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 2006.

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: 01668
AEA Identification Number: ED45077030

Approved Signatories: K. Stevenson
S. Eaton ✓

Signed: Date:

Date of issue: 12 March 2007

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 =2006	Site	Analyser number	[1]Zero output	Uncertainty (ppm)	[2]Calibration Factor	Uncertainty (%)	*Maximum Residual (%)
	Scottish Sites						
18-Jul	Aberdeen	614	0	0.3	1.051	3	3.6
24-Jul	Dumfries	1498	-1	0.3	0.992	3	3.5
12-Jul	Edinburgh St Leonards	240	0	0.3	1.038	3	1.4
04-Jul	Glasgow Centre	0410-009	-4	0.3	0.049	3	2.6
06-Jul	Glasgow City Chambers	721	1	0.3	1.000	3	1.4
04-Jul	Glasgow Kerbside	Ambirak 002	11	0.3	0.054	3.2	1.9
14-Jul	Grangemouth	1710	1	0.3	0.995	3	3.6
19-Jul	Inverness	1500	1	0.3	1.005	3	0.7
	Welsh Sites						
12-Jul	Cardiff Centre	242	0	0.3	0.926	3	1.2
11-Jul	Cwmbran	103006	0	0.3	1.004	3	0.8
10-Jul	Swansea	70	27	0.3	0.049	3	2.7
11-Sep	Wrexham	12556	1	0.3	0.951	3	0.6
	N.Irish Sites						
14-Aug	Belfast Centre	m1811-m491	37	0.3	0.049	3	2.8
30-Aug	Derry	j-ar-009	3	0.3	0.053	3	3.1

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.

A business name of AEA Technology plc.
Registered office 329 Harwell, Didcot, Oxfordshire OX11 0QJ
Registered in England and Wales no 3095862

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Date Year =2006	Site	Analyser number	[1]Zero output	Uncertainty (ppm)	[2]Calibration Factor	Uncertainty (%)	*Maximum Residual (%)
	English Sites						
08-Aug	Barnsley Gawber		-8	0.3	0.050	3	0.2
07-Sep	Bath Roadside	95483	-12	0.3	0.051	3	1.4
09-Aug	Birmingham Centre	14418	-8	0.3	0.050	3	0.4
06-Sep	Birmingham Tyburn	106006	0	0.3	1.050	3	1
13-Sep	Blackpool Marton	l-ar-010	1	0.3	0.051	3	0.9
01-Aug	Bolton	440	0	0.3	1.008	3	1.5
23-Aug	Bournemouth	1501	0	0.3	1.052	3	2.1
31-Jul	Bradford Centre		-1	0.3	0.046	3	3.8
12-Jul	Brentford Roadside	168	0	0.3	0.955	3	1.1
18-Sep	Brighton Roadside	1434	1	0.3	1.042	3.2	3.5
17-Jul	Bristol Old Market	717	0	0.3	1.001	3	0.9
17-Jul	Bristol St Paul's	257	0	0.3	1.005	3	0.1
02-Aug	Bury Roadside	277	-1	1.1	1.045	3	1.1
02-Aug	Coventry Memorial Park		-1	0.3	1.026	3	0.5
18-Jul	Exeter Roadside	f010070s	0	1.0	0.985	3	0.9
19-Sep	Hove Roadside	1433	0	0.3	0.986	3	1.4
01-Aug	Hull Freetown	M489	53	0.3	0.050	3	3.9
23-Aug	Leamington Spa	2198	21	0.3	0.050	3	1.7
02-Aug	Leeds Centre	207003	0	0.3	1.035	3	1.5
22-Aug	Leicester Centre	207004	0	0.3	1.037	3	0.6
12-Sep	Liverpool Speke	487	50	0.3	0.051	3	1.4
06-Jul	London A3 Roadside	h-ar-001	0	0.3	0.045	3	0.2
21-Aug	London Bexley	443	0	0.3	1.002	3	5.1
19-Jul	London Bloomsbury	14330	9	0.3	0.049	3	0.9
04-Jul	London Brent	1694	21	0.3	0.049	3	1.2
09-Oct	London Cromwell Road 2	868	14	0.3	0.051	3	1.3
05-Jul	London Hackney	2113-m546	1	0.3	0.947	3	2.1
31-Aug	London Harlington	11492	0	0.3	0.990	3	1.5
06-Jul	London Hillingdon	5	-78	0.3	0.044	3	1.8
05-Sep	London Marylebone Rd	10073	-2	0.3	1.039	3	3.7
20-Jul	London N. Kensington	360	1	0.3	1.002	3	2.4
14-Aug	London Southwark	843	0	1.0	1.002	3	1.0
14-Sep	London Westminster	65	-17*		0.049*		
15-Aug	Manchester Piccadilly	8	-3	0.3	0.049	3	1.2
15-Aug	Manchester Town Hall	828	0	0.3	1.028	3	1.8
18-Jul	Market Harborough	60983-329	289	0.3	0.005	19.0	0.1
13-Sep	Middlesbrough	204	0	0.3	0.996	3	2.0
11-Sep	Newcastle Centre	m488	51	0.3	0.049	3	0.9
26-Jul	Northampton	8905410102	0	0.3	0.979	3	0.6
25-Sep	Norwich Centre	207002	0	1.1	1.044	3	0.7
17-Jul	Nottingham Centre	0410-010	-1	0.3	0.049	3	2.0
04-Jul	Oxford Centre Roadside	127	101	0.3	0.048	3	0.6
19-Jul	Plymouth Centre	gra0410007	39	0.3	0.005	3	0.5
08-Aug	Portsmouth	902015	0	0.3	1.115	3	0.4

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: 01668
AEA Identification Number: ED45077030

Date Year =2006	Site	Analyser number	[1]Zero output	Uncertainty (ppm)	[2]Calibration Factor	Uncertainty (%)	*Maximum Residual (%)
13-Sep	Preston	I-ar-013	6	0.3	0.045	3	1.4
11-Jul	Reading New Town		12	0.3	0.045	3	0.8
13-Sep	Redcar	610	1	0.3	0.053	3	5.5
15-Aug	Salford Eccles	2386	0	1.0	1.004	3	4.1
25-Jul	Sandwell West Bromwich	94603	-9	0.3	0.051	3	1.7
07-Aug	Sheffield Centre	410-006	3	0.3	0.049	3	1.4
07-Aug	Sheffield Tinsley	517	3	0.3	0.050	3	2.8
22-Aug	Southampton Centre	m490	52	0.3	0.048	3	1.3
05-Oct	Southend-on-Sea		0	0.3	1.004	3	1.5
05-Oct	St Osyth	60872	0	0.3	0.541	19.2	0.2
02-Aug	Stockport Shaw Heath	1701	20	0.3	0.050	3	0.9
12-Sep	Stockton-on-Tees Yarm	M339	0	0.3	1.049	6.6	5.0
14-Aug	Stoke-on-Trent Centre		-21	0.3	0.043	3	2.8
06-Sep	Thurrock	262	-32	0.3	0.049	3	9.5
31-Jul	Tower Hamlets Roadside	272	4	0.3	1.008	3	1.7
09-Oct	West London	81	-14	0.3	0.052	3	1.7
01-Aug	Wigan Centre	6011	0	0.3	1.037	3	0.6
12-Sep	Wirral Tranmere	0	0	0.3	0.051	3	0.8
30-Aug	Wolverhampton Centre	410	-7	0.3	0.052	3	3.8

2. Sulphur Dioxide

Date Year =2006	Site	Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max Residual (%)	*m-xylene interference (ppb)
	Scottish Sites							
18-Jul	Aberdeen	12182	4	4.3	1.022	5.3	1.5	15.6
12-Jul	Edinburgh St Leonards	71	4	4.2	1.077	5.7	1.5	
04-Jul	Glasgow Centre	43C-1400	16	4.1	0.188	5.8	2.1	1.7
14-Jul	Grangemouth	703B-274	-1	4.3	0.954	5.7	2.6	20.5
	Welsh Sites							
12-Jul	Cardiff Centre	70	6	4.2	1.049	5	0.8	11.8
11-Jul	Cwmbran	408001	1	4.2	0.987	5	0.6	4.9
13-Jul	Narberth	RAG4580	8	4.2	1.131	5	0.3	29.4
10-Jul	Port Talbot	943	-2	4.2	1.296	5	1.2	22.0
10-Jul	Swansea	168	-8	4.1	0.201	5	2.2	6.2
11-Sep	Wrexham	12183	0	4.3	1.083	5	0.4	11.6
	N.Irish Sites							
14-Aug	Belfast Centre	m1637-m637	173	4	0.167	5.4	0.9	25.1
14-Aug	Belfast East	703	1	4.1	0.903	5	0.3	4.5
30-Aug	Derry	j-ar-009	27	4.3	1.475	6.8	4.3	7.4
	English Sites							
07-Aug	Barnsley 12	706	4	4.3	0.962	5.7	1.5	20.7
08-Aug	Barnsley Gawber		125	4.4	1.855	5	0.3	7.4
09-Aug	Birmingham Centre	14352	34	4.3	0.210	5	0.9	22.4
06-Sep	Birmingham Tyburn	301002	2	4.2	1.058	5	0.8	3.2
13-Sep	Blackpool Marton	I-ar-010	27	4.3	1.531	8.6	3.3	6.1

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: 01668
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Date Year =2006	Site	Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max Residual (%)	*m-xylene interference (ppb)
01-Aug	Bolton	760	0	4.2	0.975	5	0.8	15.6
23-Aug	Bournemouth	1179	0	4.2	1.069	5	0.4	15.0
31-Jul	Bradford Centre		38	5.1	1.355	6.7	2.6	7.5
17-Jul	Bristol St Paul's	73	1	4.2	1.034	5	0.2	23.8
02-Aug	Bury Roadside	559	5	4.3	0.937	5.6	3.6	23.0
02-Aug	Coventry Memorial Park		1	4.2	0.975	5	0.4	2.2
18-Jul	Exeter Roadside	j000f1s0	1	4.1	0.938	5	0.3	19.7
13-Jul	Harwell	79	7	4.1	0.541	5	2.2	8.7
19-Sep	Hove Roadside	1178	3	4.2	0.998	5	1.6	15.7
01-Aug	Hull Freetown	M686	245	4	0.124	5.1	1.1	20.9
27-Sep	Ladybower	84	-1	4.1	0.466	7.1	4.1	11.6
23-Aug	Leamington Spa	1793	22	4.2	0.865	5	0.4	10.6
02-Aug	Leeds Centre	214004	1	4.2	0.990	5	1.3	2.0
22-Aug	Leicester Centre	215001	1	4.2	1.262	5	0.9	2.5
12-Sep	Liverpool Speke	626	252	4.1	0.330	5.4	0.7	8.4
21-Aug	London Bexley	318	-2	4.4	1.287	5	1	20.3
19-Jul	London Bloomsbury	14323	-13	4	0.195	5.1	2.1	20.7
04-Jul	London Brent	1828	17	19.3	0.971	5	1.1	21.8
21-Aug	London Eltham	822	34	4.2	1.246	5	0.4	39.9
06-Jul	London Hillingdon	386	3	4	0.194	5.6	3.2	6.8
12-Sep	London Lewisham	m1220-m498	1	4.3	0.883	5	0.4	20.8
05-Sep	London Marylebone Road	10071	-7	4.4	1.146	5.9	4.9	21.2
20-Jul	London N. Kensington	1020	52	4.3	1.031	5.1	1	35.6
14-Aug	London Southwark	535	-2	4.2	0.997	5	0.9	6.0
31-Jul	London Teddington	58811-320	3	4.1	0.857	5	0.7	4.3
14-Sep	London Westminster	705	4	4.4	1.114	5	0.4	20.6
25-Sep	Lullington Heath	690	100	4.1	0.425	5.4	2.9	21.9
15-Aug	Manchester Piccadilly	477	56	4.2	0.208	5	0.3	12.4
14-Aug	Manchester South	13	-8	4	0.196	5	0.6	33.0
13-Sep	Middlesbrough	1660	7	4.1	0.732	5.2	1.3	9.6
11-Sep	Newcastle Centre	m689	245	4.2	0.431	6.1	1.2	23.9
26-Jul	Northampton	890563033	3	4.1	0.892	5	1.1	2.7
25-Sep	Norwich Centre	214005	1	4.3	0.997	5	0.8	27.4
17-Jul	Nottingham Centre		8	4	0.200	5	0.7	0.4
04-Jul	Oxford Centre Roadside	161	101	4.3	0.955	5	1.1	2.4
19-Jul	Plymouth Centre	77551-386	34	4	0.098	5	2.2	8.2
08-Aug	Portsmouth	578323093	-1	4.2	1.015	5	0	9.1
13-Sep	Preston	l-ar-013	70	4.5	1.230	5	0.4	6.8
11-Jul	Reading New Town		50	5.1	1.112	9.5	5.3	17.2
13-Sep	Redcar	482	3	4.1	0.921	5.5	1.8	12.0
13-Oct	Rochester	95058	2	4.2	1.014	5.9	3.9	9.1
09-Aug	Rotherham Centre	16	3	4.2*	0.634*	54.7*	20.9*	40.4*
15-Aug	Salford Eccles	2346	-5	4.9	1.842	6.8	1.7	19.3
25-Jul	Sandwell West Bromwich	93082	-3	4.2	1.106	5	0.9	15.5
01-Aug	Scunthorpe Town	468	4	4.3	1.090	5	0.6	19.9
07-Aug	Sheffield Centre	0477-015	57	4.1	0.228	5	0.4	15.6
22-Aug	Southampton Centre	m676	184	4.1	0.185	10.0	4.2	2.6

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 =2006	Site	Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max Residual (%)	*m-xylene interference (ppb)
05-Oct	Southend-on-Sea		0	4.2	1.014	7.8	3	2.2
02-Aug	Stockport Shaw Heath	1690	20	4.2	0.988	5	2.2	24.7
14-Aug	Stoke-on-Trent Centre		54	4.4	0.852	5	0.2	22.4
14-Sep	Sunderland	72	1	4.2	1.173	5.7	2.4	14.1
06-Sep	Thurrock	555	15	4.2	0.858	5	0.4	18.5
27-Sep	Wicken Fen	14349	-2	4.2	0.756	5	0.9	21.5
01-Aug	Wigan Centre	57674025	1	4.2	1.000	5	2.3	2.0
12-Sep	Wirral Tranmere		8	4.5	1.861	5	0.2	13.0
30-Aug	Wolverhampton Centre	43c	8	4	0.187	5	0.4	0.9

3. Ozone

Date Year =2006	Site	Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max Residual (%)
	Scottish Sites						
18-Jul	Aberdeen	800	1	3	0.914	3	1.3
12-Jul	Bush Estate	77087-385	1	3	0.481	3	1.5
12-Jul	Edinburgh St Leonards	136	1	3	0.924	3	0.7
24-Jul	Eskdalemuir	145	4	3	0.504	3	2.4
05-Jul	Fort William	M400E 434	0	3	1.000	3	0.9
04-Jul	Glasgow Centre	GRA427-013	-23	3.5	0.202	3	3.5
26-Oct	Lerwick	841b-176	2	3	0.812	3.3	0.8
20-Jul	Strath Vaich	324	4	3	0.471	3	2.0
	Welsh Sites						
26-Sep	Aston Hill	144	-9	3	0.496	3	0.3
12-Jul	Cardiff Centre	168	0	3	0.993	3	0.7
11-Jul	Cwmbran	205004	9	3	0.901	3	1.8
13-Jul	Narberth	RAG4580	2	3.2	1.282	3	2.4
10-Jul	Port Talbot	339	4	3	0.499	3	0.4
10-Jul	Swansea	156	17	3	0.104	3	1.6
	N.Irish Sites						
14-Aug	Belfast Centre	m1626-m335	209	3	0.099	3	0.4
30-Aug	Derry	j-ar-009	0	3	0.950	3	1.6
22-Aug	Lough Navar	337	-9	3	0.520	3	1.1
	English Sites						
08-Aug	Barnsley Gawber		2	3	1.244	3	1.7
09-Aug	Birmingham Centre	14357	-9	3	0.099	3	0.6
06-Sep	Birmingham Tyburn	301002	1	3	0.984	3	0.4
13-Sep	Blackpool Marton	l-ar-010	0	3	0.958	3	1.5
01-Aug	Bolton	196	1	3	0.897	3	0.7
21-Jul	Bottesford	61689-332	3	3	0.964	3	0.6
23-Aug	Bournemouth	824	1	3	0.996	3	0.3
31-Jul	Bradford Centre		3	3	0.975	3	2.7
18-Sep	Brighton Preston Park	542	4	3	0.503	3	0.5
17-Jul	Bristol St Paul's	155	3	3	0.986	3	1.0
02-Aug	Bury Roadside	106	2	4.1	0.975	3	4.7
02-Aug	Coventry Memorial Park		1	3	0.895	3	0.6
18-Jul	Exeter Roadside	1317	1	3	0.955	3	1.9

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 =2006	Site	Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max Residual (%)
16-Aug	Glazebury	138	8	3	0.716	3	1.3
25-Jul	Great Dun Fell	176	-2	3	0.515	3	0.9
13-Jul	Harwell	1018	-51	3	0.533	3	1.0
25-Jul	High Muffles	346	-21	3	0.451	3	2.0
01-Aug	Hull Freetown	M356	243	3	0.092	3	0.4
27-Sep	Ladybower	125b-101	54	3	0.454	3	1.5
23-Aug	Leamington Spa	1469	19	3	0.836	3	0.8
02-Aug	Leeds Centre	206003	2	3	0.969	3	0.3
22-Aug	Leicester Centre	205006	1	3	0.936	3	1.5
24-Jul	Leominster	14470	-1	3	0.970	3	0.5
12-Sep	Liverpool Speke	331	237	3	0.098	3	0.6
21-Aug	London Bexley	403	1	3	0.985	3	3.2
19-Jul	London Bloomsbury	14907	20	3	0.101	3	0.5
04-Jul	London Brent	1608	21	3	0.974	3	1.0
21-Aug	London Eltham	375	9	3	1.122	3	0.5
05-Jul	London Hackney	M2110-m382	2	3	0.904	3	4.9
13-Sep	London Haringey	538	10	3	0.944	3	2.7
31-Aug	London Harlington	14309	-1	3	0.955	3	1.2
06-Jul	London Hillingdon	12	7	3	0.103	3	1.1
12-Sep	London Lewisham	939b-187	2	3	0.915	3	3.2
05-Sep	London Marylebone Road	10074	2	3	1.009	3	0.4
20-Jul	London N. Kensington	497	10	3	0.961	3	0.1
14-Aug	London Southwark	5776	-1	3	0.999	3	0.8
31-Jul	London Teddington	374	-18	3	0.192	3	2.1
31-Aug	London Wandsworth	491	10	3	0.993	3	0.5
14-Sep	London Westminster	879	12	3	0.488	3	0.4
25-Sep	Lullington Heath	337	99	3	0.459	3	1.5
15-Aug	Manchester Piccadilly	17	-7	3	0.213	3	1.1
14-Aug	Manchester South	3	-35	3	0.098	3	1.1
18-Jul	Market Harborough	60894-328	3	3	0.480	3	0.6
13-Sep	Middlesbrough	944	3	3	1.399	3	0.6
11-Sep	Newcastle Centre	m357	245	3	0.089	3	1.6
26-Jul	Northampton	8905240110	1	3	0.980	3	1.5
25-Sep	Norwich Centre	206002	1	3	0.882	3	4.5
17-Jul	Nottingham Centre	0427-011	-13	3	0.098	3	0.6
19-Jul	Plymouth Centre	35925-251	57	3	0.080	3	1.4
08-Aug	Portsmouth	205002	0	3	0.956	3	0.3
13-Sep	Preston	I-ar-013	0	3	0.954	3	1.0
11-Jul	Reading New Town		11	4.7	1.043	3.1	3.9
13-Sep	Redcar	799	12	3	0.459	3	0.6
13-Oct	Rochester	95063	3	3	1.084	3	1.6
09-Aug	Rotherham Centre	ra427	6	3	0.991	3.6	0.9
15-Aug	Salford Eccles	2363	-2	3	0.948	3	0.5
25-Jul	Sandwell West Bromwich	121	1	3	0.483	3	0
07-Aug	Sheffield Centre	427-010	5	3	0.102	3	1.5
05-Sep	Sibton	219	11	3	0.482	3	0.7
20-Jul	Somerton	95249	4	3	0.475	3	1.2
22-Aug	Southampton Centre	m354	245	3	0.096	3	1.0
05-Oct	Southend-on-Sea		-14	3	0.724	3	1.2

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UKAS CALIBRATION 0401

Certificate Number: 01668
AEA Identification Number: ED45077030

Date Year =2006	Site	Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max Residual (%)
05-Oct	St Osyth	60869	0	3	56.301	3	0.4
14-Aug	Stoke-on-Trent Centre		5	3.1	1.239	3	1.7
14-Sep	Sunderland Silksworth	436	1	3	0.983	3	0.7
06-Sep	Thurrock	2040	-3	3	0.466	3	1.4
05-Sep	Weybourne	70532-366	2	3	0.984	3	1.7
27-Sep	Wicken Fen	14345		Not	tested		
01-Aug	Wigan Centre	4009	-1	3	0.997	3	0.8
12-Sep	Wirral Tranmere		2	3	0.963	3	1.7
30-Aug	Wolverhampton Centre	427-009	2	3	0.098	3	1.6
28-Sep	Yarner Wood	437	-29	3	0.465	3	1.0

4. Oxides of Nitrogen

Date Year =2006	Site		Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max residual (%)	*Converter efficiency (%)
	Scottish Sites								
18-Jul	Aberdeen	NO NOx		1 0	5 5.5	1.74 1.75	5 5.1	2.2 2.1	99.3
24-Jul	Dumfries	NO NOx	781	2 2	5 5.4	1.32 1.32	5 5	1.0 0.4	99.6
12-Jul	Edinburgh St Leonards	NO NOx	73	4 4	5 5.3	1.20 1.21	5 5.1	0.9 0.6	97.4
24-Jul	Eskdalemuir	NO NOx	347	1 -1	5 5.4	1.19 1.09	5 5.2	1.6 2.0	100.2
05-Jul	Fort William	NO NOx	M200E 344	1 1	5 5.3	1.03 1.04	5 5	1.1 0.9	100.5
04-Jul	Glasgow Centre	NO NOx	447	5 5	5 5.2	0.52 0.52	5.7 5.6	1.6 3.3	96.9
06-Jul	Glasgow City Chambers	NO NOx	575	1 3	5 5.4	1.32 1.38	5 5	1.4 0.9	100.0
04-Jul	Glasgow Kerbside	NO NOx		-12 -10	5 8.9	3.33 3.35	5.6 6.9	0.9 1.1	98.4
14-Jul	Grangemouth	NO NOx	700B-312	1 2	5 5.4	1.02 1.03	5 5.3	1.9 2.3	95.7
19-Jul	Inverness	NO NOx		0 3	5 5.3	1.19 1.18	5 5.1	0.7 0.7	97.6
	Welsh Sites								
	Aston Hill	NO NOx	2221		Not	tested			
12-Jul	Cardiff Centre	NO NOx	71	2 3	5 5.4	1.28 1.30	5.2 5.7	0.9 0.3	100.2
11-Jul	Cwmbran	NO NOx	406003	-3 -3	5 5.3	1.19 1.14	5 5.4	0.5 0.4	96.8
13-Jul	Narberth	NO NOx	RAG4580	42 40	5 5.4	1.02 1.02	7 6.6	2.2 1.8	100.4
10-Jul	Port Talbot	NO NOx	320	-1 -1	5 5.4	1.29 1.31	5 5.1	0.7 0.9	97.4
10-Jul	Swansea	NO NOx	148	0 5	5 5.2	0.52 0.52	5 5.7	0.2 1.2	100.1
11-Sep	Wrexham	NO NOx	12185	0 1	5 5.3	1.03 1.01	5 5	0.3 0.6	99.9

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Date Year =2006	Site		Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max residual (%)	*Converter efficiency (%)
	N.Irish Sites								
14-Aug	Belfast Centre	NO NOx	m1804- m733	243 248	5 5.2	0.44 0.46	5 5	0.8 0.8	101.9
30-Aug	Derry	NO NOx	j-ar-009	56 56	5 5.4	1.59 1.62	5 5.2	1.5 2.1	102.9
	English Sites								
08-Aug	Barnsley Gawber	NO NOx		11 10	5 6.5	2.77 2.80	5 8.9	0.6 2.2	96.6
07-Sep	Bath Roadside	NO NOx	12758	12 12	5 5.4	1.57 1.57	5 5	0.6 0.2	97.7
12-Sep	Billingham	NO NOx	574	1 2	5 5.3	1.15 1.16	5 5	1.5 0.9	111.3
09-Aug	Birmingham Centre	NO NOx	14324	-7 0	5 5.2	0.45 0.45	5 5	1.7 1.7	100.1
06-Sep	Birmingham Tyburn	NO NOx	209006	0 1	5 5.3	1.01 1.01	5 5	0.7 0.1	97.8
13-Sep	Blackpool Marton	NO NOx	l-ar-010	68 68	5 5.4	1.59 1.62	5 5.8	1.8 0.7	98.2
01-Aug	Bolton	NO NOx	433	-2 7	5 5.7	1.00 0.96	5 5	0.1 1.3	104.5
23-Aug	Bournemouth	NO NOx	522	-1 -4	5 5.3	1.08 1.07	5 5	0.9 0.6	99.7
31-Jul	Bradford Centre	NO NOx		12 12	5 5.5	1.79 1.87	5 5.8	2.1 2.1	96.9
12-Jul	Brentford Roadside	NO NOx	712	-2 8	5 5.5	1.09 1.10	5 5	0.8 0.3	100.2
18-Sep	Brighton Preston Park	NO NOx	2222	-1 -1	5 5.4	1.31 1.29	5 5	1.0 0.2	95.4
18-Sep	Brighton Roadside	NO NOx	1225	9 10	5 5.4	1.39 1.37	5 5.7	0.5 0.8	95.2
17-Jul	Bristol Old Market	NO NOx	10510	0 1	5 5.6	1.29 1.29	5 5	0.7 1.0	100.1
17-Jul	Bristol St Paul's	NO NOx	77	3 10	5 5.3	1.07 1.10	5 5	2.1 0.8	99.9
02-Aug	Bury Roadside	NO NOx	229	0 5	5 5.5	1.20 1.21	5 5.2	1.4 2.8	100.8
04-Sep	Cambridge Roadside	NO NOx	303	-2 -3	5 5.4	0.94 0.93	5 5	0.5 0.7	97.6
15-Aug	Camden Kerbside	NO NOx	623	2 4	5 5.4	1.02 1.06	5 5	0.4 0.5	98.1
28-Sep	Canterbury	NO NOx	11666	1 4	5 5.4	1.33 1.34	5 5.3	0.6 0.2	99.7
02-Aug	Coventry Memorial Park	NO NOx		-1 -5	5 5.3	1.07 1.09	5 5	0.3 0.5	97.0
18-Jul	Exeter Roadside	NO NOx	g0000d1s	0 0	5 5.3	0.97 0.98	5 5	0.7 0.6	100.5
16-Aug	Glazebury	NO NOx	78	1 -3	5 5.3	0.62 0.61	5 5	1.0 1.1	97.1
13-Sep	Haringey Roadside	NO NOx	397	4 5	5 5.7	1.10 0.80	5.6 5.8	3.9 3.5	95.6
13-Jul	Harwell	NO NOx	83	15 13	5 5.3	0.79 0.78	5 5	0.2 0.8	100

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Date Year =2006	Site		Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max residual (%)	*Converter efficiency (%)
25-Jul	High Muffles	NO NOx	M1935- M784	18 34	5 5.2	0.55 0.57	5 5	1.7 1.7	99.0
19-Sep	Hove Roadside	NO NOx	199	-5 -4	5 5.2	0.71 0.69	5 5	1.1 1.6	99.6
01-Aug	Hull Freetown	NO NOx	M732	248 253	5 5.2	0.47 0.49	5 5	0.5 0.3	100.3
27-Sep	Ladybower	NO NOx	189	3 2	5 5.2	0.60 0.58	5 5	0.7 0.2	95.9
23-Aug	Leamington Spa	NO NOx	1705	20 21	5 5.8	2.68 2.64	5 5	1.6 1.3	100.3
02-Aug	Leeds Centre	NO NOx	210005	1 2	5 5.3	1.07 1.02	5 5	2.2 0.5	97.8
22-Aug	Leicester Centre	NO NOx	210004	0 0	5 5.3	1.09 1.11	5 5	0.7 0.3	100.0
24-Jul	Leominster	NO NOx	14863	1 4	5 5.4	1.04 1.05	5 5	0.2 0.5	98.5
12-Sep	Liverpool Speke	NO NOx	734	244 249	5 5.3	0.45 0.45	5 5.5	1.0 1.3	99.6
06-Jul	London A3 Roadside	NO NOx		65 68	5 7.1	2.91 3.12	6.1 6.3	1.9 1.8	99.7
21-Aug	London Bexley	NO NOx	327	1 3	5 5.3	0.81 0.79	5 5	0.6 0.7	98.5
19-Jul	London Bloomsbury	NO NOx	14328	16 10	5 5.2	0.62 0.61	5 6.1	1.9 2.4	97.9
04-Jul	London Brent	NO NOx	1852	22 30	5 6.2	2.15 2.20	5 5.1	0.5 0.3	98.5
05-Jul	London Bromley	NO NOx	10669	0 0	5 5.3	1.14 1.18	5 5	2.2 1.1	100.2
09-Oct	London Cromwell Road 2	NO NOx		-1 1	5 6.7	2.92 2.94	5 5	0.6 0.8	99.4
21-Aug	London Eltham	NO NOx	307	3 4	5 5.6	1.18 1.29	5 6.4	0.6 1.5	98.9
05-Jul	London Hackney	NO NOx	532b-234	1 4	5 5.3	0.99 1.05	5 5	0.5 0.9	100.9
31-Aug	London Harlington	NO NOx	11491	-3 -3	5 5.4	1.34 1.35	5 5	1.0 1.1	98.0
06-Jul	London Hillingdon	NO NOx	10	24 28	5 5.2	0.36 0.37	5.9 6.3	5.9 5.8	99.1
12-Sep	London Lewisham	NO NOx	m1231- m530	0 2	5 5.4	1.23 1.43	5 5	0.7 1.0	99.9
05-Sep	London Marylebone Road	NO NOx	10072	2 2	5 5.9	1.90 1.83	5 5.3	1.2 2.6	99.6
20-Jul	London N. Kensington	NO NOx	459	3 7	5 5.3	1.15 1.14	5 5.4	0.2 0.8	96.3
14-Aug	London Southwark	NO NOx	197	2 3	5 5.3	0.96 0.96	5 5	1.1 0.7	100
31-Jul	London Teddington	NO NOx		-1 -2	5 5.6	1.51 1.50	6.3 7	3.4 3.9	100
31-Aug	London Wandsworth	NO NOx	378	2 3	5 5.5	1.40 1.33	5 5.1	0.7 0.5	103.2
14-Sep	London Westminster	NO NOx	573	1 -1	5 5.7	2.05 2.22	5 5.5	0.3 1.5	98.3

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Date Year =2006	Site		Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max residual (%)	*Converter efficiency (%)
25-Sep	Lullington Heath	NO NOx	675	101 101	5 5.4	1.07 1.07	5.8 6	2.5 3.5	99.2
15-Aug	Manchester Piccadilly	NO NOx	11	2 2	5 5.5	0.47 0.47	5 5	2.2 2.0	96.9
14-Aug	Manchester South	NO NOx	8	-13 0	5 5.2	0.57 0.58	5 5.1	2.7 2.5	98.0
15-Aug	Manchester Town Hall	NO NOx	846	5 6	5 5.5	1.09 1.11	5 5.2	0.9 1.0	98.0
18-Jul	Market Harborough	NO NOx	61963-333	8 12	5 5.3	0.59 0.59	5 5	2.4 1.4	100.4
13-Sep	Middlesbrough	NO NOx	2287	-1 -5	5 5.4	1.35 1.32	5 5	0.9 1.2	96.6
11-Sep	Newcastle Centre	NO NOx	m730	249 253	5 5.6	0.50 0.51	5.5 5	1.2 1.2	95.9
26-Jul	Northampton	NO NOx	8513180611	0 2	5 5.3	1.08 1.07	5 5	0 0.3	96.8
25-Sep	Norwich Centre	NO NOx	211001	0 1	5 5.3	1.10 1.11	5 5	0.8 0.9	100.3
26-Sep	Norwich Forum Roadside	NO NOx	10616	1 1	5 5.3	1.09 1.07	5 5	1.3 0.5	100.8
17-Jul	Nottingham Centre	NO NOx	0447-009	-13 -13	5 5.2	0.59 0.58	5 5.1	0.9 0.9	95.9
04-Jul	Oxford Centre Roadside	NO NOx	947	98 104	5 5.3	1.02 1.03	5 5	1.0 1.1	97.3
19-Jul	Plymouth Centre	NO NOx		2 11	5 5.2	0.17 0.20	5 5	0.7 0.8	100.0
08-Aug	Portsmouth	NO NOx	904005	0 0	5 5.3	1.01 1.00	5 5	0.4 0.3	100.7
13-Sep	Preston	NO NOx	l-ar-013	143 142	5 5.4	1.45 1.42	5 5.3	1.5 1.1	99.3
11-Jul	Reading New Town	NO NOx		5 6	5 5.5	1.23 1.23	5 5.5	3.4 3.6	99.7
13-Sep	Redcar	NO NOx	497	0 3	5 5.4	1.06 1.08	5 5	1.6 2.0	98.3
13-Oct	Rochester	NO NOx	95059	0 -1	5 5.5	1.16 1.19	5 5	0.7 0.8	96.5
09-Aug	Rotherham Centre	NO NOx	0447-001	12 10	5 5.3	1.14 1.13	5 5.1	1.4 1.6	95.5
15-Aug	Salford Eccles	NO NOx	2381	1 2	5 5.5	1.17 1.17	5 6.6	1.6 3.2	98.7
25-Jul	Sandwell West Bromwich	NO NOx	93081	1 0	5 5.3	1.01 1.03	5 5	1.3 1.8	100.2
07-Aug	Sheffield Centre	NO NOx	0447-008	10 5	5 5.2	0.52 0.53	5 5.5	0.7 0.5	92
07-Aug	Sheffield Tinsley	NO NOx	847	-4 -3	5 6	2.90 2.96	5 5.5	0.3 2.9	103.3
20-Jul	Somerton	NO NOx	12895	4 5	5 5.2	0.45 0.44	5 5	0.5 0.7	99.0
22-Aug	Southampton Centre	NO NOx	m723	210 225	5 5.4	0.69 0.68	5 5.4	0.4 1.1	96.5
05-Oct	Southend-on-Sea	NO NOx		0 -1	5 5.3	1.01 1.03	5 5.1	0.9 1.0	98.1

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05-Oct	St Osyth	NO	60988	0	6.4	51.6	5.9	3.6	
		NOx		0	8	52.1	6.1	3.2	98.0
02-Aug	Stockport Shaw Heath	NO	1853	18	5	2.93	5.4	2.3	
		NOx		19	7	3.08	6.2	2.2	103.8
12-Sep	Stockton-on-Tees Yarm	NO	118	3	5	1.37	6.5	4.3	
		NOx		-2	6.8	1.41	5.7	3.7	95.8
14-Aug	Stoke-on-Trent Centre	NO		50	5	1.06	5.2	3.3	
		NOx		51	5.3	1.15	6.8	2.8	95.2
14-Sep	Sunderland Silksworth	NO	734B-322	0	5	1.12	5	1.6	
		NOx		0	5.3	1.12	5.2	1.7	99.3
06-Sep	Thurrock	NO	920	1	5	1.12	5	1.2	
		NOx		3	5.3	1.10	5.3	1.3	97.7
31-Jul	Tower Hamlets Roadside	NO	306	3	5	1.01	5	0.6	
		NOx		5	5.4	0.93	5.2	0.4	100.4
10-Jul	Walsall Alumwell	NO	848	-4	5	0.87	5	3.2	
		NOx		-6	5.3	0.88	5.2	3.2	98.6
24-Aug	Walsall Willenhall	NO	1337	0	5	1.11	5	0.8	
		NOx		4	5.3	1.12	5	0.4	99.6
09-Oct	West London	NO		-3	5	1.25	5.5	0.9	
		NOx		-2	5.5	1.23	5	0.4	99.6
27-Sep	Wicken Fen	NO	13069	19	5	0.53	5	1.0	
		NOx		21	5.2	0.56	5.2	1.4	99.8
01-Aug	Wigan Centre	NO	805005	0	5	1.08	5	0.5	
		NOx		0	5.3	1.06	5	0.2	98.9
12-Sep	Wirral Tranmere	NO		22	5	2.24	5.2	2.8	
		NOx		23	5.7	2.32	5.5	1.3	99.8
30-Aug	Wolverhampton Centre	NO	7	71	5	0.60	5	0.6	
		NOx		62	5.6	0.61	5	1.5	98.4
28-Sep	Yarner Wood	NO	1784	31	5	0.87	5	1.7	
		NOx		28	5.3	0.83	5	1.3	95.4

5. Particulate Analysers

Date Year =2006	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								
18-Jul	Aberdeen	24427	11774	1	1.8	**2.90**	**2.2**	**13.33**	2.2
24-Jul	Dumfries							Not	tested
12-Jul	Edinburgh St Leonards	21308	12907	1	0.7	2.01	2.2	16.16	2.2
04-Jul	Glasgow Centre	22980	13203	1	0.5	1.95	2.2	16.18	2.2
04-Jul	Glasgow Kerbside	24444	10635	1	1.7	2.09	2.2	17.47	2.2
14-Jul	Grangemouth	22763	12518	1	-1.0	3.33	2.2	17.80	2.2
19-Jul	Inverness	212550003						16.93	2.2
	Welsh Sites								
12-Jul	Cardiff Centre	24449	14317	1	0.1	**2.05**	**2.2**	**14.27**	**2.2**
11-Jul	Cwmbran	21557	12692	1	1.2	**2.89**	2.2	**13.49**	**2.2**
13-Jul	Narberth	2000	12612	1	3.6	**2.99**	**2.2**	**14.27**	**2.2**
10-Jul	Port Talbot	2000	10827	1	2.2	**3.08**	**2.2**	**14.87**	**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.

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: 01668
AEA Identification Number: ED45077030

Date Year =2006	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 (%)
10-Jul	Swansea	2130	14422	1	-1.0	**2.05**	**2.2**	**14.57**	**2.2**
11-Sep	Wrexham	21224001						16.10	2.2
	N.Irish Sites								
14-Aug	Belfast Centre	24423	14297	1	0.7	**2.03**	**2.2**	**14.23**	**2.2**
16-Aug	Belfast Clara St	25456	11810	1	-0.7	**2.04**	**2.2**	**14.10**	**2.2**
30-Aug	Derry	49608	10945	1	0.5	**2.10**	**2.2**	**15.06**	**2.2**
22-Aug	Lough Navar	21196	12920	1	0.8	**2.89**	**2.2**	Not	tested
	English Sites								
09-Aug	Birmingham Centre	3297	12166	1	0.7	3.02	2.2	16.66	2.2
06-Sep	Birmingham Tyburn	24637	13735	1	-3.3	2.99	2.2	15.38	2.2
13-Sep	Blackpool Marton	24424	12923	1	0.2	2.02	2.2	15.64	2.2
01-Aug	Bolton	21197	15242	1	0.5	**3.09**	**2.2**	**14.49**	**2.2**
23-Aug	Bournemouth							16.13	2.2
31-Jul	Bradford Centre	21494	11445	1	0.8	2.00	2.2	16.05	2.2
18-Sep	Brighton Roadside							16.82	2.2
17-Jul	Bristol St Paul's	24426	13250	1	0.5	2.00	2.2	16.27	2.2
02-Aug	Bury Roadside	658	11682	1	0.7	2.04	2.2	16.77	2.2
15-Aug	Camden Kerbside	0	16402	1	-0.1	2.97	2.2	16.68	2.2
28-Sep	Canterbury	20931	14128	1	0.7	**2.98**	**2.2**	**13.62**	**2.2**
02-Aug	Coventry Memorial Park	25026	13225	1	0.3	**2.92**	**2.2**	**13.13**	**2.2**
13-Sep	Haringey Roadside	9407	11463	1	0.1	**2.62**	**2.2**	**14.45**	**2.2**
13-Jul	Harwell PM_{10}	21489	14736	1	-1.2	3.05	2.2	16.45	2.2
13-Jul	Harwell $PM_{2.5}$	21490	10826	1	-0.5	3.06	2.2	16.85	2.2
01-Aug	Hull Freetown	24445	14287	1	1.3	2.04	2.2	15.87	2.2
23-Aug	Leamington Spa	2075	11080	1	1.3	3.12	2.2	17.08	2.2
02-Aug	Leeds Centre	24451	13458	1	0.5	**2.85**	**2.2**	**13.44**	**2.2**
22-Aug	Leicester Centre	24442	14073	1	0.4	3.08	2.2	16.32	2.2
12-Sep	Liverpool Speke	2445	15802	1	-0.1	2.00	2.2	15.88	2.2
06-Jul	London A3 Roadside	24425	12344	1	-0.7	1.98	2.2	16.15	2.2
21-Aug	London Bexley	2000	10531	1	0.6	1.96	2.2	16.09	2.2
19-Jul	London Bloomsbury PM_{10}	24446	13904	1	1.2	**3.18**	**2.2**	**15.19**	**2.2**
19-Jul	London Bloomsbury $PM_{2.5}$	21492	15005	1	0.4	3.01	**2.2**	13.02	**2.2**
04-Jul	London Brent	21145	17636	1	0.7	**3.09**	**2.2**	**9.15**	**2.2**
21-Aug	London Eltham	Not	tested	analyser	fault				
31-Aug	London Harlington	22835	14343	1	1.0	2.00	2.2	16.06	2.2
06-Jul	London Hillingdon	24422	14194	1	-0.3	**1.96**	**2.2**	**15.23**	**2.2**
05-Sep	London Marylebone Road PM_{10}	21306	13378	1	0.3	3.05	2.2	16.30	2.2
05-Sep	London Marylebone Road $PM_{2.5}$	21493	14312	1	-1.6	3.05	2.2	16.00	2.2
20-Jul	London N. Kensington	20715	10983	1	1.5	**3.04**	**2.2**	**13.43**	**2.2**
14-Sep	London Westminster	204969902						16.21	2.2
15-Aug	Manchester Piccadilly	2000	12180	1	1.1	**1.99**	**2.2**	**14.19**	**2.2**
13-Sep	Middlesbrough	24325	13867	1	-1.9	2.03	2.2	15.84	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.

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Date Year =2006	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-Sep	Newcastle Centre	24448	13795	1	-0.2	**2.98**	**2.2**	**13.27**	**2.2**
26-Jul	Northampton	21621	11266	1	1.1	**2.85**	**2.2**	**12.55**	**2.2**
26-Jul	Northampton Partisol							Not	tested
25-Sep	Norwich Centre	21495	11231	1	-8.0	**2.15**	**2.2**	**14.32**	**2.2**
17-Jul	Nottingham Centre	20904	8876	1	2.3	**2.01**	**2.2**	**13.85**	**2.2**
19-Jul	Plymouth Centre	24428	13059	1	0.9	**2.02**	**2.2**	**15.15**	**2.2**
08-Aug	Portsmouth	21578	10499	1	-0.7	**2.93**	**2.2**	**13.81**	**2.2**
13-Sep	Preston	22881	12881	1	-0.6	2.02	2.2	16.29	2.2
11-Jul	Reading New Town	2000	13291	1	0.7	1.81	2.2	15.67	2.2
13-Sep	Redcar	21344	11831	1	0.4	0.73	2.2	12.20	2.2
13-Oct	Rochester PM_{10}	24381	12032	1	-0.2	2.99	2.2	16.05	2.2
13-Oct	Rochester $PM_{2.5}$	21491	13602	1	-2.4	3.11	2.2	17.09	2.2
15-Aug	Salford Eccles	21168	14591	1	1.2	2.09	2.2	16.09	2.2
01-Aug	Scunthorpe Town	6000	12612	1	-0.4	**3.17**	**2.2**	**14.24**	**2.2**
07-Aug	Sheffield Centre	25024	12249	1	0.0	**2.02**	**2.2**	**14.52**	**2.2**
22-Aug	Southampton Centre	4484	14018	1	1.0	1.93	2.2	16.52	2.2
05-Oct	Southend-on-Sea	22927	13486	1	0.7	**1.97**	**2.2**	**14.54**	**2.2**
02-Aug	Stockport Shaw Heath	2000	10614	1	1.9	**3.07**	**2.2**	**14.11**	**2.2**
12-Sep	Stockton-on-Tees Yarm	22885	14148	1	-1.0	3.02	2.2	15.79	2.2
14-Aug	Stoke-on-Trent Centre	25028	12419	1	-0.7	1.98	2.2	16.27	2.2
06-Sep	Thurrock	25039	12906	1	-0.5	**2.98**	**2.2**	**14.10**	**2.2**
01-Aug	Wigan Centre	22015	12090	1	0.2	**3.01**	**2.2**	**13.45**	**2.2**
12-Sep	Wirral Tranmere	22883	13204	1	-0.7	1.98	2.2	16.33	2.2
30-Aug	Wolverhampton Centre	20917	13924	1	1.3	2.02	2.2	16.23	2.2

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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 23/3/2007 and held by AEA at the above address. Hard copies are available on request.