

Report

**QA/QC Data Ratification Report for the
Automatic Urban and Rural Network,
April – June 2004**

A 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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UNRESTRICTED

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Jane Vallance-Plews

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1 Introduction

This quarterly report covers the Quality Assurance and Control (QA/QC) activities undertaken by **netcen** to ratify automatic monitoring data from Defra and the Devolved Administrations' urban and rural air quality monitoring network (AURN) for the period April to June 2004. During this period there were 121 monitoring sites in the Network of which 85 are urban sites, 22 rural network sites and 14 sites in the London Air Quality Monitoring Network (LAQN) which are affiliated into the national network. The following information is contained in this report:

- Section 1: Introduction including recent changes that have taken place in the network and a general overview of network performance.
- Section 2: Generic data quality issues and recommendations for improving or resolving these issues.
- Section 3: Site specific issues.
- Section 4: Reasons for data loss at sites where data capture falls below 90%.
- Section 5: Data capture statistics for April - June 2004 presented in tables.
- Appendix A1 Recommendations for replacing or up-grading equipment (compiled in conjunction with CMCUs).
- Appendix A2 List of critical sites in the AURN.

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 year to date is given in Table 1.1.

QA/QC Unit has been working closely with Casella Stanger and the Local Authorities regarding the following site relocations:

Scunthorpe/Scunthorpe Town

Due to health and safety reasons the site at Scunthorpe was closed on 18th March 2004 and relocated to a nearby site in Rowland Road. The new site commenced monitoring on 6th June 2004 and has been renamed Scunthorpe Town.

Wigan Leigh

The Wigan Leigh site was closed on 28th September 2004 due to the necessary redevelopment of the Police Station. The Defra funded instruments have been relocated to an existing site at Deanery School and the site renamed "Wigan Centre". The site commissioning audit was carried out on 6th October 2004 and the new site commenced operation on 11th October 2004.

Birmingham East and Centre

The Birmingham East site closed on 4th August 2004 as the school was unable to renew the lease for the site. QA/QC Unit worked closely with Birmingham County Council to identify another suitable site. The new site at Birmingham Tyburn commenced operation on August 16th 2004. The Birmingham Centre site is also scheduled for relocation by the end of March 2005.

Cwmbran

The site at Cwmbran will be temporarily relocated in December prior to construction activity taking place at the school in January 2005. A suitable site close to the original site and in similar surroundings has been identified.

Blackpool

The site at Blackpool ceased operation on 10th November 2004 due to redevelopment in the area. The housing will be moved to a new location at Stanley school as soon as provision of the electricity supply is sorted out.

Middlesbrough

The site at Middlesbrough will need to be relocated due redevelopment in the area around the school. Another suitable site, 17 metres from the existing location, has been identified and plans to move the monitoring cabin are in place.

DD3 Requirements

Installation of additional ozone and rural NO_x analysers in the network in order to comply with the Third Daughter Directive (DD3) is now complete. The final NO_x analyser was installed at Eskdalemuir on 13th October 2004. Data will come on-line once the NO_x analyser is operating satisfactorily and the commissioning audit is completed. Plans are also underway to add a further four new DD3 sites at Brighton Preston Park¹, Fort William, Sunderland Silkworth and Leominster. Progress on the affiliation of the remaining DD3 analysers is summarised in Table 1.1 and discussed in more detail in Section 2.1

Table 1.1 Changes to the AURN between January to June 2004

Sites	Date Commenced	Pollutants
New sites		
London Harlington	1/01/04	NO ₂ CO O ₃ PM ₁₀
Site Relocations		
Scunthorpe relocated to Scunthorpe Town	Scunthorpe closed 18/3/04 Scunthorpe Town started 6 th June 04	SO ₂ PM ₁₀
Wigan Leigh relocated to Wigan Centre	Wigan Leigh closed on 28 th September 2004. Wigan Centre started on 13 th October 2004	NO _x O ₃ CO SO ₂ and PM ₁₀
Birmingham East relocated to Birmingham Tyburn	Birmingham East closed on 4 th August 2004. Relocated to Birmingham Tyburn starting on August 16 th 2004	NO _x O ₃ CO SO ₂ and PM ₁₀
Additional O₃ and/or NO_x (DD3)		
Eskdalemuir	NO _x analyser installed on 13 th October 2004. Awaiting attention to NO _x analyser and commissioning audit	NO _x and PM ₁₀
Glazebury	NO _x commissioned on 26 th January 2004	NO _x

1.2 Overview of Network Performance

Ratified hourly average data capture for the network averaged 94% for all pollutants (O₃, NO₂, SO₂, CO, PM₁₀ and PM_{2.5}) during the 3-month reporting period April to June 2004 (see Table 1.2 below). In general, this has been a very good quarter with average data capture for all the pollutants being well above the 90% target level.

¹ Brighton Preston Park commenced operation on November 3rd 2004

Table 1.2 AURN Ratified Data Capture (%) April to June 2004
(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 - March 2004	92.0	90.3	93.1	91.1	97.9	91.7	92
Q2 April – June 2004	93.2	93.6	96.2	94.7	98.1	93.1	94

Overall, 353 out of the 420 analysers (84%) achieved data capture levels above the required 90% target during this reporting period (See Table 1.3). This is even better than in the previous quarter (January to March 2004) when 80% of analysers achieved the data capture target. Some improvement is to be expected this quarter as there was no disruption due to service and intercalibration exercise for the majority of the sites. The figures given in Table 1.3 demonstrate that the network operating in steady-state with a relatively small proportion of analyser (15-20%) failing to meet the 90% data capture target and the distribution of problems spread evenly cross the different analyser types.

Table 1.3 Number of Analysers with Data Capture below 90%

	Total Number of Analysers	Analysers with Data Capture <90%	
		Q1 Jan–March 2004	Q2 Apr – June 2004
CO	79	16 (20%)	13 (16%)
NO ₂	106	26 (25%)	18 (17%)
O ₃	84	14 (16%)	10 (12%)
PM ₁₀	71	12 (17%)	11 (16%)
PM _{2.5}	4	0	0
SO ₂	76	16 (21%)	15 (19%)
All sites	420	84 (20%)	67 (16%)

A more detailed breakdown of the hourly data capture statistics for each site is presented in Section 5, Table 5.1 (April – June 2004) and Table 5.2 (January- June 2004). In total, 24 out of the 121 network sites (20%) had an average data capture rate below the required 90% level for the April – June 2004 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.

Table 1.4 Sites with Average Data Capture < 90%, April -June 2004
(Data capture calculated from site start date)

Site	Owner	Site Average Data Capture (%)
England		
Bristol Old Market	Affiliate	72.7
Bury Roadside	Affiliate	89.1
Camden Kerbside	Affiliate	80.4
Exeter Roadside	Affiliate	86.9
High Muffles	Defra	86.4
Hull Freetown	Defra	86.0
Leeds Centre	Defra	85.0
Leicester Centre	Defra	86.4
Manchester Town Hall	Defra	84.2
Market Harborough	Defra	86.2
Middlesbrough	Affiliate	88.9

Site	Owner	Site Average Data Capture (%)
Newcastle Centre	Defra	74.6
Northampton	Affiliate	88.0
Northampton PM ₁₀	Affiliate	62.6
Oxford Centre	Affiliate	85.6
Rotherham Centre	Affiliate	86.6
Sheffield Centre	Defra	85.5
Southend-on-Sea	Defra	74.2
Sunderland	Defra	81.1
Walsall Willenhall	Affiliate	76.5
Wicken Fen	Defra	79.1
Scotland		
Glasgow Centre	Defra	80.4
Wales		
Aston Hill	Defra	77.7
Wrexham	Defra	83.0
Number of sites < 90%		24

Netcen carried out the Summer intercalibration and site audits at 121 operational urban and rural sites during July - September 2004. Results from this intercalibration exercise have been used to assess the accuracy and consistency of the data for this reporting period. Details of the Summer 2004 intercalibration will be reported in conjunction with the next data ratification report (January 2005).

1.3 LSO Manual

An electronic version of the Local Site Operator's manual has recently been put on to disc and this will be distributed at the forth-coming annual LSO meeting in December 2004. The manual is already available electronically on the following web sites:

AURN Hub <http://www.aeat.co.uk/com/AURNHUB/Isoman.html>

Air Quality Archive <http://www.aeat.co.uk/netcen/airqual/reports/Isoman/Isoman.html>

1.4 AURN Hub Updates

The AURN project information hub web is located at²:

<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
- Monthly PM₁₀ (Gravimetric) exceedences for September 2004
- QA/QC Unit's Summer 2004 intercalibration and audit schedule
- ESU's Summer service schedules (where provided)
- QA/QC Unit's data ratification and intercalibration report, January - March 2004
- Recent Management Unit reports (April – June 2004)
- Change of address details for QA/QC Unit (Netcen)*

*Please note, as of 1st November 2004, QA/QC Unit (Netcen) will be moving to Harwell at the following address:

² Password protected site: username and password available from Jane.vallance-plews@aeat.co.uk

netcen
Building 551
Harwell
Didcot
Oxfordshire
OX11 0QJ

All phone and fax numbers remain unchanged.

2 Generic Data Quality Issues

2.1 Progress on Monitoring Requirements of the EU Daughter Directives

In order to comply with the third Daughter Directive (DD3 implementation date 9th September 2003), an additional 6 ozone and 7 rural NO_x monitors were required at a number of existing sites in the network. Further details on the third Daughter Directive can be found at:

<http://www.defra.gov.uk/environment/consult/air-23daughter/index.htm>

Installation of all of the additional NO_x and O₃ analyser required to comply with the Third Daughter Directive now been completed. The final NO_x analyser was installed at Eskdalemuir on 13th October 2004. However, further attention to the NO_x analyser is currently required before the site commissioning audit can take place.

In order to satisfy the requirements of DD3, progress is also being made to commission 3 new direct-funded NO_x and O₃ sites and affiliate one Local Authority owned site at the following locations:

- Brighton Preston Park (Brighton/Worthing/Littlehampton agglomeration)
- Fort William (Highland zone)
- Leominster (Midlands zone).
- Sunderland Silkworth (North East zone) – Sunderland City Council

Progress on the establishment/affiliation of the new sites is given in Table 2.1.

Table 2.1 New DD3 Monitoring Stations, October 2004

New Site	Pollutants	Progress to date	Expected integration date
Brighton Preston Park	O ₃ and NO _x	The site commenced operation on November 3 rd 2004.	Completed
Fort William	O ₃ and NO _x	Planning consent now granted but still awaiting the lease.	Early 2005
Sunderland Silkworth	O ₃ and NO _x	Arrangements are in hand to affiliate the Local Authority NO _x analyser. A new O ₃ analyser has been installed but issues with the data logger still need to be resolved.	November 2004
Leominster	O ₃ and NO _x	Planning consent and lease have now been granted. Arrangements for site installation going ahead.	Early 2005

2.2 PM₁₀ Episodes

Overall there have been far fewer exceedences of the daily mean gravimetric PM₁₀ standard recorded this year compared to the same time last year. Apart from further episodes due to the local pollution sources at Scunthorpe, Glasgow Kerbside and London Marylebone Road there was very little activity to report. The sites that have recorded the highest number of days with exceedences of 50µg/m³ from January to the end of September 2004 (based on provisional data) are as follows:

63 days - London Marylebone Road (Kerbside)
 32 days - Port Talbot (Industry)
 30 days - Camden Kerbside (Kerbside)
 29 days - Glasgow Kerbside (Kerbside)
 20 days - Bury Roadside (Roadside)
 18 days – Scunthorpe (Industrial)
 13 days – Liverpool Speke (Urban background/local source)

Further information on the extent and duration of the episodes and monthly PM₁₀ exceedence statistics are presented on the Air Quality Archive and AURN hub at <http://www.aeat.co.uk/com/AURNHUB/aunhubPUBLIC-399.htm>.

2.3 Data Capture for Critical Sites in Zones and Agglomerations

In order to meet the requirements of the Daughter Directives, any zone or agglomeration³ 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 has been revised to reflect the requirements of the First, Second and Third Daughter Directives (see Appendix A2). In total 61 sites have been identified as critical for DD1, DD2 or DD3 (25 sites in agglomerations and 36 in zones).

Critical sites with less than 90% data capture during the 6-month period January to June 2004 are given in Section 5, Table 5.3. Reasons for data loss at these sites are given in Section 4. In total 47 out of the 191 critical site analysers (25%) did not meet the required 90% data capture during the first 6 months of 2004. Note in this period, Scunthorpe was relocated to Scunthorpe Town so both sites now appear in Table 5.3. Any critical site analyser with less than 80% data capture during this first 6-month period will not achieve the 90% data capture target for the year. The 19 site analysers that fall into this category are as follows:

- Leicester Centre CO
- Newcastle Centre CO
- Southend on Sea CO
- Grangemouth CO

- Newcastle Centre NO₂
- Aston Hill NO₂
- High Muffles NO₂
- Wicken Fen NO₂

- Reading New Town O₃
- Lough Navar O₃

- Glasgow Centre PM₁₀
- Stoke-on-Trent PM₁₀
- Scunthorpe/Scunthorpe PM₁₀
Town

³ 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>

- Blackpool SO₂
- Hull Freetown SO₂
- Newcastle Centre SO₂
- Scunthorpe/Scunthorpe Town SO₂
- Wigan Leigh SO₂
- Wrexham SO₂

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 repair as soon as possible to avoid unnecessary data loss at these sites

2.4 Gravimetric PM₁₀ Data Ratification

Gravimetric PM₁₀ analysers (Partisols) are located at seven sites in the network (Bournemouth, Northampton, Wrexham, Dumfries, Inverness, London Westminster and Brighton Roadside PM₁₀). The gravimetric PM₁₀ analyser at Northampton is also co-located with a TEOM analyser which provides a useful check that both techniques are operating correctly. Gravimetric PM₁₀ concentrations and the daily mean TEOM scaled by 1.3 at Northampton for the 6-month period January-June 2004 are shown in Figure 2.1. In general, the agreement between the analysers is good although there were a number of operational problems with the Partisol during May 2004 resulting in extended periods of data loss.

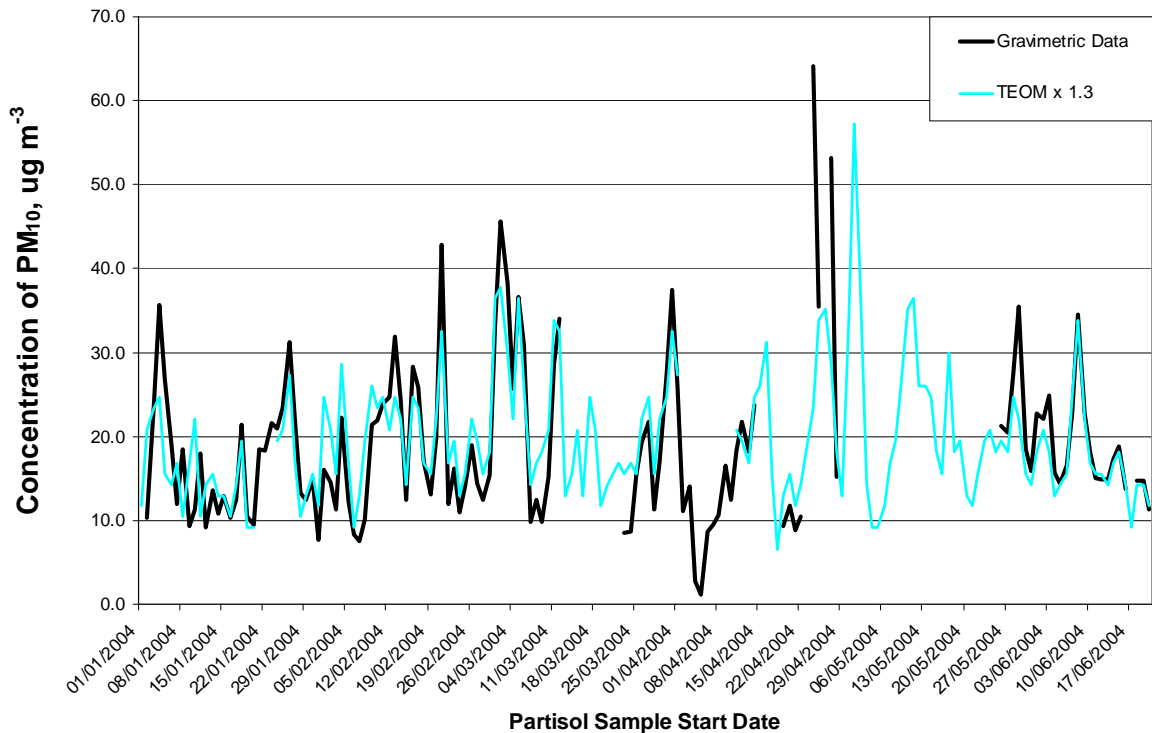


Figure 2.1 Partisol and TEOM (x1.3) Concentrations at Northampton (Jan-June 2004)

Data capture for the gravimetric PM₁₀ (Partisol) analysers for the period April to June 2004 and for the 6-month period January –June 2004 is given in Table 2.2. Four out of the

seven operational gravimetric PM₁₀ analysers did not meet the required 90% data capture target for the April-June reporting period. Details of data loss associated with these four sites (Northampton, Dumfries, Inverness and Wrexham) are given in Section 4.1.

Table 2.2 Gravimetric PM₁₀ Data Capture (%) January – June 2004
(Calculated from site start date)

Site	Data Capture (%) April - June 2004	6-months Data Capture (%) January – June 2004
Bournemouth	96.7	96.2
Brighton Roadside PM ₁₀	96.7	95.6
London Westminster	93.4	91.8
Northampton	62.6	75.3
Dumfries	86.8	84.1
Inverness	87.9	91.8
Wrexham	79.1	88.5
Average	86.2	89

Six out of the seven Partisol sites have now been connected to telemetry. This allows the exposure data and filter numbers to be downloaded automatically and regular checks on the operational status of the analyser can be carried out remotely. The one remaining Partisol unit at Bournemouth needs to be connected via a separate mobile phone system, as the existing line is not compatible with the Partisol software.

2.5 NO₂ Converter Efficiencies

Eight converter failures were identified during QA/QC Unit's Summer 2004 intercalibration exercise. This was an improvement from the previous audit when 15 converter faults were reported. Of the eight converter faults identified, three were considered to be borderline cases and there was no resulting effect on data quality or capture. A summary of all the converter faults and the resulting effect on data quality are given in Table 2.3 below.

Table 2.3 Converter faults identified at the Summer 2004 Intercalibration Exercise (July-Sept 2004)

Site	Audit date	Converter Efficiency	Resulting Effect on Data Quality
Glasgow Kerbside	19/7	90.9%	1-minute NO ₂ span calibration data were obtained which showed no history of a declining NO ₂ span response. Data were therefore only deleted between the audit on 19 th July to the service on 28 th July when the converter was replaced. (10 days)
Manchester South	24/8	91.9%	Repeat offender (93% at previous audit). Data were deleted from the last stable calibration at end of July until repair of converter at the service on 2/9/04. (1 month)
Middlesbrough	14/9	78%	Calibration data from mid May showed a slight divergence in NO ₂ calibration response compared to the NO response, indicating the likely start of the converter fault. Data were therefore deleted from 18 th May until the service on 14 th September 2004. (4 months)

Site	Audit date	Converter Efficiency	Resulting Effect on Data Quality
Oxford Centre	7/7	89.6%	Data were rejected from the first unstable NO ₂ calibration on 2 nd June until the converter was replaced at the service on 13 th July 2004. (6 weeks)
Walsall Alumwell	22/9	86%	Poor converter result due to water ingress. The sample inlet funnel was not attached and water had entered the sampling system. Data from 23 rd September to the service on 27 th September have been deleted (5 days). The converter was replaced at the service.
BORDERLINE FAIL			
Dumfries	12/7	94.8%	Repeat offender (94.6% at previous audit) Borderline case – no data loss
London A3 Roadside	8/7	94.8%	Borderline case - no data loss Converter replaced at service.
Yarner Wood	4/8	94.9	Borderline case - no data loss

Two sites (Manchester South and Dumfries) were identified as “repeat offenders” because the converters had also failed at the previous 6-month audit. Extra care should be taken at these sites in order to determine the cause of the repeated converter failures and/or to ensure the converters are replaced.

Recommendations

The ESUs should have already replaced or repaired the faulty converters listed in Table 2.3 during the Summer 2004 service exercise in order to ensure satisfactory performance of the analysers.

It is recommended the ESUs undertake an additional 3-month converter test at Manchester South and Dumfries where the analysers have failed 2 consecutive audits.

At a further 10 sites the converters were found to be “borderline pass” cases i.e. operating on the margin of the acceptable limit, just slightly above the 95% level. (See Table 2.4). If no action is taken at the service to improve the efficiency of these converters, it is possible that they may fail at the next audit.

Table 2.4 Converters identified as “borderline passes” during the Summer 2004 intercalibration exercise (July-Sept 2004)

BORDERLINE PASS	Audit Date	Converter Efficiency
Barnsley Gawber	10/8	95.2%
London Bloomsbury	6/7	95.1%
London Eltham	23/8	95.1%
Hove	6/9	95.3%
Lullington Heath	6/9	95.1%
Norwich Roadside	11/8	95.2%
Stoke on Trent	16/8	95.1%
Stockton on Tees Yarm	6/9	95.3%
London Wandsworth	8/8	95.2%
Glasgow Centre	19/7	95.5%

QA/QC Unit has been taking measures to ensure procedures used in the AURN will comply with any CEN requirements before they become mandatory. (For details see Section 15 in Part B of the January-March 2004 data ratification report). One of the CEN requirements is

to ensure NO_x converter efficiency is better than 98%. NO₂ data will have to be rescaled for converter efficiencies between 95-98%, but rejected if below 95%. These are tougher requirements than currently used where "borderline failures" are accepted. It is, therefore, especially important that the borderline cases also get adequate attention at the service in order to ensure they are set up to operate satisfactorily for the next 6-month period.

Recommendation

We recommend that the converter efficiency at the sites listed in Table 2.4 be increased (if not already done so at the summer service) in order to ensure they perform satisfactorily during the 6 months after service. Ideally all NO_x analysers should be set up after service with converters operating at 98% or above.

2.6 Ozone Outliers

22 out of 84 ozone analysers (26%) were identified as outliers during QA/QC Unit's Summer 2004 intercalibration exercise (See Table 2.5). This is consistent the previous Winter intercalibration where again 26% of the analysers tested were identified as outliers. Where appropriate, the data from these sites have been rescaled accordingly during the ratification process.

Table 2.5 Ozone outliers identified at the summer 2004 intercalibration

	Site	Summer 2004 Outlier
1	Aberdeen	+6%
2	Barnsley Gawber	-15%
3	Birmingham East	+6%
4	Blackpool	-6%
5	Bristol Centre	-16%
6	Cwmbran	-10%
7	Derry	-16%
8	Exeter Roadside	-12%
9	Glazebury	+8%
10	Hull Freetown	+8%
11	Ladybower	+13%
12	Leeds Centre	-8%
13	London Haringey	-12%
14	London Harlington	+7%
15	London Teddington	-8%
16	Lough Navar	+10%
17	Manchester Piccadilly	-8%
18	Plymouth Centre	-14%
19	Reading New Town	-9%
20	Redcar	+11%
21	Salford Eccles	-8%
22	Stoke-on-Trent	-9%
23	Yarner Wood	+15%

2.7 TEOM k_0

One of the TEOM instruments tested during the Summer 2004 intercalibration was found to be operating with a calibration constant (k_0) outside the acceptable $\pm 2.5\%$ deviation. The data from this analyser (Sheffield Centre) have been rescaled. In addition a further 4 TEOM analysers were found to have a k_0 mis-match, where the value of the calibration constant stamped on the sensor unit was found to be different from the value stored in the control unit. (See Table 2.6). At 3 of the sites the difference was small and within the acceptable $\pm 2.5\%$ limit so no data rescaling was necessary. At London A3 Roadside, however, the difference was much larger resulting in ambient data being rescaled by 10%.

Table 2.6 TEOM k_0 issues identified at the Summer 2004 Intercalibration

Site	Problems identified at audit	Effect on data quality
Sheffield Centre	k_0 outlier (-2.9%) at audit on 9/8/04. This was consistent with the previous Winter audit result (-3.1%).	Data from 1/1/04 have been rescaled by 3%.
Portsmouth	k_0 values were found to be different on sensor unit and in the control unit software at the summer audit on 14/7/04. This agreed with findings at the previous 6-month audit on 16/1/03.	The difference was 1% so within acceptable limit and no data rescaling was necessary. ESU needs to set control unit to agree with sensor.
Thurrock	k_0 on sensor and control unit different by 1.7% at summer 2004 audit	The difference was 1.7% so within acceptable limit and no data rescaling necessary. ESU needs to set control unit to agree with sensor.
London A3 Roadside	k_0 on sensor and control unit different by 10% at summer audit on 8/7/04.	Data rescaled from when the replacement TEOM was installed on 21 st April until the ESU visit on 23 rd July to exchange the TEOM.
Wigan Leigh	k_0 value stamped on sensor unit low by 10%. The measured k_0 determined at audit agreed with the control unit so no data rescaling was necessary.	No data rescaling required. Note: this site has recently been relocated to Wigan Centre so the TEOM unit may not be operational at the moment. The k_0 mis-match will still need fixing though.

Recommendations

The ESUs need to re-certify the TEOM k_0 at Sheffield Centre and set the control unit k_0 to agree with the sensor unit at Portsmouth and Thurrock. At Wigan Leigh the k_0 value stamped on sensor unit needs to be changed to agree with the value stored in the control unit.

2.8 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. 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 lost, 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 problem at many of the sites and tried different ways to resolve the problem including thorough cleaning of the solenoid valves and installation of permapur driers. In most cases this has improved the situation but it has not always eliminated the problem completely. The 34 sites showing continuing problems with the autocalibration run-on during April to June 2004 are given in Table 2.7. Any autocalibration run-on data that look visibly significant have been deleted from these data sets during ratification.

Table 2.7 Estimate of Spike or Dip due to Auto-calibration Run-on (15-minute average) April - June 2004

Site	Pollutant	Run-on (ppb)	Data loss (Hours per day)	autocal span concentration (ppb)
Aston Hill	NO ₂	1.3	2	300
Barnsley Gawber	NO ₂	2	1	350
Belfast Centre	NO ₂	7	1	300
Birmingham Centre	NO ₂	9	1	750
Blackpool	NO ₂	3	1	400
Bournemouth	NO ₂	3	1	600
Bury Roadside	NO ₂	14	1	700
Bush Estate	NO ₂	2.4	2	240
Derry	NO ₂	3	1	300
Glazebury	NO ₂	4.9	2	380
High Muffles	NO ₂	8	11	500
Ladybower	NO ₂	0.9	2	300
Leamington Spa	NO ₂	9	1	1700
London Brent	NO ₂	6	1	1400
London Southwark	NO ₂	9	1	150
Lullington Heath	NO ₂	5	1	300
Manchester Town Hall	NO ₂	6	2	700
Market Harborough	NO ₂	3	1	350
Narberth	NO ₂	1.6	1	150
Norwich Centre	NO ₂	3	1	350
Oxford Centre	NO ₂	12	1	250
Reading New Town	NO ₂	5	1	250
Rochester	NO ₂	2.8	1	200
Somerton	NO ₂	5.8	3	45
Southend-on-Sea	NO ₂	3	2	200
St Osyth	NO ₂	3.9	2	300
Stoke-on-Trent Centre	NO ₂	5	1	335
Wolverhampton Centre	NO ₂	3	1	175
Wrexham	NO ₂	4	1	350
Bournemouth	SO ₂	0.2	1	
Southend-on-Sea	SO ₂	2	1	
Stoke-on-Trent	SO ₂	1	1	
Wigan Leigh	SO ₂	0.5	1	
Blackpool	CO	-0.1 ppm	1	zero run-on

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. These sites are shown in **bold** in Table 2.7. It would also be helpful to have some feedback from the ESUs as to the actions they have taken and their views on trying to resolve this problem. We have suggested to CMCU that the ESUs have an opportunity to present their findings at the annual LSO meeting in December.

We also recommend that the autocalibration devices be adjusted at these sites to reduce the concentration of the span gas. It is strongly advised that NO₂ autocalibration span concentrations of less than 200ppb (urban sites) and 100ppb (rural sites) are used throughout the network.

2.9 CO Background Concentrations

QA/QC Unit has recently undertaken an investigation of background CO concentrations in order to determine the best way to process CO data during ratification. There has always been some uncertainty about exact levels of baseline CO concentrations in the UK as measurements have mainly been at urban locations. However, the recent establishment of two CO instruments in rural locations (St Osyth and Market Harborough) and the drop in urban CO concentrations has prompted a review of background CO concentrations in relation to current data ratification procedures.

Processing ambient CO data is difficult for a number of reasons because:

- the analysers are often measuring very low level CO concentrations at or below the lowest detectable limit of the analyser (typically ± 0.1 ppm),
- CO analysers are very susceptible to changes in operating temperature and sample humidity which can cause unstable baseline response or high noise (see examples given in Section 3.1),
- it is difficult to get a good zero calibration of the analyser because the zero calibration gas used is dry, whereas the ambient sample is humid.

Consequently ratified concentrations can, with additional response noise and the use of inefficient zero scrubbers, be reported with a baseline varying between 0 ppm and 0.2 ppm or more. Reported background concentrations, which are at the very lowest limit of detection, can therefore appear inconsistent between sites and years. However, the analysers used at the rural CO sites are more sensitive and can report measurements to within ± 0.01 ppm. This means that any background concentration should be well within the detectable range of these instruments.

QA/QC Unit has investigated likely CO background concentrations from satellite data and from measurements made by gas chromatography at Mace Head, which is a remote site on the Atlantic coast of Galway in Ireland. These investigations showed that typical background CO concentrations in the UK were expected to be in the range 0.08 – 0.15 ppm. This information has been used to improve and update the data ratification process and hence, from 2004 onwards, CO data in the AURN will have a baseline of at least 0.07 ppm. This equates to 0.1 ppm for instruments operating in urban areas and 0.07 ppm for the two rural instruments.

3 Site Specific Issues

3.1 Noisy CO analysers

There were a number of CO analysers in the network that showed unacceptably high noise or unstable baseline response during this period resulting in data capture below 90%. At most of these sites the response problems will have been resolved by the ESUs during the summer service. However, there are a number of sites where high response noise and/or unstable baselines are still evident (as of September 2004). These sites include:

- Bradford Centre: - still high noise after the service on 2nd September.
- Barnsley Gawber - very noisy.
- Exeter Roadside - noisy (early September) and unstable.
- Glasgow Kerbside - frequent negative spikes.
- Inverness - noisy baseline.
- London Hillingdon - noisy, wandering baseline and down spikes.
- Manchester Piccadilly - negative spikes.
- Manchester Town Hall - very unstable.
- Nottingham Centre - noisy with negative spikes.
- Plymouth Centre - very noisy.
- Sheffield Tinsley - unstable towards end of September.

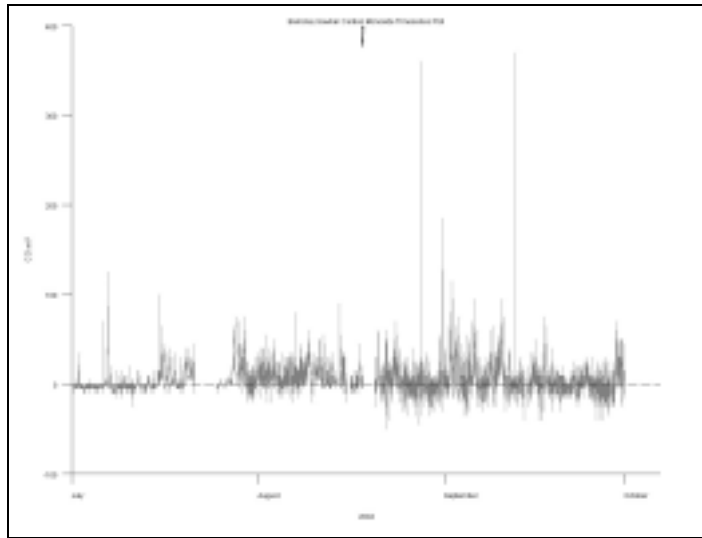
Time series graphs of raw CO data (mV) data illustrating the response problems seen at some of these sites are given in Figure 3.1 (a to f).

Recommendation

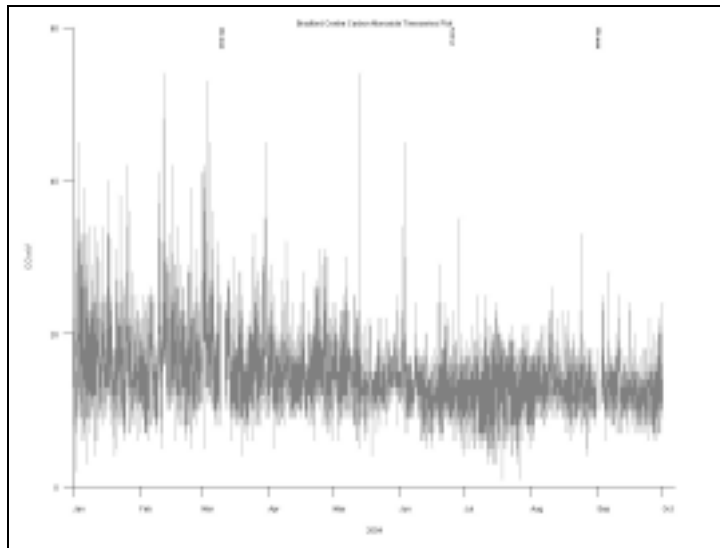
ESUs to investigate the reason for unstable CO analyser performance at the sites listed above and undertake repairs where possible.

Figure 3.1 (a to f) Examples of noisy and unstable CO analysers, July-September 2004 (Provisional data)

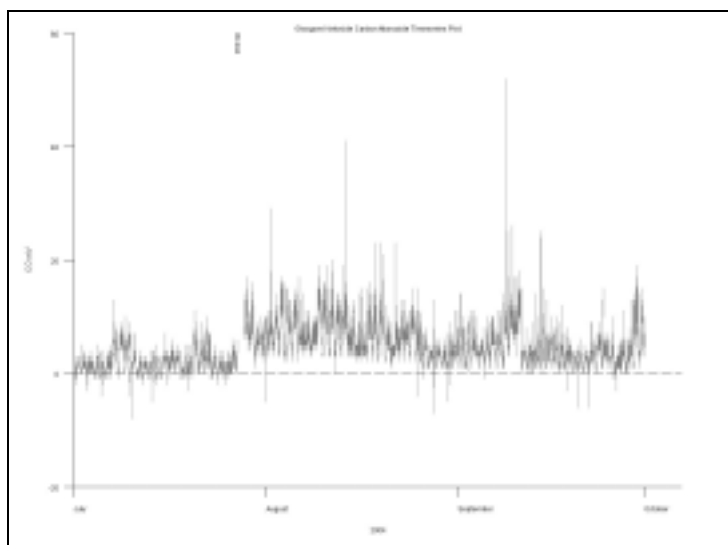
a) Barnsley Gawber CO
Noisy response



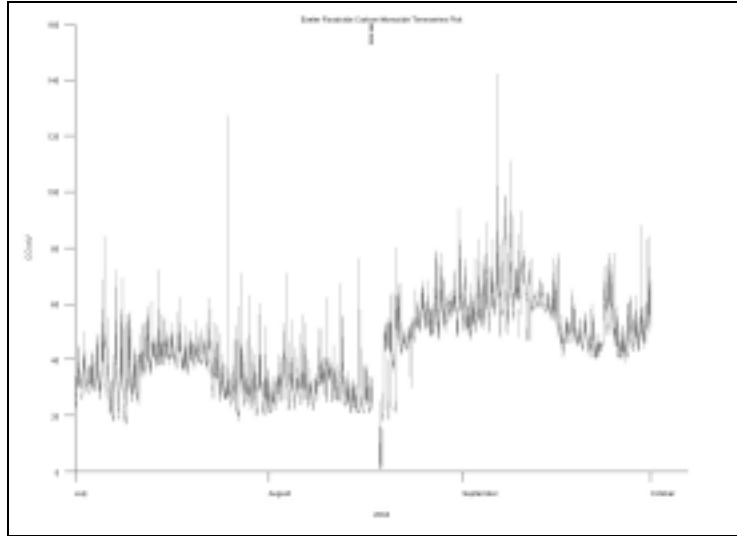
b) Bradford Centre CO
Noisy response



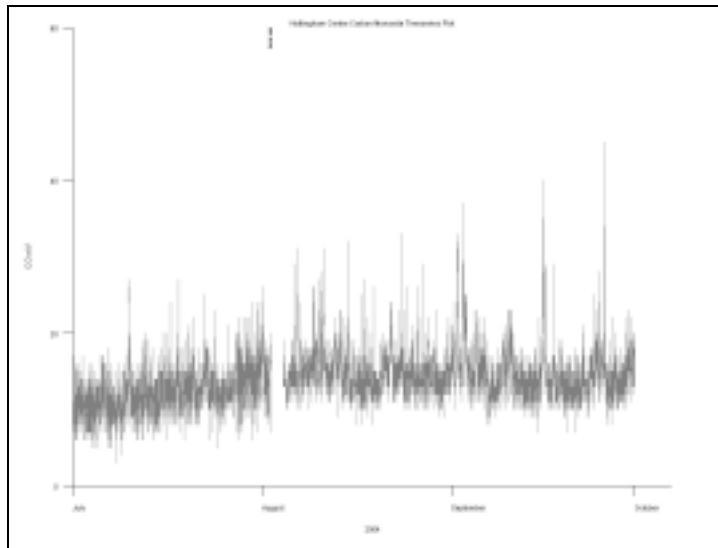
c) Glasgow Kerbside CO
Negative spikes



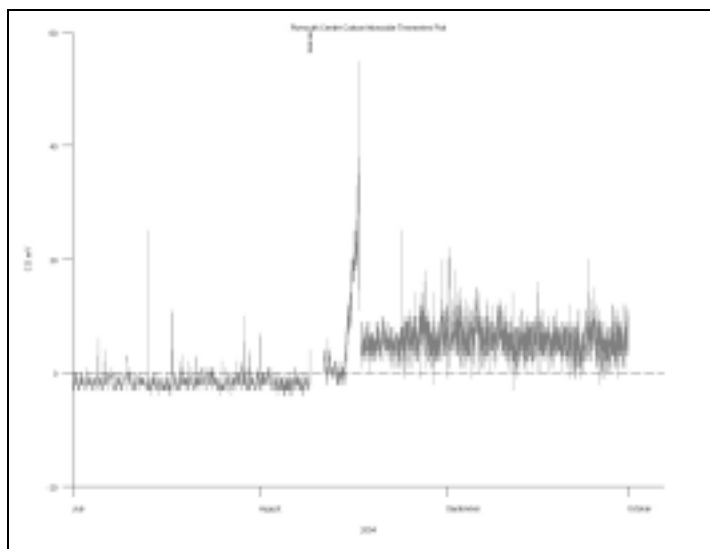
d) Exeter Roadside CO
Unstable and wandering baseline



e) Nottingham Centre CO
Noisy with negative spikes



f) Plymouth Centre CO
Noisy with negative spikes



3.2 Sheffield Centre SO₂

The SO₂ analyser at Sheffield Centre showed erratic performance after the service with several step changes in baseline response (See Figure 3.2). The problems were found to be due to poor logger connections, a pump fault and a faulty electronic component (wafer device). Two months data from 1st April until the repair on 2nd June 2004 have been deleted during ratification.

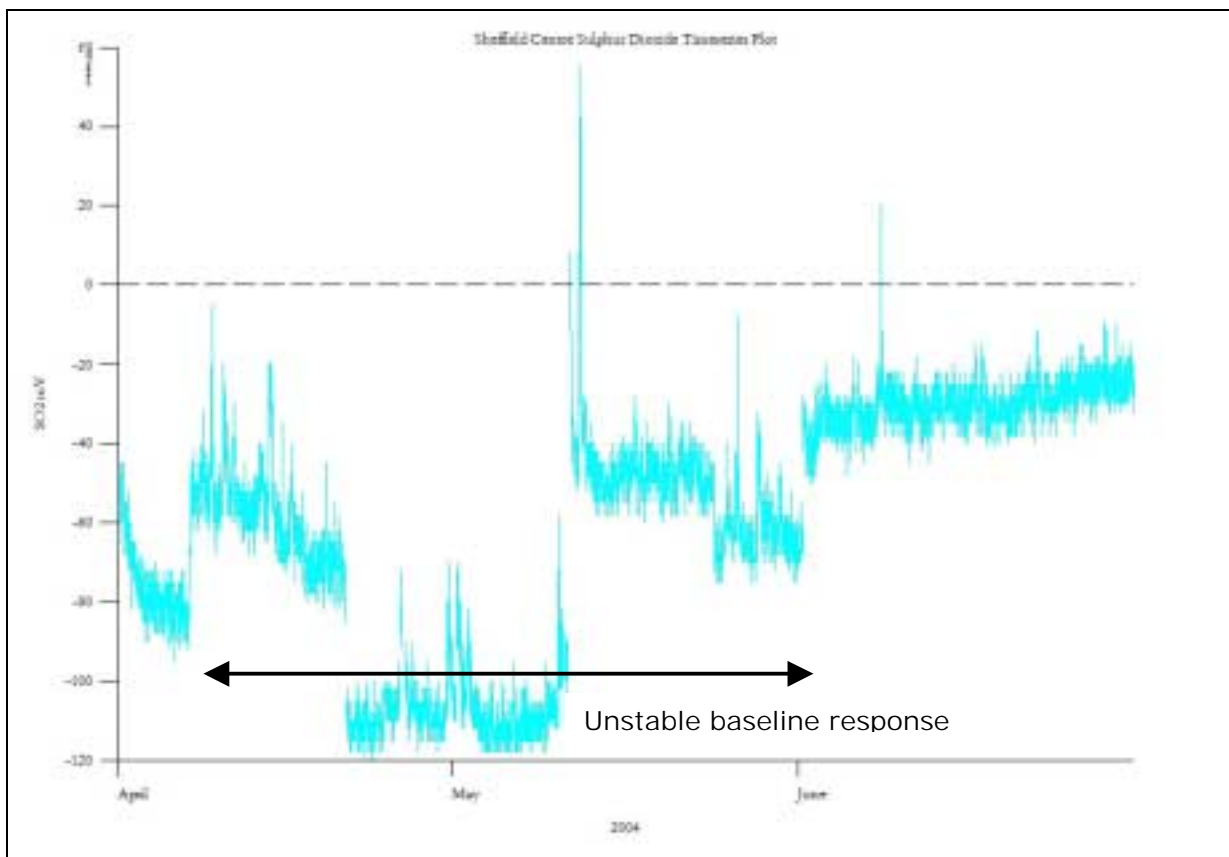


Figure 3.2 Sheffield Centre SO₂ step changes in baseline response

3.3 Zero Response Truncation

There were a few sites where significant periods of data were lost due to zero truncation (or baseline clipping). This occurs when the analyser response drifts downwards until it falls below the minimum response threshold resulting in extended period of 0mV response. This problem can occur if the analyser is not configured to output negative voltages or if the logger cannot record a response below a certain voltage threshold. Cases of zero response truncation resulting in data loss were seen at the following sites during this period:

- Leamington Spa CO April – June 2004 (25 days in this period)
- Wirral Tranmere CO June 2004 baseline clipping due to pump fault (12 days)

Recommendation

We recommend that, wherever possible, all analysers are routinely set up after the service with zero baseline offsets of 20-50mV. Special attention should be given to the sites mentioned above in order to ensure the baseline response does not drift downwards over time, resulting in further periods of truncation and data loss.

3.4 Camden Kerbside NO_x Response Instability

This problem was reported in detail in the previous January - March 2004 data ratification report (Section 3.5). Four months of NO_x data from Camden Kerbside site have been deleted from the service on 5th January to the repair of the analyser on 5th May 2004 because of the rapid NO sensitivity drift seen over this period. The response problem was due to an instrument sampling fault caused by a blocked ozone orifice.

4 Sites with Data Capture Below 90%

The following section provides a summary of the main site operational problems which have resulted in data capture below the required 90% level during the reporting period April to June 2004 (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% April to June 2004
(Using the start date of any new site or end date of site closed)

Data Capture (%)	Start date	End date	Reason	Comments	Days	Hours	
ENGLAND							
Birmingham Centre							
O ₃	87.5%	09-Apr-04	19-Apr-04	Instrument fault	Noisy response due to faulty printed circuit board followed by an ozone generator fault	10.5	253
Bristol Old Market							
CO	46.5%	25-Feb-04	19-May-04	Sampling fault	Zero baseline drifting downwards and response truncation from 25/2/04. Analyser removed for repair to pump and cooling fans. Reinstalled on 31/3 but calibrations unstable and there was a large leak in the sample inlet filter. A new SIF holder was fitted but the analyser response instability continued until 19 th May.	84	2017
Bury Roadside							
SO ₂	65.9%	25-May-04	25-May-04	Communication fault	Problems at site with logging system	0.3	6
		01-Jun-04	14-Jul-04	Instrument fault	Unstable response data rejected due to UV lamp fault	43.8	1050
Camden Kerbside							
NO ₂	61.3%	05-Jan-04	05-May-04	Instrument fault	Data rejected from service on 19/1/04 until 5 th May due to a blocked ozone orifice (See Section 3.4)	121	2905
Coventry Memorial Park							
PM ₁₀	83.2%	19-May-04	21-May-04	Response instability	Unstable data rejected after filter change	2.2	52
		04-Jun-04	16-Jun-04	High noise	High noise data rejected. A new TEOM analyser was installed on 8 th June but it was not correctly configured until 16 th June.	12.5	299
Exeter Roadside							
CO	87.0%	06-Apr-04	06-Apr-04	No mV data collected	No raw data – possible power cuts	0.5	11

Issue 1

AEAT/ENV/R/1819

		09-Apr-04	11-Apr-04	Power cut	As above	2.7	64
		26-Apr-04	29-Apr-04	High noise	Noisy data rejected	3.1	74
		21-May-04	26-May-04	High noise	Noisy data rejected	4.8	116
SO ₂	75.7%	05-Mar-04	19-Apr-04	Sampling fault	Flow fault giving intermittent data loss. Replacement flow control board installed.	45	1079
		21-May-04	22-May-04	Power cut	Power cut and subsequent data logger corruption	0.8	20
		24-May-04	26-May-04	Power cut	As above	2	49

Glazebury

O ₃	89.6%	18-May-04	27-May-04	Instrument fault	Analyser power supply fault. Faulty monitor replaced and returned for warranty repair.	9.3	222
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High Muffles

NO ₂	74.2%	01-Apr-04	01-Jun-04	Autocal run-on	Extreme autocalibration run-on problem resulting in up to 11 hours data loss per day. ESU tests carried out on 1/6/04 and fault traced to moisture and contamination of sample/calibration valve.	0.3	6 -11 hours per day
		06-Apr-04	07-Apr-04	Power cut	Site prone to power cuts and system resets.	0.9	22
		17-Apr-04	17-Apr-04	Power cut	Power cut	0.5	12

Hull Freetown

NO ₂	73.1%	13-May-04	04-Jun-04	Instrument fault	Recurring flow fault and ozone generator flow problems. Charcoal bag and sintered filter replaced.	22	529
		14-Jun-04	15-Jun-04	Logger fault	Power cut causing logger corruption.	1.5	37
SO ₂	66.0%	06-Apr-04	29-Apr-04	High noise	Spurious noisy response data deleted due to loose connection between analyser and logger.	22.6	543
		07-May-04	13-May-04	Logger fault	As above	6	144
		27-May-04	27-May-04	Unstable response	Spurious high data rejected after calibration.	0.3	6
		14-Jun-04	15-Jun-04	Logger fault	Power cut causing logger corruption.	1.5	37

Leamington Spa

CO	70.5%	01-Apr-04	22-Apr-04	Zero truncation	Response truncation from 1/4/04 until service on 22/4/04.	21	505
		25-Jun-04	30-Jun-04	Zero truncation	Zero truncation again after large step down in baseline. Continues into July.	5.4	130

Leeds Centre

General					Recurring site power cuts due to faulty rack cooling fans triggering thermal cut-off.		
CO	54.1%	01-Apr-04	30-Apr-04	Unstable response	Cabin temperature problems affecting analyser response stability.	29.5	709

Issue 1

AEAT/ENV/R/1819

		02-Jun-04	14-Jun-04	Unstable response	As above	12.1	290
NO ₂	87.9%	01-Apr-04	05-Apr-04	Sampling fault	Split tube in autocal system and ozone generator fault.	3.8	92
		14-Apr-04	15-Apr-04	No mV data collected	Erratic data rejected due to loose signal output connections.	1.1	26
		19-Apr-04	22-Apr-04	Unstable response	Erratic data as above	3.3	78
O ₃	89.3%	28-Apr-04	30-Apr-04	Power cut	Power cut – rack overheating	2	48
		22-Mar-04	07-Apr-04	Sample leak	Internal sampling	16	383
		28-Apr-04	30-Apr-04	Power cut	Power cut due to faulty rack cooling fan	2	49

Leicester Centre

General

					Old analysers decommissioned on 2/6 and site up-graded with new analysers installed at the service on 8/6/04		
CO	76.4%	26-Mar-04	03-Apr-04	Unstable response	Unstable baseline	8.5	205
		03-May-04	12-May-04	Unstable response	Unstable baseline	9.5	228
		02-Jun-04	10-Jun-04	Switched out-of-service	Unstable analyser switched out of service until new analyser installed.	8.2	196
NO ₂	74.5%	02-Jun-04	02-Jun-04	Switched out-of-service	ESU visit to install new TEOM and calibrate site.	0.3	6
		08-Jun-04	26-Jul-04	Unstable response	Spurious low data and problem with unstable response sensitivity until calibration on 26/7/04	48	1153
PM ₁₀	88.2%	20-Apr-04	20-Apr-04	Unstable response	Large negative data rejected	0.3	6
		14-May-04	20-May-04	Unstable response	Auxiliary flow fault giving high noise response. Replacement TEOM installed on 19 th May.	6.7	160
		02-Jun-04	02-Jun-04	Analyser fault	Original site TEOM re-installed after replacement of faulty mass flow controller.	0.3	6
		08-Jun-04	11-Jun-04	ESU service	Service and equipment up-graded	3	73

London Bexley

PM ₁₀	84.1%	16-Jun-04	30-Jun-04	Sampling fault	Flow fault giving high noise response. Leak at pump fixed.	14.1	339
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London Eltham

PM ₁₀	78.3%	01-Apr-04	20-Apr-04	High noise	Data deleted due to high noise and negative response. Access to site not possible over Easter holidays so repaired at service on 20/4/04	19.5	469
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London Harlington

CO	84.9%	26-Mar-04	13-Apr-04	Analyser fault	Flat response due to leak in sample valve	18.3	438
		20-Apr-04	21-Apr-04	ESU service	Service	0.6	14

London Southwark

NO ₂	81.0%	15-Apr-04	16-Apr-04	ESU service	Service	1.1	26
		11-Jun-04	23-Jun-04	Removed for repair	Analyser removed by ESU for investigation of autocalibration run-on problem.	12.1	291

Lullington Heath

General

Site still prone to brief power cuts. Direct link to enable remote reset of SO₂ analyser installed in September 04 but problem with analyser not re-setting correctly after power cuts continued. New microprocessor boards are going to be installed to resolve problem.

SO ₂	84.2%	17-May-04	24-May-04	Power cut	Analyser fault following power cut.	7.1	171
		01-Jun-04	03-Jun-04	Power cut	As above	1.8	42
		20-Jun-04	22-Jun-04	Instrument fault	As above	2.1	51
		26-Jun-04	29-Jun-04	Instrument fault	As above	2.7	65

Manchester Town Hall

CO	73.4%	07-Jun-04	03-Aug-04	Instrument fault	Noisy and erratic response due to IR source fault.	57.3	1374
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Market Harborough

General

A series of communication faults resulted in intermittent data loss over the period 6-27th April. Only 3 days of data recoverable from logger at a time. Logger has since been reprogrammed to extend this. The modem was replaced on 29th April.

CO	86.8%	06-Apr-04	12-Apr-04	Communication fault	Telemetry fault	6.1	146
		18-Apr-04	20-Apr-04	Communication Analyser fault	Communication fault followed by an IR source fault. Lamp replaced.	2.6	62
		24-Apr-04	27-Apr-04	Communication fault	Communications fault	3.1	74
NO ₂	83.7%	06-Apr-04	12-Apr-04	Communication fault	As above	6.3	151
		18-Apr-04	19-Apr-04	Communication fault	As above	1.5	37
		24-Apr-04	27-Apr-04	Communication fault	As above	3.3	79
O ₃	88.2%	06-Apr-04	12-Apr-04	Communication fault	As above	6.1	146
		18-Apr-04	19-Apr-04	Communication fault	As above	1.3	31
		24-Apr-04	27-Apr-04	Communication fault	As above	3.1	74

Middlesbrough

NO ₂	52%	18-May-04	14-Sep-04	NO _x converter	Converter fault (78%) identified at audit. Data deleted from start of NO ₂ calibration span divergence on 18 th May until service on 14 th September 04	119	2856
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Newcastle Centre

General				Air conditioning	Air conditioning unit malfunction resulted in activation of the thermal cut out causing several power cuts. Air conditioning unit replaced on 23/4/04		
CO	74.8%	03-Mar-04	23-Apr-04	Power cut	Power cut due to thermal cut out	51.3	1231
NO ₂	70.7%	03-Mar-04	27-Apr-04	Power cut	As above	55	1321
O ₃	79.1%	03-Apr-04	22-Apr-04	Power cut	As above	18.8	452
PM ₁₀	78.4%	03-Apr-04	22-Apr-04	Power cut	As above	19.4	465
SO ₂	70.1%	03-Mar-04	28-Apr-04	Power cut + no calibrations	Power cut and no calibrations until end of April.	55.6	1335

Northampton

NO ₂	87.0%	01-Apr-04	13-Apr-04	Communication fault	Telemetry fault with mobile phone link.	11.7	280
O ₃	81.8%	01-Apr-04	10-Apr-04	Communication fault	As above	8.3	200
		10-May-04	18-May-04	Low flow rate	Faulty sample flow sensor	7.8	186

Oxford Centre

NO ₂	65.3%	02-Jun-04	13-Jul-04	NO _x converter fault	NO _x converter low (88%) at audit on 7/7/04.	41.3	991
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Plymouth Centre

CO	85.4%	20-May-04	02-Jun-04	Unstable response	Spurious data deleted due to elevated and unstable baseline following calibration.	13	312
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Portsmouth

SO ₂	70.9%	28-May-04	21-Jun-04	Analyser fault	Elevated site temperature effecting analyser giving intermittent response problems. Analyser removed for repair.	23.6	567
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Preston

CO	79.3%	30-Mar-04	19-Apr-04	Instrument fault	Chopper motor failure. Two attempts to repair but unsuccessful so new analyser installed on 19/4/04.	19.8	474
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Reading New Town

SO ₂	83.5%	07-Apr-04	20-Apr-04	Unstable response	History of lamp faults seen in previous period continued, giving response drift and step changes in baseline.	14	336
		07-May-04	07-May-04	Communication	Communications fault. EPROM	0.6	15

			fault	replaced		
Rotherham Centre						
O ₃	71.3%	05-Apr-04	30-Apr-04	ESU service and analyser fault	UV lamp replaced at service on 5/4/04 but analyser would not calibrate properly. Replacement unit installed but this was not configured with photometer correctly (>50% under) so data were deleted.	25.1 602
		05-Jun-04	05-Jun-04	No mV data collected	No information provided	0.5 12
Salford Eccles						
O ₃	82.8%	29-Mar-04	15-Apr-04	Instrument fault	Spurious low response data deleted. Possible internal sampling.	17 408
		19-May-04	19-May-04	No mV data collected	No information provided	0.3 6
SO ₂	82.3%	15-Apr-04	29-Apr-04	Unstable response	Data deleted due to unstable zero baseline	15 360
		19-May-04	19-May-04	No mV data collected	No information provided	0.3 6
Sheffield Centre						
SO ₂	31.2%	29-Mar-04	02-Jun-04	ESU service and analyser fault	Erratic analyser performance after service in March (See Section 3.2)	65.2 1564
Somerton						
NO ₂	89.9%			Autocal run-on	NO ₂ autocal run-on (6 ppb) resulting in 3 hours data loss each day	3 hrs per day
Southend-on-Sea						
CO	0.0%	10-Feb-04	29-Jul-04	High noise	High noise and negative data deleted. IR source and pump replaced on 19 th May 2004. Continued noise and drift in calibration sensitivity so analyser replaced on 26 th July.	170 4084
NO ₂	84.1%	05-May-04	16-May-04	Communication fault and unstable response	Site telemetry fault 11-13 th May. PC and modem replaced. NO _x analyser unstable response and erratic signal immediately before and after the communications fault.	10.6 254
		19-May-04	19-May-04	No mV data collected	No details provided	0.3 7
St Osyth						
NO ₂	86.4%	22-Jun-04	02-Jul-04	Pump fault	Pump fault and subsequent contamination of sampling system by permeation tube.	10.5 251
Stockport Shaw Heath						
SO ₂	75.6%	09-Jun-04	12-Jul-04	Instrument fault	UV lamp board failure. Delay whilst awaiting provision of new UV lamp driver board.	33.8 810

Sunderland

SO ₂	81.1%	24-Apr-04	11-May-04	Sampling fault	Pump failed on 24 th April. Repaired on 28/4 but failed again so replacement pump installed.	17	407
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Tower Hamlets Roadside

NO ₂	87.5%	07-May-04	17-May-04	Sampling fault	Pump diaphragm split.	10.8	258
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Walsall Willenhall

NO ₂	76.5%	05-May-04	26-May-04	Operator error	Data deleted between LSO calibrations due to elevated baseline. Possibly due to cylinder regulator not being fully closed.	21	504
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Wicken Fen

NO ₂	79.1%	29-Apr-04	14-May-04	Logger fault	Logger problems so logger replaced on 13 th May. Problems with date configuration lead to further data loss to 14 th May.	14.6	350
		25-Jun-04	29-Jun-04	Power cut	Site power cut resulted in logger corruption	4.2	100
O ₃	79.0%	29-Apr-04	14-May-04	Logger fault	Logger fault as above	14.6	350
		25-Jun-04	29-Jun-04	Power cut	Site power cut resulted in logger corruption	4.2	100
SO ₂	79.1%	29-Apr-04	14-May-04	Logger fault	Logger fault as above	14.6	350
		25-Jun-04	29-Jun-04	Power cut	Site power cut resulted in logger corruption	4.2	100

Wigan Leigh

SO ₂	79.9%	03-Feb-04	15-Apr-04	No calibrations	No calibrations for an extended period as cylinder empty and building work taking place restricting access to site.	73	1752
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Wirral Tranmere

CO	86.0%	16-Jun-04	28-Jun-04	Baseline truncated	Baseline truncation due to sample pump fault.	12.4	298
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SCOTLAND**Glasgow Centre**

PM ₁₀	21.2%	20-Apr-04	28-Jul-04		High noise data deleted. TEOM unit replaced on June 9 th but spare analyser not working correctly so original re-installed. Audit showed main flow leak (-70%) so data deleted until repair at service on 28 th July.	98.9	2373
SO ₂	83.4%	12-May-04	13-May-04	No mV data collected	No information provided	0.8	19
		26-May-04	09-Jun-04	Unstable response	Spurious step change in baseline response offset.	14	337

WALES**Aston Hill**

NO ₂	64.8%	04-May-04	02-Jun-04	Operator error and Sampling fault	Internal sampling 4-18 th May. Sample line not reconnected to manifold after site visit. Erratic baseline response until 2 nd June due to pump fault	29.3	702
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Cardiff Centre

O ₃	78.2%	28-Mar-04	20-Apr-04	Service and sampling fault	Sampling fault due to tubing being incorrectly connected after service.	22.8	547
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Narberth

PM ₁₀	87.9%	18-Apr-04	28-Apr-04	High noise	Data deleted due to high noise and negative spikes. Replacement TEOM installed on 28 th April.	10	239
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Wrexham

SO ₂	60.2%	20-May-04	24-Jun-04	Unstable response	Problems with the air conditioning unit and elevated site temperature effecting analyser performance, giving severe baseline drift and response instability. Replacement analyser installed 23/6/04	36	864
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4.1 Gravimetric PM₁₀ Sites with Data Capture Below 90%

This section gives details of the main operational problems which have resulted in gravimetric PM₁₀ data capture below the required 90% level during the reporting period April to June 2004. Casella Stanger has supplied the measured data, undertaken the filter weighing and calculated the particulate concentrations.

Dumfries (Data capture 86.8%)

The Partisol analyser was re-started on 1st April, after an 11 day gap due to a filter exchange failure. As noted in the previous period, error codes R (filter temperature range) and P (elapsed sample time) were frequently recorded. These are now causing data loss on occasions where the sampling period drops below 18 hours. The cause should be investigated by the ESU as soon as possible in order to avoid further data loss. The Partisol unit was connected to telemetry on 27th April so this should enable CMCU to identify any future operational problems more quickly.

Month	Comment	Data Loss
March	22 nd March – 1 st April: filter exchange failure	11 days
April, May	11 intermittent days with sample period < 18 hours	11 days

Inverness (Data Capture 87.9%)

Error codes R (filter temperature range) and P (elapsed sample time) continued to be recorded throughout his period resulting in 10 days data loss when the sampling period was less than 18 hours. The ESU should investigate the reason for the faults. The Partisol unit was connected to telemetry on 5th May, so again this should facilitate faster front-end screening of operational problems.

Month	Comment	Data Loss
May	1 st , 4 th , 7 th , 9-10 th , 12 th , 25-27 th May sample period < 18 hours	9 days
April, May	22 nd June: sample period < 18 hours	1 days

Northampton (Data Capture 62.6%)

There were numerous problems with the Partisol unit at Northampton, particularly recurring problems with the flow rate and sampling period. The engineer was called out three times and the pump and o-rings were replaced. There were two occasions when the exposed filter weight was less than the pre-exposure weight. Possible reasons for this are that the filter may have been either incorrectly pre-weighed, incorrectly conditioned, not exposed or damaged during/after exposure, although no filter damage was recorded.

Month	Comment	Data Loss
April	15-18 th April: Flow out of range, sampling period < 18 hours	4 days
	23 rd & 26 th April: Apparent negative particulate weight	2 days
April - May	29 th April – 25 th May: Flow out of range, sampling period < 18 hours	27 days
June	17 th June: Missing filter	1 day

Wrexham (Data capture 79.1%)

18 days of data were lost in April and May due to error codes R and P where the sampling period dropped below 18 hours. These problems appeared to stop at the end of May, but it is unclear whether any action was taken to repair the Partisol analyser.

Month	Comment	Data Loss
April -May	24 th April – 29 th May: Sampling period < 18 hours.	18 days

Bournemouth (Data capture 96.7%)

Although high data capture was achieved in this reporting period, three days data (30th April, 28th May and 29th June) were lost due to error code 40000 (coefficient of variation of average flow too high). This fault was first noted in the previous reporting period, occurring on 23rd January, 24th February and 27th March 2004. We therefore recommend that this Partisol should be monitored in case this marks the beginning of a recurring problem.

Recommendations

The ESUs should investigate the cause of the frequent R and P error codes recorded at Dumfries and Inverness.

The Partisol at Bournemouth should also be investigated to determine the reason for the excessive variation in flow.

The reason for the apparent negative filter weights at Northampton needs to be determined if this problem is continuing.

5 Ratified Data Capture Statistics

Table 5.1 provides the ratified data capture figures for each site for the 3-month period April to June 2004. Data capture values below 90% are shown in the shaded boxes.

Table 5.1 AURN Ratified Data Capture (%) for April to June 2004
(Using the start date of any new site or end date of site closed)

Site	CO	NO ₂	O ₃	PM ₁₀	PM _{2.5}	SO ₂	Site Average
England							
Barnsley 12	-	-	-	-	-	99.5	99.5
Barnsley Gawber	98.6	95.8	98.9	-	-	98.4	97.9
Bath Roadside	99.6	99.5	-	-	-	-	99.6
Billingham	-	99.8	-	-	-	-	99.8
Birmingham Centre	99.2	94.1	87.5	97.8	-	99.1	95.5
Birmingham East	99.5	99.5	99.5	99.8	-	99.5	99.6
Blackpool	95.2	92.2	98.7	99.6	-	99.2	97.0
Bolton	97.6	97.5	97.5	97.6	-	97.5	97.6
Bottesford	-	-	99.6	-	-	-	99.6
Bournemouth	99.7	95.4	99.9	96.7	-	98.4	98.0
Bradford Centre	98.9	97.3	98.9	98.5	-	97.6	98.3
Brentford Roadside	97.8	93.4	-	-	-	-	95.6
Brighton Roadside	99.6	99.6	-	-	-	-	99.6
Brighton Roadside PM10	-	-	-	96.7	-	-	96.7
Bristol Centre	99.7	99.5	94.8	99.7	-	99.7	98.7
Bristol Old Market	46.5	98.9	-	-	-	-	72.7
Bury Roadside	95.0	92.2	96.1	96.2	-	65.9	89.1
Cambridge Roadside	-	99.6	-	-	-	-	99.6
Camden Kerbside	-	61.3	-	99.6	-	-	80.4
Canterbury	-	91.0	-	99.7	-	-	95.4
Coventry Memorial Park	99.4	96.2	98.3	83.2	-	98.4	95.1
Exeter Roadside	87.0	92.3	92.7	-	-	75.7	86.9
Glazebury	-	93.6	89.6	-	-	-	91.6
Great Dun Fell	-	-	99.7	-	-	-	99.7
Haringey Roadside	-	99.3	-	97.9	-	-	98.6
Harwell	-	99.4	99.5	96.6	96.6	99.5	98.3
High Muffles	-	74.2	98.7	-	-	-	86.4
Hove Roadside	98.1	99.6	-	-	-	96.5	98.1
Hull Freetown	97.2	73.1	96.6	97.2	-	66.0	86.0
Ladybower	-	90.3	98.5	-	-	98.5	95.8
Leamington Spa	70.5	93.2	97.6	98.1	-	97.3	91.3
Leeds Centre	54.1	87.9	89.3	97.4	-	96.4	85.0
Leicester Centre	76.4	74.5	96.5	88.2	-	96.7	86.4
Liverpool Speke	99.5	99.5	99.4	99.4	-	99.5	99.4
London A3 Roadside	99.5	99.1	-	99.3	-	-	99.3
London Bexley	99.5	98.9	98.3	84.1	-	99.5	96.0
London Bloomsbury	93.6	97.1	95.8	97.7	97.7	96.2	96.3
London Brent	99.5	95.1	99.5	99.6	-	99.5	98.6
London Bromley	98.4	98.8	-	-	-	-	98.6
London Cromwell Road 2	99.5	99.5	-	-	-	99.5	99.5
London Eltham	-	99.4	99.5	78.3	-	98.5	93.9
London Hackney	99.7	99.6	98.8	-	-	-	99.4
London Haringey	-	-	93.1	-	-	-	93.1
London Harlington	84.9	98.1	99.0	99.7	-	-	95.4
London Hillingdon	99.3	99.0	95.8	99.6	-	99.4	98.6

Site	CO	NO ₂	O ₃	PM ₁₀	PM _{2.5}	SO ₂	Site Average
London Lewisham	-	99.7	99.6	-	-	99.8	99.7
London Marylebone Road	90.1	98.2	98.3	97.6	98.5	98.2	96.8
London N. Kensington	99.5	97.8	99.8	99.7	-	99.7	99.3
London Southwark	97.8	81.0	98.3	-	-	98.1	93.8
London Teddington	-	93.3	94.0	-	-	94.1	93.8
London Wandsworth	-	99.2	99.4	-	-	-	99.3
London Westminster	99.1	93.0	99.1	93.4	-	99.1	96.8
Lullington Heath	-	91.8	95.3	-	-	84.2	90.5
Manchester Piccadilly	99.4	99.5	99.4	99.1	-	99.4	99.3
Manchester South	-	99.6	99.5	-	-	99.5	99.5
Manchester Town Hall	73.4	95.1	-	-	-	-	84.2
Market Harborough	86.8	83.7	88.2	-	-	-	86.2
Middlesbrough	93.1	52.0	99.8	99.9	-	99.7	88.9
Newcastle Centre	74.8	70.7	79.1	78.4	-	70.1	74.6
Northampton	90.6	87.0	81.8	90.1	-	90.5	88.0
Northampton PM ₁₀	-	-	-	62.6	-	-	62.6
Norwich Centre	99.6	95.5	99.6	99.7	-	99.5	98.8
Norwich Roadside	-	95.0	-	-	-	-	95.0
Nottingham Centre	97.3	95.8	97.8	97.8	-	97.8	97.3
Oxford Centre	92.0	65.3	-	-	-	99.5	85.6
Plymouth Centre	85.4	99.6	99.6	99.5	-	99.7	96.7
Portsmouth	91.3	98.4	99.5	98.5	-	70.9	91.7
Preston	79.3	99.0	99.5	99.3	-	99.1	95.2
Reading New Town	99.5	95.3	99.7	99.2	-	83.5	95.4
Redcar	97.4	97.2	92.6	97.1	-	97.3	96.3
Rochester	-	95.5	99.7	99.6	99.7	99.7	98.8
Rotherham Centre	-	95.2	71.3	-	-	93.3	86.6
Salford Eccles	98.3	98.4	82.8	98.3	-	82.3	92.0
Sandwell West Bromwich	98.6	99.2	98.7	-	-	99.0	98.9
Scunthorpe Town	-	-	-	90.5	-	99.2	94.8
Sheffield Centre	99.0	98.9	99.2	99.3	-	31.2	85.5
Sheffield Tinsley	98.2	99.6	-	-	-	-	98.9
Sibton	-	-	93.9	-	-	-	93.9
Somerton	-	89.9	94.8	-	-	-	92.4
Southampton Centre	99.6	99.5	99.6	98.8	-	99.3	99.3
Southend-on-Sea	0.0	84.1	97.6	97.4	-	92.1	74.2
Southwark Roadside	98.4	99.6	-	-	-	99.5	99.2
St Osyth	99.6	86.4	99.6	-	-	-	95.2
Stockport Shaw Heath	99.6	99.5	-	97.9	-	75.6	93.1
Stockton-on-Tees Yarm	98.4	98.3	-	98.3	-	-	98.3
Stoke-on-Trent Centre	91.3	94.0	98.9	98.3	-	95.8	95.7
Sunderland	-	-	-	-	-	81.1	81.1
Thurrock	99.3	99.3	99.3	93.8	-	99.3	98.2
Tower Hamlets Roadside	99.5	87.5	-	-	-	-	93.5
Walsall Alumwell	-	97.7	-	-	-	-	97.7
Walsall Willenhall	-	76.5	-	-	-	-	76.5
West London	99.5	99.5	-	-	-	-	99.5
Weybourne	-	-	100.0	-	-	-	100.0
Wicken Fen	-	79.1	79.0	-	-	79.1	79.1
Wigan Leigh	98.8	98.4	98.1	99.4	-	79.9	94.9
Wirral Tranmere	86.0	98.8	99.5	99.4	-	98.8	96.5
Wolverhampton Centre	99.2	94.9	99.4	99.5	-	99.4	98.5

Site	CO	NO ₂	O ₃	PM ₁₀	PM _{2.5}	SO ₂	Site Average
Yarner Wood	-	99.3	99.3	-	-	-	99.3
N Ireland							
Belfast Centre	99.3	94.9	99.1	99.3	-	95.9	97.7
Belfast Clara St	-	-	-	93.7	-	-	93.7
Belfast East	-	-	-	-	-	99.6	99.6
Derry	98.2	92.7	98.5	98.2	-	98.4	97.2
Lough Navar	-	-	99.6	99.5	-	-	99.6
Scotland							
Aberdeen	100.0	99.7	99.9	99.6	-	99.7	99.8
Bush Estate	-	92.7	98.2	-	-	-	95.5
Dumfries	98.4	98.4	-	86.8	-	-	94.6
Edinburgh St Leonards	97.3	99.2	97.9	99.8	-	99.4	98.7
Eskdalemuir	-	-	92.9	-	-	-	92.9
Glasgow Centre	99.5	98.8	98.9	21.2	-	83.4	80.4
Glasgow City Chambers	99.6	98.1	-	-	-	-	98.9
Glasgow Kerbside	98.5	98.2	-	95.0	-	-	97.2
Grangemouth	96.2	96.2	-	96.2	-	96.3	96.3
Inverness	99.5	99.6	-	87.9	-	-	95.7
Strath Vaich	-	-	93.8	-	-	-	93.8
Wales							
Aston Hill	-	64.8	90.7	-	-	-	77.7
Cardiff Centre	91.5	98.0	78.2	98.1	-	97.3	92.6
Cwmbran	94.2	99.9	100.0	99.7	-	90.0	96.8
Narberth	-	95.4	99.4	87.9	-	99.6	95.6
Port Talbot	-	90.8	99.5	98.0	-	99.5	97.0
Swansea	99.5	98.8	99.5	99.6	-	99.2	99.3
Wrexham	98.4	94.3	-	79.1	-	60.2	83.0
Number of sites	79	106	84	71	4	76	121
Number of sites < 90%	13	18	10	11	0	15	24
Network Mean (%)	93.2	93.6	96.2	94.7	98.1	93.1	94

Sites and instruments established between 01/4/2004 and 30/6/2004

Site	Instruments	Start Date
Scunthorpe Town	SO ₂ PM ₁₀	06/06/2004

Table 5.2 provides the ratified data capture figures for each site for the 6-month period January to June 2004. Data capture values below 90% are shown in the shaded boxes.

Table 5.2 AURN Ratified Data Capture (%) for January to June 2004
(Using the start date of any new site or end date of site closed)

Site	CO	NO ₂	O ₃	PM ₁₀	PM _{2.5}	SO ₂	Site Average
England							
Barnsley 12	-	-	-	-	-	98.9	98.9
Barnsley Gawber	98.1	96.5	98.3	-	-	98.0	97.7
Bath Roadside	98.9	97.7	-	-	-	-	98.3
Billingham	-	99.1	-	-	-	-	99.1
Birmingham Centre	94.8	90.8	90.6	95.9	-	96.5	93.7
Birmingham East	98.7	91.1	98.0	98.9	-	98.7	97.1
Blackpool	94.1	88.2	95.4	97.8	-	58.9	86.9
Bolton	97.2	97.2	97.2	96.2	-	97.2	97.0
Bottesford	-	-	99.6	-	-	-	99.6
Bournemouth	98.8	96.8	99.2	96.2	-	98.3	97.8
Bradford Centre	98.0	97.1	97.9	97.1	-	97.2	97.5
Brentford Roadside	95.3	96.4	-	-	-	-	95.8
Brighton Roadside	99.0	99.1	-	-	-	-	99.1
Brighton Roadside PM10	-	-	-	95.6	-	-	95.6
Bristol Centre	97.0	95.1	91.6	96.9	-	95.1	95.1
Bristol Old Market	53.0	98.6	-	-	-	-	75.8
Bury Roadside	88.2	88.4	84.8	87.9	-	60.1	81.9
Cambridge Roadside	-	98.7	-	-	-	-	98.7
Camden Kerbside	-	33.2	-	99.2	-	-	66.2
Canterbury	-	94.9	-	99.7	-	-	97.3
Coventry Memorial Park	99.4	97.7	98.7	86.3	-	98.9	96.2
Exeter Roadside	83.4	95.0	95.3	-	-	70.9	86.1
Glazebury	-	95.0	93.2	-	-	-	94.1
Great Dun Fell	-	-	99.5	-	-	-	99.5
Haringey Roadside	-	99.3	-	98.4	-	-	98.8
Harwell	-	94.3	97.6	96.9	97.0	97.6	96.7
High Muffles	-	78.3	99.0	-	-	-	88.7
Hove Roadside	98.2	98.3	-	-	-	97.4	97.9
Hull Freetown	94.5	81.2	90.2	94.1	-	78.7	87.8
Ladybower	-	87.3	98.2	-	-	98.1	94.6
Leamington Spa	84.8	93.0	98.5	98.8	-	98.3	94.7
Leeds Centre	74.6	90.0	89.1	97.4	-	96.7	89.5
Leicester Centre	78.7	85.4	96.5	92.4	-	95.4	89.7
Liverpool Speke	98.3	98.3	98.0	97.1	-	97.8	97.9
London A3 Roadside	98.9	98.7	-	98.8	-	-	98.8
London Bexley	91.0	93.7	92.4	86.4	-	92.9	91.3
London Bloomsbury	95.7	97.3	96.3	97.8	97.8	97.0	97.0
London Brent	98.9	93.9	98.9	98.9	-	98.8	97.9
London Bromley	99.0	98.4	-	-	-	-	98.7
London Cromwell Road 2	98.7	98.7	-	-	-	98.7	98.7
London Eltham	-	99.4	93.9	88.9	-	98.8	95.2
London Hackney	99.4	99.4	98.6	-	-	-	99.1
London Haringey	-	-	88.9	-	-	-	88.9
London Harlington	89.2	98.9	99.4	99.8	-	-	96.8
London Hillingdon	98.0	97.8	96.3	98.0	-	98.1	97.6
London Lewisham	-	99.6	83.4	-	-	98.8	93.9
London Marylebone	93.9	98.0	97.5	97.3	98.2	93.6	96.4

Site	CO	NO ₂	O ₃	PM ₁₀	PM _{2.5}	SO ₂	Site Average
Road							
London N. Kensington	98.4	98.4	99.4	92.6	-	95.7	96.9
London Southwark	90.8	79.9	90.8	-	-	90.8	88.1
London Teddington	-	95.7	96.2	-	-	96.2	96.0
London Wandsworth	-	99.1	99.2	-	-	-	99.2
London Westminster	98.5	71.7	96.7	91.8	-	98.4	91.4
Lullington Heath	-	92.4	94.0	-	-	89.8	92.1
Manchester Piccadilly	96.9	97.0	97.0	97.0	-	97.0	97.0
Manchester South	-	97.9	97.9	-	-	97.9	97.9
Manchester Town Hall	82.5	96.6	-	-	-	-	89.5
Market Harborough	92.3	88.5	93.1	-	-	-	91.3
Middlesbrough	95.9	72.0	99.2	97.1	-	99.2	92.7
Newcastle Centre	71.5	69.4	87.0	86.7	-	69.2	76.8
Northampton	94.9	92.0	90.2	93.5	-	94.8	93.1
Northampton PM10	-	-	-	75.3	-	-	75.3
Norwich Centre	90.0	88.8	96.0	96.0	-	94.6	93.1
Norwich Roadside	-	96.6	-	-	-	-	96.6
Nottingham Centre	85.6	89.0	97.2	97.3	-	97.3	93.3
Oxford Centre	94.9	80.7	-	-	-	98.7	91.4
Plymouth Centre	90.6	83.7	97.7	96.3	-	97.8	93.2
Portsmouth	94.4	97.4	98.1	87.6	-	82.9	92.1
Preston	87.6	95.8	98.4	97.7	-	98.1	95.5
Reading New Town	94.0	92.8	73.5	94.8	-	83.9	87.8
Redcar	97.2	97.1	94.9	97.1	-	97.2	96.7
Rochester	-	96.6	98.9	98.4	99.0	98.8	98.4
Rotherham Centre	-	97.0	85.4	-	-	89.4	90.6
Salford Eccles	94.9	95.0	85.4	94.3	-	82.7	90.4
Sandwell West Bromwich	97.9	98.6	98.2	-	-	98.5	98.3
Scunthorpe	-	-	-	96.3	-	97.4	96.9
Scunthorpe Town	-	-	-	90.5	-	99.2	94.8
Sheffield Centre	98.0	98.0	98.1	98.0	-	63.8	91.2
Sheffield Tinsley	98.1	98.8	-	-	-	-	98.5
Sibton	-	-	96.8	-	-	-	96.8
Somerton	-	90.9	96.2	-	-	-	93.5
Southampton Centre	84.6	96.3	83.4	95.0	-	94.6	90.8
Southend-on-Sea	22.0	90.4	97.3	97.1	-	94.5	80.3
Southwark Roadside	98.2	52.8	-	-	-	98.7	83.2
St Osyth	99.0	88.4	99.1	-	-	-	95.5
Stockport Shaw Heath	98.9	98.7	-	95.1	-	86.9	94.9
Stockton-on-Tees Yarm	95.7	98.0	-	97.7	-	-	97.1
Stoke-on-Trent Centre	90.1	92.8	97.6	62.8	-	94.2	87.5
Sunderland	-	-	-	-	-	84.8	84.8
Thurrock	94.8	83.1	98.1	90.9	-	98.0	93.0
Tower Hamlets Roadside	99.3	93.6	-	-	-	-	96.4
Walsall Alumwell	-	94.2	-	-	-	-	94.2
Walsall Willenhall	-	84.6	-	-	-	-	84.6
West London	98.8	98.8	-	-	-	-	98.8
Weybourne	-	-	96.5	-	-	-	96.5
Wicken Fen	-	47.2	88.2	-	-	88.3	74.5
Wigan Leigh	97.3	96.9	96.5	97.4	-	56.8	89.0
Wirral Tranmere	91.6	90.9	98.4	98.2	-	95.5	94.9
Wolverhampton Centre	92.0	95.0	97.7	98.1	-	97.8	96.1
Yarner Wood	-	98.7	98.8	-	-	-	98.8

Site	CO	NO ₂	O ₃	PM ₁₀	PM _{2.5}	SO ₂	Site Average
N Ireland							
Belfast Centre	95.7	91.4	95.6	95.1	-	93.1	94.2
Belfast Clara St	-	-	-	91.2	-	-	91.2
Belfast East	-	-	-	-	-	95.7	95.7
Derry	97.0	90.6	97.2	96.5	-	94.0	95.0
Lough Navar	-	-	50.0	99.5	-	-	74.7
Scotland							
Aberdeen	97.2	98.5	99.3	99.1	-	99.1	98.6
Bush Estate	-	93.2	98.0	-	-	-	95.6
Dumfries	98.4	98.4	-	84.1	-	-	93.6
Edinburgh St Leonards	97.1	83.5	97.6	98.2	-	98.2	94.9
Eskdalemuir	-	-	96.2	-	-	-	96.2
Glasgow Centre	90.3	90.1	97.6	59.0	-	86.8	84.8
Glasgow City Chambers	98.8	97.4	-	-	-	-	98.1
Glasgow Kerbside	97.8	97.6	-	93.1	-	-	96.2
Grangemouth	63.6	97.6	-	97.7	-	97.7	89.1
Inverness	98.0	99.0	-	91.8	-	-	96.3
Strath Vaich	-	-	95.0	-	-	-	95.0
Wales							
Aston Hill	-	78.1	94.5	-	-	-	86.3
Cardiff Centre	93.6	96.8	83.6	96.9	-	96.2	93.4
Cwmbran	96.4	99.2	99.3	99.4	-	94.3	97.7
Narberth	-	88.8	92.6	48.0	-	85.1	78.6
Port Talbot	-	91.6	96.4	95.3	-	96.3	94.9
Swansea	98.1	86.2	98.2	53.8	-	97.9	86.9
Wrexham	98.3	95.8	-	88.5	-	79.1	90.4
Number of sites	79	106	84	72	4	77	122*
Number of sites < 90%	15	26	12	13	0	18	28
Network Mean (%)	92.6	92.0	94.6	92.9	98.0	92.4	93

* 122 sites as both Scunthorpe and Scunthorpe Town data capture reported

Sites and instruments established between 01/1/2004 and 30/6/2004

Site	Status	Pollutant	Start Date
Glazebury	Defra	NO ₂	26/01/2004
London Harlington	Affiliate	NO ₂ CO O ₃ PM ₁₀	01/01/2004
Scunthorpe Town	Affiliate	SO ₂ PM ₁₀	06/06/2004

Table 5.3 shows the ratified AURN data capture for the 61 **critical sites** in the network for the 6-month period January to June 2004.

**Table 5.3 AURN Ratified Data Capture (%) for CRITICAL SITES
January to June 2004**

Critical Sites		CO	NO ₂	O ₃	PM ₁₀	SO ₂
AGGLOMERATIONS						
Belfast Centre	DEFRA	95.7	91.4	95.6		
Blackpool	DEFRA	94.1	88.2	95.4	97.8	58.9
Bournemouth	Affiliate	98.8	96.8	99.2	96.2	98.3
Brighton Roadside PM ₁₀	Affiliate				95.6	
Bristol Centre	DEFRA		95.1	91.6	96.9	95.1
Cardiff Centre	DEFRA	93.6	96.8	83.6	96.9	96.2
Coventry Memorial Park	DEFRA	99.4	97.7	98.7	86.3	98.9
Edinburgh St Leonards	DEFRA	97.1	83.5	97.6	98.2	98.2
Glasgow Centre	DEFRA		90.1	97.6	59	86.8
Hove Roadside	Affiliate			-	-	97.4
Hull Freetown	DEFRA	94.5	81.2	90.2	94.1	78.7
Leicester Centre	DEFRA	78.7	85.4	96.5	92.4	95.4
Liverpool Speke	Affiliate	98.3	98.3	98	97.1	97.8
Newcastle Centre	DEFRA	71.5	69.4	87	86.7	69.2
Nottingham Centre	DEFRA	85.6	89	97.2	97.3	97.3
Portsmouth	Affiliate	94.4	97.4	98.1	87.6	82.9
Preston	DEFRA	87.6	95.8	98.4	97.7	98.1
Reading New Town	DEFRA	94	92.8	73.5	94.8	83.9
Sheffield Centre	DEFRA				98	
Southampton Centre	DEFRA	84.6	96.3	83.4	95	94.6
Southend-on-Sea	DEFRA	22	90.4	97.3	97.1	94.5
Stoke-on-Trent Centre	DEFRA	90.1	92.8	97.6	62.8	94.2
Swansea	Affiliate	98.1				
Wirral Tranmere	DEFRA	91.6	90.9	98.4	98.2	95.5
ZONES						
Aberdeen	Affiliate	97.2	98.5	99.3	99.1	99.1
Aston Hill	DEFRA	-	78.1	94.5	-	-
Barnsley Gawber	Affiliate	98.1	96.5	98.3	-	
Bush Estate	DEFRA	-	93.2	98	-	-
Canterbury	Affiliate	-		-	99.7	-
Cwmbran	Affiliate	96.4	99.2	99.3	99.4	94.3
Derry	Affiliate	97	90.6	97.2	96.5	94
Dumfries	DEFRA	98.4	98.4	-	84.1	-
Eskdalemuir	DEFRA	-	-	96.2	-	-
Glazebury	DEFRA	-	81.9	93.2	-	-
Grangemouth	Affiliate	63.6	97.6	-	97.7	97.7
Great Dun Fell	DEFRA	-	-	99.5	-	-
High Muffles	DEFRA	-	78.3	99	-	-
Inverness	DEFRA		99	-	91.8	-
Leamington Spa	Affiliate	84.8	93	98.5	98.8	98.3
Lough Navar	DEFRA	-	-	50		-
Narberth	Affiliate	-		92.6		
Northampton	Affiliate	94.9	92	90.2	93.5	94.8
Norwich Centre	DEFRA		88.8	96		
Oxford Centre	Affiliate	94.9		-	-	98.7
Plymouth Centre	DEFRA				96.3	
Scunthorpe*	Affiliate	-	-	-	41.3	41.8
Scunthorpe Town*		-	-	-	12.4	13.6
Sibton	DEFRA	-	-	96.8	-	-

Critical Sites		CO	NO ₂	O ₃	PM ₁₀	SO ₂
Somerton	Affiliate	-	90.9	96.2	-	-
St Osyth	DEFRA	99	88.4	99.1	-	-
Stockton-on-Tees Yarm	Affiliate	95.7	98	-	97.7	-
Strath Vaich	DEFRA	-	-	95	-	-
Sunderland	DEFRA	-	-	-	-	84.8
Thurrock	Affiliate		83.1	98.1		
Wicken Fen	DEFRA	-	47.2	88.2	-	
Wigan Leigh	Affiliate	97.3	96.9	96.5	97.4	56.8
Wrexham	DEFRA	98.3	95.8	88.5	-	79.1
Yarner Wood	DEFRA	-	98.7	98.8	-	-
Number of sites < 90%		8	13	7	8	11

Key  Pollutant monitored but not critical at this site

- Not monitored

* Scunthorpe site closed on 18/3/04 and relocated to Scunthorpe Town where monitoring commenced on 6/6/04

Note that critical sites where monitoring has not yet commenced are not included in the above table.

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.

Appendix A1

As requested by the Department, QA/QC Unit has provided a list of suggestions for equipment that may need replacing or up grading in the network. The following provides a summary of the list and the actions taken to date since January 2004. 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 2004	Priority	Action
1	Advice on requirements for further AURN equipment up-grades has been given to CMCU (20/1/04)		On-going
2	Recommend up-grade/modifications to SO ₂ Ambirack bench at Blackpool and Norwich Centre to improve response noise. (Already done at Wirral Tranmere and Preston)	Blackpool Critical Site	Blackpool - new SO ₂ bench fitted 9 th March 2004
Recommendations July 2004			
3	Recommend up-grading or modify SO ₂ Ambirack bench at Reading New Town	Critical Site (Defra)	On-going
4	Sheffield Tinsley CO noisy and drifting response. Recommend up-grade or repair	Medium	On-going
5	Exeter Roadside CO unstable baseline. Recommend up-grading or repair.	Medium	On-going
Recommendations October 2004			
6	Further advice for AURN equipment replacement and up-grading was given to CMCU on 8 th September 2004.		
7	Recommend repair or up-grading of 11 unstable CO analysers detailed in Section 3.1 of this report. Of these, Barnsley Gawber (Affiliate) and Nottingham Centre (Defra) are critical for CO.	Critical sites	

APPENDIX A2

CRITICAL SITES IN THE AURN (October 2004)

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
Wirral Tranmere	Birkenhead Urban Area	NO ₂ PM ₁₀ SO ₂	CO	NO ₂ O ₃
Blackpool	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 ⁶ O ₃ ⁶
Brighton Roadside PM ₁₀ +	Brighton/Worthing/Littlehampton	PM ₁₀		
Hove Roadside+	Brighton/Worthing/Littlehampton	SO ₂		
Bristol Centre	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
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
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
Swansea+	Swansea Urban Area		CO	
Stoke-on-Trent Centre	The Potteries	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

"+" indicates Affiliate site"

Note 2: PM₁₀ monitored by Gravimetric and TEOM

Note 3: DD3 Critical as Rural Background station

Note 4: If NO₂ at West Midlands is Suburban then NO₂ at Leamington Spa is no longer critical for DD1

Note 6: Not Affiliated/Monitoring yet.

Note 7: Addresses CO, Benzene not included here

Table A2 Critical Sites in Zones

Site Name	Zone	Critical Pollutant		
		DD1	DD2 ⁷	DD3
Grangemouth+	Central Scotland	NO ₂ PM ₁₀ SO ₂	CO	
Bush Estate	Central Scotland			NO ₂ O ₃
Northampton+	East Midlands	NO ₂ PM ₁₀ ² SO ₂	CO	NO ₂ O ₃
Sibton	Eastern			O ₃ ³
St Osyth	Eastern			NO ₂ O ₃
Norwich Centre	Eastern			NO ₂ O ₃
Wicken Fen	Eastern			NO ₂ O ₃
Thurrock	Eastern			NO ₂ O ₃
Fort William	Highland			NO ₂ ⁶ O ₃ ⁶
Strath Vaich	Highland			O ₃ ³
Inverness	Highland	NO ₂ PM ₁₀		
Sunderland Silkworth+	North East			NO ₂ ⁶ O ₃ ⁶
Stockton-on-Tees Yarm+	North East	NO ₂ PM ₁₀	CO	
Sunderland	North East	SO ₂		
Aberdeen+	North East Scotland	NO ₂ PM ₁₀ SO ₂	CO	NO ₂ O ₃
Aston Hill	North Wales			NO ₂ O ₃
Wrexham	North Wales	NO ₂ PM ₁₀ SO ₂	CO	
Great Dunn Fell	North West & Merseyside			O ₃ ³
Wigan Leigh+/Centre ⁸	North West & Merseyside	NO ₂ PM ₁₀ SO ₂	CO	NO ₂ O ₃
Glazebury	North West & Merseyside			NO ₂ O ₃
Lough Navar	Northern Ireland			O ₃ ³
Derry+	Northern Ireland	NO ₂ PM ₁₀ SO ₂	CO	NO ₂ O ₃
Eskdalemuir	Scottish Borders			NO ₂ ⁶ O ₃
Dumfries	Scottish Borders	NO ₂ PM ₁₀	CO	
Canterbury+	South East	PM ₁₀		
Oxford Centre+	South East	SO ₂	CO	
Narberth	South Wales			O ₃ ³
Cwmbran+	South Wales	NO ₂ PM ₁₀ SO ₂	CO	NO ₂ O ₃
Somerton	South West			NO ₂ O ₃
Yarner Wood	South West			NO ₂ O ₃
Plymouth Centre	South West	PM ₁₀		
Leominster	West Midlands			NO ₂ ^{4&6} O ₃ ⁶
Leamington Spa+	West Midlands	NO ₂ PM ₁₀ SO ₂	CO	NO ₂ O ₃
Barnsley Gawber+	Yorkshire & Humberside	NO ₂	CO	NO ₂ O ₃
High Muffles	Yorkshire & Humberside			NO ₂ O ₃
Scunthorpe Town+	Yorkshire & Humberside	PM ₁₀		

Total of 61 Critical Sites (25 in Agglomerations and 36 in Zones)
 51% of network stations critical under one or more Daughter Directives
 "+ indicates Affiliate site"

Note 2: PM₁₀ monitored by Gravimetric and TEOM

Note 3: DD3 Critical as Rural Background station

Note 4: If NO₂ at Leominster is Suburban then NO₂ at Leamington Spa is no longer critical for DD1

Note 6: Not Affiliated/Monitoring yet

Note 7: Addresses CO, Benzene not included here

Note 8: Wigan Leigh relocated to Wigan Centre on 11 October 2004

