AEAT/ENV/R/0357

QA/QC Data Ratification Report for the Automatic Urban Network, January - June 2000

Jane Vallance-Plews

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1. Introduction

This report covers the Quality Assurance and Control (QA/QC) activities undertaken by NETCEN to ratify automatic urban monitoring network data for the 6-month period January to June 2000. It summarises significant QA/QC issues related to the network, identifying the major site problems where data capture falls below the required 90% level. Included in this report is an up-to-date inventory of Department-owned equipment used by QA/QC Unit (Appendix A) and a recommended list of equipment that may need replacing or up-grading in the network (Appendix B)

Two new DETR-funded sites were affiliated into the network during this period, bringing the total number of operational AUN monitoring sites to 68. The site at Wirral Tranmere was commissioned on 14th May and the Preston site was commissioned on 6th June 2000. A further two monitoring stations at Blackpool and South End on Sea are scheduled to be commissioned during the next quarter (July-September 2000).

A two-day training course was held in April 2000 for the new site operators. QA/QC Unit provided hands-on training in all operational aspects of routine site calibration and maintenance.

Ratified hourly average data capture for the network averaged 94% for all pollutants (O_3, NO_2, SO_2, CO and PM_{10}) during this 6-month reporting period (see Table 1.1).

Table 1.1 AUN Ratified Data Capture (%) January - June 2000

Pollutant	**O_3**	**NO_2**	**CO**	**SO_2**	**PM_{10}**	**Average**
Data Capture (%)	94	91	94	94	96	94

Generic data quality issues affecting the network are discussed in Section 2 and other specific issues affecting individual sites are given in Section 3. The main site operational and QA/QC issues giving rise to data capture below the required 90% level are summarised in Section 4.

A more detailed breakdown of the hourly data capture statistics for each site is presented in Section 5, Table 5.1. In total, 12 out of the 68 sites (18%) had an average data capture rate below the required 90% level for the January to June 2000 period.

QA/QC Unit carried out the summer network intercalibration and site audits during July to September 2000 and the results have been used to assess the accuracy and consistency of the data for this reporting period. Details of this intercalibration and audit exercise will be reported separately.

QA/QC Unit has recently developed and tested an electronic version of the LSO site calibration sheet. This will help to provide a more efficient and “paperless” system for transferring and processing the calibration records. To date, 17 local site operators

are using the software to enter the routine calibration information, which is then faxed or e-mailed to CMCU and QA/QC Unit. The calibration data are then automatically extracted from the electronic calibration sheets, thereby avoiding the need to enter the data manually into the ratification database.

2. Generic Data Quality Issues

2.1 YEAR 2000 COMPLIANCE

All network participants worked together to ensure that any disruption to network operations was minimised during the transition to the Year 2000. CMCU, the Site Operators and Equipment Support Units undertook checks to ensure that all network equipment including the analysers, loggers, telemetry and associated data collection software were Y2K compliant. Where required, any equipment and software was up-graded. As a result of these actions the transition into the year 2000 passed smoothly with only 3 sites (Sunderland, Brighton and Hove) incurring data loss as a direct result of problems associated with Year 2000 compliance.

2.2 PM_{10} EPISODES

An episode of high PM_{10} concentration was recorded at most sites in the network on 2nd and 3rd of March 2000. The Meteorological Office had issued a volcanic ash alert on 28th February following the eruption of the volcano Hekla on Iceland and air mass trajectories indicate that this was a possible source of the PM_{10}. It has also been suggested by Meteorological Office that a Saharan dust storm may have caused the episode and they have undertaken more detailed modelling studies to investigate this possibility.

The effect of the millennium firework celebrations could also been seen at many sites where elevated PM_{10} concentrations were recorded at around midnight on 31 December 1999.

2.3 LOW NO_X CONVERTER EFFICIENCIES

Tests carried out during the summer intercalibration exercise identified seven sites where the NOx converters were found to be operating below the required 95% efficiency. Details of these are given below:

Table 2.1 Sites with Low NOx Converter Efficiency (summer 2000 audit)

Site	Analyser Type	Converter Efficiency (%)	Comment
Coventry	Signal	80/82	Repeat fail (89% at last audit)
Glasgow Centre	Signal	92/93	Repeat fail (92/94% at last audit)
London Hillingdon	Signal	93/95.8	Borderline
Nottingham	Signal	93/94	Borderline
Manchester South	Signal	94.5	Borderline

Aberdeen	ML	89/93	Borderline
Hove	API	88/90	Fail

In accordance with the new audit test procedures, QA/QC Unit re-checked any failed converters at lower NO_2 concentrations. Where two converter efficiency results are given (e.g. 80/82) the first result is for the higher NO_2 concentration test (500ppb) and the second is at the lower NO_2 concentration (200 ppb).

At four of the above sites (London Hillingdon, Nottingham, Manchester South and Aberdeen) the converter results were on the border of the acceptable limit. Careful examination of the data at these sites did not reveal any significant effect on the overall data quality and consequently no action has been taken to reject data. In these "border line" cases the following criteria were used to assess whether or not the data quality was acceptable:

- Converter test result border line
- Previous audit result satisfactory
- Stable NO_2 calibration spans (where possible to determine)
- Audit results show data to be accurate and consistent
- ESU service and call-out records satisfactory
- No other operational or response problems (e.g temperature instability, zero baseline drift, high noise etc)

At two of the remaining three sites (Coventry and Hove), the converter efficiency results were well below the required 95% level even when tested at the lower concentrations, and this has significantly compromised NO_2 data quality and capture rates. The converters in the analysers at Coventry and Glasgow Centre also failed at the previous winter audit and therefore showed a repeat history of poor performance.

The impact of the individual converter faults on site data capture for this ratification period is summarised in Table 2.2 below:

Table 2.2 Effect of converter fault on data capture

Site	Data Capture	Comment
Coventry	14%	Data have been rejected from 28th March (first unstable calibration response) until replacement/repair of the converter at the service on 31 July 2000.
Glasgow Centre	58%	Data have been deleted from 18th April (first unstable calibration response) until repair/replacement at the service in August.
Hove	83%	The service at this site was inadvertently carried out 4 days before the audit and as a result the low converter efficiency determined at the audit was only representative of the data from the service on 27th July onwards. Therefore, no data have been deleted in this reporting period due to the converter. However, in the next reporting period all data from

		the service in July until repair/replacement of the converter by the ESU will be rejected.

2.3.1 Identifying Faulty Converters

In order to examine the effect of the converter performance on the data quality, QA/QC Unit has looked at the chart records (where available) to examine the calibration response to NO_2 span gas. In some cases, where the converter efficiency is low, a noticeable decline in the response of the NO_2 span can be seen during calibration. (see Figure 2.1).

At the sites with Ambirack analysers installed, additional information was provided by the Equipment Support Unit (Signal) to help assess the impact of the converter performance on data quality. Examination if the 1-minute NO_2 calibration data showed stable response when the converter was performing satisfactorily (Figure 2.2). However, a few weeks later a drop in the NO_2 response during the routine calibration can be seen, giving an indication that the converter performance was declining (Figure 2.3).

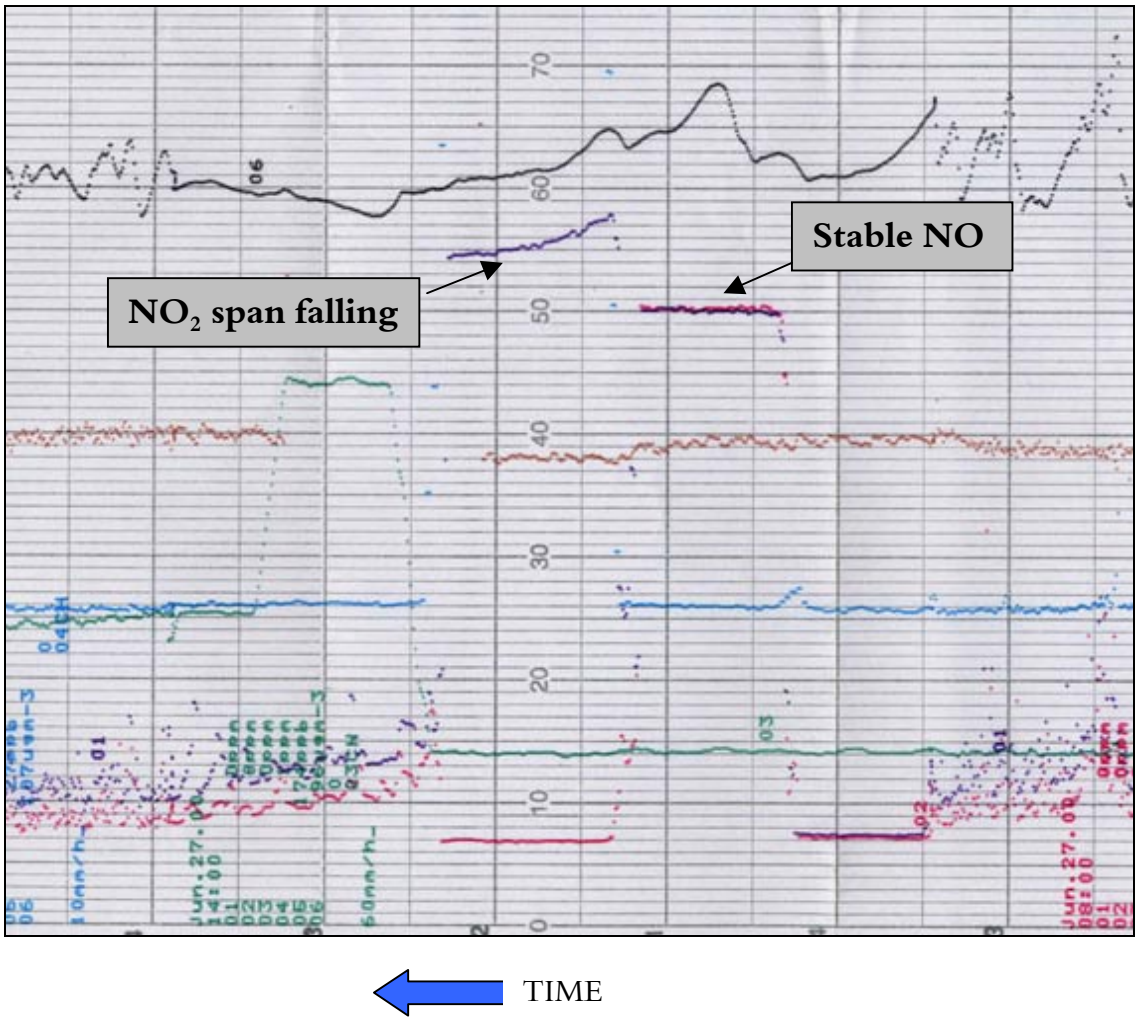

Figure 2.1 Chart response showing poor NO_2 converter performance

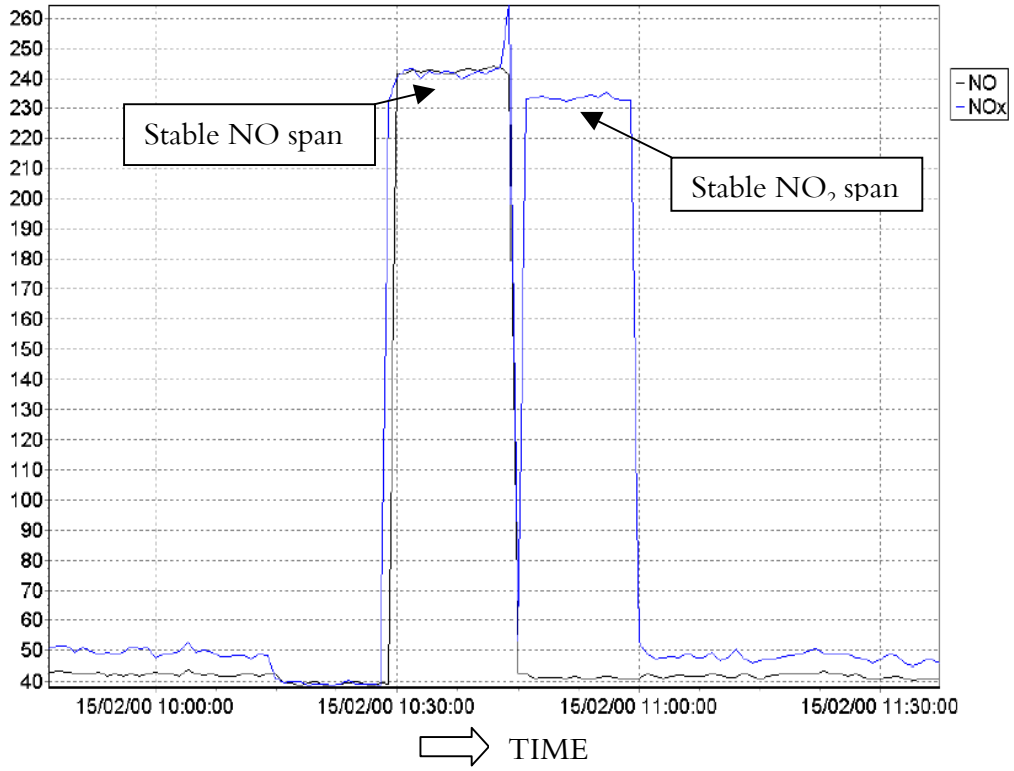

Figure 2.2 Ambiview screen showing satisfactory converter performance

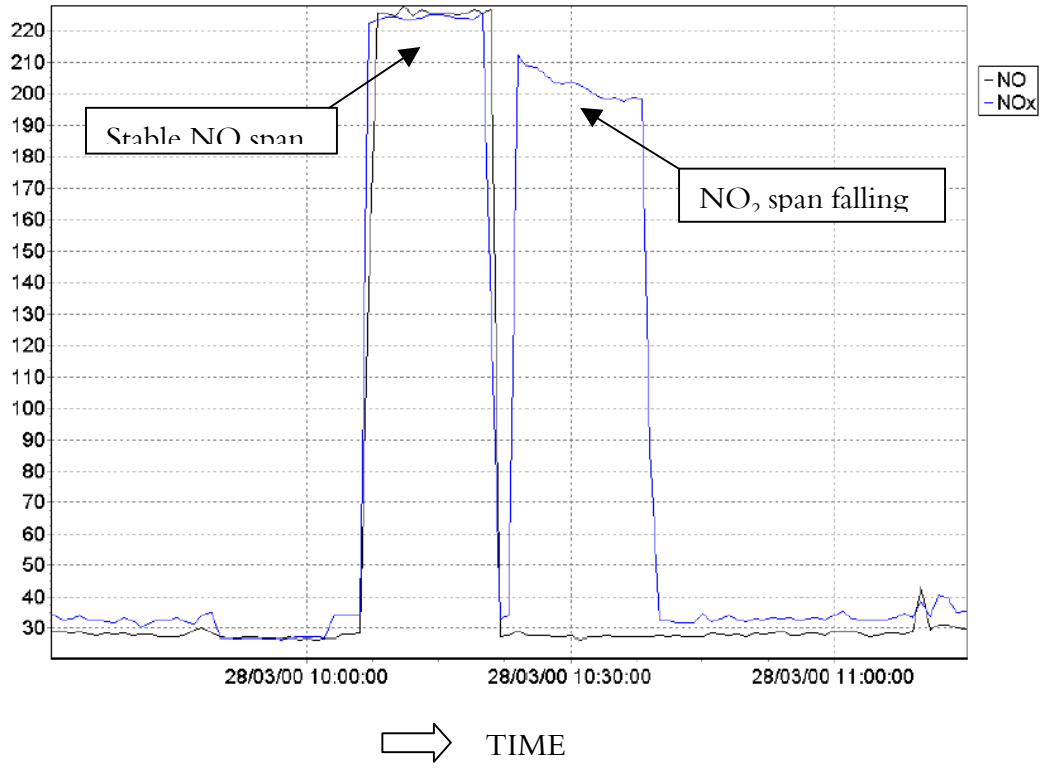

Figure 2.3 Ambiview screen showing poor converter performance

2.3.2 Recommendations for Improving Procedures

In order to minimise further data loss due to converter faults and to take forward some lessons learnt from this problem, we have made the following recommendations:

i) Actions for Site Operators

We recommend that all LSOs pay careful attention to the stability of the NO_2 calibration response. CMCU should be notified if a declining NO_2 response is recorded.

Early detection of poor converter performance by the LSOs will help to minimise data loss and expedite the repair/replacement of the fault converters. The following methods can be used to check the NO_2 calibration response stability:

Chart recorder	Examine the NO_2 trace during the 20-minute span calibration for a steady fall in the response. (see Figure 2.1)
Ambirack Systems	Check the mV response on the calibration screen during the calibration. The Ambirack viewer programme may be used to inspect the calibration response stability. Instructions have been provided by Signal and are given in Appendix C
Data Logger	Record the NO_2 span response at 2, 5, 10 and 15-minute intervals to see if the response is gradually falling.

ii) Action for Equipment Support Units

Where an instrument shows a history of poor converter performance by failing at least 2 audits in a row, we recommend that a further check on the converter be carried out by the ESU three months after the repair/service to ensure performance is satisfactory.

iii) Action for QA/QC Unit

Following a site operator's recommendation, a "trouble-shooting" section will be included in the LSO manual. This will contain examples of instrument response problems to look out for such as the decline in NO_2 span response indicating a possible converter fault.

2.4 OZONE ANALYSER RECONFIGURATION

A total of 16 out of the 35 ozone analysers (46%) tested during the summer 2000 audit were found to be outliers. This high number is mainly a direct consequence of the problem already described in the previous ratification report (AEAT Report 0249)

where an ESU was setting up the analysers after the service using a photometer that did not agree with the NPL/NETCEN reference photometer.

Although no data have been lost as a direct result of this over-sight, it has been necessary for QA/QC Unit to spend a considerable amount of time retrospectively rescaling data for three consecutive 6-month reporting periods for up to 16 of the network sites.

Following discussion with NPL, it has now been agreed that the ESU photometers are routinely calibrated, and if necessary, realigned with the NPL reference photometer before being returned to the ESUs. Now that this problem has been addressed, it is anticipated that fewer outliers will be identified at the next winter 2000/01 audit.

3. Site Specific Issues

3.1 BRIGHTON AND HOVE

The Dasibi data loggers used at the Brighton and Hove monitoring sites were not Year 2000 compliant. The necessary software up-grade could not be carried out until the relevant components became available in mid January. Following the up-grade of the logger at the Hove site, data collection was resumed although intermittent communications faults gave rise to further periods of data loss.

The logger was also up-graded at the Brighton site in mid January. However, following this modification, CMCU was unable to retrieve any further data from the logger. In May 2000 the Local Authority purchased new Odessa loggers for both sites and since these were installed normal data collection has been resumed.

3.2 BRISTOL OLD MARKET

The CO analyser at this site is unable to output negative voltages. When the base line drifts down to 0mV the response is therefore cut-off and a constant output of 0ppm is recorded.
In total, 5 weeks of data were lost due to response truncation during the periods from 13-17th March and 12th May to 2nd June 2000.

Recommendation

The CO zero base line is prone to drift at this site and careful attention needs to be given by the LSO and ESU to ensure that an adequate off-set of say (30mV) is always applied.

3.3 EXETER OZONE

Two years of data (1998-1999) have already been rejected due to spurious high ozone levels being recorded by the site analyser. A replacement analyser was installed on 12th September 1999 and for 5 months there were no further problems. However, immediately after the analyser was serviced on February 8th 2000, the problem recurred and spurious high ozone values were again recorded. In order to investigate the poor quality data, QA/QC Unit installed a parallel analyser at the site at the end of June 2000. Results showed that the site analyser was recording levels that were approximately10ppb higher than data from the parallel analyser. The site instrument was therefore switched out-of-service and data were collected from the parallel analyser during the period 27th June until 27th July. The Equipment Support Unit carried out a site service on 27th July and replaced all the scrubbers in the original site ozone analyser. After this service, the data from the site analyser showed good agreement with the parallel instrument and the site analyser was therefore switched back into service.

Five months of spurious high data from after the service on 8th February 2000 until the parallel analyser was installed on 27th June have been deleted.

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 January-June 2000. The number of days of data lost during this reporting period is also given. In some cases the data gap extends beyond the 6-month reporting period, in which case the total data loss due to the fault is given below in italics.

Aberdeen

Data Capture	Reason for Data Loss	Data Loss
CO = 85%	Data were lost from January 9th until February 4th due to a chopper motor fault and problem with the optical bench assembly. The analyser was removed from site for repair and reinstalled at the site service on 4th February.	26 days

Barnsley Gawber

SO_2 = 88%	All data from 1st July 99 until 11th January 2000 were deleted due to sample flow, vacuum faults and optical bench temperature problems giving rise to irregular step changes in calibration sensitivity. Modifications to the SO_2 analyser were carried out on 11th January which resulted in improved response stability. Problems with the air conditioning unit resulted in intermittent periods of data loss during June. (3-5th , 9-10th and 17-19th June)	11 days *6 months in total* 6 days

Bath Roadside

NO_2 = 69%	The analyser was removed from site on 25th February 2000 until 6th March due to a response instability fault. Recurrence of the response instability problem resulted in further data loss when the analyser was again taken away to be repaired from 28th March to 11th May.	10 days 6 weeks

Birmingham Centre

SO_2 = 85%	Failure of the chopper motor resulted in data loss from 3rd to 7th February	4 days

	The analyser was removed from site on 17th February in order to investigate response instability problems. A replacement analyser was installed but removed after a week, as it was also unstable. The second replacement analyser did not provide a satisfactory zero for data scaling. All data have been deleted from 17th February until 10th March when the original site analyser was reinstalled.	3 weeks

Bradford Centre

O_3 = 86%	Spurious low data were deleted from 15-22nd March due to a leak in the sampling system arising from a crack in the glass sample detector tube. Further spuriously low data were recorded after a routine site calibration on 10th May. At the same time, problems with the Ambirack PC also occurred resulting in further data loss from 10th May until 23rd May when the PC hard drive was replaced. Data were lost from 11-13th June when malfunction of the air conditioning unit caused high cabin temperatures which activated the automatic shut down of the site power supply.	1 week 2 weeks 2 days

Brighton Roadside

NO_2 = 32%	The Dasibi data logger was not Year 2000 compliant and data collection stopped on 1st January 2000. Although the logger was up-graded in mid January, it was not possible to resume data collection. All data were lost from 1 January until a new logger was installed on 3rd May. (see Section 3.1)	4 months
CO = 32%	As above	4 months

Bristol Old Market

CO = 84%	The CO zero baseline fell rapidly to 0mV causing periods of response truncation from 13-17th March and 12th May to 2nd June. (see Section 3.2)	5 weeks
NO_2 = 84%	Spurious data from 6th June until 10th July were deleted due to a cracked lens in the reaction cell.	3 weeks *5 weeks in total*

Bury Roadside

PM_{10} = 89%	A fault with the TEOM sensor unit resulted in data loss from 28th May to 12th June.	2 weeks

Coventry Centre

General	A pump fault and leaks in the sampling system affecting all pollutants were identified at the Winter 1999 audit. All data were therefore deleted from October 13th 1999 until the service and repair on 4th February 2000.	6 weeks *4 months in total*
O_3 = 75%	In this period, data were deleted from 1st January until 4th February 2000 due to leaks in the sampling system. Bad data recorded after a routine calibration were deleted from 28th March to 4 April 2000.	6 weeks 6 days
NO_2 = 14%	In this period, data were deleted from 1st January until 4th February due to leaks in the sampling system. The NOx converter efficiency was found to be low at the Summer audit in July 2000. The 1-minute NO_2 calibration response was examined to determine when the converter fault started. Data were deleted from the first unstable NO_2 calibration on 28th March until the converter was replaced at the service on 31st July.	6 weeks 3 months *4 months in total*
CO = 78%	Data were deleted from 1st January until 4th February2000 due to the leaks in the sampling system identified at the audit.	6 weeks
SO_2 = 78%	As above	6 weeks

Exeter Roadside

O_3 = 23%	Unusually high levels of ozone were recorded after the site service on February 8th 2000. All unrepresentative data have been deleted until a second analyser was switched into service on 27th June 2000. (see Section 3.3)	4.5 months

Hove Roadside

General	Data were lost from 1-13th January due to a data logger fault (Year 2000 non-compliant – see Section 3.1). Further intermittent periods of data were lost due to logger communications problems on 25-27th March, 31st March-3 April and 26 April – 3 May A new Odessa logger was installed at the site on May 3rd	13 days 12 days
NO_2 = 83%	As above	25 days
CO = 83%	As above	25 days

London Bexley

CO = 81%	Data were deleted from 18th February until 20th March due to a recurring response instability fault. The analyser's infrared source, correlation wheel and synchronisation card were replaced during repair.	1 month

Manchester South

NO_2 = 64%	The NO_2 converter was found to be unacceptably low (87%) at the Winter audit in February 2000. All data from the service on 21st September 1999 until the repair at the next service on 1st March 2000 have been deleted due to this fault. Data were deleted from 13-16th March due to sample flow problems caused by a faulty solenoid valve.	2 months *5.5 months in total* 4 days
SO_2 = 71%	Erratic response data were deleted from 1 March until a replacement analyser was installed on April 20th	17 days

Plymouth Centre

General	A fault with the air conditioning unit during May resulted in increased site temperatures causing instability of the NO_2 and SO_2 analysers.	
NO_2 = 75 %	Data were rejected from 21 December 1999 until the service on 26th January due to a low converter efficiency identified at the Winter audit (87%). The converter performance was satisfactory at the following Summer 2000 audit. Data were deleted from 5-27th May due to response instability caused by increased site temperatures and a flow fault. The photomultiplier cooler assembly was replaced during repair.	26 days *5 weeks in total* 3 weeks
SO_2 = 79%	A UV lamp fault resulted in several periods of high noise and negative response data being deleted from 10-17th May, 25–31st May and 10-30th June.	5 weeks

Salford Eccles

O_3 = 82%	Spuriously low data were rejected after the service on 30th November until the repair on 20th January 2000 due to a leak in the sample inlet filter holder. Further data were lost from 22nd June until 18th July when the sample line was accidentally left disconnected from the manifold after a routine calibration.	3 weeks *7 weeks in total* 8 days *4 weeks in total*

Sandwell West Bromwich

NO_2 = 79%	Data were lost from 10th May until 13th June due to a site temperature problem, giving rise to lost data and unstable calibration response making accurate data scaling impossible.	1 month

Sunderland

SO_2 = 79%	A Year 2000 logger up-grade problem resulted in data loss from December 22nd until 4th January 2000. Routine monitoring was temporarily suspended from 30th March until 2nd May when site maintenance and building work was taking place. Monitoring was stopped again on 30th June due to building refurbishment. Site operations had not resumed by 30th September.	4 days *2 weeks in total* 1 month

Walsall Willenhall

NO_2 = 69%	The NO_2 converter was found to be low (92%) at the Winter 99/2000 audit. Data were deleted from 22nd December until the converter was replaced on 11th February 2000. A converter temperature fault resulted in further data loss from 13-20th April. Data were lost from 22-25th June due to software problems with the PC-based operating system. An ozone generator fault resulted in data loss from 28-30th June.	6 weeks *7 weeks in total* 1 week 4 days 2 days

Wolverhampton

SO_2 = 87%	A fault occurred with the analyser after the service on February 14th until 3rd March. No ESU documentation giving details has been provided. A UV lamp fault resulted in data loss from 7-10th May	18 days 3 days

Port Talbot

General	There were several power cuts throughout this period resulting in data loss for all pollutants on: 2-4th January 7-10th and 12-14th February 3-6th March	10 days in total
NO_2 = 77%	A sample flow fault resulted in data loss from December 26th until 7th January 2000.	1 week *12 days*

	Data were also lost from 13-31st January but no details of this fault were documented.	*in total* 19 days
SO_2 = 81%	Data were lost from 13-31st January but no details of this fault were documented.	19 days

5. Ratified Data Capture Statistics

Table 5.1 provides the ratified data capture figures for each site for the period January to June 2000. Data capture values below 90% are shown in the shaded boxes.

Table 5.1 AUN ratified data capture (%) for January – June 2000.

Site Name	O_3	NO_2	CO	SO_2	PM_{10}	Site Average
ENGLAND						
Barnsley 12	-	-	-	99	-	**99**
Barnsley Gawber	95	90	-	88	-	**91**
Bath Roadside	-	69	99	-	-	**84**
Billingham	-	99	-	-	-	**99**
Birmingham Centre	98	98	97	85	98	**95**
Birmingham East	98	98	98	98	96	**97**
Bolton	98	96	98	93	98	**97**
Bradford Centre	86	95	95	95	95	**93**
Brighton Roadside	-	32	32	-	-	**32**
Bristol Centre	97	93	91	91	94	**93**
Bristol Old Market	-	84	84	-	-	**84**
Bury Roadside	97	97	96	92	89	**94**
Cambridge Roadside	-	98	-	-	-	**98**
Coventry Centre	75	14	78	78	-	**61**
Exeter Roadside	23	98	98	98	-	**79**
Hove Roadside	-	83	83	-	-	**83**
Hull Centre	98	98	98	95	94	**97**
Leamington Spa	99	98	98	95	98	**97**
Leeds Centre	98	98	91	98	95	**96**
Leicester Centre	93	95	95	98	98	**96**
Liverpool Centre	95	95	95	95	93	**95**
London A3 Roadside	-	96	98	-	97	**97**
London Bexley	98	95	81	98	97	**94**
London Bloomsbury	98	98	95	98	98	**98**
London Brent	99	99	99	99	98	**99**
London Cromwell	-	98	98	98	-	**98**
London Hillingdon	98	98	83	98	98	**95**
Manchester Piccadilly	97	98	98	97	98	**98**
Manchester South	96	64	-	71	-	**77**
Manchester Town Hall	-	93	99	-	-	**96**
Middlesbrough	98	94	98	96	94	**96**

Site Name	O_3	NO_2	CO	SO_2	PM_{10}	Site Average
Newcastle Centre	98	98	98	98	97	**98**
Norwich Centre	97	96	97	93	97	**96**
Norwich Roadside	-	99	-	-	-	**99**
Nottingham Centre	99	98	98	99	99	**98**
Oxford Centre	-	99	99	99	-	**99**
Plymouth Centre	98	75	96	79	95	**89**
Preston	99	99	99	87	100	**97**
Reading	97	98	98	98	92	**97**
Redcar	94	98	98	98	98	**97**
Rotherham Centre	99	98	-	93	-	**96**
Salford Eccles	82	97	97	97	98	**94**
Sandwell West	94	79	94	94	-	**90**
Scunthorpe	-	-	-	99	92	**95**
Sheffield Centre	95	95	95	95	95	**95**
Sheffield Tinsley	-	97	99	-	-	**98**
Southampton Centre	95	97	97	97	98	**97**
Stockport	-	98	97	99	98	**98**
Stoke-on-Trent Centre	94	97	97	98	98	**97**
Sunderland	-	-	-	79	-	**79**
Thurrock	95	92	95	95	92	**94**
Walsall Alumwell	-	98	-	-	-	**98**
Walsall Willenhall	-	69	-	-	-	**69**
West London	-	99	99	-	-	**99**
Wirral Tranmere	99	99	100	100	99	**99**
Wolverhampton Centre	99	98	98	87	98	**96**
N.IRELAND						
Belfast Centre	98	98	97	98	98	**98**
Belfast Clara St	-	-	-	-	96	**96**
Belfast East	-	-	-	99*	-	**99**
Derry	97	96	97	95	95	**96**
SCOTLAND						
Aberdeen	-	96	85	-	95	**92**
Edinburgh Centre	95	95	98	98	94	**96**
Glasgow Centre	98	58	97	95	97	**89**
Glasgow City	-	98	99	-	-	**98**
Glasgow Kerbside	-	98	98	-	98	**98**
WALES						
Cardiff Centre	98	97	93	90	98	**95**
Port Talbot	93	77	-	81	93	**86**
Swansea	98	98	95	98	97	**97**
Network Mean (%)	**94**	**91**	**94**	**94**	**96**	**94**

* Belfast East PM_{10} (BAM) data are provisional

Appendix A

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, October 2000

Computer software	A 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	1 intercalibration equipment set (includes mass flow controllers and read-out unit) A second intercalibration kit is under construction (October 2000) 3 UV photometers : *API model M401- purchased April 99* *ML model 9812 – purchased April 99* *API model 401 - purchased October 2000*
Zero air pumps	6 spare zero air pumps for routine maintenance/repair of zero air generators in the AUN

Appendix B

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. From October 2000, the recommendations have been prioritised as follows:

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

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

	Recommendations: October 1998		Action
1	Replace old teflon-coated sample manifolds at former SUN sites		Completed
2	Replace long sample line at Manchester Town Hall		Completed
3	Use of 1 micron sample filters on API ozone analysers		In-hand at DETR sites
4	Fitting all AUN sites with ladder securing clips		In hand
5	Improving access to PM_{10} head at Scunthorpe		No action (affiliated site)
6	Safer access to Walsall Alumwell		No action
7	Installing temperature probes at site without air-conditioning		Access to temp data from Ambirack site now possible
	Recommendations: April 2000		
8	Consideration could be given to up-grading the "older generation" Ambirack system at Coventry in view of the problems identified at the audit.		Plans are being considered to relocate the site and up-grade the analysers
	Recommendations October 2000	**Priority**	
9	The site at Walsall Alumwell should be moved from school roof to ground level in order to improve site access and safety.	Medium	
10	Safer access to PM_{10} head at Scunthorpe	Medium	
11	Safer access to PM_{10} head at Stockport. Check that the recent fire damage to the next door building has not reduced the structural integrity of the shared flat roof.	Medium	

12	The CO analyser at Birmingham is very noisy (outside the ±0.5ppm acceptance level) and should be considered for replacement/up-grade	Medium	

Appendix C

DRAFT PROCEDURES FOR AMBIVIEW OPERATION

This procedure must be used post service. The Ambirak should be in normal logging mode.

1. Minimise Ambilog.

2. From "Ambisoft Main Menu", open view data (one click as it is a button). Note - if Ambisoft main menu is not up, maximise it.

3. From Ambiview screen, select view, pull down menu.

4. From view, pull down menu select chart.

5. From pop-up box, select OK

   Note - the select data to view default to today, one minute files.
   The file will now load to the screen.

6. The traces in view can be reduced by clicking the select boxes on the legend section of the display, they may be re-instated by reverse operation.

7. A more detailed view can be obtained by moving the vertical bars and using the zoom button, or, press the zoom-in button, the then the ≤ (back) or ≥ (forward) to select the area of interest.

8. When finished, press close.

9. From the Ambiview screen, select file, then exit or use the standard windows close button.

10. From the background screen, maximise the Ambilog screen. Do not use the "Ambisoft Main Menu", as you will attempt to open 2 copies of Ambilog.