

School of
Biomedical &
Health Sciences

Environmental
Research Group



University of London

UK Automatic Urban Network London Air Quality Network Affiliated Sites

Management Report January to March 2009

**Prepared for the Department for Environment, Food and Rural
Affairs (DEFRA), Scottish Executive, Welsh Assembly Government
and the DoE in Northern Ireland**

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Table of Contents

1	Introduction	5
2	Routine Data Handling.....	5
2.1	Data Dissemination Performance.....	5
3	Quality Control / Quality Assurance (QA/QC).....	6
3.1	QA/QC Site Audits.....	6
4	Changes to sites affiliated to the AURN.....	7
5	Quarterly Data Capture Statistics	8
5.1	Camden Kerbside PM ₁₀ (FDMS) 9.4%.....	10
5.2	Camden Kerbside PM _{2.5} 43.3%.....	10
5.3	Haringey Roadside Nitrogen Dioxide 71.5%.....	10
5.4	Haringey Roadside PM ₁₀ 87.9%.....	10
5.5	Haringey Roadside PM _{2.5} 0%	11
5.6	Sandy Roadside PM _{2.5} 69.8%	11
5.7	Southwark Roadside - all analysers 0%.....	11
5.8	Stewartby Sulphur Dioxide 34.4%.....	11
6	Contact Information	12

List of Tables

Table 1:	Sites managed by King's which have been identified for affiliation to the AURN.....	7
Table 2:	Hourly data capture for January 2009	8
Table 3:	Hourly data capture for February 2009.....	8
Table 4:	Hourly data capture for March 2009	9
Table 5:	Hourly data capture for January to March 2009	9

1 Introduction

This report details the equipment performance for the AURN affiliate sites where the King's College London Environmental Research Group (ERG) is contracted as the Central Management Unit and Control Unit (CMCU) by Defra under contract number EPG 1/3/168. The report highlights issues causing data capture to fall below 90% during the period January to March 2009.

2 Routine Data Handling

The routine handling of data from the air sampling through to the dissemination of verified data to the QA/QC Unit is a multi stage process. Data is stored on site in either an external logging system or in individual, in-built analyser logging systems. This is the first stage of quality control as many loggers and analysers are capable of diagnosing faults and identifying them as non-ambient data. Data is collected every hour from each air quality monitoring site using the MONNET data handling software and transferred to an MS-SQL database. After data collection, files are placed in an import queue to await processing, in practice the processing power of the King's air quality server is such that files are processed in a matter of seconds. During this transfer process raw data is checked against algorithms to ensure data quality and data is scaled according to the last known calibration response. Both scaled and raw measurements are stored in the MS-SQL database, this ensures that data can be rescaled from the raw values if necessary.

Data is disseminated to the DDU on an hourly basis by email. Data collection calls are scheduled to complete within the first 20 minutes of each hour. This enables an email to be automatically assembled and dispatched at 27 minutes past the hour, arriving sufficiently early to update the National Air Quality Archive at 45 minutes past the hour.

Manual verification occurs twice daily, this aims to confirm valid data, record site events, identify and diagnose analyser faults.

Fifteen-minute mean measurements, including those diagnosed as non-ambient, are transferred to the QA/QC Unit at the start of each month in the format required. Data from the automatic overnight calibrations and routine LSO visits are also supplied.

2.1 Data Dissemination Performance

Between January and March 2009, ERG estimate that 98% of hourly emails arrived at the DDU to meet their timetabled requirements. Accurate figures of punctual e-mails can be obtained from the DDU.

3 Quality Control / Quality Assurance (QA/QC)

Sites affiliated to the AURN are operated in accordance with the Network Operations Manual and any additional QA/QC procedures requested. Through close liaison with the local authorities and the LSOs, the QA/QC unit is provided with unrestricted access to the monitoring sites.

3.1 QA/QC Site Audits

The following audits were carried out by the QA/QC Unit (AEA Energy and Environment) at AURN affiliated sites managed by King's during the first quarter of 2009.

Site	Equipment	Date
London Bexley		23/02/2009
Camden Kerbside		16/02/2009
Camden Kerbside	PM _{2.5}	25/02/2009
London Eltham		12/02/2009
Haringey Roadside		03/02/2009
Haringey Roadside	PM ₁₀ & PM _{2.5}	12/03/2009
London Haringey		03/02/2009
London Harrow Background		12/03/2009
London North Kensington		06/03/2009
London North Kensington	PM ₁₀	03/04/2009
Sandy Roadside		17/02/2009
Sandy Roadside	PM ₁₀ & PM _{2.5}	30/04/2009
Marylebone Road		17/02/2009
Marylebone Road	PM ₁₀ & PM _{2.5}	02/04/2009
Horley		04/02/2009
Tower Hamlets Roadside		25/02/2009
Stanford-le-Hope Roadside		23/04/2009
Stanford-le-Hope Roadside	PM ₁₀ & PM _{2.5}	23/04/2009

4 Changes to sites affiliated to the AURN

The AURN is in the process of reorganisation due to the requirements of the EU Directive on ambient air quality and cleaner air for Europe. This resulted in the de-affiliation of several sites from the LAQN at the end of March 2007 and the affiliation of several sites from networks managed by King's. The sites identified for affiliation to the AURN and the current status of each site is shown in Table 1

Site	Current Status
Horley	Affiliated 21/11/07
Stewartby	Affiliated 26/11/07
London Haringey (NO _x)	Affiliated 29/11/07
Stanford-Le-Hope Roadside	Affiliated 22/01/08
London Bexley (PM _{2.5} FDMS)	Affiliated 25/02/08
London Eltham (PM _{2.5} FDMS)	Affiliated 15/05/08
Sandy Roadside	Affiliated 28/07/08
London Bexley (PM _{2.5} FDMS)	Installed 20/10/08
London Harrow Background (PM _{2.5} FDMS)	Affiliated 16/12/08 (audit 12/03/09)
London North Kensington (PM _{2.5} FDMS)	Affiliated 17/12/08 (audit 06/03/09)
Sandy Roadside (PM _{2.5} FDMS)	Affiliated 27/01/09
Sandy Roadside (PM ₁₀ FDMS)	Affiliated 28/01/09
Haringey Roadside (PM ₁₀ FDMS)	Affiliated 18/02/09
Haringey Roadside (PM _{2.5} FDMS)	Affiliated 18/02/09
Camden Kerbside (PM ₁₀ FDMS)	Affiliated 19/02/09
Camden Kerbside (PM _{2.5} FDMS)	Affiliated 19/02/09
Marylebone Road (PM _{2.5} FDMS)	Installed 20/03/09
Marylebone Road (PM ₁₀ FDMS)	Installed 21/03/09
London North Kensington (PM ₁₀ FDMS)	Installed 31/03/09
Stanford-Le-Hope Roadside (PM _{2.5} FDMS)	Affiliated 01/04/09
Stanford-Le-Hope Roadside (PM ₁₀ FDMS)	Affiliated 01/04/09
Storrington Roadside	Awaiting site installation
Eastbourne Background	Awaiting site installation

Table 1: Sites managed by King's which have been identified for affiliation to the AURN

5 Quarterly Data Capture Statistics

Data capture rates for January, February and March are detailed in Table 2, Table 3 and Table 4. The data capture for each month was calculated from valid hourly averages, after excluding data lost due to calibration and the faults discussed. The overall data capture for the quarter January to March is detailed in the Table 5.

Specific issues affecting data collection and quality at each site are discussed in 5.1 to 5.8. Details of faults are specified where data capture falls below 90% for the quarter. Instruments affiliated or deaffiliated part way through the quarter also have data capture below 90% as this was calculated as a percentage of the whole quarter rather than since the affiliation date.

Site	Data Capture % for January 2009						
	CO	NO ₂	O ₃	PM ₁₀ (FDMS)	PM ₁₀ (TEOM)	PM _{2.5}	SO ₂
Camden Kerbside		89.7			98.9		
Haringey Roadside		99.3			98.0		
Horley		99.6					
London Bexley						81.7	
London Eltham		99.6	98.8			99.6	
London Haringey		99.9	99.7				
London Harrow Background						100.0	
Marylebone Road	99.3	99.5	99.5		85.1		99.5
North Kensington	99.3	99.5	97.9	95.0	99.2	92.2	99.2
Sandy Roadside		95.6		11.6		13.2	
Southwark Roadside		-			-		
Stanford-Le-Hope Roadside		94.6			99.9		99.6
Stewartby							99.2
Tower Hamlets Roadside	98.5	98.9					

Table 2: Hourly data capture for January 2009

Site	Data Capture % for February 2009						
	CO	NO ₂	O ₃	PM ₁₀ (FDMS)	PM ₁₀ (TEOM)	PM _{2.5}	SO ₂
Camden Kerbside		97.2		0	58.2	28.9	
Haringey Roadside		53.3		36.6	33.3		
Horley		99.0					
London Bexley						96.9	
London Eltham		95.7	97.5			81.7	
London Haringey		99.1	98.8				
London Harrow Background						100.0	
Marylebone Road	95.1	99.0	92.1		98.2		98.8
North Kensington	99.6	99.6	99.6		99.0	99.6	99.4
Sandy Roadside		92.4		95.1		99.1	
Southwark Roadside		-			-		
Stanford-Le-Hope Roadside		99.1			99.6		99.1
Tower Hamlets Roadside	99.3	99.4					

Table 3: Hourly data capture for February 2009

Site	Data Capture % for March 2009						
	CO	NO ₂	O ₃	PM ₁₀ (FDMS)	PM ₁₀ (TEOM)	PM _{2.5}	SO ₂
Camden Kerbside		99.7		27.4		99.6	
Haringey Roadside		60.2		94.1			
Horley		99.6					
London Bexley						98.9	
London Eltham		98.9	98.3			100.0	
London Haringey		99.7	99.7				
London Harrow Background						85.0	
Marylebone Road	98.8	98.8	82.5	33.2	63.7		98.8
North Kensington	98.8	98.8	98.9		92.9	98.9	98.8
Sandy Roadside		95.4		100.0		100.0	
Southwark Roadside		-			-		
Stanford-Le-Hope Roadside		95.4			98.5		95.4
Tower Hamlets Roadside	99.3	99.5					

Table 4: Hourly data capture for March 2009

Site	Data Capture % for January to March 2009						
	CO	NO ₂	O ₃	PM ₁₀ (FDMS)	PM ₁₀ (TEOM)	PM _{2.5}	SO ₂
Camden Kerbside		95.5		9.4	52.2	43.3	
Haringey Roadside		71.5		43.8	44.1	0	
Horley		99.4					
London Bexley						92.4	
London Eltham		98.2	98.2			94.2	
London Haringey		99.6	99.5				
London Harrow Background						94.8	
Marylebone Road	97.9	99.1	91.3	11.4	81.8		99.0
North Kensington	99.2	99.3	98.8		96.9	96.8	99.1
Sandy Roadside		94.5		68.0	29.4	69.8	
Southwark Roadside		-			-		
Stanford-Le-Hope Roadside		96.3			99.3		98.1
Stewartby							34.4
Tower Hamlets Roadside	99.0	99.2					

Table 5: Hourly data capture for January to March 2009

5.1 Camden Kerbside PM₁₀ (FDMS)

9.4%

17th to 19th February 2009

129 Hours

Air Monitors attended to upgrade the TEOM to FDMS. Some initial work was carried out on 17th February. The commissioning of the analyser was completed on 19th February due to the site being inaccessible on 18th February.

19th February to 23rd March 2009

687 Hours

The measurements from the upgraded FDMS instrument were noisy and unstable and did not match well with other sites. The LSO attended to change both the purge and microbalance filters on 23rd February but this did not resolve the problem. On 25th February the LSO attended again to check that the data was not affected by the aethalometer attached to the auxiliary flow line, however, the measurements were still noisy following this investigation.

A callout was issued to Air Monitors on 3rd March due to the fact that the noisy data started after the FDMS upgrade. The engineer attended on 10th March and the sensor board was tuned but it was also recommended that if the fault persisted, the amplifier board in the TEOM would need to be tuned by the current TEOM ESU. As the measurements showed no sign of improvement, these recommendations were forwarded to the TEOM ESU who attended on 23rd March to tune the amplifier in the sensor unit, following which the noise was reduced and the measurements matched much better with other sites.

5.2 Camden Kerbside PM_{2.5}

43.3%

The instrument was installed on 19th February 2009

5.3 Haringey Roadside Nitrogen Dioxide

71.5%

3rd to 11th February 2009

184 Hours

The converter efficiency was found to be 94.8% at the audit on 3rd February. The converter was repaired at the service. The measurements between the audit and service have been set for review by the QAQC unit. Some measurements prior to the audit may also need to be excluded by the QAQC unit during ratification.

11th to 16th February 2009

119 Hours

Shortly after the service, the measurements became unresponsive to expected ambient concentrations, reading close to the instrument baseline. A callout was issued on 13th February and the engineer returned to site on 16th February. He found that a fault had developed with the sample bench fan and was repaired.

19th to 31st March 2009

295 Hours

The measurements again became unresponsive, reading close to the instrument baseline on 19th March and a callout was issued to the ESU. However, the measurements improved on 20th March so the callout was cancelled. The fault resumed on Saturday 21st March and the callout was re-issued on 24th March.

The engineer attended site on 25th March but was unable to resolve the fault. The ESU returned with parts for the analyser on 31st March and completed the repair by replacing the temperature sensor, temperature regulator and fan.

5.4 Haringey Roadside PM₁₀

87.9%

3rd to 11th February 2009

183 Hours

The audit on 3rd February found the total flow to be 55% too low, indicating a major leak on the main and auxiliary flow. The ESU repaired the leaks at the service. The engineer found that there were leaks at the analyser fittings and the seals were replaced. The measurements between the audit and service have been set for review by the QAQC unit. It is likely that further measurements prior to the audit will also need to be excluded by the QAQC unit during ratification.

18th February 2009

1 Hour

A new FDMS was installed by Air Monitors and the TEOM was removed.

12th to 14th February 2009

43 Hours

The pre-affiliation check was carried out on the new FDMS on 12th March. The instrument was slow to recover with volatile PM measurements remaining lower than other sites for some time after the audit. The measurements recovered to normal levels without any further intervention.

5.5 Haringey Roadside PM_{2.5}

0%

18th February to 1st April 2009

1020 Hours

The instrument was installed by Air Monitors on 18th February. Following the installation, the measurements were noisy and not matching well with other sites. The purge and microbalance filters were changed on 26th February but this did not improve the noise issue. A callout was issued to Air Monitors on 3rd March. They requested that the filters should be changed again by the LSO, which was done on 6th March. However, there was still no improvement seen in the measurements.

The engineer from Air Monitors attended site on 11th March but the measurements continued to be noisy and unstable. Air Monitors were asked to return on 12th March. A visit was scheduled for 23rd March although at this time there appeared to be some improvement in the data. The noisy measurements returned soon after and Air Monitors attended to swap the TEOM sensor and control unit on 1st April. After this, the measurements were much improved and matched well with other sites.

5.6 Sandy Roadside PM_{2.5}

69.8%

The instrument was installed on 17th February 2009.

5.7 Southwark Roadside - all analysers

0%

The site is currently closed for relocation.

5.8 Stewartby Sulphur Dioxide

34.4%

The site was decommissioned on 1st February as the source of the sulphur dioxide that was being monitored is no longer present.

6 Contact Information

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