

School of  
Biomedical &  
Health Sciences

Environmental  
Research Group



University of London

# **UK Automatic Urban Network London Air Quality Network Affiliated Sites**

## **Management Report April to June 2009**

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

**August 2009**

<b>Title</b>	UK Automatic Urban Network London Air Quality Network Affiliated Sites Management Report, April to June 2009
--------------	--

<b>Customer</b>	Department for Environment, Food and Rural Affairs (DEFRA), Scottish Executive, Welsh Assembly Government and the DoE in Northern Ireland
-----------------	---

<b>Customer Ref</b>	EPG 1/3/168
---------------------	-------------

<b>File Reference</b>	ERG\Airquali\London\DEFRA\Report\2009
-----------------------	---------------------------------------

<b>Report Number</b>	KCLERG\MT\DEFRA\CMCU\Q12009
----------------------	-----------------------------

Environmental Research Group King's College London 4th Floor Franklin-Wilkins Building 150 Stamford St London SE1 9NH Tel 020 7848 4044 Fax 020 7848 4045
--

	<b>Name</b>	<b>Signature</b>	<b>Date</b>
--	-------------	------------------	-------------

<b>Author</b>	Louise Meston		August 2009
---------------	---------------	--	-------------

<b>Reviewed by</b>	David Green		August 2009
--------------------	-------------	--	-------------

<b>Approved by</b>	Gary Fuller		August 2009
--------------------	-------------	--	-------------

## Table of Contents

<b>1</b>	<b>Introduction .....</b>	<b>5</b>
<b>2</b>	<b>Routine Data Handling.....</b>	<b>5</b>
2.1	Data Dissemination Performance.....	5
<b>3</b>	<b>Quality Control / Quality Assurance (QA/QC).....</b>	<b>6</b>
3.1	QA/QC Site Audits.....	6
<b>4</b>	<b>Changes to sites affiliated to the AURN.....</b>	<b>7</b>
<b>5</b>	<b>Quarterly Data Capture Statistics .....</b>	<b>8</b>
5.1	Camden Kerbside PM <sub>10</sub> 82.9% .....	9
5.2	London Bexley PM <sub>2.5</sub> 78.6%.....	10
5.3	Marylebone Road PM <sub>2.5</sub> 64.1% .....	10
5.4	North Kensington PM <sub>10</sub> 86.1% .....	10
5.5	Sandy Roadside Nitrogen Dioxide 87.3% .....	11
5.6	Sandy Roadside PM <sub>2.5</sub> 89.7% .....	11
5.7	Southwark Roadside - all analysers 0%.....	11
5.8	Stanford-Le-Hope Roadside PM <sub>10</sub> 49.4% .....	11
5.9	Stanford-Le-Hope Roadside PM <sub>2.5</sub> 81%.....	12
5.10	Tower Hamlets Roadside Carbon Monoxide 78.8%.....	12
<b>6</b>	<b>Contact Information .....</b>	<b>13</b>

## List of Tables

Table 1:	Quarter 2 audit dates .....	6
Table 2:	Sites managed by King's which have been identified for affiliation to the AURN.....	7
Table 3:	Hourly data capture for April 2009 .....	8
Table 4:	Hourly data capture for May 2009 .....	8
Table 4:	Hourly data capture for June 2009 .....	9
Table 5:	Hourly data capture for April to June 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 April to June 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 April and June 2009, ERG estimate that 99% 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

There were no audits 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. However, pre-affiliation checks were carried out on the following newly installed instruments:

Site	Equipment	Date
Marylebone Road	PM <sub>10</sub> & PM <sub>2.5</sub>	02/04/2009
London North Kensington	PM <sub>10</sub>	03/04/2009
Stanford-le-Hope Roadside	PM <sub>10</sub> & PM <sub>2.5</sub>	23/04/2009
Sandy Roadside	PM <sub>10</sub> & PM <sub>2.5</sub>	30/04/2009

Table 1: Quarter 2 audit dates

## 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 September 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

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

Table 2: Sites managed by King's which have been identified for affiliation to the AURN

## 5 Quarterly Data Capture Statistics

Data capture rates for April, May and June 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 April to June is detailed in the Table 5.

Specific issues affecting data collection and quality at each site are discussed in 5.1 to 5.10. 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 April 2009						
	CO	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub> (FDMS)	PM <sub>10</sub> (TEOM)	PM <sub>2.5</sub>	SO <sub>2</sub>
Camden Kerbside		99.4		83.3		99.3	
Haringey Roadside		99.7		99.6		96.8	
Horley		99.6					
London Bexley						74.4	
London Eltham		92.6	93.1			76.0	
London Haringey		81.7	97.5				
London Harrow Background						81.5	
Marylebone Road	99.4	99.4	79.9	97.6			99.3
North Kensington	99.3	99.6	99.6	98.9		99.9	99.2
Sandy Roadside		95.6		98.2		96.8	
Southwark Roadside		-		-			
Stanford-Le-Hope Roadside		98.3		1.8	1.8	96.9	99.6
Tower Hamlets Roadside	99.3	99.7					

Table 3: Hourly data capture for April 2009

Site	Data Capture for May 2009						
	CO	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub> (FDMS)	PM <sub>10</sub> (TEOM)	PM <sub>2.5</sub>	SO <sub>2</sub>
Camden Kerbside		99.5		91.4		90.6	
Haringey Roadside		99.7		99.6		100.0	
Horley		99.7					
London Bexley						98.1	
London Eltham		99.2	99.3			100.0	
London Haringey		99.9	99.7				
London Harrow Background						99.9	
Marylebone Road	92.9	93.6	93.6	91.5		91.7	93.4
North Kensington	99.2	99.6	96.8	75.3		93.3	97.9
Sandy Roadside		93.3		83.1		80.4	
Southwark Roadside		-		-			
Stanford-Le-Hope Roadside		99.1		90.5		91.0	99.5
Tower Hamlets Roadside	63.4	98.7					

Table 4: Hourly data capture for May 2009



Site	Data Capture for June 2009						
	CO	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub> (FDMS)	PM <sub>10</sub> (TEOM)	PM <sub>2.5</sub>	SO <sub>2</sub>
Camden Kerbside		98.1		73.8		86.4	
Haringey Roadside		99.3		99.9		99.9	
Horley		99.7					
London Bexley						62.5	
London Eltham		99.6	99.7			99.7	
London Haringey		99.4	99.6				
London Harrow Background						92.2	
Marylebone Road	99.6	99.7	99.3	99.9		99.6	99.2
North Kensington	99.3	83.1	99.6	84.6		99.6	99.3
Sandy Roadside		72.9		92.9		92.2	
Southwark Roadside		-		-			
Stanford-Le-Hope Roadside		74.7		52.8		54.7	76.4
Tower Hamlets Roadside	74.2	99.7					

Table 5: Hourly data capture for June 2009

Site	Data Capture for April to June 2009						
	CO	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub> (FDMS)	PM <sub>10</sub> (TEOM)	PM <sub>2.5</sub>	SO <sub>2</sub>
Camden Kerbside		99.0		82.9		92.1	
Haringey Roadside		99.6		99.7		98.9	
Horley		99.8					
London Bexley						78.6	
London Eltham		97.2	97.4			92.0	
London Haringey		93.8	99.0				
London Harrow Background						91.3	
Marylebone Road	97.3	97.5	90.9	96.3		64.1	97.3
North Kensington	99.3	94.1	98.6	86.1		97.5	98.8
Sandy Roadside		87.3		91.3		89.7	
Southwark Roadside		-		-			
Stanford-Le-Hope Roadside		90.9		48.8	0.6	81.0	92.0
Tower Hamlets Roadside	78.8	99.4					

Table 6: Hourly data capture for April to June 2009

### 5.1 Camden Kerbside PM<sub>10</sub>

**82.9%**

11<sup>th</sup> to 16<sup>th</sup> April 2009

117 Hours

The volatile measurements did not match well with other sites, the FDMS measuring lower volatile particulate than expected. The elevated measurements settled without any action being taken. The measurements have been set for review with the final decision to be made by the QAQC unit.

12<sup>th</sup> to 16<sup>th</sup> June 2009

95 Hours

The instrument took some time to settle after a filter change with the volatile measurements not matching other sites. Again the readings settled without any intervention and have been set for review by the QAQC unit.

24<sup>th</sup> May onwards

The site has been affected by overheating due to a fault with, and the eventual failure of, the air conditioning unit. The measurements from the FDMS showed temperature faults during hot weather and where faults were not flagged, some of the measurements were noisy or unstable coinciding with elevated cabin temperatures. Unstable readings including those flagged with a temperature fault were excluded.

## 5.2 London Bexley PM<sub>2.5</sub>

78.6%

11<sup>th</sup> to 17<sup>th</sup> April 2009

152 Hours

The volatile measurements from the FDMS became elevated compared to other sites. The LSO attended to change the filter and the measurements returned to expected levels. The measurements have been set for review by the QAQC unit.

26<sup>th</sup> to 28<sup>th</sup> April 2009

30 Hours

The measurements became noisy and unstable but settled without any intervention.

6<sup>th</sup> May 2009

7 Hours

There was a brief spell of noise in the measurements, they returned to normal without any intervention.

15<sup>th</sup> June 2009

14 Hours

Some erratic readings were recorded which settled without any action required.

20<sup>th</sup> to 30<sup>th</sup> June 2009

251 Hours

The volatile measurements became elevated compared to other sites. This was resolved when the filter was changed by the LSO. The measurements have been set for review by the QAQC unit.

## 5.3 Marylebone Road PM<sub>2.5</sub>

64.1%

1<sup>st</sup> April to 1<sup>st</sup> May 2009

728 Hours

Following the installation, the volatile measurements did not match well with other sites, with the FDMS measuring less volatile particulate than expected. On 9<sup>th</sup> April, the ESU which installed the instrument was asked to investigate. After some checks on the instrument remotely, an engineer attended site on 15<sup>th</sup> April where they adjusted the configuration of the cooler pipes.

The volatile measurements continued to differ from other sites so the ESU returned again on 20<sup>th</sup> April to replace the dryer. Unfortunately this did not resolve the fault. On 29<sup>th</sup> April, the ESU replaced the sensor unit and after a period where the measurements were settling, the volatile measurements agreed much more closely with other sites.

## 5.4 North Kensington PM<sub>10</sub>

86.1%

3<sup>rd</sup> April

7 Hours

A pre-affiliation check was carried out on 3<sup>rd</sup> April. Subsequent measurements were excluded until matching with other sites.

6<sup>th</sup> to 10<sup>th</sup> May 2009

99 Hours

The volatile measurements took some time to settle following a filter change. The measurements returned to expected levels gradually without any action required.

12<sup>th</sup> May 2009

15 Hours

A fault developed, possibly due to a power issue at site. The non-volatile and PM<sub>10</sub> measurements became low and unresponsive. The LSO attended and rebooted the analyser, following which the readings returned to expected levels.

27<sup>th</sup> to 30<sup>th</sup> May 2009

69 Hours

A leak check was carried out by the LSO due to concerns that the PM<sub>10</sub> measurements from the FDMS seemed low compared to the measurements from the co-located TEOM. No leak was found but the volatile measurements took some time to settle after the check. Measurements were from the FDMS were excluded until matching other sites.

3<sup>rd</sup> to 7<sup>th</sup> June 2009

90 Hours

The volatile measurements did not match other sites following a filter change. Measurements were excluded until the volatile reading returned to normal.

## 5.5 Sandy Roadside Nitrogen Dioxide

87.3%

23<sup>rd</sup> to 24<sup>th</sup> May 2009

18 Hours

The instrument flagged a temperature fault and additional measurements were excluded as levels appeared elevated whilst the room temperature remained high.

Further temperature faults occurred the following day.

4<sup>th</sup> June 2009

13 Hours

The analyser was again affected by elevated cabin temperatures, leading to a temperature fault. The LSO went to site and found that the air conditioning unit had frozen up following servicing. After turning it off for a few hours, the air conditioning unit was then functioning correctly.

24<sup>th</sup> June to 1<sup>st</sup> July 2009

165 Hours

The measurements became elevated following a site visit on 24<sup>th</sup> June. The LSO returned to site to check the analyser on 25<sup>th</sup> June but could not find any problems with the sample line or inlet. A callout was issued to the ESU who attended on 1<sup>st</sup> July to find that the filter housing was loose. The measurements returned to expected levels following the ESU visit.

## 5.6 Sandy Roadside PM<sub>2.5</sub>

89.7%

21<sup>st</sup> April to 5<sup>th</sup> June 2009

437 Hours

The instrument was affected by high cabin temperatures. Intermittent temperature faults were flagged and measurements were erratic and unstable during warmer weather. The LSO arranged for the air conditioning to be serviced, which was carried out on 3<sup>rd</sup> June. However, another fault developed after the service and the air conditioning unit was found to be frozen up. After turning the air conditioning off for a few hours, it was then functioning correctly.

## 5.7 Southwark Roadside - all analysers

0%

The site is currently closed for relocation.

## 5.8 Stanford-Le-Hope Roadside PM<sub>10</sub>

49.4%

The TEOM was upgraded to an FDMS on 1<sup>st</sup> April

1<sup>st</sup> to 30<sup>th</sup> April 2009

692 Hours

The pre-affiliation check carried out on 23<sup>rd</sup> April found that the pump vacuum was too low and the inlet was higher than the surrounding tube. The ESU who installed the FDMS attended site on 30<sup>th</sup> April to address the faults. The measurements between the installation and repair have been set for review by the QAQC unit.

2<sup>nd</sup> May to 1<sup>st</sup> July

632 Hours

The instrument was affected by high cabin temperatures. The analyser flagged intermittent temperature faults and measurements were erratic and unstable. The air conditioning unit was serviced on 18<sup>th</sup> June and the measurements looked improved.

Another fault occurred on 24<sup>th</sup> June and the LSO attended to find the air conditioning was blowing hot air. The FDMS was turned off until the air conditioning could be repaired. The air conditioning unit was repaired on 30<sup>th</sup> June.

*30<sup>th</sup> June to 1<sup>st</sup> July*

*17 Hours*

When the FDMS was turned back on after the air conditioning repair, the measurements were low and unresponsive. The LSO found that it was stuck in the reference cycle and rebooting the analyser did not resolve the fault. A callout was issued to the ESU.

#### **5.9 Stanford-Le-Hope Roadside PM<sub>2.5</sub>**

**81%**

*2<sup>nd</sup> May to 30<sup>th</sup> June*

*626 Hours*

The instrument was affected by intermittent temperature faults due to a problem with the air conditioning unit as described above for the PM<sub>10</sub>.

#### **5.10 Tower Hamlets Roadside Carbon Monoxide**

**78.8%**

*1<sup>st</sup> May 2009*

*3 Hours*

The ESU were called out to investigate the rapidly drifting measurement baseline of the analyser. The engineer attended on 1<sup>st</sup> May to carry out the repair.

*9<sup>th</sup> May 2009*

*9 Hours*

The site was affected by a power cut and the measurements from the carbon monoxide analyser took some time to stabilise after the power was restored.

*19<sup>th</sup> May 2009*

*3 Hours*

The ESU attended again due to continued concerns about the rapid drift of the instrument baseline.

*21<sup>st</sup> May to 8<sup>th</sup> June 2009*

*430 Hours*

The measurements from the analyser became very noisy and unstable on 21<sup>st</sup> May. The ESU were contacted and they requested the analyser diagnostic values. The readings stabilised for a couple of days but the noise and instability returned on 26<sup>th</sup> May. The ESU attended on 28<sup>th</sup> May to remove the instrument to the workshop for repair. It was returned to site on 8<sup>th</sup> June.

## **6 Contact Information**

### **Project Director**

Gary Fuller

Air Quality Manager

Email: [Gary.Fuller@erg.kcl.ac.uk](mailto:Gary.Fuller@erg.kcl.ac.uk)

Telephone: 020 7848 4019

### **Project Manager**

David Green

Deputy Air Quality Manager

Email: [David.Green@erg.kcl.ac.uk](mailto:David.Green@erg.kcl.ac.uk)

Telephone: 020 7848 4035

Day-to-day operational issues can be directed to the ERG Duty Officer by telephone on 020 7848 4022 or by Email on [airquality@erg.kcl.ac.uk](mailto:airquality@erg.kcl.ac.uk)