1.   Introduction

This is the ninth report to Defra and indicates the progress made to date, covering the period December 2003 – February 2004. It provides summary statistics and data capture rates. Where significant amounts of data are missing the reasons for these are given together with details of any remedial action taken.

2.   Sampling Locations and Details

Instruments are located at 11 established sites, ten of which form part of Defra's Automatic Urban and Rural Monitoring Network either directly or through affiliation, and one (Harwell Organic) which is part of the Automatic Hydrocarbon Monitoring Network. The sites are:

- Belfast Centre (Urban Centre, O.S Grid ref J339744)
- Birmingham Centre (Urban Centre, O.S Grid ref SP064868)
- Glasgow Centre (Urban Centre, O.S Grid ref NS589650)
- Harwell Inorganic (Rural, O.S Grid ref SU474863)
- Harwell Organic (Rural, O.S Grid ref SU 474863)
- London Bloomsbury (Urban Centre, O.S Grid ref TQ302820)
- London Kensington (Urban Centre, O.S Grid ref TQ240817)
- London Marylebone Rd (Urban Kerbside, O.S Grid ref TQ281820)
- Manchester Piccadilly (Urban Centre, O.S Grid ref SJ843983)
- Port Talbot (Urban Centre, O.S Grid ref SS780882)
- Rochester (rural, O.S Grid ref TQ831762)

Table 1 details the location of the monitoring equipment.

Table 1   Location of monitoring equipment

Site	PM$_{2.5}$ Partisol	PM$_{2.5}$ TEOM	PM$_{10}$ Partisol	PM$_{10}$ TEOM	PM$_{10}$ Sulphate	PM$_{10}$ Carbon	PM$_{2.5}$ Nitrate	SMPS	CPC	Met Sensor
Belfast Centre	*			*	√	√	√		√	
Birmingham Centre	*			*					√	
Glasgow Centre	*		*	*					√	
Harwell (Inorganic)		√		√				√		√
Harwell (organic)					√	√	√			
London Bloomsbury		√		*				√	√	
London Kensington	*			*	√	√			√	
London Marylebone Rd		√		*	√	√		√		
Manchester Piccadilly	*		*	*					√	
Port Talbot	*			*					√	
Rochester		√		*						√ [1]

*   Monitoring equipment operating under AURN contract

[1]   Local authority owned equipment

3.   Data Capture

3.1   TEOM

Data capture statistics for PM_{10} and $PM_{2.5}$ mass concentrations are presented in Table 2 for each of the monitoring sites.

Table 2   Monthly particle mass data capture (%)
Dec 2003 – Feb 2004

	PM_{10}				$PM_{2.5}$			
	LM[1]	LB[2]	RO	HAR	LM	LB	RO	HAR
Dec	99	99	100	100	98	97	99	99
Jan	95	96	100	99	96	96	100	98
Feb	92	100	99	96	100	100	99	97
Quarter	98	98	100	98	98	98	99	98

(1) PM_{10} data from Marylebone Rd is available as part of the London Network, which is operated
       by seiph (ERG). Casella Stanger do not report these data directly.
(2)   London Bloomsbury PM_{10}, and Harwell PM_{10} are operated under DEFRA's
       AURN contract.

Data capture from the TEOM instruments was high, with few significant losses occurring

3.2   SMPS

Table 3   SMPS particle count data capture (%) at London Bloomsbury,
Marylebone Rd and Harwell, Dec 2003 – Feb 2004

	Bloomsbury	Marylebone Rd	Harwell
Dec	60	74	50
Jan	64	75	84
Feb	61	95	14
Quarter	64	81	50

All SMPS operated fairly well throughout the quarter achieving relatively high data capture for these instruments. The exception to this was at Harwell during February, when recurrent software failures resulted in large periods of missing data.

3.3 CPC

Table 4 CPC particle count data capture (%) at the seven monitoring sites, Dec 2003 – Feb 2004

	CPC						
	Co-Loc	**Belf**	**Man Pic**	**Birm**	**Port Talbot**	**Glasgow**	**N Kens**
Dec	78	100	78	0	89	0	73
Jan	69	100	69	50	100	0	72
Feb	60	100	0	100	100	0	78
Quarter	69	100	50	50	98	0	75

Co-located CPC operated well although some data had to be recovered from a failed computer.

Belfast's instrument performed exceptionally well with no faults during the quarter. High data capture was maintained throughout the previous year.

Manchester CPC Was serviced resulting in a long period of missing data.

Birmingham Centre's CPC was out of service throughout December and into January due to a slow repair following a pump fault.

The Port Talbot CPC performed very well throughout the quarter.

The Glasgow CPC suffered from a fault which gave flat data whilst giving a graphical display which looked reasonable at a glance. This problem was not identified immediately as the local operators did not supply regular data updates.

North Kensington's CPC has functioned fairly well through the quarter.

3.4   Sulphate Partisol

**Table 5   Particulate sulphate data capture (%)
          Dec 2003 – Feb 2004**

Site	Data capture
North Kensington	89
Marlyebone Road	39
Belfast	97
Harwell	92

Data capture is based on available exposure data, as filter analysis results are not yet available for the whole period.

Flow faults again caused Marylebone Rd instrument to halt sampling. This Partisol has been consistently unreliable and ways to stop the problem are being investigated by the equipment support unit. North Kensington's Partisol also experienced flow problems during the quarter but to a much lesser extent.

3.5   Carbon Particulate Monitor

Table 6   Carbon particulate data capture (%)
     Dec 2003 – Feb 2004

Site	December	January	February	Average
Belfast Centre	50	87	99	79
Harwell	30	77	0	36
London Marylebone Road	0	0	73	24
London North Kensington	51	78	12	47

Belfast Centre

Prior to 8th January 2004, there was a leak in collector B, resulting in the collection of only channel A data. This was fixed on 8th January, beyond which time the instrument performed well.

Harwell

Prior to the 12th January, a series of malfunctions led to the removal of data during the ratification phase. Between 12th January and 3rd February, the instrument was performing in such a way that the total carbon data is available, but the EC and OC speciation data is not. Subsequent to the 8th February, the instrument has performed well.

London Marylebone Road

Prior to the 31st December, sample line B performed well, however the sample flow through channel A was slightly high (yet the instrument still reported OK status codes), resulting in the capture of only 50 % data. The instrument then performed well until a major power failure at the site on 25th January led to the carbon monitor being switched off until 26th February, when it was declared safe to continue the experiments.

London North Kensington

A power failure on 12th December caused the instrument to lose all data in December prior to the 12th. From 12th December to 31st December, channel A performed well, however collector B had a temperature problem. This was fixed on the 31st December, beyond which point the instrument ran well until the CO_2 detector went out of range on the 25th January.

3.6   Nitrate Particulate Monitor

**Table 7   Nitrate particulate data capture (%)
               June - August 2003**

Site	December	January	February	Average
Belfast Centre	60	61	81	49
Harwell	60	60	83	68

Belfast

The instrument generally performed excellently. Gaps in the data were caused by communications failure to the instrument at the site, and so it was not possible to download the data even though the instrument was working. R&P have released updated software, and this problem is no longer occurring.

Harwell

The instrument generally performed well. Gaps in the data were caused by communications failure to the instrument at the site, and so it was not possible to download the data even though the instrument was working. R&P have released updated software, and this problem is no longer occurring. Problems were also encountered in delivering nitrogen to the site owing to the increased police security at the site, accounting for the very low data capture in January.

4   Summary Data and Statistics

4.1   Particle Mass concentration

**Table 8   Average particle mass concentration (μg m^{-3}),
December 2003 – February 2004**

	PM$_{10}$	PM$_{2.5}$	PM$_{coarse}$
Harwell	17.4	12.0	5.4
London Bloomsbury	24.3	14.0	10.3
Marylebone Road	38.4	15.9	22.5
Rochester	21.3	12.7	8.6

- PM$_{coarse}$ is defined as PM$_{10}$ – PM$_{2.5}$

Course fraction shows great variation from site to site ranging from 31 – 59% of the total PM10. Interestingly, this is highest in the urban sites possibly due to re suspension during the prolonged dry period. During wetter Autumn weather, these figures drop to 23 – 40% although overall PM10 levels are relatively unchanged

4.2 CPC vs SMPS measurements (London Bloomsbury)

The CPC spent this quarter at London Bloomsbury, the following table shows ratios between total count as measured by the stand alone CPC and SMPS system

	CPC	SMPS	Ratio
Dec	30,596	12031	2.5
Jan	29,091	14706	2.0
Feb	-	16316	-
Quarter	29,892	14,165	2.1

The ratio shown A significant increase since the last comparison although this has previously been shown to be variable.