1. Introduction

This is the sixth report to DEFRA and indicates the progress made to date, covering the period January - March 2003. 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 (%)
January - March 2003

	PM_{10}				$PM_{2.5}$			
	LM(1)	LB(2)	RO(3)	HAR	LM	LB	RO	HAR
January	98	99	-	100	100	99	99	99
February	99	100	34	99	99	99	96	100
March	99	98	21	100	100	96	100	100
Quarter	99	99	25	100	100	98	98	100
Running (Oct 01 – Mar 03)	94	97	69	99	98	97	90	99

(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.

(3) Rochester PM10 data provided by Medway District Council. Monitoring resumed 25/03/2003

Data capture from the TEOM instruments was high, with few significant losses occurring with the exception of Rochester's PM10 instrument which was out of action for most of the quarter. Although some data were obtained during February using a spare TEOM, the site was not fully reinstated until 25th March.

3.2 SMPS

Table 3 SMPS particle count data capture (%) at London Bloomsbury, Marylebone Rd and Harwell, January - March 2003

	Bloomsbury	Marylebone Rd	Harwell
January	91	97	75
February	99*	90	43
March	100*	83*	35
Quarter	97*	90*	51
Running (Oct 01 – Mar 03)	57	72	72

* Figures adjusted for servicing down time

Servicing of the London Bloomsbury SMPS took place between the 21st February and 28th March. Data capture outside of this period was generally good.

Apart from minor problems with software, data capture from Marylebone Rd was good up to the instrument being removed for service on the 17thMarch.

Harwell's SMPS had a number of problems during the quarter relating to computer software stopping logging between visits. This occurred on six separate occasions during the quarter. In an attempt to avert these software problems the system at Harwell will shortly be replaced with new Hardware and software, allowing better communications.

3.3 CPC

Table 4 CPC particle count data capture (%) at the seven monitoring sites, January - March 2003

	CPC						
	LB	**Belf**	**Man Pic**	**Birm**	**Port Talbot**	**Glasgow**	**N Kens**
January	97	-	-	18	86	72	100
February	-	-	94*	100	100	-	100
March	-	77*	99	100	100	-	38
Quarter	32	77*	97	73	95	72	79
Running (Oct 01 – Mar 03)	72	93	96	84	92	60	83

London Bloomsbury suffered a laptop failure, which resulted in loss of data until a replacement could be obtained. Prior to this, the CPC had been performing well.

Belfast's instrument service took a long time to complete resulting in the loss of data at the start of the year. Since re-installation, it has performed well.

Following a serious fault with the Manchester CPC during the last quarter, the instrument was serviced and returned in February.

Birmingham Centre experienced a large number of software related problems, during January, causing sampling to stop between sample runs. This was aggravated by power problems at the site. Data capture during the rest of the quarter was excellent.

The Glasgow CPC suffered an internal pump failure at the end of January and was returned to TSI Instruments (formerly BIRAL), for repair and annual service. Due to

the backlog of work from the routine service schedule, the analyser was not returned during this quarter.

North Kensington instrument operated very well until a pump failure in March. The instrument has been returned to TSI for repair.

3.4 Sulphate Partisol

Table 5 Particulate sulphate data capture (%)
January - March 2003

Site	Data capture
North Kensington	43
Marlyebone Road	21
Belfast	79
Harwell	39

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

A number of flow faults occurred at Harwell and a number of call outs where issued to try and remedy the problems. Ultimately, replacement of the instrument was the only successful course of action.

Marylebone Rd suffered ongoing data communication issues with the instruments. In addition, flow and filter exchange problems reduced overall data capture.

North Kensington's Partisol also experienced recurrent flow problems during the quarter.

3.5 Carbon Particulate Monitor

Table 6 Carbon particulate data capture (%)
January - March 2003

Site	January	February	March	Average
Belfast Centre	0	4	90	31
Harwell	100	82	100	94
London Marylebone Road	94	86	100	93
London North Kensington	93	89	93	92

The average data capture for this period at Harwell, London Marylebone Road and London North Kensington was above 90% in each case. The Marylebone Road unit underwent a major service starting on 30 January, and was out of service for 5 days accounting for the lower capture rates in these months.

Over the period 14 January to 19 March there are periods when data from the North Kensington unit look suspiciously low, particularly with respect to the organic carbon component. Whilst no significant faults were recorded by the instrument during this quarter it may be necessary to amend the statistics for this site after the data have been ratified.

The Harwell unit displayed a status condition which suggested there was a fault with the pinch valve from 1 January to 24 February. This problem was referred to

Rupprecht and Patashnick who suggested that it was unlikely to be a true fault but rather misalignment of microswitches designed to sense the status of the pinch valve. After adjustment of these on 24 February the error message disappeared, and on the advice from R&P no data were deleted.

The Belfast unit continued to suffer from problems with the sample and afterburner temperatures, and the sample flow problem identified in the previous report. Sample and afterburner heater lamps were replaced but the appropriate spares needed to restore proper flow were not available and had to be specially ordered from the manufacturers. In the meantime ETI managed to improve the flow sufficiently to give valid data and the unit operated in this state from 28 February to 28 March, when the flow eventually dropped below the acceptable minimum rate.

This unit has since undergone a major service and is now operating satisfactorily.

Table 7 Carbon particulate rolling average data capture from start of monitoring to 31 March 2003

Site	Data capture (%)
Belfast Centre	59
Harwell	81
London Marylebone Road	88
London North Kensington	98

The Carbon Particulate monitoring start dates for each site were:

Belfast Centre: 21 November 2001
Harwell: 14 February 2002
London Marylebone Road: 13 March 2002
London North Kensington: 13 March 2002

and data capture statistics have been prepared from these dates.

3.6 Nitrate Particulate Monitor

The difficulties with communications described in the previous report continued during this quarter, and it was not possible to remotely download the data. These units are configured to give 10 minute average samples and are therefore collecting considerably more data than the carbon units which are set to sample every 3 hours. Thus any problems which extend data download intervals beyond one week will result in data loss.

It was also clear that both units were unable to operate continuously for periods of more than a few days and the decision was taken to remove them from service so that they could be properly overhauled. This has now been completed and the instruments are working satisfactorily and data have been successfully downloaded.

Outside of this project there has been little or no experience in the UK of using these instruments in remote monitoring locations. They are state-of –the-art monitors which have inevitably required considerable time and effort to develop into reliable monitoring systems, but which are now producing good data.

4 Summary Data and Statistics

4.1 Particle Mass concentration

Table 8 Average particle mass concentration (μg m^{-3}), January - March 2003

	PM_{10}	**$PM_{2.5}$**	**PM_{coarse}**
Harwell	15.6	12.5	3.1
London Bloomsbury	33.7	15	18.7
Marylebone Road	39	20.1	18.9
Rochester	28.1	13.3	14.8

- PM_{coarse} is defined as $PM_{10} – PM_{2.5}$

Note that with the exception of Harwell, there was a marked increase in coarse fraction and PM10 during the quarter. This trend was seen at Harwell, although to a lesser extent.

4.2 CPC vs SMPS measurements (London Bloomsbury)

Due to routine instrument servicing and data collection problems, it is not relevant to make a comparison of the CPC and SMPS during this quarter.