

**London Air Quality Network:
Ratification Report for
July to December 1999**

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by

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1. INTRODUCTION

This report has been prepared for the Department of the Environment, Transport and the Regions by NPL under contract EPG 1/3/123. It covers the ratification of data in the London Air Quality Network relating to the period July to December 1999.

The ratified data capture percentages and specific problems at sites are presented in this report.

2. RATIFICATION PROCEDURE

The data received by NPL from the CMCU were processed and scaled according to calibrations carried out by the Local Site Operators every two weeks, and by NPL on a three monthly basis. The results of these NPL field calibrations are reported to the Department separately.

During an NPL intercomparison ozone analyser accuracy is quantified with a transfer standard photometer, NO_x, CO and SO₂ analyser calibration responses are measured with gas mixtures - certified against primary standard gases at NPL. Analyser linearities are determined by multi-point dilution of a high concentration mixture with zero air. Particulate analysers are calibrated with traceable pre-weighed masses, and sample and bypass flow rates are measured.

The data ratification process takes account of all relevant data from LSO's, NPL and Equipment Service Unit calibrations. The optimum time-varying set of analyser response functions are determined and then applied to raw data to produce the ratified data set. The causes of gaps in the new data set are identified and periods for which analyser responses are seen to be unstable or changing rapidly are deleted.

3. DATA CAPTURE

The percentage data capture at each site for each pollutant is given in Table 1.

Table 1: Data capture for July to December 1999

Site Name	Percentage Data Capture by Pollutant					
	O ₃	NO _x	SO ₂	CO	PM ₁₀	Mean
Bromley		96		99		98
Camden		98			97	98
Eltham	99	98	88		98	96
Hackney	92	92		90		91
Haringey 1		98			95	97
Haringey 2	98					98
Hounslow		86		87		87
Kensington and Chelsea	99	94	99	98	98	98
Lewisham	83	92	97			91
Marylebone Road	98	92	98	97	98	93
Southwark 1	98	90	92	99		95
Southwark 2		36	78	99		71
Sutton 1		95	99	99	97	98
Sutton 3	99	91				95
Tower Hamlets		98		99		99
Wandsworth 2	99	95				97
Mean	96	90	93	96	97	

4. GENERIC REASONS FOR ABSENT RATIFIED DATA

We distinguish three general categories for ratified data loss:

4.1 ABSENT UNRATIFIED DATA

During periods of power failure, telecommunications failure, instrument calibration and repair, or other similar circumstances, clearly there is no “raw” data to ratify, and this will be reflected directly in the data capture. Such instances are described below as periods for which data was not received by the QA/QC Unit. Typically the reasons are not investigated, as this is more of a matter for the CMCU.

4.2 ISOLATED INSTRUMENT MALFUNCTIONS

From time to time most instruments will produce some data that cannot be ratified with sufficient confidence due to an analyser problem, leaking pipework etc that is not readily apparent remotely. In these cases the problem is usually noticed at a visit by the LSO or QA/QC Unit, then reported and remedied. As LSO visits on the London Network are fortnightly (and QA/QC Unit visits quarterly) this can lead to periods of data lasting several weeks being deleted. The crucial elements in minimising data loss are experience in recognising the problems, clear communication of the problem to the CMCU, and prompt remedial action. To a limited extent the experience of these problems can be used to modify LSO, CMCU, ESU or QA/QC Unit procedures, or extend the training of LSOs.

4.3 RECURRENT INSTRUMENT MALFUNCTIONS

In some instances, the cause of ratified data loss is an underlying problem which can be predicted to recur, and preventative action can therefore be recommended.

5. SPECIFIC PROBLEMS AT SITES

The sites with data capture of less than 90% for any pollutant are listed here and reasons are given for the absence of the data.

Every site measuring NO_x showed a fault from 19 - 21 November, 48 hours of data were deleted from every site because the raw data from the NO_x and NO channels of each analyser were identical.

Eltham (SO₂ 88 % data capture)

Instrument malfunction

13 October - 1 November (461 hours) due to a leak in the sample line leading to internal sampling. The problem was caused by a badly sealing sample line filter following an LSO calibration. This fault would very likely not have been detected by the CMCU and was remedied at the following LSO visit when the filter was changed.

Hounslow (NO_x 86%, CO 87% data capture)

Instrument Malfunction

30 November - 31 December (755 hours) caused by an unstable site cylinder.

Southwark 2 (NO_x 36%, SO₂ 78% data capture)

Instrument malfunction

30 July - 4 August (131 hours of SO₂ data) resulting from an internal leak in the analyser. The ESU were called out and fixed the problem.

5 August - 25 November (2691 hours of NO_x data) caused by an analyser malfunction. The ESU were unable to fix the analyser or provide a spare until 16 October, but the LSO was then unable to calibrate the analyser as a result of not having any calibration gas until 25 November.

6. AUTO-CALIBRATION DATA

As may be seen from Section 5, there are a number of problems at sites which could be more easily diagnosed using auto-calibration data. For some of the sites in the LAQN there are no working auto-calibration facilities, and therefore the QA/QC unit do not have as much information on which to base the ratification of the final datasets. Table 2 shows the sites for which the QA/QC unit received valid auto-calibration data during this period.

Table 2: Sites in the LAQN with valid auto-calibration data January - June 1999

Site Name	Pollutant of Interest			
	Ozone	NO _x	SO ₂	CO
Bromley	-	y	-	n
Camden	-	zero only	-	-
Eltham	y	zero only	zero only	-
Haringey 1	-	y	-	-
Haringey 2	y	-	-	-
Hackney	n	zero only	-	n
Hounslow	-	n	-	zero only
Kensington and Chelsea	y	zero only	y	y
Lewisham	n	n	n	-
Marylebone Road	y	y	y	y
Southwark 1	n	n	n	n
Southwark 2	-	n	n	n
Sutton 1	-	zero only	y	y
Sutton 3	y	y	-	-
Tower Hamlets	-	y	-	y
Wandsworth 2	y	y	-	-

y = valid auto-calibration data.

n = no valid auto-calibration data were received.

zero only = the auto-calibration data contained no valid spans.

- = not applicable to this site.

7. INVENTORY

The DETR assets held by NPL for this work are shared with the Automatic Rural Network and are given in the corresponding report.