AIR QUALITY IN LONDON

Year Ending 30th June 2004

Environmental Research Group
King's College London
December 2004

Title	London Air Quality Network Year Ending 30th June 2004

Customer	

Customer Ref	

File Reference	\\erg\AIRQUALI\LONDON\ANNUALRE\2004\Q2

Report Number	

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

	Name	Contact	
Authors	Gary Fuller	gary.fuller@erg.kcl.ac.uk	

	Name	Signed	Date 8th Dec 2004
Reviewed by	Paul Johnson		

Approved by	Gary Fuller		**Date 8th Dec 2004**

CONTENTS

SUMMARY

The purpose of this report is to review air quality in London during the 2nd quarter of 2004 and to report detailed measurement results for the year ended 30th June 2004.

During the quarter, 3 monitoring sites joined the London Air Quality Network (LAQN); Bexley 7, Bexley 8 and Sutton 3.

PM_{10} and O_3 incidents were measured during the second quarter of 2004. However, the maximum concentration and duration of the incidents were less than those experienced during the same time period in 2003.

Provisional measurements during the year ending 30th June 2004 have been compared to the Air Quality Strategy (AQS) Objectives. Pollution measurements during the 12 month period are still affected by pollution incidents during 2003:

- The CO Objective was met at all CO monitoring sites.
- The annual mean NO_2 Objective was exceeded at all road and kerbside sites in London except Enfield 2, Havering 1 and Havering 3.
- The annual mean NO_2 Objective was also exceeded at background sites in inner and west London.
- The AQS Objective for O_3 was exceeded at all permanent measurement sites in London except the kerbside site Marylebone Road and the urban background site Wandsworth 2.
- The incident-based PM_{10} AQS Objective was exceeded at 3 kerb/roadside TEOM sites in Inner and Central London, and at 3 TEOM sites situated alongside major arterial roads in Outer London. The two TEOM sites situated near the entrances to waste management facilities (Bexley 4 and Brent 5) also exceeded the incident-based PM_{10} AQS Objective. All background and suburban TEOM sites met the incident-based Objective.
- The annual mean PM_{10} AQS Objective was exceeded at the roadside TEOM site Bexley 4 and at the kerbside TEOM site Marylebone Road.
- The incident-based PM_{10} AQS Objective was exceeded at all kerbside and roadside BAM sites, and at 2 such sites in background locations. The annual mean PM_{10} AQS Objective was also exceeded at the Enfield 4 roadside BAM site.
- All sites met the AQS Objective for SO_2.

INTRODUCTION

The purpose of this report is to review air quality in London during the 2nd quarter of 2004 and to report the detailed measurement results for the year ending 30th June 2004. This report represents a departure from the previous reporting timetable whereby reports were issued at quarterly intervals following the ratification of all air pollution measurements. However, ratification is a retrospective analysis of measurements within an established calibration history and draws on the results of additional tests carried out at 6 monthly audit. Ratification cannot therefore be completed until 6-9 months after a measurement is made. Following consultation with report recipients during October 2003, the reporting timetable has been rescheduled and, henceforth, preliminary reports will be issued soon after the end of each quarter. This change will enable prompt reporting of recent pollution incidents. Preliminary reports will be based on a mixture of ratified and unratified measurements. A preliminary annual report for 2003 was issued during March 2004 to bridge the gap between the old and new reporting timetable. Final annual reports will continue to be produced following the completion of measurement ratification.

Measurements have been analysed with specific reference to the AQS Objectives which are detailed in Appendix 4. Full details of the sites in the London Air Quality Network (LAQN) are presented in Appendix 1 and the detailed monitoring results are presented in Appendix 3.

The LAQN was formed in 1993 to coordinate and improve air pollution monitoring in London. Currently, thirty London boroughs are supplying data to the LAQN. Increasingly, these data are being supplemented by measurements from local authorities surrounding London, thereby providing an overall perspective of air pollution in South East England. The LAQN is operated and managed by the Environmental Research Group (ERG) at King's College London. Each borough funds monitoring in its own area. The core LAQN activities are funded by the ERG itself. The Department of Environment, Food and Rural Affairs (DEFRA) funds the ERG to operate the Marylebone Road site and to maintain 14 of the LAQN sites as affiliate sites to the UK Automatic Urban and Rural Network (AURN). This DEFRA support assists the operation of the overall LAQN.

In response to requests from air pollution modellers, this report includes annual mean NO_X measurements for each NO_2 monitoring site in the LAQN. This report also presents gas measurements expressed as mass per unit volume (μgm^{-3} and mgm^{-3}) using conversion factors at 293 K and 1.03 KPa as suggested in the Draft Guidance LAQM.TG(02) (DEFRA 2002). NO_X measurements are reported as NO_2 equivalent.

To understand air pollution in London it is necessary to understand air pollution in the surrounding area, and vice-versa. The LAQN contains sites in Essex, Kent and Surrey. A more complete picture of air pollution in South East England can be obtained from the combined results of the LAQN, the Kent Air Quality Monitoring Network (KAQMN) and the Hertfordshire and Bedfordshire Air Pollution Monitoring Network (HBAPMN). Reports for these networks are available from the ERG.

Hourly updated measurements from the LAQN and neighbouring networks are published by the ERG on the Internet at:

www.londonair.org.uk

AIR QUALITY APRIL - JUNE 2004

Network Changes

Three monitoring sites joined the LAQN during the quarter.

Bexley 7 and 8

The Bexley 7 and 8 monitoring sites were installed in April alongside Thames Road (A206) in Crayford in the north east of the borough. The sites have been installed ahead of a roadway widening programme which will result in Thames Road becoming a dual carriageway. The sites will measure pollutant concentrations before, during and after the road works. The sites have been deployed on opposite sides of Thames Road to enable the accurate quantification of pollution emissions arising from the road itself, and to thereby inform emissions inventory compilation and model validation.

Bexley 7 is located to the north of Thames Road in the grounds of a disused industrial site. Although the site is approximately 22 m from the present Thames Road it will become roadside following the completion of the dual carriageway. The site monitors NO_X, O_3, PM_{10} (TEOM), $PM_{2.5}$ (TEOM), PM_{10} (FDMS) and meteorological parameters. The site is shown in Figure 1.

Figure 1 The Bexley 7 monitoring site

Bexley 8 is located to the south of Thames Road, opposite Bexley 7, on a grass verge in front of housing. The site is currently approximately 22 m from Thames Road. The site (shown in Figure 2) monitors NO_X, O_3, PM_{10} (TEOM), and $PM_{2.5}$ (TEOM).

Figure 2 The Bexley 8 monitoring site

In addition to installing two new monitoring sites, the Bexley air quality monitoring programme was redesigned. The monitoring equipment at Bexley 1 was renewed and supplemented with $PM_{2.5}$ (TEOM) measurements. A PM_{10} (FDMS) was installed at the Bexley 2 suburban site to provide background measurements for the Bexley 7 instrument. The Bexley 3 and Bexley 5 sites were closed.

Sutton 3

The Sutton 3 monitoring site reopened during April after a closure of 23 months. The site monitors NO_X and O_3 in a suburban location in the Council's ecology centre in Carshalton (http://www.sutton.gov.uk/Sutton/Our+Environment/Ecology+Centre/). Sutton 3 is one of the oldest sites in the LAQN, having started monitoring in May 1995. Its reopening is therefore especially welcome to support the medium-term analysis of background concentrations of NO_X and O_3 in Sutton and in the wider London area.

Figure 3 The Sutton 3 monitoring site.

Air Pollution Incidents

During the 2nd quarter of 2004, widespread PM_{10} and O_3 incidents were measured. The maximum concentration and duration of these incidents were less than those experienced during the same time period in 2003.

PM_{10}

During the 2nd quarter of 2004, London did not experience a repetition of the widespread PM_{10} incidents that characterised the 2nd quarter of 2003 (ERG 2004). Although a widespread PM_{10} episode did occur during the 2nd quarter of 2004, the magnitude and length of the episode was smaller than that measured during 2003. Figure 4 shows the daily mean concentration of PM_{10} measured at 4 urban background and suburban sites during the 2nd quarters of 2003 and 2004. The PM_{10} incident during April 2003 can be clearly seen. The 2004 episode was measured during late April and early May with concentrations reaching a peak on 1st May. The magnitude of the 2004 episode was less than that of the episode during 2003 and daily mean concentrations above 50 μgm^{-3} (TEOM*1.3) were largely confined to roadside sites and background sites in central London. The 2004 episode was associated with photochemistry as discussed below.

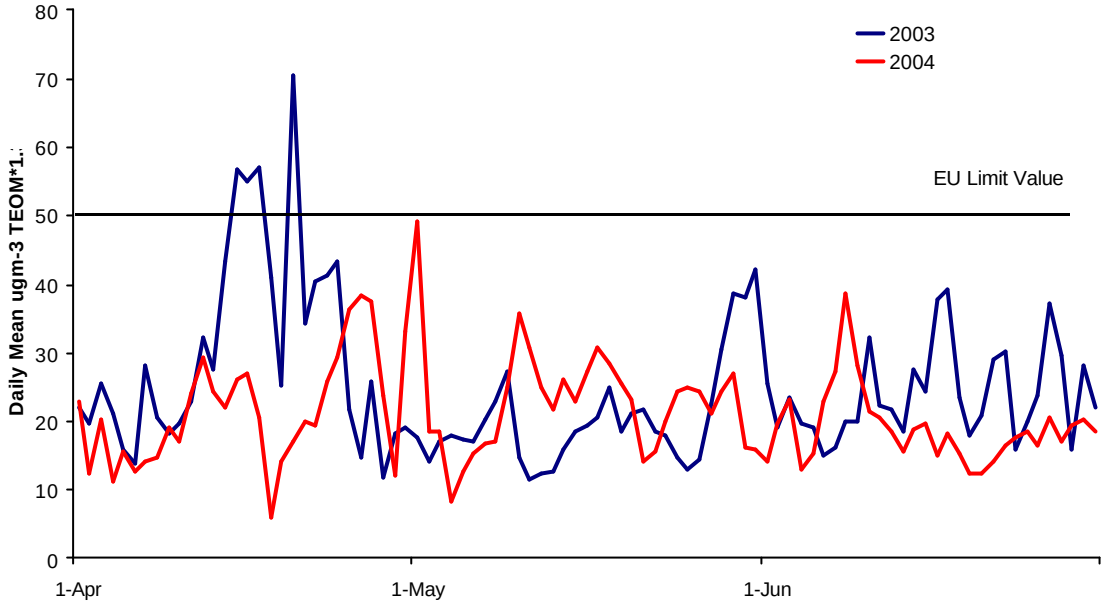

Figure 4 Daily mean PM_{10} during the 2nd quarters of 2003 and 2004. Measurements shown are a mean of measurements made at the background and suburban sites Harrow 1, Hounslow 2 Kensington and Chelsea 1 and Mole Valley 2.

O_3

During the 2nd quarter of 2004, London experienced a series of photochemical episodes that led to 'moderate' concentrations of O_3. Figure 5 shows hourly mean O_3, measured at 5 suburban sites, during the quarter. Highest concentrations were measured on the 7th and 8th June when widespread 'moderate' O_3 was measured across London and South-East England. Provisional measurements suggest that concentrations reached 'high' at the Sevenoaks urban background site in Kent on 8th June. The photochemical origins of the quarter's PM_{10} episodes can be clearly seen by comparing Figure 4 and Figure 5; elevated concentrations of PM_{10} being associated with the 'moderate' O_3 measured during late April and on the 7th and 8th June.

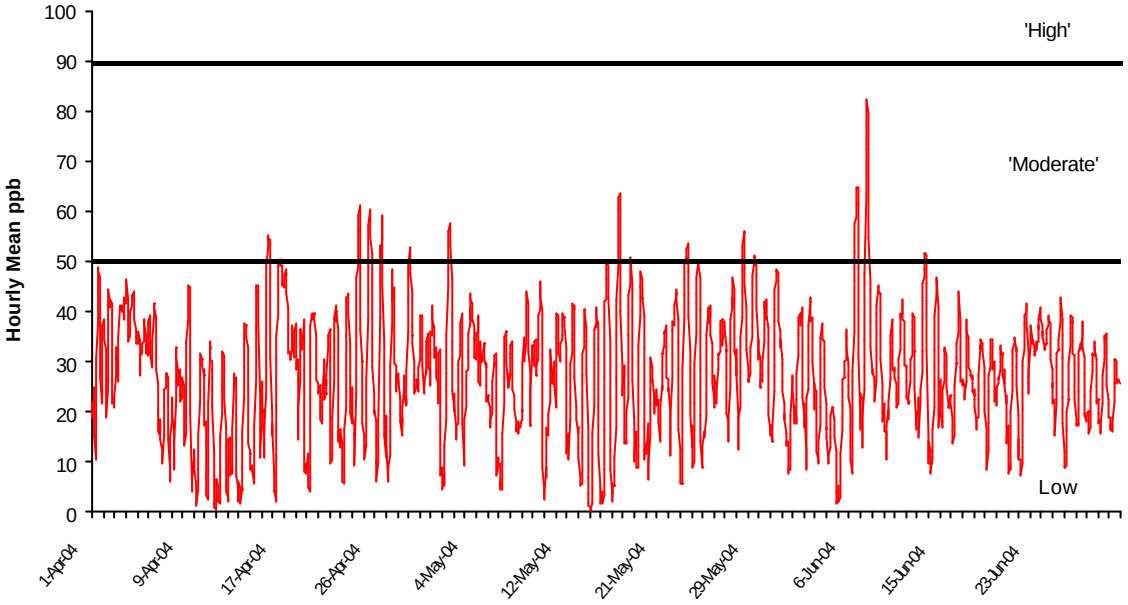

Figure 5 Hourly mean O_3 concentrations. Measurements have been averaged across the background and suburban sites Bromley 5, Enfield 3, Haringey 2, Kingston 1 and Sevenoaks 2

AIR QUALITY YEAR ENDING 30TH JUNE 2004

Discussion of Results

Comparisons of measurements with national Objectives and standards are shown in Appendix 3.

When examining data it is important to consider the location of the monitoring site; kerbside, urban background, rural, etc., and the data quality. The site type and quality assurance standard for each site is listed in Appendix 1 and 2. Sites are classified into three quality standards. Data from sites affiliated to the AURN and London Standard sites have traceabilty to National Metrological Standards, whereas for the Locality Standard sites there is insufficient information to demonstrate such traceability.

No scientific measurement is absolutely accurate or absolutely precise. The combination of accuracy and precision is termed the uncertainty. In order to place results in context, the uncertainty associated with each result has to be considered. Estimates of the uncertainty associated with air quality measurement are discussed in the 2001 LAQN annual report (ERG, 2003). This suggests that a working uncertainty of around 10% (2σ) should be considered when discussing elevated concentrations and long-term averages of CO, NO_2 and SO_2 measured at London Standard sites. This is justified on the basis of both mathematical modelling and equipment performance tests. However, due to the statistical distribution of the data, a 10% uncertainty in measurements does not imply a 10% uncertainty in the number of breaches of a standard. The uncertainty associated with the measurement of PM_{10} is more complex since the results obtained are highly dependent on the measurement method used.

Data are subject to two quality assurance processes. Initially, data are validated using the best calibration and instrument performance information available at the time. Data are retrospectively examined during the ratification process, using long-term instrument histories and the results of further quality checks. Hence the data in this report will differ from those initially published. The measurements in this report are largely unratified. Further revisions are therefore likely before a final data set is published in the 2004 annual report.

The final data sets for the AURN sites are published by the DEFRA.

The Air Quality Regulations (DETR 2000b) specify Objectives in terms of mass / volume for all pollutants. However, continuous gas analysers and the calibration standards used are measured in terms of volume ratio. These are two entirely different bases of measurement with conversion between them being dependent on temperature and pressure conditions. Conversions have been made based on 293 K and 101.3 kPa, where appropriate, for comparison to the AQS Objectives, (DETR 2000c).

Carbon Monoxide

CO emissions within the LAQN area are dominated by road transport sources. The AQS Objective of 8.6 ppm ($10 mgm^{-3}$) as a rolling 8 hour mean (DEFRA 2002) was met at all LAQN monitoring sites.

Nitrogen Dioxide

NO_2 is largely a secondary pollutant formed by the oxidation of NO. In the LAQN area, road transport is the dominant source of NO_X. This is reflected in the general distribution of NO_2, with the greatest annual mean concentrations being measured near roads and in central London locations. Lower concentrations are observed in background and suburban areas.

The AQS stipulates two Objectives for NO_2: an annual mean of 21 ppb (40 μgm^{-3}) and an incident-based Objective of 104.6 ppb (200 μgm^{-3}), as an hourly mean, not to be exceeded more than 18 times per year.

The annual mean NO_2 Objective was exceeded at all kerbside monitoring sites and the majority of roadside monitoring sites. Preliminary measurements suggest that three roadside monitoring sites in Outer London (Enfield 2, Havering 1 and Havering 3) achieved Objective. This represents an improvement on the situation reported for the year ending March 2004 when all kerbside and roadside sites exceeded this Objective.

The annual mean NO_2 Objective was exceeded at background sites in inner London. Background and suburban sites in outer London and the Home Counties achieved the Objective with the exception of sites in West London; Heathrow Airport, Hounslow 2 and Ealing 1.

The incident-based Objective for NO_2 was exceeded at the kerbside sites Barnet 1, Lambeth 4, Marylebone Road, Redbridge 3 and Sutton 4. The Objective was also exceeded at the roadside sites Ealing 6, Hammersmith & Fulham 1, Hounslow 4, Kensington & Chelsea 3 and Kensington & Chelsea 4. The highest number of hourly means above 105 ppb was measured at the new Lambeth 4 site, which measured 1840 since joining the network in late December 2003. During the year ended 30th June 2004, 100 hours or more above 105 ppb were measured at Hammersmith & Fulham 1 (100), at Kensington & Chelsea 3 (273) and at Marylebone Road (582).

Ozone

O_3 is a seasonal pollutant with the highest concentrations being measured during the summer months. It is also a regional pollutant, with episodes extending over many hundreds of kilometres. O_3 exhibits local variation caused by the scavenging effect of NO close to NO_X emission sources, for example at the roadside. Health-based standards are rarely exceeded at roadside and kerbside sites and O_3 monitoring is not generally undertaken in these locations. However, roadside monitoring of O_3 can lead to a better understanding of the mechanisms that determine roadside NO_2 concentrations (e.g. Clapp and Jenkins, 2001 and Carslaw and Beevers, 2004) and for this reason further O_3 monitoring at roadside sites in London would be encouraged.

The AQS has an Objective of 100 μgm^{-3} (50 ppb), measured as a rolling 8 hour mean, which should not be exceeded on more than 10 days per year. The greatest concentrations of O_3 are generally measured at sites in outer London and in the Home Counties. During the 3 years 2000 to 2002, the majority of sites in outer London and the Home Counties exceeded the Objective whilst many sites in inner and west London met the Objective. During 2000 to 2002, outer London sites typically experienced around 20 to 30 days per year with peak concentrations above 100 μgm^{-3}, measured as a rolling 8 hour mean. During the summer of 2003, several sites measured over 40 days above 100 μgm^{-3}, expressed as a rolling 8 hour mean; almost double the number of days measured annually during 2000 to 2002. Measurements from the photochemical incidents during summer 2003 (ERG 2004) dominate the results for the year ending 30th June 2004. During the year ending 30th June 2004, the AQS Objective was exceeded at all permanent O_3 measurement sites in London except the kerbside site Marylebone Road and the urban background site Wandsworth 2.

PM_{10} particulate

There are two AQS Objectives for PM_{10}. These are in line with the EU Daughter Directive Stage 1 Limit Value for PM_{10}. The AQS has an incident-based Objective of 50 μgm^{-3}, measured as a daily mean not to be exceeded on more than 35 days per year, and an annual mean Objective of 40 μgm^{-3}.

PM_{10} poses many measurement challenges. Rather than comprising a single, defined chemical compound, like CO or SO_2 for example, the composition of PM_{10} varies with location, time of year and during episodes. PM_{10} can be considered to comprise; primary particulates (mainly emitted from local sources), secondary particulates (mainly from distant sources), and coarse particulates whose origin can be local or further afield. The variation in composition affects each measurement technique differently and therefore each measurement technique produces systematically different results. The EU Daughter Directive is based on a 'gravimetric' method where PM_{10} is collected on a filter that is then weighed in a laboratory (CEN, 1998). There is ample evidence to suggest that the most common measurement methodology employed in the UK, the Tapered Element Oscillating Microbalance (TEOM), produces a result lower than the 'gravimetric' method (APEG, 1999; Green 1999, Green *et al*., 2000). DETR (1999) suggested that a correction factor of 1.3 be applied to TEOM results for comparison to the AQS Objective.

Beta Attenuation Monitors (BAM) are also used to measure PM_{10} in the LAQN. Research at Marylebone Road (Green, 1999) sought to compare the results from TEOM, 'gravimetric' and BAM instruments. The BAM instrument tested produced higher results than the 'gravimetric' method at this location during the test period. However, no correction factor has been applied to the BAM measurements.

PM_{10} measurements during 2003 were affected by the series of PM_{10} incidents, which are discussed in ERG (2004). However, 3 of the 4 PM_{10} incidents during 2003 occurred during the spring and are not included in the year ending 30th June 2004. The measurements for the year ending 30th June 2004 therefore exhibit a large reduction in the concentrations of this pollutant when compared to those reported for the year ending 31st March 2004.

The incident-based PM_{10} AQS Objective was exceeded in Inner and Central London at the Marylebone Road and Camden 1 TEOM kerbside sites, and at the TEOM roadside site Camden 3. In Outer London, the incident-based PM_{10} Objective was exceeded at 3 TEOM sites situated alongside major arterial roads; Brent 4 (North Circular), Greenwich 7 (A2 - Blackheath Hill) and Hounslow 5 (M4 and A4 at Brentford). The 2 TEOM sites situated near the entrances to waste management facilities (Bexley 4 and Brent 5) also exceeded the incident-based PM_{10} Objective. All background and suburban TEOM sites met the incident-based Objective. The annual mean Objective of 40 μgm^{-3} was exceeded at the roadside TEOM site Bexley 4 and at the kerbside TEOM site Marylebone Road.

The incident-based Objective was exceeded at all kerbside and roadside BAM sites. The background and suburban BAM sites (Lambeth 3 and Haringey 2) also exceeded the incident-based PM_{10} AQS Objective. The annual mean Objective was exceeded at the Enfield 4 roadside BAM site.

Sulphur Dioxide

The distribution of SO_2 concentrations is influenced by both road traffic and industrial point sources. Road traffic sources are the main factor influencing annual mean concentrations, whereas industrial point sources produce short-term high values due to plume grounding. The annual mean concentrations of SO_2 do not vary to any large degree over the network.

The AQS incident-based Objective for SO_2 is based on a 15 minute mean concentration of 266 μgm^{-3} (100 ppb) which must not be exceeded more than 35 times per year. This Objective was not approached at any site in the network, although Brent 3, Bexley 1, Castle Point, Enfield 3, Tower Hamlets 1 and Thurrock 1 measured 15 minute means in excess of 266 μgm^{-3}. The AQS also has an hourly mean Objective of 350 μgm^{-3} (132 ppb) which should not be exceeded on more than 24 occasions per year. A single hourly mean above 350 μgm^{-3} was measured at Thurrock 1.

References

Clapp, L. and Jenkin, M.E., 2001. Analysis of the relationship between ambient levels of O_3, NO_X and NO as a function of NO_X in the UK. Atmospheric Environment 35, 6391-6405.

Carslaw, D.C. and Beevers, S.D., 2003. Investigating the Potential Importance of Primary NO_2 in a Street Canyon, submitted to Atmospheric Environment, December 2003.

Department for the Environment, Transport and the Regions (DETR), 1999. Assistance with the review and assessment of PM_{10} concentration in relation to the proposed EU Stage 1 limit values. HMSO.

Department for the Environment, Transport and the Regions (DETR) 2000a. The air quality strategy for England, Wales and Northern Ireland. HMSO.

Department for the Environment, Transport and the Regions (DETR), 2000b. The air quality regulations 2000. HMSO.

Department for the Environment, Transport and the Regions (DETR), 2000c. Review and assessment: monitoring air quality LAQM.TG1(00). HMSO.

Department for the Environment, Food and Rural Affairs (DEFRA), 2002. Report on the review of the National Air Quality Strategy; proposals to amend the strategy. HMSO.

Environmental Research Group (ERG), 2000a. Air quality in London April to June 1999. ERG, King's College London.

Environmental Research Group (ERG), 2000b. Air quality in London July to September 1999. ERG, King's College London.

Environmental Research Group (ERG), 2003. Air quality in London 2001. ERG, King's College London.

Environmental Research Group (ERG), 2004. Air quality in London 2003 – preliminary report. ERG, King's College London.

South East Institute of Public Health (SEIPH), 1994. Air quality in London, the first report of the London Air Quality Network. ERG, King's College London.

South East Institute of Public Health (SEIPH), 1995. Air quality in London, the second report of the London Air Quality Network. ERG, King's College London.

South East Institute of Public Health (SEIPH), 1999. Air quality in London 1997. ERG, King's College London.

APPENDIX 1: LAQN MONITORING SITES

A.1.0 Details of Monitoring Sites

The following tables detail the pollution monitoring sites in the LAQN at the end of this 12 month period. The start date of each site is shown along with the pollutants monitored and the data quality. In some cases a monitoring site was not operating during the 12 month period. The availability of data from a site is indicated in the data column in the tables below.

Sites are classified according to their location:

- Kerbside sites are those with sampling locations within 1 m of the kerbside and with a sampling height of 3 m or less.
- Roadside sites are those with sampling locations within 1-5 m of the roadside and with a sampling height of 3 m or less.
- Urban background sites are located to represent pollution conditions in the centre of an urban area. Sampling locations are away from the influence of individual pollution sources; 25 m from major roads for example.
- Suburban sites are typical of residential locations on the edge of a built up area. Sampling locations are away from the influence of individual pollution sources; 25 m from major roads for example.

A.1.1 Kerbside Sites

	Start	CO	NO_2	SO_2	O_3	PM_{10}	$PM_{2.5}$	Data	Quality
Barnet 1	**Dec 98**		●			**T**		**Yes**	**
Bromley 4	**Feb 96**	**Closed Jul 98**							
Camden 1	**Apr 96**		●			**T**		**Yes**	** **A**
Croydon 5	**Oct 00**		●					**Yes**	**
Lambeth 4	**Dec 03**		●	●		**B**		**Yes**	**
Marylebone Road	**Jun 97**	●	●	●	●	**TG**	●	**Yes**	** **A**
Redbridge 2	**Dec 99**	**Closed Apr 03**							
Redbridge 3	**Dec 99**		●			**B**		**Yes**	*
Richmond 5	**Feb 01**	**Closed Aug 01**							
Sutton 4	**Jul 02**		●			**T**		**Yes**	**

Key: T =TEOM, B=Beta Attenuation, G= Gravimetric, * Locality Standard, ** Traceability to National Standards
A= Affiliated to UK AURN- final data set published by DEFRA

A.1.2 Roadside Sites

	Start	CO	NO_2	SO_2	O_3	PM_{10}	$PM_{2.5}$	Data	Quality
Bexley 4	May 99					T		Yes	**
Bexley 7 (1)	Apr 04		●		●	TF	T	Yes	**
Bexley 8 (1)	Apr 04		●		●	T	T	Yes	**
Brent 2	Jun 01	Closed Sep 02							
Brent 3	Dec 01		●	●		T		Yes	**
Brent 4	Jun 03		●	●		T		Yes	**
Brent 5	Feb 03		●			T		Yes	**
Bromley 7	July 98	●	●			B	(B)	Yes	*/** A
Camden 3	Apr 00		●			T		Yes	**
Croydon 2	Sept 94		●					Yes	**
Croydon 4	Sept 99		●	●		T		Yes	**
Crystal Palace	Oct 99	●	●	●		T		Yes	**
Ealing 2	Sept 96	●	●			T	T	Yes	**
Ealing 4	Dec 98	Closed Mar 99							
Ealing 5	Mar 99	Closed Jun 01							
Ealing 6	Aug 03		●					Yes	**
Enfield 2	Jan 98	●	●			B		Yes	**
Enfield 4	Mar 00		●	●		B		Yes	**
Greenwich 5	Sept 97		●			T		Yes	**
Greenwich 7	Mar 02		●			T		Yes	**
Greenwich Bexley 6	Oct 00		●			T	T	Yes	**
Hams & Fulham 1	Aug 99		●	●		T		Yes	**
Hackney 6	Nov 02		●			T		Yes	**
Haringey 1	Dec 94		●	●		T		Yes	** A
Haringey 3	Apr 99	Closed Mar 01							
Harrow 2	Jun 03		●			T		Yes	**

Key: T =TEOM, B=Beta Attenuation, G= Gravimetric, F = FDMS TEOM (to be reported separately), *Locality Standard, ** Traceability to National Standards. A= Affiliated to UK AURN- final data set published by DEFRA.
(1) The distance of these sites to their nearby roads will be affected by highway widening.

A.1.2 Roadside Sites (continued)

	Start	CO	NO_2	SO_2	O_3	PM_{10}	$PM_{2.5}$	Data	Quality
Havering 1	Dec 95		●					Yes	**
Havering 3	Dec 98		●	●		T		Yes	**
Hillingdon 1	Sept 99		●			T		Yes	**
Hillingdon 2	Sept 02		●			T		Yes	**
Hounslow 1	Apr 93	Closed Dec 02							
Hounslow 3	Mar 99	Closed Nov 02							
Hounslow 4	Aug 99		●	●		T		Yes	**
Hounslow 5	Aug 03	●	●			T		Yes	** A
Islington 2	Jul 00	●	●			T		Yes	**
Ken & Chelsea 2	May 98					T		Yes	**
Ken & Chelsea 3	Mar 00		●					Yes	**
Ken & Chelsea 4	Sep 00		●					Yes	**
Ken & Chelsea 5	May 02					G		Yes	*
Kingston 2	Apr 96		●			T		No	
Lambeth 1	Sep 00		●	●		B		Yes	*
Lambeth 2	Dec 01		●	●		B		Yes	*
Redbridge 4	Dec 99	●	●	●		B		Yes	*
Redbridge 5	Nov 03	●	●			B		Yes	*
Richmond 1	Jun 00		●			T		Yes	**
Southwark 2	Oct 94	●	●	●		T		Yes	*/** A
Sutton 1	May 95	Closed May 02							
Thurrock 2	May 03		●					Yes	**
Thurrock 3	Aug 03		●	●		T		Yes	**
Tower Hamlets 2	Mar 94	●	●					Yes	** A
Wandsworth 1	Sept 94	Closed Mar 96							
Wandsworth 4	Feb 98	●	●			T		Yes	**
Waltham Forest 3	Jul 03		●	●		T		Yes	**
Westminster 2	Jun 95	Last data 95							

Key: T =TEOM, B=Beta Attenuation, G= Gravimetric, F = FDMS TEOM (to be reported separately), *Locality Standard, **Traceability to National Standards. A= Affiliated to UK AURN- final data set published by DEFRA.

A.1.3 Urban Background Sites

	Start	CO	NO_2	SO_2	O_3	PM_{10}	$PM_{2.5}$	Data	Quality
Barnet 2	Aug 00		●			T		Yes	**
Barnet 3	Aug 00	Closed May 02							
Brent 1	Aug 95	●	●	●	●	T		Yes	* A
Bromley 1	Jan 93	Closed Fe b 96							
Castle Point	May 96		●	●				Yes	**
City of London 1	Oct 01		●	●	●			Yes	*
Croydon 3	May 97				●	T		Yes	**
Ealing 1	Mar 95	(●)	●	●	●			Yes	**
Enfield 3	Nov 98	●	●	●	●	B		Yes	**
Greenwich 4	Sept 93		●	●	●	T		Yes	** A
Hackney 4	Oct 93	●	●		●		T	Yes	*/** A
Hams & Fulham 2	Aug 03		●			T		Yes	**
Heathrow Airport	Mar 99	●	●			T		Yes	*
Hillingdon (O)	Oct 94	Last Data Apr 95							
Ken & Chelsea 1	Mar 95	●	●	●	●	TG	G	Yes	** A
Islington 1	Sep 94	(●)	●			T		Yes	**
Lambeth 3	Dec 01		●	●		B		Yes	*
Lewisham 1	Jan 95		●	●	●			Yes	** A
Mole Valley 3	Oct 01		●			T		Yes	**
Redbridge 1	Dec 99		●		●	B		Yes	*
Sevenoaks 2	Feb 98	●	●	●	●	T		Yes	**
Southwark 1	Mar 93	●	●	●	●	T		Yes	*/** A
Thurrock 1	Feb 95	●	●	●	●	TG		Yes	* A
Tower Hamlets 1	Jan 94		●	●	●	T		Yes	**
Tower Hamlets 3	Oct 99		●	●		T		Yes	**
Waltham Forest 1	Jul 98		●	●		T		Yes	**
Wandsworth 2	Oct 94	●	●	●	●			Yes	** A
Westminster 1	Jan 93	Last Data 96							

Key: T =TEOM, B=Beta Attenuation, G= Gravimetric, F = FDMS TEOM (to be reported separately), *Locality Standard, **Traceability to National Standards. A= Affiliated to UK AURN- final data set published by DEFRA.

A.1.4 Suburban Sites

	Start	CO	NO_2	SO_2	O_3	PM_{10}	$PM_{2.5}$	Data	Quality
Bark & Dag 1	Sep 93		●	●				Yes	**
Bark & Dag 2	Oct 99					T		Yes	**
Bexley 1	Jan 93	●	●	●	●	T	T	Yes	*A
Bexley 2	Jan 98		●			TF	T	Yes	**
Bexley 3	Jan 98					T	T	Yes	**
Bexley 5	Nov 99	●	●	●				Yes	**
Brentwood 1	Aug 95		●					Yes	**
Bromley 5	Mar 96				●			Yes	**
Croydon 6	Jan 01		●					Yes	**
Enfield 1	Jul 95		●					Yes	**
Haringey 2	Apr 96		●		●	B		Yes	**A
Havering 2	Apr 98	Closed Nov 00							
Harrow 1	Apr 99		●	●		T		Yes	**
Hounslow 2	Apr 99		●	●	●	T		Yes	**
Kingston 1	Mar 96				●			Yes	**
Mole Valley 2	Apr 97		●			T		Yes	**
Reigate & Bans 1	Jul 00		●			T		Yes	**
Reigate & Bans 2	Aug 03		●					Yes	**
Richmond 2	Apr 01		●		●	T		Yes	**
Sutton 2	May 95	Closed May 02							
Sutton 3	May 95		●		●			Yes	**
Wandsworth 3	Oct 94	Closed Nov 00							

A.1.5 Rural Sites

	Start	CO	NO_2	SO_2	O_3	PM_{10}	$PM_{2.5}$	Data	Quality
Mole Valley 1	Mar 96	Closed Mar 99							
S'oaks Scudders H	Sept 95	Closed Sept 97							

Key: T =TEOM, B=Beta Attenuation, G= Gravimetric, F = FDMS TEOM (to be reported separately), *Locality Standard, **Traceability to National Standards. A= Affiliated to UK AURN- final data set published by DEFRA.

Deployments of the Richmond mobile site (Richmond 3+) are not individually listed.

APPENDIX 2: DEFRA DIRECTLY FUNDED SITES

Measurements from these monitoring sites are included in the LAQN database following the completion of ratification. A full dataset for the 12 month period has not yet been processed and measurements from these sites have therefore not been included in this report.

A.2.0 Roadside Sites

	CO	NO_2	SO_2	O_3	PM_{10}	$PM_{2.5}$
A3	●	●			T	
Cromwell Rd	●	●	●		#	

A.2.1 Background Sites

	CO	NO_2	SO_2	O_3	PM_{10}	$PM_{2.5}$
Bloomsbury	●	●	●	●	T	T
Hillingdon	●	●	●	●	T	
Teddington		●	●	●		
Westminster	●	●	●	●	G	
West London	●	●				

 # Reported as LAQN site Kensington & Chelsea 2.
T = TEOM. G = Gravimetric.

APPENDIX 3: SUMMARY OF MONITORING RESULTS YEAR ENDED 30TH JUNE 2004

Monitoring results are summarised below compared to the AQS Objectives and the UK Air Quality Information System descriptors. Many AQS Objectives require data representative of the whole year. If insufficient data are available, then comparison with the Objective is not possible. This, for example, may be the case for sites installed during the year or those that experienced serious and prolonged instrument failure. A data capture Objective of 90% is recommended in LAQM.TG(02) (DEFRA 2002) in line with EU Directive requirements. The UK Air Quality Information System for PM_{10} only applies to TEOM measurements; results from other methods are included in parenthesis for information only.

A.3.0 Carbon Monoxide

Carbon Monoxide	Type	Capture Rate (%)	Days Moderate and Above
Bexley 1	U	92	0
Brent 1	U	98	0
Bromley 7	R	79	0
Crystal Palace 1	R	98	0
Ealing 2	R	96	0
Enfield 2	R	94	0
Enfield 3	U	94	0
Hackney 4	U	96	0
Heathrow Airport	U	94	0
Hounslow 5	R	81	0
Islington 2	R	90	0
Kens and Chelsea 1	U	99	0
Kens and Chelsea 2	R	66	0
Marylebone Rd	K	98	0
Redbridge 4	R	93	0
Redbridge 5	R	31	0
Richmond 15	R	52	0
Richmond 17	U	21	0
Richmond 19	U	17	0
Sevenoaks 2	U	97	0
Southwark 1	U	94	0
Southwark 2	R	59	0

Carbon Monoxide	Type	Capture Rate (%)	Days Moderate and Above
Thurrock 1	U	97	0
Tower Hamlets 2	R	98	0
Wandsworth 2	U	88	0
Wandsworth 4	R	95	0

Carbon Monoxide	Type	No occurrences of rolling 8hr mean >=10mgm^{-3} (8.6ppb)	Achieved
Brent 1	U	0	YES
Bexley 1	U	0	YES
Bromley 7	R	0	NA
Crystal Palace 1	R	0	YES
Ealing 2	R	0	YES
Enfield 2	R	0	YES
Enfield 3	U	0	YES
Hackney 4	U	0	YES
Hounslow 5	R	0	NA
Islington 2	R	0	YES
Kens and Chelsea 1	U	0	YES
Kens and Chelsea 2	R	0	NA
Heathrow Airport	U	0	YES
Marylebone Rd	K	0	YES
Redbridge 4	R	0	YES
Redbridge 5	R	0	NA
Richmond 15	R	0	NA
Richmond 17	U	0	NA
Richmond 19	U	0	NA
Sevenoaks 2	U	0	YES
Southwark 1	U	0	YES
Southwark 2	R	0	NA
Tower Hamlets 2	R	0	YES
Thurrock 1	U	0	YES
Wandsworth 2	U	0	NA
Wandsworth 4	R	0	YES

A.3.1 Nitrogen Oxides

Nitrogen Oxides	Type	Capture Rate (%)
Barking & Dagenham 1	S	99
Barnet 1	K	66
Barnet 2	U	98
Bexley 1	U	89
Bexley 2	S	96
Bexley 5	S	76
Bexley 7	R	23
Bexley 8	R	23
Brent 1	U	95
Brent 3	R	76
Brent 4	R	80
Brent 5	R	30
Brentwood 1	U	98
Bromley 7	R	98
Camden 1	K	69
Camden 3	R	99
Castle Point 1	U	93
City of London 1	U	91
Croydon 2	R	88
Croydon 4	R	88
Croydon 5	K	98
Croydon 6	S	97
Crystal Palace 1	R	98
Ealing 1	U	90
Ealing 2	R	88
Ealing 6	R	42
Enfield 1	S	54
Enfield 2	R	98
Enfield 3	U	94
Enfield 4	R	99
Greenwich 4	U	98
Greenwich 5	R	99

Nitrogen Oxides	Type	Capture Rate (%)
Greenwich 7	R	90
Greenwich Bexley 6	R	94
Hackney 4	U	98
Hackney 6	R	85
Haringey 1	R	94
Haringey 2	S	82
Harrow 1	U	90
Harrow 2	R	66
Havering 1	R	99
Havering 3	R	92
Heathrow Airport	U	97
Hillingdon 1	R	97
Hillingdon 2	R	83
Hounslow 2	S	97
Hounslow 4	R	97
Hounslow 5	R	89
H'smith and Fulham 1	R	58
H'smith and Fulham 2	U	62
Islington 1	U	99
Islington 2	R	100
Kens and Chelsea 1	U	98
Kens and Chelsea 2	R	69
Kens and Chelsea 3	R	99
Kens and Chelsea 4	R	99
Lambeth 1	R	99
Lambeth 2	R	0
Lambeth 3	U	98
Lambeth 4	K	50
Lewisham 1	U	100
Lewisham 2	R	100
Marylebone Rd	K	93
Mole Valley 2	S	99
Mole Valley 3	U	99

Nitrogen Oxides	Type	Capture Rate (%)
Redbridge 1	U	99
Redbridge 3	K	95
Redbridge 4	R	85
Redbridge 5	R	58
Reigate and Banstead 1	S	99
Reigate and Banstead 2	S	69
Richmond 1	R	96
Richmond 15	R	48
Richmond 17	U	17
Richmond 19	U	17
Richmond 2	S	100
Sevenoaks 2	U	95
Southwark 1	U	90
Southwark 2	R	68
Sutton 3	S	21
Sutton 4	K	93
Thurrock 1	U	86
Thurrock 2	R	95
Thurrock 3	R	84
Tower Hamlets 1	U	95
Tower Hamlets 2	R	96
Tower Hamlets 3	U	87
Waltham Forest 1	U	84
Waltham Forest 3	R	88
Wandsworth 2	U	99
Wandsworth 4	R	95

Nitrogen Oxides	Type	Annual Mean NO_X ppb	Annual Mean NO_X as NO_2 µgm $^{-3}$
Barking & Dagenham 1	S	26	50
Barnet 1	K	105	200
Barnet 2	U	35	66
Bexley 1	U	32	61
Bexley 2	S	29	56
Bexley 5	S	26	50
Bexley 7	R	41	79
Bexley 8	R	41	78
Brent 1	U	30	57
Brent 3	R	69	132
Brent 4	R	146	278
Brent 5	R	54	103
Brentwood 1	U	26	49
Bromley 7	R	42	81
Camden 1	K	84	161
Camden 3	R	88	167
Castle Point 1	U	19	36
City of London 1	U	44	84
Croydon 2	R	72	138
Croydon 4	R	61	116
Croydon 5	K	111	212
Croydon 6	S	38	72
Crystal Palace 1	R	64	123
Ealing 1	U	40	77
Ealing 2	R	82	156
Ealing 6	R	179	343
Enfield 1	S	35	67
Enfield 2	R	41	79
Enfield 3	U	29	56
Enfield 4	R	59	112
Greenwich 4	U	27	52
Greenwich 5	R	53	102
Greenwich 7	R	73	139

Nitrogen Oxides	Type	Annual Mean NO_X ppb	Annual Mean NO_X as NO_2 μgm^{-3}
Greenwich Bexley 6	R	77	147
Hackney 4	U	51	98
Hackney 6	R	75	143
Haringey 1	R	52	100
Haringe y 2	S	30	58
Harrow 1	U	26	50
Harrow 2	R	65	124
Havering 1	R	42	81
Havering 3	R	48	93
Heathrow Airport	U	67	128
Hillingdon 1	R	67	128
Hillingdon 2	R	39	74
Hounslow 2	S	41	78
Hounslow 4	R	95	182
Hounslow 5	R	87	167
H'smith and Fulham 1	R	116	222
H'smith and Fulham 2	U	30	58
Islington 1	U	39	74
Islington 2	R	90	173
Kens and Chelsea 1	U	35	67
Kens and Chelsea 2	R	101	193
Kens and Chelsea 3	R	123	235
Kens and Chelsea 4	R	125	238
Lambeth 1	R	65	123
Lambeth 2	R	52	99
Lambeth 3	U	34	65
Lambeth 4	K	287	548
Lewisham 1	U	53	102
Lewisham 2	R	78	149
Marylebone Rd	K	150	287
Mole Valley 2	S	22	42
Mole Valley 3	U	23	45
Redbridge 1	U	35	67

Nitrogen Oxides	Type	Annual Mean NO_X ppb	Annual Mean NO_X as NO_2 μgm^{-3}
Redbridge 3	K	80	153
Redbridge 4	R	62	118
Redbridge 5	R	68	130
Reigate and Banstead 1	S	25	48
Reigate and Banstead 2	S	34	64
Richmond 1	R	46	88
Richmond 15	R	66	126
Richmond 17	U	31	59
Richmond 19	U	20	39
Richmond 2	S	27	52
Sevenoaks 2	U	20	39
Southwark 1	U	48	92
Southwark 2	R	68	130
Sutton 3	S	23	44
Sutton 4	K	99	189
Thurrock 1	U	33	64
Thurrock 2	R	105	201
Thurrock 3	R	52	99
Tower Hamlets 1	U	33	62
Tower Hamlets 2	R	91	174
Tower Hamlets 3	U	36	68
Waltham Forest 1	U	35	67
Waltham Forest 3	R	36	69
Wandsworth 2	U	64	122
Wandsworth 4	R	52	100

A.3.3 Nitrogen Dioxide

Nitrogen Dioxide	Type	Capture Rate (%)	Days moderate and above
Barking & Dagenham 1	S	99	0
Barnet 1	K	66	0
Barnet 2	U	98	0
Bexley 1	U	89	0
Bexley 2	S	96	0
Bexley 5	S	76	0
Bexley 7	R	23	0
Bexley 8	R	23	0
Brent 1	U	95	0
Brent 3	R	76	1
Brent 4	R	80	0
Brent 5	R	30	0
Brentwood 1	U	98	0
Bromley 7	R	98	0
Camden 1	K	69	0
Camden 3	R	99	0
Castle Point 1	U	93	0
City of London 1	U	91	0
Croydon 2	R	88	0
Croydon 4	R	88	0
Croydon 5	K	98	3
Croydon 6	S	97	0
Crystal Palace 1	R	98	0
Ealing 1	U	90	0
Ealing 2	R	88	0
Ealing 6	R	42	0
Enfield 1	S	54	0
Enfield 2	R	98	0
Enfield 3	U	94	0
Enfield 4	R	99	0
Greenwich 4	U	98	0
Greenwich 5	R	99	0

Nitrogen Dioxide	Type	Capture Rate (%)	Days moderate and above
Greenwich 7	R	90	0
Greenwich Bexley 6	R	94	0
Hackney 4	U	98	0
Hackney 6	R	85	0
Haringey 1	R	94	0
Haringey 2	S	82	0
Harrow 1	U	90	0
Harrow 2	R	66	0
Havering 1	R	99	0
Havering 3	R	92	0
Heathrow Airport	U	97	0
Hillingdon 1	R	97	1
Hillingdon 2	R	83	0
Hounslow 2	S	97	0
Hounslow 4	R	97	4
Hounslow 5	R	89	0
H'smith and Fulham 1	R	58	2
H'smith and Fulham 2	U	62	0
Islington 1	U	99	0
Islington 2	R	100	0
Kens and Chelsea 1	U	98	0
Kens and Chelsea 2	R	69	0
Kens and Chelsea 3	R	99	14
Kens and Chelsea 4	R	99	0
Lambeth 1	R	99	0
Lambeth 2	R	0	0
Lambeth 3	U	98	0
Lambeth 4	K	50	114
Lewisham 1	U	100	0
Lewisham 2	R	100	0
Marylebone Rd	K	93	12
Mole Valley 2	S	99	0
Mole Valley 3	U	99	0

Nitrogen Dioxide	Type	Capture Rate (%)	Days moderate and above
Redbridge 1	U	99	0
Redbridge 3	K	95	0
Redbridge 4	R	85	0
Redbridge 5	R	58	0
Reigate and Banstead 1	S	99	0
Reigate and Banstead 2	S	69	0
Richmond 1	R	96	0
Richmond 15	R	48	0
Richmond 17	U	17	0
Richmond 19	U	17	0
Richmond 2	S	100	0
Sevenoaks 2	U	95	0
Southwark 1	U	90	0
Southwark 2	R	68	0
Sutton 3	S	21	0
Sutton 4	K	93	0
Thurrock 1	U	86	0
Thurrock 2	R	95	1
Thurrock 3	R	84	0
Tower Hamlets 1	U	95	0
Tower Hamlets 2	R	96	0
Tower Hamlets 3	U	87	0
Waltham Forest 1	U	84	0
Waltham Forest 3	R	88	0
Wandsworth 2	U	99	0
Wandsworth 4	R	95	0

Nitrogen Dioxide	Type	Annual Mean less than 21ppb	Annual Mean less than 40µgm $^{-3}$	Achieved
Barking & Dagenham 1	S	16	31	YES
Barnet 1	K	39	75	NA
Barnet 2	U	19	37	YES
Bexley 1	U	18	35	NA
Bexley 2	S	18	34	YES
Bexley 5	S	17	33	NA
Bexley 7	R	21	40	NA
Bexley 8	R	20	38	NA
Brent 1	U	18	34	YES
Brent 3	R	33	63	NA
Brent 4	R	39	75	NA
Brent 5	R	25	47	NA
Brentwood 1	U	18	34	YES
Bromley 7	R	22	43	NO
Camden 1	K	35	66	NA
Camden 3	R	38	73	NO
Castle Point 1	U	13	25	YES
City of London 1	U	27	51	NO
Croydon 2	R	26	50	NA
Croydon 4	R	28	54	NA
Croydon 5	K	36	70	NO
Croydon 6	S	20	38	YES
Crystal Palace 1	R	26	50	NO
Ealing 1	U	22	42	NO
Ealing 2	R	31	58	NA
Ealing 6	R	51	97	NA
Enfield 1	S	18	35	NA
Enfield 2	R	20	39	YES
Enfield 3	U	17	32	YES
Enfield 4	R	25	49	NO
Greenwich 4	U	17	33	YES
Greenwich 5	R	26	49	NO
Greenwich 7	R	29	55	NO

Nitrogen Dioxide	Type	Annual Mean less than 21ppb	Annual Mean less than 40µgm $^{-3}$	Achieved
Greenwich Bexley 6	R	26	51	NO
Hackney 4	U	25	48	NO
Hackney 6	R	31	59	NA
Haringey 1	R	25	48	NO
Haringey 2	S	18	34	NA
Harrow 1	U	16	30	YES
Harrow 2	R	23	44	NA
Havering 1	R	20	37	YES
Havering 3	R	20	38	YES
Heathrow Airport	U	30	58	NO
Hillingdon 1	R	24	46	NO
Hillingdon 2	R	20	37	NA
Hounslow 2	S	24	46	NO
Hounslow 4	R	41	78	NO
Hounslow 5	R	28	54	NA
H'smith and Fulham 1	R	46	87	NA
H'smith and Fulham 2	U	21	39	NA
Islington 1	U	24	47	NO
Islington 2	R	34	65	NO
Kens and Chelsea 1	U	22	42	NO
Kens and Chelsea 2	R	40	75	NA
Kens and Chelsea 3	R	48	91	NO
Kens and Chelsea 4	R	49	93	NO
Lambeth 1	R	30	57	NO
Lambeth 2	R	25	47	NA
Lambeth 3	U	20	39	YES
Lambeth 4	K	96	184	NA
Lewisham 1	U	25	48	NO
Lewisham 2	R	33	63	NO
Marylebone Rd	K	55	104	NO
Mole Valley 2	S	14	27	YES
Mole Valley 3	U	14	26	YES
Redbridge 1	U	20	39	YES

Nitrogen Dioxide	Type	Annual Mean less than 21ppb	Annual Mean less than 40µgm $^{-3}$	Achieved
Redbridge 3	K	33	64	NO
Redbridge 4	R	26	50	NA
Redbridge 5	R	27	52	NA
Reigate and Banstead 1	S	16	31	YES
Reigate and Banstead 2	S	18	35	NA
Richmond 1	R	23	44	NO
Richmond 15	R	26	50	NA
Richmond 17	U	18	35	NA
Richmond 19	U	15	28	NA
Richmond 2	S	18	34	YES
Sevenoaks 2	U	12	24	YES
Southwark 1	U	26	51	NO
Southwark 2	R	33	63	NA
Sutton 3	S	15	29	NA
Sutton 4	K	40	77	NO
Thurrock 1	U	18	35	NA
Thurrock 2	R	40	76	NO
Thurrock 3	R	21	41	NA
Tower Hamlets 1	U	21	40	NO
Tower Hamlets 2	R	34	66	NO
Tower Hamlets 3	U	23	43	NA
Waltham Forest 1	U	20	37	NA
Waltham Forest 3	R	18	35	NA
Wandsworth 2	U	32	61	NO
Wandsworth 4	R	26	49	NO

Nitrogen Dioxide	Type	No more than 18 occurrences of hourly mean >=200µgm $^{-3}$ (104.6ppb)	Achieved
Barking & Dagenham 1	S	0	YES
Barnet 1	K	32	NO
Barnet 2	U	0	YES
Bexley 1	U	1	NA
Bexley 2	S	0	YES
Bexley 5	S	0	NA
Bexley 7	R	0	NA
Bexley 8	R	0	NA
Brent 1	U	3	YES
Brent 3	R	16	NA
Brent 4	R	14	NA
Brent 5	R	0	NA
Brentwood 1	U	0	YES
Bromley 7	R	0	YES
Camden 1	K	3	NA
Camden 3	R	0	YES
Castle Point 1	U	0	YES
City of London 1	U	0	YES
Croydon 2	R	0	NA
Croydon 4	R	0	NA
Croydon 5	K	10	YES
Croydon 6	S	0	YES
Crystal Palace 1	R	2	YES
Ealing 1	U	0	YES
Ealing 2	R	3	NA
Ealing 6	R	52	NO
Enfield 1	S	0	NA
Enfield 2	R	0	YES
Enfield 3	U	0	YES
Enfield 4	R	2	YES
Greenwich 4	U	0	YES
Greenwich 5	R	0	YES

Nitrogen Dioxide	Type	No more than 18 occurrences of hourly mean >=200µgm $^{-3}$ (104.6ppb)	Achieved
Greenwich 7	R	0	YES
Greenwich Bexley 6	R	1	YES
Hackney 4	U	8	YES
Hackney 6	R	0	NA
Haringey 1	R	0	YES
Haringey 2	S	0	NA
Harrow 1	U	0	YES
Harrow 2	R	9	NA
Havering 1	R	1	YES
Havering 3	R	0	YES
Heathrow Airport	U	0	YES
Hillingdon 1	R	13	YES
Hillingdon 2	R	7	NA
Hounslow 2	S	1	YES
Hounslow 4	R	90	NO
Hounslow 5	R	28	NO
H'smith and Fulham 1	R	100	NO
H'smith and Fulham 2	U	0	NA
Islington 1	U	0	YES
Islington 2	R	3	YES
Kens and Chelsea 1	U	0	YES
Kens and Chelsea 2	R	1	NA
Kens and Chelsea 3	R	273	NO
Kens and Chelsea 4	R	49	NO
Lambeth 1	R	0	YES
Lambeth 2	R	0	NA
Lambeth 3	U	0	YES
Lambeth 4	K	1840	NO
Lewisham 1	U	2	YES
Lewisham 2	R	10	YES
Marylebone Rd	K	582	NO
Mole Valley 2	S	0	YES

Nitrogen Dioxide	Type	No more than 18 occurrences of hourly mean >=200µgm $^{-3}$ (104.6ppb)	Achieved
Mole Valley 3	U	0	YES
Redbridge 1	U	1	YES
Redbridge 3	K	21	NO
Redbridge 4	R	1	NA
Redbridge 5	R	1	NA
Reigate and Banstead 1	S	0	YES
Reigate and Banstead 2	S	0	NA
Richmond 1	R	0	YES
Richmond 15	R	2	NA
Richmond 17	U	0	NA
Richmond 19	U	0	NA
Richmond 2	S	0	YES
Sevenoaks 2	U	0	YES
Southwark 1	U	0	YES
Southwark 2	R	1	NA
Sutton 3	S	0	NA
Sutton 4	K	76	NO
Thurrock 1	U	0	NA
Thurrock 2	R	15	YES
Thurrock 3	R	0	NA
Tower Hamlets 1	U	0	YES
Tower Hamlets 2	R	9	YES
Tower Hamlets 3	U	0	NA
Waltham Forest 1	U	7	NA
Waltham Forest 3	R	0	NA
Wandsworth 2	U	9	YES
Wandsworth 4	R	0	YES

A.3.2 Ozone

Ozone	Type	Capture Rate (%)	Days moderate and above
Bexley 1	U	95	34
Bexley 7	R	5	2
Bexley 8	R	5	0
Brent 1	U	98	34
Bromley 5	S	95	52
City of London 1	U	89	26
Croydon 3	S	96	52
Ealing 1	U	99	40
Enfield 3	U	95	47
Greenwich 4	U	96	43
Hackney 4	U	97	23
Haringey 2	S	88	31
Hounslow 2	S	59	32
Kens and Chelsea 1	U	99	41
Kingston 1	S	99	47
Lewisham 1	U	91	21
Marylebone Rd	K	96	4
Redbridge 1	U	99	36
Richmond 15	R	55	18
Richmond 17	U	21	6
Richmond 19	U	17	6
Richmond 2	S	100	47
Sevenoaks 2	U	98	67
Southwark 1	U	94	27
Sutton 3	S	23	15
Thurrock 1	U	98	41
Tower Hamlets 1	U	99	51
Wandsworth 2	U	90	12

Ozone	Type	No more than 10 days where maximum rolling 8hr mean >=100µgm $^{-3}$ (50ppb)	Achieved
Bexley 1	U	19	NO
Bexley 7	R	1	NA
Bexley 8	R	0	NA
Brent 1	U	24	NO
Bromley 5	S	39	NO
City of London 1	U	18	NO
Croydon 3	S	34	NO
Ealing 1	U	22	NO
Enfield 3	U	32	NO
Greenwich 4	U	22	NO
Hackney 4	U	15	NO
Haringey 2	S	19	NO
Hounslow 2	S	17	NO
Kens and Chelsea 1	U	25	NO
Kingston 1	S	37	NO
Lewisham 1	U	11	NO
Marylebone Rd	K	1	YES
Redbridge 1	U	19	NO
Richmond 15	R	15	NO
Richmond 17	U	3	NA
Richmond 19	U	3	NA
Richmond 2	S	31	NO
Sevenoaks 2	U	47	NO
Southwark 1	U	22	NO
Sutton 3	S	8	NA
Thurrock 1	U	23	NO
Tower Hamlets 1	U	32	NO
Wandsworth 2	U	6	YES

A.3.3 PM_{10}

PM_{10}	Type	Instrument	Capture Rate (%)	Days moderate and above
Barking & Dagenham 2	S	T	99	10
Barnet 1	K	T	63	6
Barnet 2	U	T	100	4
Bexley 1	U	T	94	5
Bexley 2	S	T	99	5
Bexley 4	R	T	98	151
Bexley 7	R	T	19	4
Bexley 8	R	T	18	3
Brent 1	U	T	97	4
Brent 3	R	T	81	14
Brent 4	R	T	86	40
Brent 5	R	T	33	57
Bromley 7	R	B	78	(38)
Camden 1	K	T	99	25
Camden 3	R	T	100	15
Croydon 3	S	T	92	0
Croydon 4	R	T	91	7
Crystal Palace 1	R	T	91	1
Ealing 2	R	T	99	12
Enfield 2	R	B	95	(98)
Enfield 3	U	B	93	(39)
Enfield 4	R	B	90	(139)
Greenwich 4	U	T	98	7
Greenwich 5	R	T	99	9
Greenwich 7	R	T	94	19
Greenwich Bexley 6	R	T	98	13
Hackney 6	R	T	79	7
Haringey 1	R	T	98	7
Haringey 2	S	B	94	(81)
Harrow 1	U	T	95	5
Harrow 2	R	T	98	15
Havering 3	R	T	93	5

PM_{10}	Type	Instrument	Capture Rate (%)	Days moderate and above
Heathrow Airport	U	T	97	8
Hillingdon 1	R	T	92	14
Hillingdon 2	R	T	98	12
Hounslow 2	S	T	98	5
Hounslow 4	R	T	87	11
Hounslow 5	R	T	96	22
H'smith and Fulham 1	R	T	68	17
H'smith and Fulham 2	U	T	44	0
Islington 1	U	T	97	8
Islington 2	R	T	94	15
Kens and Chelsea 1	U	T	96	8
Kens and Chelsea 2	R	T	96	15
Lambeth 1	R	B	93	(102)
Lambeth 2	R	B	0	(0)
Lambeth 3	U	B	97	(60)
Lambeth 4	K	B	49	(112)
Lewisham 2	R	T	100	14
Marylebone Rd	K	T	98	57
Mole Valley 2	S	T	99	1
Mole Valley 3	U	T	81	3
Redbridge 1	U	B	96	(47)
Redbridge 3	K	B	48	(85)
Redbridge 4	R	B	98	(98)
Redbridge 5	R	B	57	(77)
Reigate and Banstead 1	S	T	99	4
Richmond 1	R	T	94	8
Richmond 15	R	T	51	12
Richmond 17	U	T	21	1
Richmond 19	U	T	17	0
Richmond 2	S	T	98	6
Sevenoaks 2	U	T	97	2
Southwark 1	U	T	100	8
Southwark 2	R	T	66	6

PM_{10}	Type	Instrument	Capture Rate (%)	Days moderate and above
Sutton 4	K	T	99	9
Thurrock 1	U	T	96	8
Thurrock 3	R	T	82	0
Tower Hamlets 1	U	T	99	10
Tower Hamlets 3	U	T	86	2
Waltham Forest 1	U	T	52	0
Waltham Forest 3	R	T	93	7
Wandsworth 4	R	T	94	8

Instrument type; T = TEOM, B = BAM.PM_{10}	Type	Instrument	No more than 35 days where daily mean >=50µgm^{-3} (TEOM *1.3, BAM *1)	Achieved
Barking & Dagenham 2	S	T	24	YES
Barnet 1	K	T	19	NA
Barnet 2	U	T	12	YES
Bexley 1	U	T	11	YES
Bexley 2	S	T	8	YES
Bexley 4	R	T	137	NO
Bexley 7	R	T	9	NA
Bexley 8	R	T	4	NA
Brent 1	U	T	10	YES
Brent 3	R	T	23	NO
Brent 4	R	T	71	NO
Brent 5	R	T	57	NA
Bromley 7	R	B	24	NA
Camden 1	K	T	49	NO
Camden 3	R	T	50	NO
Croydon 3	S	T	5	YES
Croydon 4	R	T	22	YES
Crystal Palace 1	R	T	11	YES
Ealing 2	R	T	33	YES
Enfield 2	R	B	64	NO
Enfield 3	U	B	24	YES
Enfield 4	R	B	101	NO
Greenwich 4	U	T	9	YES
Greenwich 5	R	T	14	YES
Greenwich 7	R	T	38	NO
Greenwich Bexley 6	R	T	21	YES
Hackney 6	R	T	16	NA
Haringey 1	R	T	16	YES
Haringey 2	S	B	55	NO
Harrow 1	U	T	7	YES
Harrow 2	R	T	30	YES
Havering 3	R	T	15	YES
Heathrow Airport	U	T	19	YES

Instrument type; T = TEOM, B = BAM.PM_{10}	Type	Instrument	No more than 35 days where daily mean >=50µgm $^{-3}$ (TEOM *1.3, BAM *1)	Achieved
Hillingdon 1	R	T	27	YES
Hillingdon 2	R	T	20	YES
Hounslow 2	S	T	10	YES
Hounslow 4	R	T	29	NA
Hounslow 5	R	T	48	NO
H'smith and Fulham 1	R	T	31	NA
H'smith and Fulham 2	U	T	1	NA
Islington 1	U	T	13	YES
Islington 2	R	T	33	YES
Kens and Chelsea 1	U	T	12	YES
Kens and Chelsea 2	R	T	34	YES
Lambeth 1	R	B	77	NO
Lambeth 2	R	B	0	NA
Lambeth 3	U	B	39	NO
Lambeth 4	K	B	82	NO
Lewisham 2	R	T	28	YES
Marylebone Rd	K	T	111	NO
Mole Valley 2	S	T	6	YES
Mole Valley 3	U	T	7	NA
Redbridge 1	U	B	29	YES
Redbridge 3	K	B	56	NO
Redbridge 4	R	B	65	NO
Redbridge 5	R	B	50	NO
Reigate and Banstead 1	S	T	7	YES
Richmond 1	R	T	13	YES
Richmond 15	R	T	20	NA
Richmond 17	U	T	1	NA
Richmond 19	U	T	1	NA
Richmond 2	S	T	11	YES
Sevenoaks 2	U	T	7	YES
Southwark 1	U	T	15	YES
Southwark 2	R	T	20	NA
Sutton 4	K	T	15	YES

Instrument type; T = TEOM, B = BAM.PM_{10}	Type	Instrument	No more than 35 days where daily mean >=50µgm $^{-3}$ (TEOM *1.3, BAM *1)	Achieved
Thurrock 1	U	T	12	YES
Thurrock 3	R	T	9	NA
Tower Hamlets 1	U	T	22	YES
Tower Hamlets 3	U	T	6	NA
Waltham Forest 1	U	T	0	NA
Waltham Forest 3	R	T	11	YES
Wandsworth 4	R	T	20	YES

Instrument type; T = TEOM, B = BAM.PM_{10}	Type	Instrument	Annual Mean less than 40µgm^{-3} (TEOM *1.3, BAM *1)	Achieved
Barking & Dagenham 2	S	T	29	YES
Barnet 1	K	T	31	NA
Barnet 2	U	T	24	YES
Bexley 1	U	T	24	YES
Bexley 2	S	T	24	YES
Bexley 4	R	T	52	NO
Bexley 7	R	T	32	NA
Bexley 8	R	T	28	NA
Brent 1	U	T	23	YES
Brent 3	R	T	32	NA
Brent 4	R	T	39	NA
Brent 5	R	T	59	NA
Bromley 7	R	B	29	NA
Camden 1	K	T	36	YES
Camden 3	R	T	37	YES
Croydon 3	S	T	24	YES
Croydon 4	R	T	30	YES
Crystal Palace 1	R	T	26	YES
Ealing 2	R	T	31	YES
Enfield 2	R	B	39	YES
Enfield 3	U	B	27	YES
Enfield 4	R	B	44	NO
Greenwich 4	U	T	24	YES
Greenwich 5	R	T	27	YES
Greenwich 7	R	T	32	YES
Greenwich Bexley 6	R	T	30	YES
Hackney 6	R	T	33	NA
Haringey 1	R	T	26	YES
Haringey 2	S	B	36	YES
Harrow 1	U	T	21	YES
Harrow 2	R	T	30	YES
Havering 3	R	T	25	YES
Heathrow Airport	U	T	29	YES

Instrument type; T = TEOM, B = BAM.PM10	Type	Instrument	Annual Mean less than 40µgm-3 (TEOM *1.3, BAM *1)	Achieved
Hillingdon 1	R	T	30	YES
Hillingdon 2	R	T	29	YES
Hounslow 2	S	T	24	YES
Hounslow 4	R	T	31	NA
Hounslow 5	R	T	36	YES
H'smith and Fulham 1	R	T	35	NA
H'smith and Fulham 2	U	T	21	NA
Islington 1	U	T	27	YES
Islington 2	R	T	35	YES
Kens and Chelsea 1	U	T	26	YES
Kens and Chelsea 2	R	T	36	YES
Lambeth 1	R	B	39	YES
Lambeth 2	R	B	45	NA
Lambeth 3	U	B	31	YES
Lambeth 4	K	B	54	NA
Lewisham 2	R	T	32	YES
Marylebone Rd	K	T	44	NO
Mole Valley 2	S	T	22	YES
Mole Valley 3	U	T	23	NA
Redbridge 1	U	B	32	YES
Redbridge 3	K	B	44	NA
Redbridge 4	R	B	36	YES
Redbridge 5	R	B	41	NA
Reigate and Banstead 1	S	T	23	YES
Richmond 1	R	T	27	YES
Richmond 15	R	T	33	NA
Richmond 17	U	T	24	NA
Richmond 19	U	T	23	NA
Richmond 2	S	T	24	YES
Sevenoaks 2	U	T	21	YES
Southwark 1	U	T	28	YES
Southwark 2	R	T	33	NA
Sutton 4	K	T	31	YES

Instrument type; T = TEOM, B = BAM.PM_{10}	Type	Instrument	Annual Mean less than 40µgm $^{-3}$ (TEOM *1.3, BAM *1)	Achieved
Thurrock 1	U	T	25	YES
Thurrock 3	R	T	26	NA
Tower Hamlets 1	U	T	27	YES
Tower Hamlets 3	U	T	23	NA
Waltham Forest 1	U	T	21	NA
Waltham Forest 3	R	T	25	YES
Wandsworth 4	R	T	29	YES

Instrument type; T = TEOM, B = BAM.

A.3.4 $PM_{2.5}$

$PM_{2.5}$	Type	Instrument	Annual Mean µgm $^{-3}$	Capture Rate (%)
Bexley 1	U	T	12	26
Bexley 2	S	T	12	99
Bexley 3	S	T	12	75
Bexley 7	R	T	13	23
Bexley 8	R	T	13	24
Ealing 2	R	T	15	55
Greenwich Bexley 6	R	T	14	99
Hackney 4	U	T	15	82

Instrument type; T = TEOM.

A.3.5 Sulphur Dioxide

Sulphur Dioxide	Type	Capture Rate (%)	Days moderate and above
Barking & Dagenham 1	S	99	0
Bexley 1	U	90	1
Bexley 5	S	76	0
Brent 1	U	97	0
Brent 3	R	74	1
Brent 4	R	74	0
Castle Point 1	U	94	1
City of London 1	U	87	0
Croydon 4	R	97	0
Crystal Palace 1	R	95	0
Ealing 1	U	92	0
Enfield 3	U	94	1
Enfield 4	R	96	0
Greenwich 4	U	98	0
Haringey 1	R	95	0
Harrow 1	U	80	0
Havering 3	R	93	0
Hounslow 2	S	97	0
Hounslow 4	R	95	0
H'smith and Fulham 1	R	49	0
Kens and Chelsea 1	U	98	0
Kens and Chelsea 2	R	66	0
Lambeth 1	R	97	0
Lambeth 2	R	0	0
Lambeth 3	U	99	0
Lambeth 4	K	50	0
Lewisham 1	U	99	0
Lewisham 2	R	97	0
Marylebone Rd	K	96	0
Redbridge 4	R	95	0
Richmond 15	R	53	0
Richmond 17	U	21	0

Sulphur Dioxide	Type	Capture Rate (%)	Days moderate and above
Richmond 19	U	10	0
Sevenoaks 2	U	94	0
Southwark 1	U	94	0
Southwark 2	R	91	0
Thurrock 1	U	95	3
Thurrock 3	R	84	0
Tower Hamlets 1	U	99	1
Tower Hamlets 3	U	77	0
Waltham Forest 1	U	72	0
Waltham Forest 3	R	68	0
Wandsworth 2	U	94	0

Sulphur Dioxide	Type	No more than 35 occurrences of 15min mean >=350µgm $^{-3}$ (100ppb)	Achieved
Barking & Dagenham 1	S	0	YES
Bexley 1	U	1	YES
Bexley 5	S	0	NA
Brent 1	U	0	YES
Brent 3	R	1	NA
Brent 4	R	0	NA
Castle Point 1	U	1	YES
City of London 1	U	0	NA
Croydon 4	R	0	YES
Crystal Palace 1	R	0	YES
Ealing 1	U	0	YES
Enfield 3	U	1	YES
Enfield 4	R	0	YES
Greenwich 4	U	0	YES
Haringey 1	R	0	YES
Harrow 1	U	0	NA
Havering 3	R	0	YES
Hounslow 2	S	0	YES
Hounslow 4	R	0	YES
H'smith and Fulham 1	R	0	NA
Kens and Chelsea 1	U	0	YES
Kens and Chelsea 2	R	0	NA
Lambeth 1	R	0	YES
Lambeth 2	R	0	NA
Lambeth 3	U	0	YES
Lambeth 4	K	0	NA
Lewisham 1	U	0	YES
Lewisham 2	R	0	YES
Marylebone Rd	K	0	YES
Redbridge 4	R	0	YES
Richmond 15	R	0	NA
Richmond 17	U	0	NA

Sulphur Dioxide	Type	No more than 35 occurrences of 15min mean >=350µgm $^{-3}$ (100ppb)	Achieved
Richmond 19	U	0	NA
Sevenoaks 2	U	0	YES
Southwark 1	U	0	YES
Southwark 2	R	0	YES
Thurrock 1	U	7	YES
Thurrock 3	R	0	NA
Tower Hamlets 1	U	1	YES
Tower Hamlets 3	U	0	NA
Waltham Forest 1	U	0	NA
Waltham Forest 3	R	0	NA
Wandsworth 2	U	0	YES

APPENDIX 4: AIR QUALITY STRATEGY OBJECTIVES & UK AIR QUALITY INFORMATION SYSTEM

The following Objectives are set out in the Air Quality Regulations 2000 for the purposes of Local Air Quality Management.

Pollutant	Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	5 μgm^{-3} (1.5 ppb)	Annual Mean	31 Dec 2010
1, 3 Butadiene	2.25 μgm^{-3} (1 ppb)	Annual Mean	31 Dec 2003
Carbon Monoxide	10 μgm^{-3} (8.6 ppb)	Running 8 hour mean	31 Dec 2003
Lead	0.5μgm^{-3}	Annual Mean	31 Dec 2003
	0.25 μgm^{-3}	Annual Mean	31 Dec 2008
Nitrogen Dioxide (provisional)	200 μgm^{-3} (105 ppb) not to be exceeded more than 18 times a year	1 hour mean	31 Dec 2005
	40 μgm^{-3} (21 ppb)	Annual Mean	31 Dec 2005
Particles (PM_{10})	50 μgm^{-3} not to be exceeded more than 35 times a year	24 hour mean	31 Dec 2004
	40 μgm^{-3}	Annual Mean	31 Dec 2004
Sulphur Dioxide	350 μgm^{-3} (132 ppb) not to be exceeded more than 24 times a year	1 hour mean	31 Dec 2004
	125 μgm^{-3} (47 ppb) not to be exceeded more than 3 times a year	24 hour mean	31 Dec 2004
	266 μgm^{-3} (100 ppb) not to be exceeded more than 35 times a year	15 minute mean	31 Dec 2005

The following Objectives are not included in the Air Quality Regulations 2000 for the purposes of Local Air Quality Management.

Pollutant	Objective		Date to be achieved by
	Concentration	Measured as	
Objectives for the protection of human health			
Ozone (provisional)	100 μgm^{-3} (50 ppb) not to be exceeded more than 10 times per year	Daily maximum of running 8 hour mean	31 Dec 2005
Objectives for the protection of vegetation and ecosystems			
Nitrogen Oxides (assuming NO_X is taken as NO_2)	30 μgm^{-3} (16 ppb)	Annual mean	31 Dec 2000
Sulphur Dioxide	20 μgm^{-3} (8 ppb) 20 μgm^{-3} (8 ppb)	Annual Mean Winter Mean (1 Oct- 31 Mar)	31 Dec 2000 31 Dec 2000

DETR, 2000; The Air Quality Strategy for England, Scotland, Wales and Northern Ireland – A consultation Document.

DETR, 2000; Air Quality Regulations 2000.

DEFRA, 2002; Report on the Review of the National Air Quality Strategy; Proposals to Amend the Strategy.

The 'descriptors' applied to air pollution concentrations are defined by the UK Air Quality Information system.

Pollutant / Band	LOW	MODERATE	HIGH	VERY HIGH
Sulphur Dioxide	below 100ppb, averaged over 15 minutes	100ppb, averaged over 15 minutes	200ppb, averaged over 15 minutes	400ppb, averaged over 15 minutes
Ozone	below 50ppb, as an 8 hour running average and below 50ppb averaged over one hour	50ppb, as an 8 hour running average or 50ppb averaged over one hour	90 ppb, averaged over one hour	180 ppb, averaged over one hour
Carbon Monoxide	below 10 ppm, as an 8 hour running average	10 ppm, as an 8 hour running average	15 ppm, as an 8 hour running average	20 ppm, as an 8 hour running average
Nitrogen Dioxide	below 150 ppb, averaged over one hour	150 ppb, averaged over one hour	300 ppb, averaged over one hour	400 ppb, averaged over one hour
PM_{10} Particles (by TEOM)	below 50 ug/m^3, as a 24 hour running average	50 ug/m^3, as a 24 hour running average	75 ug/m^3, as a 24 hour running average	100 ug/m^3, as a 24 hour running average