Local Air Quality Management Report

April 2007

THE ROYAL BOROUGH OF
KENSINGTON
AND CHELSEA

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EXECUTIVE SUMMARY

Under the Government's Air Quality Strategy, the Council is required to assess air quality within the Borough annually. As a result of one review in 2000, the whole Borough was declared an Air Quality Management Area on the basis that certain Government air quality objectives, for nitrogen dioxide and particulate matter would not be met. In 2003, the Council published its first Air Quality Action Plan, which sets out the steps the Council is taking to work towards meeting these quality objectives.

This latest progress report once again consists of two parts; an update on local air quality management (LAQM) which is followed by an action plan progress report.

The LAQM review includes monitoring data collected during 2006 on the seven key pollutants listed in the national Air Quality Strategy. These are carbon monoxide; benzene; 1,3-butadiene; lead, nitrogen dioxide (NO_2), sulphur dioxide and particulate matter (PM_{10}). We have also included information on the hydrocarbon benzo(α)pyrene (b(a)p) and ozone.

Most pollutants remain well within their respective objective levels. However, NO_2 and PM_{10} continue to exceed their objectives and at some locations have shown increases.

The second part of the report provides an update on progress with implementing the Council's Air Quality Action Plan. This is the last update of this plan as the Council is in the process of revising it and adding new actions to help us to meet the air quality objectives.

Over the lifetime of this plan eight out of 25 actions have been completed, however, significant progress has been made with the remainder, as most involve on-going action. In this latest year, we are particularly pleased with progress made with action 8, working with schools to develop travel plans and action 9 relating to our car club scheme. We have also been able to demonstrate the impact that these actions have had on emissions.

Another achievement we are proud of this year is our success in having been short listed for beacon status in the category of 'Delivering Cleaner Air'. Whilst we were unsuccessful in obtaining the beacon status itself, we were one of only five local authorities in the country to have been short listed so this is a noteworthy achievement.

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INTRODUCTION

Background

In 1997 the first national air quality strategy was produced. This set health based standards and objectives, most of which were incorporated within Air Quality Regulations. Objectives were set for key pollutants, covering different time averaging periods and each has a date by when it should be achieved (table below).

Table 1 Air Quality Objectives within London

Pollutant	Concentration	Measured as	Date to be achieved
Benzene	16.25μg/m^3 5.00μg/m^3	running annual mean annual mean	31.12.2003 31.12.2010
1,3-butadiene	2.25μg//m^3	running annual mean	31.12.2003
Carbon monoxide	10 mg/m^3	max daily running 8hr mean	31.12.2003
Lead	0.5 μg/m^3 0.25 μg/m^3	annual mean annual mean	31.12.2004 31.12.2008
Nitrogen dioxide	200 μg/m^3 (not to be exceeded more than 18 times per year) 40 μg/m^3	1hr mean annual mean	31.12.2005 31.12.2005
Particles – PM_{10}	50μg/m^3 (not to be exceeded more than 35 times per year) 40μg/m^3	24 hr mean annual mean	31.12.2004 31.12.2004
Sulphur dioxide	350 μg/m^3 (not to be exceeded more than 24 times per year) 125μg/m^3 (not to be exceeded more than 3 times per year) 266 μg/m^3 (not to be exceeded more than 35 times per year)	1 hr mean 24 hr mean 15 minute mean	31.12.2004 31.12.2004 31.12.2005

Review and assessment of air quality

Section 82 of the Environment Act 1995 places a duty on local authorities to work towards achieving these air quality objectives and report annually on our progress. Details about previous review and assessment reports can be found in Annex 1. In addition a provisional objective for ozone was also set, however it is not dealt within the LAQM process because it requires action at the European level. However because of concern over its health effects and regular exceedence of objectives is included for information purposes on p24.

Additional objectives and legislation

Following the publication of the addendum of the Air Quality Strategy for England, Scotland, Wales and Northern Ireland in 2003, further objectives were set for particles and polycyclic aromatic hydrocarbons (PAHs). However, these (shown below) have not been incorporated within the Air Quality Regulations. While there is no requirement to include an assessment of PAHs at this time, a brief section has been included (see page 23) for information only.

Table 2 Objectives adopted but not incorporated within the Air Quality Regulations.

Pollutant	Concentration	Measured as	Date to be achieved
Particles PM_{10}	50 µg/m^3 not to be exceeded more than 10 times per year 23 µg/m^3 20 µg/m^3	24 hr mean annual mean annual mean	31.12.2010 31.12.2010 31.12.2015
Polyaromatic hydrocarbons	25 ng/m^3	annual mean	31.12.2010

Air Quality Strategy review

The national Air Quality Strategy (AQS) was reviewed and consulted on between 2005 and 2006. It outlined a number of policy measures to improve air quality and assessed them according to their monetary costs and benefits, exceedences of the air quality objectives, and other positive or negative environmental effects e.g. on ecosystems, noise etc. The AQS consultation, also invited comments on proposals to introduce an objective for fine particles ($PM_{2.5}$) for central Government and considered a new approach for pollution control – the exposure reduction approach. This is shown in Table 3 below. Some of these proposals have arisen from the draft EU Directive incorporating the work of the CAFÉ (Clean air for Europe) programme, which includes proposals for $PM_{2.5}$ objectives. Publication of the final AQS document has been delayed to summer 2007. The Council responded to the consultation in June 2006. The new Air Quality Directive is due to receive its second reading in autumn 2007.

Table 3 Air Quality Strategy review proposal

Pollutant	Concentration	Measured as	Date to be achieved
Particles -$PM_{2.5}$	20% reduction on 2010 value*	Annual mean	2020
	25µg/m^3	Annual mean	1 Jan 2010 (2015 with derogation)

*exposure reduction

Further information

For further copies of this report, or any other report in the Review and Assessment series (for full list see Annex 1), please contact Kyri Eleftheriou-Vaus on 020 7341 5686 or visit our website **http://www.rbkc.gov.uk/EnvironmentalServices/AirQuality/**.

If you have any comments or ideas on how the Council could work towards improving air quality then please email them to **air.quality@rbkc.gov.uk** or post them to the Environmental Quality Unit, Royal Borough of Kensington and Chelsea, Council Offices, 37 Pembroke Road, London W8 6PW.

AIR QUALITY MONITORING

There are two main types of monitoring undertaken in the borough. We have fully automated continuous sites and monitoring which is undertaken using sampling devices, such as diffusion tubes. Gravimetric monitoring whilst operating continuously is a sampling device that does not provide real time data (see glossary).

Automated monitoring data

This is collected at five monitoring sites in the borough; table 4 provides details about each. Air quality data for 2006 has been included in the report where it is available. This data is provisional.

Non automatic networks

Monitoring data for benzene and nitrogen dioxide (in addition to continuous monitoring) is collected using passive diffusion techniques. Bureau Veritas collates this data as part of the London Wide Environmental Programme.

Quality control and assurance

Automated data that we collect is subject to quality control and audit procedures by Kings Environmental Research Group (Kings ERG) who operate the London Air Quality Network (LAQN). In addition independent consultants carry out audits annually. The North Kensington site is further scrutinised by Defra's contractors as it is affiliated to the Automatic Urban and Rural Network (AURN). Further information on data collection and quality control is included in appendix A2.

Overleaf (table 4) is an outline of the monitoring network in the Borough. It is followed by an assessment of each pollutant individually.

Table 4 Monitoring locations in the Royal Borough of Kensington and Chelsea

Site name	North Kensington	Cromwell Rd/ Cromwell Rd 2	Cromwell Rd 2	West London	Knightsbridge	Chelsea	Earls Court
Site type*	LAQN & AURN affiliate	AURN	LAQN	AURN	LAQN	LAQN	-
Ownership	RBKC	DEFRA	RBKC	DEFRA	RBKC	RBKC	RBKC
Pollutants measured	nitrogen oxides PM_{10} carbon monoxide sulphur dioxide	nitrogen oxides carbon monoxide sulphur dioxide	PM_{10}	nitrogen oxides carbon monoxide	nitrogen oxides	nitrogen oxides	PM_{10} gravimetric
Other monitoring undertaken	Gravimetric monitoring PM_{10} & $PM_{2.5}$	Lead and heavy metals					
Grid reference	TQ401821	TQ264789 TQ265790 >1998	TQ265790	TQ251788	TQ527179	TQ527178	TQ525178
Site location and description	Sited in the grounds of Sion Manning school in St Charles Square, North Kensington. Surrounded by a mainly residential area. Height inlet is approx. 3m.	Originally sited at the kerbside of the Cromwell Rd. Traffic density approx. 60,000 vehicles per day. Now located at the rear of the pavement at the Natural History Museum, 3.5m from the Cromwell Road. The height of the inlet is approx. 2m.	Located within the DEFRA monitoring cabin in the grounds of the Natural History Museum. Approx. within 8m of the Cromwell Rd and 5m of Queens Gate. Height inlet is approx. 1.4m.	Located within the Council depot, Pembroke Road. The nearest road is Warwick Rd (50m). The surrounding area is built-up. Height inlet is approx. 30m.	Located on the Kerb of Hans Road and 4m from the Brompton Rd. Height inlet approx 3m.	Located at the building façade of the Chelsea Old Town Hall at the rear of the pavement approx. 8m from the Kings Road. Height inlet approx. 3m.	Sited on the kerb of the Earls Court Road.
Site definition	Urban background	Kerbside < Roadside	Roadside	Urban background	Kerbside/ Roadside	Roadside	Kerbside
Start date	1/4/1995 Affiliated from 1/4/1996	22/2/1973	22/5/1998	1/1/1987	28/03/2000	27/9/2000	29/05/2002
Website for data	www.londonair.org.uk www.airquality.co.uk	www.airquality.co.uk	www.londonair.org.uk	www.airquality.co.uk	www.londonair.org.uk	www.londonair.org.uk	www.londonair.org.uk

*LAQN- London Air Quality Network, AURN- Automatic Urban and Rural Network

Kerbside: within 1m of a busy road, Roadside: located 1-5m, Urban background at least 50m from any major pollutant source.

CARBON MONOXIDE

The objective for carbon monoxide (CO) is 10 mg/m^3 as a maximum daily 8 hour running mean. We have looked at data from 2006 to check this objective continues to be met.

Monitoring data

All available carbon monoxide monitoring data (since 1999) recorded in the Borough has been collated below, along with data from one other busy kerbside location from central London.

Table 5 Concentrations of CO measured in the Borough and at one central London site.

Year	Site	Annual mean (mg/m^3)	Max daily 8-hour* (mg/m^3)	No. of hours above 10mg/m^3	% Data capture
1999	North Kensington	0.4	3.9	0	96
	West London	0.4	4.3	0	97
	Cromwell Rd 2	1.5	5.1	0	98
	Marylebone Rd	2.1	8.5	0	92
2000	North Kensington	0.4	5.8	0	95
	West London	0.3	5.3	0	97
	Cromwell Rd 2	1.3	6.0	0	98
	Marylebone Rd	2.4	9.9	0	96
2001	North Kensington	0.5	3.4	0	92
	West London	0.4	3.8	0	98
	Cromwell Rd 2	1.2	4.1	0	98
	Marylebone Rd	1.7	6.5	0	96
2002	North Kensington	0.4	5	0	96
	West London	0.4	3	0	97
	Cromwell Rd 2	1.0	4	0	93
	Marylebone Rd	1.4	5	0	98
2003	North Kensington	0.4	2.5	0	92
	West London	0.4	2.1	0	95
	Cromwell Rd 2	0.9	2.9	0	89
	Marylebone Rd	1.3	3.7	0	98
2004	North Kensington	0.5	2.3	0	99
	West London	0.4	1.6	0	99
	Cromwell Rd 2	0.8	2.3	0	98
	Marylebone Rd	1.1	3.0	0	96
2005	North Kensington	0.4	3.1	0	96
	West London	0.4	2.1	0	94
	Cromwell Rd 2	0.7	3.5	0	94
	Marylebone Rd	0.9	3.6	0	98
2006	North Kensington	*0.3*	*2.0*	*0*	*97*
	West London	*0.4*	*1.8*	*0*	*84*
	Cromwell Rd 2	*0.7*	*2.0*	*0*	*95*
	Marylebone Rd	*1.0*	*2.8*	-	*66#*

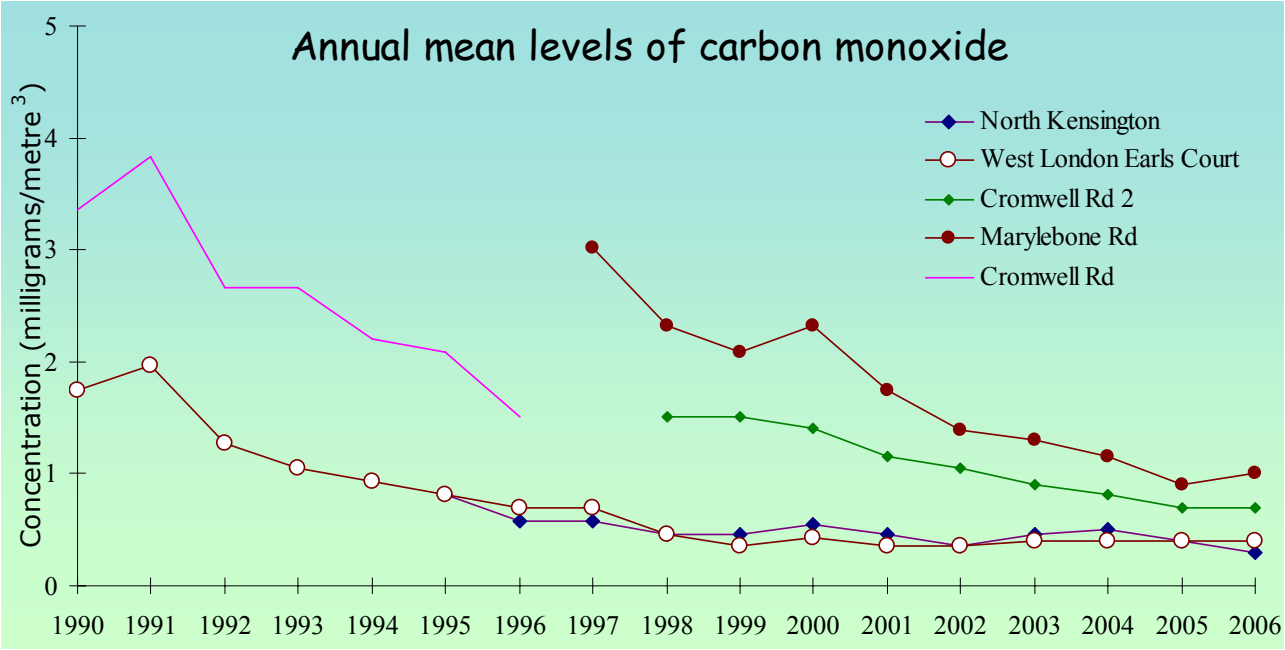
*** Maximum daily 8-hour running mean**

2006 data is provisional and must be treated with caution

 # Low data capture at Marylebone road

There were no exceedences of the objective in 2006 at any of the monitoring locations in the Royal Borough. The highest maximum daily 8 hour running mean measured at any of the sites in the borough during 2006 was 2.0 mg/m^3. The Marylebone Road site, whilst not located within the Borough, is none the less indicative of levels at busy kerbside locations, and even here the objective level has not been exceeded; however it is important to note that in 2006 there was only 66% data capture for this site. Generally road side locations measure annual mean levels which are approximately double the concentrations at background locations.

The chart below shows that whilst annual mean levels have previously declined, they have now largely stabilised with some minor fluctuations.



Conclusion

Levels of carbon monoxide measured remain well within the10 mg/m^3 (as a maximum 8 hour running mean) objective. It is also unlikely that any exceedences will occur in the Borough in 2007.

BENZENE

Two objectives have been set for the assessment of benzene – a running annual mean of 16.25µg/m^3 to be met by 31.12.2003, and a more stringent annual mean of 5µg/m^3 to be achieved by 31.12.2010.

Monitoring data

We undertake sampling at five locations using diffusion samplers. Since the previous report (produced April 2006), monitoring at the petrol forecourt site has ceased due to the station's closure in May 2006. We have however set up new monitoring close to the boundary of another petrol station. This began in June 2006, so data from this site must be treated with caution, as only seven months of data are available.

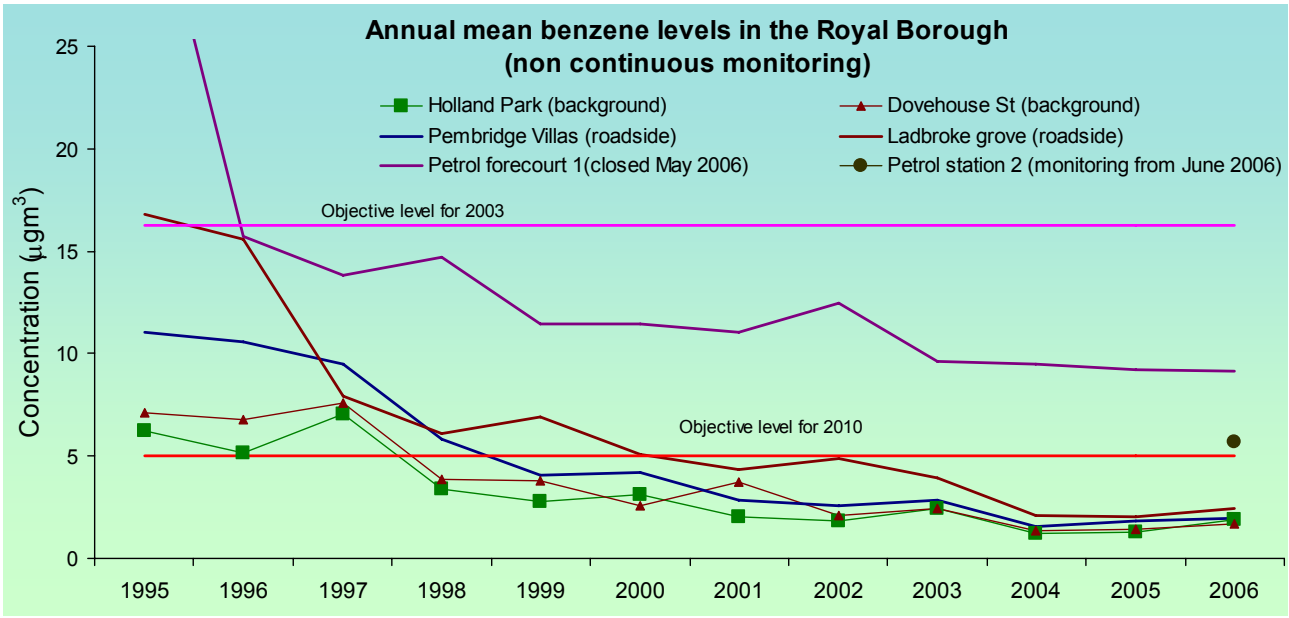
The table below demonstrates that the 2003 (16.25µg/m^3) objective has been met at all sites since 1997 (the measured annual mean is assumed to be the equivalent of the running annual mean). The highest levels of benzene were recorded on the forecourt of a petrol station (1), indeed the stricter 2010 objective (5µg/m^3) was exceeded, despite an overall downward trend. As mentioned above, this petrol station is no longer operating. The data from the new site (established June 2006), for the sampling period so far is 5.7µg/m^3; this is just above the 2010 objective level. Of the remaining sites there has been a very slight increase in the monitoring levels for 2006 compared to 2005, but remain well within both objective levels.

Table 6 Annual average benzene levels using diffusion samplers (µg/m^3)

Location	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Holland Park (B)	8.1	10.5	9.0	6.2	5.1	7.1	3.4	2.8	3.1	2.0	1.8	2.43	1.24	1.28	1.88
Dovehouse St (B)	15.2	22.8	13.1	7.1	6.8	7.6	3.9	3.8	2.6	3.7	2.1	2.47	1.38	1.43	1.66
Pembridge Villas (R)	-	-	10.2	11.1	10.6	9.5	5.8	4.0	4.2	2.9	2.6	2.85	1.59	1.83	1.99
Ladbroke grove (R)	28.7	20.6	14.8	16.8	15.6	7.9	6.1	6.9	5.1	4.3	4.9	3.92	2.07	2.03	2.26
Petrol forecourt (1)	59.7	44.0	27.3	34.9	15.7	13.8	14.7	11.5	11.4	11.0	12.5	9.63	9.46	9.24	**9.17**
Petrol station (2)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**5.70**

B= background, R= roadside
2006 data Petrol forecourt (1) = 4 months, Petrol station (2) = 7 months

The graph below demonstrates the long term trend; generally there has been a significant overall decline though this has slowed down in recent years with a very slight upturn in 2005 and 2006.



Whilst continuous monitoring is more accurate than diffusive samplers they are costly and complicated to operate; consequently there are few continuous monitors within London. The London-Wide Benzene survey is subject to quality control procedures including exposing additional diffusion tubes for duplicate or triplicate exposure at a monitoring site within each borough. In addition, diffusion tubes are also exposed at the Hydrocarbon Network site on Marylebone Road. Tubes exposed at this site are compared against benzene data from the automatic Hydrocarbon Network data. Generally, but particularly in more recent years this has shown a good correlation. Very low data capture at Marylebone Road last year means this has not been undertaken for 2006.

Table 7 Comparison of benzene monitoring methods at Marylebone Road

Year	Diffusive Sampler	Continuous analyser
2000	3.2	2.1
2001	6.8	4.5
2002	4.5	3.92
2003	3.3	3.33
2004	2.2	2.75
2005	2.1	2.2

Source: Air Quality Archive/NETCEN

The maximum running annual means, which allow for direct comparison with the objective from the two automated DEFRA sites in London, is shown in the table below. This shows that benzene levels have declined significantly at the Marylebone Road site since monitoring started, and has met the objective from 2002. The Eltham site also meets the more stringent 2010 objective when it has been operating. This data confirms the trend demonstrated by our own monitoring.

Table 8 Maximum running annual mean benzene levels for automated sites ($\mu g/m^3$)

Location	1999	2000	2001	2002	2003	2004	2005	2006
Marylebone Rd	12.8	10.8	6.29	4.97	3.92	3.37	2.75	*
Eltham	2.81	2.52	-	-	-	-	0.86	*1.05*

*** low data capture**
2006 data (in italics) is provisional

Conclusion

Examination of monitoring data in the borough indicates that the 2003 objective has been met at all locations. Based on the available data (which must be treated with caution, due to the short sampling period), the new site, located closely to a petrol forecourt shows levels are just above the 2010 objective. Next year, we anticipate an improvement in this level. The station is currently closed and undergoing a complete refurbishment. This is due to be completed in May 2007. When it re-opens the site will be operating two (in addition to stage one) vapour recovery equipment.

1, 3-BUTADIENE

For this pollutant, measurements should meet the 2003 objective as a running annual mean of 2.25µg/m^3.

Monitoring data

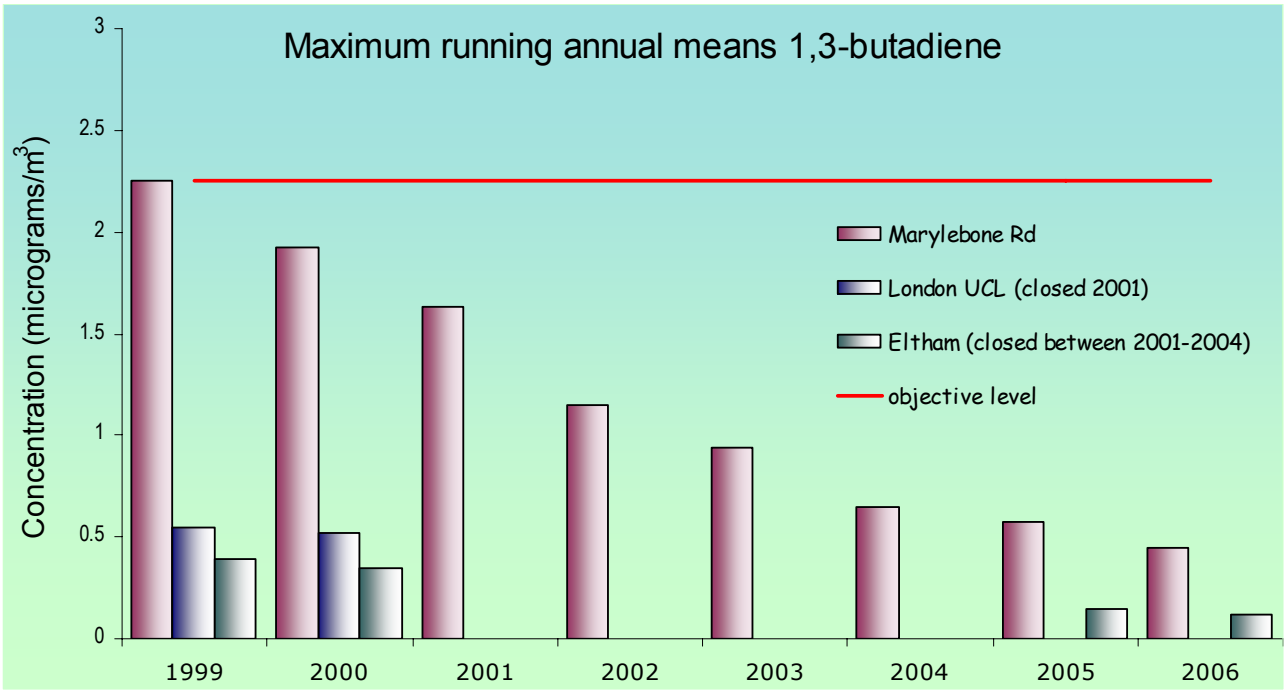
1,3-butadiene is not monitored in Kensington and Chelsea, however data is collected by Defra at sites within London. This data is shown in the table below. Currently in London, data are collected at Marylebone Road and Eltham; these sites can be used to indicate likely conditions in the borough.

Table 9 Levels of 1,3-butadiene (maximum annual running means, µg/m^3) in London

Location	1999	2000	2001	2002	2003	2004	2005	2006
Marylebone Rd	2.25	1.92	1.63	1.15	0.95	0.65	0.57	*0.45**
Eltham	0.39	0.35	-	-	-	-	0.15*	*0.12*

***Incomplete data**
Data (in italics) is provisional

The running annual mean concentration has been declining steadily at the Marylebone Road (roadside) site since 1999, dropping from 2.25µg/m^3 to 0.45 µg/m^3 in 2006. The London UCL site met the objective when it was operating. The Eltham site which has operated intermittently is also well within the objective level during 1999 and 2000. These results indicate that there are unlikely to be any exceedences of the 2003 objective in the borough.



Conclusion

There is sufficient evidence to suggest that no exceedences are likely in the Borough.

LEAD

There are two annual mean objectives for lead: 0.5µg/m^3 to be achieved by 2004 and an objective of 0.25µg/m^3 to be achieved by 2008.

Monitoring data

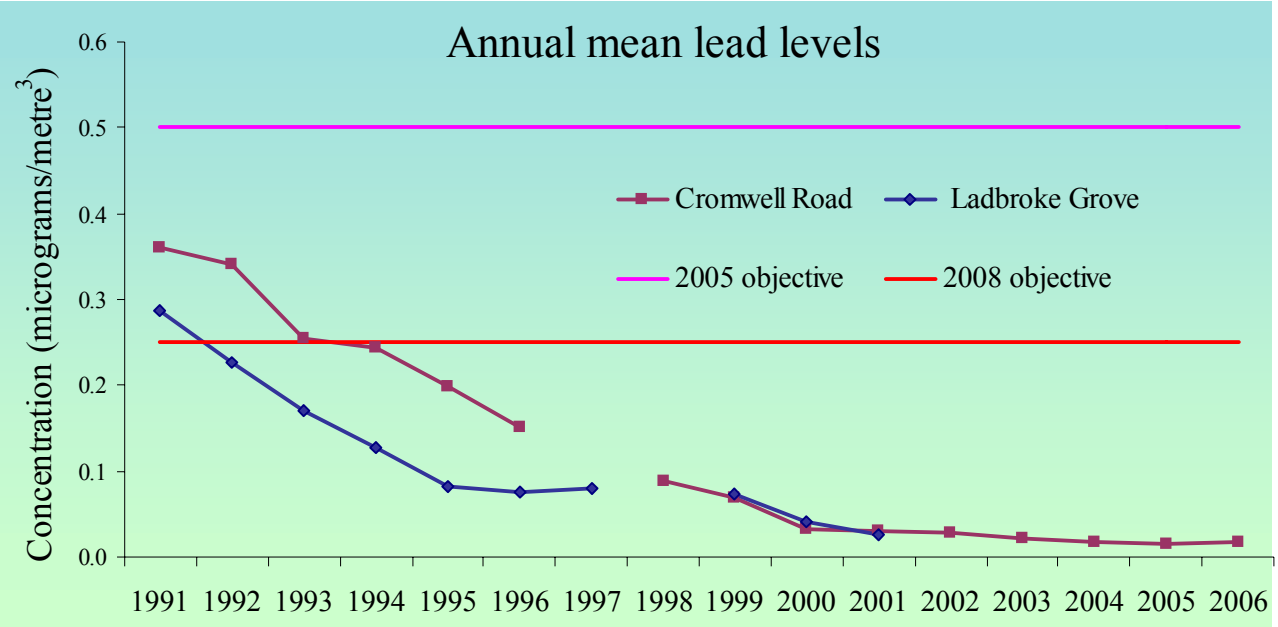
Lead monitoring in the Borough is undertaken by Defra at the Cromwell Road monitoring site. Previously monitoring was also undertaken by the Council in Ladbroke Grove. However this site closed at the end of 2001; levels dropped significantly due to the phasing out of leaded petrol, so it was not necessary to retain it. Monitoring data are shown in the table below.

Table 10 Lead levels within the Borough

Year	Ladbroke Grove (µg/$m^{3)}$	Cromwell Rd (µg/m^3)	Objective level (µg/m^3)
1999	0.073	0.068	0.5
2000	0.041	0.032	0.5
2001	0.026	0.031	0.5
2002	-	0.027	0.5
2004	-	0.017	0.5
2005	-	0.015	0.5
2006	-	0.017	0.5

Data source: National air quality archive

As demonstrated in the chart below, monitoring data shows a downward trend at both Cromwell Road and Ladbroke Grove. This trend continues today at the Cromwell Road site. The 2004 and 2008 objectives were met by 1992 at the Ladbroke Grove site and by 1994 at the Cromwell Road site.



Conclusion

There is sufficient evidence from monitoring to suggest that lead levels within the Borough remain significantly below the 2004 and 2008 objectives and have done so since the mid 1990's.

NITROGEN DIOXIDE

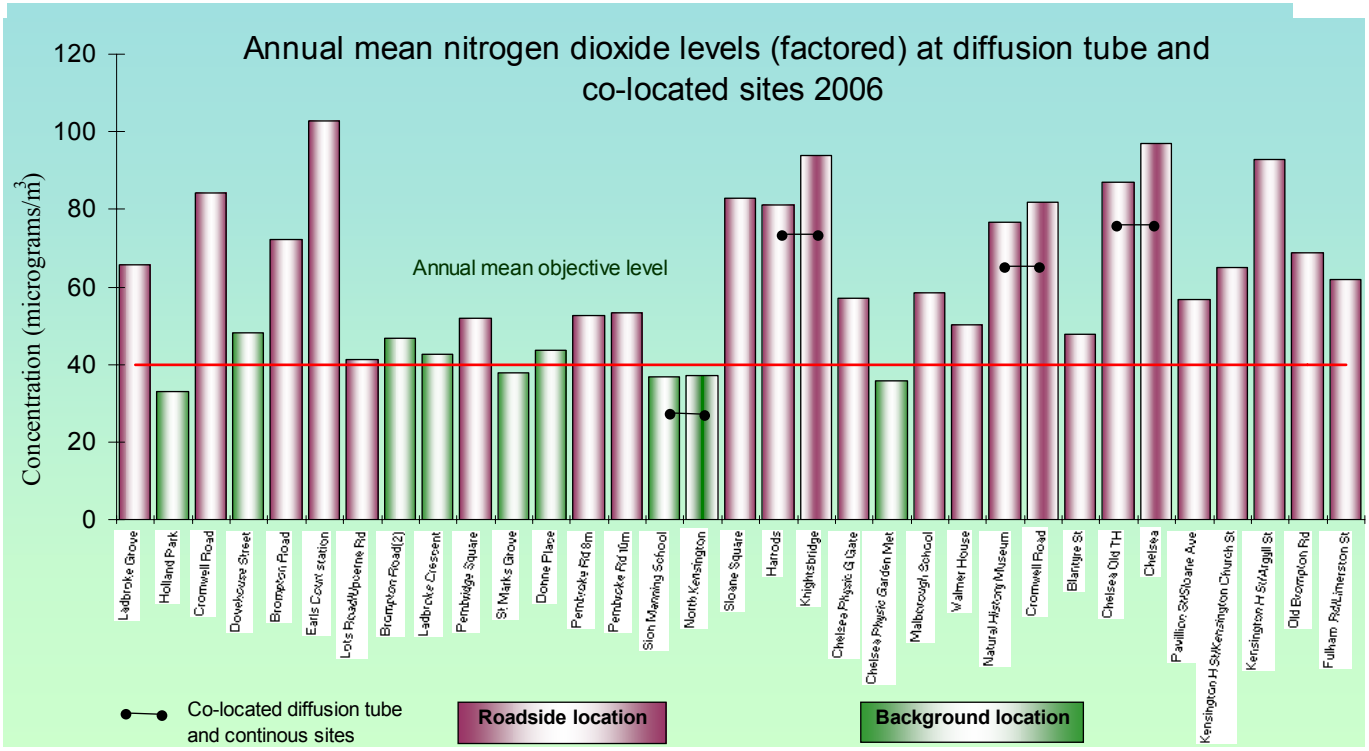
There are two objectives for nitrogen dioxide (NO_2); a short term objective of 200µg/m^3 not to be exceeded more than 18 times as a one hour mean, and a longer term objective of 40µg/m^3 as an annual mean. The deadline for achieving these objectives was the end of 2005. The whole of the Royal Borough was declared an Air Quality Management Area in 2000. It was declared on the basis that NO_2 (and PM_{10} to a lesser extent) would fail to meet its objectives.

Monitoring data

Automatic chemiluminescent analysers and passive diffusion tubes are used to monitor NO_2 in the borough. The later method provides more limited data but does allow levels to be compared to the annual mean objective at a greater number of locations than would be practicable by continuous methods alone.

Diffusion tube monitoring

Diffusion tube data is collected at 29 locations in the Borough (factored data from 2001-2006 is shown overleaf in table 11). The data is factored to take into account the differences between the two monitoring techniques as this method tends to underestimate concentrations. The factors used are based on the London Wide Environmental Programme (LWEP) co-location study. The graph below shows the diffusion tube data for 2006 and includes the measurement from continuous sites where these are co-located. Whilst the results for the background site show a very good correlation, the factor for roadside locations tends to underestimate concentrations.



An examination of the factored NO_2 data, in table 11 overleaf, shows that between 2001 and 2006 there were between two and five sites that measured levels below the objective. The results for 2006 indicate that three of the 29 sites were below the objective level. These were located in Holland Park, school grounds and in the centre of the Chelsea Physic Garden.

Table 11 Factored NO_2 Diffusion tube data

Location	2001	2002	2003	2004	2005	2006
Ladbroke Grove	**50.1**	**47.0**	**59.5**	**61.0**	**64.74**	***65.8***
Holland Park	31.8	29.2	37.1	36.5	35.03	*32.9*
Cromwell Road	**75.2**	**69.9**	**82.6**	**84.9**	**82.49**	***84.2***
Dovehouse Street	**49.2**	**43.8**	**53.3**	**51.1**	**50.35**	***48.2***
Brompton Road	**49.5**	**50.7**	**62.3**	**60.7**	**64.57**	***72.1***
Earls Court station	**87.6**	**89.4**	**94.5**	**95.1**	**94.16**	***102.7***
Lots Road/Upcerne Rd	**43.3**	**46.1**	**42.5**	**40.9**	**41.82**	***41.2***
Brompton Road (2)	**55.5**	**45.9**	**59.8**	**48.8**	**49.52**	***46.6***
Ladbroke Crescent	**42.6**	**43.1**	**43.4**	**44.6**	**43.98**	***42.5***
Pembridge Square	**50.2**	**40.6**	**52.3**	**50.6**	**50.11**	***51.9***
St Marks Grove	**44.4**	35.3	**42.3**	**41.7**	38.94	*37.8*
Donne Place	**47.4**	39.1	**49.7**	**48.7**	**46.18**	***43.7***
Pembroke Rd 8m	**45.8**	**41.1**	**53.4**	**45.3**	**51.94**	***52.5***
Pembroke Rd 10m	**57.7**	**41.0**	**51.9**	**50.7**	**52.84**	***53.4***
Sion Manning School	**43.1**	38.1	**41.0**	38.6	38.23	*36.7*
Sloane Square	**68.9**	**64.3**	**72.8**	**77.9**	**80.15**	***83.0***
Harrods	**69.3**	**66.7**	**72.8**	**73.3**	**77.74**	***81.3***
Chelsea Physic Garden (Gate)	**59.3**	**50.4**	**61.8**	**58.9**	**56.61**	***57.0***
Chelsea Physic Garden (Met station)	37.4	34.8	38.7	**40.7**	37.48	*35.6*
Malborough School	**59.1**	**50.8**	**79.3**	**63.1**	**56.82**	***58.4***
Walmer House	**50.9**	**44.4**	**54.4**	**48.4**	**48.77**	***50.1***
Natural History Museum	**59.6**	**55.5**	**72.5**	**72.7**	**68.34**	***76.8***
Blantyre St	**55.1**	**43.4**	**49.7**	**46.9**	**49.77**	***47.8***
Chelsea Old Town Hall	**64.4**	**51.2**	**71.9**	**74.6**	**81.58**	***86.9***
Pavillion St/Sloane Ave	**62.7**	**46.6**	**55.6**	**50.3**	**56.88**	***56.6***
Kensington H St/Kensington Church St	**55.0**	**46.9**	**65.4**	**65.4**	**66.92**	***64.9***
Kensington H St/Argyll St	**53.4**	**68.6**	**78.2**	**85.0**	**87.86**	***92.7***
Old Brompton Rd	**52.3**	**51.7**	**67.6**	**69.7**	**66.33**	***68.9***
Fulham Rd/Limerston St	**59.3**	**48.2**	**61.0**	**62.2**	**57.18**	***62.0***

Bold indicates an exceedence of the annual mean objective
2006 data (in italics) is provisional and should be treated with caution.

Continuous monitoring data

Continuous monitoring is undertaken at five sites in this Borough; details of these sites are included in Table 4, page 4. The results are shown in table 12 and in the chart overleaf. The levels have been compared to the annual mean and the hourly mean objectives. Caution must be applied to the 2006 data as it is provisional however any subsequent adjustments are unlikely to affect the overall conclusions.

Preliminary monitoring results for 2006 indicates that exceedences of the annual average NO_2 annual mean objective level have occurred at all continuous sites in the Borough apart from the North Kensington background site. All roadside locations showed an increase in the annual mean level compared to 2005. Two also recorded an increase in the number of hours above the hourly mean objective; this has increased steadily since monitoring began at these sites. The West London background site remained the same but is still well above the annual mean objective.

Table 12 Concentrations of NO_2 in and near the Borough using continuous monitors

Year	Site	Annual mean µg/m^3 (ppb)	Max hour µg/m^3 (ppb)	No of hours >200 µg/m$^{3\#}$	% Data Capture
1995	North Kensington*	**52 (27)**	283 (148)	17	75
	West London	**54 (28)**	251 (131)	10	98
	Cromwell Rd	**90 (47)**	325 (170)	141	92
1996	North Kensington	**50 (26)**	237 (124)	8	92
	West London	**54 (28)**	392 (205)	**18**	91
	Cromwell Rd*	**82 (43)**	300 (157)	101	68
1997	North Kensington	**52 (27)**	346 (181)	20	98
	West London	**56 (29)**	415 (217)	**38**	97
	Marylebone Rd*	92 (48)	300 (1570)	69	39
1998	North Kensington	**46 (24)**	226 (118)	2	99
	West London	**52 (27)**	193 (101)	0	98
	Cromwell Rd 2*	**82 (43)**	222 (116)	4	60
	Marylebone Rd	92 (48)	176 (92)	71	98
1999	North Kensington	**46 (24)**	178 (93)	0	97
	West London	**55 (29)**	205 (107)	1	98
	Cromwell Rd 2	**92 (48)**	253 (132)	12	98
	Marylebone Rd	90 (47)	325 (170)	51	85
2000	North Kensington	**40 (21)**	425 (222)	3	96
	West London	**53 (28)**	304 (159)	0	98
	Cromwell Rd 2	**88 (46)**	746 (390)	12	94
	Knightsbridge*	**74 (39)**	2818 (1473)	**52**	72
	Chelsea Town Hall*	**86 (45)**	270 (141)	2	25
	Marylebone Rd	92 (48)	570 (298)	100	96
2001	North Kensington	**42 (22)**	220 (115)	4	96
	West London	**52 (27)**	187 (98)	0	95
	Cromwell Rd 2	**76 (40)**	204 (107)	1	97
	Knightsbridge	**84 (44)**	325 (170)	**97**	97
	Chelsea Town Hall	**86 (45)**	228 (120)	16	95
	Marylebone Rd	82 (43)	273 (173)	74	94
2002	North Kensington	**40 (21)**	160 (84)	0	99
	West London	**46 (24)**	151 (79)	0	95
	Cromwell Rd 2	**73 (38)**	183 (96)	0	95
	Knightsbridge	**86 (45)**	366 (192)	**154**	98
	Chelsea Town Hall	**84 (44)**	193 (101)	0	99
	Marylebone Rd	80 (42)	237 (124)	2	99
2003	North Kensington	**44**	195	0	94
	West London	**55**	186	0	96
	Cromwell Rd 2	**76**	224	6	93
	Knightsbridge	**93**	371	**235**	99
	Chelsea Town Hall	**98**	282	**50**	99
	Marylebone Rd	107	394	471	94
2004	North Kensington	**40**	170	0	99
	West London	**50**	206	1	99
	Cromwell Rd 2	**80**	229	3	99
	Knightsbridge	**87**	472	**254**	98
	Chelsea Town Hall	**92**	268	**56**	99
	Marylebone Rd	110	361	529	99
2005	North Kensington	**40**	238	14	96
	West London	**50**	204	1	95
	Cromwell Rd 2	**79**	248	9	94
	Knightsbridge	**93**	475	**379**	99
	Chelsea Town Hall	**92**	267	**98**	99
	Marylebone Rd	112	364	853	98
2006	North Kensington	***37***	*176*	*0*	*96*
	West London	***50***	*197*	*0*	*95*
	Cromwell Rd 2	***82***	*229*	*4*	*94*
	Knightsbridge	***94***	*381*	***384***	*98*
	Chelsea Town Hall	***97***	*284*	***139***	*100*
	Marylebone Rd	*112*	*399*	*676*	*96*

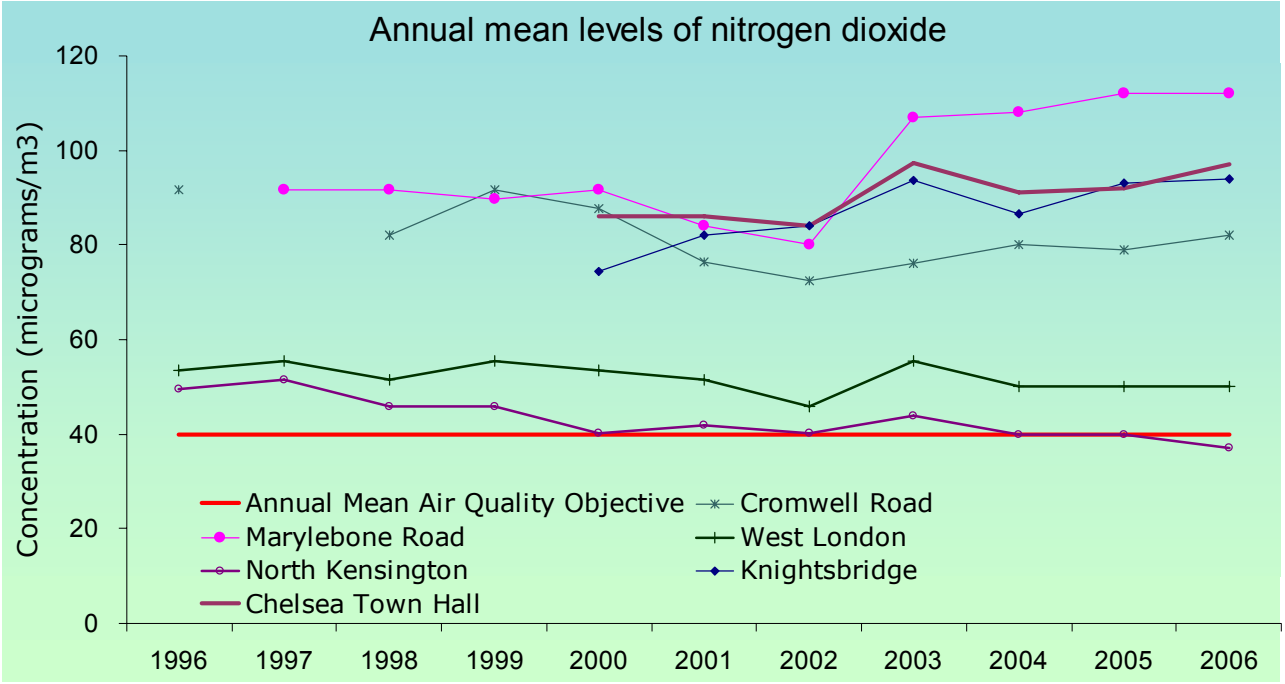
* some sites have operated for part of a year only, data from these sites must be treated with caution

more than 18 hours above 200 µg/m^3 indicate an exceedence of the objective

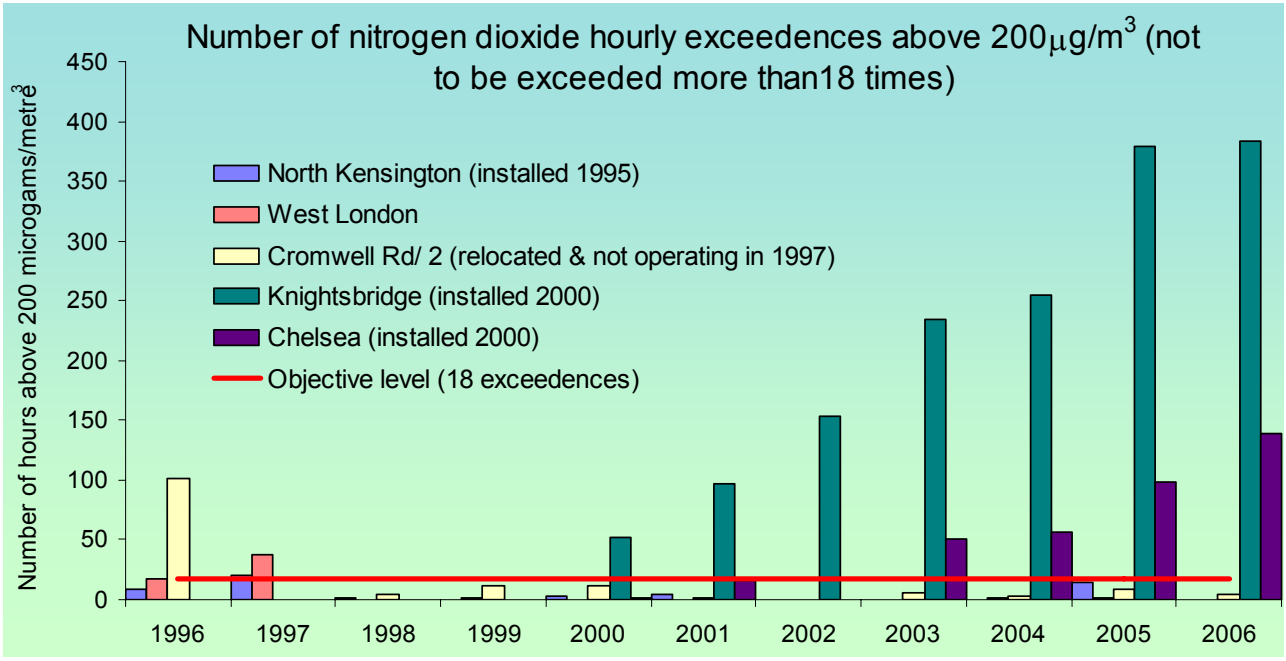
Figures in bold indicate an exceedence of an objective, recorded within Kensington and Chelsea.

2006 data (in italics) is provisional and should be treated with caution.

The chart below shows that annual mean levels at all sites have been above the objective for the eleven years shown, apart from North Kensington which fell below the objective level for the first time in 2006. It also shows there has been an overall increase at most roadsides locations, though the Cromwell Road site shows no overall trend. The annual mean concentration at the West London background site has largely stabilised showing no change for approximately three years.



The chart below shows the rising number of hourly exceedences particularly at two roadside locations in the Borough. One site is close to the kerb of a side road but 4m from the main road, the other is approximately 8m from the road but close to a busy junction. The hourly objective has been breached at both sites, with the number of one hourly means above 200µg/m^3 increasing fairly steadily since their installation in 2000.



This is a worrying trend that is also being observed at other busy roadside locations in central London areas e.g. Marylebone Road. A recent Air Quality Expert Group (AQEG) report has examined a number of issues which may be exacerbating this problem. It could be due to increased penetration of Euro-III diesel vehicles fitted with oxidation catalysts and/or the fitting of catalytically regenerative particle traps to vehicles such as buses. It is likely to be a combination of factors and appears to be related to an increase in the proportion of NO_X being emitted as direct NO_2. AQEG has been tasked with investigating the causes of this trend further.

In addition, 'hotspot' locations are typically characterised by congested and or stop/start traffic conditions, and are often heavily trafficked by buses. This may explain why there have been large increases in the hourly mean exceedences at roadside locations in the Borough and at other central London locations, such as the Marylebone road site.

Modelling

Recent dispersion modelling work has been undertaken by the GLA for the London area for 2010. Maps for the borough have been extracted from this work and are included in appendix 3. Map 1 indicates that approximately 80% of the borough is likely to remain above the annual mean objective.

This map is less optimistic than previous modelling which showed that much of the borough would achieve the annual mean objective for NO_2 other than at busy roads. The latest maps have incorporated more realistic assumptions on emissions reductions and NO/NO_2 ratios.

Conclusion

There has been some improvement in nitrogen dioxide concentrations at a few background sites located furthest from busy roads but little improvement at roadside sites. Provisional concentrations for 2006 have exceeded the annual mean objective at the majority of monitoring stations, as have measurements of the hourly mean objective at busy roadside/kerbside locations.

SULPHUR DIOXIDE

Three objectives have been set for this pollutant; a one hour mean of 350 μg/m^3 (not to be exceeded more than 24 times per year), a 24 hour mean of 125μg/m^3 (not to be exceeded more than 3 times per year) and a 15 minute mean of 266 μg/m^3 (not to be exceeded more than 35 times per year), as shown in table 1, page 1.

Monitoring data
Monitoring data is currently collected at two sites in the borough and is shown in the table below. Historical data based on non continuous '8 port bubbler' method are also available from the Dovehouse Street and Town Hall sites. Some of this data is included in the chart overleaf.

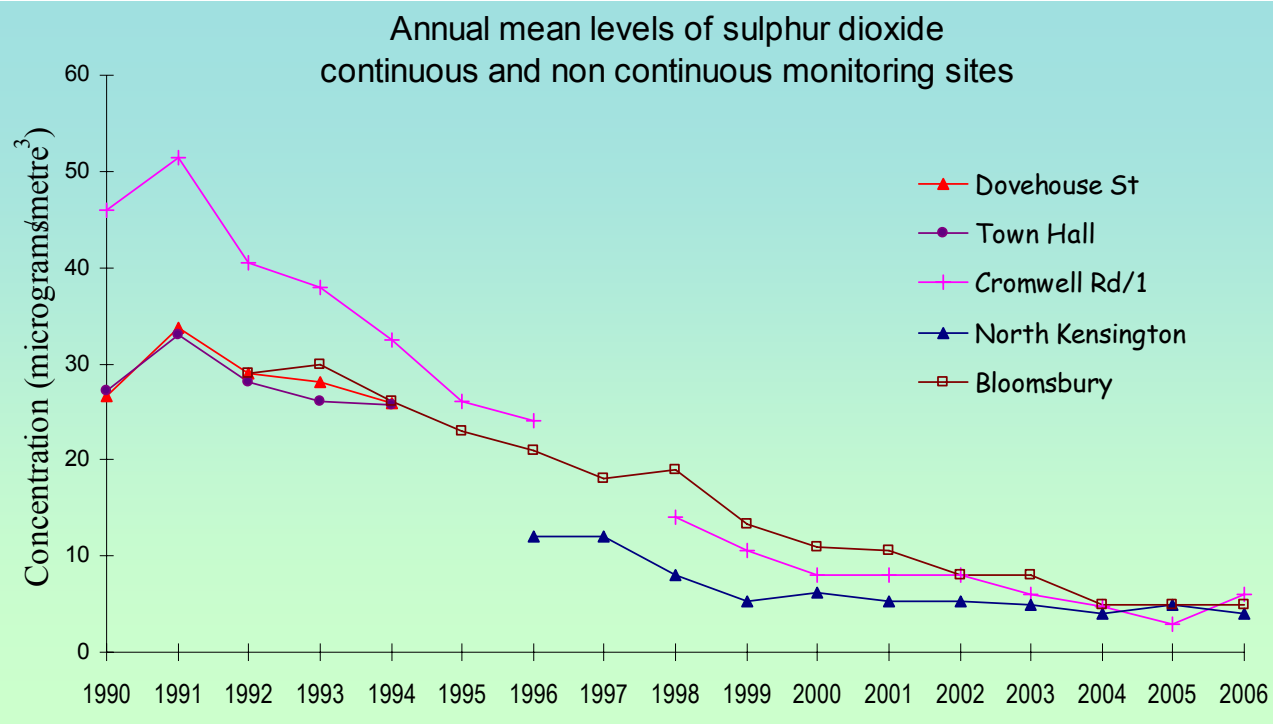
Table 13 Sulphur dioxide concentrations in the Borough

Year	Location	Annual average μg/m^3	No. of 1 hour means > 350μg/m^3	No. of 24 hour means > 125μg/m^3	No. of 15min means > 266μg/m^3	Data capture
1999	North Kensington	5	0	0	0	99
	Cromwell Rd	11	0	0	0	98
2000	North Kensington	6	0	0	0	96
	Cromwell Rd	8	0	0	0	97
2001	North Kensington	5	0	0	0	97
	Cromwell Rd	8	0	0	0	95
2002	North Kensington	5	0	0	0	99
	Cromwell Rd	8	0	0	0	85
2003	North Kensington	5	0	0	0	99
	Cromwell Rd	6	0	0	0	88
2004	North Kensington	4	0	0	0	97
	Cromwell Rd	5	0	0	0	99
2005	North Kensington	3	0	0	0	99
	Cromwell Rd	5	0	0	0	95
2006	North Kensington	*4*	*0*	*0*	*0*	*99*
	Cromwell Rd	*6*	*0*	*0*	*1*	*89*

2006 data (in italics) is provisional and should be treated with caution.

No exceedences of any of the objectives have been observed in the past eight years at monitoring locations in the Borough. Unusually there was a single exceedence of the 15 minute mean standard in 2006. Elevated sulphur dioxide is most likely to be the result of a plume grounding episode arising from industrial sources in the East Thames area.

The one-hour and 24 hour objectives were due to be met by the end of 2004 and the 15 min mean by the end of 2005. These objectives have been achieved.



The graph above illustrates the long term decline in annual mean sulphur dioxide levels over the past 16 years. However, annual mean levels in the past three years have now largely stabilised at between 3 and 5µg/m^3. Other data from another central London monitoring location is included to show comparability.

Conclusion

Monitoring data shows that there have been no exceedences of any of the three objectives.

PARTICULATE MATTER

Two objectives for particles, to be achieved by the end of 2004, have been incorporated within the Air Quality Regulations (see table 1, p1) – a short term 24 hour mean objective and a long term annual average objective. In addition to these objectives, three more stringent objectives have been set (see table 2 on page 2) to be achieved by 2010 and 2015. These three have not been incorporated into the Air Quality Regulations; the status on these objectives may become clearer when the review of the national Air Quality Strategy is completed.

The whole of the Royal Borough was declared an Air Quality Management Area in 2000; this decision was partially based on exceedences of the 2004 PM_{10} objectives at some locations.

Monitoring Data

Since 1998, automatic monitoring (TEOM) of PM_{10} has been carried out at two sites within the Borough – North Kensington (urban background site) and Cromwell Road (roadside), whilst a recent report found these instruments not to be equivalent to gravimetric methods, the data from these sites is still relevant for local air quality management purposes. In any case gravimetric data are available from the North Kensington site where Defra has chosen to co-locate Partisol instruments alongside our TEOM instrument. These data show that estimated gravimetric levels from the TEOM, using an adjustment factor of 1.3, gives a reasonable approximation of the annual average; but is less reliable when applied to exceedences of the daily objective. A gravimetric sampler, installed by the Council, has been operating on the Earls Court Road since May 2002.

The monitoring results are given in table 14 (overleaf) and indicate that the 2004 annual mean objective is likely to be met in most locations. However, concentrations at the Earls Court kerbside location have either been on or just above the annual mean objective level of 40$\mu g/m^3$ between 2003 and 2006. This site has also exceeded the daily mean objective every year apart from its year of installation when it operated for six months only.

The Council is concerned that with the western extension of the congestion charge zone into the Borough, there could be an impact on air quality, specifically along the Earls Court One Way System, as this route is not subject to a charge. Consequently, it may attract additional traffic. Levels of particulates and nitrogen dioxide already exceed air quality objectives; if the road is to become even more congested this could see concentrations rise further.

Table 14 Concentrations of particulate matter PM_{10} (TEOM) measured in the Borough and other nearby locations ($\mu g/m^3$)

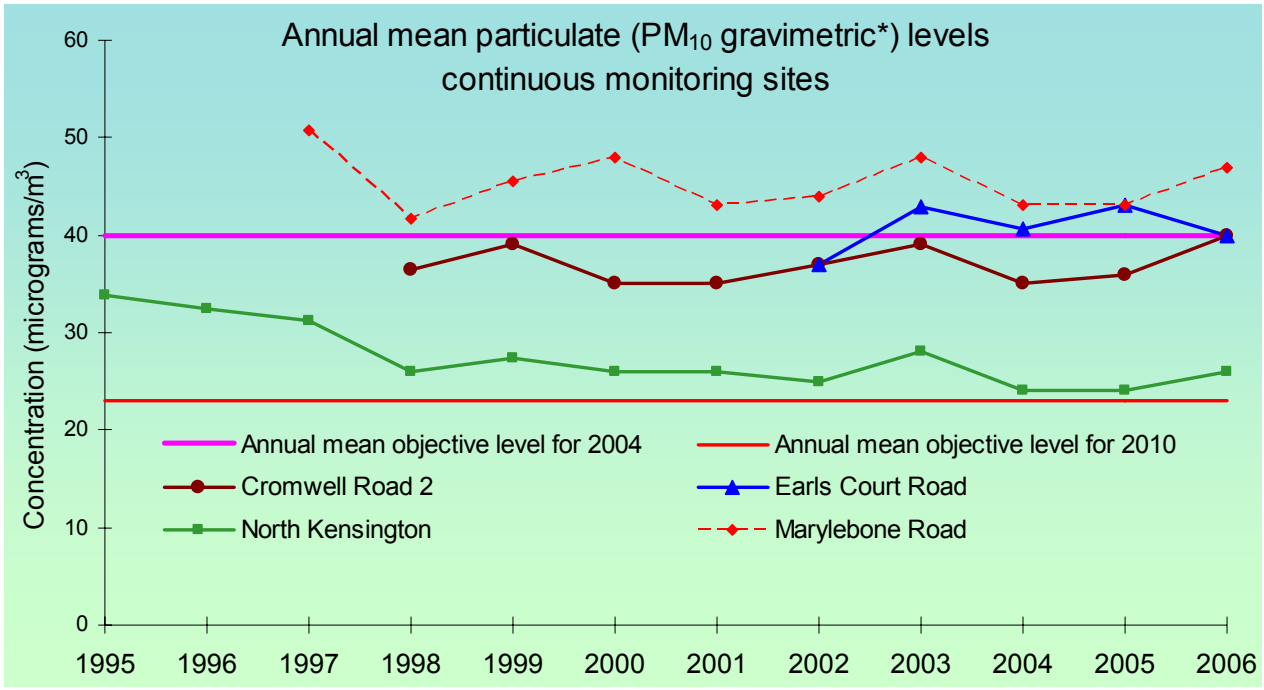
Year	Site	Annual mean $\mu g/m^3$ (TEOM)	Annual mean 40$\mu g/m^3$ 2004 (GRAV)	No of days above 50$\mu g/m^3$ (GRAV) fixed 24 hr mean	% Data Capture
1996	North Kensington	25	33	46	98
	Bloomsbury	30	39	65	92
1997	North Kensington	24	31	34	98
	Bloomsbury	27	35	43	96
	Marylebone Rd*	39	51	50	45
1998	North Kensington	20	26	16	98
	Bloomsbury	23	30	21	94
	Cromwell Rd2*	28	37	28	60
	Marylebone Rd	32	42	85	98
1999	North Kensington	21	27	16	99
	Bloomsbury	22	29	21	96
	Cromwell Rd2	30	39	**51**	95
	Marylebone Rd	35	46	114	95
2000	North Kensington	20	26	11	96
	Bloomsbury	21	28	11	97
	Cromwell Rd2	27	35	30	97
	Marylebone Rd	37	48	159	99
2001	North Kensington	20	26	4	96
	Bloomsbury	22	29	16	98
	Cromwell Rd2	27	35	34	99
	Marylebone Rd	34	43	105	98
2002	North Kensington	19	25	8	99
	N Kensington Partisol	Not applicable	25	**39**	88
	Bloomsbury	29	38	43	85
	Cromwell Rd 2	28	37	**36**	95
	Marylebone Rd	34	44	111	98
	Marylebone Rd Partisol	Not applicable	44	44	Not available
	Earls Court Partisol*	Not applicable	37	30	62
2003	North Kensington	22	28	29	98
	N Kensington Partisol	Not applicable	28	**32**	88
	Bloomsbury	23	30	14	58
	Cromwell Rd 2	30	39	**56**	88
	Marylebone Rd	37	48	161	99
	Marylebone Rd Partisol	Not applicable	45	96	98
	Earls Court Partisol	Not applicable	**43**	**91**	97
2004	North Kensington	19	24	6	97
	N Kensington Partisol	Not applicable	25	12	79
	Bloomsbury	20	26	7	98
	Cromwell Rd 2	27	35	29	99
	Marylebone Rd	33	43	97	98
	Marylebone Rd Partisol	Not applicable	41	66	84
	Earls Court Partisol	Not applicable	**41**	**67**	*89*
2005	North Kensington	19	24	6	99
	N Kensington Partisol	Not applicable	29	26	74
	Bloomsbury	21	27	5	95
	Cromwell Rd 2	28	36	**39**	98
	Marylebone Rd	33	43	118	96
	Marylebone Rd Partisol	Not applicable	44	85	87
	Earls Court Partisol	Not applicable	**43**	**81**	94
2006	North Kensington	*20*	*26*	*15*	*99*
	N Kensington Partisol*	*Not applicable*	*32*	*22*	*66*
	Bloomsbury	*23*	*30*	*21*	*98*
	Cromwell Rd 2	*31*	*40*	***60***	*98*
	Marylebone Rd	*36*	*47*	***151***	*97*
	Marylebone Rd Partisol*	*Not applicable*	*46*	*69*	*55*
	Earls Court Partisol	*Not applicable*	***40***	***62***	*87*

* Indicates that these sites were not operating for a full year or low data capture. Partisol indicates gravimetric collection method.

- Figures in bold indicate an exceedence of an objective recorded within Kensington and Chelsea.

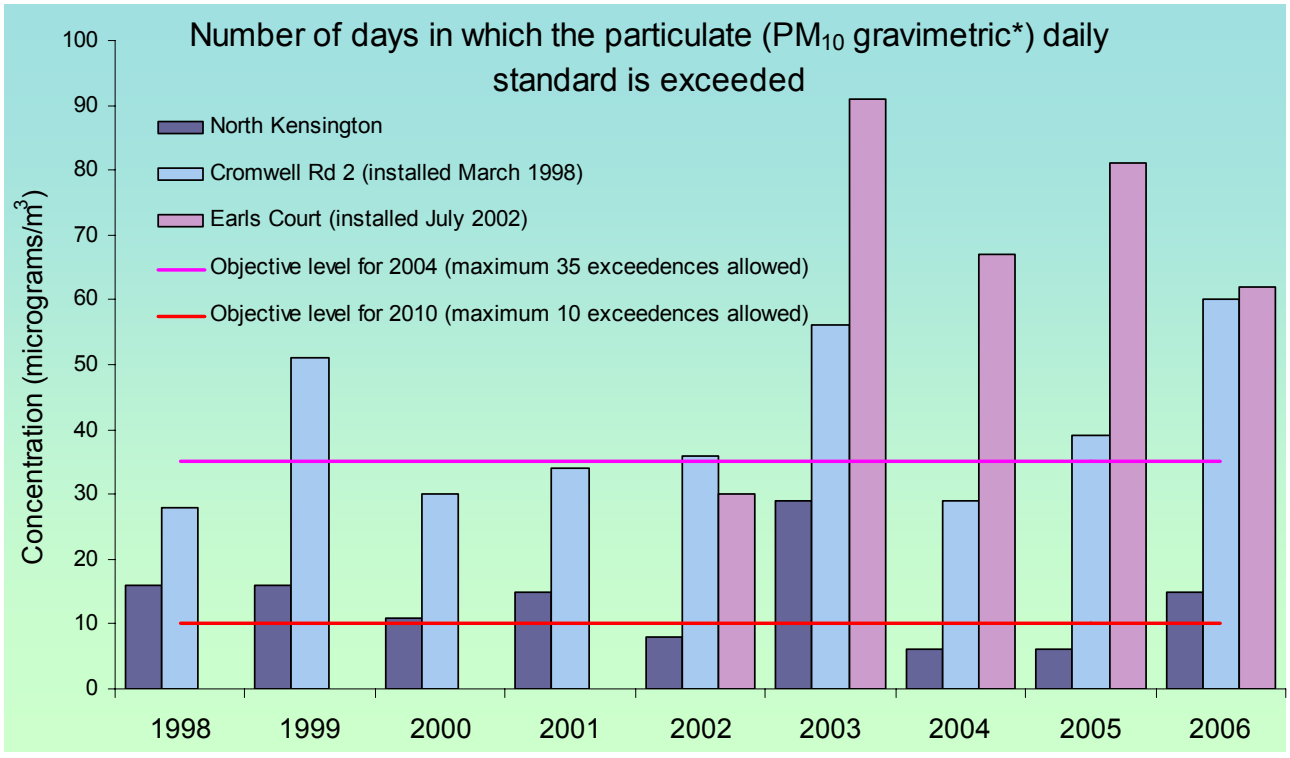
\# Data shown in italics is provisional

Annual mean PM_{10} levels (shown in the chart below) do not demonstrate a clear overall trend. The Earls Court site showed a slight reduction in the annual mean level in 2006 compared to other sites however this may be in part due to a lower than normal data capture rate as a result of site problems.



*levels measured by TEOM are factored by 1.3

The 24 hour (or daily mean) objective has been regularly exceeded at the roadside locations (shown in the chart below), but again there is no clear overall trend. The extent of the exceedences is likely to be dependent on factors such as weather conditions. Only the North Kensington urban background site has not exceeded this objective. However it is important to note that measurements from Defra's co-located gravimetric monitor reveal a greater number of days above 50µg/m^3 though these are still below the objective of 35 days.



*levels measured by TEOM are factored by 1.3

Modelling
Dispersion modelling has been undertaken by the GLA to predict future levels of PM_{10} for the London area; the maps in Appendix 3 have been extracted from this work to show the levels in the borough.

The results predicted for 2010 (Map 2, Appendix 3) indicate that exceedences of the 2004 annual mean objective level are likely to continue at isolated hotspot locations near to roads. The stricter 2010 objective (this is not currently included in regulations) is likely to be exceeded along all main roads and other busy routes (indicated in orange and red).

Map 3, appendix 3 shows the area exceeding the daily mean objective for 2010 (based on the stricter 2010 objective of no more than 10 days above the $50\mu g/m^3$ standard) will increase. Exceedences of the 2004 objective are predicted to occur along many of the main road; this will extend to other busy routes if the stricter 2010 objective is introduced.

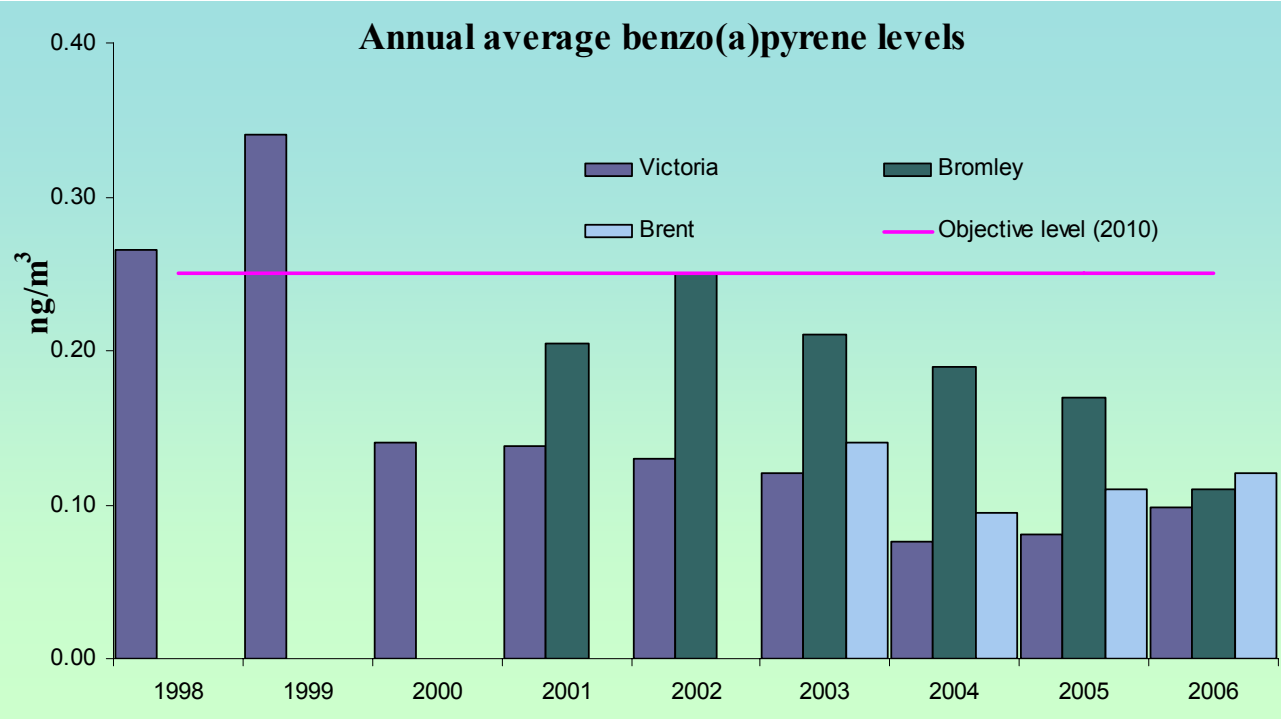
Conclusion
There have been more than 35 exceedences of the 24-hour objective and an exceedence of the annual mean level at a roadside location in 2004 and 2005. This demonstrates that busy roadside locations continue to be at risk of breaching the objectives.

Polycyclic Aromatic Hydrocarbons

Polycyclic Aromatic Hydrocarbons (PAHs) are a complex mixture of organic compounds some of which are carcinogens. The Government has set an objective for these pollutants. It would be very difficult and expensive to monitor a selection of these pollutants, consequently, the Government has selected benzo(α)pyrene (b(a)p) as a marker for PAH and set an objective based on this pollutant: 0.25ng/m^3 as an annual average to be achieved by the end of 2010.

Whilst this objective has been introduced it has not been included in regulations for the purposes of local air quality management. However monitoring data from the London area has been included in this report for information. The main sources of b(a)p are industrial emissions and domestic coal and wood burning. Vehicles no longer appear to be a major source. Urban areas, without significant industrial activity, such as London have shown reductions in concentrations.

Recent data from monitoring at sites in Victoria, Bromley and Brent indicates that at these locations concentrations have generally been declining. The chart below shows that since 2003, the annual average concentrations of benzo(α)pyrene measured at these sites have met the objective for 2010.



Conclusion

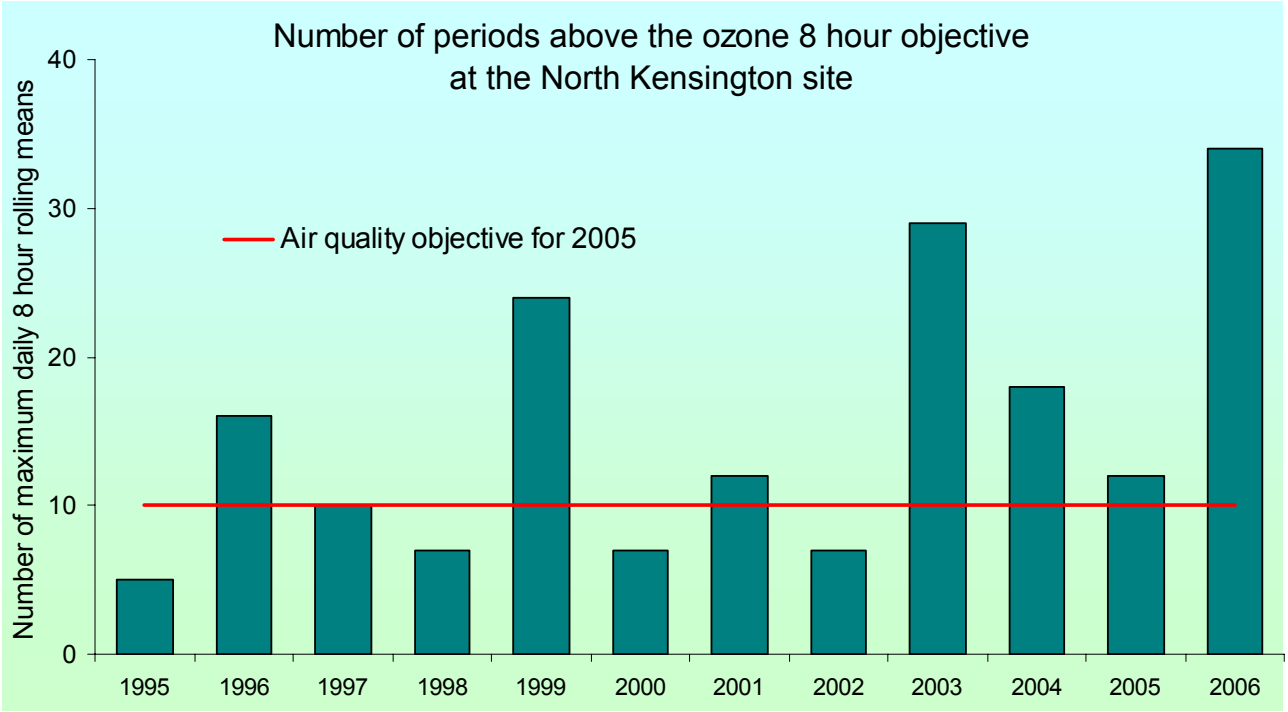
As the borough has no industrial processes and very little coal and wood burning, concentrations of b(a)p would be expected to be similar to the levels indicated by the above monitoring results and are therefore highly likely to be well within the 2010 objective.

Ozone

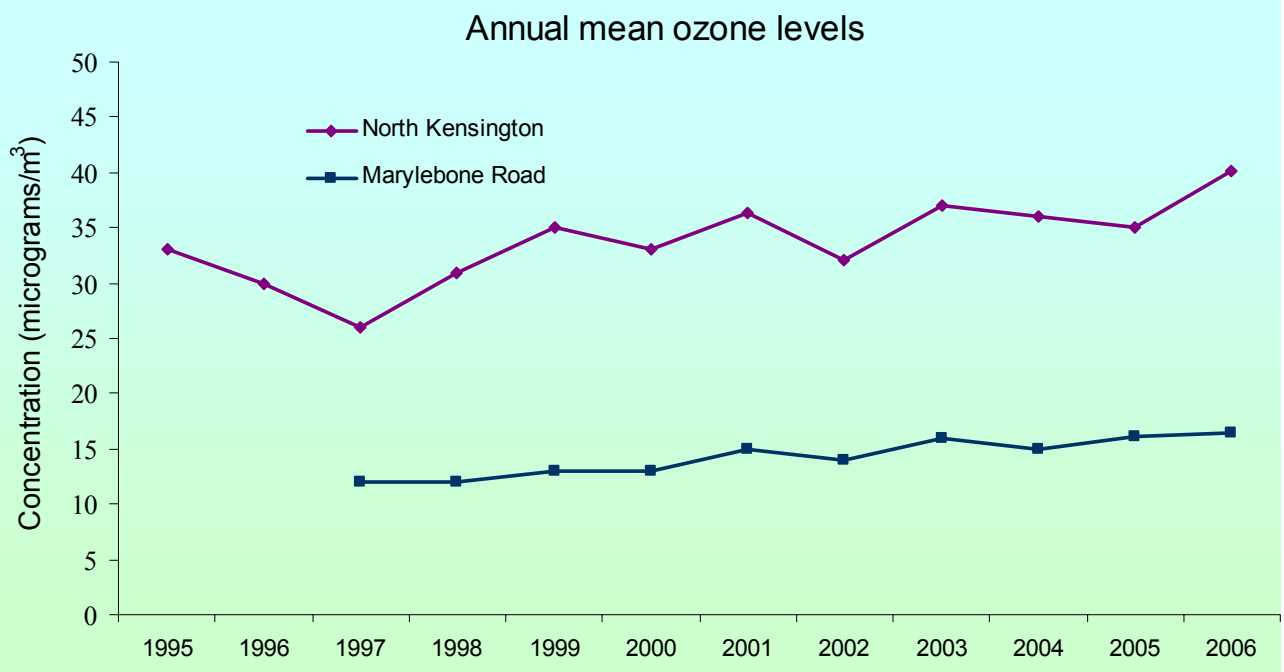
The objective for ozone is 100µg/m^3 not to be exceeded more than 10 times a year (calculated as the daily maximum 8 hour mean) by 2005. The Borough is not required to work towards the achievement of this, because of the difficulty in taking action at a local level and is therefore not included in the LAQM process. However due to its health effects monitoring is undertaken at one background location in the borough (North Kensington).

Ozone formation is dependant on high temperatures and sunny weather as well as the necessary precursor pollutants such as oxides of nitrogen NO_x and volatile organic compounds. Some of these pollutants may not be locally produced and consequently attempts to control ozone are being undertaken at a European level. Unlike most pollutants ozone tends to be higher at background locations away from busy roads, often the highest levels being reached in rural locations. This is because oxides of nitrogen (NO_x) emitted from exhaust will react with ozone, reducing its level in urban areas.

The chart below shows exceedences of the objective at a background location in the borough. Overall there has been an increase in the number of periods exceeding the objective; however this varies considerably from year to year. There has been an exceedence of the objective in seven out of twelve years that monitoring has occurred, these have been in 1996, 1999, 2001, and 2003–2006. These are likely to be years in which temperatures and sunshine hours are highest.



The chart overleaf shows the annual mean levels at the North Kensington and Marylebone Road site, a roadside location outside the borough. The later site is included to demonstrate the lower levels measured near to busy roads. Overall this also shows that annual mean levels have increased since monitoring began.



Conclusion

Ozone currently exceeds the objective level in the Borough at background locations.

New local developments

There are no new roads, landfill or mineral developments planned in the borough. Of the new large mixed use developments planned none are predicted to have a significant impact on air quality where an assessment has been requested by the Council. The Council is not aware of any plans for any new processes as listed in Appendix 2 of TG (03).

Overall Conclusions

Monitoring has shown that despite the work of the action plan, improvements in levels of the pollutants which remain of most concern for local air quality management purposes i.e. nitrogen dioxide and particulate matter have been slow to materialise.

We are however pleased to report some improvement in concentrations of nitrogen dioxide at some background locations. For the first time since its commissioning the annual mean level at North Kensington has dropped below the objective. The remainder of the pollutants at this site which currently already meet objective levels continue to show very small reductions or have largely stabilised.

However, at road side locations, nitrogen dioxide and particulate matter continue to exceed their objectives and are likely to remain so for the immediate future. This is clearly of great concern.

The potential change to objectives following the national strategy review and European legislation also introduces an element of uncertainty for future objectives; regardless of this, the Council shall continue to work towards delivering cleaner air.