
THE ROYAL
BOROUGH OF



KENSINGTON
AND CHELSEA

**Updating and Screening Assessment
Review of Air Quality in the
Royal Borough of Kensington and Chelsea**

December 2003

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EXECUTIVE SUMMARY

This Updating and Screening Assessment is the first part of the second round of Review and Assessment. It reviews the seven key pollutants that were originally investigated in the first round, of which the final (Fourth Stage) report was published earlier this year.

The seven pollutants are:

- Carbon monoxide
- Benzene
- 1,3-butadiene
- Lead
- Nitrogen dioxide
- Sulphur dioxide and
- Particulate matter.

A new pollutant – benzo(α)pyrene (b(a)p) – has recently been added to the list of key pollutants to represent, or act as a marker for a group of organic compounds known as polycyclic aromatic hydrocarbons that are implicated in the formation of cancers. Although as yet the objective has not been included in Regulations, a brief indication of the concentrations to be expected has been included as a reference point for future work.

Turning to the process of re-assessment, Technical Guidance (LAQM.TG(03)) was issued that contains a checklist of information for each pollutant. We have considered amongst other things, the new, tighter objectives that have been incorporated into the Air Quality Regulations, new monitoring data to see if there have been any significant increases, or decreases, in pollutant concentrations, local industrial sources, various aspects of road usage, and relevant exposure of the local population to sources of pollution.

We have looked at whether any changes have occurred to the pollutants and in light of more recent information, whether they are still likely to meet or exceed the objectives set. Correction factors have been applied to monitored data to predict what the levels are likely to be in the year that the objectives have to be achieved by. If changes have occurred, then we would need to declare this and recommend proceeding further to the second stage of this review, in a ‘Detailed Assessment’, to be carried out next year.

We conclude that this Updating and Screening Assessment confirms that there have been few changes since the first round of review and assessment and we will not be proceeding to a Detailed Assessment for any pollutant.

Below is a summary of the results, based on the checklist included in the Technical Guidance (see overleaf).

Summary of Findings

Pollutant	Main reasons why it will not be necessary to proceed to a detailed assessment
Carbon monoxide	<ul style="list-style-type: none"> • Monitoring data does not exceed objectives. • No 'very busy roads' or junctions where background concentrations are expected to be above 1 mg/m³.
Benzene	<ul style="list-style-type: none"> • Monitoring data does not exceed running annual mean objective. • One tube, located at a petrol station, exceeds the new 2010 annual objective. This station is to be redeveloped so the source will be removed. • No 'very busy roads' or junctions where background concentrations are expected to be above 2 µg/m³ in 2010.
1,3-butadiene	<ul style="list-style-type: none"> • Monitoring data does not exceed current running annual mean objective. • No industrial sources within the borough.
Lead	<ul style="list-style-type: none"> • Monitoring data does not exceed annual mean objectives. • No industrial sources within the borough.
Nitrogen dioxide	<ul style="list-style-type: none"> • Air Quality Management Area already declared for this pollutant. • All predicted annual mean concentrations still exceed 2005 objective • The hourly average objective is still exceeded at kerbside locations. Therefore because there are no changes in the circumstances of this pollutant it is not necessary to proceed to a Detailed Assessment.
Sulphur dioxide	<ul style="list-style-type: none"> • Monitoring data does not exceed objectives. • No industrial sources within the borough. • No significant areas of domestic coal burning. • No significant boilers identified. • No diesel locomotive is stationary at either of the two stations in the Borough for significant periods, and in addition there is no relevant exposure to the public.
Particulate matter	<ul style="list-style-type: none"> • Air Quality Management Area already declared for this pollutant. • There are greater than 35 exceedences at monitored roadside locations. • There are no industrial sources in the borough. • There are no significant areas of domestic solid fuel burning. • There are no quarries etc within the borough.

INTRODUCTION

In 1997, the first National Air Quality Strategy was produced. This strategy set health based standards, and objectives, most of which were incorporated within Air Quality Regulations. Section 82 of the Environment Act 1995 places a duty on local authorities to periodically review and assess air quality in their area and an obligation to work towards achieving these air quality objectives.

First Round of Review and Assessment

Earlier this year, the Royal Borough of Kensington and Chelsea completed the first round of Review and Assessment. This was divided into four stages. A summary of each stage is given below.

Stage One

All Local Authorities were required to carry out an assessment of seven key pollutants as specified in the National Air Quality Strategy. These were nitrogen dioxide (NO₂), particulate matter (PM₁₀), carbon monoxide (CO), benzene (C₆H₆), sulphur dioxide (SO₂), 1,3-butadiene and lead (Pb). Objectives were set for each pollutant, covering different time averaging periods and each has a date by when it should be achieved.

Stage one involved gathering monitoring data on these pollutants and identifying what produces them, how much is produced by that source and whether these pollutants were likely to meet the objectives set. If it seemed unlikely that they would be met, then it was necessary to carry out a more detailed survey.

Table 1 Summary of results

Pollutant	Assessment
NO ₂	Firm indication that further assessment needed
PM ₁₀	Firm indication that further assessment needed
CO	Some uncertainty that further assessment needed
Benzene	Some uncertainty that further assessment needed
SO ₂	Some uncertainty that further assessment needed
1,3-butadiene	Firm indication that no further assessment needed
Pb	Firm indication that no further assessment needed

Stage Two

This was essentially a further screening procedure and was completed in 1999. It confirmed the need to examine in detail the emission and dispersion of four pollutants – NO₂, PM₁₀, SO₂ and CO, and to predict and compare the concentrations of these against the relative objectives. Due to a change in Government guidance, it was no longer necessary to assess benzene.

Table 2 Summary of results

Pollutant	Assessment
NO ₂	Firm indication that further assessment needed
PM ₁₀	Firm indication that further assessment needed
SO ₂	Some uncertainty that further assessment needed
CO	Some uncertainty that further assessment needed
Benzene	Firm indication that no further assessment needed

Stage Three

A sophisticated 'dispersion' model, in the form of a computer program, was used to establish whether the government objectives for the four remaining pollutants were likely to be met. In brief, the model simulates how emissions are affected by dilution, dispersion and chemical reactions, and takes into consideration the emission rates from the various sources of pollution, changes in land use and trends in vehicle usage. It then displays the results as ground level concentrations, and can predict the levels of concentrations for future years, over different time periods so that they can be compared against the relevant objective.

Table 3 Summary of results

Pollutant	Assessment
NO ₂	High likelihood the Borough would exceed the annual mean and hourly mean objective along many of the major roads in the borough.
PM ₁₀	High likelihood that the Borough would exceed the 24 hour mean objective at a few locations.
SO ₂	Virtually no likelihood that the Borough would exceed the objectives for sulphur dioxide.
CO	No likelihood that the Borough would exceed the objectives for carbon monoxide.

Consequently an Air Quality Management Area was declared in December 2000. This covers the whole of the Royal Borough of Kensington and Chelsea.

Stage Four

Alongside Stage Four, an Air Quality Management Plan was produced, setting out 25 actions that the Council should take to work towards improving air quality.

Stage four was carried out to check the results of the previous reports in the light of the latest air monitoring results. It also took into account the revised information gathered on road traffic emissions, which essentially acknowledged that the exhaust emissions of newer vehicles were not as clean as previously claimed.

The latest NO₂ maps showed a worse outlook with the whole Borough exceeding the annual average objective, without any exceptions (compared with the previous maps which showed the majority of the Borough exceeding) but also indicated a uniform pattern of higher concentrations superimposed over the road network. For the first time, the hourly average NO₂ concentrations map showed that parts of Knightsbridge towards Hyde Park Corner and the eastern end of Kensington High Street were likely to exceed the objective.

In contrast, the re-modelled predictions for PM₁₀ showed a less severe picture. The critical 24-hour objective had been predicted only to be exceeded at a number of isolated locations, while the longer term outlook for PM₁₀, post 2004, required Local Authorities in London to contend with more stringent objectives to be achieved by 2010.

Second Round of Review and Assessment

This second round is made up of two major components - the Updating and Screening Assessment (USA) and the Detailed Assessment (DA). In years when neither of these documents is required, Local Authorities will be required to submit Progress Reports.

The purpose of the USA is to identify whether any changes have taken place with the seven pollutants highlighted in table 1.

Since the first round of Review and Assessment began, there have been several changes in the objectives that the Government requires Local Authorities to work towards. The table below shows the objectives in London included within the Air Quality Regulations 2000 and 2002. The objectives in bold indicate those that have changed.

Table 4 Air Quality Objectives within London

Pollutant	Concentration	Measured as	Date to be achieved
Benzene	16.25 $\mu\text{g}/\text{m}^3$ 5.00$\mu\text{g}/\text{m}^3$	running annual mean annual mean	31.12.2003 31.12.2010
1,3-butadiene	2.25 $\mu\text{g}/\text{m}^3$	running annual mean	31.12.2003
Carbon monoxide	10 mg/m³	max daily running 8hr mean	31.12.2003
Lead	0.5 $\mu\text{g}/\text{m}^3$ 0.25 $\mu\text{g}/\text{m}^3$	annual mean annual mean	31.12.2004 31.12.2008
Nitrogen dioxide	200 $\mu\text{g}/\text{m}^3$ (not to be exceeded more than 18 times per year)	1 hr mean	31.12.2005
	40 $\mu\text{g}/\text{m}^3$	annual mean	31.12.2005
Particles	50 $\mu\text{g}/\text{m}^3$ (not to be exceeded more than 35 times per year)	24 hr mean	31.12.2004
	40 $\mu\text{g}/\text{m}^3$	annual mean	31.12.2004
Sulphur dioxide	350 $\mu\text{g}/\text{m}^3$ (not to be exceeded more than 24 times per year)	1 hr mean	31.12.2004
	125 $\mu\text{g}/\text{m}^3$ (not to be exceeded more than 3 times per year)	24 hr mean	31.12.2004
	266 $\mu\text{g}/\text{m}^3$ (not to be exceeded more than 35 times per year)	15 minute mean	31.12.2005

For two pollutants – particles and polycyclic aromatic hydrocarbons (PAHs), further objectives have been set. These have not yet been incorporated within the Air Quality Regulations.

Table 5 Objectives adopted but not yet incorporated within the Air Quality Regulations.

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

While there is no requirement to include an assessment of PAH at this time, a brief section has been included for information purposes only.

Generally this report looks at the changes that have occurred to pollution concentrations in relation to road traffic, heating and industrial sources and whether new objectives have resulted in some pollutants requiring further more detailed assessment, where previously it was not deemed necessary. The remainder of the report is devoted to the key pollutants, with a separate section for each one. The following information gives an outline of the monitoring network in the Borough.

Automated monitoring data

Continuous monitoring data is collected at a six monitoring sites in the borough, two of these are operated by DEFRA. See table 6 overleaf.

Locations of continuous and semi automated monitoring in the Borough

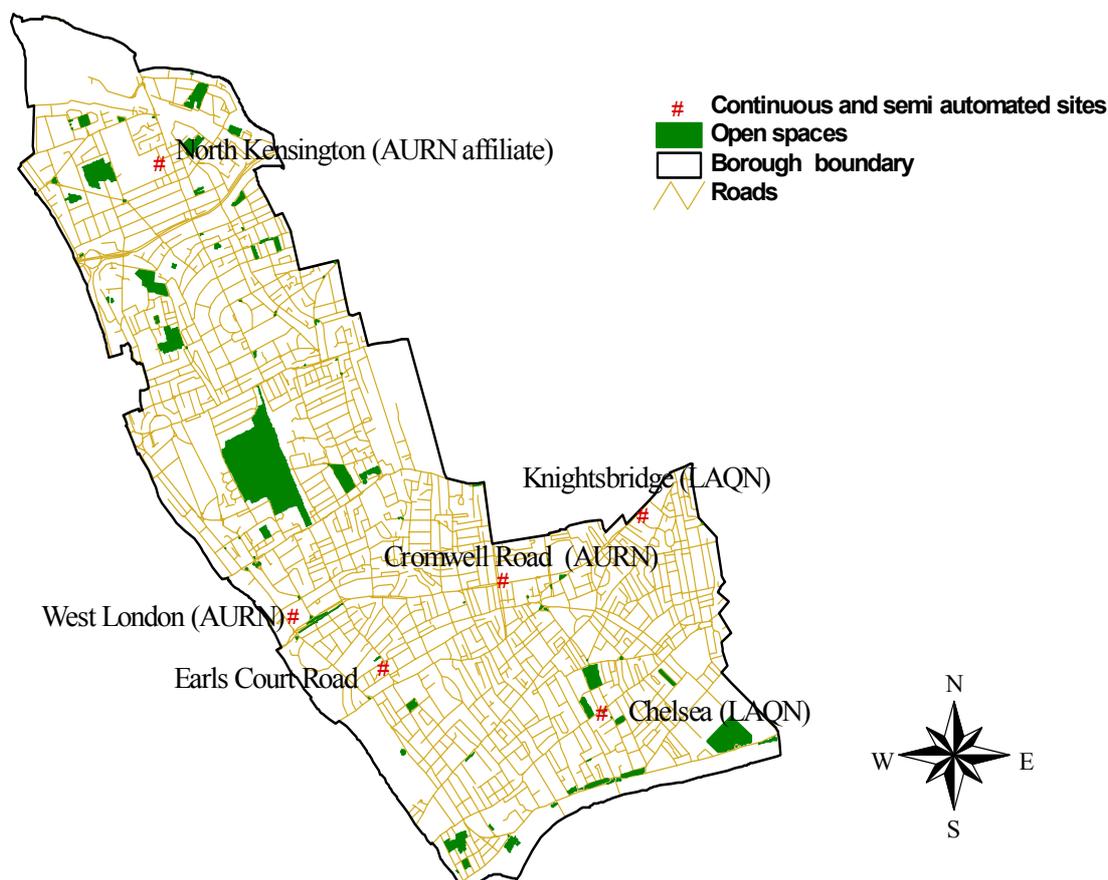


Table 6 Monitoring locations in the Royal Borough of Kensington and Chelsea

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.erg.kcl.ac.uk www.airquality.co.uk	www.airquality.co.uk	www.erg.kcl.ac.uk	www.airquality.co.uk	www.erg.kcl.ac.uk	www.erg.kcl.ac.uk	Currently not available

*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

All automated monitoring is ratified as part of the AURN or by the Kings ERG and regularly audited by an independent laboratory.

CARBON MONOXIDE

The objective for carbon monoxide (CO) has been revised since the last review and assessment as shown in table 4 (page 3) and is now tighter at 10 mg/m³ as a maximum daily 8 hour running mean. For this pollutant, guidance indicates that two aspects need to be assessed, recent monitoring data and traffic levels at very busy road locations, to see if the objective is still likely to be met by 31.12.2003.

Monitoring data

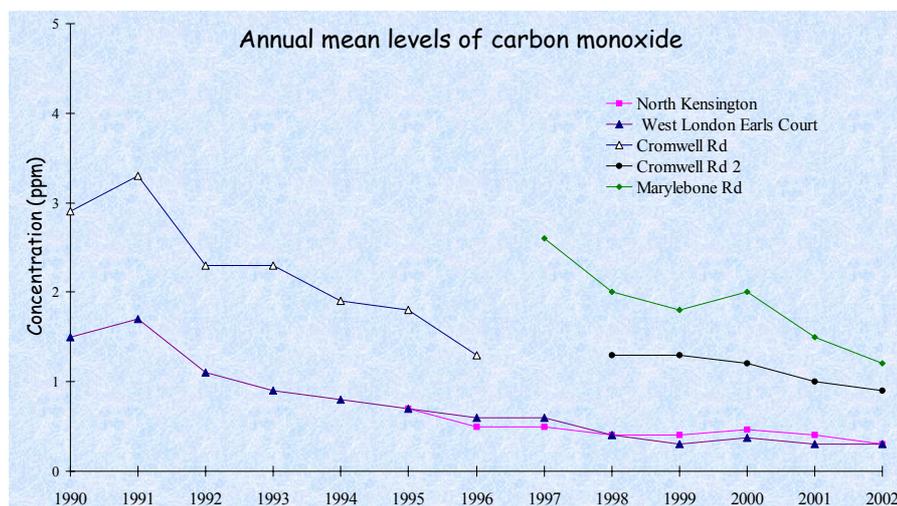
All available carbon monoxide monitoring data (since 1999) from within the Borough has been collated in the table below, including data from one other busy kerbside location from central London. The table focuses on data collected since the last round of review and assessment.

Table 7 Concentrations of carbon monoxide 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

* Maximum daily 8-hour running mean

This data shows there have been no exceedences of the objective level at monitored locations during this time. The Marylebone Road site, whilst not located within the Royal Borough, is none the less indicative of levels at kerbside locations, and even here the objective level has not been exceeded. The chart below shows that whilst annual mean levels have for many years been declining, levels now appear to be stabilising.



Very busy roads

The Technical Guidance note (LAQM.TG (03)) defines ‘very busy roads’ as those with road flows greater than:

- 80,000 for a single carriage way;
- 120,000 for a dual carriage way and
- 140,000 for a motorway;

Road flows on the Borough’s busiest roads have been checked using rotating census count data and the Borough’s own traffic count data.

Table 8 Roads flows on the major roads within the borough.

Road Name	Type	Traffic flow	Source	Criteria	Exceeds
Westway (A40)	Dual	101,000	RCC 2001	>120,000	No
West Cromwell Road (A4)	Dual	90,000	RCC 2001	>120,000	No
Cromwell Rd (A4)	Single/ Dual	51,500	RCC 2001	>80,000/ 120,000	No
Brompton Rd	Single	57,000	RBKC 2001	>80,000	No

There are therefore no roads in the borough that exceed the criteria for ‘very busy roads’.

There are however a small number of junctions, where the combined traffic flows, may have the potential to exceed the criteria given in the guidance.

- Cromwell Road where it meets Earls Court Road and
- Warwick Road where it meets the West Cromwell Road.

In Stage 3, CO was modelled along sections of the Westway and the Cromwell Rd using a dispersion model called Breeze Way (CAL3QHC). The results indicated that there would not be a problem at these locations. Predictions for 2005 were made using meteorological data from 1995, 1996 and 1997. The greatest levels were predicted using 1997 met data. The highest of these concentrations was 9.4mg/m³ (maximum 8 hour running mean) predicted at various locations including the West Cromwell Road. Validation of the model also indicated that it tends to over predict.

The modelling was undertaken to predict concentrations in 2005. The objective level has since been brought forward to 2003. The technical guidance states that it is only necessary to consider ‘very busy’ roads and junctions in areas where the 2003 background concentrations are expected to be above 1 mg/m³. Table 7 shows that in 2002, the measured background concentration is 0.4 mg/m³. After applying the correction factor, the maximum measured background concentration within the Borough for 2003 is predicted to be 0.33 mg/m³.

CONCLUSION

There is sufficient evidence to suggest that no further assessment is necessary particularly as monitoring is already well within the new objective, and within Kensington and Chelsea there are no ‘very busy roads’, or junctions, where background concentrations are expected to be above 1 mg/m³.

BENZENE

As shown in table 4 (page 3) two objectives have been set for the assessment of benzene – a running annual mean ($16.25\mu\text{g}/\text{m}^3$ to be met by 31.12.2003) and a newer, more stringent annual mean of $5\mu\text{g}/\text{m}^3$ to be achieved by 31.12.2010.

For this pollutant, we need to consider our monitoring data, very busy roads, industrial sources, petrol stations and any major fuel storage depots that there may be within the Borough to see if the objectives are still likely to be met.

Monitoring data

As part of the London Wide Environmental Programme, we undertake sampling at five locations using diffusion samplers.

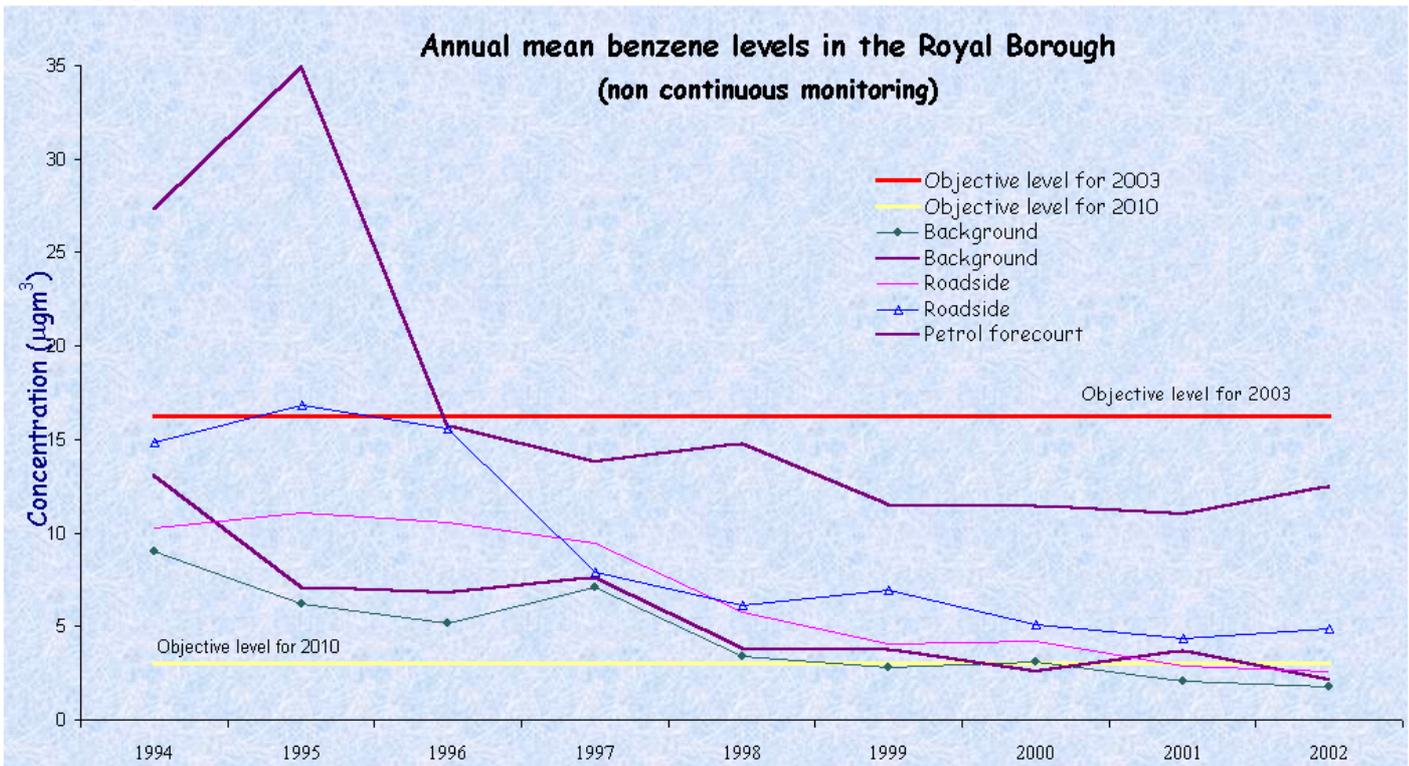
Table 9 Annual average benzene levels using diffusion samplers ($\mu\text{g}/\text{m}^3$)

Location	Concentration ($\mu\text{g}/\text{m}^3$) 2001	Concentration ($\mu\text{g}/\text{m}^3$) 2002
Holland Park (B)	2.0	1.8
Dovehouse Street (B)	3.7	2.1
Pembridge Villas (R)	2.9	2.6
Ladbroke Grove (R)	4.3	4.9
Petrol forecourt	11.0	12.5

B= background, R= roadside

Table 9 (above) shows that the highest levels are recorded at the petrol forecourt location. Despite this, the 2003 annual average objective of $16.25\mu\text{g}/\text{m}^3$ is met at all other locations, but the stricter 2010 objective is exceeded at the petrol forecourt location.

The graph shows that overall there has been a decline in benzene concentrations since 1994.



Within London, concentrations of benzene are only monitored continuously at one location, therefore limited co-location data is available. Continuous monitoring is more accurate than diffusive samplers. Comparisons of measurements at the Marylebone Road site show fairly good agreement, though the diffusion samplers tend to over estimate the concentrations. However it should be noted that the exposure periods were not identical.

Table 10 Comparison of concentrations at Marylebone Road

Year	Diffusive Sampler	Continuous analyser
2000	3.2	2.1
2001	6.8	4.5

Source: Air Quality Archive/NETCEN

Some automated monitoring is undertaken by DEFRA at a small number of sites in London. Unfortunately several sites were closed during 2001 and new replacement sites did not start until mid 2002 so that recent data is limited to the Marylebone Road site.

Table 11 Running annual mean values for automated sites ($\mu\text{g}/\text{m}^3$)

Location	1999	2000	2001	2002
Marylebone Rd	12.8	10.8	6.29	4.97
London UCL	3.99	3.62	-	-
Eltham	2.81	2.52	-	-

Benzene levels have dropped over the years. Both the London UCL and Eltham sites already meet the more stringent 2010 objective, and in 2002, so did the Marylebone Road site.

Table 12 Estimated values for 2003 and 2010 based on 2001 diffusion sampler concentrations

Location	Annual average ($\mu\text{g}/\text{m}^3$) 2001	Estimated annual average ($\mu\text{g}/\text{m}^3$) 2003*	Estimated annual average ($\mu\text{g}/\text{m}^3$) 2010*
Holland Park (B)	2.04	1.79	1.35
Dovehouse Street (B)	3.70	3.24	2.44
Pembridge Villas (R)	2.87	2.50	1.86
Ladbroke Grove (R)	4.33	3.77	2.80
Petrol forecourt	11.0		
Marylebone Road	4.55	3.96	2.94
Location	Running annual average ($\mu\text{g}/\text{m}^3$) 2001	Estimated annual average ($\mu\text{g}/\text{m}^3$) 2003*	Estimated annual average ($\mu\text{g}/\text{m}^3$) 2010*
Marylebone Road	6.29	5.47	4.07
Objective levels		16.25	5

* Correction factors from LAQM. TG (03)

The only location where the 2010 objective might be exceeded is at the petrol forecourt (on Warwick Road). Estimated concentrations cannot be calculated, as the Guidance states that there is no straightforward way to project future exceedences, this is discussed further in the following paragraphs.

Very busy roads or junctions in built up areas

Guidance states that we need only be concerned about ‘very busy roads’ and junctions in areas where the 2010 background is expected to be above $2 \mu\text{g}/\text{m}^3$. Estimated annual average benzene background concentrations for 2001 have been made available on the air quality archive website. This data indicates that annual average levels for 2001 range from $1.23\text{-}1.49 \mu\text{g}/\text{m}^3$ on a km grid square within the Borough. While predicted background levels for 2003 range from $1.08\text{-}1.31 \mu\text{g}/\text{m}^3$ and for 2010 they range from $0.826\text{-}0.998 \mu\text{g}/\text{m}^3$. Based on these estimates concentrations are declining and no background levels are expected to be above $2 \mu\text{g}/\text{m}^3$. However the estimated level based on monitoring indicates that one background site will be above $2.0 \mu\text{g}/\text{m}^3$. This however may be due to an uncharacteristically high value measured during the 2001 monitoring period. If the data for 2002 is used as the basis for the estimate then the predicted level at the same site is below $2.0 \mu\text{g}/\text{m}^3$ for 2010.

In addition, road flows on the Borough’s busiest roads have been checked using rotating census count data and the Borough’s own traffic count data. As table 8 shows, there are no roads in the borough that exceed the criteria for ‘busy roads’. Only two junctions have been identified as ‘very busy’ locations, but estimated levels at background levels are within the $2.0 \mu\text{g}/\text{m}^3$ in these areas.

Industrial Sources

There are no industrial sources of benzene in the Borough, therefore it will not be necessary to proceed to a detailed assessment.

Petrol stations

Within this borough, there are currently nine petrol filling stations operating. Guidance states that we must investigate all petrol stations with an annual throughput of more than 2000m^3 of petrol per annum and that have a busy road nearby with a traffic flow of more than 30,000 vehicles per day. If these criteria are exceeded then, in addition, it is necessary to consider whether there is any relevant exposure (for example, residential properties) within 10 metres of the pumps.

Of the nine stations operating, seven are authorised to operate Stage I vapour recovery and have a throughput of more than 1000m^3 of petrol per annum. However none of the roads adjacent to these petrol stations have traffic flows of more than 30,000 vehicles per day. Only those with traffic flows above 20,000 annual average daily flow (aadf) and a throughput over 2000m^3 are shown in the table below.

Table 13 Petrol stations with a throughput greater than 2000m^3 of petrol per annum and an annual average daily flow above 20,000 vehicles on adjacent roads.

Company	Address	Traffic volume on nearest Road (aadf)*AADF	Distance to nearest residential property (m)	Further assessment
Shell	181-183 Warwick Road, Kensington, London, W14 4PU	23,400	4.0	NO
Shell	106 Old Brompton Road, South Kensington, London, W14 3RA	20,771	12.7	NO
Shell	49 Tadema Road, London, SW10 0FY	21,000	11.6	NO
Esso/ Tesco	Chelsea Express 459 Fulham Road, Chelsea, London, SW10 9UZ	21,200	11.0	NO

*aadf- annual average daily flow

To proceed to a detailed assessment, petrol stations would need to be within 10 metres of a residential property, near a road used by more than 30,000 vehicles per day and with a throughput of 2000m³. With this in mind, it is not necessary to proceed to a Detailed Assessment.

However, monitoring at one of the petrol stations (181-183 Warwick Rd) is currently above the 2010 objective level. This petrol station may have residential property within 10m. In this respect some further assessment for benzene would normally be necessary. However in the last month, planning permission has been granted to re-develop this site, so the petrol station will close soon.

Major Fuel Storage Depots

Within Kensington and Chelsea, there are no major fuel storage depots.

CONCLUSION

Examination of monitoring data indicates that the 2003 objective will be met at all locations.

However, monitoring at one location - a petrol forecourt - indicated that the more stringent 2010 objective might not be achieved, so further assessment might have been necessary at this location. In the last month, planning permission has been granted to re-develop this site, therefore there is sufficient evidence to suggest that no further assessment is required.

1, 3-BUTADIENE

For this pollutant, we need to see if the running annual mean objective of $2.25\mu\text{g}/\text{m}^3$ can still be achieved by 31.12.2003. To do this, we must consider our monitoring data recorded since Stage 1 was completed and any new industrial sources that have been identified since then.

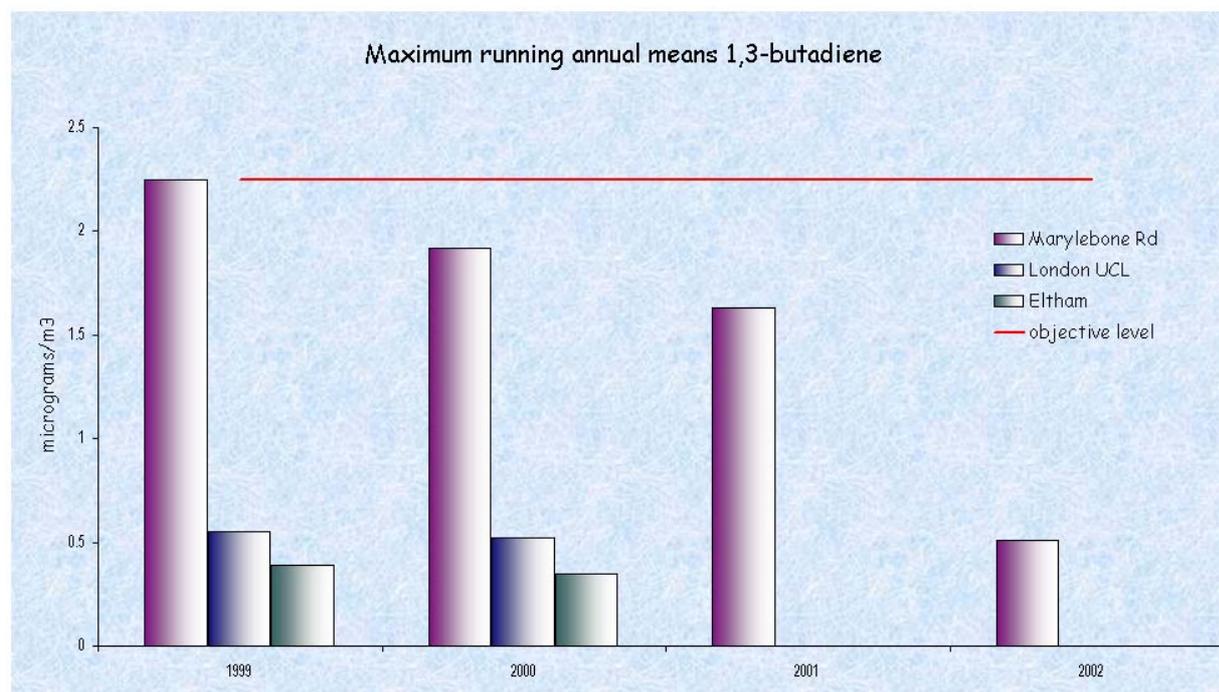
Monitoring data

1,3-butadiene is not monitored in Kensington and Chelsea, however data has been collected by DEFRA at three other sites within London. This data is shown in the table below. Only Marylebone Road now continues to collect data for this pollutant in central London.

Table 14 Levels of 1,3-butadiene (maximum annual running means, $\mu\text{g}/\text{m}^3$) in London

Location	1999	2000	2001	2002
Marylebone Rd	2.25	1.92	1.63	1.15
London UCL	0.55	0.52	-	-
Eltham	0.39	0.35	-	-

The highest running annual mean was recorded at the Marylebone Road (roadside) site in 1999. This measurement of $2.25\mu\text{g}/\text{m}^3$ has continued to drop as the years have progressed, dropping to $0.15\mu\text{g}/\text{m}^3$ in 2002. This table shows that there are no exceedences of the 2003 objective. Therefore it is not necessary to proceed to a detailed assessment.



Industrial Sources

There are no industrial sources with the potential to emit significant quantities of 1,3-butadiene in the Borough.

CONCLUSION

There is sufficient evidence to suggest that no further assessment of 1,3-butadiene is necessary, as monitoring is already well within the new objective.

LEAD

There are two annual mean objectives for lead: $0.5\mu\text{g}/\text{m}^3$ to be achieved by 2004 and the newer objective of $0.25\mu\text{g}/\text{m}^3$ to be achieved by 2008. To assess whether concentrations in the Borough still meet these objectives, we must again look at monitoring data and the presence of industrial sources. For this pollutant, it is not necessary to consider roads.

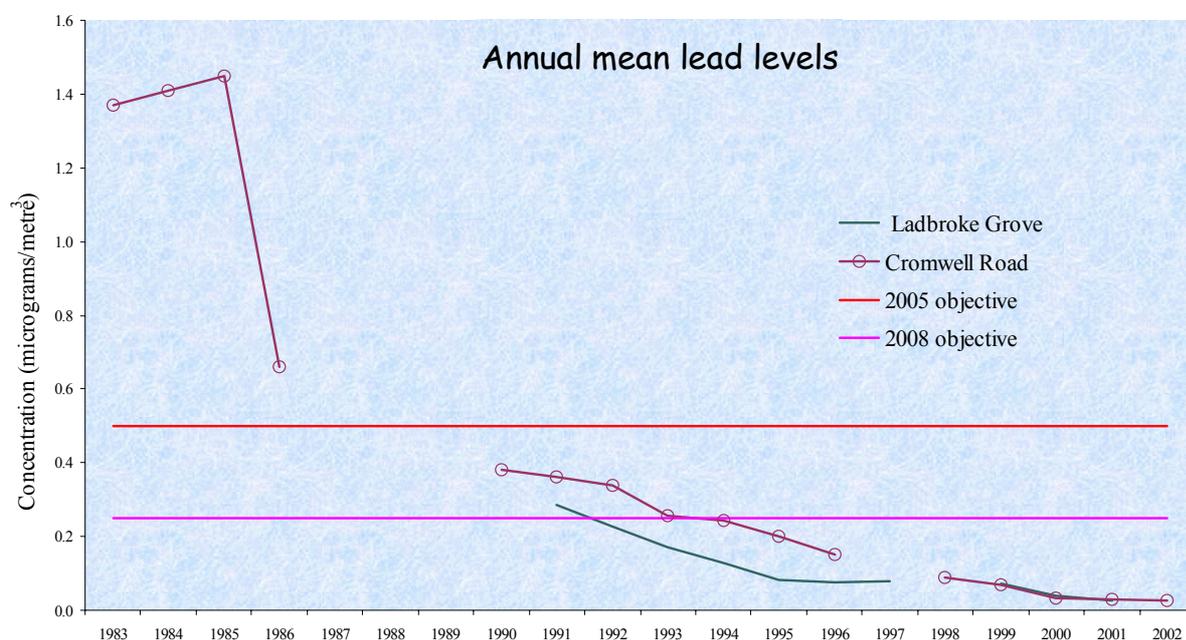
Monitoring data

Monitoring of lead is now only undertaken by DEFRA at the Cromwell Road monitoring site. The Royal Borough previously undertook lead monitoring at one additional site in Ladbroke Grove, however this site closed at the end of 2001 as levels had dropped so significantly, it was not considered necessary to retain it.

Table 15 Lead levels within the Borough

Year	Ladbroke Grove ($\mu\text{g}/\text{m}^3$)	Cromwell Rd ($\mu\text{g}/\text{m}^3$)
1999	0.073	0.068
2000	0.041	0.032
2001	0.026	0.031
2002	-	0.027

Monitoring data, as demonstrated below, shows a downward trend at both Cromwell Road and Ladbroke Grove. Since the re-siting of the Cromwell Rd site to the rear of the pavement, both sites have shown comparable levels. Concentrations of lead at the sites are already within the objectives for both 2004 and 2008.



Industrial emission sources

There are no industrial sources within the Borough, therefore there is little likelihood of any exceedences.

CONCLUSION

There is sufficient evidence to suggest that no further assessment of lead is necessary, as monitoring is already well within both objectives.

NITROGEN DIOXIDE

There are two different objectives for nitrogen dioxide; a short term objective of $200\mu\text{g}/\text{m}^3$ not to be exceeded more than 18 times as a one hour mean, and a longer term objective of $40\mu\text{g}/\text{m}^3$ as an annual mean, both to be achieved by the end of 2005. To assess nitrogen dioxide, we need to consider the following:

- Monitoring data;
- Narrow congested streets with residential properties close to the kerb;
- Junctions;
- Busy streets where people may spend 1-hour or more close to traffic;
- Roads with high flow of buses and/or HGV's;
- New roads (constructed or proposed);
- Roads previously close to the objective;
- Roads with significantly changed traffic flows;
- Bus stations;
- Industrial sources and;
- Aircraft.

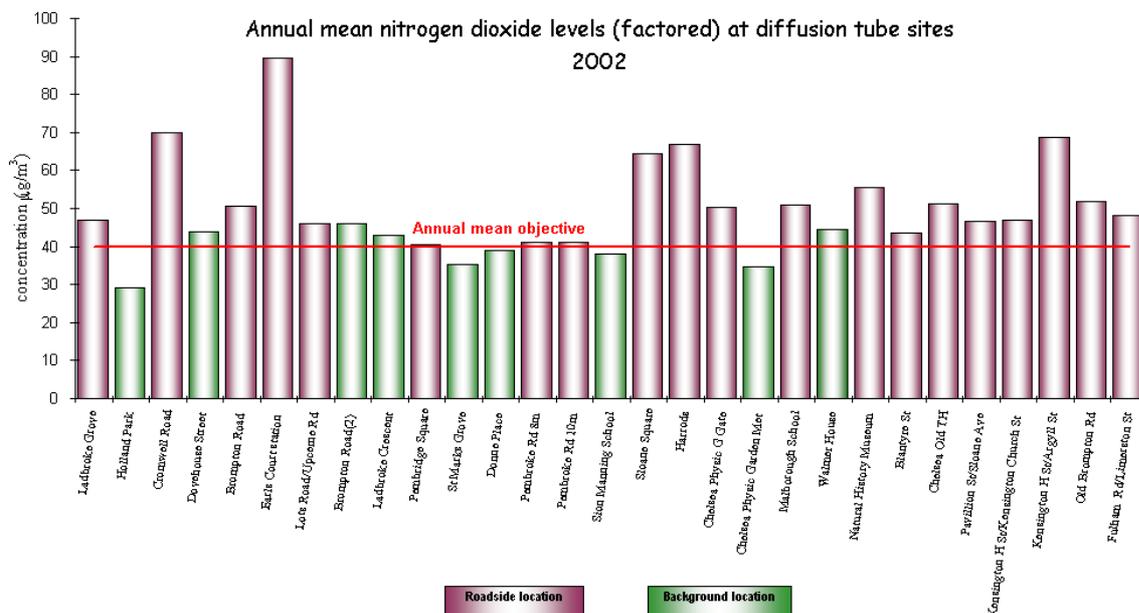
The whole of the Royal Borough's area was declared an Air Quality Management Area in 2001. It was declared on the basis that nitrogen dioxide (and PM_{10}) would fail with regard to their respective objectives.

Monitoring data

Nitrogen dioxide is monitored by automatic chemiluminescent analysers and also using passive diffusion tubes.

Diffusion tube monitoring for 2002

Diffusion tube data is collected at a number of locations in the Borough. The data in the graph below has been factored to take into account the differences between the two monitoring techniques as the diffusion tube method tends to under-estimate concentrations. The factor used for the 2002 data was 1.37 based on the LWEP co-location study.



The chart indicates that twenty-four out of twenty nine sites are above the objective level.

Continuous monitoring data

Continuous monitoring is now undertaken at five sites in this Borough.

Table 16 Concentrations of NO₂ measured in and near the Borough using chemiluminescent 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

* some sites have operated for part of a year only, data from these sites must be treated with caution other sites in central London are included for overview /completeness.

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

Exceedences of the annual average nitrogen dioxide objective level have occurred at all sites in the Borough. As expected, levels are lowest at the background site at North Kensington, and in 2000 and 2002, the recorded annual mean equalled the objective.

Exceedences of the one-hour objective have only been occasionally breached in this Borough. Post 1997, this has only been recorded at the kerbside monitoring site in Knightsbridge. Here, members of the public are regularly exposed over this time period and similar locations may be at risk of exceedences as indicated by the previous modelling work.

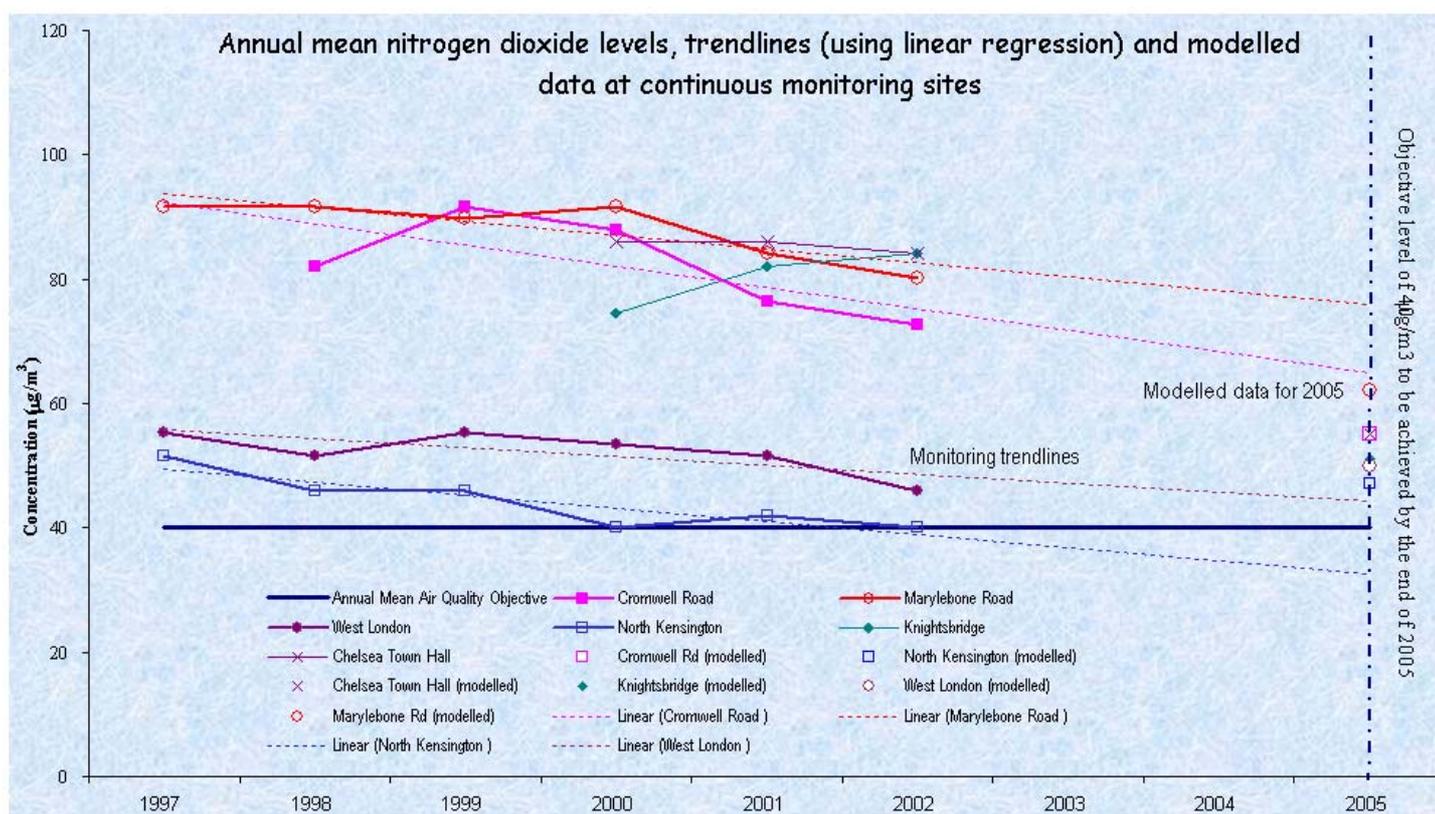
Recent Estimations

The tables below shows the levels of nitrogen dioxide that have been predicted for nitrogen dioxide in 2005 at roadside and kerbside locations from 2001 and 2002 concentrations. The fourth column contains the levels predicted during our stage four Review and Assessment modelling.

Table 17 Estimated NO₂ values for 2005 based on 2002 concentrations

Location	Concentration $\mu\text{g}/\text{m}^3$ (2002)	Estimated level for 2005	Modelled level (Stage 4) for 2005
Cromwell Rd 2	73	67.2	55
Knightsbridge	84	77.3	55
Chelsea	84	77.3	51
Marylebone Rd	80	73.6	62

The table above shows that estimates based on the guidance indicate levels are expected to be higher than those predicted by our stage four modelling predictions. The two sets of data are based on different methods, the first is a simple technique which applies a correction factor to a known level whilst the later involved a sophisticated dispersion model to predict levels based on expected emissions and real weather data. In both approaches the results indicate we still expect to have an NO₂ problem in 2005.



The graph above shows monitoring data with associated trend-lines and stage four modelling results. Some difference can be seen between the two sets. Neither monitoring trendlines nor predictions are exact methods for estimating future emissions. The resulting difference is due to the use of different techniques. Monitoring trend-lines cannot take into account changes in emissions e.g. due to technological improvements, whilst dispersion modelling will take this into account. However the important point to note is that apart from one background location all sites exceed the relevant objective level for 2005.

Table 18 Estimated NO₂ values for 2005 based on 2001 concentrations

Location	Concentration $\mu\text{g}/\text{m}^3$ (2001)	Estimated level for 2005 $\mu\text{g}/\text{m}^3$	Modelled levels for 2005 (Stage 4 R&A)
Cromwell Rd 2	76	67.8	55
Knightsbridge	84	74.9	55
Chelsea	86	76.7	51
Marylebone Rd	82	73.1	62

An estimation of annual mean levels for 2005 indicate that roadside concentrations are likely to be substantially above the objective level of $40 \mu\text{g}/\text{m}^3$. These results are comparable to the levels indicated by the monitoring trend lines. However, the modelled data predicts levels at roadside and kerbside sites to be lower than that estimated using the correction factors supplied in the Technical Guidance.

As the whole Borough has been declared an Air Quality Management Area and future concentrations are not predicted to be below the objectives, guidance indicates that a Detailed Assessment is not required for nitrogen dioxide as there has been no significant change.

The following topics were looked at in our Stage Four modelling, which was undertaken across the whole Borough:

- Narrow congested streets with residential properties close to the kerb;
- Junctions;
- Busy streets where people may spend one hour, or more, close to traffic;
- Roads with high flow of buses and/or HGV's.

We therefore believe that a re-examination of these situations is unnecessary.

New roads (constructed or proposed)

No new roads have been constructed or are currently proposed.

Roads previously close to the objective

There has been no change since the modelling work undertaken in Stage Four.

Significant changes to traffic emissions

No increases to existing roads have been identified on a scale that would merit re-examination of the modelling work. The exceedences of the annual mean are of such a magnitude as to make it unnecessary to repeat this work at this stage.

New industrial sources

There have been few significant changes in emissions with the exception of the closure of Lots Road power station in the southwest corner of the borough. This closure had already been accounted for in the modelling work previously undertaken.

CONCLUSION

There has been very little change in nitrogen dioxide sources and concentrations since stage four was undertaken, therefore it is not necessary to proceed to a Detailed Assessment.

SULPHUR DIOXIDE

As table 4 shows on page 3, three objectives have been set for this pollutant. To assess whether a Detailed Assessment is necessary, we needed to review the following information:

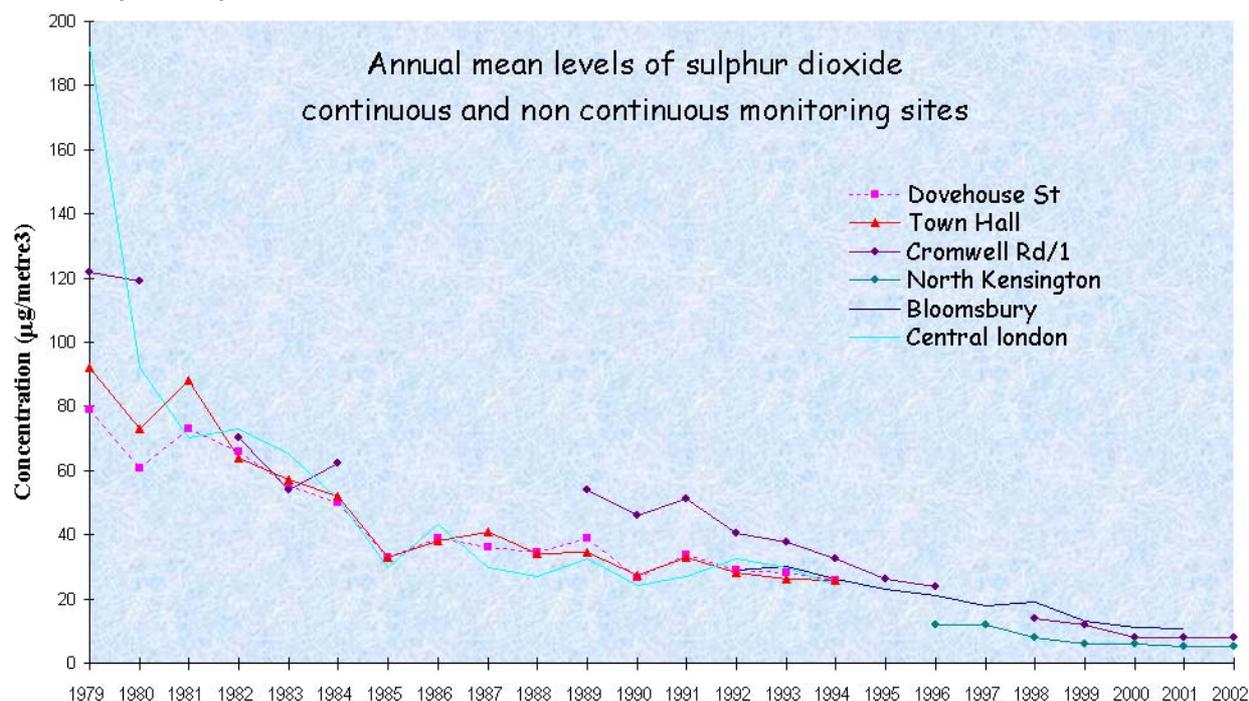
- Monitoring data;
- Industrial sources;
- Areas of domestic coal burning;
- Small boilers;
- Shipping and Railway Locomotives.

Monitoring data

Table 19 Sulphur dioxide concentrations in the Borough from data collected at our two monitoring sites.

Year	Location	Annual average $\mu\text{g}/\text{m}^3$	No. of 1 hour means $> 350\mu\text{g}/\text{m}^3$	No. of 24 hour means $> 125\mu\text{g}/\text{m}^3$	No. of 15min means $> 266\mu\text{g}/\text{m}^3$
1999	North Kensington	5	0	0	0
	Cromwell Rd	11	0	0	0
2000	North Kensington	6	0	0	0
	Cromwell Rd	8	0	0	0
2001	North Kensington	5	0	0	0
	Cromwell Rd	8	0	0	0
2002	North Kensington	5	0	0	0
	Cromwell Rd	8	0	0	0

No exceedences of any of the objectives have been observed in the past four years at monitoring locations in the borough. The graph below confirms the decline in sulphur dioxide levels over the last twenty-three years.



New industrial sources or increased emissions

There are no industrial sources in the borough.

Domestic coal burning

There is no significant coal burning in the Borough. This is confirmed by the London Atmospheric Emissions Inventory. Most of the Borough is already in a Smoke Control Area, and the few streets that are currently excluded, will be incorporated in a new single Order which is in the process of being prepared and will make the whole of the Royal Borough a Smoke Control Area. The technical guidance states that smokeless fuel has similar sulphur content to coal and should also be considered. However we do not believe that there are any 'significant' areas (according to the definition in the guidance) where appreciable amounts of smokeless fuel are burnt.

Small boilers (>5MW)

A small number of boilers burning fuel oil in the borough have been identified, however these boilers are either below 5MW output (the threshold for inclusion) or are dual fired and use heavy oil for back up purposes only. In any case, guidance states that boilers burning fuel oil on their own are unlikely to be significant because of new regulations limiting the sulphur content to 1% in fuel oil.

Table 20 Oil fired boilers in the borough or close vicinity

Location	Fuel	Usage litres per annum	Thermal Output	SO ₂ Tons/annum
The National Army museum	Gas oil Class D	154,000	2 x 0.63MW	0.005236
Natural History Museum	35 sec. light oil	100	2 x12 MW*	Insignificant
Imperial College of Science and Technology	Gas oil Class D	22,000	<i>Not available</i>	0.000748

*This is the total output of dual fired boilers which mainly use gas.

Shipping Ports

There are no shipping ports within Kensington and Chelsea.

Railway locomotives

Guidance states that we must assess exposure to stationary diesel and coal-fired locomotives against the short term 15-minute objective. To do this we must identify locations particularly where diesel locomotives are regularly stationary for periods greater than 15 minutes and establish if there is the potential for regular outdoor exposure of members of the public within 15 metres of the stationary locomotives. There are currently two stations within the Borough – West Brompton and Kensington Olympia. These stations are served almost entirely by electric trains. Special steam train excursions rarely use this line and most diesel hauled trains are non-stopping freight services. The few diesel powered trains that do operate, neither remain stationary at these stations for any significant length of time, nor is there any relevant exposure at either location.

CONCLUSION

Monitoring data shows that there have been no exceedences of any of the three objectives. We do not have any industrial sources, or combination of boilers that are likely to produce significant amounts of sulphur dioxide, or any diesel locomotives that sit stationary for a significant length of time at the two stations within the Borough. Therefore it will not be necessary to carry out a Detailed Assessment.

PARTICULATE MATTER

Table 4 on page 3 shows that there are currently two objectives that have been incorporated within the Air Quality Regulations set to be achieved by the end of 2004 – a short term 24 hour mean objective and a long term annual average objective. In addition to these are three more stringent objectives that have been set (see table 5 on page 4) to be achieved by 2010 and 2015. These have not yet been incorporated into the Air Quality Regulations, and for this reason, we have not included an assessment against these future objectives, in this Updating and Screening Report.

To assess particulates (PM₁₀) for the current objectives, we need to consider the following:

- Monitoring data;
- Junctions;
- Roads with a high flow of buses and/or HGV's;
- New roads (constructed or proposed);
- Roads with particulate concentrations close to the objective previously;
- Roads with significantly changed traffic flow;
- Industrial sources;
- Areas with domestic solid fuel burning;
- Quarries, landfill sites etc;
- Aircraft.

Monitoring Data

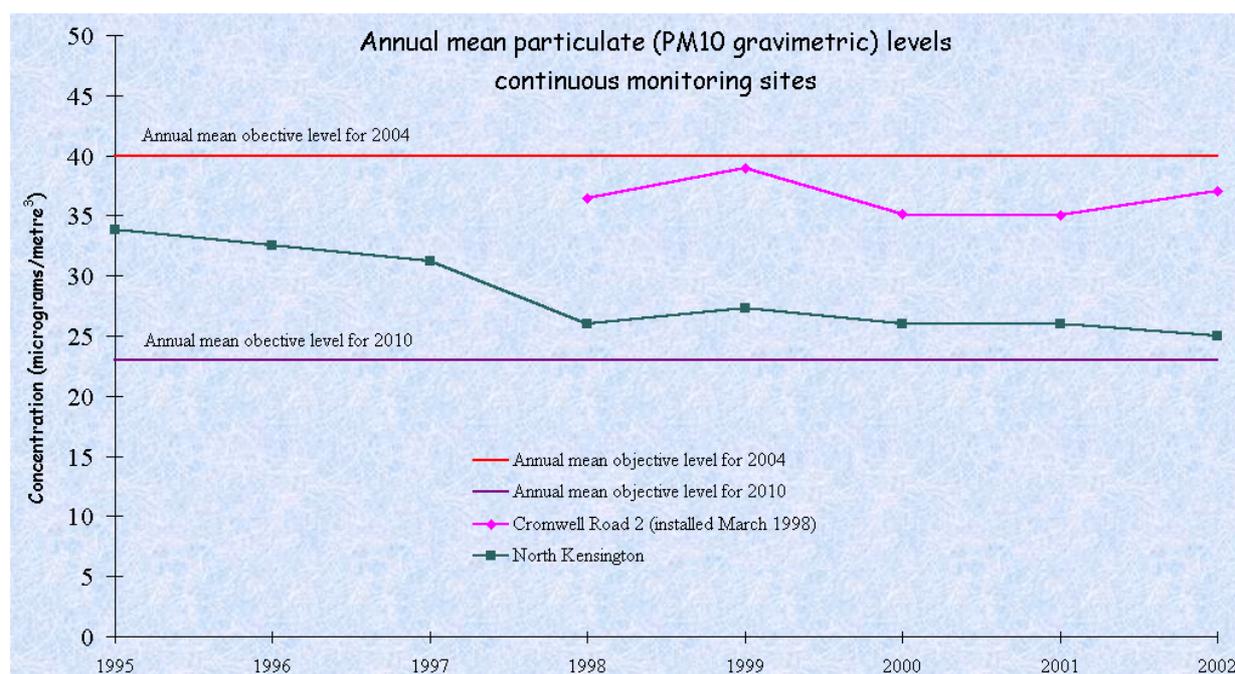
Since 1998, automatic monitoring of PM₁₀ has been carried out at two sites within the Borough – North Kensington (Urban Background site) and Cromwell Road (Roadside). The results in table 21 (overleaf) indicate that, as identified in our Stage four Review and Assessment, the 2004 annual mean objective is likely to be met in most locations, but the 24-hour objective will not be met.

We also have data from two gravimetric samplers which have been included for 2002, this shows that estimated gravimetric levels from TEOM instruments using an adjustment factor of 1.3 gives a fairly good approximation of the annual average, however it is less reliable when applied to exceedences of the daily objective. However it is important to note that data capture rates are not exactly the same for both methods.

Table 21 Concentrations of particulate matter PM₁₀ (TEOM) measured in the Borough and other nearby locations (µg/m³)

Year	Site	Annual mean µg/m ³ (TEOM)	Annual mean 40µg/m ³ -2004 (GRAV)	No of days above 50µg/m ³ (GRAV) fixed 24 hr mean	% Data Capture
1995	North Kensington*	26	34	25	75
	Bloomsbury	28	36	58	93
1996	North Kensington	25	33	35	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	36	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

- Indicates that these sites were not operating for a full year. Partisol indicates gravimetric collection method.
- Figures in bold indicate an exceedence of an objective recorded within Kensington and Chelsea above 35 days.



The guidance requires authorities to calculate levels for 2004 based on monitoring data. Tables 22 and 23 (below) show how the monitored data from the year 2000 has been adjusted to estimate 24-hour exceedences in 2004.

Table 22 Approach to correcting measured PM10 concentrations to 2004.

	North Kensington	Cromwell Road
Measured concentration 2000	26	35
Secondary concentration 2001	8.38	8.38
Secondary (+ correction factors) 2000	7.47	7.47
Primary 2000	8.03	17.03
Primary 2004	7.29	15.45
Secondary 2004	7.81	7.81
Total	25.6	33.76

Table 23 Estimated exceedences (number of days) above the 24-hour PM₁₀ objective in 2004.

Location	Annual mean ($\mu\text{g}/\text{m}^3$)	Predicted no. of exceedences
North Kensington (background)	25.6	14
Cromwell Road (roadside)	33.76	38

These estimates based on factors contained in the technical guidance support the modelling work previously undertaken, which shows exceedences are limited to some roadside locations. Therefore there has been no change since the Stage Four report was carried out. At certain roadside locations the 24-hour mean objective in 2004 will still be exceeded.

The following points were considered in detail during the work undertaken in Stage four modelling:

- Junctions;
- Roads with high flows of buses and HGV's;
- Roads previously close to the objective.

No changes have occurred since then.

New roads (constructed or proposed)

No new roads have been constructed or are currently proposed that will result in any significant change to the Stage four results.

Significant changes to traffic flows

No increases to existing roads have been identified on a scale that would merit re-examination of the modelling work.

Industrial sources

There are no industrial sources within the Borough.

Areas with domestic solid fuel burning

There are no significant areas of domestic solid fuel burning within the Borough. This has been confirmed by referring to the London Atmospheric Emissions Inventory.

CONCLUSION

An Air Quality Management Area has already been declared for this pollutant. There have been no significant changes since the Stage Four review and assessment was carried out, and it is still predicted that there will be greater than 35 exceedences of the 2004 24 hour objective at a monitored roadside location.

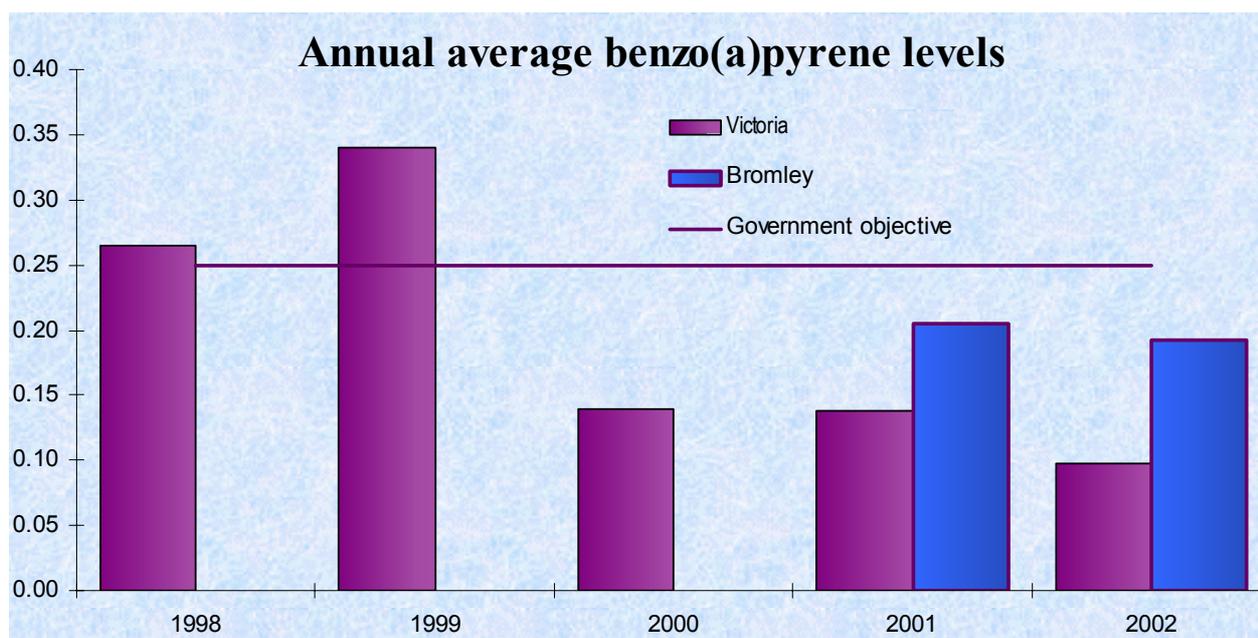
Polycyclic Aromatic Hydrocarbons (PAH)

Polycyclic Aromatic Hydrocarbons are a complex mixture of organic compounds some of which are carcinogens. The Government has set a new standard 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: $0.25\text{ng}/\text{m}^3$ as an annual average to be achieved by the end of 2010

Whilst this objective for PAHs has been introduced it has not been included in Regulations for the purposes of local air quality management (LAQM). However some information has been included in this report, in anticipation of the Regulations.

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 of b(a)p. Urban areas, without significant industrial activity, such as London have shown large reductions.

Only limited monitoring data exists for PAH in inner and outer London, from monitoring at Victoria and Bromley. The current data indicates that at these locations the levels are within the objective level.



This chart suggests that over the last few years, levels of annual average levels of benzo(α)pyrene have fallen below the objective level.

CONCLUSION

In 2000, the Royal Borough of Kensington and Chelsea declared an Air Quality Management Area on the basis that both nitrogen dioxide and particulate matter would not meet the relevant objectives. This Updating and Screening Assessment has not identified any significant changes that will require the borough to proceed to a Detailed Assessment for any pollutant and therefore our original conclusions are still valid.

During the course of this study, we have examined new monitoring data and objectives. Those pollutants that previously exceeded the objectives (NO_2 and PM_{10}) still do, and carbon monoxide, 1,3-butadiene, lead, and sulphur dioxide, based on current monitored levels, are still likely to meet the objectives.

The only exception is the pollutant Benzene. Since the new, more stringent 2010 objective has been brought in, an exceedence has been recorded at one location – a petrol station. Where this might have required a Detailed Assessment, planning permission has now been granted to redevelop the site, and the filling station will close, so the Detailed Assessment is no longer required.

GLOSSARY

Advanced air quality dispersion model – computer based air quality dispersion models are used to predict pollutant dispersion and deposition patterns. This helps to identify areas where highest ambient concentrations are to be expected.

AQMA - Air Quality Management Area, an area designated by a local authority where it is likely that the air quality objectives in the National Air Quality Strategy will not be achieved by the appropriate future year specified by each pollutants' objective.

Air Quality Action Plan – a plan of initiatives that is being implemented to improve air quality.

Automatic monitoring sites - sites producing high-resolution measurements typically hourly or shorter period averages.

AURN - Automated Urban Rural Network - A DEFRA (previously DETR) air quality monitoring network.

AURN affiliate - a monitoring site owned and operated by a local authority but included in the DEFRA network of sites.

Background site - a sampling site greater than 40 metres from the source/road.

Benzene - an aromatic hydrocarbon.

1,3-Butadiene - colourless gaseous hydrocarbon.

Carbon monoxide - gas formed by the incomplete combustion of carbon containing fuels.

DETR - Department of Environment, Transport and the Regions since replaced by DEFRA.

DEFRA – Department for Environment, Food & Rural Affairs.

Diffusion tube - a small air pollution monitor that passively absorbs a pollutant over a monthly time period, and is then collected and analysed.

Emissions inventory – a comprehensive data set of pollution emitted from a variety of sources.

Fine particles – see Particles.

Gravimetric method – a method of sampling particulate matter by collecting it on a filter and weighing it.

HGV – heavy goods vehicle, a goods carrying vehicle of 3.5 tons, or more, gross laden weight.

8 hr running mean - an average taken over an 8-hour period, which progresses hour by hour.

Intermediate site - a sampling site within 20-40 metres of the source/road.

Kerbside site – a site sampling within 1 metre of a busy road.

Lead – one of the heavy metals that are a toxic and acts as a cumulative poison.

LAQN - London Air Quality Network, a network run by a consortium including local authorities, the Environmental Research Group - King's College (formerly South East Institute of Public Health) and the Association of London Government, to co-ordinate air pollution monitoring.

µg/m³ - a microgram of pollutant in a cubic metre of air.

NAQS - National Air Quality Strategy, issued by the Department of the Environment in 1997 to implement the air quality part of the Environment Act 1995.

Nitric oxide (NO) - a colourless toxic gas arising from the combination of atmospheric nitrogen with oxygen in high temperature combustion.

Nitrogen dioxide (NO₂) - a stable brown gas largely produced by the oxidation of NO. NO₂ is more toxic than NO.

99th percentile - the concentration at which 99% of the data are below.

Particles – or fine particles, these are microscopic particles of varying composition, and for the purposes of this report the term 'particles' refers to a range of particle sizes from 10µ to 0.1µ.

Pollutant specific guidance – issued by DEFRA, provides advice on review and assessment for each pollutant identified in the air quality regulations 1997.

Objective – we have used the word objective throughout this report. This is the term used by the Government to describe standards which have a set timescale (i.e. a target date) for their achievement.

ppb - parts per billion.

ppm - parts per million.

PM₁₀ - particulate matter less than 10 μ (micrometres) in diameter.

Roadside site - a sampling site between 1 metre of the kerbside of a busy road and the back of the pavement. Typically within 5 metres of the road.

Screening models - give a preliminary level of assessment and only require simple input data.

Source apportionment – the degree to which various sources of pollution contribute to air quality problems.

Sulphur dioxide (SO₂) - a colourless toxic and acid forming gas, it is the main product of the combustion of sulphur contained in fuels.

Technofix – the use of improved engine and fuel technology to reduce pollution.

TEOM - Tapered Element Oscillating Microbalance - a device for continuously measuring fine particles.