

# **CHELTENHAM BOROUGH COUNCIL**

## **AIR QUALITY REVIEW AND ASSESSMENT PROGRESS REPORT**



**2007**

### **Part IV of the Environment Act 1995 Local Air Quality Management**

**Produced with assistance from the Air Quality Management  
Resource Centre, University of the West of England, Bristol.**



**DOCUMENT CONFIRMATION & CONTROL SHEET**

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## **1. Introduction to Local Air Quality Management Progress Reports**

This Air Quality Progress Report forms part of the Local Air Quality Management (LAQM) system introduced by the Environment Act 1995 ('The Act') and subsequent Regulations. It is a requirement as part of the Act, and follows on from Cheltenham Borough Council's Updating and Screening Assessment (USA) in 2006. Cheltenham Borough Council's produced a Progress Report in 2004 which concluded that a Detailed Assessment would be required for Nitrogen Dioxide. As a result of this, Cheltenham Borough Council began compiling a Detailed Assessment which will be submitted in 2007. The 2006 USA concluded that a Detailed Assessment (other than the Detailed Assessment currently being compiled) would not be required; therefore this Progress Report fulfils Cheltenham Borough Council's Review and Assessment requirements for 2007.

The overall aim of this document is to report upon the ongoing implementation of Local Air Quality Management in Cheltenham Borough Council, and progress made in achieving concentrations below the air quality objectives. Progress Reports have been introduced into the LAQM system following a detailed evaluation of the first round (Round 1) of local authority Reviews and Assessments. Progress Reports are to be prepared in years when Cheltenham Borough Council is not undertaking an Updating and Screening Assessment or a Detailed Assessment. It is intended that this Progress Report should assist Cheltenham Borough Council in the following ways:

- Maintaining a profile for LAQM within Cheltenham Borough Council;
- Providing a means for communicating air quality information to Members and the public;
- Maximising the usefulness and interpretation of the monitoring effort being carried out by Cheltenham Borough Council;
- Maximising the value of the investment in monitoring equipment;
- Making the next round of Review and Assessment easier, as there will be a readily available up-to-date source of information;
- Assisting Cheltenham Borough Council to respond to requests for up-to-date information on air quality;
- Providing information to assist with other policy areas, such as transport and land-use planning;
- Providing a ready source of information on air quality for developers carrying out environmental assessments for new schemes;

- Demonstrating progress with implementation of any future air quality action plans required or Gloucestershire's County-wide Air Quality Strategy, and
- Providing a timely indication of the need for further measures to improve air quality, rather than delaying until the next full round of review and assessment.

Copies of this Progress Report have been sent to the Secretary of State, Environment Agency (in England and Wales) and other neighbouring local authority departments for information and copies of the report have been made available to the public and local stakeholders.

### 1.1 Overall aims of the Progress Report

This Progress Report has two main aims, as follows:

- To report on progress being made with the implementation of local air quality management (LAQM) in Cheltenham Borough Council, and
- To report on progress in maintaining concentrations below the air quality objectives.

New monitoring data within Cheltenham Borough Council and new developments that might affect local air quality are the focus of this report, and are the minimum requirements for progress reporting purposes. Each is considered in turn, using the Progress Report Checklist made available on the Review and Assessment website. Table 1 below provides an indication of what is expected of local authorities in their progress reporting.

**Table 1: Minimum Reporting Requirements**

<b>Monitoring data</b>	The minimum requirement is to report monitoring data and trends over recent years. To maximise the value of air quality monitoring, careful attention should be paid to the type of equipment used and the locations where the monitors are placed, as well as the QA/QC and data verification procedures.
<b>New developments</b>	A consideration of new development with the potential to affect local air quality (mainly through the generation of traffic), such as residential developments, industrial processes, retail premises, roads and quarries.

In addition to the minimum requirements, the government recommends that local authorities report upon a number of additional elements in their Progress Reports. These additional elements are listed in Table 2.

**Table 2: Recommended additional reporting requirements**

<b>Additional monitoring data</b>	<p>Projecting the measured concentrations forward to the objective years is helpful in providing early indication of likely exceedences that may not have been previously identified.</p> <p>Local authorities may also find it helpful to report on their monitoring for pollutants not covered by the regulations, e.g. ozone, polycyclic aromatic hydrocarbons (PAH), as well as other air quality data, i.e. odour complaints, dust deposition, radiation monitoring.</p>
<b>Action Plans</b>	<p>Any progress on the implementation of air quality action plans where appropriate.</p>
<b>Local or Regional Air Quality Strategies</b>	<p>Government guidance strongly recommends that all authorities, particularly those without AQMAs but who have areas close to the exceedence levels, should consider drawing up a local air quality strategy. Progress Reports provide the opportunity for local authorities to report on the development of local or regional strategies. Local authorities should report upon the extent to which the local authority has developed or implemented an air quality strategy, how to access the strategy and when the strategy is to next be reviewed (as appropriate).</p>
<b>Planning policy</b>	<p>Any relevant updates on planning policies that relate specifically to air quality. Policies within Local Development Frameworks (formally Local Plans) determine the local authority approach to the relationship between planning and air quality, with new developments judged against these policies. Reference to any supplementary planning guidance to address air quality matters should be referenced.</p>
<b>Planning applications</b>	<p>A list of planning applications that have the potential to affect local air quality should be provided. The land-use planning system is recognised as playing an integral part in improving air quality. This requires close co-operation between planners and environmental health officers. Some local authorities have developed procedures to help ensure that planning applications that might have impacts on air quality are forwarded to the</p>

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	<p>environmental health department for comment.</p> <p>Updating and Screening Assessments and Detailed Assessments should take account of planning applications that have been approved only. Progress Reports, however, provide the opportunity to log planning applications for new developments to give a picture of areas where changes may take place and where combined impacts from several developments may become important.</p> <p>The information provided should therefore include a list of any major developments under consideration that might affect air quality. Such a list could be based on those applications for which an air quality assessment has been provided or for which an air quality assessment has been requested.</p>
<b>Local Transport Plans and Strategies</b>	<p>Progress on implementing those elements of the Local Transport Plan (LTP) that might affect air quality should be provided. Measures to improve air quality on a local scale are closely related to the LTP. Local authorities should reference those measures within the LTP that relate specifically to bringing about air quality improvements.</p> <p>Local authorities should also report on any other measures aimed at addressing transport-related air quality issues that have not been (or will not be) reported in the LTP Annual Progress Report.</p>

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## 2. Minimum Requirements

This chapter provides the necessary information to fulfill the minimum requirements of Cheltenham Borough Council's Progress Report.

### 2.1 New monitoring results for Cheltenham Borough Council

This report provides a summary of all available monitoring data from 2006 in a format suitable for comparison with the relevant air quality objectives. Cheltenham Borough Council carried out real-time air quality monitoring for NO<sub>x</sub>, NO, NO<sub>2</sub>, SO<sub>2</sub>, O<sub>3</sub> and PM<sub>10</sub> (operated by Casella ETi) in 2006. The Air Quality Monitoring Site (AQMS) is located near to the town centre within 200m of roads carrying between 12,000 and 18,000 vehicles per day (some of these roads form part of the A40 between Oxford and Gloucester). The monitoring site is within a Smoke Control Area and was chosen to represent urban background pollution in Cheltenham. The main local pollution source is road traffic and there are no significant polluting sources (Part A) within 5 miles of the site. There are a number of Part B processes within the area and a hospital boiler within 0.5 km of the monitoring site.

Cheltenham Borough Council manages 21 nitrogen dioxide diffusion tube sites including a triplicate co-location study at the AQMS. The diffusion tubes used are 20% TEA in water supplied and analysed by Bristol Scientific Services. A heavy metal sampler operated by Cheltenham Borough Council at the rear of the Cheltenham Borough Council Municipal buildings was decommissioned in 2005 due to technical problems.

The following information has been included in this report:

- Map and details of the monitoring locations (Appendix 1);
- A summary table of concentrations that allow a comparison with the air quality objectives (see Table 3 below);
- Table 8 in Appendix 2 presents the NO<sub>2</sub> diffusion tube data for Cheltenham Borough Council. The 2006 annual mean has been bias adjusted (see Table 7) and projected forward to 2005 and 2010 in accordance with TG(03) Box 6.6. Any locations and annual mean figures shaded red indicate an exceedence of the 40µg/m<sup>3</sup> annual mean NO<sub>2</sub> objective; and
- A plot showing trends in concentrations (Figure 2 and Figure 3, Appendix 2).



**Table 3: New monitoring results for Cheltenham Borough Council (2006)**

<b>Carbon monoxide (CO)</b>	Cheltenham Borough Council does not carry out any carbon monoxide monitoring.
<b>Benzene</b>	Cheltenham Borough Council does not carry out any benzene monitoring.
<b>1,3-butadiene</b>	Cheltenham Borough Council does not carry out any 1,3-butadiene monitoring.
<b>Lead (Pb)</b>	Cheltenham Borough Council does not carry out any lead monitoring.
<b>Nitrogen dioxide (NO<sub>2</sub>)</b>	<p>Cheltenham Borough Council carries out monitoring of NO<sub>2</sub> using both diffusion tubes and a continuous monitor.</p> <p><b>NO<sub>2</sub> Diffusion Tubes:</b> The diffusion tubes (20% TEA in water) are supplied and analysed by Bristol Scientific Services. The tubes at all 21 locations through out the Cheltenham Borough Council area have a monthly exposure period. A triplicate co-location study at the automatic monitoring site generated a bias adjustment factor of 0.95. Further details of the tube locations, bias adjustment and results can be found in Appendix 1 and 2.</p> <ul style="list-style-type: none"> <li>Study of the diffusion tube results identified two locations that will exceed the annual mean objective of 40µg/m<sup>3</sup>. These are Site 14 Promenade (2006 annual mean of 44.2µg/m<sup>3</sup>) and Site 16 lower Bath Road (2006 annual mean of 46.2µg/m<sup>3</sup>). There is relevant exposure at Site 16 only, and a Detailed Assessment of this location is due for submission in 2007.</li> </ul> <p><b>NO<sub>2</sub> Automatic Monitoring:</b> Details of the equipment, site location and the influence of local factors are described in Section 2.1 and Appendix 1. All results have been ratified and are reported to Cheltenham Borough Council by the site operators Casella ETi as quarterly reports. The calibration process is described in Appendix 3. Data capture for 2006 was 97.7%. The results indicate zero exceedences of the 1-hour mean of 200µg/m<sup>3</sup> objective through out 2006. Table 9 illustrates the NO<sub>2</sub> results from the AQMS (Appendix 3).</p> <p><b>NO<sub>2</sub> summary</b></p> <ul style="list-style-type: none"> <li>There were two exceedences of the annual mean NO<sub>2</sub> objective of 40µg/m<sup>3</sup> in 2006. There is a requirement to proceed to a</li> </ul>

	<p>Detailed Assessment at the lower Bath Road location. This Detailed Assessment is currently being finalised and should be submitted in 2007.</p> <ul style="list-style-type: none"> <li>No exceedences of NO<sub>2</sub> objective, 200µg/m<sup>3</sup> as a 1-hour mean not to be exceeded more than 18 times a year.</li> </ul>
<b>Particulates (PM<sub>10</sub>)</b>	<p>Cheltenham Borough Council carry out continuous Particulate PM<sub>10</sub> monitoring at the AQMS described in Section 2.1. Data capture for 2006 was 94.5%. The results indicate one exceedence of the 24 hour objective. Table 10 illustrates the PM<sub>10</sub> results from the AQMS (Appendix 3).</p> <p><b>PM<sub>10</sub> summary</b></p> <ul style="list-style-type: none"> <li>There was one exceedence of the PM<sub>10</sub> objective, 50µg/m<sup>3</sup> as a 24-hour mean, not to be exceeded more than 35 times a year.</li> <li>There was no exceedence of the annual PM<sub>10</sub> objective of 40µg/m<sup>3</sup>.</li> </ul>
<b>Sulphur dioxide (SO<sub>2</sub>)</b>	<p>Cheltenham Borough Council carry out continuous sulphur dioxide monitoring at the AQMS described in Section 2.1. Data capture for 2006 was 97.5%. The results indicate there were no exceedences of the 15 minute, 1 hour, and 24 hour objectives. Table 11 illustrates the SO<sub>2</sub> results from the AQMS (Appendix 3).</p> <p><b>SO<sub>2</sub> summary</b></p> <ul style="list-style-type: none"> <li>There were no measured exceedences of the 15 minute, 1 hour, and 24 hour SO<sub>2</sub> objectives.</li> </ul>

### 2.1.1 Monitoring data summary

- Cheltenham Borough Council currently operates a real-time air quality monitoring (AQMS) for NO<sub>x</sub>, NO, NO<sub>2</sub>, SO<sub>2</sub>, and PM<sub>10</sub>. The AQMS monitoring data for 2006 indicates that there are no exceedences of the air quality objectives for all of the pollutants measured.
- Cheltenham Borough Council also manages 21 NO<sub>2</sub> diffusion tubes sites. Study of the diffusion tube results identified two locations that will exceed the annual mean objective of 40µg/m<sup>3</sup>. These are Site 14 Promenade (2006 annual mean of 44.2µg/m<sup>3</sup>) and Site 16 lower Bath Road (2006 annual mean of 46.2µg/m<sup>3</sup>). Cheltenham Borough Council is currently undertaking a Detailed Assessment for NO<sub>2</sub> at lower Bath Road (following on from the 2004 Progress Report). There is no relevant exposure at the Promenade site, as the monitoring site was established on a traffic island to monitor traffic emissions directly.

- Cheltenham Borough Council does not carry out heavy metal monitoring. Nitrogen dioxide concentrations measured at the diffusion tube sites in 2006 are on average approximately 3% higher than concentrations in 2002, but are slightly lower than concentrations subsequent to 2002. The percentage change of nitrogen dioxide concentrations at each site range from -27 % to 35 % between 2002 and 2006. There is no clear trend in changing nitrogen dioxide concentrations at Cheltenham between 2002 and 2006, however the 2010 concentrations are predicted to be approximately 13 % below 2006 nitrogen dioxide concentrations. (Appendix 2, Figure 2 and Figure 3).

## 2.2 New local developments

This section considers any new developments and changes that have taken place, or are proposed, that may affect air quality. Such developments are logged so that they can be considered more thoroughly during the next full round of Review and Assessment. Table 4 provides details of relevant new developments in Cheltenham Borough Council.

**Table 4: New local developments with potential to affect local air quality in Cheltenham Borough Council**

<b>New Part A /A2</b>	Cheltenham Borough Council has identified no new Part A/A2 developments
<b>New Part B</b>	Cheltenham Borough Council has identified no new Part B developments.
<b>New retail development</b>	Cheltenham Borough Council has identified no new retail developments that will significantly change traffic flows in the area.
<b>New road scheme</b>	Cheltenham Borough Council has identified no new road schemes that will significantly alter traffic flows in the area.
<b>New mineral development</b>	Cheltenham Borough Council has identified no new mineral developments that will significantly change traffic flows or impact on local air quality.
<b>New landfill development</b>	Cheltenham Borough Council has identified no new landfill sites, quarries etc., that have been granted planning permission, and which have nearby relevant exposure.
<b>New mixed-use development</b>	Cheltenham Borough Council has identified no new mixed use developments that will significantly change traffic flows.

### 2.2.1 New development summary

There are no new developments of significance that will influence air quality in the Cheltenham Borough Council area.

### 3. Recommended Additional Elements

Progress made in respect of a County-wide Air Quality Strategy, Gloucestershire's Local Transport Plan and other elements are reported in Table 5 below.

**Table 5: Recommended additional elements with respect to air quality progress reporting in Cheltenham Borough Council**

<p><b>Additional monitoring data</b></p>	<p><b>Ozone monitoring:</b> Cheltenham Borough Council carry out Ozone monitoring at the AQMS described in Section 2.1. Results indicate that ozone concentrations measured at the AQMS in 2006 exceed the proposed ozone standard 100 µg/m<sup>3</sup> as an 8-hour rolling average (not set in regulations). Table 12 illustrates the ozone results from the AQMS (Appendix 3).</p> <p><b>Radiation monitoring:</b> Cheltenham Borough Council carries out radiation monitoring. Two types of monitoring are undertaken;</p> <ul style="list-style-type: none"> <li>a) Instantaneous gamma dose measurement at two sites every two months.</li> <li>b) Thermoluminescent dosimetry. Accumulates total gamma and cosmic radiation energy at two sites – detectors changed every two months.</li> </ul> <p>The results of the radiation monitoring are not available at the time of reporting</p> <p><b>Other monitoring:</b> Cheltenham Borough Council does not carry out any other air quality monitoring.</p>
<p><b>Action Plans</b></p>	<p>Cheltenham Borough Council was not required to develop or implement an air quality action plan following Round 1 and Round 2 Review and Assessment work.</p>
<p><b>Local or Regional Air Quality Strategies</b></p>	<p>The County-wide Gloucestershire Air Quality Strategy was adopted in 2005 and is providing an important framework for maintaining good air quality and improving upon poor air quality over the years ahead. As the pressures of large-scale developments, housing growth and road-building increases, the strategy contributes to maintaining the quality of the environment and the health and well-being of the public and communities served by the six local authorities of Gloucestershire. Community planning and sustainability planning processes underway within the Cheltenham Borough Council are taking account of local air</p>

	<p>quality, for the benefit of communities now and in the future across Gloucestershire.</p> <p>The main objectives of the county strategy include:</p> <ul style="list-style-type: none"> <li>• Working toward maintaining the national air quality objectives.</li> <li>• Continue working towards reducing ozone concentrations.</li> <li>• Comply with the LAQM timetable regarding the submission of reports.</li> <li>• Provide a framework for designating, revoking and amending AQMA's within Gloucester and for developing AQAP's.</li> <li>• Review and seek to improve the key structures and mechanisms in place regionally to deliver air quality improvements.</li> <li>• Ensure that air quality is a key objective in all future LTP's.</li> <li>• Review and reduce the main constraints to improving air quality.</li> <li>• Reduce air pollution inline with the underlying principles of the European Ambient Air Quality Framework Directive (96/62/EC).</li> <li>• Maintain good air quality and prevent the deterioration of air quality.</li> <li>• Reduce emissions of CO<sub>2</sub> emitted by road transport.</li> <li>• Consider subsequent reviews of the Strategy in conjunction with annual reviews of the LTP.</li> </ul>
<b>Planning policy</b>	<p>There is no Supplementary Planning Guidance (SPG) to address air quality matters currently available to the Borough, although the authority has made use of the SPG on Planning an Air Quality produced by the Bristol, Gloucestershire and Somerset (BG&amp;S) Environment Protection Committee in 2001.</p>
<b>Planning applications</b>	<p>There are no significant planning applications currently submitted in Cheltenham Borough Council. The council operates procedures to help ensure that planning applications that might have impacts on air quality are forwarded to the environmental health department for comment. There are currently no major</p>

	developments under consideration that might affect air quality.
<b>Local Transport Plan</b>	<p>One of the four key priorities in Gloucestershire County Council's Local Transport Plan is to improve air quality in areas where it is significantly affected by pollution from traffic. The Traffic Management Act and Gloucestershire County Council proposals to adopt ITS (mainly in the form of UTMC) and to create a traffic control centre will help reduce congestion by smoothing traffic flows and providing better travel information helping people to avoid congestion and encourage use of alternative modes. County wide plans are being developed to:</p> <ul style="list-style-type: none"> <li>• Promote 30 minute inter urban services to Gloucester and Cheltenham from main market towns in the county to help reduce demand on key radials, some of which run through air quality hot spots.</li> <li>• Promote school and business travel plans and development of Gloucestershire car share scheme.</li> <li>• Road safety - further 20mph schemes etc - all aimed at encouraging vulnerable modes.</li> </ul> <p>Plans specific to the Cheltenham Borough Council Area include:</p> <ul style="list-style-type: none"> <li>• Creation of Park and Ride at Uckington with bus priority measures on Tewkesbury Rd - provide relief on major radial into Cheltenham.</li> <li>• Completion of Northern Relief Rd to relieve town centre roads and enable implementation of next stages of Civic Pride which aims to remove traffic from town centre core.</li> </ul> <p>Improvements are already in progress for:</p> <ul style="list-style-type: none"> <li>• Traffic management on A46 Shurdington Rd (highly congested radial).</li> <li>• Creation of a network of ten minute turn-up-and-go bus services.</li> </ul> <p>Measures which have been completed include:</p> <ul style="list-style-type: none"> <li>• Expansion of Arle Court Park and Ride and introduction of further bus lanes - take pressure off A40.</li> </ul>

#### 4. Progress Report conclusions

- From the evidence provided in this report, an exceedence of the 2005 annual mean NO<sub>2</sub> objective is likely to occur at two locations (one with relevant exposure). Cheltenham Borough Council has commenced a Detailed Assessment for the location with relevant exposure in response to the findings of the Progress Report. It is recommended that this Detailed Assessment be completed and submitted as soon as possible to address the findings of the 2005 and subsequent Review and Assessment reports which all identify this location as a problem.
- No other exceedences of the air quality objectives for PM<sub>10</sub> and sulphur dioxide have been identified.
- 54 exceedences were identified for the proposed 8 hour mean ozone air quality objective. This objective is not set in Regulations and is managed at a national rather than local governance level.
- There are no new developments of significance that will influence air quality in the Cheltenham Borough Council area.



### Appendix 1: Air Quality Monitoring Locations

Figure 1: Map of air quality monitoring locations in Cheltenham Borough Council

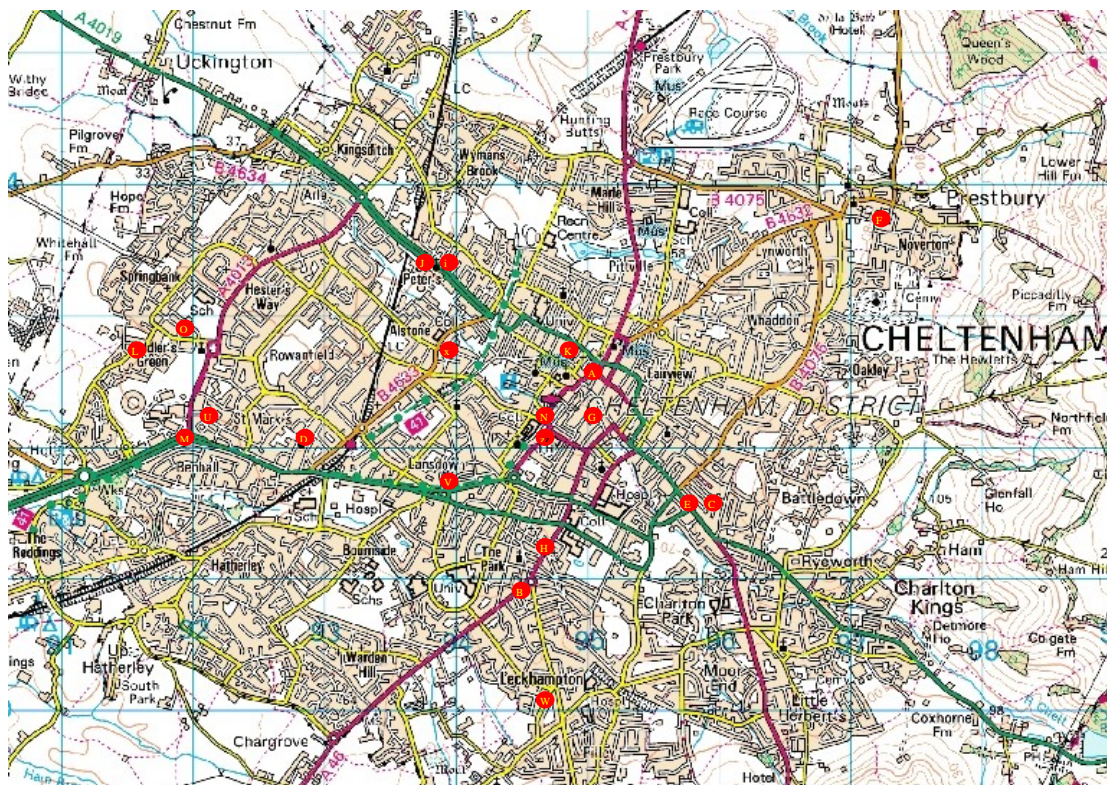


Table 6: Monitoring locations and details

Ref	Site Class	Site name	Monitor	Pollutants monitored	Grid
A	U1	Boots Corner	Diffusion tube	NO <sub>2</sub>	394944 - 222504
B	U3	Upper Norwood St	Diffusion tube	NO <sub>2</sub>	394483 - 220826
C	U2	212 London Road	Diffusion tube	NO <sub>2</sub>	395964 - 221343
D	U2	Church Road P.S.	Diffusion tube	NO <sub>2</sub>	392840 - 221878
E	U2	Chelsea Close	Diffusion tube	NO <sub>2</sub>	395794 - 221383
F	U2	Old Bakery Prestbury	Diffusion tube	NO <sub>2</sub>	397052 - 223882
G	U3	Cambray	Diffusion tube	NO <sub>2</sub>	395073 - 222272
H	U1	Bath Road	Diffusion tube	NO <sub>2</sub>	394607 - 221143
I	U2	off Tewkesbury Road	Diffusion tube	NO <sub>2</sub>	393882 - 223436
J	U1	Tewkesbury Road	Diffusion tube	NO <sub>2</sub>	393840 - 223415
K	U3	St Georges Street	Diffusion tube	NO <sub>2</sub>	394706 - 222745
L	U2	Fiddlers Green Lane	Diffusion tube	NO <sub>2</sub>	391364 - 222629
M	U2	Miserden Road	Diffusion tube	NO <sub>2</sub>	391871 - 222037
N	U3	Promenade	Diffusion tube	NO <sub>2</sub>	394706 - 222186
O	U2	St Aidans Close	Diffusion tube	NO <sub>2</sub>	392072 - 222733
P	U2	lower Bath Road	Diffusion tube	NO <sub>2</sub>	395103 - 222100
U	U2	P.E.Way	Diffusion tube	NO <sub>2</sub>	391998 - 222163
V	U1	Westal Green	Diffusion tube	NO <sub>2</sub>	393934 - 221603
W	U2	54 Church Road, Leckhampton	Diffusion tube	NO <sub>2</sub>	394583 - 219723
X	U1	116 Gloucester Road	Diffusion tube	NO <sub>2</sub>	394796 - 222592
Y	U3	Town Hall AQ Station	Continuous monitoring	NO <sub>x</sub> , SO <sub>2</sub> , O <sub>3</sub> , PM <sub>10</sub>	394722 - 222031
			Diffusion tubes	NO <sub>2</sub>	

## Appendix 2: Nitrogen Dioxide Diffusion Tube Data

### A2.1 Calculation of the 2006 bias adjustment factor

As previously reported Cheltenham Borough Council operate a triplicate diffusion tube co-location study at its AQMS. Table 7 indicates the bias adjustment factor estimated for 2006 data.

**Table 7: Diffusion tube bias adjustment 2006 (based on TG(03) Box 6.4 Pg 6-7)**

Month	Diffusion Tube 1 ( $\mu\text{g}/\text{m}^3$ )	Diffusion Tube 2 ( $\mu\text{g}/\text{m}^3$ )	Diffusion Tube 3 ( $\mu\text{g}/\text{m}^3$ )	Diffusion Tube Mean ( $\mu\text{g}/\text{m}^3$ )	AQMS Monthly Mean* ( $\mu\text{g}/\text{m}^3$ )
Jan	24.1	23.6	24.2	24.0	28.7
Feb	23.6	20.7	23.4	22.6	30.4
Mar	25.9	22.9	25.8	24.9	22.3
Apr	20.9	20.0	21.7	20.9	18.7
May	18.3	21.6	18.8	19.6	16.0
Jun	18.4	18.2	21.0	19.2	17.2
Jul	16.7	17.3	16.8	16.9	16.4
Aug	18.6	19.3	18.9	18.9	14.1
Sept	16.3	21.2	22.5	20.0	14.5
Oct	25.3	25.2	26.4	25.6	18.4
Nov	29.4	25.0	24.8	26.4	26.9
Dec	25.3	25.4	24.9	25.2	26.4
Ann Mean				<b>22.0</b>	<b>20.8</b>
<b>Bias Adjustment Factor</b>					<b>0.95</b>

AQMS monthly mean data is ratified

The co-location study results have been checked for precision and accuracy to confirm the precision of the diffusion tube results, and the accuracy of the automatic monitoring results in relation to data capture. All results had good data capture and a coefficient of variation less than 20% and from these results, a Bias Adjustment factor of 0.95 was determined. A bias adjustment factor for 2006 was also estimated using the published Bias Adjustment Factors Spreadsheet (v02/07). A factor of 0.89 was estimated from three studies (including results from the Cheltenham collocation study). Although in many cases, using an overall correction factor derived from as many co-location studies as possible will provide the 'best estimate' of the 'true' annual mean concentration, it is important to recognise that uncertainty associated with this bias adjusted annual mean remains. One analysis has shown that the uncertainty for tubes bias adjusted in this way is  $\pm 20\%$  (at 95% confidence level). This compares with a typical value of  $\pm 10\%$  for chemiluminescence monitors subject to appropriate QA/QC procedures. Having studied both scenarios regarding which factor to use it has been decided to pursue a precautionary principle and use the 'local' co-location adjustment factor of 0.95.

## A2.2 Nitrogen Dioxide Diffusion Tube Data (2006)

Table 8 presents the NO<sub>2</sub> diffusion tube data for Cheltenham Borough Council. The 2006 annual mean has been bias adjusted and projected forward to 2010 in accordance with TG(03) Box 6.6 Pg 6-9. Any locations and annual mean figures shaded in red indicate an exceedence of the 40µg/m<sup>3</sup> annual mean NO<sub>2</sub> objective.

**Table 8: NO<sub>2</sub> diffusion tube data for all locations in Cheltenham Borough Council (2006)**

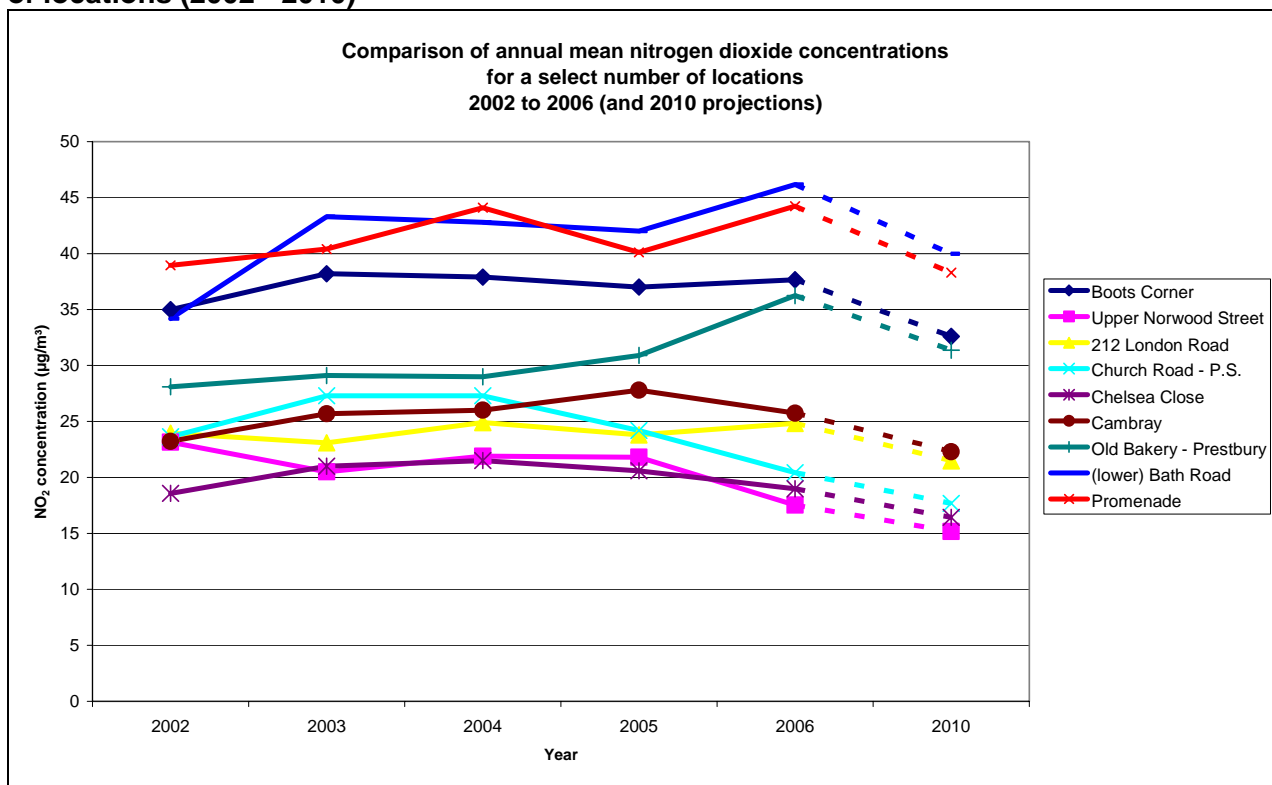
Site No	Tube site	Jan*	Feb*	Mar*	Apr*	May*	Jun*	Jul*	Aug*	Sept*	Oct*	Nov*	Dec*	2006 <sup>#</sup> Mean	2010 <sup>#</sup> Mean
		µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>
A	Boots Corner	26.9	30.5	43.4	43.3	41.2	41.6	34.2	37.4	39.0	42.9	47.9	47.4	37.7	32.6
B	Upper Norwood Street	26.8	19.5	21.9	18.9	16.3	17.3	-	17.5	16.0	19.2	27.9	20.2	17.5	15.2
C	212 London Road	28.7	24.5	27.0	26.1	21.9	19.1	20.2	22.1	26.2	27.5	36.1	34.2	24.8	21.5
D	Church Road - P.S.	25.8	28.3	25.3	24.5	20.7	21.4	24.3	-	25.3	28.7	33.8	-	20.4	17.7
E	Chelsea Close	31.8	23.8	20.4	19.3	12.5	15.6	11.2	18.9	19.7	20.9	23.1	22.6	19.0	16.4
F	Old Bakery, Prestbury	32.5	35.7	28.9	31.0	38.5	38.3	43.7	31.1	39.7	40.2	57.9	40.2	36.2	31.4
G	Cambray	32.6	33.7	28.7	28.3	22.8	24.3	17.2	20.4	20.7	28.6	32.6	35.3	25.7	22.3
H	Bath Road, Leck.	32.2	30.5	34.8	39.5	-	31.8	28.1	34.8	35.7	37.2	-	-	24.1	20.9
I	off Tewkesbury Road	28.3	30.1	25.7	26.0	21.7	23.1	33.2	20.2	21.1	28.5	34.0	28.8	25.4	22.0
J	Tewkesbury Road	39.0	32.8	36.3	38.5	39.8	45.8	24.3	38.9	45.4	46.0	49.2	39.4	37.6	32.6
K	St Georges Street	34.9	26.5	32.3	32.5	30.9	26.9	30.9	31.0	37.1	29.9	30.2	37.8	30.2	26.1
L	Fiddlers Green Lane	29.6	28.4	23.3	25.9	26.6	-	18.9	22.9	22.3	23.8	35.7	26.5	22.5	19.5
M	Miserden Road	30.3	32.2	34.5	37.9	25.3	37.9	19.1	31.9	27.4	31.9	41.1	30.8	30.1	26.1
N	<b>Promenade</b>	38.1	41.4	43.3	47.1	50.3	51.8	44.8	42.2	51.1	47.7	53.9	47.1	44.2	38.3
O	St Aidens Close	31.5	22.6	27.7	-	19.8	23.7	18.1	21.5	26.0	28.4	34.1	27.5	22.2	19.3
P	<b>6 lower Bath Road</b>	41.8	37.9	48.2	43.7	52.1	54.2	51.0	42.6	48.7	54.3	56.3	52.4	46.2	40.0
U	Princess Eliz. R'bout	32.0	28.8	32.5	34.3	31.4	35.3	36.4	30.7	38.0	34.7	54.1	33.3	33.4	28.9
V	Westal Green	34.8	36.0	38.4	35.5	34.6	28.9	28.4	33.2	39.3	33.0	53.0	36.1	34.1	29.6
W	56 Church Road, Leck.	30	29.4	26.2	20.4	20.4	22.4	19.7	20.2	24.0	24.5	26.6	30.0	23.3	20.1
X	116 Gloucester Road	32.2	31.5	39.5	34.1	32.6	37.4	36.7	30.1	39.7	37.1	34.9	-	30.5	26.4
Y	Monpellier ETI #1	24.1	23.6	25.9	20.9	18.3	18.4	16.7	18.6	16.3	25.3	29.4	25.3	20.8	18.0
Y	Monpellier ETI #2	23.6	20.7	22.9	20.0	21.6	18.2	17.3	19.3	21.3	25.2	25.0	25.4	20.6	17.9
Y	Monpellier ETI #3	24.2	23.4	25.8	21.7	18.8	21.0	16.8	18.8	22.5	26.4	24.8	24.9	21.3	18.4

\* Data in these columns are not bias adjusted

# Data in these columns are bias adjusted

### A2.3 Assessment of air quality trends

**Figure 2: Comparison of annual mean nitrogen dioxide concentrations for a select number of locations (2002 - 2010)**



There is no clear trend in nitrogen dioxide concentrations between 2002 and 2006. The change in nitrogen dioxide concentrations (per site) range from -27% to 35% change. On average the concentrations for all sites in 2006 are 0.5% higher than in 2002, but 4.1% lower than average concentrations at all Cheltenham sites in 2005.

Annual mean nitrogen dioxide concentration at Cheltenham's most polluted diffusion tube site; lower Bath Road, has increased by 35.1% between 2002 and 2006. This is the greatest increase of concentrations at all sites, and the resulting concentration is higher than that measured at the Promenade, where traffic emissions of nitrogen dioxide are measured on a road island in the middle of a busy road.

Nitrogen dioxide concentrations measured at the diffusion tube sites in 2006 are on average approximately 3% higher than concentrations in 2002, but are slightly lower than concentrations subsequent to 2002. There is no clear trend in changing nitrogen dioxide concentrations at Cheltenham between 2002 and 2006, however the 2010 concentrations are predicted to be approximately 13 % below 2006 nitrogen dioxide concentrations.

**Figure 3: Comparison of air quality objectives for 2002 - 2006**

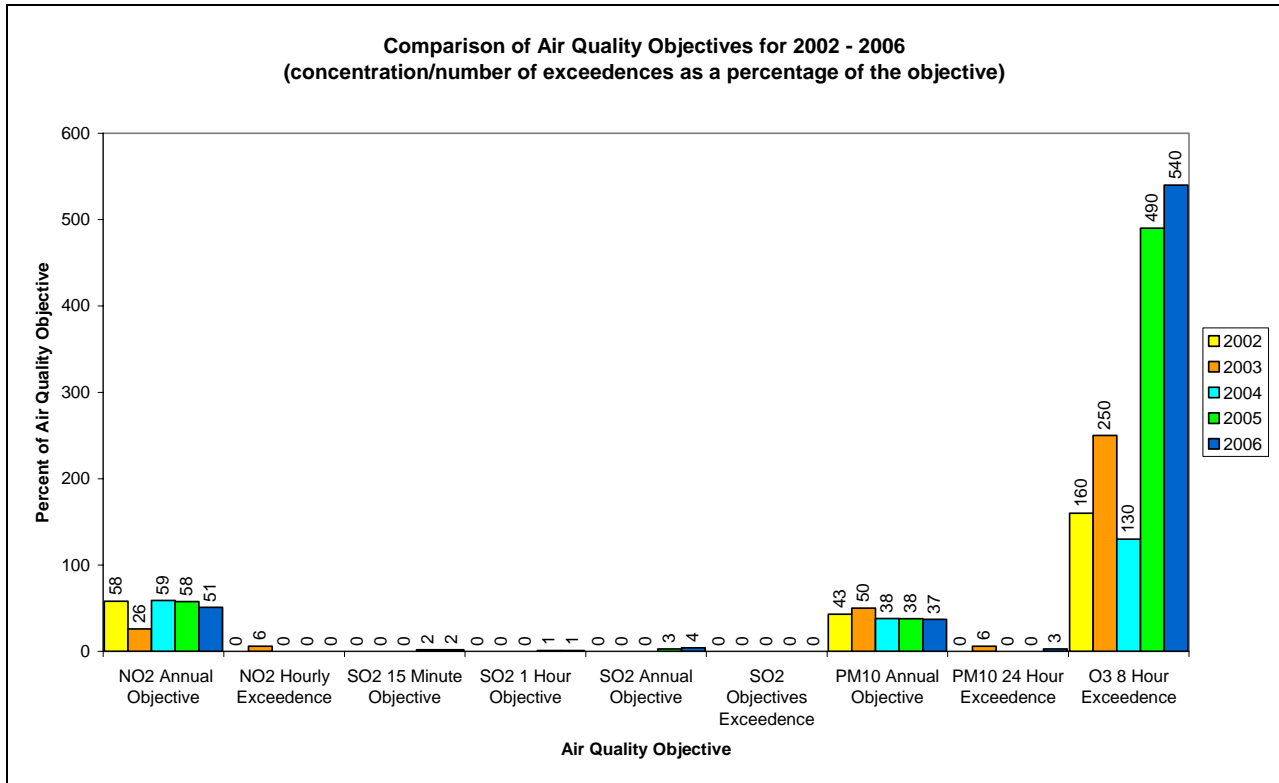


Figure 3 illustrates trends in the air quality objectives for the last four years from the AQMS monitoring station. A comprehensive conclusion of annual trends in concentrations measured at the site is difficult due to the limited number of monitoring years. Figure 3 indicates that NO<sub>2</sub> and PM<sub>10</sub> annual concentrations have decreased slightly since 2002. Exceedences of the proposed ozone objective have increased more than 400% since 2004.

**Appendix 3: Monitoring Data from Cheltenham Borough Council AQMS.****Table 9: NO<sub>2</sub> monitoring data from Cheltenham Borough Council AQMS (Monitor Labs ML9841B Chemiluminescent Analyser)**

<b>Month (2006)</b>	<b>NO<sub>2</sub> monthly mean (µg/m<sup>3</sup>)</b>	<b>Exceedences of the 1-hr mean (200 µg/m<sup>3</sup>)</b>	<b>Data Capture (%)</b>
January	28.5	0	98.4
February	30.4	0	100
March	23.2	0	99.9
April	18.8	0	87.8
May	16.2	0	94.8
June	16.9	0	100
July	16.7	0	99.5
August	13.7	0	100
September	14.4	0	100
October	8.2	0	100
November	25.8	0	99.7
December	23.2	0	92.1
<b>Mean</b>	<b>20.4</b>	<b>0</b>	<b>97.7</b>

**A3.1 Calibration Process for Nitrogen Oxides Analyser**

The AQMS at Cheltenham uses the daily automatic calibration checks. To validate the data, an automatic daily calibration check is conducted to verify the response of the analyser in reference to the 'zero' and 'span' by introducing a high known concentration of NO gas. The daily calibration check produces an actual zero and actual span response value which is stored on a calibration file on the logger. The calibration results are then used to create a calibration factor, which is used to rescale the data.

**Table 10: PM<sub>10</sub> monitoring data from Cheltenham Borough Council AQMS.  
(TEOM – results have been adjusted by a factor of 1.3)**

Month (2006)	PM <sub>10</sub> monthly mean	Exceedences of the			Data Capture
	(µg/m <sup>3</sup> )	24-hr mean (50 µg/m <sup>3</sup> )			(%)
January	17.4	0			93.5
February	19.6	1			82.1
March	15.9	0			93.5
April	14.0	0			86.7
May	13.6	0			93.5
June	17.4	0			100
July	19.9	0			100
August	11.8	0			93.5
September	14.5	0			100
October	10.5	0			100
November	13.7	0			100
December	11.5	0			90.3
<b>Mean</b>	<b>14.9</b>	<b>1</b>			<b>94.5</b>

**Table 11: SO<sub>2</sub> monitoring data from Cheltenham Borough Council AQMS  
(Monitor Labs ML9850B UV Fluorescence Analyser)**

Month (2006)	SO <sub>2</sub> Monthly Mean (µg/m <sup>3</sup> )	Exceedences of 15-min, 1-hr and 24-hr objectives			Data Capture (%)
		15-min	1-hr	24-hr	
January	5.7	0	0	0	99.1
February	5.1	0	0	0	100
March	4.8	0	0	0	99.7
April	4.5	0	0	0	87.9
May	5.2	0	0	0	94.6
June	5.6	0	0	0	97.5
July	5.0	0	0	0	99.9
August	3.3	0	0	0	100
September	4.5	0	0	0	99.9
October	4.2	0	0	0	100
November	4.8	0	0	0	99.7
December	4.3	0	0	0	92.1
<b>Mean</b>	<b>4.8</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>97.5</b>

**Table 12: O<sub>3</sub> monitoring data from Cheltenham Borough Council AQMS  
(Monitor Labs ML9810B Ozone Analyser)**

<b>Month (2006)</b>	<b>O<sub>3</sub> monthly mean (µg/m<sup>3</sup>)</b>	<b>Exceedences of the 8-hr mean (100 µg/m<sup>3</sup>)</b>	<b>Data Capture (%)</b>
January	46	1	98.9
February	56	1	100
March	72	4	100
April	71	5	86.7
May	72	10	94.6
June	73	13	97.5
July	72	16	96.8
August	47	0	100
September	54	4	100
October	49	0	100
November	47	0	100
December	48	0	91.4
<b>Mean</b>	<b>59</b>	<b>54</b>	<b>97.4</b>