

Gloucester City Council

# 2009 Air Quality Updating and Screening Assessment for Gloucester City Council

In fulfillment of Part IV of the Environment Act 1995  
Local Air Quality Management

May 2009

|                                |                               |
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| <b>Report Reference number</b> | USA 2009 |
| <b>Date</b>                    | May 2009 |

## Executive Summary

This report is intended to consider any matters not previously considered by Gloucester City Council. If any items appear not to be mentioned, they have been considered before and are not considered to give rise to potential problems with the air quality of the City of Gloucester. All previous reports are available on the City's website at [www.gloucester.gov.uk/pollution](http://www.gloucester.gov.uk/pollution).

New technical advice from DEFRA (TG(09)) has been issued and may be read on their website. This has resulted in consideration of potential problems from railways and industrial sites with unpaved haul roads, processing plant and materials handling. These are discussed later and result in a new detailed assessment requirement. New developments, such as the new bypass and the Gloucester Quays development have been considered during the planning stages, and any concerns were dealt with at that stage. We have similarly been consulted on other large developments which have not yet reached the formal planning application stage.

New nitrogen dioxide monitoring data is included, which confirms the continuing need for our existing Air Quality Management Areas. It also shows that, once again, a detailed assessment is needed for a short section of Barnwood Road between Elmbridge Road and the Cross Keys public house.

New benzene monitoring data shows that there is no concern from this substance, although the area near the level crossing has more benzene in the air than elsewhere.

It is recommended to the Highway Authority that the size of the notices at the level crossing advising drivers to switch off their engines while waiting should be increased, and repeater signs added.

**A new detailed assessment is required for nitrogen dioxide at Barnwood Road between Elmbridge Road and Cross Keys public house.**

**A new detailed assessment is required for PM<sub>10</sub> for the housing areas off Myers Road and Armscroft Road, from the activities in the industrial areas off Myers road. This is defined as housing within 200m of Myers Road from the junction with Hamer Street, and within 200m of the Allstones site.**

# Table of contents

|          |   |                                     |
|----------|---|-------------------------------------|
| <b>1</b> | <b>Introduction</b>   | <b>4</b>                            |
| 1.1      | Description of Local Authority Area   | 4                                   |
| 1.2      | Purpose of Report   | 4                                   |
| 1.3      | Air Quality Objectives  | 4                                   |
| 1.4      | Summary of Previous Review and Assessments                                      | 6                                   |
| <b>2</b> | <b>New Monitoring Data</b>  | <b>8</b>                            |
| 2.1      | Summary of Monitoring Undertaken  | 8                                   |
| 2.2      | Comparison of Monitoring Results with AQ Objectives                             | 10                                  |
| <b>3</b> | <b>Road Traffic Sources</b>   | <b>13</b>                           |
| 3.1      | Narrow congested streets with residential properties close to the kerb          | 13                                  |
| 3.2      | Busy streets where people may spend 1-hour or more close to traffic             | 13                                  |
| 3.3      | Roads with high flow of buses and/or HGVs.                                      | 13                                  |
| 3.4      | Junctions and busy roads  | 13                                  |
| 3.5      | New roads constructed or proposed since the last round of review and assessment | 14                                  |
| 3.6      | All roads with significantly changed traffic flows.                             | 14                                  |
| 3.7      | Bus and coach stations  | 14                                  |
| <b>4</b> | <b>Other Transport Sources</b>  | <b>15</b>                           |
| 4.1      | Airports  | 15                                  |
| 4.2      | Railways (diesel and steam trains)  | 15                                  |
| 4.3      | Ports (shipping)  | 15                                  |
| <b>5</b> | <b>Industrial Sources</b>   | <b>16</b>                           |
| 5.1      | New or Proposed Industrial Installations  | 16                                  |
| 5.2      | Major fuel (petrol) storage depots  | 16                                  |
| 5.3      | Petrol stations   | 16                                  |
| 5.4      | Poultry farms   | 17                                  |
| <b>6</b> | <b>Commercial and Domestic Sources</b>  | <b>18</b>                           |
| 6.1      | Biomass combustion – Individual Installations                                   | 18                                  |
| 6.2      | Biomass combustion – Combined Impacts   | <b>Error! Bookmark not defined.</b> |
| 6.3      | Domestic Solid-Fuel Burning   | 18                                  |
| <b>7</b> | <b>Fugitive or Uncontrolled Sources</b>   | <b>19</b>                           |
| <b>8</b> | <b>Conclusions and Proposed Actions</b>   | <b>20</b>                           |
| 8.1      | Conclusions from New Monitoring Data  | 20                                  |
| 8.2      | Conclusions from Assessment of Sources  | 20                                  |
| 8.3      | Proposed Actions  | 20                                  |
| <b>9</b> | <b>References</b>   | <b>21</b>                           |

# Gloucester City Council

## Appendices

- Appendix A [Laboratory Quality Assurance](#)
- Appendix B [Diffusion Tube data for 2008](#)
- Appendix C [Maps of Air Quality Management Areas](#)

# 1 Introduction

## 1.1 Description of Local Authority Area

Gloucester is a small city (population 110,000) on the left bank of the tidal River Severn backed by the Cotswold escarpment. The prevailing airflow is from the southwest up the river, channelled by the hills in the distance to either side. The M5 motorway edge forms the eastern boundary, and thus airflows are mainly from the city towards the motorway. The air quality at the caravan site adjacent to the motorway is thus generally good. The city is unusual in having very little rural hinterland. It does therefore suffer from farming odours at certain times of the year.

A large waste disposal site occupies the northwest part of the city, which benefits from a comprehensive Permit to Operate issued by the Environment Agency. As a result it operates to a high standard, which has not always been the case. There are several Part A1 industrial processes in the city, mainly due to discharges to sewer, and thus of no concern here. There are 45 installations permitted under Part B, including petrol stations, vehicle refinishers, dry cleaners, timber yards, none of which are significant polluters.

## 1.2 Purpose of Report

This report fulfils the requirements of the Local Air Quality Management process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and Technical Guidance documents. The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where exceedences are considered likely, the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

## 1.3 Air Quality Objectives

The air quality objectives applicable to LAQM in **England** are set out in the Air Quality (England) Regulations 2000 (SI 928), The Air Quality (England) (Amendment) Regulations 2002 (SI 3043), and are shown in Table 1.1. This table shows the objectives in units of microgrammes per cubic metre  $\mu\text{g}/\text{m}^3$  (milligrammes per cubic metre,  $\text{mg}/\text{m}^3$  for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

**Table 1.1 Air Quality Objectives included in Regulations for the purpose of Local Air Quality Management in England.**

| Pollutant  | Air Quality Objective   |                     | Date to be achieved by |
|--|---|---------------------|------------------------|
|  | Concentration   | Measured as         |                        |
| <b>Benzene</b>                                   | 16.25 $\mu\text{g}/\text{m}^3$  | Running annual mean | 31.12.2003             |
|  | 5.00 $\mu\text{g}/\text{m}^3$   | Running annual mean | 31.12.2010             |
| <b>1,3-Butadiene</b>                             | 2.25 $\mu\text{g}/\text{m}^3$   | Running annual mean | 31.12.2003             |
| <b>Carbon monoxide</b>                           | 10.0 $\text{mg}/\text{m}^3$   | Running 8-hour mean | 31.12.2003             |
| <b>Lead</b>                                      | 0.5 $\mu\text{g}/\text{m}^3$  | Annual mean         | 31.12.2004             |
|  | 0.25 $\mu\text{g}/\text{m}^3$   | Annual mean         | 31.12.2008             |
| <b>Nitrogen dioxide</b>                          | 200 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 18 times a year   | 1-hour mean         | 31.12.2005             |
|  | 40 $\mu\text{g}/\text{m}^3$   | Annual mean         | 31.12.2005             |
| <b>Particles (PM<sub>10</sub>) (gravimetric)</b> | 50 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 35 times a year  | 24-hour mean        | 31.12.2004             |
|  | 40 $\mu\text{g}/\text{m}^3$   | Annual mean         | 31.12.2004             |
| <b>Sulphur dioxide</b>                           | 350 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 24 times a year | 1-hour mean         | 31.12.2004             |
|  | 125 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 3 times a year  | 24-hour mean        | 31.12.2004             |
|  | 266 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 35 times a year | 15-minute mean      | 31.12.2005             |

## 1.4 Summary of Previous Review and Assessments

Reports from 2003 onwards are available on the City Council website via [www.gloucester.gov.uk/pollution](http://www.gloucester.gov.uk/pollution) ; copies of earlier documents can be made available for our normal copying charge. The outcomes of the various reports are summarised below.

Maps of our current AQMAs are in **Appendix C**

Assessment reports under the act began in 1998, when it was thought that particulates and nitrogen dioxide would need further study

*Air Quality in Gloucester: December 1998*

Stage II showed that at that time there were no areas of concern for air quality in the city

*Air quality Review and Assessment Stages 2 and 3: December 2000*

The USA for 2002 showed that detailed assessments were required as follows:

For benzene: Millbrooke Road near the level crossing

For Nitrogen Dioxide: Priory Road; Barton Street; Eastern Avenue/ Painswick Road junction

For PM10: Barnwood Road at Elmbridge road; Eastern Ave/ Painswick Road junction

*Updating and Screening Assessment of Local Air Quality for 2002: May 2003*

The detailed assessments subsequently found that AQMAs were required for nitrogen dioxide for Priory Road and for Barton Street. These were declared after consultations in 2005.

*Detailed Assessment of Local Air Quality for 2003/4: December 2004*

*Progress Report for 2004: March 2005*

The USA for 2005 found that a detailed assessment for nitrogen dioxide was required again for a small part of Painswick Road (the same area as in 2002)

*Updating and Screening Assessment for 2005: April 2006*

Source apportionment for Priory Road and Barton Street was explored in 2006, without firm conclusions

*Source Apportionment for the two AQMAs in Gloucester: December 2006*

The progress report for 2006 included a detailed assessment for Painswick Road which confirmed that an AQMA should be declared and that a detailed assessment was required for 53-65 Barnwood Road. The report included progress reports on the Priory Road and Barton Street AQMAs

*Gloucester Air Quality Progress Report for 2006: March 2007*

The Painswick Road AQMA was declared after consultation (which enlarged the expected area) in 2007

The Progress report for 2007 included the detailed assessment for Barnwood Road. This showed that an AQMA was not required. Unfortunately a further detailed assessment will now be required.

*Gloucester Air Quality Progress Report for 2007: March 2008*



**Gloucester City Council**

*Draft Air Quality Action Plan for Priory Road, Painswick Road (North) and Barton Street: July 2008*

## **2 New Monitoring Data**

### **2.1 Summary of Monitoring Undertaken**

#### **2.1.1 Automatic Monitoring Sites**

There have been no automatic monitoring sites during or before the period covered by this report. However Gloucestershire County Council has constructed a new site in April 2009, and it is hoped that this site will meet the standards for inclusion in future reports. The site is within the Barton Street AQMA. The City Council has agreed to provide staff time for the calibration of this nitrogen oxide monitor in exchange for the data.

#### **2.1.2 Non-Automatic Monitoring**

Non-Automatic monitoring has continued for nitrogen dioxide and for benzene. The data is given in Appendix **B**. Information on laboratory QA/QC is given in **Appendix A**. The locations of the sampling points are tabled below. Discussion of results follows at section 2.2

# Gloucester City Council

**Table 2.2 Details of Non- Automatic Monitoring Sites**

| Site Name               | Site Type        | OS Grid Ref          | Pollutants Monitored     | In AQMA ? | Relevant Exposure? (Y/N with distance (m) to relevant exposure) | Distance to kerb of nearest road (N/A if not applicable) | Worst-case Location ? |
|-------------------------|------------------|----------------------|--------------------------|-----------|---|--|-----------------------|
| Elmbridge Junior School | Urban background | X 385430<br>Y 218870 | Benzene, NO <sub>2</sub> | N         | Y 1m  | NA   | N                     |
| Guildhall               | Urban background | X 383243<br>Y 218489 | Benzene, NO <sub>2</sub> | N         | N   | NA   | N                     |
| 79 Millbrook Street     | Roadside         | X 384190<br>Y 218160 | Benzene, NO <sub>2</sub> | N         | Y <1M   | 1.0  | Y                     |
| 61 Bristol Rd           | Roadside         | X 382690<br>Y 217440 | Benzene, NO <sub>2</sub> | N         | N   | 2.2  | Y                     |
| 56 Priory Road          | Roadside         | X 382921<br>Y 219034 | NO <sub>2</sub>          | Y         | Y <1m   | 5.0  | Y                     |
| 46 Priory Road          | Roadside         | X 382898<br>Y 219029 | NO <sub>2</sub>          | Y         | Y <1m   | 5.0  | Y                     |
| 66 Priory Road          | Roadside         | X 382950<br>Y 219040 | NO <sub>2</sub>          | Y         | Y <1m   | 6.0  | Y                     |
| 53 Barnwood Road        | Roadside         | X 385113<br>Y 218595 | NO <sub>2</sub>          | N         | Y <1m   | 1.5  | Y                     |
| 35 Buscombe Gardens     | Background       | X 387670<br>Y 217250 | NO <sub>2</sub>          | N         | Y <1m   | NA   | N                     |
| Opp 248 Barton St       | Roadside         | X 384090<br>Y 217731 | NO <sub>2</sub>          | Y         | Y <1m   | 2.5  | Y                     |
| 12 Caravan Green Lane   | Backgorund       | X 387250<br>Y 216530 | NO <sub>2</sub>          | N         | Y <1m   | NA   | N                     |
| 246 Barton Street       | Roadside         | X 384081<br>Y 217725 | NO <sub>2</sub>          | Y         | Y <1m   | 1.5  | Y                     |
| 316 Barton street       | Roadside         | X 384175<br>Y 217501 | NO <sub>2</sub>          | Y         | Y <1m   | 2.4  | Y                     |
| 219A Barton St          | Roadside         | X 384000<br>Y 217863 | NO <sub>2</sub>          | Y         | Y 1M  | 1.7  | Y                     |
| 196 Barton Street       | Roadside         | X 383989<br>Y 217857 | NO <sub>2</sub>          | Y         | Y 1m  | 2.0  | Y                     |
| 99 Barton Street        | Roadside         | X 383717<br>Y 218094 | NO <sub>2</sub>          | Y         | Y 1m  | 1.4  | Y                     |
| 124 Barton Street       | Roadside         | X 383726<br>Y 218074 | NO <sub>2</sub>          | Y         | Y 1m  | 1.5  | Y                     |
| 97 Painswick Road       | Roadside         | X 384558<br>Y 216946 | NO <sub>2</sub>          | Y         | Y 1M  | 5.1  | Y                     |
| 106 painswick Road      | Roadside         | X 384550<br>Y 216932 | NO <sub>2</sub>          | Y         | Y 1m  | 3.5  | Y                     |
| 157 Bristol Rd          | Roadside         | X 382410<br>Y 217013 | NO <sub>2</sub>          | N         | Y 1m  | 6.5  | Y                     |
| 238 Bristol Rd          | Roadside         | X 382369<br>Y 216985 | NO <sub>2</sub>          | N         | Y 1m  | 5.6  | Y                     |
| 59 Bristol road(façade) | Background       | X 382690<br>Y 217440 | NO <sub>2</sub>          | N         | Y 1m  |  | Y                     |
| 36 Priory Road          | Background       | X 382835<br>Y 219007 | NO <sub>2</sub>          | N         | Y 1m  | 9.0  | N                     |
| 88 Painswick Road       | Roadside         | X 384509<br>Y 216998 | NO <sub>2</sub>          | Y         | Y 1m  | 3.8  | Y                     |
| 301 Barton St           | Roadside         | X 384182<br>Y 217533 | NO <sub>2</sub>          | Y         | Y 1m  | 4.8  | Y                     |
| Rear 58 Priory Road     | Background       | X 382929<br>Y 219019 | NO <sub>2</sub>          | Y         | Y 1m  | NA   | N                     |
| End Vauxhall Terrace    | Background       | X 383860<br>Y 218010 | NO <sub>2</sub>          | N         | Y 1m  | NA   | N                     |
| 61 Barnwood Road        | Roadside         | X 385130<br>Y 218585 | NO <sub>2</sub>          | N         | Y 1m  | 4.6  | Y                     |
| 65 Painswick Rd         | Roadside         | X 384512<br>Y 217023 | NO <sub>2</sub>          | N         | Y 1m  | 5.4  | Y                     |
| 76 Painswick            | Roadside         | X 384490<br>Y 217027 | NO <sub>2</sub>          | N         | Y 1m  | 3.7  | Y                     |

## 2.2 Comparison of Monitoring Results with AQ Objectives

### 2.2.1 Nitrogen Dioxide

A summary of the corrected results is given in the table below, with results of concern in **Bold**. The raw data is at Appendix B. Sites 1 and 2 represent urban background. All other sites except the lamppost on Bristol Road (site 4) are representative of public exposure, mostly being on the facades of housing. The lamppost is immediately in front of the façade measurement at site no.5, and is maintained to show the public the drop off of nitrogen dioxide concentration with distance from the kerb.

These results confirm that all three existing AQMA's are still required.

For the Priory Road AQMA extra sample tubes were set at no.36 across Mount Street, confirming that the area does not need extending. The samples to the rear of No. 58 (on the rear façade) show that air at the backs of the houses, while poorer than background, is of an acceptable quality. This is important for the wellbeing of occupants, who never open front windows, due to traffic noise, and gain their air from the rear. No.58 is adjacent to a gap in the terrace, so is a worst-case rear point. It happens to be the only property with relatively easy rear access.

For Barton Street AQMA, as before some samples outside the narrow canyon on the western side are acceptable. The Vauxhall Terrace sample (acceptably near background level) is effectively the rear of Barton Street dwellings, showing that the poor air is trapped within the canyon; air outside this is acceptable.

The Painswick Road AQMA shows, as before, that the western side has acceptable air quality. This side was only included after residents requested it during consultation. The result for no. 76 shows that the AQMA might need extending, but as all samples were much better air quality last year, only a watching brief is needed for now. All sampling points inside and outside the AQMA will be retained.

For Barnwood Road one sample is above 40ug/m<sup>3</sup> and the other close to this level. As in a previous year, a detailed assessment will be required for this short terrace between Elmbridge Road and the Cross Keys public house.

The other areas still measured, such as Bristol Road and the motorway area remain of no concern for air quality. Elmbridge School and the Guildhall are maintained as background sites.

A forthcoming Policy Position Statement on *Nitrogen Dioxide Concentrations in the Atmosphere* to be published by the Chartered Institution of Water and Environmental Management (CIWEM) urges Government to promote further research into the behaviour of nitrogen oxides in urban areas (The chemistry involved in forming and removing nitrogen dioxide is complex). Two of the areas highlighted above are short lengths of houses fronting a busy road, with open areas on the other side of the road, which would not be expected with current knowledge to have high nitrogen dioxide concentrations. Similar problems are being encountered in many smaller towns across the country.

The statement also urges European collaboration on emission testing of modern vehicles, as most live testing has been done on older vehicles. The numbers of modern vehicles tested are not yet representative enough for good modelling.

Diffusion Tube Monitoring Data

Table 2.4 Results of Nitrogen Dioxide Diffusion Tubes

| Site ID                         | Location                       | Within AQMA? | Data Capture 2008 % | Annual mean concentrations 2008 ( $\mu\text{g}/\text{m}^3$ ) Adjusted for bias |
|---------------------------------|--------------------------------|--------------|---------------------|--|
| 1                               | Guildhall                      | N            | 92                  | 21.6   |
| 2                               | Elmbridge School               | N            | 100                 | 21.2   |
| 3                               | 79 Millbrook Street            | N            | 100                 | 36   |
| 4                               | 61 Bristol Road lamppost       | N            | 92                  | 38.5   |
| 5                               | 59 Brisol Road façade          | N            | 83                  | 34.3   |
| 6                               | 157 Bristol Road               | N            | 100                 | 31.5   |
| 7                               | 238 Bristol Road               | N            | 100                 | 33.5   |
| 8                               | 35 Buscombe Gardens            | N            | 100                 | 33.7   |
| 9                               | 12 Caravan site                | N            | 100                 | 28.1   |
| <b>Priory Road AQMA</b>         |                                |              |                     |  |
| 10                              | 36 Priory Road                 | N            | 100                 | 30.5   |
| 11                              | <b>46 Priory Road</b>          | <b>Y</b>     | <b>100</b>          | <b>48.7</b>  |
| 12                              | <b>56 Priory Road</b>          | <b>Y</b>     | <b>100</b>          | <b>53.2</b>  |
| 13                              | <b>66 Priory Road</b>          | <b>Y</b>     | <b>100</b>          | <b>57.8</b>  |
| 14                              | Rear 58 Priory Road            | Y            | 92                  | 34   |
| <b>Barton Street AQMA</b>       |                                |              |                     |  |
| 15                              | <b>99 Barton Street</b>        | <b>Y</b>     | <b>100</b>          | <b>42.2</b>  |
| 16                              | <b>124 Barton Street</b>       | <b>Y</b>     | <b>100</b>          | <b>52.6</b>  |
| 17                              | <b>196 Barton St lamp post</b> | <b>Y</b>     | <b>100</b>          | <b>44.6</b>  |
| 18                              | <b>219a Barton Street</b>      | <b>Y</b>     | <b>100</b>          | <b>42.5</b>  |
| 19                              | End Vauxhall Terrace           | N            | 100                 | 24.6   |
| 20                              | <b>246 Barton Street</b>       | <b>Y</b>     | <b>100</b>          | <b>42.4</b>  |
| 21                              | Opp. 248 Barton St             | Y            | 92                  | 33.2   |
| 22                              | <b>316 Barton St</b>           | <b>Y</b>     | <b>100</b>          | <b>44.2</b>  |
| 23                              | 301 Barton Street              | Y            | 100                 | 28.3   |
| <b>Painswick Road AQMA Area</b> |                                |              |                     |  |
| 24                              | 65 Painswick Road              | N            | 100                 | 33.3   |
| 25                              | 76 Painswick Road              | N            | 100                 | 38.6   |
| 26                              | <b>88 Painswick Road</b>       | <b>Y</b>     | <b>100</b>          | <b>44.3</b>  |
| 27                              | 97 Painswick Road              | Y            | 100                 | 36.6   |
| 28                              | <b>106 Painswick Road</b>      | <b>Y</b>     | <b>100</b>          | <b>49.9</b>  |
| <b>Barnwood Road</b>            |                                |              |                     |  |
| 29                              | 53 Barnwood Road               | N            | 83                  | 38.3   |
| 30                              | <b>61 Barnwood Road</b>        | <b>N</b>     | <b>92</b>           | <b>45.0</b>  |

### 2.2.2 Benzene

The results from the benzene monitoring given in appendix B show that there is no cause for concern, although the concentration at the level crossing (Derby Road) remains much higher than elsewhere, such that the policy of encouraging vehicles to switch off while waiting should be more firmly publicised.

Gloucester City Council has examined the results from monitoring in the city. Concentrations are all below the objectives, therefore there is no need to proceed to a Detailed Assessment.

### 3 Road Traffic Sources

#### 3.1 Narrow Congested Streets with Residential Properties Close to the Kerb

Gloucester City Council confirms that there are no new/newly identified congested streets with a flow above 5,000 vehicles per day and residential properties close to the kerb, that have not been adequately considered in previous rounds of Review and Assessment.

#### 3.2 Busy Streets Where People May Spend 1-hour or More Close to Traffic

Gloucester City Council confirms that there are no new/newly identified busy streets where people may spend 1 hour or more close to traffic.

#### 3.3 Roads with a High Flow of Buses and/or HGVs.

Gloucester City Council confirms that there are no new/newly identified roads with high flows of buses/HGVs.

***DELETE BOX IF NOT APPLICABLE. OTHERWISE ADD LOCAL AUTHORITY NAME AND LEAVE IN.***

#### 3.4 Junctions

<LA Name> confirms that there are no new/newly identified busy junctions/busy roads.

***DELETE BOX IF NOT APPLICABLE. OTHERWISE ADD LOCAL AUTHORITY NAME AND LEAVE IN.***

### 3.5 New Roads Constructed or Proposed Since the Last Round of Review and Assessment

The new roads near the Quays development do not meet the criteria for study.

Gloucester City Council confirms that there are no new/proposed roads meeting the criteria in Section A.5 of Box 5.3 in TG(09).

### 3.6 Roads with Significantly Changed Traffic Flows

Gloucester City Council confirms that there are no new/newly identified roads with significantly changed traffic flows that meet the criteria in section A.6 of Box 5.3 of TG(09).

***DELETE BOX IF NOT APPLICABLE. OTHERWISE ADD LOCAL AUTHORITY NAME AND LEAVE IN.***

### 3.7 Bus and Coach Stations

Gloucester City Council confirms that there are no relevant bus stations in the Local Authority area.



## 4 Other Transport Sources

### 4.1 Airports

Gloucester Airport is far enough outside the city and below the criteria given that it does not need consideration.

Gloucester City Council confirms that there are no airports in the Local Authority area.

### 4.2 Railways (Diesel and Steam Trains)

#### 4.2.1 Stationary Trains

Trains are occasionally stationary for more than 15 minutes at the station and on approaches in all directions, but there are no relevant receptors near enough to need further study.

Elderly diesel locomotives are also sometimes parked adjacent to the offices and warehouses on Great Western Way. These trains are owned by an independent train leasing company. They do give rise to occasional smoke nuisance, but the occasions are not regular enough to warrant study for sulphur dioxide.

Gloucester City Council confirms that there are no locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m.

#### 4.2.2 Moving Trains

All lines in the City except that out towards Wales have more than 100 movements per day. Since the draft guidance was written, it has been relaxed as a result of further advice, and it seems likely that a much greater number of movements are needed to cause concern. Only certain heavily trafficked lines across the country, none near here, will now be considered. Monitoring at the various city rail underbridges during 2002 reported in the Updating and Screening assessment for that year showed that railway movements did not measurably increase nitrogen dioxide.

Gloucester City Council confirms that there are no locations with a very large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m.

### 4.3 Ports (Shipping)

Gloucester City Council confirms that there are no ports or shipping that meet the specified criteria within the Local Authority area.

## 5 Industrial Sources

### 5.1 Industrial Installations

#### 5.1.1 New or Proposed Installations for which an Air Quality Assessment has been Carried Out

Gloucester City Council confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

#### 5.1.2 Existing Installations where Emissions have Increased Substantially or New Relevant Exposure has been Introduced

Gloucester City Council confirms that there are no industrial installations with substantially increased emissions or new relevant exposure in their vicinity within its area or nearby in a neighbouring authority.

#### 5.1.3 New or Significantly Changed Installations with No Previous Air Quality Assessment

Gloucester City Council confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

### 5.2 Major Fuel (Petrol) Storage Depots

*Delete whichever is not applicable:*

There are no major fuel (petrol) storage depots within the Local Authority area.

### 5.3 Petrol Stations

Gloucester City Council confirms that there are no petrol stations meeting the specified criteria.

## 5.4 Poultry Farms

Gloucester City Council confirms that there are no poultry farms meeting the specified criteria.

## **6 Commercial and Domestic Sources**

### **6.1 Biomass Combustion – Individual Installations**

Gloucester City Council confirms that there is no biomass combustion plant in the Local Authority area.

### **6.2 Domestic Solid-Fuel Burning**

Gloucester City Council confirms that there are no areas of significant domestic fuel use in the Local Authority area.

## 7 Fugitive or Uncontrolled Sources

The 2009 guidance proposes that detailed assessments for fine particles are required where there is relevant exposure with 200m of sources of fugitive dust, such as dusty industry or haul roads which are unpaved or have noticeable dust deposits on them. From background mapping, the 2004 concentration of PM<sub>10</sub> at a potential site off Myers Road was 19.9 ug/m<sup>3</sup>, limiting the potentially affected area to 200m.

The area that will need a detailed assessment will include all or part of the following streets:

Coldray Close  
Norman Ball Way  
Etheridge Place  
Hamer Street (Part)  
Blinkhorns Bridge Lane  
Armscroft Gardens  
Armscroft Place (Part)  
Coronation Grove (Part)

People in several of these streets have complained about dust at various times. The private part of Myers Road (owned by BRB Residuary) has been surfaced in recent years and has reduced complaints. Dust is however still deposited. The area involved includes a sand and gravel merchant and waste transfer site, a permitted readymix plant, several coalyards and similar firms, all likely to generate dust.

In practice a worst-case location should be examined, as PM<sub>10</sub> monitoring is costly and requires long sampling times.

Another potential site off Bristol Road with the same PM<sub>10</sub> background does not have housing within 200m and can thus be disregarded.

Gloucester City Council has identified potential sources of fugitive particulate matter that meet specified criteria, and **will need to proceed to a Detailed Assessment for PM<sub>10</sub>**.

## **8 Conclusions and Proposed Actions**

### **8.1 Conclusions from New Monitoring Data**

The new monitoring data shows that the three AQMAs are still required, but do not need extending in area. However a continuing watch will be needed on the area of the Painswick Road, where a nearby location (No. 76) is approaching the nitrogen dioxide action level.

The short section of Barnwood Road at Elmbridge Road has one sample exceeding 40ug/m<sup>3</sup> and the other approaching that level. This section has been the subject of previous detailed assessments and once again will be assessed.

No concerns are raised in the other areas monitored.

### **8.2 Conclusions from Assessment of Sources**

No new potential pollution sources have been assessed this year

### **8.3 Proposed Actions**

A detailed assessment will again be made for the Barnwood Road terrace between Elmbridge Road and the Cross Keys for nitrogen dioxide.

No changes are expected in the existing AQMAs. Existing monitoring will continue. A brief sampling sequence has already started kerbside on the approach to Priory Road AQMA under the railbridge, which will be reported next year. No other new sampling points are intended.

It is hoped that data from the new automatic monitoring station in Barton Street will become available later this year (It has not been commissioned at time of writing). This site is intended to control the nearby traffic lights. The study would be worthy of a research degree if a student and funding could be found. Local mentoring would be available in the City.

It is intended that the next report will be a progress report in spring 2010, which will include a detailed assessment of the Barnwood Road stretch.

Work is ongoing with the County Council to collect more detailed traffic data in and around the AQMAs and Barnwood Road, which will help decide future courses of action to mitigate the problems.

## 9 References

All documents produced by the City Council are referenced in section 1.4 and can be seen via [www.gloucester.gov.uk/pollution](http://www.gloucester.gov.uk/pollution)

DEFRA Guidance documents are available at <http://www.defra.gov.uk/environment/airquality/local/index.htm> The main document referred is TG 09

QA data was provided by Bristol Scientific Services (Private communication)

The Bias Adjustment spreadsheet is available at <http://www.uwe.ac.uk/aqm/review/index.html>





## **Appendices**

Appendix A: QA/QC Data

Appendix B: Monitoring Data

Appendix C: Maps of AQMAs

## Appendix A: QA:QC Data

### Diffusion Tube Bias Adjustment Factors

Tubes were supplied and analysed by Bristol Scientific Services using 50 ul 20%TEA. The tubes were prepared according to the practical guidance manual published by AEA for DEFRA. The bias adjustment factor for 2008 was 0.87 from helpdesk spreadsheet v03/09

### Factor from Local Co-location Studies (if available)

No co-location studies were available

### Short-term to Long-term Data adjustment

No adjustments were made as there were few gaps in the record. These were due to loss of tube to vandalism, spiders in tube or collapse of holder.

### QA/QC of diffusion tube monitoring

WASP results for Bristol Scientific Services are quoted here.

WASP Results Lab 152 Round 97 onwards:

| Round   | 97    | 98    | 99    | 100   | 101    | 102    | 103    | 104    |
|---|-------|-------|-------|-------|--------|--------|--------|--------|
| Tube 1 (µg NO <sub>2</sub> )  | 0.890 | 1.865 | 2.085 | 1.358 | 0.949  | 1.489  | 1.178  | 1.179  |
| Tube 2 (µg NO <sub>2</sub> )  | 1.573 | 1.228 | 2.093 | 1.474 | 2.576  | 1.431  | 0.916  | 1.108  |
| Tube 3 (µg NO <sub>2</sub> )  | 1.582 | 1.857 | 0.885 | 1.354 | 1.813  | 2.307  | 0.934  | 1.840  |
| Tube 4 (µg NO <sub>2</sub> )  | 0.914 | 1.217 | 0.879 | 1.467 | 0.914  | 1.960  | 1.071  | 1.960  |
| Spike tube 1 (µg NO <sub>2</sub> )  | 0.890 | 1.830 | 2.150 | 1.360 | 0.920  | 1.370  | 1.220  | 1.220  |
| Spike tube 2 (µg NO <sub>2</sub> )  | 1.580 | 1.190 | 2.150 | 1.470 | 1.860  | 1.370  | 0.940  | 1.220  |
| Spike tube 3 (µg NO <sub>2</sub> )  | 1.580 | 1.830 | 0.840 | 1.360 | 1.860  | 2.280  | 0.940  | 2.020  |
| Spike tube 4 (µg NO <sub>2</sub> )  | 0.890 | 1.190 | 0.840 | 1.470 | 0.920  | 2.280  | 1.220  | 2.020  |
| Standardised result tube 1  | 1.000 | 1.019 | 0.970 | 0.999 | 1.032  | 1.087  | 0.966  | 0.966  |
| Standardised result tube 2  | 0.996 | 1.032 | 0.973 | 1.003 | 1.385  | 1.045  | 0.974  | 0.908  |
| Standardised result tube 3  | 1.001 | 1.015 | 1.054 | 0.996 | 0.975  | 1.012  | 0.994  | 0.911  |
| Standardised result tube 4  | 1.027 | 1.023 | 1.046 | 0.998 | 0.993  | 0.860  | 0.878  | 0.970  |
| Performance index   | 1.87  | 5.29  | 16.61 | 0.08  | 374.65 | 73.42  | 41.98  | 45.95  |
| Rolling performance index<br>(NOT best of 4 out of 5)   |       |       |       | 5.96  | 99.16  | 116.19 | 122.53 | 134.00 |
| Rolling performance index<br>(best 4 out of 5)  |       |       |       | 5.96  | 5.96   | 23.85  | 33.02  | 40.36  |
| Performance classification<br>(criteria from April 2009)<br>Good =<56.25<br>Acceptable =<225<br>Unacceptable >225 |       |       |       | Good  | Good   | Good   | Good   | Good   |

## Appendix B: Diffusion tube data

| 2008 Nitrogen Dioxide corrected monthly data  |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                |
|---|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|----------------|
| All values microgrammes per cubic metre   |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                |
| Location  | Jan-08<br>Bias-<br>adj | Feb-08<br>Bias-<br>adj | Mar-08<br>Bias-<br>adj | Apr-08<br>Bias-<br>adj | May-08<br>Bias-<br>adj | Jun-08<br>Bias-<br>adj | Jul-08<br>Bias-<br>adj | Aug-08<br>Bias-<br>adj | Sep-08<br>Bias-<br>adj | Oct-08<br>Bias-<br>adj | Nov-08<br>Bias-<br>adj | Dec-08<br>Bias-<br>adj | Average<br>Adj |
| <b>Sites previously in national monitoring programme</b>  |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                |
| Glos Guildhall  | 24.2                   |                        | 20.6                   | 23.4                   | 23.6                   | 15.3                   | 17.1                   | 13.3                   | 20.9                   | 20.6                   | 25.6                   | 32.6                   | 21.6           |
| Elmbridge Junior School   | 23.8                   | 32.5                   | 19.4                   | 21.0                   | 16.4                   | 13.9                   | 15.0                   | 16.0                   | 22.9                   | 21.1                   | 21.7                   | 30.9                   | 21.2           |
| 79 Millbrook Street   | 38.5                   | 49.3                   | 38.5                   | 41.1                   | 34.1                   | 26.9                   | 28.5                   | 20.0                   | 38.3                   | 35.1                   | 36.4                   | 45.7                   | 36.0           |
| 61 Bristol Rd lamp post   | 37.9                   | 56.2                   |                        | 40.2                   | 41.2                   | 28.8                   | 29.2                   | 27.8                   | 39.8                   | 34.8                   | 43.7                   | 44.3                   | 38.5           |
| <b>Bristol Road sites</b>   |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                |
| 59 Bristol Road   | 35.8                   | 46.3                   |                        |                        | 39.0                   | 27.4                   | 26.7                   | 23.3                   | 39.8                   | 33.7                   | 33.1                   | 38.2                   | 34.3           |
| 157 Bristol Road  | 34.5                   | 43.5                   | 31.1                   | 32.1                   | 27.2                   | 25.2                   | 24.2                   | 24.6                   | 34.0                   | 32.3                   | 34.5                   | 35.3                   | 31.5           |
| 238 Bristol Road  | 38.6                   | 47.2                   | 33.1                   | 36.9                   | 31.6                   | 23.2                   | 23.8                   | 25.2                   | 34.0                   | 36.6                   | 31.5                   | 40.2                   | 33.5           |
| <b>Sites near M5 Motorway</b>   |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                |
| 35 Buscombe Gardens   | 34.5                   | 44.6                   | 29.3                   | 34.9                   | 46.9                   | 27.1                   | 24.5                   | 29.7                   | 35.8                   | 32.1                   | 28.1                   | 37.1                   | 33.7           |
| 12 Orchard Park Green Lane  | 27.8                   | 41.1                   | 26.3                   | 25.8                   | 39.5                   | 20.7                   | 22.4                   | 21.1                   | 30.0                   | 25.1                   | 25.5                   | 32.2                   | 28.1           |
| <b>Priory Road AQMA Area</b>  |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                |
| 36 Priory Road  | 27.1                   | 40.1                   | 28.6                   | 32.3                   | 41.8                   | 29.1                   | 22.9                   | 19.7                   | 32.3                   | 27.0                   | 28.4                   | 36.6                   | 30.5           |
| 46 Priory Road  | 51.9                   | 61.9                   | 45.4                   | 56.3                   | 63.8                   | 39.8                   | 40.5                   | 36.5                   | 45.3                   | 38.3                   | 46.2                   | 58.2                   | 48.7           |
| 56 Priory Road  | 31.2                   | 67.7                   | 56.4                   | 64.8                   | 71.4                   | 49.9                   | 44.5                   | 43.0                   | 52.5                   | 53.4                   | 49.8                   | 53.6                   | 53.2           |
| 66 Priory Road  | 59.2                   | 70.4                   | 57.9                   | 61.9                   | 67.8                   | 56.1                   | 52.9                   | 43.9                   | 54.4                   | 53.9                   | 53.7                   | 61.9                   | 57.8           |
| Rear 58 Priory Road   | 26.8                   | 43.8                   | 40.1                   | 36.4                   | 41.2                   | 28.4                   |                        | 16.2                   | 33.8                   | 28.7                   | 37.4                   | 41.6                   | 34.0           |
| <b>Barton Street AQMA Area</b>  |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                |
| 99 Barton St (Enterprize cntr)  | 41.1                   | 55.4                   | 45.1                   | 43.5                   | 45.1                   | 40.8                   | 32.8                   | 28.3                   | 46.0                   | 37.4                   | 39.9                   | 50.5                   | 42.2           |
| 124 Barton St (Icon.net)  | 54.8                   | 63.5                   | 52.9                   | 58.1                   | 45.4                   | 52.7                   | 47.2                   | 39.8                   | 56.9                   | 56.1                   | 49.9                   | 53.9                   | 52.6           |
| 196 Barton Street lamppost  | 46.5                   | 55.9                   | 45.9                   | 48.3                   | 42.9                   | 42.2                   | 39.2                   | 38.6                   | 42.2                   | 46.2                   | 38.5                   | 48.3                   | 44.6           |
| 219A Barton St post   | 36.4                   | 52.5                   | 45.0                   | 48.2                   | 55.7                   | 44.6                   | 35.9                   | 27.7                   | 43.5                   | 40.1                   | 35.7                   | 45.0                   | 42.5           |
| End Vauxhall Terrace  | 27.7                   | 33.6                   | 27.9                   | 23.0                   | 18.6                   | 17.0                   | 18.4                   | 16.0                   | 25.5                   | 27.9                   | 29.2                   | 30.5                   | 24.6           |
| 246 Barton Street   | 45.5                   | 55.2                   | 43.5                   | 43.0                   | 41.4                   | 39.1                   | 31.8                   | 33.1                   | 46.0                   | 41.7                   | 42.5                   | 46.3                   | 42.4           |
| opp. 248 Barton Street  | 31.2                   | 48.2                   | 0.0                    | 32.6                   | 39.2                   | 32.4                   | 25.9                   | 18.8                   | 38.4                   | 28.0                   | 28.4                   | 41.6                   | 33.2           |
| 316 Barton Street   | 49.1                   | 58.5                   | 48.5                   | 48.1                   | 36.0                   | 42.6                   | 35.8                   | 38.3                   | 40.2                   | 50.1                   | 38.9                   | 43.9                   | 44.2           |
| 301 Barton Street   | 27.4                   | 38.7                   | 28.5                   | 31.0                   | 30.6                   | 22.0                   | 21.7                   | 18.7                   | 30.7                   | 26.5                   | 29.0                   | 35.1                   | 28.3           |
| <b>Painswick Road AQMA Area</b>   |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                |
| 65 Painswick Road   | 31.0                   | 43.8                   | 30.7                   | 36.6                   | 46.1                   | 30.9                   | 27.9                   | 19.6                   | 34.2                   | 26.7                   | 33.0                   | 38.9                   | 33.3           |
| 76 Painswick Road   | 38.2                   | 49.2                   | 38.0                   | 41.2                   | 38.5                   | 34.3                   | 32.7                   | 27.2                   | 37.1                   | 37.9                   | 40.3                   | 48.3                   | 38.6           |
| 88 Painswick Road   | 47.5                   | 53.1                   | 46.3                   | 46.1                   | 42.8                   | 43.2                   | 40.3                   | 31.1                   | 42.9                   | 45.7                   | 45.6                   | 47.7                   | 44.3           |
| 97 Painswick Road   | 37.5                   | 46.4                   | 34.8                   | 36.5                   | 43.9                   | 34.1                   | 33.1                   | 26.3                   | 38.9                   | 32.5                   | 34.8                   | 40.9                   | 36.6           |
| 106 Painswick Road  | 56.6                   | 60.3                   | 54.5                   | 54.1                   | 47.2                   | 47.2                   | 45.2                   | 39.0                   | 47.1                   | 50.1                   | 44.6                   | 53.1                   | 49.9           |
| <b>Barnwood Road</b>  |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                |
| 53 Barnwood Road  | 38.5                   |                        | 41.7                   | 39.8                   | 51.2                   | 31.4                   | 38.0                   | 30.5                   | 0.0                    | 31.8                   | 34.0                   | 46.6                   | 38.3           |
| 61 Barnwood Road  | 38.5                   | 53.1                   | 43.9                   | 50.1                   | 63.0                   |                        | 38.0                   | 27.2                   | 47.9                   | 38.5                   | 42.6                   | 51.9                   | 45.0           |
| <p style="text-align: center;"> <span style="background-color: #cccccc; display: inline-block; width: 1em; height: 1em; vertical-align: middle;"></span> Sites Above National Objective<br/>                     Bias adjustment 0.87 using AQMRC spreadsheet v03/09 for Bristol Scientific Services 20%TEA in water                 </p> |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                |

| 2008 Nitrogen Dioxide raw monthly data                   |                                |        |        |        |        |        |        |        |        |        |        |        |        |         |
|--|--------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|
| All values microgrammes per cubic metre                  |                                |        |        |        |        |        |        |        |        |        |        |        |        |         |
| No.  | Location                       | Jan-08 | Feb-08 | Mar-08 | Apr-08 | May-08 | Jun-08 | Jul-08 | Aug-08 | Sep-08 | Oct-08 | Nov-08 | Dec-08 | Average |
| <b>Sites previously in national monitoring programme</b> |                                |        |        |        |        |        |        |        |        |        |        |        |        |         |
| 1  | Glos Guildhall                 | 27.8   |        | 23.7   | 26.9   | 27.1   | 17.6   | 19.6   | 15.3   | 24.0   | 23.7   | 29.4   | 37.5   | 24.8    |
| 2  | Elmbridge Junior School        | 27.4   | 37.4   | 22.3   | 24.1   | 18.8   | 16.0   | 17.2   | 18.4   | 26.3   | 24.2   | 24.9   | 35.5   | 24.4    |
| 3  | 79 Millbrook Street            | 44.2   | 56.7   | 44.2   | 47.2   | 39.2   | 30.9   | 32.8   | 23.0   | 44.0   | 40.3   | 41.8   | 52.5   | 41.4    |
| 4  | 61 Bristol Rd post             | 43.6   | 64.6   |        | 46.2   | 47.3   | 33.1   | 33.6   | 32.0   | 45.8   | 40.0   | 50.2   | 50.9   | 44.3    |
| <b>Bristol Road sites</b>                                |                                |        |        |        |        |        |        |        |        |        |        |        |        |         |
| 5  | 59 Bristol Road facade         | 41.1   | 53.2   |        |        | 44.8   | 31.5   | 30.7   | 26.8   | 45.8   | 38.7   | 38.0   | 43.9   | 39.5    |
| 6  | 157 Bristol Road               | 39.6   | 50.0   | 35.7   | 36.9   | 31.3   | 29.0   | 27.8   | 28.3   | 39.1   | 37.1   | 39.7   | 40.6   | 36.3    |
| 7  | 238 Bristol road               | 44.4   | 54.2   | 38.1   | 42.4   | 36.3   | 26.7   | 27.4   | 29.0   | 39.1   | 42.1   | 36.2   | 46.2   | 38.5    |
| <b>Sites near M5 Motorway</b>                            |                                |        |        |        |        |        |        |        |        |        |        |        |        |         |
| 8  | 35 Buscombe Gardens            | 39.7   | 51.3   | 33.7   | 40.1   | 53.9   | 31.2   | 28.2   | 34.1   | 41.2   | 36.9   | 32.3   | 42.6   | 38.8    |
| 9  | 12 Orchard Park Green Lane     | 32.0   | 47.2   | 30.2   | 29.7   | 45.4   | 23.8   | 25.7   | 24.2   | 34.5   | 28.9   | 29.3   | 37.0   | 32.3    |
| <b>Priory Road AQMA Area</b>                             |                                |        |        |        |        |        |        |        |        |        |        |        |        |         |
| 10   | 36 Priory Road                 | 31.1   | 46.1   | 32.9   | 37.1   | 48.1   | 33.5   | 26.3   | 22.7   | 37.1   | 31.0   | 32.7   | 42.1   | 35.1    |
| 11   | 46 Priory Road                 | 59.6   | 71.1   | 52.2   | 64.7   | 73.3   | 45.8   | 46.6   | 42.0   | 52.1   | 44.0   | 53.1   | 66.9   | 56.0    |
| 12   | 56 Priory Road                 | 35.9   | 77.8   | 64.8   | 74.5   | 82.1   | 57.3   | 51.2   | 49.4   | 60.4   | 61.4   | 57.2   | 61.6   | 61.1    |
| 13   | 66 Priory Road                 | 68.0   | 80.9   | 66.6   | 71.2   | 77.9   | 64.5   | 60.8   | 50.5   | 62.5   | 62.0   | 61.7   | 71.2   | 66.5    |
| 14   | Rear 58 Priory Road            | 30.8   | 50.3   | 46.1   | 41.8   | 47.4   | 32.7   |        | 18.6   | 38.8   | 33.0   | 43.0   | 47.8   | 39.1    |
| <b>Barton Street AQMA Area</b>                           |                                |        |        |        |        |        |        |        |        |        |        |        |        |         |
| 15   | 99 Barton St (Enterprize cntr) | 47.2   | 63.7   | 51.8   | 50.0   | 51.8   | 46.9   | 37.7   | 32.5   | 52.9   | 43.0   | 45.9   | 58.1   | 48.5    |
| 16   | 124 Barton St (Icon.net)       | 63.0   | 73.0   | 60.8   | 66.8   | 52.2   | 60.6   | 54.2   | 45.7   | 65.4   | 64.5   | 57.4   | 62.0   | 60.5    |
| 17   | 196 Barton Street lamppost     | 53.4   | 64.3   | 52.8   | 55.5   | 49.3   | 48.5   | 45.0   | 44.4   | 48.5   | 53.1   | 44.2   | 55.5   | 51.2    |
| 18   | 219A Barton St post            | 41.8   | 60.3   | 51.7   | 55.4   | 64.0   | 51.3   | 41.3   | 31.8   | 50.0   | 46.1   | 41.0   | 51.7   | 48.9    |
| 19   | End Vauxhall Terrace           | 31.8   | 38.6   | 32.1   | 26.4   | 21.4   | 19.5   | 21.1   | 18.4   | 29.3   | 32.1   | 33.6   | 35.0   | 28.3    |
| 20   | 246 Barton Street              | 52.3   | 63.4   | 50.0   | 49.4   | 47.6   | 44.9   | 36.5   | 38.1   | 52.9   | 47.9   | 48.8   | 53.2   | 48.8    |
| 21   | opp. 248 Barton Street         | 35.9   | 55.4   |        | 37.5   | 45.1   | 37.2   | 29.8   | 21.6   | 44.1   | 32.2   | 32.6   | 47.8   | 38.1    |
| 22   | 316 Barton Street              | 56.4   | 67.2   | 55.8   | 55.3   | 41.4   | 49.0   | 41.1   | 44.0   | 46.2   | 57.6   | 44.7   | 50.5   | 50.8    |
| 23   | 301 Barton street              | 31.5   | 44.5   | 32.8   | 35.6   | 35.2   | 25.3   | 24.9   | 21.5   | 35.3   | 30.5   | 33.3   | 40.3   | 32.6    |
| <b>Painswick Road AQMA Area</b>                          |                                |        |        |        |        |        |        |        |        |        |        |        |        |         |
| 24   | 65 Painswick Road              | 35.6   | 50.3   | 35.3   | 42.1   | 53.0   | 35.5   | 32.1   | 22.5   | 39.3   | 30.7   | 37.9   | 44.7   | 38.3    |
| 25   | 76 Painswick Road              | 43.9   | 56.5   | 43.7   | 47.4   | 44.2   | 39.4   | 37.6   | 31.3   | 42.7   | 43.6   | 46.3   | 55.5   | 44.3    |
| 26   | 88 Painswick Road              | 54.6   | 61.0   | 53.2   | 53.0   | 49.2   | 49.7   | 46.3   | 35.7   | 49.3   | 52.4   | 52.4   | 54.8   | 51.0    |
| 27   | 97 Painswick Road              | 43.1   | 53.3   | 40.0   | 41.9   | 50.5   | 39.2   | 38.0   | 30.2   | 44.7   | 37.3   | 40.0   | 47.0   | 42.1    |
| 28   | 106 Painswick Road             | 65.0   | 69.3   | 62.6   | 62.2   | 54.2   | 54.2   | 52.0   | 44.8   | 54.1   | 57.6   | 51.3   | 61.0   | 57.4    |
| <b>Barnwood Road</b>                                     |                                |        |        |        |        |        |        |        |        |        |        |        |        |         |
| 29   | 53 Barnwood Road               | 44.2   |        | 47.9   | 45.7   | 58.9   | 36.1   | 43.7   | 35.0   |        | 36.5   | 39.1   | 53.6   | 44.1    |
| 30   | 61 Barnwood Road               | 44.3   | 61.0   | 50.5   | 57.6   | 72.4   |        | 43.7   | 31.3   | 55.0   | 44.3   | 49.0   | 59.7   | 51.7    |

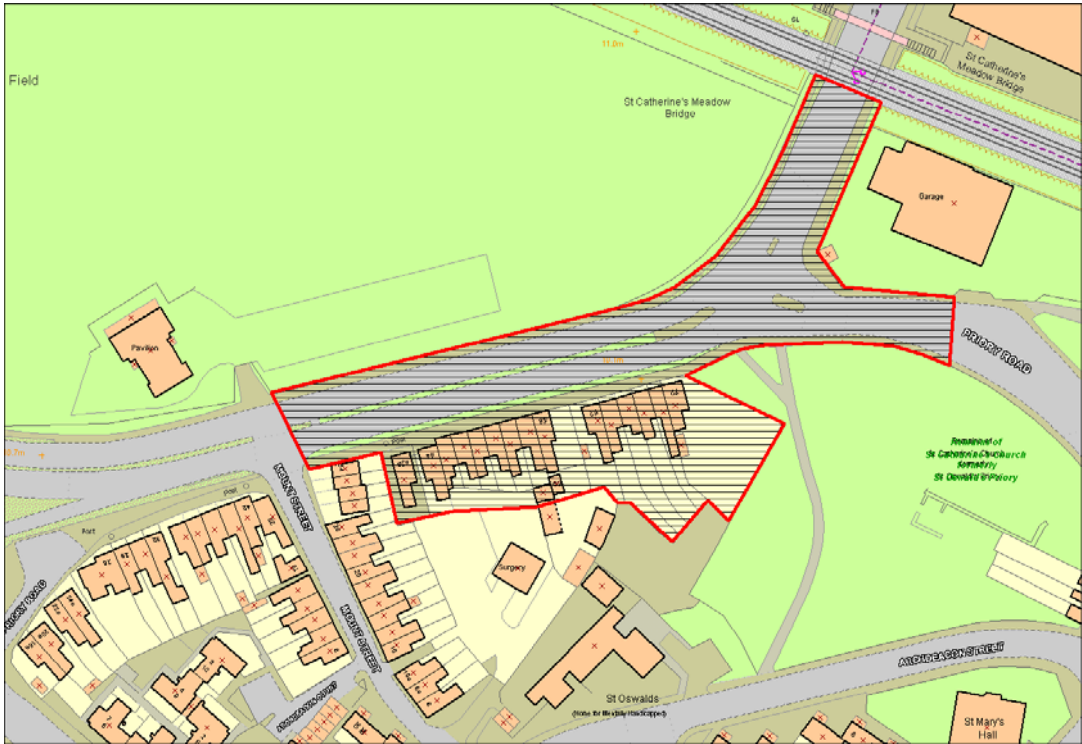
**Benzene Data**

| microgram/m3     | Jan-08 | Feb-08 | ##### | Apr-08 | May-08 | Jun-08 | Jul-08 | ##### | Sep-08 | Oct-08 | ##### | Dec-08 | Ave |
|------------------|--------|--------|-------|--------|--------|--------|--------|-------|--------|--------|-------|--------|-----|
| Glos Arts Centre | 0.7    | 2.0    | 0.7   | 0.7    | 2.0    | 0.7    | 0.7    | 2.0   | 0.7    | 0.7    | 2.0   | 0.7    | 1.1 |
| Millbrook Street | 1.6    | 3.9    | 2.3   | 1.6    | 3.9    | 2.3    | 1.6    | 3.9   | 2.3    | 1.6    | 3.9   | 2.3    | 2.6 |
| Elmbridge School | 0.7    | 2.0    | 1.0   | 0.7    | 2.0    | 1.0    | 0.7    | 2.0   | 1.0    | 0.7    | 2.0   | 1.0    | 1.2 |
| Bristol Rd       | 1.0    | 3.3    | 1.3   | 1.0    | 3.3    | 1.3    | 1.0    | 3.3   | 1.3    | 1.0    | 3.3   | 1.3    | 1.8 |

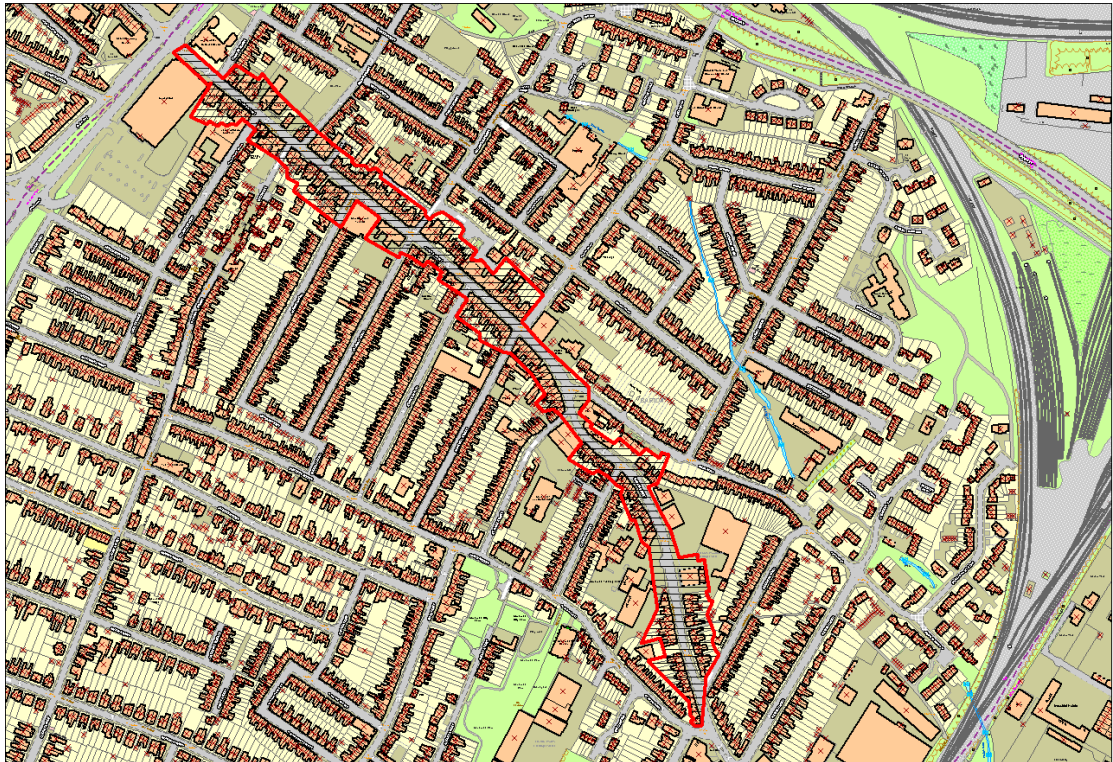
Previous experience shows that passive benzene tubes tend to overassess concentrations. These are thus likely to be high readings. As they indicate no area of concern, no attempt has been made to seek a correction factor this year.

# Appendix C: Maps of Air Quality Management Areas in Gloucester City

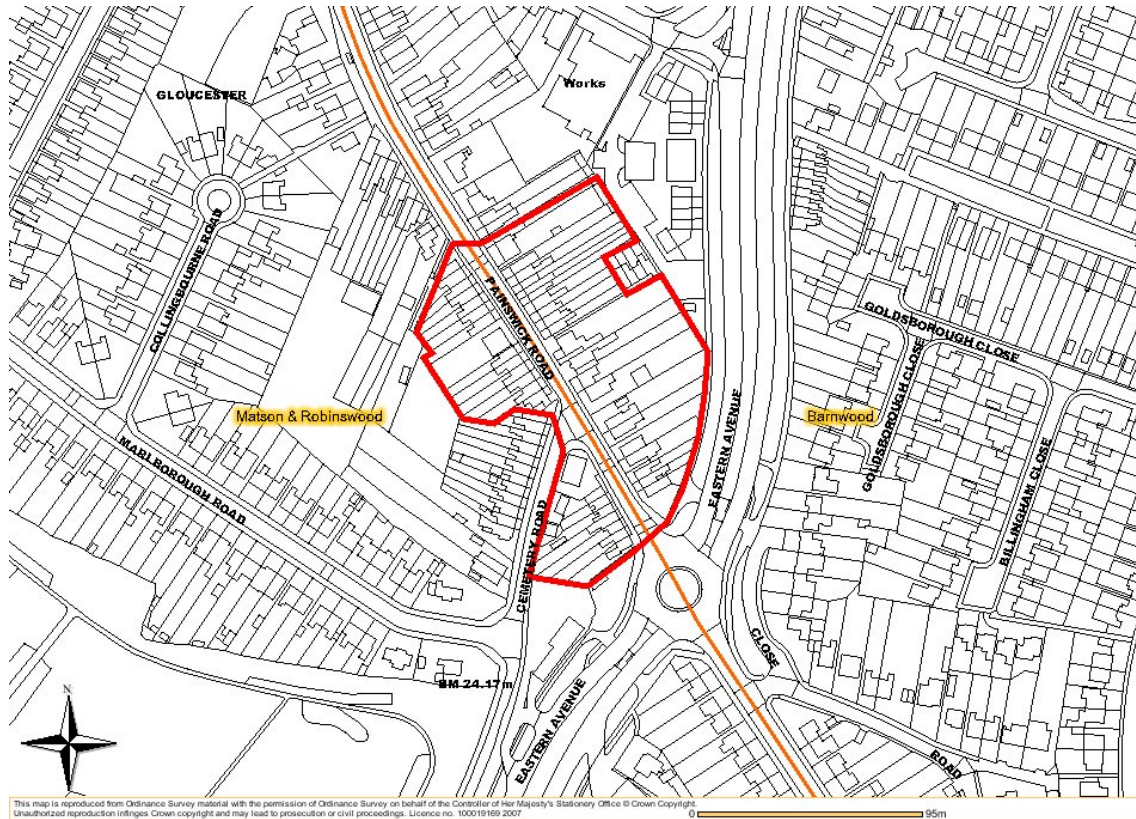
Priority Road AQMA including affected domestic properties



Map 2 Barton Street AQMA including affected domestic properties  
Future domestic properties fronting the Street are also included in the order



# Painswick Road Air Quality Management Area



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