



COTSWOLD
DISTRICT COUNCIL

2017 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the
Environment Act 1995
Local Air Quality Management
October 2017

| | |
|-------------------------|-----------------------------------|
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Executive Summary: Air Quality in Our Area

Cotswold District Council has continued the diffusion tube monitoring survey for nitrogen dioxide across the district. The sites are representative of relevant exposure and relate to emissions from traffic.

Monitoring carried out within the Air Quality Management Area (AQMA) near the junction of Thames Street, Lechlade, shows nitrogen dioxide levels continue to be at risk of exceeding the national air quality standard, which was set to protect the health of residents. Monitoring will continue so that we can keep a check on the situation which is affected by meteorological conditions as well as the number and type of vehicles using the junction. The continuous monitor in Lechlade was decommissioned in 2016 for technical reasons

At the Air Balloon Roundabout in Birdlip the diffusion tube data in the area shows no significant change in the levels of nitrogen dioxide (NO₂), which remain above the national objective level. This is expected as the cause of the exceedance is traffic emissions and there has been no significant change in the usage of the road.

Traffic management within our air quality management areas (AQMA) is outside the direct control of Cotswold District Council. As the exceedance at Lechlade is marginal it is anticipated that improvements in emissions from the national fleet could reduce the pollution to acceptable levels in the future, but in the meantime the Council is working with the County Highways Department regarding the traffic management controls at the junction, and investigating whether there are any options which might reduce nitrogen dioxide levels in the shorter term.

The Council will continue to encourage and support any measures considered by the Highways Agency to improve the situation at the Birdlip AQMA. Central government funding has been made available to alter the strategic trunk route in due course, but there are no details on proposals for improvement. It is not known if a change will address the air quality issue which is principally related to the number of HGVs and the topography; the steep incline on the approach to the roundabout from the Gloucester direction gives rise to the slow moving traffic labouring along this section of the road. The Council will take note of any further developments in the proposed improvement to the roads within the AQMA at the Air Balloon roundabout at Birdlip.

Cotswold District Council will not revoke the AQMA for Thames Street, Lechlade at this time, as the measured nitrogen dioxide annual average concentration exceeds the national objective at one point and is close to the objective level at the other points monitored in Thames Street. Monitoring will continue in the area. The problem, which is thought to be

caused by idling traffic queuing at the junction, will be discussed with the County Highways Department.

There are no new areas of concern that have been identified within Cotswold District Council's area. Monitoring will continue at the same sites as previously identified and will be carried out in accordance with Defra guidance TG(09). An updated air quality report will be produced in 2018.

Air Quality in Cotswold District Council

Air pollution is associated with a number of adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Additionally, air pollution particularly affects the most vulnerable in society: children and older people, and those with heart and lung conditions. There is also often a strong correlation with equalities issues, because areas with poor air quality are also often the less affluent areas^{1,2}.

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion³.

Air Quality in the Cotswold Area is generally very good. There are however air pollution hotspots where nitrogen dioxide associated with traffic emissions is higher and where it has been necessary to declare Air Quality Management Areas (AQMA). These areas are typically where houses are very close to a busy road and the pollution from the traffic can be exacerbated by problems with congestion as well as the topography, the presence of street canyons and meteorological conditions such as inversion layers and fog.

There are two air quality AQMA in the district, both declared because nitrogen dioxide levels, related to traffic emissions, exceed national objectives.

The two Air Quality Management Areas (AQMA) are:

- the Air Balloon Roundabout in Birdlip, declared in 2008
- an area of Thames Street Lechlade, declared 2014.

The AQMA at the Air Balloon roundabout is related to the quantity of traffic using the strategic trunk roads and the tailback of traffic on the hill which approaches the roundabout from the Gloucester direction.

In Thames Street, Lechlade, the AQMA relates to the very close proximity of houses to the road which suffers congestion at the traffic controlled junction, during rush hours in particular. A street canyon effect combined with frequent foggy conditions when there is an inversion layer due to proximity to the nearby River Thames exacerbate the accumulation of traffic exhaust emissions as atmospheric dispersion and dilution is inhibited.

¹ Environmental equity, air quality, socioeconomic status and respiratory health, 2010

² Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006

³ Defra. Abatement cost guidance for valuing changes in air quality, May 2013

Air quality monitoring is undertaken throughout the district with a greater level of monitoring in the AQMAs. Monitoring is undertaken for nitrogen dioxide (NO₂). Previous review and assessment of air quality has established that this is the only pollutant of concern in the area. The monitoring results give an annual average for nitrogen dioxide which is assessed for compliance with the National Air Quality Objective and compared with the monitoring results from previous years. Current monitoring indicates that levels are broadly similar to levels recorded in recent years. We monitor air quality at 16 locations throughout the district. The survey shows there was a slight increase in NO₂ levels this year compared to last year, thought to be mainly due to the meteorological conditions during the year as we experienced many days with temperature inversions during the winter and autumn months. The levels remain above the national objective within the AQMAs, which is to be expected as there has been no change in the usage of the roads in these areas. The monitoring survey does not indicate any additional areas of concern with regard to air quality, within the District. There are no industrial developments with air pollution implications and any development proposals have been considered with regard to their potential to increase traffic pollution in the AQMAs and other areas.

Defra has an internet site containing Air Quality Reports from all local authorities that have AQMAs. The page for Cotswold District Council reports can be found here: https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=68

Actions to Improve Air Quality

Air Quality in the District is mainly very good. In 2012 an Action Plan to address the AQMA at the Air Balloon roundabout was published. The high nitrogen dioxide levels are due to traffic on the major trunk route; management of which is outside the control of Cotswold District Council. The Action Plan concluded that Cotswold District Council would provide support and encouragement for measures that may help to control traffic and encourage alternative transport, through a working group led by the County Highways Department.

The exceedance in the AQMA at Lechlade has continued so monitoring will continue in this location and the AQMA will not be revoked until levels are consistently below the national air quality objective level. Cotswold District Council is working with the County Highways Department to learn whether any changes to the road layout or traffic light controls can be implemented, to improve air quality in this AQMA.

Local Priorities and Challenges

Over the next year we will continue the diffusion tube monitoring survey. We will continue discussions with the County Council with a view to giving further consideration to the traffic issues in our AQMAs and how these can be best addressed.

In addition to any financial consideration, a further constraint upon the progress of any Action Plan has been the political implication (and potential impasse) which might arise as traffic is diverted from one sensitive area towards another area of similar concern within a neighbouring District. This requires consideration and we are discuss such issues with our neighbouring authorities through liaison groups which meet approximately twice a year.

How to Get Involved

As the air pollution of concern in the district is related to traffic emissions, we can all do our bit to reduce emissions, by not using a car unless entirely necessary. Walking or cycling, or

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taking public transport or car sharing rather than driving an otherwise empty car, reduces our individual carbon footprint.

The solution to congestion related pollution lies to a large extent in road traffic management and District authorities do not have the remit to manage this. Local interest groups can however lobby County Councils directly to influence the content of Local Transport Plans (LTP).

Copies of the latest Air Quality Report can be found on Cotswold District Council's Website at:

<http://www.cotswold.gov.uk/residents/environment/environmental-health/air-quality/>

Any queries about Air Quality should be directed to the Environmental Protection team within Cotswold District Council.

This team can be contacted by e mail on: ers@2020partnership.uk

Table of Contents

| | |
|---|-----------|
| Executive Summary: Air Quality in Cotswold | i |
| Air Quality in Cotswold District Council | ii |
| Actions to Improve Air Quality | iii |
| Local Priorities and Challenges..... | iiii |
| How to Get Involved..... | iv |
| 1 Local Air Quality Management | 1 |
| 2 Actions to Improve Air Quality | 2 |
| 2.1 Air Quality Management Areas..... | 2 |
| 2.2 Progress and Impact of Measures to address Air Quality in Cotswold..... | 3 |
| 2.3 PM _{2.5} – Local Authority Approach to Reducing Emissions and or Concentrations..... | 6 |
| 3 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance | 7 |
| 3.1 Summary of Monitoring Undertaken | 7 |
| 3.1.1 Non-Automatic Monitoring Sites..... | 8 |
| 3.2 Individual Pollutants | 8 |
| 3.2.1 Nitrogen Dioxide (NO ₂)..... | 8 |
| Appendix A: Monitoring Results | 12 |
| Appendix B: Full Monthly Diffusion Tube Results for 2015 | 15 |
| Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC | 17 |
| Appendix D: Map(s) of Monitoring Locations | 18 |
| Appendix E: Summary of Air Quality Objectives in England | 25 |
| Glossary of Terms | 26 |

List of Tables

| | |
|--|---|
| Table 2.1 – Declared Air Quality Management Areas | 3 |
| Table 2.2 – Progress on Measures to Improve Air Quality..... | 5 |

List of Figures

| | |
|---|----|
| Figure 2.1 Maps of AQMA Boundaries | 2 |
| Figure 2.4 Graph showing the trends over 9 years at long term diffusion tube monitoring sites | 10 |

1 Local Air Quality Management

This report provides an overview of air quality in Cotswold District during 2015. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) 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 an exceedance is considered likely the local authority must 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. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by Cotswold District Council to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England can be found in Table E.1 in Appendix E.

2 Actions to Improve Air Quality

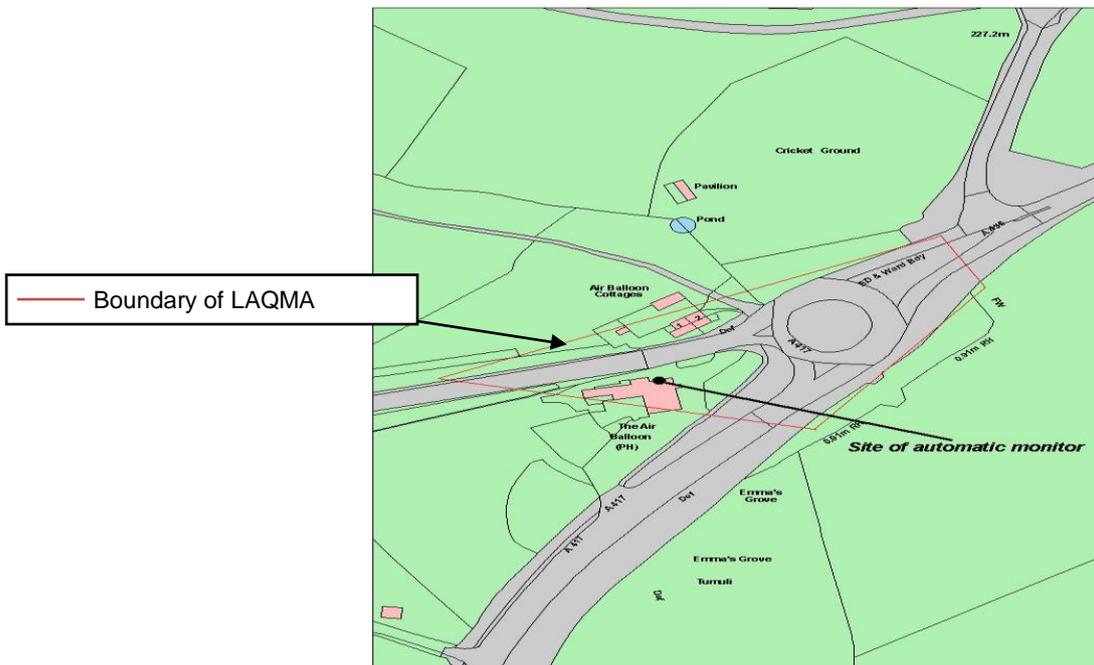
2.1 Air Quality Management Areas

Air Quality Management Areas (AQMA) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority must prepare an Air Quality Action Plan (AQAP) setting out measures it intends to put in place in pursuit of the objectives.

A summary of AQMAs declared by Cotswold District Council can be found in Table 2.1. Further information related to declared AQMAs, including maps of AQMA boundaries are available online at https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=68 and on the Council [air quality webpage](http://www.cotswold.gov.uk/residents/environment/environmental-health/air-quality/) at: <http://www.cotswold.gov.uk/residents/environment/environmental-health/air-quality/>

Figure 2.1 Maps of AQMA Boundaries

Air Balloon Birdlip



Cotswold District Council
Air Quality Management (Thames Street, Lechlade 2014) Area

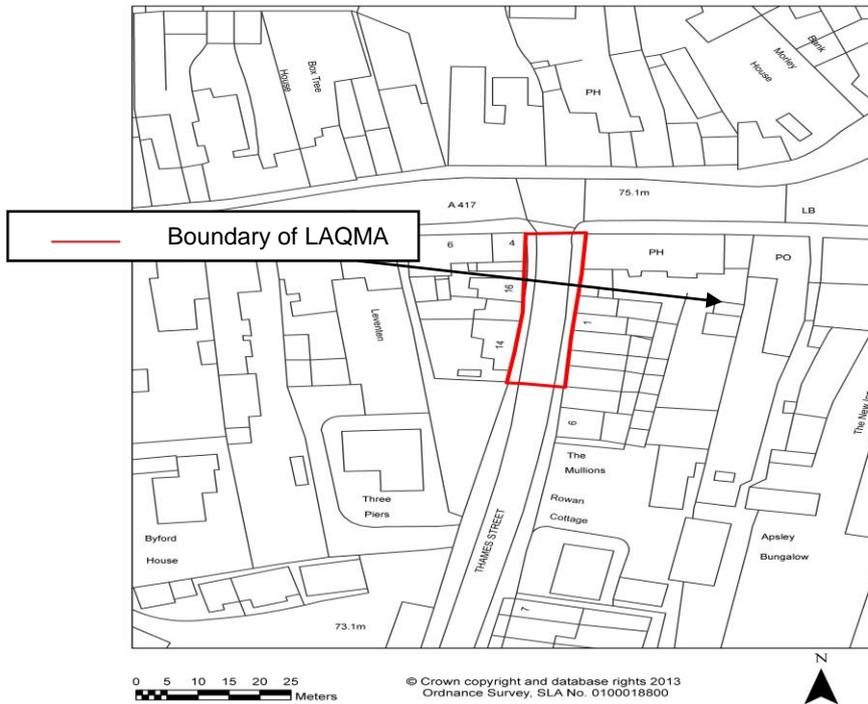


Table 2.1 – Declared Air Quality Management Areas

| AQMA Name | Pollutants and Air Quality Objectives | City / Town | One Line Description | Action Plan |
|-------------------------|---------------------------------------|-------------|---|------------------------------------|
| Air Balloon Roundabout | NO ₂ annual mean | Birdlip | An area encompassing properties adjacent to the roundabout on a strategic trunk route | AQ Action Plan pending |
| Thames Street, Lechlade | NO ₂ annual mean | Lechlade | Residential properties along Thames Street near the junction with the High Street. | AQ Action Plan under consideration |

2.2 Progress and Impact of Measures to address Air Quality in Cotswold District Council

Progress on the Air Balloon Action Plan has stopped, due to the lack of options regarding any potential improvements through an alternative road layout.

Cotswold District Council has been exploring the possibility of moving the traffic lights in the Lechlade, Thames Street AQMA in liaison with Gloucestershire County Council

Highways Department. The overall impact of this option has not yet been established in terms of safety, road traffic use and air quality.

Cotswold District Council

Table 2.2 – Progress on Measures to Improve Air Quality

| Measure No. | Measure | EU Category | EU Classification | Lead Authority | Planning Phase | Implementation Phase | Key Performance Indicator | Target Pollution Reduction in the AQMA | Progress to Date | Estimated Completion Date | Comments |
|-------------|-------------------------|----------------------------------|---|--------------------------------|----------------------------|----------------------|-----------------------------|---|------------------|---------------------------|-----------------|
| 1 | Air Balloon Roundabout | Freight and Delivery Management | Trunk route management/ Strategic routing strategy for HGVs | Gloucestershire County Council | LTP | TBC | Reduced NO2 levels recorded | Annual average NO2 to be reduced to meet AQ objective | Awaited | Not known | On hold |
| 2 | Thames Street, Lechlade | Freight and Delivery Management | Trunk route management | CDC | 1 | TBC | Reduced NO2 levels recorded | Annual average NO2 to be reduced to meet AQ objective | Awaited | Not known | To be commenced |
| 3 | CDC | Promoting Low Emission Transport | Promote LEVs | CDC | Promote LEV infrastructure | TBC | Increased number of LEVs | Reduced NO2 | Awaited | Not known | To be commenced |
| 4 | CDC | Promoting Travel Alternatives | Facilitate home-working | CDC | | | Less journeys | Reduced NO2 | Awaited | Not known | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

2.3 PM_{2.5} – Local Authority Approach to Reducing Emissions and or Concentrations

As detailed in Policy Guidance LAQM.PG16 (Chapter 7), local authorities are expected to work towards reducing emissions and/or concentrations of PM_{2.5} (particulate matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that PM_{2.5} has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

Other than the potential source from vehicles, no other significant source of PM_{2.5} has been identified within the District. Therefore the control at this stage is aligned with the measures designed to achieve a reduction in vehicular emissions.

Liaison with Gloucester County transport and health committees will be pursued to ensure Air Quality is considered in policy making.

3 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance

3.1 Summary of Monitoring Undertaken

This section sets out the monitoring that has taken place and how it compares with national objectives as well as previous years' results.

Continuous monitoring within AQMA at the Air Balloon Roundabout junction was undertaken for 8 years. In 2014 there were problems with power outages; consequently the data collection was poor and inconsistent. This analyser was decommissioned in 2015 with an option to re-install in the area if there are major changes to the layout of the road.

Central government has made funds available for major alterations to the Air Balloon Roundabout in due course. At the time of writing no details as to effects and timescales are available. However it is possible that because of the topography of the area, mainly the steep incline, and the high volume of HGVs using this route, proposed changes in upgrading part of the route and changing the road lay out will have minimal effect on the air quality. Cotswold District Council will keep a watching brief on the development of this project.

Continuous monitoring at Thames Street, Lechlade was carried out intermittently. Difficulties accessing the site where the analyser was located and technical problems maintaining the analyser meant that data became unreliable and the analyser was decommissioned in 2016.

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3.1.1 Non-Automatic Monitoring Sites

No new areas have been identified that required monitoring; Cotswold District Council has therefore retained its existing diffusion tube survey sites across the district. The sites all relate to traffic emissions. There have been no new roads or major changes that have affected traffic flows. .

Cotswold District Council undertook non- automatic (passive) monitoring of NO₂ at sixteen sites during 2016. All sites related to traffic emissions and were positioned in locations where there is “relevant public exposure”, in accordance with guidance in TG (09). (The “car park” tube at Air Balloon was decommissioned as it was not representative of “relevant exposure”)

Four tubes were located within each of our air quality management areas (AQMAs).

Appendix A provides details of the sites.

Maps showing the location of the monitoring sites are provided in Appendix D.

3.2 Individual Pollutants

3.2.1 Nitrogen Dioxide (NO₂)

The air quality monitoring results presented in this section are, where relevant, adjusted for “annualisation” and bias. As there were at least 9 months data for each monitoring site, annualisation was not required. Details on the bias adjustment are provided in Appendix C.

A.2 in Appendix A compares the ratified and adjusted monitored NO₂ annual mean concentrations for the past 5 years, for comparison with the air quality objective of 40µg/m³. The full 2016 dataset of monthly mean NO₂ levels from the diffusion tube survey is provided in Appendix B.

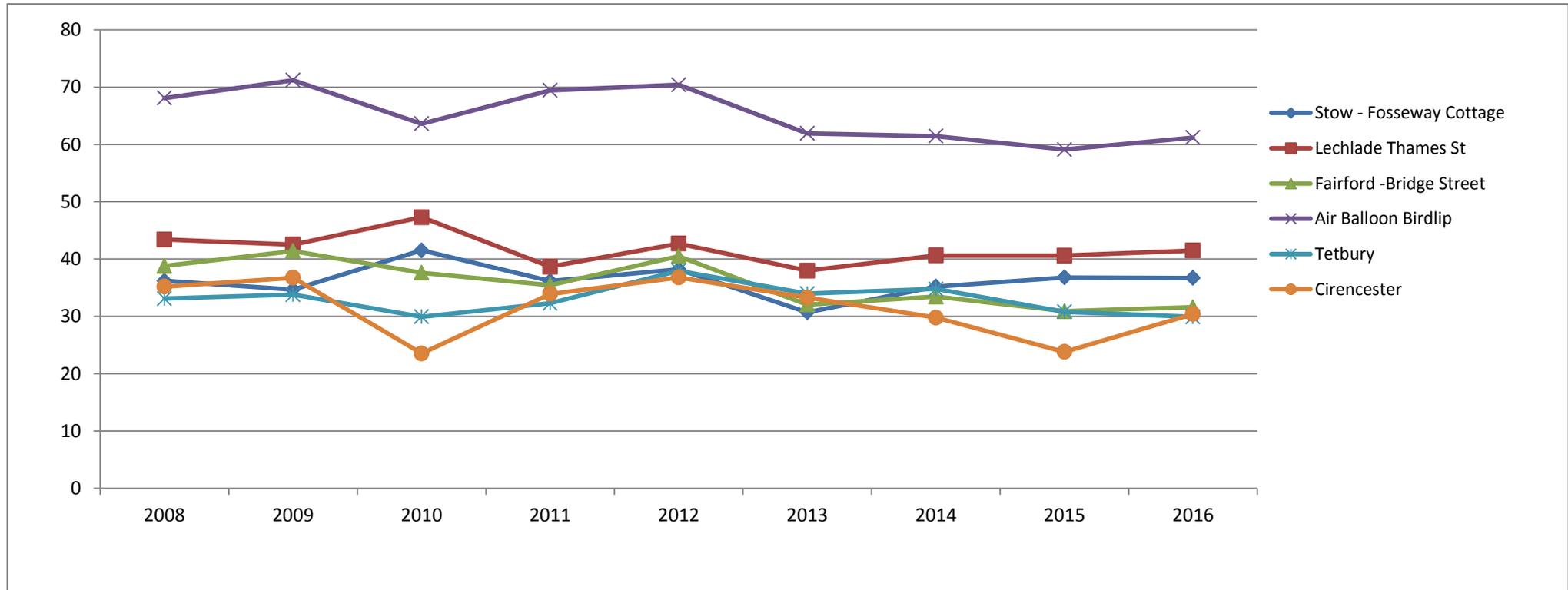
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Nitrogen dioxide levels remain high within Air Balloon roundabout AQMA, which is as expected given the significant volume of traffic on this strategic trunk route. The monitored concentrations have varied very little over the last few years, as can be seen from the trend graph which shows levels for the last 9 years, although there was a slight increase in 2016, probably due to meteorology causing poor atmospheric dispersion conditions, thus exacerbating the accumulation of vehicle exhaust emissions.

Nitrogen dioxide levels in Thames Street Lechlade continue to be close to the national objective of $40 \mu\text{g}/\text{m}^3$. The Council will continue diffusion tube monitoring in the area. These levels are thought to be caused by exhaust emissions from idling traffic queuing at the T-junction, which is controlled by traffic lights. Cotswold District Council will liaise with the County Highways Department to determine whether there are any safe alternatives to this choice of traffic management technique at this junction with the potential to improve the air quality situation. A slight increase in the levels were experienced which was thought to be due to poor dispersion conditions. Thames Street often suffers fog during inversion conditions, due to its proximity to the River Thames and dispersion from vehicle exhausts queuing at the traffic lights is hampered by the "street canyon effect" caused by the relatively high buildings either side of the narrow road.

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Figure 2.4 Graph showing the trends over 9 years at long term diffusion tube monitoring sites



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The data points in the graph in Figure 2.4 are the annual average levels of NO₂, bias adjusted and expressed in µg/m³

The graph shows that the levels recorded at all the sites were slightly increased upon last years levels. This is thought to be most likely due to more days in the year that suffered from temperature inversions and foggy conditions which hindered air movement and thus dispersion and dilution of vehicle exhaust emissions. At the Birdlip Air Balloon roundabout, nitrogen dioxide levels have decreased overall by around 10µg/m³ since 2012 (when there was an annual average of 70 µg/m³) but the rate of decrease has slowed down over the last few years.

It can be seen that over the last 3 years, levels at Lechlade, Thames Street, have remained consistently close to the national objective level for nitrogen dioxide, which is 40 µg/m³.

Over the last 3 years there has been only a relatively small variation in NO₂ levels at most of the sites and there is no significant change in levels other than at the Wagon and Horses in Cirencester where there was quite a substantial drop last year but this year the level has returned approximately to its previous (2014) level.

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Appendix A: Monitoring Results

Table A.1 – Details of Non-Automatic Monitoring Sites

| Site Name | Site Type | X OS Grid Ref | Y OS Grid Ref | Pollutants Monitored | In AQMA? | Is monitoring collocated with a Continuous analyser (Y/N) | Relevant Exposure? (Y/N with distance (m) to relevant exposure) | Distance to kerb of nearest road (N/A if not applicable) | Does this location represent worst-case exposure? |
|--|-----------|---------------|---------------|----------------------|----------|---|---|--|---|
| Stow-in-the Wold - Fosseway Cottage | Roadside | 419079 | 226054 | NO ₂ | N | N | y (1m) | 3m | N |
| Lechlade -Thames St | Kerbside | 421378 | 199506 | NO ₂ | Y | N | y(<1m) | 0.5m | Y |
| Lechlade No 2 Thames St | Kerbside | 421359 | 199404 | NO ₂ | Y | N | Y(1m) | <1m | Y |
| Lechlade - Thames St cottage 4 | Kerbside | 421364 | 199477 | NO ₂ | Y | N | y(<1m) | 1.5m | Y |
| Lechlade – High St | Kerbside | 421367 | 199532 | NO ₂ | N | N | y (<1m) | <1m | Y |
| Fairford - London Rd | Kerbside | 415378 | 200949 | NO ₂ | N | N | y (1m) | 1m | Y |
| Fairford Bridge St | Kerbside | 415167 | 201004 | NO ₂ | N | N | y (1m) | 1m | Y |
| Cirencester – London Rd (Wagon/Horses) | Kerbside | 402735 | 201962 | NO ₂ | N | N | y (<1m) | <1m | Y |
| Tetbury - Long St | Kerbside | 389007 | 193197 | NO ₂ | N | N | y(1m) | 1m | Y |
| Tetbury - Church St | Kerbside | 389034 | 193110 | NO ₂ | N | N | y(1m) | 1m | Y |
| Birdlip Air Balloon | Kerbside | 393446 | 216118 | NO ₂ | Y | N | y(1m) | 1m | Y |
| Birdlip - Air Balloon 1 | Kerbside | 393459 | 216124 | NO ₂ | Y | N | y(1m) | 4m | Y |
| Birdlip - Air Balloon 2 | Kerbside | 393459 | 216124 | NO ₂ | Y | N | y(1m) | 4m | Y |
| Birdlip - Air Balloon, beer garden B | Kerbside | 393459 | 216091 | NO ₂ | Y | N | Y(<1M) | 1m | Y |
| Stow Lodge | Kerbside | 403943 | 202961 | NO ₂ | N | N | y(5m) | 0.5m | Y |

Cotswold District Council

Table A.2 – Annual Mean Nitrogen Dioxide (NO₂) Diffusion Tubes Monitoring Results (2012 to 2016)

Notes: Exceedances of the NO₂ annual mean objective of 40µg/m³ are shown in **bold**. The highest result in each AQMA is highlighted in **red**

| Site ID | Site Type | Within AQMA? | Annual mean concentration (adjusted for bias) µg/m ³ | | | | |
|---------|---|--------------|---|--|--|--|---|
| | | | 2012* (Bias Adjustment Factor = 94) | 2013* (Bias Adjustment Factor = 95) | 2014* (Bias Adjustment Factor = 79) | 2015* (Bias Adjustment Factor = 0.81) | 2016 (Bias Adjustment Factor = 0.78) |
| T1 | Stow-in-the -Wold Fosseway Cottage | N | 36.8 | 30.71 | 35.18 | 36.8 | 36.7 |
| T2 | Lechlade - Thames Street * | Y | 41.4 | 38.92 | 38.19 | 34.2 (average of 2 co-located tubes) | 37.8 (average of 2 co-located tubes) |
| T3 | Lechlade –Cottage no 4 | Y | 43.4 | 42.96 | 40.63 | 40.6 | 39.1 |
| T4 | Lechlade -Cottage No 2 Thames St | Y | 39.23 | 39.89 | 36.07 | 38.7 | 41.5 |
| T5 | Lechlade High St | N | 35.9 | 32.65 | 33.26 | 32.9 | 29.1 |
| T6 | Fairford - London Rd | N | 33.2 | 28.11 | 27.89 | 25.8 | 24.3 |
| T7 | Fairford - Bridge St | N | 39.2 | 33.97 | 33.45 | 30.9 | 31.6 |
| T8 | Cirencester - London Rd (Waggon/Horses) | N | 35.7 | 33.28 | 29.78 | 23.8 | 30.4 |
| T9 | Tetbury - Church St | N | 36.8 | 32.04 | 34.78 | 30.8 | 29.9 |
| T10 | Tetbury - Long Street | N | 29.3 | 26.67 | 27.01 | 28.8 | 25.5 |
| T11 | Birdlip - Air Balloon | Y | 68.3 | 61.93 | 61.46 | 59.1 | 61.2 |
| T12 | Birdlip - Air Balloon 2 | Y | 46.1 | 42.18 | 40.30 | 40.5 | 39.8 |
| T13 | Birdlip - Air Balloon 3 | Y | 47.2 | 41.60 | 41.38 | 39.4 | 39.2 |
| T14 | Birdlip - Air Balloon, beer garden A | Y | 44.6 | 42.93 | 43.26 | 40.5 | 40.4 |
| T15 | Birdlip - Air Balloon, beer car park C | Y | 27.1 | 27.44 | 23.01 | - | - |
| T16 | Stow Lodge | N | 35.3 | 33.74 | 32.22 | 31.7 | 33.3 |

*Optional

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Table A3 Further information about nitrogen dioxide diffusion tube monitoring in 2016

| Site ID | Location | Site Type | Within AQMA? | Triplicate or Collocated Tube | Number of Months Data Capture 2016 | Data with less than 9 months has been annualised (Y/N) | Confirm if data has been distance corrected (Y/N) | Annual mean concentration (Bias Adjustment factor = 0.78) |
|---------|---------------------------------|-----------|--------------|-------------------------------|------------------------------------|--|---|---|
| | | | | | | | | 2016 ($\mu\text{g}/\text{m}^3$) |
| T1 | Stow - Fosse Cottage | Roadside | N | | 12 | N | N | 36.7 |
| T2 | Lechlade Thames St A | Kerbside | Y | Co-located | 12 | N | N | 36.4 |
| T2 | Lechlade Thames St B | Kerbside | Y | Co-located | 12 | N | N | 39.2 |
| T3 | Lechlade Thames St Cott No4 | Kerbside | Y | | 12 | N | N | 39.1 |
| T5 | Lechlade Thames St No2 | Kerbside | Y | | 11 | N | N | 41.5 |
| T6 | Lechlade High Street | Kerbside | N | | 11 | N | N | 29.1 |
| T8 | Fairford London Road | Kerbside | N | | 12 | N | N | 24.3 |
| T7 | Fairford Bridge St | Kerbside | N | | 11 | N | N | 31.6 |
| T8 | Cirencester Wagon + Horses | Kerbside | N | | 12 | N | N | 30.4 |
| T19 | Tetbury Church St | Kerbside | N | | 12 | N | N | 29.9 |
| T10 | Tetbury Long St | Kerbside | N | | 10 | N | N | 25.5 |
| T12 | Birdlip - Air Balloon 1 | Kerbside | Y | Co-located | 12 | N | N | 39.8 |
| T13 | Birdlip - Air Balloon 2 | Kerbside | Y | Co-located | 12 | N | N | 39.2 |
| T13 | Birdlip Air Balloon Beer Garden | Kerbside | Y | | 12 | N | N | 40.4 |
| T11 | Birdlip Cottages | Kerbside | Y | | 12 | N | N | 61.2 |
| T16 | Stow Lodge | Kerbside | N | | 12 | N | N | 33.3 |

Cotswold District Council

Appendix B: Full Monthly Diffusion Tube Results for 2016

Table B.1 – NO₂ Monthly Diffusion Tube Results – 2016

| | NO ₂ Mean Concentrations (µg/m ³) | | | | | | | | | | | | Annual Mean | Annual mean bias adjusted | Data collection % |
|---|---|-----------|-------|-------|------|---------|------|--------|-----------|---------|----------|----------|-------------|---------------------------|-------------------|
| | January | February | March | April | May | June | July | August | September | October | November | December | | | |
| AIR QUALITY DIFFUSION TUBE RESULTS -2016 | | | | | | | | | | | | | | 0.78 | |
| Stow - Fosse Cottage | 43.9 | 47.4 | 47.8 | 39.1 | 45 | 51.8 | 42.2 | 44.8 | 53.9 | 44 | 54.2 | 51 | 47.1 | 36.7 | 100 |
| Fairford London Road | 36.3 | 22.8 | 29.9 | 27.8 | 23.4 | 31 | 29.3 | 29.1 | 30.5 | 27.3 | 42.1 | 43.9 | 31.1 | 24.3 | 100 |
| Fairford Bridge St | 41.6 | 39.8 | 40 | 41.9 | 44.3 | Missing | 29.4 | 36 | 42.7 | 42.1 | 41.8 | 46.3 | 40.5 | 31.6 | 91.7 |
| Lechlade Thames St A | 42.1 | 47.6 | 50.9 | 48 | 50.3 | 49.4 | 30.4 | 34.6 | 46.9 | 47.4 | 50 | 62.1 | 46.6 | 36.4 | 100 |
| Lechlade Thames St B | 45 | 45.9 | 53.9 | 51.6 | 68 | 49.1 | 32.9 | 38.2 | 49.4 | 52.2 | 51.3 | 65.5 | 50.3 | 39.2 | 100 |
| Lechlade Thames St No 2 | 46.2 | *Rejected | 58.3 | 53.5 | 56.3 | 54.5 | 32.5 | 46.9 | Missing | 57.4 | 55.6 | 70.8 | 53.2 | 41.5 | 91.7 |
| Lechlade Thames St Cott No4 | 50 | 49.2 | 44.9 | 61.4 | 48.9 | 53 | 45.1 | 44.6 | 50 | 47.9 | 53.7 | 53.1 | 50.2 | 39.1 | 100 |
| Lechlade High Street | 39.9 | 37.8 | 46.9 | 46.2 | 31.9 | 37.5 | 27.4 | 28.5 | 36.4 | 45.3 | 32 | Missing | 37.3 | 29.1 | 91.7 |

Cotswold District Council

| | | | | | | | | | | | | | | | |
|---------------------------------|------|------|----------|----------|----------|----------|----------|----------|------|-------------|------|-------------|------|------|------|
| Birdlip - Air Balloon 1 | 46.2 | 46.2 | 55. 6 | 54. 8 | 54. 8 | 58. 5 | 42. 1 | 49. 3 | 45.8 | 60.4 | 48.2 | 50.8 | 51.1 | 39.8 | 100 |
| Birdlip - Air Balloon 2 | 45.7 | 40.8 | 50. 9 | 57. 0 | 56. 4 | 55. 4 | 34. 1 | 48. 2 | 46.7 | 56.1 | 53.3 | 58.2 | 50.2 | 39.2 | 100 |
| Birdlip Cottages | 84.9 | 82.7 | 83 | 88. 4 | 69. 3 | 81 | 78. 7 | 74. 5 | 70.3 | 67.4 | 83.3 | 77.5 | 78.4 | 61.2 | 100 |
| Birdlip Air Balloon Beer Garden | 49 | 49.1 | 52. 2 | 59. 4 | 51. 8 | 47. 7 | 41. 8 | 47. 3 | 48.9 | 49.3 | 56.9 | 68.7 | 51.8 | 40.4 | 100 |
| Tetbury Church St | 39.1 | 34.1 | 42 | 44. 9 | 34. 7 | 37. 7 | 31 | 32. 4 | 35.4 | 39.4 | 46.9 | 42.9 | 38.4 | 29.9 | 100 |
| Tetbury Long St | 36.7 | 33.3 | 36. 1 | 37. 1 | 23. 8 | 29. 6 | 26. 3 | 26 | 33.2 | Missi ng | 45.1 | Missi ng | 32.7 | 25.5 | 83.3 |
| Cirencester Wagon + horses | 37.2 | 38.7 | 40. 4 | 43. 2 | 30. 4 | 35. 7 | 32. 8 | 33. 9 | 37.6 | 41.8 | 44.8 | 50.6 | 38.9 | 30.4 | 100 |
| Stow Lodge | 42.1 | 38.0 | 43. 9 | 43. 1 | 41. 5 | 38. 3 | 36. 3 | 41. 4 | 42.8 | 47.3 | 48 | 49.2 | 42.7 | 33.3 | 100 |

*Rejected for quality purposes (black cap split)

Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC

Diffusion Tube Bias Adjustment Factors

The diffusion tubes (50% TEA in acetone) were supplied and analysed by ESG Dicot laboratories. The tubes at all locations have a monthly exposure period.

National bias adjustment factors have been used from Defra database, available at: <http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html>

(see below) The factor used is 0.78 based on 38 studies and this was applied to all diffusion tubes.

National Diffusion Tube Bias Adjustment Factor Spreadsheet

Spreadsheet Version Number: 06/17

Follow the steps below in the correct order to show the results of relevant co-location studies
 Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods
 Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet
 This spreadsheet will be updated every few months; the factors may therefore be subject to change. This should not discourage their immediate use

The LAQM Helpdesk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory. Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.

Step 1: Select the Laboratory that Analyses Your Tubes from the Drop-Down List
Step 2: Select the Preparation Method from the Drop-Down List
Step 3: Select the Year from the Drop-Down List
Step 4: Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor shown in blue at the foot of the final column.

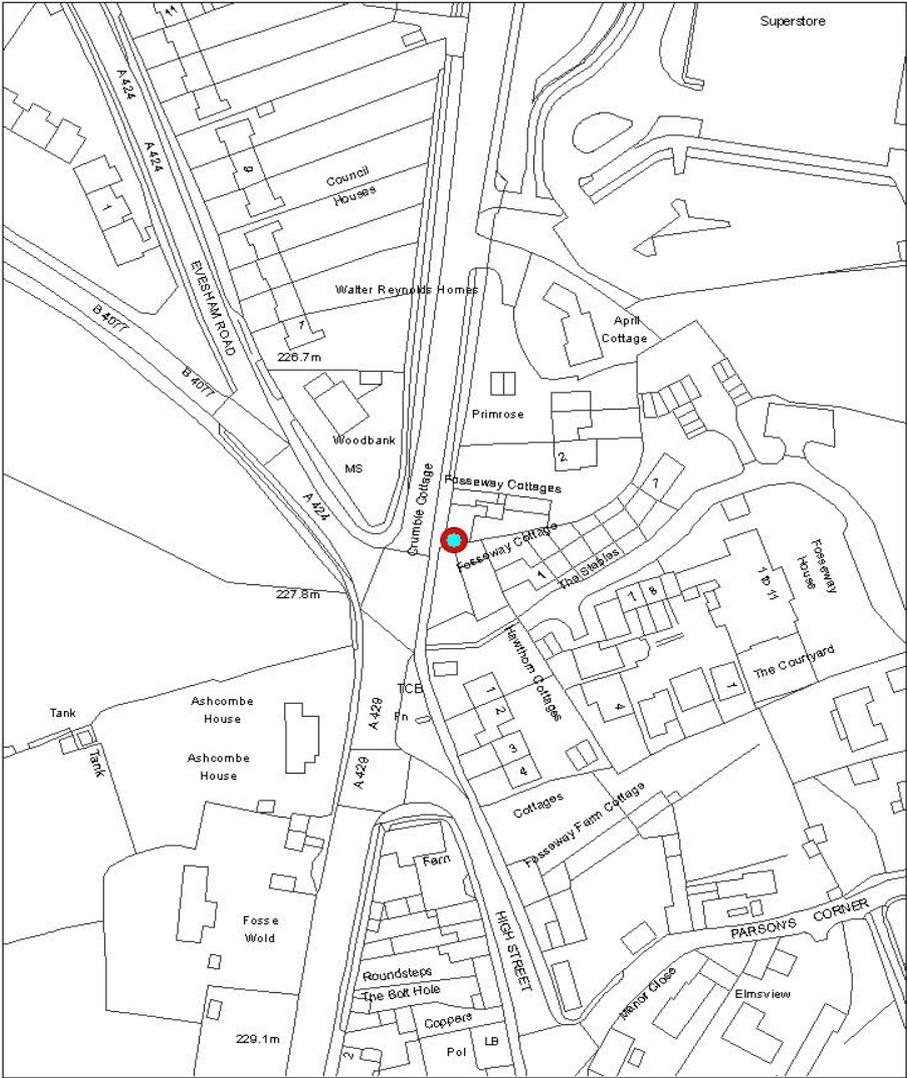
If you have your own co-location study then see footnote*. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMhelpdesk@uk.bureauveritas.com or 0800 0327953

| Analysed By | Method | Year | Site Type | Local Authority | Length of Study (months) | Diffusion Tube Mean Conc. (Dm) (µg/m ³) | Automatic Monitor Mean Conc. (Cm) (µg/m ³) | Bias (B) | Tube Precision | Bias Adjustment Factor (A) (Cm/Dm) | |
|------------------------------------|--------------------|------|-----------|---------------------------------|--------------------------|---|--|----------|----------------|------------------------------------|-------------|
| ESG Dicot | 50% TEA in acetone | 2006 | R | North East Lincolnshire Council | 10 | 36 | 30 | 20.0% | G | 0.83 | |
| ESG Dicot | 50% TEA in acetone | 2006 | R | North East Lincolnshire Council | 10 | 57 | 42 | 37.3% | G | 0.73 | |
| ESG Dicot | 50% TEA in acetone | 2006 | R | North East Lincolnshire Council | 11 | 44 | 28 | 32.0% | G | 0.66 | |
| ESG Dicot | 50% TEA in acetone | 2006 | RU | Raigate and Banstead BC | 12 | 27 | 20 | 33.6% | G | 0.75 | |
| ESG Dicot | 50% TEA in acetone | 2006 | B | Raigate and Banstead BC | 12 | 20 | 17 | 20.7% | G | 0.83 | |
| ESG Dicot | 50% TEA in acetone | 2006 | KS | Slough Borough Council | 11 | 42 | 33 | 27.6% | G | 0.78 | |
| ESG Dicot | 50% TEA in acetone | 2006 | R | Wrexham County Borough Council | 9 | 20 | 18 | 8.2% | G | 0.92 | |
| Overall Factor (38 studies) | | | | | | | | | | Use | 0.78 |

Footnote: For Casella Seal/GMSS/Casella CRE/Bureau Veritas Lab/Eurofins/ use Environmental Scientific Groups
 From 2011 for Environmental Scientific Groups use ESG Glasgow
 From 2011 for Harwell Scientific Services use ESG Dicot
 For Staffordshire CC/Staffordshire County Analysts use Staffordshire Scientific Services
 For Berkshire Health Sciences and Fife Analytical Laboratories use Fionna

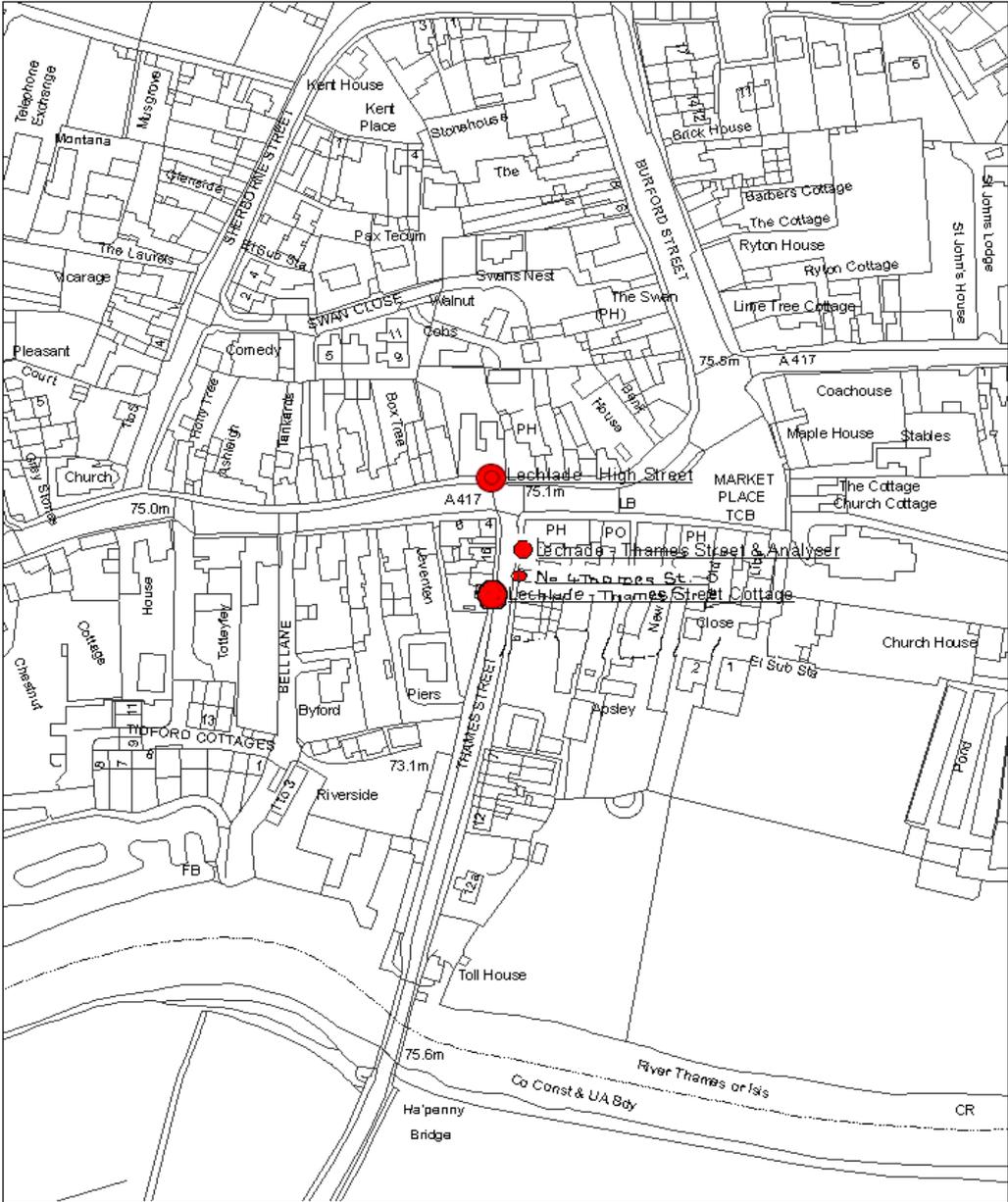
Appendix D: Map(s) of Monitoring Locations

Site T1 Stow in the Wold

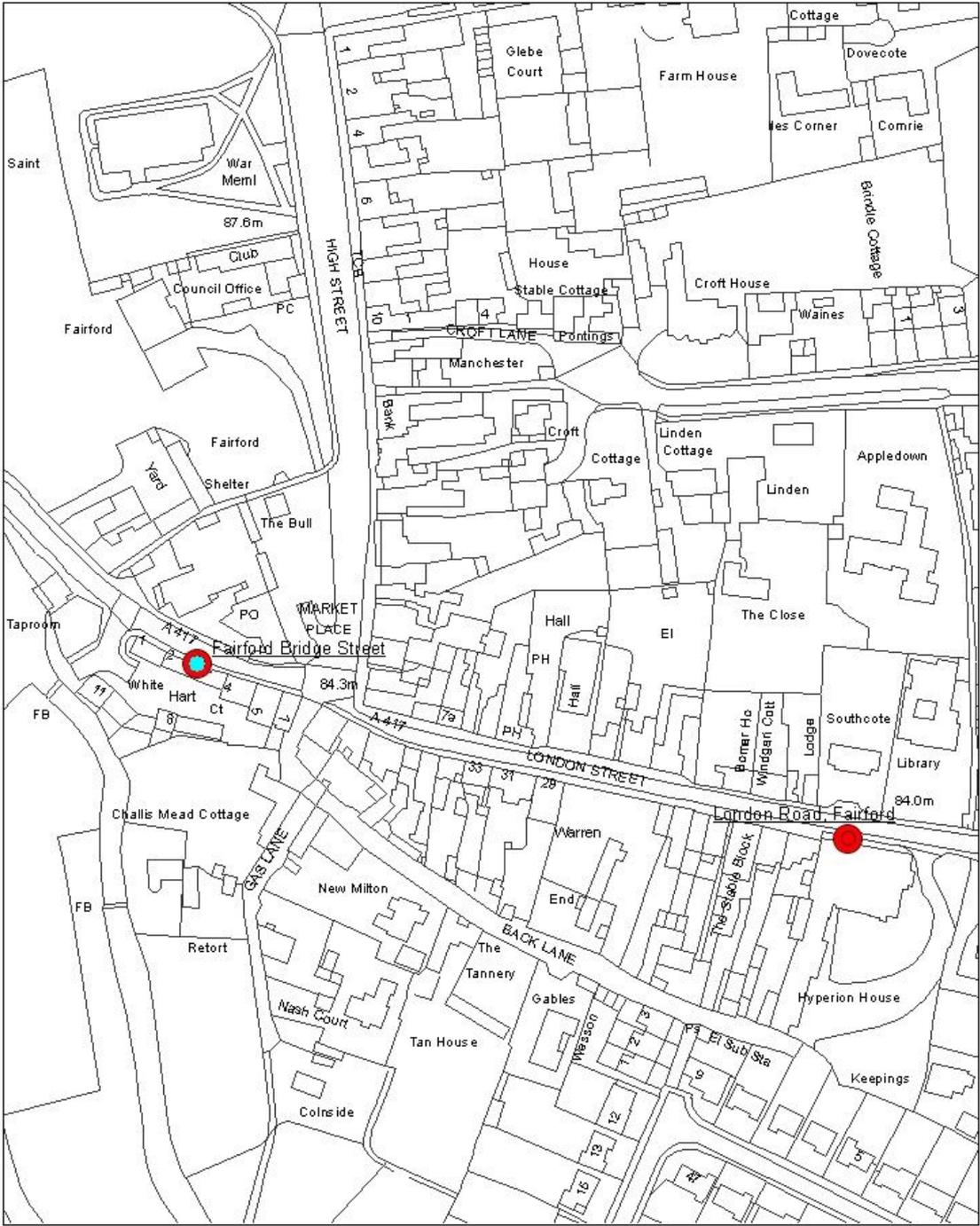


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Site T2, T3, T4, T5 Thames Street, High Street Lechlade

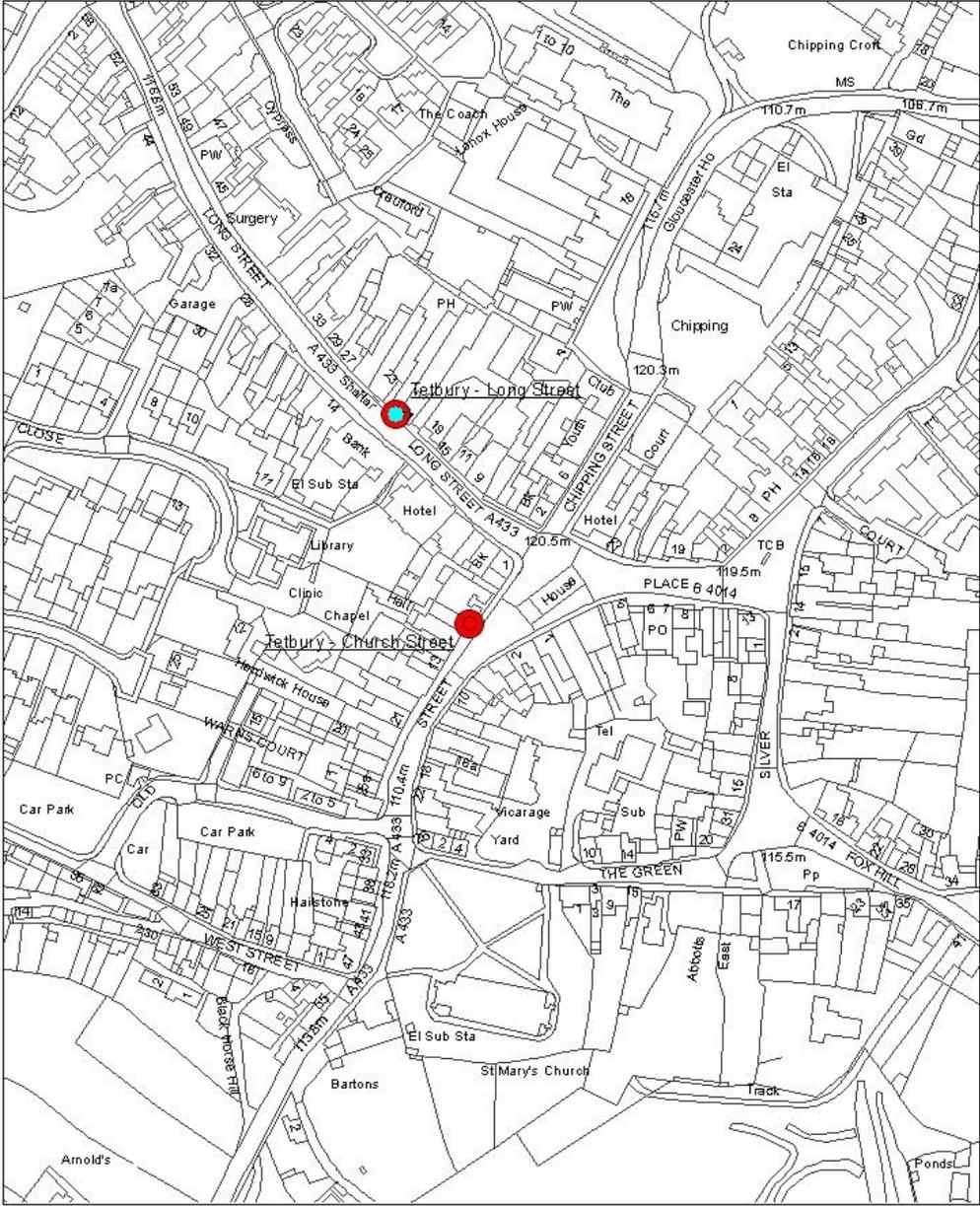


Site T6, London Road, T7 Bridge Street Fairford



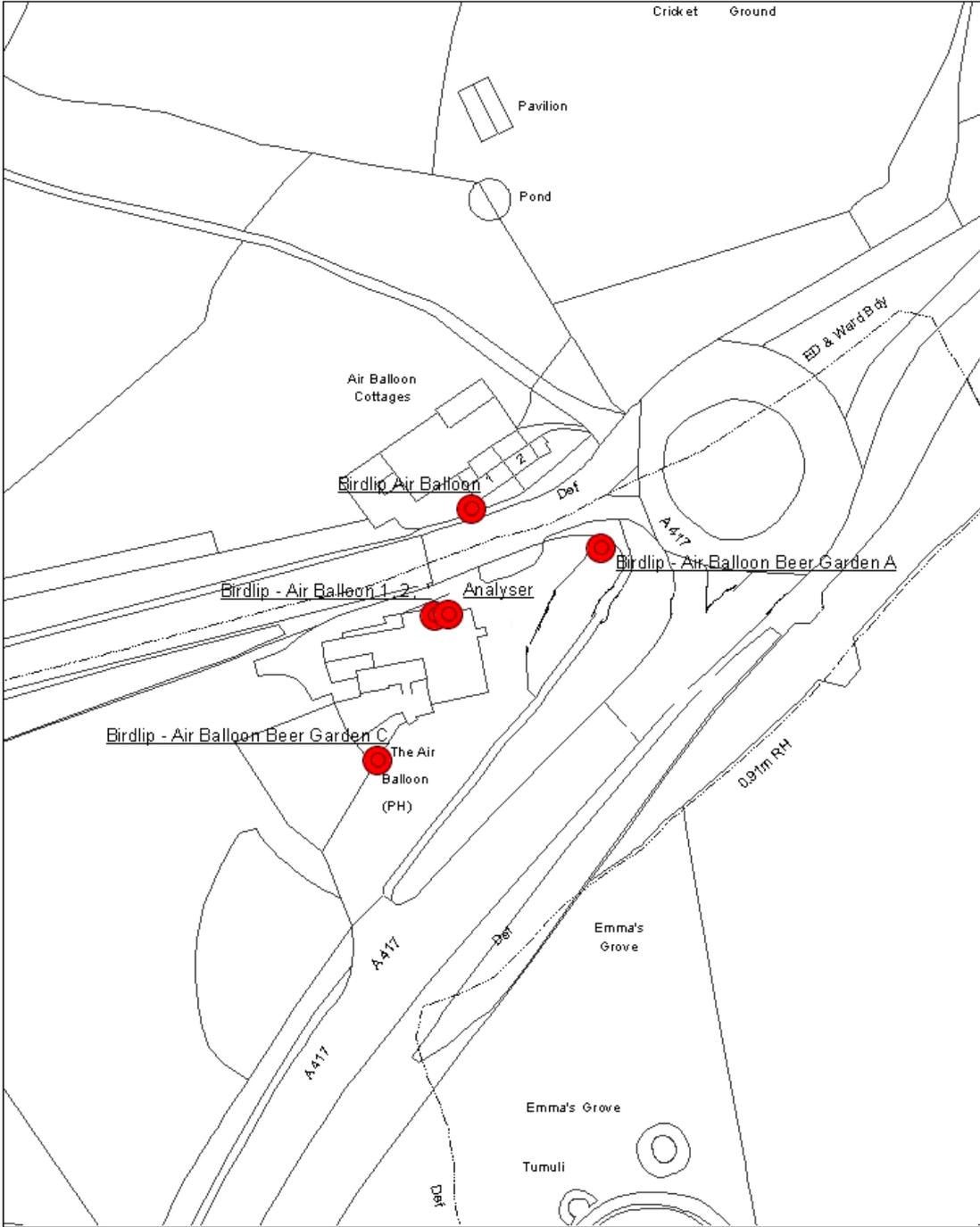
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Site T9 Church Street T10 Long Street Tetbury



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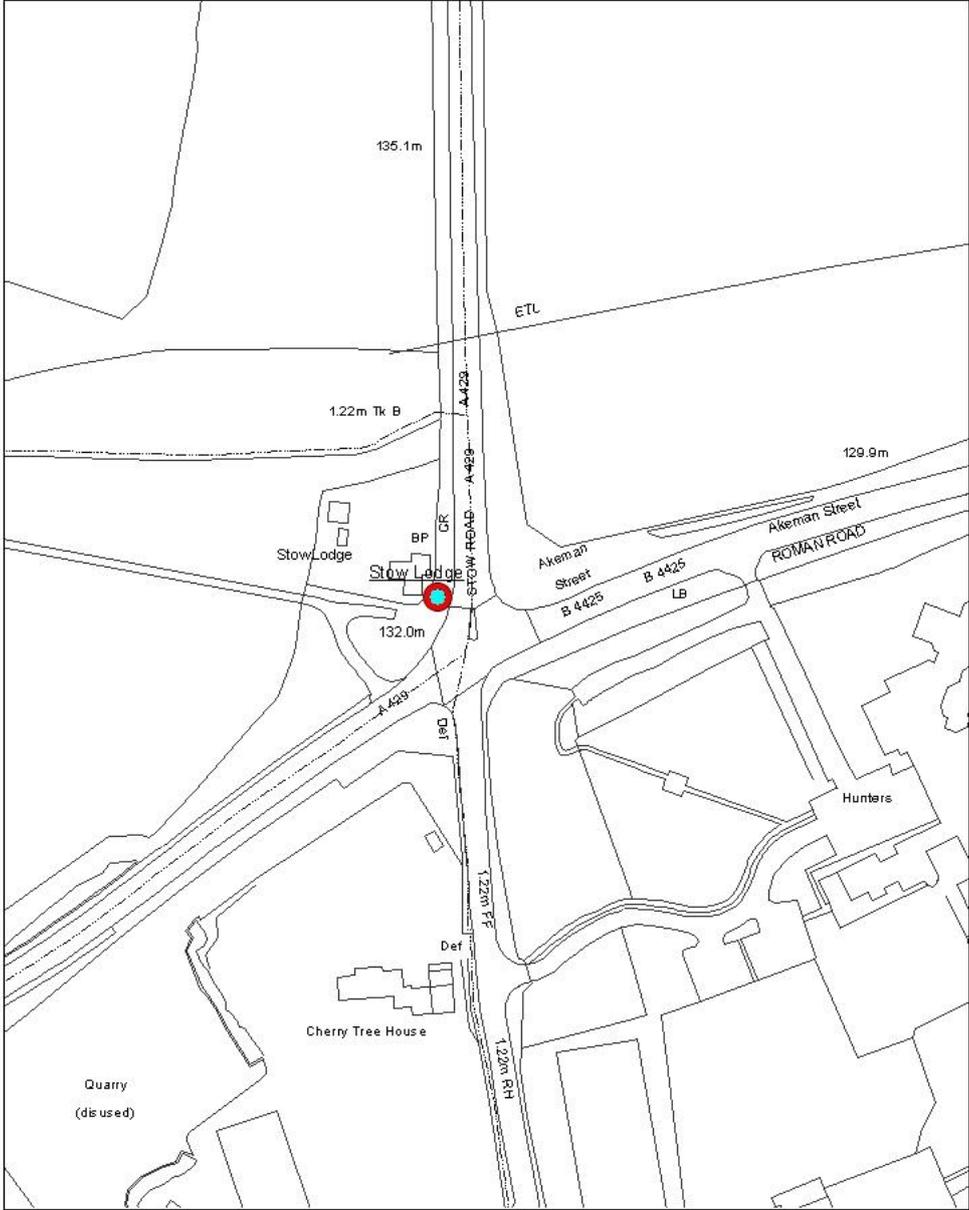
Sites at Air Balloon Roundabout T11 T12 T13 T14
T15



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Site T16 Stow Lodge



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Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

| Pollutant | Air Quality Objective ⁴ | |
|--|--|----------------|
| | Concentration | Measured as |
| Nitrogen Dioxide (NO ₂) | 200 µg/m ³ not to be exceeded more than 18 times a year | 1-hour mean |
| | 40 µg/m ³ | Annual mean |
| Particulate Matter (PM ₁₀) | 50 µg/m ³ , not to be exceeded more than 35 times a year | 24-hour mean |
| | 40 µg/m ³ | Annual mean |
| Sulphur Dioxide (SO ₂) | 350 µg/m ³ , not to be exceeded more than 24 times a year | 1-hour mean |
| | 125 µg/m ³ , not to be exceeded more than 3 times a year | 24-hour mean |
| | 266 µg/m ³ , not to be exceeded more than 35 times a year | 15-minute mean |

⁴ The units are in microgrammes of pollutant per cubic metre of air (µg/m³).

Glossary of Terms

| Abbreviation | Description |
|-------------------|---|
| AQAP | Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values' |
| AQMA | Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives |
| ASR | Air quality Annual Status Report |
| Defra | Department for Environment, Food and Rural Affairs |
| DMRB | Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England |
| EU | European Union |
| LAQM | Local Air Quality Management |
| NO ₂ | Nitrogen Dioxide |
| NO _x | Nitrogen Oxides |
| PM ₁₀ | Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less |
| PM _{2.5} | Airborne particulate matter with an aerodynamic diameter of 2.5µm or less |
| QA/QC | Quality Assurance and Quality Control |