



COTSWOLD
DISTRICT COUNCIL

2018 AIR QUALITY ANNUAL STATUS REPORT (ASR) FOR COTSWOLD DISTRICT COUNCIL

**In fulfillment of
PART IV OF THE ENVIRONMENT ACT 1995
LOCAL AIR QUALITY MANAGEMENT**

June 2018

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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, and congestion levels here.

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 (AQMAs) 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 levels in the future, but in the meantime the Council has been working with the County Highways Department regarding the traffic management controls at the junction. New traffic lights have been installed, with revised delay periods in order to improve traffic flows and reduce periods of congestion.

The Council will continue to encourage and support any measures considered by the Highways Agency to improve the situation at the Birdlip AQMA. The government's [Road Investment Strategy](#) identified this road section as requiring measures to improve safety, and to ease congestion and reduce pollution. Public consultation on two potential options was carried out between February 18th and March 29th 2018. Details can be found [here](#). The outcome of the consultation is not yet known.

It is not yet known if either of the proposals 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 which may affect 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 remains close to the national objective level in Thames Street. The problem is thought to be caused by idling traffic queuing at the

T junction. The County Highways Department are aware of this and have made changes to the traffic management at the junction. This appears to have had the effect of improving traffic flow such that the nitrogen dioxide levels have remained below the national air quality objective.

In 2017 we reviewed the monitoring locations in the survey network. Many years' worth of data in the locations being monitored, provide us with enough information to be assured that there is no problem with air quality in most of the locations previously being monitored. For continuity we decided to continue our monitoring at 4 locations, 3 within our AQMAs and 1 in Cirencester. We also set up 8 new monitoring locations, partly in response to requests of local residents represented by a pressure group known as "Save Our Cirencester", who opposed a major development scheme for housing near Cirencester and wished to see more monitoring carried out around Cirencester itself.

There are no new areas of concern that have been identified within Cotswold District Council's area. Monitoring will continue around the district and will be carried out in accordance with Defra [guidance LAQM TG\(16\)](#). An updated air quality report will be produced in 2019.

Air Quality in Cotswold District

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 AQMAs 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 in 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 is related 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.

Air quality monitoring, using a network of diffusion tubes to measure nitrogen dioxide (NO₂) levels, is undertaken throughout the district. 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

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

compared with the monitoring results from previous years. Current monitoring indicates that levels remain broadly similar to those of recent years. We monitor air quality at 13 locations throughout the district. 12 are roadside locations of which one is at a site measuring “background” levels, two are sited by junctions in an area of farmland that is to be developed in the future (Chesterton) and one is sited on a house frontage which is set back by about 12 metres from a busy main road where monitoring is also taking place (Burford Road).

The survey shows that NO₂ levels remain fairly stable in comparison to previous years and that most sites experience levels that are comfortably below the National Air Quality Objective.

The NO₂ levels remain above the national objective in the Air Balloon roundabout AQMA at Birdlip; this is as expected, as there has been no change in the usage of the roads here.

The levels in our other AQMA, in Thames Street, Lechlade, increase when we have poor meteorological conditions. The annual average appears to be linked to the amount of time each year that we experience poor dispersion conditions. This year (2017) the annual average NO₂ level was acceptable, lying below the National Air Quality Objective.

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. We are now monitoring around Chesterton, where we are expecting a major residential development in the future, which will provide us with information regarding the change in nitrogen dioxide levels as vehicular traffic in that area increases.

Defra has an internet site containing Air Quality Reports from all local authorities that have AQMAs. The Cotswold District Council reports can be viewed on the [Department for Environment Food and Rural Affairs UK air information webpage](#).

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 government’s [Road Investment Strategy](#) identified this road section as requiring measures to improve safety, and to ease congestion and reduce pollution. Public consultation on two potential

options was carried out between February 18th and March 29th 2018. Details can be found [here](#). The outcome of the consultation is not yet known.

There has been no air pollution exceedance in the AQMA at Lechlade this year, but levels in Thames Street are thought to be linked to meteorological conditions and the prevalence of poor dispersion conditions in any year. The levels remain quite high, 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. The County Highways Department has implemented new traffic controls with amended delay times, to try to improve traffic flows and reduce congestion at the T junction, in order 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 considering the traffic issues in our AQMAs, the impact of measures taken to date and what more might be done to further reduce congestion.

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 discuss such issues with our neighbouring authorities through “air quality” 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 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 the [Cotswold District Council Air Quality webpage](#).

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

This team can be contacted by email on: ers.pollution@publicagroup.uk

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Local Air Quality Management

This report provides an overview of air quality in Cotswold District during 2017.

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.

Actions to Improve Air Quality

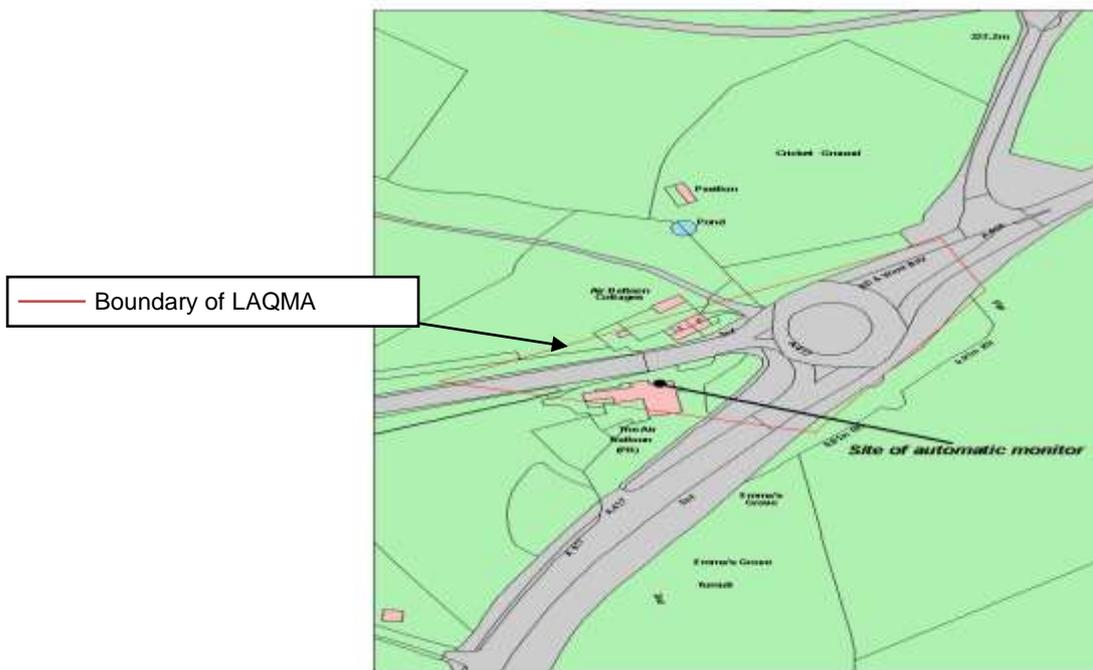
Air Quality Management Areas

Air Quality Management Areas (AQMAs) 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 0.1. Further information related to declared AQMAs, including maps of AQMA boundaries are available on the [Department for Environment Food and Rural Affairs UK air information webpage](#) and the [Cotswold District Council Air Quality webpage](#).

Figure 2.1 Maps of AQMA Boundaries

Air Balloon Birdlip



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

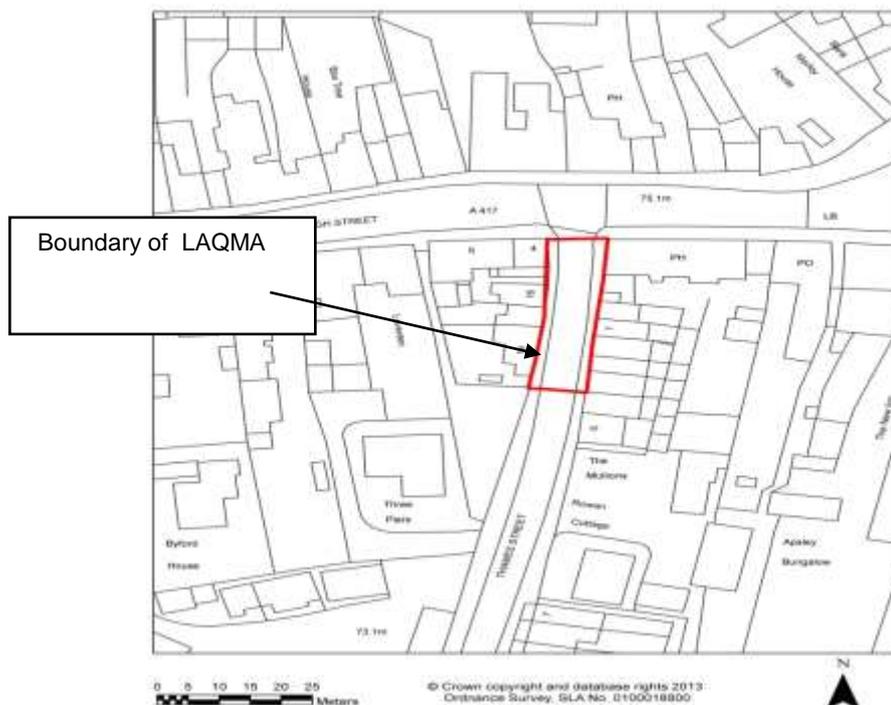


Table 0.1 – Declared Air Quality Management Areas

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	Government Road Investment Strategy - to consider new road layout
Thames Street, Lechlade	NO ₂ annual mean	Lechlade	Residential properties along Thames Street near the junction with the High Street.	County Council traffic management controls

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

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, but a public consultation has been carried out regarding two key options. 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 layout will have minimal effect on the air quality at the roundabout, although it may improve flows and improve air quality in “rat runs” around the area. Cotswold District Council will keep a watching brief on the development of this project.

In the Lechlade AQMA at the Thames Street junction with the High Street, Gloucestershire County Council Highways Department has carried out works on the traffic management controls at the T junction to improve flows and reduce congestion. The overall impact of this work has not yet been established in terms of air quality, which is closely linked to meteorological conditions especially in the winter months when poor dispersion conditions can prevail due to the proximity of the river as well as the street canyon effect.

Table 0.2 – 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 NO ₂ levels recorded	Annual average NO ₂ to be reduced to meet AQ objective	Public consultation carried out in Spring 2017	Not known	Awaiting results of consultation
2	Thames Street, Lechlade	Freight and Delivery Management	Trunk route management	CDC	I	2017	Reduced NO ₂ levels recorded	Annual average NO ₂ to be reduced to meet AQ objective	Improved traffic controls, reducing delay times	Completed 2017	Work completed
3	CDC	Promoting Low Emission Transport	Promote LEVs	CDC	Promote LEV infrastructure through Planning controls	In conjunction with government Clean Air Strategy (CAS)	Increased number of LEVs	Reduced NO ₂	Major planning applications affected	It will be an ongoing project	Government CAS currently being consulted upon
4	CDC	Promoting Travel Alternatives	Facilitate home-working	CDC			Less journeys	Reduced NO ₂	Ongoing	Ongoing	

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.

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

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.

In 2017 Cotswold District Council reviewed the monitoring locations in the nitrogen dioxide survey network. Many years' worth of data in the locations being monitored, have provided us with sufficient information to be assured that there is no problem with air quality in most of the locations previously being monitored. We decided to continue monitoring at 4 locations, 3 within our AQMAs and 1 in Cirencester for continuity. We also set up 8 new monitoring locations, partly in response to requests of local residents represented by a pressure group known as "Save Our Cirencester", who opposed a major development scheme for housing near Cirencester and wished to see more monitoring carried out around Cirencester itself.

1.1.1 Non-Automatic Monitoring Sites

Cotswold District Council undertook non- automatic (passive) monitoring of NO₂ at thirteen sites during 2017. Appendix A provides details of the sites. Maps showing the location of the monitoring sites are provided in Appendix D.

Individual Pollutants

1.1.2 Nitrogen Dioxide (NO₂)

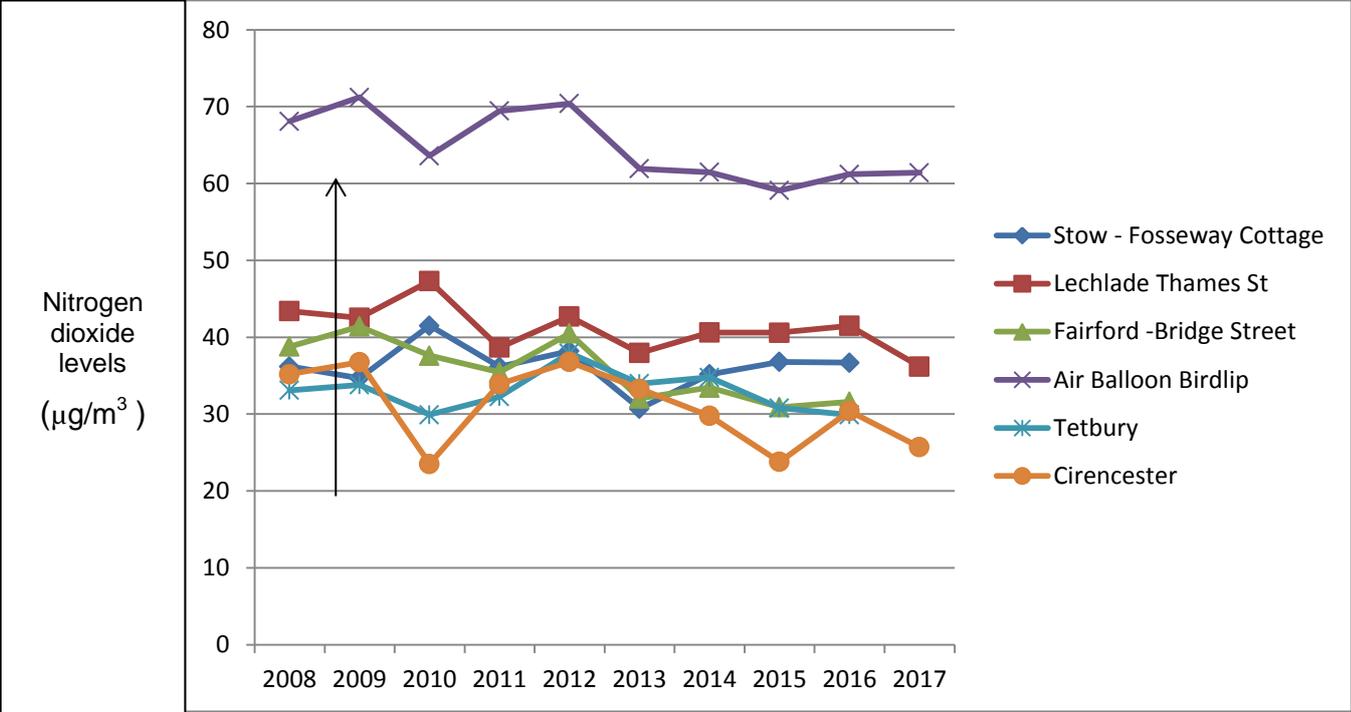
The air quality monitoring results presented in this section are, where relevant, adjusted for "annualisation" and bias. As there were at least 9 months data for each monitoring site, annualisation was not required. Details on the bias adjustment are provided in Appendix C.

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 2017 dataset of monthly mean NO₂ levels from the diffusion tube survey is provided in Appendix B.

Nitrogen dioxide levels remained 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, though to be due to meteorology causing poor atmospheric dispersion conditions, thus exacerbating the accumulation of vehicle exhaust emissions.

The annual average nitrogen dioxide level in Thames Street, Lechlade, continued to remain below 40 $\mu\text{g}/\text{m}^3$, set as the national objective level to protect health. Exhaust emissions from idling traffic queuing at the High Street junction traffic lights, cause elevated levels at this junction. The County Highways Department has altered the timing of the traffic light controls in an attempt to reduce congestion in Thames Street. Thames Street often suffers fog during inversion conditions, due to its proximity to the River Thames and dispersion of vehicle exhaust emissions is hampered by the relatively high buildings either side of the narrow road. Annual average nitrogen dioxide levels here are thought to be linked to the frequency of these meteorological conditions during the year. The Council will continue diffusion tube monitoring in the area.

Figure 2.4 Graph showing the trend in NO₂ levels at long term diffusion tube monitoring sites



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 were very similar or slightly less than last years’ levels. (2016 experienced more days with temperature inversions and foggy conditions which hindered air movement and thus dispersion and dilution of vehicle exhaust emissions.) At the Birdlip Air Balloon AQMA, 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 halted over the last few years.

It can be seen that over the last 4 years, levels at Thames Street, Lechlade, have remained consistently close to the national objective level for nitrogen dioxide, which is 40 µg/m³. The nitrogen dioxide level monitored near the Waggon and Horses in Cirencester fell slightly during 2017.

We did not monitor at the Stow, Fairford or Tetbury sites during 2017, having relocated the diffusion tube monitors to alternative sites around Cirencester. Cotswold DC has a database of monitoring carried out over a number of years and we understand the nitrogen dioxide levels that are expected at these sites. To further build our database and enhance our understanding of pollution levels around the district, it was decided to relocate the monitors to other parts of the district this year.

By comparing the monthly results (Appendix B) for the two monitoring locations in Burford Road, Cirencester, (by the roadside and on the house frontage of No. 6), the expected reduction in nitrogen dioxide levels as you move away from the roadside can be seen. This reduction is expected due to processes such as deposition of nitrogen dioxide on surrounding surfaces, and dispersion and dilution of the emitted pollutants.

The Berkeley Road and the Spratsgate Lane sites, around Chesterton Farm experience levels below $10 \mu\text{g}/\text{m}^3$ which are generally expected in locations away from any sources. This can be considered as the “background” level in the Cotswolds. These sites are in the Chesterton Farm vicinity and are being monitored so we can see the change when the new residential development is built.

Most of the Cirencester monitoring locations experience relatively low annual average levels of NO_2 considering they are roadside locations. The highest results are found in Grove Lane at the junction with Spitalgate Lane, and in London Road opposite the Wagon and Horses. In the months where dispersion is hindered by poor meteorological conditions the levels are the highest as would be expected. The levels experienced at these two locations are typical of busy roadsides around the whole country.

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
Burford Road, Cirencester (opposite 8) Roadside	Roadside	403124	202245	NO ₂	N	N	n (15m)	2m	N
Burford Road, Cirencester (o/s 8) House									
Berkeley Road (Berkeley Rd/Somerford Road junction) Cirencester (Chesterton Farm)	Roadside	402439	200297	NO ₂	Y	N	y(1m)	1m	Y
Birdlip Air Balloon	Kerbside	393462	216111	NO ₂	Y	N	y(1m)	1m	Y
Tetbury Road, Cirencester	Roadside	401064	201044	NO ₂	Y	N	y(1m)	1m	Y
Grove Road, Cirencester (o/s 62 Grove Lane j/w Spitalgate Lane)	Roadside	402305	202519	NO ₂	Y	N	y(1m)	1m	Y
Hammond Way, Cirencester (o/s Bathgate Place, nr Waitrose roundabout)	Kerbside	402039	201765	NO ₂	Y	N	y(<1m)	0.5m	Y

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?
Lechlade – High St (o/s charity shop)	Kerbside	421374	199511	NO ₂	N	N	y (<1m)	<1m	Y
Lechlade -Thames St (o/s 15)	Kerbside	421397	199489	NO ₂	Y	N	y(<1m)	0.5m	Y
Lewis Lane, Cirencester (o/s 39)	Roadside	402480	201772	NO ₂	Y	N	y(1m)	1m	Y
Cirencester – London Rd (opposite Wagon/Horses)	Kerbside	402783	201946	NO ₂	N	N	y (<1m)	<1m	Y
Somerford Road, Cirencester (o/s 34)	Roadside	402241	201102	NO ₂	Y	N	y(1m)	1m	Y
Spratsgate Lane, Cirencester (Chesterton Farm)	Roadside	402394	199581	NO ₂	Y	N	y(1m)	1m	Y

Table A.2 – Annual Mean Nitrogen Dioxide (NO₂) Diffusion Tubes Monitoring Results (2013 to 2017)

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

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) µg/m ³				
			2013* (Bias Adjustment Factor = .95)	2014* (Bias Adjustment Factor = .79)	2015* (Bias Adjustment Factor = 0.81)	2016 (Bias Adjustment Factor = 0.78)	2017 (Bias Adjustment Factor = 0.77)
T1	Stow-in-the -Wold Fosseway Cottage	N	30.71	35.18	36.8	36.7	-
T2	Lechlade - Thames Street *	Y	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	42.96	40.63	40.6	39.1	-
T4/N@IS2	Lechlade –“Cottage No 2” Thames St (no15)	Y	39.89	36.07	38.7	41.5	36.2
T5/N@IS3	Lechlade High St	N	32.65	33.26	32.9	29.1	29.0
T6	Fairford - London Rd	N	28.11	27.89	25.8	24.3	-
T7	Fairford - Bridge St	N	33.97	33.45	30.9	31.6	-
T8/N@ISI1	Cirencester - London Rd (Waggon/Horses)	N	33.28	29.78	23.8	30.4	25.7
T9	Tetbury - Church St	N	32.04	34.78	30.8	29.9	-
T10	Tetbury - Long Street	N	26.67	27.01	28.8	25.5	-
T11/N@ISI	Birdlip - Air Balloon	Y	61.93	61.46	59.1	61.2	61.4
T12	Birdlip - Air Balloon 2	Y	42.18	40.30	40.5	39.8	-
T13	Birdlip - Air Balloon 3	Y	41.60	41.38	39.4	39.2	-
T14	Birdlip - Air Balloon, beer garden A	Y	42.93	43.26	40.5	40.4	-
T16	Stow Lodge	N	33.74	32.22	31.7	33.3	-
N@ISI2	Opp 8 Burford Road, roadside	N					23.2
N@ISI3	8 Burford Road, house	N					17.8

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$				
			2013* (Bias Adjustment Factor = .95)	2014* (Bias Adjustment Factor = .79)	2015* (Bias Adjustment Factor = 0.81)	2016 (Bias Adjustment Factor = 0.78)	2017 (Bias Adjustment Factor = 0.77)
N@IS6	Berkeley Road, background (Chesterton Farm)	N					9.4
N@IS4	Tetbury Road, Cirencester	N					24.6
N@IS8	62 Grove Road, Cirencester	N					34.8
N@IS9	Hammond Way, Cirencester	N					21.0
N@IS10	Lewis Lane, Cirencester	N					22.6
N@IS7	Somerford Road, Cirencester	N					17.6
N@IS5	Spratsgate Lane, Cirencester (Chesterton Farm)	N					9.6

*Optional

Table A3 Further information about nitrogen dioxide diffusion tube monitoring in 2017

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Number of Months Data Capture 2017	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 = 0.77)
								2017 ($\mu\text{g}/\text{m}^3$)
N@IS12	Burford Road, Cirencester (opposite no 8)	Roadside	N	N	10	N/A	N	23.2
N@IS13	8 Burford Road, (house facade) Cirencester	Set back from road	N	N	11	N/A	N	17.8
N@IS6	Berkeley Road (Chesterton Farm)	Background	N	N	11	N/A	N	9.4
N@IS1	Birdlip Cottages, Air Balloon roundabout	Kerbside	Y		11	N/A	N	61.4
N@IS4	Tetbury Road, Cirencester	Roadside	N	N	11	N/A	N	24.6
N@IS8	62 Grove Road, Cirencester	Roadside	N	N	10	N/A	N	34.8
N@IS9	Hammond Way, Cirencester	Roadside	N	N	11	N/A	N	21.0
N@IS3	Lechlade High Street (o/s charity shop)	Kerbside	N	N	9	N/A	N	29.0
N@IS2	Lechlade 15 Thames Street	Kerbside	Y	N	10	N/A	N	36.2
N@IS10	39 Lewis Lane, Cirencester	Roadside	N	N	11	N/A	N	22.6
N@IS11	London Road, Cirencester (opp. Wagon + Horses)	Kerbside	N	N	10	N/A	N	25.7
N@IS7	34 Somerford Road, Cirencester	Roadside	N	N	11	N/A	N	17.6
N@IS5	Spratsgate Lane, (Chesterton Farm)	Roadside	N	N	11	N/A	N	9.6

Appendix B: Full Monthly Diffusion Tube Results for 2017

Table B.1 – NO₂ Monthly Diffusion Tube Results – 2017

AIR QUALITY DIFFUSION TUBE RESULTS -2017	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	unadjusted	BAF 0.77	
8 Burford Road, roadside		37.9	35.7	23	27.3	24.2	23.7	23.6	23.7	33.8	35.1	Missing	30.1	23.2	83.3
8 Burford Road, house frontage		26.2	26.6	21.5	19.9	17.1	17.5	20.0	23.7	22.7	29.7	26.8	23.1	17.8	91.7
Berkeley Road, background (Chesterton Farm development)		19.2	13.2	10.8	14.2	9.3	7.9	9.5	11.3	10.9	13.4	10.4	12.1	9.4	91.7
Birdlip Air Balloon roundabout (AQMA)		77.8	97.0	82.8	67.4	71.9	71.1	74.8	73.1	78.1	95.1	80.9	79.7	61.4	91.7
Tetbury Road,Cirencester		30.2	37.2	30.5	29.9	29.2	28	27.6	29.1	30.1	37.7	35.0	32.0	24.6	91.7
Grove Road, Cirencester (62, near junction with Spitalgate Lane)		52.9	40	45.2	49.1	Missing	38.8	34.1	43.6	42.7	54.2	38.8	45.2	34.8	83.3
Hammond Way, Cirencester (near Waitrose roundabout)		35.2	29.4	25.8	22.9	19	16.9	20.5	26.9	29.5	33.3	33.6	27.3	21.0	91.7
Lechlade High Street (charity shop)		Missing	38.1	Missing	42.7	33.9		27.6	35.9	32.5	39.4	39.2	37.6	29.0	75
Lechlade, 15 Thames Street (AQMA)		48.	49.4	53.4	Missing	42.5	42.	41.3	43.2	37.5	57.7	44.7	47.0	36.2	83.3

-	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	unadjusted	BAF 0.77	
		3			sing		5								
39 Lewis Lane, Cirencester		37.6	30.3	28.6	27	21.8	22.4	25.8	25.9	26.1	40.7	29.3	29.3	22.6	91.7
London Road, Cirencester (Wagon & Horses)		43.4	42.1	30.1	28.3	29.2	25.1	14.0	28.2	32.4	36.3	Missing	33.4	25.7	83.3
34 Somerford Road, Cirencester		30.8	28.1	21.7	20	14.3	15.9	17.4	19.7	23.5	28.6	23.0	22.9	17.6	91.7
Spratsgate Lane, Chesterton Farm (near junction with Parkway)		17.1	18	10.5	11.5	9.8	6.9	8.5	9.7	12.2	14.7	11.9	12.5	9.6	91.7

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 Didcot laboratories. The tubes at all locations have a monthly exposure period.

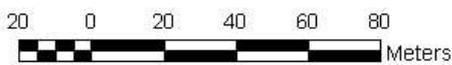
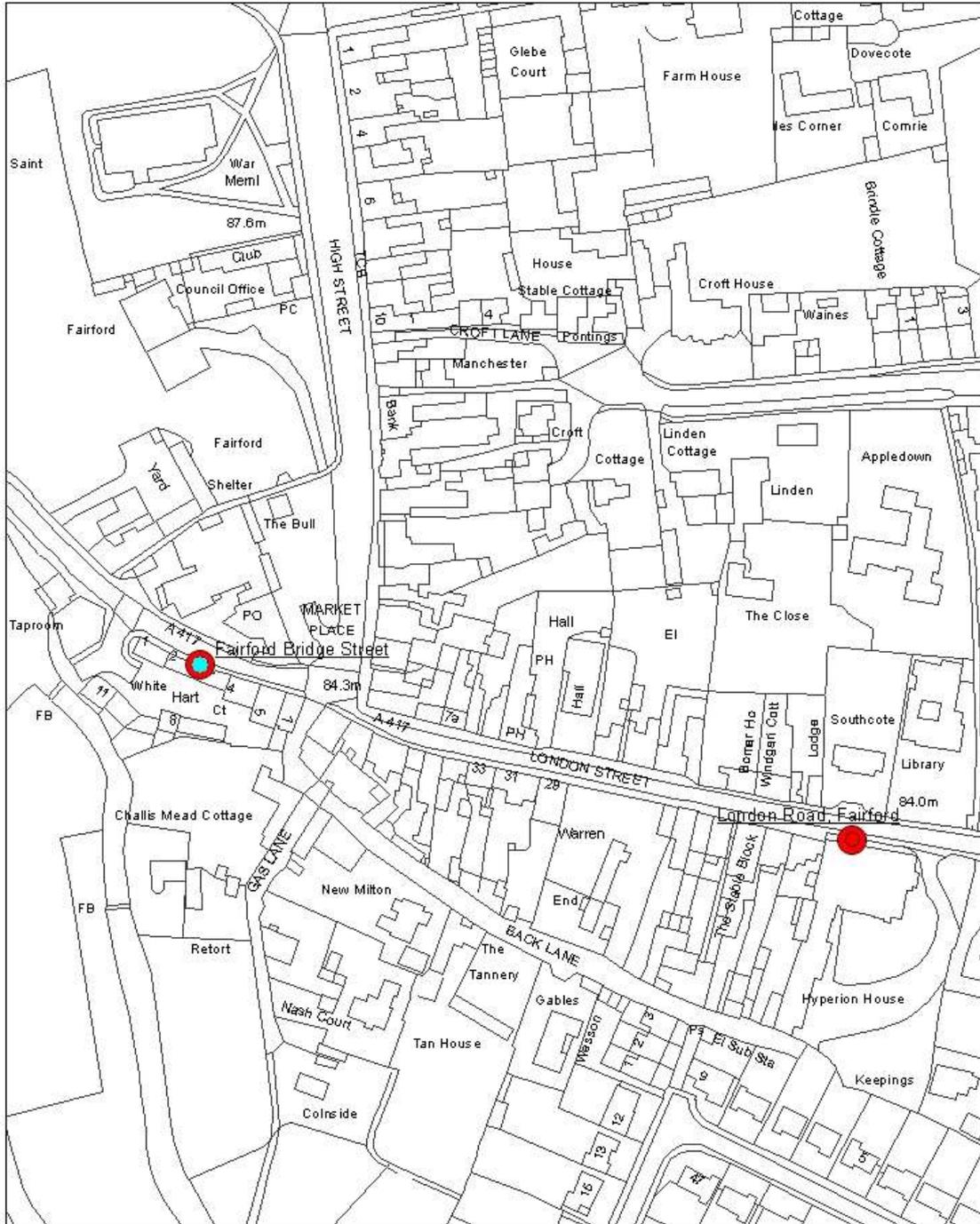
National bias adjustment factors have been extracted from the Defra database, available at: <http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html>

(see below) The factor used is 0.77 based on 27 studies and this was applied to all diffusion tubes.

National Diffusion Tube Bias Adjustment Factor Spreadsheet						Spreadsheet Version Number: 03/18				
Follow the steps below in the correct order to show the results of relevant co-location studies						This spreadsheet will be updated at the end of June 2018				
Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods						LAQM Helpdesk: 03227953				
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:		Step 2:		Step 3:		Step 4:				
Select the Laboratory that Analyses Your Tubes from the Drop-Down List		Select a Preparation Method from the Drop-Down List		Select a Year from the Drop-Down List		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 ² shown in blue at the foot of the final column.				
If a laboratory is not shown, we have no data for this laboratory.		If a preparation method is not shown, we have no data for this method at this laboratory.		If a year is not shown, we have no data		If you have your own co-location study then see footnote ⁴ . If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQM-Helpdesk@uk.bureauveritas.com or 0800 0327953				
Analysed By ¹	Method <small>To add your selection, choose (M) from the pop-up list</small>	Year ² <small>To add your selection, choose (All)</small>	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 ³	Bias Adjustment Factor (A) (Cm/Dm)
ESG Didcot	50% TEA in acetone	2017	R	Suffolk Coastal DC	12	45	37	21.7%	G	0.82
ESG Didcot	50% TEA in acetone	2017	R	Dumfries and Galloway Council	12	36	29	23.3%	G	0.81
ESG Didcot	50% TEA in acetone	2017	KS	Marlybone Road Intercomparison	12	106	79	34.3%	G	0.74
ESG Didcot	50% TEA in acetone	2017	R	Vale of White Horse District Council	11	31	25	26.0%	G	0.79
ESG Didcot	50% TEA in acetone	2017	LB	Cardiff City Council	10	29	21	35.1%	G	0.74
ESG Didcot	50% TEA in acetone	2017	R	Cambridge City Council	12	45	33	37.7%	G	0.73
ESG Didcot	50% TEA in acetone	2017	R	Wrexham County Borough Council	12	20	17	14.5%	G	0.87
ESG Didcot	50% TEA in acetone	2017	UL	North Lincolnshire Council	12	22	16	40.7%	G	0.71
ESG Didcot	50% TEA in acetone	2017	KS	Caerphilly CBC	12	37	32	15.8%	G	0.86
ESG Didcot	50% TEA in acetone	2017	R	Caerphilly CBC	11	44	29	51.2%	G	0.66
ESG Didcot	50% TEA in acetone	2017	LB	City of York Council	12	23	15	53.4%	G	0.65
ESG Didcot	50% TEA in acetone	2017	R	City of York Council	10	37	28	30.8%	G	0.76
ESG Didcot	50% TEA in acetone	2017	R	City of York Council	11	32	23	41.0%	G	0.71
ESG Didcot	50% TEA in acetone	2017	R	City of York Council	12	40	25	58.6%	G	0.63
ESG Didcot	50% TEA in acetone	2017	R	Hambleton District Council	10	21	20	4.0%	G	0.96
ESG Didcot	50% TEA in acetone	2017	R	Horsham District Council	11	35	29	18.1%	G	0.85
ESG Didcot	50% TEA in acetone	2017	R	Horsham District Council	12	31	26	21.3%	G	0.82
ESG Didcot	50% TEA in acetone	2017	R	Horsham District Council	11	33	23	41.1%	G	0.71
ESG Didcot	50% TEA in acetone	2017	LC	Leeds City Council 1	12	41	32	28.5%	G	0.78
ESG Didcot	50% TEA in acetone	2017	R	Leeds City Council 10	11	48	38	25.1%	S	0.80
ESG Didcot	50% TEA in acetone	2017	R	Leeds City Council 2	12	47	35	34.4%	S	0.74
ESG Didcot	50% TEA in acetone	2017	R	Leeds City Council 4	11	56	43	29.1%	S	0.77
ESG Didcot	50% TEA in acetone	2017	R	Leeds City Council 7	11	38	27	39.8%	S	0.72
ESG Didcot	50% TEA in acetone	2017	R	Slough Borough Council	12	45	35	26.4%	G	0.79
ESG Didcot	50% TEA in acetone	2017	LB	Slough Borough Council	12	32	25	28.6%	G	0.78
ESG Didcot	50% TEA in acetone	2017	LB	Slough Borough Council	11	39	33	19.2%	G	0.84
ESG Didcot	50% TEA in acetone	2017	R	Tunbridge Wells	12	56	40	38.2%	G	0.72
ESG Didcot	50% TEA in acetone	2017		Overall Factor² (27 studies)				Use		0.77

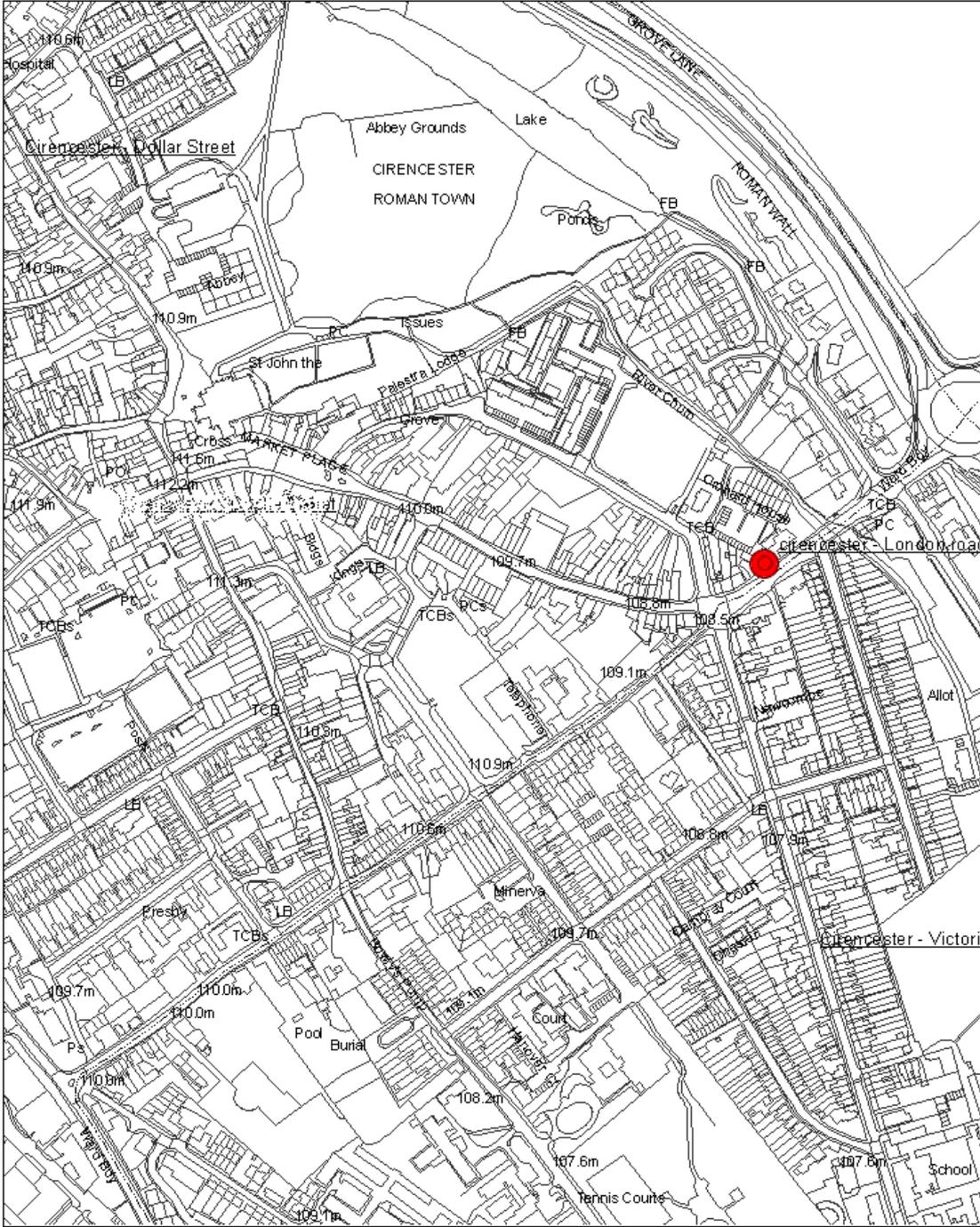
National Bias Adjustment Factor to be applied to NO2 diffusion tube data from calendar year 2017
 Screen shot of spreadsheet dated March 2018
 Factor based on 27 studies = 0.77

Site T7 Bridge Street Fairford (only referred to in Fig 2.4)



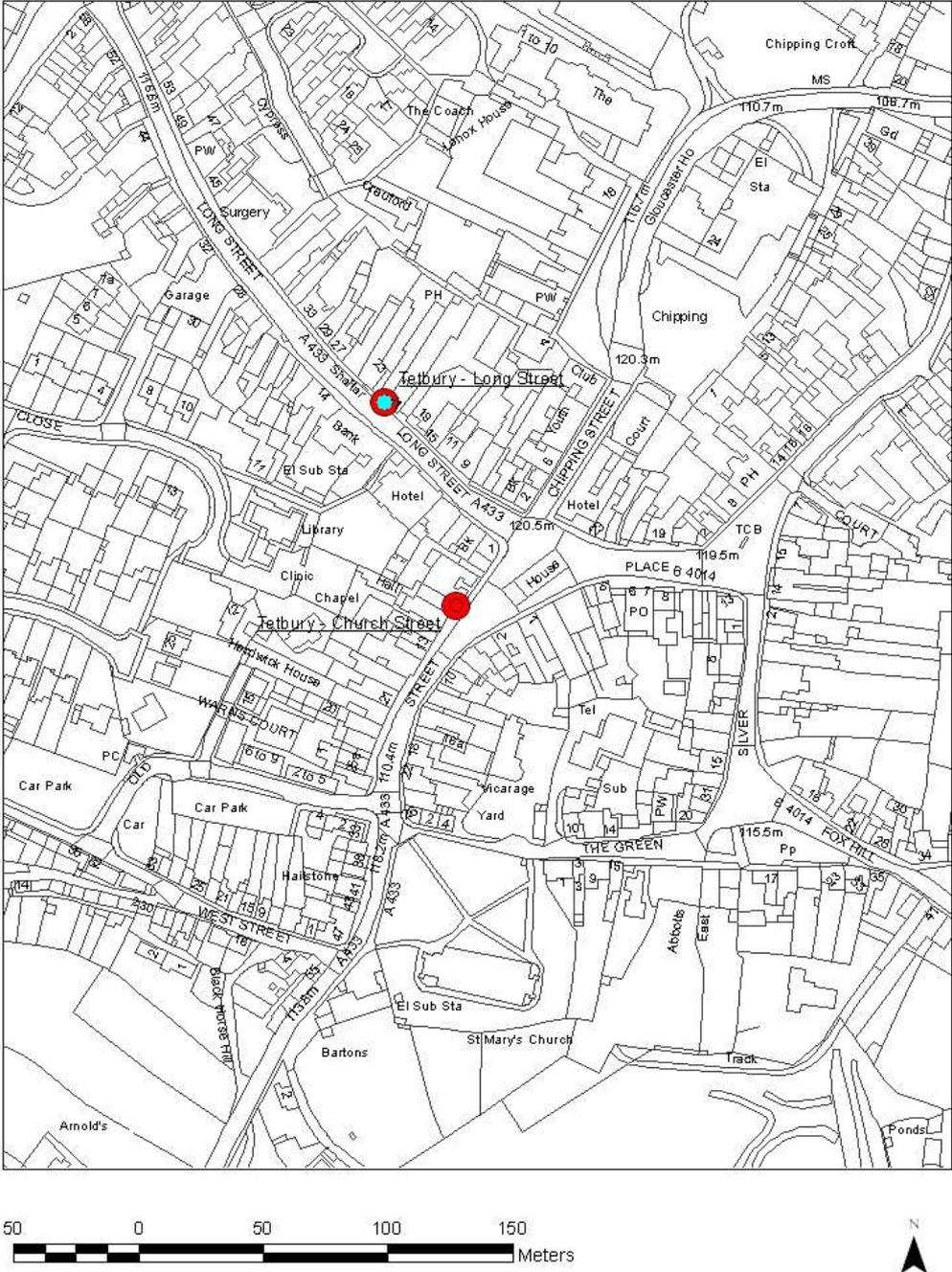
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**Site T8 London Road,(Wagon & Horses) Cirencester
Now referred to as Site N@IS11 (lamppost opposite Wagon & Horses)**



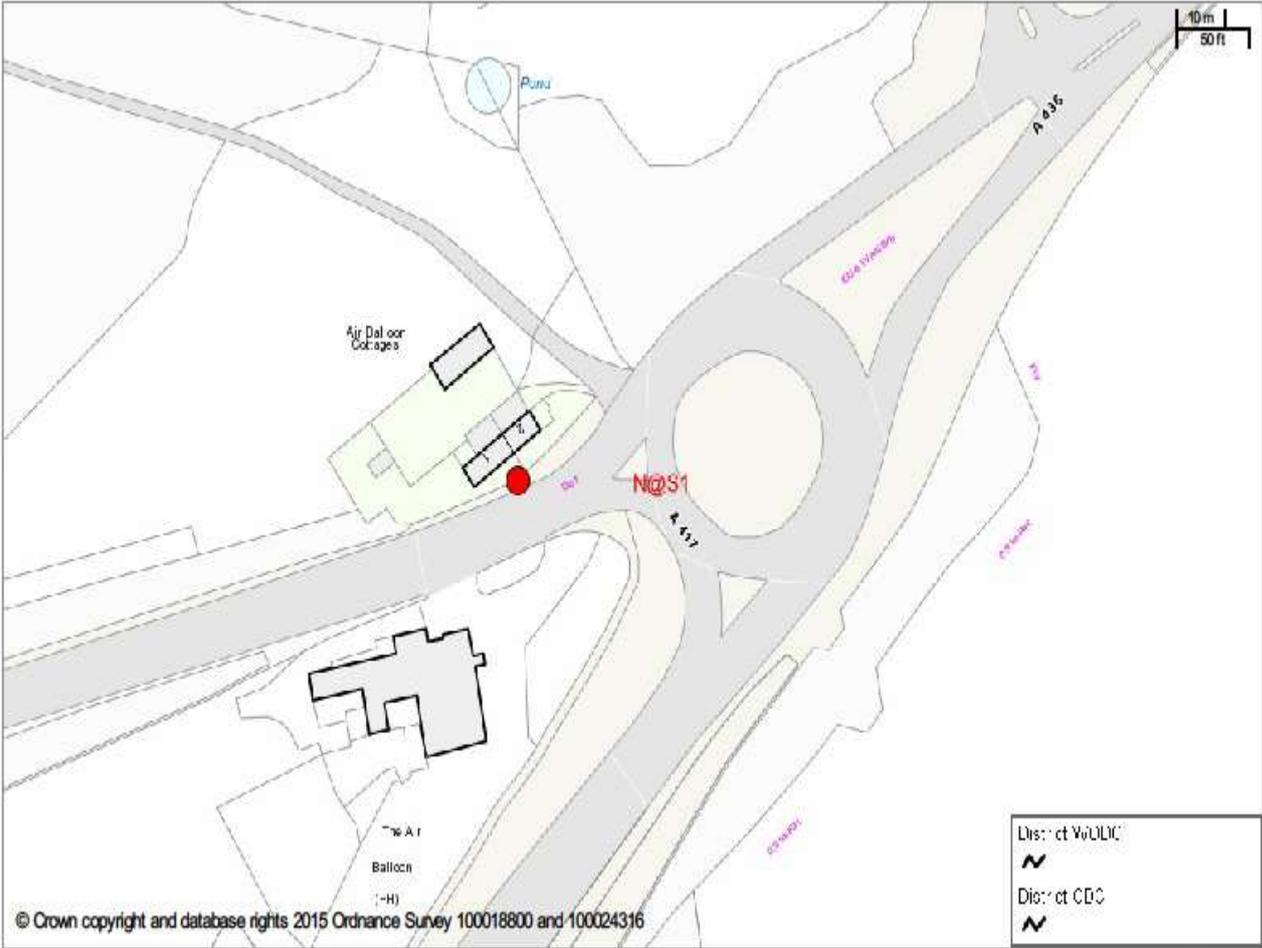
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Site T9 Church Street T10 Long Street Tetbury (only referred to in Fig 2.4)



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Site N@ISI Air Balloon Roundabout , Birdlip (AQMA)



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Site N@IS2 Thames Street and Site N@IS3 High Street, Lechlade (AQMA)

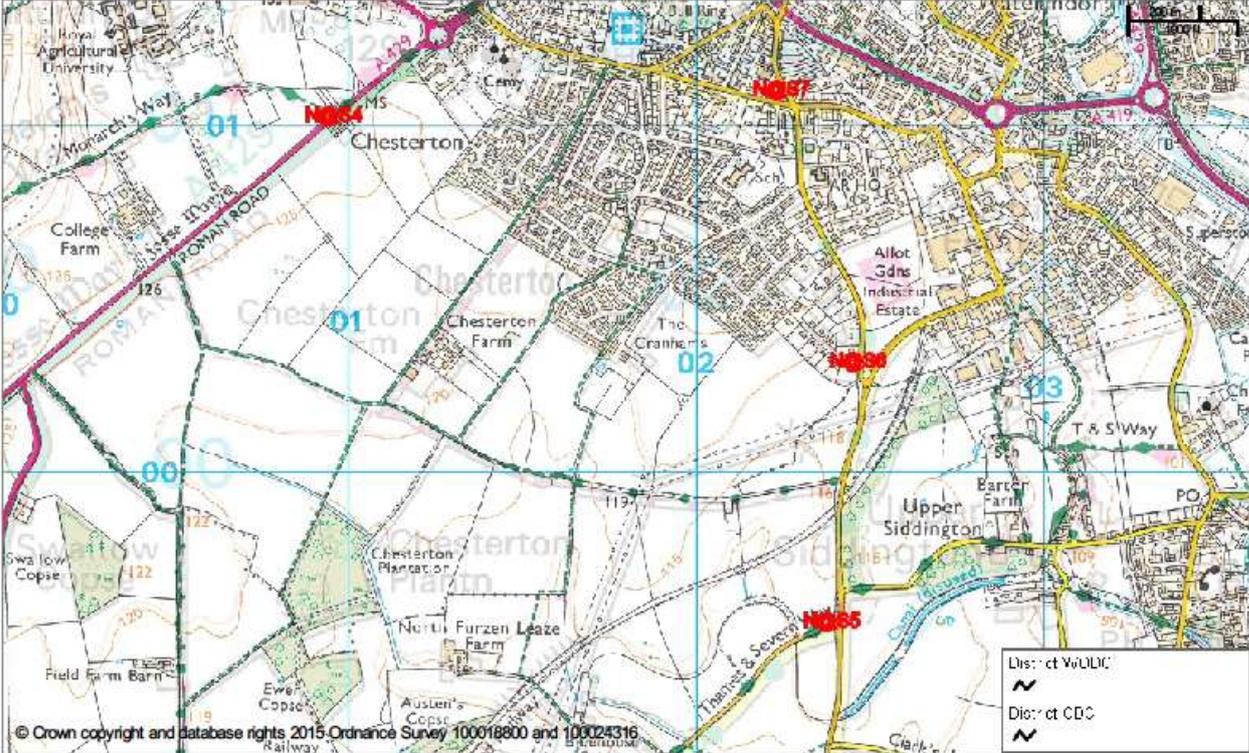


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N@S2 - 15 Thames Street, Lechlade
N@S3 - On Traffic Light, High Street, Lechlade



Overview of Sites N@IS4 – N@IS7

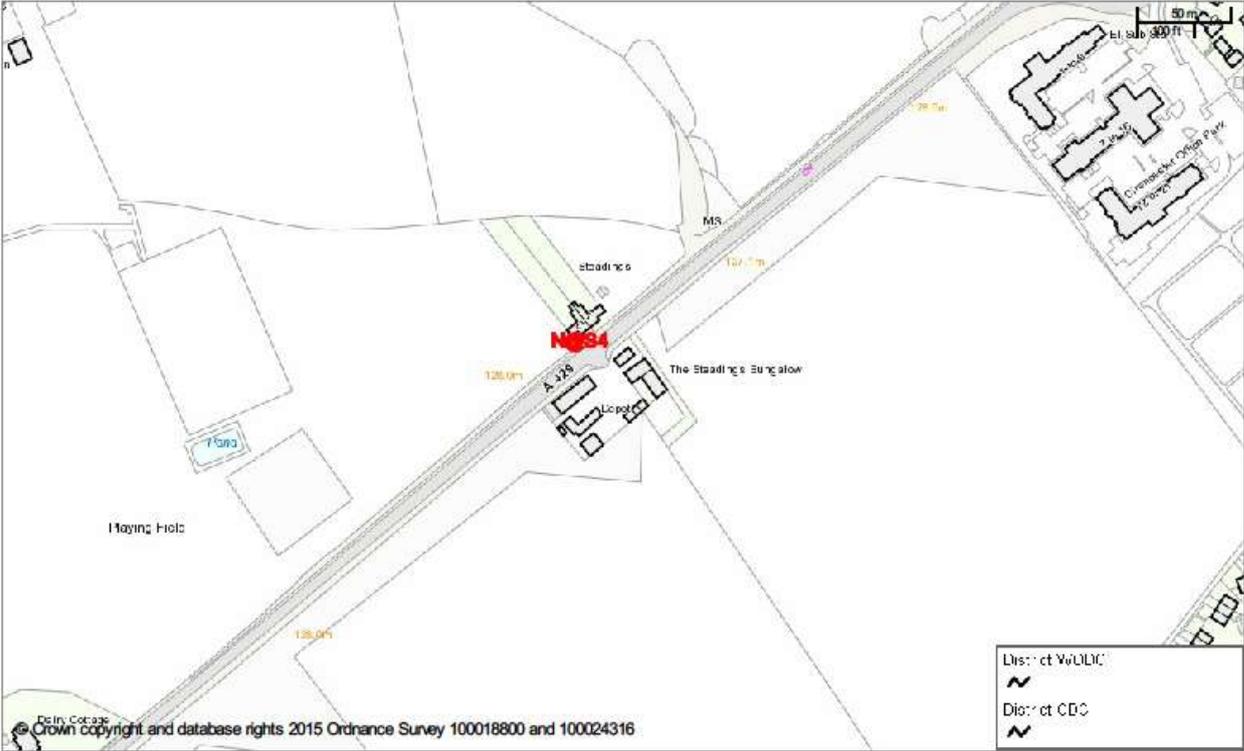


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- N@S4 - Tetbury Road on bus stop opposite Woodhouse Haulage
- N@S5 - Spratsgate Lane near j/w Parkway (On telegraph pole)
- N@S6 - Berkley Road j/w Somerford Road
- N@S7 - 34 Somerford Road (Lampost)



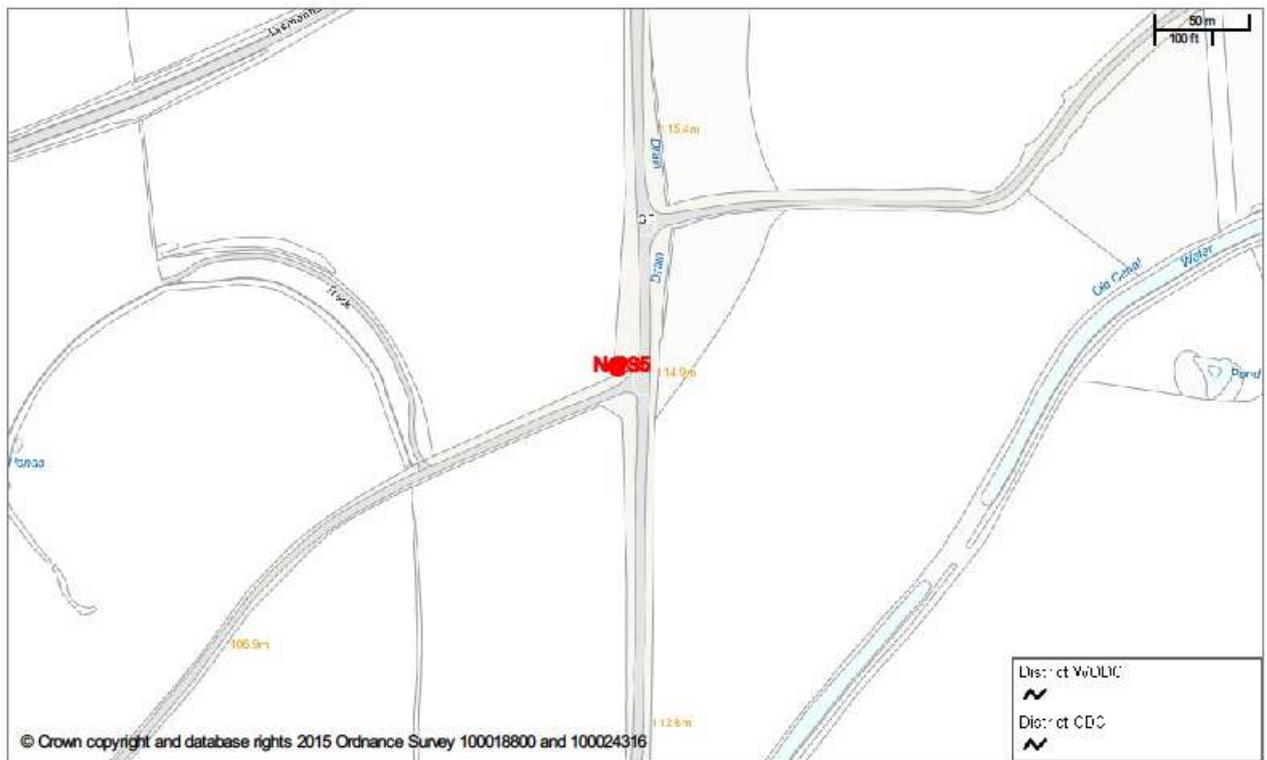
Site N@S4 Tetbury Road, Cirencester



N@S4



Site N@S5 Spratsgate Lane, Cirencester (Chesterton Farm development)



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N@S5



Site N@S7 Somerford Road, Cirencester

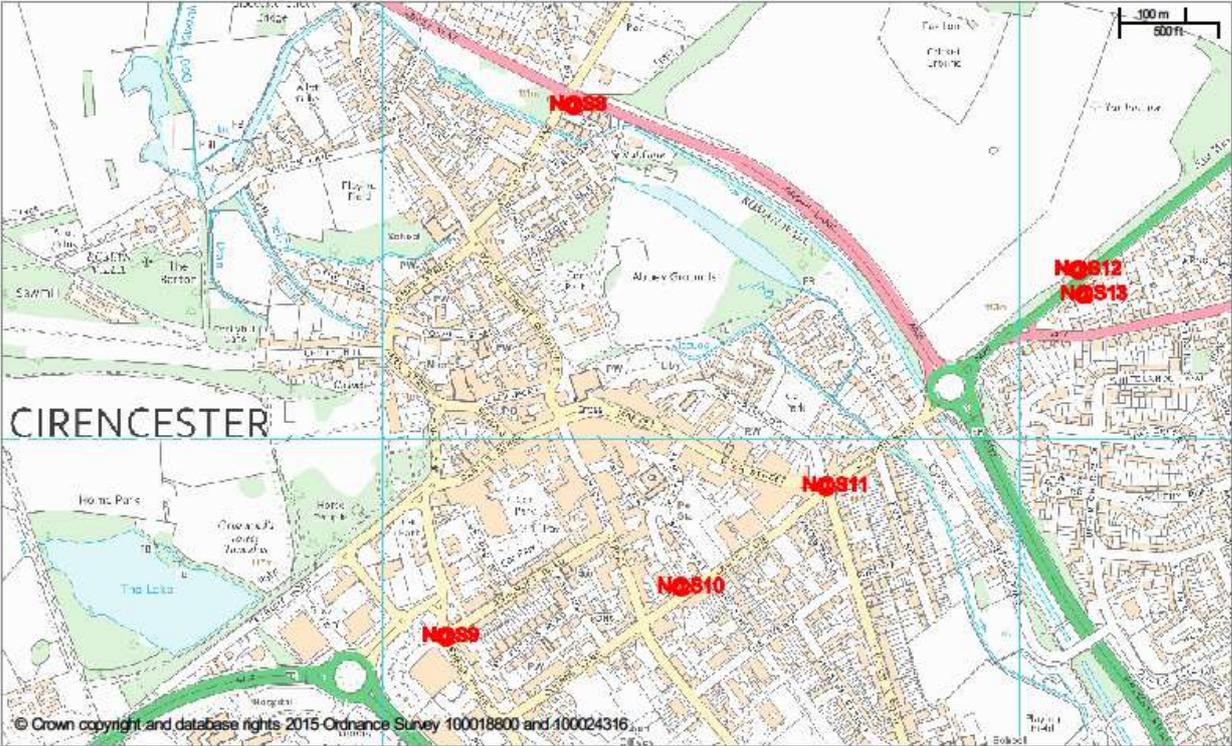


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N@S7



Overview of Sites N@IS8 – N@IS13



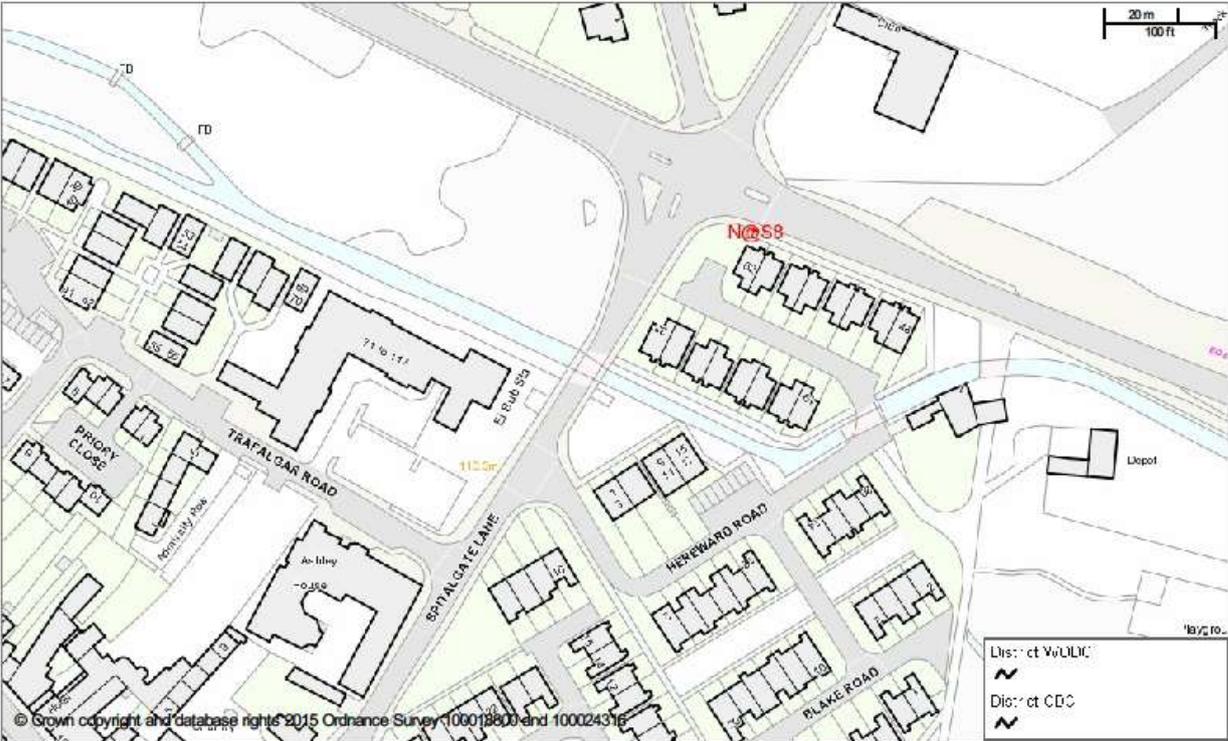
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- N@S8 - O/S 62 Grove Lane.
- N@S9 - Hammond Way
- N@S10 - O/S 39 Lewis Lane
- N@S11 - London Road opp. Waggon & Horses
- N@S12 & N@S13 - 8 Burford Road (House & lamp post opposite)



Site N@S8 Grove Lane, Cirencester



Scale: 1:1250
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N@S8



Site N@IS9 Hammond Way, Cirencester



Scale: 1:1250
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N@S9



Site N@S10 Lewis Lane, Cirencester



Scale: 1:1000
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N@S10



Site N@S11 London Road, Cirencester



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Scale: 1:1000
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N@S11



Sites N@SI12 and N@SI13 Burford Road, Cirencester



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N@S12 & N@S13



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