



2022 Air Quality Annual Status Report (ASR)

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

Date: June 2022

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Executive Summary: Air Quality in Our Area

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

In 2021, our diffusion tube network monitored nitrogen dioxide levels at 16 locations. We have long-term results at 4 of these locations, 3 within our Air Quality Management areas (AQMAs) and 1 in Cirencester. The remaining 12 locations are around Cirencester, Bourton-on-the-Water, Moreton in Marsh and at Stow-on-the-Wold. One location in Moreton-in-Marsh was repositioned at the start of 2021 with monitoring commencing in January (location S48).

In 2021 the Coronavirus pandemic continued with a third national lockdown across England between January and March 2021 and this appears to have affected traffic levels in the Cotswold area. From 8 March 2021, England began a phased exit from lockdown from then until July 2021. Across the Cotswold District nitrogen dioxide (NO₂) levels remained below 2019 (pre-pandemic) levels during these main phases of the lockdown. Although levels at the commencement of the year were somewhat lower than those of 2019, by the end of 2021 levels were recovering to close to 2019's, presumably as social activity and thus vehicular traffic recovered in response to the lifting of restrictions.

The District has two Air Quality Management Areas (AQMA), Thames Street, Lechlade and the Air Balloon Roundabout, Birdlip.

Monitoring of NO₂ was carried out at the AQMA near the junction of Thames Street, Lechlade. The monitoring point located on the junction of High Street and Thames Street was relocated across the road, some 5m from its original position, following renewal of traffic signals in 2020. Over 2021, monitoring in the new location indicates that nitrogen dioxide levels, as with previous years, were not at risk of exceeding the National Air Quality Objective, set to protect the health of residents. The reduced traffic flows, resulting from the national Covid situation, will have depressed NO₂ levels in the early part of the year. To ensure NO₂ concentrations do not increase to levels of concern at this new location, monitoring will need to continue so that we can continue to assess the situation, which is also affected by meteorological conditions, the number and type of vehicles using the junction, and congestion.

At the Air Balloon Roundabout, Birdlip, the diffusion tube data shows reduced levels of NO₂ compared to 2019, with the adjusted concentrations a little below the national objective level. The cause of the relatively high levels is traffic emissions. The adjusted concentrations were close (within 10%) of the objective level so it is intended that both monitoring and the AQMA for this location will be maintained to confirm that the observed improvement is sustained.

The air quality issue there is principally related to the quantity of vehicles using this section of road, including 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. A major road improvement scheme is planned for this location and environs which will see the existing road layout replaced. After a public consultation exercise on the proposed route in 2019, Highways England (now National Highways) chose a preferred route for a new 3.6 mile dual carriageway, known as Option 30. A further consultation was carried out between October and November 2020 and plans for the scheme have now been submitted to the Planning Inspectorate for consent.

The recommended changes to the road network in this area are subject to funding from Government being provided and the timeframe for any future alterations is not known. The proposed changes to the highway layout is likely to improve air quality at the Air Balloon roundabout as the majority of the traffic would be diverted along a new section of road before approaching the roundabout.

Further details will be found in the “Actions to Improve Air Quality” section of this report.

The Council will continue to encourage and support any measures considered by National Highways to improve the situation at the Birdlip AQMA.

Traffic management within our AQMAs is outside the direct control of Cotswold District Council, but the Council has been working with the County Highways Department regarding the traffic management controls at the junction in Lechlade. Alterations in the timing of the traffic lights in recent years to improve traffic flows and reduce periods of congestion appear to have had a positive impact on levels and combined with reduced pollutant emissions from newer vehicles, air quality has improved considerably at this junction.

Other than the amended tube position in Moreton-in-Marsh no other changes were made to tube locations this year. The effects of the coronavirus pandemic have been to reduce overall traffic volumes and measured nitrogen dioxide concentrations are not therefore

considered representative of a typical year. Going into 2022, two monitoring sites have been repositioned: one in Cirencester to take into account new development there (Stroud Road) and the other in Bourton-on-the-Water (to assess air quality in Lansdowne).

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 2023.

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, the elderly, and those with existing heart and lung conditions. There is also often a strong correlation with equalities issues because areas with poor air quality are also often less affluent areas^{1,2}.

The mortality burden of air pollution within the UK is equivalent to 28,000 to 36,000 deaths at typical ages³, with a total estimated healthcare cost to the NHS and social care of £157 million in 2017⁴.

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.

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 of 40 ug/m³, set to protect health, and compared with the monitoring results from previous years. Current monitoring indicates that background levels were somewhat similar to those of recent years but levels at the more trafficked monitoring sites were noticeably lower. The 16 locations throughout the district where we monitor air quality are mainly roadside locations, of which one is at a site measuring “background” levels and two are situated by junctions in an area of farmland that is to be developed in the future (Chesterton).

¹ Public Health England. Air Quality: A Briefing for Directors of Public Health, 2017

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

³ Defra. Air quality appraisal: damage cost guidance, July 2021

⁴ Public Health England. Estimation of costs to the NHS and social care due to the health impacts of air pollution: summary report, May 2018

The two AQMAs in the district, both declared because nitrogen dioxide levels, relate to traffic emissions and exceeded the national objective at the time of the declaration.

The two AQMAs 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. Here, the diffusion tube data shows increased levels of nitrogen dioxide (NO₂) compared to last year, with the adjusted concentrations a little below the national objective level. This probably reflects the easing of lockdown restrictions during 2021 and thus increased social mobility.

In Thames Street, Lechlade, the AQMA is related to the road which has in the past suffered congestion at the traffic light controlled junction, during rush hours in particular. The levels in Thames Street tend to increase when we have poor meteorological conditions. A street canyon effect combined with frequent foggy conditions (when there is an inversion layer due to proximity to the nearby River Thames), exacerbates the accumulation of traffic exhaust emissions as atmospheric dispersion and dilution is inhibited. Since alterations to the timing of the traffic lights, the area is no longer suffering poor air quality; during 2020 the annual average NO₂ level was acceptable, lying below the National Air Quality Objective. However, the situation is still being reviewed because although nitrogen dioxide levels monitored in the High Street fell during both 2018 and 2019, there was a marginal increase in measured annual nitrogen dioxide concentrations at Thames Street in 2019 compared with 2018. As the Covid pandemic affected local traffic levels in most towns and cities from around February 2020, the results of monitoring during 2020 may not be representative of levels that might have been obtained had the year been more “typical”. Therefore, monitoring will be continued at this location for at least another year before a decision is made about revoking the AQMA.

The District’s air quality monitoring shows that NO₂ levels during 2020 were below the National Air Quality Objective in all locations. At the Air Balloon roundabout, Birdlip, levels have fallen since last year but remain close to the National Air Quality Objective of 40 ug/m³.

The elevated concentrations are expected, as this location is a very heavily trafficked section of road which suffers severe congestion during both morning and afternoon

periods (an extended “rush hour”), and there has been no change in the layout of the roads at this roundabout.

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 continue to monitor around Chesterton, where we are expecting a major residential development in the future, thus collecting information which will help us identify any change in nitrogen dioxide levels as vehicular traffic in that area increases.

DEFRA has an internet site containing air quality information from all local authorities that have AQMAs. The page for Cotswold District Council reports can be found here:

[Link to CDC AQMA Information](#)

Actions to Improve Air Quality

Whilst air quality has improved significantly in recent decades, and will continue to improve due to national policy decisions, there are some areas where local action is needed to improve air quality further.

The 2019 Clean Air Strategy⁵ sets out the case for action, with goals to reduce exposure to harmful pollutants. The Road to Zero⁶ sets out the approach to reduce exhaust emissions from road transport through a number of mechanisms; this is extremely important given that the majority of Air Quality Management Areas are designated due to elevated concentrations heavily influenced by transport emissions.

Air Quality in the Cotswold 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

⁵ Defra. Clean Air Strategy, 2019

⁶ DfT. The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy, July 2018

alternative transport, through a working group led by the County Highways Department. These measures are moving forward.

The Government's Road Investment Strategy: 2015-2020 initially identified this road section, known as the "Missing Link" as requiring measures to improve safety, ease congestion and reduce pollution at the Air Balloon Roundabout. Once completed this will provide full dual-carriageway from the M4 at Swindon to the M5 in Gloucestershire and should remove the current traffic bottleneck centred on Crickley Hill, Birdlip and further south at Nettleton. It is hoped that this will significantly reduce nitrogen dioxide concentrations at this location so that the AQMA can be revoked (formally cancelled).

The scheme is led by National Highways. Progress has been made during 2021. After a public consultation exercise on the proposed route in September and October 2019 (details can be found [here](#)), Highways England chose a preferred route for a new 3.6 mile dual carriageway, known as Option 30. A further consultation was carried out on updated proposals between October and November 2020. The Planning Inspectorate has accepted proposals for the A417 Missing Link for formal examination. At the end of 2021 the Planning Inspectorate announced the start of a six-month examination of the Development Consent Order (DCO) application by National Highways for the proposed scheme. More information about this process and how to get involved on the Planning Inspectorate's website here:

[Link to Planning Inspectorate Website for examination of A417 Missing Link](#)

The recommended changes to the road network in this area are subject to funding from Government being provided and the timeframe for this is not known. The Road Investment Strategy 2 (RIS2) : 2020-2025 confirms that the A417 Air Balloon project is committed for the second Road Period 2 (RP2) and that construction of this project is expected to start by 1 April 2025.

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. Although below the national objective level, the NO₂ levels remain fairly elevated so monitoring will continue for now, at least until there is sustained evidence post-pandemic that these observed levels are sustained.

Into 2022, the District Council is working with the County Council to set up an extension to the School Streets scheme in Cirencester. Roads within a School Streets area will only be open to pedestrians, cyclists and those with exemptions, including emergency vehicles, Blue Badge holders and residents, for a short period at the start and end of each school day. This is in order to encourage safer means for children to access their school, and improve air quality in and around school gates. Additional nitrogen dioxide monitoring has been set up in advance of

the scheme taking effect to assess the effect on local air quality. This will be reported on from 2023.

Conclusions and Priorities

Over the next year we will continue the diffusion tube monitoring survey. We will continue discussions with the County Council and National Highways considering the traffic issues in our AQMAs, the impact of measures taken to date and what more might be done to further reduce congestion.

2021's monitoring, as with 2020, has shown a marked decrease in nitrogen dioxide levels across the whole of the district with the most significant reductions in urban centres such as Cirencester and with the AQMA at Birdlip. This has been attributed predominantly to the Covid pandemic which affected most activities in the UK throughout 2021 and importantly resulted in a general reduction in traffic levels particularly during the height of the lockdown.

Both the District's AQMAs saw reductions in NO₂ concentrations which although continuing previous trends were larger than would have been expected pre-Covid. The annual concentrations at both were below the air quality objective. However, the AQMAs will not be revoked until levels are consistently below the National Air Quality Objective level post-pandemic.

The Council will continue to work with other bodies especially National Highways to develop the new road A417 scheme especially as it affects the highways approaching the Air Balloon roundabout. It is hoped that this will eventually allow revocation (cancelling) of the AQMA at this location. Similarly it is hoped that continuing monitoring in the centre of Lechlade post pandemic will allow a decision will be made as to whether air quality remains sufficiently improved there to allow this AQMA to be revoked.

Whilst this remains a distinct possibility it is considered that no updates to air quality plans are required.

Local Engagement and How to Get Involved

As the air pollution of concern in the Cotswold District is related to traffic emissions, we can all do our bit to reduce emissions, such as by not using a car unless entirely necessary. In addition, walking, cycling, 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:

[Cotswold District Council Air Quality](#)

Any queries about Air Quality should be directed to the Environmental Pollution team within Cotswold District Council. This team can be contacted by email at: ers@cotswold.gov.uk

Table of Contents

Executive Summary: Air Quality in Our Area	i
Air Quality in Cotswold District Council	iv
Actions to Improve Air Quality	vi
Conclusions and Priorities	viii
Local Engagement and How to Get Involved	viii
1 Local Air Quality Management	1
2 Actions to Improve Air Quality	2
Air Quality Management Areas	2
Progress and Impact of Measures to address Air Quality in Cotswold District Council	4
PM _{2.5} – Local Authority Approach to Reducing Emissions and/or Concentrations	10
2.3.1 General Approach	10
2.3.2 Public Health Outcomes Framework	10
3 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance	12
Summary of Monitoring Undertaken	12
3.1.1 Automatic Monitoring Sites	12
3.1.2 Non-Automatic Monitoring Sites	12
Individual Pollutants	12
3.1.3 Nitrogen Dioxide (NO ₂)	13
3.1.4 Particulate Matter	16
Appendix A: Monitoring Results	18
Appendix B: Full Monthly Diffusion Tube Results for 2021	23
Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC	25
New or Changed Sources Identified Within Cotswold District During 2021	25
Additional Air Quality Works Undertaken by Cotswold District During 2021	25
QA/QC of Diffusion Tube Monitoring	25
Diffusion Tube Annualisation	25
Diffusion Tube Bias Adjustment Factors	26
NO ₂ Fall-off with Distance from the Road	27
Appendix D: Map(s) of Monitoring Locations and AQMAs	28
Appendix E: Summary of Air Quality Objectives in England	41
Glossary of Terms	42
References	43

Figures

Figure 2.1 Extract from EIA Section 5 Assessment showing proposed scheme at Birdlip ...	7
Figure 3.1 Comparison NO ₂ concentrations, Air Balloon, during 2019 and 2021	13
Figure 3.2 Comparison NO ₂ concentrations, Lechlade Thames St, during 2019 & 2021	14
Figure D.1 – Maps of AQMA Boundaries.....	28
Figure D2 Maps of Non-Automatic Monitoring Sites.....	30

Tables

Table 2.1 – Declared Air Quality Management Areas.....	3
Table 2.2 Comments and actions arising from the previous years' report.....	4
Table 2.2 – Progress on Measures to Improve Air Quality.....	9
Table A.1 – Details of Non-Automatic Monitoring Sites	17
Table A.2 – Annual Mean NO ₂ Monitoring Results: Non-Automatic Monitoring (µg/m ³)	20
Table B.1 – NO ₂ 2021 Diffusion Tube Results (µg/m ³)	23
Table C.1 – Bias Adjustment Factor	27
Table C.2 – NO ₂ Fall off With Distance Calculations	26
Table E.1 – Air Quality Objectives in England	41

1 Local Air Quality Management

This report provides an overview of air quality in Cotswold District Council during 2021. 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 are presented in Table E.1.

2 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 should prepare an Air Quality Action Plan (AQAP) within 12 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

A summary of AQMAs declared by Cotswold District Council can be found in can be found in **Error! Reference source not found.** Further information related to declared AQMAs are below, maps of AQMA boundaries are in Appendix D and available online at [AQMAs Declared by Cotswold District Council](#) and on the Council's own web page: [Cotswold District Council's air quality webpage](#).

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	One Line Description	Is air quality in the AQMA influenced by roads controlled by National Highways?	Level of Exceedance: Declaration	Level of Exceedance: Current Year	Name and Date of AQAP Publication	Web Link to AQAP
Air Balloon Roundabout	08.04.2008	NO ₂ Annual Mean	An area encompassing properties adjacent to the roundabout on a strategic trunk route	YES	55 µg/m ³	35.5 µg/m ³	Air Quality Action Plan 2011 - Birdlip – Air Balloon Roundabout Action Plan page Government Road Investment Strategy – proposed new road layout Road Investment Strategy	Cotswold District Council Air Quality Pages
Thames Street, Lechlade	02.04.2014	NO ₂ Annual Mean	An area encompassing a number of properties at the junction of High Street and Thames Street, Lechlade.	No	41 µg/m ³	23.2 µg/m ³	County Council traffic management controls	Need for action plan is under review because of improving air quality

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

Each year the Council's Air Quality Annual Status Report is submitted to central Government (DEFRA) for peer review before publishing. DEFRA's comments on presentation and treatment of data are considered and where appropriate incorporated into the following year's updated report. Comments arising from the 2020 report review included those shown in Table 2.2 below along with the actions taken.

Table 2.2 Comments and actions arising from the previous years' report

Comment	Action
The Council has included discussion and review of its AQMAs and monitoring strategy with some air quality improvements seen however we won't know the true extent of the improvements until the next year with the current data for 2020 compounded by the pandemic lockdowns	Pandemic lockdowns continued to impact measurements in 2021. This action will be carried over to post-pandemic assessments.
We note that the need for an updated AQAP was mentioned in last years' ASR appraisal, and there is deliberation on whether an AQAP is required with the improving air quality in the AQMA. If the air quality does not continue to improve going forward, then the Council should consider adopting a new AQAP in the future.	The need for action plans is being constantly reviewed. It is dependent on post pandemic assessment and in the case of the AQMA at Birdlip upon the progression of the proposed A417 "Missing Link" highway improvements. However broad objectives as set out in the existing plan have not changed.
The Public Health Outcomes Frameworks was mentioned. The Council have referred specifically to indicator D01, which is the fraction of mortality attributable to particulate air pollution, and this is encouraged. No measures discussed to address PM2.5 emissions.	At this time local PM _{2.5} concentrations are not expected to exceed levels of concern, however the Council is aware of ongoing consultations and proposals for addressing PM2.5 and will adapt accordingly.
Council have provided a clear map of the diffusion tube monitoring network; trends are displayed and discussed in great depth in the report, however some of the graphs do not display concentration values on the y-axis.	This has been rectified for this year's report
Overall the report is detailed, concise and satisfies the criteria of relevant standards. The Council should continue their good and thorough work.	

Some progress has been made to address air quality in the District and this is described below and summarised in Table 2.3.

One of the two AQMAs in the Cotswolds District is on the A417 at the **Air Balloon Roundabout**. The A417 runs between Gloucester, Cirencester and Swindon and is used by many motorists travelling between London and the West Midlands as a shortcut between the M4 and the M5. Central Government is making funds available for major alterations to the Air Balloon Roundabout and approach roads in due course. Once completed, this will provide full dual-carriageway from the M4 at Swindon to the M5 in Gloucestershire and should remove the current traffic bottleneck centred on Crickley Hill, Birdlip and further south at Nettleton. This work is being led by the part of central Government responsible for roads, National Highways (formerly Highways England).

During 2019, Highways England chose a preferred route for a new 3.6 mile dual carriageway which will cost £435million, known as Option 30. Highways England carried out a public consultation exercise on the proposed route in September and October 2019. This is the current timeline:

- December 2014: Scheme announced
- February - March 2018: Route options consultation
- April 2018 - Spring 2019: Selection and development of preferred route
- Spring 2019: Preferred route announcement
- September 2019: Statutory consultation
- October 2020 Further consultation following changes arising from 2019 consult
- During 2021: -Development Consent Order (DCO) proposals submitted to the Planning Inspectorate
- Examination and hearings continue in 2022

Further information on the scheme can be found here:

[National Highways Information Webpages](#)

The scheme would include:

- Some 3.4 miles of new dual carriageway connecting the existing A417 Brockworth bypass with the existing A417 dual carriageway south of Cowley
- The section to the west of the existing Air Balloon roundabout would follow the existing A417 corridor. However, the section to the south and east of the Air Balloon roundabout would be offline, away from the existing road corridor

- A new junction at Shab Hill, providing a link from the A417 to the A436 towards Oxford and into Birdlip
- A new junction would be included near Cowley, replacing the existing Cowley roundabout.

National Highways has commissioned various environmental studies in connection with preparations for the scheme. Of particular relevance is:

- Arup, A417 Missing Link Preliminary Environmental Information Report, Chapter 5 Air Quality, Sept 2020.

A link is available to this report, here: [Link to A417 Air Quality Assessment Report](#)

The consultants undertook modelling of air quality for the project (using ADMS –Roads software) considering an existing (baseline) scenario and the effects on local air quality with and without the proposed scheme, by 2024. The modelling predicts that overall traffic will increase along the A417 but traffic flow is improved and is moved away from the sensitive receptors (Air Balloon Inn and cottages) at the roundabout. Also, traffic will be significantly reduced south of the Air Balloon Roundabout along the existing alignment. The modelling predicts an improvement in NO₂ concentration of 13ug/m³ (over 2016 baseline figures see the above report Table 5-6, receptor points 49 and 51) at the AQMA. The modelling has also considered nitrogen deposition as a result of the road scheme, in accordance with the Conservation of Habitat and Species Regulations 2017 (a 'Habitats Regulations Assessment'). At Crickley Hill and Barrow SSSI which is located adjacent to the proposed scheme north of the A417, there is a predicted 47.8% *decrease* in nitrogen deposition. The improvement in nitrogen deposition is due to the proposed scheme moving traffic away from the designated habitat and improved traffic flow.

The report concludes that the proposed A417 scheme does not result in any exceedance of AQOs in new areas and it moves traffic away from a number of properties that are currently located within an AQMA resulting in local improvements in air quality at those areas. The relationship between the existing AQMA, present and proposed road alignments is shown in Figure 2.1.

Figure 2.1 Extract from EIA Section 5 Assessment showing proposed scheme at Birdlip (lines in red) relative to existing scheme (grey) and AQMA (shaded blue)



Progress on this scheme is outside of the direct control of Cotswold District Council, however the Council will continue to keep a watching brief on the development of this project and assist with any technical studies on air quality if approached.

At the **Lechlade AQMA** at the Thames Street junction with the High Street, the Council has continued to assess the effects of revised traffic signals and their effect on traffic flow. The position of the NO₂ diffusion tube in the High Street was revised in 2020 when the traffic signals were renewed and as a result there has been an increase in measured NO₂ at this point. However, the NO₂ concentration is still well below the national objective level. Part of this concentration uptick will probably also be due to easing of pandemic restrictions during 2021 which is reflected at the Thames Street monitoring point. As the UK comes out of restrictions in 2022 it will be prudent to confirm this over the coming months and monitoring will be continued at this location.

If improvements continue and the current nitrogen dioxide levels are sustained at this AQMA then it is probable that this AQMA could be revoked in coming years.

Into 2022, the District Council is working with the County Council to set up an extension to the School Streets scheme in Cirencester. Roads within a School Streets area will only be open to pedestrians, cyclists and those with exemptions, including emergency vehicles, Blue Badge holders and residents, for a short period at the start and end of each school day. Typically this will involve a 45 minute closure at start and end of school day (8:15-9am and 2:45-3:30pm). This is intended to encourage safer means for children to access their school,

and improve air quality in and around school gates. Additional nitrogen dioxide monitoring has been set up in advance of the scheme taking effect to assess the effect on local air quality. This will be reported on from 2023.

Table 2.3 – Progress on Measures to Improve Air Quality

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
1	A417 Trunk Road Improvements at Air Balloon Roundabout	Transport Planning and Infrastructure	Other – trunk road improvement	2014	Expected to start by 1 April 2025	National Highways	The second Road Investment Strategy (RIS2)	No	Funded	£250-500m	Planning	50%	Annual average NO ₂ to be reduced to meet AQ objective	Funding secured, planning inspectorate phase	Lengthy Timescale and funding
2	Thames Street, Lechlade - Reduction of speed limits, 20mph zones	Traffic Management	Congestion management	2017	2017	Gloucestershire County Council	Gloucestershire County Council	No	Funded	n/a	Completed	>20%	Annual average NO ₂ to be reduced to meet AQ objective	Completed 2017	None, completed
3	Thames Street, Lechlade - New traffic signals	Traffic Management	Congestion management	2020	2020	Gloucestershire County Council	Gloucestershire County Council	No	Funded	n/a	Completed	Reduced vehicle emissions	Annual average NO ₂ to be reduced to meet AQ objective	Completed 2020	None, completed
4	District Planning Policy - Sustainable Transport (POLICY INF3)	Promoting Travel Alternatives	Other	2018	Ongoing	Cotswold District Council	Cotswold District Council	No	Funded	none	Implementation	Reduced vehicle emissions	Annual average NO ₂ to be reduced to meet AQ objective	Implementation on-going	None, completed
5	Gloucestershire's Local Transport Plan 2020-41	Promoting Travel Alternatives	Other	2021	Ongoing	Gloucestershire County Council	Gloucestershire County Council	No	Funded	none	Implementation	Reduced vehicle emissions	Annual average NO ₂ to be reduced to meet AQ objective	Implementation on-going	None, completed
6	School Streets	Alternatives to private vehicle use	Other	2022	2023	Gloucestershire County Council	Gloucestershire County Council	NO	Funded	< £10k	Planning	Reduced vehicle emissions	Before and during diffusion tube measurements to show reduction in NO ₂ concentration	Measurement points in place and monitoring in progress in advance of scheme	None

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

2.3.1 General Approach

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, the most significant source of PM_{2.5} identified within the District is the burning solid fuel for domestic heating. Average PM_{2.5} concentrations within the District, based on background mapping data supplied by DEFRA, are low at around 8.4µg/m³ with a maximum of 10.4µg/m³. Control at this stage is aligned with the measures designed to achieve a reduction in vehicular emissions alongside new national controls on the sale of solid fuel (see section 3.1.4).

2.3.2 Public Health Outcomes Framework

Public Health England publishes various information related to public health.

The importance of the effect of air pollution on public health is reflected by the inclusion of an indicator of mortality associated with air pollution in the Public Health Outcomes Framework. This is a series of “indicators” prepared by Central Government as a measure of public health in various categories and across the regions of the UK. One category of data is “D01 - Fraction of mortality attributable to particulate air pollution” (2020).

For Gloucestershire as a whole, the estimated Fraction of Mortality attributable to particulate air pollution (May 2021 update) is ranked 6 out of 15 areas in the South West of England. This equates to a percentage of 5.4% compared with the regional average of 5.6%.

For the Cotswold District, the estimated Fraction of Mortality attributable to particulate air pollution is ranked 16 out of 37 areas in the South West of England. This equates to a percentage of 5.0% compared with the regional average of 5.2%.

PM_{2.5} is the pollutant which has a significant impact on public health and on which the Public Health Outcomes Framework (PHOF) indicator D01 is based⁷. PM_{2.5} data is available for 2020 which indicated that for the PHOF indicator Air pollution: fine particulate matter (2020 indicator) Cotswold District is ranked 14 out of 29 areas in the South West of England. This equates to estimated annual mean concentrations of 8.0µg m⁻³ PM_{2.5} (2020) for the Cotswold District compared with the 2020 Southern England estimated regional average of 7.7µg m⁻³ PM_{2.5}.

In 2021 the estimated annual mean concentrations of PM_{2.5} were 8.5µg m⁻³ (2021) for the Cotswold District compared with the 2021 Southern England estimated regional average of 7.6µg m⁻³ PM_{2.5} (source: UK AIR Background Mapping data for local authorities – 2018 background mapping).

[Link to Background Mapping data for local authorities - 2018](#)

⁷ Source: Background annual average PM_{2.5} concentrations for the year of interest are modelled on a 1km x 1km grid using an air dispersion model, and calibrated using measured concentrations taken from background sites in Defra's Automatic Urban and Rural Network (<http://uk-air.defra.gov.uk/interactive-map>.) Data on primary emissions from different sources and a combination of measurement data for secondary inorganic aerosol and models for sources not included in the emission inventory (including re-suspension of dusts) are used to estimate the anthropogenic (human-made) component of these concentrations. By approximating LA boundaries to the 1km by 1km grid, and using census population data, population weighted background PM_{2.5} concentrations for each lower tier LA are calculated. This work is completed under contract to Defra, as a small extension of its obligations under the Ambient Air Quality Directive (2008/50/EC). Concentrations of anthropogenic, rather than total, PM_{2.5} are used as the basis for this indicator, as burden estimates based on total PM_{2.5} might give a misleading impression of the scale of the potential influence of policy interventions (COMEAP, 2012).

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

This section sets out the monitoring undertaken within 2021 by Cotswold District Council and how it compares with the relevant air quality objectives. In addition, monitoring results are presented for a five-year period between 2017 and 2021 to allow monitoring trends to be identified and discussed.

Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

Cotswold District Council has no automatic (continuous) monitoring sites within its area.

3.1.2 Non-Automatic Monitoring Sites

Cotswold District Council undertook non- automatic (i.e. passive) monitoring of NO₂ at 16 sites during 2021. 1 in Appendix A presents the details of the non-automatic sites.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on Quality Assurance/Quality Control (QA/QC) for the diffusion tubes, including bias adjustments and any other adjustments applied (e.g. annualisation and/or distance correction), are included in Appendix C.

One monitoring location in Moreton-in-Marsh was repositioned at the start of 2021 with monitoring commencing in January (location S48).

Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias, annualisation (where the annual mean data capture is below 75% and greater than 25%), and distance correction. Further details on adjustments are provided in Appendix C.

3.1.3 Nitrogen Dioxide (NO₂)

The air quality monitoring results presented in this section are, where relevant, ratified then adjusted for bias, annualisation (where the annual mean data capture is below 75% and greater than 33%), and distance correction. Further details on adjustments are provided in Appendix C.

As there were at least 9 months data for all monitoring sites, annualisation was not required. Further details on Quality Assurance/Quality Control (QA/QC) for the diffusion tubes, including bias adjustments and any other adjustments applied (e.g. distance correction), are included in Appendix C.

Table A.2 in Appendix A compares the ratified and adjusted monitored NO₂ annual mean concentrations for the past 5 years (where available), for comparison with the air quality objective of 40µg/m³. The full 2021 dataset of monthly mean NO₂ levels from the diffusion tube survey is provided in Appendix B. Note that the concentration data presented in Table B.1 includes distance corrected values only where relevant.

Across the district the Coronavirus pandemic continued to have an effect on mobility and thus traffic volumes. Council staff continued to make measurements of pollution over all months of the year. A third lockdown prevented much of the usual traffic from early January 2021. Various phases of social restrictions during the rest of 2021 had a related effect on traffic volumes and thus it seems NO₂ concentrations at the locations measured, particularly in the early part of the year. As 2021 developed and social restrictions were removed in stages from March then there are signs that traffic levels and thus pollution started to return towards 2019 levels.

Overall however there were no measured exceedances of the annual mean air quality objectives at either AQMA, close to an AQMA boundary or located away from the current AQMAs.

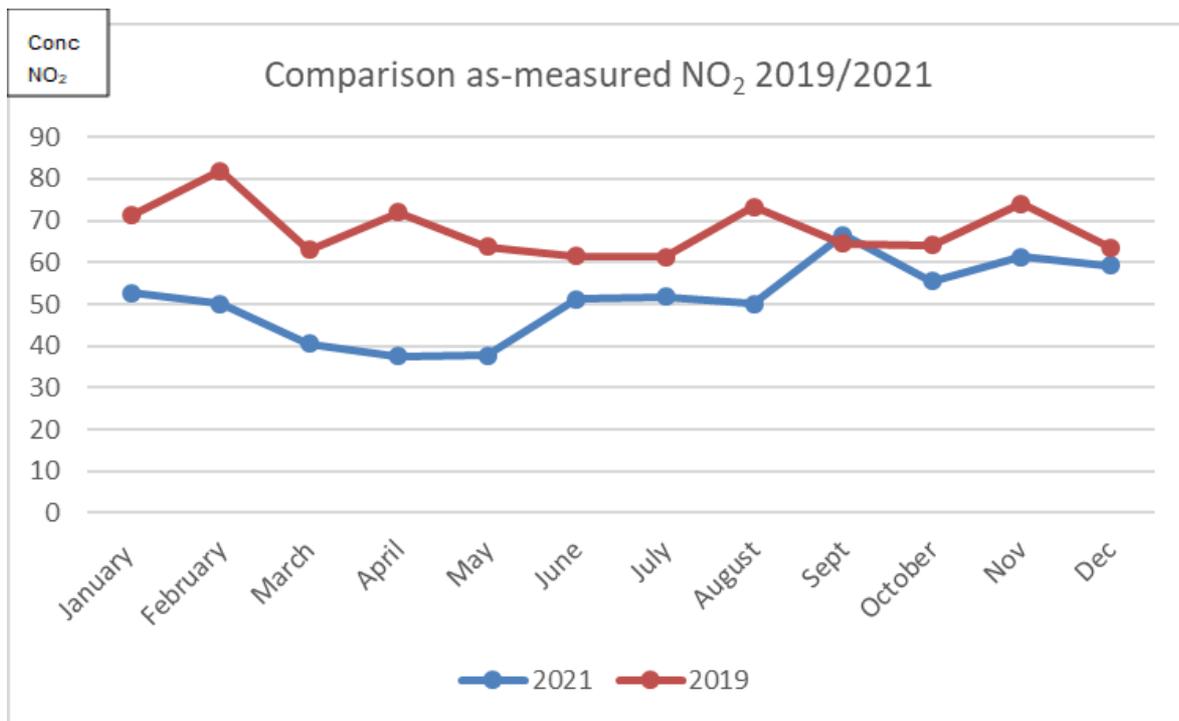
Nitrogen dioxide levels remained high within the Air Balloon roundabout AQMA, which is as expected given the significant volume of traffic on this strategic trunk route, and were marginally higher than the 2020 levels, albeit lower than 2019's levels. The bias adjusted mean annual nitrogen dioxide level at this location was a little below 40 µg/m³, set as the national objective level to protect health. When this is adjusted for distance to the dwellings at this location the NO₂ concentration was around 7µg/m³ above the previous year's. Reduction in traffic flows, because of the pandemic, throughout much of 2021 is thought to be the primary cause. So, although the adjusted concentration (35.5µg/m³) was

well below the objective level ($40 \mu\text{g}/\text{m}^3$) and this is the third year in a row that the objective level has not been exceeded, it is intended that both monitoring and the AQMA for this location will be maintained to confirm that the observed improvement is sustained.

Figure 3.1 shows a comparison of 2021's monthly concentration readings compared with the same periods in 2019. The year began with further Covid19 pandemic lockdown from 6 January. The lockdown was lifted in stages from March until 19th July when most legal limits on social contact were removed. The data shows that between January and August 2021, NO₂ concentrations were somewhat below the 2019 levels, recovering in the summer of 2021 as restrictions were lifted. Levels appear to have partially recovered in June and July 2021 but below the 2019 levels, corresponding to the lifting of some restrictions on social gatherings from mid-May. From August 2021 levels were similar to 2019 levels reflecting few social restrictions in England.

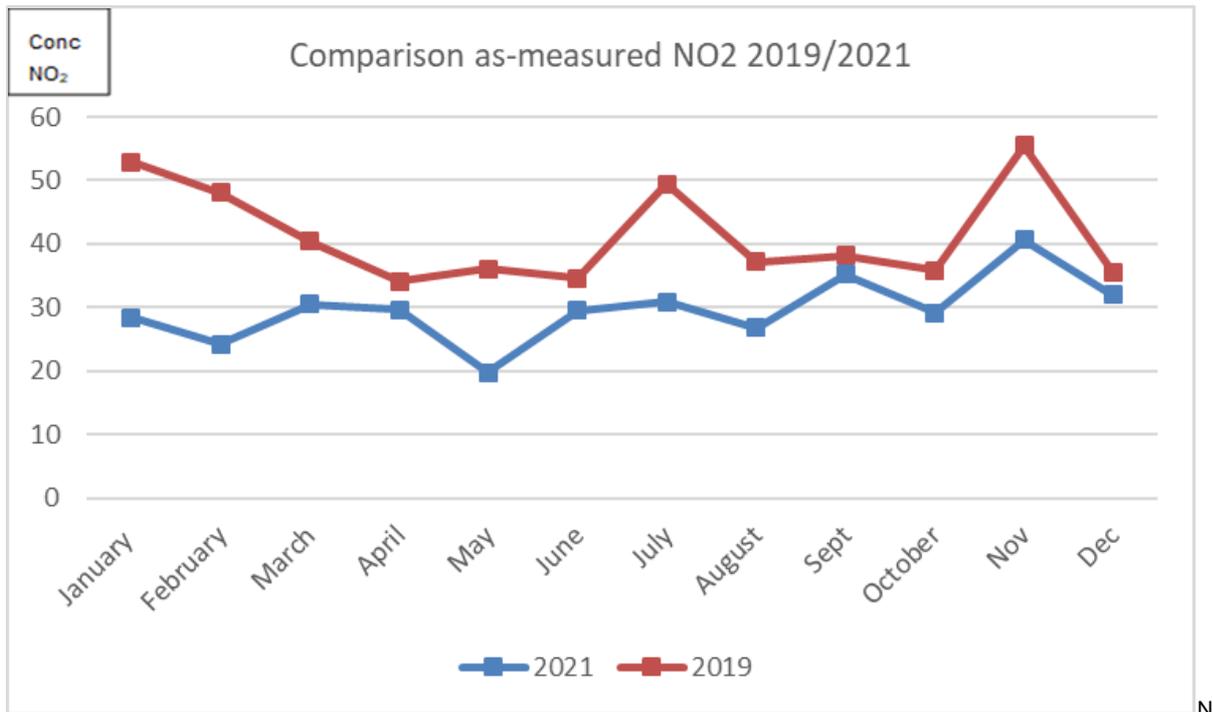
The annual average nitrogen dioxide level in Thames Street, Lechlade continued to remain below the $40 \mu\text{g}/\text{m}^3$ national objective level. Figure 3.2 shows a comparison of 2021's monthly concentration readings compared with the same periods in 2019. As with the Air Balloon roundabout, levels of NO₂ were generally lower than the previous year with recovery towards higher levels following the easing of the lockdown in the early summer of 2021. Levels remained below those of 2019 throughout the year.

Figure 3.1 Comparison NO₂ concentrations, Air Balloon, during 2019 and 2021



NB concentrations illustrated are measured concentration of NO₂ ($\mu\text{g}/\text{m}^3$) without correction for bias nor adjusted for distance to receptor.

Figure 3.2 Comparison NO₂ concentrations, Lechlade Thames St, during 2019 and 2021

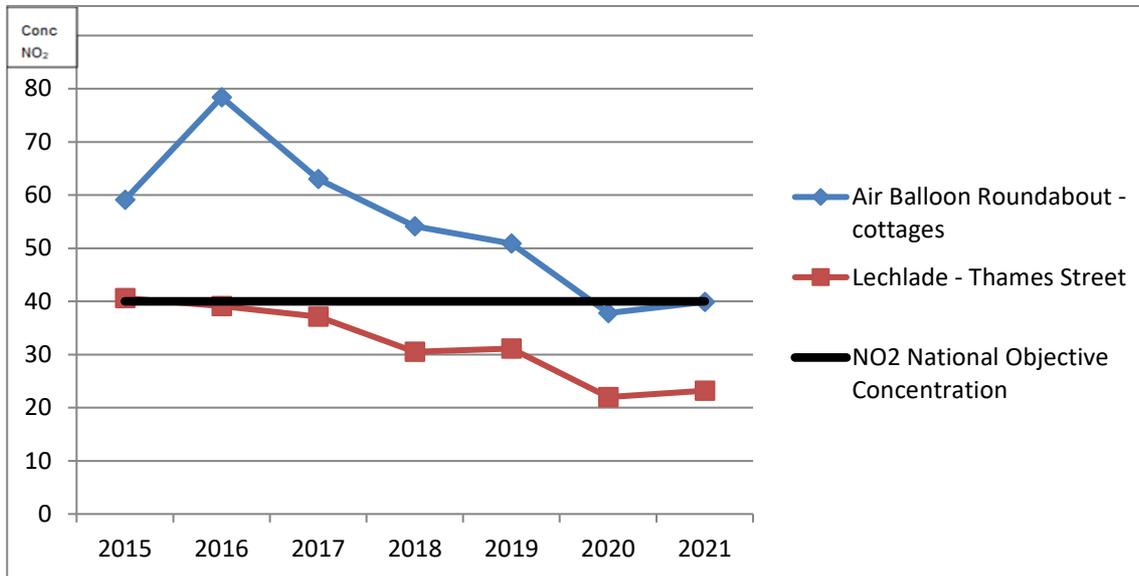


concentrations illustrated are measured concentration of NO₂ (µg/m³) without correction for bias nor adjusted for distance to receptor.

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. In addition, 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 and maintain the AQMA whilst the pandemic is still a feature of our society, but once traffic levels become “normal” it is likely that the Council will review the data and seek to remove the AQMA at this location.

Figure 3.3 illustrates the change in annual mean NO₂ concentrations within the AQMAs over the last 5 years. Note the gradual decline at both locations since 2016, albeit more marked at Air Balloon Roundabout, Birdlip. There is a slight uptick in concentrations at Birdlip where traffic levels are likely to have increased over the previous year as pandemic restrictions were removed.

Figure 3.3 – Trends in Annual Mean NO₂ Concentrations - Graph showing the trends over 5 years at AQMA long-term diffusion tube monitoring sites



NB concentrations illustrated are measured concentration of NO₂ (µg/m³) corrected for bias but not adjusted for distance to receptor.

Road Closures affecting monitoring results

It is noted that in Cirencester, Somerford Road at its junction with Spratsgate Lane was closed between 20 Sept 2021 and 12 Nov 2021. This is likely to affect readings at diffusion tube NAS35 (Berkeley Road) and possibly nearby locations NAS34 and NAS36 during that time, where traffic levels would be slightly reduced as traffic finds alternative routes into Cirencester. At all these locations NO₂ concentrations are well within the national objective level and not of particular concern.

3.1.4 Particulate Matter

Measurements of particulate matter were not made within the District.

The UK Government has produced a selection of statistics on annual emissions to air in the UK for the period 1970 to 2019. Whilst there has been a long-term decrease in the emissions of all of the air pollutants covered, burning of other solid fuels for domestic heating and industry has increased in recent years and this is having an adverse effect on the release of particulate matter. Decreases in emissions of particulates from many sources have been partially offset by increases in emissions from residential burning (domestic solid fuel heating; emissions of PM_{2.5} from this source increased by 28 per cent

between 2009 and 2019). In fact domestic combustion using wood as a fuel accounted for 38 per cent of primary emissions of PM_{2.5} in 2019. This reflects the increasing popularity of solid fuel appliances in the home such as wood-burning stoves. Now emissions of particulates from domestic burning is now cumulatively greater than that from road transport.

As a reflection of these concerns, new legislation has come into effect in England, controlling the sale of wood and coal for domestic heating. Under the Air Quality (Domestic Solid Fuels Standards) (England) Regulations 2020, wet wood (that is, wood having a moisture content of more than 20%) cannot be sold in units of less than 2m³. The same legislation outlaws sale of bags of coal for domestic fireplaces. This is intended to encourage use of approved kiln-dried logs which produce much less smoke and thus particulates.

Appendix A: Monitoring Results

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

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube Co-located with a Continuous Analyser?	Tube Height (m)
NAS26	Unicorn PH, Stow on the Wold, Gloucestershire	Roadside	419003	225693	NO ₂	No	1.2	1.2	No	2.1
NAS27	Coach Park, Station Road, Bourton-on-the-Water, Gloucestershire	Urban Centre	417028	220781	NO ₂	No	6.4	6.4	No	2.5
NAS28	Burford Rd Traffic lights j/w A417, Cirencester, Gloucestershire	Roadside	403020	202175	NO ₂	No	1.5	1.5	No	2.3
NAS29	Abbey Way j/w Spitalgate, Cirencester, Gloucestershire	Roadside	402305	202519	NO ₂	No	1.4	1.4	No	2.2
NAS30	London Road, Cirencester, Gloucestershire	Kerbside	402783	201946	NO ₂	No	2.8	2.8	No	2.2
NAS31	Lewis Lane, Cirencester, Gloucestershire	Roadside	402480	201772	NO ₂	No	1.5	1.5	No	2.1
NAS32	Hammond Way, Cirencester, Gloucestershire	Roadside	402039	201765	NO ₂	No	1.7	1.7	No	2.4

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube Co-located with a Continuous Analyser?	Tube Height (m)
NAS33	Tetbury Road, Cirencester (O/S Steading Cottages), Gloucestershire	Roadside	401064	201044	NO ₂	No	2.9	2.9	No	2.2
NAS34	Spratsgate Lane nr j/w Park Way, Cirencester, Gloucestershire	Roadside	402394	199581	NO ₂	No	2.3	2.3	No	2.1
NAS35	NAS35 - Berkeley Road j/w Somerford Road, Cirencester	Roadside	402439	200297	NO ₂	No	0.5	0.5	No	2.1
NAS36	Somerford Road, Cirencester, Gloucestershire (on lamp post 6)	Roadside	402241	201102	NO ₂	No	1.7	1.7	No	2.4
NAS37	NAS37 - Thames Street, Lechlade, Gloucestershire	Kerbside	421365	199503	NO ₂	Yes/Lechlade	1.3	1.3	No	2.4
NAS38a	4 High Street, Lechlade, Gloucestershire	Kerbside	421367	199515	NO ₂	Yes/Lechlade	1.0	1.0	No	2.2
NAS39	Air Balloon Roundabout, Birdlip	Kerbside	393462	216111	NO ₂	Yes/Air Balloon	1.1	1.1	No	2.1
NAS42	A429 j/w A44 (White Horse Hotel) Moreton-in-Marsh, Gloucestershire	Roadside	420486	232419	NO ₂	No	3.3	3.3	No	2.4

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube Co-located with a Continuous Analyser?	Tube Height (m)
NAS48	Gateway House A429 j/w East Street, Moreton on Marsh, Gloucestershire	Roadside	420462	232344	NO ₂	No	7.0	7.0	No	2.2

Notes:

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).

(2) N/A if not applicable.

Table A.2 – Annual Mean NO₂ Monitoring Results: Non-Automatic Monitoring (µg/m³)

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2021 (%) ⁽²⁾	2017	2018	2019	2020	2021
NAS26	419003	225693	Roadside	100	100.0	-	-	38.7	29.3	31.8
NAS27	417028	220781	Urban Centre	100	100.0	-	13.6	10.8	8.4	8.8
NAS28	403020	202175	Roadside	74.9	74.9	-	-	29.8	22.1	23.8
NAS29	402305	202519	Roadside	100	100.0	34.8	29.8	29.9	23.8	25.3
NAS30	402783	201946	Kerbside	100	100.0	25.7	22.6	23.4	17.7	18.1
NAS31	402480	201772	Roadside	100	74.9	22.6	20.9	20.6	15.7	15.8
NAS32	402039	201765	Roadside	100	100.0	21.0	18.1	17.2	13.2	14.1
NAS33	401064	201044	Roadside	100	100.0	24.6	21.8	21.6	16.2	16.2
NAS34	402394	199581	Roadside	100	92.3	9.6	9.5	9.3	7.4	7.0
NAS35	402439	200297	Roadside	100	92.3	9.4	9.4	9.9	7.0	7.9
NAS36	402241	201102	Roadside	100	100.0	17.6	14.5	14.9	11.2	10.8
NAS37	421365	199503	Kerbside	100	100.0	36.2	30.5	31.1	22.0	23.2
NAS38a	421367	199515	Kerbside	100	90.4	-	-	-	22.8	29.4

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2021 (%) ⁽²⁾	2017	2018	2019	2020	2021
NAS39	393462	216111	Kerbside	100	100.0	<u>61.4</u>	54.1	50.9	37.7	39.9
NAS42	420486	232419	Roadside	100	84.7	-	-	29.0	20.0	21.9
NAS48	420462	232344	Roadside	100	75.1					18.6

Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.

Diffusion tube data has been bias adjusted.

Reported concentrations are those at the location of the monitoring site (bias adjusted and annualised, as required), i.e. prior to any fall-off with distance correction.

Notes:

The annual mean concentrations are presented as $\mu\text{g}/\text{m}^3$.

Exceedances of the NO₂ annual mean objective of $40\mu\text{g}/\text{m}^3$ are shown in **bold**.

NO₂ annual means exceeding $60\mu\text{g}/\text{m}^3$, indicating a potential exceedance of the NO₂ 1-hour mean objective are shown in **bold and underlined**.

Means for diffusion tubes have been corrected for bias. All means have been “annualised” as per LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Concentrations are those at the location of monitoring and not those following any fall-off with distance adjustment.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

Appendix B: Full Monthly Diffusion Tube Results for 2021

Table B.1 – NO₂ 2021 Diffusion Tube Results (µg/m³)

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Easting)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.78)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
NAS26	419003	225693	35.9	35.8	35.3	38.7	42.1	34.5	47.2	47.8	55.1	41.6	43.5	31.7	40.8	31.8	-	
NAS27	417028	220781	13.4	11.4	10.7	9.7	8.6	9.0	18.1	9.3	11.7	10.1	12.9	11.1	11.3	8.8	-	
NAS28	403020	202175	24.8	27.6	Missing	Missing	29.1	29.5	23.9	30.5	38.4	37.6	Rejected	32.9	30.5	23.8	-	
NAS29	402305	202519	35.7	31.4	29.2	27.7	32.0	28.1	30.8	28.9	40.3	36.1	38.8	30.5	32.5	25.3	-	
NAS30	402783	201946	27.6	24.8	21.7	18.5	22.6	17.5	19.6	18.0	24.3	25.6	29.6	28.5	23.2	18.1	-	
NAS31	402480	201772	28.1	20.2	Missing	Missing	16.1	18.2	15.6	15.4	21.3	20.9	missing	26.1	20.2	15.8	-	
NAS32	402039	201765	23.6	18.6	18.4	15.3	14.5	12.7	13.3	13.2	20.6	17.8	25.4	23.0	18.0	14.1	-	
NAS33	401064	201044	26.9	15.6	21.2	12.6	20.7	19.9	18.1	17.3	23.2	25.8	25.1	22.5	20.7	16.2	-	
NAS34	402394	199581	12.9	11.4	9.9	7.8	6.7	7.4	6.7	6.4	9.8	7.6	missing	11.8	8.9	7.0	-	
NAS35	402439	200297	12.6	14.9	10.9	9.8	5.4	8.4	9.4	8.4	10.7	8.1	missing	12.8	10.1	7.9	-	
NAS36	402241	201102	18.0	16.2	17.2	12.7	7.5	11.8	9.3	10.2	14.9	15.4	17.9	14.4	13.8	10.8	-	
NAS37	421365	199503	28.4	24.2	30.5	29.7	19.8	29.5	30.9	26.8	35.2	29.2	40.7	32.0	29.7	23.2	-	
NAS38a	421367	199515	40.3	33.3	34.9	Missing	33.3	35.2	34.8	32.1	42.9	42.1	47.2	38.6	37.7	29.4	-	
NAS39	393462	216111	52.7	50.1	40.6	37.5	37.8	51.3	51.8	50.1	66.5	55.6	61.3	59.3	51.2	39.9	35.5	
NAS42	420486	232419	30.4	30.1	Missing	23.1	Missing	24.0	26.3	25.4	34.0	29.0	30.1	28.1	28.1	21.9	-	
NAS48	420462	232344	22.9	Missing	Missing	Missing	23.7	22.3	22.6	24.1	25.6	20.8	26.5	25.8	23.8	18.6	-	

☒ All erroneous data has been removed from the NO₂ diffusion tube dataset presented in Table B.1.

☒ Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16.

☒ National bias adjustment factor used.

- ☒ Where applicable, data has been distance corrected for relevant exposure in the final column.
- ☒ Cotswold District Council confirms that all 2021 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System.

Notes:

Exceedances of the NO₂ annual mean objective of 40µg/m³ are shown in **bold**.

NO₂ annual means exceeding 60µg/m³, indicating a potential exceedance of the NO₂ 1-hour mean objective are shown in **bold and underlined**.

See Appendix C for details on bias adjustment and annualisation.

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

New or Changed Sources Identified Within Cotswold District During 2021

Cotswold District has not identified any new sources relating to air quality within the reporting year of 2021.

Additional Air Quality Works Undertaken by Cotswold District During 2021

Cotswold District has not completed any additional works within the reporting year of 2021.

QA/QC of Diffusion Tube Monitoring

Supplier of Diffusion Tubes

The diffusion tubes (50% TEA in acetone) were supplied and analysed by Socotec Didcot laboratories.

The monitoring has been completed in adherence with the 2021 Diffusion Tube Monitoring Calendar.

Diffusion Tube Annualisation

Where monitoring has been completed for less than 75% of the year, annualisation techniques can be used to estimate an annual average from a part year average. For annualisation to be completed there must be at least 3 months of monitoring data available.

All diffusion tube monitoring locations within Cotswold District recorded data capture of 75% therefore it was not necessary to annualise any monitoring data.

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2021 ASR have been corrected for bias using an adjustment factor. Bias represents the overall tendency of the diffusion tubes to under or over-read relative to the reference chemiluminescence analyser. LAQM.TG16 provides guidance with regard to the application of a bias adjustment factor to correct diffusion tube monitoring. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data taken from NO_x/NO₂ continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

National bias adjustment factors have been used from Defra database, available at:

[Link to DEFRA National Bias Adjustment factors](#) (see more below).

Cotswold District Council has applied a national bias adjustment factor of 0.78 (based on 23 studies) to the 2021 monitoring data and this was applied to all diffusion tubes. A summary of bias adjustment factors used by Cotswold District Council over the past five years is presented in **Error! Not a valid bookmark self-reference.** An extract of the information supporting the choice of national factor selected is set out below

National Diffusion Tube Bias Adjustment Factor Spreadsheet						Spreadsheet Version Number: 03/22				
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 2022				
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				
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 ² .	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 LAQMHelpdesk@bureauveritas.com or 0800 0327953						
Analysed By ¹	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 ³	Bias Adjustment Factor (A) (Cm/Dm)
Socotec Didcot	50% TEA in acetone	2021	UB	Gravesham Borough Council	12	23	21	7.9%	G	0.93
Socotec Didcot	50% TEA in acetone	2021	UB	Gravesham Borough Council	11	27	23	18.2%	G	0.85
Socotec Didcot	50% TEA in acetone	2021	R	Horsham District Council	12	27	20	34.5%	G	0.74
Socotec Didcot	50% TEA in acetone	2021	R	Ipswich Borough Council	12	29	23	23.8%	G	0.81
Socotec Didcot	50% TEA in acetone	2021	R	Ipswich Borough Council	12	38	29	33.3%	G	0.75
Socotec Didcot	50% TEA in acetone	2021	UB	Kingston upon Hull City Council	11	24	17	39.7%	G	0.72
Socotec Didcot	50% TEA in acetone	2021	R	Kingston upon Hull City Council	12	30	25	22.9%	G	0.81
SOCOTEC Didcot	50% TEA in acetone	2021	UB	City of York Council	11	17	13	38.2%	G	0.72
SOCOTEC Didcot	50% TEA in acetone	2021	R	City of York Council	12	25	20	27.0%	G	0.79
SOCOTEC Didcot	50% TEA in acetone	2021	R	City of York Council	12	22	17	29.0%	G	0.77
SOCOTEC Didcot	50% TEA in acetone	2021	R	City of York Council	12	37	25	45.5%	G	0.69
SOCOTEC Didcot	50% TEA in acetone	2021	UI	North Lincolnshire Council	12	17	14	19.3%	G	0.83
Socotec Didcot	50% TEA in acetone	2021	R	Bridgend Borough Council / Shared R	12	36	25	42.9%	G	0.70
Socotec Didcot	50% TEA in acetone	2021	UB	Derry City and Strabane District Council	12	11	9	28.4%	G	0.78
Socotec Didcot	50% TEA in acetone	2021	R	Derry City and Strabane District Council	12	30	30	2.4%	G	0.98
Socotec Didcot	50% TEA in acetone	2021	R	East Suffolk Council	11	30	25	22.3%	P	0.82
Socotec Didcot	50% TEA in acetone	2021	KS	Marylebone Road Intercomparison	10	56	42	32.9%	P	0.75
Socotec Didcot	50% TEA in acetone	2021	R	North East Lincolnshire Council	10	27	29	-7.6%	G	1.08
Socotec Didcot	50% TEA in acetone	2021	R	North East Lincolnshire Council	9	45	33	34.5%	P	0.74
Socotec Didcot	50% TEA in acetone	2021	R	Leeds City Council	13	40	29	35.5%	G	0.74
Socotec Didcot	50% TEA in acetone	2021	KS	Leeds City Council	12	34	25	37.9%	G	0.73
Socotec Didcot	50% TEA in acetone	2021	R	Leeds City Council	9	43	31	40.8%	G	0.71
Socotec Didcot	50% TEA in acetone	2021	UC	Leeds City Council	12	31	23	37.4%	G	0.73
SOCOTEC Didcot	50% TEA in acetone	2021		Overall Factor² (23 studies)					Use	0.78

Table C.1 – Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2021	National	March 2022	0.78
2020	National	03/21	0.77
2019	National	03/20	0.75
2018	National	03/19	0.76
2017	National	03/18	0.79

NO₂ Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO₂ concentration at the nearest location relevant for exposure has been estimated using the Diffusion Tube Data Processing Tool/NO₂ fall-off with distance calculator available on the LAQM Support website. Where appropriate, non-automatic annual mean NO₂ concentrations corrected for distance are presented in Table B.1.

Corrections for distance (to allow for the distance the diffusion tubes are from the roadside) have been made within this assessment. This is at one site (NAS39) where concentrations are not representative of actual exposure (because the receptor is set back from the roadway) fall within 10% of the annual mean objective.

Distance correction has been made where appropriate using the DEFRA correction tool.

Table C.2 – NO₂ Fall off With Distance Calculations (concentrations presented in µg/m³)

Site ID	Distance (m): Monitoring Site to Kerb	Distance (m): Receptor to Kerb	Monitored Concentration (Annualised and Bias Adjusted)	Background Concentration	Concentration Predicted at Receptor	Comments
NAS39	1.1	5.3	39.9	9.0	35.5	

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

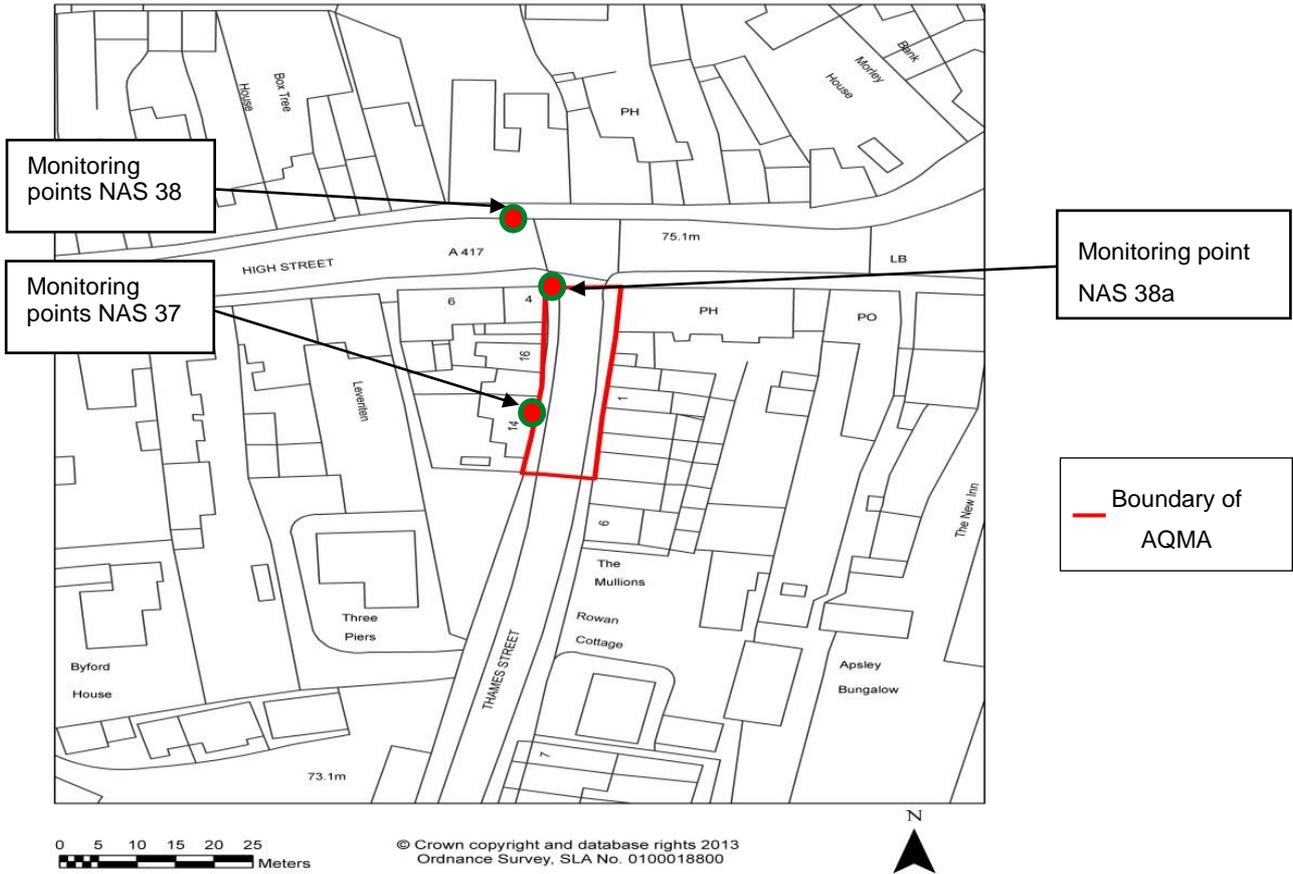
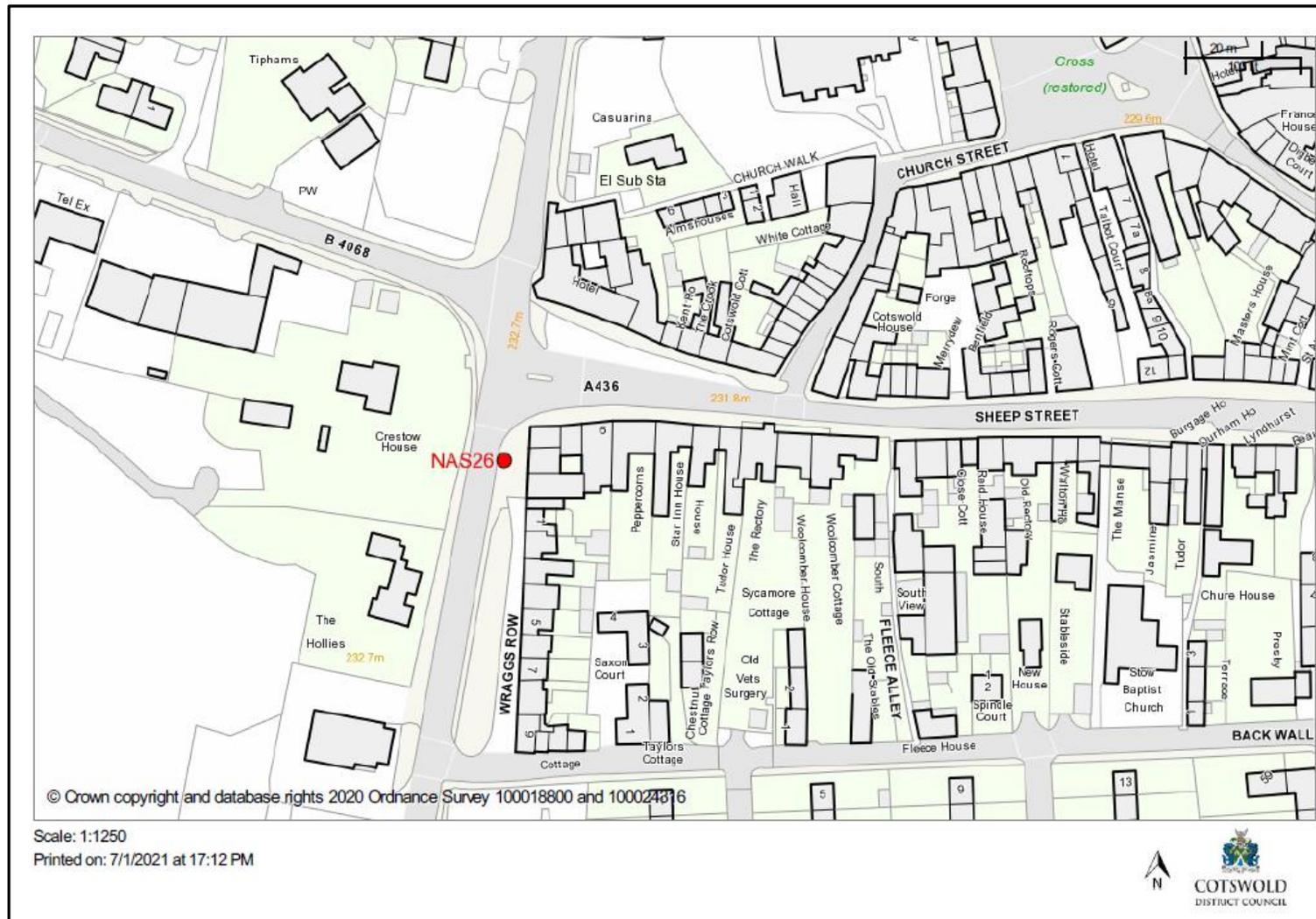
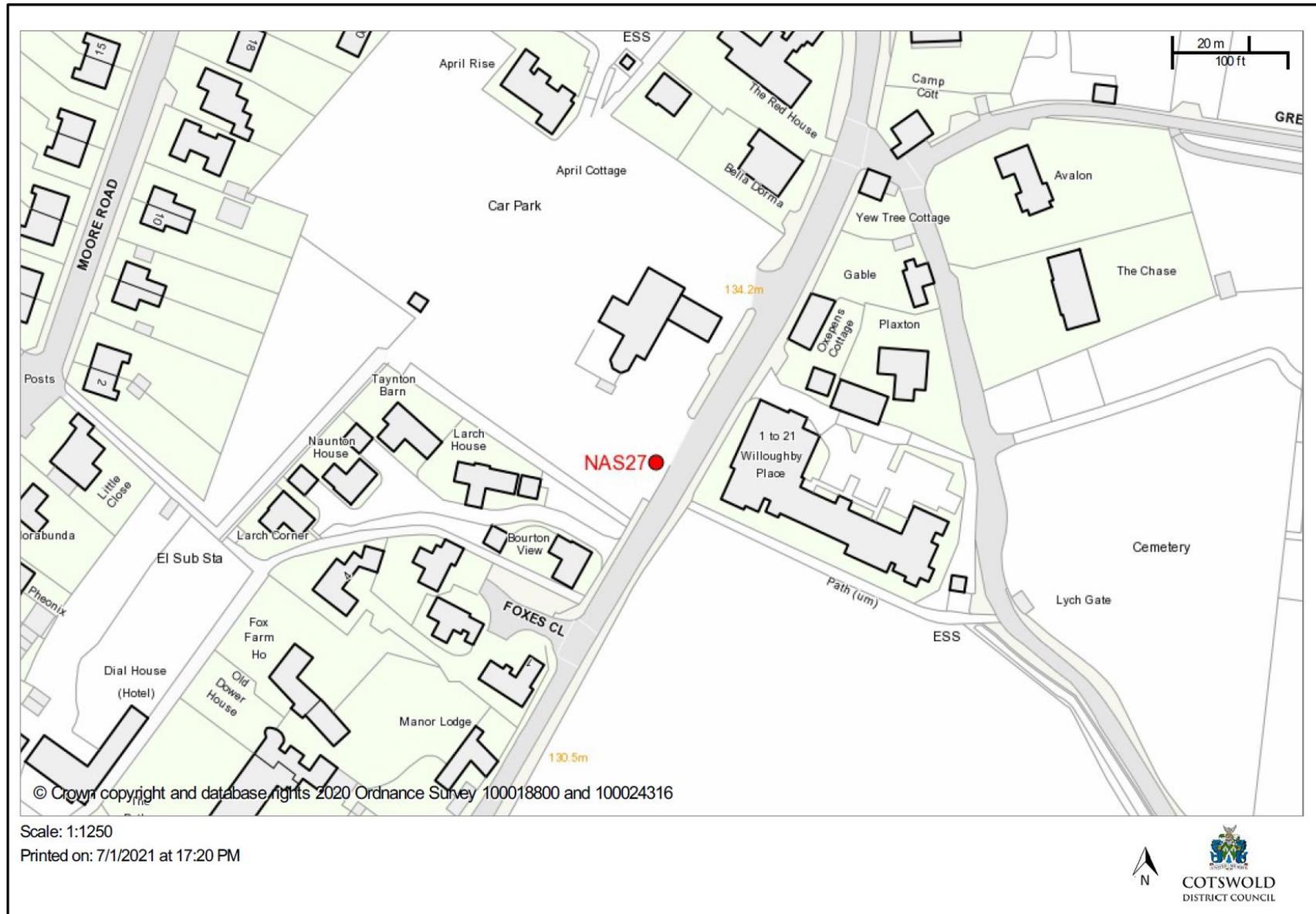


Figure D2 Maps of Non-Automatic Monitoring Sites

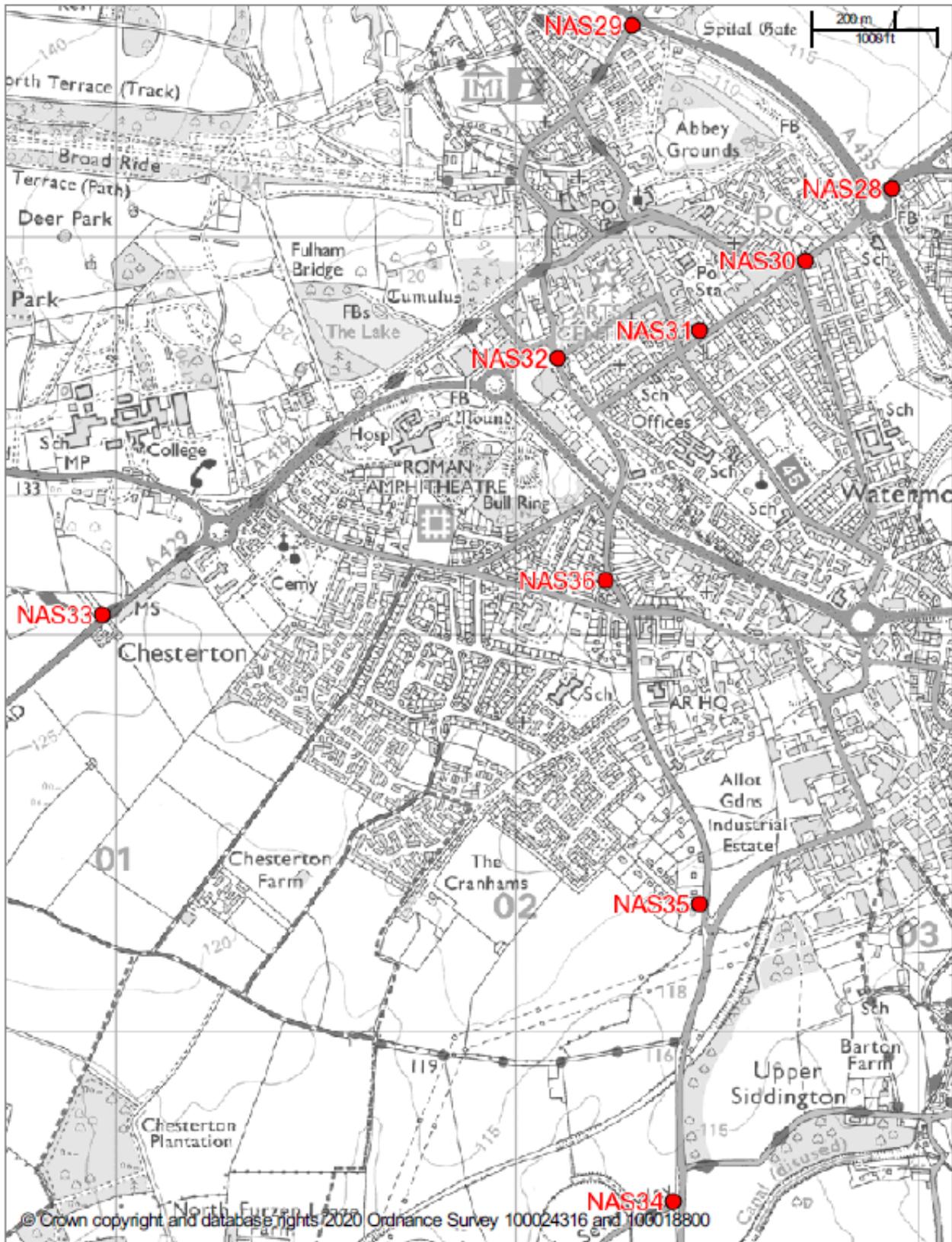
Location 26 Stow – Unicorn



Location 27 Bourton-on-the-Water



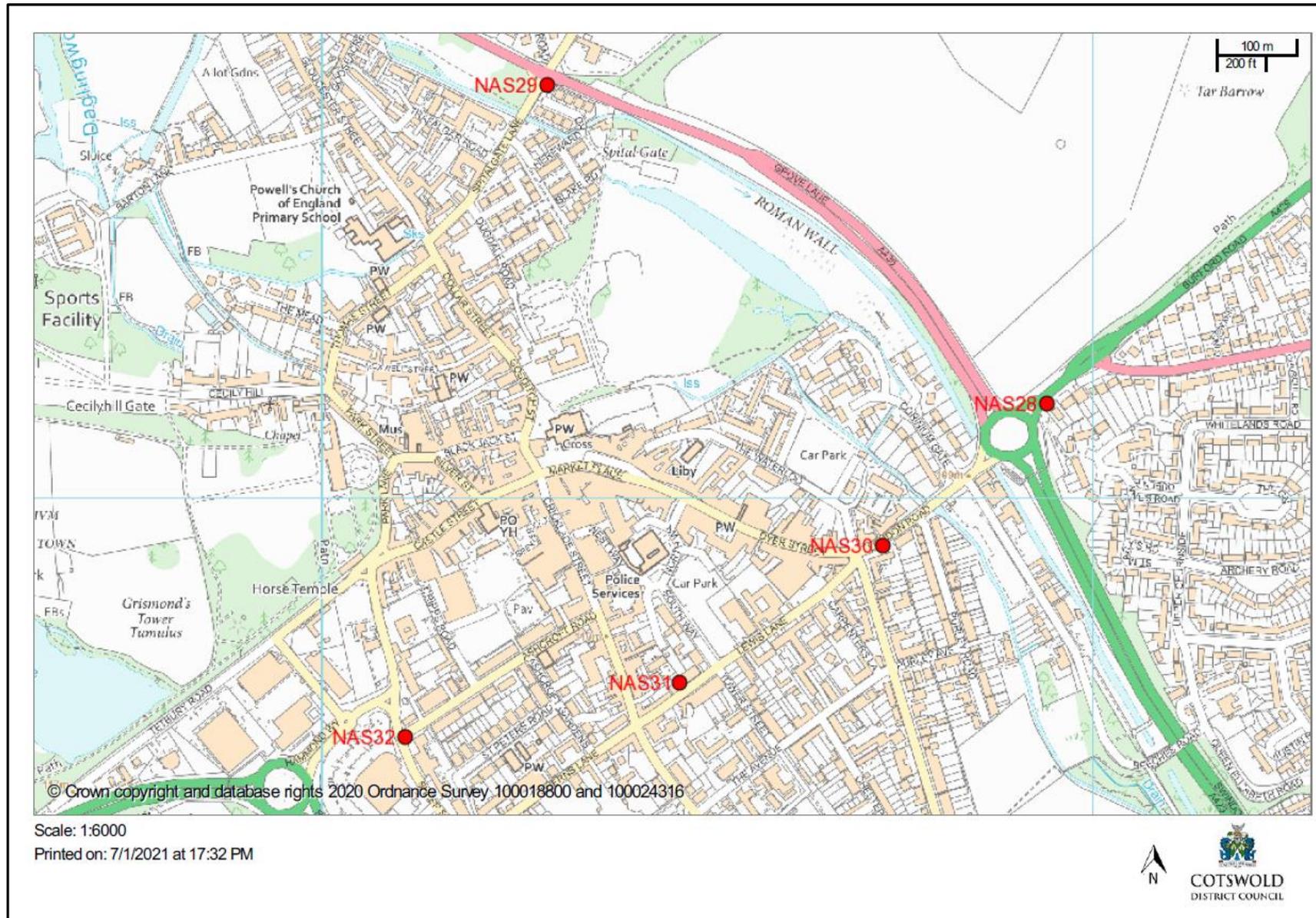
Locations in Cirencester



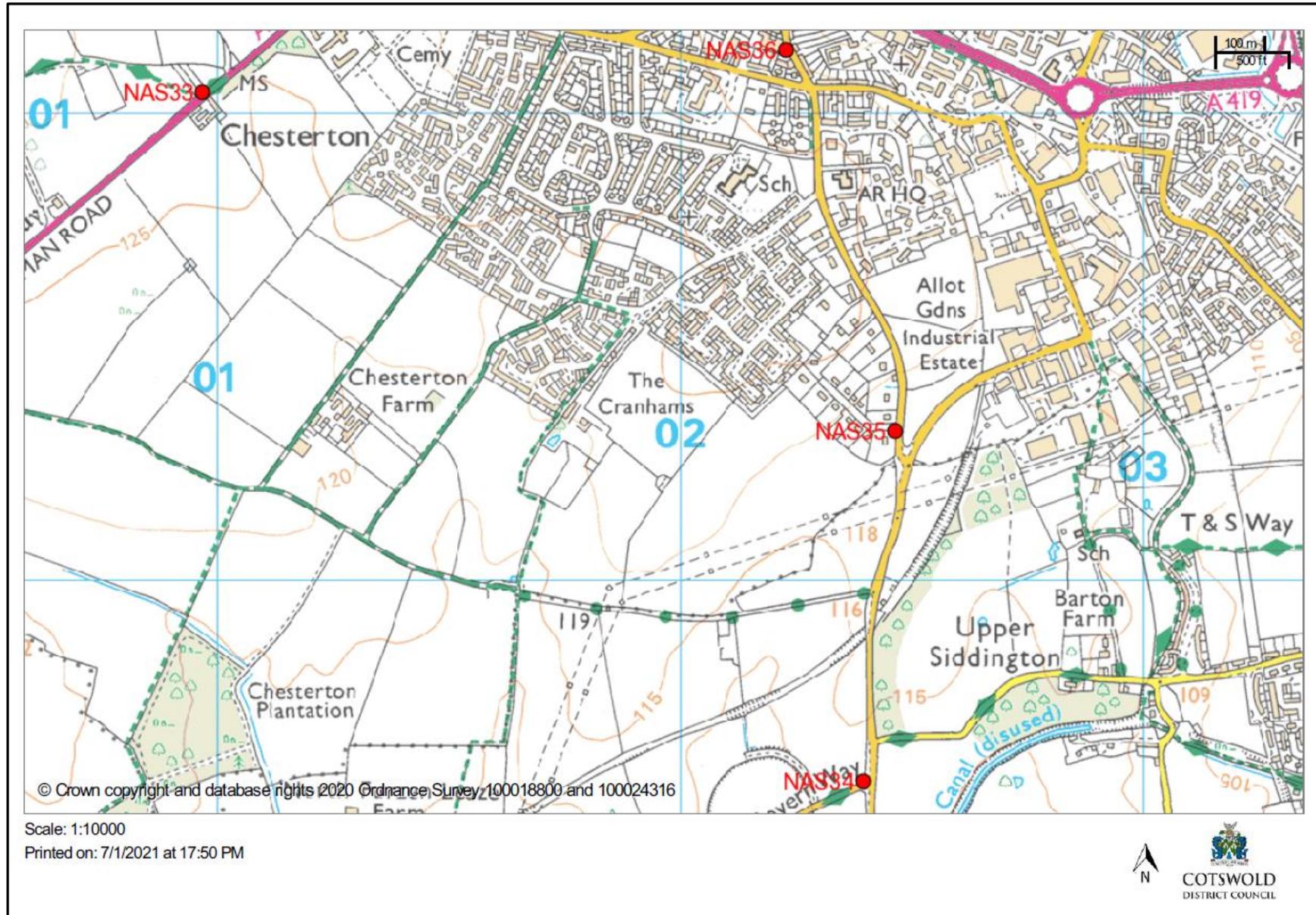
Scale: 1:12500
Printed on: 8/1/2021 at 10:28 AM



Locations 28-32 Cirencester



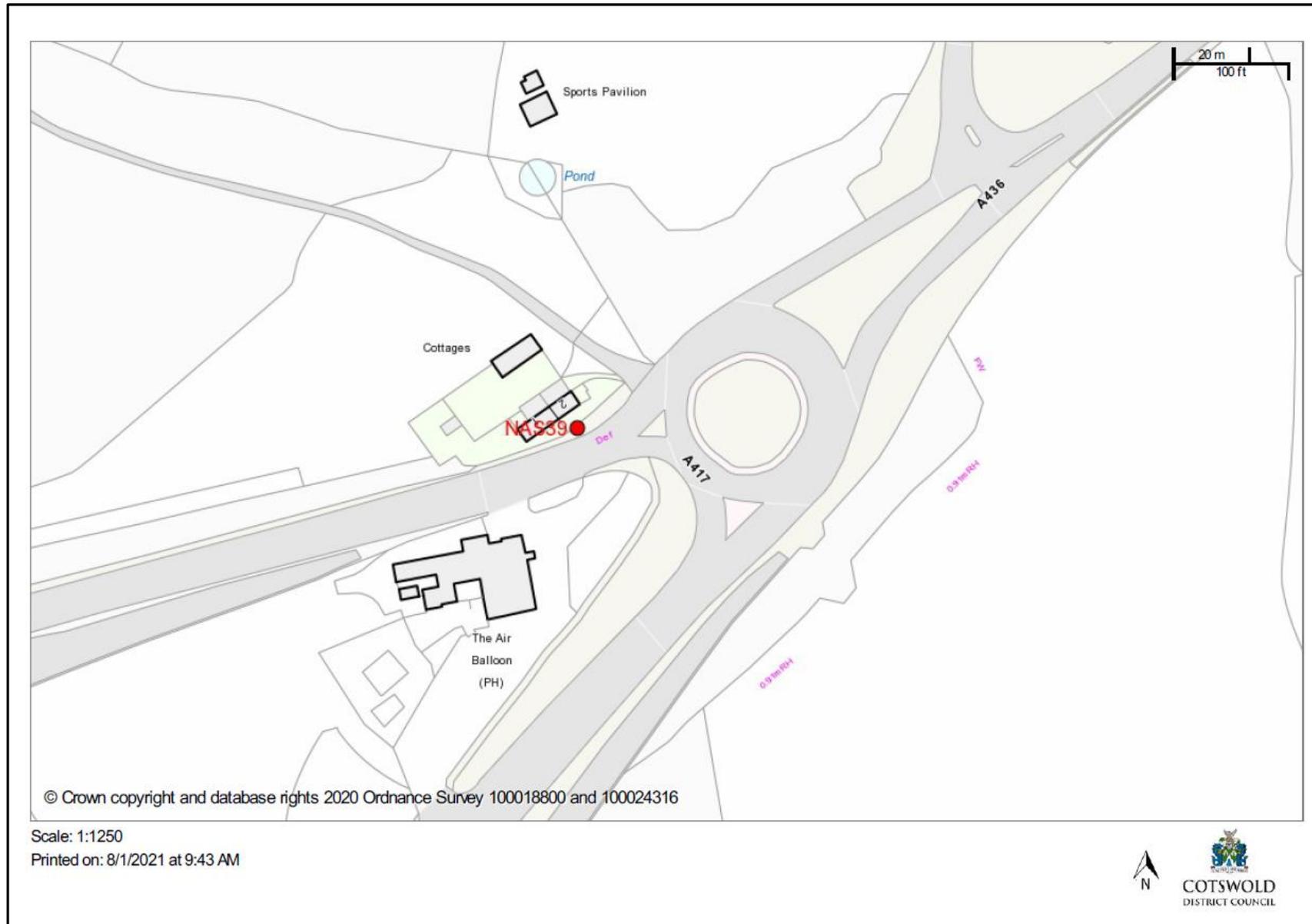
Locations 33-36 Cirencester



Locations NAS37-38 Lechlade



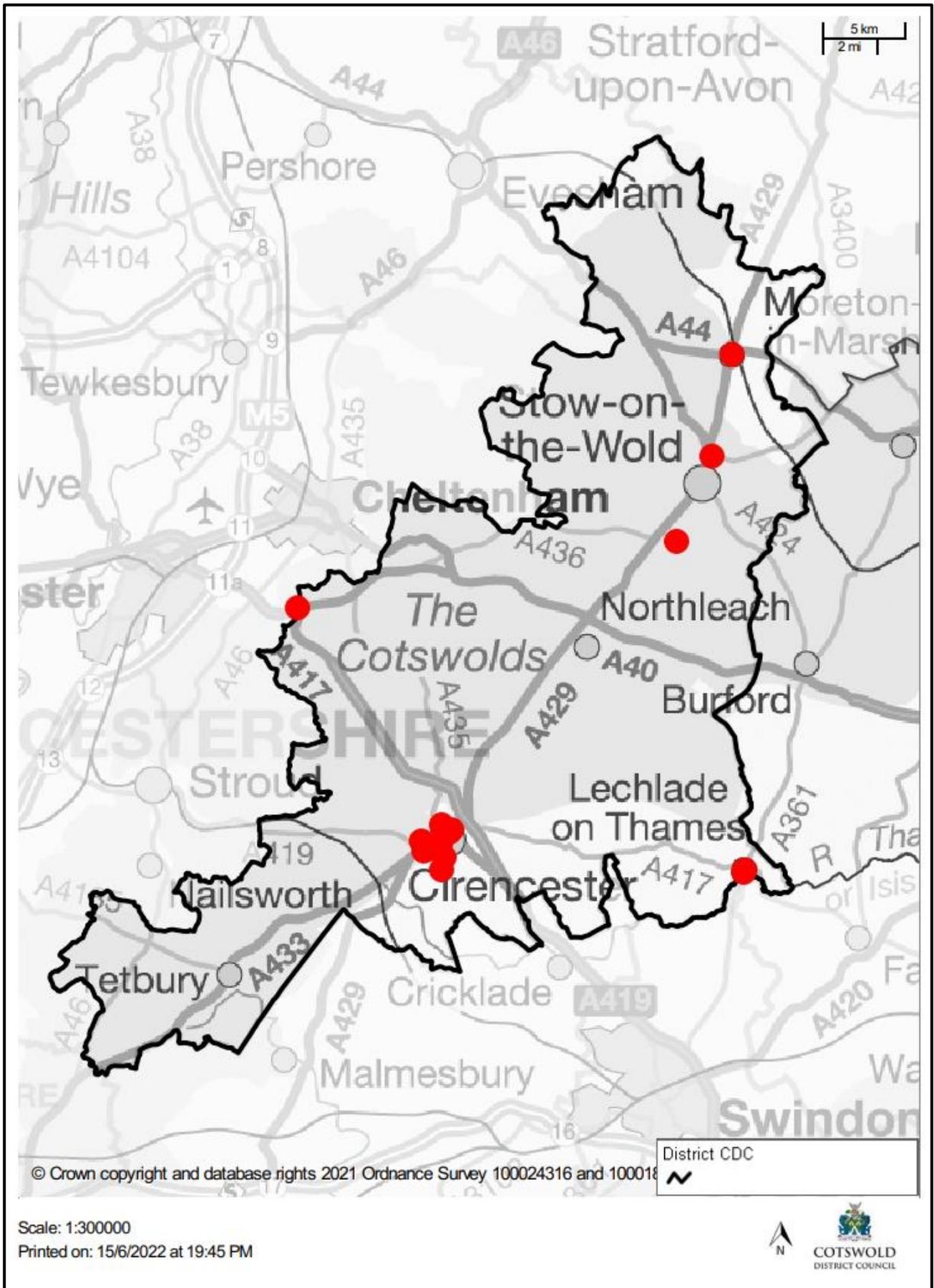
Location NAS39 Air Balloon Roundabout, Birdlip, Gloucester



Sites NAS 42 and 48 Moreton-in-Marsh



Cotswold District, showing distribution of monitoring locations



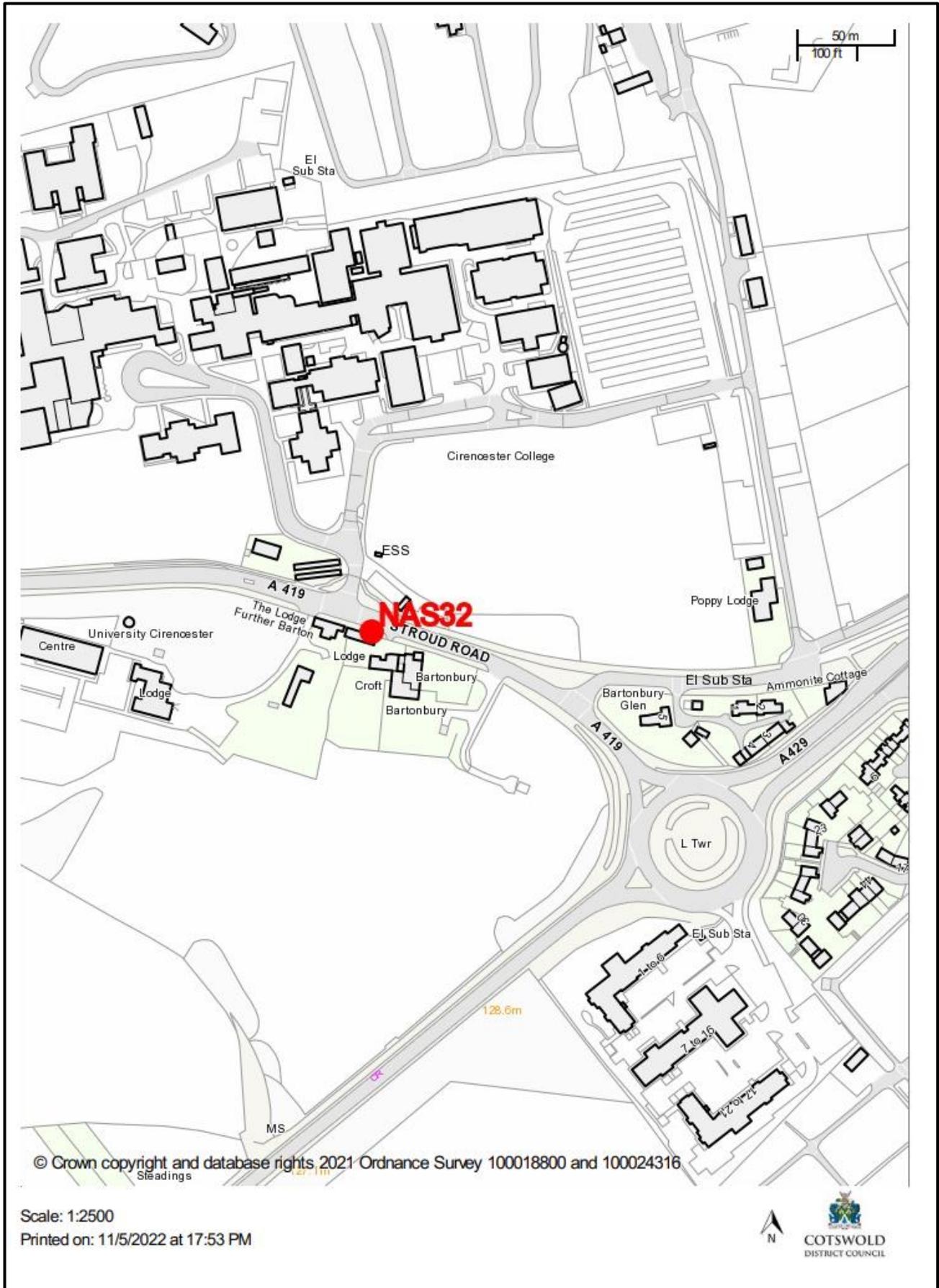
● NO2 monitoring location

New Monitoring Locations for 2022 (to be reported on next year)

New NAS27 Landsdowne, Bouton-on-the-Water (from January 2022)



New NAS32 Stroud Road, Cirencester (from January 2022)



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England⁸

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

⁸ 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	Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by National Highways
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxides
PM ₁₀	Airborne particulate matter with an aerodynamic diameter of 10µm or less
PM _{2.5}	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO ₂	Sulphur Dioxide

References

- Local Air Quality Management Technical Guidance LAQM.TG16. April 2021. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- Local Air Quality Management Policy Guidance LAQM.PG16. May 2016. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.