COTSWOLD
DISTRICT COUNCIL

2020 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the

Environment Act 1995

Local Air Quality Management

June 2020

Local Authority Officer	David Rudland
Department	Environmental Regulatory Services
Address	Trinity Road, Cirencester GL7 1PX
Telephone	01285 623000
E-mail	ers@cotswold.gov.uk
Report Reference number	COTS ASR 2020
Date	June 2020

Table of Contents

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.

In 2019, our diffusion tube network monitored nitrogen dioxide levels at 16 locations. We have long term results at 4 of these locations, 3 within our 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. The three locations in Moreton-in-Marsh and Stow-on-the-Wold were new for 2019 and monitoring at the Moreton sites commenced mid-year in May. One location (Burford Road, Cirencester) was repositioned.

Cotswold District Council

The Cotswold District has two Air Quality Management Areas (AQMA). Monitoring carried out at the AQMA near the junction of Thames Street, Lechlade, shows nitrogen dioxide levels had risen slightly from the previous year but as with last year were not at risk of exceeding the National Air Quality Objective, 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, Birdlip, the diffusion tube data shows reduced levels of nitrogen dioxide (NO_2) compared to last year with the adjusted concentrations a little below the national objective level. The cause of the exceedance is traffic emissions and there has been no significant change in the usage of the road. 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 September and October 2019, Highways England chose a preferred route for a new 3.6 mile dual carriageway, known as Option 30. 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. At the time of preparation of this report the DCO (Development Consent Order) proposals were due to be submitted to the planning inspectorate. 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.

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

Traffic management within our air quality management areas (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.

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 2021.

Air Quality in Cotswold District Council

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

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion[3].

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 (NO_2) 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/m^3, set to protect health, and compared with the monitoring results from previous years. Current monitoring indicates that background levels were very similar to those of recent years but levels at the more trafficked monitoring sites were noticeably lower. We monitor air quality at 16 locations

[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

throughout the district. They 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).

There are two AQMAs in the district, both declared because nitrogen dioxide levels, related to traffic emissions, exceeded the national objective at the time of the declaration.

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. Here, the diffusion tube data shows reduced levels of nitrogen dioxide (NO_2) compared to last year with the adjusted concentrations a little below the national objective level.

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 2019 the annual average NO_2 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 have fallen during both 2018 and 2019, there was a marginal increase in measured annual nitrogen dioxide concentrations at Thames Street in 2019 compared with 2018. Therefore, monitoring will be continued at this location.

The District's air quality monitoring shows that NO_2 levels during 2019 were below the National Air Quality Objective in all locations. At the Air Balloon roundabout, Birdlip, levels have fallen since last year but are close to the National Air Quality Objective of 40 ug/m^3. 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 or usage 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 Reports from all local authorities that have AQMAs. The page for Cotswold District Council reports can be found here:

CDC AQMA Information

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 at the Air Balloon Roundabout 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. It is hoped that this will significantly reduce nitrogen dioxide concentrations at this location so that the AQMA can be revoked.

Progress has been made during 2019. 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. At the time of preparation of this report the DCO (Development Consent Order) proposals were due to be submitted to the planning inspectorate. 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.

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, and this appears to have had a positive effect.

Local Priorities and Challenges

Over the next year we will continue the diffusion tube monitoring survey. We will continue discussions with the County Council and Highways England 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 "pollution" liaison groups, which meet approximately three times 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 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

Local Air Quality Management

This report provides an overview of air quality in Cotswold District during 2019.

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 National Air Quality Objectives applicable to LAQM in England can be found in **Error! Reference source not found.** 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 **Error! Reference source not found.**. Further information related to declared AQMAs, including maps of AQMA boundaries are available online at AQMAs Declared by Cotswold District Council and on the Council's air quality webpage.

Table 0.1 – Declared Air Quality Management Areas

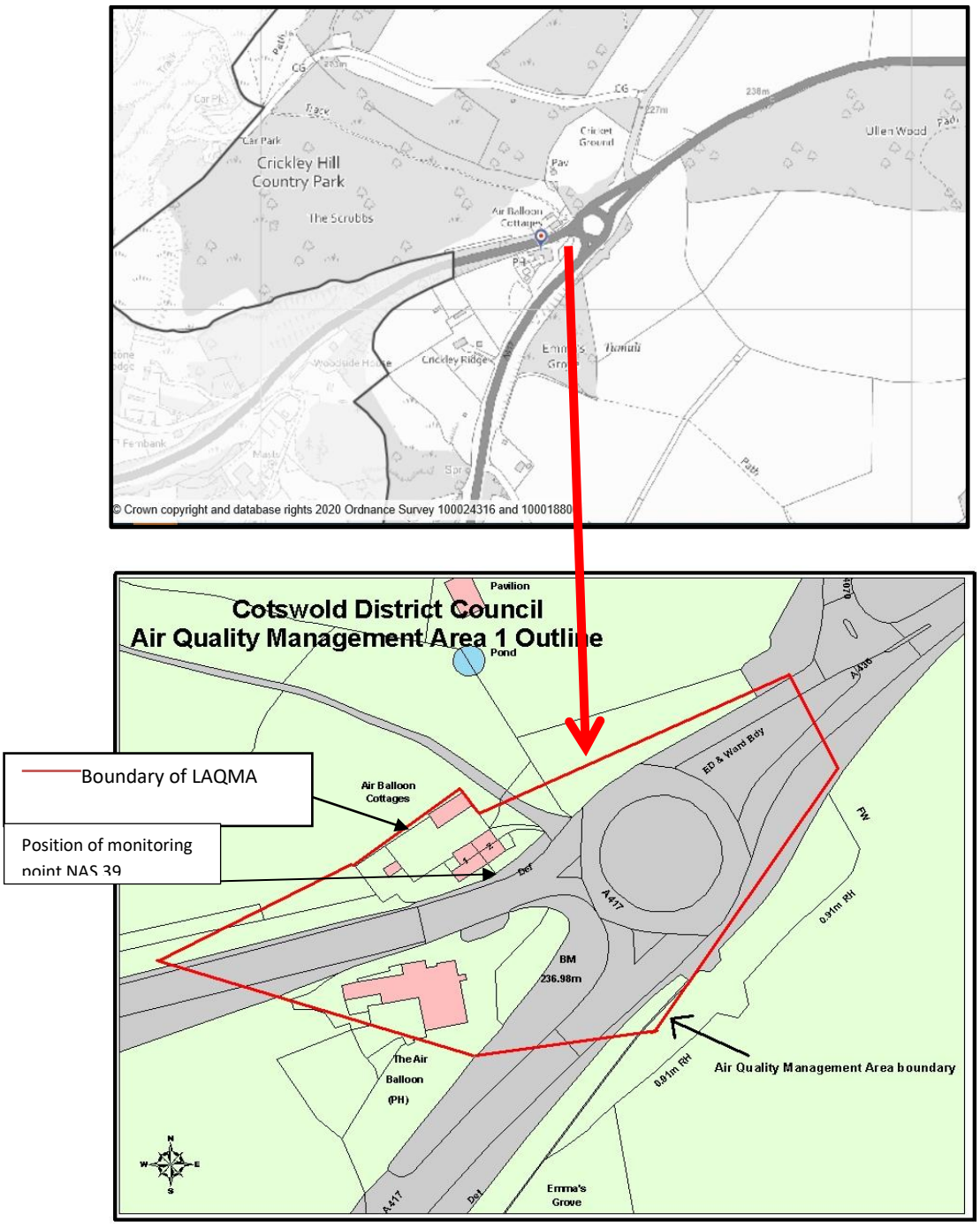
AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	City / Town	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance (maximum monitored/modelled concentration at a location of relevant exposure)				Action Plan		
						At Declaration		Now		Name	Date of Publication	Link
Air Balloon Roundabout	08.04.2008	NO2 Annual Mean	Birdlip	An area encompassing properties adjacent to the roundabout on a strategic trunk route	YES	55	µg/m^3	37.3	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	2012 2019	Cotswold District Council Air Quality Pages
Thames Street, Lechlade	02.04.2014	NO2 Annual Mean	Lechlade	E.g. An area encompassing a number of properties at the junction of High Street and Thames Street,	No	41	µg/m^3	31.1	µg/m^3	County Council traffic management controls	NA	Need for action plan is under review because of improving air quality

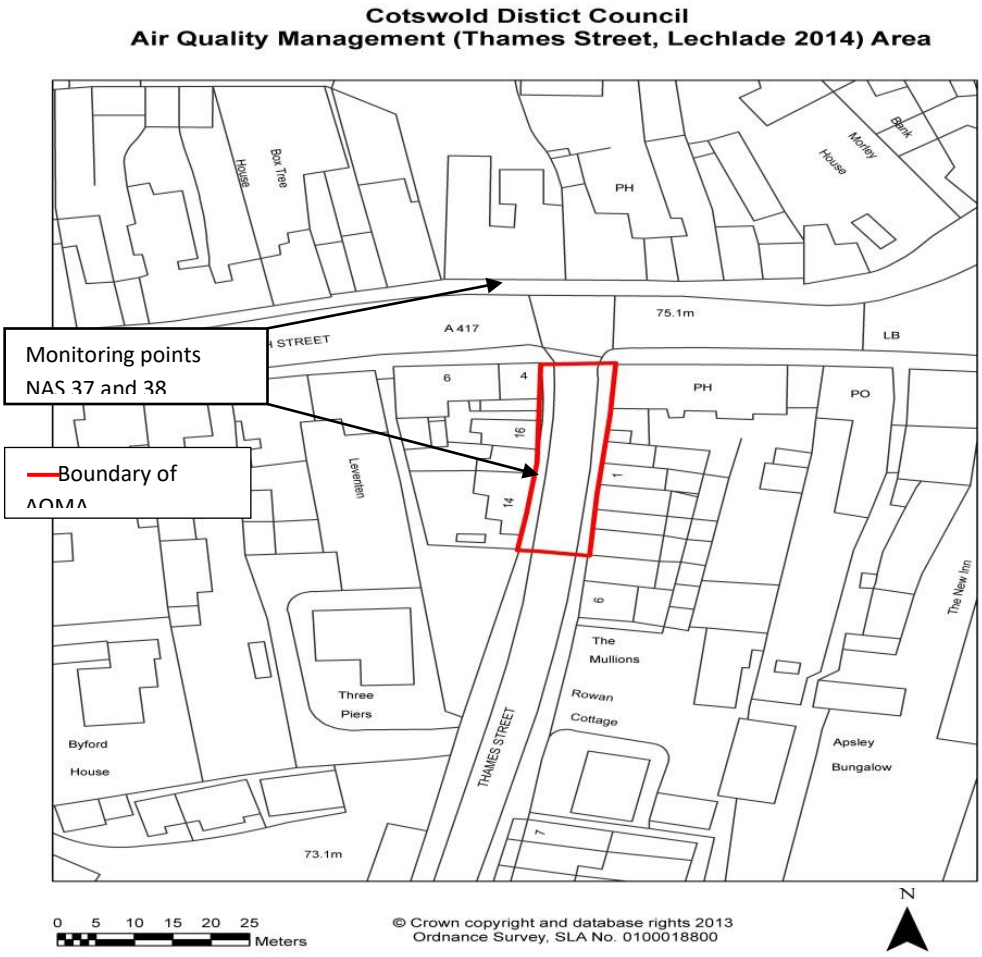
Cotswold District Council

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	City / Town	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance (maximum monitored/modelled concentration at a location of relevant exposure)				Action Plan		
						At Declaration		Now		Name	Date of Publication	Link
				Lechlade.								

Figure 2.1 Maps of AQMA Boundaries

Air Balloon Birdlip





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

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 has made funds available for major alterations to the Air Balloon Roundabout 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.

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
- Spring 2020: -Development Consent Order (DCO) proposals due to be submitted to the planning inspectorate

Further information can be found here: Highways England Information Webpages

It is possible that because of the topography of the area, mainly the steep incline, and the high volume of HGVs using this route, proposed changes in upgrading part of the route and changing the road lay out will have minimal effect on the air quality 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 and assist with any technical studies on air quality if approached.

At the Lechlade AQMA at the Thames Street junction with the High Street, in recent years 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 fully 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. This may be the cause of a marginal increase in measured annual nitrogen dioxide concentrations at Thames Street in 2019 compared with 2018.

Therefore monitoring will be continued at this location.

Table 0.1 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Cate-gory	EU Classification	Date Measure Introduced	Organis-ations involved	Funding Source	Key Perform-ance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
1	A417 Trunk Road Improvements at Air Balloon Roundabout	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	Planning ongoing	Highways England	The second Road Investment Strategy (RIS2)	Reduced NO_2 levels recorded	Annual average NO_2 to be reduced to meet AQ objective	Development Consent Order being prepared for submission	2024 (est)	Awaiting allocation of government funds - within the second Road Investment Strategy (RIS2), due April 2020
2	Thames Street, Lechlade	Traffic Management	Reduction of speed limits, 20mph zones	2017	Gloucestershire County Council (GCC)	Gloucestershire County Council	Reduced NO_2 levels recorded	Annual average NO_2 to be reduced to meet AQ objective	Completed	Completed 2017	Measures appear effective and are being monitored
3	District Planning Policy - Sustainable Transport (POLICY	Alternatives to private vehicle use	Other	2018	Cotswold District Council	Developers	Increased number and use of LEVs	Reduced NO_2	Major planning applications affected	It will be an ongoing project	See Government Clean Air Strategy (CAS 2019)

Measure No.	Measure	EU Cate-gory	EU Classification	Date Measure Introduced	Organis-ations involved	Funding Source	Key Perform-ance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
	INF3)										
4	Gloucestershire's Local Transport Plan 2015-41	Promoting Travel Alternatives	Other	2019	Gloucestershire County Council	Gloucestershire County Council	Promoting alternative journey modes	Reduced local car use	Consultation complete 26 March 2020	Ongoing	Funding

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

General Approach

As detailed in Policy Guidance LAQM.PG16 (Chapter 7), local authorities are expected to work towards reducing emissions and/or concentrations of PM2.5 (particulate matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that PM2.5 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.

Partnership working with the county-wide Gloucestershire Pollution Group has included liaison with Gloucestershire County to coordinate air quality policy.

Public Health Outcomes Framework

PM2.5 is the pollutant which has the biggest impact on public health and on which the Public Health Outcomes Framework (PHOF) indicator 3.015 is based[4].

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" (2017).

[4] Source: Background annual average PM2.5 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 PM2.5 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, PM2.5 are used as the basis for this indicator, as burden estimates based on total PM2.5 might give a misleading impression of the scale of the potential influence of policy interventions (COMEAP, 2012).

For Gloucestershire as a whole, the estimated Fraction of Mortality attributable to particulate air pollution is ranked 6 out of 16 areas in the South West of England. This equates to a percentage of 4.7% compared with the regional average of 4.4%.

For the Cotswold District, the estimated Fraction of Mortality attributable to particulate air pollution is ranked 14 out of 37 areas in the South West of England. This equates to a percentage of 4.6% compared with the regional average of 4.4%.

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.

The 2019 monitoring year was largely one of consolidation with most of the monitoring locations similar to the previous year's. However three new locations were set up during 2019 – NAS 42 and NAS 43 in Moreton in Marsh and NAS 26 in Stow-on-the-Wold.

Otherwise we continued monitoring at 13 other locations, making a total of 16 in all. Of these, 3 were within our AQMAs (NAS37, NAS38 in Lechlade and NAS39 at Birdlip). The majority of the remainder were within Cirencester, partly in response to requests of local residents represented by a pressure group known as "Save Our Cirencester", who wished to see more monitoring carried out around Cirencester itself. During 2019 we continued to monitor in the same locations within Cirencester except that 2 locations in Burford Road were reduced to one.

Non-Automatic Monitoring Sites

Cotswold District Council undertook non- automatic (passive) monitoring of NO_2 at 16 sites during 2019. Appendix A provides details of the sites. Maps showing the location of the monitoring sites are provided in Appendix D.

Individual Pollutants

Nitrogen Dioxide (NO_2)

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 all but 2 monitoring sites, annualisation was not required for most of those. However for the 2 sites where monitoring was part year, annualisation was carried out to provide an estimated annual exposure. 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.

Table A.2 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past 5 years (where available), for comparison with the air quality objective of 40µg/m^3. The full 2019 dataset of monthly mean NO_2 levels from the diffusion tube survey is provided in Appendix B.

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, but were lower than last year's levels. Significantly the adjusted mean annual nitrogen dioxide level at this location was a little below 40 µg/m^3, set as the national objective level to protect health. 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 annual average nitrogen dioxide level in Thames Street, Lechlade, continued to remain below the 40 µg/m^3 national objective level. 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.

It is noted that during October and November of 2019 there were significant roadworks in High Street Lechlade to install new cables. Specifically this occurred during the period 1 Oct - 26 Nov 2019. The raw measured concentrations of nitrogen dioxide during that period deviate significantly from those of 2018 as set out in Table 3.1 below. This may reflect the traffic disruptions at this time, which involved traffic lane constrictions and night time highway closures through the town centre. It may have had a similar effect on adjoining Thames Street. The Council will continue diffusion tube monitoring in the area and maintain the AQMA.

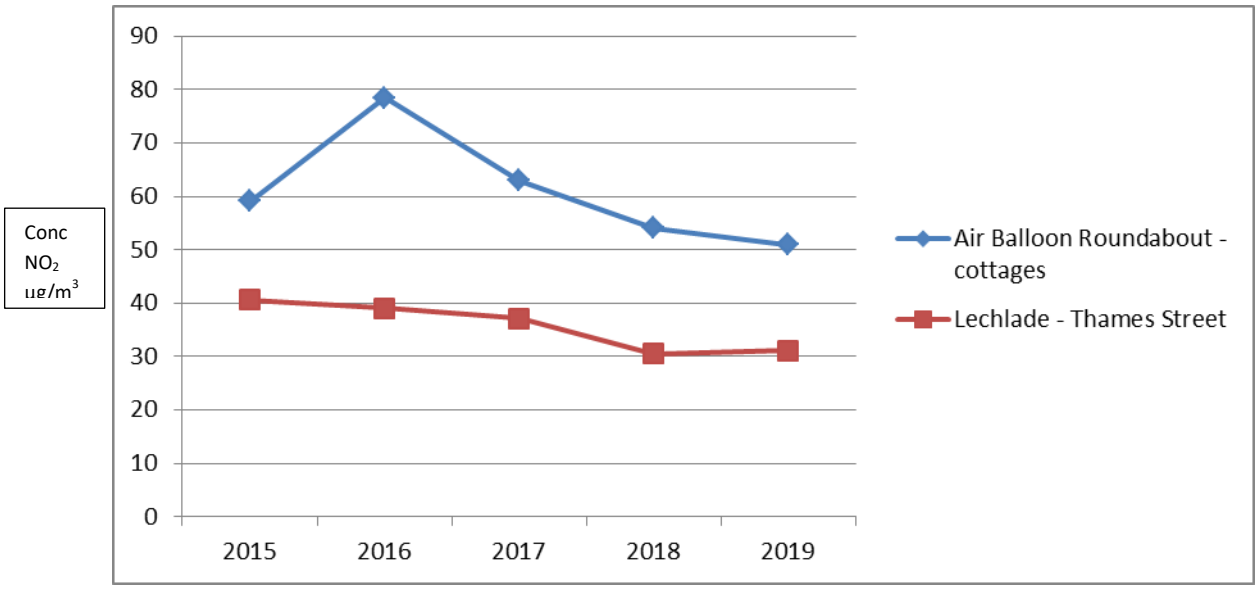
Table 3.1 High St, Lechlade NO_2 Comparison Autumn 2018 and 2019*

Year	**NO_2 µg/m^3**	**NO_2 µg/m^3**
	October	November
2018	45.8	36.3
2019	31	45.9

*NB raw, unadjusted data, for comparison

Figure 3.1 illustrates the change in annual mean NO_2 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.

Figure 3.1 – Trends in Annual Mean NO_2 Concentrations - Graph showing the trends over 5 years at AQMA long term diffusion tube monitoring sites



NB concentrations illustrated are measured concentration corrected for bias but not adjusted for distance to receptor.

The levels recorded during 2019 at our other roadside sites were mainly slightly less than 2018 levels although in a few cases (such as NAS30 - London Road, Cirencester) there was a marginal increase, in each case less than 1 µg/m^3.

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 at Burford Road traffic lights at the junction with the A417 main road, a revised location for 2019. In the months where dispersion is hindered by poor meteorological conditions the levels are the highest as would be expected.

The Berkeley Road and the Spratsgate Lane sites, around Chesterton Farm experience levels below 10 µg/m^3 which are generally expected in locations away from any sources. This can be considered as the "background" level in the Cotswolds, but will be reviewed as and when proposed developments in this area commence. 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. All background site levels were recorded to be similar to those measured last year.

Appendix A: Monitoring Results

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

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
NAS26	Unicorn PH, Stow on the Wold	Roadside	419003	225693	NO2	No	6.46	1.21	NO	2.11
NAS27	Coach Park,Station Road, Bourton-on-the Water	Urban Centre	417028	220781	NO2	No	15.15	6.44	NO	2.47
NAS28	Burford Rd Traffic lights j/w A417, Cirencester	Roadside	403020	202175	NO2	No	10.0	1.51	NO	2.32
NAS29	Abbey Way j/w Spitalgate, Cirencester	Roadside	402305	202519	NO2	No	6.04	1.39	NO	2.23
NAS30	London Road, Cirencester	Kerbside	402783	201946	NO2	No	5.83	2.75	NO	2.2
NAS31	Lewis Lane,	Roadside	402480	201772	NO2	No	2.68	1.54	NO	2.07

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) [1]	Distance to kerb of nearest road (m) [2]	Tube collocated with a Continuous Analyser?	Height (m)
	Cirencester									
NAS32	Hammond Way, Cirencester	Roadside	402039	201765	NO2	No	8.0	1.7	NO	2.4
NAS33	Tetbury Road, Cirencester (O/S Steading Cottages)	Roadside	401064	201044	NO2	No	3.83	2.85	NO	2.15
NAS34	Spratsgate Lane nr j/w Park Way, Cirencester	Roadside	402394	199581	NO2	No	0	2.32	NO	2.14

Table A1 (cont)

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) [1]	Distance to kerb of nearest road (m) [2]	Tube collocated with a Continuous Analyser?	Height (m)
NAS35	Berkeley Road j/w Somerford Road, Cirencester	Roadside	402439	200297	NO2	No	15.0	0.48	NO	2.14
NAS36	Somerford Road, Cirencester. (on lamp post 66)	Roadside	402241	201102	NO2	No	4.62	1.69	NO	2.35
NAS37	Thames Street, Lechlade	Kerbside	421397	199489	NO2	Yes (Lechlade)	0.2	1.25	NO	2.36
NAS38	High Street, Lechlade	Kerbside	421374	199511	NO2	No	0.25	1.95	NO	2.11
NAS39	Air Ballon Roundabout, Birdlip	Kerbside	393462	216111	NO2	Yes (Birdlip)	4.21	1.12	NO	2.13
NAS42	A429 j/w A44 (White Horse Hotel) (New 1/5/19)	Roadside	420486	232419	NO2	No	0.38	3.27	NO	2.39
NAS43	A429 j/w East	Roadside	420495	232336	NO2	No	2.25	0.84	NO	2.19

	Street, Moreton on Marsh (new 1/5/19)									

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 NO_2 Monitoring Results

Site ID	X OS Grid ref (Easting)	Y OS Grid ref (Northing)	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	NO_2 Annual Mean Concentration (µg/m^3) (3) (4)				
							2015	2016	2017	2018	2019
NAS26 - Unicorn PH, Stow on the Wold	419003	225693	Roadside	Diffusion Tube		91.7	-	-	-	-	38.7
NAS27 - Coach Park, Station Road,Bourton on Water	417028	220781	Urban Centre	Diffusion Tube		100	-	-	-	13.6	10.8
NAS28 - Burford Rd Traffic lights j/w A417, Cirencester	403124	202245	Roadside	Diffusion Tube		83.3	-	-	-	-	29.8
NAS29 - Abbey Way j/w Spitalgate, Cirencester	402305	202519	Roadside	Diffusion Tube		100	-	-	34.8	29.8	29.9
NAS30 - London Road,Cirencester	402783	201946	Kerbside	Diffusion Tube		91.7	23.8	30.4	25.7	22.6	23.4
NAS31 - Lewis Lane, Cirencester	402480	201772	Roadside	Diffusion Tube		100	-	-	22.6	20.9	20.6
NAS32 - Hammond Way, Cirencester	402039	201765	Roadside	Diffusion Tube		91.7	-	-	21	18.1	17.2

Site ID	X OS Grid ref (Easting)	Y OS Grid ref (Northing)	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3) (4)				
							2015	2016	2017	2018	2019
NAS33 - Tetbury Road, Cirencester (O/S Steading Cottages)	401064	201044	Roadside	Diffusion Tube		100	-	-	24.6	21.8	21.6
NAS34 - Spratsgate Lane nr j/w Park Way, Cirencester	402394	199581	Roadside	Diffusion Tube		100	-	-	9.6	9.5	9.3

Table A.2 (cont)

Site ID	X OS Grid ref (Easting)	Y OS Grid ref (Northing)	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	NO_2 Annual Mean Concentration (µg/m^3) (3) (4)				
							2015	2016	2017	2018	2019
NAS35 - Berkeley Road j/w Somerford Road, Cirencester	402439	200297	Roadside	Diffusion Tube		100	-	-	9.4	9.4	9.9
NAS36 - Somerford Road, Cirencester (on lamp post 66)	402241	201102	Roadside	Diffusion Tube		83.3	-	-	17.6	14.5	14.9
NAS37 - Thames Street, Lechlade	421397	199489	Kerbside	Diffusion Tube		100	38.7	**41.5**	36.2	30.5	31.1
NAS38 - High Street, Lechlade	421374	199511	Kerbside	Diffusion Tube		91.7	32.9	29.1	29	28	26.2
NAS39 - Air Ballon Roundabout, Birdlip	393462	216111	Kerbside	Diffusion Tube		100	**59.1**	**61.2**	**61.4**	**54.1**	**50.9**
NAS42 - A429 j/w A44 (White Horse Hotel) (New 1/5/19)	420486	232419	Roadside	Diffusion Tube	100	67	-	-	-	-	29.0
NAS43 - A429 j/w East Street, Moreton on Marsh (new 1/5/19)	420495	232336	Roadside	Diffusion Tube	100	67	-	-	-	-	14.8

Notes:

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined.**

(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%).

(3) Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16 if valid data capture for the full calendar year is less than 75% (applicable this year only for NAS 42 and 43 because in other locations data capture was good). See Appendix C for details.

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

Appendix B: Full Monthly Diffusion Tube Results for 2019

Table B.1 – NO_2 Monthly Diffusion Tube Results – 2019

	NO_2 Mean Concentrations (µg/m^3)												Annual Mean	Annual Mean	Annual Mean
AIR QUALITY DIFFUSION TUBE RESULTS - 2019	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Unadjusted**	**bias Adjusted BAF 0.75**	**Distance corrected to nearest exposure**
NAS26 - Unicorn PH, Stow on the Wold	Missing	44.9	48.4	60.1	55.8	56.7	56.6	48.9	56.6	43.5	61.6	33.9	51.5	38.7	26.8
NAS27 - Coach Park,Station Road,Bourton on Water	16.4	17.9	12.2	17.2	11.3	11	11.7	11.1	13.3	14.7	22.7	13.6	14.4	10.8	n/a
NAS28 - Burford Rd Traffic lights j/w A417, Cirencester	39.6	46.5	44.1	Missing	Missing	37.6	38.7	35.4	34.3	37.8	48.9	33.8	39.7	29.8	n/a
NAS29 - Abbey Way j/w Spitalgate, Cirencester	48.3	43.7	33.8	45.6	40.9	35.6	36	31.3	39.8	37.1	52.9	33	39.8	29.9	n/a
NAS30 - London Road,Cirencester	37.5	43.2	30.9	Missing	22.9	24.3	23.7	26.5	27.4	28.5	40.1	38.7	31.2	23.4	n/a
NAS31 - Lewis Lane, Cirencester	38.1	31.5	29.5	27	20.7	21.3	21.4	18.4	25	23.3	42.5	30.4	27.4	20.6	n/a
NAS32 - Hammond Way, Cirencester	24.8	33.4	24.8	26.2	18.9	18.3	18.5	16.7	21.1	21.8	Missing	28.3	23.0	17.2	n/a
NAS33 - Tetbury Road, Cirencester (O/S Steading Cottages)	32.8	35.9	24.1	29.1	24.7	27.5	25.1	24.5	28.1	31	38.4	24.3	28.8	21.6	n/a
NAS34 - Spratsgate Lane nr j/w Park Way, Cirencester	16.9	19	10.5	14.7	8	7.7	8.2	6.7	9.6	12.8	22.8	12.5	12.5	9.3	n/a
NAS35 - Berkeley Road j/w Somerford Road, Cirencester	18.3	16.1	10.4	15.4	8.6	9.2	9	15.1	11.3	12	22	10.7	13.2	9.9	n/a

	NO_2 Mean Concentrations (µg/m^3)												Annual Mean	Annual Mean	Annual Mean
NAS36 - Somerford Road, Cirencester. (on lamp post 66)	30	26.7	19	19.8	13.8	Missing	12.5	11.3	16.8	18.7	29.7	Missing	19.8	14.9	n/a
NAS37 - Thames Street, Lechlade	52.9	48.1	40.4	34.1	36.1	34.6	49.4	37.2	38.2	35.8	55.5	35.6	41.5	31.1	n/a
NAS38 - High Street, Lechlade	46.9	45.6	34.1	40	Missing	30.7	28.3	21.9	29.7	31	45.9	30.3	34.9	26.2	n/a
NAS39 - Air Ballon Roundabout, Birdlip	71.2	82	63	72	63.8	61.5	61.3	73.4	64.5	64.1	74.1	63.6	67.9	50.9	37.3
NAS42 - A429 j/w A44 (White Horse Hotel) (New 1/5/19)	X	X	X	X	32.3	35	33.6	31.8	32.6	38.4	31.4	38.3	34.2	29.0	n/a
NAS43 - A429 j/w East Street, Moreton on Marsh (new 1/5/19)	X	X	X	X	15	15.5	16.3	15	18.9	16.8	25.5	17.2	17.5	14.8	n/a

nr=not required. Adjustment for distance not required when annual average concentration is significantly below the annual objective value

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 Socotec Didcot laboratories.

National bias adjustment factors have been used from Defra database.

The factor used is 0.75 based on 24 studies and this was applied to all diffusion tubes.

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 03/20

Follow the steps below in the correct order to show the results of relevant co-location studies

Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods

Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet

This spreadsheet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.

This spreadsheet will be updated at the end of June 2020

LAQM Helpdesk Website

The LAQM Helpdesk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.

Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.

Step 1: Select the Laboratory that Analyses Your Tubes from the Drop-Down List

If a laboratory is not shown, we have no data for this laboratory.

Step 2: Select a Preparation Method from the Drop-Down List

If a preparation method is not shown, we have no data for this method at this laboratory.

Step 3: Select a Year from the Drop-Down List

If a year is not shown, we have no data[2]

Step 4:

Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] shown in blue at the foot of the final column.

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@uk.bureauveritas.com or 0800 0327953

Analysed By[1]	Method (To undo your selection, choose (All) from the pop-up list)	Year[2] (To undo your selection, choose (All))	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[4]	Bias Adjustment Factor (A) (Cm/Dm)
Socotec Didcot	50% TEA in acetone	2019	UB	Kingston upon Hull City Council	12	30	23	32.2%	G	**0.76**
Socotec Didcot	50% TEA in acetone	2019	O	Kingston upon Hull City Council	11	32	26	19.1%	G	**0.84**
Socotec Didcot	50% TEA in acetone	2019	R	Vale of Glamorgan	11	40	24	68.0%	G	**0.60**
Socotec Didcot	50% TEA in acetone	2019	R	Watford Borough Council	12	35	30	16.8%	S	**0.86**
Socotec Didcot	50% TEA in acetone	2019	R	Dumfries & Galloway Council	13	35	31	11.9%	G	**0.89**
Socotec Didcot	50% TEA in acetone	2019	KS	Marylebone Road Intercomparison	12	92	65	40.5%	G	**0.71**
Socotec Didcot	50% TEA in acetone	2019	UB	City of York Council	12	22	16	35.6%	G	**0.74**
Socotec Didcot	50% TEA in acetone	2019	R	City of York Council	12	33	26	26.8%	G	**0.79**
Socotec Didcot	50% TEA in acetone	2019	R	City of York Council	9	32	23	37.2%	G	**0.73**
Socotec Didcot	50% TEA in acetone	2019	R	City of York Council	11	40	28	43.4%	G	**0.70**
Socotec Didcot	50% TEA in acetone	2019	R	Ipswich Boorough council	11	34	26	34.1%	G	**0.75**
Socotec Didcot	50% TEA in acetone	2019	R	Swale BC	12	51	39	31.7%	G	**0.76**
Socotec Didcot	50% TEA in acetone	2019	R	Swale BC	12	33	27	23.9%	G	**0.81**
Socotec Didcot	50% TEA in acetone	2019	R	Swale BC	12	40	31	26.7%	G	**0.79**
Socotec Didcot	50% TEA in acetone	2019	R	Wrexham County Borough Council	10	20	16	22.2%	G	**0.82**
Socotec Didcot	50% TEA in acetone	2019	R	City of Wolverhampton Council	12	39	27	48.4%	G	**0.67**
Socotec Didcot	50% TEA in acetone	2019	R	North Herts DC	12	59	46	28.5%	G	**0.78**
Socotec Didcot	50% TEA in acetone	2019	R	Horsham District Council	12	30	24	24.5%	G	**0.80**
Socotec Didcot	50% TEA in acetone	2019	R	Horsham District Council	11	31	22	44.5%	G	**0.69**
Socotec Didcot	50% TEA in acetone	2019	R	Horsham District Council	11	32	24	34.4%	G	**0.74**
Socotec Didcot	50% TEA in acetone	2019	B	Medway Council	10	21	13	59.5%	P	**0.63**
Socotec Didcot	50% TEA in acetone	2019	R	Medway Council	12	33	24	35.1%	G	**0.74**
Socotec Didcot	50% TEA in acetone	2019	R	Waverley Borough Council	10	38	30	27.5%	G	**0.78**
Socotec Didcot	50% TEA in acetone	2019	R	Waverley Borough Council	12	35	24	44.7%	G	**0.69**
SOCOTEC Didcot	50% TEA in acetone	2019		**Overall Factor[3] (24 studies)**				**Use**		**0.75**

Annualisation of data

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 3 months of monitoring data available. Monitoring at 2 sites (NAS42 and NAS43, Moreton-in-Marsh) was carried out only part year as the monitoring locations were only set and operational from May 2019, meaning that data was only made available for 8 months of the year.

A measured mean concentration for the respective periods of exposure is available for each location. However it will be necessary to estimate the annual mean for these 2 locations, for comparison with the annual target concentration, because less than 75% availability for this area.

The procedure involves the following steps:

1. Identification of two to four nearby, long-term, continuous monitoring sites, ideally those forming part of the national network. The data capture for each of these sites should ideally be at least 85%. These sites should be background (Urban Background, Suburban or Rural) sites to avoid any very local effects that may occur at Urban Centre, Roadside or Kerbside sites, and should, wherever possible lie within a radius of about 50 miles. If no background sites are available, and the site to be annualised is itself a Urban Centre, Roadside or Kerbside site, then it is permissible to annualise using roadside or kerbside sites rather than background sites.

The nearest sites that have characteristics similar to the areas requiring normalisation are located in Swindon and Oxford (St Ebbes).

2. Obtain the annual means, 'Am', for the calendar year for these sites.

3. Work out the period means, 'Pm', for the period of interest, in this case May-Dec 2019 for the two Moreton-in- Marsh sites NAS42 and NAS43.

4. Calculate the ratio, 'R', of the annual mean to the period mean ('Am/Pm') for each of the sites.

5. Calculate the average of these ratios, 'Ra'. This is then the annualisation factor.

6. Multiply the measured period mean concentration 'M' by this annualisation factor Ra to give the estimate of the annual mean for 2019.

For the diffusion tube location NAS42 alongside the A429 at the junction with A44 (White Horse Hotel) Moreton, the best estimate of the annual mean in 2019 is 1.13 x 34.2µg/m^3 =38.6 µg/m^3, as set out in the table below. For the A429 j/w East Street, Moreton NAS43 tube, the best estimate of the annual mean in 2019 (again using the table below) is 1.13 x 17.5 µg/m^3 = 19.8 µg/m^3. These figures are then further adjusted for bias by multiplication

with 0.75 (from the national spreadsheeet to 29.0 µg/m^3 (NAS42) and 14.8 µg/m^3 (NAS43). See Table C1.

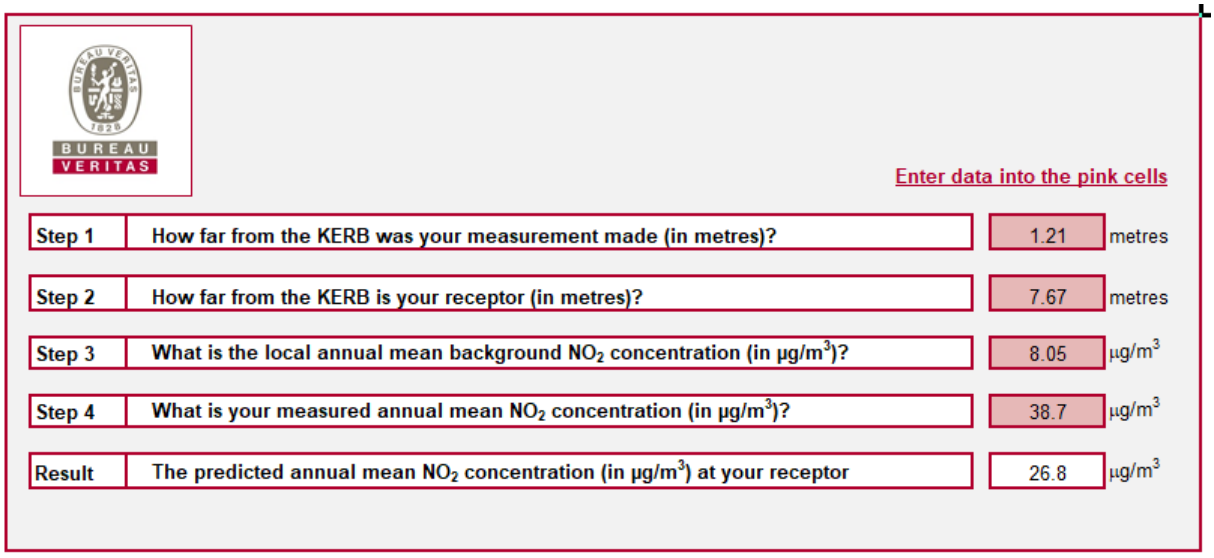
Table C1 Annualisation Data, NAS42 and NAS43 Moreton – (units µg/m^3)

Background Site	Annual Average Am	Period Mean Pm	Ratio Am/Pm
		May-Dec 2019	
NAS42 NAS43		34.2 17.5	
AURN St Ebbes Oxford	15.8	14.6	1.08
AURN Swindon Walcot	13.3	11.2	1.19
Annualisation Factor			1.13

Correction for distance

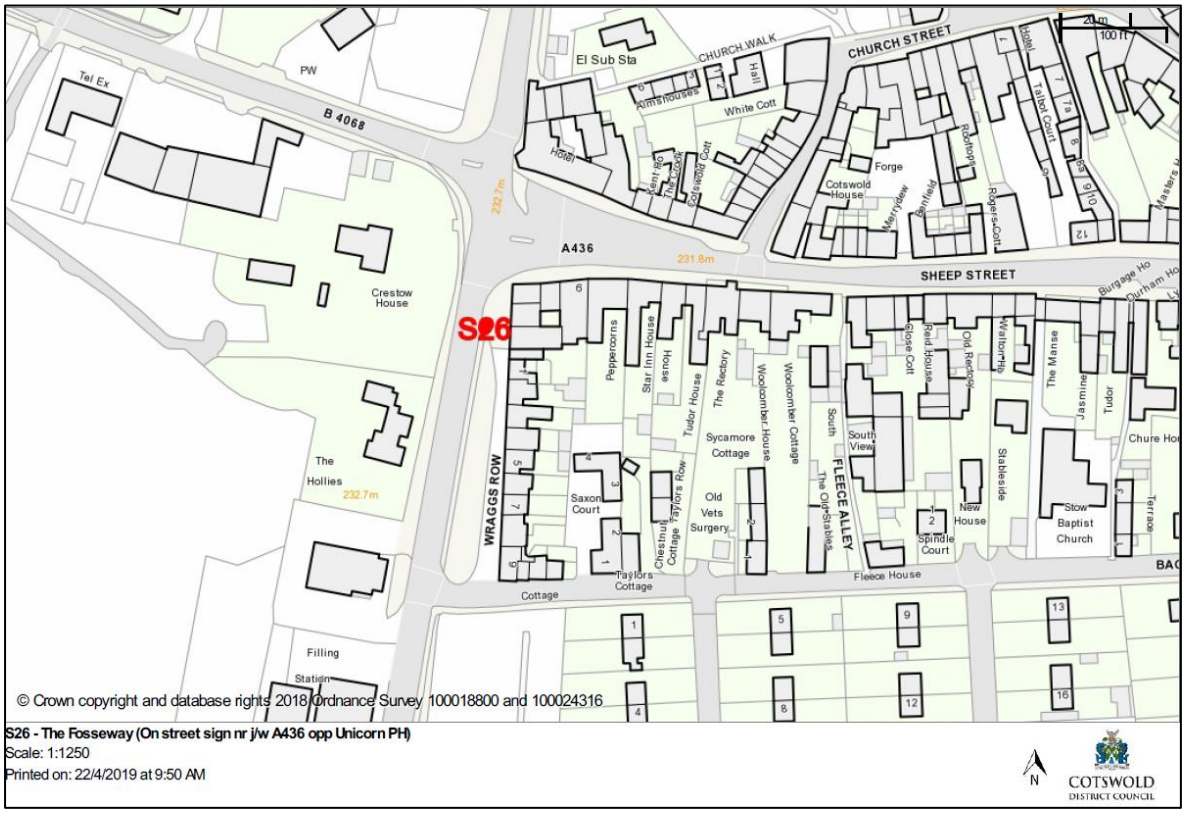
Corrections for distance (to allow for the distance the diffusion tubes are from the roadside) have been made within this assessment. This is at two sites where concentrations not representative of actual exposure (because the receptor is set back from the roadway) fall within 10% of the annual mean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

Distance correction has been made where appropriate using the DEFRA supplied correction tool. An example of the output, for the monitoring point located NAS26 at Stow, is shown below.

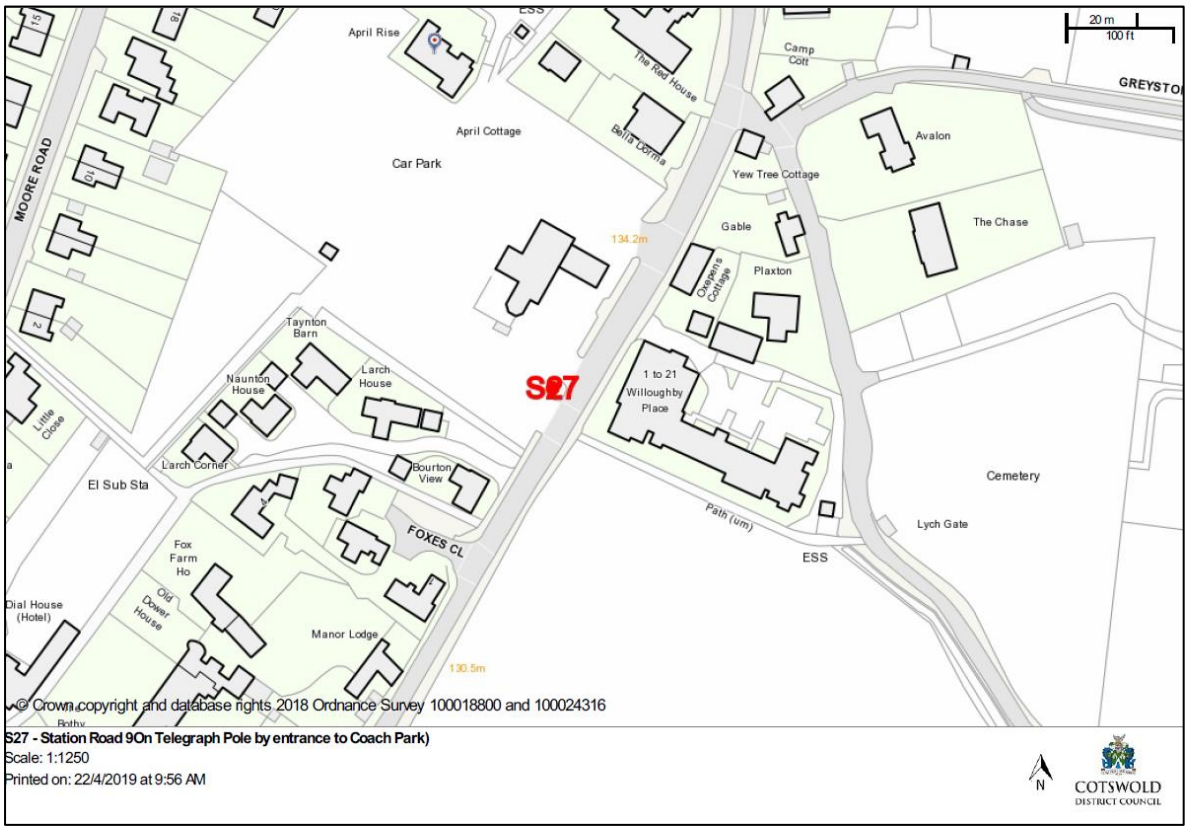


Appendix D: Map(s) of Monitoring Locations and AQMAs

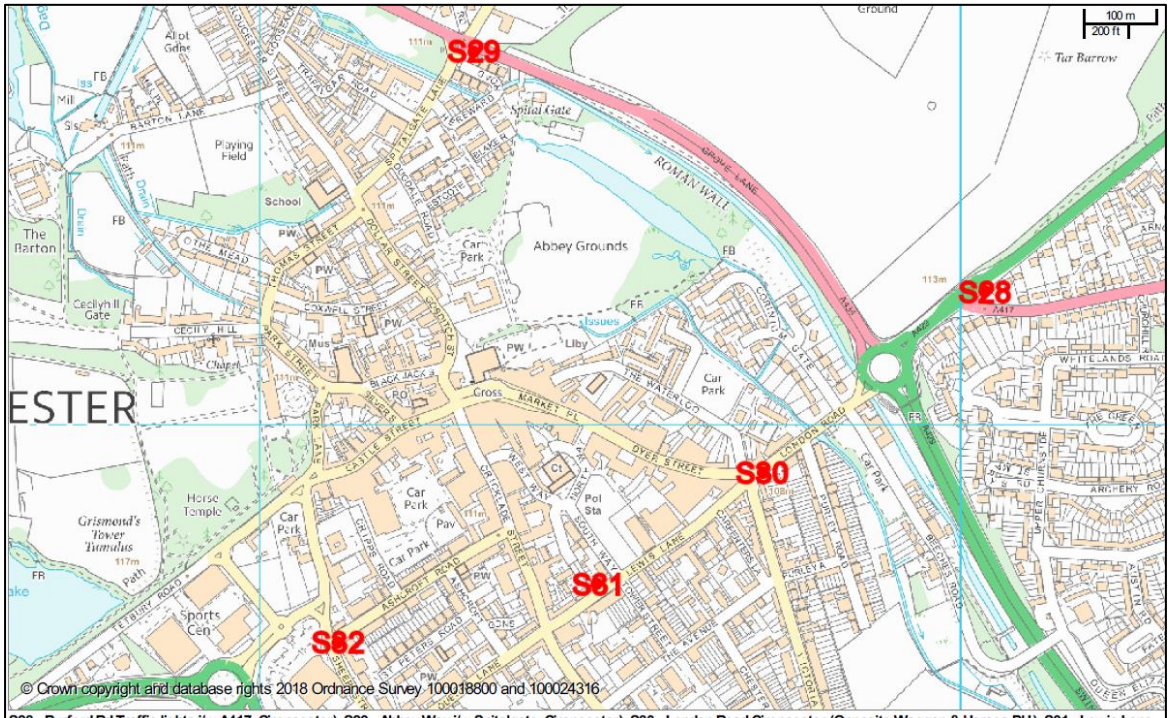
Site NAS 26 Stow, Unicorn, Fosseway



Site NAS27 Coach Park, Bourton-on-the-Water

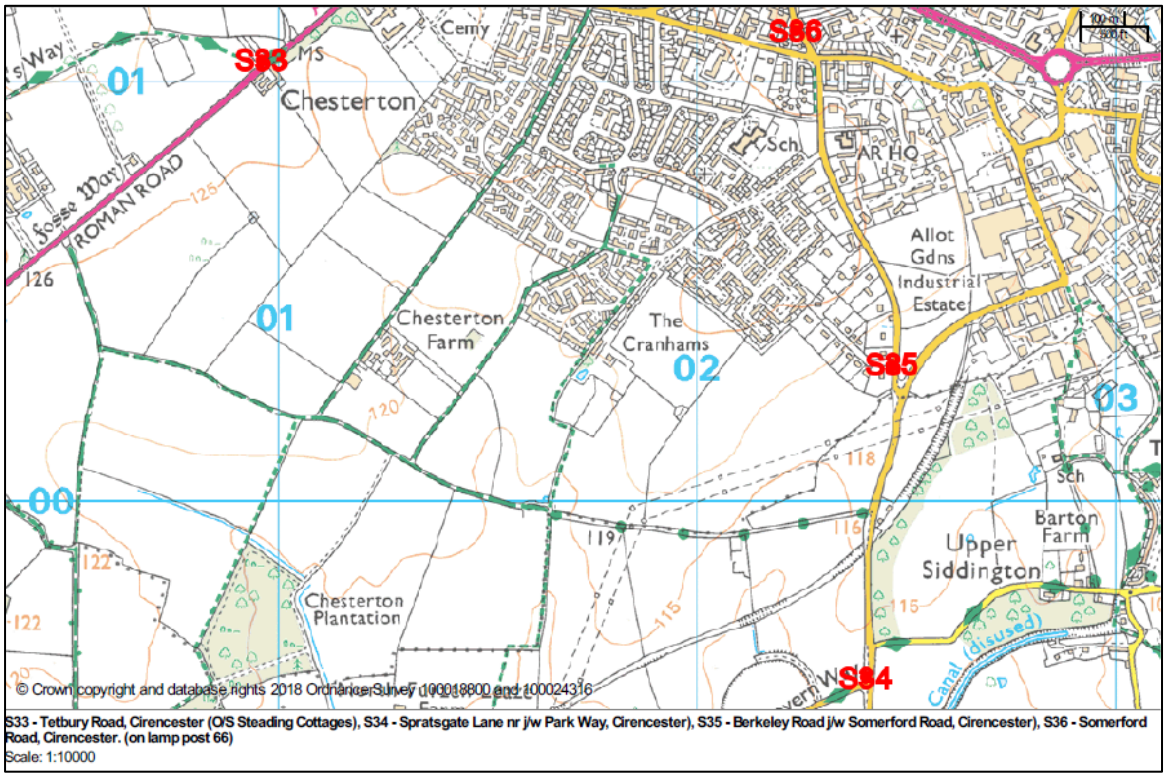


Sites NAS28 – 32 Cirencester centre and east



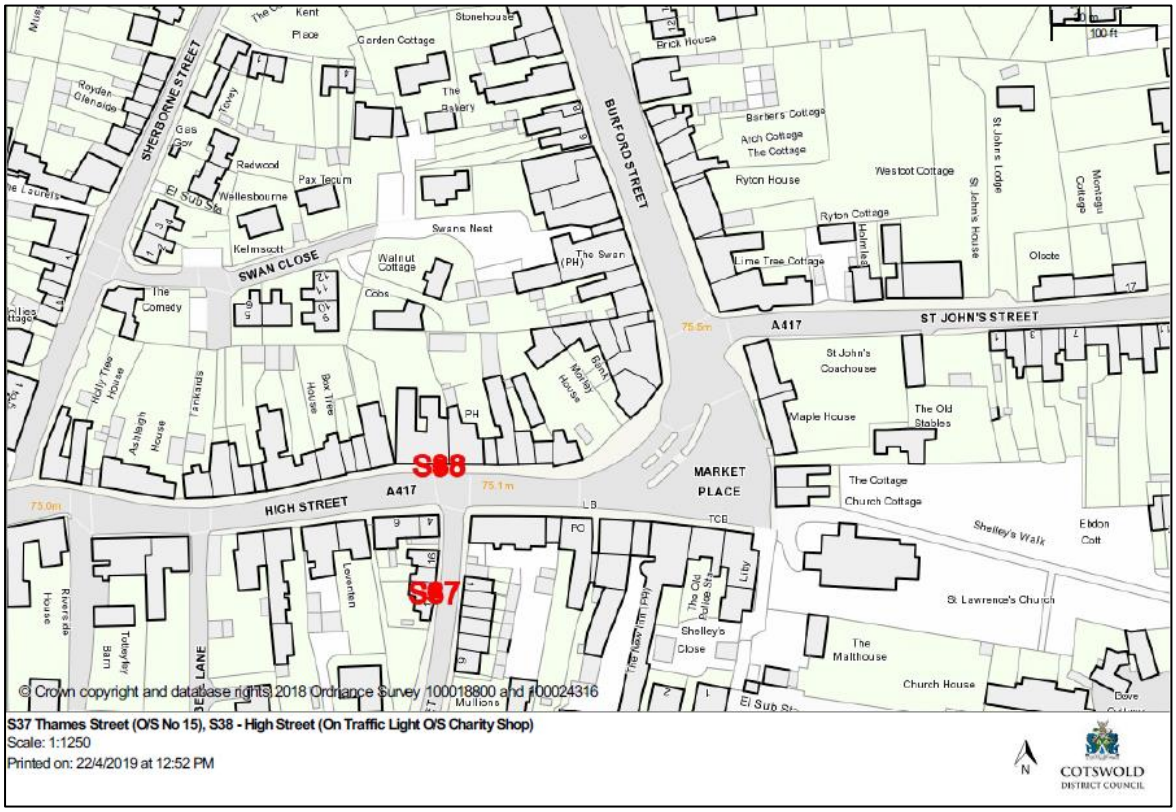
S28 - Burford Rd Traffic lights j/w A417, Cirencester), S29 - Abbey Way j/w Spitalgate, Cirencester), S30 - London Road,Cirencester (Opposite Waggon & Horses PH), S31 - Lewis Lane, Cirencester (O?S No 39), S32 - Hammond Way, Cirencester (R/Bout j/w Ashcroft Road)
Scale: 1:6000
Printed on: 22/4/2019 at 10:44 AM

Sites NAS 33-36 South of Cirencester

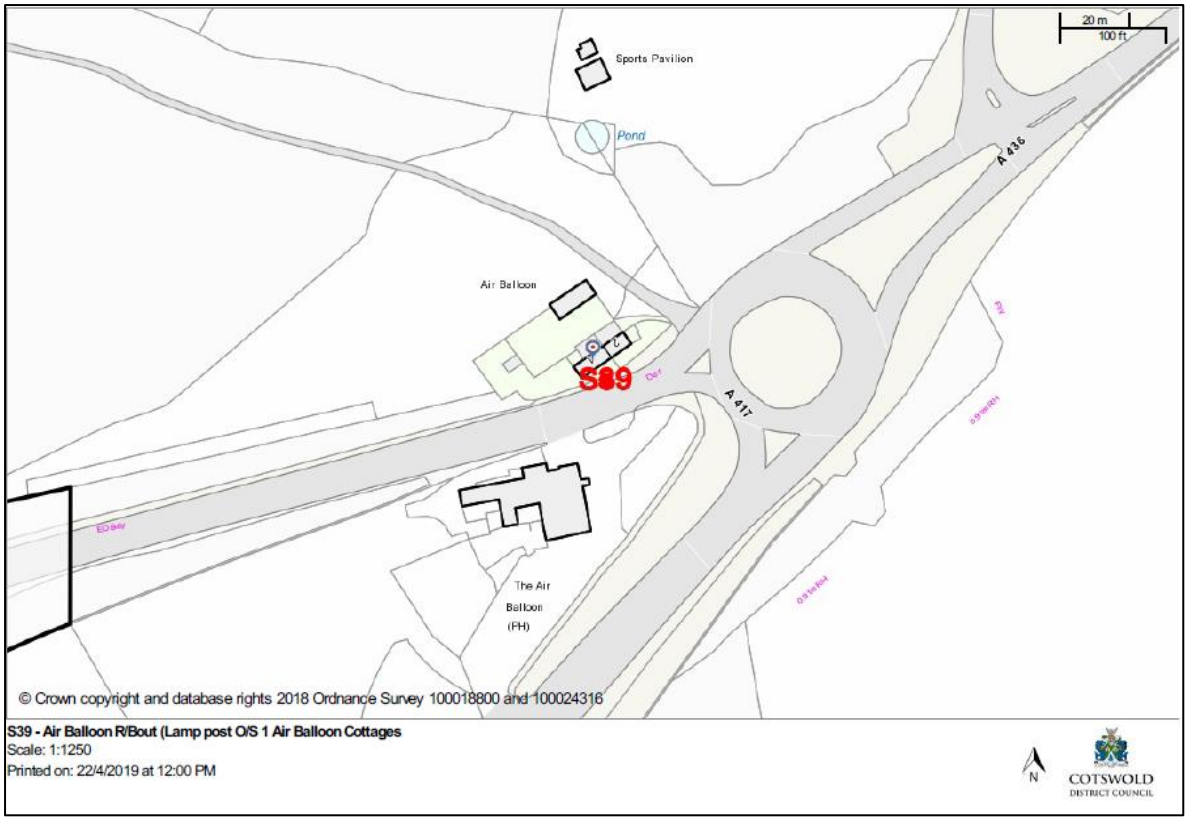


S33 - Tetbury Road, Cirencester (O/S Steading Cottages), S34 - Spratsgate Lane nr j/w Park Way, Cirencester), S35 - Berkeley Road j/w Somerford Road, Cirencester), S36 - Somerford Road, Cirencester. (on lamp post 66)
Scale: 1:10000

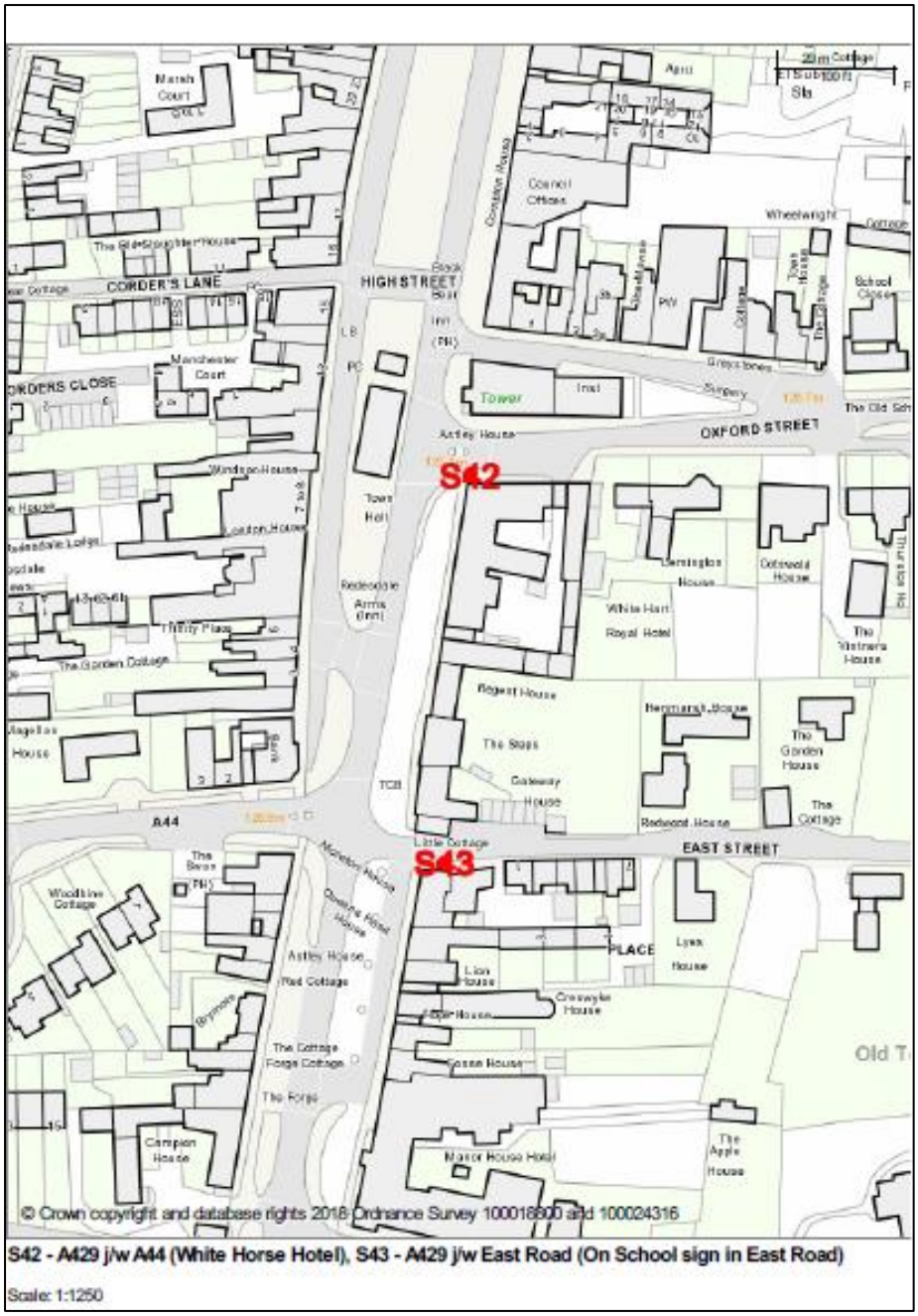
Sites NAS 37-38 Lechlade



Site NAS 39 Air Balloon Roundabout, Birdlip



Sites NAS 42-43 Moreton-in-Marsh



S42 - A429 j/w A44 (White Horse Hotel), S43 - A429 j/w East Road (On School sign in East Road)

Scale: 1:1250