Breckland District Council

Annual Status Report 2020

Bureau Veritas

August 2020

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2020 Air Quality Annual Status Report (ASR)

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

August 2020

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Executive Summary: Air Quality in Our Area

Air Quality in Breckland 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].

The District of Breckland is approximately 500 square miles of mostly rural areas and comprises the principal market towns of Attleborough, Dereham, Swaffham, Thetford and Watton. The district has a fairly low population density with 130,000 residents recorded in the 2011 census[4]. The main source of air pollution within the District is found in Swaffham, where the A1065 runs through the centre of the town and is the main route for both local traffic and for traffic travelling to North Norfolk. The layout of the town leads to frequent traffic congestion and this leads to elevated concentrations of NO_2. Over the past few years these concentrations have hovered mostly below, but sometimes above, the Annual Mean Objective of 40µg/m^3. Previous AQ reports with full details of all monitoring and results can be found on the Council website with this link http://www.breckland.gov.uk/article/3244/Air-Pollution.

There is currently one Air Quality Management Area (AQMA) designated within Breckland District Council (BDC); AQMA No.2 within Swaffham spans the main vehicular route in the town centre, around the A1065. The current AQMA has been declared due to exceedances of the NO_2 annual mean, the boundaries of the AQMA can be seen in Appendix D: Maps of Monitoring Locations and AQMAs and online at https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=32.

During 2019, BDC monitored NO_2 using 30 passive NO_2 diffusion tubes and two automatic monitoring locations at twenty six separate locations. There were two co-located triplicate tubes at each of the automatic sites (diffusion tube sites S3 and 20).

[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
[4] https://www.breckland.gov.uk/media/7891/Authorities-Monitoring.../AMR_2017.pdf

The NO_2 diffusion tube network is in place to monitor NO_2 concentrations across the District, monitoring at known hotspot areas and also being used to identify any new sensitive areas. Across the entire diffusion tube network, over the last five years, NO_2 concentrations have decreased at almost all locations since 2015 and no exceedances were reported in 2019. NO_2 concentrations increased at 21 of the 30 diffusion tubes reported when comparing 2019 with 2018 values, the greatest increase (an increase of 10.3µg/m^3) was reported at monitoring site S13, which is located just outside the boundary of the declared AQMA.

Actions to Improve Air Quality

With regard to the National Planning Policy Framework, air quality considerations have been adopted across the district when dealing with planning applications and the provision of pre-application advice. In 2017, an Air Quality Development Management Policy was implemented as part of the Air Quality Planning and Policy Guidance classification.

Following the declaration of the AQMA in 2017 in Swaffham, an Air Quality Action Plan (AQAP) was produced and was published in 2018[5]. Improvements in traffic queueing and delays are a strong focus in the AQAP, with proposed removal of the traffic lights on the Station Street/Mangate Street junction, encouragement of public transport use and review of car parking enforcement and the town centre one-way system.

Progress is being made on the actions outlined in the 2018 AQAP including installation of infrastructure to encourage use of electric vehicles within the town centre such as fast chargers that have been installed in Market Place and Rapid chargers are also being installed in Pedlar car park.

Conclusions and Priorities

This year's ASR is an update of the monitoring carried out last year and illustrates that there is a slight worsening of air quality across the district. The AQAP published in October 2018 will assist in the continuation of NO_2 reduction across Breckland.

There were no exceedances of the NO_2 annual mean objective identified across the 26 passive monitoring sites and two automatic monitoring sites. There have been no exceedances within the AQMA since it's declaration in 2017, however the passive

[5] https://www.breckland.gov.uk/media/13048/Breckland-AQAP-2018/pdf/Breckland_AQAP_2018.pdf?m=636958655840170000

monitoring site S12 reported an increase in NO_2 concentration from 31.5µg/m^3 in 2018 to 38.0µg/m^3 in 2019. Therefore BDC is not considering revoking the AQMA this year because concentrations are still being reported within 10% of the objective and have increased from 2018. Additionally, there have been no exceedances of the PM_{10} annual mean AQS objective within the past 5 years.

Local Engagement and How to get Involved

As part of the ongoing AQMA process, and since publication of the AQAP and from the 2017 public forums discussing the improvements of the district's air quality, we welcome continuous suggestions from residents, local business and interest groups in order to improve air quality in the area. We have further met with local and regional organisations and Councils to ensure that we are in touch with local concerns and are better placed to explore potential solutions.

Find out more about your local air quality by;

- Contacting the Air Quality officer at Breckland (details at the beginning of this report) or email envprotect@breckland.gov.uk
- Contact your local councillor with any concerns http://democracy.breckland.gov.uk/mgMemberIndex.aspx?FN=ALPHA&VW=LIST&PIC=0
- Consider how and when you use your car, especially at peak times. Consider using public transport where possible for trips into towns and walking or cycling for a non-polluting and healthy alternative.

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1 Local Air Quality Management

This report provides an overview of air quality in Breckland District Council 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 Breckland District Council to improve air quality and any progress that has been made.

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

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

Air Quality Management Areas (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) within 12-18 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

A summary of AQMAs declared by Breckland District Council can be found in Table 2.1. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=32 (see full list at http://uk-air.defra.gov.uk/aqma/list). Alternatively, see Appendix D: Maps of Monitoring Locations and AQMAs, which provides a map of air quality monitoring locations in relation to the AQMA.

The previous 2019 ASR mentioned consideration to revoke the declared AQMA if the downward trend in concentrations continued and all monitoring was below 10% of the annual mean Air Quality Objective for NO_2 (40µg/m^3). However, although no exceedances were reported within the AQMA, the maximum concentration reported in the AQMA had increased to 38.0µg/m^3 at monitoring site S12, which is within 10% of the objective. This location has increased from last year by 6.5µg/m^3.

Table 2.1 – 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
Breckland District Council Air Quality Management Area number 2 Order 2017	Declared 1 May 2017	NO2 Annual Mean	Swaffham	An area encompassing a number of residential properties in Station Street and London Road Swaffham	NO	41.0 µg/m^3	38.0 µg/m^3	AP01/18	09/10/18	https://www.breckland.gov.uk/media/13048/Breckland-AQAP-2018/pdf/Breckland_AQAP_2018.pdf?m=636958655840170000

Note: The NO_2 concentrations shown in the table above are from the monitoring sites, within the AQMAs, where the highest concentration was reported in the year of declaration and the current year. The maximum concentration will not necessarily be at the same monitoring site for both years. In 2019, the greatest exceedance was at Diffusion tube site S12.

☒ **Breckland District Council confirm the information on UK-Air regarding their AQMA is up to date**

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

Defra's appraisal of last year's ASR concluded that:

1. *The maximum NO_2 concentration in the AQMA was below 10% of the objective (<36 µg/m^3), should this compliance be sustained for 3 consecutive years the council should consider revocation of the AQMA.*
2. *Continual review of the NO_2 monitoring locations with historically low NO_2 levels is encouraged, to ensure monitoring at the most relevant locations and any review of and changes to the network should be reported on in the 2020 APR.*
3. *QA/QC of the data was considered to be thorough, with annualisation of data carried out at one site and a local bias adjustment factor used for the non-automatic network. Table 3 (annualisation calculations) should be included in the QA/QC section of the appendix.*
4. *The report included links to Public Health outcomes Frameworks but doesn't included specific measures to address $PM_{2.5}$. This should be considered for next year's ASR.*
5. *Priorities for 2019 were identified, which is welcomed. Progress made on these priorities should be reported on in next year's report.*

BDC continues to monitor within the AQMA and has reported the maximum concentration in the AQMA during 2019 as 38µg/m^3, this is within 10% of the objective and has increased from the concentration reported in 2018. BDC will continue to assess the maximum concentration within the AQMA to allow consideration for revocation if a downward trend is noticed. To address the other appraisal comments, although specific measures to address $PM_{2.5}$ have not been introduced, multiple measures outlined in the AQAP[5] target road traffic emissions, which is a major source of $PM_{2.5}$. Specifically, anti-idling messages have been added to BDC's webpage as well as being shared on social media (https://www.breckland.gov.uk/idlingengines). Additionally, the annualisation table has been moved to the QA/QC section of the appendix. BDC has also reported on the progress made on the priorities that were outlined in the 2019 ASR, this is discussed further below.

BDC has taken forward a number of direct measures during the current reporting year of 2019 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2.

More detail on these measures can be found in the respective Action Plan[6] that was published in 2018. Key completed measures that address the priorities that were set out in the 2019 ASR are:

- Fast chargers were installed in Market Place and Rapid chargers are being installed in Pedlar car park to encourage use of electric vehicles within the town centre;
- Review of illegal and habitual parking on Station Street that hinders traffic flow has been completed. The draft NCC Swaffham Network Improvement Strategy (February 2020) recommended that no changes are made to the current parking restrictions and that this measure not be considered any further;
- Promoting eco-driving awareness through promoting air quality issues on websites, e.g. anti-idling added to council's web pages. Clean Air Day on 20th June 2019 to inform schools of air quality issues. Schools already have travel plans in place that they are encouraged to maintain; and
- Encouraging greater use of public transport for journeys into the town centre, NCC advised that they are unable to provide additional public transport but promote its use at a county wide level. Housing developers are encouraged to contact bus companies to provide enhanced services within their transport assessments and travel plans as part of big developments.

BDC expects the following measures to be completed over the course of the next reporting year:

- Investigation of Green Space initiatives was also identified as a priority in the 2019 ASR. Additional green space facilities are being considered as part of town centre improvements and a review by Swaffham Town Council is taking place over the next 6 months;
- Review of car parking policy arrangements and possible actions at county/district level;

[6] https://www.breckland.gov.uk/media/13048/Breckland-AQAP-2018/pdf/Breckland_AQAP_2018.pdf?m=637269568047100000

- Review town centre one-way system to create a better circulation of traffic around the town and, if appropriate, devise a revised layout; and
- Improve the visibility of the current car parking signage within the town.

The principal challenge and barriers to implementation that BDC anticipates facing are:

- Funding will need to be identified to improve the one-way system for the detailed design and implementation of providing a southern entrance to Theatre Street car park and associated signage

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, BDC anticipates that further additional measures not yet prescribed will be required in subsequent years to achieve compliance and enable the revocation of the Swaffham AQMA.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Date Measure Introduced	Organisations involved	Funding Source	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
POLICY ACTIONS											
1	Consideration of Air Quality Impacts when providing comments on planning applications within an AQMA or where an AQMA could be impacted or created.	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	Ongoing	District Council (LPA & Env Protection Team)	District Council (LPA & Env Protection Team)	Number of pre application discussions and planning applications	1µg/m^3	Ongoing consultations - requiring review of AQ impacts of proposals and recommending mitigation including active travel and measure to encourage forms of low or non-polluting travel	Ongoing	Ongoing action – AQ as part of planning development to link in action around the local plan
6	Review car parking policy arrangements and consider the implementation of control measures, enforcement and the likely benefits. This will need to be compatible with the proposed countywide review of Civil Parking Enforcement (CPE)	Traffic Management	Other	2018	County Council and District Council Town Council	County Council District Council Town Council			This matter crosses a number of different organisational controls so a review of this will need to include officers / councils responsible for car parking at County/ District and town levels. Initial meetings to be set up in Autumn 2019. Time limits on some car parks in the centre of Swaffham are set to be introduced by Breckland as part of a trial which aims to boost the town's economy. Drivers will be limited to parking for a maximum of two hours in Market Place, Pedlars and Pit Lane car parks	2020	Review of possible actions at county/ district (facilities team) level.
TRANSPORT MEASURES											
7	Further investigate an improvement at the Station Street/ Mangate Street junction to reduce queuing and delays particularly on Station Street and, if appropriate, devise a scheme for implementation. This may result in removing the traffic lights.	Transport Planning and Infrastructure	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	2018	County Council District Council Town Council	County Council District Council Town Council			Norfolk County Council has undertaken an investigation and report to examine changes to the junction and incorporate considerations around pedestrian safety and pollution modeling. The final conclusions of the report are still being produced to identify potential improvement options with a cost / benefit analysis interms of likely pollution reductions.	2020	Review of final report and actions Norfolk County Council to work with partners at district and town council level if pollution levels increase. The draft NCC Swaffham Network Improvement Strategy February 2020 recommend that no further work is carried out on this measure whilst measured NO_2 levels are beneath the threshold

Measure No.	Measure	EU Category	EU Classification	Date Measure Introduced	Organisations involved	Funding Source	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
									Initial conclusions suggest however that costly changes to the road junction would not produce significant / measurable reductions in pollution levels. Changes to the market place, roads and pathways might be possible interms of other projects aimed at improving the attractiveness of the town centre.		
8	Review town centre one-way system to create a better circulation of traffic around the town and, if appropriate, devise a revised layout	Transport Planning and Infrastructure	Other	2018	County Council District Council Town Council	County Council District Council Town Council			NCC Highways are in the process of producing a report considering traffic flows and the options for the one way system. The initial considerations are that this would have a limited level of improvement on air quality but could allow easier movement of traffic towards the Theatre Road car park	2020	Review of final report and actions to be carried out in conjunction with Breckland Councils market town initiative work especially bus routes, car parks and options to reduce the amount of traffic flows north to south and south to north. The draft NCC Swaffham Network Improvement Strategy February 2020 concludes that a scheme to provide a southern access to the Theatre Street car park with associated signing is progressed. Funding will need to be identified for both detailed design and implementation
9	Review town centre car parking arrangements to minimise vehicular traffic in sensitive areas and, if appropriate, devise a revised strategy	Traffic Management	Workplace Parking Levy, Parking Enforcement on highway	2018	County Council District Council Town Council	County Council District Council Town Council		1µg/m^3	NCC Highways have produced a draft report to review the theatre street carpark access arrangements which are current only one way in and one way out – NCC to produce possible options on this issue within their report as per action points 7 & 8	2019	Review of final report and actions Review of car parks to be made at district and town council levels especially the HGV lorry park The draft NCC Swaffham Network Improvement Strategy February 2020 recommends that car parking signage within the town could be revisited with the removal of lorry parking pictograms and replacement with named car parks a measure to improve the visibility of the current car parking signage
10	Consider options for new car parks on the edge of the town to keep vehicles	Traffic Management	Workplace Parking Levy, Parking Enforcement on highway	2018	County Council District Council Town Council	County Council District Council Town Council		1µg/m^3	NCC Highways draft report produced considering traffic and signage improvements this should be read in	2019	Review of final report and actions. See recommendation from the draft NCC Swaffham Network Improvement

Measure No.	Measure	EU Category	EU Classification	Date Measure Introduced	Organisations involved	Funding Source	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
	from entering the town centre								context with the review in action point 9.		Strategy February 2020 in item 9 above.
15	Improve walking and cycling facilities in and around the town	Promoting Travel Alternatives	Bus route improvements Cycle network Public cycle hire scheme	2018	County Council District Council Town Council	County Council District Council Town Council		1µg/m^3	This matter crosses a number of different organisational controls so a review of this will need to include officers / councils responsible for walking and cycling at County/ District and town levels. Initial meetings to be set up in Autumn 2019. This could also include the Communities team as part of the Market towns Initiative – which perhaps could include provision of cycle stands in the town and setting up of safe cycle routes. NNC advise as per item 14 Developers need to provide evidence within their transport assessments linking developments to the community and in this case the town centre.	2019	Consideration of additional facilities as part of town centre improvements Issue to be raised with Breckland Business improvement team
16	Review existing travel arrangements to schools and any existing Travel Plans including the role of car sharing	Promoting Travel Alternatives	Bus route improvements Cycle network Public cycle hire scheme	2018	County Council District Council Town Council	County Council District Council Town Council			This matter crosses a number of different organisational controls so a review of this will need to include officers / councils responsible for school travel at County/ District and town levels. Initial meetings to be set up in Autumn 2019. This could also include the Communities team as part of the Market towns Initiative. All schools have travel plans. However Norfolk County Council have no officers or resources in place to proactively promote this. Possibly a targeted programme could be made to encourage schools to	2019	Swaffham Town council to make contact with local schools to maintain their travel plans and encourage implementation of identified actions

Measure No.	Measure	EU Category	EU Classification	Date Measure Introduced	Organisations involved	Funding Source	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
									maintain their travel plans and encourage implementation of identified actions. Transport is provided if school more than 3miles away. The NCC schools transport team advise that they do not specify any particular emissions standards for the vehicles used for school transport contracts. The only requirement is for the vehicles to be road legal. NCC would like to ask for lower polluting or electric vehicles but this would have a likely effect of increasing costs which would not be covered by the existing funding resources.		
PUBLIC HEALTH MEASURES											
22	Investigate Green Space Initiatives	Other	Other	2018/19	District Council Town Council	District Council Town Council		1µg/m^3	This matter crosses a number of different organisational controls so a review of this will need to include officers / councils responsible for green spaces at County/ District and town levels. Initial meetings to be set up in Autumn 2019. This could also include the Communities team as part of the Market towns Initiative. Measure to be considered as part of development plans for Swaffham market place and possibly improvements to traffic flow stemming from transport plan in item 7	2019	Consideration of additional facilities as part of town centre improvements Review by Swaffham Town Council over next 6 months.

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

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

The Public Health Outcomes Framework indicator[7] for the fraction of deaths attributable to $PM_{2.5}$ in Breckland was 5.2% during 2018 (latest available data), which is below the regional average of 5.5% and the national average of 5.2%, and is one of the lowest across the authorities in the East of England region.

There is currently no ongoing monitoring of $PM_{2.5}$ within the District. However, in accordance with LAQM. TG(16), the $PM_{2.5}$ concentrations can be estimated from PM_{10} monitoring using either a local PM_{10} and $PM_{2.5}$ monitoring ratio, or a nationally derived correction ratio of 0.7. As there is no local monitoring for $PM_{2.5}$, the nationally derived correction ratio of 0.7 was applied to the PM_{10} concentration (15µg/m^3) at the automatic monitoring site East Wretham. The estimated $PM_{2.5}$ concentration in 2019 at the automatic monitoring site was therefore 10.5µg/m^3, which is below the $PM_{2.5}$ obligatory standard of 25µg/m^3.

The current Defra 2019 background maps for Breckland District Council (2017 based[8]) show that all background concentrations of $PM_{2.5}$ are below the 2020 annual mean AQS objective for $PM_{2.5}$. The highest concentration is predicted to be 10.2µg/m^3 within the 1 x 1km grid square with the centroid grid reference of 578500, 287500. This is an area that encompasses a stretch of the A1065 Trunk Road on the outskirts of Brandon, closely located to a several distribution hubs and light industry.

BDC is addressing $PM_{2.5}$ concentrations through targeting road traffic emissions, that are a main source of $PM_{2.5}$. Additionally BDC introduced anti idling messages on their webpage and have recently shared the link through social media: https://www.breckland.gov.uk/idlingengines.

[7] https://fingertips.phe.org.uk/profile/public-health-outcomes-framework/data#page/3/gid/1000043/pat/6/par/E12000006/ati/101/are/E07000143/iid/30101/age/230/sex/4
[8] Defra Background Mapping data for local authorities (2017-based), available online at https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html

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

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

This section sets out what monitoring has taken place and how it compares with objectives.

Breckland District Council undertook automatic (continuous) monitoring at two sites during 2019. Table A.1 in Appendix A shows the details of the sites. National monitoring results are available at https://www.airqualityengland.co.uk/local-authority/?la_id=38.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C.

3.1.2 Non-Automatic Monitoring Sites

Breckland District Council undertook non- automatic (passive) monitoring of NO_2 at 26 sites during 2019, including 2 triplicate sites (locations S3 and 20). Table A.2 in Appendix A shows the details of the 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.

3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias[9] and “annualisation” (where the data capture falls below 75%). Distance correction[10] was not required as all monitoring locations are reported as being at relevant exposure. Further details on adjustments are provided in Appendix C.

[9] https://laqm.defra.gov.uk/bias-adjustment-factors/bias-adjustment.html
[10] Fall-off with distance correction criteria is provided in paragraph 7.77, LAQM.TG(16)

3.2.1 Nitrogen Dioxide (NO_2)

Table A.3 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3. Note that the concentration data presented in Table A.3 represents the concentration at the location of the monitoring site, following the application of bias adjustment and annualisation, as required (i.e. the values are exclusive of any consideration to fall-off with distance adjustment).

For diffusion tubes, the full 2019 dataset of monthly mean values is provided in Appendix B. Table A.4 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year. Following the application of bias adjustment and annualisation to the raw data, no sites were reported to exceed the NO_2 annual mean objective in 2019. In 2016 the monitoring location S8 was reported at 41µg/m^3, prompting the declaration of the 2017 AQMA. By subsequent comparison, S8 has reported significantly lower annual means in the following years of 34.7µg/m^3 in 2017, 30.5µg/m^3 in 2018 and 31.3 in 2019 µg/m^3. The highest NO_2 concentration reported across the diffusion tube network in 2019 was at diffusion tube site S12, which reported 38µg/m^3. This is within 10% of the AQO, and as this location is within the declared AQMA, the AQMA can not yet be considered for revocation.

Annualisation was completed for diffusion tube location S12 as data capture was reported at 66.7% in 2019. The minimum required data capture for an annual mean is 75% across the year. Table C.2 illustrates the annualisation at this location, using data from three nearby continuous monitoring sites.

The annual mean NO_2 concentration did not exceed 60µg/m^3 at any monitoring locations, which indicates that an exceedance of the 1-hour mean objective (200µg/m^3) is unlikely at these sites.

3.2.2 Particulate Matter (PM_{10})

Table A.5 in Appendix A compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

Table A.6 in Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations for the past 5 years with the air quality objective of 50µg/m^3, not to be exceeded more than 35 times per year.

Data capture was high at the monitoring site S20 and reported significantly below both PM_{10} objectives for annual mean and daily mean concentrations and has been as such for the last 5 years.

3.2.3 Particulate Matter ($PM_{2.5}$)

Currently there is not any monitoring of $PM_{2.5}$ completed within Breckland District. However, in accordance with LAQM. TG(16), the $PM_{2.5}$ concentrations can be estimated from PM_{10} monitoring using either a local PM_{10} and $PM_{2.5}$ monitoring ratio, or a nationally derived correction ratio of 0.7. As there is no local monitoring for $PM_{2.5}$, the nationally derived correction ratio of 0.7 was applied to the PM_{10} concentration (15µg/m^3) at the automatic monitoring site East Wretham (S20). The estimated $PM_{2.5}$ concentration in 2019 at the automatic monitoring site was 10.5µg/m^3, which is below the $PM_{2.5}$ obligatory standard of 25µg/m^3.

3.2.4 Other Pollutants

In addition to monitoring NO_2 and PM_{10}, the automatic analyser located at East Wretham also monitors Ozone (O_3) concentrations. There is no requirement to report this data for LAQM purposes; however, the results are discussed herein for completeness.

O_3 is a trans-boundary pollutant; its sources can be frequently spatially distant from the measured site of the concentration. This pollutant is not prescribed an air quality objective for the purposes of LAQM and therefore the results presented are for information only.

The AQS objective for ground level O_3 (to be met by 2005) states that the maximum daily concentration (measured as an 8-hour mean) of 100µg/m^3 should not be exceeded more than 10 times per year.

Table A.7 – Results of East Wretham Automatic Ozone Monitoring in Appendix A summarises the number of exceedances over the last 5 years. The number of exceedances of the maximum daily concentration (measured as a running 8-hour mean) of 120µg/m^3 is less than the permitted 25, reporting 13 exceedances for 2019.

Appendix A: Monitoring Results

Table A.1 - Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
S20	East Wretham	Rural	591315	288704	NO_2, PM_{10}, O_3	N	Chemiluminescence, TEOM corrected by VCM	0	10	0
S3	Swaffham	Roadside	582093	308469	NO_2	N	Chemiluminescent	0	2	0

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 – 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)
A1	High Street Attleborough	Urban Centre	604550	295125	NO2	N	0	6	NO	2
A2	Croft Green Attleborough	Urban Background	603843	294085	NO2	N	0	7	NO	2
D1	High Street Dereham	Urban Centre	598920	313267	NO2	N	0	2	NO	2
D2	Station Road Dereham	Urban Background	599283	313599	NO2	N	0	8	NO	2
D3	Wellington Street Dereham	Urban Centre	599319	313197	NO2	N	0	5	NO	2
S1	Impsons Butchers Swaffham	Urban Centre	581986	309031	NO2	Y	0	5	NO	2.5
S2	Ceres Books Swaffham	Urban Centre	582008	308764	NO2	N	0	3	NO	2
S3(3)	London Street	Roadside	582182	308434	NO2	N	0	4	YES	2
S3a(3)	London Street	Roadside	582182	308434	NO2	N	0	4	YES	2
S3b(3)	London Street	Roadside	582182	308434	NO2	N	0	4	YES	2
S4	Bridewell Place Swaffham	Roadside	582058	308625	NO2	N	0	4	NO	2
S5	London Street Zebra Crossing	Roadside	582075	308496	NO2	N	0	7	NO	2
S6	London Street N Roundabout	Roadside	582048	308609	NO2	N	0	5	NO	2

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)
S7	Station Road Swaffham	Roadside	581999	309099	NO2	Y	0	7	NO	2
S8	Station Road Swaffham	Roadside	581979	309162	NO2	Y	0	5	NO	2
S9	Anglia Computer Solutions Swaffham	Roadside	581959	309057	NO2	Y	0	4	NO	2
S10	Kev's Tackle Swaffham	Roadside	582670	309058	NO2	N	0	3	NO	2
S11	13 Station Road Swaffham	Roadside	581990	309145	NO2	Y	0	3	NO	2
S12	Glazedale Lamp post Swaffham	Roadside	581986	309213	NO2	Y	0	3	NO	2
S13	33 Station Road Swaffham	Roadside	581978	309312	NO2	N	0	3	NO	1
S14	Corner Whitecross	Roadside	582082	309856	NO2	N	0	3	NO	2
T1	London Street Fire Station	Roadside	587126	283336	NO2	N	0	3	NO	2
T2	55 Bury Road Thetford	Roadside	586846	282721	NO2	N	0	3	NO	2
T3	41 E. Cavell Close Thetford	Suburban	587036	284579	NO2	N	0	101	NO	2
W1	High Street Corals Watton	Urban Centre	591747	300796	NO2	N	0	2.5	NO	2
W2	Charles Avenue Watton	Urban Background	591885	300622	NO2	N	0	2	NO	2
20[3]	Wretham SSSI	Rural	591315	288704	NO2	N	0	55	YES	3

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)
20a(3)	Wretham SSSI	Rural	591315	288704	NO2	N	0	55	YES	3
20b(3)	Wretham SSSI	Rural	591315	288704	NO2	N	0	55	YES	3
30	East Harling	Rural	599403	286353	NO2	N	0	2.5	NO	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.

(3) Triplicate sites

Table A.3 – 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/m³) (3) (4)				
							2015	2016	2017	2018	2019
S20	591315	288704	Rural	Automatic	98.8	98.8	22.0	27.0	25.0	12.1	10.3
S3	582093	308469	Roadside	Automatic	99.3	99.3	33.0	29.0	28.0	24.9	26.2
A1	604550	295125	Urban Centre	Diffusion Tube	91.7	91.7	27.0	28.6	23.6	23.8	24.6
A2	603843	294085	Urban Background	Diffusion Tube	100.0	100.0	10.9	11.5	10.2	9.7	10.4
D1	598920	313267	Urban Centre	Diffusion Tube	91.7	91.7	33.9	34.3	30.9	27.3	29.3
D2	599283	313599	Urban Background	Diffusion Tube	91.7	91.7	27.8	28.6	25.0	22.5	22.6
D3	599319	313197	Urban Centre	Diffusion Tube	91.7	91.7		11.2	13.7	20.0	22.4
S1	581986	309031	Urban Centre	Diffusion Tube	100.0	100.0	22.6	24.2	20.2	20.0	20.0
S2	582008	308764	Urban Centre	Diffusion Tube	91.7	91.7	37.3	38.4	33.5	28.6	28.7
S3 - Triplicate Site	582182	308434	Roadside	Diffusion Tube	100.0	100.0	29.1	30.5	25.8	25.7	26.2
S4	582058	308625	Roadside	Diffusion Tube	100.0	100.0	25.2	26.9	20.9	21.4	22.4
S5	582075	308496	Roadside	Diffusion Tube	100.0	100.0	25.9	25.7	22.7	21.8	24.1
S6	582048	308609	Roadside	Diffusion Tube	100.0	100.0	31.1	33.2	29.1	26.9	29.6
S7	581999	309099	Roadside	Diffusion Tube	83.3	83.3	34.8	38.4	29.7	30.2	30.2

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 (µg/m^3) (3) (4)				
							2015	2016	2017	2018	2019
S8	581979	309162	Roadside	Diffusion Tube	91.7	91.7	37.7	**41.0**	34.3	30.5	31.6
S9	581959	309057	Roadside	Diffusion Tube	91.7	91.7	26.4	26.7	21.9	21.8	23.0
S10	582670	309058	Roadside	Diffusion Tube	100.0	100.0	24.7	24.9	22.7	20.3	21.6
S11	581990	309145	Roadside	Diffusion Tube	100.0	100.0	34.0	37.0	30.6	30.9	26.6
S12	581986	309213	Roadside	Diffusion Tube	66.7	66.7	31.4	32.0	29.2	31.5	38.0
S13	581978	309312	Roadside	Diffusion Tube	100.0	100.0	25.0	26.4	21.7	14.9	25.2
S14	582082	309856	Roadside	Diffusion Tube	91.7	91.7	22.9	24.2	21.2	17.2	21.3
T1	587126	283336	Roadside	Diffusion Tube	100.0	100.0	26.9	27.2	25.8	24.8	25.1
T2	586846	282721	Roadside	Diffusion Tube	100.0	100.0	25.2	25.7	22.0	21.9	21.2
T3	587036	284579	Suburban	Diffusion Tube	100.0	100.0	13.7	14.9	14.1	12.0	14.1
W1	591747	300796	Urban Centre	Diffusion Tube	91.7	91.7	23.4	26.7	24.1	24.0	24.2
W2	591885	300622	Urban Background	Diffusion Tube	100.0	100.0	12.2	13.1	12.4	11.8	12.3
20 - Triplicate Site	591315	288704	Rural	Diffusion Tube	100.0	100.0	10.1	11.1	10.8	10.8	10.1
30	599403	286353	Rural	Diffusion Tube	91.7	91.7	17.5	15.8	13.7	10.2	11.5

☒ **Diffusion tube data has been bias corrected**

☒ **Annualisation has been conducted where data capture is <75%**

Results not available

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%. See Appendix C for details.

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

(5) Triplicate sites report an average across three diffusion tubes

Figure A.1 – Trends in Annual Mean NO_2 Concentrations – Within Declared AQMA

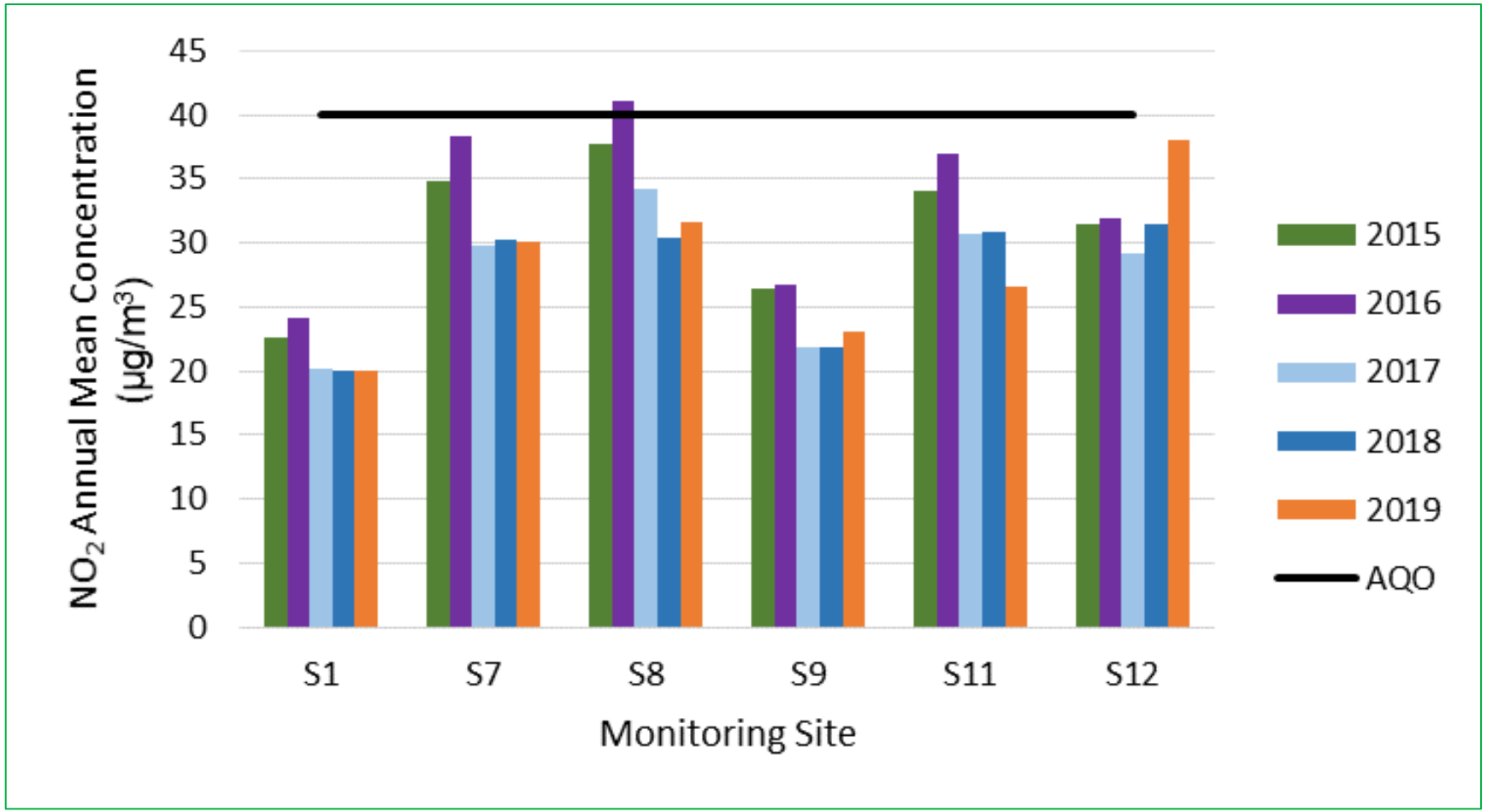


Figure A. 2 - Trends in Annual Mean NO_2 Concentrations – Outside Declared AQMA

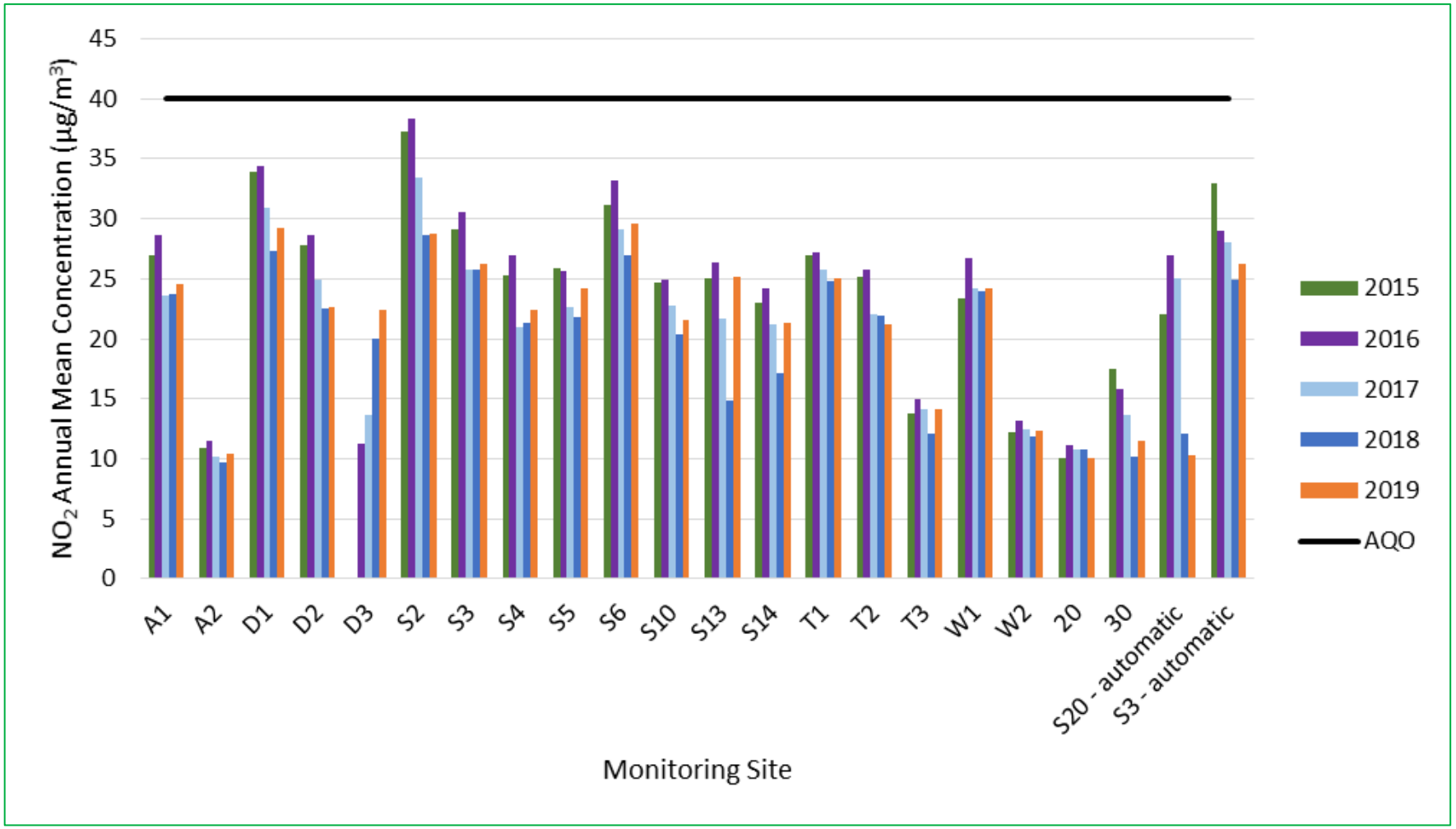


Table A.4 – 1-Hour Mean NO_2 Monitoring Results

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 1 Hour Means > 200µg/m^3 (3)				
							2015	2016	2017	2018	2019
S20	591315	288704	Rural	Automatic	98.8	98.8	0	0	0	0	0
S3	582093	308469	Roadside	Automatic	99.3	99.3	0	0	0	0	0

Notes:

Exceedances of the NO_2 1-hour mean objective (200µg/m^3 not to be exceeded more than 18 times/year) are shown in **bold.**

(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) If the period of valid data is less than 85%, the 99.8th percentile of 1-hour means is provided in brackets.

Table A.5 – Annual Mean PM_{10} Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	PM_{10} Annual Mean Concentration (µg/m³) (3)				
						2015	2016	2017	2018	2019
S20	591315	288704	Rural	98	98	16	15	16	17	15

☒ **Annualisation has been conducted where data capture is <75%**

Notes:

Exceedances of the PM_{10} annual mean objective of 40µg/m³ are shown in **bold.**

(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) All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Figure A.3 – Trends in Annual Mean PM_{10} Concentrations

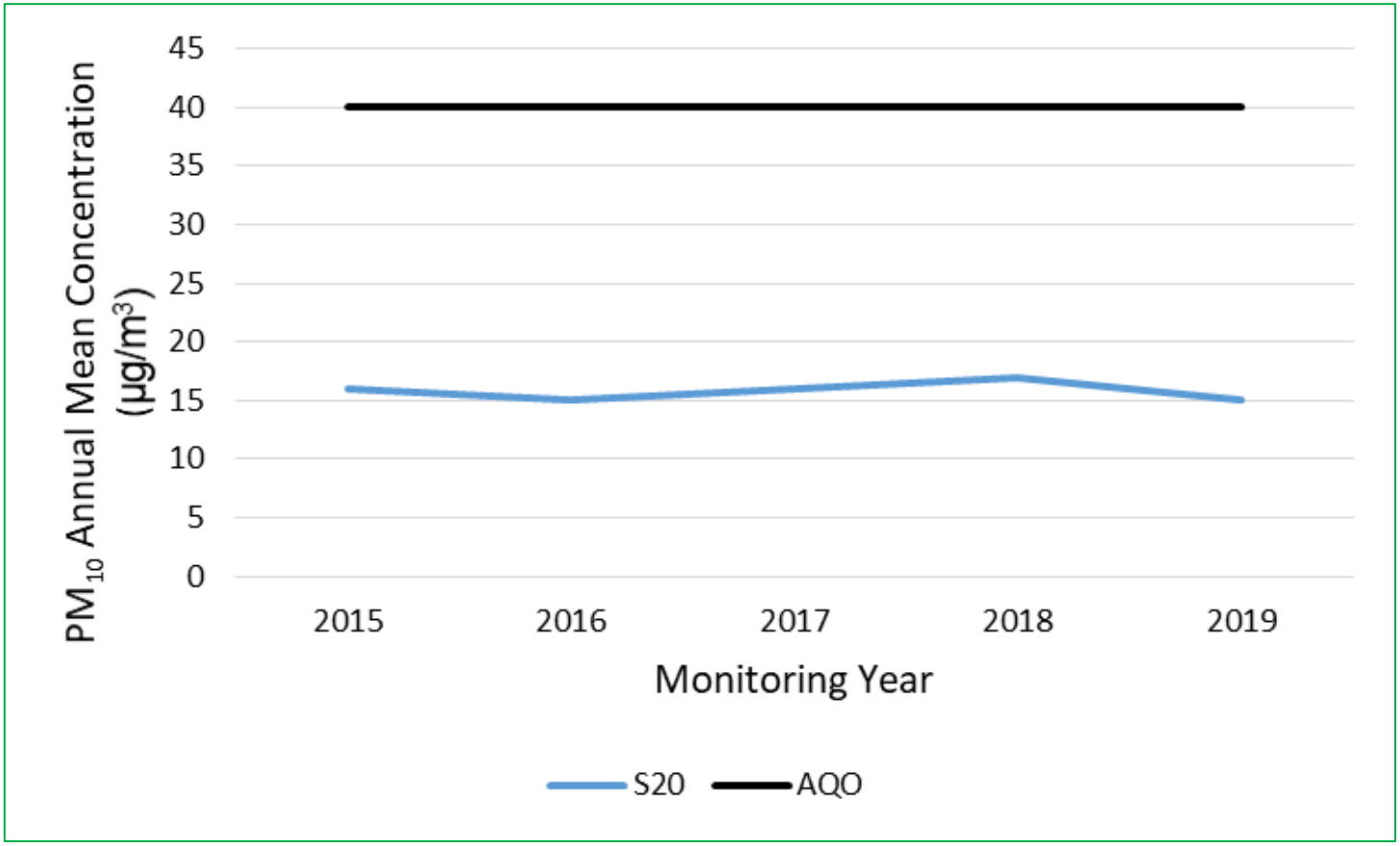


Table A.6 – 24-Hour Mean PM_{10} Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	PM_{10} 24 Hour Means > 50µg/m^3 (3)				
						2015	2016	2017	2018	2019
S20	591315	288704	Rural	99	99	2	1	4	4	3

Notes:

Exceedances of the PM_{10} 24-hour mean objective (50µg/m^3 not to be exceeded more than 35 times/year) are shown in **bold.**

(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) If the period of valid data is less than 85%, the 90.4th percentile of 24-hour means is provided in brackets.

Figure A.4 – Trends in Number of 24-Hour Mean PM_{10} Results >50µg/m³

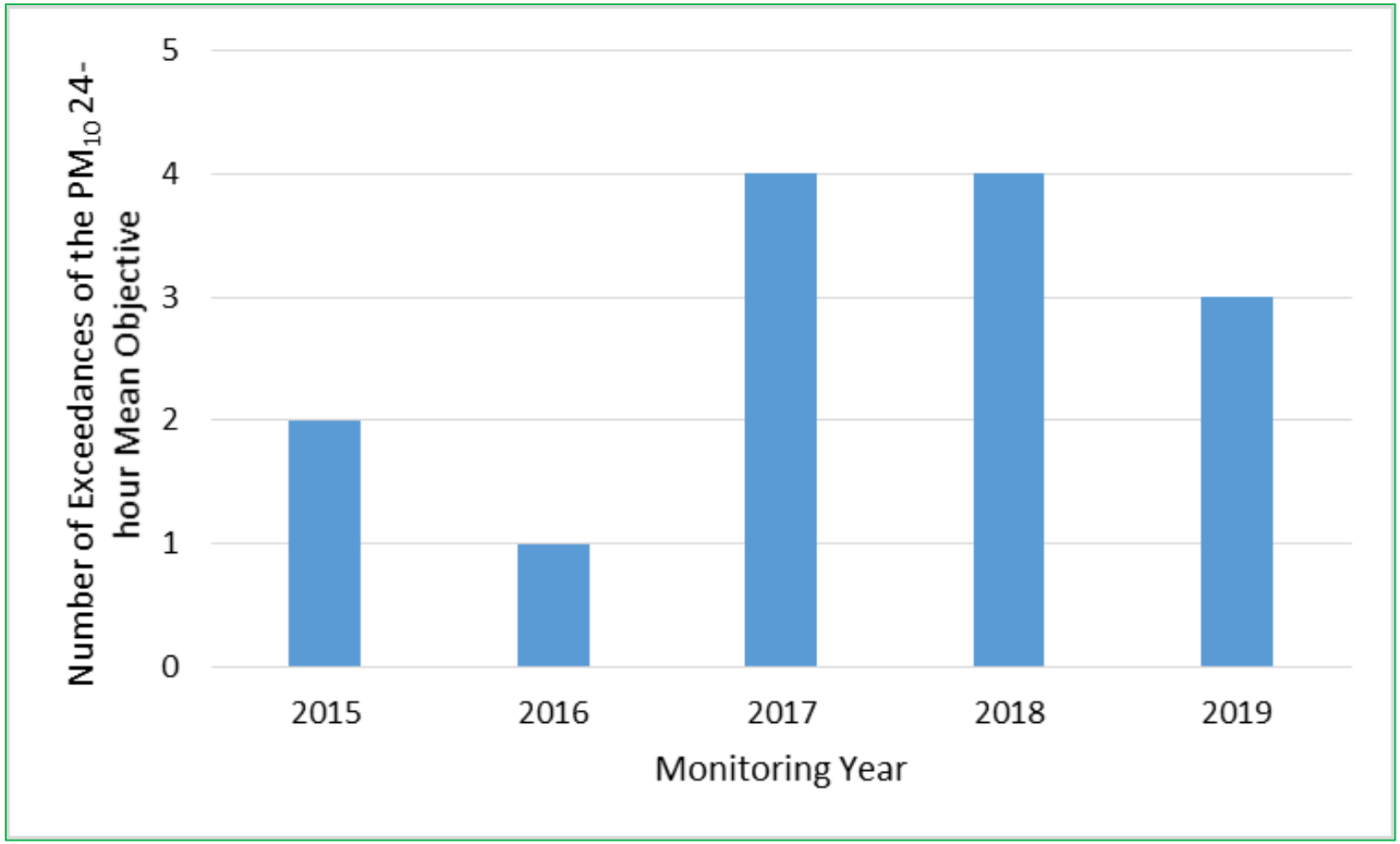


Table A.7 – Results of East Wretham Automatic Ozone Monitoring

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	O_3 Number of Exceedances of Maximum Daily Concentration (8 hour rolling mean)				
						2015	2016	2017	2018	2019
S20	591315	288704	Rural	99.0	99.0	5	4	1	12	13

Notes:

Exceedance of the O_3 objective: maximum daily 8-hour rolling mean of 120µg/m^3 not to be exceeded on more than 25 days per calendar year averaged over three years.

(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 2019

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

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	NO_2 Mean Concentrations ($\mu g/m^3$)														
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
															Raw Data	Bias Adjusted (0.95) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
A1	604550	295125	36.2	32.9	28.4	25.9		20.4	19.9	19.8	18.6	20.8	32.3	29.1	25.9	24.6	-
A2	603843	294085	16.5	16.3	10.7	10.3	7.3	6.2	6.4	7.1	9.0	12.1	14.9	14.6	11.0	10.4	-
D1	598920	313267	42.6	49.4	29.6	25.8	25.7	24.3	29.3	22.8	28.3	28.4	32.9		30.8	29.3	-
D2	599283	313599	30.1	38.2	25.8		20.3	17.9	20.7	14.6	18.6	21.6	28.6	25.7	23.8	22.6	-
D3	599319	313197	26.2	29.6	21.8	21.4	18.5	15.7	13.0	22.7	25.9	29.1	35.9		23.6	22.4	-
S1	581986	309031	26.5	25.7	19.5	23.8	19.3	16.7	16.9	17.3	16.4	20.7	24.9	24.2	21.0	20.0	-
S2	582008	308764	44.3		31.0	26.3	26.2	26.2	27.6	29.6	28.6	28.8	32.4	31.1	30.2	28.7	-
S3	582182	308434	32.1	37.1	25.8	30.5	27.1	22.4	23.8	23.4	21.6	26.0	33.3	27.9	27.6	26.2	-
S4	582058	308625	28.0	28.0	22.1	26.3	22.8	19.4	19.8	18.7	21.8	23.5	29.0	23.7	23.6	22.4	-
S5	582075	308496	38.5	31.6	26.9	23.4	21.8	17.9	20.2	18.2	23.5	24.4	30.3	28.3	25.4	24.1	-
S6	582048	308609	36.0	39.8	30.4	27.4	26.5	29.3	26.8	29.9	29.0	30.4	35.3	33.4	31.2	29.6	-
S7	581999	309099			29.0	35.8	32.5	28.2	28.9	32.4	30.3	29.8	41.0	29.6	31.7	30.2	-
S8	581979	309162	40.7	45.9	32.6	24.1	31.8	29.6	27.5	25.5	34.3		39.2	35.0	33.3	31.6	-
S9	581959	309057	34.2	30.2	22.7	23.7	24.2		21.3	17.6	19.9	20.8	28.2	23.8	24.2	23.0	-

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	NO_2 Mean Concentrations ($\mu g/m^3$)														
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
															Raw Data	Bias Adjusted (0.95) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
S10	582670	309058	31.5	30.4	23.5	15.7	18.8	18.5	18.7	21.4	20.9	22.2	23.2	27.6	22.7	21.6	-
S11	581990	309145	35.5	39.7	30.0	33.3	32.6	26.8	28.0	29.6	18.2	18.1	22.0	22.7	28.0	26.6	-
S12	581986	309213			30.9	32.9	30.5	28.6	31.2	29.7	24.4	29.8			29.7	38.0	-
S13	581978	309312	33.5	32.5	21.8	29.0	23.7	23.1	23.4	22.1	24.3	25.2	29.2	30.2	26.5	25.2	-
S14	582082	309856	24.2		18.6	16.4	16.7	16.2	16.9	18.3	29.0	25.5	34.2	30.2	22.4	21.3	-
T1	587126	283336	27.9	31.5	28.4	27.8	23.8	21.6	20.4	20.7	23.3	30.2	29.9	31.2	26.4	25.1	-
T2	586846	282721	27.9	28.7	22.6	22.4	19.6	18.4	17.1	14.5	18.7	23.7	28.7	25.0	22.3	21.2	-
T3	587036	284579	21.8	24.2	16.1	10.9	9.1	9.2	9.5	10.5	12.4	15.2	18.9	20.8	14.9	14.1	-
W1	591747	300796	33.8	32.0	28.2		21.2	20.0	22.4	16.9	23.2	23.5	34.0	24.5	25.4	24.2	-
W2	591885	300622	20.0	21.5	12.7	10.0	7.3	7.6	8.3	8.4	11.0	13.9	17.1	17.7	13.0	12.3	-
20	591315	288704	13.8	16.6	9.2	9.3	7.6	7.2	7.8	8.4	8.6	11.0	13.0	15.1	10.6	10.1	-
30	599403	286353	16.0	17.4	10.5	11.0	9.1	8.2	7.4		9.8	11.5	17.6	14.2	12.1	11.5	-

☒ Local bias adjustment factor used

☐ National bias adjustment factor used

☒ Annualisation has been conducted where data capture is <75%

☒ Where applicable, data has been distance corrected for relevant exposure in the final column – all monitoring sites are located at relevant exposure therefore distance correction is not applicable

Tube missing

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) See Appendix C for details on bias adjustment and annualisation.

(2) Distance corrected to nearest relevant public exposure.

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

Diffusion Tube Bias Adjustment Factors

The diffusion tube data has been corrected using a bias adjustment factor, which is an estimate of the difference between the diffusion tube concentration and continuous monitoring, the latter assumed to be a more accurate method of monitoring. The Defra LAQM.TG(16) 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/NO_2 continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

With regard to the application of a bias adjustment factor for diffusion tubes, Defra LAQM.TG(16) and the LAQM Helpdesk[11] recommend the use of a local bias adjustment factor where available and relevant to diffusion tube sites. The continuous monitoring site S3 in Swaffham, has been previously used for the local bias calculation. The triplicate site's data calculated a factor for 2019 of 0.95, which is close to the national bias for 2019 (0.92)[12]. Table C.1 illustrates the local bias adjustment calculation.

The local bias adjustment factor has been used in this year's ASR to ensure best practice in line with LAQM.TG(16) whilst maintaining consistency with previous years' results.

The diffusion tube data for Breckland District Council is supplied and analysed by Gradko International Ltd. The tubes were prepared using the 20% TEA in water preparation method. As stated, the national bias adjustment factor for Gradko 20% TEA in water is 0.92 for the year 2019 (based on 30 studies, version 06/20) as derived from the national bias adjustment factor spreadsheet.

For previous years data (2015 to 2018) the bias adjustment factors have been taken from previous LAQM reports completed by Breckland District Council, with 2016 based

[11] Laqm.defra.gov.uk
[12] National Diffusion Tube Bias Adjustment Factor Spreadsheet version 06/19 available at https://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html

on the national bias figure and all other years' taking adjustment data from the local bias. There is a 0.03 difference between the 2019 local and national bias adjustment calculations.

Table C.1 - Local Bias Adjustment Factor at S3 Swaffham Triplicate Site: 2019

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	03/01/2019	05/02/2019	31.0	33.8	31.6	32	1.5	5	3.7
2	05/02/2019	05/03/2019	38.0	36.6	36.8	37	0.7	2	1.8
3	05/03/2019	09/04/2019	25.9	25.5	26.1	26	0.3	1	0.7
4	09/04/2019	09/05/2019	31.7	30.6	29.2	30	1.2	4	3.1
5	09/05/2019	05/06/2019	26.7	27.3	27.4	27	0.4	1	1.0
6	05/06/2019	02/07/2019	19.8	22.4	25.0	22	2.6	11	6.4
7	02/07/2019	08/08/2019	23.4	23.4	24.5	24	0.6	3	1.6
8	08/08/2019	02/09/2019	21.0	22.8	26.4	23	2.8	12	6.9
9	02/09/2019	07/10/2019	16.1	25.8	23.0	22	5.0	23	12.4
10	07/10/2019	04/11/2019	24.3	27.2	26.4	26	1.5	6	3.7
11	04/11/2019	02/12/2019	36.1	30.0	33.9	33	3.1	9	7.7
12	02/12/2019	02/01/2020	29.1	27.6	27.2	28	1.0	4	2.4
13									

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
32.4086	99.8737374	Good	Good
35.0895	100	Good	Good
23.4841	100	Good	Good
32.6984	99.5833333	Good	Good
24.7506	99.845679	Good	Good
20.7411	98.6111111	Good	Good
19.8792	99.6621622	Good	Good
23.6676	99.8333333	Good	Good
21.6305	100	Poor Precision	Good
25.2931	97.9166667	Good	Good
32.8382	99.8511905	Good	Good
23.4801	96.5053763	Good	Good
Overall survey -->		Good precision	Good Overall DC

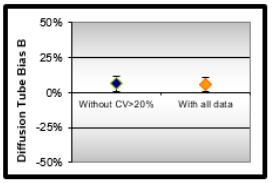
(Check average CV & DC from Accuracy calculations)

Site Name/ ID: Breckland Swaffham

Precision: 11 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%
Bias calculated using 11 periods of data
Bias factor A: 0.95 (0.9 - 1)
Bias B: 5% (0% - 11%)
Diffusion Tubes Mean: 28 µgm^{-3}
Mean CV (Precision): 5
Automatic Mean: 27 µgm^{-3}
Data Capture for periods used: 99%
Adjusted Tubes Mean: 27 (25 - 28) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA
Bias calculated using 12 periods of data
Bias factor A: 0.95 (0.91 - 1.01)
Bias B: 5% (0% - 10%)
Diffusion Tubes Mean: 28 µgm^{-3}
Mean CV (Precision): 7
Automatic Mean: 26 µgm^{-3}
Data Capture for periods used: 99%
Adjusted Tubes Mean: 26 (25 - 28) µgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

QA/QC of Diffusion Tube Monitoring

The diffusion tubes for the year 2019 were supplied and analysed by Gradko International Ltd, the tubes were prepared using the 20% TEA in water method. All results have been bias adjusted and annualised where required before being presented in Table B.1.

Gradko International Ltd is a UKAS accredited laboratory and participates in laboratory performance and proficiency testing schemes. These provide strict performance criteria for participating laboratories to meet, thereby ensuring NO_2 concentrations reported are of a high calibre. The laboratory follows the procedures set out in the Harmonisation Practical Guidance and participates in the AIR proficiency-testing (AIR-PT) scheme. Defra and the Devolved Administrations advise that diffusion tubes used for LAQM should be obtained from laboratories that have demonstrated satisfactory performance in the AIR-PT scheme. Laboratory performance in the AIR-PT is also

assessed by the National Physical Laboratory (NPL), alongside laboratory data from the monthly NPL Field Inter-Comparison Exercise.

In the 2019 AIR-PT results, Gradko scored 87.5% in AIR-PT AR030 (January to February 2019) but scored 100% for all other periods in 2019: AIR-PT AR031 (April to May 2019), AR033 (July to August 2019) and AR034 (September to November 2019). The percentage score reflects the results deemed to be satisfactory based upon the z-score of < ±2.

Short-term to Long-term Data Adjustment

For the 2019 diffusion tubes, annualisation was required at one of the monitoring sites as data capture was below 75%. Site S12 was active for only eight months (66.7%) in 2019 which was considered an invalid data capture. Table C.2 illustrates the monitoring stations and associated ratios used for the annualisation of S12. The average ratio is applied to the raw data result, i.e. prior to adjustment for bias.

Table C.2 – Annualisation of Diffusion Tubes

Site ID	Unadjusted Annual Mean (µg/m^3)	AF Breckland East Wretham	AF Norwich Lakenfields	AF Wicken Fen	Average AF	Annualised Concentration (µg/m^3)
S12	29.7	1.3632	1.2656	1.4084	1.3457	40.0

Appendix D: Maps of Monitoring Locations and AQMAs

Figure D.1 - S20 Continuous Monitoring Station Location

Legend

- Continuous Monitoring Station

Air Quality
Bureau Veritas
5th Floor
66 Prescott Street
London, E1 8HG

Location	East Wretham
Title	S20 Continuous Monitoring Station Location
By TC	**Approved** HS
Scale Not To Scale	**Job Ref** 6486174
Date June 2019	**Figure No.** D.1

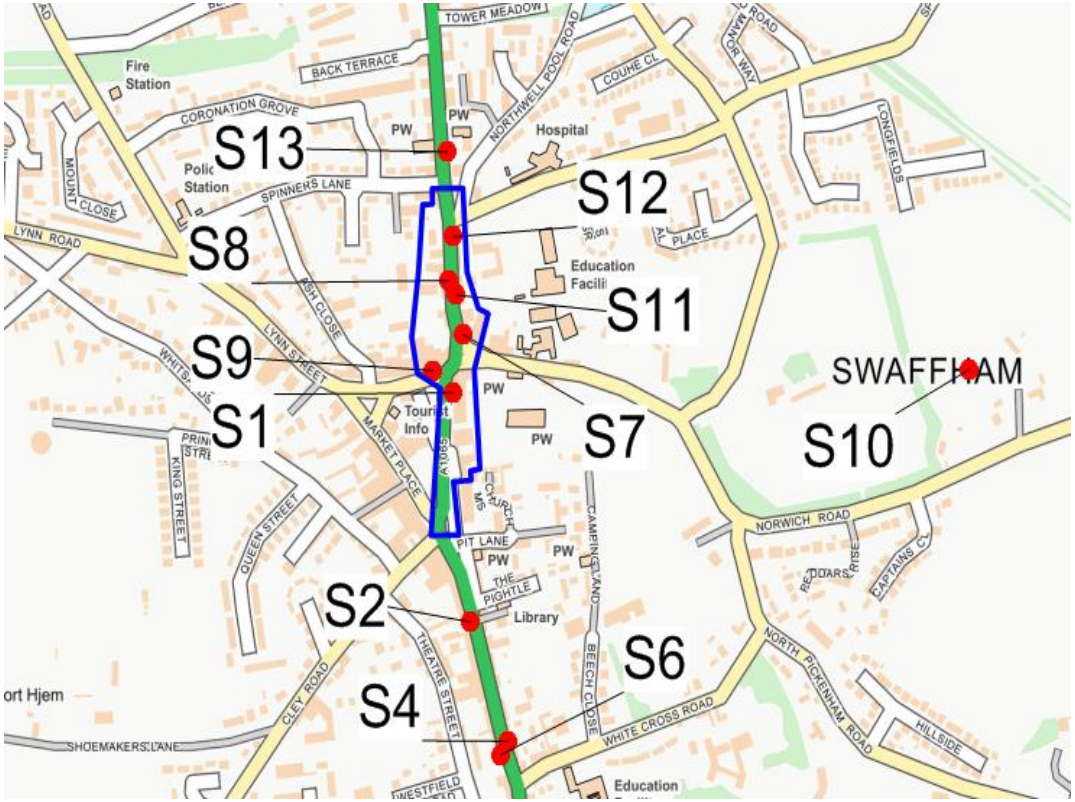
Figure D.2 - S3 Continuous Monitoring Station Location

Legend

- Continuous Monitoring Station

	Air Quality Bureau Veritas 5th Floor 66 Prescott Street London, E1 8HG
Location	Swaffham
Title	S3 Continuous Monitoring Station Location
By TC	**Approved** HS
Scale Not To Scale	**Job Ref** 6486174
Date June 2019	**Figure No.** D.2

Figure D.3 - Swaffham AQMA & Diffusion Tube Locations



Legend

Diffusion Tube Locations — **AQMA Boundary**

Air Quality
Bureau Veritas
5th Floor
66 Prescott Street
London, E1 8HG

Location	
Swaffham	
Title	
Swaffham AQMA & Diffusion Tube Locations	
By	**Approved**
TC	HS
Scale	**Job Ref**
Not To Scale	6486174
Date	**Figure No.**
June 2019	D.3

Figure D.4 - Attleborough Diffusion Tube Locations

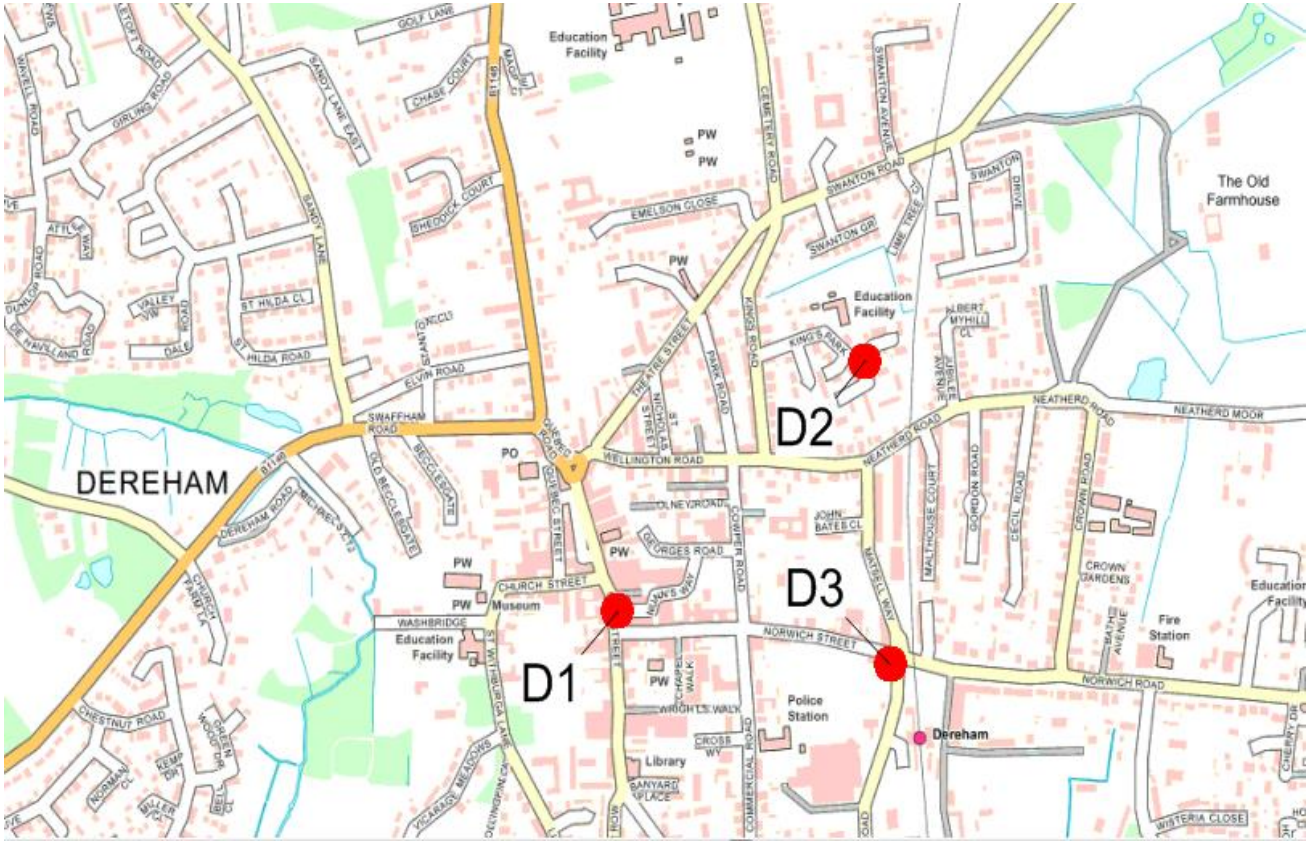
Legend

- Diffusion Tube Locations

Air Quality
Bureau Veritas
5th Floor
66 Prescott Street
London, E1 8HG

Location	
Attleborough	
Title	
Attleborough Diffusion Tube Locations	
By	**Approved**
TC	HS
Scale	**Job Ref**
Not To Scale	6486174
Date	**Figure No.**
June 2019	D.4

Figure D.5 - Dereham Diffusion Tube Locations



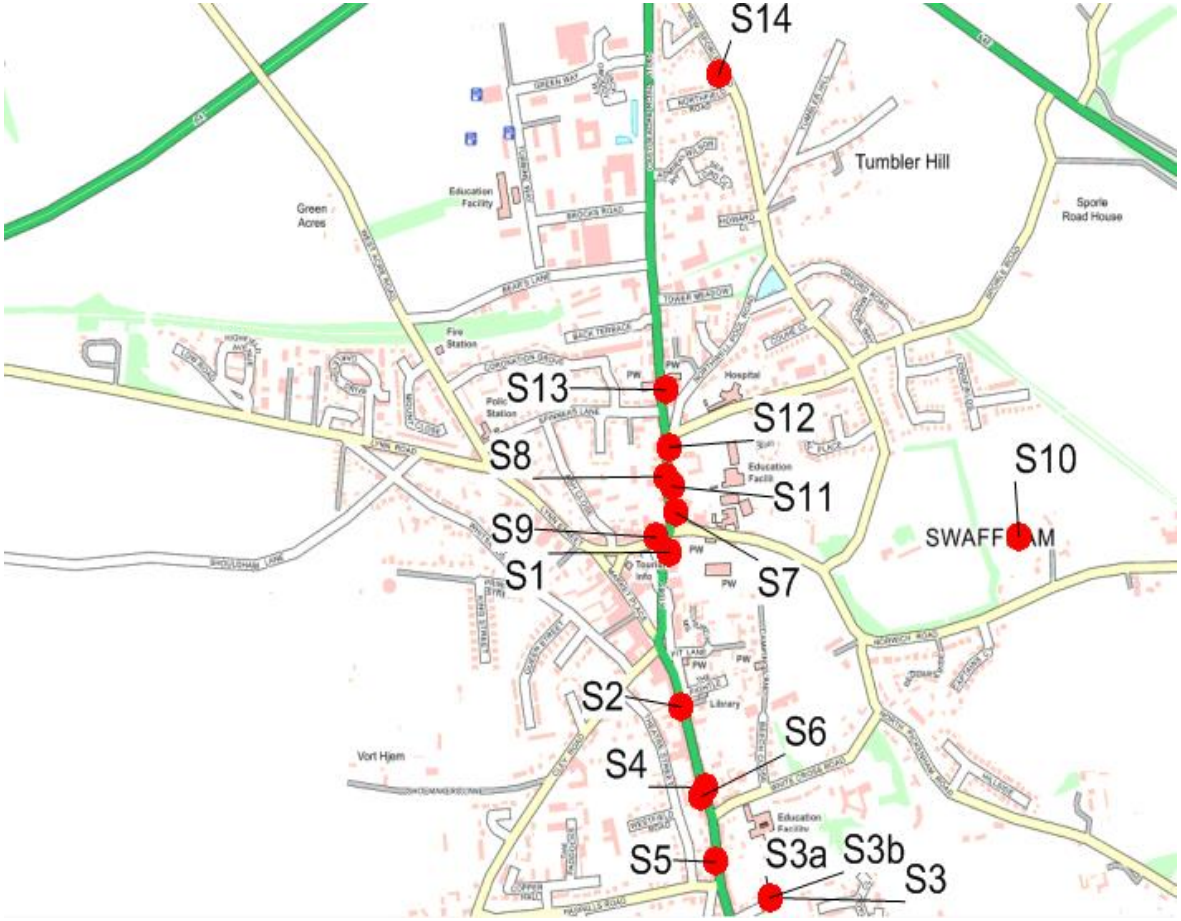
Legend

- Diffusion Tube Locations

Air Quality
Bureau Veritas
5th Floor
66 Prescott Street
London, E1 8HG

Location Dereham	
Title Dereham Diffusion Tube Locations	
By TC	**Approved** HS
Scale Not To Scale	**Job Ref** 6486174
Date June 2019	**Figure No.** D.5

Figure D.6 - Swaffham Diffusion Tube Locations



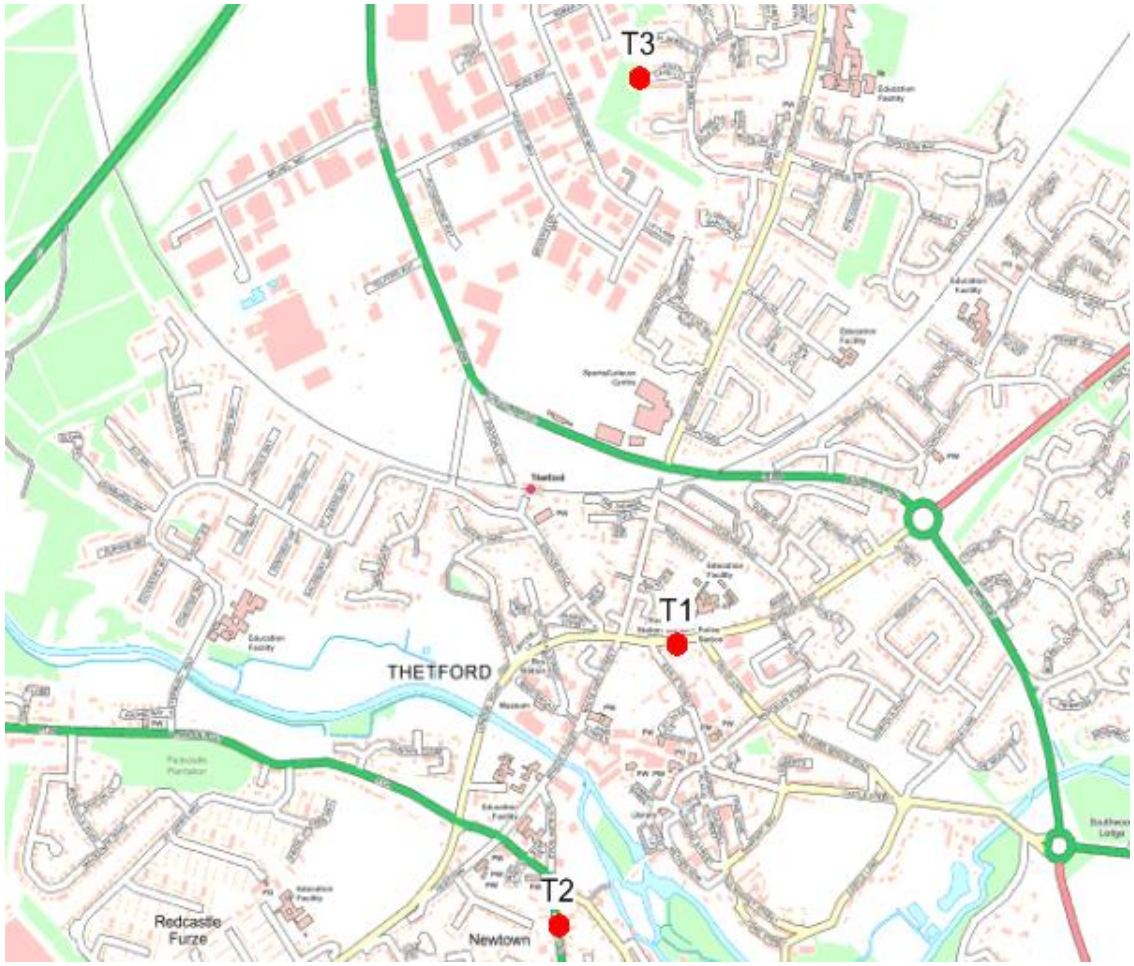
Legend

Diffusion Tube Locations

Air Quality
Bureau Veritas
5th Floor
66 Prescott Street
London, E1 8HG

Location Swaffham	
Title Swaffham Diffusion Tube Locations	
By TC	**Approved** HS
Scale Not To Scale	**Job Ref** 6486174
Date June 2019	**Figure No.** D.6

Figure D.7 - Thetford Diffusion Tube Locations



Legend

- Diffusion Tube Locations

Air Quality
Bureau Veritas
5th Floor
66 Prescott Street
London, E1 8HG

Location	Thetford
Title	Thetford Diffusion Tube Locations
By TC	**Approved** HS
Scale Not To Scale	**Job Ref** 6486174
Date June 2019	**Figure No.** D.7

Figure D.8 - Watton Diffusion Tube Locations

Legend

- Diffusion Tube Locations

	Air Quality Bureau Veritas 5th Floor 66 Prescott Street London, E1 8HG
Location Watton	
Title Watton Diffusion Tube Locations	
By TC	**Approved** HS
Scale Not To Scale	**Job Ref** 6486174
Date June 2019	**Figure No.** D.8

Figure D.9 - East Harling Diffusion Tube Locations

Legend

- Diffusion Tube Locations

Air Quality
Bureau Veritas
5th Floor
66 Prescott Street
London, E1 8HG

Location East Harling	
Title East Harling Diffusion Tube Locations	
By TC	**Approved** HS
Scale Not To Scale	**Job Ref** 6486174
Date June 2019	**Figure No.** D.9

Figure D.10 - Wretham SSSI Diffusion Tube Locations

Legend

- Diffusion Tube Locations

Air Quality
Bureau Veritas
5th Floor
66 Prescott Street
London, E1 8HG

Location	
Wretham SSSI	
Title	
Wretham SSSI Diffusion Tube Locations	
By	**Approved**
TC	HS
Scale	**Job Ref**
Not To Scale	6486174
Date	**Figure No.**
June 2019	D.10

Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[13]	
	Concentration	Measured as
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m^3	Annual mean
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m^3	Annual mean
Ozone (O_3)	100 µg/m^3 not to be exceeded more than 10 times a year	8 hour mean
Sulphur Dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

[13] The units are in microgrammes of pollutant per cubic metre of air (µg/m^3).

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Air quality Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EU	European Union
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 (micrometres or microns) or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO_2	Sulphur Dioxide
O_3	Ozone

References

- Local Air Quality Management Technical Guidance LAQM.TG(16). February 2018. 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.PG(16). May 2016. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- Breckland District Council Air Quality Action Plan 2018.
- Breckland District Council 2015 - 2019 Annual Status Reports.
- National Diffusion Tube Bias Adjustment Factor Spreadsheet, version 06/20 published in June 2020.
- https://www.breckland.gov.uk/planningapplicationweeklylists