North Devon Council
Annual Status Report 2019
Bureau Veritas
July 2019

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Document Control Sheet

Identification	
Client	North Devon Council
Document Title	2019 Air Quality Annual Status Report
Bureau Veritas Ref No.	AIR6486318/UK/4

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Configuration				
Version	**Date**	**Author**	**Reason for Issue/Summary of Changes**	**Status**
01	05/06/19	P Bentley	Draft for comment	Draft
02	21/06/19	P Bentley	Following client comments	Draft
03	26/06/19	P Bentley	Clarifications on distance correction	Draft
04	16/07/19	P Bentley	Final following DCC comments	Final

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2019 Air Quality Annual Status Report (ASR)

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

July, 2019

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Report Reference number	2019 ASR
Date	July 2019

Executive Summary: Air Quality in Our Area

Air Quality in North Devon

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].

North Devon is predominantly rural in nature and is fortunate that air quality across the district is generally good. The main pollutant of local concern is nitrogen dioxide (NO_2), which within North Devon is primarily from vehicles using the road network. In addition to NO_2, particulate matter (PM_{10} and $PM_{2.5}$) emissions are also produced from traffic sources.

Since 2000 there has been a council led NO_2 monitoring network running across the district using passive NO_2 diffusion tubes. In addition, there has been an Automatic Urban and Rural Network (AURN) monitor, measuring both PM_{10} and $PM_{2.5}$, located within Barnstaple since 2013. During 2018 the Filter Dynamics Measurement System (FDMS) PM monitor was replaced by a Beta Attenuation Monitor (BAM) as part of the AURN replacement initiative that is currently ongoing.

Currently within North Devon there is one Air Quality Management Area (AQMA) situated within Braunton. The AQMA was declared in July 2011 following an exceedance of the annual mean NO_2 objective and subsequently an Air Quality Action Plan (AQAP) has been developed that describes specific measures that have been designed to reduce NO_2 concentrations within the AQMA.

During 2018 there were no exceedances of any air quality objectives at any monitoring sites across North Devon. Since full monitoring of PM_{10} and $PM_{2.5}$ commenced at the Barnstaple AURN monitor in 2014 there have been no exceedances of the relevant air quality objectives at this location. Within the existing AQMA there have been three

[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

consecutive years where the two NO_2 diffusion tubes located within the AQMA have reported annual mean concentrations below the NO_2 annual mean objective. However both sites, at the point of exposure during 2018 were within 10% of the annual mean objective. Following distance correction, the concentration at Site 12 remains well below the annual objective. The concentration at Site 13 increased during 2018 when compared to 2017 to within 10% of the air quality objective at a location of relevant exposure, therefore the AQMA will remain in force.

Full details of the North Devon monitoring network, including monitoring concentrations are included in Appendix A and Appendix B.

Actions to Improve Air Quality

Concentrations of air pollutants across the majority of North Devon continue to be below the air quality objectives. However Braunton AQMA remains in designation, and with increased development within the district and ever increasing vehicle numbers travelling within the district the council will continue to liaise with relevant stakeholders to protect and improve local conditions.

The 2016 AQAP remains the main document designed to improve local air quality within the Braunton AQMA and across the district. The measures that are documented within the AQAP and Table 2.2 have been designed to reduce NO_2 concentrations within the Braunton AQMA. Where possible these have been developed throughout 2018, and this process will continue as previously documented.

During 2018 there have been a number of steering group meetings, these are used to discuss development of action plan measures, designate actions that are required to take the measures forward, and discuss potential new measures that would be beneficial to the goal of reducing NO_2 concentrations across the district.

Monitoring of NO_2 is to continue within the Braunton AQMA and across the district so that concentration trends can continue to be identified and any decisions on the possible revocation of the AQMA are based upon long term trends in NO_2 concentrations. Based upon Defra recommendations the completion of a detailed study of Braunton AQMA is currently being investigated and will be decided upon within 2019.

Conclusions and Priorities

Within 2018 there were no exceedances of any air quality objectives at any monitoring location across North Devon. There were three NO_2 monitoring sites within 2018 that had annual mean concentrations within 10% of the 40µg/m^3 objective value (12, 13 and B5). Monitoring sites are not always located at sites of relevant exposure, further details on relevant locations in terms of the air quality objectives can be found within Box 1.1 of Defra guidance LAQM.TG(16) that is replicated within Table C.2. Two of the locations where exceedances of the annual mean objective have been recorded, are not located at locations, as per Box 1.1 of LAQM.TG(16), of relevant exposure in relation to the annual mean NO_2 objective (12 and B5). Due to this, to allow comparison with the objective distance correction is required to predict the annual mean concentration at the point of exposure. Distance corrected concentrations for 2018 are detailed in Table B.1 Appendix B.

Following the completed distance correction the number of recorded exceedances of the objective reduced to one site; Site 13 which is located at the London Inn within the Braunton AQMA. The 2018 PM_{10} and $PM_{2.5}$ annual mean concentrations recorded at the Barnstaple automatic monitoring station were 15.6µg/m^3 and 6.9µg/m^3 respectively, far below the annual mean objectives of 40µg/m^3 and 20µg/m^3 (to come into force in 2020) for PM_{10} and $PM_{2.5}$.

Following completion of the 2019 ASR, it has been concluded that the current AQMA within Braunton should remain. NO_2 monitoring data within the AQMA continues to be below, but within 10% of the annual mean objective, therefore the Braunton AQMA should currently remain in force. Within previous years ASR appraisals, Defra have recommended that North Devon look to develop a detailed study of the AQMA to ascertain concentrations throughout the AQMA. The council are currently looking into the viability of an assessment to inform upon the requirement of the AQMA and its boundary based upon the context of the data presented within this 2019 ASR, and that previously accepted by Defra.

A steering group met on a number of occasions throughout 2018 to discuss the current AQAP and the measures that are being developed and taken forward with an aim to reduce NO_2 concentrations within the Braunton AQMA. Representatives from North Devon Council, Devon County Council and now Braunton Parish Council are in attendance at the meetings which are used as both an idea platform for possible new

measures, and also to inform upon developments relating to the current measures. Actions for relevant parties are assigned where appropriate to enable the development of measures, and updates are provided on each measure at the next subsequent meeting.

Local Engagement and How to get Involved

Air quality continues to move up the political agenda and public concern to grow as there is a greater understanding of the issues and complexities around the quality of the air we all breathe. Industry, agriculture, transport, planning and individuals are being encouraged to look at interventions, behavioural changes and practical actions to improve air quality. These issues need to be addressed at all levels, internationally to individually. In terms of air quality everyone can make a difference.

Due to the main source of air pollution in North Devon originating from transport sources, the simplest way for the public to get involved with helping improving air quality within the area would be to look at alternatives to the way they usually travel.

The following are suggested alternatives to private travel that would contribute to improving the air quality within the district:

- Use public transport where available – This reduces the number of private vehicles in operation reducing pollutant concentration through the number of vehicles and reducing congestion;
- Walk or cycle if your journey allows – From choosing to walk or cycle for your journey the number of vehicles is reduced and also there is the added benefit of keeping fit and healthy.
- Car/lift sharing – Where a number of individuals are making similar journeys, such as travelling to work or to school car sharing reduces the number of vehicles on the road and therefore the amount of emissions being released. This can be promoted via travel plans through the workplace and within schools; and
- Alternative fuel / more efficient vehicles – Choosing a vehicle that meets the specific needs of the owner, fully electric, hybrid fuel and more fuel efficient cars are available and all have different benefits by reducing the amount of emissions being released.

Clean Air Day 2019 is on the 20th of June 2019 and is a UK wide platform that promotes the benefits of cleaner air through engagement with local communities and schools within the district. Further information in regards to Clean Air Day can be found through the following link - https://www.actionforcleanair.org.uk/campaigns/clean-air-day.

Further information on local air quality and useful links can be found on the North Devon Council website at http://www.northdevon.gov.uk/environment/air-quality/.

Table of Contents

List of Tables

List of Figures

1 Local Air Quality Management

This report provides an overview of air quality in North Devon during 2018. 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 North Devon to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England can be found within 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 the current AQMA declared by North Devon 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://www.northdevon.gov.uk/environment/air-quality/.

Alternatively, see Appendix D: Maps of Monitoring Locations and AQMAs, which provides for a map of air quality monitoring locations in relation to the AQMA.

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 concentration at a location of relevant exposure) (µg/m^3)		Action Plan		
						At Declaration	Now	Name	Date of Publication	Link
North Devon AQMA No.1	11/07/2011	NO_2 Annual Mean	Braunton	Area encompassing the B3231 in Braunton between the junction of the square in the middle of the village and the village green.	No	44.4	36.5(1)	North Devon Council – Air Quality Action Plan	May 2016	https://www.northdevon.gov.uk/environment/air-quality/

☒ **North Devon confirm the information on UK-Air regarding their AQMA is up to date**

Notes:
(1) – Annual mean NO_2 concentration from diffusion tube Site 13 located at The London Inn.

2.2 Progress and Impact of Measures to address Air Quality in North Devon

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

"The report is well structured, detailed, and provides the information specified in the Guidance.

1. *PM_{10}, $PM_{2.5}$ and NO_2 monitoring results continue to demonstrate compliance with air quality objectives within the District.*
2. *The Local Authority states that one of their priorities for the next reporting year is to review the current AQMA declaration based on the recent monitoring results.*
3. *The Technical Guidance TG(16) advises that "in most cases the decision to amend or revoke an AQMA should only be taken following a detailed study", and that "before revoking an AQMA on the basis of measured pollutant concentrations, the authority therefore needs to be reasonably certain that any future exceedance occur in more adverse meteorological conditions) are unlikely. For this reason, it is expected that authorities will need to consider measurements carried out over several years or more, national trends in emissions, as well as local factors that may affect the AQMA, including measures introduced as part of the Air Quality Action Plan, together with information from national monitoring on high and low pollution years."*
4. *The District Council should consider this guidance before proceeding to revocation of the Broughton AQMA. It is also typically recommended that an AQMA demonstrate three consecutive years of NO_2 concentrations less than 36 µg/m^3 before revocation.*
5. *The status of many of the measures within the AQAP is unclear. There is generally no specific planning, implementation, or expected/estimated completion dates. These should be included in future reporting.*
6. *No details have been included in Appendix C regarding QA/QC of PM data, including any relevant corrections. These should be included in future reporting.*

7. *The Council have confirmed that sites 12 and 13 are located within the AQMA. However Figure D.3 in Appendix D appears to locate these sites just outside of the AQMA boundary. The Local Authority may wish to amend this in future reporting."*

The appraisal comments received have been taken into account and North Devon have looked to address each comment within the 2019 ASR.

North Devon has taken forward a number of direct measures during the reporting year of 2018 in pursuit of improving local air quality. Details of all current measures completed, in progress or planned are set out in Table 2.2. The air quality steering group meets every three months to discuss progress of measures and any potential new measures that could be implemented. These meetings will continue for the foreseeable future with actions being assigned to the relevant individual/organisation in terms of developing each specific measures.

More detail on the initial measures developed in response to the AQMA designation can be found in the 2016 North Devon AQAP that is available on the North Devon Council website, https://www.northdevon.gov.uk/environment/air-quality/.

Key completed measures are:

- The supplementary planning document for air quality has been completed and will be presented for public consultation within 2019;
- The completion of the Park & Change facility at Chivenor having been built; and
- Circulation of travel information to enable smarter travel choices to be made, including a social media campaign is set to begin within 2019.

North Devon's priorities for the coming year are:

- To continue to hold regular steering group meetings with all relevant stakeholders in order to provide updates on the development of action plan measures, and to define actions to take the measures forward;
- Continue to liaise with all stakeholders in relation to the Braunton AQMA; DCC and BPC, working together to develop further actions designed to reduce pollutant concentrations within Braunton and across the District;

- To consider the appropriateness for the undertaking of a Detailed Assessment in relation to the Braunton AQMA, in the context of results submitted within this ASR; and
- Continue to monitor NO_2 concentrations throughout the district in order to assess concentration trends and work towards revocation of the Braunton AQMA.

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, currently the Braunton AQMA is to remain in force until such a time that concentrations are proven to be consistently lower than within 10% of the NO_2 annual mean objective, in accordance with LAQM.TG(16) guidance.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
1	Upgrading of the traffic signals at "The Square" to "MOVA" (Microprocessor Optimised Vehicle Actuation)	Traffic Management	UTC, Congestion management, traffic reduction	DCC (Potential s106 funding)	Ongoing	Ongoing	Improved traffic flows / less congestion	0 - 2µg/m3	Discussions have continued between DCC and BPC regarding implementation of the measure in a way which obtains both BPC and Community support	TBC	Resolution now achieved in regards to BPC's acceptance of NDC's monitoring data as presented to Defra.
2	Consider amending the South Street one way system in relation to optimising traffic flow	Traffic Management	UTC, Congestion management, traffic reduction	DCC	Completed	N/A	Modelling results	N/A	Cancelled	N/A	Work undertaken identified a possible 5.23% reduction in annual average daily traffic movements on Caen Street. DCC advised that the AQ benefit would be very small.
3	Consider the implementation of a comprehensive one way system around the village and / or the pedestrianisation of Caen Street	Traffic Management	UTC, Congestion management, traffic reduction	DCC	Completed	N/A	Reduced traffic volume on Caen Street	N/A	Feasibility report completed	N/A	Discontinued due to high costs predicted, land ownership and planning barriers.
4	Review all pedestrian movements around the village, to identify the optimal type and location of signals / crossings to maximise	Traffic Management	UTC, Congestion management, traffic reduction	DCC	Ongoing	Ongoing	Improved traffic routing	0 - 1µg/m3	Consideration to changing the zebra crossing on Chaloners Road to a signal controlled crossing Area close to the zebra crossing on Saunton Road is to be reviewed in terms of safety	TBC	Progress has been made in identifying areas of concern and possibility for change Opinions to be sought from nearby schools in terms of access and potential benefits

	traffic flow. This review should include - but not be limited to - the consideration of amending signal / crossing timings, resiting / removal of the crossing outside The George Hotel, crossing patrol associated with Caen Primary School										
5	Improving parking management, including the prevention of parking associated with blocking bus stops	Traffic Management	Emission based parking or permit charges	BPC / DCC	Ongoing	2020	Improved flow of key road links	Assessed by monitoring on relevant road links	DCC have provided a summary list of options for consideration by BPC, who have responded with their views	TBC	Agreement to be reached between DCC and BPC concerning which measures from DCC's summary list are to be implemented
6	Installation of a delivery hub	Freight and Delivery Management	Freight Consolidation Centre	DCC	Ongoing	Ongoing	Routing of delivery vehicles	Unknown at this stage, can be assessed if the no loading restrictions are developed.	DCC have provided a summary list of options for consideration by BPC, who have responded with their views Options developed to extend the times of non-loading restrictions, possible implementation of pay and display parking to create more turnover and increase the availability of spaces for vehicles to find spaces	TBC	Agreement to be reached between DCC and BPC concerning how to implement

7	Redirecting traffic along A399	Traffic Management	UTC, Congestion management, traffic reduction	DCC	Signage has been installed	Completed	Routing of vehicles	No significant change in NO_2 concentration at diffusion tube monitoring sites 14 and 15	Electronic signage has been installed to redirect traffic at peak flow times	Completed	-
8	Off peak delivery times	Freight and Delivery Management	Quiet & out of hours delivery	DCC	Ongoing	Ongoing	Number of delivery vehicles and the times they work within	0 - 1µg/m3	DCC have provided a summary list of options for consideration by BPC, who have responded with their views	TBC	Agreement to be reached between DCC and BPC concerning which how best to implement
9	Improving Public Transport	Transport Planning and Infrastructure	Public transport improvements- interchanges stations and services	DCC	Ongoing	Ongoing	Numbers of vehicles upgraded	Assessed by monitoring on transport road links	Upgrades to the bus fleet operating on main services through the villages were introduced in 2012/13. Further upgrades have been identified through contributions from planned developments over the local plan period	TBC	Bus operators travelling through Braunton have been prioritised for improvements in emission standards
10	Fleet partnerships - working with local companies to encourage lower emissions fleet vehicles	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	DCC	Initial review undertaken	Ongoing	Introduction in lower emission vehicles in fleet	0 - 1µg/m3	Bus service improvements from Westward Ho! to Ifracombe are linked with planned development in the Bideford area	Ongoing	Bus operators travelling through Braunton have been prioritised for improvements in emission standards
11	Implementing school / work travel plans	Promoting Travel Alternatives	School Travel Plans	DCC	Ongoing	Ongoing	Reduction of personal travel and uptake in more sustainable travel modes	Unknown at this stage, information on specific travel plans would need to be known first	Confirmed that it would not be possible to embed a requirement for sustainable travel plans into current/future planning policy A travel plan would be sought from any developer for any planning application which was deemed applicable	Complete	, DCC confirmed applications to be assessed on a case by case basis

12	Developing a supplementary planning document for air quality	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	NDC	Consultation document completed	2019/2020	Numbers of planning applications assessed in terms of AQ	Control of future emissions	Submitted internally at NDC in February 2019, public consultation will follow once approved	2019/2020	To be adopted once consultation and any required revisions have been completed
13	Producing travel packs for holiday accommodation	Public Information	To be done electronically via a social media campaign	NDC	Ongoing	Apr-19	Numbers using public transport	Assessed by monitoring on transport road links	Project is scheduled to commence in April 2019	End of 2019	-
14	Installation of a "Park + Change" facility at Chivenor	Alternatives to private vehicle use	Bus based Park & Ride	NDC	Completed	Ongoing	Number using the facility	Assessed by monitoring on transport road links	Construction has been completed but facility is not yet open, is set to open by 2020 / 2021.	Completed	Final checks on facility to be completed before opening

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.

As detailed in Table A.1, the AURN automatic monitoring station Barnstaple 1 located on Eastern Avenue (A39) within Barnstaple monitors both PM_{10} and $PM_{2.5}$ using an FDMS and a BAM. The annual mean $PM_{2.5}$ concentration recorded for 2018 was 6.9µg/m^3 based upon a data capture of 90.0%. This is the lowest annual mean concentration since monitoring began at the site. Since monitoring commenced at this location, all annual mean concentrations recorded have been well below the current 2020 target annual mean objective of 25µg/m^3.

The current Defra 2018 background maps, derived from the Pollution Climate Model (PCM) for North Devon Council (2017 based), show that all background concentrations of $PM_{2.5}$ are well below the 2020 annual mean objective for $PM_{2.5}$. The highest concentration is predicted to be 11.5µg/m^3 within the 1 x 1km grid square with the centroid grid reference of 269500, 125500 that is set to the west of South Molton containing both farmland and industrial/commercial usage.

The Public Health Outcomes Framework data tool compiled by Public Heath England quantifies the mortality burden of $PM_{2.5}$ within England on a county and local authority scale. Data for 2017 for England, the South West Region and for North Devon Council are presented in Table 2.3 below.

Table 2.3 – Adult Mortality Attributable to $PM_{2.5}$ Pollution

Area	North Devon District	South West Region	England		
			Average	Highest	Lowest
% of Adult Mortality	3.6%	4.4%	5.1%	7.1%	2.5%

It can be seen from Table 2.3 that in 2017 the percentage of adult mortality attributable to $PM_{2.5}$ pollution within North Devon was 0.8% lower than the average fraction for the South West Region, and 1.5% lower than the average fraction for England. When compared to 2016 % data; both the South West Region and North Devon have slightly increased by 0.1%.

Due to the health effects attributable to $PM_{2.5}$ pollution through exposure, North Devon Council is continuing to take measures to reduce $PM_{2.5}$ concentrations within the district. There has not been any update to the initiatives taken in 2018 when compared to 2017, these remain as:

- Regular inspections of industrial processes permitted by North Devon Council where combustion and non-combustion processes could lead to anthropogenic emissions of $PM_{2.5}$; and
- Continuing the implementation works on the action plan measures listed within Table 2.2. Although the measures have been specifically designed to reduce NO_2 concentrations within the AQMA, a number of the initiatives are related to transport sources and therefore will typically have a positive effect on the reduction of $PM_{2.5}$ as well.

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

3.1 Summary of Monitoring Undertaken

North Devon Council has operated an NO_2 diffusion tube monitoring programme since 2000. Currently the network consists of twenty seven monitoring locations, in addition there is an AURN automatic monitoring site located on the A39 within Barnstaple.

3.1.1 Automatic Monitoring Sites

Automatic (continuous) monitoring was undertaken at one site during 2018. This is not a council operated site; it is part of the AURN and is run by the Environmental Agency.

National monitoring results are available through the Defra UK-AIR website at https://uk-air.defra.gov.uk/networks/.

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

North Devon Council undertook non- automatic (passive) monitoring of NO_2 at 27 sites during 2018. Site 16 that was located on Broad Street, South Molton has been discontinued due to the annual mean NO_2 concentrations recorded at the site being constantly below the annual mean air quality objective of 40µg/m^3. This tube was installed at a new location and relisted as Site 18, Babbages in Bickington.

Table A.2 in Appendix A shows the details of the sites.

A thorough review of all diffusion tube locations and site details has been completed during 2018 to ensure that all details presented in Table A.2 are correct. Due to reported NO_2 concentrations within the designated AQMA being with 10% of the annual mean air quality objective, and distance correction being applied, it is essential that all monitoring details are correct to determine the concentrations at relevant receptors.

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, “annualisation” and distance correction. Further details on adjustments are provided in Appendix C.

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. Previously presented data, 2014 – 2017, has been fully accepted be Defra following the appraisal of previously completed ASRs and Progress Reports. The 2018 monitoring data is to be treated as provisional until approved by Defra.

For diffusion tubes, the full 2019 dataset of monthly mean values is provided in Appendix B.

Following the application of a national bias adjustment factor of 0.93 to the raw monitoring data, no diffusion tube sites exceeded the NO_2 annual mean air quality objective in 2018. As there were for the 2017 monitoring results, there were two monitoring sites within 2018 that were within 10% of the annual mean NO_2 objective (Site 12 and Site B5). Where a monitoring site is not located at a location of relevant exposure relating to the NO_2 annual mean objective as per Box 1.1, and the reported annual mean concentration is above, or within 10% of the objective as per Defra LAQM.TG(16) guidance distance correction should be applied to predict the annual mean concentration at the point of relevant exposure. Relevant locations where the air quality objectives should apply are presented within Table C.2.

As per LAQM.TG(16) guidance, distance correction was applied at these locations due to the distance between the monitoring location and a location of relevant exposure. At the two locations, the annual mean NO_2 concentrations calculated at the closest relevant receptors were predicted to be far below the annual mean objective.

There have not been any annual mean concentrations of NO_2 above the annual mean objective within the existing AQMA in North Devon since 2015, and anywhere outside of the existing AQMA for the 5-year monitoring period presented. Site 13 however,

which is located at The London Inn within the designated Braunton AQMA, recorded an annual mean of 36.5µg/m^3 which is within 10% of the annual mean air quality objective. Due to there not being a continued period of compliance with the NO_2 annual mean objective at the monitoring sites within the AQMA, the current designation of the AQMA is to remain in force.

There were no sites where the NO_2 annual mean was greater than 60µg/m^3, therefore in accordance with Defra LAQM.TG(16) there are no sites likely to be at risk of exceeding the 1-hour mean objective.

Trend graphs for all monitoring locations presenting up to 5 years of monitoring data are presented in Appendix A. The results presented within the graphs have been annualised and bias adjusted where applicable, but have not distance corrected to avoid any confusion with the results presented within the ASR. Distance corrected values are solely presented in Appendix B, these have been calculated using the LAQM NO_2 fall off with distance calculator derived with the calculations utilised presented in Table C.5.

3.2.2 Particulate Matter (PM_{10})

Table A.4 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, and a five year trend graph for annual mean concentration is presented in Figure A.4.

Table A.5 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, A five year trend graph for short term exceedances is presented in Figure A.5.

There was not an exceedance of either the annual mean objective, or the 24-hour short term objective at the Barnstaple automatic monitoring station during 2018. Since monitoring commenced at this site in 2014 there have been no exceedances of either objective recorded at this location.

During 2018 the PM_{10} and $PM_{2.5}$ FDMS monitors were replaced with a BAM 1020 Heated monitor, this was completed as part of the AURN PM monitoring upgrade programme that is currently being competed across the network. PM_{10} Data capture for the year was 69.4, therefore the monitoring data has been annualised in

accordance with LAQM.TG(16). Full details on the annualisation process are presented in Appendix C.

3.2.3 Particulate Matter ($PM_{2.5}$)

Table A.6 in Appendix A presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for the past 5 years, and a five year trend graph for annual mean concentration is presented in Figure A.6.

The annual mean concentration of $PM_{2.5}$ recorded in 2018 at the Barnstaple AURN monitoring station was 6.9µg/m^3. This shows a reduction of 0.9µg/m^3 from the 2017 annual mean concentrations and is also the lowest annual mean for the past five years, and also the lowest annual mean since the $PM_{2.5}$ monitoring commenced at the site since 2013.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique (1)	Distance to Relevant Exposure (m) (2)	Distance to kerb of nearest road (m) (3)	Inlet Height (m)
Barnstaple 1	AURN – Barnstaple A39 (UKA00574)	Roadside	257048	132591	PM_{10} and $PM_{2.5}$	No	FDMS and BAM 1020 Heated	20	3	3.3 FDMS 3.5 BAM

Notes:

(1) The FDMS was replaced in August 2018 with the BAM.

(2) 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).

(3) N/A if not applicable.

Table A.2 – Details of Non-Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	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)
Site 1	Pilton Causeway, Barnstaple	Kerbside	255774	133732	NO_2	NO	7	1.01	NO	2.58
Site 2	Rolle Street , Barnstaple	Kerbside	255556	133583	NO_2	NO	2.18	1.31	NO	2.49
Site 4	Lower Sticklepath Roundabout, Barnstaple	Kerbside	255651	132808	NO_2	NO	34	2.8	NO	2.78
Site 5	Sticklepath School, Barnstaple	Kerbside	254197	132354	NO_2	NO	2	1.7	NO	2.69
Site 6	Cedars Roundabout, Barnstaple	Urban Background	253886	132394	NO_2	NO	25	1.6	NO	2.53
Site 7	Newport Road, Barnstaple	Kerbside	256706	132253	NO_2	NO	0.45	1.2	NO	2.6
Site 8	South Street, Newport,	Kerbside	256683	132130	NO_2	NO	2.5	1.19	NO	2.39
Site 9	Castle Street, Barnstaple	Kerbside	255661	133179	NO_2	NO	0	1.71	NO	2.43
Site 10	Alexandra Road, Barnstaple	Kerbside	256186	133164	NO_2	NO	2.2	1.58	NO	2.54
Site 11	Belle Meadow Road, Barnstaple	Kerbside	255967	132985	NO_2	NO	12	1.6	NO	2.47

Site 12	The Square, Braunton	Kerbside	248789	136560	NO_2	YES	3.3	1	NO	2.3
Site 13	The London Inn, Braunton	Kerbside	248732	136592	NO_2	YES	0	1.07	NO	2.42
Site 14	Traffic Lights,Church Street, Ilfracombe	Kerbside	251533	147330	NO_2	NO	0.5	1.62	NO	2.58
Site 15	High Street, Ilfracombe	Kerbside	251971	147689	NO_2	NO	0	2.5	NO	2.95
Site 17	Picston House, Bickington	Kerbside	253595	132433	NO_2	NO	10.15	2.83	NO	2.66
Site 18	Babbages, Bickington	Kerbside	253053	132541	NO_2	NO	6.47	0.59	NO	2.66
Site B1	Exeter Road 1, Braunton (Vellator)	Kerbside	249042	135903	NO_2	NO	10.95	1.28	NO	2.7
Site B2	Exeter Road 2, Braunton (Wingate)	Kerbside	248969	136060	NO_2	NO	6.8	2.9	NO	2.69
Site B3	Exeter Road 3, Braunton (Parklyn)	Kerbside	248863	136403	NO_2	NO	3.91	1.7	NO	2.39
Site B4	Exeter Road 4, Braunton (Kaya)	Kerbside	248766	136437	NO_2	NO	6.06	2.6	NO	2.31
Site B5	Exeter Road 5, Braunton (Paint a Pot)	Kerbside	248862	136372	NO_2	NO	3.9	0.5	NO	2.47
Site B6	South Street 1, Braunton (Barton Lane)	Kerbside	248716	136067	NO_2	NO	7	0	NO	2.96
Site B7	South Street 2, Braunton (Village End)	Kerbside	248787	136498	NO_2	NO	2.4	0	NO	2.79

Site B8	Chaloners Road, Braunton (Parish Hall)	Kerbside	248791	136621	NO_2	NO	30	1.34	NO	2.43
Site B9	Caen Gardens, Braunton (J Benning)	Kerbside	248615	136596	NO_2	NO	0	3.8	NO	2.69
Site B10	Saunton Road 1, Braunton (Field Lane)	Kerbside	248417	136610	NO_2	NO	3.39	1.48	NO	2.53
Site B11	Saunton Road 2, Braunton (Sharlands)	Kerbside	248363	136630	NO_2	NO	9.8	1.42	NO	3.91

Notes:

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

(2) N/A if not applicable.

Table A.3 – Annual Mean NO_2 Diffusion Tube Monitoring Results (not distance corrected)

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2018 (%) [2]	NO_2 Annual Mean Concentration (µg/m³) [3]				
					2014	2015	2016	2017	2018
Site 1	Kerbside	DT	100.0	100.0	28.4	26.0	33.2	22.7	27.8
Site 2	Kerbside	DT	91.7	91.7	27.7	26.6	27.2	26.2	26.6
Site 4	Kerbside	DT	75.0	75.0	19.9	22.4	15.2	19.9	21.2
Site 5	Urban Background	DT	91.7	91.7	23.3	19.9	24.4	22.8	23.9
Site 6	Kerbside	DT	91.7	91.7	17.3	16.1	18.9	16.4	18.9
Site 7	Kerbside	DT	83.3	83.3	27.6	26.6	25.9	25.3	26.4
Site 8	Kerbside	DT	91.7	91.7	24.3	23.6	24.9	28.0	22.1
Site 9	Kerbside	DT	100.0	100.0	15.8	14.0	15.2	14.0	15.6
Site 10	Kerbside	DT	83.3	83.3	27.3	26.5	20.6	25.6	25.7
Site 11	Kerbside	DT	100.0	100.0	24.1	22.1	25.8	26.1	26.1
Site 12	Kerbside	DT	91.7	91.7	-	**41.0**	39.8	39.4	39.9
Site 13	Kerbside	DT	91.7	91.7	**40.5**	30.2	32.5	30.0	36.5
Site 14	Kerbside	DT	83.3	83.3	21.9	17.2	19.7	17.1	20.6
Site 15	Kerbside	DT	0.0	0.0	18.4	17.1	14.9	18.0	- [4]
Site 17	Kerbside	DT	66.7	66.7	-	-	-	29.5	32.8
Site 18	Kerbside	DT	83.3	83.3	-	-	-	22.7	19.6
Site B1	Kerbside	DT	83.3	83.3	16.6	15.5	17.4	14.4	17.1
Site B2	Kerbside	DT	83.3	83.3	16.7	16.6	16.2	15.4	17.8
Site B3	Kerbside	DT	91.7	91.7	19.7	19.5	22.7	19.9	22.0
Site B4	Kerbside	DT	100.0	100.0	21.4	16.1	18.1	15.1	16.8
Site B5	Kerbside	DT	83.3	83.3	34.1	35.4	38.7	36.7	36.4

Site B6	Kerbside	DT	75.0	75.0	9.8	9.4	11.6	10.4	11.0
Site B7	Kerbside	DT	50.0	50.0	-	13.4	16.9	14.3	17.7
Site B8	Kerbside	DT	66.7	66.7	22.7	21.8	21.8	18.9	26.6
Site B9	Kerbside	DT	100.0	100.0	14.8	16.2	15.5	14.0	14.6
Site B10	Kerbside	DT	100.0	100.0	24.3	22.1	27.4	22.5	25.8
Site B11	Kerbside	DT	100.0	100.0	20.7	18.0	23.0	18.2	21.1

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

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

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.**

2014 – 2017 monitoring data has previously been accepted by Defra, the 2018 monitoring data will be appraised by Defra following the submission of this ASR.

(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) Site 15 recorded a data capture of 0% due to the diffusion tube constantly being removed, for 2019 the location has been changed to a safer location.

Distance Correction Explanation:

During 2019 North Devon Council received stakeholder representation concerning confusion caused by the inclusion of distance corrected NO_2 values for any monitored annual mean concentrations either above the annual mean objective - or within 10% of the annual mean objective and not sited at locations of relevant exposure relating to the annual mean objective as per Box 1.1 of LAQM.TG(16) (Table C.2). To provide clarity in this matter, all concentrations presented within Table A.3 and Figures A.1 – A.3, and also all data predating 2016 held within any Review and Assessment Reports that have been approved by Defra, have not been distance corrected. This is to allow trend analysis between concentrations recorded without any further assumptions, such as distance correction, altering the monitored results.

Distance correction has been completed, where required, to all results post 2016 to estimate annual mean NO_2 concentrations at locations of relevant exposure where monitoring sites are not specifically located at points of exposure. For 2018 monitoring results these are presented within Table B.1 in Appendix B.

The data presented in Table A.3 of this ASR presents the data which has been used to inform previous decisions and discussions, and should be used for any future work concerning long term trend analysis. Pre 2014 data, used for the same purpose, is accessible is through the Council's website - https://www.northdevon.gov.uk/environment/air-quality/.

Figure A.1 – Trends in Annual Mean NO_2 Concentrations: Barnstaple (not distance corrected)

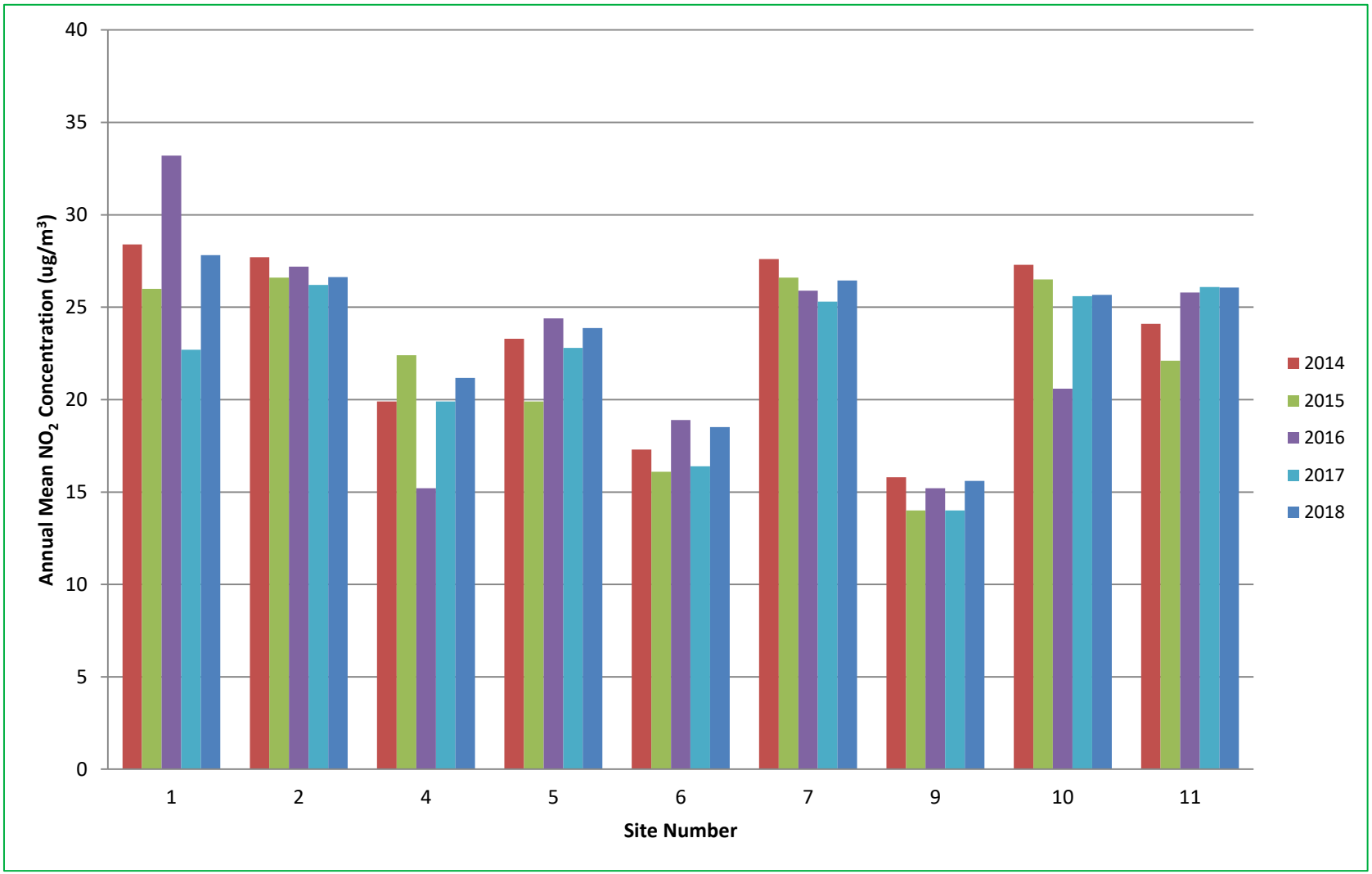


Figure A.2 – Trends in Annual Mean NO_2 Concentrations: Braunton (not distance corrected)

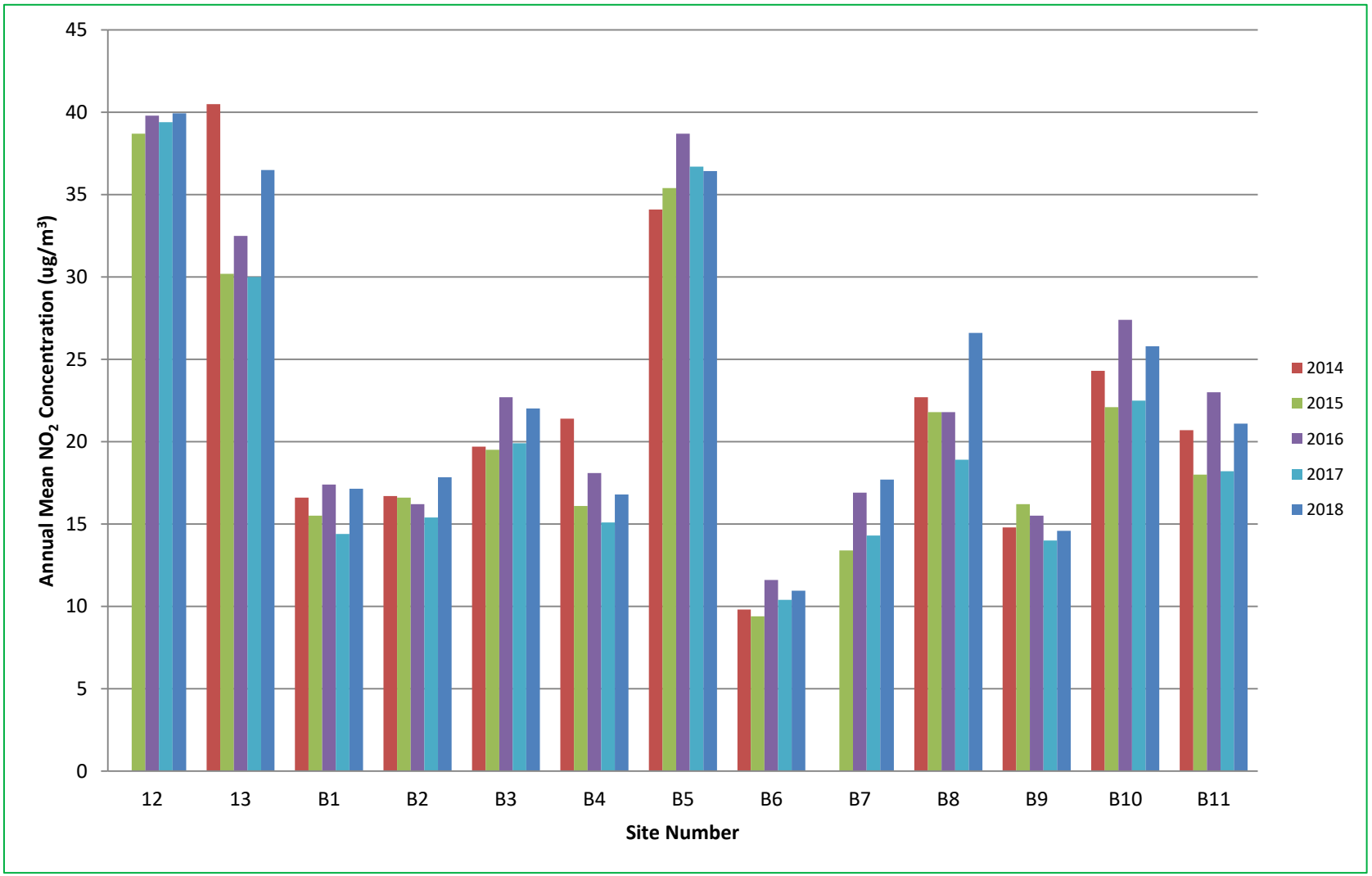


Figure A.3 – Trends in Annual Mean NO_2 Concentrations: Newport, Ilfracombe, South Moulton and Bickington (not distance corrected)

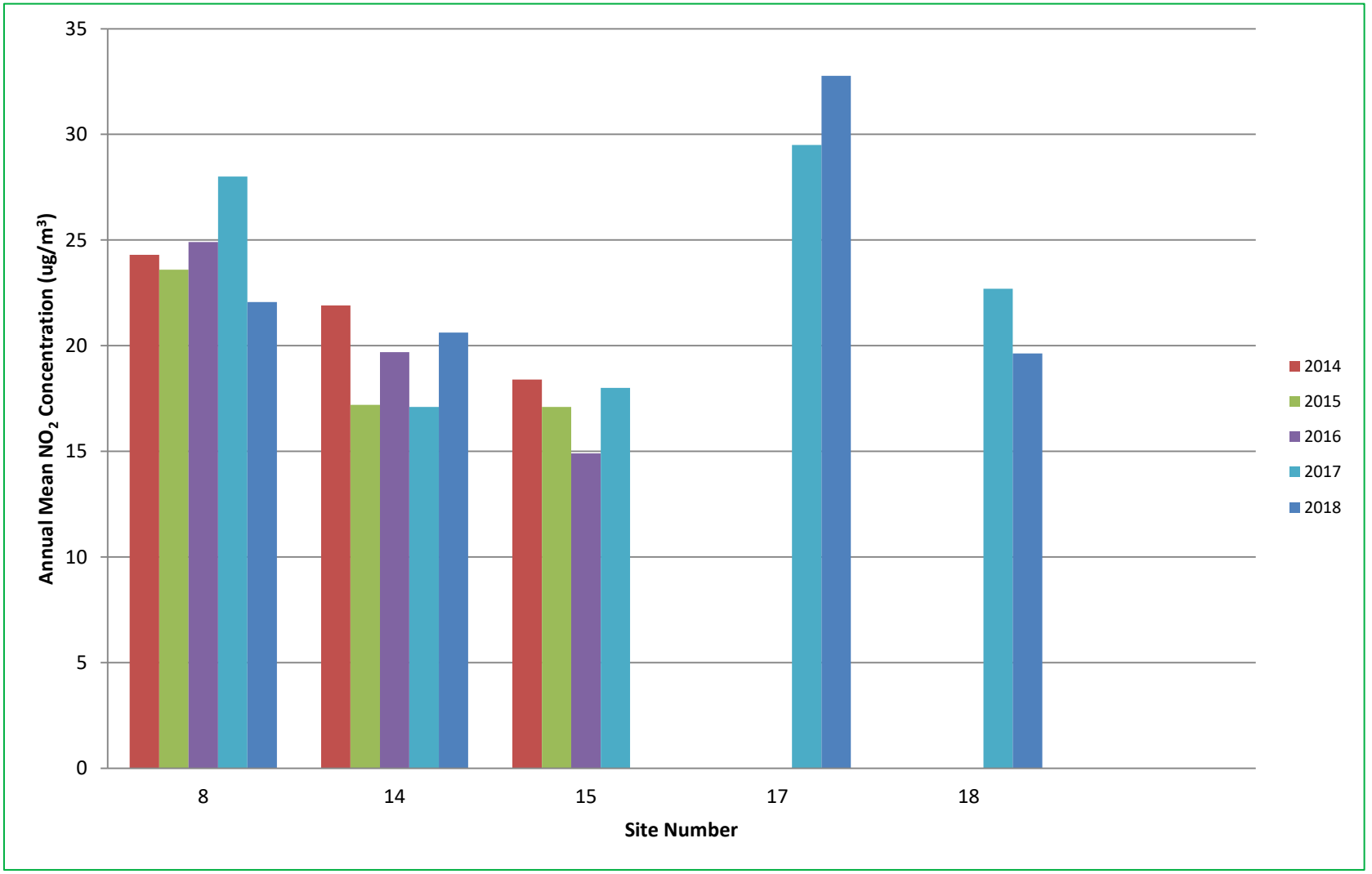


Table A.4 – Annual Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	PM_{10} Annual Mean Concentration ($\mu g/m^3$) (3)				
				2014	2015	2016	2017	2018
Barnstaple 1	Roadside	69.4	69.4 (4)	16.0	17.7	16.9	15.6	14.9

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

Notes:

Exceedances of the PM_{10} annual mean objective of 40$\mu g/m^3$ 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.

(4) During August 2018 the PM_{10} monitor was changed from a TEOM to a BAM 1020 Heated monitor, this was due to an AURN upgrade in PM_{10}/$PM_{2.5}$ monitors within the network.

Figure A.4 – Trends in Annual Mean PM_{10} Concentrations

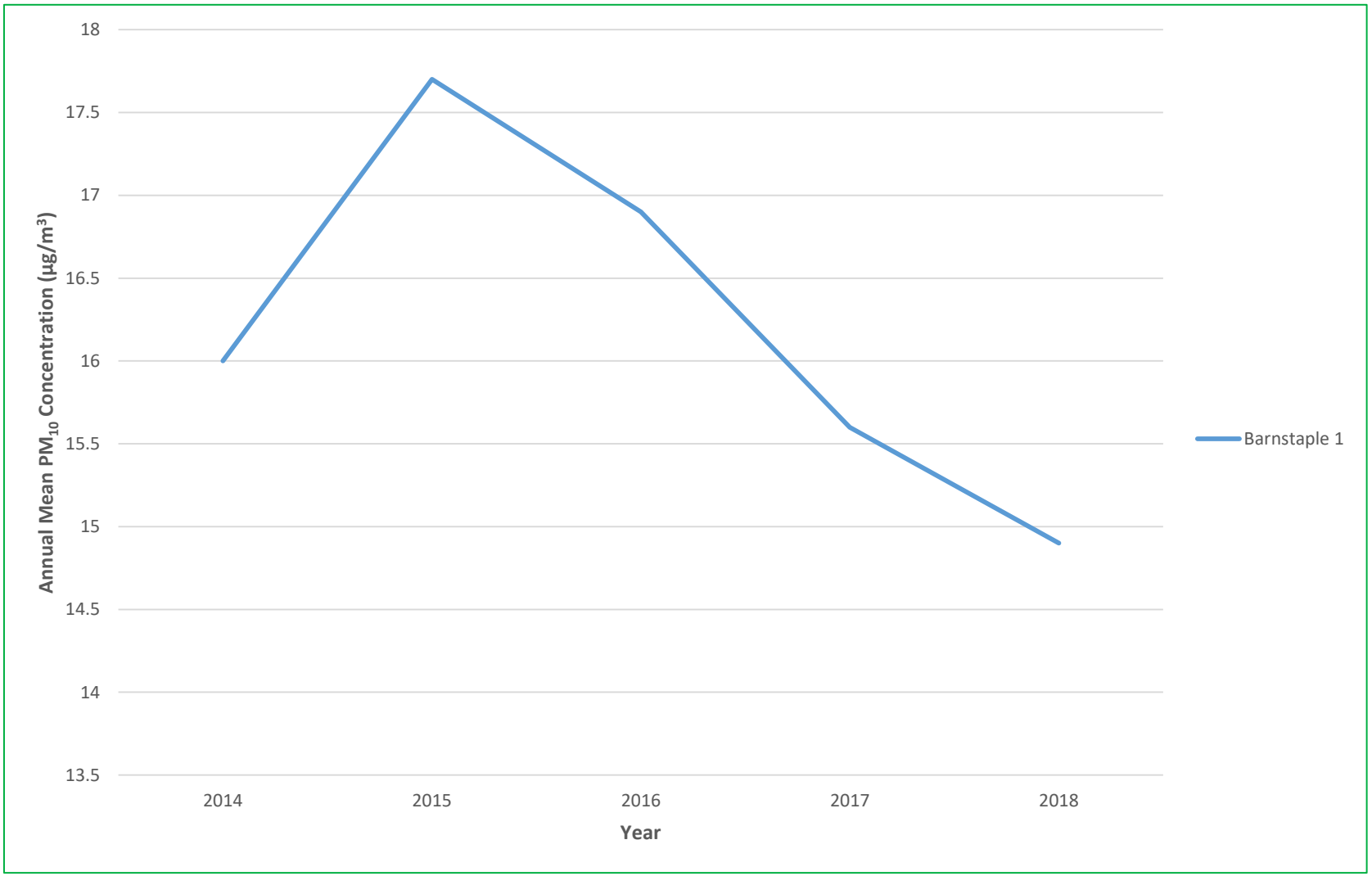


Table A.5 – 24-Hour Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1) (4)	Valid Data Capture 2018 (%) (2) (4)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
				2014	2015	2016	2017	2018
Barnstaple 1	Roadside	69.4	69.4	2	4 (27.7)	0	0 (28.5)	0 (22.1)

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.

(4) During August 2018 the PM monitor was changed from a TEOM to a BAM 1020 Heated monitor, this was due to an AURN upgrade in PM monitors within the network.

Figure A.5 – Trends in Number of 24-Hour Mean PM_{10} Results >50µg/m^3

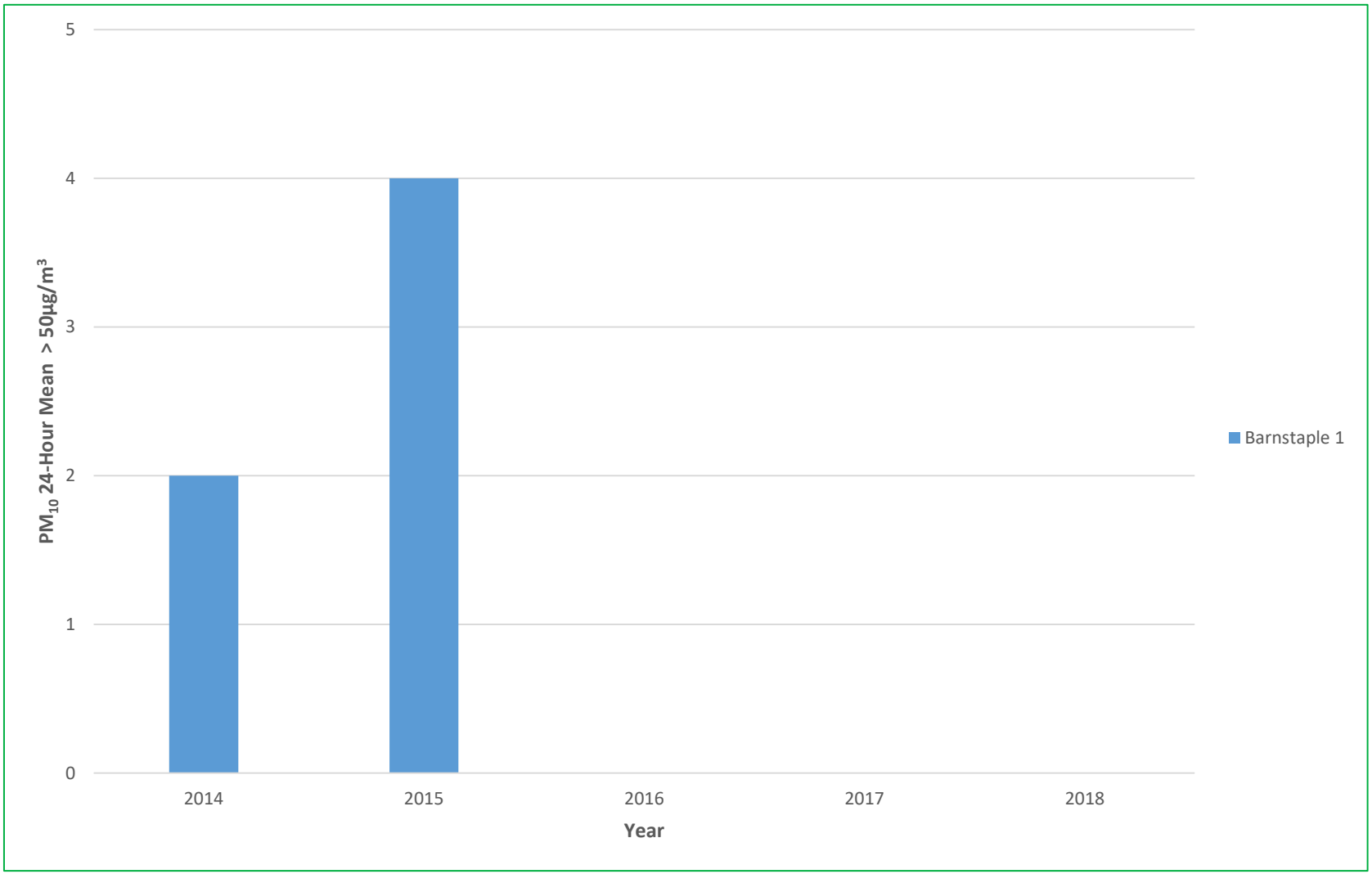


Table A.6 – $PM_{2.5}$ Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	$PM_{2.5}$ Annual Mean Concentration (µg/m^3) (3)				
				2014	2015	2016	2017	2018
Barnstaple 1	Roadside	90.9	90.9	9.1	9.6	10.7	7.8	6.9

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

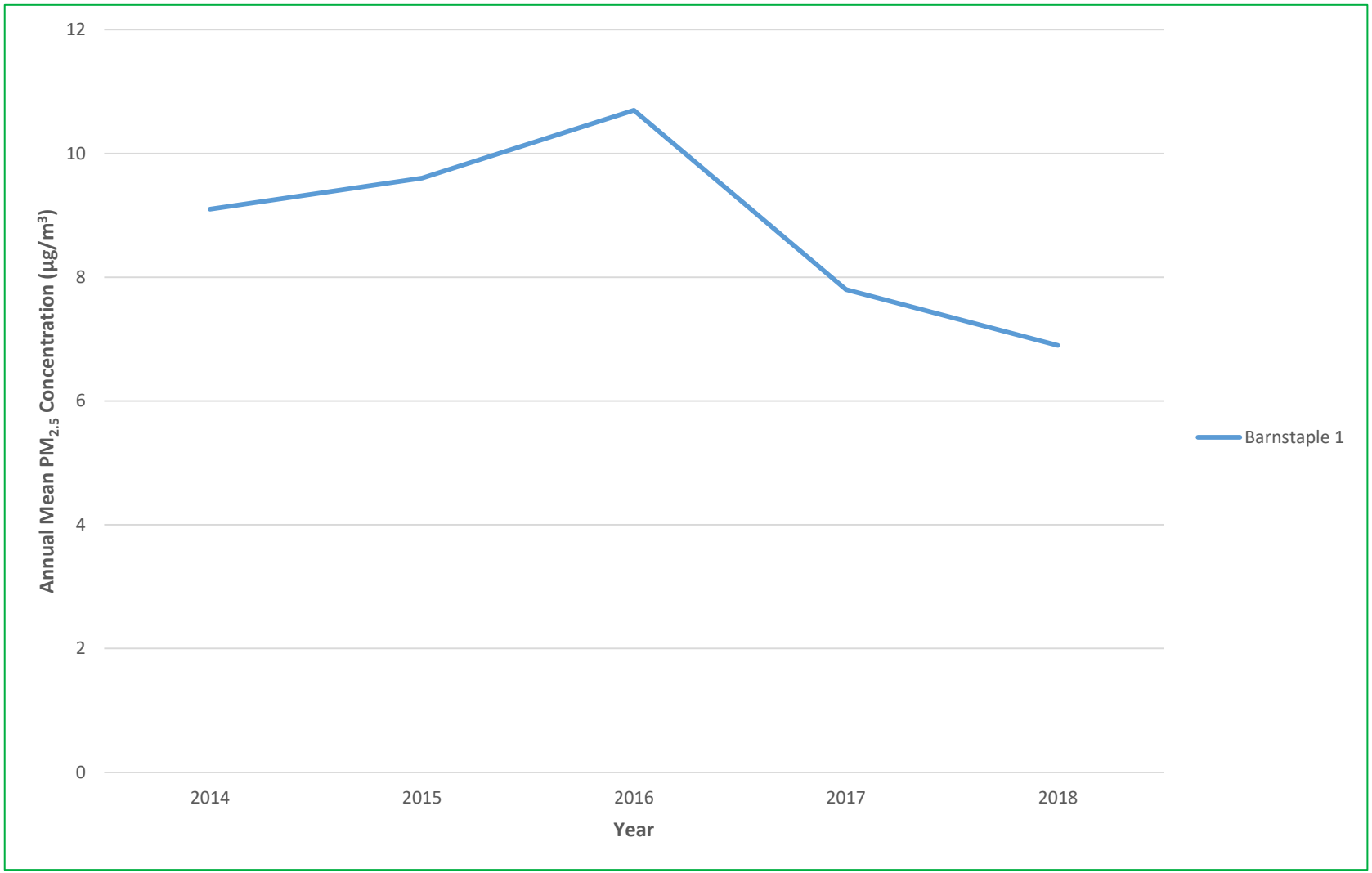
Notes:

(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.6 – Trends in Annual Mean $PM_{2.5}$ Concentrations



Appendix B: Full Monthly Diffusion Tube Results for 2018

Table B.1 – NO_2 Monthly Diffusion Tube Results - 2018

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (0.93) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
1	30.8	38.5	30.6	28.9	32.1	34.9	21.6	21.8	19.2	34.1	36.8	29.7	29.9	27.8	-
2	31.3	34.2	32.9	28.2	25.9	25.2	22.1	-	25.6	32.7	28.2	28.9	28.6	26.6	-
4	-	-	-	23.9	21.6	21.2	17.3	19.5	23.3	23.3	29.3	25.5	22.8	21.2	-
5	26.2	22.5	21.1	25.9	-	24.3	23.2	23.2	27.0	24.7	33.1	31.2	25.7	23.9	-
6	20.6	22.3	33.3	20.0	18.4	14.7	15.8	15.1	16.4	18.6	22.6	21.1	19.9	18.9	-
7	-	-	27.8	29.6	26.6	26.6	22.0	24.0	28.6	30.9	35.9	32.2	28.4	26.4	-
8	-	24.8	18.0	24.3	24.0	22.3	24.6	23.6	27.9	23.0	22.5	26.0	23.7	22.1	
9	19.6	20.0	32.7	14.5	12.8	11.5	12.3	12.9	14.2	15.3	17.3	18.5	16.8	15.6	-
10	30.7	31.5	28.0	27.8	-	23.3	22.3	-	23.9	31.0	27.1	30.3	27.6	25.7	-
11	28.8	25.5	62.7	24.7	25.2	24.4	22.3	22.2	24.5	24.0	26.8	25.3	28.0	26.1	-
12	38.6	34.5	43.5	-	85.8	39.4	37.3	39.7	38.1	39.5	36.8	39.2	43.0	39.9	29.5
13	33.7	31.2	41.5	38.0	37.6	36.5	36.2	34.0	0.6	64.2	42.2	36.5	39.2	36.5	-
14	-	-	23.3	23.0	26.4	26.8	21.5	17.9	19.6	17.3	25.5	20.3	22.2	20.6	-
15	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	29.5	45.0	31.3	26.6	31.8	28.9	27.0	24.7	-	-	-	-	30.6	32.8	-
18	-	-	24.6	21.5	21.8	19.6	18.7	17.5	18.8	20.9	24.4	23.2	21.1	19.6	-

B1	16.5	20.8	21.1	18.8	19.4	20.3	14.2	0.5	-	19.2	16.4	17.6	18.4	17.1	-
B2	-	-	21.9	20.2	18.3	17.0	17.7	17.9	17.7	19.4	21.2	20.6	19.2	17.8	-
B3	24.9	23.1	22.5	24.2	24.6	23.0	27.0		21.4	27.8	18.9	23.0	23.7	22.0	-
B4	16.5	19.3	19.2	19.2	21.6	22.8	13.7	13.0	13.9	21.2	20.2	16.2	18.1	16.8	-
B5	36.6	32.5	43.8	40.5		39.3	49.6	45.2	-	40.4	35.9	28.1	39.2	36.4	24.1
B6	-	15.3	13.0	11.6	10.1	10.4	10.0	9.3	-	13.1	-	13.4	11.8	11.0	-
B7	-	-	18.9	15.8	18.0	-	-	13.0	14.4	-	19.3	-	16.5	17.7	-
B8	-	1.8	-	27.6	28.2	25.7	23.6		24.9	28.2	29.6	21.3	26.1	26.6	-
B9	14.6	16.3	16.8	16.0	16.6	16.5	16.2	14.8	14.0	13.8	17.1	15.6	15.7	14.6	-
B10	24.8	27.3	33.1	21.8	33.4	30.0	29.3	28.7	24.4	27.8	27.1	25.0	27.7	25.8	-
B11	27.5	22.1	22.6	28.6	22.1	20.6	18.7	18.3	18.2	22.4	24.9	26.2	22.7	21.1	-

☐ **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**

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.

Yellow Cell – Results removed due to a spider being within the diffusion tube.

Green Cells – Possibly high anomaly results, these have been left within the annual mean calculations.

Orange Cells – Results removed due to very low concentrations.

Black Cells – No monthly results due to diffusion tubes missing.

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

Sources of Pollution

North Devon have not identified any potential new sources within the district as described in Chapter 7, Section 1 of Defra LAQM.TG(16).

Diffusion Tube Bias Adjustment Factor

The diffusion tube data has been corrected using a bias adjustment factor, which is an estimate of the difference between 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 recommend the use of a local bias adjustment factor where available and relevant to diffusion tube sites.

North Devon Council does not operate any continuous NO_2 monitoring stations within the District and therefore a co-location study is not available to derive a local bias factor, thus the national bias adjustment factor spreadsheet has been used.

Diffusion tubes for North Devon Council are supplied and analysed by Gradko International Ltd. The tubes were prepared using the 20% TEA in water preparation method. The national bias adjustment factor for Gradko 20% TEA in water is 0.93 for the year 2018 (based on thirty studies) as derived from the national bias adjustment factor spreadsheet as presented in Figure C.1.

Figure C.1 – Gradko 20% TEA in Water 2018 National Bias Adjustment Factor

Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 03/19

to show the results of **relevant** co-location studies
nd are not suitable for correcting individual short-term monitoring periods
ould state the adjustment factor used and the version of the spreadsheet
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 2019
LAQM Helpdesk Website

ra and the Devolved Administrations by Bureau Veritas, in conjunction with contract
atory.

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

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

Method — To undo your selection, choose (All) from the pop-up list	Year[5] — 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[6]	Bias Adjustment Factor (A) (Cm/Dm)
20% TEA in water	2018	R	Fareham Borough Council	12	28	34	-17.5%	G	**1.21**
20% TEA in water	2018	R	Fareham Borough Council	12	37	34	8.9%	G	**0.92**
20% TEA in water	2018	R	Fareham Borough Council	12	32	28	12.6%	G	**0.89**
20% TEA in water	2018	R	NOTTINGHAM CITY COUNCIL	12	35	34	0.3%	G	**1.00**
20% TEA in water	2018	R	Bracknell Forest Borough Council	12	44	37	19.4%	G	**0.84**
20% TEA in water	2018	R	Brighton & Hove City Council	9	48	50	-3.7%	G	**1.04**
20% TEA in water	2018	R	Eastleigh Borough Council	11	28	32	-12.0%	G	**1.14**
20% TEA in water	2018	R	Eastleigh Borough Council	12	42	38	10.2%	G	**0.91**
20% TEA in water	2018	UB	Eastleigh Borough Council	12	27	28	-4.4%	G	**1.05**
20% TEA in water	2018	R	Gateshead Council	12	29	25	13.9%	G	**0.88**
20% TEA in water	2018	R	Gateshead Council	12	32	29	10.8%	G	**0.90**
20% TEA in water	2018	R	Gateshead Council	9	40	41	-1.8%	G	**1.02**
20% TEA in water	2018	R	Wokingham Borough Council	12	38	33	13.2%	G	**0.88**
20% TEA in water	2018	R	Bath & North East Somerset	12	40	39	4.0%	G	**0.96**
20% TEA in water	2018	R	Bedford Borough Council	10	30	27	8.8%	G	**0.92**
20% TEA in water	2018	KS	Marylebone Road Intercomparison	11	93	85	9.3%	G	**0.91**
20% TEA in water	2018	R	South Gloucestershire Council	12	21	20	6.3%	G	**0.94**
20% TEA in water	2018	R	Thurrock Borough Council	12	53	52	2.3%	S	**0.98**
20% TEA in water	2018	R	Thurrock Borough Council	12	34	30	15.1%	G	**0.87**
20% TEA in water	2018	R	Thurrock Borough Council	12	31	24	28.8%	G	**0.78**
20% TEA in water	2018	UB	Thurrock Borough Council	12	27	25	9.2%	S	**0.92**
20% TEA in water	2018		**Overall Factor[3] (30 studies)**				**Use**		**0.93**

QA/QC of Diffusion Tube Monitoring

The diffusion tubes for the year 2018 were supplied and analysed by Gradko International Ltd, the tubes were prepared using the 20% TEA in water preparation method. All results have been bias adjusted and annualised where required before being presented in Table A.3.

Gradko is a UKAS accredited laboratory and participates in the AIR-PT Scheme (a continuation of the Workplace Analysis Scheme for Proficiency (WASP)) for NO_2 tube analysis and the Annual Field Inter-Comparison Exercise. These provide strict performance criteria for participating laboratories to meet, thereby ensuring NO_2 concentrations reported are of a high calibre. The lab follows the procedures set out in the Harmonisation Practical Guidance. In the latest available AIR-PT results, AIR-PT AR024 (January to February 2018), AIR-PT AR025 (April to May 2018), AIR-PT AR027 (July to August 2017) and AIR-PT AR028 (September to October 2018) Gradko has scored 100%, and for AIR-PT AR030 (January to February 2019) Gradko scored 75%.

The percentage score reflects the results deemed to be satisfactory based upon the z-score of < ± 2.

Twenty eight out of the thirty co-location studies in 2018 were rated as 'good' (tubes are considered to have "good" precision where the coefficient of variation of duplicate or triplicate diffusion tubes for eight or more periods during the year is less than 20%).

Short-term to Long-term Data Adjustment

In regards to the 2018 diffusion tube data set, annualisation was required at three diffusion tube locations and for the AURN Barnstaple PM_{10} automatic monitoring data due to data capture being below 75%. Annualisation has been completed in line with Box 7.9 and Box 7.10 within LAQM.TG(16) and full working details are presented in Table C.3 and Table C.4.

In completing the annualisation process, data has been taken from a number of automatic monitoring sites that are part of the AURN. In line with LAQM.TG(16) the monitoring sites that have been used lie within a radius of approximately 50 miles of the sites to be annualised and have a data capture of 85% or above.

All monitoring stations that were used are background monitoring stations and as such are not influenced by local sources of air pollution such as road traffic emissions at roadside monitoring sites. The monitoring sites that were used are listed in Table C.1.

Table C.1 – AURN Monitoring Stations used for Annualisation

Pollutant	Background AURN Sites used for Annualisation
NO_2	• Yarner Wood – Rural Background • Charlton Mackerill – Rural Background • Honiton – Urban Background • Plymouth Centre – Urban Background
PM_{10}	• Narbeth – Rural Background • Cardiff Centre – Urban Background • Plymouth Centre – Urban Background

Distance from Road Correction

In line with LAQM.TG(16) distance correction has been applied to NO_2 monitoring sites that have recorded an annual mean concentration above the annual mean objective,

or within 10% of the annual mean objective and are not sited at locations of relevant exposure as detailed within Table C.2. There were three sites within North Devon's NO_2 monitoring network that were within 10% of the NO_2 annual mean objective in 2018, and two of these are not at locations of relevant exposure; Site 12 and Site B5.

The NO_2 Fall-Off with Distance Calculator (v4.2) has been used to derive the NO_2 concentration at a location of relevant exposure; the results of the calculations are presented in Table C.5.

Table C.2 – Examples of where the Air Quality Objectives should apply

Averaging Period	Objectives should apply at:	Objectives should generally not apply at:
Annual mean	All locations where members of the public might be regularly exposed. Building facades of residential properties, schools, hospitals, care homes etc.	Building facades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
24-hour mean and 8-hour mean	All locations where the annual mean objectives would apply, together with hotels. Gardens of residential properties	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
1-hour mean	All locations where the annual mean and 24 and 8-hour mean objectives would apply. Kerbside sites (e.g. pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where the public might reasonably be expected to spend one hour or more. Any outdoor locations at which the public may be expected to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.

QA/QC of Automatic Monitoring

The Barnstaple automatic monitoring site is part of the UK Automatic Urban and Rural Network (AURN) that is run by the Environmental Agency. It is the largest automatic monitoring network within the UK, and is the main network used for compliance reporting against the Ambient Air Quality Directives. As such the PM_{10} and $PM_{2.5}$ monitoring is completed in line with the strict operational procedures set out by the Central Management and Co-ordination Unit (CMCU) for the AURN, with data ratification completed by the by Quality Assurance and Control Unit (QA/QC Unit).

North Devon Council regularly attend the monitoring site acting as the Local Site Operators (LSO) to complete routine site calibrations and maintenance ensuring a consistent, accurate data flow. Six monthly equipment servicing is completed by an Equipment Support Unit (ESU) for the site, and the QA/QA unit completed scheduled site operating audits in accordance with the AURN Site Operators Manual.

Due to the monitoring site being operated by the Environmental Agency, North Devon Council do not have first-hand access to any data that has been manipulated or removed through the QA/QC procedure completed. The data presented within the 2019 ASR has been downloaded from the UK-Air website and is all shown as ratified.

Table C.3 – Diffusion Tube Short Term to Long Term Monitoring Data Adjustment (2018)

Site ID	Unadjusted Diffusion Tube Mean (µg/m^3)	Annualisation Factor Yarner Wood	Annualisation Factor Charlton Mackerill	Annualisation Factor Honiton	Annualisation Factor Plymouth Centre	Average Annualisation Factor	Annualised & Bias Adjusted (0.93) Concentration (µg/m^3)
Site 17	30.6	0.999	1.165	1.073	1.048	1.071	32.8
Site B7	16.5	1.037	1.099	1.102	1.046	1.071	17.7
Site B8	26.1	1.060	0.994	1.027	0.987	1.017	26.6

Table C.4 – PM_{10} Short Term to Long Term Monitoring Data Adjustment (2018)

Site ID	Unadjusted Monitored Mean (µg/m^3)	Annualisation Factor Narbeth	Annualisation Factor Cardiff Centre	Annualisation Factor Plymouth Centre	Average Annualisation Factor	Annualised Concentration (µg/m^3)
Barnstaple 1	14.0	1.088	1.035	1.074	1.066	14.9

Table C.5 – NO_2 Fall-Off with Distance Calculations

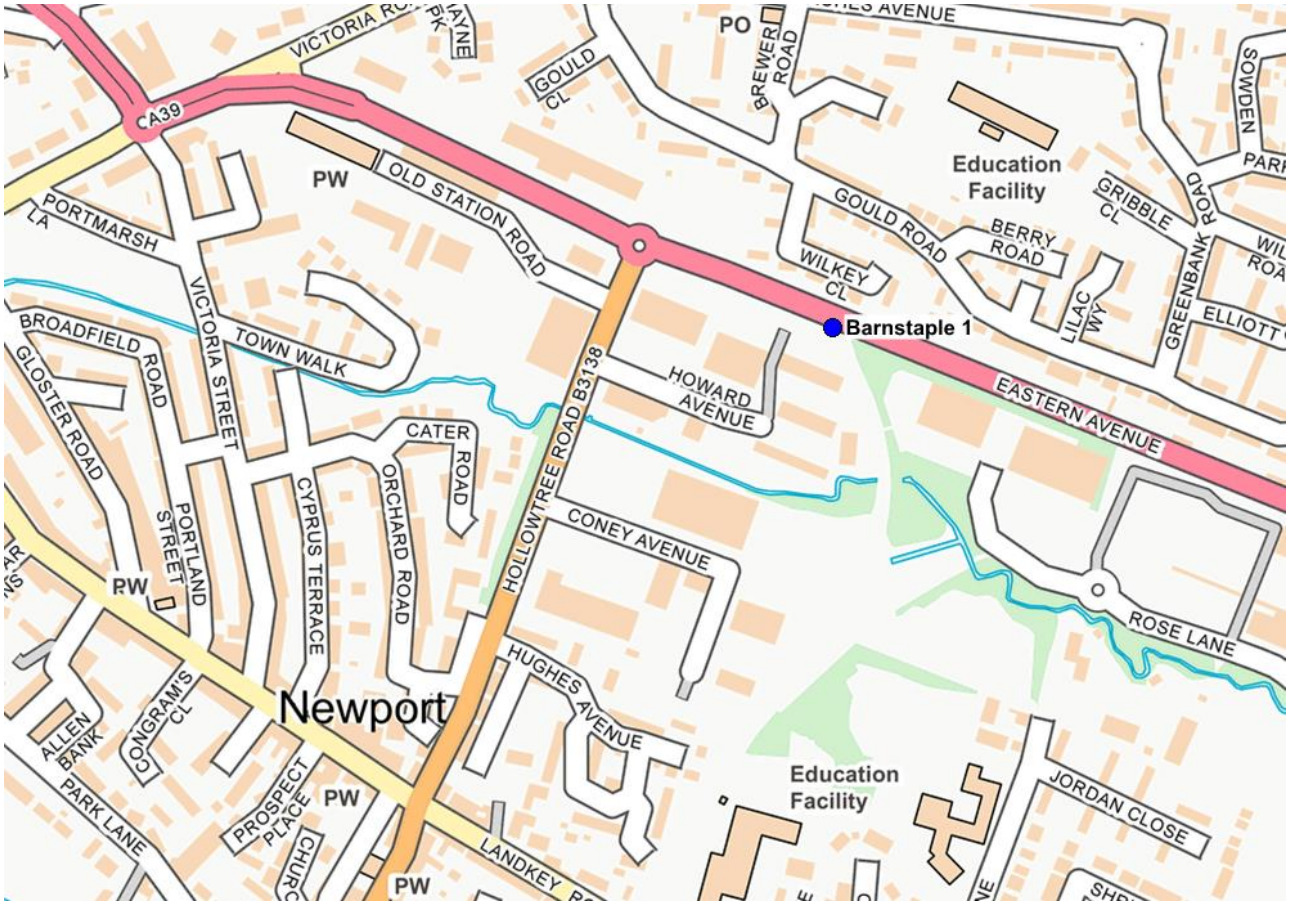
Site ID	Distance (m)		NO_2 Annual Mean Concentration (µg/m^3)		
	Monitoring Site to Kerb	Receptor to Kerb	Background (1)	Monitoring at Site	Predicted at Receptor
Site 12	1.0	4.3	4.5	39.9	29.5
Site B5	0.5	4.4	4.5	36.4	24.1

Notes:

(1) Background NO_2 concentrations have been taken from the 2018 Defra Background Maps for North Devon.

Appendix D: Maps of Monitoring Locations and AQMAs

Figure D.1 – Automatic Monitoring Site: Barnstaple



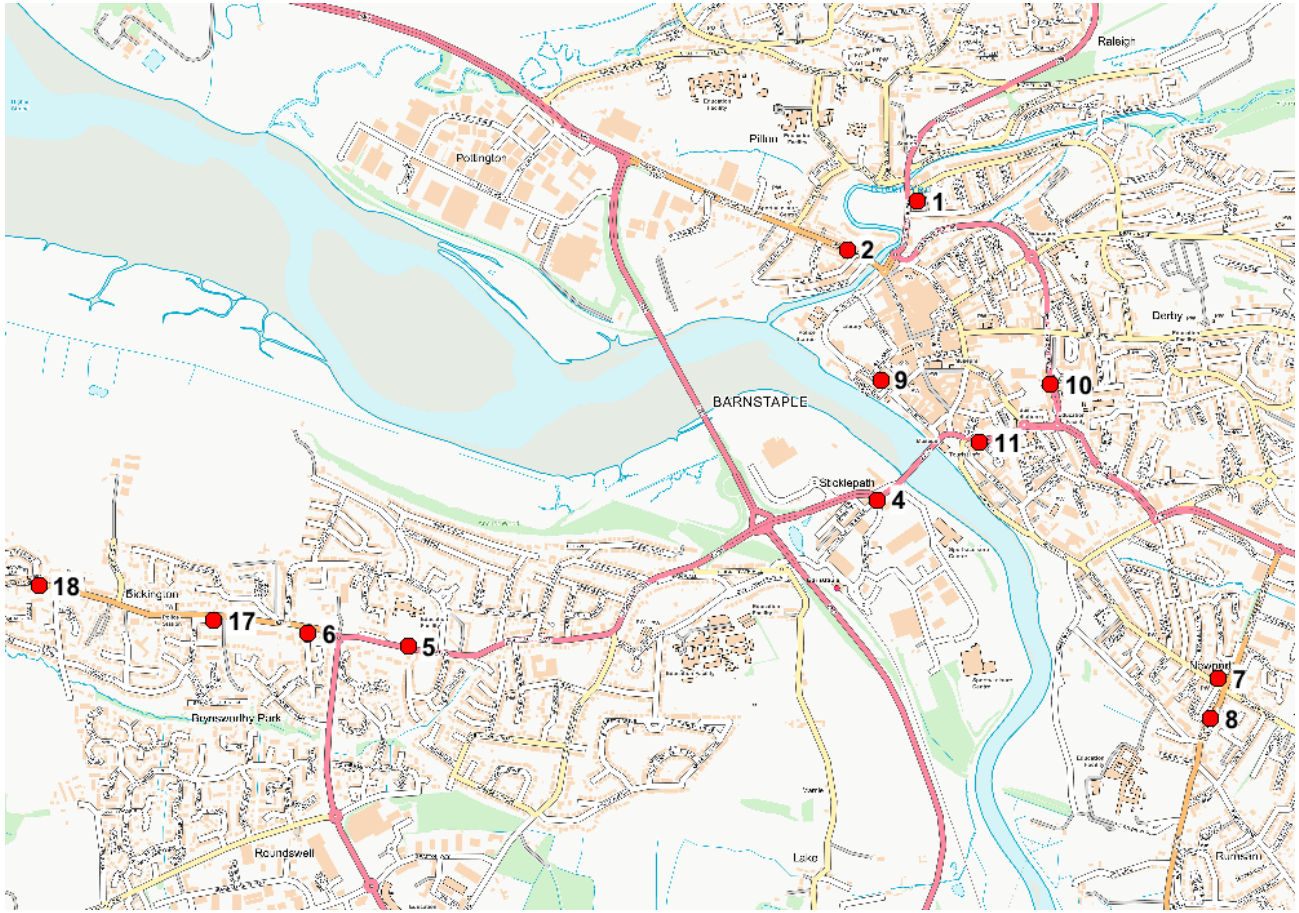
Legend

Automatic Monitor

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

Location	
North Devon Council	
Title	
Automatic Monitoring Site: Barnstaple	
By	**Approved**
PB	HS
Scale	**Job Ref**
Not to Scale	6486318
Date	**Figure No.**
May 2019	**D.1**

Figure D.2 – Diffusion Tube Monitoring Locations: Barnstaple



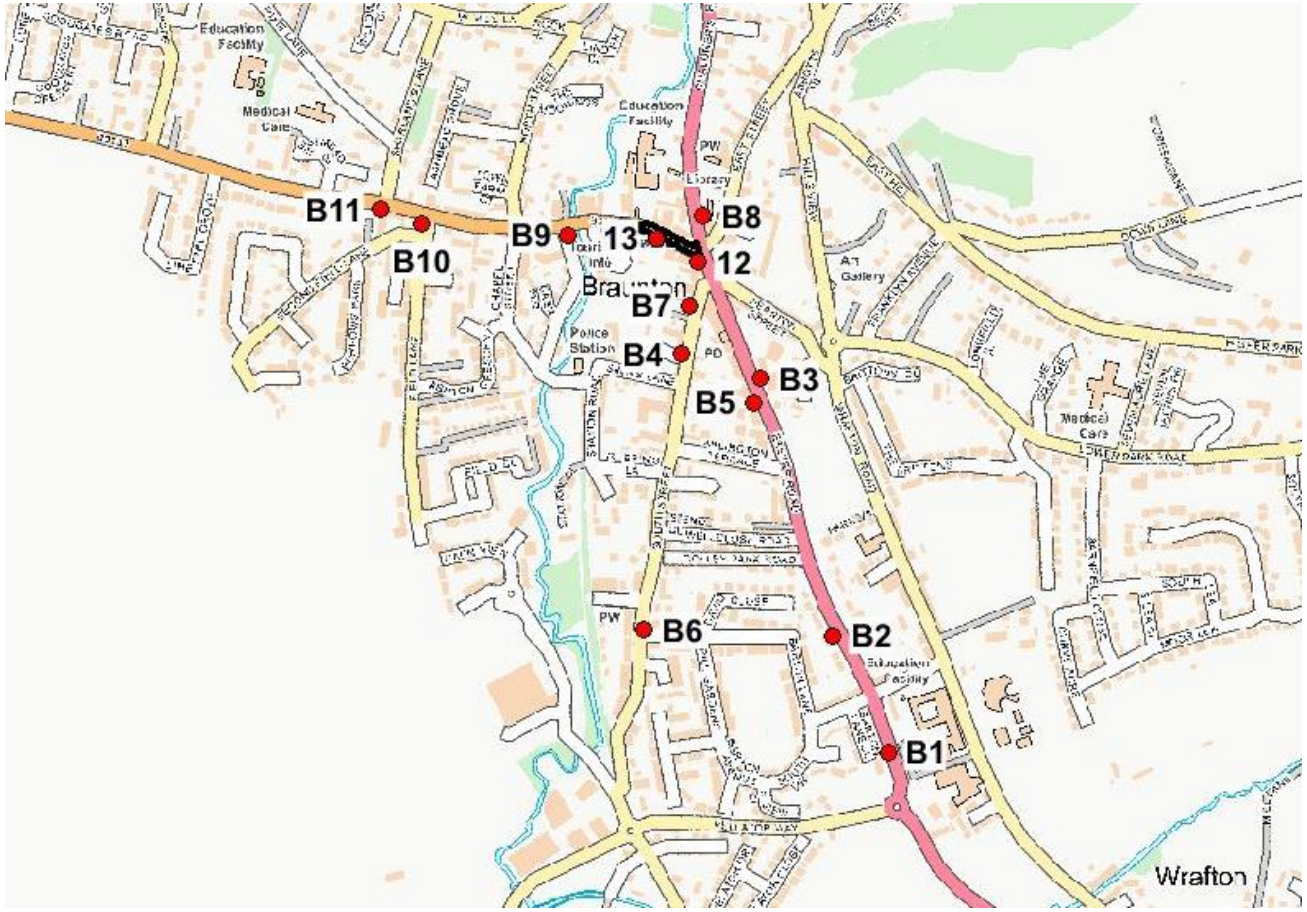
Legend

Diffusion Tube

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

Location	
North Devon Council	
Title	
Diffusion Tube Locations: Barnstaple	
By	**Approved**
PB	HS
Scale	**Job Ref**
Not to Scale	6486318
Date	**Figure No.**
May 2019	**D.2**

Figure D.3 – Diffusion Tube Monitoring Locations: Braunton



Legend

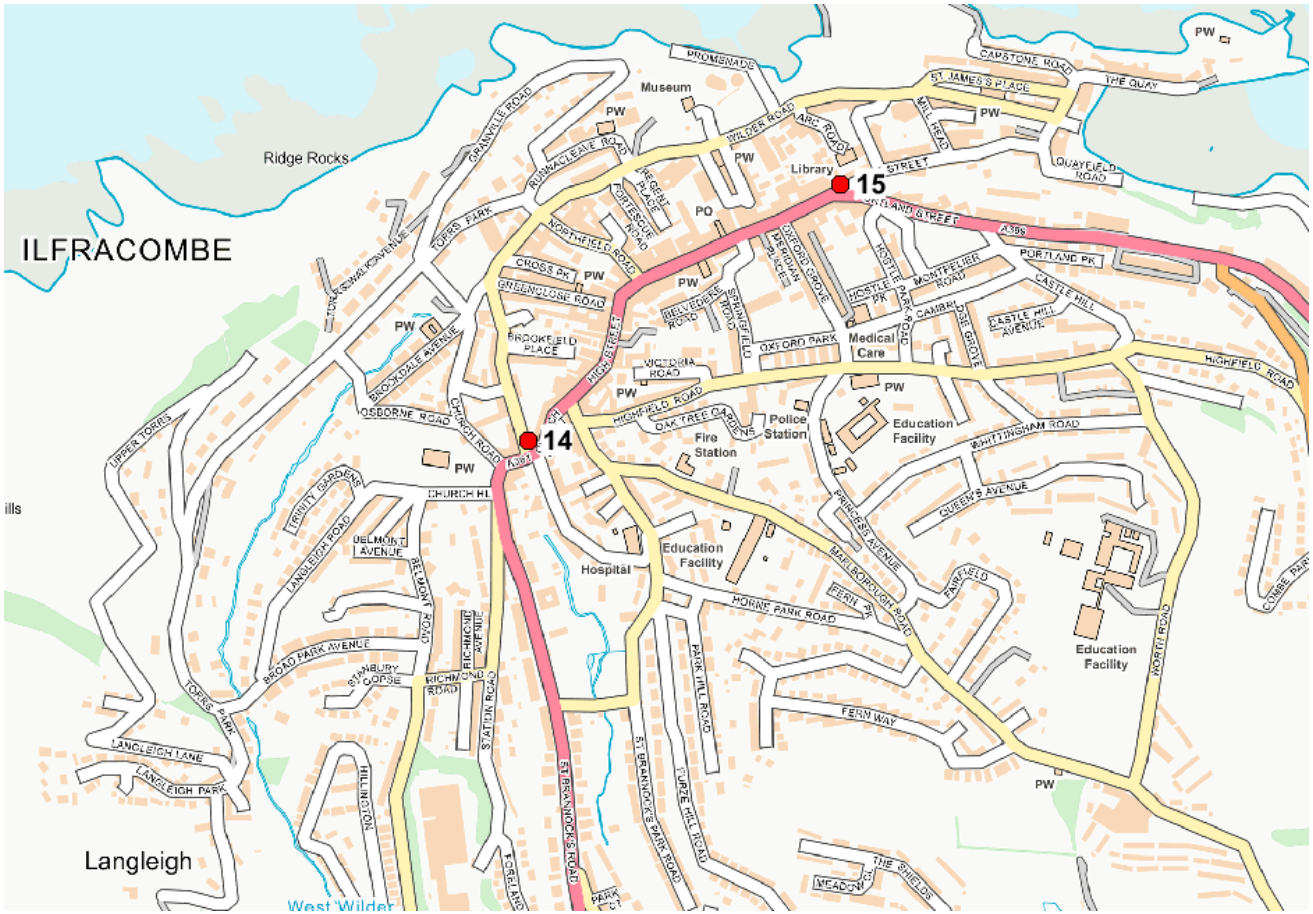
AQMA Boundary

Diffusion Tube

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

Location	
North Devon Council	
Title	
Diffusion Tube Locations: Braunton	
By	**Approved**
PB	HS
Scale	**Job Ref**
Not to Scale	6486318
Date	**Figure No.**
May 2019	**D.3**

Figure D.4 – Diffusion Tube Monitoring Locations: Ilfrcombe



Legend

Diffusion Tube

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

Location	
North Devon Council	
Title	
Diffusion Tube Locations: Ilfracombe	
By	**Approved**
PB	HS
Scale	**Job Ref**
Not to Scale	6486318
Date	**Figure No.**
May 2019	**D.4**

Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[4]	
	Concentration	Measured as
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m^3	Annual mean
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

[4] The units are in microgrammes of pollutant per cubic metre of air (µg/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
AURN	Automatic Urban and Rural Network
BAM	Beta Attenuation Monitor
CMCU	Central Management and Control Unit
Defra	Department for Environment, Food and Rural Affairs
EU	European Union
ESU	Equipment Support Unit
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
LSO	Local Site Operator
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

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.
- North Devon Council Air Quality Action Plan, May 2016.
- North Devon Council 2017 Annual Status Report.
- North Devon Council 2018 Annual Status Report.
- National Diffusion Tube Bias Adjustment Factor Spreadsheet, version 03/19 published in March 2019.
- Defra Nitrogen Dioxide fall off with distance calculator, https://laqm.defra.gov.uk/air-quality-assessment/
- Defra Background Maps (2017 based), https://laqm.defra.gov.uk/air-quality-assessment/
- Public Health England, Public Health Profiles, Fraction of mortality attributable to particulate air pollution (2017), https://fingertips.phe.org.uk/