BEDFORD
BOROUGH COUNCIL

2022 Air Quality Annual Status Report (ASR)

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

Date: June, 2022

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Executive Summary: Air Quality in Our Area

Air Quality in Bedford

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

The mortality burden of air pollution within the UK is equivalent to 28,000 to 36,000 deaths at typical ages[3], with a total estimated healthcare cost to the NHS and social care of £157 million in 2017[4].

Air quality in Bedford Borough is mostly **very good**, however, there are locations where pollutants build up and are slow to disperse due to traffic volumes and road traffic routes with unfavourable layouts/local geography.

The main pollutant of concern in Bedford Borough is Nitrogen dioxide (NO_2), the primary source of which is road traffic emissions. Bedford has several strategic transport routes including the A1, A421 and A6 which carry high levels of traffic. Traffic routes are constrained in and around the town centre by river, road and rail bridges, and one-way traffic systems have evolved in response to pinch points created by these constraints. This combined with high levels of car ownership and use results in congestion hotspots.

Bedford Borough Council is currently undertaking air quality monitoring for NO_2 at two automatic sites and at 55 passive diffusion tube sites. The 2021 monitoring results have determined that there are exceedances of the annual mean NO_2 objective at just one diffusion tube site at a location of relevant exposure within the AQMA. This is at the same

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

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

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

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

location as exceeded in 2020. 23 diffusion tube results were lower than those in 2020 with 32 locations showing increased results, a significant factor associated to this is the Covid-19 pandemic which resulted in significant and sustained reductions in vehicle movements associated to the initial lockdown in 2020 with 2021 seeing a reduction in restrictions with traffic levels increasing over the course of the year. Lower results relating to Bedford High Street were as a result of the closure of the High Street for the majority of 2021 as work was carried out to reduce the street from two lanes of traffic to a single lane.

An Earthsense Zephyr air quality monitor has been situated on Ampthill Rd since February 2021 just outside the AQMA (location indicated on the maps in Appendix D). It is understood that results from such monitors should not be included within the formal reporting for this return however these can provide indicative data for particulate matter in the area. The average PM10 (Feb-Dec) was 13.8 µg/m^3 and PM2.5 average 9.98 µg/m^3. Another monitor has been placed on Ampthill Rd/Britannia Rd junction inside the AQMA which will give an indicative PM level for 2022.

Bedford Borough Council has one AQMA - AQMA 5 Bedford Town Centre - https://ukair.defra.gov.uk/aqma/details?aqma_ref=618

Over the course of 2021 the Covanta waste incinerator situated on the border of the Borough became operational. This is an Environment Agency permitted activity with limits on emissions from the stack set as conditions within the permit for the site. The air quality in this area is very good and approximately 10K from AQMA 5. A diffusion tube situated outside of the site entrance to consider potential air quality impacts relating to vehicle movements once operational showed the annual average NO_2 data was still significantly below the objective at 13.6 µg/m^3. The location will continue to be monitored during 2022 as will the other suburban location in Stewartby which resulted in an annual mean of 11.6 µg/m$^{3.}$

Bedford Borough Council has submitted to DEFRA, for review, an updated Air Quality Action Plan for the AQMA 5 Bedford Town Centre covering the next five years which was accepted. The Council is also working in close partnership with Transport, Public Health, Planning and other council departments to continue to identify pollution hotspots and key sources of pollution across the Borough, and opportunities and actions to improve local air quality.

Actions to Improve Air Quality

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

The 2019 Clean Air Strategy[5] sets out the case for action, with goals to reduce exposure to harmful pollutants. The Road to Zero[6] sets out the approach to reduce exhaust emissions from road transport through a number of mechanisms; this is extremely important given that the majority of Air Quality Management Areas (AQMAs) are designated due to elevated concentrations heavily influenced by transport emissions.

Bedford Borough Council submitted to DEFRA an updated Air Quality Action Plan for the Town Centre AQMA 5 in 2021 covering the years 2021 to 2026. The action plan was accepted with a small number of recommendations/comments with the ultimate aim to achieve stable and compliant air quality concentrations across the Borough, and allow for the consideration of reduction of the Town Centre AQMA 5 by 2026.

Bedford has seen an overall decrease in measured NO_2 levels over the past five years which is due to a number of measures implemented as well as a general increase in the use of less polluting vehicles.

During 2021 there has been continued work associated to Transporting Bedford 2020, an £18 million investment to tackle traffic congestion across the town centre. Primarily the High Street has been reduced to a single lane which will aim to reduce overall traffic and congestion and NO_2 data from 2022 will be indicative of the expected levels (2021 saw the road closed most of the year and the Covid-19 pandemic in 2020 reduced overall traffic numbers). Any future work comparing data with a view to justifying any revision of the current AQMA will use relevant period's indicative of typical traffic volumes.

From May 2021, major improvement works commenced on Ampthill Road to reduce congestion and improve road safety. During these works, the road was widened creating a second northbound lane which provides restricted use for buses and Ultra Low Emission Vehicles, enabling people to continue benefiting from the bus lane and encouraging the

[5] Defra. Clean Air Strategy, 2019

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

use of electric vehicles as they become more common. Works were also delivered to separate turning traffic along the road from the main flow of traffic in order to improve vehicle flow and reduce stationary vehicles idling.

Prebend Street is the single diffusion tube location that has exceeded the annual average objective for NO_2 during the last two years. The location is one of the crossing points for the Great Ouse which divides the town with the exceedance occurring due to congestion as a result of a busy junction and buildings in close proximity to the road creating a canyon effect which impedes dispersal of vehicle emissions. Bedford Borough Council have proposed bids and actions to attempt to reduce the congestion which would also improve the air quality. To date these bids have been unsuccessful.

Bedford Borough Council applied for a DEFRA air quality grant in 2020, to support implementation of a School Streets project aimed at educating pupils and parents around air quality impacts associated to school travel, promoting alternative school travel options with a number of schools being supported to introduce road closures as part of the project.

Conclusions and Priorities

This Annual Status Report identifies that the annual mean objective for Nitrogen dioxide (NO_2) exceeded at one location across the Borough during 2021 with this location within the AQMA. This is the same location as 2020 and a reduction since 2019 from 4 exceedances. There were only two diffusion tube results within 10% of the 40 µg/m^3 limit both situated in the AQMA. One is the exceedance at Prebend Street at 43.3 µg/m^3 and St Peters Street at 38.1 µg/m^3. Despite these reductions data for 2020 and 2021 need to be viewed with caution due to the impacts of the pandemic on traffic movements and behaviours, and small increases during 2022 may occur, when compared with 2021, due to traffic levels potentially returning to pre-pandemic trends. Despite this monitoring data will continue to be reviewed over the next 2 years to consider the possibility of reducing the current size of the AQMA. This will need to be based on robust data and exclude data that may have been impacted as a result of reduced traffic movements and behavioural changes as a result of the Pandemic.

Current priorities include publishing of the new AQAP for AQMA 5 Bedford Town Centre and the ongoing delivery of the Transporting Bedford projects.

Local Engagement and How to get involved

A dedicated link has been provided on the council website in relation to the work around Transporting Bedford, which can be accessed here –

https://www.bedford.gov.uk/parking-roads-and-travel/strategies-and-projects/transporting-bedford-2020/

The air quality webpage has been updated on the Council website. Historic ASRs, Action Plans and Detailed Assessments are available from this site, and members of the public can also report air quality issues via contact details provided on this page. The air quality webpage can be accessed here –

https://www.bedford.gov.uk/environmental-issues/noise-nuisances-and-pollution/air-quality/

Local businesses have been identified and sent information about the The Air Quality (Domestic Solid Fuels Standards) (England) Regulations 2020, containing an overview of the legislation and the requirements for selling solid fuel.

The smoke control area map has been updated and available as a GIS layer on the council web site so residents can easily identify if they are in a smoke control area.

A practical guide to open fires and wood burning stoves has been produced and published on the website, which also directs members of the public to report businesses that may not be complying with requirements of the Solid Fuel Regulations, this will be subject to further publicity in September 2022.

Autumn 2021 saw the launch of a DEFRA funded project which primary focus was working with educational establishments in a pre-determined area of Bedford where air quality levels were close to threshold levels.

Relationships were built with 2 nurseries, 4 primary schools, 2 secondary schools and 1 university. Plans were made for a new school street closure, which was to be actioned later in 2022. Activities at schools included sessions to encourage walking and cycling and also educating students on the risks of poor air quality and what they can do to minimise their personal risk.

Social Media will be used to support National Clean Air Day reiterating messaging around the domestic burning of solid fuels and promoting alternative transport choices.

How to get involved and make a positive difference:

- For shorter journeys, opt to use more sustainable travel options such as walking or cycling instead of the car.
- For longer journeys share lifts and carpool
- Where possible use buses, coaches and trains
- Switch your engine off and don't leave it running when your car is waiting stationary.
- Drive economically by accelerating smoothly, braking gently and obeying speed limits.
- Look after your vehicle with regular servicing and tyre pressure checks
- Use only DEFRA approved smoke free solid fuel in open fires and wood burners
- If possible drive outside of peak times
- Consider alternative school pick up and drop off travel choices

Local Responsibilities and Commitment

This ASR was prepared by the Regulatory services department of Bedford Borough Council with the support and agreement of the following departments:

Sustainable transport
Public Health
Planning
Transport Policy
Planning Policy

This ASR has been approved by:

Vicky Head Director of Public Health

This ASR has been signed off by a Director of Public Health.

If you have any comments on this ASR please send them to ehadmin@bedford.gov.uk at:

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1 Local Air Quality Management

This report provides an overview of air quality in Bedford during 2021. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by Bedford Borough Council to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England are presented in Table E.1.

2 Actions to Improve Air Quality

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

A summary of AQMAs declared by Bedford Borough Council can be found in Table 2.1. The table presents a description of the AQMA that is currently designated within Bedford.

Appendix D: Map(s) of Monitoring Locations and AQMAs provides maps of AQMA and also the air quality monitoring locations in relation to the AQMA. The air quality objectives pertinent to the current AQMA designation are as follows:

- NO_2 annual mean;

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	One Line Description	Is air quality in the AQMA influenced by roads controlled by National Highways?	Level of Exceedance: Declaration	Level of Exceedance: Current Year	Name and Date of AQAP Publication	Web Link to AQAP
AQMA 5 Bedford Town Centre	06/11/2009	NO2 Annual Mean	An area encompassing the majority of properties within Bedford town centre, and incorporating the 2 previous AQMAs in the town centre	NO	59	43	AQAP for AQMA 5 August 2021	Not yet available

☒ **Bedford Borough Council confirm the information on UK-Air regarding their AQMA(s) is up to date**

☒ **Bedford Borough Council confirm that all current AQAPs have been submitted to Defra**

2.2 Progress and Impact of Measures to address Air Quality in Bedford

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

1. The report is thorough, comprehensive and follows the most recent template. Detailed discussion is provided throughout.
2. Good QA/QC procedures were applied. Calculations for bias adjustment and annualisation were outlined in detail. Most of the adjusted concentration are well below AQO.
3. The Council has included discussion and review of its monitoring strategy. This demonstrates the Councils proactive and dedicated approach to improving air quality across the area.
4. Council have provided a map of the diffusion tube monitoring network; trends are displayed in the report. The Council were reminded to include high-quality maps of their monitoring locations and AQMA boundaries, perhaps including several maps at a larger scale.

   Maps updated in this year's report with more detail.
5. There are a few reference source errors in the report, cross-reference should be corrected.

Bedford Borough Council has taken forward a number of direct measures during the current reporting year of 2021 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2. Eight measures are included within Table 2.2, with the type of measure and the progress Bedford Borough Council have made during the reporting year of 2021 presented. Where there have been, or continue to be, barriers restricting the implementation of the measure, these are also presented within Table 2.2.

More detail on these measures can be found in their respective Action Plans. Key completed measures are:

- AQAP: the action plan has been approved by DEFRA and due to be published 2022
- Indicative PM monitoring in place – initial indications show that particulate matter (PM10 and PM2.5) has similar values as modelled.
- School streets project ongoing – educating in schools and trialling school road closures encouraging alternative transport.

- Transporting Bedford: High street reduced to single lane to reduce traffic numbers and congestion.
- Transporting Bedford: Ampthill Rd SMART road works underway, to encourage cycling and EV use.
- Continued electric charging point installation throughout the Borough
- The Queens green canopy – tree planting begun with a view to the planting of 10 000 trees across the Borough by the end of 2022.
- Implement transporting Bedford to carry out work to encourage walking and cycling

Bedford Borough Council expects the following measures to be completed over the course of the next reporting year:

- Transporting Bedford: Work on the final phase of construction which includes widening Clapham Road and installing traffic lights at the Great Ouse Way and Shakespeare Road roundabouts is underway and will be completed in by spring 2022.
- Urban traffic management control and technology: Updating of traffic signal hardware and software will provide significant improvements in reducing congestion and improving journey time for all road users.
- Ongoing school streets project work including education and air quality measurements using indicative monitors
- Tree planting continuing throughout 2022
- Finalise air quality planning guidance document
- Further indications in the Borough of PM2.5 levels from monitoring equipment
- The Air Quality (Domestic Solid Fuels Standards) (England) Regulations 2020 compliance visits

Bedford Borough Council's priorities for the coming year are:

- Continued provision of support towards the implementation of Transporting Bedford
- Improving air quality education of residents through project work, encouraging electric and low emission vehicle use and highlighting areas of congestion.

Bedford Borough Council worked to implement these measures in partnership with the following stakeholders during 2021:

- Public Health;
- Transport Policy;
- Sustainable Transport
- Planning Development
- Planning Strategy

The principal challenges and barriers to implementation that Bedford Borough Council anticipates facing are:

- Possible funding changes
- Increase in demands associated high priority service delivery

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, Bedford Borough Council anticipates that further additional measures not yet prescribed will be required in subsequent years to achieve compliance and enable the revocation of AQMA 5, although it is envisaged that a reduction to the size of the current AQMA may be feasible as evidence is gathered and reviewed over the coming years

Table 2.2 – Progress on Measures to Improve Air Quality

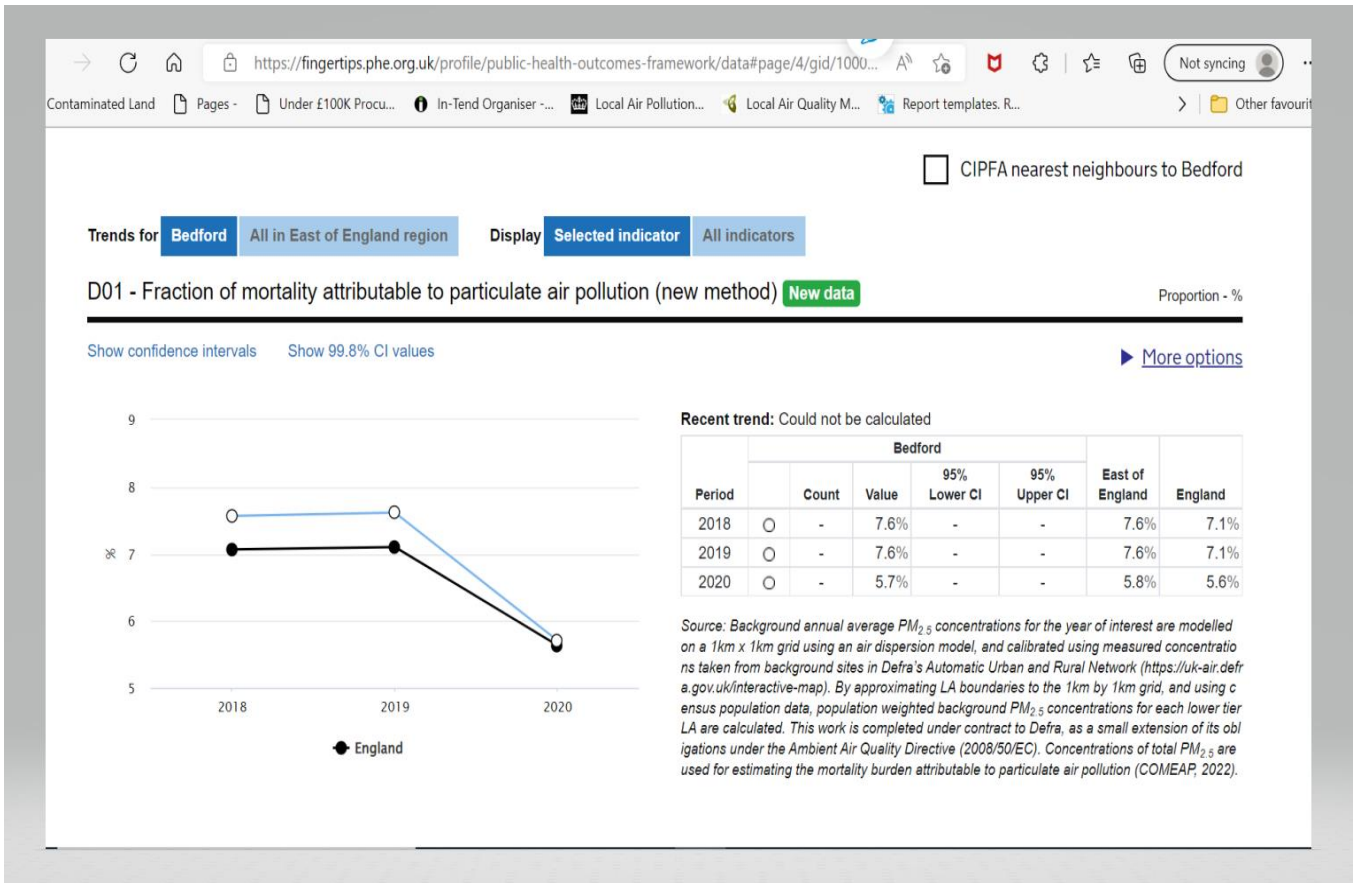
Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
1	Grant application for School streets project - (pedestrian and cycling zones)	Traffic Management	Anti-idling enforcement	2021	2022	Local Authority Environmental Health, Local Authority Transport Dept.	Defra and LA	YES	Fully funded	£100k - £500k	Implementation	not yet known	reduction of car journeys and anti-idling	Funding secured, implementation of school streets and monitors due 2022	purchase of monitors delayed
2	Reducing High St to single lane	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	2020	2021	Local Authority Environmental Health, Local Authority Transport Dept.	SEMLEP	NO	Funded	£500k - £1 million	Completed	not yet known as High st closed most of 2021	High st NO2 below 36 ug/m3	work complete - reduction is pollutant more evident end 2022	delay to start of work due to Covid pandemic
3	Ampthill road smart corridor including bus lanes, cycle lanes	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	2021	2023	Local Authority Environmental Health, Local Authority Transport Dept.		NO	Funded	£1 million - £10 million	Implementation	work underway	Ampthill Rd NO2 to remain below 36 ug/m3	work underway - 2 air quality monitors in place	
4	tree planting	Other	Other	2021	2022	Local authority		NO			Implementation	immeasurable	10 000 trees planted 2021-2022		
5	Bedford Borough Council agile working policy	Promoting Travel Alternatives	Encourage / Facilitate home-working	2015	2024	Local authority		NO	Not Funded		Implementation	decreasing traffic numbers to office	Majority of staff continue to work remotely following Covid 19.	Agile working is becoming embedded in the authorities working practices with ongoing reductions associated to travel to the office	
6	Air quality action plan for next 5 years	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	2019	2022	Local authority		NO	Not Funded		Completed	immeasurable	action plan to be published	Covid pandemic delayed	
7	Enforcement of solid fuel regulations	Policy Guidance and Development Control	Low Emissions Strategy	2021	2022	Local authority		NO	Not Funded		Implementation		reduction in non-compliant solid fuel burning	information sent to local businesses and information available on the council web site	
8	Taxi and private hire license consultation	Promoting Low Emission Transport	Taxi Licensing conditions	2021	2022	Local authority		NO			Implementation	immeasurable	draft policy has anti idling and requirement for all new vehicles to be less than five (5) years old when first licensed, therefore meeting Euro6emission standards,		

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.

Bedford Borough Council is taking the following measures to address $PM_{2.5}$:

In Bedford in 2020 the fraction of mortality attributable to particulate air pollution (new method) was 5.7% according to the public health outcomes framework.



This value is slightly lower than the East of England and slightly higher than England. The overall trend is a decrease since 2019.

Bedford Borough Council does not currently monitor PM2.5 concentrations as per relevant guidelines. However a Zephyr air quality monitor has been in place on Ampthill Rd since Feb 2021 and gives an indicative annual mean of 9.98 µg/m^3 in this location.

Modelled PM2.5 background data from DEFRA for 2021 (Background Mapping data for local authorities - 2018 - Defra, UK) show the maximum background level was 11.00 µg/m^3 at Elstow Interchange, Elstow, Kempston a roundabout on the A421, some distance from residential properties or pedestrians. The second highest is on Edward Rd close to the railway line with a value of 10.31 µg/m^3, the indicative monitor on Ampthill Rd is approx. 500 m distance away. The averaged modelled background PM2.5 value for Bedford Borough in 2021 was 9.06 µg/m^3, a reduction from 2020 which was 9.20 µg/m^3.

A review of the smoke control areas and update of the map was carried out in 2021 currently a large part of Bedford and Kempston are already smoke control areas.

The Air Quality (Domestic Solid Fuels Standards) (England) Regulations 2020 came into force on 1st May 2021. Advice and guidance relating to these regulations have been sent to known solid fuel suppliers in the Borough and information made available on the web site. Compliance visits will be carried out in 2022 to ensure these regulations are being met.

Wood burning guidance has been published on the Bedford Borough Council web site to advise and educate residents regarding wood burners and the use of solid fuels. Education alongside the actions detailed for NO_2 will reduce PM2.5 levels further within the limited fraction that can be impacted by actions within the Borough (traffic sources and wood burning etc.). Industrial sources will be controlled by the permitting process which limits emissions as required in the permitting legislation. In 2021, the government released its Heat and Buildings Strategy, and from 2025, gas boilers will be banned from all new builds which may start to show gradual reductions from this source.

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

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

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

Bedford Borough Council undertook automatic (continuous) monitoring at 2 sites during 2021.Table A.1 in Appendix A shows the details of the automatic monitoring sites. The Hertfordshire and Bedfordshire - Air Quality monitoring service (airqualityengland.co.uk) page presents automatic monitoring results for Bedford, with automatic monitoring results also available through the UK-Air website .

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

Bedford Borough Council undertook non- automatic (i.e. passive) monitoring of NO_2 at 51 sites during 2021. Table A.2 in Appendix A presents the details of the non-automatic sites.

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

3.2 Individual Pollutants

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

3.2.1 Nitrogen Dioxide (NO_2)

Table A.3 and Table A.4 in Appendix A compare the ratified and adjusted monitored NO_2 annual mean concentrations for the past five years with the air quality objective of 40µg/m^3. Note that the concentration data presented 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 2021 dataset of monthly mean values is provided in Appendix B. Note that the concentration data presented in Table B.1 includes distance corrected values, only where relevant.

Table A.5 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past five years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year.

In 2021 there was one exceedance of the annual mean NO2 objective of 40µg/m3 after bias adjustment and annualisation. This occurred at the following site located inside the Town Centre AQMA 5:

- DT20 Prebend Street – 43µg/m^3

This was the same number of exceedances as 2020 and at the same location, but an increase from 41µg/m^3. Due to the Covid pandemic 2020 results were lower due in part to decreased traffic numbers. Comparing 2021 results with 2019 the annual average at DT 20 was 47µg/m^3 with 4 exceedances in total within the AQMA.

There was one additional diffusion tube within 10% of the objective at 37.2 µg/m^3 – the location for this is on St Peters Street. The 2019 annual mean was 44 µg/m^3 at this location and is therefore still below the 2019 level.

Compared to 2020 out of the 55 locations 32 increased and 23 decreased, these increases were due to the traffic levels returning to pre pandemic levels.

There were no exceedances of the hourly objective for the fifth year running.

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? Which AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
CM1	Prebend street	Roadside	504496	249625	NO_2	YES AQMA 5	Chemiluminescent	1	4.2	1.5
CM2	Lurke street	Roadside	505044	249980	NO_2	YES AQMA 5	Chemiluminescent	3.5	7.5	1.5

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

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
DT5	Bromham Road, Bedford	Roadside	503819	250060	NO2	No	15.0	3.1	No	2.5
DT7	4 Bunyan Road, Kempston	Roadside	503160	247751	NO2	No	1.8	1.4	No	2.5
DT10	1 Kirkstall Close, Bedford	Other	505425	247063	NO2	No	5.0	2.0	No	2.5
DT12	8 The Lane, Wyboston	Roadside	516345	256592	NO2	No	10.0	2.7	No	3.0
DT13	Gt Nth Road, Wyboston - A1 South	Other	516420	256552	NO2	No	8.0	2.6	No	3.0
DT14	Horne Lane, Bedford	Roadside	504857	249652	NO2	Yes - AQMA 5	2.6	2.7	No	2.4
DT16	Kempston Road ,Bedford	Roadside	504585	249003	NO2	Yes - AQMA 5	6.0	3.9	No	2.2
DT17	Ampthill Road , Bedford	Roadside	504783	248711	NO2	Yes - AQMA 5	4.0	4.4	No	2.5
DT19	Kimbolton Road ,Bedford	Roadside	505551	250584	NO2	Yes - AQMA 5	9.0	1.1	No	2.5
DT20	Prebend Street ,Bedford	Roadside	504486	249616	NO2	Yes - AQMA 5	0.1	2.0	No	2.5
DT25	London Road crossroad	Roadside	505389	248858	NO2	Yes - AQMA 5	2.9	2.4	No	3.0

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
DT27	High St ladbrookes	Urban Centre	505057	249741	NO2	Yes - AQMA 5	0.2	2.3	No	2.5
DT28	Prebend St corner of commercial road	Roadside	504576	249501	NO2	Yes - AQMA 5	2.8	2.5	No	2.4
DT29	Goldington Road opp uni	Roadside	506630	250274	NO2	Yes - AQMA 5	4.0	2.5	No	2.0
DT30	High St Barovic jewellers	Urban Centre	505020	250044	NO2	Yes - AQMA 5	2.0	1.4	No	2.3
DT31	High St, luddingtons	Urban Centre	505060	249766	NO2	Yes - AQMA 5	0.1	2.0	No	3.0
DT33	Shakespeare Road/Bromham Rd Junction	Roadside	504100	250142	NO2	Yes - AQMA 5	5.0	2.6	No	3.0
DT34	St Marys St kings arms PH	Roadside	505102	249411	NO2	Yes - AQMA 5	0.5	2.4	No	3.0
DT35	Prebend St, crown quay	Roadside	504599	249432	NO2	Yes - AQMA 5	3.0	3.3	No	2.2
DT36	37 Ashburnham Road	Roadside	504289	249711	NO2	Yes - AQMA 5	2.0	2.0	No	3.0
DT40	YMCA, Tavistock St	Roadside	504808	250232	NO2	Yes - AQMA 5	6.0	2.1	No	2.5
DT42	28 St Johns St	Roadside	505143	249299	NO2	Yes - AQMA 5	9.0	3.3	No	2.5
DT43	45 Dame Alice St	Roadside	504913	250038	NO2	Yes - AQMA 5	0.6	2.3	No	3.0

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
DT44	Midland Road-outside No.137,139A	Roadside	504423	249647	NO2	Yes - AQMA 5	0.2	2.4	No	2.0
DT46	Midland Rd-outside Beegees opp Priory St	Urban Centre	504635	249724	NO2	Yes - AQMA 5	1.4	1.2	No	3.0
DT47	On corner Harpur St – opp 51A	Urban Background	504894	250049	NO2	Yes - AQMA 5	8.0	2.7	No	2.0
DT48	Outside Sound & Vision –Tavistock St	Urban Centre	504903	250199	NO2	Yes - AQMA 5	3.0	1.9	No	2.5
DT50	Outside John Bull – St Peters St	Urban Centre	505190	250075	NO2	Yes - AQMA 5	0.3	1.9	No	3.5
DT53	Outside Longstaff Gentle & Co – 59-61 Harpur St	Roadside	504907	250084	NO2	Yes - AQMA 5	1.9	2.5	No	2.5
DT54	Outside 63 – Union St	Roadside	504505	250361	NO2	Yes - AQMA 5	1.7	2.3	No	3.0
DT55	Opp urban & Rural on corner – Bromham Rd	Roadside	504475	250123	NO2	Yes - AQMA 5	4.0	2.4	No	2.5
DT57	Outside 110 - Newnham Av	Roadside	506626	250226	NO2	Yes - AQMA 5	2.4	1.2	No	2.2
DT61	Outside 185 Goldington Rd	Kerbside	506588	250254	NO2	Yes - AQMA 5	5.0	0.9	No	2.2
DT62	Outside 139 Goldington Rd	Kerbside	506390	250243	NO2	Yes - AQMA 5	6.0	1.0	No	2.2
DT65	Outside no.43 London Rd	Roadside	505438	248793	NO2	Yes - AQMA 5	3.0	1.5	No	2.5

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
DT66, DT67, DT68	Monitoring station	Roadside	504495	249622	NO2	Yes - AQMA 5	1.7	3.7	Yes	2.0
DT69	River Street, opposite chinese	Urban Centre	504734	249689	NO2	Yes - AQMA 5	0.3	3.8	No	3.0
DT70	Outside bus station	Urban Centre	504706	249860	NO2	Yes - AQMA 5	5.0	2.5	No	2.0
DT71	174 Ampthill Road ,Bedford	Roadside	504625	248169	NO2	No	3.0	4.4	No	2.5
DT72	150 Ampthill Road ,Bedford	Roadside	504648	248257	NO2	No	3.0	2.3	No	2.5
DT73	112 Ampthill Road ,Bedford	Kerbside	504684	248388	NO2	No	8.0	1.0	No	2.5
DT74, DT75, DT76	LS Monitor	Roadside	505044	249980	NO2	Yes - AQMA 5	2.0	5.0	Yes	1.5
DT 77	Green lane, Stewartby	Roadside	501574	242181	NO2	No	250.0	2.3	No	3.0
DT 78	churchill close, stewartby	Suburban	501878	242176	NO2	No	5.0	1.9	No	2.5
DT 79	Turner way off Manton Lane	Roadside	504356	251146	NO2	No	10.0	1.5	No	2.2
DT 80	Shakespeare Rd/Clapham Rd junction	Roadside	503946	250765	NO2	No	5.0	1.8	No	2.5
DT 81	Brooklands avenue - Wixams	Suburban	505273	245175	NO2	No	4.0	1.7	No	3.0

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
DT 82	32 Fields Rd, Wootton	Roadside	500968	244911	NO2	No	5.0	1.6	No	2.5
DT 83	37 Cemetery road, off Branston way	Suburban	501595	247537	NO2	No	7.0	1.7	No	2.5
DT 85	Rope Walk/Cardington Rd	Roadside	505493	249254	NO2	No	10.0	1.5	No	2.5
DT 86	Outside 33 Goldington Rd	Roadside	505464	250142	NO2	Yes - AQMA 5	2.0	1.5	No	2.5

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.3 – Annual Mean NO_2 Monitoring Results: Automatic Monitoring (µg/m^3)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
CM1 (Prebend)	504496	249625	Roadside	Automatic	96	28	29	32	26	32
CM2 (Lurke)	505044	249980	Roadside	Automatic	96	28	26	30	21	18

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

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

Notes:

The annual mean concentrations are presented as µg/m^3.

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

All means have been "annualised" as per LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

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

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

Table A.4 – Annual Mean NO_2 Monitoring Results: Non-Automatic Monitoring (µg/m^3)

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
DT5	503819	250060	Roadside	100	82.7	27.0	30.0	22.9	17.9	22.8
DT7	503160	247751	Roadside	100	100.0	26.0	25.0	25.7	23.2	24.6
DT10	505425	247063	Other	100	100.0	25.0	24.0	21.7	19.3	18.9
DT12	516345	256592	Roadside	100	100.0	20.0	21.0	18.2	14.6	16.1
DT13	516420	256552	Other	100	75.0	27.0	23.0	21.8	21.6	22.5
DT14	504857	249652	Roadside	100	100.0	31.0	31.0	32.6	22.0	25.5
DT16	504585	249003	Roadside	100	92.3	26.0	28.0	26.7	21.1	26.0
DT17	504783	248711	Roadside	100	75.0	32.0	33.0	31.0	23.8	27.7
DT19	505551	250584	Roadside	100	100.0	25.0	26.0	24.8	21.1	21.4
DT20	504486	249616	Roadside	100	92.3	**50.0**	**44.0**	**47.4**	**41.3**	**43.3**
DT25	505389	248858	Roadside	100	100.0	**42.0**	39.0	34.6	30.6	34.0
DT27	505057	249741	Urban Centre	100	57.7	**40.0**	**41.0**	**42.0**	34.0	28.2
DT28	504576	249501	Roadside	100	100.0	34.0	34.0	32.4	27.3	31.5

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
DT29	506630	250274	Roadside	100	82.7	37.0	38.0	35.5	26.4	30.7
DT30	505020	250044	Urban Centre	100	100.0	**40.0**	**41.0**	38.8	31.4	27.8
DT31	505060	249766	Urban Centre	100	65.4	36.0	**40.0**	38.8	28.2	24.0
DT33	504100	250142	Roadside	100	90.4	38.0	38.0	36.3	27.5	34.1
DT34	505102	249411	Roadside	100	100.0	37.0	**42.0**	38.4	30.1	31.2
DT35	504599	249432	Roadside	100	75.0	33.0	36.0	36.3	29.1	32.0
DT36	504289	249711	Roadside	100	100.0	34.0	36.0	33.5	26.8	30.1
DT40	504808	250232	Roadside	100	100.0	26.0	25.0	25.1	20.6	21.2
DT42	505143	249299	Roadside	100	100.0	37.0	39.0	38.8	30.1	35.0
DT43	504913	250038	Roadside	100	100.0	35.0	**40.0**	31.5	22.9	28.5
DT44	504423	249647	Roadside	100	92.3	38.0	**42.0**	**40.2**	33.3	35.8
DT46	504635	249724	Urban Centre	100	100.0	36.0	34.0	36.6	32.1	33.8
DT47	504894	250049	Urban Background	100	100.0	27.0	30.0	32.5	21.2	24.1
DT48	504903	250199	Urban Centre	100	100.0	35.0	37.0	36.0	29.6	31.4

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
DT50	505190	250075	Urban Centre	100	100.0	**46.0**	**43.0**	**43.6**	36.1	38.1
DT53	504907	250084	Roadside	100	90.4	32.0	33.0	31.0	25.7	27.5
DT54	504505	250361	Roadside	100	100.0	32.0	31.0	30.0	24.2	27.1
DT55	504475	250123	Roadside	100	100.0	33.0	33.0	29.9	22.5	27.1
DT57	506626	250226	Roadside	100	100.0	34.0	33.0	31.5	25.2	27.3
DT61	506588	250254	Kerbside	100	100.0	37.0	34.0	33.3	27.9	29.3
DT62	506390	250243	Kerbside	100	84.6	27.0	27.0	26.6	21.7	23.2
DT65	505438	248793	Roadside	100	100.0	31.0	31.0	34.3	26.3	25.6
DT66, DT67, DT68	504495	249622	Roadside	100	100.0	32.0	30.3	33.8	28.0	30.9
DT69	504734	249689	Urban Centre	100	92.3	31.0	30.0	32.3	24.0	26.5
DT70	504706	249860	Urban Centre	100	92.3	33.0	32.0	33.6	24.6	28.0
DT71	504625	248169	Roadside	100	100.0	31.0	32.0	30.6	26.7	29.2
DT72	504648	248257	Roadside	100	92.3	36.0	36.0	32.2	28.6	31.0
DT73	504684	248388	Kerbside	100	100.0	34.0	33.0	33.9	27.3	29.7

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
DT74, DT75, DT76	505044	249980	Roadside	100	100.0	30.3	28.3	27.5	21.5	18.0
DT 77	501574	242181	Roadside	100	100.0		19.0	18.5	12.6	13.6
DT 78	501878	242176	Suburban	100	100.0		15.0	15.1	10.4	11.4
DT 79	504356	251146	Roadside	100	82.7			22.7	19.7	20.4
DT 80	503946	250765	Roadside	100	84.6			33.9	27.1	29.9
DT 81	505273	245175	Suburban	100	100.0			16.6	15.2	17.2
DT 82	500968	244911	Roadside	100	92.3			17.8	14.6	15.4
DT 83	501595	247537	Suburban	100	100.0			22.1	18.4	19.9
DT 85	505493	249254	Roadside	100	100.0				23.7	26.2
DT 86	505464	250142	Roadside	100	84.6				23.4	25.6

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

☒ **Diffusion tube data has been bias adjusted.**

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

Notes:

The annual mean concentrations are presented as µg/m^3.

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**.

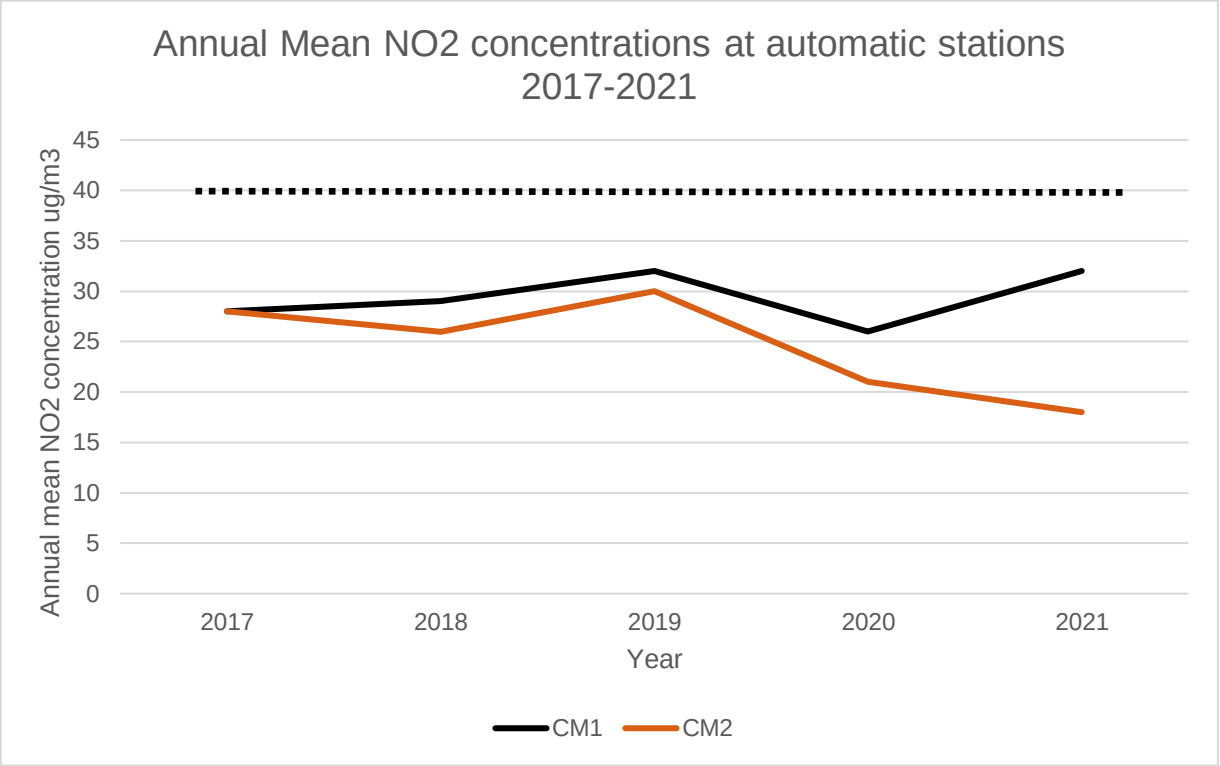
Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

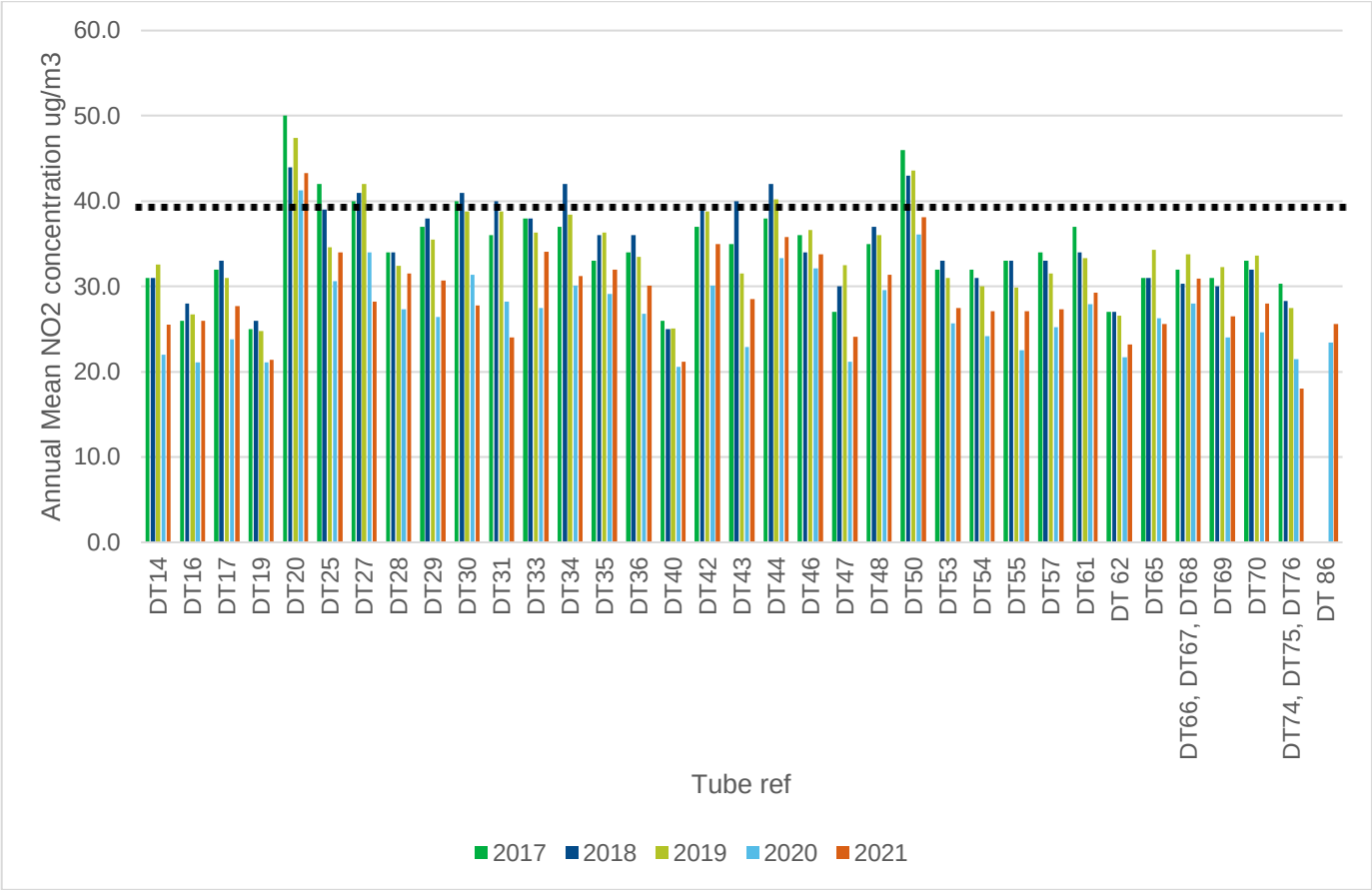
Concentrations are those at the location of monitoring and not those following any fall-off with distance adjustment.

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

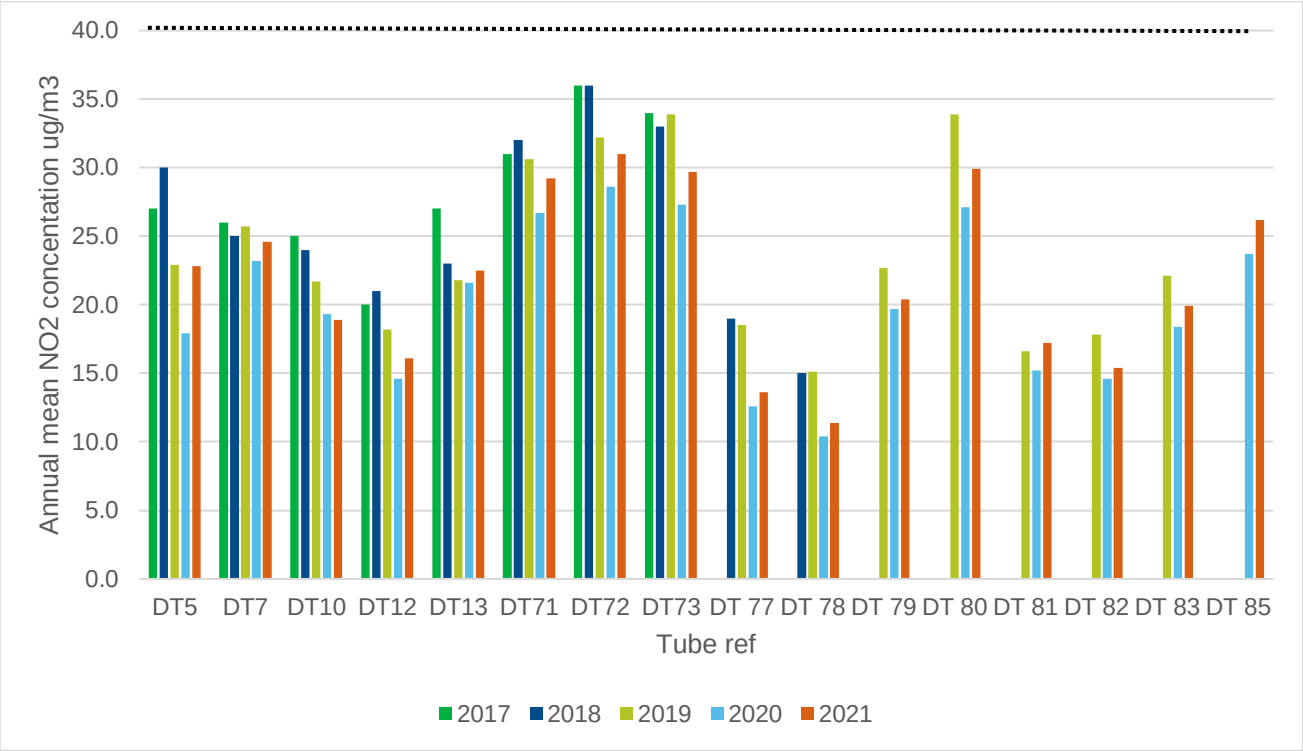
(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

Figure A.1 – Trends in Annual Mean NO_2 Concentrations





Annual mean NO_2 concentrations at diffusion tubes located inside the AQMA from 2017 to 2021



Annual mean NO_2 concentrations at diffusion tubes located outside the AQMA from 2017 to 2021

Table A.5 – 1-Hour Mean NO_2 Monitoring Results, Number of 1-Hour Means > 200µg/m^3

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
CM1	504496	249625	Roadside	100	96	0	0	0	0	0
CM2	505044	249980	Roadside	100	96	0	0	0	0	0

Notes:

Results are presented as the number of 1-hour periods where concentrations greater than 200µg/m^3 have been recorded.

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**.

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

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

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

Appendix B: Full Monthly Diffusion Tube Results for 2021

Table B.1 – NO_2 2021 Diffusion Tube Results (µg/m^3)

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Easting)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.91)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
DT5	503819	250060	28.0	29.0	23.0	22.0	24.0	18.0			28.0	26.0	26.0	27.0	25.1	22.8	-	
DT7	503160	247751	33.0	31.0	28.0	25.0	26.0	24.0	24.0	20.0	29.0	29.0	28.0	28.0	27.1	24.6	-	
DT10	505425	247063	28.0	27.0	21.0	18.0	18.0	12.0	15.0	16.0	21.0	23.0	25.0	25.0	20.8	18.9	-	
DT12	516345	256592	21.0	23.0	17.0	15.0	16.0	14.0	13.0	14.0	21.0	20.0	18.0	20.0	17.7	16.1	-	
DT13	516420	256552	33.0	25.0	27.0	19.0	24.0	21.0	18.0				31.0	25.0	24.8	22.5	-	
DT14	504857	249652	26.0	31.0	26.0	26.0	31.0	21.0	27.0	22.0	36.0	30.0	30.0	31.0	28.1	25.5	-	
DT16	504585	249003	33.0	37.0	25.0	31.0	25.0	25.0	25.0		34.0	27.0	24.0	29.0	28.6	26.0	-	
DT17	504783	248711	35.0		34.0			26.0	27.0	24.0	34.0	32.0	32.0	30.0	30.4	27.7	-	
DT19	505551	250584	29.0	26.0	26.0	18.0	20.0	19.0	18.0	17.0	24.0	28.0	30.0	27.0	23.5	21.4	-	
DT20	504486	249616	55.0	54.0	49.0	41.0	51.0	39.0	44.0		59.0	49.0	45.0	38.0	47.6	**43.3**	**43.0**	
DT25	505389	248858	39.0	38.0	41.0	34.0	37.0	40.0	36.0	20.0	43.0	43.0	39.0	39.0	37.4	34.0	-	
DT27	505057	249741	42.0	30.0	30.0	24.0	34.0	25.0	25.0						30.0	28.2	-	
DT28	504576	249501	34.0	40.0	35.0	41.0	34.0	33.0	36.0	27.0	39.0	32.0	35.0	30.0	34.7	31.5	-	
DT29	506630	250274	40.0	39.0	32.0	33.0	32.0		29.0	26.0	34.0		41.0	32.0	33.8	30.7	-	
DT30	505020	250044	42.0	31.0	30.0	23.0	27.0	23.0	23.0	25.0	34.0	33.0	39.0	37.0	30.6	27.8	-	
DT31	505060	249766	33.0	29.0	26.0	21.0	26.0	23.0	22.0	20.0					25.0	24.0	-	
DT33	504100	250142	41.0	42.0	39.0	32.0	44.0	33.0		31.0	42.0	39.0	33.0	37.0	37.5	34.1	-	

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Easting)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.91)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
DT34	505102	249411	38.0	36.0	33.0	37.0	35.0	30.0	32.0	29.0	40.0	34.0	34.0	34.0	34.3	31.2	-	
DT35	504599	249432	39.0		36.0			30.0	31.0	29.0	40.0	39.0	39.0	34.0	35.2	32.0	-	
DT36	504289	249711	35.0	39.0	34.0	33.0	34.0	27.0	31.0	28.0	36.0	31.0	37.0	32.0	33.1	30.1	-	
DT40	504808	250232	30.0	28.0	24.0	20.0	21.0	17.0	18.0	17.0	24.0	27.0	28.0	26.0	23.3	21.2	-	
DT42	505143	249299	37.0	39.0	45.0	40.0	37.0	37.0	40.0	33.0	45.0	35.0	37.0	37.0	38.5	35.0	-	
DT43	504913	250038	36.0	35.0	31.0	31.0	30.0	27.0	28.0	25.0	36.0	31.0	34.0	32.0	31.3	28.5	-	
DT44	504423	249647		42.0	41.0	42.0	39.0	38.0	39.0	33.0	43.0	38.0	41.0	37.0	39.4	35.8	-	
DT46	504635	249724	43.0	40.0	36.0	34.0	40.0	32.0	34.0	31.0	45.0	39.0	36.0	36.0	37.2	33.8	-	
DT47	504894	250049	30.0	32.0	26.0	26.0	24.0	18.0	23.0	24.0	31.0	29.0	28.0	27.0	26.5	24.1	-	
DT48	504903	250199	39.0	41.0	33.0	34.0	35.0	29.0	30.0	27.0	39.0	39.0	34.0	34.0	34.5	31.4	-	
DT50	505190	250075	42.0	45.0	43.0	36.0	47.0	38.0	41.0	34.0	47.0	49.0	44.0	37.0	41.9	38.1	37.2	
DT53	504907	250084	30.0	37.0	30.0	31.0	30.0	26.0	29.0	20.0	37.0		29.0	34.0	30.3	27.5	-	
DT54	504505	250361	31.0	33.0	29.0	28.0	30.0	26.0	29.0	23.0	36.0	34.0	31.0	28.0	29.8	27.1	-	
DT55	504475	250123	35.0	33.0	29.0	30.0	28.0	26.0	27.0	24.0	32.0	32.0	31.0	31.0	29.8	27.1	-	
DT57	506626	250226	32.0	29.0	32.0	27.0	28.0	27.0	25.0	24.0	33.0	34.0	37.0	33.0	30.1	27.3	-	
DT61	506588	250254	38.0	37.0	31.0	31.0	31.0	26.0	26.0	25.0	36.0	36.0	35.0	35.0	32.3	29.3	-	
DT62	506390	250243	33.0	31.0	25.0	22.0	24.0		20.0	18.0	26.0	28.0		28.0	25.5	23.2	-	
DT65	505438	248793	31.0	30.0	28.0	27.0	25.0	22.0	23.0	31.0	27.0	29.0	36.0	29.0	28.2	25.6	-	
DT66	504495	249622	37.0	37.0	34.0	32.0	34.0	28.0	33.0	25.0	38.0	38.0	37.0	31.0	-	-	-	Triplicate Site with DT66, DT67 and DT68 - Annual data provided for DT68 only
DT67	504495	249622	38.0	35.0	35.0	32.0	37.0	29.0	32.0	24.0	38.0	36.0	37.0	33.0	-	-	-	Triplicate Site with DT66, DT67 and DT68 - Annual data provided for DT68 only
DT68	504495	249622	35.0	37.0	34.0	32.0	33.0	39.0	33.0	26.0	40.0	37.0	33.0	33.0	33.9	30.9	-	Triplicate Site with DT66, DT67 and DT68 - Annual data provided for DT68 only

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Easting)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.91)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
DT69	504734	249689	31.0	27.0	27.0	27.0	31.0		28.0	22.0	36.0	30.0	33.0	29.0	29.2	26.5	-	
DT70	504706	249860	37.0	34.0		25.0	34.0	26.0	27.0	26.0	34.0	33.0	31.0	32.0	30.8	28.0	-	
DT71	504625	248169	36.0	38.0	31.0	40.0	28.0	33.0	28.0	25.0	31.0	27.0	40.0	28.0	32.1	29.2	-	
DT72	504648	248257	41.0	43.0		40.0	35.0	30.0	31.0	24.0	36.0	32.0	33.0	30.0	34.1	31.0	-	
DT73	504684	248388	42.0	38.0	37.0	29.0	28.0	30.0	27.0	26.0	33.0	36.0	33.0	33.0	32.7	29.7	-	
DT74	505044	249980	27.0	23.0	20.0	16.0	17.0	11.0		15.0	23.0	23.0	27.0	24.0	-		-	Triplicate Site with DT74, DT75 and DT76 - Annual data provided for DT76 only
DT75	505044	249980	25.0	24.0	19.0	16.0		13.0	14.0	15.0	22.0	24.0	24.0	24.0	-	-	-	Triplicate Site with DT74, DT75 and DT76 - Annual data provided for DT76 only
DT76	505044	249980	26.0	24.0	18.0	16.0	17.0	13.0	14.0	14.0	22.0	23.0	24.0	25.0	19.8	18.0	-	Triplicate Site with DT74, DT75 and DT76 - Annual data provided for DT76 only
DT 77	501574	242181	9.0	18.0	14.0	13.0	13.0	12.0	11.0	11.0	17.0	20.0	24.0	18.0	15.0	13.6	-	
DT 78	501878	242176	18.0	15.0	12.0	11.0	10.0	9.0	7.0	9.0	12.0	14.0	18.0	15.0	12.5	11.4	-	
DT 79	504356	251146	26.0	25.0	24.0	22.0	20.0	19.0	20.0	17.0			29.0	22.0	22.4	20.4	-	
DT 80	503946	250765	34.0	38.0	33.0	35.0	31.0		34.0	25.0		34.0	34.0	31.0	32.9	29.9	-	
DT 81	505273	245175	26.0	20.0	20.0	17.0	16.0	15.0	13.0	15.0	20.0	19.0	25.0	21.0	18.9	17.2	-	
DT 82	500968	244911	22.0	22.0	16.0	17.0	15.0	13.0	12.0	12.0		17.0	20.0	20.0	16.9	15.4	-	
DT 83	501595	247537	24.0	25.0	21.0	22.0	20.0	20.0	18.0	18.0	24.0	23.0	25.0	23.0	21.9	19.9	-	
DT 85	505493	249254	32.0	34.0	26.0	30.0	29.0	23.0	26.0	22.0	36.0	29.0	32.0	27.0	28.8	26.2	-	
DT 86	505464	250142	34.0	33.0	27.0	24.0		23.0	14.0		32.0	30.0	34.0	31.0	28.2	25.6	-	

☒ **All erroneous data has been removed from the NO_2 diffusion tube dataset presented in Table B.1.**

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

☒ **Local bias adjustment factor used.**

☐ **National bias adjustment factor used.**

☒ **Where applicable, data has been distance corrected for relevant exposure in the final column.**

☒ **Bedford Borough Council confirm that all 2021 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System**.

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**.

See Appendix C for details on bias adjustment and annualisation.

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

New or Changed Sources Identified Within Bedford During 2021

Bedford Borough Council has not identified any new sources relating to air quality within the reporting year of 2021.

Additional Air Quality Works Undertaken by Bedford Borough Council during 2021.

Bedford Borough Council has not completed any additional works within the reporting year of 2021.

QA/QC of Diffusion Tube Monitoring

The diffusion tubes used by Bedford Borough Council were analysed by Gradko International ltd using a preparation method of 20% TEA in water. The laboratory is UKAS accredited; ensuring conformance with the requirements of ISO/IEC 17025.

The monitoring was undertaken in adherence to the 2021 diffusion tube monitoring calendar.

Diffusion Tube Annualisation

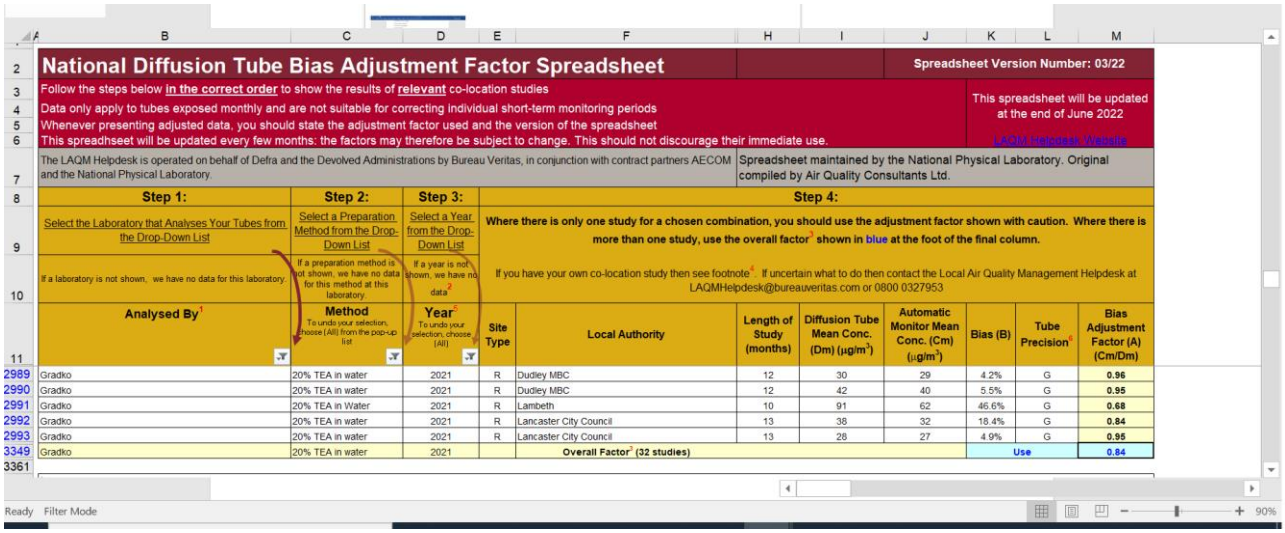
Annualisation was required for two diffusion tubes situated on the High street – this was due to the tubes being removed because of extensive work on the High street reducing it to single lane. Annualisation was carried out as detailed in TG16 using continuous monitoring data from the two sources available in the Borough. The Annual Mean/Period Mean ratios are calculated (Am/Pm) and averaged to provide an annualisation factor for each site requiring annualisation. These and the final annualised average NO2 concentrations for each of the diffusion tube sites are presented in table C2 below.

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2021 ASR have been corrected for bias using an adjustment factor. Bias represents the overall tendency of the diffusion tubes to under or over-read relative to the reference chemiluminescence analyser. LAQM.TG16 provides guidance with regard to the application of a bias adjustment factor to correct diffusion tube monitoring. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data taken from NO_x/NO_2 continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

Bedford Borough Council have applied a local bias adjustment factor of 0.91 to the 2021 monitoring data. A summary of bias adjustment factors used by Bedford Borough Council over the past five years is presented in Table C.1.

The national bias adjustment factor was 0.84 using version 03/22 using 22 studies. The local bias adjustment gave good overall precision and good overall data capture for both monitoring stations with data capture at 96% - for this reason and in addition due to the fact it was more conservative the local bias adjustment factor was used. This was the mean of the two local bias adjustment results 0.89 and 0.93 giving a mean of 0.91.



National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 03/22

Follow the steps below in the correct order to show the results of relevant co-location studies
Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods
Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet
This spreadsheet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.

This spreadsheet will be updated at the end of June 2022

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

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

Step 1: Select the Laboratory that Analyses Your Tubes from the Drop-Down List. If a laboratory is not shown, we have no data for this laboratory.

Step 2: Select a Preparation Method from the Drop-Down List. If a preparation method is not shown, we have no data for this method at this laboratory.

Step 3: Select a Year from the Drop-Down List. If a year is not shown, we have no data[2]

Step 4: Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] shown in blue at the foot of the final column.

If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@bureauveritas.com or 0800 0327953

	Analysed By[1]	Method (To undo your selection, choose (All) from the pop-up list)	Year[2] (To undo your selection, choose (All))	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[5]	Bias Adjustment Factor (A) (Cm/Dm)
2989	Gradko	20% TEA in water	2021	R	Dudley MBC	12	30	29	4.2%	G	0.96
2990	Gradko	20% TEA in water	2021	R	Dudley MBC	12	42	40	5.5%	G	0.95
2991	Gradko	20% TEA in Water	2021	R	Lambeth	10	91	62	46.6%	G	0.68
2992	Gradko	20% TEA in water	2021	R	Lancaster City Council	13	38	32	18.4%	G	0.84
2993	Gradko	20% TEA in water	2021	R	Lancaster City Council	13	28	27	4.9%	G	0.95
3349	Gradko	20% TEA in water	2021		Overall Factor[3] (32 studies)					Use	0.84
3361											

Table C.1 – Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2021	Local	-	0.91
2020	Local	-	0.86
2019	National	03/20	0.93
2018	National	03/19	0.93
2017	National	06/18	0.87

NO_2 Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO_2 concentration at the nearest location relevant for exposure has been estimated using the Diffusion Tube Data Processing Tool/NO_2 fall-off with distance calculator available on the LAQM Support website. Where appropriate, non-automatic annual mean NO_2 concentrations corrected for distance are presented in Table B.1.

Two sites were calculated for distance correction DT20 and DT50.

QA/QC of Automatic Monitoring

In 2021 Bedford Borough Council have a service and maintenance contract for both monitoring stations with ESU1, which includes 2 scheduled on-site services per annum. There is also have a 48hour call out for any problems that may occur.

Monthly calibrations are carried out by the local authority and results sent to Ricardo

Air quality measurements from automatic instruments were validated and ratified to the standards described in the Local Air Quality Management – Technical Guidance LAQM TG (16) by Ricardo. Current readings and historic data is available at: https://www.airqualityengland.co.uk/local-authority/?la_id=408

Automatic Monitoring Annualisation

All automatic monitoring locations within Bedford recorded data capture of greater than 75% therefore it was not required to annualise any monitoring data. In addition, any sites with a data capture below 25% do not require annualisation.

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NO_2 Fall-off with Distance from the Road

No automatic NO_2 monitoring locations within Bedford required distance correction during 2021.

Table C.2 – Annualisation Summary (concentrations presented in µg/m^3)

Site ID	Annualisation Factor Lurke St	Annualisation Factor Prebend St	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean
DT27	1.0185	1.0479	1.0332	30.0	31.0
DT31	1.0481	1.0670	1.0576	25.0	26.4

Table C.3 – Local Bias Adjustment Calculation

	STEP 3a Local Bias Adjustment Input 1	STEP 3b Local Bias Adjustment Input 2
Periods used to calculate bias	11	11
Bias Adjustment Factor A	0.89 (0.83 - 0.96)	0.93 (0.85 - 1.02)
Diffusion Tube Bias B	12% (4% - 20%)	8% (-2% - 17%)
Diffusion Tube Mean (µg/m^3)	19.3	33.7
Mean CV (Precision)	2.9%	4.8%
Automatic Mean (µg/m^3)	17.3	31.3
Data Capture	100%	99%
Adjusted Tube Mean (µg/m^3)	17 (16 - 19)	31 (29 - 34)

Notes:

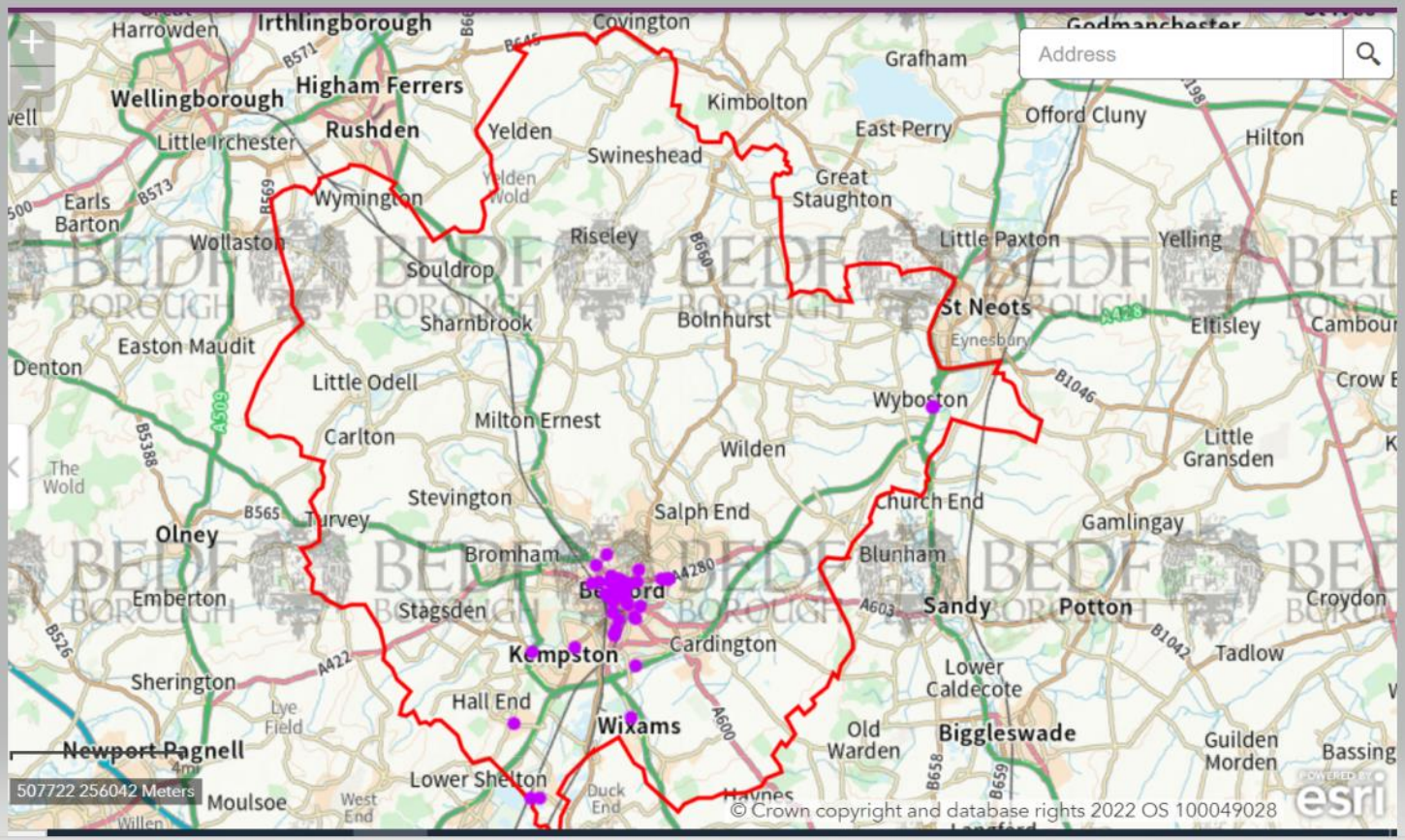
A combined local bias adjustment factor of 0.91 has been used to bias adjust the 2021 diffusion tube results.

Table C.4 – NO_2 Fall off With Distance Calculations (concentrations presented in µg/m^3)

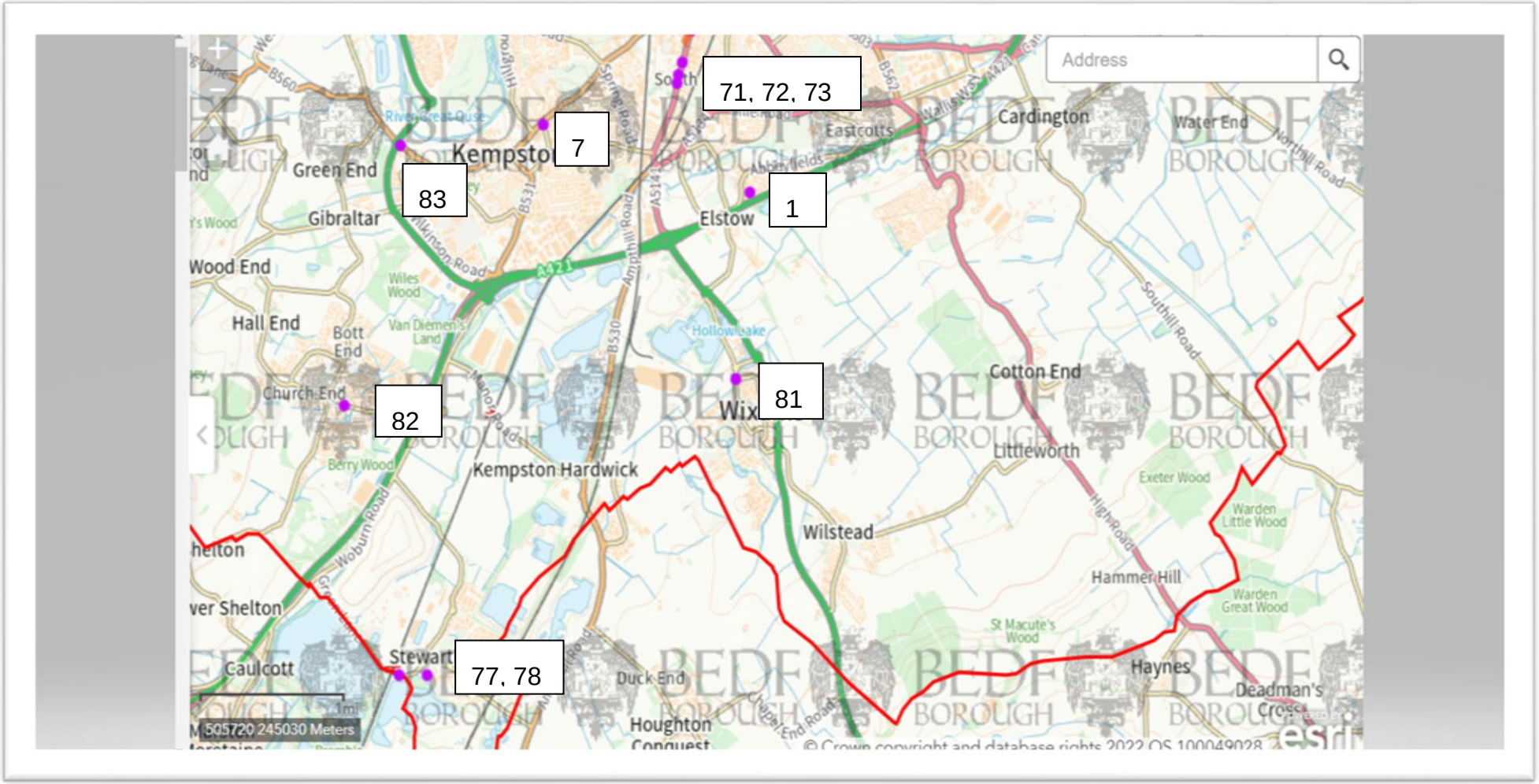
Diffusion Tube ID	Distance (m)		NO_2 Annual Mean Concentration (µg/m^3)			Comment
	Monitoring Site to Kerb	Receptor to Kerb	Bias Adjusted and Annualised	Background	Predicted at Receptor	
DT20	2.0	2.1	43.3	14.7	**43.0**	*Predicted concentration at Receptor above AQS objective.*
DT50	1.9	2.2	38.1	12.8	*37.2*	*Predicted concentration at Receptor within 10% the AQS objective.*

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

Figure D.1 – Map of Non-Automatic Monitoring Site

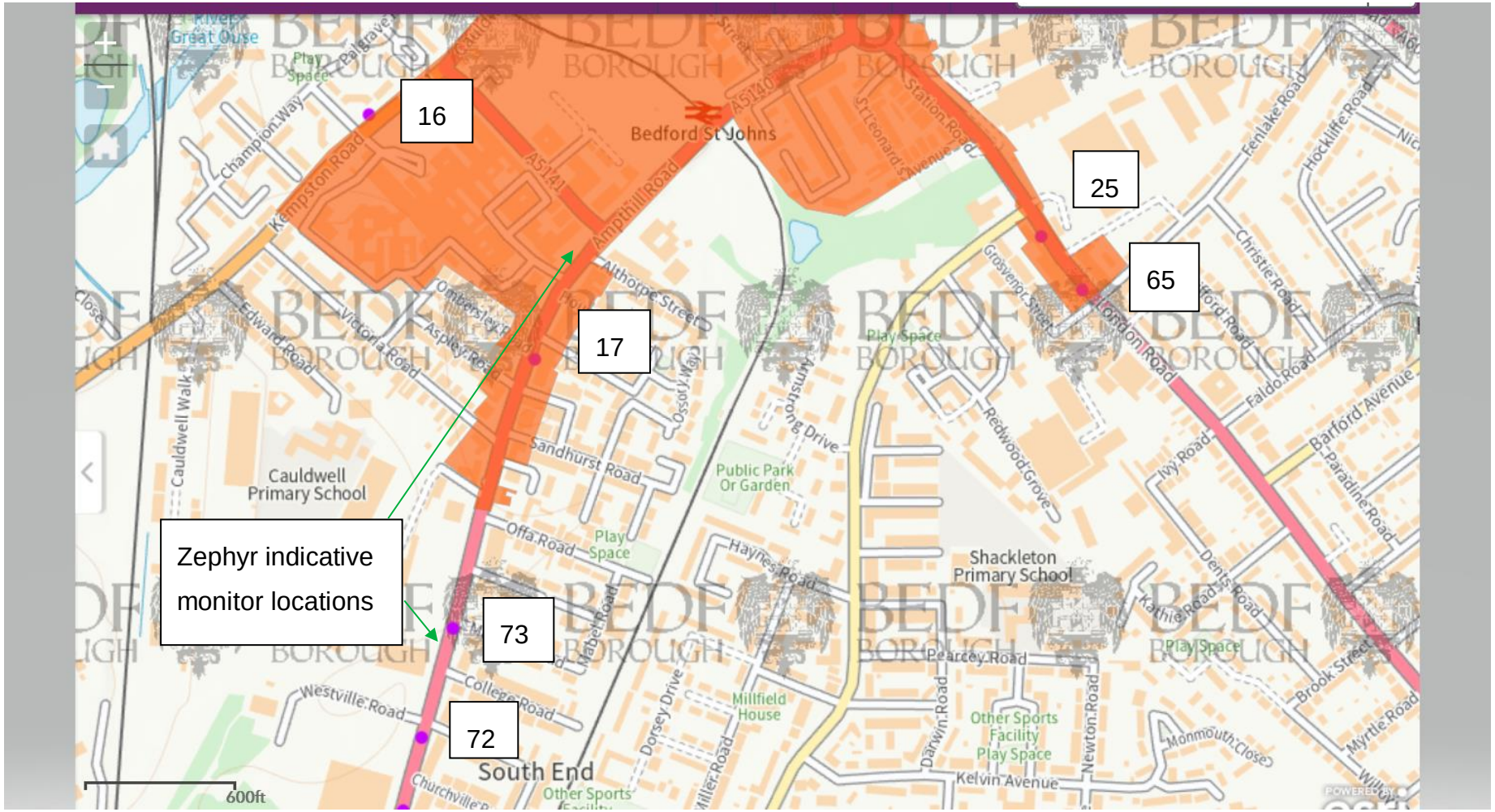


Borough outline and diffusion tube locations (purple)

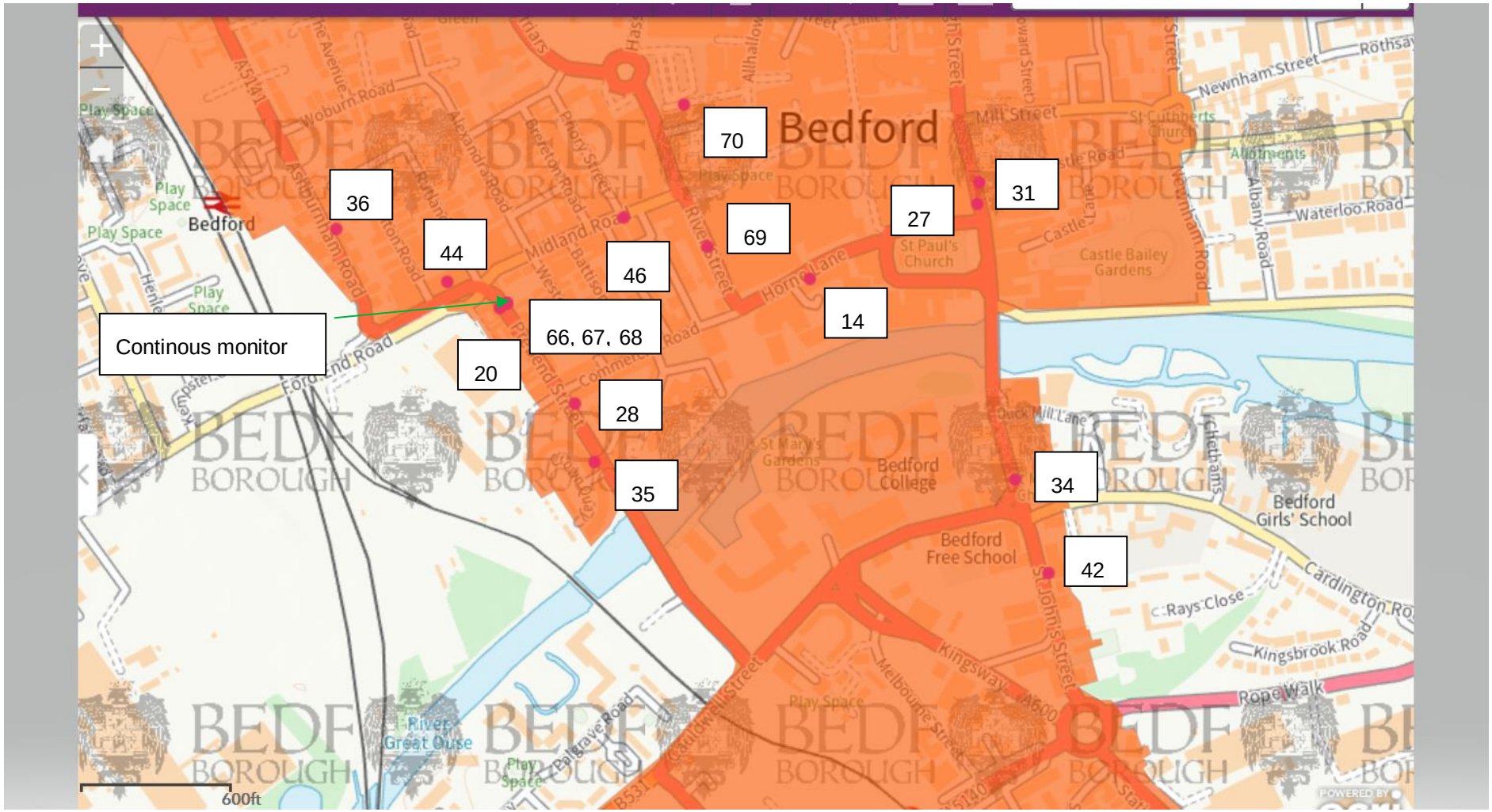


South of Borough diffusion tube locations

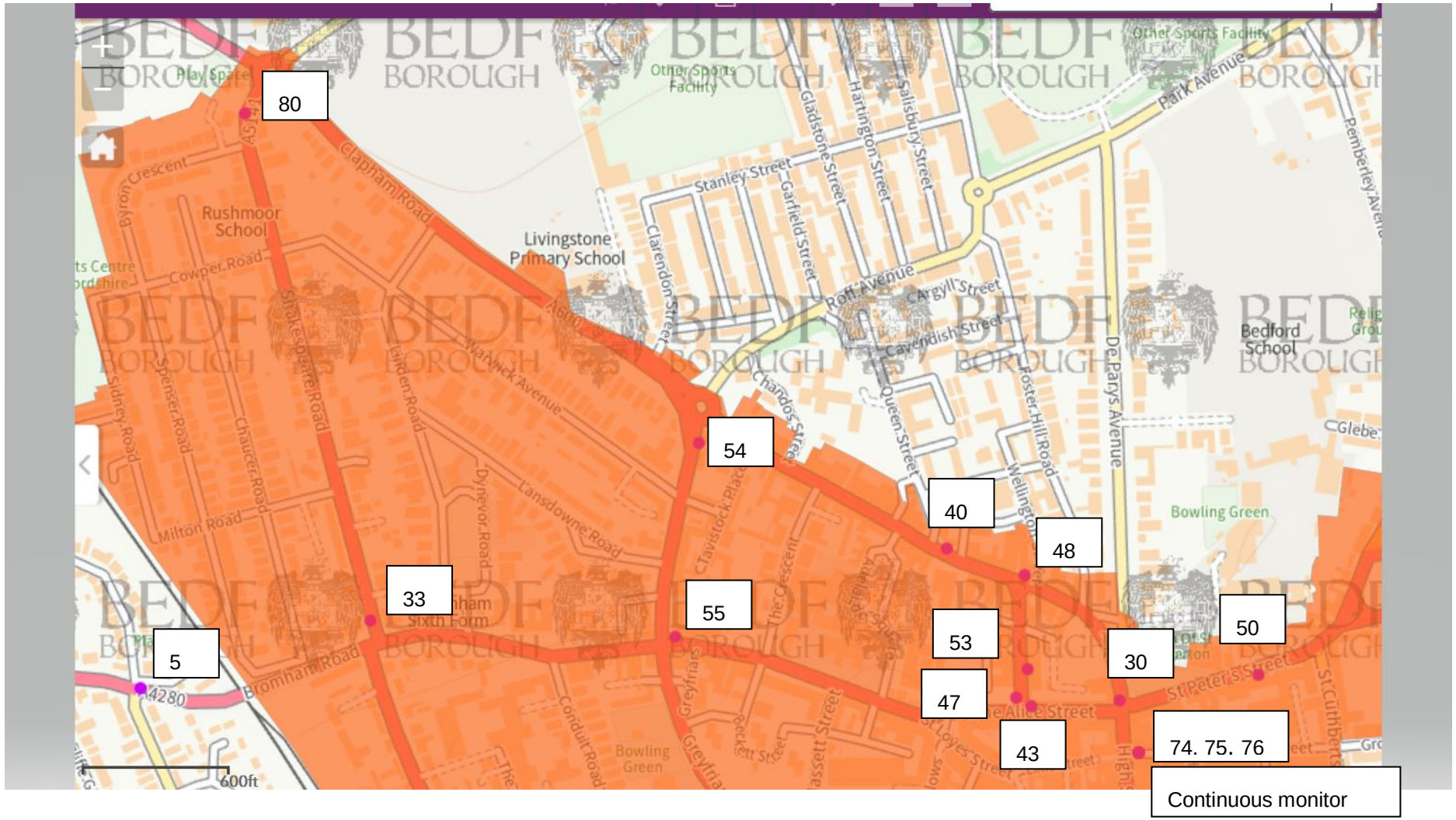
S



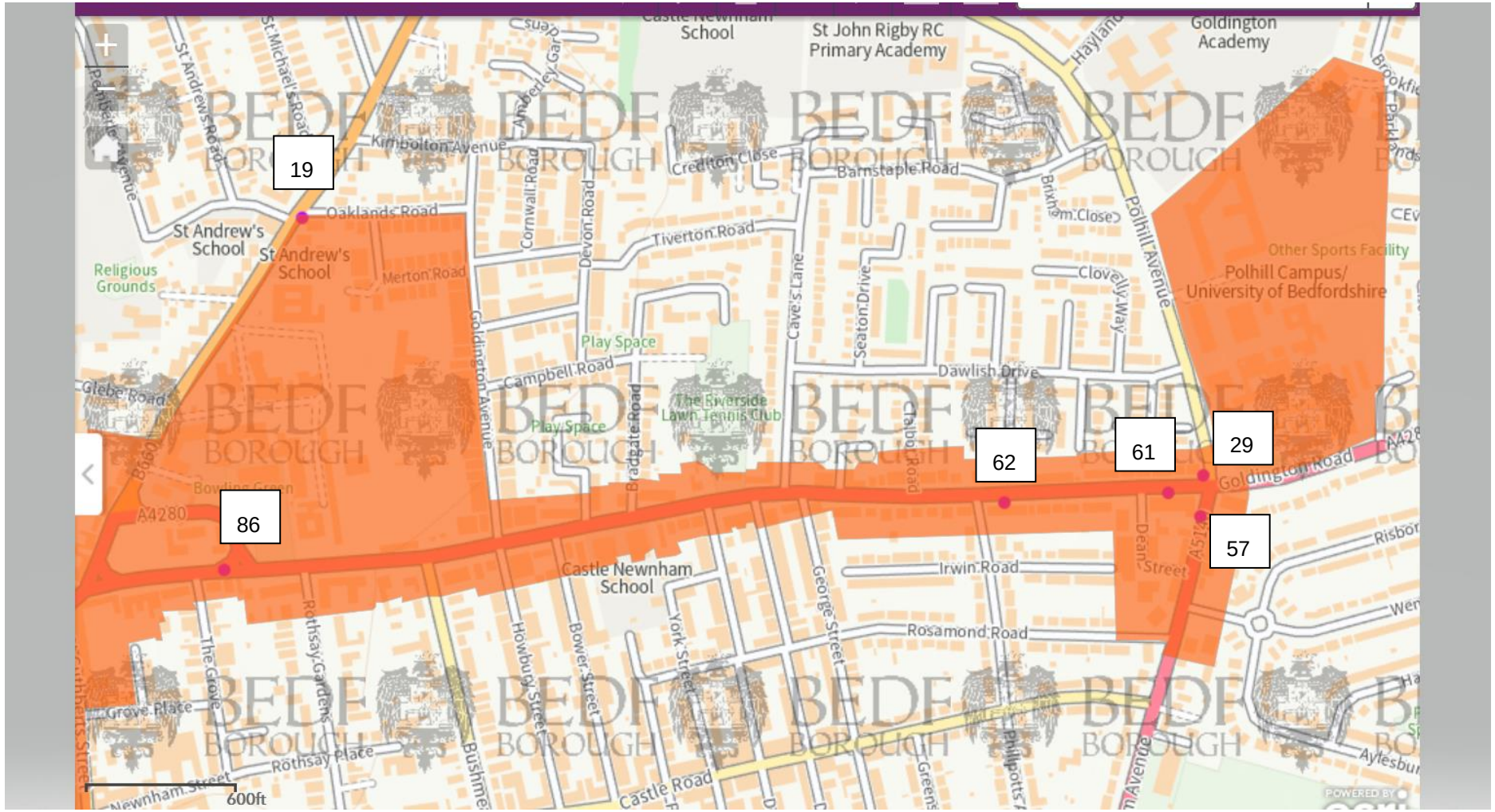
South AQMA diffusion tube locations



Central AQMA


80
54
40
48
33
55
53
50
30
5
47
43
74. 75. 76
Continuous monitor
Rushmoor School
Livingstone Primary School
Bedford School
Clapham Road
Park Avenue
Stanley Street
Gladstone Street
Harrington Street
Salisbury Street
Garfield Street
Clarendon Street
Roff Avenue
Argyll Street
Cavendish Street
Queen Street
Foster Hill Road
De Parys Avenue
Bromham Road
Lansdowne Road
Milton Road
Cowper Road
Byron Crescent
Shakespeare Road
Chaucer Road
Spencer Road
Sidney Road
Linden Road
Dynevor Road
Warwick Avenue
Tavistock Place
The Crescent
Greyfriars
Conduit Road
Bowling Green
Other Sports Facility
Play Space
Sixth Form
Remberley Avenue
Glebe
St Peter's Street
St Cuthbert's
Alice Street
Beckett Street
Bassett Street
600ft

North AQMA


19
86
62
61
29
57
St John Rigby RC Primary Academy
Goldington Academy
St Andrew's School
Religious Grounds
Other Sports Facility
Polhill Campus/ University of Bedfordshire
Play Space
The Riverside Lawn Tennis Club
Castle Newnham School
Goldington Road
Polhill Avenue
Kimbolton Avenue
Oaklands Road
Tiverton Road
Barnstaple Road
Campbell Road
Dawlish Drive
Irwin Road
Rosamond Road
Castle Road
Newnham Street
600ft

East AQMA

Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England[7]

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

[7] 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	Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by National Highways
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO_2	Sulphur Dioxide

References

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