

Tewkesbury Borough Council



# 2019 - 2021 Air Quality Annual Status Report (ASR)

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

Date: June, 2021

Tewkesbury Borough Council

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## Executive Summary: Air Quality in Our Area

### Air Quality in Tewkesbury Borough Council (TBC)

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<sup>1,2</sup>.

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

The main pollutant of concern in Tewkesbury is nitrogen dioxide (NO<sub>2</sub>). In December 2008, an Air Quality Management Area (AQMA) was designated for exceedance of the annual mean NO<sub>2</sub> Air Quality Strategy (AQS) objective of 40 µg/m<sup>3</sup>. Details of the current AQMA are available online at [https://uk-air.defra.gov.uk/aqma/details?aqma\\_ref=587](https://uk-air.defra.gov.uk/aqma/details?aqma_ref=587). This AQMA location has a classic street canyon effect, giving rise to an exceedance of the annual mean AQS objective for the traffic generated pollutant NO<sub>2</sub>. Other pollution sources, including commercial, industrial and domestic sources, also make a contribution to background pollution concentrations.

This report specifically covers the years 2018 – 2020 as the preceding two ASRs have not been prepared due to resourcing constraints. The NO<sub>2</sub> annual mean concentration data from the 2016 to 2020 monitoring period indicates a slight increase in 2017, followed by a steady decrease until 2019. There are some year-to-year variations in concentrations, which are likely due to meteorological influences. There was a significant decrease recorded in 2020 which is likely due to the impact of COVID-19 lockdown restrictions. The concentrations are

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<sup>1</sup> Public Health England. Air Quality: A Briefing for Directors of Public Health, 2017

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

<sup>3</sup> Defra. Air quality appraisal: damage cost guidance, July 2020

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

below the threshold for requiring an AQMA, and have been under the threshold of 40 µg/m<sup>3</sup> since 2015. The latest technical guidance suggests that the concentrations should be below the threshold for a period of several years or more before the AQMA is revoked. Therefore, it is proposed to revoke the AQMA, Tewkesbury AQMA Revocation report is presented in Appendix G: AQMA Revocation Assessment.

In 2020, one additional diffusion tube location (Site 56N) was added to the monitoring network. However, due to COVID-19 restrictions and limited resources, a full year of monitoring data was not obtained at this location, though results from this location are still presented in next year's ASR. Wider impacts of the pandemic on the monitoring survey are also latterly discussed.

## 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<sup>5</sup> sets out the case for action, with goals even more ambitious than EU requirements to reduce exposure to harmful pollutants. The Road to Zero<sup>6</sup> 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 AQMAs are designated due to elevated concentrations heavily influenced by transport emissions.

Following in-depth and extended consultation with all interested parties, an Air Quality Action Plan (AQAP), designed to address emission levels, was submitted to the Department for Environment, Food and Rural Affairs (DEFRA) for consultation in December 2010. The AQAP was approved for submission by Council in June 2011 and re-submitted to DEFRA in September 2011 with comments incorporated into the plan.

The AQAP made two final recommendations as follows:

- 5% reduction in overall traffic; and

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<sup>5</sup> Defra. Clean Air Strategy, 2019

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

- Remove all heavy goods vehicles (HGV's) exceeding 7.5 tonne.

These have been incorporated into traffic plans, introduced by the Gloucestershire County Council (GCC) and forms part of the Tewkesbury Town Master Plan.

Highway improvement and safety works to High Street in Tewkesbury started in April 2012 and have been completed. Close scrutiny of the AQMA has continued to monitor the effectiveness of the scheme. The data from the recent monitoring periods, following completion of the improvement works, indicate a downward trend in NO<sub>2</sub>.

GCC is responsible for strategies relating to traffic management across the County. Further details of these strategies can be found at <http://www.gloucestershire.gov.uk/ltp3>. The Overarching Transport Strategy is supported through the following policy documents; Bus, Cycle, Freight, Highways, Rail, and Think Travel.

Air quality issues are also routinely considered in response to planning consultations within the existing policy frame work and where appropriate planning conditions are included to require electric vehicle charging points into new developments and provision for safe storage of cycles. Section 106 agreements are secured where possible for Travel Plans and contributions to off-site mitigation to minimise emissions.

## Conclusions and Priorities

The Council continued undertaking monitoring from 2018 to 2020, though two sets of diffusion tube change-overs were missed during the first lockdown in March and April 2020. There was one additional diffusion tube site added to the monitoring network in 2020. This new site is located next to Tewkesbury Church of England Primary School on Chance Street.

All monitored sites met the NO<sub>2</sub> annual mean AQS objective of 40 µg/m<sup>3</sup> between 2018 and 2020. A sharp decrease was observed in NO<sub>2</sub> concentrations in 2020 at all monitoring locations, which is likely to be principally due to the COVID-19 pandemic and the associated restrictions affecting the local traffic flow. These lower results indicate it is extremely unlikely that there was an exceedance of the hourly mean AQS objective in the last three years. The NO<sub>2</sub> annual mean concentrations within the existing AQMA have been below the AQS objective since 2015, which provides a basis to revoke the existing AQMA as per Appendix G: AQMA Revocation Assessment.

Generally, concentrations of NO<sub>2</sub> are steadily declining year on year. This tends to indicate that the actions and measures within the AQAP have had a positive effect.

Priorities for the upcoming year include:

- Continue to monitor NO<sub>2</sub> concentration throughout the borough and consider relocation and/or deployment of additional diffusion tubes to identify areas of concern;
- Support changes to proposed M5 Junction 10 Improvement Scheme (Withybridge), which will help improve access to and from the motorway northbound and southbound to a new link road into Cheltenham;
- Revoke existing AQMA; and
- Continue to keep up to date with statutory reporting.

The main challenge to the improvement of air quality in the borough will be the extent of the recovery phase following COVID-19's impact.

## Local Engagement and How to get Involved

Members of the public can take simple measures to help improve air quality, the main ones being, where possible, making short trips and journeys on foot or by bike instead of by car. Traffic congestion can further be reduced by the general public through car sharing or by using public transport including the park and ride buses to access the city centre, although these are subject to social distancing rules.

TBC is part of the wider GCC Sustainable Transport Plan & Fund. This plan aims to achieve a modal shift to public transport, cycling & walking. The Gloucestershire initiative, Thinktravel, provides information and resources for sustainable travel in Gloucestershire. School Streets scheme is one of the schemes run by Thinktravel and aims to reduce volume of traffic outside school and monitor how air quality can impact positively on communities. Tewkesbury CofE Primary School is working with Thinktravel team to assist with the scheme. Further information on the initiative can be found here: [www.thinktravel.info](http://www.thinktravel.info)

One of the action plan measures is to improve the air quality information on the Council's website. There are ongoing works to provide easily accessible information on air quality, including a 'How you can help' section, which seeks to promote good practice for dust and smoke generating activities such as bonfires and wood fuel burning.

TBC currently provides information on air quality on our website at <https://www.tewkesbury.gov.uk/air-quality>, which includes the previous air quality reports, NO<sub>2</sub> tube results, information on the AQMA and links to other related information resources.

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Further information on air quality can be found on Defra's Local Air Quality Management (LAQM) website.

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## 1 Local Air Quality Management

This report provides an overview of air quality in Tewkesbury Borough Council from 2018 to 2020. 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 national Air Quality Strategy (AQS) 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 Tewkesbury Borough Council to improve air quality and any progress that has been made.

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

## 2 Actions to Improve Air Quality

### Air Quality Management Areas

AQMAs are declared when there is an exceedance or likely exceedance of an AQS objective. After declaration, the authority should prepare an AQAP within 12 months setting out measures it intends to put in place in pursuit of compliance with the AQS objectives.

A summary of AQMAs declared by Tewkesbury Borough Council can be found in Table 2.1. The table presents a description of the 1 AQMA that is currently designated within Tewkesbury Borough Council. 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 AQS objective pertinent to the current AQMA designation is the NO<sub>2</sub> annual mean.

The revocation of the Tewkesbury Town Centre AQMA is proposed within the next reporting year, based on the compliance of the monitoring locations with the relevant AQS objective since 2015 (see Appendix A: Monitoring Results and Appendix G: AQMA Revocation Assessment).

**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 Highways England?	Level of Exceedance: Declaration	Level of Exceedance: Current Year	Name and Date of AQAP Publication	Web Link to AQAP
Tewkesbury Town Centre AQMA	Declared 05/12/2008	NO <sub>2</sub> Annual Mean	An area encompassing Tewkesbury town centre, including the by-pass	No	41 µg/m <sup>3</sup>	22.3 µg/m <sup>3</sup>	Action Plan for Tewkesbury Town Centre	<a href="http://www.tewkesbury.gov.uk/airquality">www.tewkesbury.gov.uk/airquality</a>

- Tewkesbury Borough Council confirm the information on UK-Air regarding their AQMA(s) is up to date.**
- Tewkesbury Borough Council confirm that all current AQAPs have been submitted to Defra through the Report Submission Website.**

## Progress and Impact of Measures to address Air Quality in Tewkesbury Borough Council

Defra's appraisal of the last submitted ASR, which was in 2018, concluded that on the basis of the evidence provided the conclusions reached were acceptable for all sources and pollutants. The following comments were made to support the development of future reports:

- *"We agree with the Council's intention to consider revoking the AQMA if pollution levels in the Town centre continue to fall. The AQMA should be considered for revocation, if pollution levels remain more than 10% below objective levels;*
- *The maps within the Appendix should clearly show monitoring site locations;*
- *Monitoring site locations have not been reviewed for at least 5 years. The Council may wish to consider reviewing the current site locations, so that other sites of relevant exposure within the town centre can also be considered; and*
- *The current Action Plan is essentially out of date, with the main measures completed. If the AQMA continues the AQAP should be reviewed."*

The Council has reviewed the comments from the previous appraisal report. The Council is proposing to revoke the AQMA based on the compliant NO<sub>2</sub> annual mean concentrations within the AQMA. If the revocation for the AQMA is approved, an updated AQAP will not be required going forward. The Council has also added one monitoring location in 2020 and is considering deployment of additional diffusion tubes to ensure continued compliance.

TBC has taken forward a number of direct measures since 2018 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2. Five measures are included within Table 2.2, with the type of measure and the progress TBC has made since 2018 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 the Action Plan. Key completed measures are:

- 5% reduction in overall traffic;
- Remove all heavy goods vehicles (HGV's) exceeding 7.5 tonne; and
- Air Quality Action Day.

TBC's priorities for the coming year are:

- To introduce air quality measures into TBC Taxi Licensing Policy; and

- The improvement of air quality information on the TBC website

Gloucester County Council's (GCC) Local Transport Plan<sup>7</sup> (LTP) (2020- 2041) sets the strategic transport vision for the county to 2041. The LTP is structured around a number of travel corridors, each of which have distinctive transport issues and opportunities set out in six spatial strategies entitled Connecting Place Strategies<sup>8</sup> (CPS), Tewkesbury being one of the CPS.

Policy LTP PD 0.1 – Reducing Transport Carbon Emissions and Adapting to Climate Change, aims to reduce transport carbon emissions by 2045 and improve air quality in the county by addressing travel demand, promoting the use of sustainable modes of transport and the uptake of ultra-low emission vehicles to tackle climate change. Other policies which also have impact on the air quality include: Policy LTP PD0.2 – Local Environmental Protection, Policy LTP PD 0.5 Community Health and Wellbeing and Policy LTP PD 1.6 – Transport Interchange Hubs.

The principal challenges and barriers to implementation that the Council anticipates facing are likely to be related to the long term effects of the COVID-19 pandemic, which are anticipated to continue to divert resources for a significant period within 2021 and potentially beyond. This has already impacted on progress with some measures during 2020.

The measures stated above and in Table 2.2 have already helped achieve compliance in Tewkesbury Town Centre AQMA, which is proposed for revocation.

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<sup>7</sup> Gloucestershire Local Transport Plan (2020-2041). Available at:  
<https://www.gloucestershire.gov.uk/media/2105626/ltp-policy-document-final-v131.pdf>

<sup>8</sup> Gloucestershire County Council. Connecting Place Strategies (CPS). Available at:  
<https://www.gloucestershire.gov.uk/transport/gloucestershires-local-transport-plan-2020-2041/connecting-places-strategy-cps-areas-map/>

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	5% reduction in overall traffic	Transport Planning and Infrastructure	Other	2008	2013	Gloucestershire County Council	N/A	N/A	N/A	N/A	Implemented	N/A	Traffic volume	Complete	Implemented as part of the Tewkesbury High Street Road Safety Scheme
2	Remove all heavy goods vehicles (HGV's) exceeding 7.5 tonne	Traffic Management	Other	2008	2013	Gloucestershire County Council	N/A	N/A	N/A	N/A	Implemented	N/A	HGV numbers	Complete	Implemented as part of the Tewkesbury High Street Road Safety Scheme
3	Introduce air quality measures into Tewkesbury Borough Council Taxi Licensing Policy	Promoting Low Emission Transport	Taxi Licensing conditions	2018	Ongoing	Tewkesbury Borough Council	N/A	N/A	N/A	N/A	Planning	N/A	Improvement in age and euro standard of vehicles within the taxi fleet	Tewkesbury Borough Council Taxi Licensing Committee hold the final decision to approve the proposed changes	-
4	Air Quality Action Day	Public Information	Other	2018	2018	Tewkesbury Borough Council	N/A	N/A	N/A	N/A	Implemented	N/A	Attendance	Complete	-
5	Improvement of Air Quality information Tewkesbury Borough Council's Website	Public Information	Via the Internet	2018	Ongoing	Tewkesbury Borough Council	N/A	N/A	N/A	N/A	Planning	N/A	Improvements of Air Quality Information on the Council Website including a How you can help section	Delayed due to COVID-19	Improvements made although more work can be done

Commented [GA1]: For KG - Please update if more information is known

## PM<sub>2.5</sub> – 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<sub>2.5</sub> (particulate matter with an aerodynamic diameter of 2.5 µm or less). There is clear evidence that PM<sub>2.5</sub> has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

Particulates PM<sub>2.5</sub> are very fine particulates which are now considered to be a more significant health risk than the larger particulates PM<sub>10</sub> (particulate matter with an aerodynamic diameter of 10 µm or less), as they penetrate further into the respiratory system and are less easily dislodged. Recognising this, the UK Public Health Outcomes Framework (PHOF) (Healthy Lives: Healthy People) includes an indicator relating to PM<sub>2.5</sub>. In 2019 (latest available data), Tewkesbury had below the national average for the Public Health Framework Indicator, 'Fraction of mortality attributable to particulate air pollution'. The fractional value was 4.9% for Tewkesbury, lower than the national average<sup>9</sup> of 5.1%. The regional average for the South West region is slightly lower at 4.1%.

PM<sub>2.5</sub> is not yet incorporated into LAQM regulation within England. As such there is no statutory requirement on local authorities to review and assess PM<sub>2.5</sub> for LAQM purposes, and while PM<sub>2.5</sub> monitoring across the UK is desirable given the links to the Public Health Outcomes Framework, it is recognised that monitoring costs can be prohibitive on local authorities. The latest 2016 Technical Guidance suggests local authorities use results from the national network of PM<sub>2.5</sub> monitors to assess levels, and also provides a nationally derived factor of 0.7 that can be used to estimate PM<sub>2.5</sub> levels from any particulate PM<sub>10</sub> monitors that local authorities may have installed.

An Air Quality and Health impact assessment workshop was held on the 16<sup>th</sup> January 2018 in Gloucestershire. The workshop's aim was to review the relationship between air quality

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<sup>9</sup> Public Health Outcome Framework (2019), 'Health Protection'. Available at: <https://fingertips.phe.org.uk/static-reports/public-health-outcomes-framework/at-a-glance/E12000009.html?area-name=Tewkesbury>

and health in Gloucestershire, in aid of developing approaches to improve local air quality and its impact on the population's health.

The recommendations from the air quality and health system impact assessment are based on a review of the outputs from the process: evidence of relationship between air quality and health; data and epidemiology review for Gloucestershire; evidence review of intervention to improve air quality and/or mitigate its impact on health; and the outputs from the multi-stakeholder workshop. The recommendations were;

- To define a Gloucestershire strategy for air quality and health;
- To develop a model for partnership and collaboration to develop and oversee the agenda;
- To promote clean and accessible public transport;
- To strengthen air quality, health and active transport in planning and transport policies;
- To engage and educate the public on air quality and health;
- The promotion of active travel and interventions to facilitate its uptake;
- To support the uptake of electric vehicle use;
- To improve monitoring and information sharing across Gloucestershire; and
- To review public sector fleet/ contractor fleet to reduce emissions.

TBC is also going to continue to take the following measures to address PM<sub>2.5</sub>:

- Work with GCC to identify area within the Local Transport Plan that will contribute towards a reduction in PM<sub>2.5</sub>; and
- Work with TBC's health and well-being colleagues with a view to identifying and incorporating measures which will contribute towards a reduction in PM<sub>2.5</sub>.

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

This section sets out the monitoring undertaken between 2018 and 2020 by TBC and how it compares with the relevant AQS objectives. In addition, monitoring results are presented for a five-year period between 2016 and 2020 to allow monitoring trends to be identified and discussed.

### Summary of Monitoring Undertaken

#### 3.1.1 Automatic Monitoring Sites

There are currently no automatic monitoring sites within Tewkesbury.

#### 3.1.2 Non-Automatic Monitoring Sites

TBC undertook non-automatic (i.e. passive) monitoring of nitrogen dioxide (NO<sub>2</sub>) at 17 sites during 2018 and 2019, and at 18 sites during 2020. One new monitoring location was added in 2020, Site 56N, on Chance Street near Tewkesbury CofE Primary School. Site 54N on Woodside House, Crickley Hill was decommissioned at the end of 2017. Table A.1 in Appendix A presents the details of the non-automatic sites.

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

### 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 33%), and distance correction. Further details on adjustments are provided in Appendix C.

#### 3.1.3 Nitrogen Dioxide (NO<sub>2</sub>)

Table A.2 in Appendix A compares the ratified and adjusted monitored NO<sub>2</sub> annual mean concentrations for the past five years with the AQS objective of 40 µg/m<sup>3</sup>. Note that the LAQM Annual Status Report 2021

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 dataset of monthly mean values for 2018-2020 is provided in Appendix B. Note that the concentration data presented in Table B.1, Table B.2 and Table B.3 includes distance corrected values, only where relevant.

Across the monitoring network, all monitoring locations, including within the AQMA, met the NO<sub>2</sub> annual mean AQS objective of 40 µg/m<sup>3</sup>. That said, a slight increase was noted in 2017, followed by a decrease in 2018 and another slight increase in 2019. These year-to-year variations in concentrations are likely due to meteorological influences. However, the trend is that the concentrations are steadily declining year on year, as demonstrated in Figure A.1, which tends to indicate that the actions and measures within the Council's AQAP are having a positive effect.

Additional large reductions in concentrations were seen at majority of sites in 2020. The effects of the COVID-19 lockdown and further restrictions have impacted the overall traffic flow, hence the changes. A lower national bias factor of 0.82 also contributed to a lower NO<sub>2</sub> annual mean concentration. A summary of bias adjustment factors used by TBC over the past five years is presented in Table C.1. The maximum change between 2019 and 2020 was recorded at Site 41N at Barton Street with 33.2% lower concentration in 2020, where a reduction from 30.2 µg/m<sup>3</sup> to 20.2 µg/m<sup>3</sup> was recorded.

There were no recorded instances of annual means greater than 60 µg/m<sup>3</sup>, which according to the empirical relationship stated in LAQM.TG(16) indicates that an exceedance of the 1-hour mean AQS objective is also unlikely at these sites.

#### **3.1.4 Particulate Matter (PM<sub>10</sub>)**

PM<sub>10</sub> is currently not monitored in Tewkesbury Borough Council.

#### **3.1.5 Particulate Matter (PM<sub>2.5</sub>)**

PM<sub>2.5</sub> is currently not monitored in Tewkesbury Borough Council.

#### **3.1.6 Sulphur Dioxide (SO<sub>2</sub>)**

SO<sub>2</sub> is currently not monitored in Tewkesbury Borough Council.

## Appendix A: Monitoring Results

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

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube Co-located with a Continuous Analyser?	Tube Height (m)
1N	131 High Street	Roadside	389314	232807	NO <sub>2</sub>	Yes, Tewkesbury Town Centre AQMA	0.0	1.5	No	4.0
2N	43 Oldbury Road	Roadside	389399	232788	NO <sub>2</sub>	Yes, Tewkesbury Town Centre AQMA	0.0	1.5	No	3.0
5N	13-14 Barton Street	Roadside	389356	232705	NO <sub>2</sub>	Yes, Tewkesbury Town Centre AQMA	0.0	1.5	No	4.0
6N	14 High Street	Roadside	389294	232806	NO <sub>2</sub>	Yes, Tewkesbury Town Centre AQMA	0.0	1.5	No	4.0
14N	69 Sussex Gardens	Roadside	387915	217389	NO <sub>2</sub>	No	0.0	7.0	No	2.0
15N	Comus Bamfurlong	Roadside	389714	221845	NO <sub>2</sub>	No	0.0	3.0	No	1.5
16N	15 Withybridge Gardens	Roadside	390461	225544	NO <sub>2</sub>	No	5.0	3.0	No	1.5
20N	Snowhill Hill Farm	Rural	412224	233012	NO <sub>2</sub>	No	50.0	1.0	No	1.5
35N	21 High Street	Roadside	389283	232769	NO <sub>2</sub>	Yes, Tewkesbury Town Centre AQMA	0.0	1.5	No	3.0
37N	101 Church Street	Roadside	389254	232670	NO <sub>2</sub>	Yes, Tewkesbury Town Centre AQMA	1.0	2.0	No	3.0
38N	38 High Street	Roadside	389331	232950	NO <sub>2</sub>	Yes, Tewkesbury Town Centre AQMA	0.0	1.5	No	3.0
41N	31 Barton St	Roadside	389462	232721	NO <sub>2</sub>	Yes, Tewkesbury Town Centre AQMA	0.0	2.0	No	2.5
47N	65 Barton St	Roadside	389400	232600	NO <sub>2</sub>	Yes, Tewkesbury Town Centre AQMA	0.0	2.0	No	2.0

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) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube Co-located with a Continuous Analyser?	Tube Height (m)
50N	3 North Street	Roadside	402476	228456	NO <sub>2</sub>	No	0.5	1.5	No	2.0
52N	43 Stocken Close	Roadside	387570	216935	NO <sub>2</sub>	No	0.0	12.0	No	2.0
53N	Ashchurch Road	Roadside	393281	233305	NO <sub>2</sub>	No	57.0	5.0	No	2.0
55N	Stoke Road, Bishops Cleeve	Roadside	395123	227638	NO <sub>2</sub>	No	25.0	5.0	No	1.8
56N	Tewkesbury CofE Primary School	Suburban	389622	232907	NO <sub>2</sub>	Yes, Tewkesbury Town Centre AQMA	9.0	3.0	No	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 – Annual Mean NO<sub>2</sub> Monitoring Results: Non-Automatic Monitoring (µg/m<sup>3</sup>)**

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2020 (%) <sup>(2)</sup>	2016	2017	2018	2019	2020
1N	389314	232807	Roadside	66.7	66.7	30.5	28.6	28.2	29.4	16.7
2N	389399	232788	Roadside	66.7	66.7	20.2	19.3	20.7	20.6	12.5
5N	389356	232705	Roadside	66.7	66.7	26.1	22.4	24.2	23.0	15.8
6N	389294	232806	Roadside	66.7	66.7	30.2	27.5	27.1	27.7	18.7
14N	387915	217389	Roadside	83.3	83.3	26.8	24.9	26.1	23.6	17.7
15N	389714	221845	Roadside	83.3	83.3	25.6	26.4	27.5	25.7	14.8
16N	390461	225544	Roadside	83.3	83.3	29.0	26.0	24.3	22.0	16.7
20N	412224	233012	Rural	83.3	83.3	6.5	6.0	6.4	5.5	3.9
35N	389283	232769	Roadside	66.7	66.7	36.7	35.9	32.0	32.3	22.3
37N	389254	232670	Roadside	66.7	66.7	26.7	24.0	22.8	22.7	15.5
38N	389331	232950	Roadside	66.7	66.7	25.7	26.4	24.5	23.4	16.9
41N	389462	232721	Roadside	66.7	66.7	35.4	34.2	32.9	30.2	20.2
47N	389400	232600	Roadside	66.7	66.7	29.0	28.9	26.9	27.4	19.1
50N	402476	228456	Roadside	83.3	83.3	23.0	22.0	22.2	20.4	12.1
52N	387570	216935	Roadside	83.3	83.3	26.2	25.9	23.4	21.2	16.0
53N	393281	233305	Roadside	75	75	24.4	22.7	22.0	19.4	14.7
55N	395123	227638	Roadside	75	75	N/A	30.9	19.0	18.8	14.3
56N	389622	232907	Suburban	16.7	16.7					-

- 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  $\mu\text{g}/\text{m}^3$ .

Exceedances of the NO<sub>2</sub> annual mean AQS objective of  $40 \mu\text{g}/\text{m}^3$  are shown in **bold**.

NO<sub>2</sub> annual means exceeding  $60 \mu\text{g}/\text{m}^3$ , indicating a potential exceedance of the NO<sub>2</sub> 1-hour mean AQS objective are shown in **bold and underlined**.

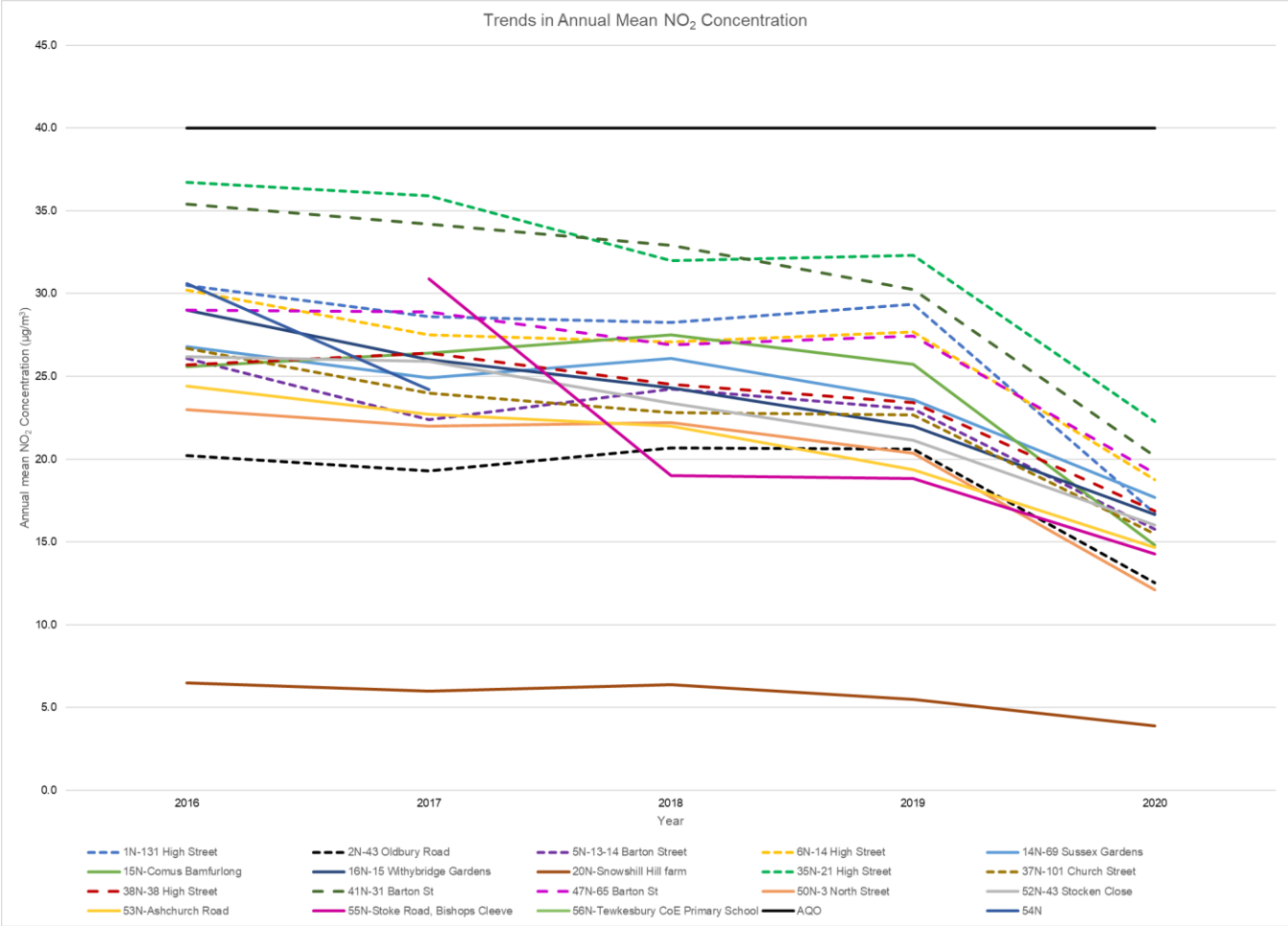
Means for diffusion tubes have been corrected for bias. All means have been “annualised” as per LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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<sub>2</sub> Concentrations



## Appendix B: Full Monthly Diffusion Tube Results for 2018-2020

Table B.1 – NO<sub>2</sub> 2018 Diffusion Tube Results (µg/m<sup>3</sup>)

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 (0.89)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
1N	389314	232807	30.4	33.8	34.2	31.9	31.4	28.4	31.2	24.6	25.4	36.7	36.7	36.2	31.7	28.2	-	-
2N	389399	232788	25.2	24.6	25.4	19.7	21.3	19.2	33.0	17.9	17.5	24.2	25.9	25.1	23.3	20.7	-	-
5N	389356	232705	26.7	29.0	30.2	23.4	31.5	27.4	26.2	23.2	23.4	31.3	25.3	29.0	27.2	24.2	-	-
6N	389294	232806	33.5	26.3	31.1	27.9	32.6	26.5	33.3	30.5	29.6	31.7	28.7	33.6	30.4	27.1	-	-
14N	387915	217389	37.5	31.2	29.5	23.0	27.7	24.6	23.4	27.0	26.8	40.8	27.6	32.7	29.3	26.1	-	-
15N	389714	221845	33.5	29.7	26.3	28.8	-	35.3	28.0	31.7	-	-	29.4	-	30.3	27.5	-	Annualised
16N	390461	225544	29.1	29.3	29.4	26.1	28.2	28.1	28.2	27.8	26.3	26.8	21.8	26.5	27.3	24.3	-	-
20N	412224	233012	8.8	10.5	8.4	7.3	6.2	4.6	4.6	4.0	4.9	7.2	10.4	9.1	7.2	6.4	-	-
35N	389283	232769	31.4	31.4	37.1	33.3	39.1	30.9	43.4	35.9	37.7	36.6	33.9	40.6	35.9	32.0	-	-
37N	389254	232670	23.7	27.1	26.5	22.7	29.2	23.0	28.3	23.3	22.7	28.2	24.0	29.1	25.6	22.8	-	-
38N	389331	232950	30.0	26.1	27.7	24.2	29.1	21.7	29.4	25.1	27.1	32.8	26.1	31.4	27.6	24.5	-	-
41N	389462	232721	39.0	37.5	41.0	31.7	39.2	39.1	41.0	33.5	31.6	38.4	32.8	39.1	37.0	32.9	-	-
47N	389400	232600	32.3	31.0	32.9	30.6	30.8	25.6	19.6	30.5	31.6	30.6	32.2	35.0	30.2	26.9	-	-
50N	402476	228456	25.1	30.0	25.6	27.5	28.4	21.7	24.5	21.0	19.5	23.0	24.3	28.9	25.0	22.2	-	-
52N	387570	216935	31.9	26.2	26.6	24.1	24.8	23.5	24.4	26.7	27.8	28.3	21.0	29.9	26.3	23.4	-	-
53N	393281	233305	27.6	25.0	21.4	21.7	29.3	25.2	22.7	20.5	26.4	31.0	18.5	27.3	24.7	22.0	-	-
55N	395123	227638	27.3	25.1	24.9	-	17.1	13.7	17.4	19.2	-	20.2	21.8	27.1	21.4	19.0	-	-

- All erroneous data has been removed from the NO<sub>2</sub> 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.
- Tewkesbury Borough Council confirm that all 2018 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System.

### Notes:

Exceedances of the NO<sub>2</sub> annual mean AQS objective of 40 µg/m<sup>3</sup> are shown in **bold**.

NO<sub>2</sub> annual means exceeding 60 µg/m<sup>3</sup>, indicating a potential exceedance of the NO<sub>2</sub> 1-hour mean AQS objective are shown in **bold and underlined**.

See Appendix C for details on bias adjustment and annualisation.

Table B.2 – NO<sub>2</sub> 2019 Diffusion Tube Results (µg/m<sup>3</sup>)

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 (0.89)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
1N	389314	232807	32.1	38.5	27.4	31.9	24.7	24.7	25.4	26.6	27.9	39.0	47.5	50.4	33.0	29.4	-	-
2N	389399	232788	24.6	29.0	19.6	23.5	18.8	18.8	16.3	14.2	-	34.7	33.4	21.8	23.2	20.6	-	-
5N	389356	232705	31.8	28.1	27.6	29.2	24.1	24.1	21.8	18.5	23.5	25.4	36.4	20.2	25.9	23.0	-	-
6N	389294	232806	36.6	36.6	32.6	25.9	29.2	29.2	29.1	27.7	29.9	28.8	36.9	31.0	31.1	27.7	-	-
14N	387915	217389	37.2	27.9	31.5	27.2	21.4	21.4	23.4	18.7	11.4	31.2	42.3	24.4	26.5	23.6	-	-
15N	389714	221845	34.8	41.1	33.7	18.3	-	24.5	-	31.7	22.5	27.7	29.9	24.8	28.9	25.7	-	-
16N	390461	225544	28.8	27.8	27.7	24.9	23.2	23.2	27.0	22.3	24.5	21.3	25.9	20.2	24.7	22.0	-	-
20N	412224	233012	7.7	8.7	4.2	8.0	4.0	4.0	4.0	2.7	5.7	7.3	12.4	5.6	6.2	5.5	-	-
35N	389283	232769	41.4	44.2	36.4	31.2	32.5	32.5	37.5	32.7	35.8	34.4	42.6	34.6	36.3	32.3	-	-
37N	389254	232670	27.4	28.9	25.0	23.3	22.8	22.8	22.6	20.3	25.6	26.9	35.3	24.6	25.5	22.7	-	-
38N	389331	232950	32.0	34.3	28.2	21.7	22.5	22.5	24.6	22.0	25.2	28.4	-	28.2	26.3	23.4	-	-
41N	389462	232721	42.4	40.9	37.3	34.4	27.1	27.1	32.9	28.9	33.6	32.3	38.9	31.9	34.0	30.2	-	-
47N	389400	232600	35.9	42.2	30.0	26.0	28.3	28.3	25.1	26.4	28.6	30.0	34.3	35.1	30.8	27.4	-	-
50N	402476	228456	29.6	23.5	24.2	27.0	20.5	20.5	21.1	16.5	21.7	22.7	30.8	16.5	22.9	20.4	-	-
52N	387570	216935	32.2	29.1	32.3	20.1	21.6	21.6	24.3	20.7	20.8	22.5	15.8	24.4	23.8	21.2	-	-
53N	393281	233305	33.9	25.6	25.7	22.7	14.5	14.5	16.2	14.7	21.9	21.3	31.7	18.6	21.8	19.4	-	-
55N	395123	227638	31.8	30.3	25.0	16.1	16.8	16.8	17.0	15.8	17.7	18.7	26.0	22.0	21.2	18.8	-	-

All erroneous data has been removed from the NO<sub>2</sub> diffusion tube dataset presented in Table B.2.

Annualisation has been conducted where data capture is <75% and >33% 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.

Tewkesbury Borough Council confirm that all 2019 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System.

**Notes:**

Exceedances of the NO<sub>2</sub> annual mean AQS objective of 40 µg/m<sup>3</sup> are shown in **bold**.

NO<sub>2</sub> annual means exceeding 60 µg/m<sup>3</sup>, indicating a potential exceedance of the NO<sub>2</sub> 1-hour mean AQS objective are shown in **bold and underlined**.

See Appendix C for details on bias adjustment and annualisation.

Table B.3 – NO<sub>2</sub> 2020 Diffusion Tube Results (µg/m<sup>3</sup>)

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 (0.82)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
1N	389314	232807	33.1	20.0	-	-	-	-	10.8	23.6	16.0	20.4	27.6	26.9	22.3	16.7	-	Annualised, missing two months due to COVID-19
2N	389399	232788	24.6	14.9	-	-	-	-	8.0	12.0	16.3	15.0	22.1	20.9	16.7	12.5	-	Annualised, missing two months due to COVID-19
5N	389356	232705	22.5	17.2	-	-	-	-	10.8	20.9	24.7	23.8	27.5	20.7	21.0	15.8	-	Annualised, missing two months due to COVID-19
6N	389294	232806	21.1	25.5	-	-	-	-	10.7	28.1	29.0	29.5	31.2	24.8	25.0	18.7	-	Annualised, missing two months due to COVID-19
14N	387915	217389	28.6	26.2	-	-	13.5	16.5	17.9	21.3	25.1	26.2	14.8	25.6	21.6	17.7	-	Missing two months due to COVID-19
15N	389714	221845	27.7	24.0	-	-	9.9	11.5	14.3	15.2	17.7	19.2	21.5	19.8	18.1	14.8	-	Missing two months due to COVID-19
16N	390461	225544	22.0	23.0	-	-	13.2	15.1	19.4	24.9	24.6	20.9	20.0	20.3	20.3	16.7	-	Missing two months due to COVID-19
20N	412224	233012	5.3	3.6	-	-	3.2	3.8	3.0	4.2	3.9	4.5	8.6	7.4	4.7	3.9	-	Missing two months due to COVID-19
35N	389283	232769	39.1	29.6	-	-	-	-	12.6	31.5	30.6	30.5	36.4	27.3	29.7	22.3	-	Annualised, missing two months due to COVID-19
37N	389254	232670	27.2	20.9	-	-	-	-	10.0	22.2	22.2	22.2	19.4	21.0	20.6	15.5	-	Annualised, missing two months due to COVID-19
38N	389331	232950	28.1	22.2	-	-	-	-	10.8	21.9	21.0	23.0	26.3	26.8	22.5	16.9	-	Annualised, missing two months due to COVID-19
41N	389462	232721	30.2	24.4	-	-	-	-	12.3	30.2	28.7	30.0	30.6	29.0	26.9	20.2	-	Annualised, missing two months due to COVID-19
47N	389400	232600	36.3	25.0	-	-	-	-	10.9	23.1	24.2	26.7	30.5	27.5	25.5	19.1	-	Annualised, missing two months due to COVID-19
50N	402476	228456	17.5	13.9	-	-	8.8	11.9	13.5	15.7	18.2	16.1	16.0	16.5	14.8	12.1	-	Missing two months due to COVID-19
52N	387570	216935	26.5	26.0	-	-	11.5	14.3	18.2	18.0	21.2	21.6	19.9	18.2	19.5	16.0	-	Missing two months due to COVID-19
53N	393281	233305	21.1	19.9	-	-	-	13.1	14.0	18.6	20.0	16.3	21.8	16.4	17.9	14.7	-	Missing two months due to COVID-19
55N	395123	227638	28.4	21.4	-	-	8.7	12.0	14.1	15.8	-	21.0	17.0	18.6	17.4	14.3	-	Missing two months due to COVID-19
56N	389622	232907	-	-	-	-	-	-	-	-	-	-	17.3	13.2	-	-	-	New tube installed later in the year

All erroneous data has been removed from the NO<sub>2</sub> diffusion tube dataset presented in Table B.3.

Annualisation has been conducted where data capture is <75% and >33% 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.

Tewkesbury Borough Council confirm that all 2020 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System.

**Notes:**

Exceedances of the NO<sub>2</sub> annual mean AQS objective of 40 µg/m<sup>3</sup> are shown in **bold**.

NO<sub>2</sub> annual means exceeding 60 µg/m<sup>3</sup>, indicating a potential exceedance of the NO<sub>2</sub> 1-hour mean AQS 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 Tewkesbury Borough Council Between 2018 and 2020**

TBC has not identified any new sources relating to air quality within the reporting years of 2018-2020.

### **Additional Air Quality Works Undertaken by Tewkesbury Borough Council Between 2018 and 2020**

TBC has not completed any additional works within the reporting years of 2018-2020.

### **QA/QC of Diffusion Tube Monitoring**

All diffusion tubes, between 2018 and 2020, were from Gradko and used a mixture of 50% TEA in acetone method. Gradko International Ltd is a UKAS accredited laboratory. Gradko participates in the AIR Proficiency Testing (PT) scheme for diffusion tubes, operated by LGC Standards and supported by the Health and Safety Laboratory (HSL), which provides a Quality Assurance / Quality Control (QA/QC) framework for local authorities carrying out diffusion tube monitoring as a part of their local air quality management process. The percentage of results submitted by Gradko International Ltd that were subsequently determined to be satisfactory was 100% for tests in AIR-PT Rounds 31, 33 and 34 (April 2019 – November 2019). For AIR-PT Rounds 30 (January-February 2019), 36 (January-February 2020) and 40 (September-October 2020), 75% of results were submitted which were subsequently determined to be satisfactory. No results were reported for AIR-PT Rounds 37 (May-June 2020) and 39 (July-August 2020).

The lockdown restrictions prevented the Council from adhering with the 2020 Diffusion Tube Monitoring Calendar, and no monitoring was undertaken in March and April 2020.

### Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within this 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<sub>x</sub>/NO<sub>2</sub> continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

TBC have applied a national bias adjustment factor to each year as TBC does not have local continuous data for local bias adjustment factor calculation. A factor of 0.89 was applied to the 2018 and 2019 monitoring data (the factor was the same in both years), and a factor of 0.82 to the 2020 monitoring data. A summary of bias adjustment factors used by TBC over the past five years is presented in Table C.1.

The national bias adjustment factor for 2018, 2019 and 2021 was derived using the Diffusion Tube Bias Adjustment Factors Spreadsheet for March 2021, the outputs for which are shown in Figure C.1, Figure C.2 and Figure C.3.

**Table C.1 – Bias Adjustment Factor**

Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2020	National	03/21	0.82
2019	National	03/21	0.89
2018	National	03/21	0.89
2017	National	-	0.96
2016	National	-	1.03

Figure C.1 DEFRA National Bias Adjustment Output for 2018

National Diffusion Tube Bias Adjustment Factor Spreadsheet										Spreadsheet Version Number: 03/21	
Follow the steps below in the correct order to show the results of relevant co-location studies										This spreadsheet will be updated at the end of June 2021	
Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods										LAQM Helpdesk Website	
Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet											
This spreadsheet will be updated every few months; the factors may therefore be subject to change. This should not discourage their immediate use.											
The LAQM Helpdesk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.					Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.						
Step 1:		Step 2:		Step 3:		Step 4:					
Select the Laboratory that Analyses Your Tubes from the Drop-Down List		Select a Preparation Method from the Drop-Down List		Select a Year from the Drop-Down List		Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor shown in blue at the foot of the final column.					
If a laboratory is not chosen, we have no data for this laboratory.		If a preparation method is not chosen, we have no data for this method in this laboratory.		If a year is not chosen, we have no data.		If you have your own co-location study then see footnote. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMhelpdesk@bureauveritas.com or 0800 0327953					
Analysed By <sup>1</sup>	Method	Year	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m <sup>3</sup> )	Automate Monitor Mean Conc. (Em) (µg/m <sup>3</sup> )	Bias (B)	Tube Precision <sup>2</sup>	Bias Adjustment Factor (A) (Em-Dm)	
Gradko	50% TEA in acetone	2018	R	City of London	12	84	84	-0.7%	G	1.12	
Gradko	50% TEA in acetone	2018	B	City of London	10	38	32	20.9%	G	0.83	
Gradko	50% TEA in acetone	2018	R	RBWM	12	39	36	7.8%	G	0.93	
Gradko	50% TEA in acetone	2018	R	RBWM	12	35	34	2.2%	G	0.98	
Gradko	50% TEA in acetone	2018	SU	Redcar and Cleveland Borough Council	9	18	10	83.3%	G	0.95	
Gradko	50% TEA in acetone	2018	R	West Berkshire	10	40	37	10.5%	G	0.91	
Gradko	50% TEA in acetone	2018	KS	Manglebone Road Intercomparison	11	91	85	6.5%	G	0.94	
Gradko	50% TEA in acetone	2018	UB	Reading Borough Council	12	20	26	-22.6%	G	1.29	
Gradko	50% TEA in acetone	2018	UI	Falkirk Council	12	21	18	19.7%	G	0.84	
Gradko	50% TEA in acetone	2018	UC	Falkirk Council	10	41	41	0.7%	G	0.99	
Gradko	50% TEA in acetone	2018	R	London Borough of Croydon	12	55	41	33.4%	G	0.75	
Gradko	50% TEA in acetone	2018	KS	London Borough of Croydon	12	56	49	15.2%	P	0.87	
Gradko	50% TEA in acetone	2018	UI	Middlesbrough	12	21	15	43.8%	G	0.70	
Gradko	50% TEA in acetone	2018	UB	Norwich City Council	12	14	12	20.4%	G	0.93	
Gradko	50% TEA in Acetone	2018	R	Sandwell Metropolitan Borough Council	12	44	40	9.1%	G	0.92	
Gradko	50% TEA in Acetone	2018	UB	Sandwell Metropolitan Borough Council	11	16	15	9.1%	S	0.92	
Gradko	50% TEA in Acetone	2018	B	Sandwell Metropolitan Borough Council	12	26	25	3.7%	G	0.96	
Gradko	50% TEA in Acetone	2018	R	Sandwell Metropolitan Borough Council	10	33	31	3.7%	S	0.96	
Gradko	50% TEA in acetone	2018		<b>Overall Factor<sup>3</sup> (18 studies)</b>					<b>Use</b>	<b>0.83</b>	

Figure C.2 DEFRA National Bias Adjustment Output for 2019

National Diffusion Tube Bias Adjustment Factor Spreadsheet										Spreadsheet Version Number: 03/21	
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 2021 <a href="#">LAQM Helpline Website</a>	
The LAQM Helpline is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.					Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.						
Step 1:	Step 2:	Step 3:	Step 4:								
Select the Laboratory that Analyses Your Tubes from the Drop-Down List	Select a Preparation Method from the Drop-Down List	Select a Year from the Drop-Down List	Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor shown in blue at the foot of the final column.								
If a laboratory is not shown, we have no data for this laboratory.	If a preparation method is not shown, we have no data for this method at this laboratory.	If a year is not shown, we have no data.	If you have your own co-location study then see footnote 1. If uncertain what to do then contact the Local Air Quality Management Helpline at LAQMHelpline@bureauveritas.com or 0800 0327953								
Analysed By <sup>1</sup>	Method	Year	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m <sup>3</sup> )	Automatic Monitor Mean Conc. (Cm) (µg/m <sup>3</sup> )	Bias (B)	Tube Precision <sup>2</sup>	Bias Adjustment Factor (A) (Cm/Dm)	
Gradko	50% TEA in acetone	2019	F	City of London	12	74	71	4.1%	G	0.96	
Gradko	50% TEA in acetone	2019	UB	City of London	12	37	33	14.3%	G	0.88	
Gradko	50% TEA in acetone	2019	KS	Margelbone Road Intercomparison	12	83	85	26.3%	G	0.79	
Gradko	50% TEA in acetone	2019	F	London Borough of Richmond upon Thames	12	46	35	30.4%	G	0.77	
Gradko	50% TEA in acetone	2019	F	London Borough of Richmond upon Thames	12	29	27	7.1%	G	0.93	
Gradko	50% TEA in acetone	2019	B	London Borough of Richmond upon Thames	11	21	21	1.0%	G	0.99	
Gradko	50% TEA in acetone	2019	UB	Falkirk Council	9	18	15	18.1%	G	0.85	
Gradko	50% TEA in acetone	2019	F	LE Newham	12	35	30	18.2%	G	0.86	
Gradko	50% TEA in acetone	2019	UB	Middlesbrough	12	20	16	22.4%	G	0.82	
Gradko	50% TEA in acetone	2019	UB	Norwich City Council	12	14	13	7.8%	G	0.93	
Gradko	50% TEA in acetone	2019	F	RBWM	12	34	32	5.8%	G	0.95	
Gradko	50% TEA in acetone	2019	F	RBWM	12	38	35	8.8%	G	0.94	
Gradko	50% TEA in acetone	2019	UB	Bureau Veritas	11	38	32	21.8%	G	0.82	
Gradko	50% TEA in acetone	2019	B	Croydon	11	69	43	18.2%	G	0.86	
Gradko	50% TEA in acetone	2019	F	Croydon	11	53	44	20.5%	G	0.83	
Gradko	50% TEA in acetone	2019	SU	Greenwich	12	20	17	17.0%	G	0.85	
Gradko	50% TEA in acetone	2019	F	Greenwich	12	60	53	14.3%	G	0.87	
Gradko	50% TEA in acetone	2019	F	Greenwich	12	44	38	24.8%	G	0.80	
Gradko	50% TEA in acetone	2019	F	Greenwich	12	41	39	5.8%	G	0.95	
Gradko	50% TEA in acetone	2019	F	Greenwich	12	37	34	10.8%	G	0.90	
Gradko	50% TEA in acetone	2019	F	Greenwich	12	33	33	0.3%	G	1.00	
Gradko	50% TEA in acetone	2019	F	Greenwich	12	36	33	9.8%	G	0.91	
Gradko	50% TEA in acetone	2019	F	Hammersmith and Fulham	11	57	59	-2.3%	G	1.02	
Gradko	50% TEA in acetone	2019	F	Newham	12	35	30	18.3%	G	0.86	
Gradko	50% TEA in acetone	2019	UB	Royal Borough of Kensington and Chelsea	12	27	27	-2.2%	G	1.02	
Gradko	50% TEA in acetone	2019	F	Sandwell MBC	10	40	33	20.3%	G	0.83	
Gradko	50% TEA in acetone	2019	UB	Sandwell MBC	11	17	15	10.5%	S	0.91	
Gradko	50% TEA in acetone	2019	UB	Sandwell MBC	12	25	22	18.2%	G	0.85	
Gradko	50% TEA in acetone	2019	F	Sandwell MBC	12	39	30	0.9%	S	1.00	
Gradko	50% TEA in acetone	2019		<b>Overall Factor<sup>3</sup> (29 studies)</b>					<b>Use</b>	<b>0.89</b>	

Figure C.3 DEFRA National Bias Adjustment Output for 2020

National Diffusion Tube Bias Adjustment Factor Spreadsheet										Spreadsheet Version Number: 03/21	
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 2021 <a href="#">LAQM Helpline Website</a>	
The LAQM Helpline is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.					Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.						
Step 1:	Step 2:	Step 3:	Step 4:								
Select the Laboratory that Analyses Your Tubes from the Drop-Down List	Select a Preparation Method from the Drop-Down List	Select a Year from the Drop-Down List	Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor shown in blue at the foot of the final column.								
If a laboratory is not shown, we have no data for this laboratory.	If a preparation method is not shown, we have no data for this method at this laboratory.	If a year is not shown, we have no data.	If you have your own co-location study then see footnote 1. If uncertain what to do then contact the Local Air Quality Management Helpline at LAQMHelpline@bureauveritas.com or 0800 0327953								
Analysed By <sup>1</sup>	Method	Year	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m <sup>3</sup> )	Automatic Monitor Mean Conc. (Cm) (µg/m <sup>3</sup> )	Bias (B)	Tube Precision <sup>2</sup>	Bias Adjustment Factor (A) (Cm/Dm)	
Gradko	50% TEA in Acetone	2020	UC	Falkirk Council	10	33	28	24.9%	G	0.80	
Gradko	50% TEA in Acetone	2020	UB	Falkirk Council	11	16	12	33.8%	G	0.75	
Gradko	50% TEA in acetone	2020	UB	Middlesbrough	10	17	12	44.3%	G	0.69	
Gradko	50% TEA in acetone	2020	R	Royal Borough of Windsor and Maidenhead	12	29	25	17.3%	G	0.85	
Gradko	50% TEA in acetone	2020	R	Royal Borough of Windsor and Maidenhead	12	24	22	11.7%	G	0.90	
Gradko	50% TEA in acetone	2020	SU	Redcar & Cleveland Borough Council	11	16	13	23.4%	P	0.81	
Gradko	50% TEA in acetone	2020	R	Newham	10	29	24	18.2%	G	0.85	
Gradko	50% TEA in acetone	2020	R	Sandwell MBC	12	34	27	26.9%	G	0.79	
Gradko	50% TEA in acetone	2020	B	Sandwell MBC	9	14	11	22.9%	S	0.81	
Gradko	50% TEA in acetone	2020	R	Sandwell MBC	11	25	23	9.4%	S	0.91	
Gradko	50% TEA in acetone	2020	UB	Sandwell Metropolitan Borough Council	11	21	19	9.4%	G	0.91	
Gradko	50% TEA in acetone	2020	KS	Margelbone Road Intercomparison	12	57	43	33.0%	G	0.75	
Gradko	50% TEA in acetone	2020	R	London Borough of Richmond upon Thames	12	22	20	9.4%	G	0.91	
Gradko	50% TEA in acetone	2020	B	London Borough of Richmond upon Thames	9	19	16	20.3%	G	0.83	
Gradko	50% TEA in acetone	2020		<b>Overall Factor<sup>3</sup> (14 studies)</b>					<b>Use</b>	<b>0.82</b>	

### **Diffusion Tube Annualisation**

In 2018, data capture for a majority of diffusion tube sites was greater than 75%, with the exception of Site 15N.

In 2019, data capture for all diffusion tube sites was greater than 75% and no annualisation was required.

In 2020, due to COVID-19 lockdown, most of the diffusion tubes had data capture lower than 75%. The sites requiring annualisation were: 1N, 2N, 5N, 6N, 35N, 37N, 38N, 41N and 47N.

The data for these respective sites were therefore subsequently annualised using DEFRA's 'Diffusion Tube Data Processing Tool V1.1', in accordance with the methodology stipulated in LAQM.TG16.

The AURN background sites used for annualisation were Leominster (Suburban Background), Leamington Spa (Urban Background), Swindon Walcot (Urban Background) and Oxford St Ebbes (Urban Background), all sites had annual data capture of >85% and were within 50 miles radius of Tewkesbury.

An annualisation summary is presented in Table C.2.

### **NO<sub>2</sub> Fall-off with Distance from the Road**

Wherever possible, local authorities should ensure that monitoring locations are representative of exposure. However, where this is not possible, the NO<sub>2</sub> concentration at the nearest location relevant for exposure should be estimated using the Diffusion Tube Data Processing Tool/NO<sub>2</sub> fall-off with distance calculator available on the LAQM Support website.

No NO<sub>2</sub> monitoring locations within Tewkesbury Borough Council required distance correction during 2018, 2019 or 2020 as all were well below 36 µg/m<sup>3</sup>.

**Table C.2 – Annualisation Summary (concentrations presented in  $\mu\text{g}/\text{m}^3$ ) for 2018**

Site ID	Annualisation Factor Leominster	Annualisation Factor Leamington Spa	Annualisation Factor Swindon Walcot	Annualisation Factor Oxford St Ebbes	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean	Comments
15N	1.0002	1.0026	1.0645	1.0081	1.0189	30.3	30.9	

**Table C.3 – Annualisation Summary (concentrations presented in  $\mu\text{g}/\text{m}^3$ ) for 2020**

Site ID	Annualisation Factor Leominster	Annualisation Factor Leamington Spa	Annualisation Factor Swindon Walcot	Annualisation Factor Oxford St Ebbes	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean	Comments
1N	0.9556	0.8632	0.9274	0.9130	0.9148	22.3	20.4	
2N	0.9556	0.8632	0.9274	0.9130	0.9148	16.7	15.3	
5N	0.9556	0.8632	0.9274	0.9130	0.9148	21.0	19.2	
6N	0.9556	0.8632	0.9274	0.9130	0.9148	25.0	22.9	
35N	0.9556	0.8632	0.9274	0.9130	0.9148	29.7	27.2	
37N	0.9556	0.8632	0.9274	0.9130	0.9148	20.6	18.9	
38N	0.9556	0.8632	0.9274	0.9130	0.9148	22.5	20.6	
41N	0.9556	0.8632	0.9274	0.9130	0.9148	26.9	24.6	
47N	0.9556	0.8632	0.9274	0.9130	0.9148	25.5	23.3	

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

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

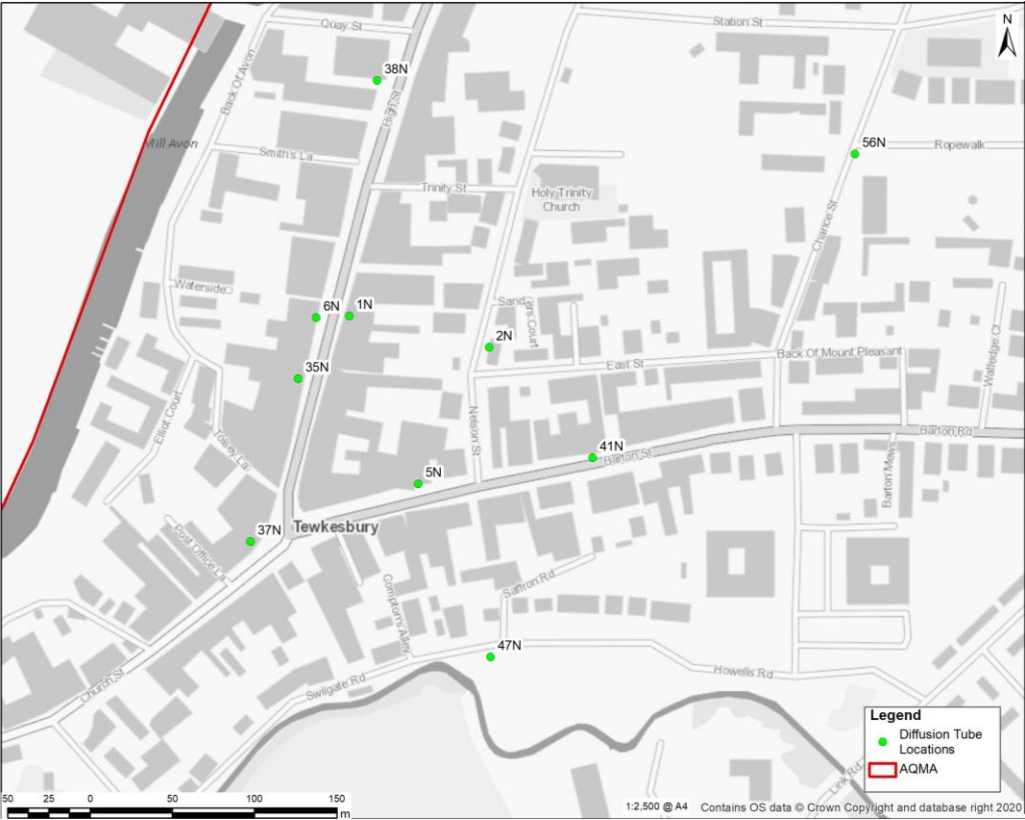
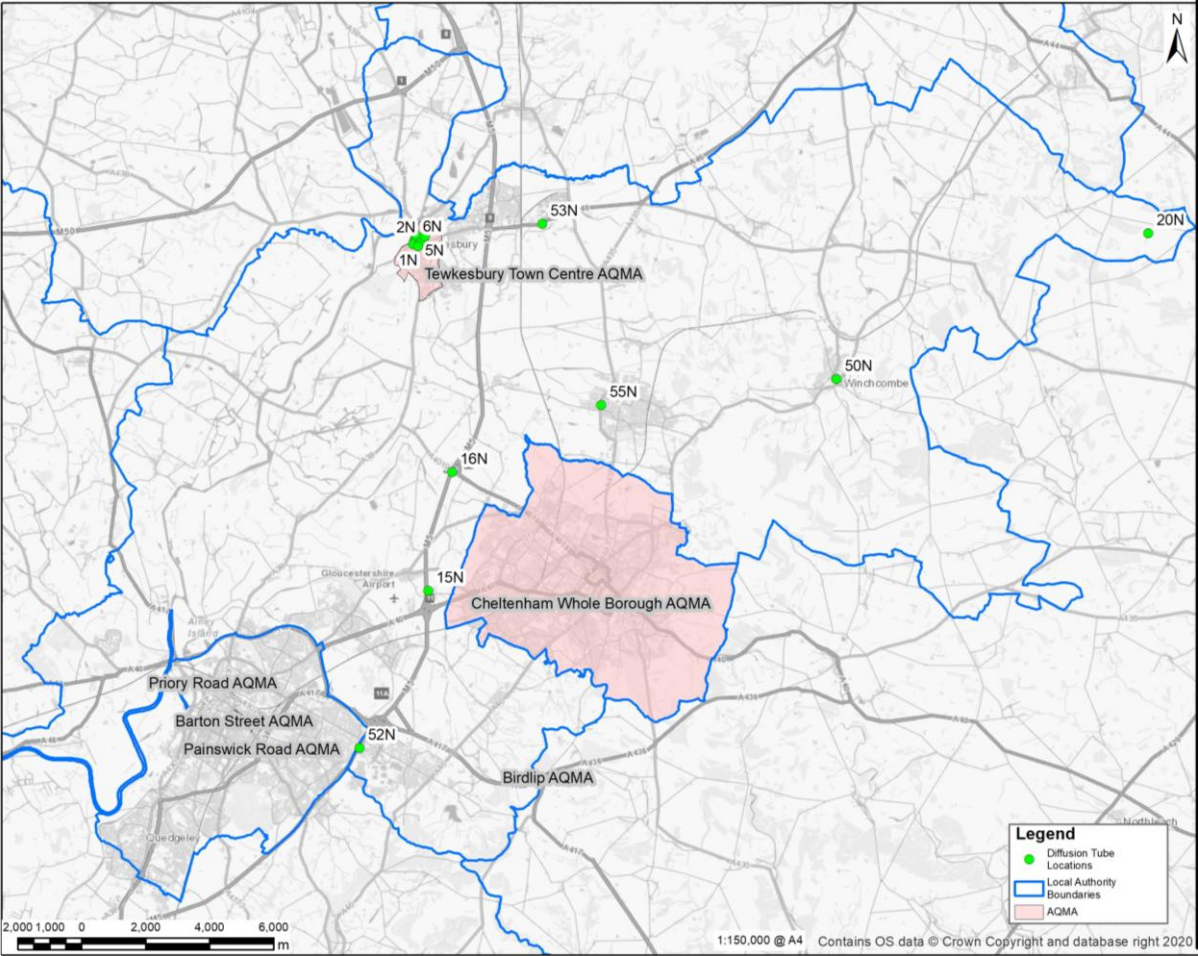


Figure D.2 – Map of Non-Automatic Monitoring Site- Wider Area



## Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England<sup>10</sup>

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

<sup>10</sup> The units are in microgrammes of pollutant per cubic metre of air (µg/m<sup>3</sup>).

## Appendix F: Impact of COVID-19 upon LAQM

COVID-19 has had a significant impact on society. Inevitably, COVID-19 has also had an impact on the environment, with implications to air quality at local, regional and national scales.

COVID-19 has presented various challenges for Local Authorities with respect to undertaking their statutory LAQM duties in the 2021 reporting year. Recognising this, Defra provided various advice updates throughout 2020 to English authorities, particularly concerning the potential disruption to air quality monitoring programmes, implementation of AQAPs and LAQM statutory reporting requirements. Defra has also issued supplementary guidance for LAQM reporting in 2021 to assist local authorities in preparing their 2021 ASR. Where applicable, this advice has been followed.

Despite the challenges that the pandemic has given rise to, the events of 2020 have also provided Local Authorities with an opportunity to quantify the air quality impacts associated with wide-scale and extreme intervention, most notably in relation to emissions of air pollutants arising from road traffic. The vast majority (>95%) of AQMAs declared within the UK are related to road traffic emissions, where attainment of the annual mean AQS objective for NO<sub>2</sub> is considered unlikely. On 23<sup>rd</sup> March 2020, the UK Government released official guidance advising all members of public to stay at home, with work-related travel only permitted when absolutely necessary. During this initial national lockdown (and to a lesser extent other national and regional lockdowns that followed), marked reductions in vehicle traffic were observed; Department for Transport (DfT) data<sup>11</sup> suggests reductions in vehicle traffic of up to 70% were experienced across the UK by mid-April, relative to pre COVID-19 levels.

This reduction in travel in turn gave rise to a change of air pollutant emissions associated with road traffic, i.e. nitrous oxides (NO<sub>x</sub>), and exhaust and non-exhaust particulates (PM). The Air Quality Expert Group (AQEG)<sup>12</sup> has estimated that during the initial lockdown period in 2020, within urbanised areas of the UK reductions in NO<sub>2</sub> annual mean concentrations were between 20 and 30% relative to pre-pandemic levels, which represents an absolute

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<sup>11</sup> Prime Minister's Office, COVID-19 briefing on the 31<sup>st</sup> of May 2020

<sup>12</sup> Air Quality Expert Group, Estimation of changes in air pollution emissions, concentrations and exposure during the COVID-19 outbreak in the UK, June 2020

reduction of between 10 to 20  $\mu\text{g}/\text{m}^3$  if expressed relative to annual mean averages. During this period, changes in  $\text{PM}_{2.5}$  concentrations were less marked than those of  $\text{NO}_2$ .  $\text{PM}_{2.5}$  concentrations are affected by both local sources and the transport of pollution from wider regions, often from well beyond the UK. Through analysis of AURN monitoring data for 2018-2020, AQEG have detailed that  $\text{PM}_{2.5}$  concentrations during the initial lockdown period are of the order 2 to 5  $\mu\text{g}/\text{m}^3$  lower relative to those that would be expected under business-as-usual conditions.

As restrictions are gradually lifted, the challenge is to understand how these air quality improvements can benefit the long-term health of the population.

## **Impacts of COVID-19 on Air Quality within Tewkesbury Borough Council**

Impact of COVID-19 on TBC's local air quality include:

- Between April and July in 2020, the diffusion tubes were not changed in line with DEFRA calendar due to the risk assessment not covering COVID-19.

## **Opportunities Presented by COVID-19 upon LAQM within Tewkesbury Borough Council**

Opportunity emerged as a consequence of COVID-19 include:

- Pandemic restrictions and lockdown caused lowered traffic flows and in turn caused lower  $\text{NO}_2$  concentrations which had positive impacts on the local air quality. The  $\text{NO}_2$  concentrations were already below the threshold before the pandemic but the data shows how low these can be further improved if the reduced traffic continues.

## **Challenges and Constraints Imposed by COVID-19 upon LAQM within Tewkesbury Borough Council**

Details on any challenges and/or constraints that have been experienced in relation to LAQM within 2020 that can be attributed to the pandemic are shown below:

- As with previous years, a national bias adjustment factor has been utilised to adjust the diffusion tube results for 2020. Within 2019 there were 29 co-location studies that

were utilised to calculate the bias factor for the laboratory and preparation method used. For 2020, this number has reduced to only 14 studies. There is therefore the potential for there to be a greater degree of uncertainty associated with the resultant annual mean NO<sub>2</sub> concentrations in 2020 than in previous years. **Large Impact**

- During 2020, access to a number of diffusion tube monitoring sites was restricted due to their locations on residential buildings. Therefore, it was not possible to maintain diffusion tube exposure periods for March to June in line with the national monitoring calendar for a number of sites. This has affected data capture within 2020, resulting in several monitoring sites having to be annualised. **Medium Impact**

The impacts as presented above are aligned with the criteria as defined in Table F.1, with professional judgement considered as part of their application.

Table F.1 - Impact Matrix

Category	Impact Rating: None	Impact Rating: Small	Impact Rating: Medium	Impact Rating: High
Automatic Monitoring – Data Capture (%)	More than 75% data capture	50 to 75% data capture	25 to 50% data capture	Less than 25% data capture
Automatic Monitoring – QA/QC Regime	Adherence to requirements as defined in LAQM.TG16	Routine calibrations taken place frequently but not to normal regime. Audits undertaken alongside service and maintenance programmes	Routine calibrations taken place infrequently and service and maintenance regimes adhered to. No audit achieved	Routine calibrations not undertaken within extended period (e.g. 3 to 4 months). Interruption to service and maintenance regime and no audit achieved
Passive Monitoring – Data Capture (%)	More than 75% data capture	50 to 75% data capture	25 to 50% data capture	Less than 25% data capture
Passive Monitoring – Bias Adjustment Factor	Bias adjustment undertaken as normal	<25% impact on normal number of available bias adjustment colocation studies (2020 vs 2019)	25-50% impact on normal number of available bias adjustment studies (2020 vs 2019)	>50% impact on normal number of available bias adjustment studies (2020 vs 2019) and/or applied bias adjustment factor studies not considered representative of local regime
Passive Monitoring – Adherence to Changeover Dates	Defra diffusion tube exposure calendar adhered to	Tubes left out for two exposure periods	Tubes left out for three exposure periods	Tubes left out for more than three exposure periods
Passive Monitoring – Storage of Tubes	Tubes stored in accordance with laboratory guidance and analysed promptly.	Tubes stored for longer than normal but adhering to laboratory guidance	Tubes unable to be stored according to be laboratory guidance but analysed prior to expiry date	Tubes stored for so long that they were unable to be analysed prior to expiry date. Data unable to be used
AQAP – Measure Implementation	Unaffected	Short delay (<6 months) in development of a new AQAP, but is on-going	Long delay (>6 months) in development of a new AQAP, but is on-going	No progression in development of a new AQAP
AQAP – New AQAP Development	Unaffected	Short delay (<6 months) in development of a new AQAP, but is on-going	Long delay (>6 months) in development of a new AQAP, but is on-going	No progression in development of a new AQAP

## Appendix G: AQMA Revocation Assessment

This appendix provides an assessment of air quality in the Tewkesbury Town Centre AQMA and presents the evidence to support its revocation.

Consideration will be given to:

- The monitoring data obtained over a number of years within the AQMA;
- The projected roadside NO<sub>2</sub> concentration;
- Local and national trends in NO<sub>2</sub> emissions; and
- Local and regional factors that may impact on the AQMA.

### Review & Assessment

Part IV of the Environment Act 1995 (the Act) introduced the Local Air Quality Management regime that places a legal duty on local authorities to regularly review and assess air quality in their areas against AQS objective levels. The AQS objective levels for England are set out in the Air Quality (England) Regulations 2000 and the Air Quality (England) (Amendment) Regulations 2002 and are shown in Table E.1.

Local authorities must declare an AQMA where any of the AQS objectives are exceeded and subsequently set out the measures they intend to put in place to secure compliance with the AQS objectives under an AQAP.

With effective implementation of the Action Plan and national policies aimed at reducing the emission of pollutants it is expected that the air quality within AQMAs should improve to a point that concentrations will remain below the AQS objectives. A revocation of an AQMA can then be formally declared by Order under section 83 of the Environment Act.

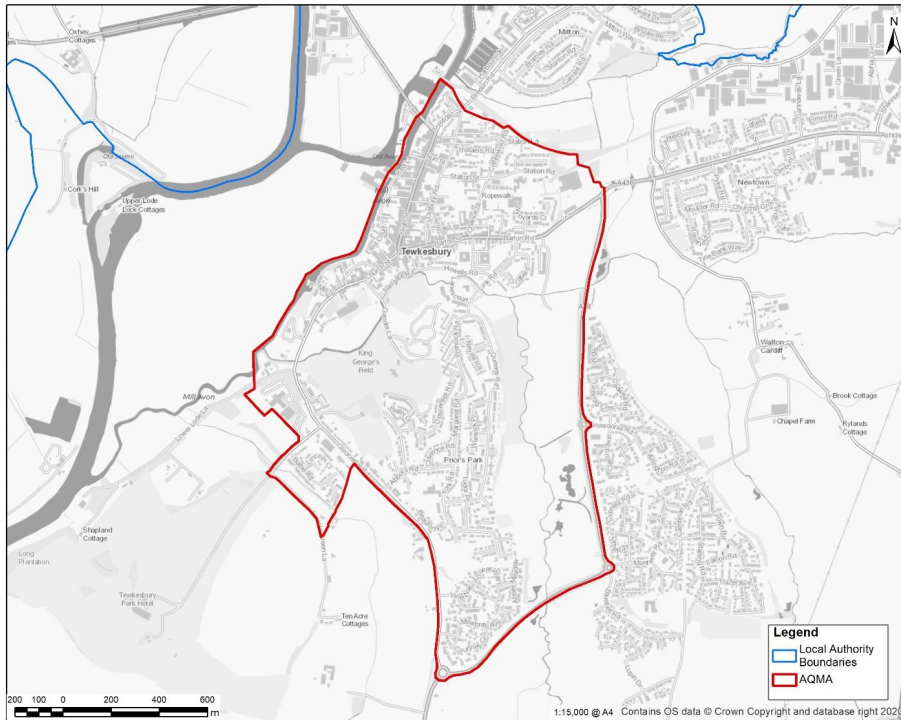
Each year an ASR must be prepared by local authorities detailing the strategies employed to improve air quality and any progress that has been made. Comments made by Defra in relation to Tewkesbury's ASR 2018 support the Council's plans to revoke Tewkesbury Town Centre AQMA, if pollution levels remain more than 10% below the AQS objective.

### Tewkesbury Town Centre AQMA

Tewkesbury Town Centre AQMA was declared in 2008 in order to address traffic related NO<sub>2</sub> concentrations in excess of the annual mean AQS objective. The AQMA encompasses

Tewkesbury town centre, along with area enclosed by A438 in the north, Gloucester Road on the west and A38 in the south and east (Figure G.1).

**Figure G.1 Tewkesbury Town Centre AQMA**



## Revoking an AQMA: The Legal Framework & Guidance

### The Environment Act 1995

Section 83 (2b) of the Environment Act (1995) states that an AQMA:

*“.....may, as a result of a subsequent air quality review, be revoked by such an order, if it appears on that subsequent air quality review that the air quality standards and objectives are being achieved, and are likely throughout the relevant period to be achieved, within the designated area”.*

## Statutory Guidance

Guidance on the requirements for revoking an AQMA are set out in statutory guidance LAQM PG16 and LAQM TG 16.

PG 16 states that:

- *“An AQMA can be revoked where a review demonstrates that air quality objectives are being met and will continue to do so. The guidance suggests that monitoring results should have been below national objective levels for 3 years or more prior to revocation.*
- *A copy of the revocation should be submitted to Defra and other statutory consultees and made publicly available to ensure the public and local businesses are aware of the situation. It is expected that the local authority will take the relevant action imposed by the Order within four months following receipt of comments from Defra.”*

TG 16 states that:

- *“In some instances detailed modelling to revoke an AQMA may not be necessary and an AQMA may be amended or revoked following a screening assessment or on the basis of robust monitoring evidence.*
- *Pollutant concentrations may vary significantly from one year to the next, due to the influence of meteorological conditions, and it is important that authorities avoid cycling between declaring, revoking and declaring again, due simply to these variations.”*

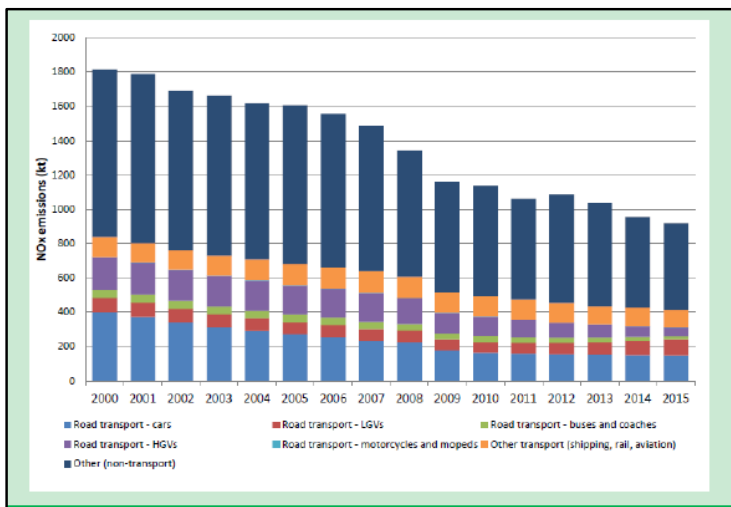
Therefore, before revoking an AQMA on the basis of measured pollutant concentrations, the Council needs to be reasonably certain that any future exceedances (that might occur in more adverse meteorological conditions) are unlikely. For this reason, it is expected that authorities will need to consider 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 AQAP, together with information from national monitoring on high and low pollution years.

## National Influence

National strategies, policies and plans have and will continue to influence local polluting emissions. Total UK emissions of NO<sub>x</sub> fell by almost 70% between 1970 and 2015 and by

over 19% between 2010 and 2015<sup>13</sup>. Figure G.2 shows the reduction for each source sector with cars having the largest proportion of transport emissions. It also shows an increasing proportion of Light Goods Vehical (LGV) emissions from 2010 above that of 2000 which mirrors the increasing proportion of LGVs in the local traffic fleet.

**Figure G.2 Annual UK Nitrogen Oxides Emissions Since 2000**



Future influence on emissions is considered in a revised Clean Air Strategy<sup>5</sup> with a major transport emission objective that states:

*“We will end the sale of new conventional petrol and diesel cars and vans by 2040. We will position the UK as the best place in the world to develop, manufacture and use zero exhaust emissions vehicles and, during the transition, we will ensure that the cleanest conventional vehicles are driven on our roads”.*

This transition to ultra-low and zero emission vehicles present the largest reductions in future polluting emissions.

<sup>13</sup> DEFRA, July 2017 'UK Plans for Tackling Roadside NO<sub>2</sub> Concentrations'

Department for Transport (DfT) road traffic forecasts<sup>14</sup> provide future numbers, compositions and emissions based on seven scenarios linked to changing population, economic and social well-being and technological changes. The findings include:

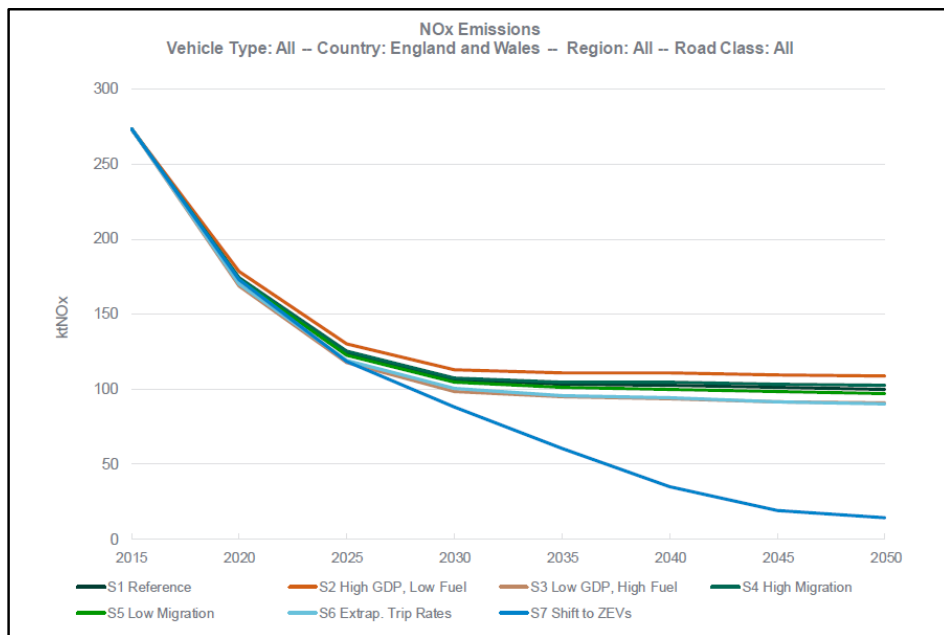
- From 2015, traffic is forecast to grow by between 17% and 51% by 2050;
- Traffic growth on the Strategic Road Network (SRN) ranges between growth of 32% and 66% by 2050;
- Forecast growth on principal roads and minor roads is between 10%-47% and 11%-50% respectively;
- Car traffic is forecast to grow between 11% and 48% by 2050, whilst LGV traffic is forecast to continue growing significantly in all scenarios (between 23% and 108%);
- HGV traffic growth is forecast to be lower than other vehicle types, with growth ranging from 5% to 12% by 2050;
- Congestion is forecast to grow as a result of increases in traffic. The proportion of traffic in congested conditions in 2050 is forecast to range from 8% to 16% depending on the scenario, compared to 7% in 2015; and
- 'There is great uncertainty around the possible impact of transport technology on road traffic demand and it is unclear how far our existing understanding of the drivers of demand will continue to apply'.

In terms of future transport emissions, the national transport model (NTM) produces forecasts of emissions of Carbon Dioxide (CO<sub>2</sub>), NO<sub>x</sub> and PM<sub>10</sub> measured at the tailpipe (though this does not capture any upstream emissions produced) as shown in Figure G.3. Scenarios 1-6 take account of the impact of committed transport policies to reduce emissions from road travel whilst scenario 7 assumes a higher level of ULEV uptake, assuming 97% of cars and LGVs are ZEVs by 2050 and almost all cars and LGVs sold from 2040 have zero emissions at tailpipe. For NO<sub>x</sub> emissions the forecast shows a decline of between 60% and 95% by 2050 (Figure G.3). Despite the predicted increase in vehicle numbers the introduction of low emission vehicles is likely to lead to continued reduction in NO<sub>2</sub> levels from transport.

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<sup>14</sup> Department for Transport (DfT), July 2018 'Road Traffic Forecast 2018 Moving Britain Forward'

Figure G.3 Forecast NO<sub>x</sub> Road Traffic Emissions for England & Wales (kt)



## Regional Influence

Gloucester County Council’s (GCC) Local Transport Plan<sup>7</sup> (LTP) (2020- 2041) sets the strategic transport vision for the county to 2041. The LTP is structured around a number of travel corridors, each of which have distinctive transport issues and opportunities set out in six spatial strategies entitled Connecting Place Strategies<sup>8</sup> (CPS), Tewkesbury being one of the CPS.

A ‘Link and Place’ Spectrum<sup>15</sup> approach was applied with the aim to identify travel focused strategy areas based on connections, moving away from a district based perspective. Each CPS area sets out priorities based on strategic, major and local schemes. LTP schemes represent the transport priorities for Gloucestershire and into bordering counties, rather than a commitment by the County Council to funding. Priorities identified in this LTP provide the

<sup>15</sup> Gloucestershire County Council. Annex 4.0 Gloucestershire Local Transport Plan- Link and Place Spectrum.. Available at: <https://www.gloucestershire.gov.uk/media/2103355/annex-40-ltp-link-and-place-spectrum-final-v10.pdf>

basis for future funding bids, as opportunities arise, and discussions with funding partners, such as government, Gloucestershire Local Enterprise Partnership (GFirst LEP), Public Health, statutory bodies, transport operators, District Councils, Parish & Town Councils, developers and the private sector.

Policy LTP PD 0.1 – Reducing Transport Carbon Emissions and Adapting to Climate Change, aims to reduce transport carbon emissions by 2045 and improve air quality in the county by addressing travel demand, promoting the use of sustainable modes of transport and the uptake of ultra-low emission vehicles to tackle climate change.

Some of the measures proposed by Policy LTP PD 0.1 include:

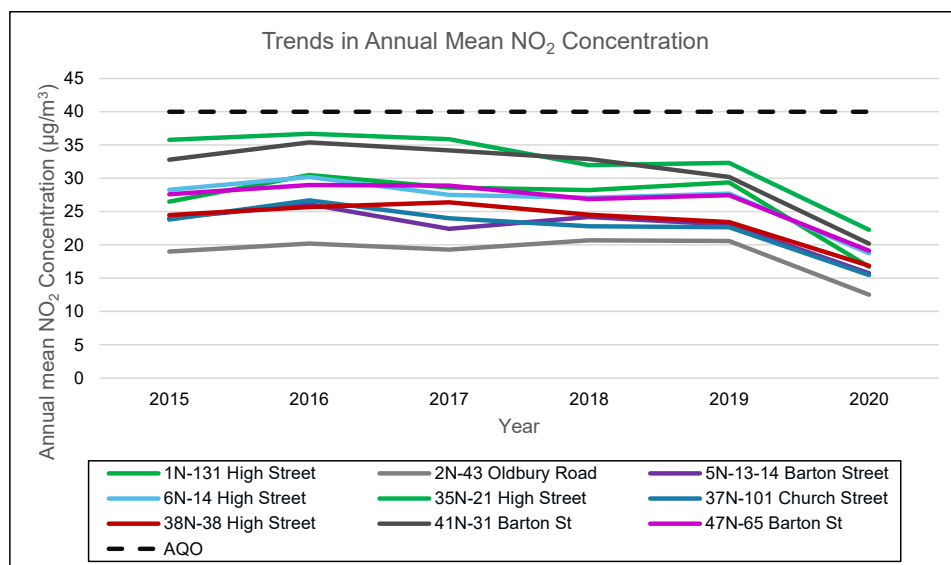
- Work in partnership with District Councils, neighbouring authorities, the GFirst LEP, Western Gateway Sub-National Transport Body, Highways England, Homes England and Department for Transport and any other necessary government bodies, to seek investment in sustainable transport and active travel infrastructure as funding opportunities arise.
- Work towards electric vehicle charging points being provided at interchange hubs and other key locations.
- Work with public transport providers to accelerate the change to clean vehicles.
- Encourage behaviour change to reduce travel demand, promote sustainable transport modes and develop lower-emission driving. This will align closely with our policy of influencing travel behaviour change through the Thinktravel programme.
- Resolve to implement and strengthen the Gloucestershire Sustainable Energy Strategy and the Climate Change Strategy, by embedding the principles of a transition towards a circular economy.
- Resolve to deliver on the recommendations following the County Council's declaration of a climate change emergency, through the development of a 'Carbon Reduction Pathway', and by identifying a climate change resilience adaptation strategy including risk mitigation.
- Develop and maintain a comprehensive bus network supported by interchange hubs across rural and urban areas, to improve connectivity within and across the county boundary.
- Developers are required to design and implement their development to deliver sustainable transport, with appropriate connectivity to the existing transport network, good access to public transport, and a high permeability to walk, cycle and be mobility friendly.

Other policies which also have impact on the air quality include: Policy LTP PD0.2 – Local Environmental Protection, Policy LTP PD 0.5 Community Health and Wellbeing and Policy LTP PD 1.6 – Transport Interchange Hubs.

## Air Quality within Tewkesbury Town Centre AQMA

A comparison of the annual mean AQS objective for NO<sub>2</sub> against the ratified monitoring results for the past 6 years from the diffusion tubes located within Tewkesbury Town Centre AQMA can be seen in Figure G.4.

**Figure G.4 Tewkesbury Town Centre AQMA NO<sub>2</sub> Diffusion Tube Monitoring Trend**



As can be seen from Figure G.4, NO<sub>2</sub> results from the nine monitoring locations within the AQMA have been consistently below the annual mean AQS objective of 40 µg/m<sup>3</sup> for 6 straight years. Furthermore, given that the concentrations have consistently been below 60 µg/m<sup>3</sup> it is safe to assume that the hourly mean AQS objective has also not been exceeded during this period.

## Predicted Trends

To provide confidence that compliance with the objective will continue into the future, and to account for the potentially anomalous concentrations monitored within 2020, DEFRA's

Roadside NO<sub>2</sub> Projection factors<sup>16</sup> (Table G.2) have been used, based on the 2019 monitoring data, to predict concentrations for future years (2021-2025). The adjustment factors applied for Tewkesbury were the 'Rest of UK HDV=<10%'. The projected results for the diffusion tube locations within the AQMA are presented in Table G.1.

**Table G.1 Projected Annual NO<sub>2</sub> mean concentration**

Site	Monitored Annual NO <sub>2</sub> mean concentration (µg/m <sup>3</sup> )	Projected Annual NO <sub>2</sub> mean concentration (µg/m <sup>3</sup> )				
	2019	2021	2022	2023	2024	2025
1N-131 High Street	29.4	26.3	24.9	23.6	22.3	21.1
2N-43 Oldbury Road	20.6	18.5	17.5	16.6	15.7	14.8
5N-13-14 Barton Street	23.0	20.7	19.5	18.5	17.5	16.6
6N-14 High Street	27.7	24.8	23.5	22.2	21.0	19.9
35N-21 High Street	32.3	29.0	27.4	25.9	24.5	23.3
37N-101 Church Street	22.7	20.3	19.2	18.2	17.2	16.3
38N-38 High Street	23.4	21.0	19.8	18.8	17.8	16.9
41N-31 Barton St	30.2	27.1	25.6	24.3	23.0	21.8
47N-65 Barton St	27.4	24.6	23.2	22.0	20.9	19.8

From Table G.1, it can be observed that the forecasted concentrations of NO<sub>2</sub> decrease over the five year period. The Government's commitment to net zero emissions by 2050 and the adoption of the Road to Zero transport strategy are expected to deliver significant further reductions in emissions from road transport. In its publication "Road Traffic Forecasts

<sup>16</sup> DEFRA Roadside No2 Projection Factors. Available at: <https://laqm.defra.gov.uk/tools-monitoring-data/roadside-no2-projection-factor.html>

2018<sup>17</sup> the Department of Transport has predicted that vehicular emissions of NO<sub>2</sub> will fall between 60% and 90%. In turn, this provides confidence that the Tewkesbury Town Centre AQMA can be revoked without concern that the objective concentration will be exceeded, unless significant new sources arise, at which point the NO<sub>2</sub> concentrations will be assessed again. The Council will continue its existing monitoring regime in order to observe this.

**Table G.2 DEFRA's Roadside NO<sub>2</sub> Projection Factors**

Projecting Annual Mean Roadside NO <sub>2</sub> Concentrations to Future Years						
Year	Adjustment Factor to be Applied					Worked Example
	Central London	Inner London	Outer London	Rest of UK (HDV = <10%)	Rest of UK (HDV >10%)	
2018	1.000	1.000	1.000	1.000	1.000	The measured NO <sub>2</sub> concentration at a roadside site in Outer London in 2019 is 44.5µg/m <sup>3</sup> . The projected concentration for 2021 would be: 44.5 x (0.829/0.945) = 39.0µg/m <sup>3</sup> .
2019	0.813	0.909	0.945	0.953	0.942	
2020	0.766	0.811	0.878	0.906	0.889	
2021	0.740	0.767	0.829	0.855	0.835	
2022	0.715	0.727	0.775	0.807	0.785	
2023	0.696	0.693	0.738	0.765	0.743	Roadside locations are typically within 1 to 5 metres of the kerbside, but may extend up to 15 metres depending upon the road configuration and traffic flow.
2024	0.676	0.661	0.695	0.724	0.703	
2025	0.660	0.634	0.657	0.686	0.667	
2026	0.652	0.616	0.630	0.653	0.637	
2027	0.645	0.598	0.606	0.622	0.610	
2028	0.638	0.580	0.582	0.595	0.587	
2029	0.632	0.563	0.560	0.571	0.566	
2030	0.626	0.546	0.542	0.550	0.549	

<sup>17</sup> Department of Transport. Road Traffic Forecasts 2018. Available at: <https://www.gov.uk/government/publications/road-traffic-forecasts-2018>

## Summary, Conclusion and Recommendation

This assessment sets out the evidence relied upon by TBC in seeking to revoke the Tewkesbury Town Centre AQMA.

Part IV of the Environment Act 1995 requires Local Authorities to review air quality in its area and assess whether AQS objectives will be achieved. Where it has been shown that the AQS objectives will not be achieved Local Authorities must declare an AQMA and put an AQAP in place to bring air quality within acceptable levels.

Where it can be subsequently demonstrated that AQS objectives are being and will continue to be met a Local Authority can revoke an AQMA by Order under the Environment Act 1995.

The Tewkesbury Town Centre AQMA was designated in 2008 following exceedance of the annual mean NO<sub>2</sub> AQS objective linked to emissions from road traffic. Since that time, monitoring has shown a continued reduction in pollutant values and concentrations have now been consistently below the AQS objectives for a number of years.

National, regional and local policies have influenced the reduction in polluting emissions within the AQMA and it is reasonable to expect that further reductions will be achieved through the increasing use of ultra-low and zero emission vehicles.

Having considered the historical monitoring data associated with the Tewkesbury Town Centre AQMA, national trends in emissions and any likely impacts on the air quality within the AQMA the Council is satisfied that the AQMA can be revoked. Whilst NO<sub>2</sub> concentrations within the Tewkesbury AQMA have been consistently below the AQS objective concentration for 6 years, it has also been demonstrated that this is likely to continue into the future.

It is therefore recommended that the Tewkesbury Town Centre AQMA be revoked at the earliest opportunity. A draft Revocation Order is presented in Appendix H: Draft AQMA Revocation Order, which provided DEFRA grants approval via the appraisal process, will be enacted on 1<sup>st</sup> January 2022.

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## Appendix H: Draft AQMA Revocation Order

### Tewkesbury Borough Council Order 2021 Environment Act 1995 Part IV Section 83(2)(b) Order Revoking an Air Quality Management Area

Tewkesbury Borough Council, in exercise of the powers conferred on it by Section 83(2)(b) of the Environment Act 1995 hereby makes the following order:

1. This Order shall revoke the area known as the Tewkesbury Town Centre AQMA (as shown in the attached map) declared for the Nitrogen dioxide (NO<sub>2</sub>) - Annual Mean on 05/12/2008.
2. This Order shall come into force on 1<sup>st</sup> January 2022.

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The Common Seal of Tewkesbury Borough Council

Was hereunto affixed

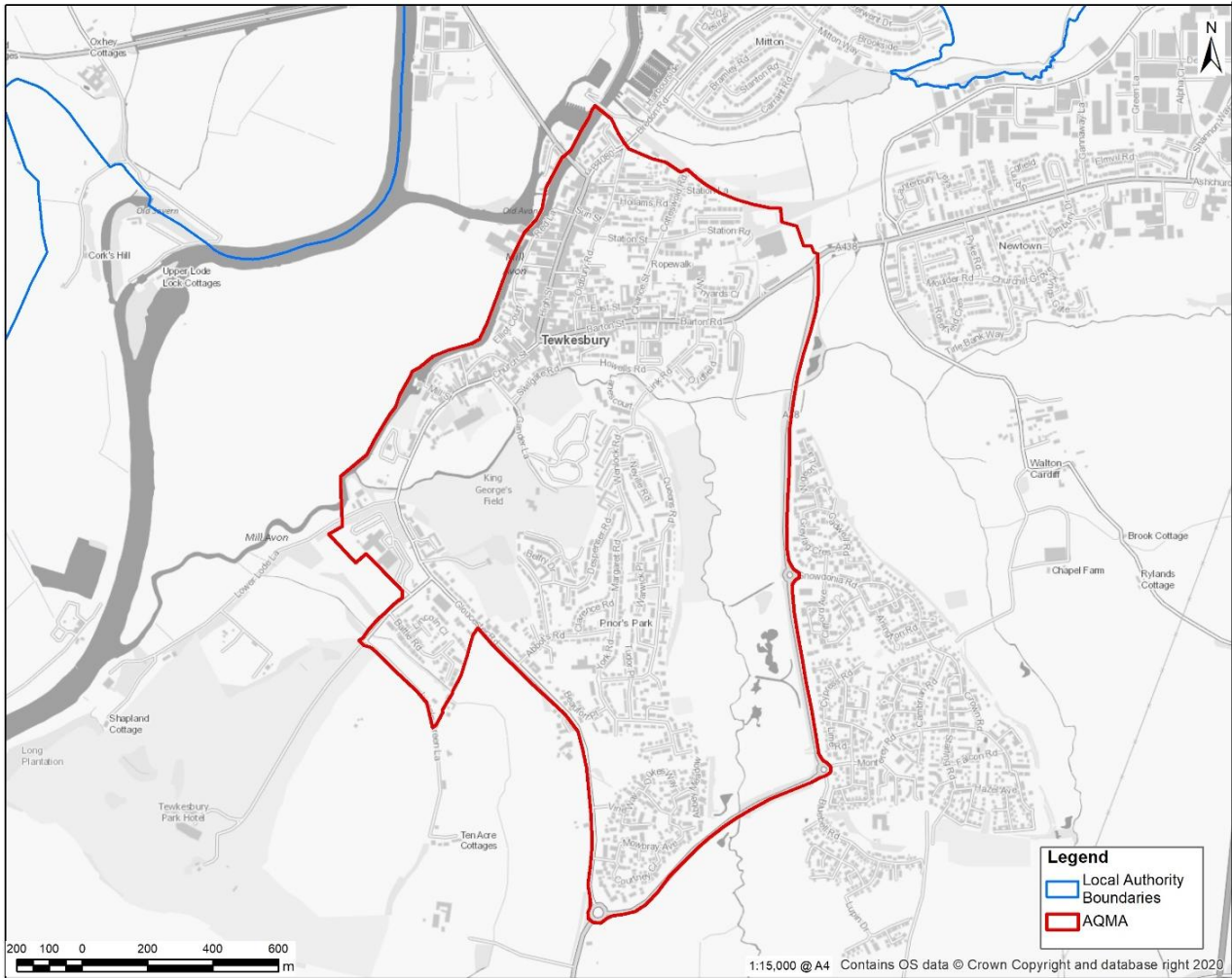
In the presence of:

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Dated:

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## 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'
AQEG	Air Quality Expert Group
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
AURN	Automatic Urban and Rural Network
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EU	European Union
FDMS	Filter Dynamics Measurement System
GCC	Gloucestershire County Council
LAQM	Local Air Quality Management
NO <sub>2</sub>	Nitrogen Dioxide
NO <sub>x</sub>	Nitrogen Oxides
PHOF	Public Health Outcomes Framework
PM <sub>10</sub>	Airborne particulate matter with an aerodynamic diameter of 10µm or less
PM <sub>2.5</sub>	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO <sub>2</sub>	Sulphur Dioxide
TBC	Tewkesbury Borough Council

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