CHESTERFIELD
BOROUGH COUNCIL

2021 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995

Local Air Quality Management

June, 2021

Information	Chesterfield Borough Council Details
Local Authority Officer	Steven Payne
Department	Environmental Health
Address	Chesterfield Borough Council Stonegravels Depot Old Brick Works Lane Chesterfield S41 7LF
Telephone	01246 959544
E-mail	steven.payne@chesterfield.gov.uk
Report Reference Number	CBC ASR 2021
Date	28th June 2021

Chesterfield ASR

Derbyshire County Council; Endorsement from the Director of Public Health

Air pollution has a significant effect on public health, and poor air quality is the largest environmental risk to public health in the UK.

The annual status report is fundamental to ensuring the monitoring of trends and identification of areas of local air pollution exposure, and I am pleased to endorse this report from Chesterfield Borough Council. The cumulative effect of a range of interventions has the greatest potential to reduce local air pollution and improve population health, as such the annual status report and associated action plans provide an opportunity to engage a range of partners. Since the publication of the last Annual Status Report, a range of public sector organisations have been working together to implement Derbyshire's Air Quality Strategy, with the collective ambition to reduce the health impact of poor air quality for the people of Derbyshire County, and actions taken to date are included within this report.

The ongoing COVID pandemic means that these remain challenging times for the population of Derbyshire, however the changes to the way we live and travel, have demonstrated that large scale behaviour change can be achieved, and can have a positive effect on local air quality as well as our physical and mental health. It is crucial that we learn lessons from this experience and ensure that we create opportunities for positive change.

Dean Wallace, Director of Public Health, Derbyshire County Council

June 2021

Executive Summary: Air Quality in Our Area

Air Quality in Chesterfield

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].

The main pollutant of concern in Chesterfield is Nitrogen Dioxide (NO_2) and the predominant source is traffic. The overall trend in levels of the pollutant continues to show a gradual decline in levels, but year-on-year data show fluctuating levels and at pollutant hotspots this variation has demonstrated intermittent breaches of the Air Quality Objective. **There were no breaches of the Air Quality Objective for Nitrogen Dioxide during 2020**

Further details are given in section 2.5.1

One location (Church Street, Brimington) has required the declaration of an Air Quality Management Area and a second location (Sheffield Road, Stonegravels) is being considered due to the changes in levels of Nitrogen Dioxide.

Details of the Air Quality Management Area can be found on the Chesterfield BC website:https://www.chesterfield.gov.uk/health-and-environment/air-quality/air-quality-management-area-brimington.aspx

A map of the location can be found in Appendix D.

---

[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 2020

[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

Fine particulate matter (PM_{10} and $PM_{2.5}$) is also a concern. The levels measured do not indicate a breach of the Air Quality Objectives, but as a general systemic irritant, measures are required to address the general increase in traffic congestion, as this is the pre-dominant source of pollution across the Borough.

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 even more ambitious than EU requirements 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.

Air quality monitoring, targeted on priority areas (where high traffic flows are located closely to housing), is continuing, allowing informed decisions on planning and public health initiatives to be made.

We attend, and participate in, the following policy and work groups:

i) Active Travel Group

ii) Planning and Health Group

iii) Active Transport Group

iv) Derbyshire Cycle Network

v) Local Sustainable Travel Group

vi) Derbyshire Air Quality Working Group

vii) Derbyshire Environmental Pollution Group

[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

viii) Sheffield City Region Air Quality and Climate Group

Conclusions and Priorities

1) Conclusions

i) The levels of pollution, attributed to traffic, have shown a decrease (following the long term trend), reversing the short-term increase in 2018. Some variation across the borough has been noted, but the decrease is, with a few minor exceptions, uniform. AURN measurements indicate that this trend is duplicated across the wider region.

ii) Current levels within the Air Quality Management Area do not demonstrate an ongoing breach of the Air Quality Objective for Nitrogen Dioxide, but the results have demonstrated variability over time. As such, we will not revoke the Chesterfield No1 Air Quality Management Area, unless the reduction is demonstrated to continue.

iii) Levels on a single stretch of Sheffield Road (where terraced housing is close to a busy section of traffic light controlled road) are all below the Air Quality Objective for Nitrogen Dioxide. However, there is notable variation along the short stretch of road. Once again, given the historic variation in the data, targeted monitoring will continue at this location.

2) Priorities

i) Long term redevelopment schemes may have an adverse effect of the levels of traffic flow through the area of the Air Quality Management Area. The information supplied in support of these planning application required will be scrutinised carefully, in order to ensure that any such impacts are fully mitigated, by the use of (for example) travel plans, supporting car clubs, and supporting active travel schemes.

ii) The East Midland Air Quality Network planning guidance document on air quality has been adopted by Chesterfield BC. We will utilise the planning process to mitigate and reduce air pollution locally, in accordance with the National Institute for Health and Clinical Excellence Quality Statement 181.

iii) We will promote the adoption and use of Low Emission Vehicles, including the “future-proofing” of developments (including workplaces, commercial developments and residential areas) by requiring that the infrastructure for electric charging points be installed as part of the build phase. This is particularly important as central government has set an aspirational target for all new vehicles in the UK to be zero emission at source by 2030 (as contained in *The UK Plan for Tackling Roadside Nitrogen Dioxide*

Concentrations: Detailed Plan, published July 2017). We support the development and adoption of a County wide Low Emission Vehicle Initiative strategy.

iv) Where practical, and possible, Chesterfield BC's internal procurement policy will promote the use of Low Emission Vehicles.

v) Encourage the planting of landscape features (trees and vegetation) such as "green" walls, setbacks, and green spaces, in order to reduce pollution exposure.

vi) The raising of public awareness of air quality and health issues, by the use of the public facing sections of our website, and by publicising national initiatives (such as Clean Air Day)

vii) We will work with County-wide sustainable travel initiatives to support modal shift either through our own workforce or wider population, through active travel, ensuring connectivity within communities and infrastructure such as (but not exclusively) cycle paths.

viii) Complete, and publish, the Air Quality Action Plan related to the Chesterfield Nº 1 AQMA.

Local Engagement and How to get Involved

Most inputs regarding managing air quality are related to the planning of local developments (either by assessing the possible impact of proposed works, or by promoting low emission infrastructure).

Following the VW emissions scandal in 2015, the reduction in the use of diesel fuels appears to be continuing. While this has a positive effect on public health and air quality grounds, it runs contrary to the previous policy which promoted the use of diesel as a positive action for addressing climate change. This continues to undermine the effectiveness of the air quality message. There is also a continued increase in the use of wood burning domestic heating appliances, again promoted as an effective alternative fuel source with positive climate change properties. Research indicates that these have an adverse effect on particulate pollution levels.

Information on action to improve air quality can be found on the Chesterfield BC website at:

https://www.chesterfield.gov.uk/health-and-environment/air-quality.aspx

Details on how the public can act to improve air quality can be found at:

https://www.chesterfield.gov.uk/health-and-environment/air-quality/the-publics-role-in-air-quality.aspx

Table of Contents

Figures

Tables

1 Local Air Quality Management

This report provides an overview of air quality in Chesterfield during 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 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 Chesterfield BC 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

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 Chesterfield BC can be found in Table 2.1. The table presents a description of the single AQMA that is currently designated within Chesterfield 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;

Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at https://www.chesterfield.gov.uk/health-and-environment/air-quality/air-quality-management-area-brimington.aspx

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
Chesterfield No1	Declared 14th August 2015	NO_2 Annual Mean	4 to 18 (evens only) Church Street, Brimington	No	42.5	31.5	AQAP in draft form	Not applicable

☒ **Chesterfield BC confirm the information on UK-Air regarding their AQMA(s) is up to date.**

☐ **Chesterfield BC confirm that all current AQAPs have been submitted to Defra.**

Progress and Impact of Measures to address Air Quality in Chesterfield BC

Defra's appraisal of last year's ASR concluded that the report was well structured and detailed. Annual NO_2 concentrations are generally decreasing steadily across the borough, this trend is also true for annual, and 24-Hour mean, levels for both PM_{10} and $PM_{2.5}$ concentrations at both AURN sites. The conclusions reached were acceptable for all sources and pollutants.

Chesterfield BC has taken forward a number of direct measures during the current reporting year of 2020 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2. 10 measures are included within Table 2.2, with the type of measure and the progress Chesterfield BC have made during the reporting year of 2020 presented. Where there have been, or continue to be, barriers restricting the implementation of the measure, these are also presented within Table 2.2.

Chesterfield BC's priorities for the coming year are:

i) to continue to press for action by the local Highway Authority to implement action to address the issue of congestion and associated poor air quality within Chesterfield No1 AQMA, and by extension the wider area.

ii) to complete the AQMA Action Plan document.

iii) to closely assess applications for housing developments which may place an increased traffic loading on the road network where air pollution levels are close to, or have already exceeded, the air quality objective.

iv) to assess the suitability of the existing electric cars and vans currently in use, in order to look into the increased use of such vehicles across the local authority fleet, with the long term view being to encourage the introduction of low emission vehicles by partner agencies.

v) to continue to work in conjunction with existing regional bodies (East Midlands Air Quality Network, Sheffield City Region Climate Change and Air Quality Group, etc.) to share experience and best practice.

The principal challenges and barriers to implementation that Chesterfield BC anticipates facing are:

i) Chesterfield is a traffic node for goods vehicles and general traffic from the south of Manchester, Stockport, Macclesfield, and Stoke-on-Trent. These vehicles use the A619 to enter Chesterfield through the Peak District and (if heading north) use this route to access the M-1. This places an increased traffic loading on the road passing through the AQMA.

ii) The changes to local authority funding which are due to come into effect may have an adverse effect, in that there will be pressure to approve applications for both commercial and residential developments which would have a deleterious impact on air quality both within the existing AQMA, and across the wider Chesterfield BC area.

iii) Lower than expected uptake of low emission vehicles across the region as a whole, in conjunction with a vehicle fleet which DVLA data suggest is older that the national average to a statistically significant degree, means that traffic pollution has a higher impact than traffic modelling data suggests.

iv) The local Highway Authority (Derbyshire County Council) has not signed up to the On-street Residential Chargepoint Scheme.

Progress on the following measures has been slower than expected due to slower than hoped action by the local Highway Authority in planning and implementing actions to free up vehicle flows along the road affected the AQMA. Pollution levels are currently not breaching the NO_2 air quality objective, but this may be due to underlying variations in regional emissions. Changes to traffic lights controlling vehicle flows through the existing AQMA may have a positive effect pending further works being carried out to change the road junction, in order to address the problem fully.

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, Chesterfield BC anticipates that further additional measures not yet prescribed will be required in subsequent years to achieve compliance and enable the revocation of Chesterfield No 1 AQMA.

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	Industrial Emissions	Environmental Permits	Other measure through permit systems and economic instruments	2010	2032	Local Authority Environmental Health Dept.	Local Authority	NO	Partially Funded	£10k - 50k	Implementation	General Reduction in Industrial Emissions	All Permitted process rated as Low/Medium Environmental Impact	Completed	Financial Constraints on private businesses may exceed saving in Permit fees
2	Joint Working	Policy Guidance and Development Control	Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	2017	2032	Local Authority Environmental Health Dept.	Local Authority	NO	Partially Funded	£10k - 50k	Implementation	General Reduction in Traffic Emissions	None assigned	Implementation on-going	Reduction in staff numbers dedicated to air quality roles/increase in non-air quality work, leading to pressure on available resources
3	Electric Vehicles	Policy Guidance and Development Control	Other policy	2016	2032	Local Authority Environmental Health Dept., LA Fleet Manager	Local Authority	NO	Funded	£10k - 50k	Implementation	Reduced vehicle emissions	None assigned	Implementation on-going	Lack of funding
4	Agile Working	Promoting Travel Alternatives	Encourage / Facilitate home-working	2014	2032	Local Authority	Local Authority	NO	Funded	£10k - 50k	Completed	Reduced vehicle emissions	Number of staff homeworking per day	Data no longer recorded	Uptake greatly increased due to Covid-19
5	Publicity	Public Information	Via the Internet	2013	2032	Local Authority Environmental Health Dept.	Local Authority	NO	Funded	< £10k	Implementation	Possible Reduction in vehicle emissions	Number of website hits	Website kept up to date	
6	Car Parking	Promoting Travel Alternatives	Workplace Travel Planning	2017	2032	Local Authority	Local Authority	NO	Funded	< £10k	Implementation	Possible Reduction in vehicle emissions	Increased Parking Income/Number of staff homeworking	Many staff working from home	Uptake greatly increased due to Covid-19
7	East Midlands Air Quality Network	Policy Guidance and Development Control	Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	2010	2032	Local Authority Environmental Health Dept., LA County Council, PHE	Local Authority	NO	Partially Funded	< £10k	Implementation	Reduction in a range of emissions	None assigned	Work Plans/Action Plans Developed	Air Quality Working Group involves key players in public and voluntary sectors
8	Travel Plans Required as planning conditions for larger developments	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	2010	2032	Local Authority Environmental Health Dept., LA Planning Dept.	Local Authority	NO	Not Funded	< £10k	Implementation	Reduced vehicle emissions	None assigned	Implementation on-going	Travel Plans required as planning conditions for larger developments

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
9	100% Coverage of Smoke Control Area	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	2010	2032	Local Authority Environmental Health Dept.	Local Authority	NO	Not Funded	< £10k	Completed	Smoke and Sulphur Dioxide emissions reduced through Clean Air Act Regulation	Air Quality Objective	Education and Enforcement, as required	Reduction in staff numbers dedicated to air quality roles/increase in non-air quality work, leading to pressure on available resources
10	Making Air Quality reports available to the public	Public Information	Via the Internet	2010	2032	Local Authority Environmental Health Dept.	Local Authority	NO	Funded	< £10k	Implementation	Reduction in a range of emissions	Air Quality Objective	Implementation on-going	Raise awareness on actions that individuals can take

$PM_{2.5}$ – 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.

Chesterfield BC is taking the following measures to address $PM_{2.5}$:

1) We are a member of the East Midlands Air Quality Network and we will continue to work with partner agencies to ensure effective traffic management, in order to minimise the impact of traffic pollution across the borough.
2) Chesterfield BC is also a non-constituent member of the Sheffield City Region combined authority, and works as part of the Sheffield City Region Air Quality and Climate group.
3) The whole of the borough area of Chesterfield is included in well-established Smoke Control Areas (often referred to as Smokeless Zones). However, the effectiveness of these is continuing to be undermined by the increase in the use of DEFRA approved wood burning appliances which are effectively exempt from local authority enforcement actions. Research results increasingly indicate that these fireplaces have an adverse effect on particulate air pollution.
4) We are working with Derbyshire County Council (the local highways authority) in order to achieve the incremental changes in traffic management which would have sufficient beneficial impact to ameliorate the effects of traffic within the vicinity of the declared AQMA, and a concomitant reduction in adverse health effects on the local population.

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

This section sets out the monitoring undertaken within 2020 by Chesterfield BC and how it compares with the relevant air quality 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

Chesterfield BC undertook automatic (continuous) monitoring at 2 sites during 2020. Table A.1 in Appendix A shows the details of the automatic monitoring sites. NB. Local authorities do not have to report annually on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead, unless local circumstances indicate there is a problem. Automatic monitoring results for Chesterfield BC are available through the UK-Air website: https://uk-air.defra.gov.uk/data/data_selector

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

Chesterfield BC undertook non- automatic (i.e. passive) monitoring of NO_2 at 36 sites during 2020. 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.

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.

3.1.3 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 (for bias factor – 0.84, and travel blank adjustment – 1.37µg/m^3 mean over-read) and annualisation, as required (i.e. the values are exclusive of any consideration to fall-off with distance adjustment).

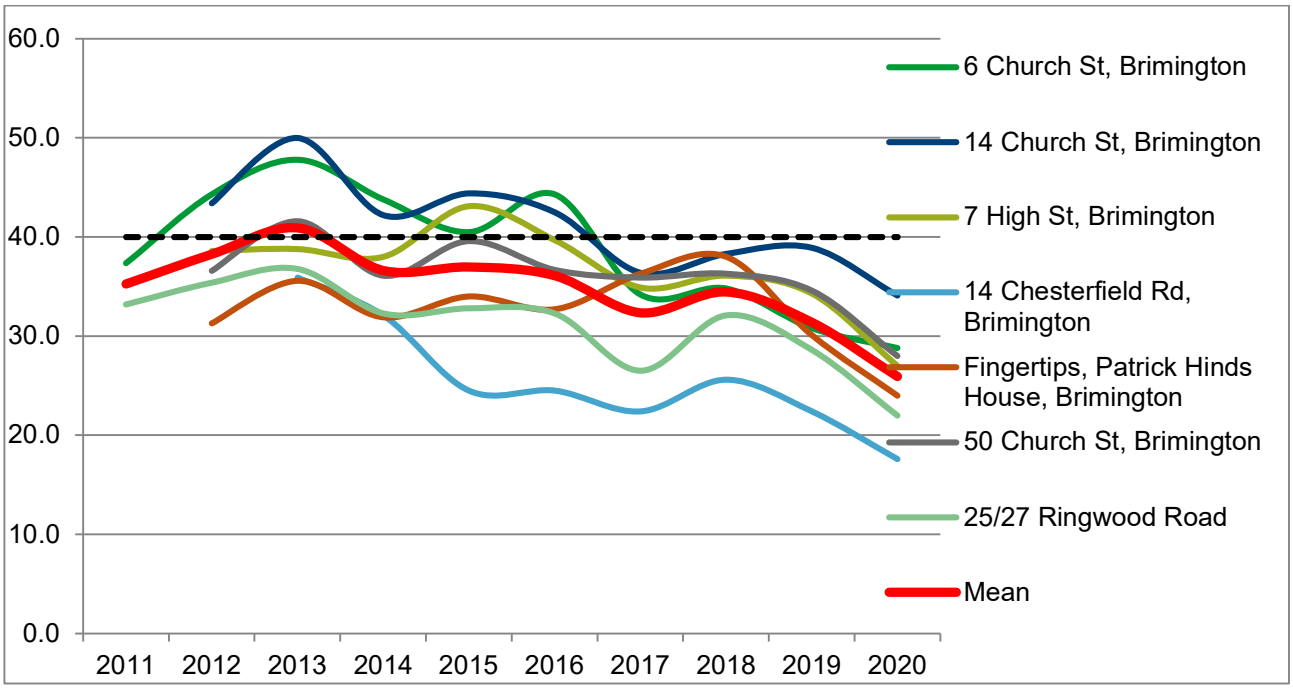
For diffusion tubes, the full 2020 dataset of monthly mean values is provided in Appendix B. Note that the concentration data presented in Table B.1 includes distance corrected values, only where relevant.

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.

No breaches of the Air Quality Objectives for Nitrogen Dioxide were found during 2020, across the whole of the Borough of Chesterfield

Ongoing monitoring within, and in the vicinity of, the Chesterfield No.1 AQMA has demonstrated continued fluctation in levels, as shown in Figure 1 (below).

Figure 1: Variation in NO_2 in and around the vicinity of Chesterfield No.1 AQMA



The two monitoring locations within the AQMA do not demonstrate a breach of the AQO for NO_2. **Once again, none of the monitoring locations within or around the AQMA demonstrate a breach of the AQO for NO_2.**

Recent traffic modelling work, in support of large scale residential development proposals in the Staveley and Rother Valley Corridor, has indicated that the one-way system which flows past the residental façade in the AQMA is expected the reach capacity in the next few years, even if the proposed residental developments do not take place. The intensive monitoring will continue within, and around the vicinity of the AQMA.

Figure 2: Locations of Diffusion Tube monitoring within and in the vicinity of Chesterfield No1 AQMA

Note: The green locations are below the AQO for NO_2 during the current year's data. The extent of the AQMA is shown in blue

We do not intend to revoke the existing AQMA.

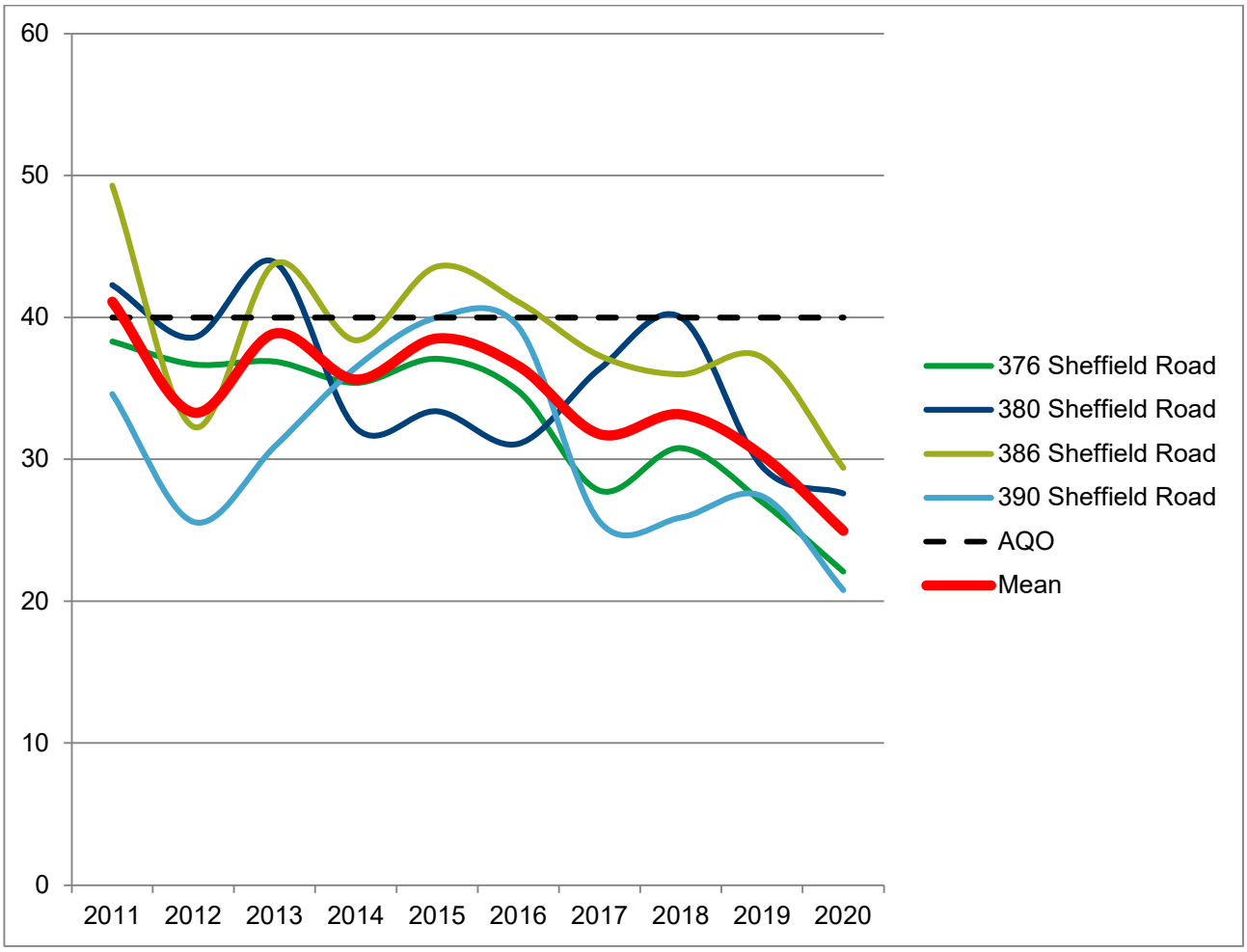
Intensive monitoring is also taking place at a row of houses affected by the change in a road junction serving a major supermarket (this has been discussed fully in the 2013 Detailed Assessment and 2014 Progress Report). This is a row of mixed commercial premises (comprising a public house, retail shop, sandwich shop, and hairdressers) and residential properties (7 homes). There are 4 diffusion tubes on this row of properties. **None of the locations on this façade demonstrate a breach of the air quality objective**.

This location was subject to a Detailed Assessment in 2012, and this was reported on in March 2013. The targetted intensive monitoring has continued at this location since that time, and levels have fluctuated around the air quality objective. There is little consistency in the monitoring results, but the overall trend demonstrates a gradual reduction on average levels (as shown in Figure 3, overleaf).

Figure 3 demonstrates the wide variation in results from the monitoring which is closely co-located. Due to this, we are not confident that the data is robust enough to justify the declaration of an AQMA, nor to draw any firm conclusions with regard to long term trends.

Given the above, intensive monitoring will continue at this location.

Figure 3: Variation in NO_2 on Sheffield Road



The locations of the monitoring, using diffusion tubes due to the restricted space available, on the façade of the terraced houses is shown in Figure 4 (overleaf).

Figure 4: Locations of Diffusion Tube monitoring on the affected façade

Note: The green locations are below the AQO for NO_2. For comparison with Figure 3 (above), the premises numbers run left to right.

Across the Borough, no annual mean results are greater than 60µg/m^3, as such we can be confident in concluding that there are no sites with an exceedance of the 1-hour mean objective.

3.1.4 Particulate Matter (PM_{10})

Both AURN sites monitor for PM_{10}. The levels monitored do not breach either the annual mean or the 24 hour mean objectives.

Table A.6 in Appendix A: Monitoring Results compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past five years with the air quality objective of 40µg/m^3.

Table A.7 in Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations for the past five years with the air quality objective of 50µg/m^3, not to be exceeded more than 35 times per year.

3.1.5 Particulate Matter ($PM_{2.5}$)

Both AURN sites monitor for PM2.5. The data show that the levels of PM2.5 within the borough area comply with the annual average EU limit value (25µg/m^3 by 2020). The levels at Chatsworth Road have been fairly consistent for the last few years, and have shown a gradual slight reduction in levels. The levels at the Loundsley Green site, are also fairly consistent, and similarly show a gradual reduction in the background level. The levels at this background site are lower, as would be expected. Monitoring is continuing.

The fraction of mortality attributable to particulate air pollution (as calculated by Public Health England, and made available in the Public Health Outcomes Framework: https://fingertips.phe.org.uk/static-reports/public-health-outcomes-framework/at-a-glance/e07000034.html?area-name=chesterfield) is 5.03%, this is slightly lower that the East Midlands region value (5.34%) and the England value (5.13%), but is not statistically significant

Table A.8 in Appendix A presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for the past five years.

3.1.6 Sulphur Dioxide (SO_2)

Sulphur Dioxide is not a pollutant of concern, following the closure of a long standing chemical works which included a Sulphuric Acid production site in 2007. Prior to this the whole of the borough was covered by a number of smoke control areas. This, combined with the widespread uptake in the use of gas for domestic heating, meant that the use of coal and other solid fuels dramatically declined. As a result of these steps, **sulphur dioxide is no longer monitored in Chesterfield.**

3.1.7 Benzene

The Chesterfield Roadside site is part of the Non-Automatic Hydrocarbon Network. The results show that the **levels are well below the Air Quality Objective and demonstrate no likelihood of breaching the Air Quality Objective**, as the long term trend demonstrates a very gradual reduction in levels since 2010.

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)
AURN 1	Chesterfield Roadside	Roadside	463348	370651	NO2, PM10, PM2.5, Benzene	NO	Chemiluminescent, Light Scattering, Pumped Tubes	3	2	3
AURN 2	Chesterfield Loundsley Green	Urban Background	436472	372038	NO2, PM10, PM2.5, Heavy Metals	NO	Chemiluminescent, Light Scattering Pumped Filter	N/A	17	3

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)
1	150 Chatsworth Rd	Façade	437222	370956	NO_2	No	0	1m	N	2
2	Bridge Inn, Hollis Lane	Facade	438710	370950	NO_2	No	0	2m	N	2
3	376 Sheffield Road	Façade	438291	373006	NO_2	No	0	1m	N	2
4	390 Sheffield Road	Façade	438284	373057	NO_2	No	0	1m	N	2
5	17, South Place	Façade	438293	370863	NO_2	No	0	1m	N	2
6	6 Church Street, Brimington	Façade	440440	373514	NO_2	Yes	0	1m	N	2
7	DCC Offices, West Street	Roadside	437670	371490	NO_2	No	3m	1m	N	2
8	212 Derby Road	Façade	438395	369776	NO_2	No	0	3m	N	2
9	287 Derby Road	Façade	438385	369574	NO_2	No	0	2m	N	2
10	7 High Street, Brimington	Façade	440531	373484	NO_2	No	0	1m	N	2
11	42, Whittington Hill	Façade	438307	374560	NO_2	No	0	2m	N	2
12	460, Sheffield Road	Façade	438279	373336	NO_2	No	0	2m	N	2
13	10 Calow Lane, Hasland	Façade	439780	369440	NO_2	No	0	1m	N	2
14	348 Derby Road, Storforth Lane	Façade	438357	369410	NO_2	No	0	2m	N	2

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)
15	Chatsworth Road AQ. Site	Co-location	436349	370658	NO_2	No	4m	4m	Y	3
16	Chatsworth Road AQ. Site	Co-location	436349	370658	NO_2	No	4m	4m	Y	3
17	Chatsworth Road AQ. Site	Co-location	436349	370658	NO_2	No	4m	4m	Y	3
18	Site Removed									
19	28a Park Road	Façade	438090	370970	NO_2	No	0	1m	N	2
20	74 Park Road	Façade	438072	370758	NO_2	No	3m	1m	N	2
21	14 Chesterfield Road, Brimington	Roadside	440175	373396	NO_2	No	1m	1m	N	2
22	25/27 Ringwood Road, Brimington	Façade	440669	373711	NO_2	No	0	1m	N	2
23	29 Mansfield Road, Hasland	Façade	439830	369320	NO_2	No	0	2m	N	2
24	10, Compton Street, Saltergate	Façade	437686	371433	NO_2	No	0	1m	N	2
25	J+S Trophies, The Green, Hasland	Façade	439490	369608	NO_2	No	0	3m	N	2
26	Site Removed									
27	Lowgates, Staveley	Façade	443897	374912	NO_2	No	0	3m	N	2
28	Patrick Hinds House, Church St, Brimington	Façade	440323	373482	NO_2	No	0	1m	N	2

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)
29	Hollywell Cross R/T, Old Post Restaurant	Façade	438417	371357	NO_2	No	0	1m	N	2
30	348, Chatsworth Rd, Brampton Mile	Façade	436702	370761	NO_2	No	0	1m	N	2
31	386 Sheffield Road	Façade	438289	373028	NO_2	No	0	2m	N	2
32	Warner Street, Hasland	Roadside	438976	370356	NO_2	No	2m	1m	N	2
33	55 Duke Street, Staveley	Façade	443452	374762	NO_2	No	0	4m	N	2
34	Travel Blank	-	-	-		-	-	-	-	-
35	Site Removed									
36	Lite Bites, Mansfield Road, Hasland	Façade	439710	369420	NO_2	No	0	2m	N	2
37	50 Church Street, Brimington	Façade	440361	373513	NO_2	No	0	1m	N	2
38	14 Church Street, Brimington	Façade	440421	373515	NO_2	Yes	0	1m	N	2
39	43 Sheffield Road	Façade	438343	371908	NO_2	No	0	1m	N	2
40	380 Sheffield Road	Façade	438290	373014	NO_2	No	0	1m	N	2
41	James Street / Lockoford Lane	Roadside	438407	372798	NO_2	No	2	1m	N	2

Notes:

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

(2) N/A if not applicable.

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 2020 (%) (2)	2016	2017	2018	2019	2020
AURN 1	463348	370651	Roadside	Automatic	95	20.3	18.0	16.8	17.4	14.9
AURN 2	436472	372038	Urban Background	Automatic	96.1	16.7	12.4	12.2	12.4	8.1

☒ **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 2020 (%) [2]	2016	2017	2018	2019	2020
1	437222	370956	Roadside	100	23.5	23.3	24.3	22.7	17.1
2	438710	370950	Roadside	100	28.4	24.9	27.0	25.4	22.3
3	438291	373006	Roadside	100	34.8	27.8	30.8	27.5	22.1
4	438284	373057	Roadside	100	39.3	25.6	25.9	27.9	20.8
5	438293	370863	Roadside	91.6	27.8	21.9	23.8	21.9	16.9
6	440440	373514	Roadside	100	**44.3**	34.2	34.8	31.3	28.8
7	437670	371490	Roadside	83.3	24.4	21.0	19.8	18.8	14.3
8	438395	369776	Roadside	100	28.8	24.0	27.4	24.8	21.1
9	438385	369574	Roadside	100	28.0	-	25.3	23.6	18.7
10	440531	373484	Roadside	100	39.7	34.9	36.1	34.9	27.0
11	438307	374560	Roadside	100	23.8	20.5	22.4	21.7	17.9
12	438279	373336	Roadside	100	28.3	23.0	25.5	24.4	19.0
13	439780	369440	Roadside	91.6	22.4	19.6	21.5	19.8	15.1
14	438357	369410	Roadside	100	33.6	27.7	31.5	28.0	22.5
15	436349	370658	Roadside	100	18.8	17.3	17.7	16.5	13.1
16	436349	370658	Roadside	100	18.2	16.7	17.4	16.2	12.5
17	436349	370658	Roadside	100	17.8	16.1	17.6	16.4	12.9
18	438104	370989	Roadside	-	22.4	19.5	22.7	20.6	-
19	438090	370970	Roadside	100	23.7	18.8	21.3	20.9	15.5
20	438072	370758	Roadside	91.6	23.8	21.3	25.1	23.4	17.1
21	440175	373396	Roadside	91.6	24.5	22.4	25.6	23.1	17.6
22	440669	373711	Roadside	100	32.2	26.5	32.1	29.1	22.0
23	439830	369320	Roadside	100	24.4	23.1	24.3	22.8	16.6
24	437686	371433	Roadside	100	33.0	32.4	35.9	33.5	25.3
25	439490	369608	Roadside	100	32.4	28.2	32.0	29.5	23.3
26	439490	369590	Roadside	-	19.1	-	-	-	-
27	443897	374912	Roadside	100	31.9	28.3	29.6	27.2	22.3
28	440323	373482	Roadside	100	32.7	36.3	38.0	30.6	24.0
29	438417	371357	Roadside	100	32.4	30.7	36.1	34.0	25.0
30	436702	370761	Roadside	100	26.6	23.9	26.9	24.6	19.0
31	438289	373028	Roadside	100	**41.4**	37.3	36.0	37.8	29.4
32	438976	370356	Roadside	100	33.3	28.7	34.0	31.1	23.4
33	443452	374762	Roadside	100	36.6	34.1	37.5	33.1	26.0
34	-	-	Travel Blank	-	-	-	-	-	-
35	435654	370537	Roadside	-	29.8	28.4	30.4	25.5	-

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture 2020 (%) [2]	2016	2017	2018	2019	2020
36	439710	369420	Roadside	83.3	27.1	23.0	27.2	25.1	17.9
37	440361	373513	Roadside	100	36.7	35.9	36.3	35.2	28.0
38	440421	373515	Roadside	100	**42.5**	36.4	38.3	39.5	34.1
39	438343	371908	Roadside	100	28.0	26.0	29.4	26.8	20.5
40	438290	373014	Roadside	100	31.1	36.4	**40.0**	30.0	27.6
41	438407	372798	Roadside	100	30.0	27.1	30.5	24.7	22.6

☐ **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

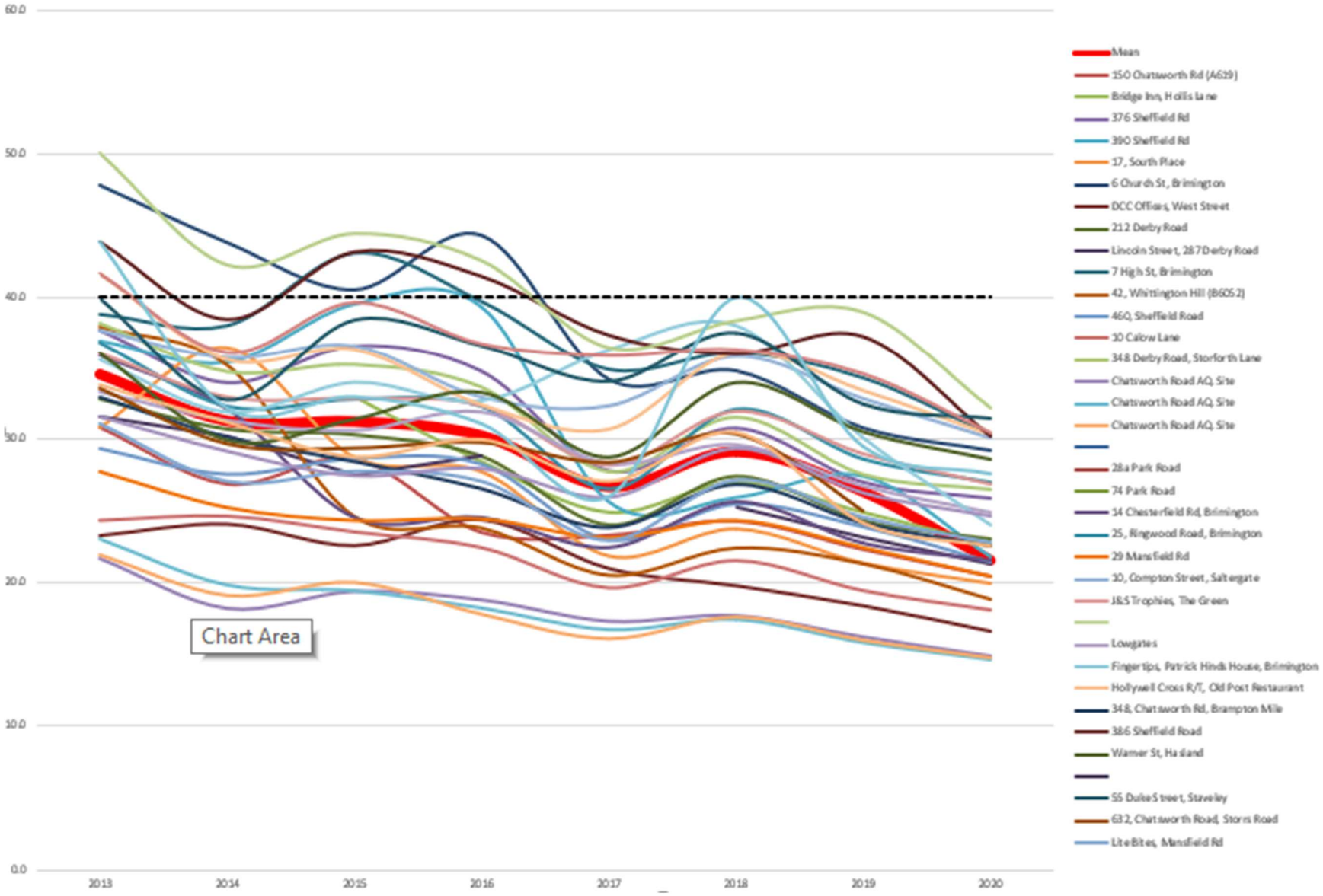


Table A.5 – 1-Hour Mean NO_2 Monitoring Results, Number of 1-Hour Means > 200µg/m^3

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2020 (%) (2)	2016	2017	2018	2019	2020
AURN 1	463348	370651	Roadside	96.15	96.15	0	0	0	0	0
AURN 2	436472	372038	Urban Background	96.14	96.14	**0 (53.5)**	0	**0 (58.2)**	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%).

Table A.6 – Annual Mean PM_{10} Monitoring Results (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 2020 (%) (2)	2016	2017	2018	2019	2020
AURN 1	463348	370651	Roadside	99.6	99.6	17.7	14.3	16.8	14.1	12.2
AURN 2	436472	372038	Urban Background	99.9	99.9	14.8	12	14.4	12.7	10.9

☐ **Annualisation has been conducted where data capture is <75% and >33% in line with LAQM.TG16.**

Notes:

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

Exceedances of the PM_{10} 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.

(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.2 – Trends in Annual Mean PM_{10} Concentrations

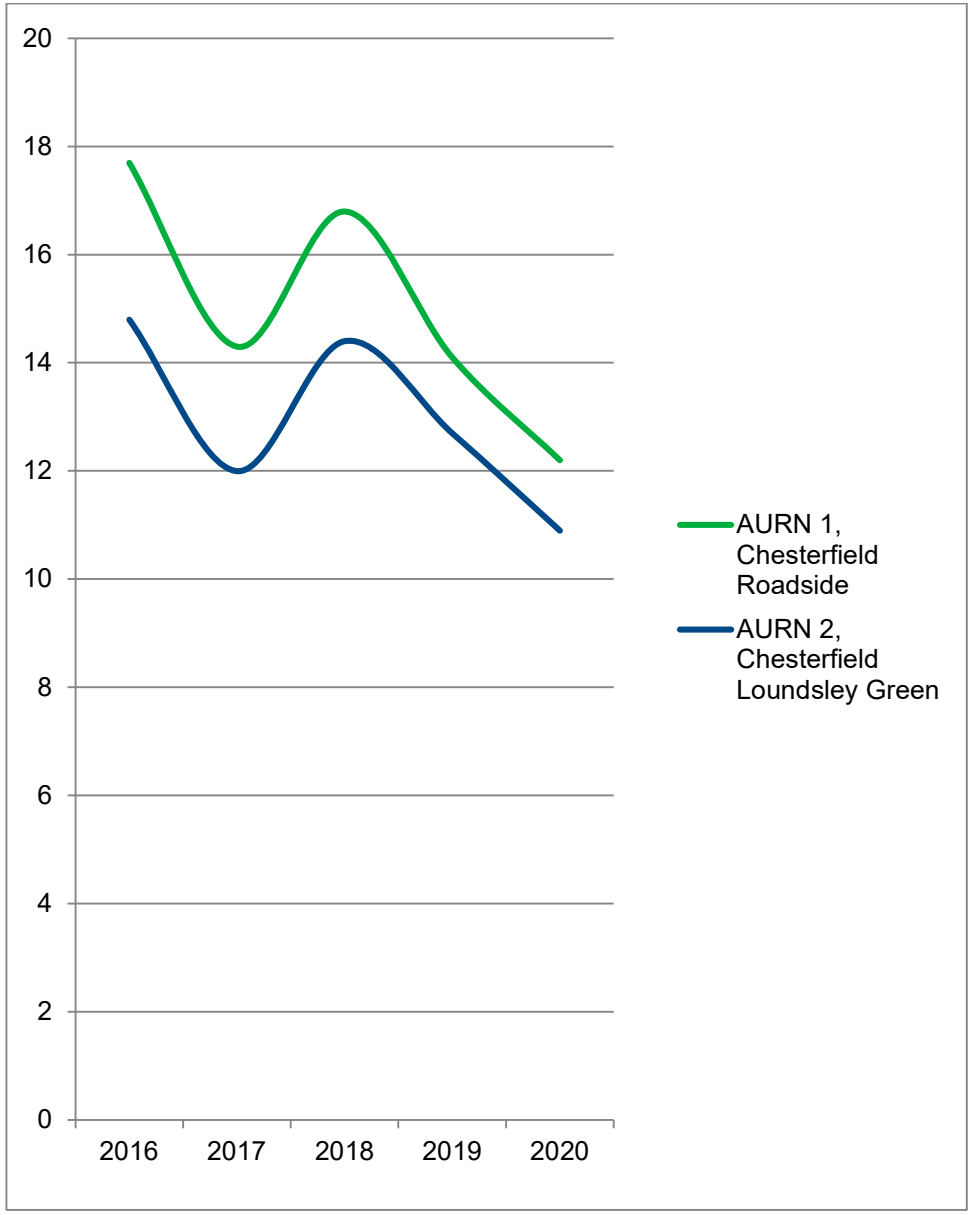


Table A.7 – 24-Hour Mean PM_{10} Monitoring Results, Number of PM_{10} 24-Hour Means > 50µg/m^3

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2020 (%) (2)	2016	2017	2018	2019	2020
AURN 1	666555	333444	Roadside	99.5	99.5	**0**	3	3	3	2
AURN 2	777444	333555	Urban Background	100	100	0	3	2	3	1

Notes:

Results are presented as the number of 24-hour periods where daily mean concentrations greater than 50µg/m^3 have been recorded.

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

If the period of valid data is less than 85%, the 90.4th percentile of 24-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%).

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

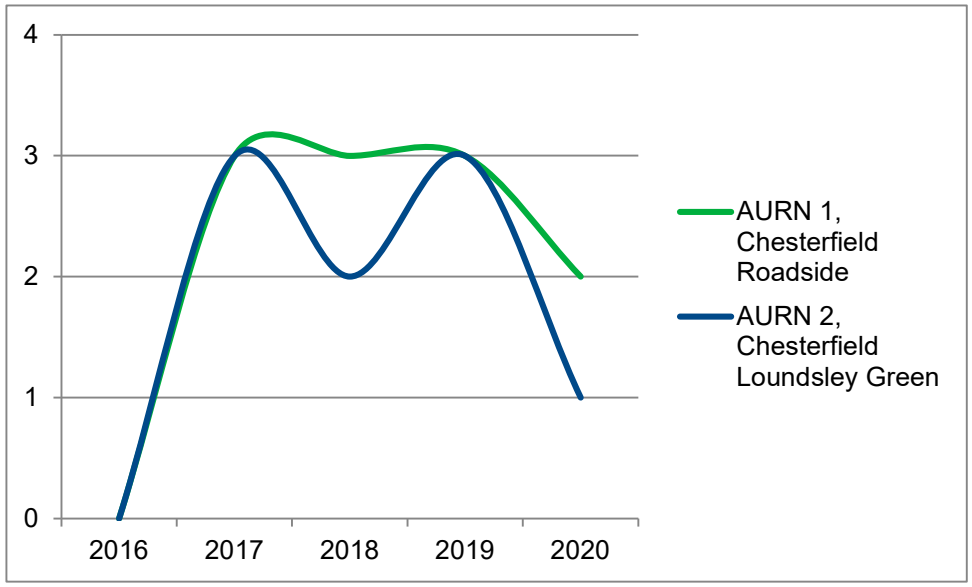


Table A.8 – Annual Mean $PM_{2.5}$ Monitoring Results ($\mu g/m^3$)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2020 (%) (2)	2016	2017	2018	2019	2020
AURN 1	463348	370651	Roadside	99.6	99.6	11.3	8.8	9.7	8.9	7.5
AURN 2	436472	372038	Urban Background	100	100	10.3	8.7	9.6	8.4	6.9

☒ **Annualisation has not been required**

Notes:

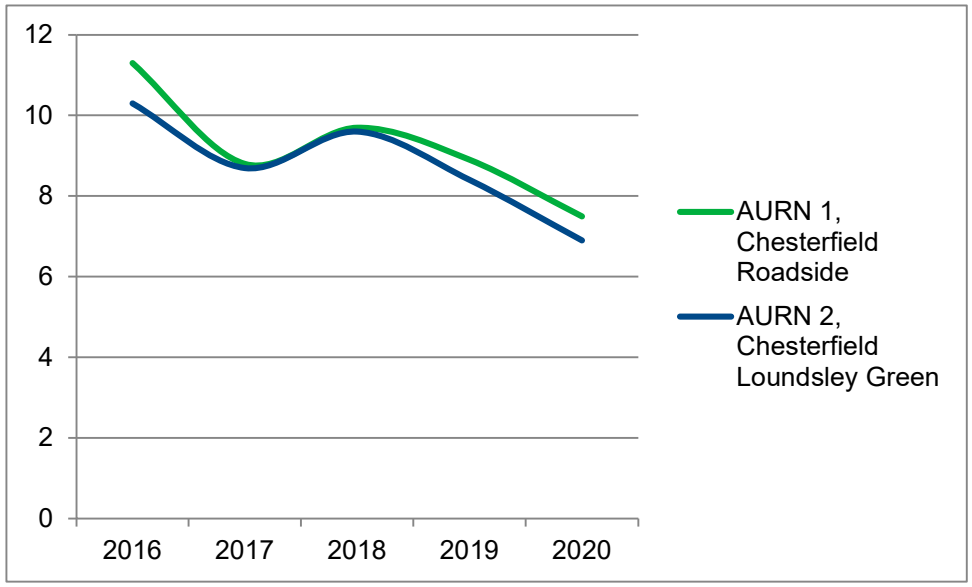
The annual mean concentrations are presented as $\mu g/m^3$.

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.

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



Appendix B: Full Monthly Diffusion Tube Results for 2020

Table B.1 – NO_2 2020 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 (0.84)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
1	437222	370956	30.74	23.87	24.34	16.23	14.70	20.33	15.68	17.72	19.09	22.80	30.56	24.92	21.75	17.1	-	
2	438710	370950	38.03	28.65	32.70	21.63	20.08	22.91	21.73	26.52	21.52	31.70	37.85	32.30	27.97	22.3		
3	438291	373006	35.77	26.60	30.42	22.14	20.70	20.71	22.29	27.95	24.83	29.76	34.72	36.45	27.69	22.1		
4	438284	373057	39.81	28.03	29.29	19.08	17.10	21.82	14.94	22.77	23.13	24.92	38.44	34.18	26.13	20.8		
5	438293	370863	29.09	22.08	25.83	17.52	16.04	19.73	16.06	19.67	22.04	22.97	NR	25.95	21.55	16.9		
6	440440	373514	33.68	26.68	38.94	37.60	28.07	44.33	26.76	38.82	37.78	37.15	42.26	35.69	35.65	28.8		
7	437670	371490	NR	NR	25.05	14.81	13.11	17.47	11.08	15.52	15.36	18.13	26.85	26.68	18.41	14.3		
8	438395	369776	33.74	24.60	31.40	17.18	22.94	26.64	17.24	27.12	23.61	26.89	34.50	32.62	26.54	21.1		
9	438385	369574	31.23	22.50	29.67	19.31	20.67	25.48	17.05	25.67	23.78	2.55	33.41	32.52	23.65	18.7		
10	440531	373484	44.02	37.73	35.55	23.90	27.88	25.54	29.33	31.71	20.13	34.73	46.75	45.36	33.55	27.0		
11	438307	374560	29.65	20.93	25.74	20.60	19.63	22.37	15.87	23.48	19.49	19.98	29.27	25.82	22.74	17.9		
12	438279	373336	31.94	25.10	27.14	18.74	17.44	18.26	16.84	21.63	22.20	27.10	29.55	31.98	23.99	19.0		
13	439780	369440	28.25	20.13	NR	14.93	14.83	15.34	12.76	15.03	17.88	19.52	28.87	24.67	19.29	15.1		
14	438357	369410	32.12	19.77	32.49	23.19	26.77	31.87	21.87	30.03	29.86	28.35	32.66	29.03	28.17	22.5		
15	436349	370658	23.76	17.82	20.20	13.21	12.54	13.73	9.66	12.28	16.34	19.12	23.80	20.91	16.95	13.1		
16	436349	370658	24.00	17.72	18.43	12.14	11.00	11.57	10.25	14.09	13.32	17.96	24.21	20.98	16.31	12.5		
17	436349	370658	21.99	16.48	18.80	12.74	12.23	13.10	9.72	14.93	13.86	19.52	28.55	19.21	16.76	12.9		
18	438104	370989	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				Site removed as tubes stolen each month
19	438090	370970	27.05	18.79	24.76	14.59	11.55	18.01	11.24	17.70	16.71	19.76	29.78	28.13	19.84	15.5		
20	438072	370758	27.07	18.77	25.27	17.89	16.88	22.14	14.28	24.57	21.39	22.17	NR	28.57	21.73	17.1		
21	440175	373396	32.86	22.16	25.73	18.50	18.19	16.74	14.35	16.49	NR	22.12	31.33	27.21	22.33	17.6		
22	440669	373711	38.53	25.73	32.51	21.78	21.35	24.19	22.53	24.56	22.91	28.52	34.70	33.85	27.60	22.0		
23	439830	369320	27.53	18.71	24.95	17.18	17.73	18.21	13.57	20.25	19.44	19.94	30.84	25.17	21.13	16.6		
24	437686	371433	48.05	35.63	31.91	19.71	22.14	27.98	24.54	31.40	33.51	33.01	37.57	32.56	31.50	25.3		
25	439490	369608	39.18	27.51	29.39	21.51	21.52	26.86	20.11	30.16	30.36	28.43	38.90	35.62	29.13	23.3		
26	439490	369590	37.44	26.74	28.90	19.53	19.87	22.79	21.33	25.49	27.12	28.88	41.56	35.95	27.97	22.3		
27	443897	374912	43.51	35.03	29.69	20.18	21.06	23.78	26.43	27.53	30.89	30.05	37.75	33.98	29.99	24.0		
28	440323	373482	40.60	25.64	34.57	23.76	21.86	31.58	19.26	33.13	31.61	31.33	39.92	40.32	31.13	25.0		
29	438417	371357	32.68	20.27	28.27	17.63	17.37	22.35	16.55	22.57	25.90	24.32	31.59	28.54	24.00	19.0		
30	436702	370761	50.31	40.48	36.69	25.01	27.28	29.80	27.49	34.39	33.48	38.01	48.14	45.96	36.42	29.4		
31	438289	373028	36.04	23.94	33.00	22.49	22.55	28.30	23.74	27.85	30.15	29.71	33.99	39.05	29.23	23.4		
32	438976	370356	43.24	32.83	35.82	22.02	22.68	26.09	27.63	30.04	33.10	35.98	38.12	40.84	32.37	26.0		
33	443452	374762	27.05	18.79	24.76	14.59	11.55	18.01	11.24	17.70	16.71	19.76	29.78	28.13	19.84	15.5		
34	Travel	Blank																
35	435654	370537	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				Site removed as home owner removed consent
36	439710	369420	30.92	18.97	24.55	19.49	NR	20.58	15.70	22.04	21.25	23.39	NR	29.85	22.67	17.9		
37	440361	373513	44.93	36.03	35.35	25.58	28.56	30.66	29.55	34.60	36.28	27.91	46.40	40.74	34.72	28.0		
38	440421	373515	46.51	37.30	44.81	41.85	42.28	41.15	33.46	40.19	43.82	35.35	50.43	47.06	42.02	34.1		
39	438343	371908	34.98	23.07	28.93	20.74	16.53	24.49	15.63	25.13	25.80	23.32	35.69	35.53	25.82	20.5		
40	438290	373014	44.71	31.38	37.09	24.28	26.63	33.14	26.44	32.70	37.27	20.52	49.35	47.88	34.28	27.6		
41	438407	372798	33.39	23.17	33.46	23.30	19.73	24.33	16.76	24.01	27.00	28.85	41.32	43.76	28.26	22.6		

☒ **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 >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.**

☒ **Chesterfield BC confirm that all 2020 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 Chesterfield During 2020

Chesterfield BC has not identified any new sources relating to air quality within the reporting year of 2020.

Additional Air Quality Works Undertaken by Chesterfield During 2020

Chesterfield BC has not completed any additional works within the reporting year of 2020.

QA/QC of Diffusion Tube Monitoring

NO_2 diffusion tubes are supplied by South Yorkshire Air Quality Samplers, the preparation method being 50% triethanolamine in acetone. The laboratory follows the procedures set out in the Harmonisation Practical Guidance. The national bias factor for the tubes supplied by this source is 0.77. Data from the two sites operated by Chesterfield BC is supplied to DEFRA for input into the calculation of this factor.

Diffusion Tube Annualisation

All diffusion tube monitoring locations within Chesterfield BC recorded data capture of 75% or more, therefore it was not required to annualise any monitoring data. In addition, any sites with a data capture below 25% do not require annualisation.

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.

Chesterfield BC have applied a local bias adjustment factor of 0.84 to the 2020 monitoring data. A summary of bias adjustment factors used by Chesterfield BC over the past five years is presented in Table C.1. The Roadside site has been used to derive a local bias factor, as this is indicative of the focus of the non-automatic monitoring which is being carried out across Chesterfield

Table C.1 – Bias Adjustment Factor

Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2020	Local	-	0.84
2019	Local	-	0.83
2018	Local	-	0.91
2017	Local	-	0.83
2016	Local	-	0.87

NO_2 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_2 concentration at the nearest location relevant for exposure should be 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.

No diffusion tube NO_2 monitoring locations within Chesterfield BC required distance correction during 2020.

QA/QC of Automatic Monitoring

Data management is carried out by BureauVeritas, as part of the AURN system

LSO Duties are carried out in-house by Chesterfield BC. Calibration visits are carried out on the fortnightly basis on both AURN sites

PM_{10} and $PM_{2.5}$ Monitoring Adjustment

The type of PM_{10} and $PM_{2.5}$ monitors utilised within Chesterfield BC do not required the application of a correction factor.

Automatic Monitoring Annualisation

All automatic monitoring locations within Chesterfield BC 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.

NO_2 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_2 concentration at the nearest location relevant for exposure should be estimated using the 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.

No automatic NO_2 monitoring locations within Chesterfield BC required distance correction during 2020.

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

Annualisation of data was not required

Table C.3 – Local Bias Adjustment Calculation

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 μgm^{-3}	Tube 2 μgm^{-3}	Tube 3 μgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	08/01/2020	05/02/2020	23.8	24.0	22.0	23	1.1	5	2.7	18.89	99.6	Good	Good
2	05/02/2020	04/03/2020	17.8	17.7	18.4	18	0.4	2	1.0	8.16	94.3	Good	Good
3	04/03/2020	01/04/2020	20.2	18.4	18.8	19	0.9	5	2.3	17.61	100	Good	Good
4	01/04/2020	29/04/2020	13.2	12.1	12.7	13	0.5	4	1.3	12.69	100	Good	Good
5	29/04/2020	03/06/2020	12.5	11.0	12.2	12	0.8	7	2.0	10.41	99.6	Good	Good
6	03/06/2020	01/07/2020	13.7	11.6	13.1	13	1.1	9	2.8	13.15	99.6	Good	Good
7	01/07/2020	29/07/2020	9.7	10.3	9.7	10	0.3	3	0.8	9.46	67.1	Good	r Data Capture
8	29/07/2020	02/09/2020	12.3	14.1	14.9	14	1.4	10	3.4	11.42	100	Good	Good
9	02/09/2020	30/09/2020	16.3	13.3	13.9	15	1.6	11	4.0	13.60	99.8	Good	Good
10	30/09/2020	04/11/2020	19.1	18.0	19.5	19	0.8	4	2.0	14.27	100	Good	Good
11	04/11/2020	02/12/2020	23.8	24.2	28.6	26	2.6	10	6.5	20.25	98.1	Good	Good
12	02/12/2020	06/01/2020	20.9	21.0	19.2	20	1.0	5	2.5	20.01	100	Good	Good
13													
												Good precision	Good Overall

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

Overall survey -->

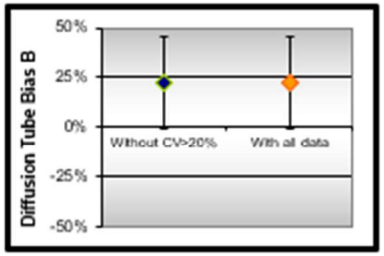
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:	Chesterfield Roadside

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

Accuracy (with 95% confidence interval) without periods with CV larger than 20%	
Bias calculated using 11 periods of data	
Bias factor A	0.84 (0.7 - 1.04)
Bias B	19% (-4% - 42%)
Diffusion Tubes Mean:	17 μgm^{-3}
Mean CV (Precision):	7
Automatic Mean:	15 μgm^{-3}
Data Capture for periods used:	99%
Adjusted Tubes Mean:	15 (12 - 18) μgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 11 periods of data	
Bias factor A	0.84 (0.7 - 1.04)
Bias B	19% (-4% - 42%)
Diffusion Tubes Mean:	17 μgm^{-3}
Mean CV (Precision):	7
Automatic Mean:	15 μgm^{-3}
Data Capture for periods used:	99%
Adjusted Tubes Mean:	15 (12 - 18) μgm^{-3}

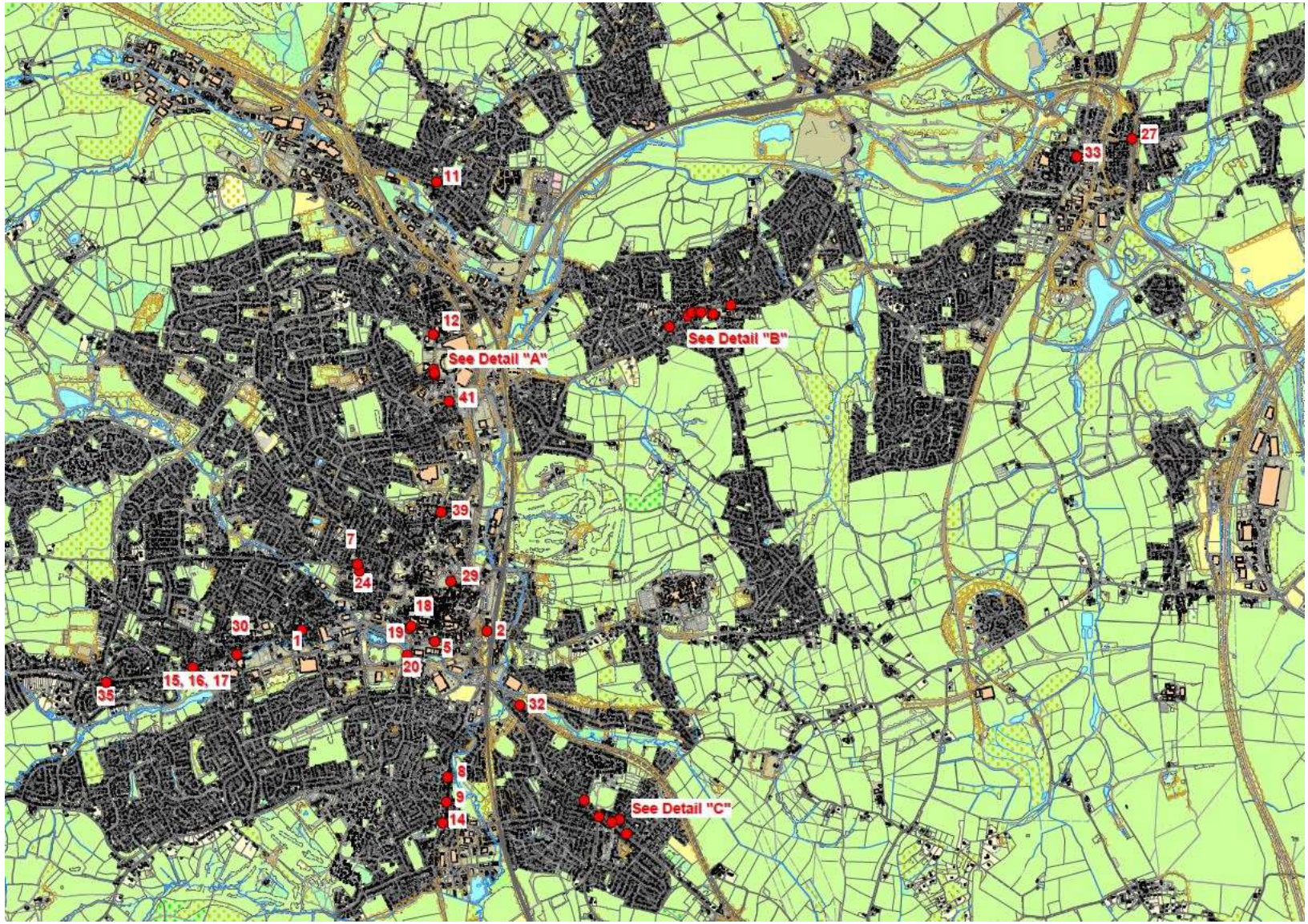


Jaume Targa, for AEA
Version 04 - February 2011

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

No monitoring data needed to be corrected

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



Detail A


4
31
40
3
The Proact Stadium
(Football Stadium)
Chesterfield
Trade Centre

Detail B

Note: See location details of Chesterfield No 1 AQMA (overleaf)

Detail C

Location and extent of Chesterfield No 1 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).

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 Air Quality Action Plans (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 objective for nitrogen dioxide (NO_2) is considered unlikely. On 23rd 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[8] 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_x), and exhaust and non-exhaust particulates (PM). The Air Quality Expert Group (AQEG)[9] has estimated that during the initial lockdown period in 2020, within urbanised areas of the UK reductions in NO_2 annual mean concentrations were between 20 and 30% relative to pre-pandemic levels, which

[8] Prime Minister's Office, COVID-19 briefing on the 31st of May 2020

[9] Air Quality Expert Group, Estimation of changes in air pollution emissions, concentrations and exposure during the COVID-19 outbreak in the UK, June 2020

represents an absolute reduction of between 10 to 20µg/m^3 if expressed relative to annual mean averages. During this period, changes in $PM_{2.5}$ concentrations were less marked than those of NO_2. $PM_{2.5}$ 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 $PM_{2.5}$ concentrations during the initial lockdown period are of the order 2 to 5µg/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 Chesterfield

Air quality monitoring data in Chesterfield has consistently demonstrated a gradual reduction in air pollution levels during recent years. This trend has continued. However, it is not possible at present to state that this reduction has been increased by the impact of Covid-19 lockdowns. This may only become apparent in future years, if the rate of reduction is changed (in either a positive or negative way) as a result of longer lasting societal changes.

Opportunities Presented by COVID-19 upon LAQM within Chesterfield BC

No LAQM related opportunities have arisen as a consequence of COVID-19 within Chesterfield.

Challenges and Constraints Imposed by COVID-19 upon LAQM within Chesterfield BC

An AQAP is being developed for AQMA 1. However, owing to the reallocation of Council resources during 2020, the development and implementation of the AQAP has been delayed. Current estimates are that the revised AQAP will be prepared in and sent out for draft consultation in late 2021. **Small 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

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 Highways England
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm 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.
- Environment Act 1995
- Environment, Food and Rural Affairs Committee, Air Quality – Fourth Report of Session 2015-16
- Air Quality Plan for the achievement of EU air quality limit value for nitrogen dioxide (NO_2) in East Midlands (UK0032)
- Improving air quality in the UK – Tackling nitrogen dioxide in our towns and cities. Technical report, December 2015
- NO_2 Diffusion Tubes for LAQM: Guidance Notes for Local Authorities, March 2006
- The Relationship Between Diffusion Tubes Bias and Distance From the Road July 2006
- Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance, Feb 2008
- QA/QC Procedures for the UK Automatic Urban and Rural Air Quality Monitoring Network
- Fine Particulate Matter ($PM_{2.5}$) in the United Kingdom, DEFRA 2012
- Assessment of Particulate Emissions from Wood Log and Wood Pellet Heating Appliances, Ricardo-AEA 2017
- Airborne Particles from Wood Burning in UK Cities, King's College London/National Physical Laboratory 2017
- A Review of Air Quality Station Type Classifications for UK Compliance Monitoring, Ricardo-AEA 2013
- Evidential Value of DEFRA Air Quality Compliance Monitoring, AQEG 2015
- http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html