2022 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995

Local Air Quality Management

Date: June, 2022

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Executive Summary: Air Quality in Our Area

Air Quality in Bristol

Air pollution is associated with several 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].

Bristol is a city, unitary authority area and ceremonial county in South West England, 105 miles (169 km) west of London, and 44 miles (71 km) east of Cardiff. It has an estimated population of 465,900[5] for the unitary authority at present, and a surrounding urban area with an estimated 670,300 residents (mid 2019). Within England and Wales, it is the 8th largest city and the 11th largest local authority.

The main pollutants of concern within Bristol are nitrogen dioxide and particulate matter. Monitoring in Bristol shows that we are currently in breach of the annual objective for nitrogen dioxide and possibly the hourly objective, set at 40µg/m^3 and 200µg/m^3 (with a permissible 18 hours per year above the 200µg/m^3 limit allowed) respectively.

Nitrogen Dioxide

In those locations that exceed the nitrogen dioxide air quality objectives, over 80% of this

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

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

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

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

[5] ONS 2020 Mid-Year Population Estimate

pollution has been shown to be from local traffic sources. Actions and decisions by BCC, other West of England (WoE) authorities and the decisions that citizens in the WoE make each day, with regards to how they move around the area, all directly impact upon the level of air pollution in the city.

Health Impacts

Air pollution has negative impacts on the health of people in Bristol, especially vulnerable members of the population. Evidence suggests that it can cause permanent lung damage in babies and young children[6] and exacerbates lung and heart disease in older people[7]. A 2017 report into the health effects of air pollution in Bristol concluded that around 300 premature deaths each year in the City of Bristol can be attributed to exposure to nitrogen dioxide (NO_2) and fine particulate matter ($PM_{2.5}$), with roughly an equal number attributable to both pollutants. This represents about 8.5% of deaths in the administrative area of Bristol being attributable to air pollution[8]. This has an estimated cost to the NHS of £83m. It should be noted that the baseline year for the study into the health impacts of air pollution was 2013. Whilst NO_2 pollution at roadside locations has fallen significantly since that date, the change in background levels of NO_2 and $PM_{2.5}$ pollution have not seen such a significant fall. A revised study using more recent air quality data would calculate a different number of premature deaths, however, it would still demonstrate that air pollution leads to a significant number of premature deaths each year, despite the measured improvements in roadside pollution levels since the reports 2013 baseline year.

Monitoring

Pollutants such as sulphur dioxide, carbon monoxide and some heavy metals used to be monitored in Bristol, however, this has ceased as compliance with health-based air quality objectives for these pollutants has been demonstrated. Extensive monitoring of nitrogen dioxide continues throughout the city. Nitrogen dioxide concentrations have demonstrated an improving trend since 2010; however, exceedances of objectives for this pollutant were

[6] Royal College of Pediatrics and Child Health, Every breath we take – The lifelong impact of air pollution, February 2016

[7] Simoni et al., Adverse effects of outdoor pollution in the elderly, Journal of Thoracic Disease, January 2015

[8] Air Quality Consultants, Health Impacts of Air Pollution in Bristol, February 2017

still measured widely in the city in 2021.

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. Further information related to declared AQMAs can be found on the Defra website, including maps of AQMA boundaries.

Due to exceedance of the annual and hourly objectives for NO_2 and possible exceedance of PM_{10} objectives, Bristol City Council declared an AQMA in 2001. It covers the whole of the city centre and most of the main arterial routes into the city. Due to ongoing exceedances of national pollution objectives, the AQMA is still in place in 2022. Approximately 100,000 people live within Bristol's AQMA. It includes the central employment, leisure and shopping districts, major hospitals, and dozens of schools and therefore many more people are exposed to air pollution in their daily lives than just those living in the AQMA. There are also two small AQMAs in South Gloucestershire, in Kingswood\Warmley and Staple Hill.

Bristol's monitoring network is focused on nitrogen dioxide (NO_2), as the concentrations of this pollutant near busy roads exceed the health-based UK objectives and EU limit values.

The Bristol City Council and Defra monitoring network in 2021 consisted of:

- 8 real time NO_2 monitors, 7 of which are BCC operated, the site at St Paul's is part of the national Automatic Urban and Rural Network operated by Defra. Data from all of these sites is uploaded automatically to a BCC open data air quality dashboard.
- 5 real time particulate monitors (2 x $PM_{2.5}$ and 3 x PM_{10}).
- 1 real time Defra operated Ozone (O_3) monitor.
- 182 NO_2 diffusion tubes which provide a monthly and annual concentration for this pollutant.

Defra operate the Bristol St Paul's monitoring site which measures NO_2, particulate matter (PM_{10} and $PM_{2.5}$) and O_3. This site is in St Pauls at an "urban background" location away from busy roads. This Defra site is representative of general pollution levels over central Bristol but not of pollution levels at busy roadside locations in the city. Defra operate the PM_{10} monitor at the Temple Way site which also houses a BCC operated NO_2 analyser. This is known as an affiliate site where Defra and the Local Authority share infrastructure that houses monitoring equipment. All other sites are owned and operated by Bristol City Council.

The air quality data has shown that at most sites in 2021, pollution increased compared to

2020; with 80 sites out of 88, that had data collected for both years, showing an increase in annual NO_2 concentrations. The average increase in measured annual NO_2 concentrations was 9.7% over all 88 tube locations for which data was available in 2020 and 2021. In 2020 restrictions of movements were in place due to Covid-19. Whilst those restrictions were in place at times in 2021, they were significantly less severe than in 2020, as a result, traffic levels increased in 2021 when compared to 2020 and it is likely that this is the reason that pollution levels increased from 2020 to 2021. Other factors that impact roadside NO_2 pollution levels include overall traffic volumes, vehicle fleet composition, meteorological conditions and local dispersion characteristics that can be influenced by things like buildings, walls, and trees.

When comparing 2021 pollution levels to 2019, in those locations at which 2019 data was available, the monitored NO_2 pollution levels were, on average, 12.6% lower in 2021. This is likely to be due to the combination of continued Covid restrictions in 2021 and a cleaner vehicle fleet as newer cleaner vehicles replace older, more polluting, vehicles.

Figure 0.1 shows the long-term trends in NO_2 concentrations at a selection of city centre monitoring sites. Monitoring at Rupert Street was stopped due to the change in road layout associated with the Metrobus works. The plot shows that NO_2 levels fell from 2010 to 2020 at all monitoring sites. Whilst many still exceeded objectives in 2019, 2020 was the first year in which all the sites shown achieved compliance with annual NO_2 objectives. Compliance in 2020 was mostly a result of Covid travel restrictions. In 2021, as travel restrictions were lifted, pollution levels increased accordingly. In 2021, three of the central sites measured annual NO_2 pollution levels that exceeded objectives.

Figure 0.1 - Trends in Annual NO_2 at City Centre Sites (2010-2021)

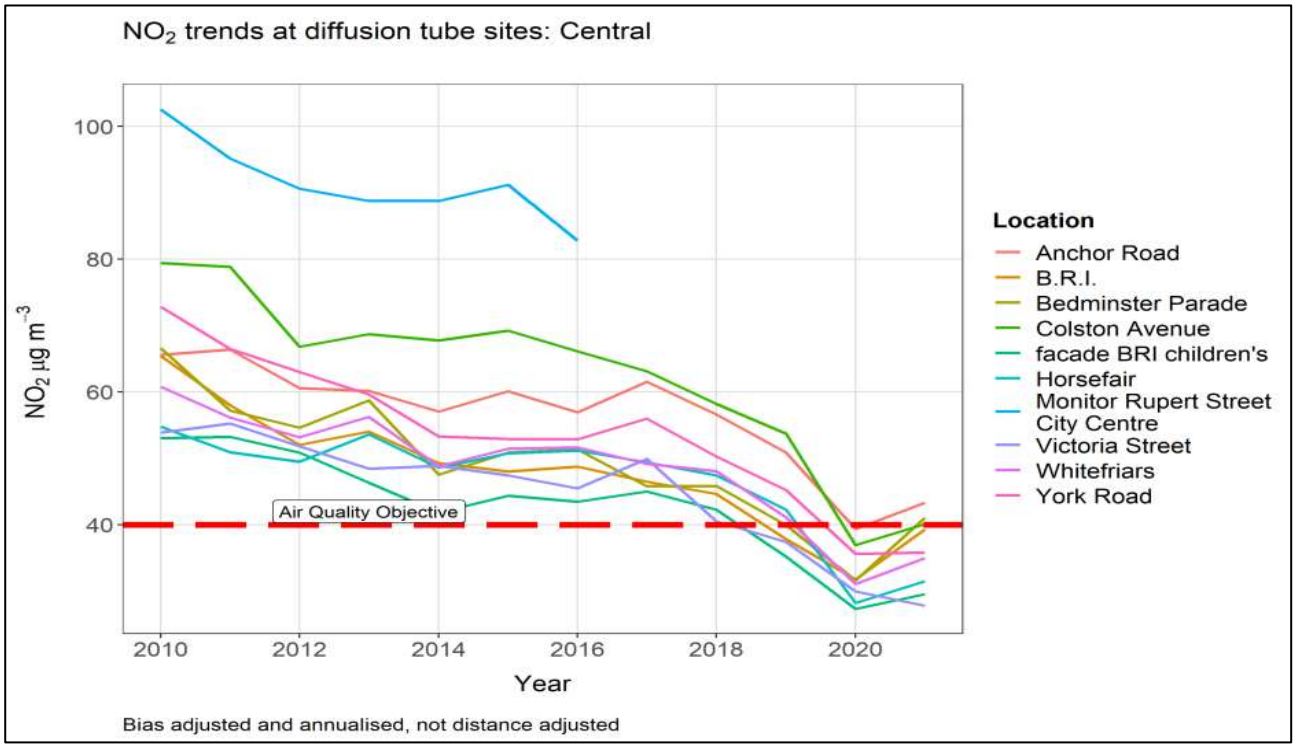
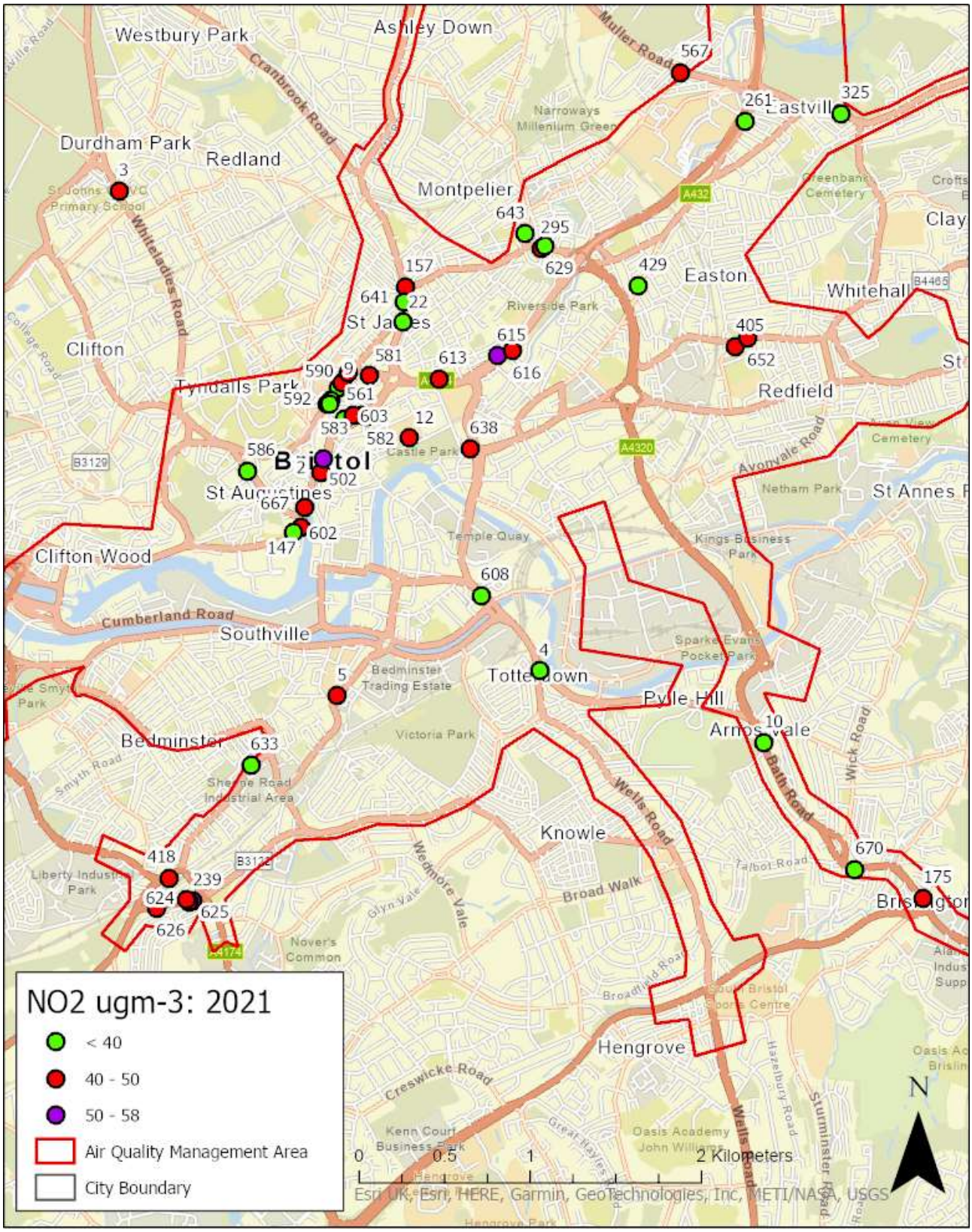


Figure 0.2 shows the locations in which monitored pollution concentrations exceed 36µg/m^3. 36µg/m^3 has been used to account for diffusion tube monitoring uncertainty. It should be noted that these are monitoring concentration and not the concentrations at relevant receptor locations as defined in the LAQM TG16 (e.g., facades of houses, schools, elderly people's homes, and hospitals).

Figure 0.2 - Monitoring Locations Where 2021 Annual NO_2 > 36µg/m^3



Particulate Matter

Whilst monitoring of particulates in the city is limited it is possible that exceedance of objectives occur in some isolated areas. Health impacts from particulate pollution have been shown to occur at levels below the EU and UK target values, with the World Health Organisation (WHO) setting particulate pollution limits significantly lower than those adopted by Europe and the UK. In September 2021 the WHO revised their air pollution guidelines based on the latest available health evidence. The annual guideline value for $PM_{2.5}$ was reduced from 10µg/m^3 to 5µg/m^3 and for PM_{10} it was set at 15µg/m^3 (the current UK annual objective for PM_{10} is 40µg/m^3). In 2022 The UK government are consulting on proposed a new annual objective for $PM_{2.5}$ of 10µg/m^3 to be achieved by 2040. In addition to this, a $PM_{2.5}$ exposure reduction target is proposed.

Whilst much of the action to improve air pollution in the UK and Bristol has focussed on achieving compliance with nitrogen dioxide limits, it is acknowledged that it is important to take action to reduce particulate pollution to improve public health. In most cases, the measures to reduce nitrogen dioxide pollution will also reduce particulate pollution.

Particulate pollution (PM) has a range of sources, both local and regional. Vehicles are a source of PM and therefore measures to reduce NO_2 pollution from this source can also help reduce emissions of particulate matter. Combustion processes such as domestic heating (especially domestic solid fuel burning) and industry can also contribute locally. There is also a contribution from sources outside of the local authority area. In the case of particulate pollution, contributions from agriculture, industry and natural sources can be significant at times, when weather patterns result in a build-up of pollution in the atmosphere and the formation of secondary particulate pollution. Secondary particulate matter (PM) is formed in the atmosphere through chemical reactions between other air pollutant gases such as nitrogen oxides (NOx), ammonia (NH_3) and sulphur dioxide (SO_2).

Appliances that burn solid fuel contribute to local air pollution and evidence is that their contribution is increasing due to the popularity of solid fuel burning for occasional heating requirements, especially in the wintertime. Domestic solid fuel burning can generate significant levels of particulate pollution.

Recent evidence from national studies shows that domestic solid fuel burning contributes more than previously thought to particulate emissions. This new national research suggests that the health impacts from local domestic wood burning are significant. As a result of this national evidence, Bristol City Council commissioned a study, Impact of Solid Fuel Burning in Bristol: Policy Options for Reducing Emissions, to try to determine the

scale of solid fuel burning in the city and the contribution that it has to particulate pollution.

In additional to the report quantifying pollutant emissions from solid fuel use, a report into the emissions from construction Non-Road Mobile Machinery (NRMM) has also been commissioned by BCC. The aim of the report is to provide the evidence base needed to develop appropriate policies to manage emissions from this potentially significant pollutant source.

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 still many areas where local authorities are reliant on action through national policy and where national policy adversely impacts air quality. There is a need to ensure that national policy complements local air quality action, which is not always the case. A number of national policies are resulting in personal car use becoming relatively cheaper and more attractive when compared to public transport options. Current messaging on the harmful effects of solid fuel burning from central government is not considered to be strong enough, misleading, and is unlikely to be effective in changing behaviour significantly. There are some areas where local action is needed to improve air quality further, but this needs to be better supported by national policy.

The 2019 Clean Air Strategy[9] sets out the case for action, with goals to reduce exposure to harmful pollutants. The Road to Zero[10] sets out the approach to reduce exhaust emissions from road transport through several mechanisms; this is extremely important given that most of the Air Quality Management Areas (AQMAs) are designated due to elevated pollutant concentrations heavily influenced by transport emissions.

As previously discussed, air pollution in those locations exceeding the health-based limits for nitrogen dioxide originates predominantly from motor vehicles. The approach to reducing NO_2 concentrations is focused on measures to reduce the number of vehicles on our roads, clean up the emissions from those vehicles and to reduce congestion.

[9] Defra. Clean Air Strategy, 2019

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

Bristol Transport Strategy

The Bristol Transport Strategy was adopted in July 2019 sets out a vision on how the city will:

- create an inclusive transport system that provides realistic transport options for everyone;
- create healthy places that promote active transport, improve air quality, and improve road safety;
- make better use of our streets to enable more efficient journeys;
- enable more reliable journeys by minimising the negative impact of congestion; and
- support sustainable growth by enabling efficient movement of people and goods, reducing carbon emissions.

Bristol City Council have developed a Shared Mobility Position Statement which is an annex of the Bristol Transport Strategy. This sets out a policy framework for how different shared mobility modes can help Bristol City Council meet transport and wider city objectives. Shared mobility refers to types of transport that are shared with other people, either concurrently or one after another. This includes car clubs, short term car rentals or micro mobility options such as e-bikes, e-cargo bikes, or e-scooters.

Local Cycling and Walking Infrastructure Plan (LCWIP)

The Local Cycling and Walking Infrastructure Plan is a detailed plan which identifies that over £400m of investment is needed and will be sought and channelled through the West of England Combined Authority. Working with Bath & North East Somerset, Bristol, North Somerset and South Gloucestershire councils, the aim is to provide high quality infrastructure to ensure the West of England is a region where cycling and walking are the preferred choice for shorter trips. Public consultation on the plan took place in early 2020.

Travel West and West of England Combined Authority (WECA)

There is long-established collaboration between the three former Avon authorities (now referred to as the West of England authorities). In this regard, the Travel West brand acknowledges the fact that the commuter doesn't think in terms of authority boundaries.

The Joint Local Transport Plan, JTLP 4 was published in March 2020 which sets the West of England Combined Authority (WECA) regions transport vision through to 2036. A

greater emphasis than previously is placed on air pollution compared to the superseded JLTP (3). The JLTP 4 document *"shows how we will aim to achieve a well-connected sustainable transport network that works for residents across the region; a network that offers greater, realistic travel choices and makes walking, cycling and public transport the natural way to travel"*

TravelWest is part of the West of England Combined authority (WECA) and brings together partners to improve transport across the region, to provide sustainable, long-term solutions to help people move around the region more easily.

A website is available to help people plan journeys and to learn about the resources available to residents in the area to help them travel more sustainably.

One City Plan

The One City approach brings together a wide range of public, private, and third sector partners within Bristol. They share an aim to make Bristol a fair, healthy, and sustainable city. A city of hope and aspiration, where everyone can share in its success.

Within the plan there are commitments and aspirations on air pollution including:

- Making progress towards cleaner air in the fastest time possible by working with city partners on successfully planning the launch of the Clean Air Zone; and
- An aspiration to achieve the WHO interim guideline value (WHO-10µg/m^3) for $PM_{2.5}$ by 2030.

Bristol Climate Emergency Declaration

- In November 2018 the Mayor declared a Climate Emergency and an initial plan of action has been developed to address this. The initial plan provided funding to work with city partners and stakeholders to develop a climate strategy for the city. For more details go to The Mayor's Climate Emergency Action Plan.

Whilst the climate emergency declaration focuses on reducing emissions of CO_2 pollution, many sources of CO_2 emissions are the same as those that emit pollutants that are directly harmful to health locally such as NO_2, particulate matter and sulphur dioxide. Many measures to reduce emissions of CO_2 from combustion sources will reduce emissions of these other pollutants that are harmful when breathed in. As a result, action to address the climate emergency are acknowledged here as important in reducing concentrations of local air pollution.

One City Climate Strategy

This Strategy provides more detail on the commitment within the One City Plan for Bristol to become carbon neutral by 2030. Within the One City Climate Strategy transport is an area where it has been identified that action is needed with a focus on:

switching to significantly more walking, cycling and zero carbon public transport modes; converting the remaining vehicles to zero carbon fuels; transforming freight, aviation and shipping.

Changes to Neighbourhood Roads and High Streets

Bristol City Council are considering making significant changes to several neighbourhood roads to:

- create more liveable neighbourhoods free from traffic and congestion
- minimise rat running
- maximise community enjoyment of busy high streets

The aim is to:

- improve walking and cycling journeys in and around the area
- improve air quality on the road
- give pedestrians and cyclists more space and make it safer for children to walk or cycle to school
- give businesses and residents more space to use to the road, such as for community events or to provide more outdoor space to shops and hospitality venues

Details of the possible changes, roads being considered and how to provide your opinion on the proposals can be found on the Bristol City Council website.

East Bristol Liveable Neighbourhood Pilot Project

Liveable neighbourhoods are areas of a city that are improved to be people-centred and more ‘liveable’. They are safe, healthy, inclusive, and attractive places where everyone can breathe clean air, have access to better quality green spaces and safe spaces to play, and feel a part of a community. The improvements in a liveable neighbourhood aim to make it easier to catch a bus and to walk or cycle, with improved infrastructure and less through traffic.

An East Bristol pilot liveable neighbourhood is being is being developed in an area including Barton Hill and parts of Redfield and St George, south of Church Road and north of the river Avon. This pilot project is being designed with the local community to make sure it will meet local needs.

School Streets

Bristol City Council is committed to making Bristol's streets safer for everyone living, working, and visiting the city. An area of priority are the streets outside our schools. One of the ways we are doing this is through the introduction of School Streets, whereby the street or streets immediately outside the school entrance are closed to non-essential vehicles at school opening and closing times. Only people walking, wheeling, cycling, and scooting are permitted access to the School Street zone while the restriction is in place, with exemptions given to emergency vehicles and Blue Badge holders. In some cases, permits will be given to residents and businesses living or working within the zone – this varies from scheme to scheme and is decided on an individual basis.

School Streets are now being rolled out by local authorities across the country. In February 2020 BCC launched a pilot scheme at two schools: St Peter's CofE Primary School and Wansdyke Primary School.

In May 2021 BCC launched School Streets at two additional schools: Redfield Educate Together Primary Academy and Victoria Park Primary School, and there are plans to extend this to a further four schools in 2022.

E-Scooter Trial

Hop-on hop-off e-scooters are available in Bristol, Bath and in parts of South Gloucestershire to help residents and visitors to get around central areas. Clusters of e-scooters will also be available at other key locations such as stations, university campuses, hospitals, and large employment sites. It is also possible for residents to get an e-scooter for a long-term trial to allow them to keep one at home for an extended period.

Metrobus

Metrobus has been designed to link and connect with existing rail and bus services and is part of an integrated approach to travel investment that includes measures to improve cycling and walking, traffic and parking management and improvements to rail via MetroWest. Metrobus services started operation in 2018.

MetroWest

MetroWest will transform rail travel in the region, generating over a million new rail journeys and giving 80,000 more people access to train services.

Portishead Rail Line: MetroWest Phase 1

- Severn Beach: Hourly services on the Severn Beach Line to Bristol Temple Meads and half hourly services from Avonmouth to Bristol Temple Meads calling at a new station at Portway next to the Park and Ride.
- Bath & Westbury: Half hourly services from Bristol Temple Meads to Bath to Westbury.
- Portishead Line: Re-opening of the Portishead Line providing an hourly service between Portishead and Bristol Temple Meads with new stations at Pill and Portishead.

A decision on the Development Consent Order for Phase 1 of Metrowest – Portishead Branch Line was due on the 19th of April 2022. The Secretary of State announced a further delay to consent for construction of MetroWest Phase 1. For further information, please refer to the written statement laid in Parliament.

Henbury Rail Line: MetroWest Phase 2

- Henbury Line: Re-opening of the Henbury Line with new stations at Henbury, North Filton and Ashley Down, providing an hourly service from Bristol Temple Meads to Filton Abbey Wood and onto North Filton and Henbury.
- Yate & Gloucester Line: Half hourly services between Bristol Temple Meads and to Gloucester via Yate with a potential new station at Charfield.

The MetroWest Phase 1 and Phase 2 proposals include new or reopened rail stations at Portishead, Pill, Henbury, North Filton and Ashley Down.

In addition to these stations, a separate new stations package is looking at the potential for future new stations in other locations.

Proposals for a new station at Saltford on the line between Bristol and Bath are being pursued by Bath & North East Somerset Council. Bristol City Council has commissioned a study to investigate the likely costs, benefits, and operational feasibility of a new station at Ashton Gate.

Freight Consolidation

As part of the One City Plan, Bristol City Council are aiming for 95% of deliveries within the city centre to be made by electric freight vehicles within the next decade, with consolidation centres at all our main access routes.

In January 2021 leading green logistics service Zedify successfully applied for a £100,000 grant from Bristol City Council, which will be invested in a fleet of electric cargo bikes and trikes capable of carrying up to 200kg of packages. A zero emissions hub will be set up to allow HGV's and diesel vans to drop off goods without entering the city centre.

Development of a Clean Air Zone

Bristol City Council has been directed by the UK Government to achieve compliance with air quality objectives in the shortest possible time. A small area Class D Clean Air Zone is being planned for Bristol for implementation in 2022.

For updates on the progress with the Bristol Clean Air Plan please visit the Clean Air for Bristol Website

GoUltraLowWest

As part of creating a better environment, all the West of England's local authorities are committed to encouraging the widespread use of electric cars, vans, and bikes.

Go Ultra Low West is a £7m project that aims to accelerate the purchase of electric vehicles across Bristol, South Gloucestershire, North Somerset and Bath & North East Somerset.

Over 120 new charge point connections are being installed to double the size of the current public charging network. The Revive vehicle charging network has been launched, taking over from the previous Source West network. This ensures that owners of electric vehicles will be able to charge at more destinations in the region.

The project includes the delivery of 4 new rapid EV charging hubs, new electric car clubs, business grants for charge point installation, updating council fleet vehicles and providing residents in the WECA region the opportunity to try out an EV for two weeks. From February 2018 to April 2021 144 EV loans were completed.

Slow the Smoke Citizen Engagement Project

Bristol City Council were awarded £122,000 through the annual Defra Air Quality Grant fund to carry out a study into solid fuel use in Bristol. This project aims to tackle particulate matter (PM) emissions from an important and growing source of pollution i.e. domestic solid fuel burning. It is primarily a research project, although if successful we hope will lead to some improvement in air quality in the study area. To date a survey has been sent to all residents in the ward, two workshops have been held to build sensors, with ten sensors being built and now used within the community. A remote workshop has also been held on Making Sense of Data and a new particulate monitor will be installed in Ashley Ward in 2022. The project will run to the end of 2022.

Conclusions and Priorities

Monitoring

Whist the trend of year-on-year reductions in annual NO_2 concentrations since 2010 has not continued into 2021 it should be noted that 2020 was a very unusual year with regards to traffic flows and pollution. As a result of lockdown restrictions, traffic flows over 2020 were lower than usual. Whilst there were continuing restrictions in 2021, they were less severe than those in 2020. As a result, overall traffic volumes were higher in 2021 than 2020. It is likely that this is the reason for the relative increase in pollution in 2021 when compared to 2020. 2021 annual NO_2 pollution levels were lower than they were in 2019, which is the last full year of data before the pandemic impacted of movement of people. In 2021 there were 8 monitoring locations where distance adjusted (representing relevant exposure) annual nitrogen dioxide concentrations were greater than 40µg/m^3, this compares to just 2 locations in 2020, however, comparing these figures directly to identify trends is misleading as in 2021, an additional 93 diffusion tube monitoring locations were added to the network. In 2021 five additional sites were at risk of exceedance when considering locations where annual NO_2 concentrations were greater than 36µg/m^3 at locations of relevant exposure.

The particulate matter (PM_{10}) trends for the past 5 years are available from an urban background site, Bristol St Pauls, and the Temple Way roadside site. One new roadside site at Colston Avenue has data since 2019. At Bristol St Pauls annual PM_{10} concentrations have increased since 2017 by 1µg/m^3 to 15.7µg/m^3. Annual 2021 PM_{10} concentrations decreased at this site when compared to 2020, falling from 17.3µg/m^3 to

15.7µg/m^3. Despite the increase in traffic movements over 2021 compared to 2020, PM_{10} concentrations decreased, which illustrates that it is more than just traffic pollution impacting on PM_{10} levels, especially at background locations. 2021 annual concentrations from the roadside Temple Way and Colston Avenue sites were 18.9µg/m^3 and 18.2µg/m^3 respectively, both of which were lower than 2020 levels.

$PM_{2.5}$ concentrations at Bristol St Pauls have fluctuated since 2017 with a decrease from 9.7µg/m^3 in 2017 to 8.3µg/m^3 in 2021. Recent monitoring shows that this is not necessarily a downward trend that will continue, so measures to reduce local emissions of $PM_{2.5}$ remain important. Annual $PM_{2.5}$ concentrations measured at the roadside site at Parsons Street School were 12.0µg/m^3 in 2021. This was a small increase from 11.8µg/m^3 in 2020. The monitored concentrations are above the WHO guideline value but below the EU and UK annual value which is set at 25µg/m^3.

The monitoring data indicates that action is still needed to achieve compliance with annual NO_2 objectives in all parts of the city. It also demonstrates that reductions in $PM_{2.5}$ concentrations are needed to meet the WHO guideline concentrations for this pollutant. $PM_{2.5}$ concentrations at this site are likely to be indicative of $PM_{2.5}$ concentrations at busy roadside locations in many parts of the city.

Measured exceedance of the annual objective outside of the AQMA boundary occurred at two locations in Bristol in 2021. One of these locations was on Muller Road, the other on Blackboy Hill. The site on Muller Road was tube 567 on the Muller Road/Glenfrome Road Junction. An annual NO_2 concentration of 44.8µg/m^3 was measured in 2021. When adjusted for distance to the closest relevant exposure, the exceedance remained with a value of 40.2µg/m^3. This is the first year that an exceedance was predicted at the relevant receptor location since monitoring started at this location in 2019. Despite being outside of the AQMA, it is only marginally outside, with the AQMA boundary passing with 20m to the south of this monitoring location.

Site 3 on Blackboy Hill has seen a significant increase in NO_2 pollution levels in 2021, which is out of step with the general trend in pollution levels are roadside locations. In 2019, measured NO_2 concentrations were 27.7µg/m^3, they increased to 44.4µg/m^3 in 2021. Further investigation as to a possible local source of pollution, other than emissions from transport, will be carried out. This site is representative of relevant exposure.

Details of these exceedances outside of the AQMA are contained within

Table C.1. Monitoring in these locations has continued in 2021.

Pollution Reduction Actions - Transport

The priority for Bristol City Council is to implement a Clean Air Zone (CAZ) in 2022 to achieve compliance with air quality objectives in the shortest time possible. This work is progressing in consultation with the governments Joint Air Quality Unit (JAQU). The other initiatives and plans, as described in the text, will continue to be taken forward and developed.

The CAZ planning work has identified that a Class D Clean Air Zone that charges non-compliant private cars and commercial vehicles will bring Bristol into compliance by 2023. This will be introduced in Bristol in 2022. A substantial financial support package will be offered to individuals and business to help adapt to the changes. Full details can be found on the Clean Air Zone Support pages.

Additional actions on transport emissions are focussed on encouraging and facilitating modal shift by providing safe, convenient, and reliable alternatives to car use, alongside facilitating a shift towards cleaner vehicles where they still need to be used.

Pollution Reduction Actions – Solid Fuel/Bonfires

Action was taken on communication and awareness raising on solid fuel emissions through the ‘Slow the Smoke’ communications in winter 2020/21. There are plans to expand on this communications work to cover domestic solid fuel use, bonfires, and the sales of solid fuels in 2022/2023. This will aim to raise awareness of the health effects of PM pollution from these sources, reduce the amount of burning in the city and to ensure best practice is used if burning still takes place. In addition, the Defra air quality grant funded ‘Slow the Smoke’ project, which involves citizens using low-cost pollution sensors, will continue until the end of 2022.

Local Engagement and How to get Involved

How Can Pollution Be Reduced? - Transport

There are many ways in which people can help contribute towards reducing air pollution in Bristol. Air pollution, at locations where we are recording illegal levels of nitrogen dioxide, comes predominantly from emissions from vehicles. Choosing to travel around the city by

foot, by bicycle or using public transport, whenever it is possible, can reduce an individual's personal contribution to air pollution in the city. To find out more information on sustainable transport options throughout the West of England region you can visit the Travel West Website or its sister website Better by Bike.

For those journeys taken by cars, choosing to travel outside of peak times can help reduce congestion and pollution levels. In 2022 Bristol will be introducing a charging clean air zone. If you are thinking of replacing your vehicle you can check to see if it will be compliant, and therefore not be subject to a daily charge to drive in the zone, by using this vehicle checker.

Whilst government vehicle taxation is based on the relative emissions of carbon dioxide (CO_2), this can be misleading to those looking for a vehicle with low emissions of pollutants that are directly harmful to health. Diesel cars have been promoted as being 'low emission / eco' vehicles. Whilst these may offer relatively low advertised CO_2 emissions, on average, older diesel vehicles, are generally worse for air pollutants such as nitrogen dioxide and particulates, which are of greatest concern for local air quality.

Measurement of real-world vehicle emissions have shown that large discrepancies exist between the required vehicle emissions standards, as defined by Euro emissions standards, and the level of pollution emitted under real world driving conditions. The largest discrepancies are related to nitrogen oxides (NO_x) emissions which lead to the formation of NO_2 pollution.

This illustrates why diesel cars continue to present problems to achievement of NO_2 air quality objectives in the city and why older diesel vehicles in particular are contributing significantly to NO_2 pollution.

How Can Pollution Be Reduced? - Domestic Heating

From an air pollution perspective, if a property does not already have a stove or open fireplace, the best option is not to install one. Even the cleanest wood burning appliance emits significantly more particulate matter than a gas oil or gas appliance.

The lowest emission stoves currently on the market are those that are 'Eco-design Ready'. These meet the EU standards that were introduced for all new stove sales in the UK in 2022. Within Bristol, as a minimum, a wood burning stove should be approved for use within a smoke control area, known as an 'exempt appliance'.

If you do chose to burn solid fuel it is important to use a wood burner or open fire correctly

to ensure that Smoke Control Area regulations are not breached. The whole of Bristol is a smoke control area. This means that, for domestic heating purposes, wood can only be burnt in a Defra approved stove. It is not permitted to burn wood in an open fire in Bristol. Only exempt smokeless fuels are permitted to be burnt in an open fire.

Whilst the type of solid fuel appliance used is an important factor in determining the level of pollution emitted, the way in which they are used is equally as important. Understanding the right fuels and the right way to use them is explained within guidance issued by Defra: Open fires and wood-burning stoves – A practical guide. The measure outlined for reducing emissions include:

- Choosing the right stove
- Considering burning less
- Buying 'Ready to Burn' fuel
- Season freshly chopped wood before use (wood can only be burnt in Bristol within a Defra exempt appliance. It is not permitted to burn even seasoned wood in an open fire, or an appliance not considered exempt by Defra for use in a smoke control area).
- Do not burn treated waste wood (e.g., old furniture) or household rubbish
- Regularly service and maintain your stove (annually)
- Get your chimney swept regularly (up to twice a year)

In May 2021 the Air Quality (Domestic Solid Fuels Standards) (England) Regulations 2020 came into force. They have been introduced to reduce emissions of PM from residential burning of wood and other solid fuels. The regulations will phase out the use of bituminous coal and unseasoned wood in residential heating appliances.

Local Responsibilities and Commitment

This ASR was prepared by the Sustainable City and Climate Change Team of Bristol City Council with the support and agreement of the following officers and departments:

This ASR has not been signed off by a Director of Public Health as this is a new request from Defra. Arrangements will be put in place for this to happen for next year's ASR.

If you have any comments on this ASR, please send them to Andrew Edwards at:

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1 Local Air Quality Management

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

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether 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 Bristol City Council to improve air quality and any progress that has been made.

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

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority should prepare an Air Quality Action Plan (AQAP) within 12 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

A summary of AQMAs declared by Bristol City Council can be found in Table 2.1. The table presents a description of the one AQMA that is currently designated within the Bristol City Council area. Appendix D: Map(s) of Monitoring Locations and AQMAs provides maps of the AQMA and 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
- PM_{10} 24-hour mean

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	One Line Description	Is air quality in the AQMA influenced by roads controlled by National Highways?	Level of Exceedance: Declaration	Level of Exceedance: Current Year	Name and Date of AQAP Publication	Web Link to AQAP
Bristol AQMA	Declared 01/05/2001. Amended on 01/05/2003 and 01/05/2008 and 26/10/2011	NO_2 Annual Mean	An area covering the city centre and parts of the main radial roads including the M32.	YES	N/A	N/A	Joint Local Transport Plan 4 Clean Air Zone (CAZ)	JLTP 4 at Travelwest Website Clean Air for Bristol Website for CAZ Plans
Bristol AQMA	Declared 01/05/2001. Amended on 01/05/2003 and 01/05/2008 and 26/10/2011	NO_2 1 Hour Mean	An area covering the city centre and parts of the main radial roads including the M32.	YES	N/A	N/A	Joint Local Transport Plan 4 Clean Air Zone	JLTP 4 at Travelwest Website Clean Air for Bristol Website for CAZ Plans
Bristol AQMA	Declared 01/05/2001. Amended on 01/05/2003 and 01/05/2008 and 26/10/2011	PM_{10} 24 Hour Mean	An area covering the city centre and parts of the main radial roads including the M32.	YES	N/A	N/A	Joint Local Transport Plan 4 Clean Air Zone	JLTP 4 at Travelwest Website Clean Air for Bristol Website for CAZ Plans

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

☒ **Bristol City Council confirm that all current AQAPs have been submitted to Defra.**

The monitoring network in Bristol has changed considerably since the declaration of the Air Quality Management Area in 2001. There is an extensive air quality monitoring network throughout the city which provides annual NO_2 data. The monitoring locations in 2021 are not directly comparable to those in 2001 and therefore the comparison between exceedance levels at declaration in 2001 and 2021 would not provide a true reflection of trends in air pollution over that timeframe. For this reason, the corresponding columns in Table 2.1 above have not been completed. Distance adjusted (where relevant) data for all 182 nitrogen dioxide diffusion tube monitoring sites has been provided in Table B.1. An indication of general trends in annual NO_2 values from 2010 are shown in Figure A.1 to Figure A.4 and is considered to be more representative of trends in recent years than would be established from looking at data from one worst case site as requested in Table 2.1.

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

Defra's appraisal of last year's ASR concluded the report is well structured, detailed, and provides the information specified in the Guidance. Several specific comments were made, details of which are outlined below.

- Bristol City Council are advised to utilise Defra's annualisation tool in future reports and include the output table provided as supporting evidence for calculations.

This has been used as requested and the evidence table included in the ASR

- It is noted that in Table A.4, 'Valid Data Capture for Monitoring Period (%)' has been calculated incorrectly for a number of sites, with many rows reading >100%. The Council are therefore required to correct these values prior to further publication of the report.

This data processing issue which led to this error has been identified. Table A.4 in the 2021 ASR contains the correct data capture figures.

- The Council have not prepared a standalone AQAP for their AQMA. Use of the LTP4 and CAZ Plan as an interim is accepted, however it is important that an AQAP which follows the prescribed template and contains the required information is produced in the near future.

Work is commencing to put together a document that will address the issue raised. The Government are currently consulting on new targets for $PM_{2.5}$ pollution and the LAQM process. As a result, any new action plan developed, given that it should cover a 5 year time period, would benefit from being produced once the details of these consultations have been finalised. This would allow an effective plan, that addresses new processes, pollutant targets and local authority responsibilities that may arise as a result of these changes.

- The Council are encouraged to discuss in greater detail the local factor (bias adjustment) selected, and the reasons for this choice. It is acknowledged that full calculations have been provided for local factor derivation for each automatic monitoring site, and this is commended. A combined local factor of 0.85 has been applied, and details of this calculation have been provided.

Additional discussion on the choice of the bias adjustment factor used has been included in the 2021 ASR.

- Diffusion tube mapping is robust and clearly demonstrates the extent of the monitoring network. The colour-coding in Figure C.4 is particularly insightful and will allow for the identification of hotspot areas.

This has been continued for the 2021 ASR.

Bristol City Council has taken forward a number of direct measures during the current reporting year of 2021 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2 . 30 measures are included within Table 2.2, with the type of measure and the progress Bristol City Council have made during the reporting year of 2021 presented. Where there have been, or continue to be, barriers restricting the implementation of the measure, these are also presented within Table 2.2.

More detail on some of these measures can be found in their respective online portals, for example at the Clean Air for Bristol website or on the TravelWest website and within sections of this report.

Bristol City Council expects the following measures to be completed over the course of the next reporting year:

- Delivery of the Bristol Clean Air Zone in agreement with the Government's Joint Air Quality Unit to deliver compliance with air quality objectives in the shortest time possible.

- Complete the Slow the Smoke Air Quality Grant funded citizen engagement project related to solid fuel.
- Carry out additional communication and awareness raising activity on domestic solid fuel use, bonfires, and sales of fuels.
- Continue planning and implementing a range of actions intended to improve public transport provision, and the infrastructure for walking and cycling, to make these transport modes more attractive.

Bristol City Council anticipates that the measures stated above and in Table 2.2 will achieve compliance in the Bristol AQMA in the shortest possible time, as required by the JAQU.

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	Bristol Clean Air Zone	Promoting Low Emission Transport	Low Emission Zone	TBC	2021	BCC	Government	NO	Funded	> £10 million	Planning	Reduced vehicle emissions	Achieving Compliance within the shortest timeframe possible	For latest Developments see https://www.cleanairforbristol.org/	
2	MetroBus BRT scheme	Transport Planning and Infrastructure	Bus route improvements	2018	2022	BCC/S.Glos/NE Somerset.	Government Funding/WECA	NO	Funded	> £10 million	Implementation	Encouragement of modal shift through provision of quick reliable bus services.	Improved bus Services, quicker journey times and more reliable services from both northern and southern city fringes	Implementation on-going	
3	Local Plan Review	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	Ongoing	2023	BCC	LA Funded	NO	Funded	£100k - £500k	Planning	Adoption of standalone policy for Air Quality and strengthen weight given to air pollution in Local Plan policy documents	Development and Adoption of New Local Plan Documents	Revised programme yet to be published	
4	Make improvements to the city Centre through the City Centre Framework.	Promoting Travel Alternatives	Other	2020	2027	BCC	WECA/BCC	NO	Funded		Planning	Improving conditions for active and public transport in the city centre	Space for business and people to operate on move around whilst maintaining social distancing	Ongoing development and review of the measures introduced	
5	Slow the Smoke	Other	Other	2021	2023	BCC, Knowle West Media Centre, University of the West of England	Government	YES	Funded	£100k - £500k	Planning	Raised awareness of emissions and impact from solid fuel use leading to behaviour change	Increased public understanding of solid fuel impacts on health and air quality. Improved understanding of BCC of impact of solid fuel use on air pollution.	Project Planning	
6	Freight Consolidation	Freight and Delivery Management	Freight Consolidation Centre (FCC)	2020	2021	BCC, Zedify	OLEV	NO	Funded	£50k - £100k	Implementation	Reduction in GHV and LDV mileage in city centre and replaced with zero emission last mile	95% of deliveries in the city centre by EVs or bikes by 2030	Ongoing development and expansion of the FCC	
7	Awareness raising campaign related to emissions from solid fuel	Public Information	Via the Internet	2020	2021	BCC	BCC	NO	Funded	£10k - 50k	Completed	Reduced emissions from solid fuel if information influences behaviour resulting in less or 'better' burning practices	Raising awareness of health impacts of solid fuel use and best practice	Complete but possible this may be repeated in 2021/22 heating season	

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
8	Prioritising purchase of EV vehicles in public sector fleets	Promoting Low Emission Transport	Public Vehicle Procurement - Prioritising uptake of low emission vehicles	2017		WoE Authorities	Govt, LA	NO	Funded		Implementation	Reduce emissions from LA vehicle fleet	100 ULEV vehicles across WoE council fleet - representing 20-25% transfer. Expected that Bristol will procure around 45 EVs (10%) of the fleet.	Ongoing	
9	Car Clubs	Alternatives to Private Car Use	Car Clubs			WoE Authorities	Private and LA, EU H2020 -Replicate	NO	Funded		Implementation	Reduced car ownership	120 car club cars currently in use in Bristol. BCC EU H2020 Replicate project. 11 EVs being trialled in Replicate project and 24 on street charge points installed	Ongoing	
10	Portbury, Avonmouth and Severnside (PAS) Transport Strategy	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	2020		BCC, SCG,NSC	LA Funded	NO	Funded		Planning	Increased active travel	Improve connectivity, promote growth, and provide sustainable travel alternatives	Transport study being undertaken to inform public engagement and strategy development.	
11	School Streets Project	Promoting Travel Alternatives	Other	2020		BCC	LA Funded	NO			Implementation	Lower pollution outside schools and increased active travel	Closing streets to motor vehicles outside schools at the start and end of the school day	Ongoing	
12	No Idling	Public Information	Other	2020		BCC	LA Funded	NO	Funded		Implementation	Reduced emissions and greater awareness of air pollution	Asking drivers to switch off especially at hotspots like hospitals and schools	Ongoing	
13	Replacement of BCC plant and fleet with Electric	Promoting Low Emission Transport	Company Vehicle Procurement - Prioritising uptake of low emission vehicles	2019	2023	BCC	LA Funded	NO			Implementation	Reduced emissions from BCC fleet and plant	All vehicles and plant replaced with electric where technology allows.	44 EV's in BCC fleet. 26	
14	Install and operate 150 electric vehicle residential charge-points for drivers without off-street parking. 10 rapid charge points for use by taxi and private hire vehicles, and 2-3 ultra rapid chargepoints for commercial	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	2022	2023	DfT/BCC	DFT/BCC	NO	Not Funded	£100k - £500k	Planning	Promote low emission vehicle use.	150 residential EV chargepoint locations installed and working	Planning phase, awaiting DfT funding decision	

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
	and public use.														
15	Install and operate 16 Rapid charge points	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	2022	2023	BCC	BCC	NO	Funded		Implementation	Promote low emission vehicle use.	Install 16 Rapid chargers	Implementation on-going	
16	Run the Electric Vehicle Centre of Excellent to provide support for businesses and build confidence to change their fleet to electric vehicles. We will buy and loan 64 electric vehicles	Promoting Low Emission Transport	Other	2021	2024	BCC	Grant Funded	NO	Funded		Implementation	Promote low emission vehicle use.	Centre of Excellence up and running	Implementation on-going	
17	Develop a freight strategy describing how we will help freight transported on Bristol roads will be zero carbon and efficient	Promoting Low Emission Transport	Other	2022	2023	BCC	BCC	NO	Funded	£10k - 50k	Planning	Develop zero carbon freight delivery in Bristol			
18	Develop plans for a Mass Transit system together with neighbouring authorities	Transport Planning and Infrastructure	Public transport improvements -interchanges stations and services	2022		WECA authorities/BCC	WECA/Network Rail	NO			Planning			A4 corridor being designed/developed Strategic Outline Business Case for citywide improvements will be complete in Summer/Autumn 2022	
19	Improve walking, cycling and public transport infrastructure through the A37/A4018 project	Promoting Travel Alternatives	Other	2019	2027	BCC	WECA CRST/BCC	NO		> £10 million	Planning	Increase public and active transport use along this corridor	Improvements to walking, cycling and public transport infrastructure along the A37/A4018 corridors.	Consultation and development of plans	
20	Leading the Bristol to Bath project to provide a	Promoting Travel Alternatives	Other	2022	2025	BCC/BANES	WECA	NO			Planning	Increase public and active transport use	Improvements to walking, cycling and public transport	Scheme and design being developed	

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
	continuous bus priority, walking and cycling routes on adjacent to A4											along this corridor	infrastructure along the A4 corridor.		
21	Liveable Neighbourhood trial in East Bristol	Promoting Travel Alternatives	Other	2021	2024	BCC	WECA	NO	Funded		Planning	Prioritisation of safe and active travel by reducing impact of motor vehicles	Improved environment for active travel and increase in those modes	Public engagement to design scheme	
22	Develop mobility hubs to offer bike hire, e-scooters, bus, and e-cargo bikes in one place	Promoting Travel Alternatives	Other	2022		BCC/WECA Authorities	WECA	NO	Funded		Planning	Increase active and public transport use	Hubs developed	Scoping locations and design stage	
23	Build a regional cycling centre for cycle training, rehabilitation, inclusive cycling, and a sports facility	Promoting Travel Alternatives	Promotion of cycling			BCC	Unknown	NO	Not Funded		Planning	Increase accessibility to cycling	Cycling centre built and operational	Feasibility work being carried out.	
24	Voi Scooter trial	Promoting Travel Alternatives	Other	2021	2022	WECA authorities/BCC		NO	Funded		Completed	Trial scooters in the WECA region		Trials underway. Trials extended until November 2022. Unclear what will happen after this date.	
25	Providing continuous bus priority and better walking and cycling links along the A4 Portway Strategic Corridor and the delivery of Portway rail station and associated access improvements	Promoting Travel Alternatives	Other	2022	2027	BCC	WECA/DfT	NO	Not funded		Planning	Improved active and public transport offer on A4 corridor to encourage modal shift	New, effective Infrastructure delivered	Station currently being delivered and Strategic Corridor improvements developing Outline Business Case for WECA funding	
26	M32 Strategic Corridor: providing improved public transport infrastructure and delivery of a P&R.	Alternatives to private vehicle use	Bus based Park & Ride	2021	2027	BCC/S.Glos	WECA	NO			Planning	Improved public transport offer to reduce emissions from private car use.	Improved M32 corridor to encourage public transport use.	Strategic Outline Business Case being developed	

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
27	Active Travel Fund walking and cycling improvements at Park Row, Old Market and Cotham Hill	Promoting Travel Alternatives	Other	2021	2024	BCC	DfT	NO	Funded		Planning	Increase in active travel and reduction in private vehicle emissions	Infrastructure improvements made	Detailed designs being developed for schemes following engagement	
28	Zero Emission Transport City: developing an Outline Business Case for how the city can accelerate plans to decarbonise the transport network through measures such as electrifying the bus fleet, delivering e-cargo freight consolidation hubs, and introducing a Zero Emission Zone. Note that no funding is guaranteed or confirmed to take forward these initiatives at this stage	Promoting Low Emission Transport	Other	2022	2023	BCC		NO	Not Funded		Planning	Business case development is the first step to Zero emission transport	Business case developed	Business case being developed	
29	Delivery of up to 10-30 cycle hangars at council owned properties	Promoting Travel Alternatives	Promotion of cycling	2022	2023	BCC	WECA	NO	Not funded		Planning	Infrastructure leads to increase in cycling	Infrastructure delivered	Full Business Case for WECA funding being developed	
30	Muller Road Sustainable Transport Improvements to improve walking, cycling and public transport links	Promoting Travel Alternatives	Other	2020	2024	BCC	WECA/CIL/HIF	NO	Funded		Implementation	Increase use of sustainable transport options for trips	Infrastructure delivered	First phase of scheme to be delivered this year including Stoke Park 'all weather path', second phase (Muller Road) Outline Business Case being developed	

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

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

Bristol City Council have identified that the recent focus on NO_2 compliance at both a national and local level through the LAQM process has resulted in there being a lack of in-depth knowledge on the scale and local sources of primary $PM_{2.5}$ emissions. The clear evidence on health impacts and requirement to work towards reducing $PM_{2.5}$ emissions and/or concentrations led Bristol City Council to commission studies to develop a more in depth understanding of local emissions of this pollutant. Whilst many actions targeted at reducing emissions of NO_2 will also reduce $PM_{2.5}$ emissions, other potentially significant sources of local primary $PM_{2.5}$ have been identified.

In 2020 two studies were carried out by Air Quality Consultants Ltd for BCC. These attempted to quantify pollutant emissions from solid fuel and construction non-road mobile machinery (NRMM) and identify policy measures to reduce emissions from these sources.

The lowest estimate from the study into solid fuel showed that solid fuel burning accounted for a third of all PM_{10} emissions and half of $PM_{2.5}$ emissions in Bristol. The report provided a number of recommendations that could reduce emissions from this source. In 2020/21 Bristol City Council launched a ‘Slow the Smoke’ communications campaign aimed at raising awareness of the health impacts of solid fuel and options for people to reduce emissions. Additionally, a Defra air quality grant funded project started in 2021 which is using low-cost sensors and innovate citizen engagement to better understand the impact of solid fuel use on air pollution.

Estimates of NRMM emissions using national data showed that this source accounts for approximately 3% of total PM_{10}, 5% of $PM_{2.5}$ and 6% of NOx emissions in Bristol. Whilst not representing a large proportion of total emissions it should be recognised that close to large scale construction sites, NRMM will be a more significant source locally than the Bristol-wide calculations suggest. The estimates are based on national data as local data is limited on this source.

The recommendations from these reports have been considered further by BCC in 2021 to identify opportunities to reduce emissions.

Bristol City Council is taking these additional measures to address $PM_{2.5}$:

- Development of a Clean Air Zone to tackle nitrogen dioxide pollution and to achieve compliance with annual objectives for NO_2 in the shortest time possible. Whilst the plan is focussed on compliance with nitrogen dioxide objectives, it will have benefits for particulate pollution
- The development of policy and infrastructure to support public and active travel will contribute to reducing particulate pollution
- A planned communication and awareness raising campaign in 2022/23 that focuses on PM emissions from domestic solid fuel use, bonfires, and sales of solid fuels.
- The projects, as outlined in Table 2.2, that provide investment in cleaner buses and electric vehicles will help to reduce particulate emissions from transport

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

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

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

Bristol City Council undertook automatic (continuous) monitoring at 8 sites during 2021. Table A.1 in Appendix A shows the details of the automatic monitoring sites. The Bristol Open Data Platform presents automatic monitoring results for Bristol City Council with automatic monitoring results also available through the UK-Air website.

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

3.1.2 Non-Automatic Monitoring Sites

Bristol City Council undertook non- automatic (i.e. passive) monitoring of NO_2 at 182 sites during 2021. Table A.2 in Appendix A presents the details of the non-automatic sites.

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

3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias, annualisation (where the annual mean data capture is below 75% and greater

than 25%), and distance correction. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO_2)

Table A.3 and Table A.4 in Appendix A compare the ratified and adjusted monitored NO_2 annual mean concentrations for the past five years with the air quality objective of 40µg/m^3. Note that the concentration data presented represents the concentration at the location of the monitoring site, following the application of bias adjustment and annualisation, as required (i.e. the values are exclusive of any consideration to fall-off with distance adjustment).

For diffusion tubes, the full 2021 dataset of monthly mean values is provided in Appendix B. Note that the concentration data presented in Table B.1 includes distance corrected values, only where relevant.

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

Data capture rates at 7 out of the 8 automatic NO_2 monitoring sites were above the required 90% rate. The lowest capture rate of 49.6% was recorded at the Marlborough Street site due to it being comissioned in July 2021. For the period of operation the data capture rate at this site was 98.5%.

The continuous monitoring data in 2021 shows an increase in measured annual NO_2 concentrations at 6 of the 7 sites for which data was avaible in both 2021 and 2020. This was to be expected given the impact that Covid related restrictions had on travel behaviour throughout 2020 and the subsequent easing of these restrictions throughout 2021. The Fishponds Road roadside site saw the largest increase of 7.2µg/m^3, however, despite the increase in 2021, NO_2 concentrations at this location were 10.1µg/m^3 lower in 2021 when compared to 2019. Wells Road was the only site that saw a fall in NO_2 concentrations in 2021 when compared to 2020, with a 4.0µg/m^3 reduction. The reasons for this are unclear.

2021 concentrations were lower at all automoatic monitoring sites than 2019, with the biggest decrease being recorded at Colston Avenue. In 2019, annual NO_2 concentration at this site was 65.5µg/m^3, which fell to 49.8µg/m^3 in 2021. This was however an increase of 4.6µg/m^3 on 2020 concntrations at this site. This value of 49.8µg/m^3 means Colston

Avenue continued to exceed the annual objective for NO_2 in 2021.

No sites recorded an hourly value greater than the 200 µg/m^3 hourly objective in 2021. This compares to 6 hours and 8 hours in 2020 and 2019 respectively, at the Colston Avenue monitoring site.

Consideration of trends in NO_2 concentrations at a selection of kerb/roadside sites on the busiest road corridors throughout Bristol, since 2010, show that a similar pattern is observed in all parts of the city. Monitoring has shown consistent exceedence of the annual objectives for NO_2 at many locations but with a consistent reduction in concentrations of NO_2 over this period, with the exception of 2021 concentrations which have inceased compared to 2020. Some sites have seen larger reductions than others over this period. Trends in various parts of the city from 2010 to 2021 are shown in Figure A.1**Error! Reference source not found.** to Figure A.4.

Figure 3.1 and Figure 3.2 show nitrogen dioxide diffusion tube monitoring locations in Bristol. Those sites shown in red or purple indicate locations where exceedence of the annual objective was measured in 2021. The data has been annualised but not distance adjusted in these maps.

All our air pollution monitoring data is available on our open data portal through an ‘Air Quality Dashboard’.

Figure 3.1 - Nitrogen Dioxide Monitoring Results 2021 – Central Area

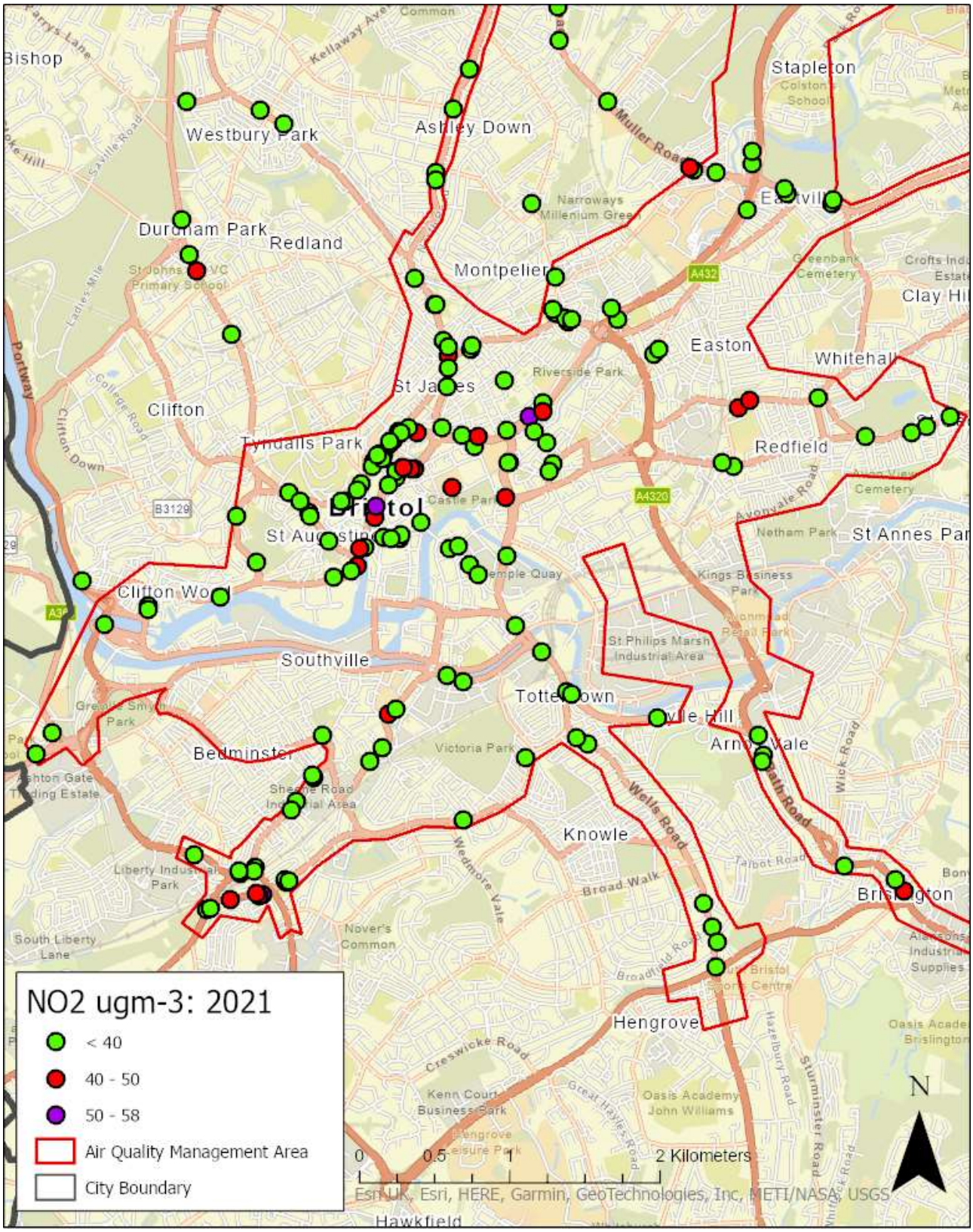
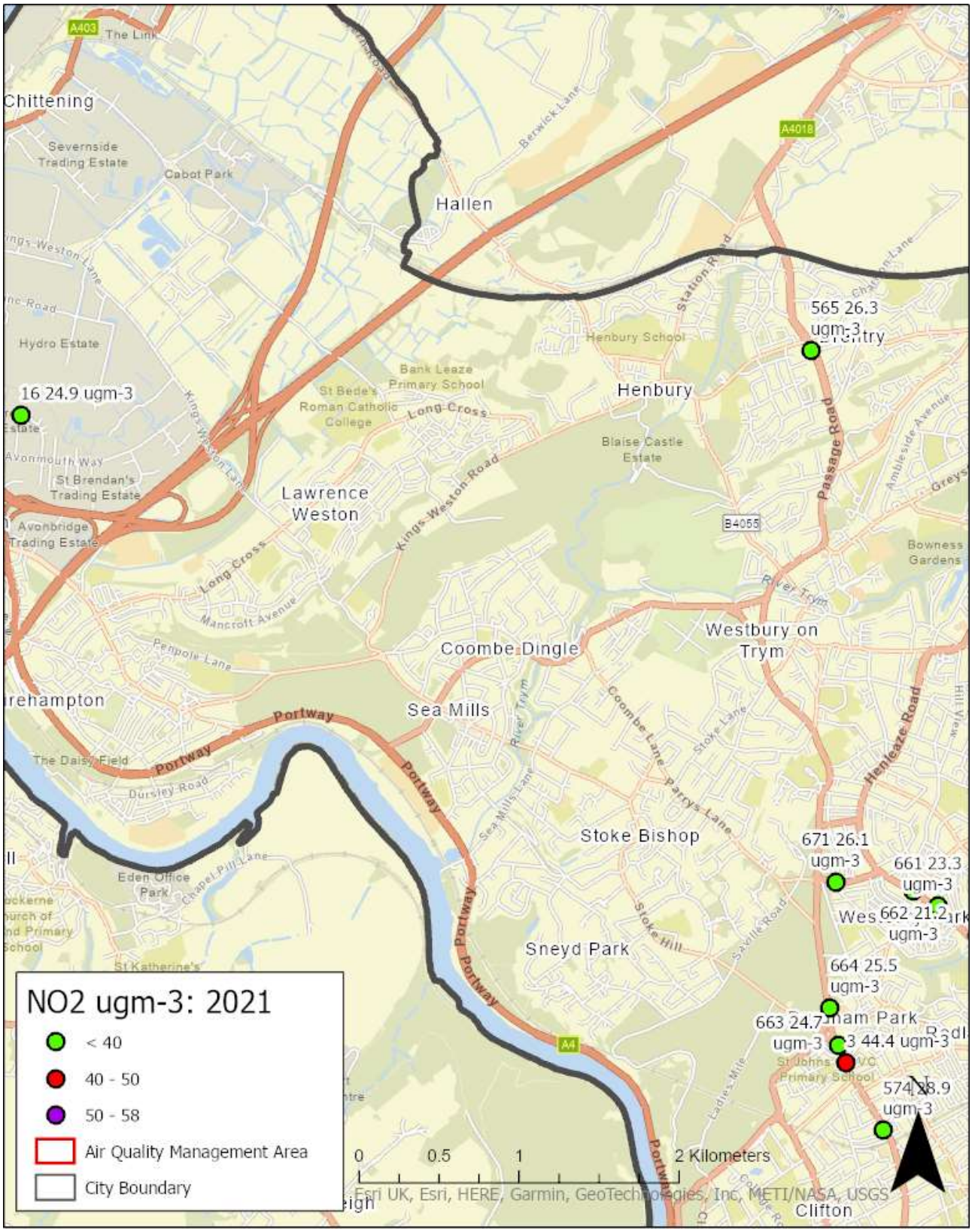


Figure 3.2 - Nitrogen Dioxide Monitoring Results 2021 – Avonmouth



3.2.2 Particulate Matter (PM_{10})

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.

PM_{10} was monitored at three locations in 2021, one urban background site and two roadside sites. The PM_{10} monitor at Colston Avenue failed in July 2021 and it was not possible to fix and reinstate the data collection from this location. 2021 data has been reported for this site but it has been annualised. There are no exceedances of the annual mean or hourly mean objectives at any of the monitoring sites. Data for 2021 at the St Pauls urban background site shows a 1.6µg/m^3 decrease in annual concentrations to 15.7µg/m^3 in 2021 compared to 2020. This is the first year since 2016 that has seen a decrease, with every year since then showing an increase. In 2021 there were two 24-hr periods averaging above above 50µg/m^3, this compares to none in both 2018 and 2019 and two in 2020.

Data for 2021 from the Temple Way and Colston Avenue sites did not show any exceedence of objectives and recorded annual PM_{10} concentrations of 18.9µg/m^3 and 18.2µg/m^3 respectively. As would be expected, measured PM_{10} concentrations are higher at these roadside sites than the AURN urban background site. The data from Temple Way shows a reduction of 0.8µg/m^3 in 2021 when compared to 2020. This continues a trend of decreasing annual PM_{10} concentrations at Temple Way since 2018, with a reduction of 3.7µg/m^3 over this time period. There were 3 days of the year when the 24 hour average was above the 50 µg/m^3 in 2021 compared to 10 in 2019 and four in 2020. The data from Colston Avenue shows a reduction of 1.2µg/m^3 in 2021 when compared to 2020. At all sites the number of days exceeding the 24 hour average of 50µg/m^3 were below the 35 days per year which are allowed to exceed this average value before breach of the air quality objective occurs.

Although no exceedances are reported from the monitoring data it is proposed that the AQMA declaration for PM_{10} is retained as a precautionary measure.

3.2.3 Particulate Matter ($PM_{2.5}$)

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

$PM_{2.5}$ is measured at the Bristol St Pauls AURN and BCC operated Parsons Street School sites. The annual average for this pollutant in 2021 was 8.3µg/m^3 at St Pauls and 12µg/m^3 at Parsons Street School. For the St Pauls site this is a decrease of 1.4µg/m^3 when compared to the 2020 annual average of 9.7µg/m^3. Both are below the UK annual objective of 25µg/m^3. The Parsons Street School site has recorded higher $PM_{2.5}$ concentrations than the urban background site, which is to be expected as Parsons Street is a roadside site. In 2021 Parsons Street saw a slight increase of 0.2µg/m^3 compared to 2020 to 12.0µg/m^3. Both sites are above the World Health Organisations (WHO) air quality annual guideline value of 5µg/m^3 for this pollutant.

At Bristol St Pauls, annual $PM_{2.5}$ concentrations have reduced year on year since 2018, from 12.0µg/m^3 to 8.3µg/m^3 in 2021.

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)
203	Brislington Depot	Urban background	361178	171566	NOx NO_2 NO	No	Chemiluminescent	NA	18	3.5
270	Wells Road	Roadside	360903	170024	NOx NO_2 NO	Yes	Chemiluminescent	9	1	1.5
672	Marlborough Street	Roadside	358728	173520	NOx NO_2 NO	Yes	Chemiluminescent	0	3	1.5
500	Temple Way	Roadside	359522	173381	NOx NO_2 NO PM_{10}	Yes	Chemiluminescent (NOx) and Beta Attenuation (PM)	0	5	1.5
452	AURN St Pauls	Urban background	359488	173924	NOx NO_2 NO $PM_{2.5}$ PM_{10} O_3	Yes	Chemiluminescent (NOx) and Beta Attenuation (PM)	NA	NA	4
215	Parson Street School	Roadside	358042	170582	NOx NO_2 NO $PM_{2.5}$	Yes	Chemiluminescent (NOx) and Beta Attenuation (PM)	0	4	1.5
463	Fishponds Road	Roadside	362926	175590	NOx NO_2 NO	Yes	Chemiluminescent	0	3	1.5
501	Colston Avenue	Roadside	358640	173090	NOx NO_2 NO PM_{10}	Yes	Chemiluminescent (NOx) and Beta Attenuation (PM)	3	2	1.5

Notes:

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

(2) N/A if not applicable

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

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co located with a Continuous Analyser?	Tube Height (m)
2	Colston Avenue	Roadside	358628	173011	NO2	Yes	0.0	1.0	No	2.8
3	Blackboy Hill	Roadside	357448	174650	NO2	No	0.0	3.0	No	2.8
4	Three Lamps	Roadside	359903	171850	NO2	Yes	0.0	3.0	No	3.2
5	Bedminster Parade	Roadside	358723	171704	NO2	Yes	0.0	1.0	No	3.2
9	B.R.I.	Roadside	358729	173499	NO2	Yes	0.0	1.0	No	2.4
10	Bath Road	Roadside	361217	171429	NO2	Yes	5.0	4.0	No	3.2
11	Whitefriars	Roadside	358813	173342	NO2	Yes	0.0	5.0	No	3.2
12	Galleries	Roadside	359142	173211	NO2	Yes	0.0	1.0	No	2.4
14	Red Lion Knowle	Roadside	360871	170291	NO2	Yes	6.0	2.0	No	3.2
15	Horsefair	Roadside	359294	173485	NO2	Yes	0.0	2.0	No	2.2
16	Third Way	Roadside	352287	178698	NO2	No	0.0	2.0	No	2.7
21	Gloucester Road	Roadside	359035	175306	NO2	Yes	3.0	2.0	No	2.8
22	Stokes Croft	Roadside	359109	173886	NO2	Yes	0.0	2.0	No	2.5
113	Victoria Street	Roadside	359258	172696	NO2	Yes	2.0	3.0	No	2.8
125	York Road	Roadside	359214	171917	NO2	Yes	3.0	2.0	No	1.8
147	Anchor Road	Roadside	358514	172691	NO2	Yes	0.0	1.0	No	2.2
154	Hotwells Road	Roadside	357601	172483	NO2	Yes	0.0	1.0	No	2.4
155	Jacobs Wells Road South	Roadside	357838	172713	NO2	Yes	0.0	2.0	No	3.2
156	Jacobs Wells road opp Clifton hill	Roadside	357709	173018	NO2	Yes	0.0	2.0	No	2.5
157	Stokes Croft Ashley Road	Roadside	359119	174090	NO2	Yes	0.0	2.0	No	2.4
159	Cromwell Road	Roadside	358891	174608	NO2	Yes	4.0	2.0	No	2.5
161	Bishop Road	Roadside	359152	175733	NO2	Yes	4.0	2.0	No	2.2
163	Strathmore Road	Roadside	359435	176574	NO2	Yes	7.0	3.0	No	3.6
175	top of Brislington Hill	Roadside	362147	170525	NO2	Yes	13.0	2.0	No	3.2
239	Parson St. A38 East	Kerbside	357880	170506	NO2	Yes	8.3	0.7	No	3.2

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)
242	Parson Street Bedminster Down Road	Kerbside	357510	170401	NO2	Yes	5.0	0.5	No	3.2
254	Merchants Road Hotwells	Kerbside	357118	172429	NO2	Yes	3.7	0.8	No	2.6
260	Stapleton Road South	Roadside	361140	175366	NO2	Yes	1.5	3.5	No	2.4
261	Stapleton Road Heath Street	Roadside	361103	175059	NO2	Yes	5.0	3.0	No	2.1
295	Lamppost 16 Ashley Road St. Pauls	Roadside	359913	174315	NO2	Yes	0.0	2.0	No	2.8
300	Facade Haart Estate Agents 755 Fishponds Road Fishponds	Roadside	363365	175883	NO2	Yes	2.0	1.0	No	2.4
303	Facade 784 Muller Road Fishponds	Roadside	361368	175170	NO2	Yes	0.0	6.0	No	2.2
307	Lamppost Glenfrome Road \ Muller Road Horfield	Roadside	360747	175328	NO2	Yes	3.0	2.0	No	2.2
312	Lamppost Ashley Hill St. Pauls	Roadside	359832	174616	NO2	Yes	4.0	2.0	No	2.7
320_1, 320_2, 320_3	Monitor Bath Road Brislington	Urban background	361180	171567	NO2	Yes	0.0	18.0	Yes	6
325	Facade 258 Fishponds Road Fishponds	Roadside	361667	175103	NO2	Yes	0.0	8.0	No	2.4
363	5102 façade	Roadside	359075	173613	NO2	Yes	0.0	3.0	No	2.7
370	Great George Street lamppost	Roadside	359775	173513	NO2	Yes	0.0	2.0	No	2.5
371	Lamb Street façade	Roadside	359813	173373	NO2	Yes	14.0	1.0	No	2.6

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)
373	123 Newfoundland Street façade	Roadside	359747	173774	NO2	Yes	0.0	17.0	No	2.1
374	St. Paul Street	Roadside	359509	173595	NO2	Yes	0.0	8.0	No	2.3
403	Lamp post 48 230 Bath Road	Roadside	360508	171676	NO2	Yes	0.0	2.0	No	2.8
405	Whitehall Rd/Easton Rd lamppost 4TZ	Roadside	361051	173743	NO2	Yes	1.0	1.0	No	2.5
406	Whitehall Rd lamppost 17 nr junction with Chalks Rd	Roadside	361576	173806	NO2	Yes	0.0	2.0	No	2.3
407	lamppost Sussex Place	Roadside	359829	174370	NO2	Yes	6.7	1.8	No	3.2
413	Wells Rd bus lane sign just below junction with Knowle Rd	Roadside	360043	171508	NO2	Yes	4.0	3.0	No	3.2
417	St John's Lane No 26 lamppost 15 (just past roundabout)	Roadside	359635	171413	NO2	Yes	0.0	1.0	No	3.2
418	Bedminster Down Rd lamppost between Ashton Motors & Plough PH	Roadside	357737	170642	NO2	Yes	0.0	2.0	No	2.8
419	Parson St lamppost outside Bristol Scuba	Kerbside	357832	170686	NO2	Yes	4.0	0.5	No	2.8
420	North St/Dean Lane on roundabout sign	Roadside	358277	171562	NO2	Yes	1.0	1.0	No	2.8
423	Façade BRI children's	Roadside	358623	173386	NO2	Yes	0.0	13.0	No	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)
429	Façade Villiers Road Stapleton Road junction	Roadside	360484	174097	NO2	Yes	0.0	6.0	No	2.6
436	Shiners Garage	Roadside	361013	173352	NO2	Yes	0.0	3.0	No	2.5
438_1, 438_2, 438_3	A37 Junction w/ Airport Road	Kerbside	360903	170024	NO2	Yes	9.0	1.0	Yes	2.4
439_1, 439_2, 439_3	Parson Street School	Roadside	358042	170582	NO2	Yes	0.0	4.0	Yes	1.5
455_1, 455_2, 455_3	St. Pauls Day Nursery	Urban background	359487	173924	NO2	Yes	0.0	4.0	Yes	2.8
464_1, 464_2, 464_3	Fishponds Road	Roadside	362927	175592	NO2	Yes	0.0	3.0	Yes	3
470	Victoria Park Primary	Roadside	359213	170997	NO2	Yes	10.0	3.0	No	3.2
472	Jamiesons Autos	Roadside	358226	171284	NO2	Yes	0.0	4.0	No	2.4
473	B&G Snax West St	Roadside	358105	171124	NO2	Yes	0.0	2.0	No	2.8
487	Junction 3 Millpond Street	Roadside	360243	174327	NO2	Yes	4.0	5.0	No	2
492	On 1 way sign at bottom of Wellington Hill	Roadside	359445	176627	NO2	Yes	10.0	3.0	No	2.8
493	No 67 Filton Avenue on wall facing Muller Rd	Roadside	359677	176758	NO2	No	0.0	2.0	No	2.3
494	Muller Road - Adjacent to Darnley Avenue	Kerbside	359558	176850	NO2	No	5.5	0.5	No	2.1
496	385 Church Road Redfield	Roadside	362296	173620	NO2	Yes	0.0	3.0	No	2.3
497	20 Ashley Road	Roadside	359268	174132	NO2	Yes	4.0	1.0	No	2.3

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)
499_1, 499_2, 499_3	Temple Way NOx site	Roadside	359522	173381	NO2	Yes	0.0	5.0	Yes	1.5
502_1, 502_2, 502_3	Co-located Colston Ave	Roadside	358640	173090	NO2	Yes	3.0	2.0	Yes	1.5
512	Colston girls	Roadside	359026	174432	NO2	Yes	2.0	3.0	No	2
525	Summer hill a420	Roadside	362455	173687	NO2	Yes	0.0	1.0	No	2
538	Dalby avenue	Roadside	358681	171478	NO2	Yes	0.0	1.2	No	2
539	Dalby avenue church lane	Roadside	358599	171391	NO2	Yes	2.0	2.0	No	2
545	Ashton park school	Roadside	356379	171436	NO2	Yes	0.0	4.0	No	2
550	Cathedral School	Roadside	358353	172613	NO2	Yes	0.0	9.0	No	2
555	420 Hotwells Road A4	Roadside	356679	172589	NO2	Yes	2.0	3.0	No	2
556	South Eastern stair access Plimsoll Bridge	Roadside	356827	172303	NO2	Yes	0.0	2.0	No	2
559	Except local buses sign Blackmoors Lane	Roadside	356485	171580	NO2	Yes	8.0	2.0	No	2
560_1, 560_2	Lamppost outside BRI CAZ	Roadside	358665	173439	NO2	Yes	2.0	2.5	No	2
561_1, 561_2	Lamppost opposite BRI CAZ	Roadside	358688	173431	NO2	Yes	3.0	5.0	No	2
565	A4018 Lamp post by layby before roundabout for Crow Ln/ Knowle Ln	Roadside	357227	179101	NO2	No	0.0	1.0	No	2
567	Muller road/ Glenfrome road junction north	Roadside	360728	175345	NO2	No	1.5	1.5	No	2
568	Traffic light on the corner of Shaldon Road	Kerbside	360178	175779	NO2	No	3.5	0.5	No	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)
569	Lamppost on North corner of Draycott road junction with Muller road.	Roadside	359855	176186	NO2	No	2.0	2.5	No	2
570	Muller road junction with Downend road lamppost north of the junction.	Kerbside	359847	176439	NO2	No	2.6	0.4	No	2
571	Muller road junction with Downend road traffic light to the south of the junction.	Roadside	359848	176411	NO2	No	5.5	1.0	No	2
574	Whiteladies Road, on loading sign next to Redland library	Roadside	357678	174229	NO2	No	0.0	3.0	No	2
575	Baldwin Street traffic light outside domino's	Kerbside	358685	172881	NO2	Yes	0.0	0.1	No	2
576	Baldwin Street lamp post by cycle way, opp St Stephens St	Roadside	358792	172874	NO2	Yes	0.0	1.0	No	2
577	High St lamp post outside Wards solicitors	Roadside	358935	172981	NO2	Yes	0.0	4.0	No	2
578	Church Road-CAZ-Outside Gurdwara	Roadside	361892	173552	NO2	Yes	4.0	2.0	No	2.5
579	Church Road-CAZ-Lamppost	Kerbside	362198	173580	NO2	Yes	1.9	0.1	No	2.5
580	Marlborough St-CAZ-Lamppost opposite hosp	Roadside	358754	173528	NO2	Yes	0.0	2.0	No	2.5
581	Marlborough St-CAZ-Lamppost by coach station	Kerbside	358908	173574	NO2	Yes	0.0	0.1	No	2.5

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co located with a Continuous Analyser?	Tube Height (m)
582	Rupert St-CAZ-Post outside fire station	Roadside	358893	173333	NO2	Yes	0.0	2.0	No	2.5
583	Rupert St-CAZ-Post outside police station	Roadside	358870	173340	NO2	Yes	0.0	3.0	No	2.5
584	Rupert St-CAZ-Post outside Fusion Tower	Roadside	358773	173276	NO2	Yes	13.0	3.0	No	2.5
585	Park St-CAZ-Lamppost by Guild	Roadside	358192	173050	NO2	Yes	5.0	2.0	No	2.5
586	Park St-CAZ-Lamppost by Agora	Kerbside	358195	173018	NO2	Yes	3.9	0.1	No	2.5
587	Baldwin St-CAZ-Lamppost by Yelland House	Roadside	358802	172896	NO2	Yes	2.1	2.5	No	2.5
588	Baldwin St-CAZ-Drainpipe on building	Roadside	358739	172869	NO2	Yes	0.0	6.4	No	2.5
589	Marlborough St-CAZ-On sign leg	Roadside	358849	173606	NO2	Yes	6.0	1.0	No	2.5
590	Marlborough St-CAZ-Post by bollards	Roadside	358789	173589	NO2	Yes	0.0	2.1	No	2.5
591	Marlborough St-CAZ-Post	Roadside	358805	173575	NO2	Yes	0.0	0.4	No	2.5
592	Upper Maudlin St-CAZ-Crossing by BRI	Kerbside	358662	173409	NO2	Yes	0.0	0.1	No	2.5
593	Upper Maudlin St-CAZ-Post by BRI	Roadside	358610	173350	NO2	Yes	3.0	1.0	No	2.5
594	Lower Park Row-CAZ-Post by Art shop	Roadside	358540	173234	NO2	Yes	0.0	2.0	No	2.5

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co located with a Continuous Analyser?	Tube Height (m)
595	Lower Park Row-CAZ-Post after OTR	Roadside	358510	173197	NO2	Yes	0.0	2.0	No	2.5
596	Park Row-CAZ-Lamppost by museum	Roadside	358431	173120	NO2	Yes	5.0	3.0	No	2.5
597	Park Row-CAZ-Post by house	Roadside	358403	173124	NO2	Yes	0.0	2.0	No	2.5
598	Queens Road-CAZ-Lamppost by UoB	Roadside	358061	173182	NO2	Yes	0.0	2.4	No	2.5
599	Park St-CAZ-Lamppost by bike stands	Roadside	358135	173123	NO2	Yes	4.0	2.0	No	2.5
600	Park St-CAZ-Lamppost by City Hall	Roadside	358322	172858	NO2	Yes	11.0	5.0	No	2.5
601	College Green-CAZ-Lamppost opp Denmark St	Roadside	358563	172818	NO2	Yes	0.0	2.6	No	2.5
602	Anchor Road-CAZ-Lamppost	Roadside	358469	172656	NO2	Yes	0.3	2.0	No	2.5
603	Lewins Mead-CAZ-Post by Evans Cycles	Roadside	358767	173320	NO2	Yes	0.0	1.5	No	2.5
604	Lewins Mead-CAZ-Post by PMT	Roadside	358817	173342	NO2	Yes	0.0	1.0	No	2.5
605	Rupert St-CAZ-Post by Courtrooms	Roadside	358718	173227	NO2	Yes	6.0	6.0	No	2.5
606	Victoria Street-CAZ-No entry sign	Roadside	359124	172803	NO2	Yes	11.6	1.0	No	2.5
607	Counterslip-CAZ-Drainpipe on building	Roadside	359183	172826	NO2	Yes	2.5	1.1	No	2.5
608	Temple Gate-CAZ-Lamppost	Kerbside	359563	172290	NO2	Yes	2.6	0.4	No	2.5

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co located with a Continuous Analyser?	Tube Height (m)
609	Bath Road-CAZ-Lamppost or sign	Roadside	359740	172116	NO2	Yes	0.0	2.0	No	2.5
610	Wells Road-CAZ-Lamppost	Roadside	359967	171548	NO2	Yes	0.0	2.0	No	2.5
611	Winterstoke Road-CAZ-Lamppost	Roadside	357425	170769	NO2	Yes	0.0	1.0	No	2.5
612	Newfoundland St-CAZ-Lamppost by layby	Roadside	359206	173557	NO2	Yes	0.0	4.0	No	2.5
613	Newfoundland St-CAZ-Lamppost by crossing	Kerbside	359316	173554	NO2	Yes	0.0	0.1	No	2.5
614	Temple Way-CAZ-Sign by Champ Square	Roadside	359516	173374	NO2	Yes	0.0	1.0	No	2.5
615	Newfoundland Way-CAZ-Lamppost by petrol station	Kerbside	359659	173688	NO2	Yes	0.0	0.8	No	2.5
616	Newfoundland Way-CAZ-Road sign	Kerbside	359747	173717	NO2	Yes	0.0	0.7	No	2.5
617	Houlton St-CAZ-30mph sign	Kerbside	359686	173587	NO2	Yes	0.0	0.5	No	2.5
618	Cheltenham Rd-CAZ-Sign opp Tesco	Roadside	359086	174187	NO2	Yes	4.7	3.0	No	2.5
619	Cheltenham Rd-CAZ-Lamppost by Bite	Roadside	359119	174149	NO2	Yes	0.0	3.0	No	2.5
621	Gloucester Rd-CAZ-Lamppost by bus stop	Roadside	359256	175999	NO2	Yes	0.0	3.0	No	2.5

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co located with a Continuous Analyser?	Tube Height (m)
622	Bedminster Rd-CAZ-Lamppost opp school	Roadside	358034	170602	NO2	Yes	2.5	2.0	No	2.5
623	Bedminster Rd-CAZ-Lamppost by school	Roadside	358059	170597	NO2	Yes	4.1	2.2	No	2.5
624	Bedminster Rd-CAZ-Post opp Van Sales	Roadside	357858	170499	NO2	Yes	8.0	2.0	No	2.5
625	Bedminster Rd-CAZ-Lamppost by Van Sales	Roadside	357842	170514	NO2	Yes	0.0	1.2	No	2.5
626	Bedminster Rd-CAZ-Post	Roadside	357667	170466	NO2	Yes	0.0	2.0	No	2.5
627	Parson St-CAZ-Lamppost by Station	Roadside	357829	170658	NO2	Yes	0.0	3.0	No	2.5
628	Lower Ashley Rd-CAZ-Lamppost by Geo Jones	Roadside	359899	174335	NO2	Yes	0.0	4.0	No	2.5
629	Lower Ashley Rd-CAZ-Lamppost opp London Rd	Roadside	359936	174330	NO2	Yes	1.0	2.0	No	2.5
630	Bedminster Down Rd-CAZ-Lamppost by billboard	Roadside	357533	170410	NO2	Yes	0.0	3.0	No	2.5
631	Bedminster Down Rd-CAZ-Roadsign by Winterstoke	Roadside	357729	170660	NO2	Yes	10.5	1.5	No	2.5
632	West St-CAZ-Lamppost by Argus Rd	Roadside	358073	171063	NO2	Yes	6.2	1.6	No	2.5
633	West St-CAZ-Lamppost opp Jamiesons	Roadside	358217	171299	NO2	Yes	0.4	2.3	No	2.5

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co located with a Continuous Analyser?	Tube Height (m)
634	Bedminster Parade-CAZ-Lamppost by William Hill	Roadside	358772	171741	NO2	Yes	0.4	2.3	No	2.5
635	York Rd-CAZ-Sign after bridge	Kerbside	359106	171962	NO2	Yes	0.0	0.5	No	2.5
636	Bath Rd-CAZ-Lamppost by Bus Lane	Roadside	359940	171838	NO2	Yes	0.0	3.0	No	2.5
637	Bath Rd-CAZ-Lamppost by Kings Road	Roadside	361206	171390	NO2	Yes	0.0	1.5	No	2.5
638	A4044 Roundabout-CAZ-Lamppost	Roadside	359498	173144	NO2	Yes	0.0	17.0	No	2.5
639	Victoria St-CAZ-Lamppost opp Mitchell Lane	Roadside	359318	172634	NO2	Yes	3.0	1.0	No	2.5
640	Lamb Street-CAZ-One way sign by Church	Roadside	359792	173319	NO2	Yes	0.0	3.0	No	2.5
641	Stokes Croft-CAZ-Lamppost	Roadside	359114	174007	NO2	Yes	0.0	2.5	No	2.5
642	Ashley Road-CAZ-Lamppost opp Drumd Rd	Roadside	359276	174155	NO2	Yes	0.0	2.0	No	2.5
643	Sussex Place-CAZ-Lamppost	Kerbside	359817	174401	NO2	Yes	10.4	0.2	No	2.5
644	Ashley Down Rd-CAZ-Lamppost	Roadside	359676	175102	NO2	No	6.0	2.0	No	2.5
645	Gloucester Rd-CAZ-Lamppost opp Baths	Kerbside	359033	175259	NO2	Yes	5.9	0.1	No	2.5
646	Cheltenham Rd-CAZ-Post by Papa Johns	Kerbside	359035	174427	NO2	Yes	2.9	0.1	No	2.5

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co located with a Continuous Analyser?	Tube Height (m)
647	Merchants Rd-CAZ-Lamppost by house	Roadside	357124	172400	NO2	Yes	2.8	1.7	No	2.5
648	Wells Rd-CAZ-Lamppost by Red Lion Carpets	Roadside	360905	170185	NO2	Yes	4.3	2.0	No	2.5
649	Bath Rd-CAZ-Lamppost	Roadside	362089	170606	NO2	Yes	10.5	2.0	No	2.5
650	Wells Rd-CAZ-Lamppost	Roadside	360818	170448	NO2	Yes	0.0	2.0	No	2.5
651	Church Rd-CAZ-Post by Barwaaqo Cafe	Roadside	360938	173376	NO2	Yes	0.0	2.0	No	2.5
652	Whitehall Rd-CAZ-Lamppost by house	Roadside	361119	173796	NO2	Yes	3.5	1.0	No	2.5
653	Stapleton Rd-CAZ-Lamppost by house	Roadside	360515	174134	NO2	Yes	2.5	1.5	No	2.5
654	Mina Rd-CAZ-Lamppost by house	Roadside	360207	174403	NO2	Yes	2.1	3.2	No	2.5
655	Muller Rd-CAZ-Lamppost opp LA DT	Roadside	361355	175203	NO2	Yes	0.0	2.0	No	2.5
656	Stapleton Rd-CAZ-Lamppost	Kerbside	361141	175446	NO2	Yes	7.6	0.5	No	2.5
657	Fishponds Rd-CAZ-Lamppost	Roadside	361676	175127	NO2	Yes	0.0	3.0	No	2.5
658	Fishponds Rd-CAZ-Lamppost	Roadside	363325	175803	NO2	Yes	3.8	1.5	No	2.5
659	Muller Rd-CAZ-Lamppost	Kerbside	359773	176702	NO2	No	8.8	0.1	No	2.5
660	Muller Rd-CAZ-Lamppost	Kerbside	360896	175312	NO2	Yes	5.8	0.2	No	2.5
661	Linden Rd-CAZ-Lamppost by house	Kerbside	358022	175630	NO2	No	6.6	0.4	No	2.5
662	Linden Rd-CAZ-Lamppost by house	Roadside	357868	175723	NO2	No	10.5	3.0	No	2.5

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co located with a Continuous Analyser?	Tube Height (m)
663	Whiteladies Rd-CAZ-Lamppost after petrol station	Roadside	357396	174761	NO2	No	3.0	3.0	No	2.5
664	Westbury Rd-CAZ-Lamppost by hospital	Kerbside	357347	174992	NO2	No	0.0	0.1	No	2.5
665	Upper Maudlin St-CAZ-Lamppost opp BRI	Roadside	358675	173405	NO2	Yes	2.0	2.0	No	2.5
666	Upper Maudlin St-CAZ-Lamppost by BRI	Roadside	358646	173426	NO2	Yes	5.0	5.0	No	2.5
667	College Green-CAZ-Post by Toni&Guy	Kerbside	358531	172803	NO2	Yes	4.5	0.5	No	2.5
669	Temple Way Bridge-CAZ-Lamppost Temple Way Bridge	Roadside	359511	172754	NO2	Yes	0.0	3.0	No	2.5
670	Bristol Hill-CAZ-Lamppost Bristol Hill	Roadside	361749	170690	NO2	Yes	1.5	3.0	No	2.5
671	North View Downs Park West	Kerbside	357381	175781	NO2	No	1.0	0.3	No	2
673_1, 673_2, 673_3	Marlborough Street - co - located	Roadside	358728	173520	NO2	Yes	0.0	3.0	Yes	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.3 – Annual Mean NO_2 Monitoring Results: Automatic Monitoring (µg/m^3)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
203	361178	171566	Urban background	95.9	95.9	29.5	25.4	25.2	18.8	20.0
215	358042	170582	Roadside	99.5	99.5	**41.1**	39.0	32.3	28.6	31.4
270	360903	170024	Roadside	99.5	99.5	39.0	33.0	29.7	27.9	23.9
452	359488	173924	Urban background	97.6	97.6	23.7	23.8	23.4	15.2	17.4
463	362926	175590	Roadside	94.9	94.9	39.1	**41.5**	39.5	22.2	29.4
500	359522	173381	Roadside	98.5	98.5	37.8	**44.3**	39.2	28.3	31.2
501	358640	173090	Roadside	98.4	98.4	**NA**	**67.2**	**65.5**	**45.2**	**49.8**
672	358728	173520	Roadside	49.6	98.5	**NA**	**NA**	**NA**	**NA**	32.7

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

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

Notes:

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

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

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

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

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

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

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

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
2	358628	173011	Roadside	100	100.0	**63.1**	**58.2**	**53.7**	36.9	**40.1**
3	357448	174650	Roadside	100	100.0	34.4	34.4	27.7	28.7	**44.4**
4	359903	171850	Roadside	100	100.0	**52.7**	**53.5**	**41**	36.8	38.9
5	358723	171704	Roadside	100	100.0	**45.8**	**45.8**	39.9	31.6	**41.0**
9	358729	173499	Roadside	100	100.0	**46.5**	**44.6**	37.8	31.7	39.3
10	361217	171429	Roadside	100	100.0	**51.6**	**51.5**	**42.2**	33.6	36.8
11	358813	173342	Roadside	100	100.0	**49.1**	**48.1**	**41.1**	31.1	35.0
12	359142	173211	Roadside	92.3	92.3	**56.6**	**57.5**	**51.8**	**41.9**	**46.5**
14	360871	170291	Roadside	100	100.0	**41.1**	**47.6**	38.7	32.4	32.7
15	359294	173485	Roadside	92.5	92.3	**49.4**	**47.5**	**42.2**	28.2	31.5
16	352287	178698	Roadside	100	100.0	35.2	32.6	28.6	23.2	24.9
21	359035	175306	Roadside	100	100.0	**49.3**	**46.4**	38.3	33.4	34.9
22	359109	173886	Roadside	90.1	90.4	**52.5**	**51**	**44.3**	34.3	37.5
113	359258	172696	Roadside	100	100.0	**49.9**	**40.5**	37.4	29.9	27.8
125	359214	171917	Roadside	92.3	92.3	**56**	**50.3**	**45.2**	35.6	35.8
147	358514	172691	Roadside	92.2	92.3	**61.5**	**56.6**	**50.9**	39.4	**43.3**
154	357601	172483	Roadside	84.5	84.6	38.5	36.1	30	22.1	25.4
155	357838	172713	Roadside	100	100.0	37.9	**40**	31.1	22.9	25.5
156	357709	173018	Roadside	100	92.3	39.3	36.2	30.5	20.7	24.9
157	359119	174090	Roadside	100	100.0	**48.5**	**45.4**	**43.1**	35.7	**40.3**
159	358891	174608	Roadside	100	100.0	**42**	**43.2**	35.8	28.5	31.9
161	359152	175733	Roadside	100	100.0	38.8	38	31.7	25.3	27.4
163	359435	176574	Roadside	100	100.0	38	36.6	30.8	24.5	27.4
175	362147	170525	Roadside	92.6	92.3	**54**	**54.9**	**44.6**	36.4	**41.4**
239	357880	170506	Kerbside	92.3	92.3	**66.8**	**65.2**	**54.4**	**47.6**	**51.4**
242	357510	170401	Kerbside	100	100.0	**56**	**51.1**	**41**	32.2	34.5
254	357118	172429	Kerbside	100	100.0	**52.2**	**49.4**	**40.5**	31.1	34.6
260	361140	175366	Roadside	100	100.0	**42.6**	**43.1**	36.2	29.5	33.2
261	361103	175059	Roadside	100	100.0	**52.4**	**51**	**41.5**	34.7	39.1
295	359913	174315	Roadside	90.3	90.4	**65.1**	**59.6**	**48.1**	37.2	**44.5**
300	363365	175883	Roadside	92.5	92.3	**45.9**	**41.1**	35.1	28.9	28.7
303	361368	175170	Roadside	100	100.0	**44**	**43.8**	36.5	29.2	31.8
307	360747	175328	Roadside	100	100.0	32.6	37.3	30.7	24.6	27.5
312	359832	174616	Roadside	100	100.0	38.5	38.5	32.8	26.2	29.5

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
320_1, 320_2, 320_3	361180	171567	Urban background	94.8	100.0	30.7	27.9	23.4	19.3	20.8
325	361667	175103	Roadside	100	100.0	**49.2**	**48.1**	39.4	34.1	37.3
363	359075	173613	Roadside	100	100.0	38.5	37.2	34	23.5	26.8
370	359775	173513	Roadside	100	92.3	37.5	36.6	30		25.0
371	359813	173373	Roadside	100	100.0	**44.7**	**42.2**	34.1	25.8	29.4
373	359747	173774	Roadside	92.3	92.3	38.5	35.7	31.2	23.9	27.9
374	359509	173595	Roadside	100	100.0	**45.2**	**47.8**	39.9	29.9	35.0
403	360508	171676	Roadside	100	100.0	35.7	35.5	28.1	23.4	25.5
405	361051	173743	Roadside	100	100.0	**50.4**	**56.2**	**48.5**	38.7	**40.4**
406	361576	173806	Roadside	92.3	92.3	38.9	38.5	31	26.6	29.3
407	359829	174370	Roadside	100	100.0	**44.5**	**46.7**	37.3	26.7	30.2
413	360043	171508	Roadside	100	100.0	38.7	37.6	31.2	25.5	27.4
417	359635	171413	Roadside	100	100.0	35.2	36	31	26.3	27.9
418	357737	170642	Roadside	100	100.0	**58.4**	**55.7**	**51.1**	**40.2**	**45.9**
419	357832	170686	Kerbside	100	100.0	**51.3**	**45**	39	31.4	34.3
420	358277	171562	Roadside	91.9	84.6	33.3	37.1	30.4	23.2	25.6
423	358623	173386	Roadside	100	100.0	**45**	**42.2**	35.2	27.3	29.5
429	360484	174097	Roadside	62.3	57.7	**47.8**	**46.8**	**41.2**	38.8	36.4
436	361013	173352	Roadside	92.3	92.3	**45.8**	**50.6**	**42**	29.2	31.2
438_1, 438_2, 438_3	360903	170024	Kerbside	97.4	100.0	**43.2**	36.6	31.8	27.1	29.0
439_1, 439_2, 439_3	358042	170582	Roadside	100	100.0	37.7	37.7	31.7	25.4	28.6
455_1, 455_2, 455_3	359487	173924	Urban background	100	100.0	26	24.4	20.9	15.9	16.4
464_1, 464_2, 464_3	362927	175592	Roadside	92.2	92.3	36.8	34.4	29.7	24.2	23.7
470	359213	170997	Roadside	100	100.0	35.9	37.9	29.4	25.1	26.8
472	358226	171284	Roadside	100	100.0	**41.6**	37.3	33.7	26.2	28.7
473	358105	171124	Roadside	92.3	92.3	**40.1**	**44**	**42.4**	**40**	28.4
487	360243	174327	Roadside	76.7	76.9	**44.5**	**41.9**	35.1	27.7	29.6

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2021 (%) [2]	2017	2018	2019	2020	2021
492	359445	176627	Roadside	100	100.0	36.8	34.8	31.3	25.2	26.4
493	359677	176758	Roadside	92.2	92.3	**41.9**	**41.8**	37	29.5	31.8
494	359558	176850	Kerbside	100	100.0	39.5	38.7	32	25.1	25.0
496	362296	173620	Roadside	100	90.4	**41.1**	39.2	33	25	25.9
497	359268	174132	Roadside	100	100.0	**42.4**	38	29.1	24.6	27.1
499_1, 499_2, 499_3	359522	173381	Roadside	92.3	92.3	38.5	**43.2**	33.6	26	31.1
502_1, 502_2, 502_3	358640	173090	Roadside	100	100.0			**68.7**	**52.1**	**58.0**
512	359026	174432	Roadside	100	84.6		**47.5**	**40.6**	30.7	36.1
525	362455	173687	Roadside	80.8	75.0		**43.5**	35.3	24.1	28.5
538	358681	171478	Roadside	90.1	90.4		33.7	26.6	20.4	22.5
539	358599	171391	Roadside	92.3	92.3		**43.3**	35.6	27.4	30.9
545	356379	171436	Roadside	100	90.4		34.9	28.6	22	24.3
550	358353	172613	Roadside	90.6	90.4		36.9	35.1	21.1	29.1
555	356679	172589	Roadside	100	100.0			32	26.5	28.0
556	356827	172303	Roadside	100	100.0			37	31.7	35.0
559	356485	171580	Roadside	91.4	82.7			29	19.8	24.5
560_1, 560_2	358665	173439	Roadside	90.3	90.4			**40.4**	30.2	32.2
561_1, 561_2	358688	173431	Roadside	96.1	100.0			**47**	33.8	36.7
565	357227	179101	Roadside	100	100.0			31.4	24.5	26.3
567	360728	175345	Roadside	92.2	92.3			**44**	**41.3**	**44.8**
568	360178	175779	Kerbside	92.2	92.3			36.2	29	32.9
569	359855	176186	Roadside	100	100.0			31.4	22.8	24.1
570	359847	176439	Kerbside	89.2	80.8			33.1	28.4	28.2
571	359848	176411	Roadside	100	100.0			**42.8**	31.3	33.1
574	357678	174229	Roadside	100	100.0				27.3	28.9
575	358685	172881	Kerbside	90.6	90.4				30.9	29.6
576	358792	172874	Roadside	90.1	90.4				23.9	26.8
577	358935	172981	Roadside	70	63.5				30.5	27.8
578	361892	173552	Roadside	90.4	90.4					33.0
579	362198	173580	Kerbside	100	100.0					35.4
580	358754	173528	Roadside	76.6	76.9					**47.9**

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2021 (%) [2]	2017	2018	2019	2020	2021
581	358908	173574	Kerbside	100	100.0					**40.8**
582	358893	173333	Roadside	67.5	67.3					**50.0**
583	358870	173340	Roadside	89.6	80.8					**42.3**
584	358773	173276	Roadside	92.3	92.3					33.0
585	358192	173050	Roadside	84.6	84.6					30.5
586	358195	173018	Kerbside	74.9	75.0					38.6
587	358802	172896	Roadside	92.3	92.3					26.5
588	358739	172869	Roadside	90.4	90.4					26.5
589	358849	173606	Roadside	100	100.0					26.5
590	358789	173589	Roadside	80.9	73.1					**42.3**
591	358805	173575	Roadside	100	100.0					34.9
592	358662	173409	Kerbside	100	100.0					39.6
593	358610	173350	Roadside	65.3	65.4					35.2
594	358540	173234	Roadside	100	100.0					34.1
595	358510	173197	Roadside	100	100.0					32.2
596	358431	173120	Roadside	100	100.0					30.0
597	358403	173124	Roadside	100	100.0					32.7
598	358061	173182	Roadside	84.8	84.6					26.9
599	358135	173123	Roadside	82.6	82.7					33.3
600	358322	172858	Roadside	100	100.0					23.9
601	358563	172818	Roadside	100	100.0					29.4
602	358469	172656	Roadside	92.3	92.3					38.0
603	358767	173320	Roadside	100	100.0					39.6
604	358817	173342	Roadside	100	100.0					**43.0**
605	358718	173227	Roadside	40	32.7					32.4
606	359124	172803	Roadside	100	100.0					25.5
607	359183	172826	Roadside	100	100.0					27.8
608	359563	172290	Kerbside	100	92.3					39.4
609	359740	172116	Roadside	100	100.0					30.2
610	359967	171548	Roadside	100	100.0					32.3
611	357425	170769	Roadside	100	100.0					19.5
612	359206	173557	Roadside	89.4	80.8					29.9
613	359316	173554	Kerbside	92.3	92.3					**40.6**
614	359516	173374	Roadside	100	100.0					28.4
615	359659	173688	Kerbside	100	100.0					**53.0**
616	359747	173717	Kerbside	100	100.0					**44.0**
617	359686	173587	Kerbside	90.4	90.4					28.4

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2021 (%) [2]	2017	2018	2019	2020	2021
618	359086	174187	Roadside	100	100.0					33.8
619	359119	174149	Roadside	92.1	92.3					34.7
621	359256	175999	Roadside	73	73.1					24.9
622	358034	170602	Roadside	100	100.0					33.7
623	358059	170597	Roadside	100	100.0					30.6
624	357858	170499	Roadside	92.3	92.3					**49.7**
625	357842	170514	Roadside	100	100.0					**45.4**
626	357667	170466	Roadside	84.9	84.6					**43.0**
627	357829	170658	Roadside	75.3	75.0					34.0
628	359899	174335	Roadside	82.9	82.7					35.9
629	359936	174330	Roadside	76.9	76.9					38.9
630	357533	170410	Roadside	100	100.0					30.3
631	357729	170660	Roadside	100	100.0					24.8
632	358073	171063	Roadside	100	100.0					23.4
633	358217	171299	Roadside	100	100.0					36.5
634	358772	171741	Roadside	100	100.0					34.6
635	359106	171962	Kerbside	90.1	90.4					25.3
636	359940	171838	Roadside	100	100.0					26.2
637	361206	171390	Roadside	92.3	92.3					21.7
638	359498	173144	Roadside	100	92.3					**43.8**
639	359318	172634	Roadside	82.7	82.7					27.0
640	359792	173319	Roadside	82.7	82.7					28.1
641	359114	174007	Roadside	100	100.0					39.7
642	359276	174155	Roadside	92.3	92.3					28.9
643	359817	174401	Kerbside	92.3	92.3					39.7
644	359676	175102	Roadside	100	90.4					31.8
645	359033	175259	Kerbside	92.3	92.3					30.3
646	359035	174427	Kerbside	100	100.0					31.7
647	357124	172400	Roadside	100	100.0					34.3
648	360905	170185	Roadside	100	100.0					29.0
649	362089	170606	Roadside	100	100.0					30.1
650	360818	170448	Roadside	92.3	92.3					22.8
651	360938	173376	Roadside	100	100.0					35.2
652	361119	173796	Roadside	100	100.0					**41.5**
653	360515	174134	Roadside	61.9	55.8					26.0
654	360207	174403	Roadside	92.3	92.3					22.9
655	361355	175203	Roadside	100	100.0					29.2

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
656	361141	175446	Kerbside	100	100.0					28.8
657	361676	175127	Roadside	91.5	82.7					29.2
658	363325	175803	Roadside	100	100.0					23.6
659	359773	176702	Kerbside	100	100.0					26.5
660	360896	175312	Kerbside	100	100.0					32.1
661	358022	175630	Kerbside	82.9	82.7					23.3
662	357868	175723	Roadside	100	100.0					21.2
663	357396	174761	Roadside	100	100.0					24.7
664	357347	174992	Kerbside	100	100.0					25.5
665	358675	173405	Roadside	92.3	92.3					37.6
666	358646	173426	Roadside	100	100.0					32.8
667	358531	172803	Kerbside	90.4	90.4					**43.6**
669	359511	172754	Roadside	83	82.7					28.6
670	361749	170690	Roadside	92.6	92.3					39.9
671	357381	175781	Kerbside	100	67.3					26.1

☒ **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 Nitrogen Dioxide at City Centre Locations 2010 to 2021

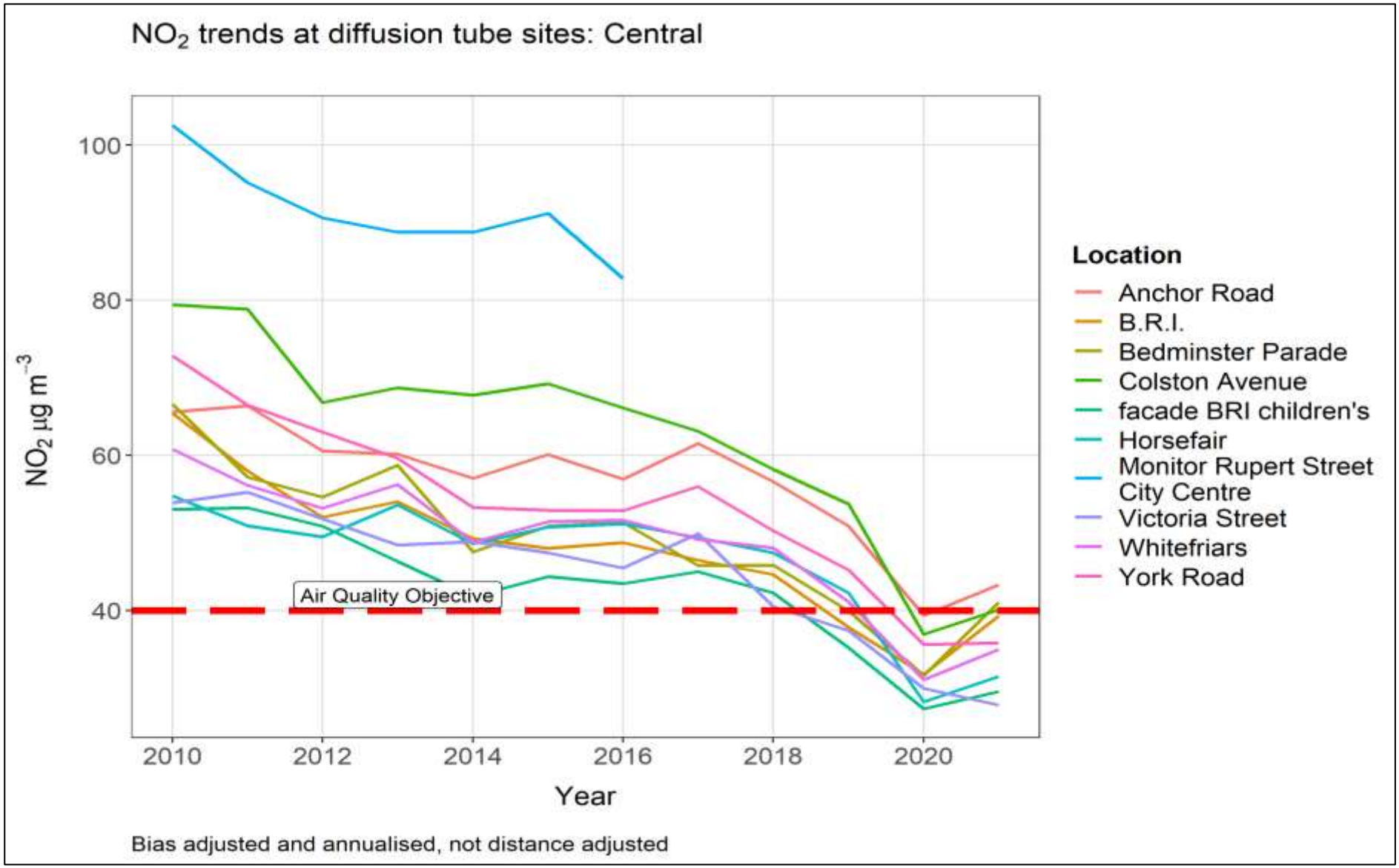


Figure A.2 – Trends in Annual Nitrogen Dioxide at Gloucester Road/Cheltenham Road Locations 2010 to 2021

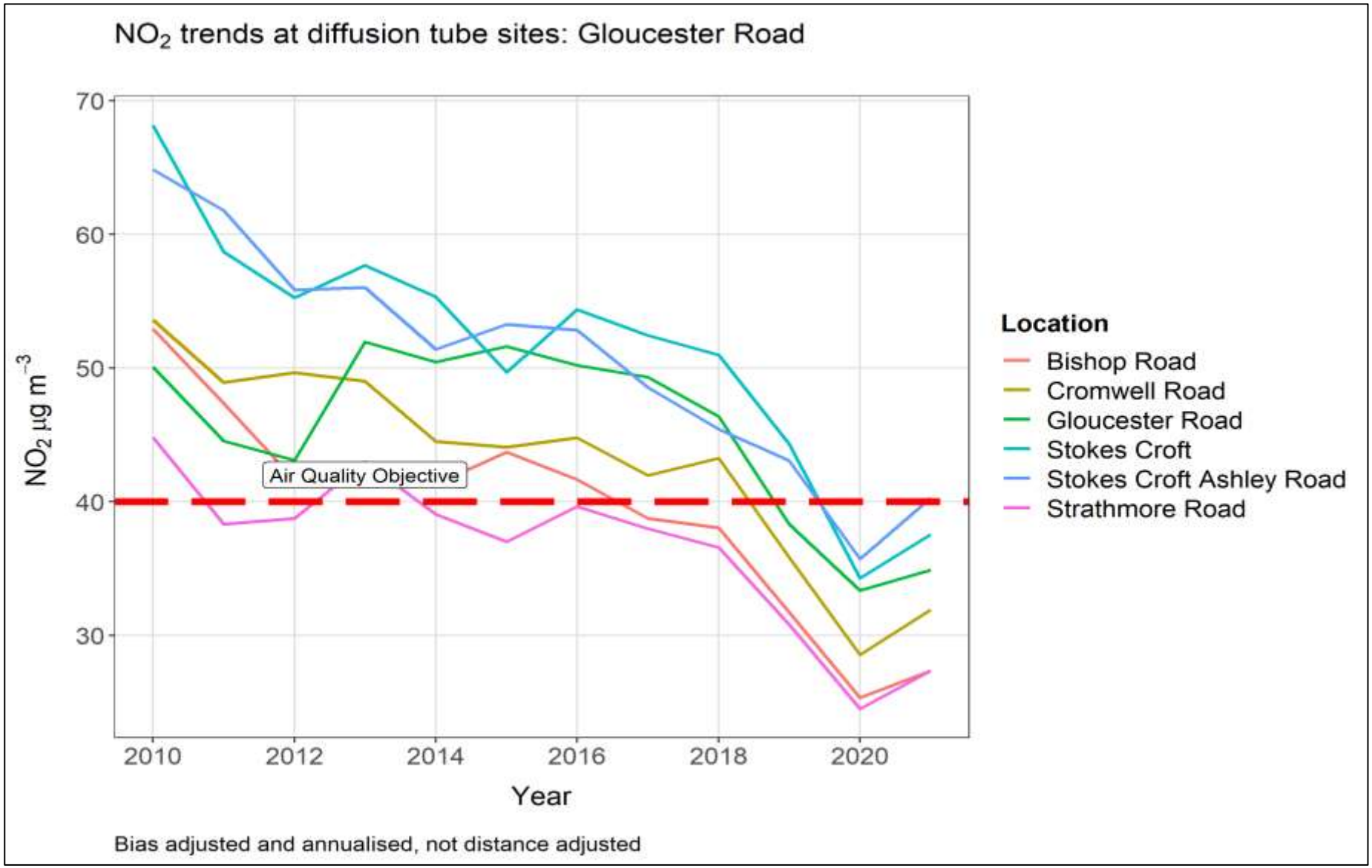


Figure A.3 - Trends in Annual Nitrogen Dioxide at Parson Street Gyratory Locations 2010 to 2021

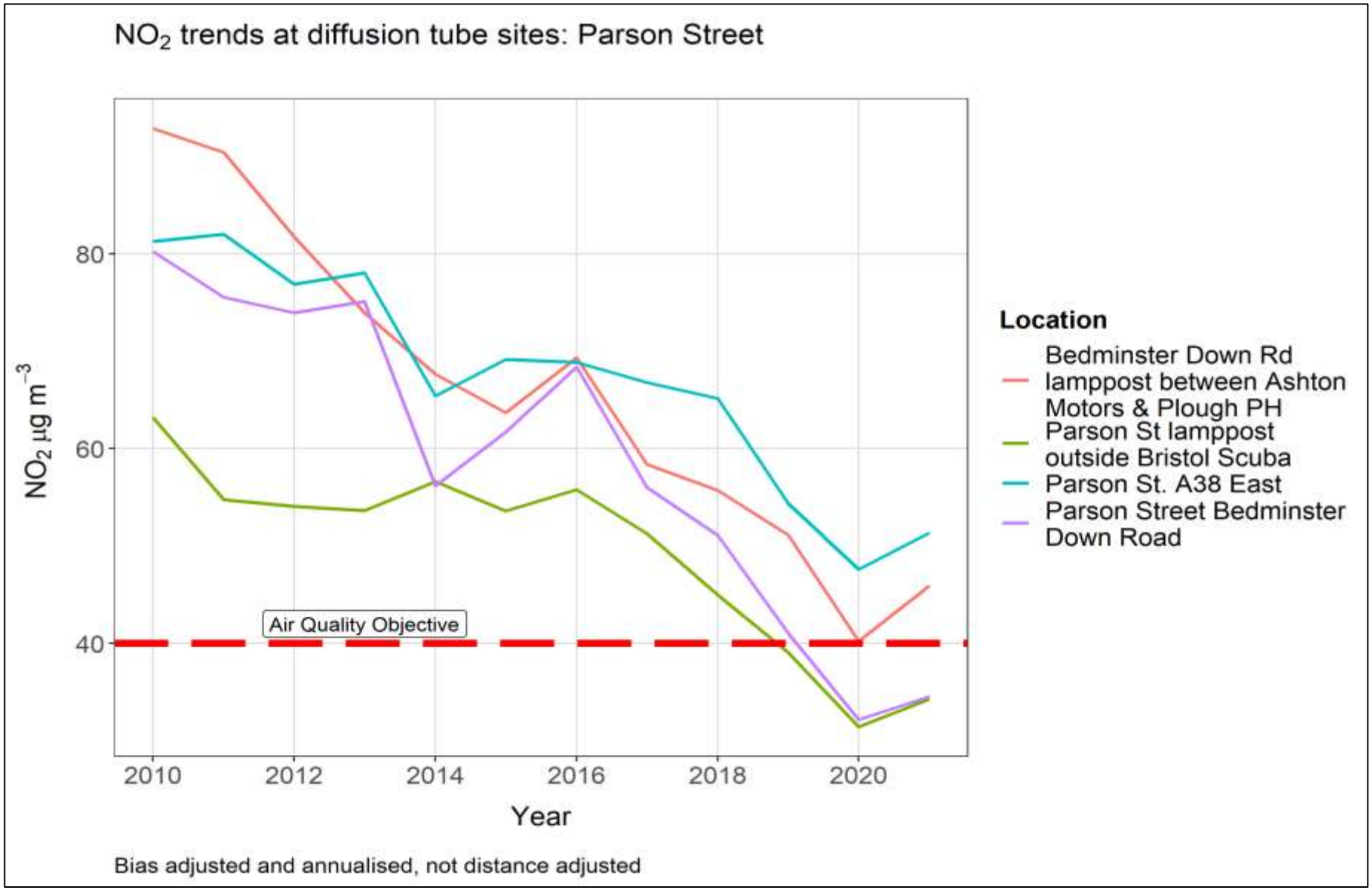


Figure A.4 – Trends in Annual Nitrogen Dioxide at Newfoundland Way / M32 Locations 2010 to 2021

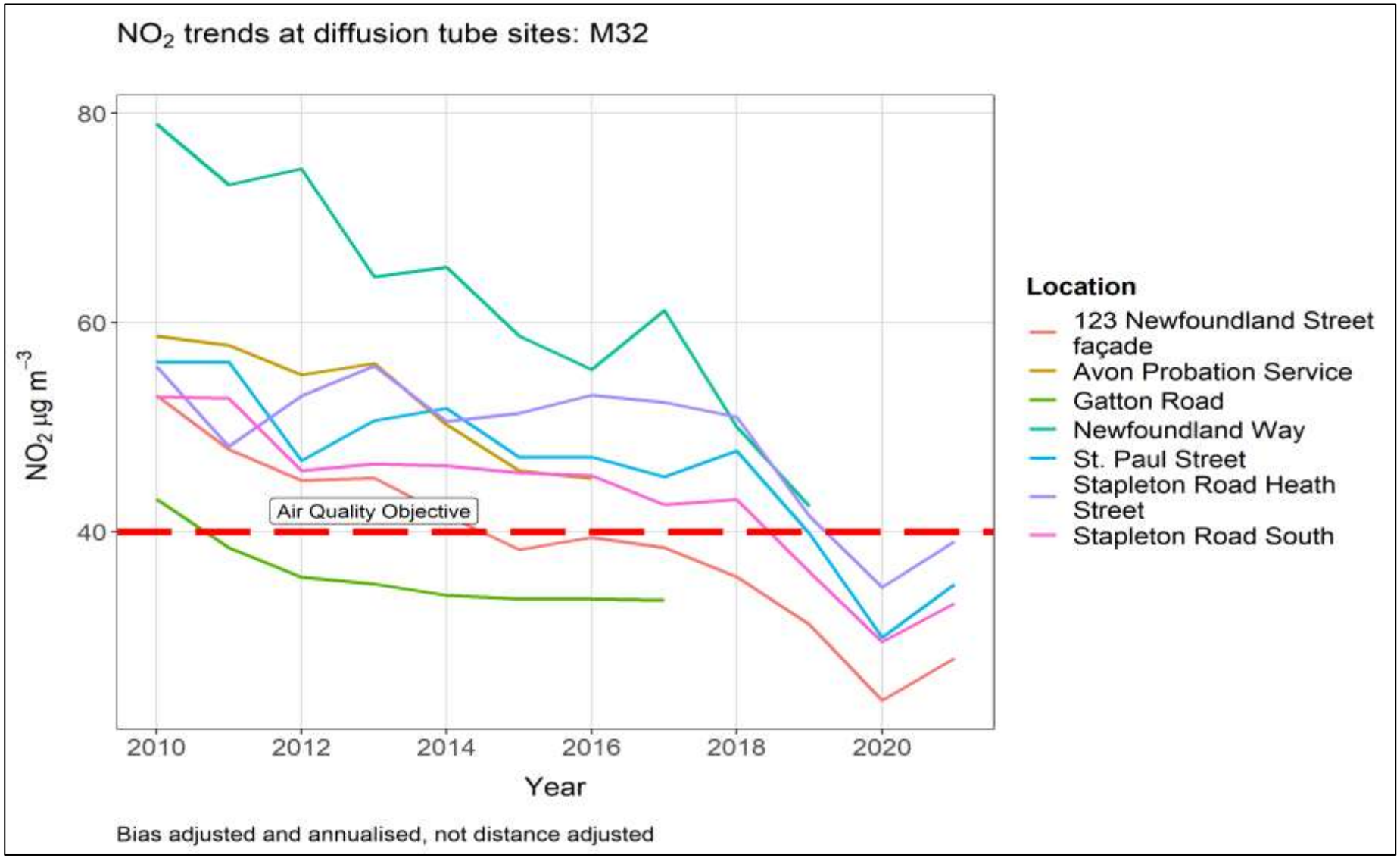


Table A.5 – 1-Hour Mean NO_2 Monitoring Results, Number of 1-Hour Means > 200µg/m^3

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
203	361178	171566	Urban background	95.9	95.9	0	0	0	0	0
215	358042	170582	Roadside	99.5	99.5	1	0	0	0	0
270	360903	170024	Roadside	99.5	99.5	**2 (168)**	0	0	0	0
452	359488	173924	Urban background	97.6	97.6	0	**0 (93)**	0	0	0
463	362926	175590	Roadside	94.9	94.9	0	1	**0 (118)**	**0 (81)**	0
500	359522	173381	Roadside	98.5	98.5	**2 (128)**	0	0	0	0
501	358640	173090	Roadside	98.4	98.4	0	**0 (186)**	8	6	0
672	358728	173520	Roadside	49.6	98.5					**0(80)**

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 2021 (%) (2)	2017	2018	2019	2020	2021
452 - AURN St Pauls	359488	173924	Urban background	96.5	96.5	14.7	15.9	16	17.3	15.7
500 - Temple Way	359522	173381	Roadside	95.2	95.2	21.7	22.6	20.9	19.7	18.9
501 - Colston Avenue	358640	173090	Roadside	81	43.3	0	0	21.8	19.4	18.2

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

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%).

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 2021 (%) (2)	2017	2018	2019	2020	2021
452-AURN St Pauls	359488	173924	Urban background	95.9	95.9	2	0 (27)	0 (28)	2	2
500-Temple Way	359522	173381	Roadside	95.1	95.1		3	10	4	3
501-Colston Avenue	358640	173090	Roadside	79.4	42.2			4	0	2 (27)

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%).

Table A.8 – Annual Mean $PM_{2.5}$ 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 2021 (%) (2)	2017	2018	2019	2020	2021
452 - AURN St Pauls	359488	173924	Urban background	96.2	96.2	9.7	12	10.8	9.7	8.3
215 - Parson Street School	358042	170582	Roadside	93.5	93.5				11.8	12

Notes:

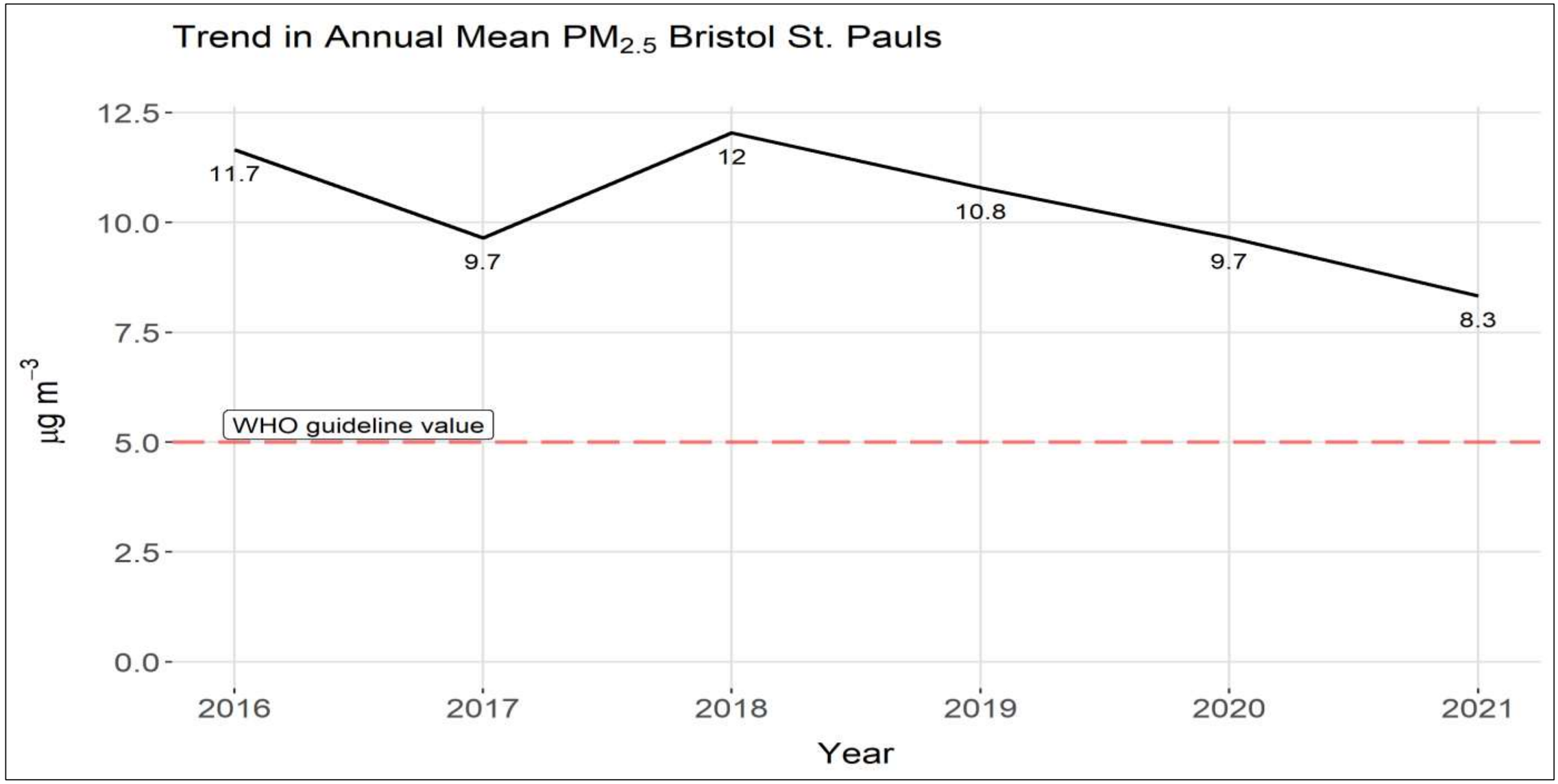
The annual mean concentrations are presented as µg/m^3.

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.5 – Trends in Annual Mean $PM_{2.5}$ Concentrations - AURN St Pauls



Appendix B: Full Monthly Diffusion Tube Results for 2021

Table B.1 – NO_2 2021 Diffusion Tube Results ($\mu g/m^3$)

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 (0.87)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
2	358628	173011	41.8	49.5	42.5	39.3	45.9	41.6	44.2	47.8	48.2	53.4	51.8	50.1	46.3	**40.1**		
3	357448	174650	44.1	50.2	75.5	66.5	48.6	56.5	45.9	50.1	50.1	42.4	51.8	34.4	51.3	**44.4**		
4	359903	171850	44.8	41.3	48.2	47.9	42.4	44.6	25.3	48.2	52.8	46.9	50.4	47.0	45.0	38.9		
5	358723	171704	42.9	35.3	52.0	44.7	39.1	47.8	49.9	47.6	54.4	53.9	58.6	42.9	47.4	**41.0**		
9	358729	173499	43.7	45.3	49.3	43.9	45.1	43.9	44.2	45.4	49.3	44.4	47.7	42.9	45.4	39.3		
10	361217	171429	41.4	43.9	44.5	45.7	41.1	35.1	41.3	38.7	43.2	43.4	47.1	44.4	42.5	36.8	31.1	
11	358813	173342	40.9	40.0	39.3	42.0	39.1	36.4	39.6	40.0	43.0	44.3	43.8	36.9	40.4	35.0		
12	359142	173211	47.9	42.7	51.2	51.3	58.7	54.5	55.8	46.7	67.1	62.7		52.9	53.8	**46.5**		
14	360871	170291	35.7	37.2	38.7	42.0	32.5	36.1	36.3	37.2	43.5	37.6	41.2	35.3	37.8	32.7		
15	359294	173485	40.0	34.8		36.4	31.6	30.5	32.3	34.3	39.7	43.7	40.0	37.0	36.4	31.5		
16	352287	178698	37.5	29.3	30.0	27.3	21.2	24.7	25.7	23.4	28.2	29.3	36.5	32.0	28.7	24.9		
21	359035	175306	42.9	39.7	43.0	35.3	39.6	36.5	40.3	41.1	39.7	38.5	47.7	39.7	40.3	34.9		
22	359109	173886	44.9	42.0	47.4		40.2	41.0	39.1	42.7	49.0	45.6	42.0	43.6	43.4	37.5		
113	359258	172696	37.5	31.6	30.7	26.7	28.2	25.1	27.8	28.2	37.6	37.4	37.9	36.9	32.1	27.8		
125	359214	171917	44.6	42.4	40.9	44.7	38.4	34.5	36.6	36.0	48.2	43.6		45.5	41.4	35.8		
147	358514	172691	53.2	53.1	49.1	37.8	50.6	43.5	44.8		55.4	57.6	54.6	50.8	50.0	**43.3**		
154	357601	172483	35.0			29.3	25.7	23.2	22.7	24.1	33.0	28.9	36.3	35.4	29.3	25.4		
155	357838	172713	29.4	31.6	25.4	33.2	29.4	28.8	25.4	28.2	33.7	26.6	32.5	29.6	29.5	25.5		
156	357709	173018		29.3	28.3	29.1	26.4	24.9	26.9	21.5	33.9	28.6	37.4	30.8	28.8	24.9		
157	359119	174090	48.5	45.1	47.5	49.6	46.8	44.9	44.8	42.3	50.9	44.3	51.2	42.8	46.6	**40.3**		
159	358891	174608	36.9	41.1	29.3	38.7	34.0	33.5	33.8	35.3	35.4	37.0	49.2	38.6	36.9	31.9		
161	359152	175733	36.5	32.9	31.4	29.2	27.9	25.5	25.2	30.3	32.0	32.5	40.8	35.1	31.6	27.4		
163	359435	176574	33.6	33.2	30.9	34.5	27.6	28.2	27.7	27.5	32.1	33.1	39.3	31.7	31.6	27.4		
175	362147	170525	45.9	39.5		39.8	49.6	51.8	48.4	53.9	52.8	51.9	52.7	40.3	47.9	**41.4**	28.1	
239	357880	170506	53.1	57.2	57.5	62.6	57.0	56.7	57.9		62.7	63.1	60.8	64.6	59.4	**51.4**	33.6	
242	357510	170401	35.7	34.7	40.3	42.3	35.3	41.2	41.8	42.0	45.2	40.9	41.1	38.4	39.9	34.5		
254	357118	172429	41.3	36.0	40.6	38.7	37.0	35.6	37.7	41.0	42.2	41.1	45.8	42.9	40.0	34.6		
260	361140	175366	39.1	36.3	36.1	35.2	35.2	35.8	35.5	38.7	41.6	45.5	42.8	38.2	38.3	33.2		
261	361103	175059	45.5	39.5	42.2	47.2	38.3	41.8	42.9	48.6	49.6	46.3	55.4	44.5	45.2	39.1	33.3	
295	359913	174315	41.9	49.6	50.0		53.5	49.0	51.9	49.0	56.6	54.2	56.4	54.1	51.5	**44.5**		
300	363365	175883	36.7	30.7		28.1	28.2	33.1	32.9	33.4	30.3	33.9	43.5	34.8	33.2	28.7		
303	361368	175170	39.6	29.7	36.0	39.0	32.2	32.3	35.4	38.4	40.0	38.4	43.3	37.0	36.8	31.8		
307	360747	175328	32.6	35.1	27.2	33.8	25.8	24.3	26.8	26.8	30.4	38.8	42.7	36.2	31.7	27.5		
312	359832	174616	36.7	33.4	32.3	35.9	30.1	29.3	33.0	30.7	35.2	36.6	41.2	35.0	34.1	29.5		
320_1	361180	171567	26.9	21.8	25.5	20.6	19.7	19.1	22.5	20.6	24.6	27.5	31.8	26.3	-	**-**		Triplicate Site with 320_1, 320_2 and 320_3 - Annual data provided for 320_3 only
320_2	361180	171567	25.9	22.7	25.7	21.7		19.6	22.5	22.1	25.2	28.3	30.6	26.3	-	**-**		Triplicate Site with 320_1, 320_2 and 320_3 - Annual data provided for 320_3 only
320_3	361180	171567	27.4	20.9	25.1	22.3		19.5	22.2	21.1	24.7	27.8	31.9	27.3	24.1	20.8		Triplicate Site with 320_1, 320_2 and 320_3 - Annual data provided for 320_3 only
325	361667	175103	44.3	41.3	39.6	43.6	43.1	39.9	43.3	44.4	42.1	44.6	49.5	41.4	43.1	37.3		
363	359075	173613	33.6	28.8	31.7	27.8	30.0	26.3	26.0	23.4	33.6	36.4	39.6	34.9	31.0	26.8		
370	359775	173513		29.5	30.0	28.0	20.9	23.7	26.2	24.7	30.0	31.2	33.6	39.9	28.9	25.0		
371	359813	173373	36.6	32.7	34.4	33.2	27.4	29.4	32.3	28.0	38.5	36.2	44.4	35.4	34.0	29.4		
373	359747	173774	38.3	31.1	33.8	28.9	31.9	24.3	26.3		32.1	37.7	33.3	37.1	32.2	27.9		
374	359509	173595	45.2	46.1	40.3	42.0	38.2	30.8	35.4	37.1	42.4	44.4	37.7	45.4	40.4	35.0		

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 (0.87)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
403	360508	171676	36.4	28.1	32.4	27.9	24.6	24.3	25.3	25.6	29.5	29.8	37.4	32.2	29.5	25.5		
405	361051	173743	49.1	38.6	43.2	45.4	46.7	46.7	49.5	44.3	55.5	47.7	49.0	44.6	46.7	**40.4**	37.0	
406	361576	173806	36.7	33.4	33.3	36.2	27.6		31.2	33.2	32.4	35.2	38.4	34.4	33.8	29.3		
407	359829	174370	33.4	36.9	33.1	42.1	28.5	33.8	35.7	32.4	37.9	34.4	34.8	35.8	34.9	30.2		
413	360043	171508	34.0	27.5	33.6	34.3	29.3	31.3	31.7	30.5	30.4	29.6	37.0	30.9	31.7	27.4		
417	359635	171413	36.0	28.7	34.9	34.2	27.4	28.3	28.9	26.8	31.8	34.2	40.7	34.7	32.2	27.9		
418	357737	170642	55.3	49.8	50.1	52.6	55.3	46.9	53.0	46.9	53.4	59.7	64.2	49.6	53.1	**45.9**		
419	357832	170686	41.8	40.0	41.4	37.7	39.9	35.2	37.1	32.4	37.7	43.8	46.3	42.1	39.6	34.3		
420	358277	171562		29.4		30.0	22.2	26.9	27.5	26.7	30.0	31.5	38.3	33.3	29.6	25.6		
423	358623	173386	36.0	31.8	34.4	31.9	31.6	27.4	32.4	34.1	33.7	38.8	41.0	36.8	34.1	29.5		
429	360484	174097		44.6			38.0			37.1	39.3	45.7	48.1	43.2	42.3	36.4		
436	361013	173352	39.3	33.6	35.2	32.2	35.2	32.2	32.1	33.4		43.6	43.9	36.6	36.1	31.2		
438_1	360903	170024	36.2	30.4	34.7	29.8	31.2	29.7	31.3	28.5	34.5	36.9	37.7	32.8	-	-		Triplicate Site with 438_1, 438_2 and 438_3 - Annual data provided for 438_3 only
438_2	360903	170024	35.1	33.6	35.9	32.0	33.1	27.1	30.6	30.9	33.0	38.1	40.0	37.0	-	-		Triplicate Site with 438_1, 438_2 and 438_3 - Annual data provided for 438_3 only
438_3	360903	170024	37.5	31.5	36.3	29.1	35.1	29.5	30.8	29.7	34.2	40.6		34.9	33.5	29.0		Triplicate Site with 438_1, 438_2 and 438_3 - Annual data provided for 438_3 only
439_1	358042	170582	35.9	33.9	34.1	32.9	31.1	28.3	32.7	31.4	35.7	34.8	34.9	33.2	-	-		Triplicate Site with 439_1, 439_2 and 439_3 - Annual data provided for 439_3 only
439_2	358042	170582	35.7	35.4	32.5	34.1	29.6	29.0	32.5	31.1	35.8	35.6	35.8	32.3	-	-		Triplicate Site with 439_1, 439_2 and 439_3 - Annual data provided for 439_3 only
439_3	358042	170582	36.8	35.9	34.1	32.1	29.6	26.9	31.7	29.8	33.3	34.2	37.0	32.5	33.1	28.6		Triplicate Site with 439_1, 439_2 and 439_3 - Annual data provided for 439_3 only
455_1	359487	173924	30.4	20.4	20.7	17.9	13.4	12.3	16.6	14.8	17.1	18.0	24.0	23.7	-	-		Triplicate Site with 455_1, 455_2 and 455_3 - Annual data provided for 455_3 only
455_2	359487	173924	26.8	21.5	21.9	18.3	14.3	14.7	14.5	14.4	17.5	21.8	23.3	23.4	-	-		Triplicate Site with 455_1, 455_2 and 455_3 - Annual data provided for 455_3 only
455_3	359487	173924	24.2	21.9	22.5	16.8	11.6	13.1	13.6	14.5	15.3	20.4	23.4	22.1	18.9	16.4		Triplicate Site with 455_1, 455_2 and 455_3 - Annual data provided for 455_3 only
464_1	362927	175592	33.2	25.8	29.5	25.0	24.1	21.9	22.6		26.1	27.1	35.3	32.8	-	-		Triplicate Site with 464_1, 464_2 and 464_3 - Annual data provided for 464_3 only
464_2	362927	175592	33.8	28.0	27.9	24.0	24.3	20.5	22.6		24.7	28.3	38.2	31.0	-	-		Triplicate Site with 464_1, 464_2 and 464_3 - Annual data provided for 464_3 only
464_3	362927	175592	33.0	28.3	26.2	24.7	24.3	22.4	22.4		27.1	28.1	33.6	29.3	27.4	23.7		Triplicate Site with 464_1, 464_2 and 464_3 - Annual data provided for 464_3 only
470	359213	170997	35.1	30.0	32.3	36.2	24.0	30.2	28.1	27.2	31.0	28.8	39.0	30.5	31.0	26.8		
472	358226	171284	35.9	37.3	35.9	36.1	32.4	25.5	27.3	28.9	33.7	35.6	35.2	34.6	33.2	28.7		
473	358105	171124	42.7	27.5	31.5	37.0	27.4	30.1	29.9	32.0		31.8	39.1	32.3	32.8	28.4		
487	360243	174327	34.5	34.2	38.1	27.4	32.4	31.3	30.0			39.1		41.2	34.2	29.6		
492	359445	176627	34.5	32.7	29.6	30.9	26.6	24.5	25.9	29.5	31.6	34.0	36.0	30.3	30.5	26.4		
493	359677	176758	40.6	34.8	38.3	34.5	34.4	33.3	34.6	36.7		36.8	41.7	38.4	36.7	31.8		
494	359558	176850	33.4	29.9	29.5	30.8	21.9	23.0	25.9	26.4	30.7	28.8	32.5	34.4	28.9	25.0		

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 (0.87)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
496	362296	173620	34.3	27.7	32.3	25.9	27.6	27.9	27.7	26.4	30.1	35.4	34.6		30.0	25.9		
497	359268	174132	38.6	30.1	33.8	28.4	30.4	23.0	28.8	23.0	35.1	34.3	35.4	35.2	31.3	27.1		
499_1	359522	173381	37.1	33.8	37.3	39.1	34.3	34.6	33.7		37.0	32.8	37.1	36.7	-	-		Triplicate Site with 499_1, 499_2 and 499_3 - Annual data provided for 499_3 only
499_2	359522	173381	35.6	33.2	41.4	38.1	33.0	32.6	35.1		35.5	33.1	39.3	36.5	-	-		Triplicate Site with 499_1, 499_2 and 499_3 - Annual data provided for 499_3 only
499_3	359522	173381	37.1	33.4	39.0	39.1	32.1	33.3	35.7		34.7	36.0	39.6	38.3	35.9	31.1		Triplicate Site with 499_1, 499_2 and 499_3 - Annual data provided for 499_3 only
502_1	358640	173090	71.1	58.0	65.7	52.9	68.3	62.4	64.2	74.1	75.1	75.0	74.0	65.2	-	-		Triplicate Site with 502_1, 502_2 and 502_3 - Annual data provided for 502_3 only
502_2	358640	173090	74.2	55.9	61.3	52.9	68.9	57.3	66.1	75.4	74.0	69.3	77.3	59.5	-	-		Triplicate Site with 502_1, 502_2 and 502_3 - Annual data provided for 502_3 only
502_3	358640	173090	75.4	56.4	62.4	62.2	70.0	62.7	70.1	72.0	81.1	68.8	72.1	63.1	67.1	**58.0**	**50.1**	Triplicate Site with 502_1, 502_2 and 502_3 - Annual data provided for 502_3 only
512	359026	174432			37.4	42.9	36.9	37.4	44.2	39.6	46.2	45.2	49.2	38.2	41.7	36.1	33.5	
525	362455	173687		30.3	35.1		29.7	29.8	31.3	32.1		34.6	39.8	34.3	33.0	28.5		
538	358681	171478	27.2	27.4	27.6		17.9	23.5	22.7	24.2	26.7	26.1	34.6	28.9	26.1	22.5		
539	358599	171391	36.2	31.0	34.3	36.9	28.9		33.7	33.7	39.0	37.4	46.1	35.9	35.7	30.9		
545	356379	171436	32.0	32.9	33.0	24.1	31.4	21.6	23.0	22.9	31.8	29.9	26.8		28.1	24.3		
550	358353	172613	32.9	32.9	33.3	36.5	31.0	32.4		35.6	35.0	31.2	36.2	33.3	33.7	29.1		
555	356679	172589	31.3	32.5	31.8	42.5	30.0	32.4	31.8	29.2	35.7	24.8	36.5	30.4	32.4	28.0		
556	356827	172303	32.4	40.2	36.4	36.4	38.5	37.4	41.4	41.3	43.0	43.6	49.6	44.8	40.4	35.0		
559	356485	171580	28.3	25.7	31.7	27.3	25.5		25.0	21.8	32.5	31.6	33.8		28.3	24.5		
560_1	358665	173439	38.8	36.8	39.0	38.8	31.4	33.0	36.5	32.7	43.7		41.8	35.2	-	-		Duplicate Site with 560_1 and 560_2 - Annual data provided for 560_2 only
560_2	358665	173439	42.2	34.9	35.3	34.4	30.3	33.5	38.6	37.1	39.1		43.8	41.9	37.2	32.2		Duplicate Site with 560_1 and 560_2 - Annual data provided for 560_2 only
561_1	358688	173431	41.2	46.7	40.3	51.9	41.6	33.8	42.0	35.5	43.0	43.1	42.6	46.7	-	-		Duplicate Site with 561_1 and 561_2 - Annual data provided for 561_2 only
561_2	358688	173431	48.1	45.8	46.0	43.1	39.3	36.3	39.9	35.8		44.7	46.3	41.0	42.4	36.7	34.5	Duplicate Site with 561_1 and 561_2 - Annual data provided for 561_2 only
565	357227	179101	27.8	23.2	29.1	34.5	31.8	31.4	32.3	29.6	33.5	28.1	34.4	29.3	30.4	26.3		
567	360728	175345	56.7		50.0	51.7	56.2	38.1	47.6	51.7	53.0	53.0	57.3	54.7	51.8	**44.8**	**40.2**	
568	360178	175779	39.1	36.6	35.4	38.7	36.0	34.7	35.7		38.5	39.8	44.4	39.2	38.0	32.9		
569	359855	176186	31.2	25.8	26.6	29.0	23.8	22.4	24.1	25.1	29.5	31.5	33.5	31.3	27.8	24.1		
570	359847	176439	36.4	36.5	34.4	34.2	30.1	27.6		32.1	32.7	24.9	36.8		32.5	28.2		
571	359848	176411	39.2	41.3	37.8	36.7	37.2	32.5	35.8	35.8	38.3	41.2	45.8	36.7	38.2	33.1		
574	357678	174229	35.2	31.4	34.5	32.0	32.5	28.4	32.4	28.0	34.1	38.8	41.0	32.8	33.4	28.9		
575	358685	172881	36.4	33.6	31.2	34.3	24.5	30.9		34.3	39.8	37.7	36.4	36.7	34.2	29.6		
576	358792	172874	31.6	27.6	26.2		26.2	24.2	26.3	38.9	32.2	31.6	42.1	34.1	31.0	26.8		
577	358935	172981	38.7	29.2	31.6			29.1		34.2	28.2	37.1	36.6		33.1	27.8		
578	361892	173552	39.9	40.5	40.0	44.5	31.4	38.2		34.3	37.9	32.0	45.8	35.1	38.1	33.0		
579	362198	173580	44.7	38.6	44.1	37.9	37.4	36.6	38.0	36.0	41.9	41.2	54.5	40.6	40.9	35.4		
580	358754	173528	55.2	49.8		53.8	60.3	46.2	55.3			58.4	67.9	51.2	55.3	**47.9**		
581	358908	173574	51.5	48.4	45.9	45.3	52.3	40.2	45.2	41.7	49.4	52.1	45.9	48.3	47.2	**40.8**		
582	358893	173333	59.0	57.8		63.1	51.3	52.3	55.6		58.1			57.6	56.9	**50.0**		
583	358870	173340	52.6	42.1	46.0	44.3	46.4	48.5		48.7	50.8	54.4	54.9		48.9	**42.3**		
584	358773	173276	41.3	41.5	45.2	42.2	31.3	31.7	34.7	36.5		35.9	38.7	40.4	38.1	33.0		
585	358192	173050	40.4	37.0	35.2	41.1	31.7	32.2	32.2		38.6	32.2		32.0	35.3	30.5		

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 (0.87)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
586	358195	173018	52.3	39.8	42.3	43.5			46.9	42.7	44.3		45.4	44.3	44.6	38.6	29.8	
587	358802	172896	32.8	28.2	29.8	29.7		25.7	27.0	29.2	31.7	31.2	35.3	36.4	30.6	26.5		
588	358739	172869	31.9	29.2	25.5	29.1	26.0	23.0	27.8	30.4	33.0		40.0	41.0	30.6	26.5		
589	358849	173606	37.0	30.5	31.6	28.8	26.4	26.8	29.6	28.4	31.8	31.0	33.6	31.8	30.6	26.5		
590	358789	173589	54.5	44.1	49.4	39.9	47.1		50.6	48.5	56.1		50.0		48.9	**42.3**		
591	358805	173575	46.8	42.4	44.6	31.2	40.8	31.0	35.0	36.1	44.3	46.1	39.9	45.6	40.3	34.9		
592	358662	173409	49.3	47.9	40.3	48.1	42.1	43.5	40.7	45.9	46.7	50.0	47.7	47.5	45.8	39.6		
593	358610	173350	40.7	38.6				37.7	37.7	41.0	42.1		45.1	41.0	40.5	35.2		
594	358540	173234	39.3	36.5	37.9	42.0	35.0	34.7	36.8	39.5	43.3	40.9	47.6	39.4	39.4	34.1		
595	358510	173197	38.0	36.7	36.1	38.4	31.9	35.7	36.0	38.4	35.8	38.3	43.5	37.9	37.2	32.2		
596	358431	173120	37.2	31.7	35.4	29.2	30.5	34.0	29.8	36.9	41.8	31.8	41.3	36.3	34.6	30.0		
597	358403	173124	40.9	37.7	39.4	37.5	35.8	31.3	32.9	37.8	35.1	37.3	45.7	41.4	37.7	32.7		
598	358061	173182	31.4	32.2		37.1	26.0	31.3	27.7	30.8		26.4	39.4	28.9	31.1	26.9		
599	358135	173123	41.1	38.7	38.3	40.1	31.6		33.5	36.5	42.5		43.5	39.2	38.5	33.3		
600	358322	172858	29.0	27.6	28.4	29.3	24.3	25.7	24.6	26.8	29.0	26.0	30.6	30.7	27.7	23.9		
601	358563	172818	40.9	37.9	35.7	29.3	27.5	32.6	31.6	30.4	35.9	27.8	40.4	38.4	34.0	29.4		
602	358469	172656	44.6	48.7	44.4	42.9		42.4	36.8	44.8	45.2	43.2	45.7	45.2	44.0	38.0	37.4	
603	358767	173320	50.2	49.4	33.1	48.9	38.1	45.2	42.8	48.7	51.6	47.6	46.6	46.7	45.7	39.6		
604	358817	173342	51.9	48.5	50.7	55.6	45.4	45.6	43.2	52.7	47.6	53.6	55.0	47.0	49.7	**43.0**		
605	358718	173227		48.2		41.1	36.3						40.0		41.4	32.4		
606	359124	172803	34.9	29.6	28.6	33.5	24.8	26.1	26.1	30.3	28.6	29.3	31.5	30.1	29.5	25.5		
607	359183	172826	34.6	29.2	29.8	35.0	29.4	31.2	31.2	31.4	35.2	29.2	37.9	31.1	32.1	27.8		
608	359563	172290		42.4	43.5	51.5	42.2	44.1	45.0	43.9	49.1	44.4	47.8	46.8	45.5	39.4	32.6	
609	359740	172116	38.3	35.1	35.5	34.2	27.4	36.3	32.6	33.8	38.2	34.6	38.6	34.8	34.9	30.2		
610	359967	171548	37.0	39.4	36.6	38.7	31.8	34.8	35.4	36.1	40.7	39.6	41.1	37.1	37.4	32.3		
611	357425	170769	25.7	25.2	21.4	27.6	19.0	21.2	16.7	18.1	23.5	20.7	28.1	23.5	22.6	19.5		
612	359206	173557	36.8	33.6	30.6	37.2	28.7	33.5	33.1	33.0	35.1		44.3		34.6	29.9		
613	359316	173554	48.4	42.3	43.3	45.6	43.5		40.7	49.3	51.0	49.6	53.6	48.6	46.9	**40.6**		
614	359516	173374	33.7	28.4	34.2	30.2	31.0	27.0	27.8	29.4	35.3	36.6	44.4	36.4	32.9	28.4		
615	359659	173688	63.4	45.3	58.5	62.5	54.3	59.5	61.7	63.7	66.2	64.3	72.5	63.2	61.2	**53.0**		
616	359747	173717	50.3	42.8	41.8	51.8	55.2	50.0	49.4	58.1	52.0	47.4	57.5	53.7	50.8	**44.0**		
617	359686	173587	36.2	31.2	29.3	30.6	32.4	30.3	31.2	31.6	36.7		40.1	31.8	32.8	28.4		
618	359086	174187	43.9	39.0	41.3	34.1	42.6	31.7	32.5	36.4	39.5	41.5	45.2	41.6	39.1	33.8		
619	359119	174149	44.1	43.9	40.3	46.8	39.9	35.0	20.3	37.8		41.2	47.5	44.4	40.1	34.7		
621	359256	175999	33.9	25.4	34.0		25.5	26.0		28.2	27.4	29.3		29.7	28.8	24.9		
622	358034	170602	47.3	45.3	40.4	36.9	29.6	33.6	37.0	41.4	44.7	25.5	47.2	39.0	39.0	33.7		
623	358059	170597	39.1	32.0	40.4	36.4	27.6	31.0	33.3	32.1	37.7	35.7	42.8	36.8	35.4	30.6		
624	357858	170499	57.0		56.5	58.6	54.4	56.4	54.2	54.3	51.0	63.4	66.9	59.0	57.4	**49.7**	36.4	
625	357842	170514	60.8	48.8	54.0	55.2	46.0	47.8	48.0	43.2	56.1	53.6	62.6	53.3	52.5	**45.4**		
626	357667	170466	50.5	56.9		59.5	53.3	41.6	46.2	45.4		39.1	51.5	52.7	49.7	**43.0**		
627	357829	170658	44.9	40.8		46.4	39.0	34.2	35.8	34.0	39.6			38.5	39.2	34.0		
628	359899	174335	41.2	38.6	41.9	53.3	36.6		34.2	38.6	45.8		46.1	39.0	41.5	35.9		
629	359936	174330	47.0			43.5		40.7	40.9	41.2	47.5	47.5	51.2	45.5	45.0	38.9	36.8	
630	357533	170410	35.8	44.6	35.7	37.6	31.5	29.0	27.6	29.5	34.1	37.7	36.0	41.2	35.0	30.3		
631	357729	170660	30.4	30.3	26.4	35.2	24.2	25.8	25.5	27.7	26.4	31.4	30.7	29.4	28.6	24.8		
632	358073	171063	31.5	29.9	26.1	28.8	23.4	21.9	22.7	22.3	27.7	28.1	32.3	29.6	27.0	23.4		
633	358217	171299	48.9	40.0	40.9	45.2	36.3	40.4	38.1	38.0	43.0	42.4	49.8	43.4	42.2	36.5	35.7	
634	358772	171741	41.3	38.5	41.5	42.3	39.1	35.4	35.8	41.0	43.4	38.5	41.9	40.8	39.9	34.6		
635	359106	171962	34.9	27.1	30.4		27.7	23.7	26.2	24.4	30.4	29.0	34.5	32.9	29.2	25.3		
636	359940	171838	38.3	27.8	32.8	29.4	26.9	23.5	26.3	24.4	30.2	23.0	44.8	36.2	30.3	26.2		
637	361206	171390	30.7	31.6	26.1	22.8		15.7	18.5	16.9	22.8	25.3	32.0	33.7	25.1	21.7		
638	359498	173144		35.3	53.2	47.4	43.3	44.6	56.5	55.4	56.0	55.2	56.9	53.6	50.7	**43.8**		
639	359318	172634	37.3	32.7	30.4	31.9	24.3	23.9	26.1		34.2		35.7	35.5	31.2	27.0		
640	359792	173319	37.0	34.8	32.4	31.9		25.3	28.6	29.2	33.1		38.5	34.1	32.5	28.1		

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Easting)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.87)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
641	359114	174007	49.0	39.0	49.1	44.7	44.2	42.4	48.2	47.2	45.5	42.8	53.9	44.7	45.9	39.7		
642	359276	174155	34.6	31.2	33.2	31.8		27.3	30.0	23.2	46.6	34.9	40.2	34.0	33.4	28.9		
643	359817	174401	50.2	40.5	46.1	39.6	42.9	47.0	43.2	49.0		45.2	53.1	47.7	45.9	39.7	25.5	
644	359676	175102	40.4	33.7	34.7	33.3	36.1	29.1	37.6	36.7	37.7	37.8	46.6		36.7	31.8		
645	359033	175259	39.6	39.5	34.0	37.3	32.7	30.7	27.8	31.1		34.3	38.5	39.2	35.0	30.3		
646	359035	174427	37.8	31.6	35.4	34.2	31.1	34.5	35.8	33.5	38.9	40.8	51.4	34.9	36.7	31.7		
647	357124	172400	45.4	37.3	36.5	38.1	36.9	34.7	37.7	40.6	44.3	38.3	43.0	42.7	39.6	34.3		
648	360905	170185	38.0	31.9	34.2	31.3	29.1	28.2	29.9	30.4	36.2	32.8	44.1	36.8	33.6	29.0		
649	362089	170606	32.0	29.4	35.6	35.5	31.2	37.3	34.8	34.9	37.8	32.4	41.6	35.5	34.8	30.1		
650	360818	170448	27.1	23.5	29.2	28.5		19.1	30.1	21.8	26.2	25.2	33.5	26.2	26.4	22.8		
651	360938	173376	44.2	36.0	37.8	42.4	37.5	39.5	38.2	37.8	43.3	43.2	49.0	39.0	40.7	35.2		
652	361119	173796	49.5	39.7	52.3	43.8	44.0	49.4	44.5	43.3	48.8	58.3	55.7	46.5	48.0	**41.5**	33.8	
653	360515	174134	37.3	35.4	34.0	30.8				28.0	28.5		40.2		33.5	26.0		
654	360207	174403	30.9	31.5	25.8	25.4	21.1	20.5	19.7	23.3		32.7	31.7	28.9	26.5	22.9		
655	361355	175203	40.4	32.9	32.3	26.9	26.7	28.6	28.9	29.3	36.4	39.0	45.3	38.5	33.8	29.2		
656	361141	175446	34.6	33.4	32.8	28.6	28.3	26.0	28.7	34.0	32.2	40.2	41.7	39.1	33.3	28.8		
657	361676	175127	42.8	33.9	27.6	28.2		29.1	30.8	32.1	33.1	35.9	43.9		33.7	29.2		
658	363325	175803	35.4	26.7	26.4	24.7	21.9	24.8	24.0	28.2	23.7	29.3	33.8	28.8	27.3	23.6		
659	359773	176702	32.2	32.9	38.9	29.8	27.4	23.5	23.3	26.7	28.7	32.4	38.0	33.4	30.6	26.5		
660	360896	175312	40.5	39.4	36.1	39.1	33.2	29.7	33.0	31.9	39.3	35.2	46.0	41.5	37.1	32.1		
661	358022	175630	28.2	25.0	26.1	29.0	22.7			20.8	27.4	26.8	35.4	27.8	26.9	23.3		
662	357868	175723	27.2	26.5	23.7	30.4	20.9	20.5	20.4	19.9	24.7	22.9	30.5	26.2	24.5	21.2		
663	357396	174761	30.2	30.5	26.9	30.3	28.2	24.3	29.1	29.6	34.3	27.7	22.4	28.6	28.5	24.7		
664	357347	174992	26.6	29.4	27.2	26.6	25.3	30.7	30.1	31.7	31.9	30.0	35.6	29.2	29.5	25.5		
665	358675	173405	43.6		43.7	45.9	45.0	37.2	40.9	38.4	44.1	47.8	48.2	43.4	43.5	37.6	34.9	
666	358646	173426	40.3	38.1	36.4	39.2	36.0	33.5	32.2	37.6	38.7	39.4	42.9	40.5	37.9	32.8		
667	358531	172803	54.0	46.2	51.8	41.2	47.4	47.2	49.4	51.7	51.7		51.9	61.3	50.3	**43.6**	33.5	
669	359511	172754	34.9	32.2	31.0	33.1	27.7	26.8		26.7	33.4	48.0		36.7	33.0	28.6		
670	361749	170690	40.1	48.6		48.8	46.4	41.0	43.7	44.1	49.6	46.1	48.3	50.5	46.1	39.9	37.0	
671	357381	175781					27.6	26.7	25.2	25.8	15.6	36.9	29.4	30.0	27.1	26.1		
673_1	358728	173520						31.1	38.8	38.4	33.5	40.0	44.7	38.8	-	-		Triplicate Site with 673_1, 673_2 and 673_3 - Annual data provided for 673_3 only
673_2	358728	173520						34.5	39.2	39.0	38.8	41.4	39.7	39.9	-	-		Triplicate Site with 673_1, 673_2 and 673_3 - Annual data provided for 673_3 only
673_3	358728	173520						36.0	33.8	40.8	40.3	38.4	41.8		38.5	36.1		Triplicate Site with 673_1, 673_2 and 673_3 - Annual data provided for 673_3 only

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

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

☒ **Local bias adjustment factor used.**

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

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

Notes:

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

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined**.

See Appendix C for details on bias adjustment and annualisation.

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

New or Changed Sources Identified Within Bristol During 2021

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

Additional Air Quality Works Undertaken by Bristol City Council During 2021

Locations Recording Exceedence Outside the AQMA

The next section of the report discusses the locations which have shown some exceedances of the annual objective for NO_2 in the past 3 years but are located outside of the AQMA. Table C.1 shows these locations and provides measured pollutant concentrations for the past 5 years where available. There are two locations, one on Muller Road and one on Blackboy Hill, where exceedances of the annula objective were measured in 2021.

Table C.1- Tubes Outside AQMA Exceeding the Annual Air Quality Objective for NO_2 Since 2017 – Muller Road

Site Location	Site ID	Annual Mean Concentrations ($\mu g/m^3$)					Action
		2017	2018	2019	2020	2021	
Blackboy Hill	3	34.4	34.4	27.7	28.7	**44.4**	2013 was the last year in which this site exceeded objectives, with 41.2µg/m^3 being recorded. In 2020 it was the only location to show an increase in NO_2 levels when compared to 2019. The large increase in pollution in 2021 indicates that something has significantly changed in this location. It indicates that there is potentially a local source of pollution that needs investigating. Further discussion is included in this section of the report.
No.67 Filton Avenue on wall facing Muller Rd	493	**41.9**	**41.8**	37.0	29.5	31.8	2019 data shows that the site was compliant with the annual objective for nitrogen dioxide for the first time since 2015. 2021 data saw a rise compared to 2020, which is to be expected, but it remains significantly below the objective for this pollutant. The monitoring location is on the façade of a

Site Location	Site ID	Annual Mean Concentrations (µg/m^3)					Action
		2017	2018	2019	2020	2021	
							residential dwelling and is therefore representative of relevant exposure.
Muller Road/ Glenfrome Road junction north	567	N/A	N/A	**44.0** (39.9)	**41.3** (37.3)	**44.8** **(40.2)**	This site was set up in 2019 to investigate whether there are exceedances along Muller Road. The tubes were established in mid-2019 with results being annualised. 2019, 2020 and 2021 monitoring data is in breach of air quality objectives at this location. The increase to 44.8µg/m^3 in 2021 makes this the first year during which the distance adjusted concentration to the nearest receptor was in breach of objectives at 40.2µg/m^3. Monitoring will continue in this location and consideration will be made as to whether the AQMA needs to be extended to cover this location.

Site Location	Site ID	Annual Mean Concentrations (µg/m^3)					Action
		2017	2018	2019	2020	2021	
Muller Road junction with Downend Road traffic light to the south of the junction.	571	N/A	N/A	**42.8** (32.7)	31.3	33.1	This site was set up in 2019 to investigate whether there are more exceedances along Muller Road. The tubes were established in mid-2019 with results being annualised. Monitoring data was in breach of air quality objectives in at this location in 2019 but compliant in 2020 and 2021 at 31.3µg/m^3 and 33.1µg/m^3 respectively.

Distance adjusted data reported in ()

Blackboy Hill

2021 monitoring data for this site shows an exceedance of air quality objective with an annual NO_2 concentration of 44.4µg/m^3. The last time that this site recorded an exceedance of the objective was 2013. Analysis of the monthly diffusion tube monitoring data indicate that from 2020, it appears that there is a new local source of pollution, other than traffic, impacting upon NO_2 concentrations at this monitoring site. Analysis of monthly data from Site 3 has been carried out and has been compared to monthly data from a number of locations in Bristol at similar roadside locations over this time period. Figure C.1 and Figure C.2 show that in early 2020, NO_2 pollution levels rose sharply at site 3, at a time when it was falling or stable at other sites. This indicates that it is not just NO_2 pollution from road sources that are impacting pollution levels at this site. Site investigations have been carried out in 2022 but no obvious additional source of pollution was observed. Investigations and monitoring will continue in 2022.

Figure C.1 - Comparison of Site 3 to Site 154 Hotwells Road

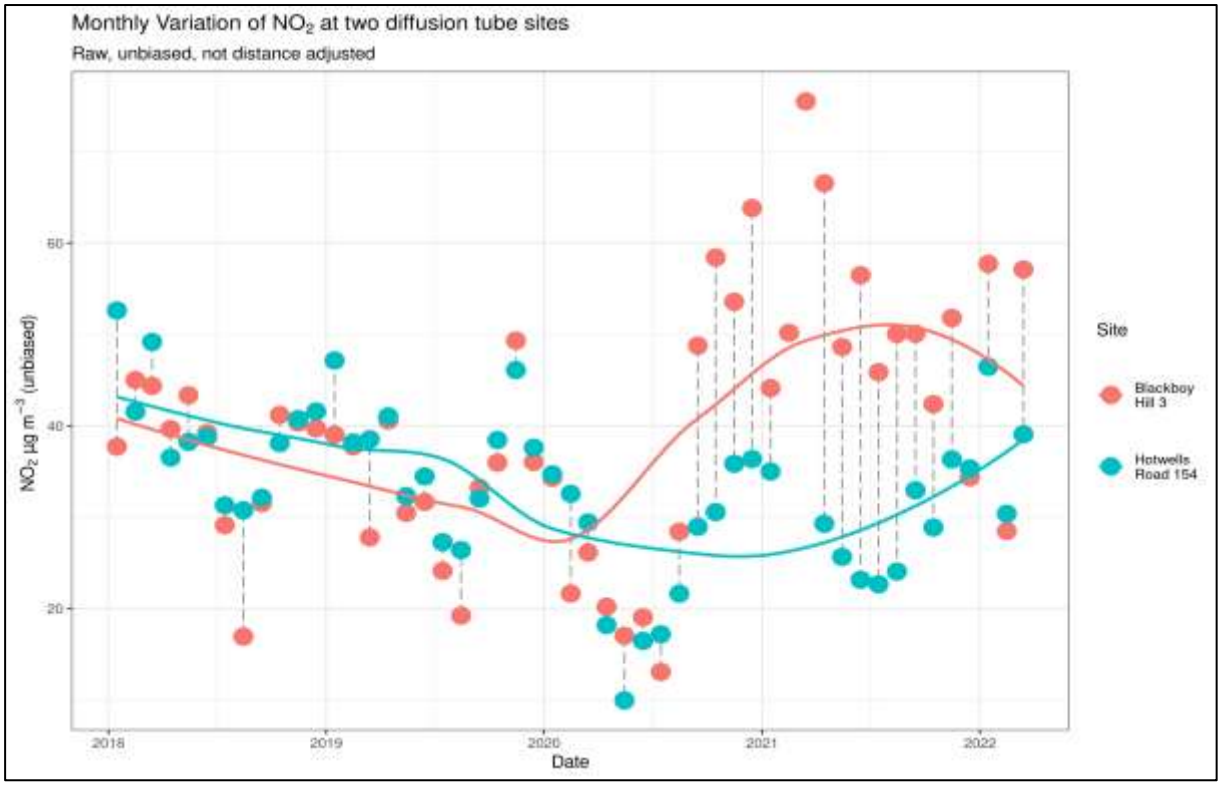
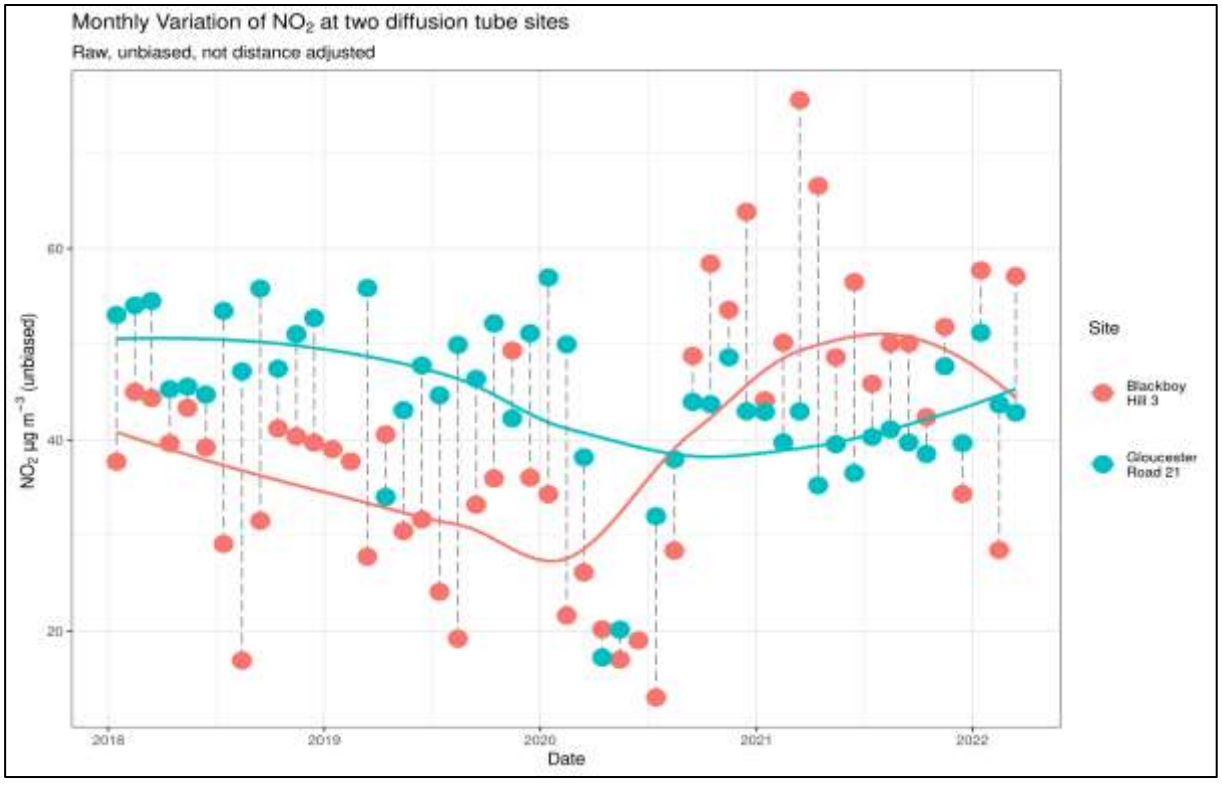


Figure C.2 - Comparison of Site 3 to Site 21 Gloucester Road



Muller Road

Monitoring site 493 was added to the monitoring network in 2015 along Muller Road. For 3 years, 2016, 2017 and 2018, this tube, which is representative of relevant exposure, measured an exceeded of air quality objectives. Tube 493 is located approximately 175m from the boundary of the current AQMA which runs along Gloucester Road. Monitoring data since 2019 has however shown compliance at Tube 493 with an annual average NO_2 concentration of 31.8µg/m^3 in 2021.

Due to the monitored exceedance outside of the existing AQMA, at tube 493, the Local Air Quality Management helpdesk was consulted in 2019 to agree an appropriate course of action. BCC asked the LAQM Helpdesk four questions via e-mail in July 2019. The query reference was 5607 with the following answers received to the following questions:

Q1: Should BCC consider amending the AQMA boundary to include the monitored location of exceedance based on the 3 years of monitored marginal exceedance?

A1: *Due to the marginal exceedances I think the best approach would be for further investigation to understand the extent of the additional exceedances outside of the AQMA, this could be additional monitoring or a detailed modelling assessment.*

Q2: Would there be a requirement to conduct modelling to support this or is diffusion tube data sufficient evidence given that modelling will be verified against monitoring data anyway?

A2: *A modelling study would provide information on the wider area, across areas where monitoring has possibly not been completed. This could lead to a better understanding of the area and provide a full review of the current designations of AQMAs.*

Q3: Would consideration be needed of possibly extending the AQMA further along Muller Road given that there is the possibility of other locations of exceedance outside of the AQMA boundary?

A3: *Following the completion of a detailed study (modelling or further monitoring), the extent of any possible amendments should be investigated and implemented where required.*

Q4: Should BCC amend the AQMA boundary, what is the current process by which this can be done, and does it involve a requirement for public consultation?

A4: *Consultation is encouraged, with Defra being the key statutory consultee but a recommended list is provided within Chapter 6 of PG(16).*

As a result of the information provided above, Bristol City Council added several new diffusion tube monitoring locations along Muller Road in August 2019. Diffusion tube monitoring was chosen over modelling as it provides more robust data and will be helpful if modelling is conducted at a later date. Figure C.3**Error! Reference source not found.** and Figure C.4**Error! Reference source not found.** show the location of the monitoring sites on Muller Road and the 2021 measured NO_2 concentrations. Measured and distance adjusted concentrations for those tubes exceeding the objective are reported in Table C.1.

Additional monitoring locations 567 and 571 were added to the network in 2019 along with a number of other tubes along Muller Road. Tube 567 has recorded exceedance for all years, however, 2021 is the first year in which this exceedance is shown to occur when adjusted for distance to relvant exposure. In 2021, an annual NO_2 concentration of 44.8µg/m^3 was measured at tube 567 on the junction of Muller Road with Glenfrome Road. When adjusted for distance to the nearest location of relevant exposure, marginal exceedance of 40.2µg/m^3 was predicted.

Tube 571 recorded an exceedance in 2019, but not when adjusted for relavant exposure. 2020 and 2021 data for this site have shown compliance wihout distance adjustment. It is proposed to continue monitoring in locations along Muller Road in 2022.

Figure C.3 - Muller Road 2021 Measured Annual NO_2 Concentrations – North

Figure C.4 - Muller Road 2021 Measured Annual NO_2 Concentrations – South

Local Pollution Hotspots – Measured Data

In the review of the 2019 ASR provided by Defra, a request was made for future ASRs to highlight and identify pollution hotspots in the city.

To identify the locations in the city with the highest monitored pollution levels, a summary of data, in locations where annual NO_2 concentrations above 50µg/m^3 were measured in 2019, or in subsequent years, has been included within the 2022 ASR. These are shown in Table C.2. Six monitoring locations had measured concentrations above 50µg/m^3 in 2019. Of the 6 sites over 50µg/m^3 in 2019, 4 of them measured levels of NO_2 below 50µg/m^3 in 2021. In 2021 there were 4 sites with annual NO_2 concentrations of 50µg/m^3 or above. The location of these site is shown in Figure C.5. This figure of over 50µg/m^3 has been chosen by BCC to illustrate the most polluted sites in the city. The values are as measured and do not necessarily represent relevant exposure.

There are several other monitoring locations with NO_2 concentrations are above 40µg/m^3 at locations of relevant exposure occur. Whilst these locations are of significant concern due to the high levels of pollution, the dispersed and relatively widespread nature of these locations mean that the term ‘hotspots’ does not properly reflect the nature of these exceedances. As a result, these locations have been discussed in the general commentary of the report, rather than being included in this specific section of the report.

The following section includes additional information on locations where annual NO_2 concentrations of 50µg/m^3 or above were measured in 2021.

Parsons Street Gyratory A38 East – Tube 239

Tube 239 is located less than 1m from the kerbside with 2021 NO_2 measured at 51.4µg/m^3. The road in this location has a relatively steep incline, with 3 lanes of traffic often accelerating from a standing start from traffic lights, which are located a relatively short distance from the monitoring site. The nearest relevant exposure is 9m from the kerbside and shows compliance at 33.6µg/m^3 when adjusted for this distance.

Colston Avenue – Tube 502

In 2019 the annual NO_2 concentration at Tube 502 was 68.7µg/m^3, this fell to 52.1 µg/m^3 in 2020 but increased again in 2021 to 58.0µg/m^3. Tube 502 has the highest recorded annual NO_2 concentration measured within Bristol. It is a city centre location impacted by large numbers of vehicles, including many buses, with high levels of congestion and restricted pollutant dispersion. At the nearest location of relevant exposure, concentrations of 50.1µg/m^3 have been calculated.

Rupert St – Tube 582

Tube 582 was added to the monitoring network in 2021 as part of the additional monitoring put in place to gather baseline data and to assess the impact that the proposed Clean Air Zone has on air pollution once it is introduced. In 2021 the measure annual NO_2 concentration was 50.0µg/m^3. The monitoring location is 2m from the kerb of a busy city centre route. Buildings in the area also mean the pollutant dispersion is likely to be hindered. The site isn't representative of relevant exposure.

Newfoundland Way – Tube 615

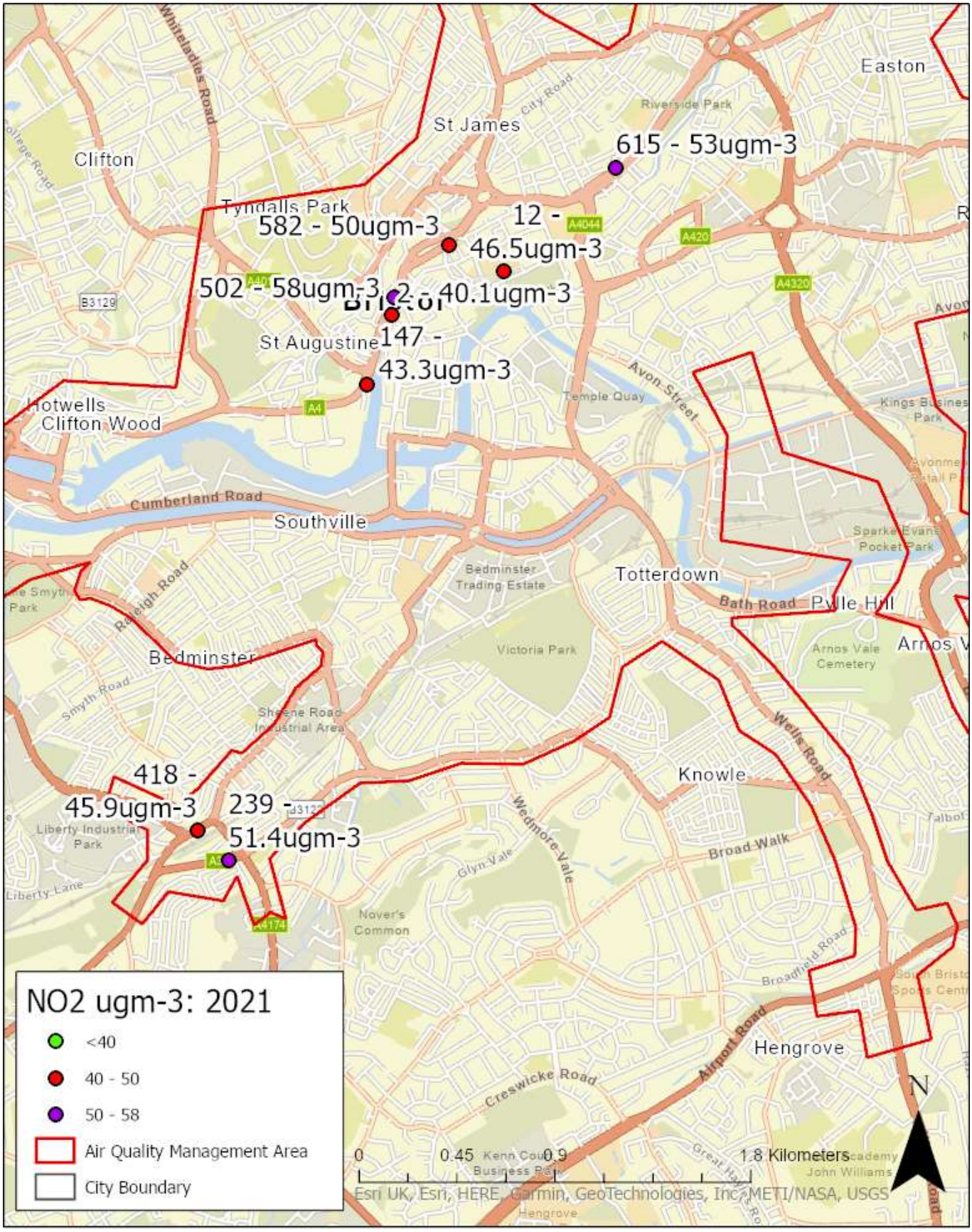
This is another monitoring location added as part of the additional CAZ monitoring network. In 2021 it recorded an annual NO_2 concentration of 53.0µg/m^3. This site is located 0.8m from the kerb of one of the main routes into Bristol on which vehicles using the M32 travel into and out of Bristol. This location is not representative of relevant exposure.

Table C.2 – Locations at which NO_2 Concentrations Above 50µg/m^3 were Measured in 2019 or 2021

Site ID	Site Name	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	NO_2 Annual Mean Concentration (µg/m^3)				
				2017	2018	2019	2020	2021
2	Colston Avenue	358628	173011	**63.1**	**58.2**	**53.7**	36.9	**40.1**
12	Galleries	359142	173211	**56.6**	**57.5**	**51.8**	**41.9**	**46.5**
147	Anchor Road	358514	172691	**61.5**	**56.6**	**50.9**	39.4	**43.3**
239	Parson St. A38 East	357880	170506	**66.8**	**65.2**	**54.4**	**47.6**	**51.4**
418	Bedminster Down Rd lamppost between Ashton Motors & Plough PH	357737	170642	**58.4**	**55.7**	**51.1**	**40.2**	**45.9**
502	Co-located Colston Ave	358640	173090			**68.7**	**52.1**	**58.0**
582	Rupert St-CAZ-Post outside fire station	358893	173333					**50.0**

615	Newfoundland Way-CAZ-Lamppost by petrol station	359659	173688					**53.0**

Figure C.5 - Measured Annual NO_2 Concentrations at locations > or equal to 50µg/m^3 in 2019 or 2021

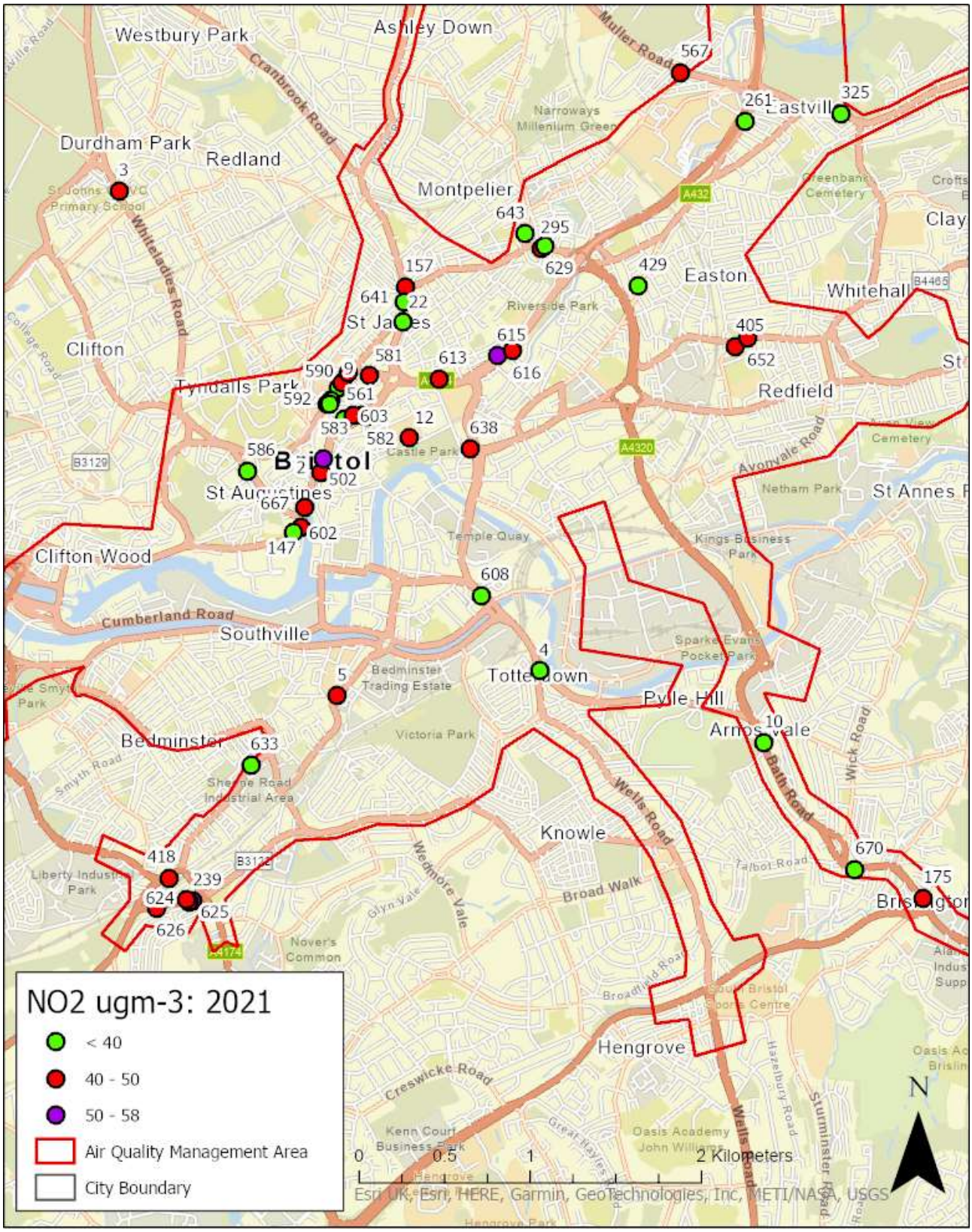


Diffusion tube data for 2019 shows that there were 28 monitoring locations at which exceedances of the annual objective for NO_2 were measured. In 2020 this had fallen to 6. In 2021 there were 28 locations where exceedances were measured. When considering diffusion tube measurement uncertainty, it is useful to consider monitoring locations with annual concentrations above 36µg/m^3, which could indicate a location of possible exceedance. An additional 21 locations were at risk of exceedance in 2021 if this criterion is used.

It should be noted that in 2021 there were an additional 93 diffusion tube monitoring locations when compared to 2019. Most of these additional tubes were added as part of the CAZ assessment work. As a result, comparison of number of sites exceeding does not give a good indication of trends of air pollution, however, it provides a good indication of the scale of the air pollution problem in Bristol.

These locations are spread throughout the city on many different central roads and arterial routes, the locations of which are shown in Figure C.6.

Figure C.6 - 2021 Measured Annual NO_2 Concentrations > 36µg/m^3



QA/QC of Diffusion Tube Monitoring

Somerset Scientific Services were used throughout the whole of 2021 to provide and analyse diffusion tubes for BCC. This lab is not UKAS accredited for diffusion tube analysis but does participate in the AIR PT Scheme for nitrogen dioxide tubes. All reference materials are of at least analytical grade or equivalent. Standards are prepared using equipment that is all within the normal quality system. The tubes used are recycled Gradko tubes prepared and set on a monthly basis. The tube changing frequency is as per the calendar on the Air Quality Archive web site and is carried out by Bristol City Council officers. The tubes are prepared with 50 µL of 20% triethanolamine in water. The method follows that set out in the practical guidance document.

Table C.3 – AIR PT Scheme Results for Somerset County Council

Air PT Round	Percent Of tubes submitted found to be satisfactory
Air PT AR037 – May/June 2020	NR (4) Cancelled due to pandemic
Air PT AR039 – July/August 2020	NR (4) Cancelled due to pandemic
Air PT AR040 – Sept/October 2020	100%
Air PT AR0402 – January March 2021	100%

Precision calculations were undertaken for all sites in the co-location study. The precision checks indicated a “good” precision rating for all measurement periods at all sites when two or more tubes were available for analysis. Automatic monitor data capture rates were good at all sites for all months except for December at the Brislington site.

Diffusion Tube Annualisation

Data capture rates for sites 429, 577, 582, 593, 605, 653, 671 and 673 were below 75% as monitoring was either carried out for part of the year or diffusion tubes were tampered with by members of the public and taken from their sites.

Annualisation of diffusion tube data for all sites with less than 75% data capture was carried out in accordance with the methodology in Box 7.10 of LAQM TG16[11]. Data from the Background AURN monitoring sites at Swindon Walcot, Newport and Bristol St Paul's were used in the process.

The calculations made to annualise the data for these sites are included in Table C.5.

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.

Bristol City Council have applied a local bias adjustment factor of 0.87 to the 2021 monitoring data. A summary of bias adjustment factors used by Bristol City Council over the past five years is presented in Table C.4

Discussion of Choice of Factor to Use

Box 7.1 of LAQM TG16 was used in order to determine the most appropriate BAF to use in 2021. Bristol has a relatively large network of automatic NO_X analysers that are operated using robust QA/QC procedures. In 2021, 7 of these sites recorded data capture rates of more than 90%. The precision of the analysis at these co-located triplicate tubes was classed as good for all sites and all months.

The locally derived bias adjustment factor calculated for 2021 was 0.87.

The national diffusion tube BAF spreadsheet contains two additional sites over and above the BCC sites. In 2021 the national BAF for Somerset Scientific Services was 0.85, therefore, using our own BAF, excluding the additional two tubes from the national calculations, provides a worst case BAF.

[11] Defra, Local Air Quality Management Technical Guidance TG16 (Feb 2018)

Bias adjustment factors used since 2017 have been provided in Table C.4 to provide transparency and put the 2021 BAF in context to those used in previous years.

Table C.4 - Bias Adjustment Factors

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2021	Local	N/A	0.87
2020	Local	N/A	0.85
2019	Local	N/A	0.82
2018	Local	N/A	0.92
2017	Local	N/A	0.95

NO_2 Fall-off with Distance from the Road

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

QA/QC of Automatic Monitoring

The Council's monitoring network is operated and run by officers trained in all aspects of the monitoring processes including routine site operations, field calibrations and data ratification. The QA/QC for the AURN Bristol St Pauls and Temple Way sites is carried out by Ricardo-AEA.

Routine Site Operations

The Council's monitoring sites have a programme of routine operational checks and programmed fortnightly site visits including:

- Daily communications checks on lines, data transfer and analyser operation;
- Daily checks of data quality;
- Repairs of faulty equipment under arrangements with outside contractors;

- Fortnightly site inspections of equipment operational status, site safety, security, and calibration checks; and
- Planned six monthly servicing and re-calibration of analysers by equipment suppliers under contract to the Council.

The Temple Way site is an affiliate site which is owned and maintained by Bristol City Council but also incorporated in the Defra AURN network. This site is maintained in accordance with the QA/QC processes as required for sites that form part of the National AURN network.

Equipment Servicing and Maintenance Regimes

BCC analysers have planned maintenance schedules that broadly follow those assigned to the AURN and affiliated site network. All analysers are maintained following manufacturers' instructions and have a six-monthly full service and re-calibration conducted under the servicing contract. During 2021 the Equipment Support Services (ESU) were carried out by ESU1 Ltd. BCC's internal data ratification procedures have been used to ensure that the reported data is valid and meets the required standards. Results of the servicing, calibrations and repairs that were carried out by ESU1 Ltd are fully documented and stored centrally. BCC staff carry out routine maintenance during regular fortnightly site visits where all associated equipment such as sample lines, modem, and electrical system are examined, and sample inlet filters are changed. Any faults, repairs or changes made to the equipment are also recorded and stored centrally and at analyser locations.

Calibration Methods

The calibration procedures are the same for all the Council's continuous analysers, with a two point zero/span calibration check being performed at regular intervals of two weeks. The methodology for the calibration procedure being derived from the manufacturers' instruction handbooks and from the AURN Site Operator's Manuals, as follows:

- Pre-calibration check - the site condition and status of the analyser is recorded prior to the zero/span check being conducted;
- Zero check – the response of the analyser to the absence of the gas being monitored;
- Span check – the response of the analyser to the presence of the gas of a known

concentration; and

- Post calibration check - the site condition and status of the analyser upon completion of all checks.

Each analyser zero/span check is fully documented with records being kept centrally using Google Sheets. Diagnostics data is recorded automatically through Envista ARM. Calibration factors are calculated in Google Sheets and are used in the scaling and ratification process.

Analyser Calibration

A two point calibration is conducted on Bristol City Council analysers with a reference NO mixture at a concentration of approximately 470ppb. Gases are supplied and certified by BOC.

Zero Air Generation

The contents of the portable scrubber (hopcalite, activated charcoal, purafil and drierite) are changed when necessary or at least every six months.

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

The type of PM_{10}/$PM_{2.5}$ monitor(s) utilised within Bristol City Council do not require the application of a correction factor.

Automatic Monitoring Annualisation

All automatic NO_2 monitoring locations within Bristol recorded data capture of greater than 75% therefore it was not required to annualise any monitoring data. However, there was a requirement to annualise the PM_{10} data from the Colston Avenue site. Table C.5 shows which NO_2 diffusion tube sites required annualisation in 2021.

NO_2 Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO_2 concentration at the nearest location relevant for exposure has been estimated using the 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**Error! Reference source not found.**.

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

Table C.5 – Annualisation Summary (concentrations presented in µg/m^3)

Site ID	Annualisation Factor St Pauls	Annualisation Factor Newport	Annualisation Factor Walcot	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean	Comments
429	0.9457	0.9831	1.0519	0.9936	42.3	42.0	
577	0.9620	0.9712	0.9759	0.9697	33.1	32.1	
582	1.0403	1.0004	1.0058	1.0155	56.9	57.7	
593	1.0034	0.9804	1.0340	1.0059	40.5	40.7	
605	0.9477	0.9329	0.8362	0.9056	41.4	37.5	
653	0.9143	0.9222	0.8534	0.8966	33.5	30.0	
671	1.0700	1.0736	1.1844	1.1093	27.1	30.1	
673_1	1.0347	1.0569	1.1601	1.0839	-	-	*Triplicate Site with 673_1, 673_2 and 673_3 - Annual data provided for 673_3 only*
673_2	1.0347	1.0569	1.1601	1.0839	-	-	*Triplicate Site with 673_1, 673_2 and 673_3 - Annual data provided for 673_3 only*
673_3	1.0347	1.0569	1.1601	1.0839	38.5	41.7	*Triplicate Site with 673_1, 673_2 and 673_3 - Annual data provided for 673_3 only*

Table C.6 – Local Bias Adjustment Calculation

	Local Bias Adjustment Input 1	Local Bias Adjustment Input 2	Local Bias Adjustment Input 3	Local Bias Adjustment Input 4	Local Bias Adjustment Input 5	Local Bias Adjustment Input 6	Local Bias Adjustment Input 7
Periods used to calculate bias	10	12	12	12	11	11	12
Bias Factor A	0.84 (0.78 - 0.92)	0.72 (0.65 - 0.8)	0.94 (0.86 - 1.05)	0.91 (0.84 - 1)	1.11 (0.93 - 1.37)	0.89 (0.83 - 0.96)	0.75 (0.69 - 0.82)
Bias Factor B	18% (8% - 29%)	40% (26% - 53%)	6% (-5% - 17%)	9% (0% - 19%)	-10% (-27% - 8%)	12% (4% - 20%)	34% (21% - 46%)
Diffusion Tube Mean (µg/m^3)	24.3	33.6	33.1	18.9	27.5	35.9	67.1
Mean CV (Precision)	2.3%	4.1%	2.7%	6.4%	3.5%	3.1%	4.1%
Automatic Mean (µg/m^3)	20.5	24.1	31.3	17.3	30.4	32.0	50.2
Data Capture	100%	100%	100%	98%	95%	99%	99%
Adjusted Tube Mean (µg/m^3)	20 (19 - 22)	24 (22 - 27)	31 (28 - 35)	17 (16 - 19)	30 (26 - 38)	24 (23 - 26)	21 (19 - 23)

Notes:

A combined local bias adjustment factor of 0.87 has been used to bias adjust the 2021 diffusion tube results.

Table C.7 – NO_2 Fall off With Distance Calculations (concentrations presented in µg/m^3)

Site ID	Distance (m): Monitoring Site to Kerb	Distance (m): Receptor to Kerb	Monitored Concentration (Annualised and Bias Adjusted	Background Concentration	Concentration Predicted at Receptor	Comments
10	4.0	9.0	36.8	11.8	31.1	
175	2.0	15.0	41.4	13.2	28.1	
239	0.7	9.0	51.4	14.4	33.6	
261	3.0	8.0	39.1	16.5	33.3	
405	1.0	2.0	40.4	15.9	*37.0*	*Predicted concentration at Receptor within 10% the AQS objective.*
502_1, 502_2, 502_3	2.0	5.0	58.0	21.0	**50.1**	*Predicted concentration at Receptor above AQS objective.*
512	3.0	5.0	36.1	16.2	33.5	
561_1, 561_2	5.0	8.0	36.7	21.0	34.5	
567	1.5	3.0	44.8	14.5	**40.2**	*Predicted concentration at Receptor above AQS objective.*
586	0.1	4.0	38.6	21.0	29.8	
602	2.0	2.3	38.0	18.8	*37.4*	*Predicted concentration at Receptor within 10% the AQS objective.*
608	0.4	3.0	39.4	19.7	32.6	
624	2.0	10.0	49.7	14.4	*36.4*	*Predicted concentration at Receptor within 10% the AQS objective.*
629	2.0	3.0	38.9	16.2	*36.8*	*Predicted concentration at Receptor within 10% the AQS objective.*
633	2.3	2.7	36.5	15.3	35.7	
643	0.2	10.6	39.7	16.2	25.5	
652	1.0	4.5	41.5	15.9	33.8	
665	2.0	4.0	37.6	21.0	34.9	
667	0.5	5.0	43.6	18.8	33.5	
670	3.0	4.5	39.9	12.6	*37.0*	*Predicted concentration at Receptor within 10% the AQS objective.*

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

Figure D.1 – Extent of Air Quality Management Area

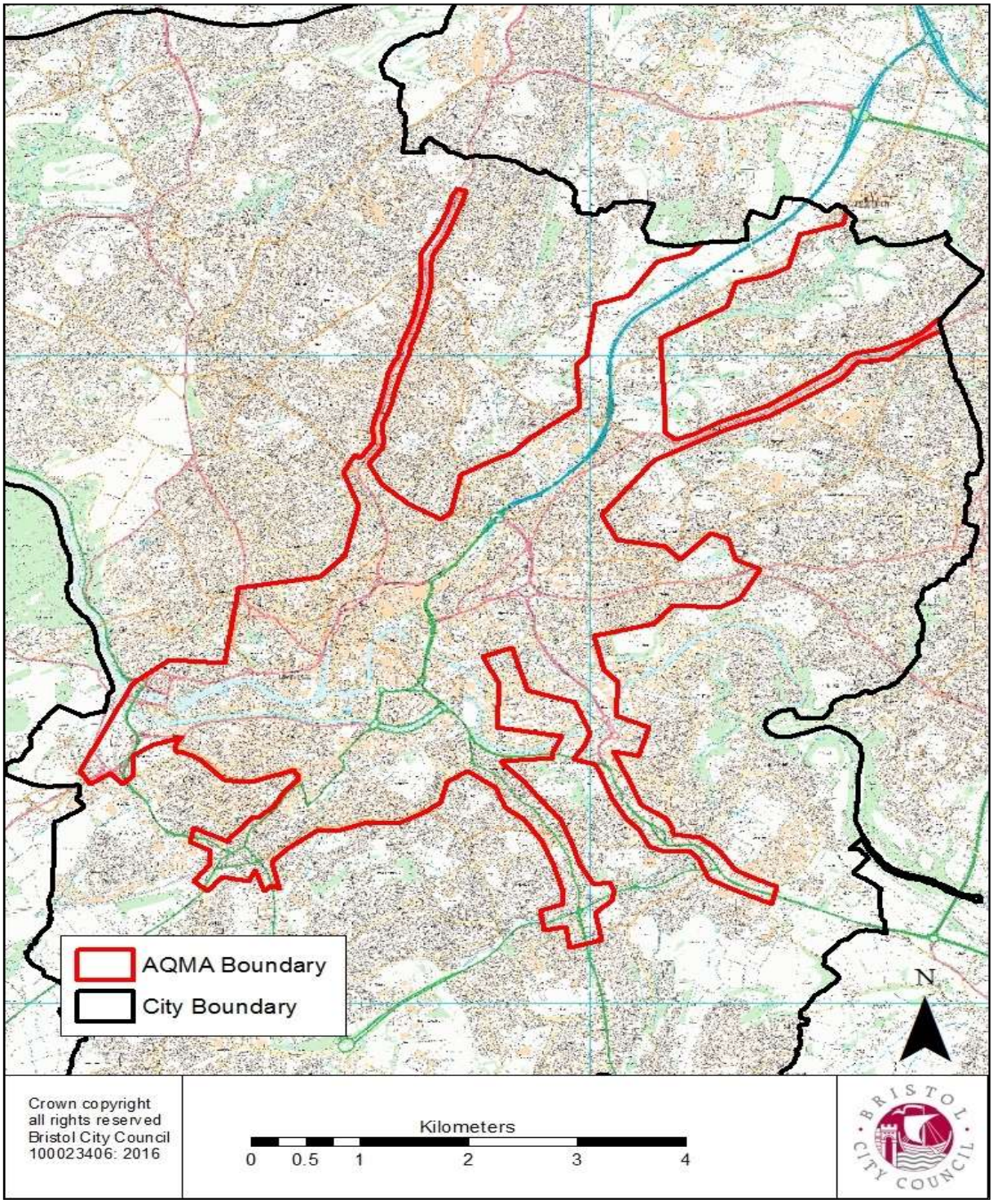


Figure D.2 - Central Monitoring Locations: 2021 Annual NO_2 Concentrations

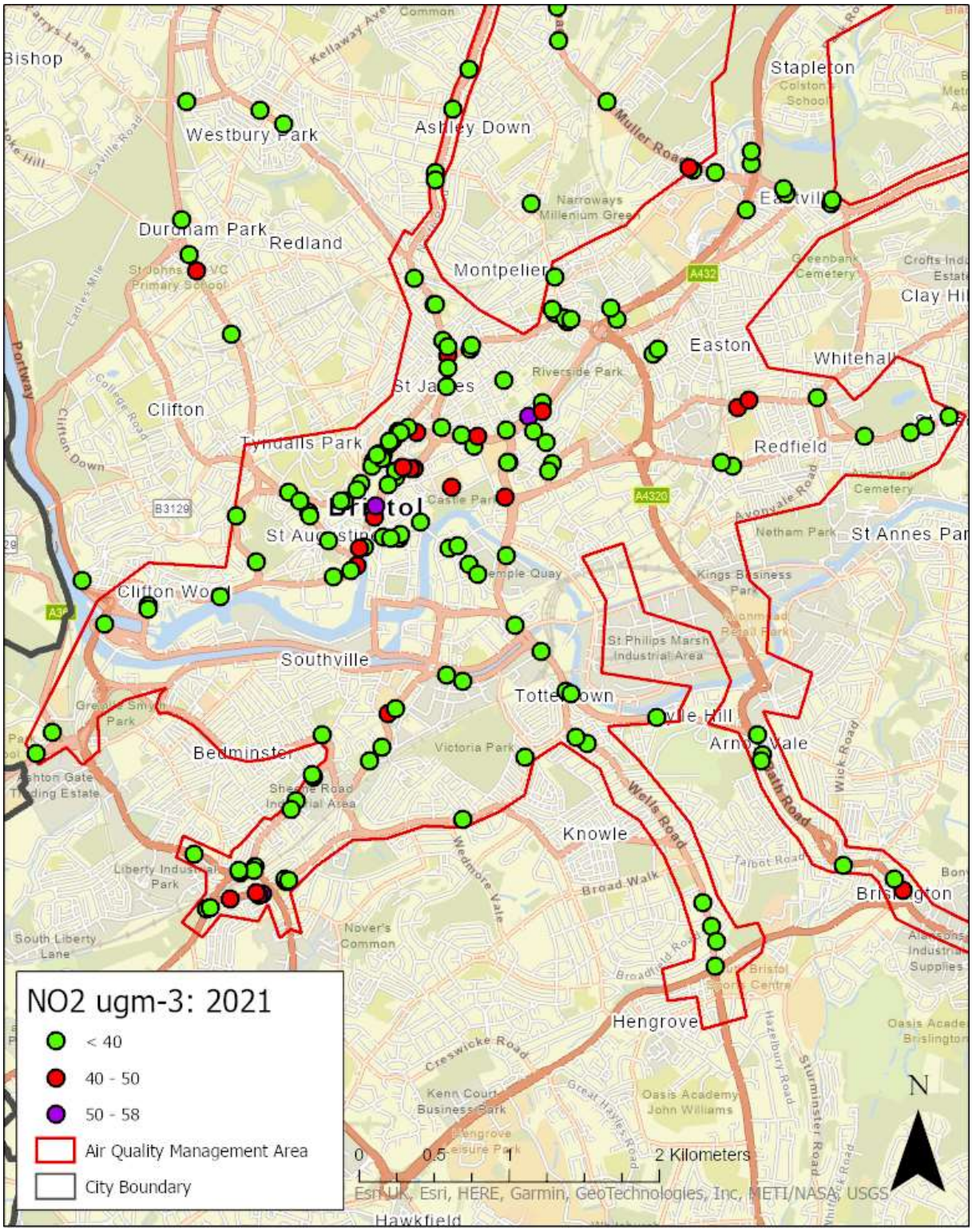


Figure D.3 - Central Monitoring Locations: 2021 Annual NO_2 Concentrations Distance Adjusted (where relevant)

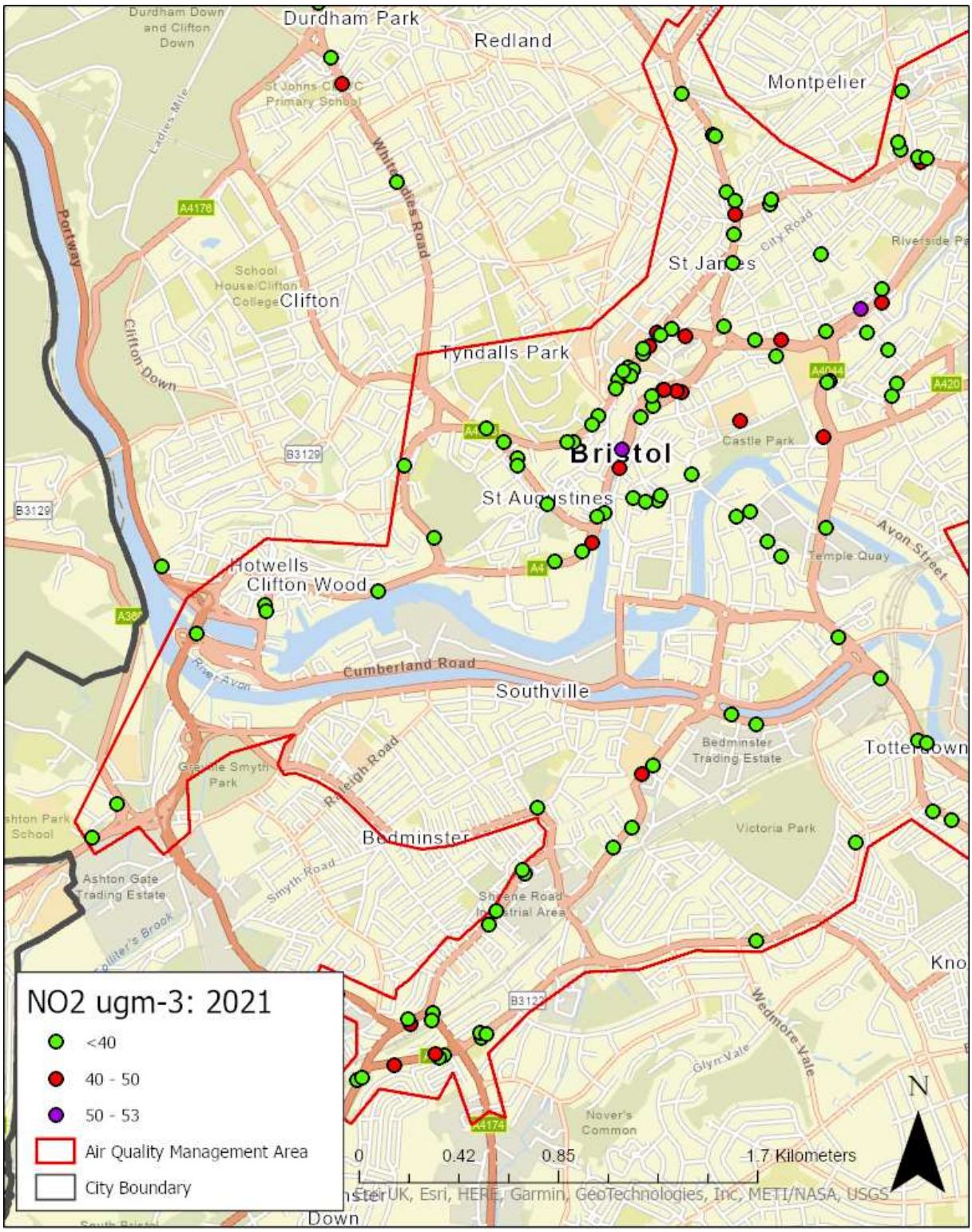


Figure D.4 - Avonmouth Monitoring Locations

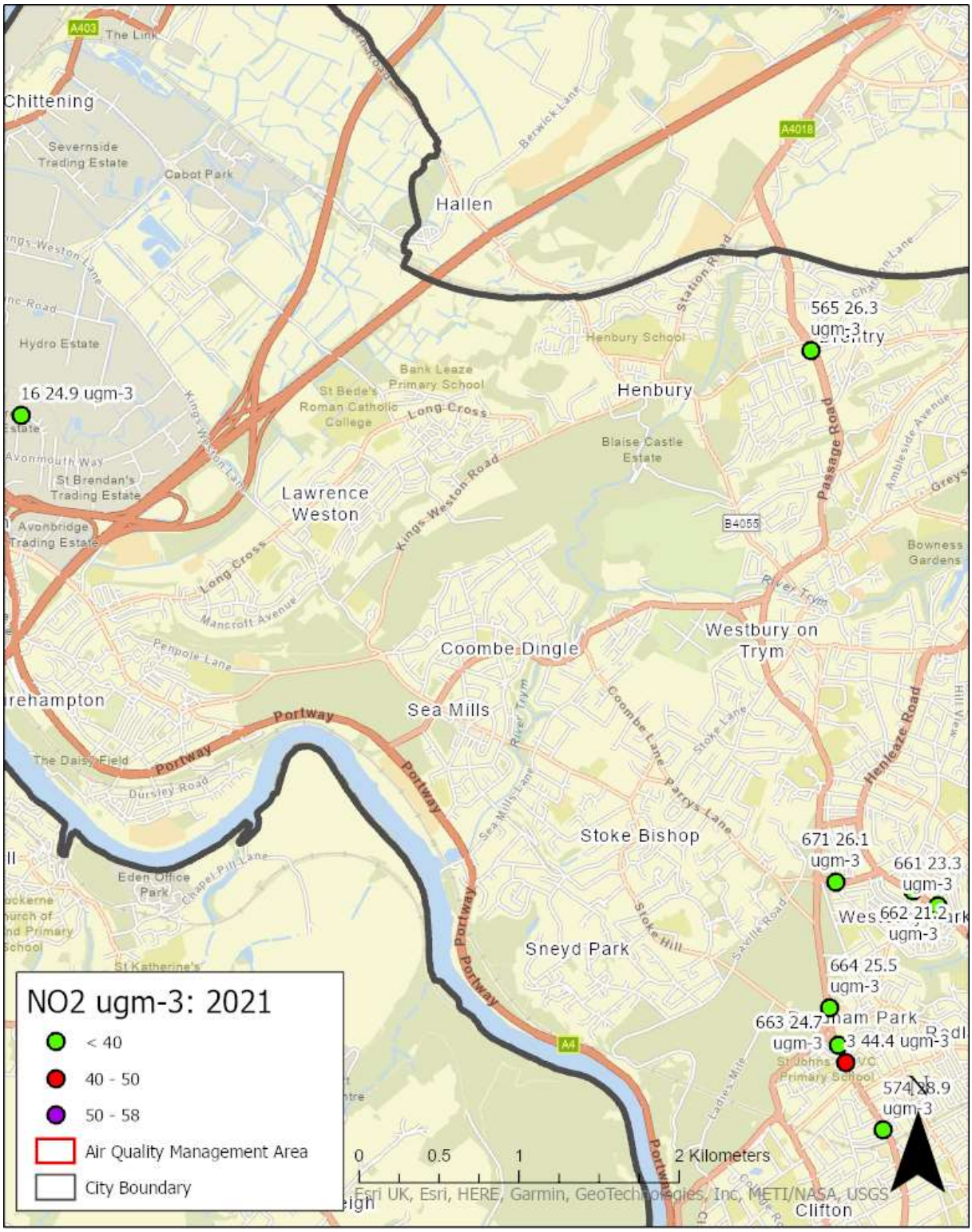
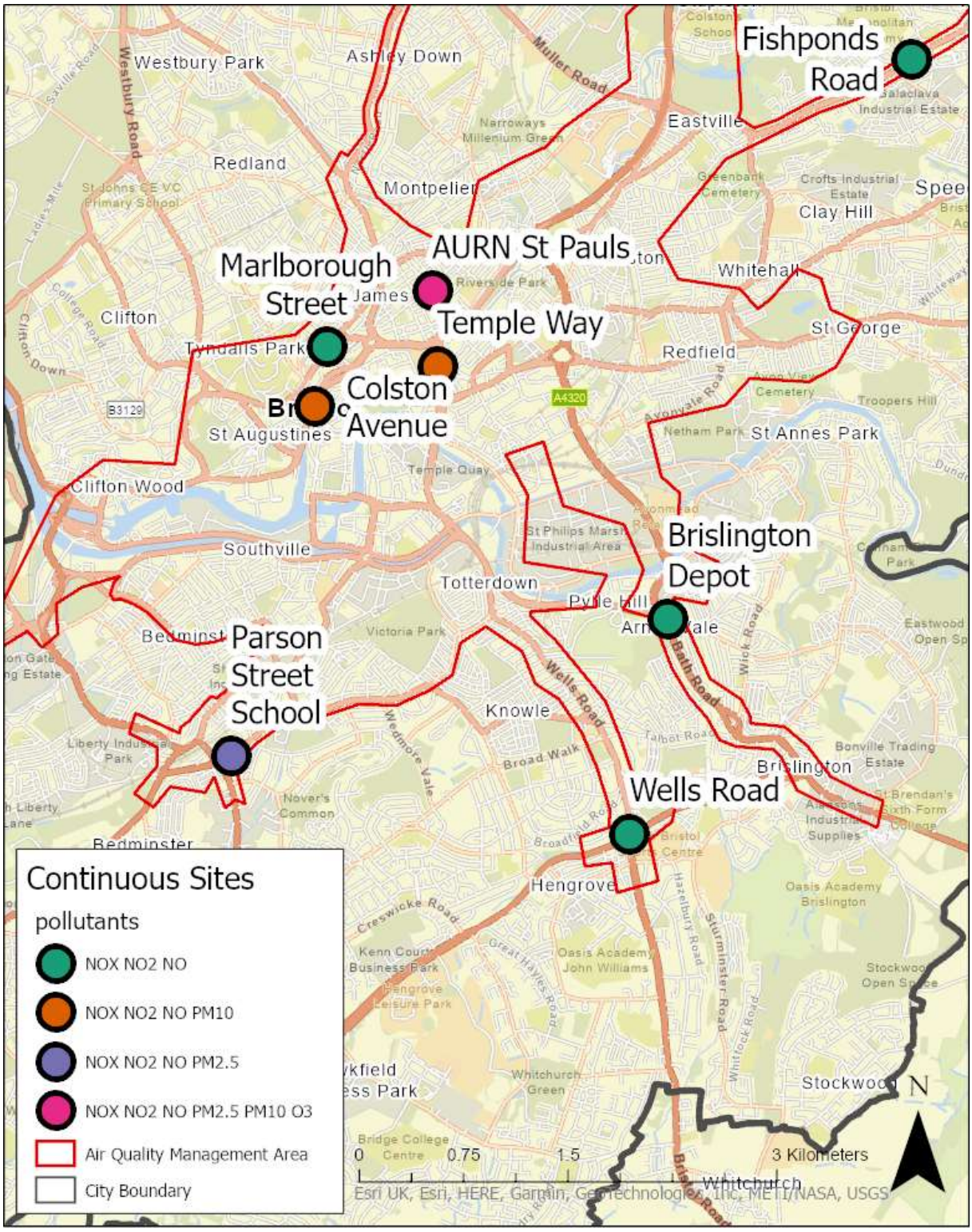


Figure D.5 - Continuous (real-time) Monitoring Locations in 2021



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England[12]

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

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

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by National Highways
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO_2	Sulphur Dioxide

References

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