



2023 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995 Local Air Quality Management, as amended by the Environment Act 2021

Date: June 2023

| Information | Eden District Council Details |
|--------------------------------|--|
| Local Authority Officer | Sara Watson/ Anna Slack |
| Department | Environmental Protection |
| Address | Mansion House, Penrith, CA11 7YG |
| Telephone | 01768 817817 |
| E-mail | pollution@eden.gov.uk |
| Report Reference Number | SJW/ANS/ASR2023 |
| Date | June 2023 |

Executive Summary: Air Quality in Our Area

2022 was the year that life seemed to return to normal as there was no lockdowns, holidays took place in the United Kingdom as well as abroad and more people moved back into the workplace rather than working from home. Overall, levels of Nitrogen Dioxide in 2022 decreased from 2021 with 15 out of the 18 monitoring sites showing to have a reduced concentration. Furthermore, all of the sites were below the objective level of $40\mu\text{g}/\text{m}^3$.

The Council gained two continuous monitoring devices for Air Quality that were installed along Castlegate in Penrith in 2021, however issues have resulted in limited data being collected for 2022. Work is ongoing to have these running to a better standard for 2023. The public can access the findings of these devices on the council's web page, [Eden District Council | AQI \(acoemuk.net\)](https://www.eden.gov.uk/air-quality).

Air Quality in Eden

Air pollution is associated with a number of adverse health impacts and is recognised as a contributing factor in the onset of heart disease and cancer. Additionally, air pollution 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 (Public Health England, 2017; Defra, 2006).

The mortality burden of air pollution within the UK is equivalent to 29,000 to 43,000 deaths at typical ages (Defra, 2023), with a total estimated healthcare cost to the NHS and social care of £157 million in 2017 (Public Health England, 2018).

The fraction of mortality attributable to particulate air pollution in Eden has been estimated and published as 3.40 percent (Public Health Outcomes Framework - Eden 2023, 2023); this is significantly less than the regional value (5.30%) or the national one (5.50%). There has been a recent change to the modelling that sits behind this figure, so this is the first year using the new methodology. Hopefully, future years will show whether the value is increasing or decreasing, and the effect of any policy interventions.

Air quality has been monitored for over 20 years in Eden and overall the air quality is very good, with the exception of a few areas where the levels can reach close to the objective level. Particulates and Nitrogen Dioxide are the main pollutants for concern in the Eden

district. There were no failures for Nitrogen Dioxide across the diffusion tube network in 2022 despite society returning to 'normality' with more travel for work and social reasons.

The district is not well connected by public transport resulting in residents and visitors using their own vehicles. During summer and school holidays, the area gets very busy with holidaymakers travelling to the Lake District National Park, Yorkshire Dales National Park and the North Pennines Areas of Outstanding Natural Beauty, all of which are in the Eden area. This can have a severe impact on the traffic travelling through Penrith especially when it coincides with traffic associated with Centre Parcs on Mondays and Fridays.

The annual mean concentration for NO₂ at the roadside for the UK was 23.6µg/m³ in 2022. In Eden, the mean of all 18 sites in 2022 was 23.1µg/m³. Eden generally seems to match the national trends with a significant reduction in mean concentration in 2020 due to COVID-19 restrictions and a noticeable decrease of NO₂ concentration between 2019 and 2022, 18.4% for Eden and 24% for the UK.

Responding to planning applications is the main mechanisms used by the council to prevent future activities having an impact on local air quality and to assess areas of housing that have the potentially to be affected by adverse air quality. In terms of new sources of pollution, there was no new processes in 2022 likely to have a significant impact upon air quality.

The Omega Proteins Ltd site at Wildriggs continues to be a source of complaints of odour for residents within Penrith. The site is permitted by the Environment Agency and in 2022, there were four new planning applications:

- Installation of 25m chimney stack (part retrospective)
- Construction of biofilter structure
- 2 x Development of industrial building – Class B2

The first and last two applications applications are still live (June 2023) and the Environmental Protection has commented upon them in terms of air quality and noise, where relevant.

Responding to planning applications continues to be the main mechanism to assess and deal with future activities that have the potential to reduce air quality or to assess and deal with areas of housing etc. that have the potential to be affected by adverse air quality.

Eden is covered by four planning authorities, Eden District Council (areas of the district not covered by National Parks), Cumbria County Council (waste and minerals planning), Lake District National Park and Yorkshire Dales National Park, so this continues to be a

challenge. It is hard to identify what levels of pollution would be present without the input of the Environmental Protection Team, but air quality is a key planning consideration upon which officers continue to assess and comment.

The Council and the Environment Agency play an important role in permitting particularly polluting industrial activities whose activities include pollution to air. Permits include conditions for controlling air pollutants that are then monitored thereafter.

The Council also started work in response to the Highways England proposals to widen the A66 from Stainmore to Penrith. This has significant implications for air quality for some dwellings; there will be improvements in the air quality of some residential properties and a decrease for others, but the final predictions have yet to be completed. The scheme is major infrastructure and will be dealt with by the Planning Inspectorate, with contributions from interested parties (for example, the public, Eden District Council, Cumbria County Council etc.) using the Planning Act 2008 process. Air quality and noise from the new road and its construction, are the main issues that concern the Environmental Protection Team at Eden District Council and we will continue to feed into this process.

Finally it should be mentioned that since 30 March 2023, Eden District Council has merged with Cumbria County Council, South Lakeland District Council and Barrow Borough Council to become Westmorland and Furness Unitary Council. In future there will be only one ASR submitted for the whole council area.

Actions to Improve Air Quality

Whilst air quality has improved significantly in recent decades, there are some areas where local action is needed to protect people and the environment from the effects of air pollution.

The Environmental Improvement Plan, published in February 2023 (Defra, 2023) sets out actions that will drive continued improvements to air quality and to meet the new national interim and long-term PM_{2.5} targets. The National Air Quality Strategy, published in April 2023, will provide more information on local authorities' responsibilities to work towards these new targets and reduce PM_{2.5} in their areas. The Road to Zero details the approach to reduce exhaust emissions from road transport through a number of mechanisms; this is extremely important given that the majority of Air Quality Management Areas (AQMAs) are designated due to elevated concentrations heavily influenced by transport emissions.

Conclusions and Priorities

In 2022, no monitoring site exceeded the objective level. The results show a reduction in NO₂ concentration from 2021 however still above the levels from 2020, as to be expected as society returns to normality. Priorities for 2023 will be responding to planning applications, playing an active role in the planning process to widen the A66 from Stainmore to Penrith, ensuring that the two pieces of new air quality monitoring equipment provide live data for the public and working with air quality colleagues in the former Barrow, South Lakeland and County Council areas to align our air quality priorities and procedures.

Local Engagement and How to get Involved

The Council has a dedicated webpage called Air Quality and what you can do. It can be found at <https://www.eden.gov.uk/environment/pollution/air-quality/air-quality-and-what-you-can-do/> and sets out a number of initiatives and ideas to tell residents and businesses about air quality and give them ideas on changes that they can make to help improve local levels of pollutants.

Cumbria County Council have launched plans for new safe cycling and walking routes in Cumbria, including Penrith which focuses on routes used for everyday shorter journeys to encourage more people to travel by foot or cycle. Views and suggestions from the public, stakeholders and delivery partners have been incorporated and the council will look to secure funding over the next 15 years. The Local Cycling and Walking Infrastructure Plans (LCWIPs) plans to encourage more of us to walk and cycle by providing routes that are coherent, safe, comfortable, direct and attractive (Your Cumbria, 2022a).

Additionally, Cumbria County Council has also launched a Cumbria Transport Infrastructure Plan (CTIP) 2022-2037 which has a vision for improving transport and infrastructure in Cumbria so residents and visitors as well as the environment can benefit. The delivery depends upon funding from the government and the support of partner organisations (Your Cumbria, 2022b).

Members of the public in the Eden District can join local groups if they wish to take an active role at improving air quality in the district. Cumbria Action for Sustainability (CAfS) is a climate change charity that aim to help those living within the county to reduce their carbon footprint and prevent climate change. Their aim is to have a zero carbon Cumbria done so by promoting and facilitating low carbon living to individuals, communities and

businesses. Local people can join the group and help by: raising funds, writing content for the newsletter and spreading the word. One of their current projects is 'Cold to Cosy Homes' which includes offering free energy saving equipment and advice to those struggling to heat their homes due to the increasing price of energy (Bell, N.D.).

The 'Warm Homes Eden' guidance can be found on the Eden District Council webpage and offers advice to residents on how they can save energy as well as explaining where further help can be found. It provides advice such as looking for the Energy Saving Recommendation logo on electrical goods and how cavity wall insulation works (Eden District Council, N.D.).

Another group working in the area is Penrith Action for Community Transition (PACT) who are committed to decreasing dependency on fossil fuels, reducing carbon emissions, helping build resilience to climate change and restoring biodiversity to nature depleted areas. It consists of volunteers working together on matters such as energy, transport, waste and recycling in the local area. The group formed in 2008 and is currently one of the eleven front line "delivery partners" in the ongoing Zero Carbon Cumbria project (2021-2025) (Penrith Action for Community Transition Limited, N.D.).

A final group working on a wider scale is Extinction Rebellion which describes itself as an international 'non-violent civil disobedience' movement wanting the government to take immediate action. It was founded in 2018 and some of the protests taking place in 2022 included protestors gluing themselves to the Department of Business, Energy and Industrial Strategy regarding the drilling for North Sea oil and gas (BBC, 2022).

On an individual scale, there are many steps people can take to try improve air quality, including the following:

- Cutting down car journeys- where possible walk or cycle, combine trips as much as possible, use public transport when possible or car share
- Home working
- Using public transport
- Consider switching energy supplier to those who use renewable energy
- Turning off car engines
- Using low/ zero carbon vehicles
- Using water-based or low solvent paints, glues, varnishes and wood preservatives, look for brands with a low VOC content.

Local Responsibilities and Commitment

This ASR was prepared by the Environmental Protection Team of Eden District Council with the support and agreement of the following officers and departments:

Anna Slack, Scientific Officer and

Sara Watson, Environmental Protection Manager

This ASR has not been approved by the Portfolio Holder, as the new authority was not in place for 2022, and this ASR has not been signed off by a Director of Public Health as the officer was not in post by the 30 June 2023.

If you have any comments on this ASR please send them to the Environmental Protection Team at:

Address: Mansion House, Friargate, Penrith, Cumbria, CA11 7YG

Telephone: 01768 817817

Email: pollution@westmorlandandfurness.gov.uk

Table of Contents

| | |
|---|-----------|
| Executive Summary: Air Quality in Our Area | i |
| Air Quality in Eden..... | i |
| Actions to Improve Air Quality | iii |
| Conclusions and Priorities | iv |
| Local Engagement and How to get Involved..... | iv |
| Local Responsibilities and Commitment | vii |
| 1 Local Air Quality Management | 1 |
| 2 Actions to Improve Air Quality | 2 |
| 2.1 Air Quality Management Areas | 2 |
| 2.2 Progress and Impact of Measures to address Air Quality in Eden..... | 2 |
| 2.3 PM _{2.5} – Local Authority Approach to Reducing Emissions and/or Concentrations | 7 |
| 3 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance | 8 |
| 3.1 Summary of Monitoring Undertaken..... | 8 |
| 3.1.1 Automatic Monitoring Sites | 8 |
| 3.1.2 Non-Automatic Monitoring Sites | 8 |
| 3.2 Individual Pollutants | 9 |
| 3.2.1 Nitrogen Dioxide (NO ₂)..... | 9 |
| Appendix A: Monitoring Results | 14 |
| Appendix B: Full Monthly Diffusion Tube Results for 2022 | 22 |
| Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC | 23 |
| New or Changed Sources Identified Within Eden District Council During 2022 | 23 |
| Additional Air Quality Works Undertaken by Eden District Council During 2022 | 23 |
| QA/QC of Diffusion Tube Monitoring | 23 |
| Diffusion Tube Annualisation | 25 |
| Diffusion Tube Bias Adjustment Factors | 25 |
| NO ₂ Fall-off with Distance from the Road..... | 26 |
| Appendix D: Map(s) of Monitoring Locations and AQMAs | 27 |
| Appendix E: Summary of Air Quality Objectives in England | 30 |
| Glossary of Terms | 31 |
| References | 32 |

Figures

| | |
|--|----|
| Figure A.1 – Trends in Annual Mean NO ₂ Concentrations..... | 18 |
| Figure D.1 – Map of Non-Automatic Monitoring Site..... | 27 |

Tables

| | |
|--|----|
| Table 2.2 – Progress on Measures to Improve Air Quality..... | 4 |
| Table A.1 – Details of Non-Automatic Monitoring Sites | 15 |
| Table A.2 – Annual Mean NO ₂ Monitoring Results: Non-Automatic Monitoring (µg/m ³) | 16 |
| Table B.1 – NO ₂ 2022 Diffusion Tube Results (µg/m ³) | 22 |
| Table C.2 – Bias Adjustment Factor | 26 |
| Table E.1 – Air Quality Objectives in England | 30 |

1. Local Air Quality Management

This report provides an overview of air quality in Eden during 2022. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995), as amended by the Environment Act (2021), and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in order to achieve and maintain the objectives and the dates by which each measure will be carried out. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by Eden District 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 18 months. The AQAP should specify how air quality targets will be achieved and maintained, and provide dates by which measures will be carried out.

Eden currently does not have any declared AQMAs.

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

Defra's appraisal of last year's ASR concluded the report was well structured, detailed, and provided the information specified in the Guidance. The following comments are designed to help inform future reports.

1. The Council have experienced an increase in NO₂ concentrations at all sites except site uBi. The Council should continue the monitoring next year and make sure all concentrations are below objectives.
2. The council should start operating the two new air quality monitoring instruments either side of the road on Castlegate to monitor particulate levels next year.
3. The trend graphs provide clear comparison with the air quality objective, it was especially helpful being divided by area.
4. The detailed maps clearly demonstrate the monitoring network. However, it doesn't show a clear boundary of AQMA in the map.
5. There are a few formatting errors and blank pages in the report, please update.
6. Robust and accurate QA/QC procedures were applied. Calculations for national bias adjustment and annualisation factors were outlined in detail. Co-location studies with the continuous monitoring instruments could be carried out for local bias adjustment factor next year.
7. There are no additional references added in the report, please update.
8. In relation to PM_{2.5}, the Council have mentioned and discussed the Public Health Outcomes Framework fraction of mortality attributable to particulate pollution, which is welcomed.

9. The report is well structured and concise and satisfies the relevant criteria to a good standard. The Council should continue their good work.

Eden District Council has taken forward a number of direct measures during the current reporting year of 2022 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 0.1. Measures are included within Table 0.1, with the type of measure and the progress Eden District Council have made during the reporting year of 2022 presented. Where there have been, or continue to be, barriers restricting the implementation of the measure, these are also presented within Table 0.1.

The principal challenges and barriers to implementation that Eden District Council anticipates facing are around the funding of resources etc. in an environment of competing demands and priorities at both the county and district level.

Progress on the following measures has been slower than expected due to Local Government Review which has meant that officer's work over 2022 has been prioritised around bringing together the two tiers of local government and seven local authorities.

Table 0.1 – Progress on Measures to Improve Air Quality

| Measure No. | Measure | Category | Classification | Year Measure Introduced in AQAP | Estimated / Actual Completion Date | 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 | Traffic Management of new/improved roads (A66) | Traffic Management | Other | 2020 | 2029 | National Highways, Cumbria County Council | National Highways, Cumbria County Council, Eden District Council | NO | Fully funded | > £10 million | Planning | 0.02 | NO ₂ , PM ₁₀ levels not to exceed Objective level | Environmental Protection Team have fed into the preferred routing consultation on air quality and noise. | Expected deadline for Planning Inspectorate to submit recommendation 29/8/2023 |
| 2 | Working from home for council workers | Promoting travel alternatives | Workplace travel planning | 2020 | Ongoing | Eden District Council | Eden District Council | NO | | | Build | Not assessed | | Measuring is still on going. Once the council has moved into its new carbon zero building, home working will be encouraged as desk space is limited | |
| 3 | Park and ride into Ullswater Valley | Alternatives to private vehicle use | Bus based Park & Ride | Ongoing | Ongoing | Lake District National Park | | | | | | | | The 508 bus collects people from Penrith and heads into the Ullswater Valley. There is also the option to park in Lowther and hire bikes to ride around Ullswater. The 508 bus also stops at Penrith Rail Station making Ullswater more accessible for holiday makers | |

| Measure No. | Measure | Category | Classification | Year Measure Introduced in AQAP | Estimated / Actual Completion Date | 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 |
|-------------|---|-------------------------------|---|---------------------------------|------------------------------------|---|---|------------------------|----------------|---------------------------|----------------|--|--|--|---------------------------------------|
| 5 | Introduction of HS2, 170 miles of a new high-speed train line | Vehicle Fleet Efficiency | Promoting Low Emission Public Transport | 2009 | 2029 | UK Government | Secretary of State for Transport | NO | Funded | > £10 million | Implementation | | | In Cumbria, HS2 trains will serve Oxenholme, Penrith and Carlisle stations. It is a high-speed network to the south and all of the trains will be powered by zero carbon energy | |
| 6 | Local Cycling and Walking Infrastructure Plans for Penrith | Promoting Travel Alternatives | Promotion of cycling | Ongoing | Ongoing | Cumbria County Council | TBC | | | | Planning | | | Members of the public attended Penrith Library on the 10th February 2022 for any questions they may have for the Cumbria County Council officials | |
| 7 | Education of promotion of air quality | Public Information | Via the Internet | Ongoing | Ongoing | Eden District Council Environmental Protection Team | Eden District Council Environmental Protection Team | | | | | | Increased public awareness about the issues related to air quality and how they can make personal choices to improve local air quality | Air quality information is available on the council's webpage as well as the data from the continuous monitoring stations located along Castlegate. Information on how to improve air quality was posted on the council's social media for Clean Air Day 2022. | |

| Measure No. | Measure | Category | Classification | Year Measure Introduced in AQAP | Estimated / Actual Completion Date | 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 | Input into planning applications | Policy Guidance and Development control | Air Quality Planning and Policy Guidance | Ongoing | Ongoing | Eden District Council Environmental Team, Eden District Council Planning Department, Cumbria County Council Planning Department, Yorkshire Dales NPA, Lake District NPA | | No | Not funded | | Implementation | | Early consultation with applicants, improved links with all of the planning departments | Whilst the Environmental Protection Team is consulted on some applications, planning officers don't consult about them all. EP team does feedback to planning officer when air quality is a concern. A member of the EP team now checks weekly applications for any of interest or concern | Hard to deal with four different planning departments. Developers often don't carry out any air quality monitoring and reply on background data map which may or may not be relevant |

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

As detailed in Policy Guidance LAQM.PG22 (Chapter 8), 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.

Eden District Council is taking the following measures to address PM_{2.5}:

In recognition of the need for the Council to understand particulate levels locally and as part of its approach to reducing PM_{2.5} levels, the Council purchased continuous monitoring equipment that are suitable for providing estimates of actual levels of PM_{2.5}.

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

This section sets out the monitoring undertaken within 2022 by Eden District Council and how it compares with the relevant air quality objectives. In addition, monitoring results are presented for a five-year period between 2018 and 2022 to allow monitoring trends to be identified and discussed.

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

Eden District Council did not undertake any automatic (continuous) monitoring during 2022. Local authorities do not have to report annually on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead, unless local circumstances indicate there is a problem. We do not have any local circumstances in Eden that mean we would need to report on these pollutants. National monitoring results are available at <https://uk-air.defra.gov.uk/>

3.1.2 Non-Automatic Monitoring Sites

Eden District Council undertook non- automatic (i.e. passive) monitoring of NO₂ at 19 sites during 2022, however one of the monitoring sites has been discarded due to a low data capture. 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.

The Council also has two continuous monitoring sites on Castlegate, Penrith, but these are not recognised as Automatic Monitoring Sites, for the purposes of assessing compliance with the Air Quality Objectives, they do however provide a good indication of the levels and how levels of pollution vary over time,

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.

We have, for the first time, also included data from our AQMesh instrument on Middle Castlegate. The equipment was installed here following a detailed assessment in 2012 and occasional elevated levels in subsequent years. We have a further instrument at Upper Castlegate but this has not provided us with continuous data that we can use in this report. Please note that these instruments are not part of a national network and are not calibrated, so the results should be regarded as general estimates, rather than absolute levels. Similarly, data from diffusion tubes do not provide figures with a high level of accuracy.

3.2.1 Nitrogen Dioxide (NO₂)

Error! Reference source not found. and **Table** in Appendix A compare the ratified and a djusted monitored NO₂ annual mean concentrations for the past five years with the air quality objective of 40µg/m³. 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 2022 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.

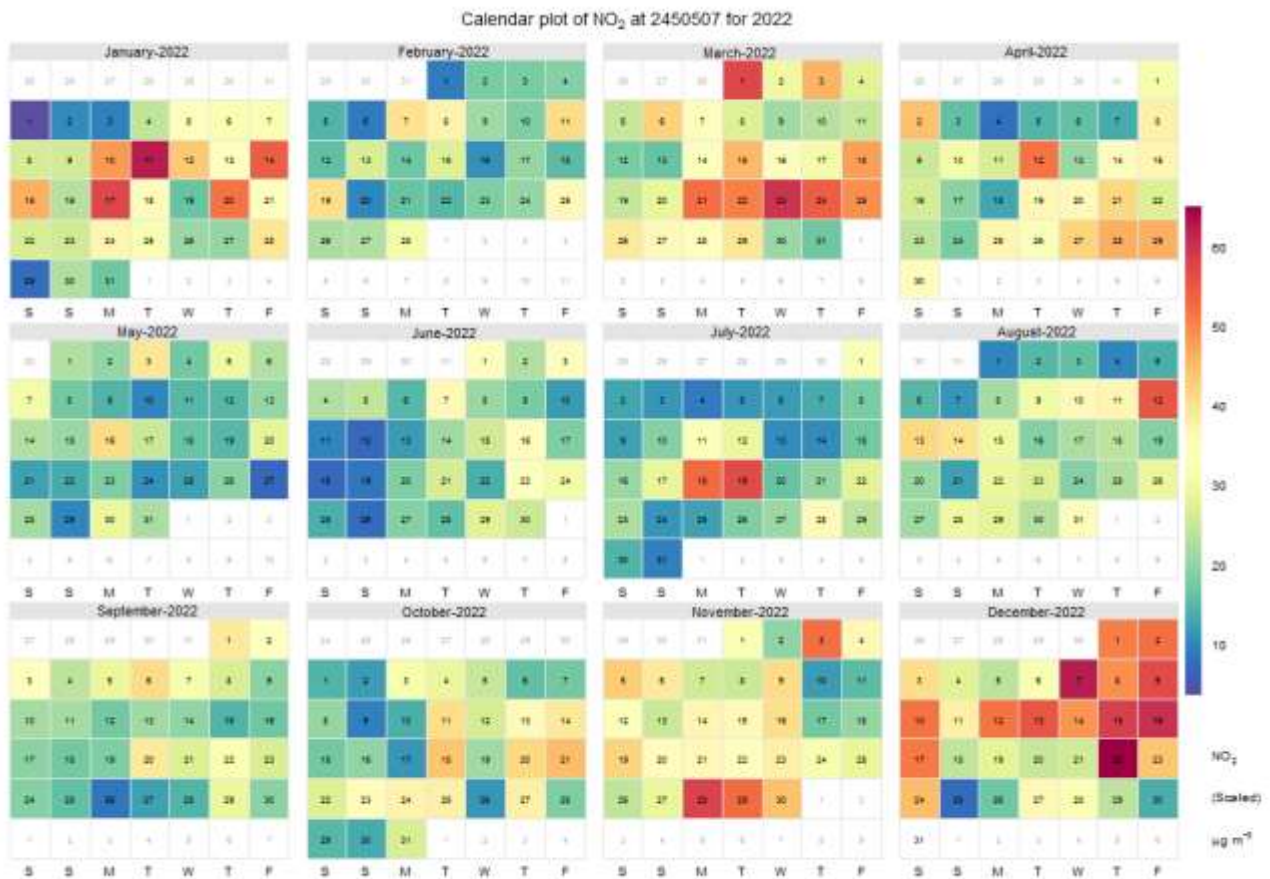
The monitoring tubes used by Eden District Council were supplied and analysed by Gradko. The tubes were prepared using a 50% TEA in Acetone solution and were normally exposed for a 4-week period. The results for 2022 have been corrected for bias using a factor of 0.82 which was determined following 14 studies undertaken by Gradko as part of the National Diffusion Tube Bias Adjustment Factor study. No annualisation or distance adjustment was required.

There were no exceedances of the air quality objective in Eden in 2022. As expected, all of the results have increased from 2020 as this was a year of lockdown which involved reduced travel for both work and leisure activities. However, all of the results from 2022

are lower than those in 2019 and 15 out of the 18 monitoring sites for 2022 are lower than those of 2021.

The area showing to have the highest concentration of Nitrogen Dioxide with an annual mean of $36.9\mu\text{g}/\text{m}^3$ was C1, which was also the highest in 2021 with a concentration of $35.6\mu\text{g}/\text{m}^3$. The site with the second highest concentration was GAF04 with $35.0\mu\text{g}/\text{m}^3$, also second highest last year and located in the same area as C1 of Castlegate. These two sites have reached concentrations above the objective level in 2018 and 2019 however since then have been below the level for the last three years.

When we look at the data of the continuous analyser from Middle Castlegate, it is evident that the 24 hour daily mean for NO₂ is, mainly higher during the winter months, as is typical in most cities. The annual mean for this site was $\mu\text{g}/\text{m}^3$ which was below the objective level of 40.



The monitoring site with the lowest concentration was uBi, $12.6\mu\text{g}/\text{m}^3$, which is placed outside of a house located on Balmoral Close Road. As the house is at a dead-end of the road, I have changed the Site Type to 'Urban Background' instead of 'Roadside' as the only traffic with be that of the owner going to and from their house. The reasoning for

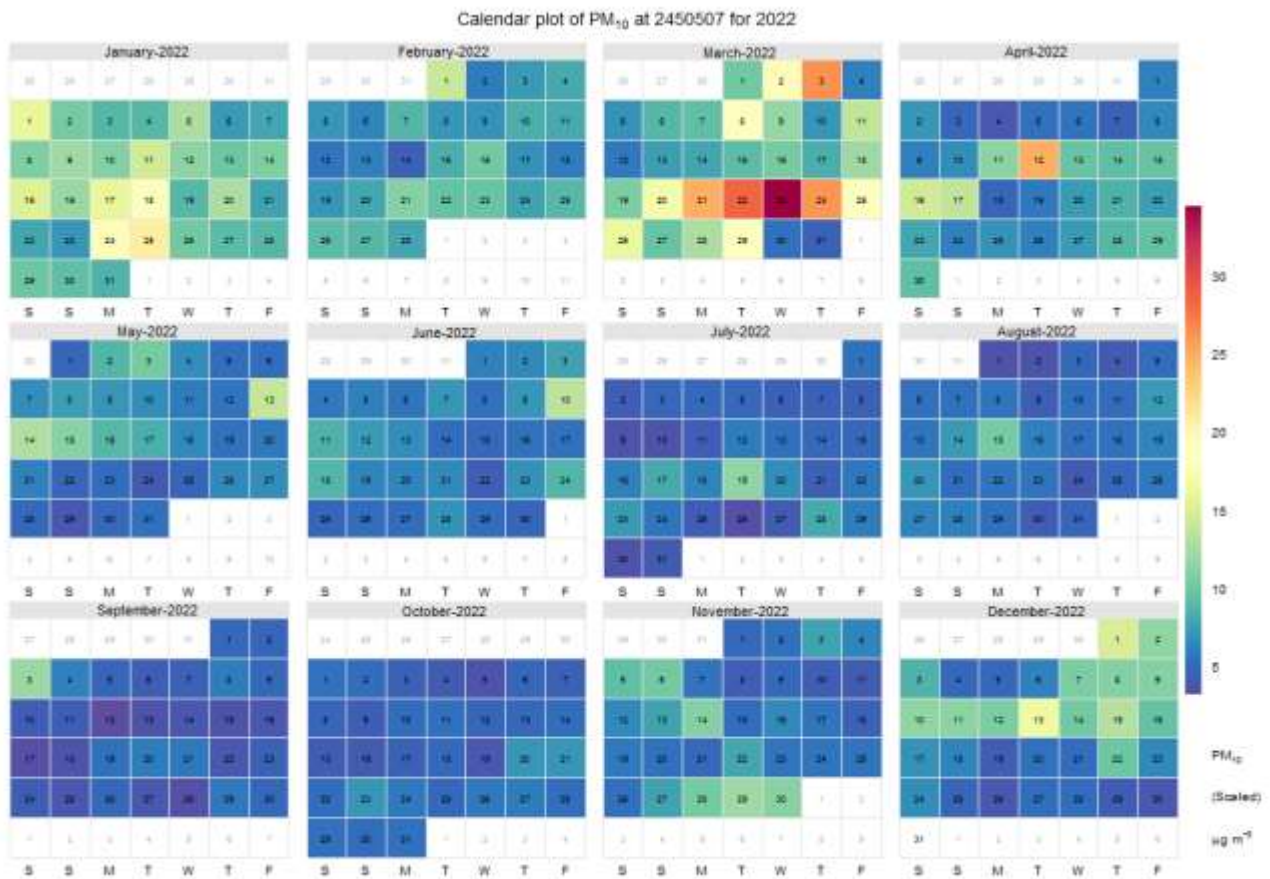
placing this tube in this quiet location is to measuring air pollutants produced by the industrial processes taking place close by on Mardale Road. We have decided that a better location, less protected from the wind, should be possible to find to get a better idea of the impacts on air quality on domestic properties from these industrial businesses.

The monitoring sites are normally reviewed annually and it was decided last year to place a new tube next to the upper continuous monitor. However, there was only a 50% data capture for this tube in 2022 so the results have been removed and it is hoped for a higher data capture for 2023.

Error! Reference source not found. in Appendix A compares the ratified continuous monitored NO₂ hourly mean concentrations for the past five years with the air quality objective of 200µg/m³, not to be exceeded more than 18 times per year.

3.2.2 Particulate Matter (PM₁₀)

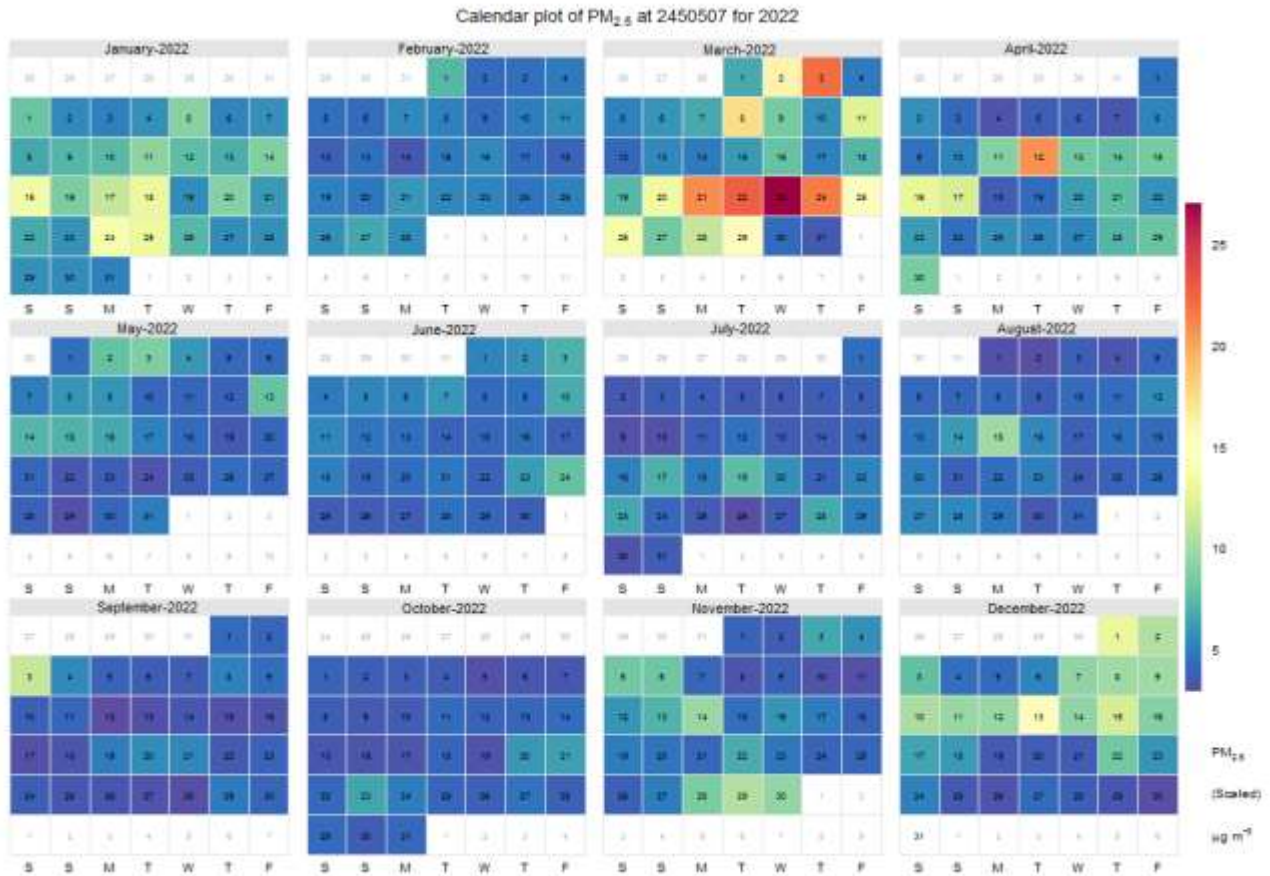
The Council installed two pieces of continuous equipment in 2021 after setbacks during 2020 due to COVID-19. For 2022, limited data has been collected as one of the continuous monitored stopped working during the year, and is proving difficult to establish the cause of the problem. The daily data collected from the continuous analyser for Middle Castlegate is shown below:



The 24-hour mean pollutant levels are shown here; the objective level is $50\mu\text{g}/\text{m}^3$ and there should be no more than 35 exceedences per annum, with an annual mean of below $40\mu\text{g}/\text{m}^3$. For most days the 24-hour mean was less than $12\mu\text{g}/\text{m}^3$, but there were days, particularly at the end of March 2022, when this rose to over $30\mu\text{g}/\text{m}^3$. However there were no exceedences of the daily mean during this year or of the annual mean which has a limit of $40\mu\text{g}/\text{m}^3$.

3.2.3 Particulate Matter (PM_{2.5})

From the one continuous monitor that did function we can see that levels were mainly at low levels of below $8\mu\text{g}/\text{m}^3$ with some days of $10\mu\text{g}/\text{m}^3$ and a few much higher figures seen in March and April. We've looked at the meteorology over this period and can see no reason for the exceedences, but we do believe that there were some roadworks in March which might have been responsible for the levels recorded. However the overall annual objective level has not been exceeded for this parameter.



Air pollution background concentration maps published by Defra are produced to provide estimates of background concentrations for specific pollutants. From looking at the data from 2021, Eden has an PM_{2.5} annual mean of 3-5µg/m³ with the exceptions of Penrith Town Centre, inclusive of the Omega Proteins site, and British Gypsum located at Kirkby Thore which show to have an annual mean of 6-8µg/m³. The reliability of this data is uncertain as it appears not to include emissions from processes controlled by Part B permits, only Part A's which are regulated by the Environment Agency (e.g. Kirkby Thore and Omega Proteins).

Appendix A: Monitoring Results

Table A.1 – Details of Non-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) |
|---------|----------------------------------|------------------|-------------------------|--------------------------|----------------------|----------------------|----------------------|--|---|------------------|
| V3 | 25b King Street | Roadside | 351720 | 529966 | NO2 | N/A | 0.0 | 2.0 | No | 2.5 |
| V5 | Front Victoria Rd / Langton Cott | Roadside | 351713 | 529941 | NO2 | N/A | 0.0 | 1.0 | No | 2.5 |
| V7 | Café 15 | Roadside | 351733 | 528918 | NO2 | N/A | 0.0 | 2.5 | No | 2.5 |
| B14 | 4 Brunswick Road | Roadside | 351394 | 530344 | NO2 | N/A | 0.0 | 2.0 | No | 2.5 |
| EB15 | Glendale | Roadside | 352329 | 528475 | NO2 | N/A | 0.0 | 1.0 | No | 2.5 |
| EB18 | Cherry Cottage | Roadside | 352246 | 528667 | NO2 | N/A | 0.0 | 2.5 | No | 2.5 |
| SG27 | 8 Scotland Rd | Roadside | 351171 | 530649 | NO2 | N/A | 0.0 | 1.0 | No | 2.5 |
| P1 | No entry sign, Norfolk Road | Roadside | 351144 | 530056 | NO2 | N/A | 1.0 | 1.0 | No | 2.5 |
| C30 | 40 Castlegate | Roadside | 351333 | 530016 | NO2 | N/A | 0.0 | 1.5 | No | 2.5 |
| C31 | 3 Benson Row | Roadside | 351741 | 530313 | NO2 | N/A | 0.0 | 1.0 | No | 2.5 |
| C32 | Penrith Nursery | Roadside | 351687 | 530387 | NO2 | N/A | 0.0 | 2.5 | No | 2.5 |
| uBi | 13 Balmoral Close | Urban Background | 350860 | 529912 | NO2 | N/A | 0.0 | 3.0 | No | 2.5 |
| GAF04 | NewVic | Roadside | 351363 | 530046 | NO2 | N/A | 0.0 | 1.0 | No | 2.5 |
| GAF05 | Station Hotel | Roadside | 351302 | 520089 | NO2 | N/A | 0.0 | 2.5 | No | 2.5 |
| 2018C1 | Lower Castlegate | Roadside | 351413 | 530069 | NO2 | N/A | 0.0 | 1.0 | No | 2.5 |
| GAF16 | Landels Court corner | Roadside | 351774 | 529838 | NO2 | N/A | 0.0 | 2.0 | No | 2.5 |
| V1 | Roper Street | Roadside | 351794 | 529870 | NO2 | N/A | 0.0 | 1.0 | No | 2.5 |
| GAF19 | 25 Victoria Road | Roadside | 351774 | 529910 | NO2 | N/A | 0.0 | 1.5 | No | 2.5 |

Notes:

- (1) 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).
- (2) N/A if not applicable

Table A.2– Annual Mean NO₂ Monitoring Results: Non-Automatic Monitoring (µg/m³)

| 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 2022 (%) ⁽²⁾ | 2018 | 2019 | 2020 | 2021 | 2022 |
|-------------------|-------------------------|--------------------------|-----------|---|--|-------------|-------------|------|------|------|
| V3 | 351720 | 529966 | Roadside | 100 | 100.0 | 30.2 | 26.7 | 21.1 | 22.2 | 22.0 |
| V5 | 351713 | 529941 | Roadside | 100 | 100.0 | 30.8 | 27.6 | 20.4 | 22.7 | 22.0 |
| V7 | 351733 | 528918 | Roadside | 100 | 100.0 | 33.3 | 30.6 | 23.4 | 24.6 | 24.5 |
| B14 | 351394 | 530344 | Roadside | 100 | 100.0 | 32.7 | 30.2 | 24.3 | 26.5 | 25.4 |
| EB15 | 352329 | 528475 | Roadside | 100 | 100.0 | 31.6 | 27.1 | 20.8 | 21.5 | 20.9 |
| EB18 | 352246 | 528667 | Roadside | 100 | 100.0 | 33.0 | 30.7 | 23.0 | 24.7 | 23.9 |
| SG27 | 351171 | 530649 | Roadside | 90.7 | 90.7 | 30.0 | 27.1 | 20.8 | 25.1 | 23.3 |
| P1 | 351144 | 530056 | Roadside | 92 | 92.0 | 23.4 | 19.0 | 15.9 | 18.1 | 17.5 |
| C30 | 351333 | 530016 | Roadside | 100 | 100.0 | 30.1 | 28.5 | 21.8 | 24.5 | 22.9 |
| C31 | 351741 | 530313 | Roadside | 100 | 100.0 | 29.1 | 25.9 | 19.3 | 20.6 | 19.5 |
| C32 | 351687 | 530387 | Roadside | 100 | 100.0 | 32.8 | 30.0 | 21.8 | 24.7 | 23.2 |
| uBi | 350860 | 529912 | Roadside | 82.7 | 82.7 | 16.8 | 14.9 | 11.8 | 11.8 | 12.6 |
| GAF04 | 351363 | 530046 | Roadside | 92.3 | 92.3 | 48.7 | 43.2 | 32.1 | 35.2 | 35.0 |
| GAF05 | 351302 | 520089 | Roadside | 92.3 | 92.3 | 29.9 | 28.3 | 22.0 | 23.2 | 22.5 |
| 2018C1 | 351413 | 530069 | Roadside | 83 | 83.0 | 48.1 | 42.4 | 33.1 | 35.6 | 36.9 |
| GAF16 | 351774 | 529838 | Roadside | 100 | 100.0 | 27.2 | 23.1 | 16.7 | 18.6 | 18.9 |
| V1 | 351794 | 529870 | Roadside | 100 | 100.0 | 29.3 | 26.4 | 19.1 | 21.7 | 20.9 |
| GAF19 | 351774 | 529910 | Roadside | 75.3 | 75.3 | 29.1 | 26.8 | 20.1 | 21.4 | 23.1 |

☒ Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22

☒ 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/m³.

Exceedances of the NO₂ annual mean objective of 40µg/m³ are shown in **bold**.

NO₂ annual means exceeding 60µg/m³, indicating a potential exceedance of the NO₂ 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.TG22 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

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

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

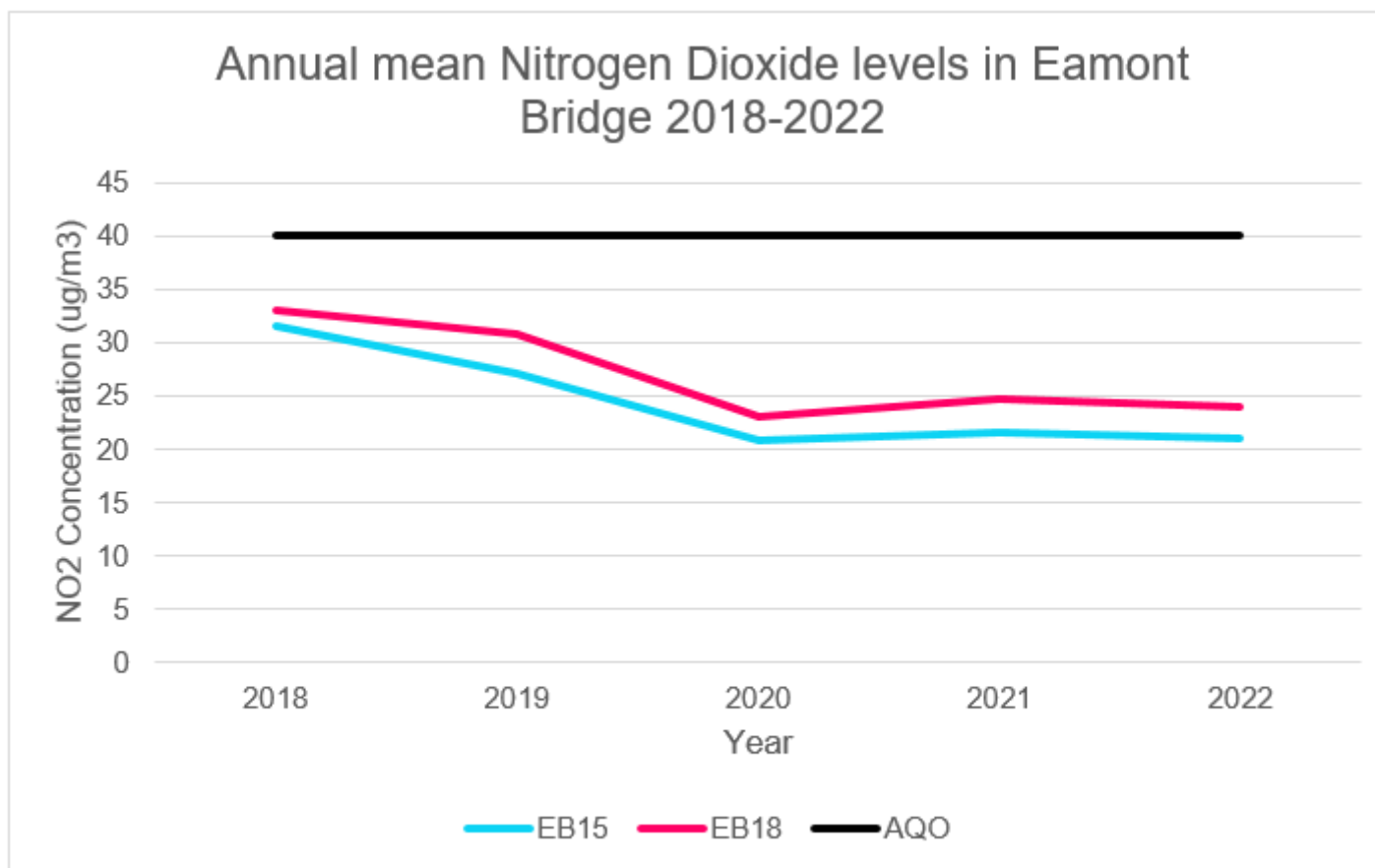
Figure A.1 – Trends in Annual Mean NO₂ Concentrations

Figure 1 presents NO₂ annual mean concentrations for sites EB15 and EB18 located in Eamont Bridge between the years 2018 and 2022. There are no exceedances of the annual mean objective over the last five years.

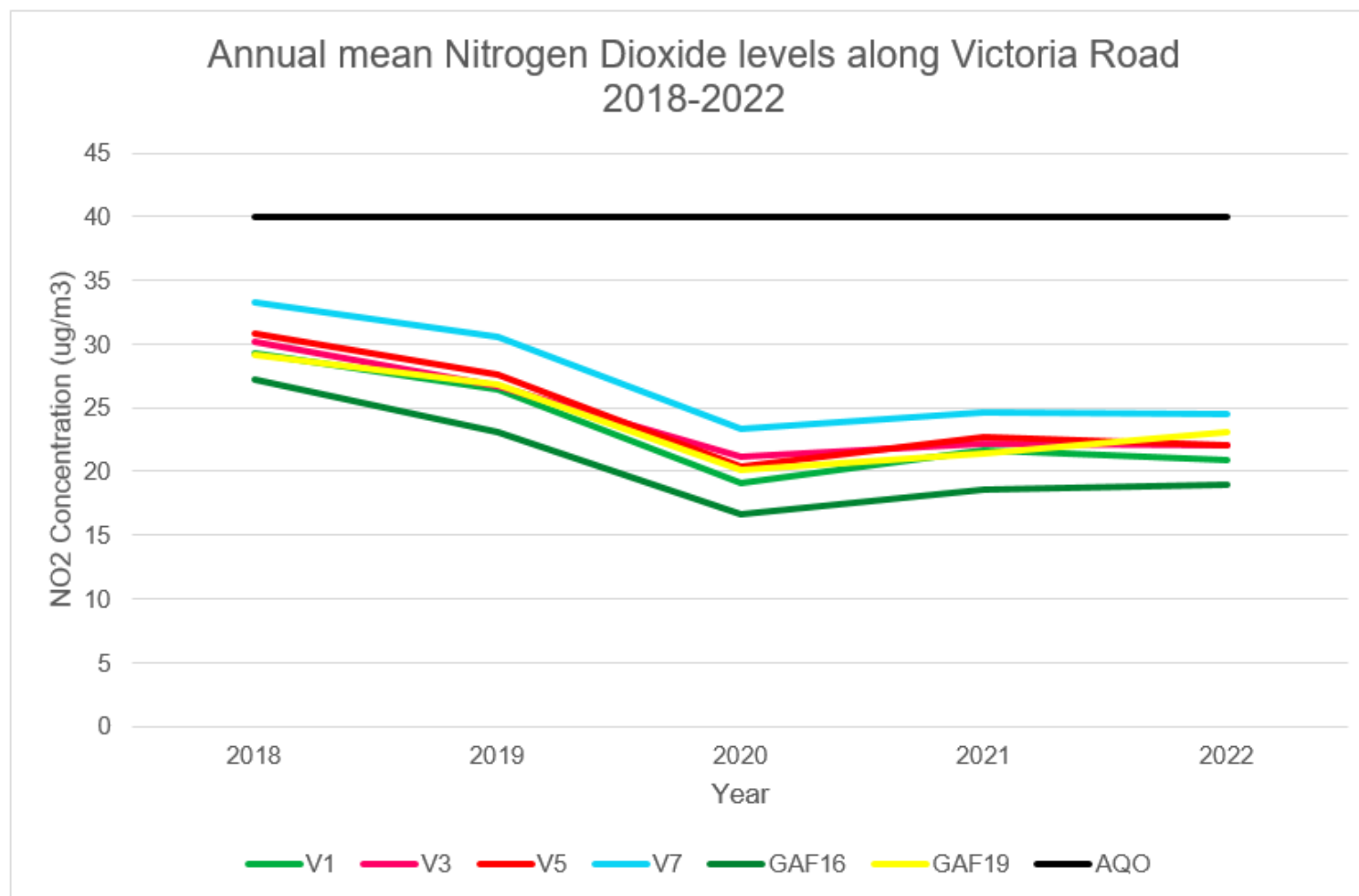


Figure 2 presents NO₂ annual mean concentrations for sites V1, V3, V5, V7, GAF16 and GAF19 located along Victoria Road between the years 2018 and 2022. There are no exceedances of the annual mean objective over the last five years.

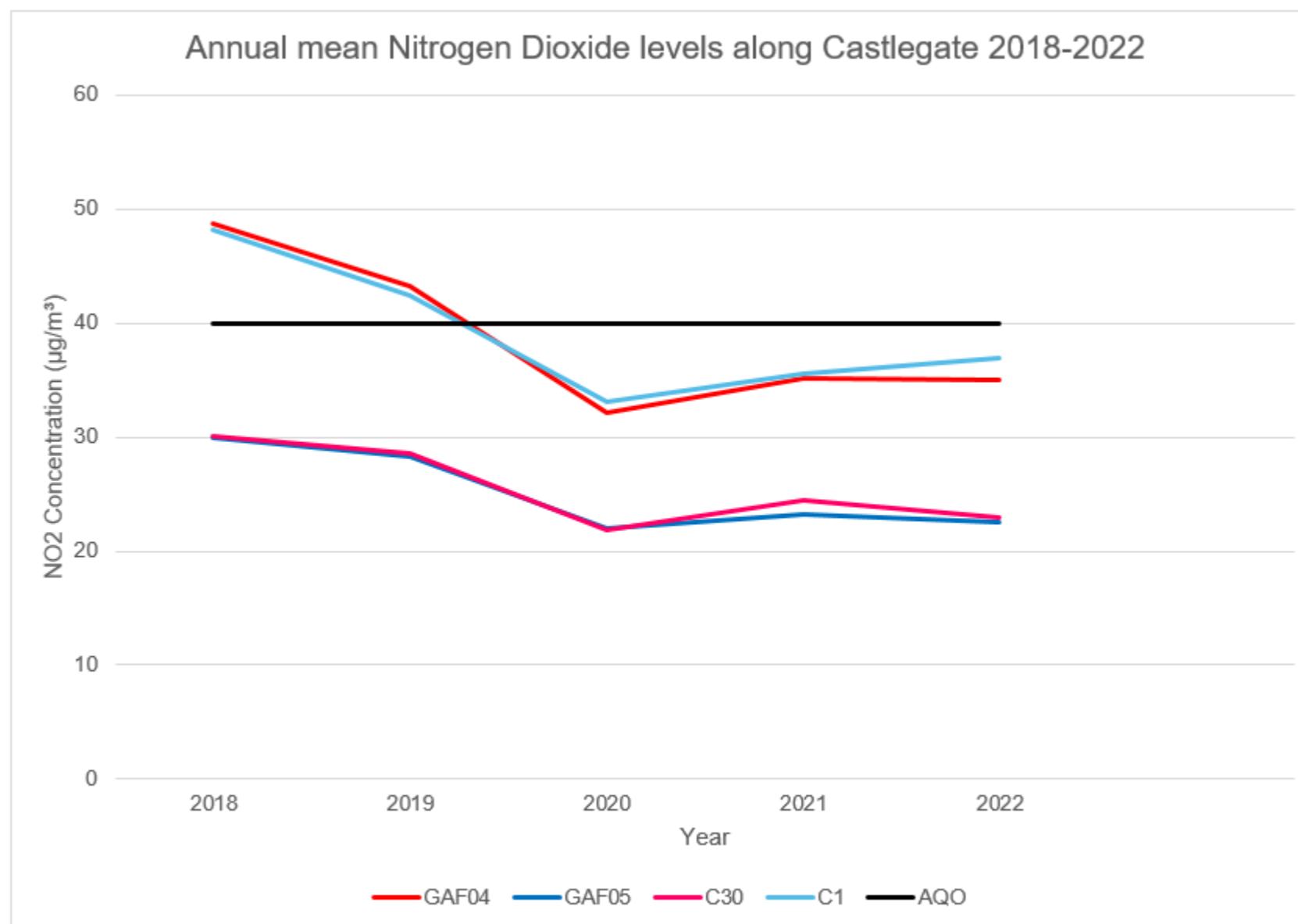


Figure 3 presents NO₂ annual mean concentrations for sites GAF04, GAF05, C30 and C1 located along Castlegate between the years 2018 and 2022. There were exceeded in 2018 and 2019 but no exceedances of the annual mean objective over the last three years.

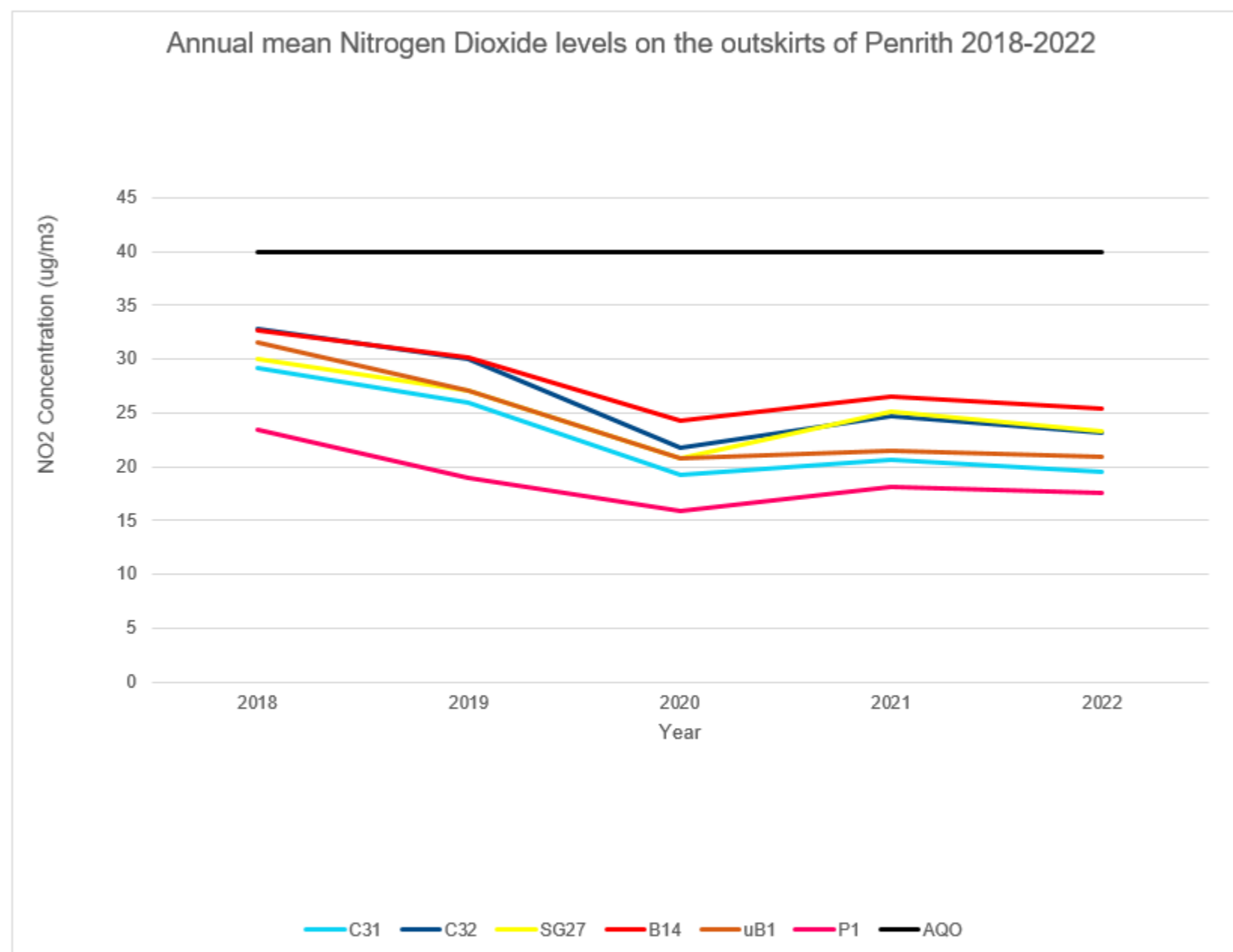


Figure 4 Figure 2 presents NO2 annual mean concentrations for sites C31, C32, SG27, B14, uBi and P1 located on the outskirts of Penrith between the years 2018 and 2022. There are no exceedances of the annual mean objective over the last five years.

Appendix B: Full Monthly Diffusion Tube Results for 2022

Table B.1 – NO₂ 2022 Diffusion Tube Results (µg/m³)

| DT ID | X OS Grid Ref (Easting) | Y OS Grid Ref (Northing) | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual Mean: Raw Data | Annual Mean: Annualised and Bias Adjusted <(x.x)> | Annual Mean: Distance Corrected to Nearest Exposure | Comment |
|--------------------|-------------------------|--------------------------|------|------|------|------|------|------|------|------|------|------|------|------|-----------------------|---|---|---------|
| V3 | 351720 | 529966 | 34.6 | 23.1 | 34.4 | 26.4 | 20.0 | 17.8 | 20.3 | 26.2 | 28.4 | 24.5 | 28.7 | 37.2 | 26.8 | 22.0 | | |
| V5 | 351713 | 529941 | 33.3 | 21.0 | 33.3 | 24.3 | 21.8 | 20.8 | 22.6 | 27.1 | 25.2 | 26.0 | 28.6 | 37.7 | 26.8 | 22.0 | | |
| V7 | 351733 | 528918 | 38.9 | 29.2 | 33.4 | 25.4 | 24.2 | 24.1 | 24.4 | 29.8 | 29.3 | 29.4 | 33.0 | 37.7 | 29.9 | 24.5 | | |
| B14 | 351394 | 530344 | 42.4 | 32.1 | 30.5 | 26.5 | 29.7 | 25.1 | 27.1 | 32.5 | 29.1 | 29.6 | 30.5 | 36.7 | 31.0 | 25.4 | | |
| EB15 | 352329 | 528475 | 32.3 | 18.9 | 28.5 | 24.3 | 23.3 | 21.8 | 23.7 | 28.8 | 24.6 | 23.7 | 23.6 | 32.3 | 25.5 | 20.9 | | |
| EB18 | 352246 | 528667 | 34.8 | 29.0 | 31.4 | 25.2 | 26.3 | 25.3 | 30.6 | 33.0 | 29.2 | 26.2 | 27.4 | 31.7 | 29.2 | 23.9 | | |
| SG27 | 351171 | 530649 | 33.4 | 18.7 | 37.6 | 27.7 | | 18.0 | 22.3 | 29.7 | 28.6 | 24.4 | 31.8 | 40.9 | 28.5 | 23.3 | | |
| P1 | 351144 | 530056 | 26.3 | 14.8 | 26.8 | 17.4 | 16.2 | | 15.4 | 19.9 | 19.2 | 20.8 | 25.8 | 32.7 | 21.4 | 17.5 | | |
| C30 | 351333 | 530016 | 36.7 | 27.1 | 30.0 | 29.4 | 25.1 | 22.3 | 22.2 | 29.4 | 28.0 | 25.2 | 26.6 | 32.6 | 27.9 | 22.9 | | |
| C31 | 351741 | 530313 | 34.2 | 20.9 | 26.2 | 20.8 | 19.9 | 14.9 | 17.7 | 24.3 | 22.2 | 22.3 | 28.1 | 34.1 | 23.8 | 19.5 | | |
| C32 | 351687 | 530387 | 35.9 | 29.5 | 32.2 | 23.4 | 24.7 | 21.3 | 24.3 | 30.0 | 21.4 | 28.1 | 32.2 | 36.3 | 28.3 | 23.2 | | |
| uBi | 350860 | 529912 | 23.1 | 15.8 | 17.4 | 12.0 | | | 10.4 | 12.2 | 10.7 | 13.1 | 19.0 | 19.6 | 15.3 | 12.6 | | |
| GAF0 ₄ | 351363 | 530046 | 47.8 | 36.1 | 50.2 | 48.5 | 36.4 | 37.6 | 36.5 | 48.2 | 39.5 | 37.7 | | 51.1 | 42.7 | 35.0 | | |
| GAF0 ₅ | 351302 | 520089 | 37.2 | 24.6 | 32.4 | 25.9 | 23.8 | 20.2 | 21.9 | 27.8 | 27.7 | 26.8 | | 33.4 | 27.4 | 22.5 | | |
| 2018C ₁ | 351413 | 530069 | 48.1 | 38.7 | 45.9 | 41.5 | | 45.2 | 40.2 | 47.3 | | 44.4 | 47.1 | 52.3 | 45.1 | 36.9 | | |
| GAF1 ₆ | 351774 | 529838 | 28.2 | 20.0 | 30.2 | 20.3 | 17.8 | 17.1 | 19.6 | 20.8 | 20.9 | 23.8 | 29.1 | 28.7 | 23.0 | 18.9 | | |
| V1 | 351794 | 529870 | 33.2 | 24.3 | 32.0 | 22.3 | 20.3 | 19.6 | 21.3 | 24.6 | 24.0 | 24.0 | 27.0 | 32.8 | 25.5 | 20.9 | | |
| GAF1 ₉ | 351774 | 529910 | 30.8 | 20.6 | 36.3 | 29.5 | | | 20.7 | | 25.6 | 22.9 | 29.6 | 37.9 | 28.2 | 23.1 | | |

- All erroneous data has been removed from the NO₂ diffusion tube dataset presented in Table B.1.
- Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22.
- Local bias adjustment factor used.
- National bias adjustment factor used.
- Where applicable, data has been distance corrected for relevant exposure in the final column.
- Eden District Council confirm that all 2022 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System.

Notes:

Exceedances of the NO₂ annual mean objective of 40µg/m³ are shown in **bold**.

NO₂ annual means exceeding 60µg/m³, indicating a potential exceedance of the NO₂ 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 Eden District Council During 2022

Eden District Council has not identified any new sources relating to air quality within the reporting year of 2022.

Additional Air Quality Works Undertaken by Eden District Council During 2022

Eden District Council has not completed any additional works within the reporting year of 2022.

QA/QC of Diffusion Tube Monitoring

During 2022, the diffusion tubes used by Eden District Council were supplied and analysed by Gradko, which is a UKAS accredited testing laboratory based in Winchester. The tubes were prepared using a 50% TEA in acetone solution and typically exposed for a four-week period. The monitoring for 2022 was completed in adherence with the 2022 Diffusion Tube Monitoring Calendar. The results for 2022 have been corrected for bias using a factor of 0.82 which was determined following 14 studies undertaken by Gradko as part of the National Diffusion Tube Bias Adjustment Factor Study.

| National Diffusion Tube Bias Adjustment Factor Spreadsheet | | | | | | Spreadsheet Version Number: 03/23 | | | | |
|---|--------------------|--|---|--|--------------------------|---|--|----------|-----------------------------|------------------------------------|
| Follow the steps below <u>in the correct order</u> to show the results of <u>relevant</u> co-location studies | | | | | | This spreadsheet will be updated at the end of June 2023 | | | | |
| Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods | | | | | | | | | | |
| Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet | | | | | | | | | | |
| This spreadsheet will be updated every few months; the factors may therefore be subject to change. This should not discourage their immediate use. | | | | | | | | | | |
| The LAQM Helpdesk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory | | | | | | Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd. | | | | |
| Step 1: | | Step 2: | Step 3: | Step 4: | | | | | | |
| Select the Laboratory that Analyzes Your Tubes from the Drop-Down List | | Select a Preparation Method from the Drop-Down List | Select a Year from the Drop-Down List | Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor shown in blue at the foot of the final column. | | | | | | |
| If a laboratory is not shown, we have no data for this laboratory | | If a preparation method is not shown, we have no data for this method at this laboratory | If a year is not shown, we have no data | If you have your own co-location study then see footnote 1. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMhelpdesk@parisairparis.com or 0800 0327953 | | | | | | |
| Analysed By | Method | Year | Site Type | Local Authority | Length of Study (months) | Diffusion Tube Mean Conc. (Dm) (µg/m ³) | Automatic Monitor Mean Conc. (Cm) (µg/m ³) | Bias (B) | Tube Precision ¹ | Bias Adjustment Factor (A) (Cm/Dm) |
| Gradko | 50% TEA in Acetone | 2022 | RS | Adair District Council | 10 | 30 | 21 | 42.9% | G | 0.78 |
| Gradko | 50% TEA in Acetone | 2022 | UC | Falkirk Council | 12 | 32 | 26 | 22.7% | G | 0.81 |
| Gradko | 50% TEA in Acetone | 2022 | UB | Falkirk Council | 9 | 15 | 13 | 16.4% | G | 0.86 |
| Gradko | 50% TEA in Acetone | 2022 | R | L1r Newham | 12 | 30 | 23 | 29.1% | G | 0.77 |
| Gradko | 50% TEA in acetone | 2022 | BU | Redcar & Cleveland Borough Council | 12 | 14 | 10 | 44.9% | G | 0.69 |
| Gradko | 50% TEA in Acetone | 2022 | R | Worthing Borough Council | 8 | 33 | 23 | 44.2% | G | 0.69 |
| Gradko | 50% TEA in acetone | 2022 | KS | Marylebone Road Intercomparison | 12 | 52 | 42 | 25.0% | C | 0.81 |
| Gradko | 50% TEA in Acetone | 2022 | R | City Of London | 11 | 60 | 54 | 11.6% | G | 0.90 |
| Gradko | 50% TEA in acetone | 2022 | UB | City Of London | 12 | 29 | 23 | 23.7% | G | 0.81 |
| Gradko | 50% TEA in Acetone | 2022 | KS | London Borough Of Croydon | 12 | 41 | 37 | 11.1% | G | 0.90 |
| Gradko | 50% TEA in Acetone | 2022 | R | Royal Borough Of Windsor And Maidenhead | 12 | 30 | 26 | 13.9% | G | 0.88 |
| Gradko | 50% TEA in Acetone | 2022 | R | Royal Borough Of Windsor And Maidenhead | 12 | 27 | 27 | -1.0% | G | 1.01 |
| Gradko | 50% TEA in Acetone | 2022 | R | Sandwell Mts | 12 | 54 | 27 | 27.1% | G | 0.79 |
| Gradko | 50% TEA in Acetone | 2022 | UB | Sandwell Mts | 12 | 21 | 19 | 11.9% | G | 0.89 |
| Overall Factor ¹ (16 studies) | | | | | | | | Use | 0.82 | |

Located on the DEFRA website is an overview of precision and accuracy related to diffusion tubes. It explains how bias adjustments are used to improve the accuracy of results however poor precision can't be adjusted for, only improved. For the purpose of Local Air Quality Management, tube precision is split into two categories: 'good' and 'poor' relating to how well the same measurement can be reproduced. In the table below, Gradko, 50% TEA in Acetone has only had 1 'Bad' between 2020 and 2022 compared to 49 'Good'.

Precision Summary Results

The diffusion tube precision summary results are provided below. This details the total number of recorded good/bad precision results for the last 3 years for laboratories that currently provide diffusion tube analysis.

Current Version

Precision Summary Table

| Diffusion Tube Preparation Method | 2020 Good | 2020 Bad | 2021 Good | 2021 Bad | 2022 Good | 2022 Bad |
|--|-----------|----------|-----------|----------|-----------|----------|
| Gradko, 50% TEA in Acetone | 19 | 1 | 16 | 0 | 14 | 0 |
| Gradko, 20% TEA in Water | 27 | 0 | 34 | 0 | 27 | 0 |
| ESG Didcot / SOCOTEC, 50% TEA in Acetone | 24 | 0 | 25 | 3 | 26 | 0 |
| ESG Didcot / SOCOTEC, 20% TEA in Water | 6 | 0 | 14 | 1 | 5 | 0 |
| Staffordshire Scientific Services | 15 | 0 | 15 | 1 | 12 | 0 |
| Glasgow Scientific Services | 2 | 7 | 2 | 5 | 3 | 3 |

(DEFRA, N.D.)

Diffusion Tube Annualisation

All diffusion tube monitoring locations within Eden District Council recorded data capture of 75% therefore it was not required to annualise any monitoring data. In addition, any sites with a data capture below 25% do not require annualisation. . A new tube was added for 2022 which only received a 50% data capture therefore it has been removed from the results for 2022 with the hope of a higher data capture for 2023.

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2022 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.TG22 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/NO₂ continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

Eden District Council have applied a national bias adjustment factor of 0.82 to the 2022 monitoring data. A summary of bias adjustment factors used by Eden District Council over the past five years is presented in Table C.1.

Table C.1 – Bias Adjustment Factor

| Monitoring Year | Local or National | If National, Version of National Spreadsheet | Adjustment Factor |
|-----------------|-------------------|--|-------------------|
| 2022 | National | 03/23 | 0.82 |
| 2021 | National | 03/22 | 0.82 |
| 2020 | National | 03/21 | 0.89 |
| 2019 | National | 09/20 | 0.89 |
| 2018 | National | 06/19 | 0.96 |

NO₂ Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO₂ concentration at the nearest location relevant for exposure has been estimated using the Diffusion Tube Data Processing Tool/NO₂ fall-off with distance calculator available on the LAQM Support website. Where appropriate, non-automatic annual mean NO₂ concentrations corrected for distance are presented in Table B.1.

No diffusion tube NO₂ monitoring locations within Eden required distance correction during 2022. There is only one monitoring location which is not representative of a relative receptor (i.e. at the façade of a residential property) however the concentration was under 36µg/m³ per DEFRA guidance.

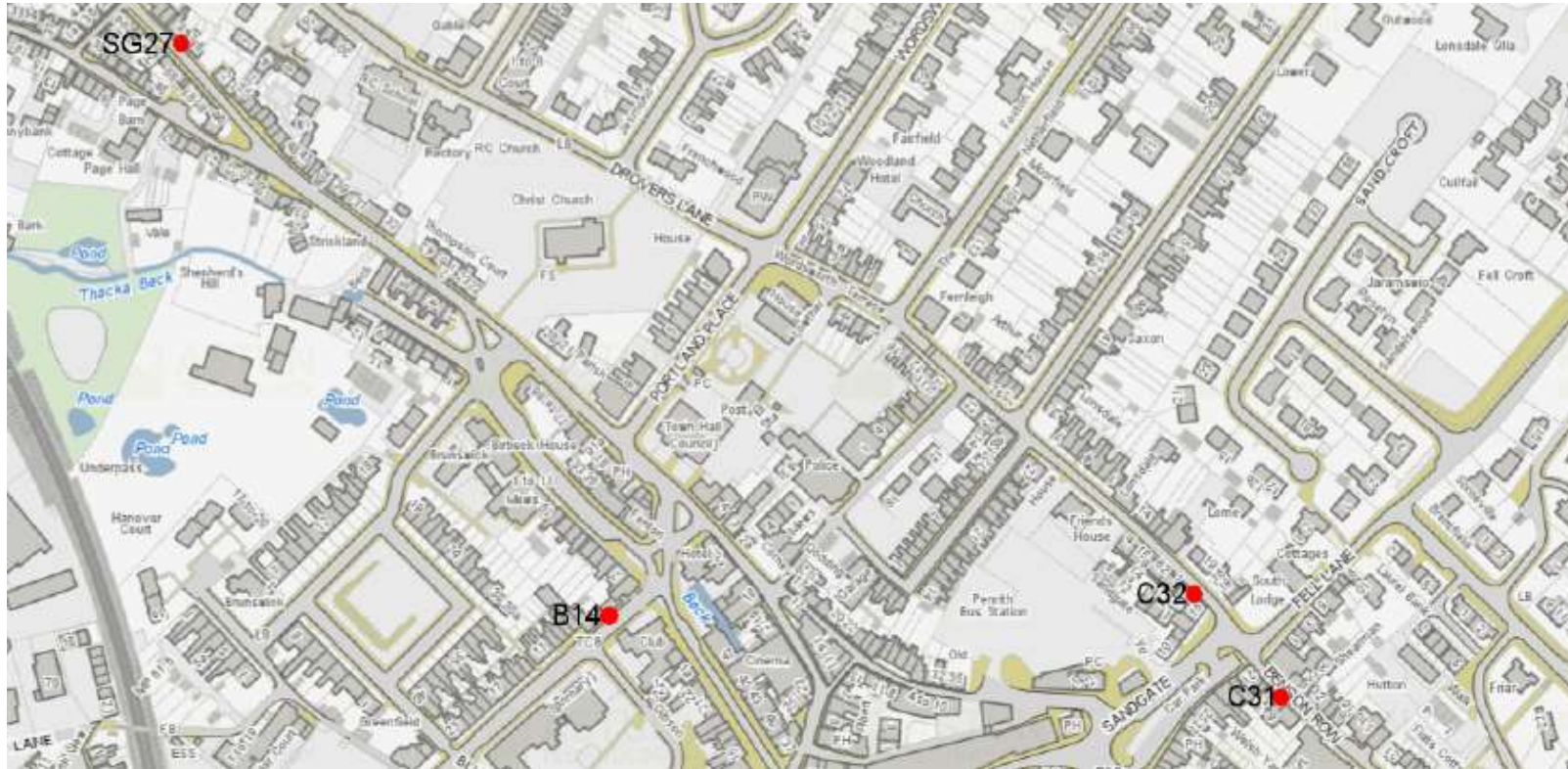
Appendix D: Map(s) of Monitoring Locations and AQMAs

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

Map D1 Monitoring locations east of Castlegate, along Castlegate and Victoria Road. The yellow and purple triangles illustrate the locations of the two continuous air monitors. The purple triangle is Upper Castlegate monitor and the yellow is Central Castlegate



Map D2 Monitoring locations in the northern outskirts of Penrith



Map D3 Monitoring locations within Eamont Bridge, EB20 was removed but kept on the map as its present in figures



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England¹

| 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 |

¹ The units are in microgrammes of pollutant per cubic metre of air (µg/m³).

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.TG22. August 2022. 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.PG22. August 2022. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- Public Health England, Air Quality: A Briefing for Directors of Public Health, 2017.
- Defra, Air Quality and Social Deprivation in the UK; an environmental inequalities analysis, 2006.
- Defra, Air quality appraisal: damage cost guidance, January 2023.
- Public Health England, Estimation of costs to NHS and social care due to the health impacts of air pollution: Summary Report, May 2018.
- Office for Health Improvement and Disparities, Public Health Outcomes Framework – Eden, May 2023.
- Defra, Environmental Improvement Plan: First revision of the 25 Improvement Plan, 2023.
- DfT. The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy, July 2018.
- Your Cumbria (2022a) *Ambitious cycling and walking plans for Penrith, Workington and Whitehaven launched!*. Available at: [Ambitious cycling and walking plans for Penrith, Workington and Whitehaven launched! \(cumbria.gov.uk\)](https://www.cumbria.gov.uk/news/2022/11/ambitious-cycling-and-walking-plans-for-penrith-workington-and-whitehaven-launched/) (Accessed on 11/5/23).
- Your Cumbria (2022b) *Cumbria's transport network improvement plans are launched*. Available at: [Cumbria's transport network improvement plans are launched](https://www.cumbria.gov.uk/news/2022/10/cumbria-s-transport-network-improvement-plans-are-launched/) (Accessed on 10/5/23).
- Bell, J (N.D.) *Cold to Cosy Homes Cumbria*. Available at: [Cold to Cosy Homes Cumbria - CAfS](https://www.cumbria.gov.uk/news/2022/12/cold-to-cosy-homes-cumbria-cafs/) (Accessed on 12/5/23).
- Eden District Council (N.D.) *Warm Homes Eden*. Available at: [Warm and Safe Eden](https://www.eden.gov.uk/news/2022/11/warm-homes-eden/) (Accessed on 11/5/23).
- Penrith Action for Community Transition Limited (N.D.) *About PACT*. Available at: [About PACT | PACT \(penrithact.org.uk\)](https://www.penrithact.org.uk/) (Accessed on 10/5/23).

- BBC (2022) What is Extinction Rebellion and what does it want? Available at: [What is Extinction Rebellion and what does it want? - BBC News](#) (Accessed on 12/5/23).
- Department for Environment Food & Rural Affairs (N.D.) *Precision and Accuracy*. Available at: [Precision and Accuracy | LAQM \(defra.gov.uk\)](#) (Accessed on 4/5/23).