2024 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: August 2024

Information	Cumberland Council Details
Local Authority Officer	Mathew Proudfoot
Department	Environmental Health Public Health and Protection Services
Address	Civic Centre, Rickergate, Carlisle, CA3 8QG
Telephone	01228 817000
E-mail	environmentalhealth@carlisle.gov.uk
Report Reference Number	ASR 24
Date	August 2024

Executive Summary: Air Quality in Our Area

Air Quality in Cumberland Council

Breathing in polluted air affects our health and costs the NHS and our society billions of pounds each year. Air pollution is recognised as a contributing factor in the onset of heart disease and cancer and can cause a range of health impacts, including effects on lung function, exacerbation of asthma, increases in hospital admissions and mortality. In the UK, it is estimated that the reduction in healthy life expectancy caused by air pollution is equivalent to 29,000 to 43,000 deaths a year[1].

Air pollution particularly affects the most vulnerable in society, children, the elderly, and those with existing heart and lung conditions. Additionally, people living in less affluent areas are most exposed to dangerous levels of air pollution[2].

Table ES 1 provides a brief explanation of the key pollutants relevant to Local Air Quality Management and the kind of activities they might arise from.

Table ES 1 - Description of Key Pollutants

Pollutant	Description
Nitrogen Dioxide (NO_2)	Nitrogen dioxide is a gas which is generally emitted from high-temperature combustion processes such as road transport or energy generation.
Sulphur Dioxide (SO_2)	Sulphur dioxide (SO_2) is a corrosive gas which is predominantly produced from the combustion of coal or crude oil.
Particulate Matter (PM_{10} and $PM_{2.5}$)	Particulate matter is everything in the air that is not a gas. Particles can come from natural sources such as pollen, as well as human made sources such as smoke from fires, emissions from industry and dust from tyres and brakes. PM_{10} refers to particles under 10 micrometres. Fine particulate matter or $PM_{2.5}$ are particles under 2.5 micrometres.

[1] UK Health Security Agency. Chemical Hazards and Poisons Report, Issue 28, 2022.

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

On 1st April 2023 Cumberland Council replaced Cumbria County Council and the three local authorities: Carlisle City Council, Allerdale Borough Council and Copeland Borough Council. This report collates the air quality data for the new Council area for the first time. Cumberland has four Air Quality Management Areas, all within the city of Carlisle.

Air quality has been monitored in Cumberland as part of the local authority review and assessment process since 1996. In addition to nitrogen dioxide, other pollutants measured include particulate matter (both PM_{10} and $PM_{2.5}$) and benzene (measured as part of Defra's Non-Automatic Hydrocarbon Network). These continue to be measured in the former Carlisle City Council area. However, as local authorities are no longer required to report benzene concentrations, we are not reporting these in this Annual Status Report.

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[3] sets out actions that will drive continued improvements to air quality and to meet the new national interim and long-term targets for fine particulate matter ($PM_{2.5}$), the pollutant of most harmful to human health. The Air Quality Strategy[4] provides more information on local authorities' responsibilities to work towards these new targets and reduce fine particulate matter in their areas.

The Road to Zero[5] details the Government's approach to reduce exhaust emissions from road transport through a number of mechanisms, in balance with the needs of the local community. This is extremely important given that cars are the most popular mode of personal travel and the majority of Air Quality Management Areas (AQMAs) are designated due to elevated concentrations heavily influenced by transport emissions.

[3] Defra. Environmental Improvement Plan 2023, January 2023

[4] Defra. Air Quality Strategy – Framework for Local Authority Delivery, August 2023

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

Cumberland Council has taken forward a number of measures during the current reporting year of 2023, in pursuit of improving local air quality. Key local measures continue to support improvements in local air quality and the City Council continues to work on:

- Carlisle Southern Link Road: This will connect Junction 42 of the M6 with the A595 to the west. The route will include new junctions linking existing radial routes into Carlisle and the Garden Village. The 8km route will include bridges over two main railway lines and the Caldew and Petteril rivers, a network of footways and cycleway. This construction work is now underway.
- Bus infrastructure improvements: Ongoing improvements to bus services with new shelters and raised kerbs continues. In addition, plans for large new housing developments will include public transport provision.
- Ongoing work to provide grant funding for home isolation and domestic renewable heating options.
- Ongoing schemes to introduce vehicle charging points on council owned land and as part of new private development, including charging provision in all new residential developments.

Conclusions and Priorities

Nitrogen dioxide concentrations were generally lower in 2023 compared to 2022 thorough out Cumberland. Of the sixty-eight locations where monitoring took place in 2022 and 2023, NO_2 concentrations decreased at fifty-four sites and increased at fourteen in 2023 compared to 2022. There continues to be no exceedance of the annual objective concentration for NO_2 at locations relevant for human exposure anywhere in Cumberland. While the NO_2 concentrations are sufficiently low within AQMA 1, AQMA 2 and AQMA 5 that they can be revoked, the concentration measured within AQMA 4 increased slightly from 33.5 to 34.1 µg m^{-3} so monitoring should continue to ensure the ongoing measures in the AQAP are achieving success.

Cumberland Council's priorities for the coming year are:

- Revoke AQMA 1, AQMA 2 and AQMA 5.
- Drive forward on actions identified in the Action Plan.
- Continue to progress development of the Carlisle Southern Link Road

- Promote travel plans and introduction of green spaces for all new housing developments. Continue to work with businesses to promote more widespread use of alternative transport.
- Improve the vehicle charging infrastructure.
- Increase zero and near zero emission vehicle uptake as part of new residential development.

Local Engagement and How to get Involved

There are a number of ways in which the public can get involved with improving air quality:

- Taking part in Green Travel Plan arrangements with their employer.
- Joining local cycle groups and walk to school/work groups.
- The use of sustainable transport options including cycling, walking and the bus.
- Investigate how to improve the energy efficiency at home, including sustainable heating and improved home insulation. Contact Cumberland Council to find out what grants are currently available.
- Become involved in community groups, for example The Waverley Viaduct Trust is currently working to reopen the Waverley Viaduct Bridge. The Local Enterprise Partnership (LEP) also works to secure government grant funding for local projects.

Cumberland Council's website can be used to view all previous air quality review and assessment reports as well as real time monitoring data and advice on how to reduce emissions to air.

Local Responsibilities and Commitment

This ASR was prepared by the Environmental Health department of Cumberland Council with the support of the Highways department and Planning department.

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

Colin Cox: 

If you have any comments on this ASR please send them to Environmental Health at:

Civic Centre, Rickergate, Carlisle, CA3 8QG

01228 817000

Environmentalhealth@cumberland.gov.uk

Table of Contents

Figures

Tables

1 Local Air Quality Management

This report provides an overview of air quality in Cumberland Council during 2023. 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 Cumberland 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.

A summary of AQMAs declared by Cumberland Council can be found in Table 2.1. The table presents a description of the four AQMAs that are currently designated within Cumberland Council. Appendix D: Map(s) of Monitoring Locations and AQMAs provides maps of AQMAs and also the air quality monitoring locations in relation to the AQMAs. The air quality objectives pertinent to the current AQMA designations are as follows:

- NO_2 annual mean.

We propose to revoke the following AQMAs: AQMA1, AQMA 2 and AQMA 5, as the monitoring has shown NO_2 concentrations to be compliant with air quality objectives for at least five years.

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance: Declaration	Level of Exceedance: Current Year	Number of Years Compliant with Air Quality Objective	Name and Date of AQAP Publication	Web Link to AQAP
AQMA 1	02/12/2005 Amended 25th July 2019	NO_2 Annual Mean	AQMA 1 Amended 25th July 2019 to include just 100 m Section along B6264 Brampton Road.	YES	45.3	24.3	11	Cumberland Council Air Quality Action Plan	https://www.carlisle.gov.uk/Portals/0/Documents/Residents/Environment/AQAP_CCC_2021.pdf?ver=MTwIH1-2grJugOerj9V9rQ%3d%3d
AQMA 2	26/01/2007	NO_2 Annual Mean	AQMA 2 Currock Street and the properties immediately to the west of it, between the junction with James St/Water St and Crown St.	NO	44.6	26.8	13	Cumberland Council Air Quality Action Plan	https://www.carlisle.gov.uk/Portals/0/Documents/Residents/Environment/AQAP_CCC_2021.pdf?ver=MTwIH1-2grJugOerj9V9rQ%3d%3d
AQMA 3	01/08/2008 Revoked 3rd July 2019	NO_2 Annual Mean	AQMA 3 Wigton Road between Crummock Street and Caldewgate roundabout as well as properties on Caldcotes.	N/A	40	N/A	N/A	N/A	N/A
AQMA 4	01/08/2008	NO_2 Annual Mean	AQMA 4 North side of the A595 at Bridge Street, northbound from the junction with Shaddongate.	YES	43.9	34.1	4	Cumberland Council Air Quality Action Plan	https://www.carlisle.gov.uk/Portals/0/Documents/Residents/Environment/AQAP_CCC_2021.pdf?ver=MTwIH1-2grJugOerj9V9rQ%3d%3d
AQMA 5	01/08/2008	NO_2 Annual Mean	AQMA 5 Junction of Dalston Road and Junction Street	NO	48	28.1	8	Cumberland Council Air Quality Action Plan	https://www.carlisle.gov.uk/Portals/0/Documents/Residents/Environment/AQAP_CCC_2021.pdf?ver=MTwIH1-2grJugOerj9V9rQ%3d%3d
AQMA 6	01/08/2008 Revoked 3rd July 2019	NO_2 Annual Mean	AQMA 6 London Road and properties on either side near the junction with Blake Street	N/A	43.3	N/A	N/A	N/A	N/A

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

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

2.2 Progress and Impact of Measures to address Air Quality in Cumberland Council

There were appraisals from the former local authorities of Carlisle City Council and Allerdale Borough Council. Copeland Borough Council did not complete an ASR in 2023 and in 2022.

Carlisle City Council

Defra's appraisal concluded the ASR was well structured, detailed and provides the information specified in the guidance. The following comments were made and where appropriate a response is provided.

1. *Calculations of Local Bias Adjustment Factor have only been mentioned and the calculations for this factor have not been completed. This factor has not been clearly stated in the report and no clear justification for why the calculations are incomplete have been provided. There is also no discussion as to the choice of bias adjustment factor applied*.
   Response: The local derived factor was 0.75 and in keeping with the previous ASRs the national factor (0.83) was chosen. The calculations and justification for the 2023 data year will be provided in this ASR.

2. *Deviations from the diffusion tube deployment calendar have been noted but the council have not provided justification for why this occurred*.
   Response: The deviation was due to staff availability, sickness and leave.

3. *Values reported in tables should only be in bold if they exceed the relevant AQO. Table A.6 reports the annual PM10 mean concentration in bold when it is below the AQO.*
   Response: This was a formatting error and will be removed this year's report.

4. *The council have provided extensive detail for its action plan measures clearly illustrating each measures progress to date and providing good context when there are barriers to implementation. It is encouraging to see that the Council are dedicated to air quality within their jurisdiction through the continuous review of their air quality strategies.*

5. *The Council have laid out detailed measures specific to lowering $PM_{2.5}$ emissions as well as reporting on the Public Health Outcomes Framework D01 indicator. This includes comparison to England and the North-West Region. This is an example of good practice and helps provide context for the council's measures for tackling $PM_{2.5}$ emissions.*

6. *The Council have discussed trends in annual mean NO_2 concentrations, providing figures to depict these trends which are grouped by location. The trends presented are informative and provide clear detail of pollutant concentration levels, in comparison to pollutant objectives.*

In addition, the appraisal report recommended that the Council should revoke AQMA 1, AQMA 2 and AQMA 5 as they have all been compliant with the AQOs for 10, 12 and 7 years respectively.

Allerdale Borough Council

Defra's appraisal commended the former local authority for work undertaken in relation to a local air quality strategy. The appraisal report also emphasised from 2023 that local authorities with no AQMA will be required to produce a local Air Quality Strategies (AQS). The appraisal concluded the ASR was well structured, detailed and provides the information specified in the guidance. There were no substantive comments.

Copeland Borough Council

It is acknowledged that the ASR for Copeland was not submitted in 2022 and 2023. This has been addressed in this report, by including the last 5 years of diffusion tube data for Copeland area. It is evident that the monitoring data for all locations continue to be well below the objective level for the 5 year period.

Cumberland Council has taken forward a number of direct measures during the current reporting year of 2023 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2. Thirteen measures are included within Table 2.2, with the type of measure and the progress Cumberland Council have made during the reporting year of 2023 presented. Where there have been, or continue to be, barriers restricting the implementation of the measure, these are also presented within Table 2.2.

More detail on these measures can be found in the respective Action Plans: ‘Cumberland Council Air Quality Action Plan 2021 (Carlisle Area) (Revised October 2023)’.

Key completed measures are:

- Improvements to the signalling on Castle Way and Bridge Street was implemented in August 2022. This change prevents vehicles, including HGV’s and buses from leaving the Willowholme industrial estate and then being subsequently stopped at the pedestrian crossing on Bridge Street. This has reduced the number of standing starts at this incline in the road.
- Construction work is underway on the Carlisle Southern Link Road. This is expected to provide a major improvement on traffic volumes and congestion in the city centre. Work will be undertaken to identify any new relevant receptors that may be negatively impacted by the new road, through increased traffic volumes. Additional monitoring may be undertaken when the road is complete and opened for use.

Cumberland Council does not expect any of our measures to be completed over the course of the next reporting year, as many of our measures are ongoing in nature, with no expected completion date. The Carlisle Southern Link Road is scheduled to open to the public in 2025.

Cumberland Council’s priorities for the coming year are:

- Drive forward on actions identified in the Action Plan.
- Continue to progress development of the Carlisle Southern Link Road
- Promote travel plans and introduction of green spaces for all new housing developments. Continue to work with businesses to promote more widespread use of alternative transport.
- Improve the vehicle charging infrastructure.
- Increase zero and near zero emission vehicle uptake as part of new residential development.
- Revoke AQMA’s 1, 2 and 5.

Cumberland Council worked to implement these measures in partnership with the following stakeholders during 2023:

- Highways department

- Planning department
- Green Spaces department

The principal challenges and barriers to implementation that Cumberland Council anticipates facing are funding restrictions and staff resources to implement measures such as public awareness campaigns.

Progress on some measures has been slower than expected due to restrictions in available funding. Some measures such as the Carlisle Southern Link Road are dependent on external organisations and influences such as inflationary pressure and global events.

Cumberland Council anticipates that the measures stated above and in Table 2.2 will achieve compliance in all our AQMA's.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure Title	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	Construction of the new Carlisle Southern Link Road (CSLR). This will extend the existing Carlisle Northern Development Route (CNDR). Monitor the air quality impacts of the CSLR and CNDR.	Traffic Management	Other	<2021	2025	Cumberland Council	Cumberland Council and Ministry of Housing, Communities and Local Government	No	Funding is in place	£150 million	Building work is underway	Potential for significant improvement in NO2 levels across the city centre.	Reduced NO2 levels at monitoring locations and within AQMA's.	The CNDR is operational. Monitoring at receptors on new road revealed consistently low NO2 levels. There is evidence of NO2 improvements and traffic reduction in the city centre. Several new cycle links from arterial roads are in place. Construction of the Carlisle Southern Link Road is underway. Environmental Health assisted in the consultation process. Delays were incurred due to rising costs and supply issues caused by global events. Expected to be open to the public in 2025.	The new Carlisle Southern Link Road is part of the wider Garden Village housing project, which is expected to deliver 10'000 new homes by 2030. The road would extend the existing CNDR. This would provide a complete bypass around the City Centre with both ends of the route connected to the M6 Motorway.
2	Effective traffic management measures will be implemented to improve traffic flow on the existing road network and in new developments.	Traffic Management	UTC, Congestion management, traffic reduction	2012	Ongoing.	Cumberland Council	Cumberland Council	No. 2022 funding bid failed	Ongoing.	Unknown	Ongoing	Modelling undertaken at AQMA 4 indicates that a 2.7% reduction in NOx would achieve compliance.	Reduced NO2 levels and standing traffic within AQMA's.	Traffic modelling has shown that emissions from diesel vehicles dominate emissions. Emissions factor toolkit has been used to show increased traffic speeds would reduce oxide of nitrogen emissions within Bridge Street AQMA. Work has been carried out to the traffic light sequence in this area to reduce standing start traffic. Early data indicates a significant improvement in NO2 levels within the AQMA.	Improvements to the signalling on Castle Way and Bridge Street was implemented in August 2022. Early monitoring data shows significant improvement in AQMA 4. A funding bid to make wider improvements to traffic management around Bridge St AQMA including automatic NOx measurements was rejected by Defra.
3	Environmental Health will work alongside the Planning Department to minimise the air quality impacts of new developments.	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	2012	Ongoing	Cumberland Council	Cumberland Council	No	Ongoing.	Unknown	Ongoing.	Not calculated	Effective links between EH and Planning. AQIA's submitted where necessary. Early consultation with applicants.	Environmental Health is consulted on all proposed developments which may impact on air quality. Responses are aimed at minimising AQ impacts, particularly within or close to our AQMA's. This includes large residential developments. Recommendations made for car charging points for all new residential properties.	Environmental Health comment on all potentially polluting developments. The outcome depends on Planning Department and current policy
4	Improvements to passenger transport infrastructure. Sustainable transport will be integrated into major new developments	Transport Planning and Infrastructure	Bus route improvements	2012	Ongoing	Cumberland Council and local public transport providers	Cumberland Council and local public transport providers	No	Ongoing.	Unknown	Ongoing.	Not calculated	Improved bus service. Increased use of transport provided. Reduced NO2 along main routes	Ongoing improvements to bus services with new shelters and raised kerbs. Plans for large new housing developments include public transport provision and/or sustainable transport options.	Success is dependent on public uptake of sustainable transport options. The council has no real control over the improvement of vehicle fleet.
5	Cycling and walking will be encouraged. Implement new and improved pedestrian and cycle links	Transport Planning and Infrastructure	Cycle network	2012	Ongoing	Cumberland Council	Cumberland Council with various funding bids.	No	Ongoing.	Unknown	Ongoing.	Not calculated	Completion of proposed works and ongoing improvement of the cycle and pedestrian route network.	Pedestrian/cycle bridge connecting Currock and Denton Holme, over the railway line are complete. Ongoing applications for government funding for schemes that aim to improve the existing cycleways, creating new sections of cycle track Extensive plans to increase the cycle path network are now in place.	Ongoing plans associated with improved pedestrian and cycle connections to the CNDR. Funding required to accelerate major improvements.

Measure No.	Measure Title	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
6	Travel plans will be required for all new developments that meet the criteria. Existing businesses will be encouraged to implement, monitor and review travel plans.	Promoting Travel Alternatives	Workplace Travel Planning	2012	Ongoing	Cumberland Council	Cumberland Council	No	Ongoing.	Unknown	Ongoing.	Not calculated	Increased number of participant businesses and more widespread use of alternative transport.	All schools within the city now have travel plans. New developments likely to result in increased highway usage must submit a travel plan for approval when making an application.	Difficult to quantify the impact of Travel Plans.
7	The council will continue to provide comprehensive environmental control over emissions from all Part A2 and B Processes located within the local authority area.	Environmental Permits	Other measure through permit systems and economic instruments	2012	Ongoing	Cumberland Council	Cumberland Council	No	Ongoing.	Unknown	Ongoing.	Not calculated	Risk based inspections showing that emission limits are being met and efforts are being made to improve on national objectives.	All processes which fall under part B & A2 processes are permitted by Cumberland Council. No recent enforcement action required in relation to emissions.	Any new applications are considered by Environmental Health as part of the planning consultation process and the environmental permitting procedures.
8	The council will continue to investigate complaints of black smoke and smoke nuisance as well as managing smokeless zones. Enforcement action will be taken as necessary.	Public Information	Other	2012	Ongoing	Cumberland Council	Cumberland Council	No	Ongoing.	Unknown	Ongoing.	Not calculated	Reduction in the number of complaints from members of the public. Reduction in repeat offences.	There is information on website. Environmental Health provide advice and enforcement as required. Smoke complaints are responded to involving domestic fires, bonfires, trade waste, industrial and dark smoke. Advice leaflet sent out for all cases of domestic burning. Advice given to minimise potential for smoke issues and ensure compliance with smokeless zones.	The Air Quality Strategy set out a goal to cut public exposure to particulate matter pollution. The aim is to reduce by half the number of people in the United Kingdom exposed to the WHO guideline concentration of 10 µg m^{-3} by 2025. The measures set out here will contribute to this target.
9	Provision of home improvement grants and energy saving advice to the public.	Public Information	Other	2012	Ongoing	Cumberland Council	Cumberland Council with various funding bids.	No	Ongoing.	Unknown	Ongoing.	Not calculated	Number of properties taking up schemes, resulting in Improved energy efficiency of housing stock.	Cumberland Council Home Improvement Agency is currently delivering Health through Warmth Scheme, supported by the Energy Companies Obligation. This includes boiler upgrades and home insulation. Safe and warm grants are provided by the council to deliver up to £7,500 to enable low income homes to carry out minor repairs and energy efficiency measures to their homes. Work has begun on enforcing the Minimum Energy Efficiency Standards, specifically aimed at private rented sector properties. New energy efficiency grants are now available up to £3000 through council grant scheme. Available schemes are regularly changing and evolving.	Cumberland Council have now revised Housing Renewal Assistance Policy under the Regulatory Reform Order 2002. This covers all grants involving housing and energy efficiency measures.
10	Environmental Health will work alongside the Neighbourhoods and Green Spaces team to implement the effective use of trees and green areas to offset traffic derived emissions.	Public Information	Other	2012	Ongoing	Cumberland Council	Cumberland Council	No	Ongoing.	Unknown	Ongoing.	Not calculated	Increase in trees and vegetation in visible locations. Increased public interest.	Cumberland Council continues to manage and maintain trees in parks and green spaces, including some additional planting, of mainly mixed broadleaf species, where necessary. Planting of green areas is an essential part of many new developments, including residential.	Limitations to planting options in busy urban areas. Parks and open spaces do not have significant air quality issues. Green Spaces continue to have a positive public impact.
11	Air Quality considerations to be included in all relevant council policies and strategies.	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	2012	Ongoing	Cumberland Council	Cumberland Council	No	Ongoing.	Unknown	Ongoing.	Not calculated	Increased awareness of air quality issues and consideration given by more council departments.	Included air quality links within most major relevant policies including Local Transport Plan (LTP 3) (2011-26) and The Carlisle	Air Quality considerations are put forward during discussion and consultation stages of policy development.

Measure No.	Measure Title	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
														District Local Plan (2015-30). New schemes being developed to deliver improved cycling routes and vehicle charging infrastructure.	
12	Promotion of air quality and sustainable transport issues. Air quality information and monitoring data will be provided to the public.	Public Information	via the Internet	2012	Ongoing	Cumberland Council	Cumberland Council	No	Ongoing.	Unknown	Ongoing.	Not calculated	Increased public awareness and participation in improving air quality.	Air quality info and real time monitoring data is available on the website. Monitoring data shows continued improvement in most areas. Cumberland Council is actively supporting and promoting Clean Air Day, utilising social media and our website, as part of the Global Action Plan. Cumberland Council has ongoing projects to cut carbon emissions. These aim to raise ambition to tackle climate change and sharing learning and resources. The public can influence and drive climate action through citizens' juries and other projects, with community groups steering the programme.	Difficult to quantify improvements as a direct result of promotional work or providing monitoring data.
13	Installation of charging points and development of charging network	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	2023	Ongoing	Cumberland Council	Cumberland Council with various funding bids.	No	Ongoing.	Unknown	Ongoing.	Not calculated	More charging points available	In 2023, Cumberland Council received notification that it had been successful with funding to install up to 900 charging points and develop its strategy[6].	Difficult to quantify improvements as a direct result of providing charging points. The aim is to assist with the transition to Electric Vehicles.

[6] https://www.yourcumbria.org/News/2021/partnershipsuccessfulbidtodriveforwardevpoints.aspx

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

As detailed in Policy Guidance LAQM.PG22 (Chapter 8) and the Air Quality Strategy[7], local authorities are expected to work towards reducing emissions and/or concentrations of fine particulate matter ($PM_{2.5}$)). There is clear evidence that $PM_{2.5}$ (particulate matter smaller 2.5 micrometres) has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

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

- Cumberland Council had monitored $PM_{2.5}$ levels at Paddy's Market AQMS since 2009 as part of the AURN. This is a busy city centre junction between two AQMA's. The annual mean concentrations were consistently well below the objective at around 8-11 µg m^3 at this location. The monitoring equipment was relocated to Morton Manor Community Centre in 2021. $PM_{2.5}$ concentrations have remained within this range. There are ongoing efforts to reduce to reduce the $PM_{2.5}$ concentrations.
- The Environmental Health Department will continue to work in partnership with the Highways Department to improve traffic flows and reduce congestion at key junctions.
- Environmental Health will continue to work with the Planning Department with regard to new local developments with significant air quality implications and ensure that air quality implications and mitigation measures are taken into consideration in the planning process.
- Environmental Health will continue to work alongside the Neighbourhoods and Green Spaces team to investigate and implement the effective use of trees and green areas to offset traffic derived emissions in existing AQMA's and in new development areas.
- The Council will also continue to provide comprehensive control over emissions from all Part A2 and B Processes located within the local authority area. We will work

[7] Defra. Air Quality Strategy – Framework for Local Authority Delivery, August 2023

closely with the operators of these installations to continuously monitor and improve on their emissions to air as part of the permitting process.

Cumberland Council has eight designated smoke control areas. These are shown in Figure 2-1.

Figure 2-1 Location of Smoke Control Areas within Cumberland Council

- Four are within the former Carlisle City Council area. More detail can be found at the following link: http://www.carlisle.gov.uk/LinkClick.aspx?fileticket=9E67HYHexDw%3d&tabid=729&portalid=0&mid=2838).

- Three within the former area of Copeland Borough Council. More detail can found at the following link: Smoke control areas | Copeland Borough Council
- One is found with the former Allerdale Borough Council.

The most recent available data from Public Health England's Public Health Outcomes Framework[8] show that the fraction of total mortality which is attributable to particulate air pollution (D01) within Cumberland Council (Carlisle Area) was 3.3 % in 2020 (the most recent data available; the Cumberland values for subsequent years were not available). This is below the average for both the North West region (5.6%) and England as a whole (5.8%) based on 2022 values.

[8] https://fingertips.phe.org.uk/profile/public-health-outcomes-framework/data#page/3/gid/1000043/pat/6/par/E12000002/ati/501/are/E06000008/iid/93861/age/230/sex/4/cat/-1/ctp/-1/yrr/1/cid/4/tbm/1

Data accessed 3rd July 2024.

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

This section sets out the monitoring undertaken within 2023 by Cumberland Council and how it compares with the relevant air quality objectives. In addition, monitoring results are presented for a five-year period between 2019 and 2023 to allow monitoring trends to be identified and discussed.

3.1 Summary of Monitoring Undertaken

On 1st April 2023 Cumberland Council replaced Cumbria County Council and the three local authorities: Carlisle City Council, Allerdale Borough Council and Copeland Borough Council. The results from the respective former monitoring networks will be combined in this year's annual status report.

3.1.1 Automatic Monitoring Sites

Cumberland Council undertook automatic (continuous) monitoring at Morton Manor Community Centre[9] during 2023. Table A.1 in Appendix A shows the details of the automatic monitoring sites. NB. Local authorities do not have to report annually on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead, unless local circumstances indicate there is a problem. Automatic monitoring results are available through the UK-Air website (https://uk-air.defra.gov.uk/data/data_selector).

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

[9] This site is known as Carlisle Morton A595 within Defra's compliance monitoring network. More information is available through UK_AIR website: Site Information for Carlisle Morton A595(UKA00932) - Defra, UK

3.1.2 Non-Automatic Monitoring Sites

Cumberland Council undertook non- automatic (i.e. passive) monitoring of NO_2 at 70 sites during 2023. This includes 28 sites for former Carlisle City Council, 18 sites for former Allerdale Borough Council and 24 sites for former Copeland Borough Council Table A.2 in Appendix A presents the details of the non-automatic sites.

Within the former Allerdale Borough Council area, two sites (Strawberry How Road, Cockermouth, DT13 and Kirkby Street, Maryport, DT14) closed at the end of 2022 and were replaced by two new sites at South End Street, Wigton, DT17 and West Street, Aspatria, DT18. Also, within this former local authority two diffusion tubes were exposed at each site as had been done in previous years.

At the other two former local authorities there were no changes for the monitoring sites compared to 2022.

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)

Automatic monitoring occurs only at Morton Manor Community Centre. Sampling at this site began in October 2021[10]. In 2023 in the annual NO_2 average concentration was 9.0 µg m^{-3}, the same as measured in 2022.

[10] The annual mean concentration for 2021 at Morton Manor Community Centre was 11.4 µg m^{-3}. Because the data capture was 18.9 % and outside the permissible range for annualisation the annual concentration is only be considered an indicative measurement.

Elsewhere within Cumberland Council automatic monitoring of nitrogen dioxide concentrations began at Paddy's Market and Stanwix Bank in 2006 and 2007 and stopped at each site in 2021 and 2016, respectively. Figure 3-1 shows that the annual mean concentration has been below the annual mean objective since 2011.

Figure 3-1 Automatic montoring data (2006 – 2023)

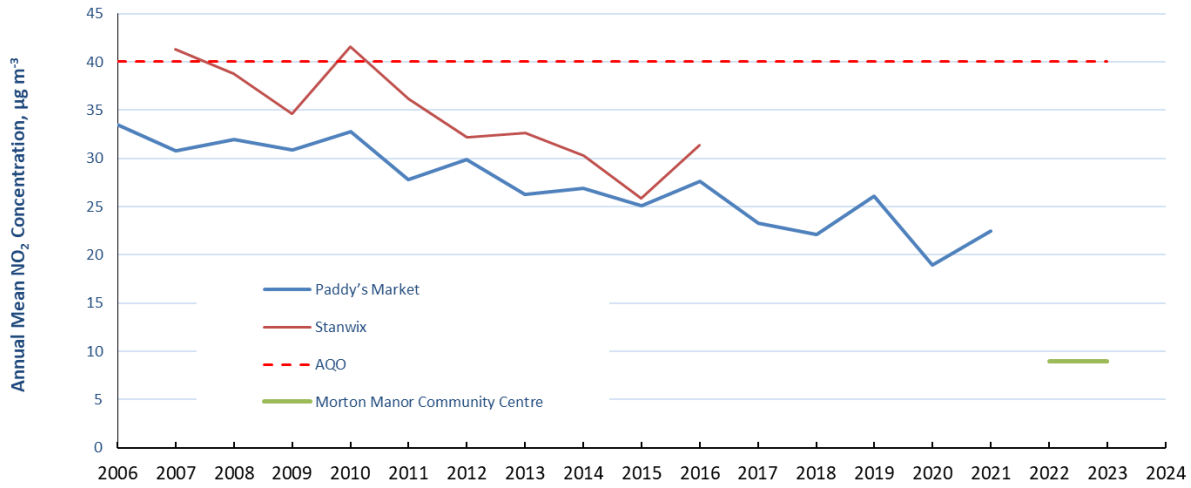


Table A.3 and Table A.4 in Appendix A compare the ratified and adjusted monitored NO_2 annual mean concentrations for the past five years with the air quality objective of 40 µg m^{-3}. Note that the concentration data presented represents the concentration at the location of the monitoring site, following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

The annual mean concentrations are compared with the air quality objective of 40 µg m^{-3} in Figures A.1 to A.7. Generally, the NO_2 concentrations are less than those measured in 2022.

Figure A.1 shows the NO_2 concentration measured by the automatic monitor at Morton Manor Community Centre in 2023. The concentration 9.0 µg m^{-3} is considerably less than those measured at Paddy's Market which over the five-year period (2016 to 2020) ranged from a low of 19 µg m^{-3} in 2020 to a high of 27.6 µg m^{-3} in 2016.

For the purposes of the presenting results for each of the former local authorities Figures A.2 to A.5 show the trends within the former local authority area of Carlisle City Council and had been grouped historically according to Air Quality Management Areas- either revoked or current as well as showing trends in a number of other areas.

Figures A.6 and A.7 show the five-year trends within the former respective local authority areas of Allerdale and Copeland.

For sites situated along the A7 (see Figure A.2), the highest concentration (28.6 µg m^{-3}) was measured at Stanwix Bank (A10) which represented a decrease of 0.1 µg m^{-3} compared to what was measured in 2022.

For sites within AQMA 2 (Currock Street, B7) and AQMA 5 (Dalston Road, B4) NO_2 annual mean concentrations were 26.8 µg m^{-3} and 28.1 µg m^{-3}, respectively. Representing decreases of by 1.9 µg m^{-3} and 1.2 µg m^{-3}, respectively, compared to what was measured in 2022. Elsewhere in the city centre, concentrations decreased at all sites with the exception of Post Office for which concentration increased by 0.5 µg m^{-3} (Figure A.3)

For sites situated along the section of Wigton Road closer to the city centre, Bridge Street and London Road (see Figure A.4) the highest concentration (34.1 µg m^{-3}) continues to be measured in AQMA 4 Bridge Street (E8). This represents an increase of 1.8 µg m^{-3} compared to 2022. At most other sites in this part of the city concentrations decreased in 2023 compared to 2022. The largest decrease in concentration (1.6 µg m^{-3}) occurred at Finkle Street (E22)- from 24.0 in 2022 to 22.4 µg m^{-3} in 2023. While the largest increase occurred at 3 Wigton Road (E22) from 25.9 µg m^{-3} to 27.1 µg m^{-3} – an increase of 1.1. µg m^{-3}.

The remaining sites along the Carlisle Northern Development Route and at a number of locations to the south of city centre and at the airport all measured concentrations considerably less than the annual objective concentration (see Figure A.5). At all these locations concentrations decreased in 2023 compared to 2022.

Figure A.6 presents the five-year trend in the former local authority of Allerdale Borough Council. In 2023 the highest NO_2 concentration (22.9 µg m^{-3}) was measured at Murray Road (DT 2); this represents an increase of 0.9 µg m^{-3} compared to 2022.

At most sites the NO_2 concentrations decreased in 2023 compared to 2022 (10 sites decreased within a total of 16 sites which had sampling in both 2022 and 2023). With the largest decrease (2.4 µg m^{-3}) occurring at Main Road (DT 8), where the concentration decreased from 12.5 µg m^{-3} to 10.1 µg m^{-3}. The largest increase (0.9 µg m^{-3}) occurring at Northside Primary School (DT12), where the concentration increased from 11.8 µg m^{-3} to 12.7 µg m^{-3}.

Figure A.7 presents the five-year trend in the former local authority of Copeland Borough Council. In 2023 the highest NO_2 concentration (15.6 µg m^{-3}) was measured at Strand St, Whitehaven (N11); this represents a decrease of 1.2 µg m^{-3} compared to 2022.

At most sites the NO_2 concentrations decreased in 2023 compared to 2022 (20 sites within a total of 24). With the largest decrease (1.3 µg m^{-3}) occurring at Council Centre, St Georges Rd, Millom (N10), where the concentration decreased from 7.3 µg m^{-3} to 6.0 µg m^{-3}. The largest increase (1.4 µg m^{-3}) occurring at 4 Holyoak, Beckermet (N13), where the concentration increased from 5.0 µg m^{-3} to 6.4 µg m^{-3}.

For diffusion tubes, the full 2023 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 200 µg m^{-3}, not to be exceeded more than 18 times per year.

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 40 µg 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 50 µg m^{-3}, not to be exceeded more than 35 times per year.

The automatic monitors within Carlisle were relocated from Paddy's Market to Morton Manor Community Centre during 2021. However, there was insufficient data capture at Morton Manor in 2021 to calculate a valid annual mean.

In 2023, the PM_{10} concentration measured at Morton Manor Community Centre was 11.8 µg m^{-3}. This represented a decrease of 2.5 µg m^{-3} compared to what was measured in 2022 (14.3 µg m^{-3}) and was lower than had been measured previously at Paddy's Market; over the five-year period 2016 to 2020 the PM_{10} concentration ranged from a low of 13.6 µg m^{-3} in 2016 to a high of 18.6 m^{-3} in 2019. That the PM_{10} concentrations measured in 2023 were the lowest historically measured in Carlisle is keeping with the national trend for

PM_{10} sites in the AURN network which also shows that PM_{10} concentrations in 2023 were historically low[11].

There were no days for which the short term AQO exceeded 50 µg m^{-3}.

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 the pollutant which has the biggest impact on public health and on which the Public Health Outcomes Framework (PHOF) indicator is based. Therefore, although not covered by the LAQM regulations, local authorities are encouraged to understand the $PM_{2.5}$ concentration within their council area.

In 2023, the $PM_{2.5}$ concentration measured at Morton Manor Community Centre was 7.9 µg m^{-3}. which is lower than the World Health Organisation guideline of 10 µg m^{-3}. Elsewhere, the background $PM_{2.5}$ maps for Cumberland Council for 2023 also showed no exceedance of the guideline concentration. The highest concentrations anywhere within Cumberland Council was 8.1 µg m^{-3}. This occurred for a 1 km x 1 km square located close to Sellafield. The square has Ordnance Survey coordinates of 302500, 504500.

Cumberland Council also acknowledges Defra's proposed Environmental Targets for $PM_{2.5}$.

- Annual mean concentration target – 10 µg m^{-3} to be achieved by 2040;
- Population Exposure Reduction Target – 35% reduction (on 2018 baseline) by 2040.

The Government expects local authorities will need to take actions in support of the new targets.

11 https://assets.publishing.service.gov.uk/media/6629080d3b0122a378a7e5f0/fig05_pm10_annual.csv/preview

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)
MMCC	Morton Manor	Roadside	338195	554990	NO_2, PM_{10} and $PM_{2,5}$	No	Chemiluminescence, BAM 1020 heated	6	8	2.37, 2.67, 2.77

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)
A1	45 SCOTLAND RD	Roadside	339995	557188	NO2	NO	4.5	1.5	NO	3.1
A10	STANWIX BANK	Roadside	340008	556842	NO2	NO	1.5	1.5	NO	3.0
A12	STANWIX BANK CAR PARK	Roadside	339935	557125	NO2	NO	0.0	3.0	NO	2.8
A5	37 KINGSTOWN RD	Roadside	339758	558059	NO2	NO	0.0	4.0	NO	2.8
A7	282 KINGSTOWN RD	Roadside	339526	559285	NO2	NO	7.5	4.0	NO	2.7
A9	BRAMPTON RD	Roadside	340028	556833	NO2	Yes, AQMA 1	0.0	1.5	NO	2.8
B4	DALSTON RD	Roadside	339434	555638	NO2	Yes, AQMA 5	0.0	3.5	NO	2.8
B7	12 CURROCK ST	Roadside	340205	555198	NO2	Yes, AQMA 2	0.0	3.0	NO	3.1
C1	LOWTHER ST	Roadside	340216	556131	NO2	NO	0.0	3.0	NO	2.9
C2	TOURIST INFO	Urban Centre	340069	555955	NO2	NO	N/A	N/A	NO	2.7
C3	DEVONSHIRE ST	Roadside	340218	555768	NO2	NO	0.0	3.0	NO	2.9
D12	POST OFFICE	Kerbside	340307	555718	NO2	NO	N/A	5.0	NO	3.0

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
D7	282 WARWICK RD	Roadside	341593	555893	NO2	NO	0.0	7.0	NO	2.8
E22	FINKLE ST	Roadside	339834	556137	NO2	NO	0.0	12.0	NO	2.8
E12	3 WIGTON RD	Roadside	339225	555821	NO2	NO	2.0	2.5	NO	3.0
E15	22 WIGTON RD	Roadside	339091	555736	NO2	NO	0.0	4.5	NO	3.9
E16	JOVIAL SAILOR	Roadside	339141	555900	NO2	NO	0.0	2.5	NO	2.7
E19	49 WIGTON RD	Roadside	338953	555610	NO2	NO	0.0	2.5	NO	3.1
E6, E61, E62	MORTON MANOR 3	Roadside	339467	555974	NO2	NO	6.0	8.0	Yes	2.4
E8	BRIDGE ST	Roadside	339516	556024	NO2	Yes, AQMA 4	0.0	4.0	NO	3.1
F10	155 BOTCHERGATE	Roadside	340600	555349	NO2	NO	0.0	3.0	NO	2.7
F7	24 LONDON RD	Roadside	340708	555240	NO2	NO	0.0	4.5	NO	2.7
F9	129 LONDON RD	Kerbside	341099	554931	NO2	NO	0.0	0.5	NO	3.0
G4	THE HOBBIT	Rural	336905	554036	NO2	NO	0.0	19.0	NO	2.9
H5	WIGTON RD	Roadside	337643	554100	NO2	NO	0.0	1.5	NO	2.4

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)
H6	PETER LANE	Roadside	337962	553220	NO2	NO	0.0	4.0	NO	2.4
H7	DALSTON RD	Roadside	338282	553396	NO2	NO	0.0	6.5	NO	2.4
H8	AIRPORT	Other	347874	561254	NO2	NO	0.0	2.0	NO	2.4
DT1, DT1B	Hall Park View, Workington	Kerbside	300721	528958	NO2	No	0.0	1.0	No	2.5
DT2, DT2B	Murray Road, Workington	Urban Centre	301194	528711	NO2	No	N/A	1.0	No	2.5
DT3, DT3B	Crown Street, Cockermouth	Kerbside	311652	530658	NO2	No	0.0	0.5	No	2.5
DT4, DT4B	Main Street, Keswick	Roadside	326419	523602	NO2	No	4.0	1.5	No	2.5
DT5, DT5B	Curzon Street, Maryport	Kerbside	303778	536534	NO2	No	5.0	1.0	No	2.5
DT6, DT6B	Ramsay Brow, Workington	Kerbside	300588	528682	NO2	No	0.0	1.0	No	2.5
DT7, DT7B	King Street, Wigton	Kerbside	325508	548419	NO2	No	2.0	1.0	No	2.5
DT8, DT8B	Main Road, High Harrington	Roadside	299591	525545	NO2	No	0.0	2.0	No	2.5
DT9, DT9B	Lawson Street, Aspatria	Kerbside	315299	542145	NO2	No	0.0	1.0	No	2.5
DT10, DT10B	South Street, Cockermouth	Kerbside	312091	530547	NO2	No	8.7	0.5	No	2.5

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
DT11, DT11B	Penrith Road, Keswick	Kerbside	327949	523764	NO2	No	7.0	1.0	No	2.5
DT12, DT12B	Northside Primary School, Northside	Kerbside	299939	529709	NO2	No	8.0	1.0	No	2.5
DT15, DT15B	Eden Street Silloth	Industrial	310949	553517	NO2	No	2.0	0.5	No	2.5
DT16, DT16B	Main Road Seaton	Kerbside	301765	530720	NO2	No	6.1	1.0	No	2.5
DT17, DT17B	South End Street Wigton	Urban Background	325568	547874	NO2	No	2.9	3.1	No	2.5
DT18, DT18B	West Street Aspatria	Roadside	314286	541751	NO2	No	15.0	2.0	No	2.5
DT19, DT19B	Marvejols Park Cockermouth	Suburban	311391	529810	NO2	No	4	1	No	2.5
DT20, DT20B	Eaglesfield Street Marypont	Urban Background	303720	536702	NO2	No	3	0	No	2.5
N1	55/56 Lowther St, Whitehaven	Urban Centre	297305	518185	NO2	NO	2.0	0.0	No	2.5
N2	Police Station, Scotch St, Whitehaven	Urban Centre	297515	518070	NO2	NO	4.0	1.0	No	2.5
N3	Fire Station, Hensingham	Urban Background	299020	517245	NO2	NO	20.0	20.0	No	2.5
N4	116 Holborn Hill, Millom	Urban Background	316725	480340	NO2	NO	1.0	1.0	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)
N5	Aldby Grove, Cleator Moor	Urban Background	302260	514890	NO2	NO	0.0	2.0	No	2.5
N6	White House, Strand St, Whitehaven	Urban Centre	297230	518155	NO2	NO	4.0	2.0	No	2.5
N7	Tourist Info, Main St, Egremont	Urban Centre	301095	510930	NO2	NO	5.0	3.0	No	2.5
N8	Presbytery, St Bridgets Ln, Egremont	Urban Background	300895	510695	NO2	NO	0.0	10.0	No	2.5
N9	Primary School, Ennerdale Bridge	Rural	307000	515855	NO2	NO	0.0	2.0	No	2.5
N10	Council Centre, St Georges Rd, Millom	Urban Centre	317310	479980	NO2	NO	40.0	2.0	No	2.5
N11	Opp JPJ, Strand St, Whitehaven	Urban Centre	297320	518280	NO2	NO	0.0	3.0	No	2.5
N12	2 The Crescent, Thornhill	Suburban	301225	508805	NO2	NO	4.0	0.0	No	2.5
N13	4 Holyoak, Beckermet	Rural	301975	506635	NO2	NO	3.0	0.0	No	2.5
N14	The Globe, The Square, Gosforth	Urban Background	306695	503535	NO2	NO	4.0	0.0	No	2.5
N15	21 Scafell Close, Seascale	Urban Background	304440	501495	NO2	NO	6.0	1.0	No	2.5
N16	Greendale Guest House, Wasdale	Rural	314410	505570	NO2	NO	30.0	18.0	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)
N17	Holmrook Service Station, Holmrook	Roadside	308235	499295	NO2	NO	30.0	5.0	No	2.5
N18	98 Main St, Distington	Urban Background	300590	523220	NO2	NO	0.0	2.0	No	2.5
N19	Railway Station, Bootle	Rural	309345	489300	NO2	NO	4.0	1.0	No	2.5
N20	King's Head, Bootle	Roadside	310735	488320	NO2	NO	6.0	2.0	No	2.5
N21	Nr Seascale Hall Farm, Seascale	Rural	303995	502445	NO2	NO	350.0	1.0	No	2.5
N22	Trinity Court, Scotch St, Whitehaven	Urban Centre	297440	517960	NO2	NO	2.0	0.0	No	2.5
N23	2a Main St, Distington	Roadside	300885	523890	NO2	NO	0.0	2.0	No	2.5
N24	New Lowther St, Whitehaven	Urban Centre	297260	518225	NO2	NO	3.0	1.0	No	2.5

Notes:

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

(2) N/A if not applicable.

Table A.3 - Annual Mean NO_2 Monitoring Results: Automatic Monitoring (µg m^{-3})

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2023 (%) (2)	2019	2020	2021	2022	2023
MMCC	338195	554990	Roadside	98.7	98.7				9.0	9.0

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

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

☒ **Where exceedances of the NO_2 annual mean objective occur at locations not representative of relevant exposure, the fall-off with distance concentration has been calculated and reported concentration provided in brackets for 2023.**

Notes:

The annual mean concentrations are presented as µg m^{-3}.

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

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%).

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 2023 (%) (2)	2019	2020	2021	2022	2023
A1	339995	557188	Roadside	90.4	90.4	31.7	23.3	25.5	23.6	22.1
A10	340008	556842	Roadside	80.8	80.8	36.7	24.9	30.5	28.7	28.6
A12	339935	557125	Roadside	100	100.0	28.7	20.8	24.3	22.3	20.5
A5	339758	558059	Roadside	100	100.0	31.5	21.4	25.2	23.8	21.5
A7	339526	559285	Roadside	100	100.0	20.7	14.1	17.1	15.5	14.2
A9	340028	556833	Roadside	100	100.0	32.7	23.0	26.9	26.1	24.3
B4	339434	555638	Roadside	100	100.0	38.7	28.3	32.9	29.3	28.1
B7	340205	555198	Roadside	100	100.0	38.1	27.0	30.4	28.8	26.8
C1	340216	556131	Roadside	100	100.0	27.6	19.7	22.1	22.1	20.9
C2	340069	555955	Urban Centre	100	100.0	17.8	11.5	13.2	13.0	12.9
C3	340218	555768	Roadside	100	100.0	27.5	18.6	22.8	20.8	19.9
D12	340307	555718	Kerbside	100	100.0	32.7	20.4	24.7	23.0	23.5
D7	341593	555893	Roadside	100	100.0	28.3	20.8	24.8	22.9	21.2
E22	339834	556137	Roadside	100	100.0	31.4	22.0	24.7	24.0	22.4
E12	339225	555821	Roadside	100	100.0	33.9	24.6	29.5	25.9	27.1
E15	339091	555736	Roadside	100	100.0	29.2	21.4	26.4	22.5	22.8
E16	339141	555900	Roadside	100	100.0	32.0	22.6	27.3	24.2	23.9
E19	338953	555610	Roadside	100	100.0	31.2	22.2	29.4	25.9	24.7
E6, E61, E62	339467	555974	Roadside	100	100.0			10.6	9.9	9.5
E8	339516	556024	Roadside	100	100.0	**42.7**	31.7	36.3	33.5	34.1
F10	340600	555349	Roadside	100	100.0	34.4	25.4	29.9	25.8	25.3
F7	340708	555240	Roadside	100	100.0	35.4	24.7	31.0	26.1	25.9
F9	341099	554931	Kerbside	100	100.0	31.4	23.6	28.9	27.1	25.6
G4	336905	554036	Rural	100	100.0	12.1	8.0	9.5	10.1	8.1
H5	337643	554100	Roadside	100	100.0	14.1	10.4	12.0	11.0	10.1
H6	337962	553220	Roadside	100	100.0	10.1	8.4	8.4	7.4	6.1
H7	338282	553396	Roadside	82.7	82.7	15.1	11.6	13.2	11.8	11.1
H8	347874	561254	Other	100	100.0	6.9	4.8	5.5	5.6	4.9

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 2023 (%) [2]	2019	2020	2021	2022	2023
DT1, DT1B	300721	528958	Kerbside	100.0	100.0	16.2	13.0	13.1	11.6	11.6
DT2, DT2B	301194	528711	Urban Centre	92.3	92.3	25.0	21.6	21.8	22.0	22.9
DT3, DT3B	311652	530658	Kerbside	100.0	100.0	19.8	15.0	16.9	15.2	14.0
DT4, DT4B	326419	523602	Roadside	100.0	100.0	25.5	18.4	21.1	21.6	19.9
DT5, DT5B	303778	536534	Kerbside	92.3	92.3	23.9	19.7	19.1	20.0	18.9
DT6, DT6B	300588	528682	Kerbside	100.0	100.0	28.5	22.4	22.3	22.9	21.0
DT7, DT7B	325508	548419	Kerbside	100.0	100.0	23.7	19.9	20.0	19.3	17.3
DT8, DT8B	299591	525545	Roadside	100.0	100.0	16.2	12.6	12.5	12.5	10.1
DT9, DT9B	315299	542145	Kerbside	100.0	100.0	16.0	13.0	12.9	12.5	11.6
DT10, DT10B	312091	530547	Kerbside	100.0	100.0	16.5	12.5	11.7	12.5	12.9
DT11, DT11B	327949	523764	Kerbside	100.0	100.0	21.7	20.2	13.1	14.8	14.1
DT12, DT12B	299939	529709	Kerbside	63.5	63.5	12.2	10.0	9.7	11.8	12.7
DT15, DT15B	310949	553517	Industrial	100.0	100.0			8.3	7.9	7.1
DT16, DT16B	301765	530720	Kerbside	92.3	92.3			9.0	8.8	9.3
DT17, DT17B	325568	547874	Urban Background	100.0	100.0			8.1	7.2	7.0
DT18, DT18B	314286	541751	Roadside	100.0	100.0			12.1	13.4	13.9
DT19, DT19B	311391	529810	Suburban	92.0	92.0					5.5
DT20, DT20B	303720	536702	Urban Background	92.9	92.9					6.2
N1	297305	518185	Urban Centre	100.0	100.0	15.2	10.2	13.5	13.4	12.5
N2	297515	518070	Urban Centre	100	100.0	20.9	12.2	13.6	12.0	11.8
N3	299020	517245	Urban Background	100	100.0	7.3	6.0	6.2	5.7	5.1
N4	316725	480340	Urban Background	100	100.0	9.5	5.8	6.3	6.0	5.7
N5	302260	514890	Urban Background	75	75.0	10.0	7.4	7.9	6.9	6.9
N6	297230	518155	Urban Centre	100	100.0	17.9	12.0	11.8	12.2	11.6
N7	301095	510930	Urban Centre	100	100.0	17.0	12.4	13.5	12.5	11.6
N8	300895	510695	Urban Background	100	100.0	6.2	5.1	5.1	4.9	4.9
N9	307000	515855	Rural	100	100.0	5.5	3.8	4.2	3.7	3.5
N10	317310	479980	Urban Centre	92.3	92.3	9.9	7.4	8.0	7.3	6.0
N11	297320	518280	Urban Centre	100	100.0	20.9	15.4	17.5	16.8	15.6
N12	301225	508805	Suburban	100	100.0	6.0	5.3	5.9	5.8	5.9
N13	301975	506635	Rural	100	100.0	6.1	5.4	4.9	5.0	6.4
N14	306695	503535	Urban Background	100	100.0	12.7	7.4	8.6	9.3	8.5
N15	304440	501495	Urban Background	100	100.0	5.2	4.1	3.6	3.9	4.2

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 2023 (%) (2)	2019	2020	2021	2022	2023
N16	314410	505570	Rural	100	100.0	3.1	2.2	2.0	2.2	2.1
N17	308235	499295	Roadside	100	100.0	6.3	4.9	5.4	5.2	4.8
N18	300590	523220	Urban Background	100	100.0	8.6	7.0	7.6	7.5	6.8
N19	309345	489300	Rural	100	100.0	5.5	4.0	3.9	4.1	3.7
N20	310735	488320	Roadside	100	100.0	9.2	7.0	6.9	6.7	6.4
N21	303995	502445	Rural	100	100.0	5.5	3.8	3.7	3.6	3.1
N22	297440	517960	Urban Centre	100	100.0	13.2	9.7	11.4	10.4	9.6
N23	300885	523890	Roadside	100	100.0	17.5	13.5	14.7	14.5	15.3
N24	297260	518225	Urban Centre	100	100.0	16.1	11.0	12.0	12.0	11.3

☒ **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 40 µg 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.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 NO_2 Concentrations: Automatic monitoring at Morton Manor

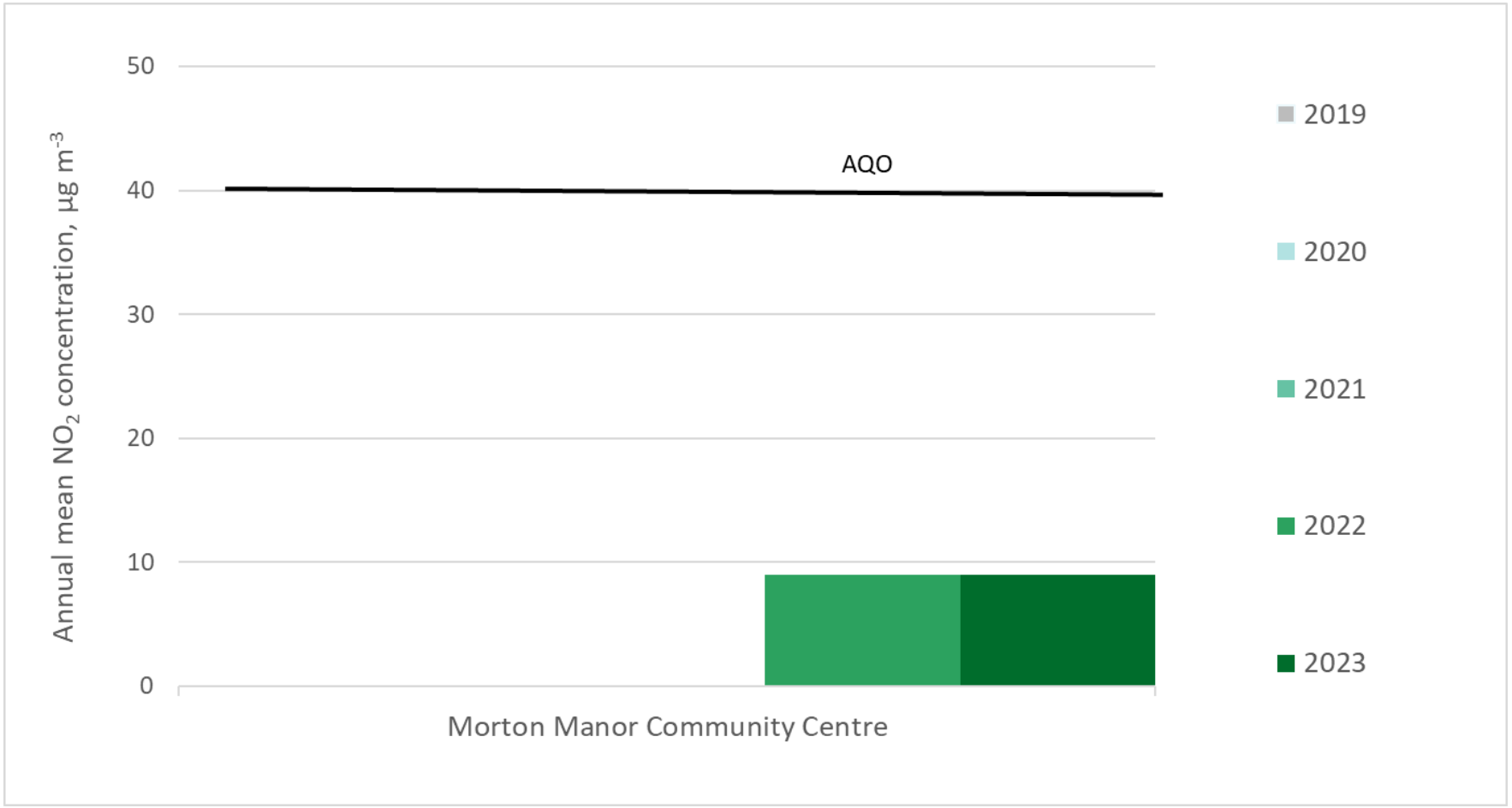


Table A.5 - 1-Hour Mean NO_2 Monitoring Results, Number of 1-Hour Means > 200 µg m^{-3}

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2023 (%) (2)	2019	2020	2021	2022	2023
MMCC	338195	554990	Roadside	98.7	98.7				0	0

Notes:

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

Exceedances of the NO_2 1-hour mean objective (200 µg 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%).

Figure A.2 - Trends in Annual Mean NO_2 Concentrations: Along A7

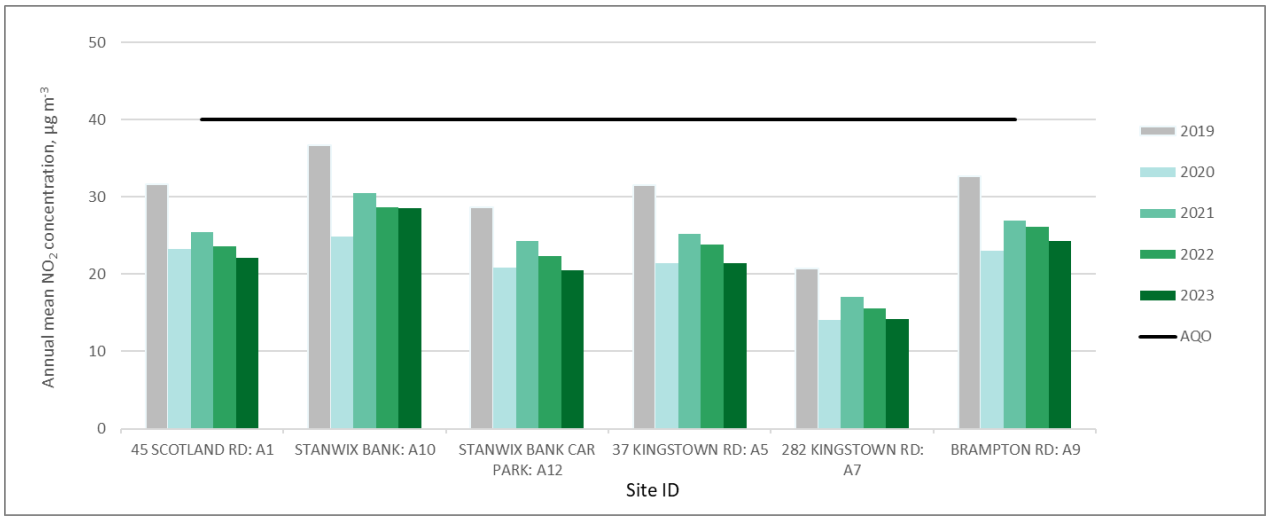


Figure A.3 - Trends in Annual Mean NO_2 Concentrations: for sites in city centre and within AQMA 2 and AQMA 5

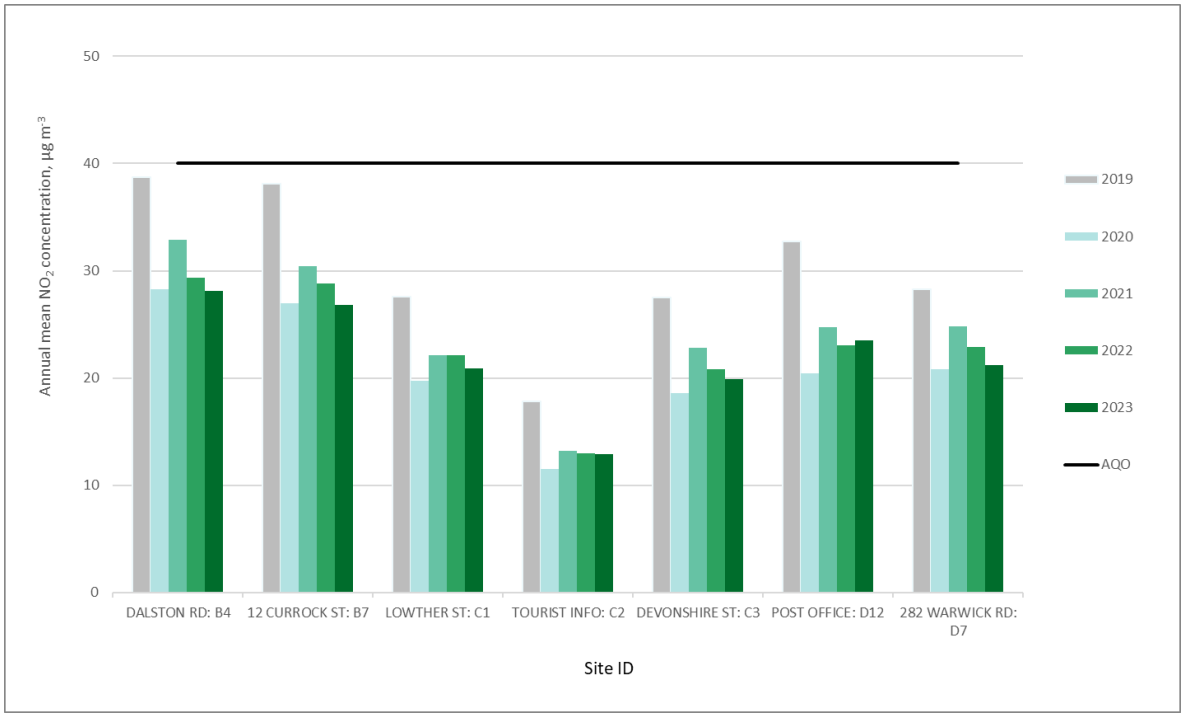


Figure A.4 - Trends in annual mean NO_2: along Wigton Road, Bridge Street and London Road

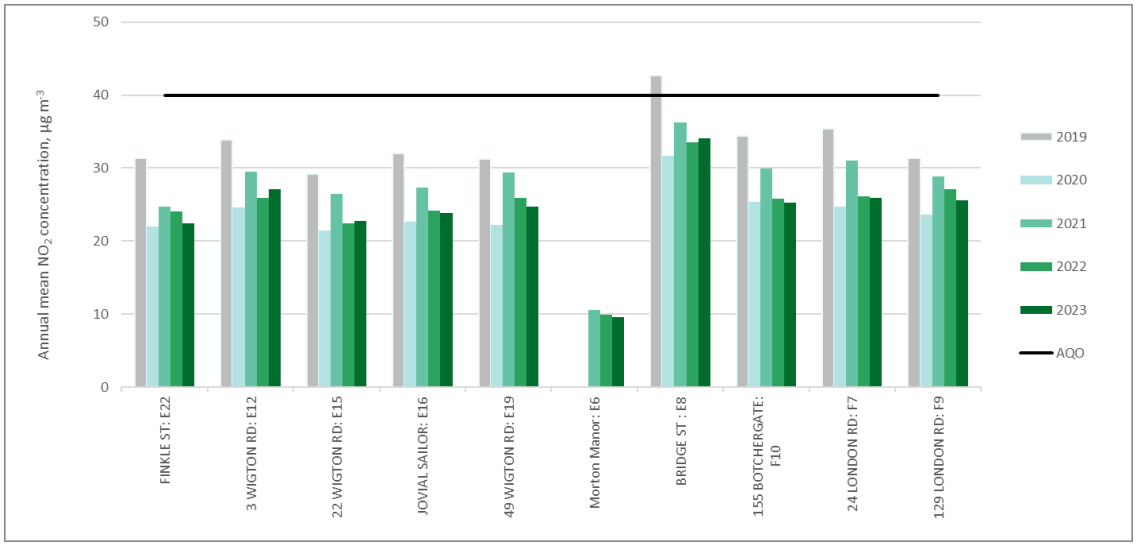


Figure A.5 - Trends in annual mean NO_2: Carlisle Northern Development Route and various other locations

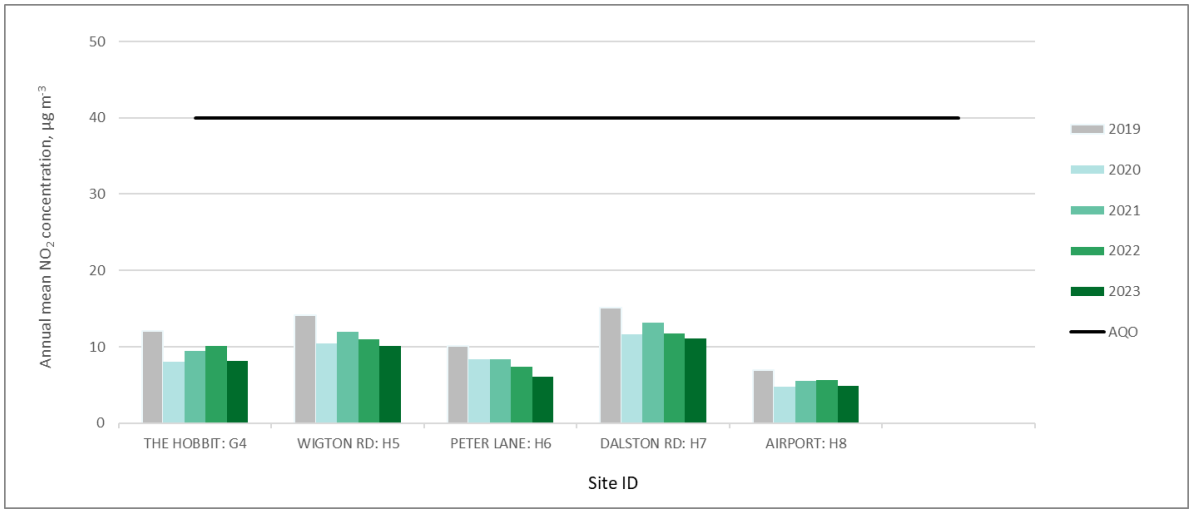


Figure A.6 - Trends in annual mean NO_2 concentrations in the former council area of Allerdale BC

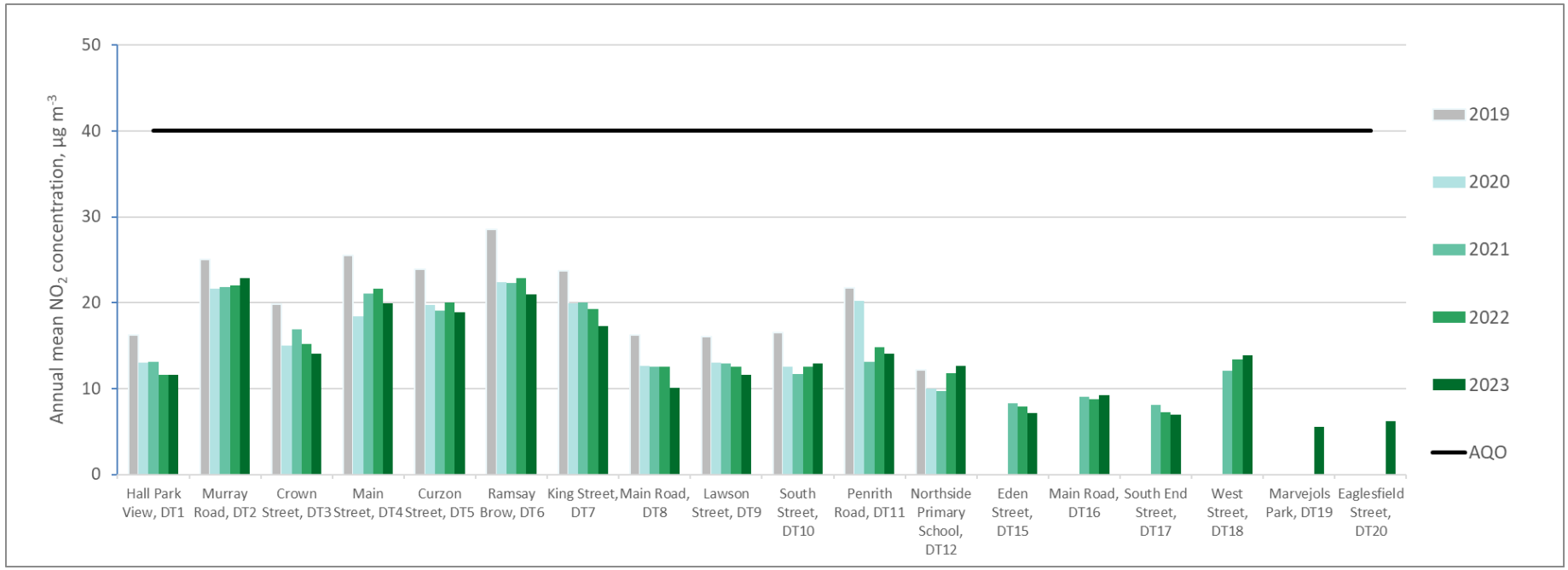


Figure A.7 - Trends in annual mean NO_2 concentrations in the former council area of Copeland BC

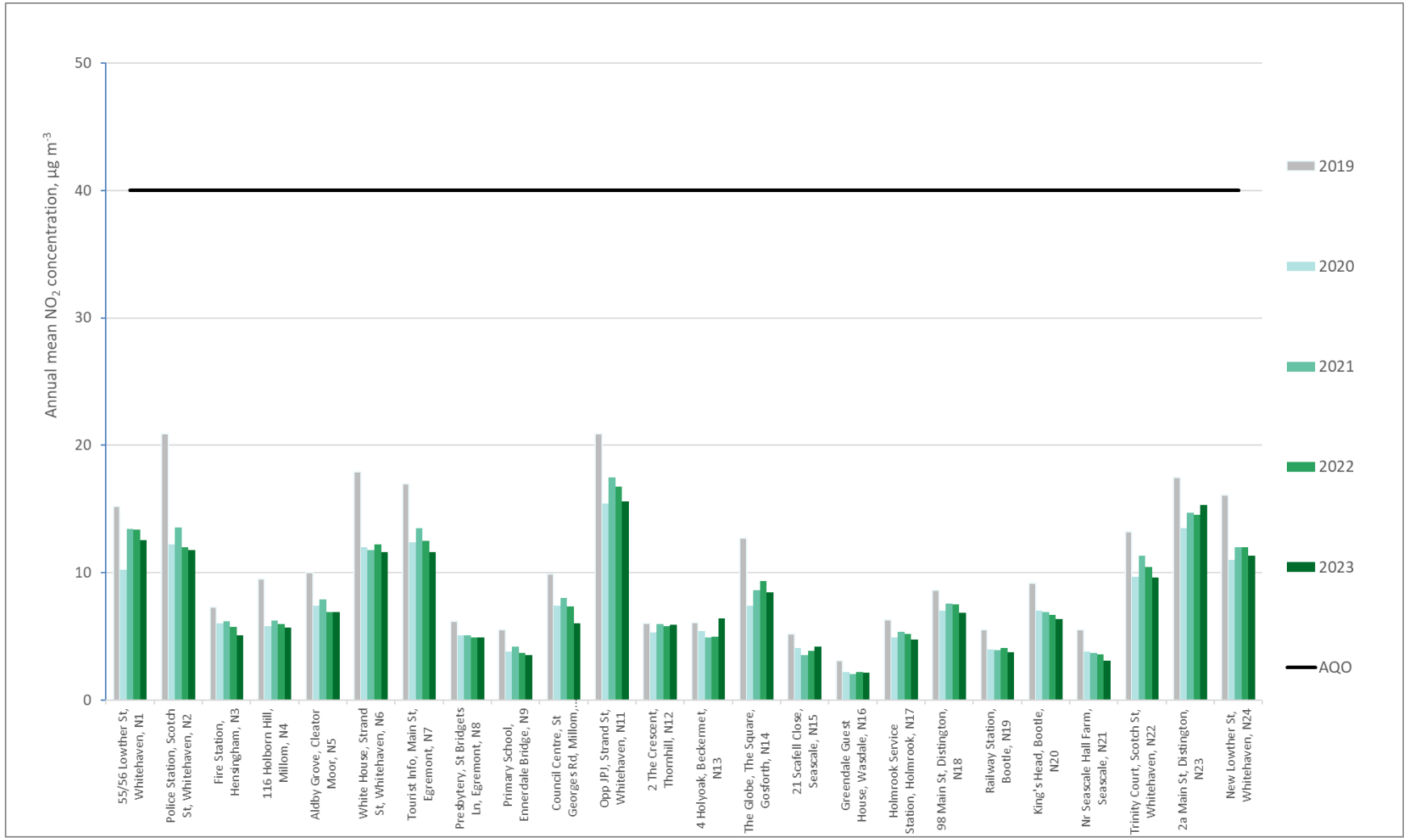


Table A.6 - Annual Mean PM_{10} Monitoring Results (µg m^{-3})

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2023 (%) (2)	2019	2020	2021	2022	2023
MMCC	338195	554990	Roadside	94.5	94.5				14.3	11.8

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

Notes:

The annual mean concentrations are presented as µg m^{-3}.

Exceedances of the PM_{10} annual mean objective of 40 µg m^{-3} are shown in **bold**.

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.

(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.8 - Trends in Annual Mean PM_{10} Concentrations

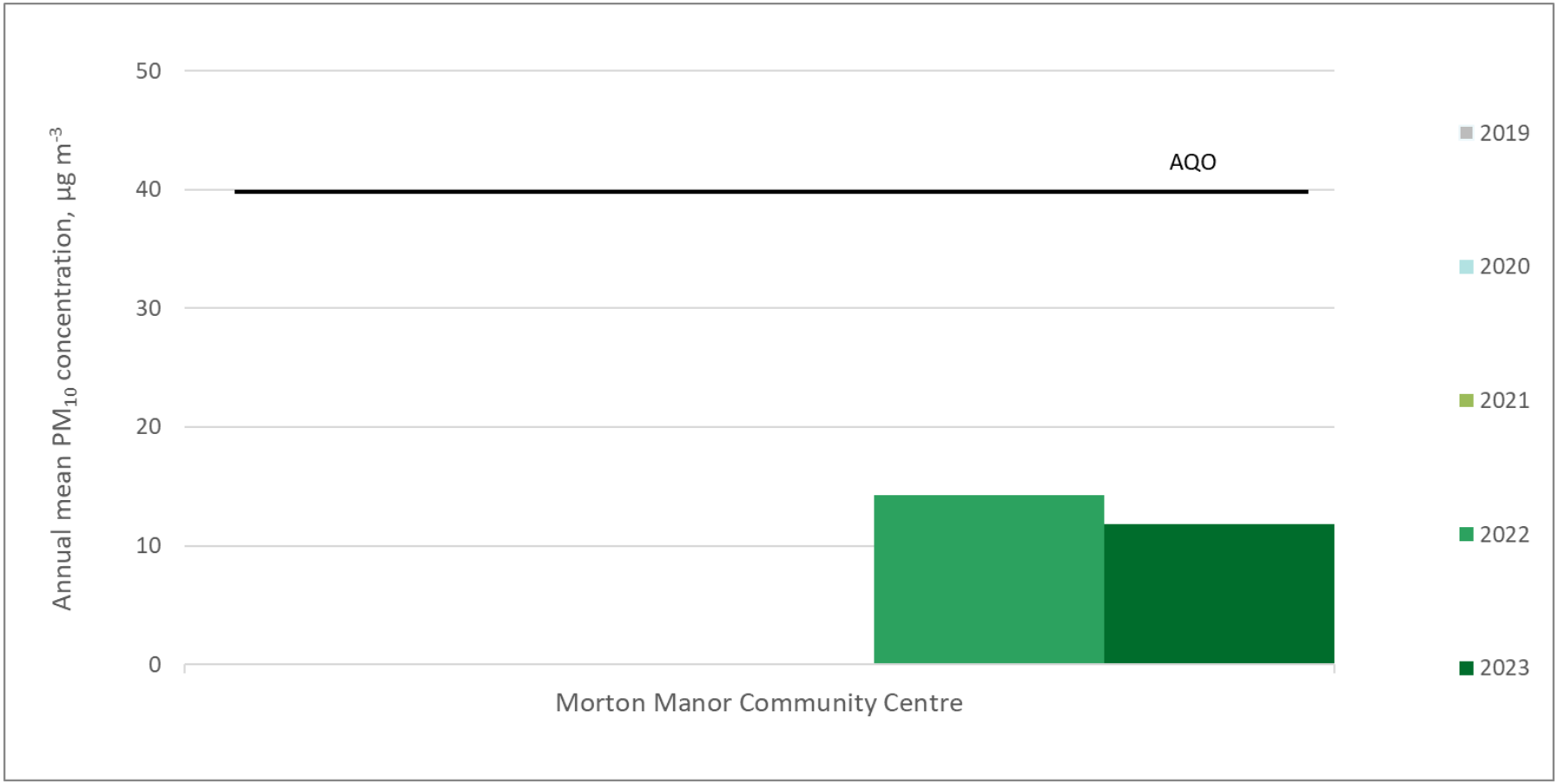


Table A.7 - 24-Hour Mean PM_{10} Monitoring Results, Number of PM_{10} 24-Hour Means > 50 µg m^{-3}

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2023 (%) (2)	2019	2020	2021	2022	2023
MMCC	338195	554990	Roadside	94.5	94.5				1	0

Notes:

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

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

If the period of valid data is less than 85%, the 90.4th percentile of 24-hour means is provided in brackets.

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

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

Figure A.9 - Trends in Number of 24-Hour Mean PM_{10} Results > 50 µg m^{-3}

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 2023 (%) (2)	2019	2020	2021	2022	2023
MMCC	338195	554990	Roadside	95.4	95.4				9.3	7.9

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

Notes:

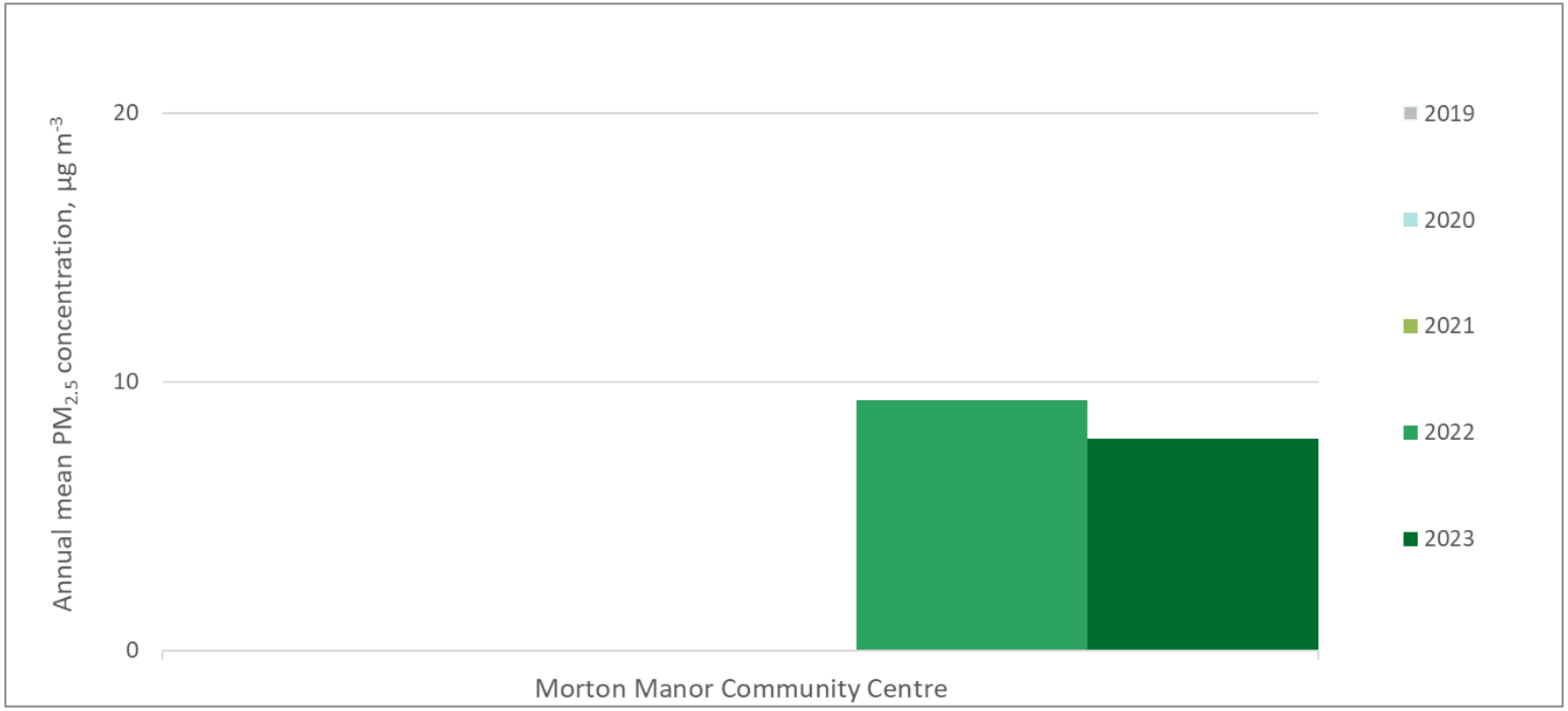
The annual mean concentrations are presented as µg m^{-3}.

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.

(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.10 - Trends in Annual Mean $PM_{2.5}$ Concentrations



Appendix B: Full Monthly Diffusion Tube Results for 2023

Table B.1 – NO_2 2023 Diffusion Tube Results (µg m^{-3})

(Awaiting confirmation of coordinates for sites in Copeland before progressing.

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 CCC = 0.81 ABC = 0.77 CBC = 0.83	Annual Mean: Distance Corrected to Nearest Exposure	Comment
A1	339995	557188	44.1	29.8	31.6	25.7	24.0	19.5	24.4	22.5	27.7	24.7		26.5	27.3	22.1	-	
A10	340008	556842	34.7	34.7	41.4	43.5	31.7	38.1	29.0		35.1	34.1		30.2	35.3	28.6	-	
A12	339935	557125	34.7	29.9	13.8	28.8	24.9	22.5	23.9	21.1	26.3	21.9	33.0	23.5	25.3	20.5	-	
A5	339758	558059	35.2	31.9	27.0	25.2	24.1	19.2	25.0	22.5	26.9	23.4	31.2	26.5	26.5	21.5	-	
A7	339526	559285	24.8	20.9	19.4	15.4	16.0	12.1	15.4	14.2	15.9	15.4	23.6	17.2	17.5	14.2	-	
A9	340028	556833	36.8	33.6	32.2	31.0	32.1	27.2	26.3	26.2	28.6	26.6	35.2	24.6	30.0	24.3	-	
B4	339434	555638	39.9	38.8	39.9	35.2	32.3	29.2	29.4	30.1	32.5	35.1	41.1	32.8	34.7	28.1	-	
B7	340205	555198	42.1	39.1	38.0	37.2	31.4	25.7	31.1	29.5	30.9	27.7	37.2	27.8	33.1	26.8	-	
C1	340216	556131	29.9	28.5	28.6	27.0	21.4	24.5	21.9	21.5	25.3	26.3	31.1	23.9	25.8	20.9	-	
C2	340069	555955	21.2	17.1	16.8	16.2	10.5	11.2	9.6	11.0	12.3	15.3	22.2	28.3	16.0	12.9	-	
C3	340218	555768	27.5	26.1	26.8	27.5	23.7	24.4	19.9	20.9	24.0	22.8	28.7	22.0	24.5	19.9	-	
D12	340307	555718	35.9	33.1	30.1	26.9	25.7	24.3	25.4	23.7	29.8	30.1	33.1	30.5	29.0	23.5	-	
D7	341593	555893	34.0	29.7	26.8	22.7	21.9	22.2	26.4	22.4	27.1	25.8	29.4	25.2	26.1	21.2	-	
E22	339834	556137	36.0	31.0	30.0	29.1	24.5	23.8	24.8	22.2	26.6	26.3	31.5	26.9	27.7	22.4	-	
E12	339225	555821	33.8	34.3	35.9	36.5	31.6	37.1	30.6	29.2	32.8	33.9	37.1	28.0	33.4	27.1	-	
E15	339091	555736	32.0	32.0	30.4	30.5	26.6	24.8	23.1	24.2	23.5	30.8	35.1	24.5	28.1	22.8	-	
E16	339141	555900	31.8	28.9	33.3	35.0	29.8	34.1	21.6	23.9	27.5	30.0	33.3	24.5	29.5	23.9	-	
E19	338953	555610	33.4	33.2	34.8	35.6	27.8	31.0	17.0	25.1	29.1	32.7	37.4	28.2	30.4	24.7	-	
E6	339467	555974	15.1	13.5	12.6	11.4	9.7	8.8	7.9	8.2	9.5	12.7	18.6	11.9	-	-	-	Triplicate Site with E6, E61 and E62 - Annual data provided for E62 only
E61	339467	555974	14.1	14.1	12.8	11.5	9.8	7.6	8.4	8.4	10.3	13.3	19.7	11.4	-	-	-	Triplicate Site with E6, E61 and E62 - Annual data provided for E62 only
E62	339467	555974	14.8	13.9	13.4	11.5	9.6	8.3	8.2	8.7	9.6	12.8	19.8	12.1	11.8	9.5	-	Triplicate Site with E6, E61 and E62 - Annual data provided for E62 only

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 CCC = 0.81 ABC = 0.77 CBC = 0.83	Annual Mean: Distance Corrected to Nearest Exposure	Comment
E8	339516	556024	43.8	44.9	50.3	49.9	42.1	47.0	34.8	35.2	38.2	41.6	44.6	32.8	42.1	34.1	-	
F10	340600	555349	34.4	28.7	34.3	35.1	31.9	29.4	25.7	27.7	30.5	32.3	38.1	26.7	31.2	25.3	-	
F7	340708	555240	38.8	34.8	33.9	33.2	32.1	26.8	26.6	28.1	31.9	30.9	36.9	29.6	32.0	25.9	-	
F9	341099	554931	33.1	31.0	32.5	36.7	32.9	30.4	25.6	26.9	30.0	32.9	40.1	26.5	31.6	25.6	-	
G4	336905	554036	13.9	10.9	10.2	8.5	8.2	7.9	7.3	8.1	9.1	10.9	14.9	10.4	10.0	8.1	-	
H5	337643	554100	17.3	15.7	14.5	13.0	9.5	7.1	8.1	8.8	9.8	12.3	20.0	13.6	12.5	10.1	-	
H6	337962	553220	7.9	5.2	5.8	6.3	7.2	8.4	5.3	6.6	7.0	11.0	12.4	7.5	7.6	6.1	-	
H7	338282	553396	15.8	11.7	13.2	13.6	10.7			10.0	13.8	16.7	19.8	12.0	13.7	11.1	-	
H8	347874	561254	8.7	6.7	4.8	4.6	4.7	6.3	4.5	5.5	5.4	7.1	8.1	5.6	6.0	4.9	-	
DT1	300721	528958	13.0	16.9	18.5	15.4	13.1	14.2	9.2	11.0	13.4	15.4	19.4	14.4	-	-	-	Duplicate Site with DT1 and DT1B - Annual data provided for DT1B only
DT1B	300721	528958	18.4	19.5	18.3	15.8	13.4	16.1	10.2	10.9	13.0	17.1	20.6	a	15.1	11.6	-	Duplicate Site with DT1 and DT1B - Annual data provided for DT1B only
DT2	301194	528711		18.6	27.7		33.2	34.7	27.7	28.8	32.5	24.5			-	-	-	Duplicate Site with DT2 and DT2B - Annual data provided for DT2B only
DT2B	301194	528711	35.3	34.8	27.0	28.2	32.5	32.5	27.5	26.0	27.4	29.9	30.3	a	29.7	22.9	-	Duplicate Site with DT2 and DT2B - Annual data provided for DT2B only
DT3	311652	530658	16.4	21.4	18.9	a	18.1	20.3	14.0	18.0	18.5	12.0	24.1	16.8	-	-	-	Duplicate Site with DT3 and DT3B - Annual data provided for DT3B only
DT3B	311652	530658	7.0	21.7	24.5	18.6	18.8	21.3	11.1	16.4	18.9	17.1	26.3	19.1	18.2	14.0	-	Duplicate Site with DT3 and DT3B - Annual data provided for DT3B only
DT4	326419	523602	28.5	25.5	27.4	26.3	25.4	24.2	23.1	a	26.4	26.5	21.7	23.7	-	-	-	Duplicate Site with DT4 and DT4B - Annual data provided for DT4B only
DT4B	326419	523602	24.4	26.8	27.8	25.1	26.2	24.9	25.3	29.2	26.0	26.3	27.8	23.3	25.9	19.9	-	Duplicate Site with DT4 and DT4B - Annual data provided for DT4B only
DT5	303778	536534	27.1	31.3	25.5	a	22.8	24.9	18.0	21.5	25.4	25.0	26.6	23.0	-	-	-	Duplicate Site with DT5 and DT5B - Annual data provided for DT5B only
DT5B	303778	536534	26.8	29.7	24.4	a	23.4	20.4	20.6	21.0	23.2	25.5	29.1	24.7	24.5	18.9	-	Duplicate Site with DT5 and DT5B - Annual data provided for DT5B only
DT6	300588	528682	33.9	36.9	33.5	17.0	25.9	30.7	28.0	19.7	32.4	24.0	14.3	26.6	-	-	-	Duplicate Site with DT6 and DT6B - Annual data provided for DT6B only
DT6B	300588	528682	28.3	34.8	32.9	31.1	26.9	26.9	25.5	23.8	29.7	30.5	12.6	28.9	27.3	21.0	-	Duplicate Site with DT6 and DT6B - Annual data provided for DT6B only

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 CCC = 0.81 ABC = 0.77 CBC = 0.83	Annual Mean: Distance Corrected to Nearest Exposure	Comment
DT7	325508	548419	19.8	26.8	26.7	20.1	24.3	21.4	15.9	21.7	19.6	10.4	29.4	28.2	-	-	-	Duplicate Site with DT7 and DT7B - Annual data provided for DT7B only
DT7B	325508	548419	27.8	30.0	24.2	a	23.1	18.4	18.7	26.5	20.8	23.2	24.4	16.3	22.4	17.3	-	Duplicate Site with DT7 and DT7B - Annual data provided for DT7B only
DT8	299591	525545	14.1	8.0	18.2	14.2	10.5	15.8	8.7	14.0	9.8	18.3	a	13.4	-	-	-	Duplicate Site with DT8 and DT8B - Annual data provided for DT8B only
DT8B	299591	525545	14.2	7.9	14.8	13.1	10.6	15.1	8.1	14.0	14.4	21.0	12.1	12.4	13.1	10.1	-	Duplicate Site with DT8 and DT8B - Annual data provided for DT8B only
DT9	315299	542145	17.8	19.0	16.6	14.3	15.2	12.6	12.2	13.7	15.1	11.3	17.8	13.3	-	-	-	Duplicate Site with DT9 and DT9B - Annual data provided for DT9B only
DT9B	315299	542145	18.6	19.4	15.5	12.1	16.1	15.5	10.5	12.8	15.1	12.8	19.2	14.4	15.0	11.6	-	Duplicate Site with DT9 and DT9B - Annual data provided for DT9B only
DT10	312091	530547	18.5	15.4	17.6	12.2	13.9	14.4	10.4	13.1	15.0	21.7	27.7	16.7	-	-	-	Duplicate Site with DT10 and DT10B - Annual data provided for DT10B only
DT10 B	312091	530547	19.2	17.2	21.8	16.3	15.3	15.4	10.3	13.1	15.1	22.6	23.7	16.9	16.8	12.9	-	Duplicate Site with DT10 and DT10B - Annual data provided for DT10B only
DT11	327949	523764	14.2	17.0	18.8	20.4	16.3	22.0	14.0	17.4	21.4	18.9	22.3	15.2	-	-	-	Duplicate Site with DT11 and DT11B - Annual data provided for DT11B only
DT11 B	327949	523764	15.2	17.7	19.2	17.5	15.7	a	13.5	18.4	19.1	22.7	25.2	14.9	18.3	14.1	-	Duplicate Site with DT11 and DT11B - Annual data provided for DT11B only
DT12	299939	529709	14.9	16.5	a	23.6	a	a	20.9	a	13.3	11.0	30.5	13.1	-	-	-	Duplicate Site with DT12 and DT12B - Annual data provided for DT12B only
DT12 B	299939	529709	14.5	14.9	a	26.6	a	a	21.1	a	10.6	10.2	32.1	11.2	17.8	12.7	-	Duplicate Site with DT12 and DT12B - Annual data provided for DT12B only
DT15	310949	553517	4.4	13.9	12.7	13.8	5.3	5.0	8.4	a	10.3	8.7	12.4	9.6	-	-	-	Duplicate Site with DT15 and DT15B - Annual data provided for DT15B only
DT15 B	310949	553517	4.1	12.9	10.5	11.0	5.0	5.9	2.4	10.1	9.5	11.0	14.6	10.1	9.2	7.1	-	Duplicate Site with DT15 and DT15B - Annual data provided for DT15B only
DT16	301765	530720	6.1	15.4	13.2	a	10.4	11.6	9.7	8.1	11.7	11.3	22.5	5.7	-	-	-	Duplicate Site with DT16 and DT16B - Annual data provided for DT16B only
DT16 B	301765	530720	7.0	14.4	14.0	a	10.9	12.2	11.6	9.5	12.6	13.0	23.0	10.7	12.0	9.3	-	Duplicate Site with DT16 and DT16B - Annual data provided for DT16B only
DT17	325568	547874	3.8	10.5	9.3	12.3	7.9	9.1	5.3	7.0	8.5	12.0	12.9	8.7	-	-	-	Duplicate Site with DT17 and DT17B - Annual data provided for DT17B only
DT17 B	325568	547874	4.7	10.4	11.7	10.2	7.0	7.9	5.8	6.7	9.0	12.6	14.7	9.6	9.1	7.0	-	Duplicate Site with DT17 and DT17B - Annual data provided for DT17B only

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 CCC = 0.81 ABC = 0.77 CBC = 0.83	Annual Mean: Distance Corrected to Nearest Exposure	Comment
DT18	314286	541751	11.4	20.7	20.0	10.9	16.6	20.9	14.7	18.6	18.9	19.2	21.4	17.0	-	-	-	Duplicate Site with DT18 and DT18B - Annual data provided for DT18B only
DT18 B	314286	541751	12.0	23.5	21.8	15.0	18.7	20.2	14.0	17.4	19.1	19.9	21.8	18.2	18.0	13.9	-	Duplicate Site with DT18 and DT18B - Annual data provided for DT18B only
DT19	311391	529810	7.2	10.9	7.2	7.2	5.2	4.9	3.9	6.1	8.0	a	12.3	6.8	-	-	-	Duplicate Site with DT19 and DT19B - Annual data provided for DT19B only
DT19 B	311391	529810	5.9	9.9	7.2	6.1	5.0	5.1	3.5	5.9	7.4	a	13.0	8.2	7.1	5.5	-	Duplicate Site with DT19 and DT19B - Annual data provided for DT19B only
DT20	303720	536702	a	10.3	11.1	6.6	9.3	8.9	4.3	5.5	6.5	8.8	10.4	7.9	-	-	-	Duplicate Site with DT20 and DT20B - Annual data provided for DT20B only
DT20 B	303720	536702	a	9.6	8.0	7.3	8.1	9.4	4.1	5.2	7.1	8.3	10.9	8.3	8.0	6.2	-	Duplicate Site with DT20 and DT20B - Annual data provided for DT20B only
N1	297305	518185	14.3	15.7	15.2	17.5	15.4	15.1	10.5	14.2	13.8	15.0	20.3	14.2	15.1	12.5	-	
N2	297515	518070	15.5	16.4	14.6	15.8	12.8	13.4	10.8	12.6	13.0	14.8	17.3	13.4	14.2	11.8	-	
N3	299020	517245	6.8	7.4	7.5	5.9	4.9	5.4	4.9	4.6	5.7	6.3	8.2	6.1	6.1	5.1	-	
N4	316725	480340	9.8	9.6	8.0	6.2	5.7	5.6	4.5	4.2	5.5	7.3	8.0	8.1	6.9	5.7	-	
N5	302260	514890	a	9.7	9.2	8.1	8.0	7.7	6.3	a	a	7.9	9.7	8.4	8.3	6.9	-	
N6	297230	518155	15.7	17.6	17.6	13.9	10.6	13.0	10.9	7.2	14.1	15.4	18.2	13.9	14.0	11.6	-	
N7	301095	510930	15.5	17.9	17.0	15.0	12.3	11.9	9.8	10.9	13.6	13.7	17.3	12.7	14.0	11.6	-	
N8	300895	510695	7.2	6.8	6.2	4.9	3.7	3.8	3.2	11.4	4.5	5.1	8.3	5.9	5.9	4.9	-	
N9	307000	515855	5.0	5.2	4.9	4.5	3.4	4.3	3.1	3.5	3.3	4.2	5.5	4.2	4.3	3.5	-	
N10	317310	479980	10.9	10.9	8.8	9.0	6.7	6.8	4.4	3.2	5.8	8.0	5.6	a	7.3	6.0	-	
N11	297320	518280	19.1	25.3	23.8	22.9	17.0	15.9	16.8	6.0	18.8	21.2	21.1	17.5	18.8	15.6	-	
N12	301225	508805	8.7	8.4	7.5	5.9	4.9	5.2	3.3	16.2	5.3	5.9	7.1	6.8	7.1	5.9	-	
N13	301975	506635	37.0	6.8	6.6	5.4	4.7	4.5	2.9	4.2	4.7	4.5	6.7	4.8	7.7	6.4	-	
N14	306695	503535	12.8	11.6	11.0	10.9	10.6	11.5	8.6	3.3	10.8	10.8	11.0	9.5	10.2	8.5	-	
N15	304440	501495	5.4	5.7	5.2	4.4	6.4	4.3	2.5	8.4	4.3	4.0	5.3	5.0	5.1	4.2	-	
N16	314410	505570	2.4	2.8	2.6	2.3	1.9	2.8	2.5	2.6	2.7	2.5	2.8	2.9	2.6	2.1	-	
N17	308235	499295	7.9	6.6	6.4	5.9	7.8	5.0	4.2	1.8	5.0	5.0	8.2	5.2	5.8	4.8	-	
N18	300590	523220	10.7	11.1	9.8	8.0	4.6	7.9	6.6	7.1	8.1	7.9	9.6	7.3	8.2	6.8	-	
N19	309345	489300	5.9	6.4	5.3	4.2	3.7	3.8	3.1	3.1	3.8	4.6	5.7	4.4	4.5	3.7	-	

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 CCC = 0.81 ABC = 0.77 CBC = 0.83	Annual Mean: Distance Corrected to Nearest Exposure	Comment
N20	310735	488320	9.2	10.9	9.9	6.5	6.8	6.2	6.3	5.7	7.5	6.7	8.9	7.3	7.7	6.4	-	
N21	303995	502445	4.8	0.9	8.1	3.6	3.3	3.8	2.9	2.6	3.3	3.2	4.0	3.9	3.7	3.1	-	
N22	297440	517960	14.1	15.0	12.7	11.1	9.1	9.1	7.1	8.9	9.9	13.5	16.6	11.8	11.6	9.6	-	
N23	300885	523890	21.3	17.3	19.7	21.2	20.9	22.4	14.7	15.7	15.3	17.3	20.4	15.4	18.5	15.3	-	
N24	297260	518225	12.3	17.7	17.8	14.0	9.6	9.8	10.6	10.1	13.2	18.2	17.1	13.0	13.6	11.3	-	

☐ **Local bias adjustment factor used.**

☒ **National bias adjustment factor used.**

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

☒ **Cumberland Council confirm that all 2023 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System.**

Notes:

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

NO_2 annual means exceeding 60 µg 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 Cumberland Council During 2023

Cumberland Council has not identified any new sources relating to air quality within the reporting year of 2023.

Additional Air Quality Works Undertaken by Cumberland Council During 2023

Cumberland Council has not completed any additional works within the reporting year of 2023.

QA/QC of Diffusion Tube Monitoring

As discussed previously Cumberland Council replaced Cumbria County Council and the three local authorities: Carlisle City Council (CCC), Allerdale Borough Council (ABC) and Copeland Borough Council (CBC) on 1st April 2023. Each former local authority used a different combination of analytical laboratory or NO_2 absorbent for the analysis of the diffusion tubes. This section provides detail relating to the following aspects of non-automatic monitoring using diffusion tubes.

Diffusion tube supplier

The analytical laboratories and NO_2 absorbent used in 2023 are listed below:

Former local authority	Analytical laboratory	NO_2 absorbent
Carlisle City Council	Gradko	20 % TEA in water
Allerdale Borough Council	Socotec	50% TEA in Acetone
Copeland Borough Council	Gradko	50% TEA in Acetone

Both analytical laboratories also participate in the AIR-PT analysis scheme[12]. This is an independent analytical proficiency-testing scheme, operated by LGC Standards and

[12] LGC. Summary of Laboratory Performance in AIR NO2 Proficiency Testing Scheme (September 2021 – October 2023) at https://laqm.defra.gov.uk/wp-content/uploads/2023/11/LAQM-NO2-Performance-data_Up-to-Oct-2023_V1_Final.pdf

supported by the Health and Safety Laboratory (HSL). Defra and the Devolved Administrations advise that diffusion tubes used for Local Air Quality management (LAQM) should be obtained from laboratories that have demonstrated satisfactory performance in the AIR NO_2 PT scheme. Results for recent analytical laboratory performance are summarised below:

AIR PT Round	AIR PT AR053	AIR PT AR055	AIR PT AR056	AIR PT AR058	AIR PT AR059
Period	September – October 2022	January – February 2023	May – June 2023	July – August 2023	September – October 2023
Socotec UK Limited	100%	100%	100%	100%	100%
Gradko International Ltd	100%	100%	100%	100%	100%

For those reporting periods in 2023 for which Gradko and Socotec reported results all were considered satisfactory (based on z-scores less than or equal to 2).

Diffusion Tube Calendar

The diffusion tube calendars used by the CCC and CBC matched the LAQM calendar. The calendar for ABC did not deviate from significantly from the LAQM calendar. The tube on and off dates are provided below:

Month	Tube On	Tube Off
Jan	04/01/2023	30/01/2023
Feb	30/01/2023	27/02/2023
Mar	27/02/2023	05/04/2023
Apr	05/04/2023	03/05/2023
May	03/05/2023	01/06/2023
Jun	01/06/2023	03/07/2023
Jul	03/07/2023	02/08/2023
Aug	02/08/2023	06/09/2023
Sep	06/09/2023	04/10/2023
Oct	04/10/2023	02/11/2023
Nov	02/11/2023	06/12/2023
Dec	06/12/2023	03/01/2024

Diffusion Tube Annualisation

Only one site, Northside Primary School (DT12) required annualisation of the annual mean concentration. The annualisation factor and annualisation simple annual mean is presented in Table C.1

Table C.1 – Annualisation Summary (concentrations presented in µg m^{-3})

Diffusion Tube ID	Annualisation Factor Blackpool Marton	Annualisation Factor Carlisle Morton A595	Annualisation Factor Newcastle Centre	Average Annualisation Factor	Raw Data Simple Annual Mean (µg m^{-3})	Annualised Data Simple Annual Mean (µg m^{-3})	Comments
DT12	0.8822	0.9174	0.9738	0.9245	-	-	*Duplicate Site with DT12 and DT12B - Annual data provided for DT12B only*
DT12B	0.8822	0.9174	0.9738	0.9245	17.8	16.5	

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2023 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/NO_2 continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

A summary of bias adjustment factors used by the former local authorities over the past five years is presented in Table C.2.

Table C.2 – Bias Adjustment Factor

Former local authority	Laboratory/Absorbent	Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
CCC	Gradko 20 % TEA in water	2023	National	03/24	0.81
CCC	Gradko 20 % TEA in water	2022	National	03/23	0.83
CCC	Gradko 20 % TEA in water	2021	National	06/22	0.84
CCC	Gradko 20 % TEA in water	2020	National	06/21	0.81
CCC	Gradko 20 % TEA in water	2019	National	03/20	0.93
ABC	Socotec 50% TEA in Acetone	2023	National	03/24	0.77
ABC	Socotec 50% TEA in Acetone	2022	National	03/23	0.76

Former local authority	Laboratory/Absorbent	Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
ABC	Socotec 50% TEA in Acetone	2021	National	03/22	0.78
ABC	Socotec 50% TEA in Acetone	2020	National	03/21	0.77
ABC	Socotec 50% TEA in Acetone	2019	National	03/20	0.75
CBC	Gradko 50% TEA in Acetone	2023	National	03/24	0.83
CBC	Gradko 50% TEA in Acetone	2022	National	03/24[13]	0.82
CBC	Gradko 50% TEA in Acetone	2021	National	03/24[10]	0.82
CBC	Gradko 50% TEA in Acetone	2020	National	03/21	0.82
CBC	Gradko 50% TEA in Acetone	2019	National	09/20	0.89

Local Bias Adjustment

A local bias adjustment factor of 0.76 was derived for the collocated triplicate tubes and the automatic analyser at Morton Community Centre. The bias adjustment was carried out using the NO_2 data processing tool[14] and the summary statistics are provided in Table C.1.

Table C.1 – Local Bias Adjustment Summary

	Local Bias Adjustment (Morton Community Centre)
Periods used to calculate bias	12
Bias Factor A	0.76 (0.72 - 0.8)
Bias Factor B	32% (24% - 39%)
Diffusion Tube Mean (µg/m^3)	11.8
Mean CV (Precision)	3.2%
Automatic Mean (µg/m^3)	9.0
Data Capture	100%
Adjusted Tube Mean (µg/m^3)	9 (8 - 9)
Local bias adjustment factor	0.76

[13] The 2022 and 2023 ASRs for Copeland Borough Council had not been completed before 2024. Annual averages needed for the five-year trend table (Table A.4) were calculated for this combined ASR for Cumberland Council. The national adjustment factors for the 2021 and 2022 data years were obtained from the national adjustment factor spreadsheet 03/24.

[14] Diffusion tube data processing tool laqm (defra.gov.uk)

National Bias Adjustment

The national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method. Cumberland Council have applied national bias adjustment factors of 0.81, 0.77 and 0.83, respectively, for the diffusion tubes measuring in the former local authorities of Carlisle City Council, Allerdale Borough Council and Copeland Borough Council. Screenshots of the respective adjustment spreadsheets are shown in Figure C.1, Figure C.2 and Figure C.3, respectively.

Figure C.1 - National bias adjustment spreadsheet (former Carlisle City Council)

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 03/24

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

This spreadsheet will be updated at the end of June 2024
LAQM Helpdesk Website

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

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

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

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

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

Step 4:
Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution
Where there is more than one study, use the overall factor[3] shown in blue at the foot of the final column.
If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@bureauveritas.com or 0800 0327953

Analysed By[1]	Method (To undo your selection, choose (All) from the pop-up list)	Year[2] (To undo your selection, choose (All))	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[4]	Bias Adjustment Factor (A) (Cm/Dm)
Gradko	20% TEA in water	2023	R	Lancaster City Council	10	35	27	28.6%	G	**0.78**
Gradko	20% TEA in water	2023	R	Eastleigh Borough Council	12	33	26	26.4%	G	**0.79**
Gradko	20% TEA in water	2023	R	Eastleigh Borough Council	12	22	19	12.5%	G	**0.89**
Gradko	20% TEA in water	2023	R	Plymouth City Council	12	35	26	38.3%	S	**0.72**
Gradko	20% TEA in water	2023	R	Plymouth City Council	10	39	31	24.2%	S	**0.80**
Gradko	20% TEA in water	2023	UC	Belfast City Council	10	26	19	38.3%	G	**0.72**
Gradko	20% TEA in water	2023	R	Cheshire West And Chester	12	35	32	10.0%	G	**0.91**
Gradko	20% TEA in water	2023	R	Cheshire West And Chester	10	32	28	14.6%	G	**0.87**
Gradko	20% TEA in water	2023	R	Dudley Mbc	12	27	23	17.1%	G	**0.85**
Gradko	20% TEA in water	2023	UB	Dudley Mbc	12	19	13	45.4%	G	**0.69**
Gradko	20% TEA in water	2023	R	Dudley Mbc	12	40	37	7.7%	G	**0.93**
Gradko	20% TEA in water	2023	R	Gateshead Council	12	23	20	17.7%	G	**0.85**
Gradko	20% TEA in water	2023	R	Gateshead Council	11	23	18	26.9%	G	**0.79**
Gradko	20% TEA in water	2023	R	Gateshead Council	12	27	22	20.7%	G	**0.83**
Gradko	20% TEA in water	2023	R	Gateshead Council	12	29	23	25.9%	G	**0.79**
Gradko	20% TEA in water	2023	R	Gateshead Council	12	30	33	-7.8%	G	**1.08**
Gradko	20% TEA in water	2023	KS	Marylebone Road intercomparison	11	45	38	20.3%	G	**0.83**
Gradko	20% TEA in water	2023	B	South Holland District Council	10	8	7	12.4%	G	**0.89**
Gradko	20% TEA in water	2023	R	Worcestershire	12	12	11	17.4%	G	**0.85**
Gradko	20% TEA in Water	2023	R	Ards And North Down Borough Council	12	33	21	60.2%	G	**0.62**
Gradko	20% TEA in Water	2023	R	Lisburn & Castlereagh City Council	11	24	20	22.1%	G	**0.82**
Gradko	20% TEA in water	2023		**Overall Factor[3] (23 studies)**				**Use**		**0.81**

Figure C.2 - National bias adjustment spreadsheet (former Allerdale Borough Council)

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 03/24

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

This spreadsheet will be updated at the end of June 2024
LAQM Helpdesk Website

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

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

Step 1:	Step 2:	Step 3:	Step 4:								
Select the Laboratory that Analyses Your Tubes from the Drop-Down List	Select a Preparation Method from the Drop-Down List	Select a Year from the Drop-Down List	Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] 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[2]	If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@bureauveritas.com or 0800 0327953								
Analysed By[1]	Method To undo your selection, choose (All) from the pop-up list	Year[2] To undo your selection, choose (All)	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[4]	Bias Adjustment Factor (A) (Cm/Dm)
SOCOTEC Didcot	50% TEA in acetone	2023	UB	City Of York Council	11	15	12	27.9%	G	**0.78**
SOCOTEC Didcot	50% TEA in acetone	2023	R	City Of York Council	11	22	17	26.8%	G	**0.79**
SOCOTEC Didcot	50% TEA in acetone	2023	R	City Of York Council	9	22	17	33.7%	G	**0.75**
SOCOTEC Didcot	50% TEA in acetone	2023	R	City Of York Council	10	31	25	26.1%	G	**0.79**
SOCOTEC Didcot	50% TEA in acetone	2023	UB	Gravesham Borough Council	12	19	15	25.6%	G	**0.80**
SOCOTEC Didcot	50% TEA in acetone	2023	UB	Gravesham Borough Council	12	23	19	18.4%	G	**0.84**
SOCOTEC Didcot	50% TEA in acetone	2023	R	Ipswich Borough Council	9	26	20	33.0%	G	**0.75**
SOCOTEC Didcot	50% TEA in acetone	2023	R	Ipswich Borough Council	12	36	27	34.3%	G	**0.74**
SOCOTEC Didcot	50% TEA in acetone	2023	R	North East Lincolnshire Council	12	43	26	61.9%	G	**0.62**
SOCOTEC Didcot	50% TEA in acetone	2023	UB	North East Lincolnshire Council	10	13	10	29.1%	G	**0.77**
SOCOTEC Didcot	50% TEA in acetone	2023	R	North East Lincolnshire Council	11	24	21	18.0%	G	**0.85**
SOCOTEC Didcot	50% TEA in acetone	2023	R	Cardiff Council / Shared Regulatory Services	11	41	34	22.2%	G	**0.82**
SOCOTEC Didcot	50% TEA in acetone	2023	UB	Torfaen County Borough Council	11	12	9	43.9%	G	**0.70**
SOCOTEC Didcot	50% TEA in Acetone	2023	R	East Suffolk Council	12	29	21	38.9%	G	**0.72**
SOCOTEC Didcot	50% TEA in Acetone	2023	R	Wrexham County Borough Council	11	17	14	25.2%	G	**0.80**
SOCOTEC Didcot	50% TEA in Acetone	2023	R	Horsham District Council	12	21	17	23.5%	G	**0.81**
SOCOTEC Didcot	50% TEA in Acetone	2023	R	Horsham District Council	10	25	17	43.5%	G	**0.70**
SOCOTEC Didcot	50% TEA in Acetone	2023	R	Horsham District Council	10	23	24	-5.4%	G	**1.06**
SOCOTEC Didcot	50% TEA in Acetone	2023	UI	North Lincolnshire Council	10	14	11	26.2%	G	**0.79**
SOCOTEC Didcot	50% TEA in acetone	2023	R	Bridgend Council	11	32	27	20.8%	G	**0.83**
SOCOTEC Didcot	50% TEA in acetone	2023	R	Cambridge City Council	12	22	18	24.8%	G	**0.80**
SOCOTEC Didcot	50% TEA in acetone	2023	R	Leeds City Council	10	39	29	32.3%	G	**0.76**
SOCOTEC Didcot	50% TEA in acetone	2023	KS	Leeds City Council	10	30	20	48.9%	G	**0.67**
SOCOTEC Didcot	50% TEA in acetone	2023	R	Leeds City Council	12	25	19	30.0%	G	**0.77**
SOCOTEC Didcot	50% TEA in acetone	2023	UC	Leeds City Council	11	26	19	40.0%	G	**0.71**
SOCOTEC Didcot	50% TEA in acetone	2023	KS	Marylebone Road intercomparison	11	53	38	41.4%	G	**0.71**
SOCOTEC Didcot	50% TEA in acetone	2023	R	Vale Of White Horse District Council	10	22	18	21.2%	G	**0.83**
SOCOTEC Didcot	50% TEA in acetone	2023	UB	Wirral Council	11	15	13	16.7%	G	**0.86**
SOCOTEC Didcot	50% TEA in acetone	2023		**Overall Factor[3] (28 studies)**					**Use**	**0.77**

Figure C.3 - National bias adjustment spreadsheet (former Copeland Council)

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 03/24

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

This spreadsheet will be updated at the end of June 2024
LAQM Helpdesk Website

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

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

Step 1:	Step 2:	Step 3:	Step 4:								
Select the Laboratory that Analyses Your Tubes from the Drop-Down List	Select a Preparation Method from the Drop-Down List	Select a Year from the Drop-Down List	Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] 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[2]	If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@bureauveritas.com or 0800 0327953								
Analysed By[1]	Method To undo your selection, choose (All) from the pop-up list	Year[2] To undo your selection, choose (All)	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[4]	Bias Adjustment Factor (A) (Cm/Dm)
Gradko	50% TEA in acetone	2023	UB	City Of London Corporation	10	28	22	26.3%	G	**0.79**
Gradko	50% TEA in acetone	2023	R	City Of London Corporation	11	36	31	15.0%	G	**0.87**
Gradko	50% TEA in acetone	2023	R	LB Newham	12	27	21	28.0%	G	**0.78**
Gradko	50% TEA in acetone	2023	SU	Redcar And Cleveland Borough Council	12	14	10	48.0%	G	**0.68**
Gradko	50% TEA in Acetone	2023	R	Sandwell Mbc	12	33	26	27.6%	G	**0.78**
Gradko	50% TEA in Acetone	2023	UB	Sandwell Mbc	11	21	18	15.8%	G	**0.86**
Gradko	50% TEA in acetone	2023	R	Sandwell Mbc	12	23	20	14.2%	S	**0.88**
Gradko	50% TEA in Acetone	2023	UC	Falkirk Council	12	33	29	14.9%	G	**0.87**
Gradko	50% TEA in Acetone	2023	UB	Falkirk Council	12	15	13	8.9%	G	**0.92**
Gradko	50% TEA in Acetone	2023	R	London Borough Of Lewisham	11	33	27	22.7%	G	**0.82**
Gradko	50% TEA in Acetone	2023	R	London Borough Of Merton	12	37	31	18.5%	G	**0.84**
Gradko	50% TEA in acetone	2023	KS	Marylebone Road intercomparison	11	47	38	25.7%	G	**0.80**
Gradko	50% TEA in acetone	2023	R	Royal Borough Of Windsor And Maidenhead	11	27	23	21.6%	G	**0.82**
Gradko	50% TEA in acetone	2023	R	Royal Borough Of Windsor And Maidenhead	12	24	24	0.6%	G	**0.99**
Gradko	50% TEA in acetone	2023	R	London Borough Of Richmond Upon Thames	11	18	16	15.6%	G	**0.86**
Gradko	50% TEA in acetone	2023		**Overall Factor[3] (15 studies)**					**Use**	**0.83**

Selection of Appropriate Bias Adjustment Factor

Morton Community Centre is the only location in Cumberland Council where a local bias adjustment factor is calculated. For 2023 the collocated bias adjusted value was calculated to be 0.76 and is less than the value obtained for the national bias adjustment factor (0.81). The national bias adjustment has been chosen so that the bias adjusted NO_2 tends to be conservative. This is in line with all previous ASRs carried out for the former Carlisle City Council.

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.

No diffusion tube measurements required distance correction during 2023.

QA/QC of Automatic Monitoring

Ricardo provides data management and local site operator (LSO) duties for the automatic monitoring sites within Carlisle. The instrumentation is calibrated every two weeks and a full site service is carried out every six months. The QA/QC is accredited to ISO 17025. All data are ratified to all LAQM reporting requirements. Measurement data are available through UKAIR.

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

PM_{10} and $PM_{2.5}$ are measured using BAM 1020 heated instrument. For the PM_{10} instrument a slope correction factor of 0.9662 is applied. No slope correction is required for the $PM_{2.5}$.

Automatic Monitoring Annualisation

As data capture was greater than 85 % annualisation was not required.

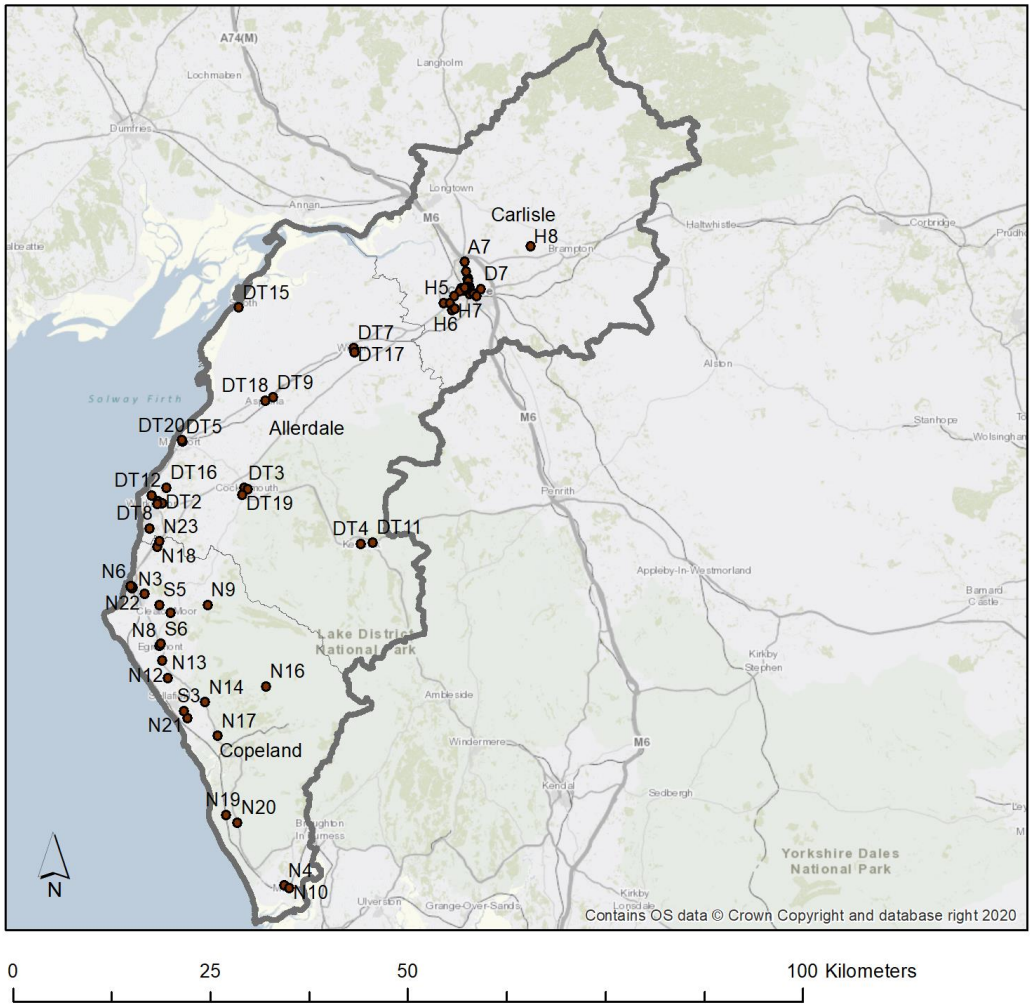
NO_2 Fall-off with Distance from the Road

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, automatic annual mean NO_2 concentrations corrected for distance are presented in Table A.3.

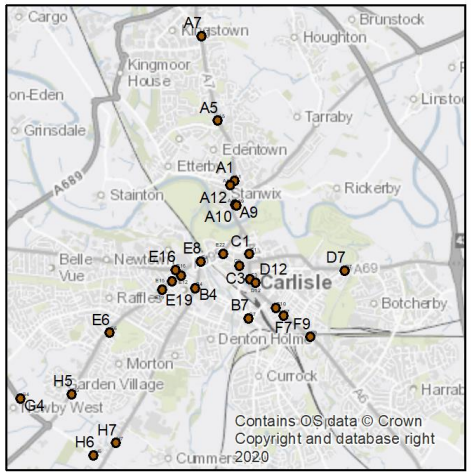
No automatic NO_2 monitoring locations required distance correction during 2023.

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

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



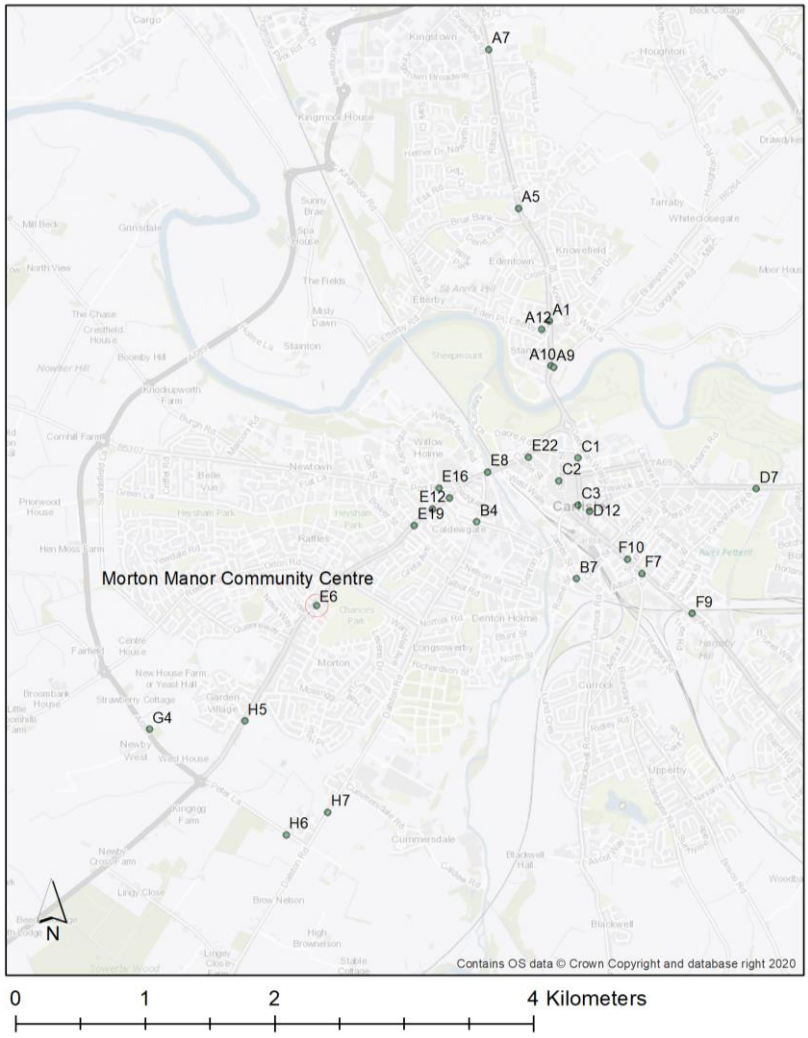
Carlisle City Centre inset



Legend

- Diffusion tubes sites
- Cumberland Council

Figure D.2 - Location of diffusion tubes within Cumberland Council (Carlisle Area)



Key to site codes

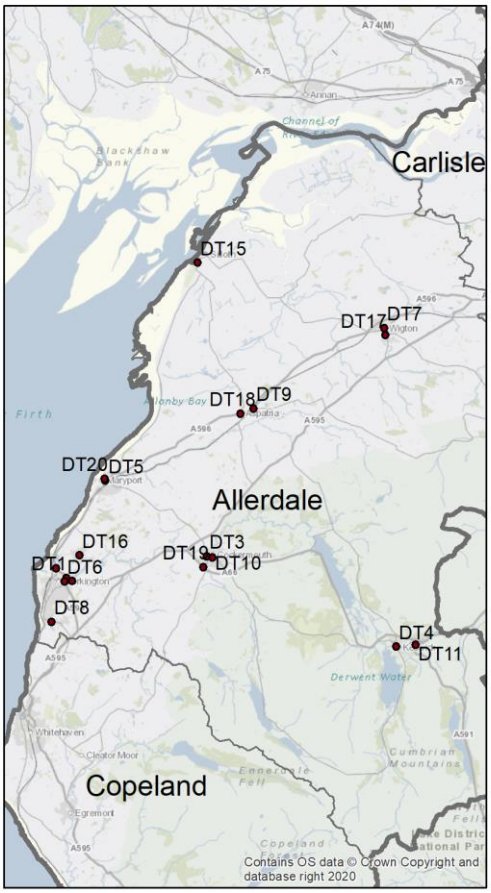
A1	45 SCOTLAND RD
A10	STANWIX BANK
A12	STANWIX BANK CAR PARK
A5	37 KINGSTOWN RD
A7	282 KINGSTOWN RD
A9	BRAMPTON RD
B4	DALSTON RD
B7	12 CURROCK ST
C1	LOWTHER ST
C2	TOURIST INFO
C3	DEVONSHIRE ST
D12	POST OFFICE
D7	282 WARWICK RD
E22	FINKLE ST
E12	3 WIGTON RD
E15	22 WIGTON RD
E16	JOVIAL SAILOR
E19	49 WIGTON RD
E6	MORTON MANOR 1
E8	BRIDGE ST
F10	155 BOTCHERGATE
F7	24 LONDON RD
F9	129 LONDON RD
G4	THE HOBBIT
H5	WIGTON RD
H6	PETER LANE
H7	DALSTON RD
H8	AIRPORT

Legend

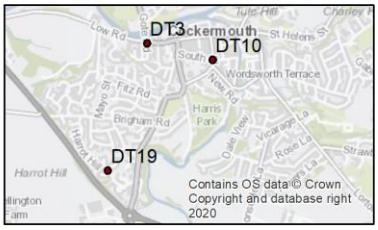
- Morton Manor Community Centre
- Diffusion tube

Figure D.3 - Location of diffusion tubes within Cumberland Council (in outlying areas of former CCC)

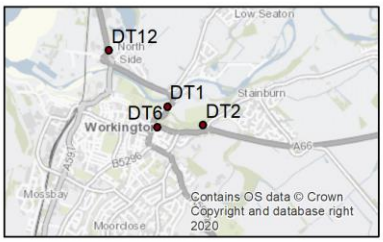
Figure D.4 - Location of diffusion tubes within Cumberland Council (Allerdale)

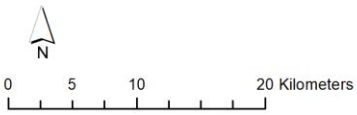


Cockermouth inset



Workington inset





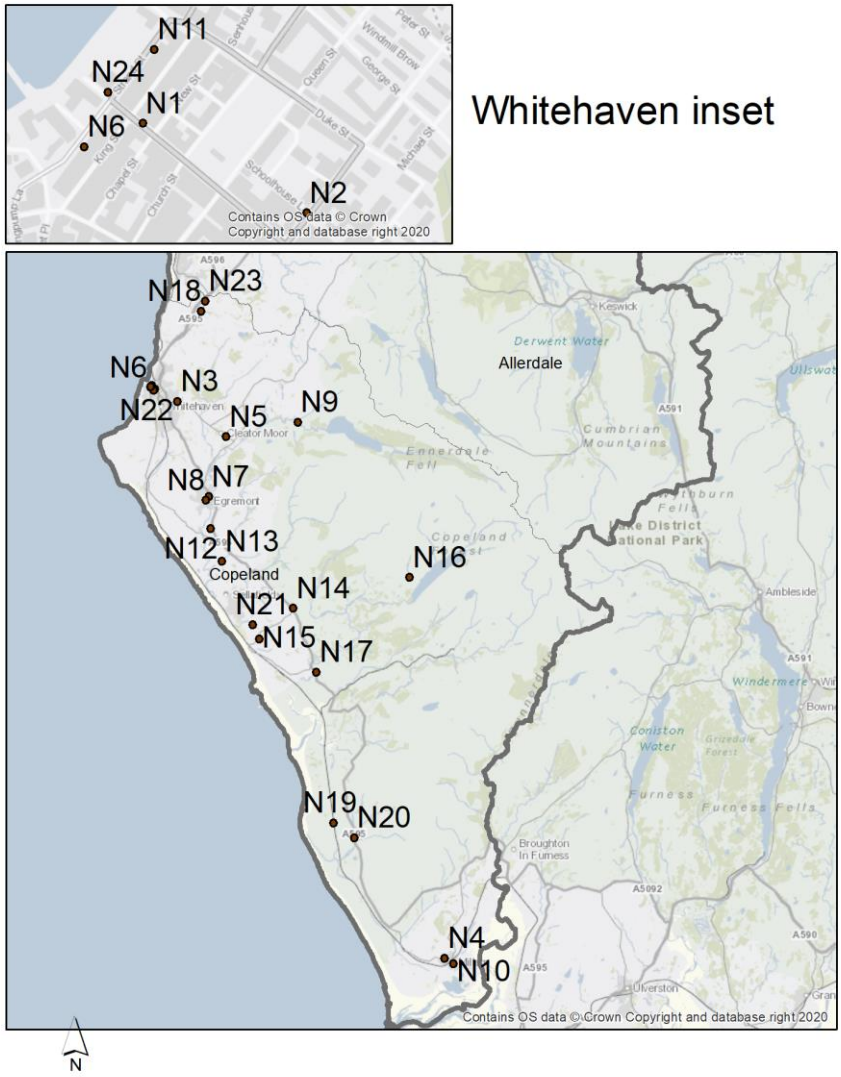
Legend

- Allerdale diffusion tubes
- Cumberland Council

Key to site codes

DT1	Hall Park View, Workington
DT2	Murray Road, Workington
DT3	Crown Street, Cockermouth
DT4	Main Street, Keswick
DT5	Curzon Street, Maryport
DT6	Ramsay Brow, Workington
DT7	King Street, Wigton
DT8	Main Road, High Harrington
DT9	Lawson Street, Aspatria
DT10	South Street, Cockermouth
DT11	Penrith Road, Keswick
DT12	Northside Primary School, Northside
DT15	Eden Street Silloth
DT16	Main Road Seaton
DT17	South End Street Wigton
DT18	West Street Aspatria
DT19	Marvejols Park Cockermouth
DT20	Eaglesfield Street Marypont

Figure D.5 - Location of diffusion tubes within Cumberland Council (Copeland)



Key to site codes

N1	55/56 Lowther St, Whitehaven
N2	Police Station, Scotch St, Whitehaven
N3	Fire Station, Hensingham
N4	116 Holborn Hill, Millom
N5	Aldby Grove, Cleator Moor
N6	White House, Strand St, Whitehaven
N7	Tourist Info, Main St, Egremont
N8	Presbytery, St Bridgets Ln, Egremont
N9	Primary School, Ennerdale Bridge
N10	Council Centre, St Georges Rd, Millom
N11	Opp JPJ, Strand St, Whitehaven
N12	2 The Crescent, Thornhill
N13	4 Holyoak, Beckermet
N14	The Globe, The Square, Gosforth
N15	21 Scafell Close, Seascale
N16	Greendale Guest House, Wasdale
N17	Holmrook Service Station, Holmrook
N18	98 Main St, Distington
N19	Railway Station, Bootle
N20	King's Head, Bootle
N21	Nr Seascale Hall Farm, Seascale
N22	Trinity Court, Scotch St, Whitehaven
N23	2a Main St, Distington
N24	New Lowther St, Whitehaven

Figure D.6 - Location of air quality management areas and diffusion tubes

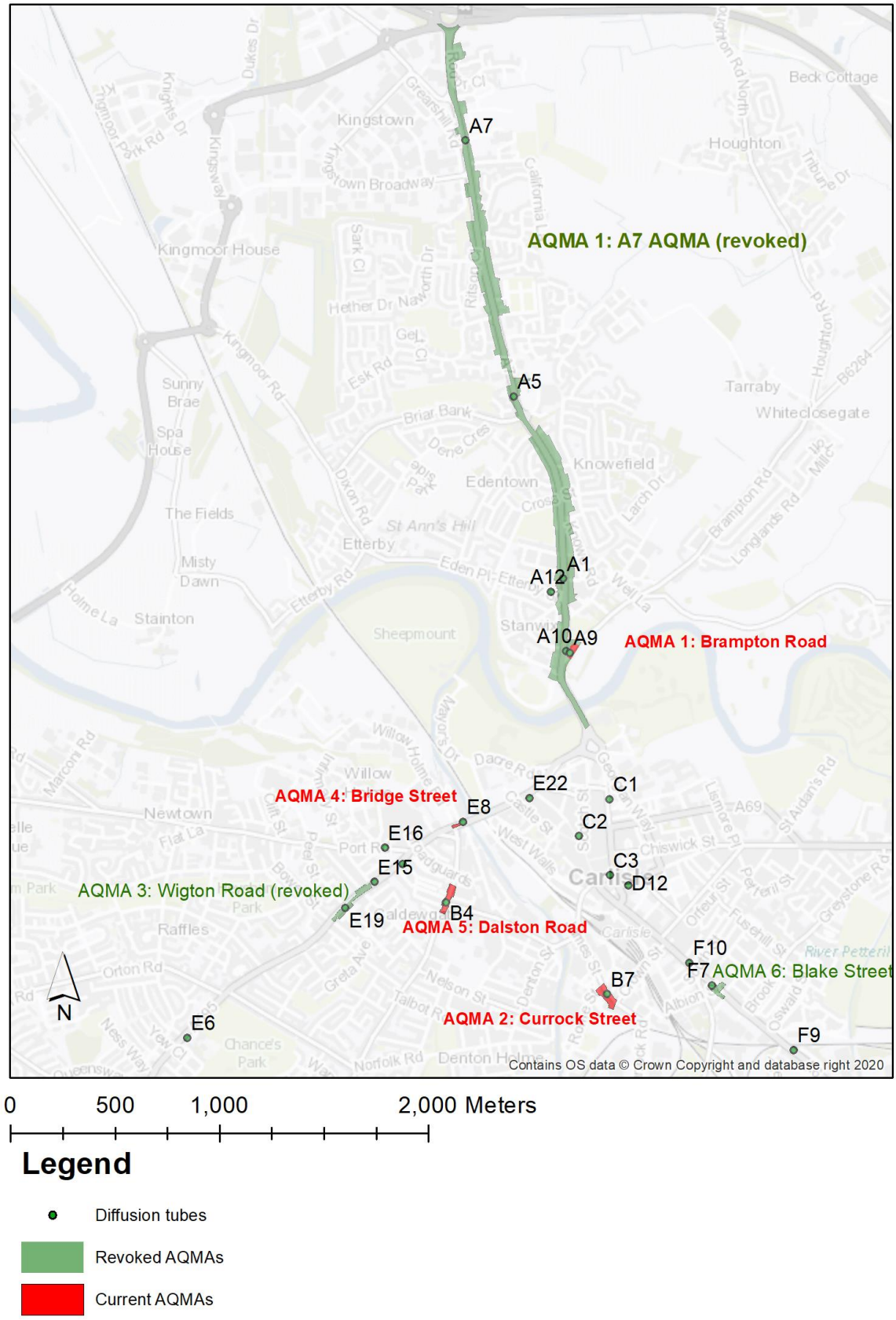
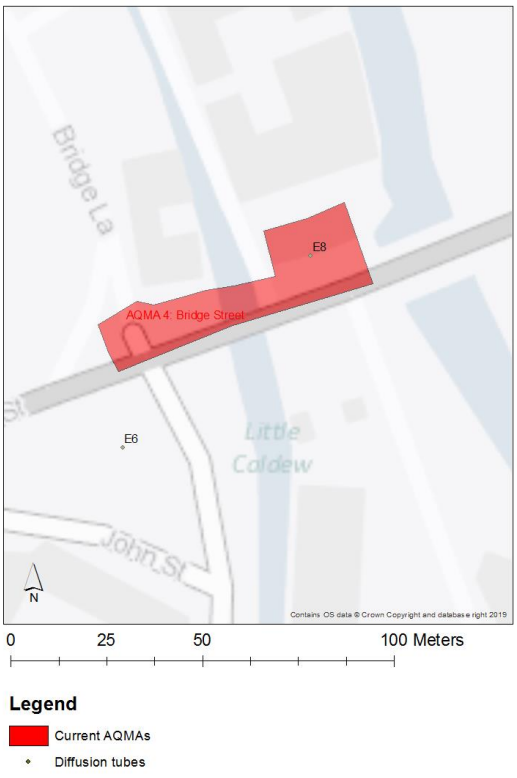


Figure D.7 - Location of air quality management areas (zoomed in)

AQMA 1: Brampton Road

AQMA 2: Currock Street

AQMA 4: Bridge Street



AQMA 5: Dalston Road

Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England[15]

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

[15] 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.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.
- Chemical hazards and poisons report: Issue 28. June 2022. Published by UK Health Security Agency
- Air Quality Strategy – Framework for Local Authority Delivery. August 2023. Published by Defra.