Eden District Council

2019 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995

Local Air Quality Management

June 2019

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Executive Summary:
Air Quality in Our Area Air Quality in Eden District Council

Air pollution is associated with a number of adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Additionally, air pollution particularly affects the most vulnerable in society: children and older people, and those with heart and lung conditions. There is also often a strong correlation with equalities issues, because areas with poor air quality are also often the less affluent areas[1,2].

In March 2019, Defra published Air Quality: National Air Pollution Control Programme. As well as setting out the national context and aims for air quality, it also includes a commitment to reduce emissions as follows:

National emission reduction commitments compared with 2005 base year (in %)	NOx	$PM_{2.5}$
2020-2029	55%	30%
From 2030	73%	46%

Currently Eden only has one NOx monitoring position that remains unchanged since 2005 and to date (2018) this has fallen by 22% which is on target, but with more improvement necessary before 2029.

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion[3].

The Council has monitored air quality within the District since 1996 as part of its Local Air Quality Management duties. As the principal town within Eden, Penrith provides many of the key services, for example healthcare, schooling, employment and shops.

Eden District Council monitors nitrogen dioxide levels using diffusion tubes across Penrith and also Eamont Bridge where historically monitored levels indicated

[1] Environmental equity, air quality, socioeconomic status and respiratory health, 2010

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

[3] Defra. Abatement cost guidance for valuing changes in air quality, May 2013

breaches of the Air Quality Objective (AQO) for nitrogen dioxide. Historically the Council has monitored air quality in other towns and areas of the district and found them to be well below any intervention level and in line with guidance, has removed these monitoring positions to focus on areas where the air quality may be poorer.

Penrith town centre has become busier over the years with increased vehicle numbers accessing the amenities. Whilst there have been improvements to emissions from modern engines, the levels within the town centre are staying fairly static. This may be due to increased traffic numbers balancing out the improvements in emissions from vehicle engines. We continue to measure highly trafficked areas in the centre of Penrith. Together with a stretch of the A6 through Eamont Bridge. (See Appendix D for a plan of the monitoring locations).

There were two recorded failures of the annual mean AQO for nitrogen dioxide within the district in 2018. These were along Castlegate within the centre of Penrith. This street is one-way, narrow with a busy roundabout junction at the top end resulting in frequent standing traffic. Over recent years the Council has tried to determine the extent of the road that is affected by the adverse air quality using diffusion tubes. This has not proved possible, so it is intended to apply for funding to buy two continuous air quality monitors to obtain real time data which will help us to understand the extent of a possible AQMA along this stretch of road.

Victoria Road, a section of the A6 which is the main north south route through the town centre has several busy junctions along this section. There have now been no failures of the annual mean AQO recorded at any location along this section for the past 3 years.

Within Eamont Bridge, there have now been no breaches of the annual mean AQO recorded in the last five years. The Council is confident that levels of nitrogen dioxide are consistently staying below the annual mean AQO but will continue to monitor both sites in 2020 because previously there were breaches of the AQO at this site and on Victoria Road.

The Council works with partner organisations Cumbria County Council, the Lake District National Park Authority, the Yorkshire Dales National Park Authority and the

Environment Agency to ensure that this is achieved through the Planning and Permitting processes.

Actions to Improve Air Quality

Development within the district of Eden is managed by Eden District Council, the Lake District National Park Authority, the Yorkshire Dales National Park Authority and Cumbria County Council. Cumbria County Council is responsible for the management of the roads across Eden and all the local planning authorities are strongly committed to development where sustainable transport is a key consideration in the process. Eden District Council is the most sparsely populated of any district in England and as a consequence many people depend on car travel since public transport can be infrequent or non-existent in rural areas.

Eden District Council's Local Plan sets out that new development will be required to demonstrate that it protects air quality and does not result in environmentally unacceptable levels of traffic. It identifies that the Council will work with partner organisations to ensure that the environmental impact of travel is reduced, to conserve energy and reduce air pollution by limiting the growth in traffic.

Eden District Council Local Plan 2014 – 2032, Policy ENV7 – Air Pollution states that:

All major development proposals will be required to assess the likely impacts of the development on air quality and mitigate any negative impacts by:

1. Ensuring the development is located within easy reach of established public transport routes.

2. Maximising provision for cycling and pedestrian facilities.

3. Encouraging the use of cleaner transport fuels on site, through the inclusion of electric car charging points, and;

4. Contributing towards the improvement of the highway network where the development is predicted to result in increased congestion on the highway network.

The Cumbria Local Transport Plan 2011 - 2026, produced by Cumbria County Council, identifies many measures aimed at improving ease of access to jobs, services and healthcare. The progress of this plan to date has seen:

- Introduction of Rural Wheels scheme - Transport for people in rural areas. Passengers sharing transport benefit from a reduced rate.
- Introduction of a Village Wheels Scheme - Timetabled service for communities to nearest town. Only available in Eden for Greystoke and Newbiggin.
- Introduction of a Community Wheels scheme - Demand responsive transport service for residents of Alston Moor Parish. One bus and service is for Alston, the other for Garrigill.
- A66 Temple Sowerby by-pass.
- Innovative rural traffic calming scheme in Clifton.
- Environmental improvements in Appleby and Kirkby Stephen.
- Surfaced walk and cycle route from Penrith to University campus at Newton Rigg.

Penrith Town Council, published their Council Plan for 2017-2022 in January 2017. This outlines the strategic plan for the town and identifies Improving Air Quality as a key theme. Measures that are identified will promote improvements in air quality include:

- Provide inclusive walking and cycling opportunities in and around Penrith;
- Improve transport services through working with partners to secure improvements in public transport services, look for real alternatives to public transport, promote Car Club, community transport schemes and workable schemes for lift and car share;
- Lobbying for electric car charge points.

As regards the wider Eden area, the Council has recently declared a Climate Emergency and agreed a number of actions, several of which are likely to impact upon air quality:

- Declaring a Climate Emergency and an Ecological Emergency.
- To aim to make Eden District carbon neutral by 2030, taking into account both production and consumption emissions.
- Critically to evaluate the ecological impacts of all Eden District Council's decisions and actions; to refuse initiatives that will result in the degradation of the natural environment and biodiversity; and actively to promote the safeguarding and improvement of the natural environment.
- To prepare, by the end of 2019, a strategic plan to achieve zero carbon emissions by 2030, across all activities for which the Council is responsible, working with independent expert advisory groups to ensure the council adopts best practice.
- To call on the UK Government to provide the powers, resources and funding to meet a 2030 zero carbon target across Eden District.
- To work together with other councils, public and private sector organisations (within Eden, Cumbria, the UK and internationally) to determine and implement best practice methods to achieve zero emissions in Eden District by 2030.
- To facilitate the involvement of Eden's residents, from schoolchildren to elders, in formulating plans to address the climate and ecological crisis, delivering those plans and monitoring their progress.

The Council is now preparing a strategic plan to set out how the Council will achieve the above and involve the community, residents and businesses. More information and detail will be provided in future Annual Status Reports.

Finally, it should be mentioned that the 30 year Master Plan identified and referred to in last year's Annual Status Report will not be taken forward by the Council (Executive Minute 2 May 2019).

Conclusions and Priorities

There have now been no exceedances of the AQO for NO2 measured along the A6 within Eamont Bridge since 2012. The traffic data has been estimated to show an ongoing trend upwards in total traffic numbers (2% increase estimated in 2016). However this is still considerably lower than has been counted on this section of road in previous years. At the end of 2017, the number of monitoring tubes within Eamont Bridge was reduced to three locations in light of the monitoring results.

In 2017 there was again no exceedance of the AQO for NO2 at any monitoring location along Victoria Road. At the end of 2017 in light of these results, a review of monitoring locations was undertaken and the total number has been reduced by two with one tube being relocated to the bottom of Roper Street.

In 2016 there was a breach of the AQO at the top of Castlegate although there were concerns regarding the accuracy of the data at this location. In 2017 there has again been a breach of the AQO at one location although this time it is further down the street but within the canyoned section. In 2018 two of the tubes on Castlegate showed a breach of the AQO and in establishing the extent of the area affected is a key priority going forward.

In 2018 the Council became aware that the nationally published background maps for nitrogen dioxide did not include a major industrial process that is upwind of Penrith or the two large industrial areas (Penrith Industrial Estate and Gilwilly Industrial Estate) on the eastern edge of the town. Air Quality reports accompanying planning applications and under-reporting the impact of air quality in the officers' opinion. The Council has therefore included for 2018, two new tube sites which it is hoped will give some useful data on these areas.

Another key priority moving forwards will be to establish an involvement with the proposed widening of the A66 through Eden and Penrith. There is the potential for significant increase in traffic numbers within the sensitive areas of Penrith and the impact of them on Air Quality is a key consideration. An initial consultation on preferred routes has been received by the Council and Members and Officers have responded with explicit reference to Air Quality concerns.

Local Engagement and How to get Involved

There has been an increasing media interest in air quality nationally as a wider understanding of the health effects from air quality has been publicised. In 2018 Defra released the Clean Air Strategy 2018 which sets out actions to improve air quality by reducing pollution from a wide range of sources.

For members of the public wanting to take an active role in improving air quality within this district there are the following action groups:

- Cumbria Action for Sustainability (CAfS) promotes low carbon living, energy saving and reduced use of fossil fuels throughout Cumbria.
- Penrith Action for Community Transition (PACT) is a transition town group started in Cumbria during 2008, and is part of the growing transition network here in the UK and around the world, working to develop community-based responses to the challenges of peak oil, climate change and economic sustainability.

In 2018, both organisations have worked with a number of villages in the district and have given presentations to Councillors at Full Council.

However there are also many simple measures that can be taken by individual members of the public to help improve air quality such as:

- Walking and cycling short journeys rather than taking the car;
- Using public transport wherever possible, the Plan Your Journey website has been established to assist with this;
- Electric bike hire is now available at several locations within Eden;
- Lift sharing to work and for the school run;
- Turning off the car engine when stationary;
- Choose a low emission vehicle such as an electric or hybrid car;
- Start a ‘walking bus’ for the journey to school.

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Local Air Quality Management

This report provides an overview of air quality in Eden during 2018. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by Eden District Council to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England can be found in Table E.1 in Appendix E.

1. Actions to Improve Air Quality

1.1 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 must prepare an Air Quality Action Plan (AQAP) within 12-18 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

Eden District Council currently does not have any AQMAs. For reference, a map of Eden District Council's monitoring locations is available in Appendix D.

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

Defra's appraisal of last year's ASR concluded that the report was well structured, detailed, and provides the information specified in the Guidance. The following comments were made:

1. It is recommended that the Council consider declaring an AQMA for the site GAF04 at the top of Castlegate, for exceedance of the NO_2 annual mean objective This site has exceeded the AQO in three years out of four since monitoring began at the site, and has recorded a significant increase since 2016. For further guidance please refer to LAQM Technical Guidance 16 (TG16).

2. The Councils revised monitoring programme is supported and encouraged. The Council should continually review the suitability of current sites and expand where appropriate.

3. Once the AQMA has been declared the Council have 12-18 months to develop an AQAP. It is recommended that the Council include measures specific to site GAF04 and the AQAP is developed in partnership with a steering group (made up of relevant stakeholders and experts). The Council is reminded that the AQAP must undergo sufficient consultations before publication. Once drafted, the AQAP should be submitted to Defra for review. For further guidance please refer to TG16.

4. It is recognised that monitoring at Castlegate has increased by one site, but the Council are encouraged to allocate further resources to better understand the extent of this exceedance.

5. Future reports should include discussion of $PM_{2.5}$ relative to the Public Health Outcomes Framework. For further guidance please refer to TG16.

6. Maps are clear and illustrate monitoring locations, as referenced in results tables.

7. Future reports should include more discussion regarding local developments and planning applications.

As a result of these comments, the Council has made changes to the sampling programme have been in order to inform a possible AQMA on Castlegate and researched additional monitoring equipment. Officers are planning to apply for additional funding for continuous monitoring equipment which can be used to better understand the extent of the exceedances on Castlegate. However the principal challenges and barriers to implementation that Eden District Council anticipates facing are resource constraints within a very small team.

All planning applications continue to be screened for possible impacts on air quality too and where appropriate, air quality assessments are required as supporting information prior to the application being determined. However, the adverse impact of air quality is rarely an over-riding factor, because invariably the consultants and developers base the calculations on background data, rather than measured results. Officers are therefore concerned that the estimates in the air quality assessments underestimate the true impact of the developments.

1.3 $PM_{2.5}$ – Local Authority Approach to Reducing Emissions and/or Concentrations

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

Due to its extremely small size, $PM_{2.5}$ can travel for long distances in the air and it is estimated that as much as 40-50% if the levels found in any given area can be from sources outside the authority's direct boundary (Fine Particulate Matter in the UK. Air Quality Expert Group Report. 2012). Nevertheless this means that the contribution of local sources to total $PM_{2.5}$ levels is significant and therefore local actions to reduce PM emissions will have a significant beneficial impact and local authorities are encouraged to monitor or model $PM_{2.5}$ wherever possible.

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

Eden District Council is a signatory of the Cumbria Joint Public Health Strategy which is informed by the Public Health Outcomes Framework. Within this Strategy Air Quality is explicitly identified as an impactor on health and an Implementation Plan is currently being developed. As a mainly rural county, Cumbria is generally favoured with very good air quality: the proportion of mortality attributable to particulate matter air pollution in Cumbria is 3.82%, lower than the national figure of 4.72%. For $PM_{2.5}$ in particular, there is no safe level and it has been estimated that in 2010 the deaths of 195 people in Cumbria may have been attributable to $PM_{2.5}$.

Air pollution background maps are published by Defra which provide estimates of background concentrations for $PM_{2.5}$ within the district. Within Eden, 98% of the background levels published by Defra are below 8 μgm^{-3} which is less than half the annual mean objective of 20 μgm^{-3} which is to be achieved by 2020. The highest estimated backgrounds are rural locations affected by the major trunk roads, the M6 and the A66. Within Penrith the background levels are predicted to be below 9 μgm^{-3}.

No monitoring of $PM_{2.5}$ is currently carried out within Eden since this is not currently required by Defra. National $PM_{2.5}$ monitoring is carried out in Carlisle, within a

neighbouring district in urban roadside location. However the Council is looking at monitoring techniques and low cost equipment which will be suitable for providing estimates of actual levels of $PM_{2.5.}$

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

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

This section sets out what monitoring has taken place and how it compares with objectives.

Eden District Council does not undertake any automatic (continuous) monitoring. 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. In Eden, these pollutants have never reached estimated levels that would require the Council to report on them.

National monitoring results are available at https://uk-air.defra.gov.uk/.

2.1.2 Non-Automatic Monitoring Sites

Eden District Council undertook non- automatic (passive) monitoring of NO_2 at 19 sites during 2018.

Table A. in Appendix A shows the details of the sites.

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

2.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias, “annualisation” and distance correction. Further details on adjustments are provided in Appendix C.

Eden District Council has selected monitoring sites which are at the façade of residential dwellings and therefore require no distance adjustment bar one new site measure during 2018 located on Norfolk road. In 2018 sufficient data was collected

so no annualisation of results was required. The bias adjustment calculation undertaken by Eden District Council is documented in Appendix C.

2.2.1 Nitrogen Dioxide (NO_2)

Table A. in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

For diffusion tubes, the full 2018 dataset of monthly mean values is provided in Appendix B.

The monitoring tubes within Eden District Council are supplied and analysed by Gradko. The tubes are prepared using a 50% TEA in acetone solution and typically exposed for a 4 week period. The 2018 results have been corrected for a bias using a factor of 0.92 which was determined following 8 studies undertaken by Gradko as part of the National Diffusion Tube Bias Adjustment Factor study. For all the monitoring locations there was >75% data capture for the year and consequently no annualisation of the data was required. All monitoring locations bar one have been chosen to be representative of a. relevant receptor, i.e at the façade of a residential property and therfore do not require any distance adjustments. The one location not located on a residential property was corrected using the Defra distance adjustment calculator.

There has been two exceedance this year, both along Castlegate. GAF04 failed at a level of 49µg/m^3. This location is at a point where the road is narrowed and canyoned and frequently has queuing traffic. The additional monitoring point C1 added in this year failed with a level of 48µg/m^3.

Appendix A: Monitoring Results

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

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
EB15	Glendale	Roadside	352329	528475	NO2	NO	0	1	NO	2.5
EB18	Cherry Cottage	Roadside	352246	528667	NO2	NO	0	2.5	NO	2.5
EB20	2 Kemplay Road	Roadside	352207	528827	NO2	NO	0	4	NO	2.5
GAF16	Landels Court corner	Roadside	351774	529838	NO2	NO	0	2	NO	2.5
GAF19	25 Victoria Road	Roadside	351774	529910	NO2	NO	0	1.5	NO	2.5
V1	Roper Street	Roadside	351794	529870	NO2	NO	0	1	NO	2.5
V3	25b King Street	Roadside	351720	529966	NO2	NO	0	2	NO	2.5

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
V5	Front Victoria Road / Langton Cottage	Roadside	351713	529941	NO2	NO	0	1	NO	2.5
V7	Café 15	Roadside	351733	528918	NO2	NO	0	2.5	NO	2.5
C1	Lower Castlegate	Roadside	351413	530069	NO2	NO	0	1	NO	2.5
C30	40 Castlegate	Roadside	351333	530016	NO2	NO	0	1.5	NO	2.5
GAF04	New Vic	Roadside	351363	530046	NO2	NO	0	1	NO	2.5
GAF05	Station Hotel	Roadside	351302	520089	NO2	NO	0	2.5	NO	2.5
P1	No entry sign, Norfolk Road	Roadside	351144	530056	NO2	NO	1	1	NO	2.5

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
uB1	13 Balmoral Close	Roadside	350860	529912	NO2	NO	0	3	NO	2.5
B14	4 Brunswick Road	Roadside	351394	530344	NO2	NO	0	2	NO	2.5
SG27	8 Scotland Rd	Roadside	351171	530649	NO2	NO	0	1	NO	2.5
C31	3 Benson Row	Roadside	351741	530313	NO2	NO	0	1	NO	2.5
C32	Penrith Nursery	Roadside	351687	530387	NO2	NO	0	2.5	NO	2.5

Notes:

(1) 0m if the monitoring site is at a location of exposure (eg installed on/adjacent to the façade of a residential property).

(2) N/A if not applicable.

Table A.2 – Annual Mean NO2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2018 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3]				
					2014	2015	2016	2017	2018
EB15	Roadside	Diffusion Tube	-	100	35	32	32	32	32
EB18	Roadside	Diffusion Tube	-	100	38	35	33	35	33
EB20	Roadside	Diffusion Tube	-	100	34	30	32	31	32
GAF16	Roadside	Diffusion Tube	-	100	28	30	34	24	27
GAF19	Roadside	Diffusion Tube	-	75	32	29	32	27	29
V1	Roadside	Diffusion Tube	-	75	-	-	-	-	29
V3	Roadside	Diffusion Tube	-	75	33	23	23	27	30

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2018 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3]				
					2014	2015	2016	2017	2018
V5	Roadside	Diffusion Tube	-	100	**41**	38	35	31	31
V7	Roadside	Diffusion Tube	-	100	**51**	36	36	35	33
C1	Roadside	Diffusion Tube	-	92	-	-	-	-	**48**
C30	Roadside	Diffusion Tube	-	92	37	38	37	31	30
GAF04	Roadside	Diffusion Tube	-	75	**48**	**50**	39	**47**	**49**
GAF05	Roadside	Diffusion Tube	-	92	33	**45**	**53**	33	30
P1	Roadside	Diffusion Tube	-	100	-	-	-	-	22
uB1	Roadside	Diffusion Tube	-	100	-	-	-	-	17

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)				
					2014	2015	2016	2017	2018
B14	Roadside	Diffusion Tube	-	100	33	31	35	33	33
SG27	Roadside	Diffusion Tube	-	100	32	31	33	30	30
C31	Roadside	Diffusion Tube	-	92	39	34	32	29	29
C32	Roadside	Diffusion Tube	-	100	-	33	36	33	33

☒ **Diffusion tube data has been bias corrected**

☐ **Annualisation has been conducted where data capture is <75% (N/A)**

Notes:

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

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

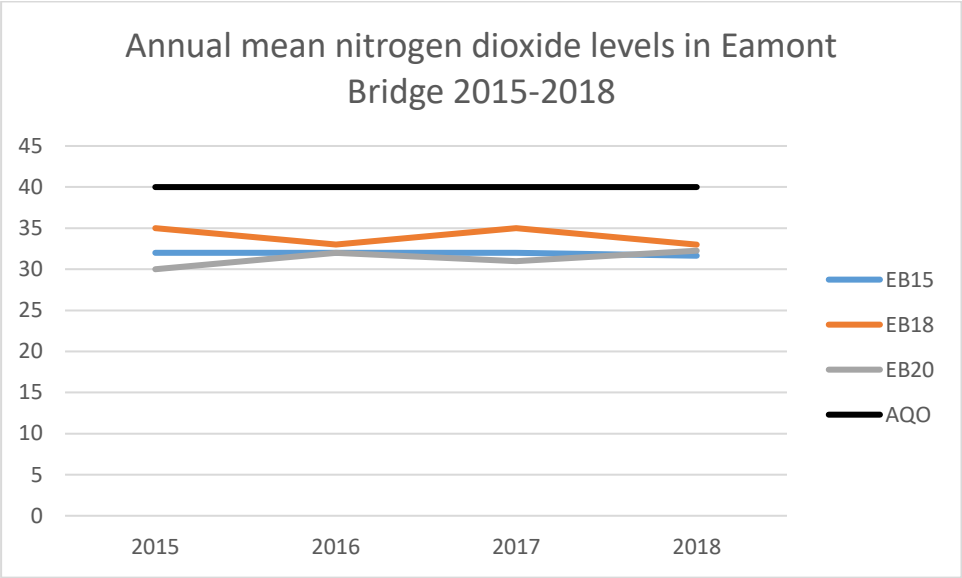
(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

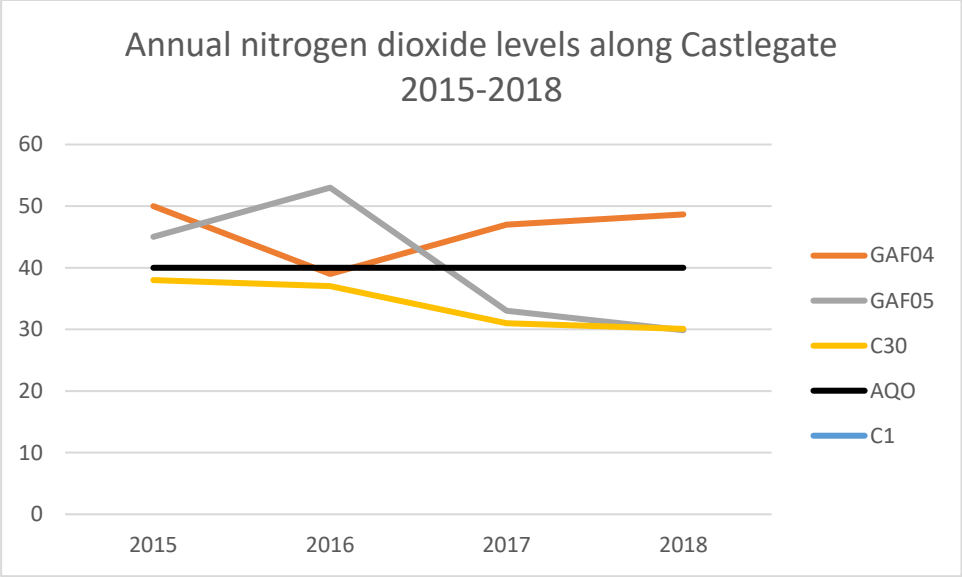
(2) Data capture for the full calendar year (eg if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

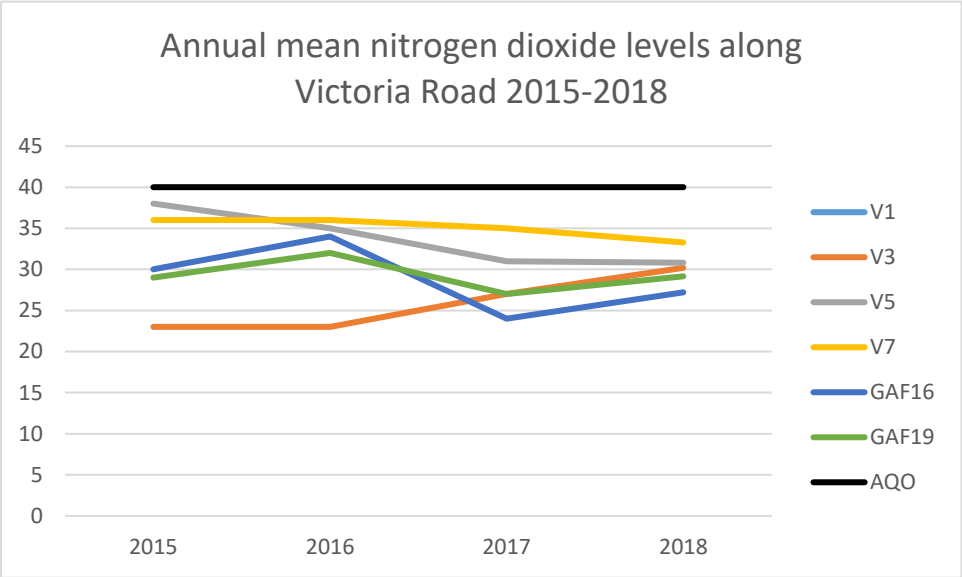
(3) Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

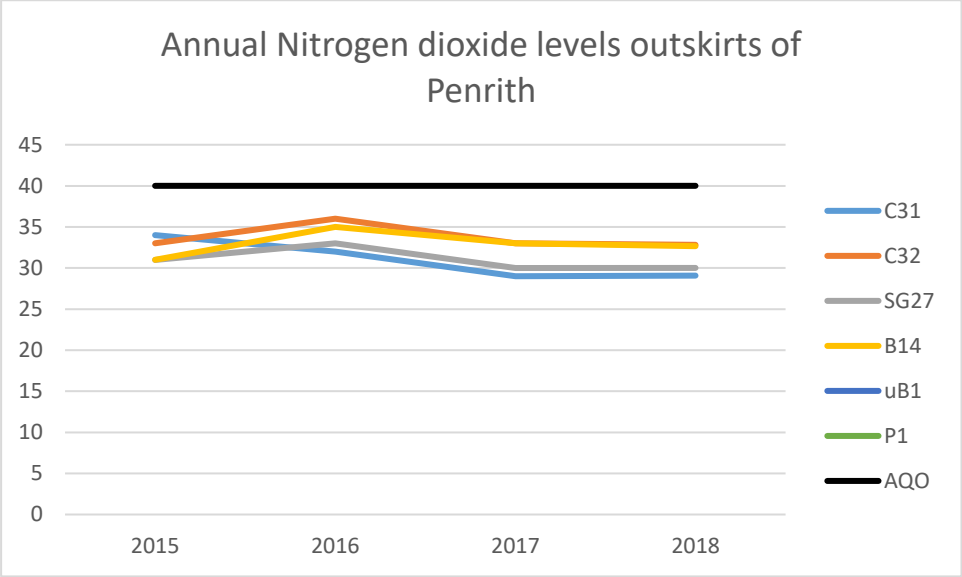
Figure A.1 – Trends in Annual Mean NO2 Concentrations

Trend plots for the last four years of data for the areas monitored. On each chart the black line represents the AQO for nitrogen dioxide of 40µg/m^3. There have been four new locations added this year: C1, V1, B1 and P1. As they are single points, these levels do not show on this year's graphs.




Annual nitrogen dioxide levels along Castlegate 2015-2018
60
50
40
30
20
10
0
2015
2016
2017
2018
GAF04
GAF05
C30
AQO
C1


Annual mean nitrogen dioxide levels along Victoria Road 2015-2018
45
40
35
30
25
20
15
10
5
0
2015
2016
2017
2018
V1
V3
V5
V7
GAF16
GAF19
AQO


Annual Nitrogen dioxide levels outskirts of Penrith
45
40
35
30
25
20
15
10
5
0
2015
2016
2017
2018
C31
C32
SG27
B14
uB1
P1
AQO

Appendix B: Full Monthly Diffusion Tube Results for 2018

Table B.1 – NO_2 Monthly Diffusion Tube Results - 2018

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (factor) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
EB15	30.6	37.1	36.7	34.8	35.5	30.7	36.6	32.9	32.0	38.3	29.8	38.0	34.4	31.6	-
EB18	30.9	36.5	37.4	38.0	36.5	30.0	37.5	33.8	37.1	39.1	34.6	39.0	35.9	33.0	-
EB20	31.6	39.4	44.4	36.1	37.9	32.9	32.4	27.5	24.4	39.8	36.9	37.4	35.1	32.3	-
GAF16	30.7	30.8	31.9	29.1	25.3	22.2	26.3	26.5	25.5	36.5	34.3	36.0	29.6	27.2	-
GAF19	33.6		38.2		32.3	28.4		25.1	22.8	32.6	32.2	39.7	31.7	29.1	-
V1		40.4		30.4	28.3		27.6	26.9	27.0	36.6	34.1	35.1	31.8	29.3	-
V3	35.0	34.9	36.2		31.0	29.2	27.8		25.7	35.9		39.4	32.8	30.2	-
V5	31.2	35.9	35.2	31.8	30.8	23.8	31.5	30.2	31.2	39.2	41.2	39.8	33.5	30.8	-

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (factor) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
V7	34.6	36.5	37.9	33.5	29.4	28.4	32.5	37.6	44.4	39.0	40.8	39.3	36.2	33.3	-
C1	46.9	51.2	55.1	60.9	52.1	45.1	44.7		55.7	50.9	56.5	56.6	52.3	48.1	-
C30	33.0	33.3	40.3		35.9	29.8	30.7	26.7	18.0	35.7	35.6	40.9	32.7	30.1	-
GAF04	46.7	50.3	57.5	59.5	56.7		49.9		48.7	52.5		54.4	52.9	48.7	-
GAF05		34.7	35.1	28.3	27.6	27.0	27.6	28.7	32.7	32.5	40.6	42.2	32.5	29.9	-
P1	23.7	26.2	28.2	21.9	25.3	17.6	21.2	18.0	37.5	26.4	26.3	32.5	25.4	23.4	21.5
uB1	22.7	23.3	15.4	17.4	11.6	11.4	16.2	15.2	15.8	20.6	21.6	27.2	18.2	16.8	-
B14	33.3	36.1	36.0	35.0	35.6	31.0	33.2	34.8	37.4	39.6	31.6	42.7	35.5	32.7	-
SG27	33.5	34.4	36.0	31.7	34.8	21.9	31.0	26.3	25.5	34.2	38.2	44.2	32.6	30.0	-

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (factor) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
C31	34.7	40.6	33.3	29.6	25.2	25.0	26.6		24.2	34.2	36.0	38.2	31.6	29.1	-
C32	34.5	43.6	35.5	36.5	35.2	31.8	28.4	32.4	34.3	41.6	34.2	39.9	35.7	32.8	-

☐ **Local bias adjustment factor used**

☒ **National bias adjustment factor used**

☐ **Annualisation has been conducted where data capture is <75%**

☒ **Where applicable, data has been distance corrected for relevant exposure**

Notes:

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

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

(1) See Appendix C for details on bias adjustment and annualisation.

(2) Distance corrected to nearest relevant public exposure.

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

Sources

Omega Proteins was granted planning approval in 2017 for a new thermal oxidiser. This industry is now permitted as an A1 process by the Environment Agency. There have also been two peak power generation plants approved in this locality of Penrith within 2017. In light of this, the two industrial estates, the M6 and the prevailing wind a new monitoring tube location to verify background nitrogen dioxide levels has been established for 2018.

A housing development for 110 houses on the outskirts of the east of Penrith was approved.

Choice of NO2 Bias Adjustment Factor

The monitoring tubes within Eden District Council are supplied and analysed by Gradko. The tubes are prepared using a 50% TEA in acetone solution and typically exposed for a 4 week period. The 2018 results have been corrected for bias using a factor of 0.92 which was determined following 8 studies undertaken by Gradko as part of the National Diffusion Tube Bias Adjustment Factor study.

QA/QC of diffusion tube monitoring

The tube precision for all 8 studies is listed as 'Good' for the Gradko laboratory on the Defra website.

The laboratory has also taken part in the AIR proficiency scheme.

Table 1: Laboratory summary performance for AIR NO_2 PT rounds AR0019, 21, 22, 24, 25, 27, 28 and 30

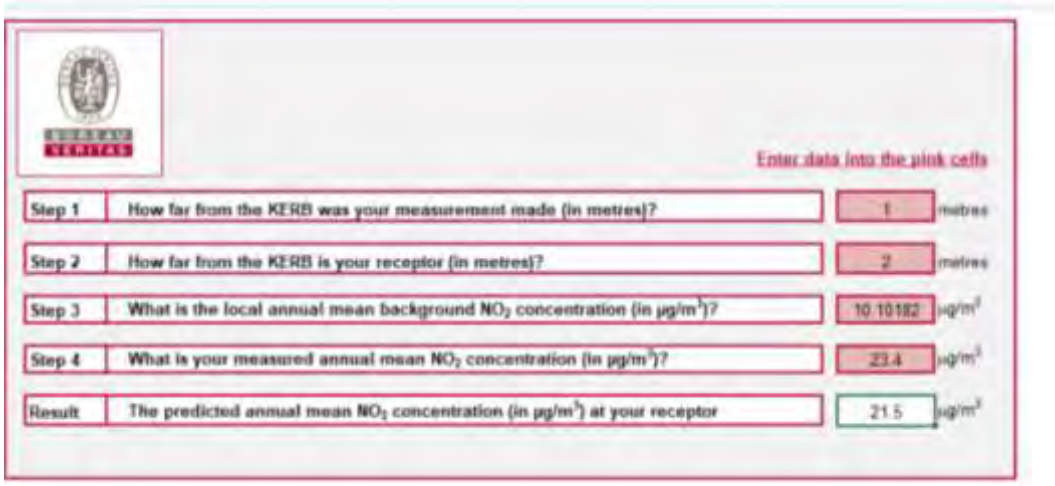
The following table lists those UK laboratories undertaking LAQM activities that have participated in recent AIR NO_2 PT rounds and the percentage (%) of results submitted which were subsequently determined to be **satisfactory** based upon a *z*-score of ≤ *a* 2 as defined above.

AIR PT Round	AIR PT AR019	AIR PT AR021	AIR PT AR022	AIR PT AR024	AIR PT AR025	AIR PT AR027	AIR PT AR028	AIR PT AR030
Round conducted in the period	April – May 2017	July – August 2017	September – October 2017	January – February 2018	April – May 2018	July – August 2018	September – October 2018	January – February 2019
Aberdeen Scientific Services	100 %	100 %	100 %	100 %	100 %	100 %	100 %	75 %
Cardiff Scientific Services	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]
Edinburgh Scientific Services	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
SOCOTEC	100 % [1]	100 % [1]	100 % [1]	100 % [1]	100 % [1]	100 % [1]	100 % [1]	87.5 % [1]
Exova (formerly Clyde Analytical)	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]
Glasgow Scientific Services	50 %	0 %	100 %	100 %	100 %	50 %	100 %	100 %
Gradko International [1]	100 % [1]	100 % [1]	100 % [1]	100 % [1]	100 %	100 %	100 %	75 %
Kent Scientific Services	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]
Kirklees MBC	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]
Lambeth Scientific Services	NR [2]	NR [2]	100 %	NR [2]	NR [2]	NR [2]	75 %	50 %
Milton Keynes Council	75 %	0 %	75 %	100 %	75 %	100 %	100 %	100 %
Northampton Borough Council	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]
Somerset Scientific Services	100 %	100 %	75 %	100 %	100 %	100 %	100 %	100 %
South Yorkshire Air Quality Samplers	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Staffordshire County Council	100 %	100 %	100 %	50 %	100 %	100 %	100 %	100 %
Tayside Scientific Services (formerly Dundee CC)	NR [2]	100 %	NR [2]	100 %	NR [2]	100 %	NR [2]	100 %
West Yorkshire Analytical Services	100 %	100 %	100 %	50 %	75 %	100 %	100 %	100 %

[1] Participant subscribed to two sets of test results (2 x 4 test samples) in each AIR PT round.
[2] NR No results reported.
[3] Northampton Borough Council, Kent Scientific Services, Cardiff Scientific Services, Kirklees MBC and Exova (formerly Clyde Analytical) do no longer carry out NO2 diffusion tube monitoring and therefore did not submit results.

As can be seen from the table above Gradko have consistently scored 100% in 2018.

For all monitoring locations within Eden. There was 75% or more data capture for the year and consequently no annualisation of the data was required. All bar one monitoring locations have been chosen to be representative of a relevant receptor (residential property) and have been located on the facade of the building and therefore do not require any distance adjustment. P1 was added as a monitoring location this year and is 1m away from the relevant receptor. This had to be adjusted for. To do this the Defra $N0_2$ fall out calculator tool was used. The background levels were found from the Defra Background Mapping data for local authorities.



Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	1	metres
Step 2	How far from the KERB is your receptor (in metres)?	2	metres
Step 3	What is the local annual mean background NO_2 concentration (in $\mu g/m^3$)?	10.10182	$\mu g/m^3$
Step 4	What is your measured annual mean NO_2 concentration (in $\mu g/m^3$)?	23.4	$\mu g/m^3$
Result	The predicted annual mean NO_2 concentration (in $\mu g/m^3$) at your receptor	21.5	$\mu g/m^3$

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

Map D1 Monitoring locations east of Castlegate, along Castlegate and Victoria Road.

Map D2 Monitoring locations in the northern outskirts of Penrith.

Map D3 Monitoring locations within Eamont Bridge.

Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[4]	
	Concentration	Measured as
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m^3	Annual mean
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

NB $PM_{2.5}$ Particulates with a diameter of less than 2.5 µg do not have an Air Quality Objective level but Local Authorities are required to work towards reducing emissions and concentrations.

[4] 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	Air quality Annual Status Report.
Defra	Department for Environment, Food and Rural Affairs.
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England.
EU	European Union.
FDMS	Filter Dynamics Measurement System.
LAQM	Local Air Quality Management.
NO_2	Nitrogen Dioxide.
NO_x	Nitrogen Oxides.
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) 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.

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- Defra - Air Quality Expert Group Fine Particulate Matter in the UK Report. 2012.
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- Penrith Town Council Plan 2017-2022 January 2017.