

2019 Air Quality Annual Status Report (ASR)





In fulfilment of Part IV of the Environment Act 1995 Local Air Quality Management

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|----------------------------|---|
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Executive Summary: Air Quality in Our Area

Air pollution is an issue that can affect everyone with varying levels of severity. The air that we breathe is essential for health and wellbeing and it shouldn't have to be a cause of detrimental health effects. Where we live, where we work, our travel choices and journeys made can affect the concentrations of certain pollutants that we are exposed to.

Local authorities have an obligation through the LAQM regime to review and assess the air quality within their regions. Specific measures are implemented by way of an Air Quality Action Plan (AQAP) for areas where poor air quality has been determined, but action by community engagement through education and promotion also helps improving air quality at a local level. Good air quality begins at local level, with actions being replicated on regional and national scales benefitting wider scale air quality and helping to meet the Air Quality Strategy (AQS) objectives that are set out in EU and UK Law.

Air Quality in Bassetlaw

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}.

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around ± 16 billion³.

In the status report (BDC/SR/2019) Bassetlaw District Council compares the monitoring data obtained during a twelve month period (Jan 2018 – December 2018) with the annual air quality objectives as defined in the Air Quality Regulations. The report concluded that there were **no** exceedances of the air quality objectives.

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

Bassetlaw District council continues to monitor levels of Nitrogen Dioxide at key locations across Bassetlaw during 2018. The results of the monitoring data obtained during a twelve month period (January 2018 – December 2018) have been compared with the previous year's monitoring data and the annual air quality objectives as defined in the Air Quality Regulations.

Actions to Improve Air Quality

A monitoring network of nitrogen dioxide (NO2) diffusion tubes is in place within the District and this currently does not show any exceedences of the relevant AQS objective for NO2 at any relevant location. This monitoring network is set to continue acting as a system to monitor changes in concentration of NO2 and to identify any changes in trends.

Historically, air quality within Bassetlaw has consistently complied with the UK AQS objectives. The District in general benefits from a very good standard of air quality.

There are also a small number of 'hot-spot' locations where pollution has been shown over a number of years to be close to the legal limits. These are in the towns of Worksop and Retford in locations where standing traffic during busy periods causes air quality to be impacted. As the A1 slices across the district it intersects in a number of key locations with some of Bassetlaw's roads. At these locations the A1 either passes under, over or directly alongside the local road network and residents in the immediate vicinity could be impacted by pollution caused by increased levels of traffic. These are areas which are kept under close review to ensure that traffic related pollution is not above the health-based objectives.

With continued levels of development being experienced across the country, an emphasis on air quality is important to ensure areas of poor air quality are identified and acted upon. Across the District air quality continues to be assessed through the monitoring network whereby any areas of poor air quality would be identified.

As an authority we are extremely keen to promote more sustainable transport methods and ensure that the region remains a green, pleasant and healthy environment for all.

Conclusions and Priorities

The conclusion from 2018 round of sampling and analysis (BDC/ASR/2018) is some sites have continued with a downward trend for NO2; however others have shown slight increases. Overall out of the 24 monitoring locations, nine have recorded NO2 levels roughly very similar to the previous year (2017), seven sites have shown an increase and five locations have continued to decrease. Table A.3 details the data from previous years and the most current set of data up to the end of December 2018.

The 2018 data shows no exceedances of the 40µg/m3 limit for NO2.

When the results are corrected for bias adjustment using the 2018 year factor (Appendix B and C) the results decrease further (Table B.1 Appendix B). The Worksop town centre monitoring locations at Watson Road (tubes 12 and 34) have shown an increase. Tube 12 increased from 29.6µg/m3 to 36µg/m3 from 2017 to 2018 data. Tube 34 only increased by only 1µg/m3 compared with 2017's data. Data for the Tuxford/A1 location continues a downward trend.

It is difficult to exactly explain why some sites have shown an increase. This could be because of NOx formation due to atmospheric conditions such as temperature and wind speed/direction affecting dispersion. The summer period (July and August 2018) was recorded nationally as being exceptionally warm with temperatures consistently above 25°C and a significant number of days averaging above 30°C.

Local Engagement and How to get Involved

Bassetlaw's Education and Awareness officer in conjunction with the Communications Team promotes Clean Air Day and will assist any local groups with their own initiatives with regards to improving air quality, for example promoting walking to school and the use of unmotorised transport.

Information is provided on Bassetlaw District Council's website in regards to air quality.

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1 Local Air Quality Management

This report provides an overview of air quality in Bassetlaw 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 Bassetlaw 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 Appendix E.

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 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.

Bassetlaw District Council currently does not have any AQMAs.

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

Bassetlaw has taken forward a number of direct measures during the current reporting year of 2018 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.1.

Table 2.1 – Progress on Measures to Improve Air Quality

| Measure No. | Measure | EU Category | EU Classification | Lead Authority | Planning Phase | Implementation Phase | Key Performance Indicator | Target Pollution Reduction in the AQMA | Progress to Date | Estimated Completion Date | Comments |
|----------------|---|----------------------------|---|-----------------|-------------------|-------------------------|---------------------------------|--|---------------------|---------------------------------|---|
| 1 | Stricter conditions on environment al permits | Environmental Permits | Measures to reduce pollution through IPPC permits going beyond BAT | Bassetlaw | Complete 2015 | Ongoing | None | N/A | Ongoing | Ongoing | All new application will be examined and issued with regards to relevant process guidance. |
| 2 | Attendance at regional working group | Control | Regional groups co-ordinating programmes to develop area wide strategies to reduce emissions and improve air quality | Nottingham City | Complete | Ongoing | None | N/A | Ongoing | Ongoing | The pollution officer will attend regional groups. In their absence where possible a substitute will attend. |
| 3 | Education and awareness campaigns | Promoting travel awareness | Promotion of cycling / walking | Bassetlaw | Complete | April 2017 | None | N/A | Ongoing | Ongoing | BDC to tie in with any national campaigns |
| 4 | New campaign leaflets | Public information | Via leaflets | Bassetlaw | Complete | April 2017 | None | N/A | Complete | Complete | Information is provided to the public via BDC website and social media |
| 5 | Info on social media | Public information | Via other mechanisms | Bassetlaw | complete | April 2017 | None | N/A | Complete | Complete | See above |

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

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

Levels of $PM_{2.5}$ as monitored and modelled by national monitoring networks are within the air quality objectives. Work is ongoing by Bassetlaw to promote measures of air quality and encourage a greater understanding of these issues with the public. These measures are deemed to fulfil the requirement to consider and see to reduce levels of $PM_{2.5}$

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

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

Bassetlaw does not have any automatic monitoring sites.

3.1.2 Non-Automatic Monitoring Sites

Bassetlaw undertook non- automatic (passive) monitoring of NO_2 at 24 sites during 2018. Table A.2 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 (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" and distance correction. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO₂)

Table A.3 in Appendix A compares the ratified and adjusted monitored NO₂ annual mean concentrations for the past 5 years with the air quality objective of $40\mu g/m^3$.

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

There have been no exceedances of the air quality objective of 40ug/m³ within 2018.

3.2.2 Particulate Matter (PM_{2.5}) & (PM₁₀)

Bassetlaw District Council do not monitor for Particulate Matter (PM_{2.5}) and (PM₁₀)

3.2.3 Sulphur Dioxide (SO₂)

Bassetlaw District Council do not monitor for sulphur dioxide.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Bassetlaw District Council does not have any automatic monitoring sites.

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

| Site ID | Site name | Site type | X OS Grid ref | Y OS Grid ref | Pollutant | In AQMA | Distance to relevant receptor | Distance to kerb of nearest road | Tube height |
|---------|--|-----------------|------------------|------------------|-----------------|---------|-------------------------------------|--|----------------|
| 2 | Cuckney | Suburban | 456490 | 371245 | NO ₂ | NO | 1m | 1m | 2 |
| 3 | 7a Kings Head, Carlton Rd, Worksop | Urban Centre | 458564 | 379284 | NO ₂ | NO | 1m | 1m | 2 |
| 5 | Newcastle Avenue, Worksop | Urban Centre | 458230 | 378909 | NO ₂ | NO | 1m | 1m | 2 |
| 12 | Watson Road, Worksop (1) | Urban Centre | 458569 | 379162 | NO ₂ | NO | 0.5m | 1m | 2 |
| 15 | Blyth Rd, Ranby | Urban Centre | 464921 | 381197 | NO ₂ | NO | 0.5m | 1m | 2 |
| 22 | Little Styrrup, DunhamTuxford | Urban Centre | 481325 | 374504 | NO ₂ | NO | 4m | 1m | 2 |
| 25 | London Rd Junction, Retford | Urban Centre | 470759 | 380698 | NO ₂ | NO | 5m | 1m | 2 |
| 26 | Hospital Road, Retford | Urban Centre | 470095 | 381292 | NO ₂ | NO | 2m | 1m | 2 |
| 27 | Arlington Way / Grove Street, Retford | Urban Centre | 470793 | 381106 | NO ₂ | NO | 1m | 1m | 2 |
| 28 | Elkesley, A1 | Urban Centre | 468518 | 375695 | NO ₂ | NO | 1m | 1m | 2 |

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| 29 | Lincoln Road, A1 Overpass, Tuxford | Urban Centre | 473779 | 371093 | NO ₂ | NO | 1m | 1m | 2 |
|----|---|-----------------|--------|--------|-----------------|----|-----|----|---|
| 30 | Beaufort Road, NrA57 bypass | Urban Centre | 457557 | 379081 | NO ₂ | NO | 2m | 1m | 2 |
| 31 | Claylands Ave, Worksop | Urban Centre | 457837 | 380581 | NO ₂ | NO | 2m | 1m | 2 |
| 32 | Birch Court, Tuxford | Urban Centre | 473911 | 370840 | NO ₂ | NO | 2m | 1m | 2 |
| 34 | Watson Road, Worksop (2) | Urban Centre | 458639 | 379009 | NO ₂ | NO | 2m | 2m | 2 |
| 35 | Selby Road, Styrrup, A1 | Urban Centre | 461104 | 390658 | NO ₂ | NO | 5m | 2m | 2 |
| 36 | Retford Road, A1, Blyth | Urban Centre | 463022 | 386937 | NO ₂ | NO | 2m | 2m | 2 |
| 37 | Scrooby Road | Urban Centre | 461636 | 391547 | NO ₂ | NO | 25m | 1m | 2 |
| 39 | Carlton Road - New Tesco | Urban Centre | 458685 | 379893 | NO ₂ | NO | 17m | 1m | 2 |
| 40 | Scrroby Road - New ASDA | Urban Centre | 462598 | 391521 | NO ₂ | NO | 2m | 1m | 2 |
| 41 | Kilton Road - New Morrisons | Urban Centre | 459376 | 379451 | NO ₂ | NO | 1m | 1m | 2 |
| 42 | Hall Drive, Worksop (St. Annes Roundabout) | Urban Centre | 457738 | 378729 | NO ₂ | NO | 1m | 1m | 2 |
| 43 | Mansfield Road, Worksop | Urban Centre | 457556 | 378743 | NO ₂ | NO | 1m | 1m | 2 |
| 44 | Shireoaks Common (Background) | Suburban | 456313 | 381183 | NO ₂ | NO | 1m | 1m | 2 |

Table A.3 – Annual Mean NO2 Monitoring Results

| Site Name | Site Type | Monitoring type | Valid data capture for monitoring period | Valid data capture for (2018) | 2014 | 2015 | 2016 | 2017 | 2018(x) |
|-----------|--------------|--------------------|--|-------------------------------------|------|------|------|------|---------|
| 2 | Suburban | Diffusion Tube | 100% | 100% | 22.9 | 23.6 | 22.3 | 21.9 | 24.57 |
| 3 | Urban Centre | Diffusion Tube | 83% | 83% | 31.1 | 31.2 | 31.2 | 29.4 | 25.76 |
| 5 | Urban Centre | Diffusion Tube | 92% | 92% | 27.4 | 29.8 | 29.4 | 27.8 | 26.44 |
| 12 | Urban Centre | Diffusion Tube | 100% | 100% | 35.3 | 32.2 | 32.2 | 30.8 | 36.06 |
| 15 | Urban Centre | Diffusion Tube | 92% | 92% | 21.2 | 25.8 | 25.8 | 21.0 | 19.10 |
| 22 | Urban Centre | Diffusion Tube | 83% | 83% | 29.1 | 25.9 | 25.9 | 25.2 | 21.56 |
| 25 | Urban Centre | Diffusion Tube | 100% | 100% | 28.8 | 31.4 | 30.7 | 26.4 | 27.48 |
| 26 | Urban Centre | Diffusion Tube | 100% | 100% | 33.8 | 32 | 32.1 | 30.5 | 33.53 |
| 27 | Urban Centre | Diffusion Tube | 100% | 100% | 30.5 | 32.8 | 32.7 | 27.3 | 30.16 |
| 28 | Urban Centre | Diffusion Tube | 83% | 83% | 34.3 | | | 20.1 | 19.80 |
| 29 | Urban Centre | Diffusion Tube | 100% | 100% | 40.1 | 39.1 | 39.4 | 37.5 | 35.55 |
| 30 | Urban Centre | Diffusion Tube | 100% | 100% | 23.3 | 24.3 | 24.5 | 21.3 | 22.38 |
| 31 | Urban Centre | Diffusion Tube | 100% | 100% | 27.7 | 27.7 | 27.7 | 25.9 | 26.96 |
| 32 | Urban Centre | Diffusion Tube | 92% | 92% | 28.8 | 26.7 | 26.7 | 22.1 | 24.46 |
| 34 | Urban Centre | Diffusion Tube | 83% | 83% | 31.6 | 32.4 | 32.4 | 26.0 | 27.09 |
| 35 | Urban Centre | Diffusion Tube | 100% | 100% | 27.5 | 27.7 | 27.7 | 23.2 | 27.17 |
| 36 | Urban Centre | Diffusion Tube | 100% | 100% | 32.6 | 30.4 | 30.4 | 28.1 | 30.76 |
| 37 | Urban Centre | Diffusion Tube | 100% | 100% | 28.2 | 32.5 | 32.5 | 28.1 | 29.96 |
| 39 | Urban Centre | Diffusion Tube | 100% | 100% | 29.3 | 26.3 | 26.3 | 26.2 | 25.83 |
| 40 | Urban Centre | Diffusion Tube | 92& | 92% | 28 | 32.9 | 32.9 | 28.6 | 25.92 |
| 41 | Urban Centre | Diffusion Tube | 92% | 92% | 29.8 | 31.5 | 31.5 | 31.4 | 29.70 |
| 42 | Urban Centre | Diffusion Tube | 92% | 92% | | 31.5 | 31.5 | 20.0 | 20.05 |

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| 43 | Urban Centre | Diffusion Tube | 100% | 100% | 26.9 | 26.5 | 23.8 | 26.35 |
|----|--------------|----------------|------|------|------|------|------|-------|
| 44 | Suburban | Diffusion Tube | 75% | 75% | 25.7 | 25.5 | 23.9 | 18.87 |

☑ Diffusion tube data has been bias corrected

Notes:

Exceedances of the NO₂ annual mean objective of $40\mu g/m^3$ are shown in **bold**.

NO₂ annual means exceeding 60µg/m³, indicating a potential exceedance of the NO₂ 1-hour mean objective are shown in **bold and underlined**.

(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%).

(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

The following figures show the results of six tube locations over the last 8 years. These six tubes have been selected for further detailed trend data because they are the ones that have been close to the annual mean (40µg/m3) exceedance level for nitrogen dioxide.













Appendix B: Full Monthly Diffusion Tube Results for 2018

Table B.1 – NO2 Monthly Diffusion Tube Results - 2018

| | | | | | | | NO ₂ Mea | n Concen | trations (µ | ıg/m³) | | | | | |
|---------|-------|-------|-------|-------|-------|-------|---------------------|----------|-------------|--------|-------|-------|-------------|---|--|
| | | | | | | | | | | | | | | Annual Mea | n |
| Site ID | Jan | Feb | Mar | Apr | Мау | Jun | Jul | Aug | Sep | Oct | Νον | Dec | Raw Data | Bias Adjusted (factor) and Annualised | Distance Corrected to Nearest Exposure |
| 2 | 25.17 | 28.70 | 27.95 | 24.35 | 22.74 | 18.97 | 20.99 | 20.87 | 20.79 | 25.14 | 31.67 | 27.48 | 24.57 | 21.4 | |
| 3 | xxx | xxx | 34.90 | 33.06 | 25.77 | 28.67 | 29.74 | 28.23 | 26.54 | 33.33 | 32.21 | 36.61 | 25.76 | 22.4 | |
| 5 | 36.83 | 26.55 | 32.23 | 29.72 | 23.88 | 26.76 | 28.79 | 27.36 | 22.49 | 30.45 | xxx | 32.21 | 26.44 | 23.0 | |
| 12 | 30.74 | 34.56 | 41.56 | 34.89 | 35.58 | 34.23 | 38.24 | 29.07 | 28.87 | 40.88 | 43.25 | 40.89 | 36.06 | 31.4 | |
| 15 | 24.52 | 24.40 | 20.77 | 21.95 | 17.29 | 14.62 | 16.63 | 22.88 | 19.60 | 24.82 | 21.73 | ххх | 19.10 | 16.6 | |
| 22 | 27.32 | 25.91 | 29.70 | 24.68 | 22.84 | 22.07 | ххх | ххх | 21.85 | 27.71 | 26.42 | 30.22 | 21.56 | 18.8 | |
| 25 | 32.58 | 30.14 | 32.70 | 30.82 | 18.20 | 19.76 | 22.03 | 25.90 | 22.24 | 30.27 | 26.67 | 38.45 | 27.48 | 23.9 | |
| 26 | 29.43 | 31.77 | 34.40 | 33.81 | 33.18 | 32.46 | 35.64 | 32.98 | 28.05 | 38.28 | 35.90 | 36.47 | 33.35 | 29.2 | |
| 27 | 31.75 | 33.36 | 34.63 | 32.75 | 26.92 | 22.21 | 27.50 | 26.26 | 22.63 | 29.81 | 34.78 | 39.29 | 30.16 | 26.2 | |
| 28 | ххх | 24.08 | 27.14 | 21.53 | 30.50 | 26.97 | 26.14 | 17.78 | 16.57 | 25.02 | xxx | 21.88 | 19.80 | 17.2 | |
| 29 | 38.96 | 31.98 | 40.80 | 43.16 | 27.23 | 25.65 | 34.23 | 37.96 | 31.66 | 39.95 | 34.86 | 40.11 | 35.55 | 30.09 | |
| 30 | 25.00 | 20.57 | 24.97 | 22.37 | 17.54 | 15.89 | 16.48 | 23.76 | 20.28 | 27.39 | 25.42 | 28.89 | 22.38 | 19.5 | |
| 31 | 27.77 | 28.05 | 24.51 | 27.28 | 22.41 | 23.27 | 23.35 | 25.45 | 22.12 | 35.09 | 28.14 | 36.08 | 26.96 | 23.5 | |
| 32 | 27.67 | 31.65 | 36.07 | 29.58 | ххх | 30.02 | 29.69 | 8.69 | 18.59 | 21.64 | 31.60 | 28.28 | 24.46 | 21.3 | |
| 34 | 33.03 | 33.27 | 32.13 | ххх | xxx | 26.76 | 31.53 | 27.01 | 25.76 | 35.16 | 41.04 | 39.48 | 27.09 | 23.6 | |
| 35 | 28.85 | 30.53 | 35.26 | 29.06 | 28.59 | 19.91 | 22.84 | 20.51 | 20.80 | 26.84 | 30.70 | 32.19 | 27.17 | 23.6 | |

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| 36 | 28.05 | 29.66 | 34.18 | 32.07 | 33.68 | 30.56 | 32.61 | 25.60 | 21.48 | 35.96 | 32.51 | 32.73 | 30.76 | 26.8 | |
|----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|--|
| 37 | 34.56 | 31.82 | 36.43 | 28.24 | 21.82 | 22.93 | 26.32 | 30.81 | 24.21 | 35.22 | 27.72 | 39.45 | 29.96 | 26.1 | |
| 39 | 31.41 | 27.25 | 31.95 | 28.37 | 16.53 | 22.25 | 21.76 | 23.82 | 21.46 | 27.86 | 27.50 | 29.79 | 25.83 | 22.5 | |
| 40 | 29.87 | 29.20 | 31.89 | 31.08 | 21.08 | 19.93 | 23.41 | ххх | 21.18 | 30.72 | 32.30 | 40.46 | 25.92 | 22.6 | |
| 41 | 39.73 | 30.35 | 32.73 | 34.33 | ххх | 27.39 | 28.49 | 32.25 | 28.76 | 36.71 | 29.92 | 35.82 | 29.70 | 25.8 | |
| 42 | 24.96 | 23.67 | 24.63 | 23.64 | 17.54 | 16.53 | 17.31 | ххх | 17.64 | 24.49 | 24.50 | 25.76 | 20.05 | 17.4 | |
| 43 | 33.09 | 26.77 | 28.68 | 29.36 | 20.91 | 22.22 | 26.91 | 22.89 | 19.51 | 24.53 | 26.94 | 34.44 | 26.35 | 22.9 | |
| 44 | 25.88 | 25.33 | 29.37 | 27.94 | 20.75 | 20.04 | 22.09 | xxx | xxx | 28.91 | 26.20 | ххх | 18.87 | 16.4 | |

□ Local bias adjustment factor used

☑ National bias adjustment factor used

 \Box Annualisation has been conducted where data capture is <75%

□ Where applicable, data has been distance corrected for relevant exposure

Notes:

Exceedances of the NO₂ annual mean objective of $40\mu g/m^3$ are shown in **bold**.

NO₂ annual means exceeding 60µg/m³, indicating a potential exceedance of the NO₂ 1-hour mean objective are shown in **bold and underlined**.

(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

Quality Assurance and quality control

LAQM.TG(09) specifically encourages local authorities to select sampling labs that maintain high standards of quality assurance and quality control. The lab selected by Bassetlaw District Council for purchasing and analysing the nitrogen dioxide tubes is Gradko International. Gradko participate in the Workplace Analysis Scheme for Proficiency (WASP). The scheme is an independent analytical performance testing scheme operated by the Health and Safety Laboratory (HSL). WASP is an important QA/QC exercise for laboratories supplying diffusion tubes to Local Authorities for use in the context of Local Air Quality Management (LAQM). At quarterly intervals HSL supplies the labs with 4 samplers doped with unknown amounts of nitrite. It then assesses and calculates a performance index from the results. Gradko's analytical laboratory is assessed annually by UKAS to establish conformance of our Laboratory Quality Procedures to the requirements of ISO/IEC 17025 Standard. Gradko employ the use of travel blanks as recommended TG (09).

Selection of suitable bias factor

Bassetlaw District Council do not have any chemiluminescense analysers so the precision and accuracy of the nitrogen dioxide tubes cannot be validated by the use of a local co-location study. An appropriate bias adjustment factor derived from nationally available bias factors must be applied to the mean values of the tube results. The spreadsheet tool referenced below and shown in figure 2.5 has been used to calculate an appropriate bias factor of 0.93

Lhttp://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html

Figure C.1 – Selection of bias adjustment factor

| | IND T CIVIL | | | | | | | | | | | |
|--|---|--|---|---|---|--|--|--|---|--|--|--|
| | в | С | D | E | F | H | I | J | K | L | М | |
| 2 | National Diffusion Tube | Bias Adiu | stment | Fac | tor Spreadsheet | | | Spreadsh | ieet Vers | eet Version Number: 03/19 | | |
| 2 | Follow the steps below in the correct orde | r to show the results | of relevant of | o-locat | tion studies | | | | This | spreadshe | et will be | |
| 4 | Data only apply to tubes exposed monthly a | - ind are not suitable f | or correcting i | ndividı | ual short-term monitoring periods | | | | updat | ed at the e | nd of June | |
| | Whenever presenting adjusted data, you st | hould state the adjust | tment factor u | sed ar | nd the version of the spreadsheet | | | | | 2019 | | |
| 6 | This spreadhseet will be updated every few | months: the factors | may therefore | e be su | ubject to change. This should not disco | urage their | immediate use | э. | | | Website | |
| 7 | The LAQM Helpdesk is operated on behalf of De partners AECOM and the National Physical Labor | fra and the Devolved A atory. | dministrations b | y Burea | au Veritas, in conjunction with contract | by the Nationa onsultants Ltd. | I Physica | al Laborato | ry. Original | | | |
| 8 | Step 1: | Step 2: | Step 3: | | | S | tep 4: | | | | | |
| 9 | 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 | W cauti | here there is only one study for a cho- ion. Where there is more than one stu | sen combin dy, use the | ation, you sho overall factor ³ | uld use the adj shown in <mark>blue</mark> | ustment at the fo | t factor sho bot of the fi | wn with nal column. | |
| 10 | If a laboratory is not shown, we have no data for this laboratory. | Ye 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 | lf you | have your own co-location study then see Helpdesk at LAQM | footnote ⁴ . If Helpdesk@ul | uncertain what t c.bureauveritas.c | o do then contac com or 0800 032 | ct the Loci 7953 | al Air Quality | Management | |
| | Analysed By ¹ | Method To side your solection, choose SII) from the poptup list | Year ⁵ To undo your relection, choore (All) | Site Type | Local Authority | Length of Study (months) | Diffusion Tube Mean Conc. (Dm) | Automatic Monitor Mean Conc. | Bias (B) | Tube Precision ® | Bias Adjustment Factor (A) | |
| 11 | | Y | T. | _ | | | (µg/m°) | (Cm) (µg/m°) | 10.011 | _ | (Cm/Dm) | |
| 2432 | Gradko | 20% TEA in water | 2018 | н | Eastleigh Borough Council | 11 | 28 | 32 | -12.07 | G | 1.14 | |
| 2433 | Laradko | | | | | 1 10 1 | A 11 | | 10.017 | | | |
| 2424 | Coulto | 20% TEA in water | 2018 | R | Eastleigh Borough Council | 12 | 42 | 38 | 10.2% | G | 0.91 | |
| 2434 | Gradko Gradko | 20% TEA in water 20% TEA in water | 2018 2018 2018 | UB | Eastleigh Borough Council Eastleigh Borough Council Cataghand Council | 12 12 12 | 42 27 29 | 38 28 25 | 10.2% | G | 0.91 | |
| 2434 2435 2436 | Gradko Gradko Gradko | 20% TEA in water 20% TEA in water 20% TEA in water 20% TEA in water | 2018 2018 2018 2018 | UB R | Eastleigh Borough Council Eastleigh Borough Council Gateshead Council Cateshead Council | 12 12 12 12 | 42 27 29 32 | 38 28 25 29 | 10.2% -4.4% 13.9% | G G G | 0.91 1.05 0.88 | |
| 2434 2435 2436 2437 | Gradko Gradko Gradko Gradko | 20% TEA in water 20% TEA in water 20% TEA in water 20% TEA in water 20% TEA in water | 2018 2018 2018 2018 2018 2018 | H UB R R B | Eastleigh Borough Council Eastleigh Borough Council Gateshead Council Gateshead Council Sateshead Council | 12 12 12 12 9 | 42 27 29 32 40 | 38 28 25 29 41 | 10.2% -4.4% 13.9% 10.8% | 6 6 6 6 | 0.91 1.05 0.88 0.90 | |
| 2434 2435 2436 2437 2442 | Gradko Gradko Gradko Gradko Gradko Gradko | 20% TEA in water 20% TEA in water 20% TEA in water 20% TEA in water 20% TEA in water 50% TEA in water | 2018 2018 2018 2018 2018 2018 2018 | H UB R R R SU | Eastleigh Borough Council Eastleigh Borough Council Gateshead Council Gateshead Council Gateshead Council Redoar and Cleveland Borough Council | 12 12 12 12 9 9 | 42 27 29 32 40 18 | 38 28 25 29 41 10 | 10.2% -4.4% 13.9% 10.8% -1.8% 83.3% | G G G G G | 0.91 1.05 0.88 0.90 1.02 0.55 | |
| 2434 2435 2436 2437 2442 2444 | Gradko Gradko Gradko Gradko Gradko Gradko Gradko | 20% TEA in water 20% TEA in water 20% TEA in water 20% TEA in water 20% TEA in water 50% TEA in acetone 50% TEA in acetone | 2018 2018 2018 2018 2018 2018 2018 2018 | H UB R R SU SU | Eastleigh Borough Council Eastleigh Borough Council Gateshead Council Gateshead Council Gateshead Council Redoar and Cleveland Borough Council West Berkshire | 12 12 12 12 9 9 10 | 42 27 29 32 40 18 40 | 38 28 25 29 41 10 37 | 10.2% -4.4% 13.9% 10.8% -1.8% 83.3% 10.5% | 6 6 6 6 6 6 | 0.91 1.05 0.88 0.90 1.02 0.55 0.91 | |
| 2434 2435 2436 2437 2442 2444 2447 | Gradko Gradko Gradko Gradko Gradko Gradko Gradko Gradko | 20% IEA in water 20% TEA in water 20% TEA in water 20% TEA in water 20% TEA in water 50% TEA in acetone 20% TEA in water | 2018 2018 2018 2018 2018 2018 2018 2018 | H UB R R SU R R | Eastleigh Borough Council Eastleigh Borough Council Gateshead Council Gateshead Council Gateshead Council Redcar and Cleveland Borough Council West Berkshire Woltingham Borough Council | 12 12 12 12 9 9 10 12 | 42 27 29 32 40 18 40 38 | 38 28 25 29 41 10 37 33 | 10.2% -4.4% 13.9% 10.8% -1.8% 83.3% 10.5% 13.2% | 6 6 6 6 6 6 6 | 0.91 1.05 0.88 0.90 1.02 0.55 0.91 0.88 | |
| 2434 2435 2436 2437 2442 2444 2447 2448 | Gradico Gradico Gradico Gradico Gradico Gradico Gradico Gradico Gradico Gradico | 20% TEA in water 20% TEA in water 20% TEA in water 20% TEA in water 20% TEA in water 50% TEA in acetone 20% TEA in water 20% TEA in water | 2018 2018 2018 2018 2018 2018 2018 2018 | H UB R R SU R R R R | Eastleigh Borough Council Eastleigh Borough Council Gateshead Council Gateshead Council Redcar and Cleveland Borough Council West Berkshire Wolkingham Borough Council Bath & North East Somerset | 12 12 12 12 9 9 10 12 12 | 42 27 29 32 40 18 40 38 40 | 38 28 25 29 41 10 37 33 33 39 | 10.2% -4.4% 13.9% 10.8% -1.8% 83.3% 10.5% 13.2% 4.0% | 6 6 6 6 6 6 6 6 | 0.91 1.05 0.88 0.90 1.02 0.55 0.91 0.88 0.96 | |
| 2434 2435 2436 2437 2442 2444 2447 2448 2449 | Gradko Gradko Gradko Gradko Gradko Gradko Gradko Gradko Gradko Gradko | 20% TEA in water 20% TEA in water | 2018 2018 2018 2018 2018 2018 2018 2018 | H UB R R SU R R R R R | Easteigh Borough Council Easteigh Borough Council Gateshead Council Gateshead Council Redoar and Cleveland Borough Council West Berkshire Wolnigham Borough Council Bath 8. North East Somerset Bedros Borough Council | 12 12 12 12 9 9 10 12 12 12 10 | 42 27 29 32 40 18 40 38 40 30 | 38 28 25 29 41 10 37 33 39 27 | 10.2% -4.4% 13.9% 10.8% -1.8% 83.3% 10.5% 13.2% 4.0% 8.8% | 6 6 6 6 6 6 6 6 | 0.91 1.05 0.88 0.90 1.02 0.55 0.91 0.88 0.96 0.92 | |
| 2434 2435 2436 2437 2442 2444 2447 2448 2449 2458 | Gradko Gradko Gradko Gradko Gradko Gradko Gradko Gradko Gradko Gradko Gradko | 20% TEA in water 20% TEA in water 20% TEA in water 20% TEA in water 20% TEA in water 50% TEA in water 20% TEA in water 20% TEA in water 20% TEA in water 20% TEA in water | 2018 2018 2018 2018 2018 2018 2018 2018 | H UB R R SU R R R R R R KS | Eastleigh Borough Council Eastleigh Borough Council Gateshead Council Gateshead Council Gateshead Council Redcar and Cleveland Borough Council West Berkshire Wolkingham Borough Council Bath & North East Somerset Bedford Borough Council Maylebone Road Intercomparison | 12 12 12 3 9 10 12 12 12 12 10 11 | 42 27 29 32 40 18 40 38 40 30 30 93 | 38 28 25 29 41 10 37 33 39 27 85 | 10.2% -4.4% 13.9% 10.8% -1.8% 83.3% 10.5% 13.2% 4.0% 8.8% 9.3% | 6 6 6 6 6 6 6 6 6 6 6 | 0.91 1.05 0.88 0.90 1.02 0.55 0.91 0.88 0.96 0.92 0.91 | |
| 2434 2435 2436 2437 2442 2444 2447 2448 2449 2458 2468 | Gradico Gradico Gradico Gradico Gradico Gradico Gradico Gradico Gradico Gradico Gradico Gradico Gradico Gradico | 20/5 TEA in water 20/5 TEA in water 20/5 TEA in water 20/5 TEA in water 20/5 TEA in acetone 20/5 TEA in acetone 20/5 TEA in acetone 20/5 TEA in water 20/5 TEA in water 20/5 TEA in water 20/5 TEA in acetone | 2018 2018 2018 2018 2018 2018 2018 2018 | H UB R R SU R R R R R KS KS | Eastleigh Borough Council Eastleigh Borough Council Gateshead Council Gateshead Council Redoar and Cieveland Borough Council West Berkshire Wokingham Borough Council Bahr & North East Somerset Bedford Borough Council Maylebone Road Intercomparison | 12 12 12 9 9 10 12 12 12 12 10 11 11 | 42 27 29 32 40 18 40 38 40 38 40 30 30 93 | 38 28 25 29 41 10 37 33 39 27 27 85 85 | 10.2% -4.4% 13.3% 10.8% -1.8% 83.3% 10.5% 13.2% 4.0% 8.8% 9.3% 6.5% | 6 6 6 6 6 6 6 6 6 6 6 6 | 0.91 1.05 0.88 0.90 1.02 0.55 0.91 0.88 0.96 0.92 0.91 0.94 | |
| 2434 2435 2436 2437 2442 2444 2447 2448 2449 2458 2468 2468 2470 | Gradko Gradko Gradko Gradko Gradko Gradko Gradko Gradko Gradko Gradko Gradko Gradko Gradko Gradko | 2007: TEA in water 2007: TEA in water | 2018 2018 2018 2018 2018 2018 2018 2018 | H B R R SU R R R R R KS UB | Easteigh Borough Council Easteigh Borough Council Gateshead Council Gateshead Council Gateshead Council Redoar and Cleveland Borough Council West Berkshire Wolkingham Borough Council Bath & North East Somerset Bedford Borough Council Marylebone Road Intercomparison Marylebone Road Intercomparison Reading Borough Council | 12 12 12 9 9 10 12 12 12 12 10 11 11 11 12 | 42 27 29 32 40 18 40 38 40 30 93 93 91 20 | 38 28 29 41 10 37 33 33 27 85 85 85 26 | 10.2% -4.4% 13.9% 10.8% -1.8% 83.3% 10.5% 13.2% 4.0% 8.8% 9.3% 6.5% -22.6% | 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 | 0.91 1.05 0.88 0.90 1.02 0.55 0.91 0.88 0.96 0.92 0.91 0.94 1.29 | |
| 2434 2435 2436 2437 2442 2444 2447 2448 2449 2458 2468 2468 2470 2477 | Gradico Gradico Gradico Gradico Gradico Gradico Gradico Gradico Gradico Gradico Gradico Gradico Gradico Gradico Gradico Gradico | 2007: TEA in water 2007: TEA in water | 2018 2018 2018 2018 2018 2018 2018 2018 | H UB R R R R R R R R R R SU R R R R SU R R R R | Eastleigh Borough Council Eastleigh Borough Council Gateshead Council Gateshead Council Gateshead Council Redcar and Cleveland Borough Council West Berkshire Wolkingham Borough Council Bath & North East Somerset Bedford Borough Council Maylebone Road Intercomparison Maylebone Road Intercomparison Reading Borough Council South Gloucestershire Council | 12 12 12 9 9 10 12 12 12 12 12 10 11 11 11 12 12 | 42 27 29 32 40 18 40 38 40 30 93 93 91 20 21 | 38 25 29 41 10 37 33 39 27 85 85 85 26 20 | 10.2% -4.4% 13.9% 10.8% -1.8% 83.3% 10.5% 13.2% 4.0% 8.8% 9.3% 6.5% -22.6% 6.3% | 6 6 6 6 6 6 6 6 6 6 6 6 | 0.91 1.05 0.88 0.90 1.02 0.55 0.91 0.88 0.96 0.96 0.92 0.91 0.94 1.29 0.94 | |
| 2434 2435 2436 2437 2442 2444 2447 2448 2449 2458 2468 2470 2477 2480 | Gradico | 2007: TEA in water 2007: TEA in water | 2018 2018 2018 2018 2018 2018 2018 2018 | H B R R R R R R R R S U R R R S U R R R R R | Easteigh Borough Council Easteigh Borough Council Gateshead Council Gateshead Council Gateshead Council Redoar and Cleveland Borough Council West Berkshire Wokingham Borough Council Bath & North East Somerset Bedford Borough Council Marylebone Road Intercomparison Reading Borough Council South Gloucestershire Council Thurrock Borough Council | 12 12 12 9 9 10 12 12 12 12 10 11 11 11 11 12 12 12 12 | 42 29 32 40 18 40 38 40 30 93 91 20 21 53 | 38 28 29 41 10 37 33 39 27 85 85 85 26 20 52 | 10.2% -4.4% 13.9% 10.8% -1.8% 83.3% 10.5% 13.2% 4.0% 8.8% 9.3% 6.5% -22.6% 6.3% 2.3% | 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 | 0.91 1.05 0.88 0.90 1.02 0.55 0.91 0.88 0.96 0.96 0.92 0.91 0.94 1.29 0.94 0.98 | |
| 2434 2435 2436 2437 2442 2444 2447 2448 2449 2458 2468 2470 2477 2480 2477 2480 2481 | Gradko Gradko Gradko Gradko Gradko Gradko Gradko Gradko Gradko Gradko Gradko Gradko Gradko Gradko Gradko Gradko | 2007: TEA in water 2007: TEA in water | 2018 2018 2018 2018 2018 2018 2018 2018 | H B R R R R R R KS KS UB R R R R R R R R | Easteigh Borough Council Easteigh Borough Council Gateshead Council Gateshead Council Gateshead Council Redcar and Cleveland Borough Council West Bertshire Wokingham Borough Council Bath & North East Somerset Bedford Borough Council Marylebone Road Intercomparison Marylebone Road Intercomparison Reading Borough Council South Gloucestershire Council Thurrock Borough Council Thurrock Borough Council | 12 12 12 12 9 9 10 12 12 12 10 11 11 11 11 12 12 12 12 12 | 42 27 29 32 40 18 40 38 40 30 33 30 93 30 93 20 21 53 34 | 38 28 25 41 10 37 33 39 27 85 27 85 26 20 52 30 | 10.2% -4.4% 13.9% 10.8% -1.8% 83.3% 10.5% 13.2% 4.0% 8.8% 9.3% 6.5% 6.5% 6.5% 6.3% 2.3% 15.1% | 6 6 6 6 6 6 6 6 6 6 5 6 5 6 | 0.31 1.05 0.88 0.90 1.02 0.55 0.31 0.88 0.96 0.92 0.31 0.94 1.29 0.94 1.29 0.94 0.94 0.98 0.87 | |
| 2434 2435 2436 2437 2442 2444 2447 2448 2449 2458 2468 2470 2477 2480 2477 2480 2481 2482 | Gradico | 2007: TEA in water 2007: TEA in water | 2018 2018 2018 2018 2018 2018 2018 2018 | H B R R S U R R R R S V R R R S V R R R R R R S V R R R R | Eastleigh Borough Council Eastleigh Borough Council Gateshead Council Gateshead Council Redoar and Cleveland Borough Council West Berkshire Wolkingham Borough Council Bath & North East Somerset Bedford Borough Council Maylebone Road Intercomparison Maylebone Road Intercomparison Reading Borough Council Thurock Borough Council Thurock Borough Council | 12 12 12 12 12 12 12 12 12 10 11 11 11 11 12 12 12 12 12 12 12 | 42 27 29 32 40 18 40 38 40 30 93 91 20 21 53 34 31 | 38 25 25 29 10 37 33 39 27 85 85 26 26 26 52 30 24 | 10.2% -4.4% 13.9% -1.8% -1.8% 83.3% 10.5% 13.2% 4.0% 8.8% 9.3% 6.5% -22.6% 6.3% 2.3% 15.1% 28.8% | 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 | 0.31 1.05 0.88 0.30 1.02 0.55 0.31 0.88 0.36 0.32 0.31 0.94 1.29 0.34 0.98 0.87 0.78 | |
| 2434 2435 2436 2437 2442 2444 2447 2448 2449 2458 2468 2470 2477 2480 2477 2480 2477 2480 2481 2482 2483 | Gradko | 2007: TEA in water 2007: TEA in water | 2018 2018 2018 2018 2018 2018 2018 2018 | H B R R R R R R R R R R R R R R R R R R | Easteigh Borough Council Easteigh Borough Council Gateshead Council Gateshead Council Redoar and Cleveland Borough Council West Berkshire Wolingham Borough Council Bath 8. North East Somerset Bedford Borough Council Marylebone Road Intercomparison Marylebone Road Intercomparison Reading Borough Council South Gloucestershire Council Thurrock Borough Council Thurrock Borough Council Thurrock Borough Council Thurrock Borough Council | 12 12 12 12 9 9 10 12 12 12 10 11 11 11 11 12 12 12 12 12 12 12 12 | 42 27 29 32 40 18 40 38 40 30 93 93 91 20 21 21 20 21 34 31 27 | 38 25 29 41 10 37 33 39 27 85 85 26 20 52 20 52 30 20 22 30 24 25 | 10.2% -4.4% 13.9% -1.8% -1.8% 83.3% 10.5% 13.2% 4.0% 8.8% 9.3% 6.5% -22.6% 6.3% 2.3% 2.3% 5.1% 28.8% 9.2% | 6 6 6 6 6 6 6 6 6 6 6 6 6 6 7 6 6 7 6 8 6 8 | 0.31 1.05 0.88 0.90 1.02 0.55 0.31 0.88 0.36 0.36 0.32 0.31 0.34 1.29 0.34 0.38 0.36 0.87 0.78 0.32 | |

A bias factor of **0.93** has been calculated from the Defra spreadsheet tool which includes the results of nationwide diffusion tube colocation studies. The bias factor is applied to the 2018 data set



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





FIGURE D.3

Map of Non-Automatic Monitoring Sites (Worksop Town Centre – Detailed)



FIGURE D.4 Map of Non-Automatic Monitoring Sites (Retford Town Centre – Detailed)



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 | |

⁴ The units are in microgrammes of pollutant per cubic metre of air (μ g/m³).

Glossary of Terms

| Abbreviation | Description | |
|-------------------|--|--|
| AQAP | Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values' | |
| AQMA | Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives | |
| ASR | 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 | |