



**STROUD
DISTRICT
COUNCIL**
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2017 Air Quality Annual Status Report (ASR)

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

October 2017

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Executive Summary: Air Quality in Our Area

The primary influence on Air Quality within Stroud District remains road traffic with the primary pollutant of concern being Nitrogen Dioxide. Air quality across the district generally remains very good with measured levels of Nitrogen Dioxide generally well below national limits. The overall trend is that Nitrogen Dioxide levels are relatively stable.

There are a few areas which have shown a slight increase in levels. However, these increases are marginal and well within the accepted accuracy of measurements made with diffusion tubes.

It is not possible to conclude from one year of relatively stable levels whether this contradicts the predicted downward trend. A watching brief will be kept on this over the next few years and comparisons will be made with other authorities to see if a national trend exists.

The two sites at Dudbridge that had crept above the levels in 2014, fell slightly in 2015 and have fallen further in 2016. For the 2016 period these tubes had been re-sited to avoid the influence of the corners of buildings and boiler flues.

Air Quality in Stroud District

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.

The main pollutant of concern within Stroud District is Nitrogen Dioxide from road traffic. Levels of Nitrogen Dioxide have been steadily falling over the years. There are currently no Air Quality Management Areas within the District.

There are a number of Diffusion Tubes located across the District, measuring Nitrogen Dioxide. These are collected and sent off for analysis on a monthly basis. Two of the tubes located at Dudbridge have shown readings on or slightly above the annual average. These tubes however have shown a general downward trend over the last few years.

Actions to Improve Air Quality

Gloucestershire County Council is responsible for strategies relating to traffic management across the County. Further details of these strategies can be found at <http://www.gloucestershire.gov.uk/ltp3>.

The Overarching Transport Strategy is supported through the following policy documents:

Bus
Cycle
Freight
Highways
Rail
Think Travel

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

Local Priorities and Challenges

A 65.3 MW Energy from Waste Plant is currently under construction at Javelin Park, near Haresfield. This plant is due to be commissioned in 2018. A Community Liaison Group made up of Parish and Town Councils, the Environment Agency, Gloucestershire County Council, nearby sensitive receptors and Stroud District Council's Environmental Protection Manager meets on a regular basis to discuss issues that concern the local community. One of the issues raised was concerns regarding the impact of the incinerator on local air quality. Assessments via the Planning and Permitting regimes indicated that there would be no significant impact. A number of extra NO_x tubes have been positioned throughout the district where modelling shows any plume from the incinerator may ground. This is with a view to providing reassurance monitoring to local residents by measuring background levels prior to commissioning then continuing afterwards. It is also currently proposed to install two continuous PM₁₀ monitors at local sites. These will be installed 6 months prior to commissioning and will remain in place for a period of 30 months thereafter. This is also to provide reassurance monitoring to the local community.

How to Get Involved

Copies of the latest Air Quality Report for Stroud District can be found on the Council's Website at <https://www.stroud.gov.uk/environment/environmental-health/pollution-and-nuisance/air-quality>.

Any queries about Air Quality should be directed to the Environmental Protection team within Stroud District Council.

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1 Local Air Quality Management

This report provides an overview of air quality in Stroud District during 2016. 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 Stroud 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.

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 the objectives.

Stroud District Council currently does not have any AQMAs.

2.2 Progress and Impact of Measures to address Air Quality in Stroud District

Stroud District Council expects the following measures to be completed over the course of the next reporting year:

- Introduction of additional Nitrogen Dioxide diffusion tubes across the district to provide background levels of Nitrogen Dioxide prior to the commissioning of the Javelin Park Incinerator, and ongoing levels following commissioning.
- Introduction of restrictions on the age of vehicles which can be licensed as Private Hire Taxis.

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.

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

- Continue to work with Gloucester County Council to identify areas within the Local Transport Plan that will contribute towards a reduction in PM_{2.5}
- In 2018 Stroud District Council will be reviewing and updating the Health and Well Being Plan. Discussions have been ongoing across the Council regarding identifying synergies between that plan, the strategic partners identified in it and the development of policies and strategies which will reduce PM_{2.5} across the district.

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

Stroud District Council has not carried out any automatic monitoring during 2016.

3.1.2 Non-Automatic Monitoring Sites

Stroud District Council undertook non- automatic (passive) monitoring of NO₂ at 21 sites during 2016. Table A.1 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) and bias adjustment for the diffusion tubes are included in Appendix C.

3.2 Individual Pollutants

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

3.2.1 Nitrogen Dioxide (NO₂)

Table A.1 in Appendix A provides details relating to the Monitoring Tubes.

Table A.2 in Appendix A shows the ratified and adjusted monitored NO₂ annual mean concentrations results for the 2016 monitoring period.

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 40µg/m³.

There are no results which exceed the national annual mean NO₂ limit.

There are no exceedances of the air quality objective of 40µg/m³.

Recognising the volume of traffic at Beeches Green and the nature of the locality, that being a steep hill and enclosed on either side, a NO_x tube was installed there in July 2016 and only 6 months of data are currently available. There are no significant relevant receptors within 20 metres of the road; however there is a bus stop, so it was decided to consider the short term exposure limits. All monthly measurements to date have been significantly below the 60 µg/m³ that would trigger a more detailed investigation. This will be reported on in more detail in the next report.

Appendix A: Monitoring Results

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

| Site I.D | Site Name | Site Type | X OS Grid Ref | Y OS Grid Ref | Pollutants Monitored | In AQMA? | Is monitoring co-located with a Continuous Analyser (Y/N) | Relevant Exposure? (Y/N with distance (m) to relevant exposure) | Distance to kerb of nearest road (N/A if not applicable) | Does this location represent worst-case exposure? |
|----------|---|-----------|---------------|---------------|----------------------|----------|---|---|--|---|
| 3 | Brookthorpe – North View | Roadside | 383410 | 212570 | NO ₂ | N | N | Y(19.8m) | 1m | Y |
| 4b | Cainscross – 2 The Rosaries | Roadside | 385308 | 205044 | NO ₂ | N | N | Y(4.0m) | 2.0m | Y |
| 4a | Cainscross – 22 Westward Road | Kerbside | 308471 | 204988 | NO ₂ | N | N | Y(0.0m) | 4.4m | Y |
| 15 | Nailsworth – Bath Road | Kerbside | 385016 | 199727 | NO ₂ | N | N | N | 3.4m | Y |
| 16a | Painswick – St Marys House | Kerbside | 386492 | 209473 | NO ₂ | N | N | Y(3.3m) | 2.0m | Y |
| 16 | Painswick – High Street Lights | Kerbside | 386677 | 209768 | NO ₂ | N | N | Y(3.2m) | 0.5m | Y |
| 16b | Painswick – Traffic Camera | Kerbside | 386700 | 209794 | NO ₂ | N | N | Y(0.5m) | 1.0m | Y |
| 16c | Painswick – Melrose | Roadside | 386810 | 209992 | NO ₂ | N | N | Y(2.8m) | 4.8m | Y |
| 21a | Stroud – British Oak Bowbridge | Roadside | 385785 | 204370 | NO ₂ | N | N | Y(1m) | 2.0m | Y |
| 25a | Stroud – Signal House, Dudbridge Hill | Roadside | 383652 | 204557 | NO ₂ | N | N | Y(5.0m) | 2.7m | N |
| 25c | Stroud – 1 Signal House, Dudbridge Hill | Roadside | 383655 | 204551 | NO ₂ | N | N | Y(2.2m) | 0.7m | Y |
| 25d | Stroud – 2 Signal House, Dudbridge Hill | Roadside | 383659 | 204556 | NO ₂ | N | N | Y(2.3m) | 1.7m | Y |
| 25e | Stroud – 3 Signal House, Dudbridge Hill | Roadside | 383662 | 204554 | NO ₂ | N | N | Y(4.2m) | 3.1m | Y |

| Site I.D | Site Name | Site Type | X OS Grid Ref | Y OS Grid Ref | Pollutants Monitored | In AQMA? | Is monitoring co-located with a Continuous Analyser (Y/N) | Relevant Exposure? (Y/N with distance (m) to relevant exposure) | Distance to kerb of nearest road (N/A if not applicable) | Does this location represent worst-case exposure? |
|----------|---|-----------|---------------|---------------|----------------------|----------|---|---|--|---|
| 25f | Stroud – 4 Signal House, Dudbridge Hill | Roadside | 383676 | 204545 | NO ₂ | N | N | Y(0.0m) | 8.0m | Y |
| 25g | Stroud – 5 Signal House, Dudbridge Hill | Roadside | 383672 | 205538 | NO ₂ | N | N | Y(0.0m) | 2.5m | Y |
| 31 | Upton St Leonards – 50 Woodland Green | Kerbside | 386301 | 215294 | NO ₂ | N | N | Y(8.8m) | 0.5m | Y |
| 33 | Trevoise, Hardwicke | Kerbside | 380188 | 211951 | NO ₂ | N | N | 21.7 | 4.7 | Y |
| 34 | Hunts Grove Drive, Hardwick | Kerbside | 381142 | 212276 | NO ₂ | N | N | N/A | N/A | N/A |
| 35 | The Lodge Haresfield | Kerbside | 380232 | 210421 | NO ₂ | N | N | N/A | N/A | N/A |
| 36 | Martyn Close | Kerbside | 387370 | 215940 | NO ₂ | N | N | N/A | N/A | N/A |
| 37 | Grove Lane, Westend | Kerbside | 378290 | 206899 | NO ₂ | N | N | N/A | N/A | N/A |
| 38 | Stroud, Beeches Green | Kerbside | 384929 | 205522 | NO ₂ | N | N | N | 3m | N/A |

- (1) 0m if the monitoring site is at a location of exposure (e.g. installed on/adjacent to the façade of a residential property).
- (2) N/A if not applicable.
- (3) 25 c & d were moved in January 2016 to avoid any potential influence from flue, distances of new locations now included.
- (4) Monitoring Points 33, 35, 36 & 37 included to monitor background levels before and after incinerator installed at Javelin park. Relevant receptors not considered at these sites.
- (5) Monitoring Point 38 included to provide information relating to short term exposure, no long term relevant receptors

Table A.2 - Results of Nitrogen Dioxide Diffusion Tubes in 2016

| Site ID | Location | Site Type | Within AQMA? | Triplicate or Co-located Tube | Data Capture 2016 Number of Months | Data with less than 9 months has been annualised (Y/N) | Confirm if data has been distance corrected (Y/N) | Annual mean concentration (Bias Adjustment factor = 0.88) |
|---------|--------------------------------|-----------|--------------|-------------------------------|------------------------------------|--|---|---|
| | | | | | | | | 2016 ($\mu\text{g}/\text{m}^3$) |
| 3 | Brookthorpe – North View | Roadside | N | N | 12 | N/A | N | 27.64 |
| 4b | Cainscross – 2 The Rosaries | Roadside | N | N | 12 | N/A | Y | 29.4 |
| 4a | Cainscross – 22 Westward Road | Kerbside | N | N | 12 | N/A | N | 29.09 |
| 15 | Nailsworth – Bath Road | Kerbside | N | N | 12 | N/A | N | 25.54 |
| 16a | Painswick – St Marys House | Kerbside | N | N | 12 | N/A | N | 31.12 |
| 16 | Painswick – High Street lights | Kerbside | N | N | 12 | N/A | Y | 30.12 |
| 16b | Painswick – Traffic Camera | Kerbside | N | N | 12 | N/A | Y | 31.5 |
| 16c | Painswick - Melrose | Roadside | N | N | 12 | N/A | N | 25.47 |

| Site ID | Location | Site Type | Within AQMA? | Triplicate or Co-located Tube | Data Capture 2016 Number of Months | Data with less than 9 months has been annualised (Y/N) | Confirm if data has been distance corrected (Y/N) | Annual mean concentration (Bias Adjustment factor = 0.88) |
|---------|---|-----------|--------------|-------------------------------|------------------------------------|--|---|---|
| | | | | | | | | 2016 ($\mu\text{g}/\text{m}^3$) |
| 21a | Stroud - Bowbridge | Roadside | N | N | 12 | N/A | Y | 38.4 |
| 25a | Stroud – Signal House, Dudbridge Hill | Roadside | N | N | 9 | N** | Y | 36.2 |
| 25c | Stroud – 1 Signal House, Dudbridge Hill | Roadside | N | N | 9 | Y | N | 39.1 |
| 25d | Stroud – 2 Signal House, Dudbridge Hill | Roadside | N | N | 12 | N | N | 37.1 |
| 25e | Stroud – 3 Signal House, Dudbridge Hill | Roadside | N | N | 12 | Y | N | 37.8 |
| 25f | Stroud – 4 Signal House, Dudbridge Hill | Roadside | N | N | 12 | N | N | 28.09 |
| 25g | Stroud – 5 Signal House, Dudbridge Hill | Roadside | N | N | 12 | N | N | 28.93 |
| 31 | Upton St Leonards –50 Woodland Green | Kerbside | N | N | 11 | N/A | N | 27.05 |

| Site ID | Location | Site Type | Within AQMA? | Triplicate or Co-located Tube | Data Capture 2016 Number of Months | Data with less than 9 months has been annualised (Y/N) | Confirm if data has been distance corrected (Y/N) | Annual mean concentration (Bias Adjustment factor = 0.88) |
|---------|------------------------------|-----------|--------------|-------------------------------|------------------------------------|--|---|---|
| | | | | | | | | 2016 ($\mu\text{g}/\text{m}^3$) |
| 33 | Trevose, Hardwicke | Kerbside | N | N | 12 | N/A | N/A | 34.64 |
| 34 | Hunts Grove Drive, Hardwicke | Kerbside | N | N | 9 | N/A | N/A | 19.07 |
| 35 | The Lodge, Haresfield | Kerbside | N | N | 11 | N/A | N/A | 24.08 |
| 36 | 9, Martyn Close, Brockworth | Kerbside | N | N | 12 | N/A | N/A | 16.24 |
| 37 | Grove Lane, Westend | Kerbside | N | N | 12 | N/A | N/A | 16.67 |
| 38 | Stroud - Beeches Green | Kerbside | N | N | 6 | N/A | N/A | N/A |

Table A.1 – Results of Nitrogen Dioxide Diffusion Tubes (2012 to 2016)

| Site ID | Site Type | Within AQMA? | Annual Mean Concentration ($\mu\text{g}/\text{m}^3$) - Adjusted for Bias ^a | | | | |
|---------|-----------|--------------|---|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| | | | 2012 (Bias Adjustment Factor = 0.95) | 2013 (Bias Adjustment Factor = 0.90) | 2014 (Bias Adjustment Factor = 0.89) | 2015 (Bias Adjustment Factor = 0.87) | 2016 (Bias Adjustment Factor = 0.88) |
| 3 | Roadside | N | 35.3 | 28.6 | 25.07 | 25.9 | 27.64 |
| 4b | Roadside | N | 38.9* | 32.5* | 29.5 | 27.5 | 29.4 |
| 4a | Kerbside | N | 37.5 | 30.6 | 28.40 | 25.7 | 29.09 |
| 15 | Kerbside | N | 32.3 | 26.5 | 27.76 | 24.9 | 25.54 |
| 16a | Kerbside | N | 29.0 | 28.9 | 26.85 | 24.2 | 31.12 |
| 16 | Kerbside | N | 36.3* | 31.3* | 29.3 | 29.5 | 30.1 |
| 16b | Kerbside | N | 38.5* | 33.7* | 36.5 | 31.3 | 31.5 |
| 16c | Roadside | N | 28.5 | 25.8 | 25.07 | 23.8 | 25.47 |
| 21a | Roadside | N | 44.3* | 39.5* | 35.6 | 37.6 | 38.4 |
| 25a | Roadside | N | 49.8* | 37* | 37.8 | 36.2 | 36.2 |
| 25c | Roadside | N | 48.8 | 39.8 | 42.00 | 39.5 | 39.1 |
| 25d | Roadside | N | 46.3 | 40.8 | 41.7 | 38.2 | 37.1 |
| 25e | Roadside | N | 46.0 | 39.9 | 37.2 | 37.9 | 37.8 |
| 25f | Roadside | N | 35.2 | 28.7 | 27.96 | 25.0 | 28.09 |
| 25g | Roadside | N | 34.2 | 31.0 | 29.52 | 26.7 | 28.93 |
| 31 | Kerbside | N | 33.7 | 26.9 | 22.91 | 24.6 | 27.05 |
| 33 | Kerbside | N | N/A | N/A | N/A | N/A | 34.64 |
| 34 | Kerbside | N | N/A | N/A | N/A | N/A | 19.07 |
| 35 | Kerbside | N | N/A | N/A | N/A | N/A | 24.08 |
| 36 | Kerbside | N | N/A | N/A | N/A | N/A | 16.24 |
| 37 | Kerbside | N | N/A | N/A | N/A | N/A | 16.67 |
| 38 | Kerbside | N | N/A | N/A | N/A | N/A | N/A |

Notes: Exceedances of the NO₂ annual mean objective of 40 $\mu\text{g}/\text{m}^3$ 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 Technical Guidance LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Table A.4 – Distance Attenuation Data

| Site ID | Raw Data µg/m ³ | Bias Adjusted (0.88) µg/m ³ | Background level µg/m ³ | Tube to kerb m | Receptor to kerb m | Predicted level µg/m ³ |
|---------|-------------------------------|---|---------------------------------------|-------------------|-----------------------|--------------------------------------|
| 4b | 40.26 | 35.43 | 11.81 | 2.0 | 6.0 | 29.4 |
| 16 | 45.30 | 39.86 | 10.18 | 0.5 | 3.2 | 30.1 |
| 16b | 38 | 33.44 | 10.18 | 1.0 | 1.5 | 31.5 |
| 21a | 49.19 | 43.29 | 11.62 | 2.7 | 5.0 | 38.4 |
| 25a | 46.03 | 40.51 | 12.57 | 2.7 | 5.0 | 36.2 |
| 25c | 52.75 | 46.42 | 12.57 | 0.7 | 2.2 | 39.1 |
| 25d | 44.25 | 38.94 | 12.57 | 1.7 | 2.3 | 37.1 |
| 25e | 46.30 | 40.74 | 12.57 | 3.1 | 4.2 | 37.8 |

Appendix B: Full Monthly Diffusion Tube Results for 2016

Table B.1 – NO₂ Monthly Diffusion Tube Results - 2016

| | LOCATION | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | AVERAGE |
|-----|--|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|--------------------|
| 3 | BROOKTHORPE - NORTH VIEW | 31.5 | 32.2 | 32.6 | 29.1 | 32.7 | 29.3 | 24.4 | 28.66 | 27.65 | 33.33 | 34.81 | 40.60 | 31.41 |
| 4b | CAINSCROSS - 2, THE ROSARIES | 44.6 | 41.8 | 43.4 | 38.9 | 43.7 | 37.0 | 35.4 | 32.92 | 33.31 | 44.00 | 40.69 | 47.40 | 40.26 |
| 4a | CAINSCROSS - 22, WESTWARD ROAD | 37.0 | 36.7 | 36.5 | 33.0 | 35.3 | 27.5 | 28.7 | 25.10 | 27.56 | 33.39 | 34.34 | 41.75 | 33.06 |
| 15 | NAILSWORTH - BATH RD | 34.0 | 32.2 | 30.3 | 26.6 | 32.5 | 28.9 | 21.3 | 23.00 | 21.14 | 29.97 | 31.64 | 36.79 | 29.02 |
| 16a | PAINSWICK - ST MARYS HOUSE | 31.7 | 31.5 | 34.7 | 28.8 | 30.8 | 34.4 | 25.1 | 25.67 | 26.52 | 35.80 | 34.44 | 33.90 | 31.12 |
| 16 | PAINSWICK - HIGH ST LIGHTS | 48.0 | 49.7 | 52.7 | 43.2 | 45.8 | 43.7 | 40.7 | 40.43 | 39.59 | 43.83 | 46.19 | 49.69 | 45.30 |
| 16b | PAINSWICK - TRAFFIC CAMERA | 43.4 | 43.3 | 44.6 | 34.7 | 38.4 | 23.6 | 30.0 | 29.81 | 34.92 | 41.05 | 39.75 | 52.56 | 38.00 |
| 16c | PAINSWICK - MELROSE | 31.1 | 26.4 | 30.9 | 26.8 | 27.7 | 29.7 | 24.9 | 22.94 | 26.38 | 32.62 | 31.73 | 36.15 | 28.95 |
| 21a | STROUD - BOWBRIDGE | 53.6 | 49.0 | 50.8 | 48.2 | 51.1 | 47.4 | 44.5 | 46.91 | 46.01 | 50.37 | 49.73 | 52.66 | 49.19 |
| 25a | SIGNAL HOUSE | | 46.9 | 52.7 | 48.6 | 50.5 | | 37.5 | 38.71 | 36.48 | 50.78 | | 52.07 | 45.98 ¹ |
| 25c | STROUD - 1, SIGNAL HOUSE | 49.7 | 48.3 | 59.5 | 52.1 | 64.2 | 52.9 | | | 45.72 | 59.51 | | | 52.75 ¹ |
| 25d | STROUD - 2, SIGNAL HOUSE | 49.0 | 43.5 | 43.3 | 43.1 | 51.4 | 45.4 | 41.6 | 37.37 | 36.66 | 45.12 | 47.91 | 46.67 | 44.25 |
| 25e | STROUD - 3, SIGNAL HOUSE | 47.4 | 45.0 | 48.2 | 44.6 | 53.8 | 48.9 | 43.9 | 42.21 | 42.84 | 44.89 | 46.05 | 47.85 | 46.30 |
| 25f | STROUD - 4, SIGNAL HOUSE | 33.1 | 36.3 | 35.0 | 31.3 | 36.2 | 31.5 | 23.3 | 25.10 | 26.85 | 35.33 | 35.18 | 33.84 | 31.92 |
| 25g | STROUD - 5, SIGNAL HOUSE | 32.5 | 32.5 | 34.1 | 33.5 | 36.6 | 34.6 | 25.9 | 27.07 | 29.73 | 37.81 | 30.61 | 39.78 | 32.88 |
| 31 | UPTON ST LEONARDS - 50, WOODLAND GREEN | 34.3 | 33.8 | 35.1 | 32.7 | 29.3 | 26.8 | 23.6 | | 22.42 | 28.26 | 35.56 | 36.37 | 30.74 |
| 33 | TREVOSE, HARDWICKE | 44.6 | 43.9 | 40.7 | 36.5 | 42.2 | 22.8 | 42.7 | 39.41 | 38.08 | 37.10 | 38.68 | 45.77 | 39.36 |
| 34 | HUNTS GROVE DRIVE, HARDWICKE | 26.1 | | | 16.5 | | 32.7 | 12.1 | 11.81 | 16.28 | 23.36 | 25.76 | 30.50 | 21.67 |
| 35 | THE LODGE, HARESFIELD | 27.7 | 25.5 | 30.2 | 26.3 | 24.6 | 14.8 | | 22.05 | 25.34 | 33.74 | 35.09 | 35.75 | 27.36 |
| 36 | 9, MARTYN CLOSE, BROCKWORTH | 22.6 | 19.5 | 21.3 | 15.9 | 14.9 | 17.5 | 11.1 | 12.00 | 13.55 | 20.59 | 23.24 | 29.49 | 18.46 |
| 37 | GROVE LANE, WESTEND | 21.5 | 20.6 | 20.5 | 15.9 | 14.5 | 16.2 | 12.5 | 13.21 | 15.62 | 22.00 | 26.28 | 28.60 | 18.94 |
| 38 | STROUD - BEECHES GREEN | | | | | | | 48.0 | 48.50 | 46.24 | 51.85 | 50.11 | 46.82 | 48.59 |

¹ Post-annualisation averages – see Tables B.2 and B.3 for derivation

Table B.2 –25c Annualised

| | 25C | 25D | | 25E | | 25F | | 25G | |
|-------------------------|----------------|-------|-------------------|-------|-------------------|-------|-------------------|-------|-------------------|
| | Period Mean Pm | Am | Period Mean Pm | Am | Period Mean Pm | Am | Period Mean Pm | Am | Period Mean Pm |
| Month | S1 | S2 | S2 When S1 result | S3 | S3 When S1 result | S4 | S4 When S1 result | S5 | S5 When S1 result |
| Jan | 49.7 | 49.0 | 49.0 | 47.4 | 47.4 | 33.1 | 33.1 | 32.5 | 32.5 |
| Feb | 48.3 | 43.5 | 43.5 | 45.0 | 45.0 | 36.3 | 36.3 | 32.5 | 32.5 |
| Mar | 59.5 | 43.3 | 43.3 | 48.2 | 48.2 | 35.0 | 35.0 | 34.1 | 34.1 |
| Apr | 52.1 | 43.1 | 43.1 | 44.6 | 44.6 | 31.3 | 31.3 | 33.5 | 33.5 |
| May | 64.2 | 51.4 | 51.4 | 53.8 | 53.8 | 36.2 | 36.2 | 36.6 | 36.6 |
| Jun | 52.9 | 45.4 | 45.4 | 48.9 | 48.9 | 31.5 | 31.5 | 34.6 | 34.6 |
| Jul | | 41.6 | | 43.9 | | 23.3 | | 25.9 | |
| Aug | | 37.37 | | 42.21 | | 25.10 | | 27.07 | |
| Sep | 45.72 | 36.66 | 36.66 | 42.84 | 42.84 | 26.85 | 26.85 | 29.73 | 29.73 |
| Oct | 59.51 | 45.12 | 45.12 | 44.89 | 44.89 | 35.33 | 35.33 | 37.81 | 37.81 |
| Nov | | 47.91 | | 46.05 | | 35.18 | | 30.61 | |
| Dec | | 46.67 | | 47.85 | | 33.84 | | 39.78 | |
| Average | 54.0 | 44.2 | 44.7 | 46.3 | 46.9 | 31.9 | 33.2 | 32.9 | 33.9 |
| Ratio R Am/Pm | | | 0.990360042 | | 0.986268556 | | 0.96124894 | | 0.969877341 |
| Average ratio | 0.97693872 | | | | | | | | |
| S1 Annual Mean estimate | 52.75 | | | | | | | | |
| Distance attenuation | National B215 | 12.6 | | | | | | | |

Table B.3 –25a Annualised

| | 25A | 25D | | 25E | | 25F | | 25G | |
|-------------------------|----------------|-------|-------------------|-------|-------------------|-------|-------------------|-------|-------------------|
| | Period Mean Pm | Am | Period Mean Pm | Am | Period Mean Pm | Am | Period Mean Pm | Am | Period Mean Pm |
| Month | S1 | S2 | S2 When S1 result | S3 | S3 When S1 result | S4 | S4 When S1 result | S5 | S5 When S1 result |
| Jan | | 49.0 | | 47.4 | | 33.1 | | 32.5 | |
| Feb | 46.9 | 43.5 | 43.5 | 45.0 | 45.0 | 36.3 | 36.3 | 32.5 | 32.5 |
| Mar | 52.7 | 43.3 | 43.3 | 48.2 | 48.2 | 35.0 | 35.0 | 34.1 | 34.1 |
| Apr | 48.6 | 43.1 | 43.1 | 44.6 | 44.6 | 31.3 | 31.3 | 33.5 | 33.5 |
| May | 50.5 | 51.4 | 51.4 | 53.8 | 53.8 | 36.2 | 36.2 | 36.6 | 36.6 |
| Jun | | 45.4 | | 48.9 | | 31.5 | | 34.6 | |
| Jul | 37.5 | 41.6 | 41.6 | 43.9 | 43.9 | 23.3 | 23.3 | 25.9 | 25.9 |
| Aug | 38.71 | 37.37 | 37.37 | 42.21 | 42.21 | 25.10 | 25.10 | 27.07 | 27.07 |
| Sep | 36.48 | 36.66 | 36.66 | 42.84 | 42.84 | 26.85 | 26.85 | 29.73 | 29.73 |
| Oct | 50.78 | 45.12 | 45.12 | 44.89 | 44.89 | 35.33 | 35.33 | 37.81 | 37.81 |
| Nov | | 47.91 | | 46.05 | | 35.18 | | 30.61 | |
| Dec | 52.07 | 46.67 | 46.67 | 47.85 | 47.85 | 33.84 | 47.85 | 39.78 | 39.78 |
| Average | 46.0 | 44.2 | 43.2 | 46.3 | 45.9 | 31.9 | 33.0 | 32.9 | 33.0 |
| Ratio R Am/Pm | | | 1.024447176 | | 1.008234453 | | 0.966475768 | | 0.996695659 |
| Average ratio | 0.998963264 | | | | | | | | |
| S1 Annual Mean estimate | 45.98 | | | | | | | | |
| Distance attenuation | National B215 | 12.57 | | | | | | | |

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

Diffusion Tube Bias Adjustment Factors

The diffusion tubes (20% TEA in water) were supplied and analysed by Somerset Scientific Services. The tubes at all locations throughout the area have a monthly exposure period. A bias adjustment factor of 0.88 (being the overall factor based on 3 studies) obtained via the national bias spreadsheet, was applied to all diffusion tubes.

This spreadsheet is available at:

<http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html>

The results were distance attenuated using the methodology at:

<http://laqm.defra.gov.uk/documents/NO2withDistancefromRoadsCalculatorIssue4.xls>

QA/QC of diffusion tube monitoring

The diffusion tubes (20% TEA in water) were supplied and analysed by Somerset Scientific Services. The tubes at all locations throughout the area have a monthly exposure period. A bias adjustment factor of 0.88 obtained via the National Bias Spreadsheet was applied to all diffusion tubes.

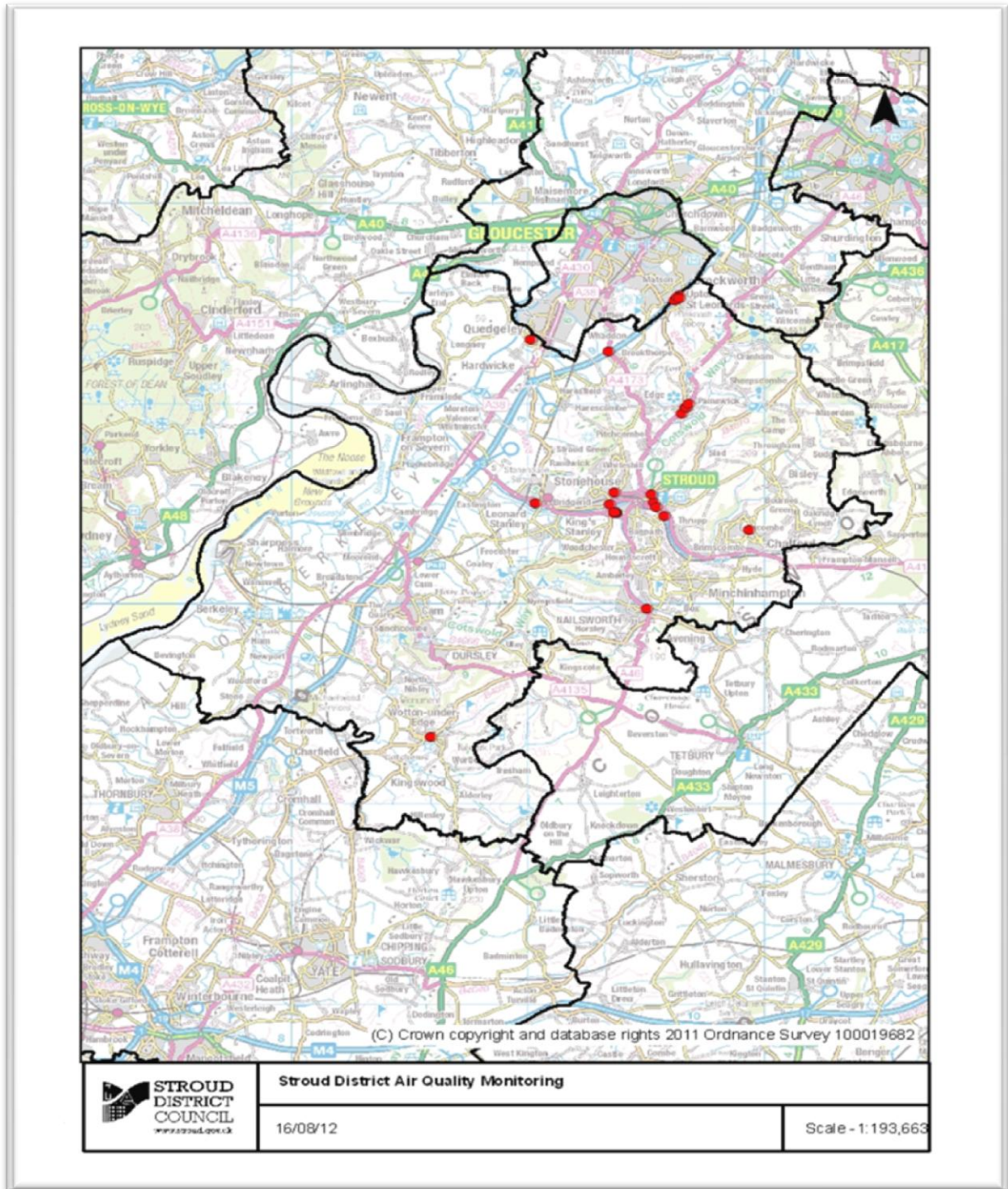
Summary of Laboratory Performance in WASP NO₂ Proficiency Testing Scheme for Rounds AR012-16

Details are available at:

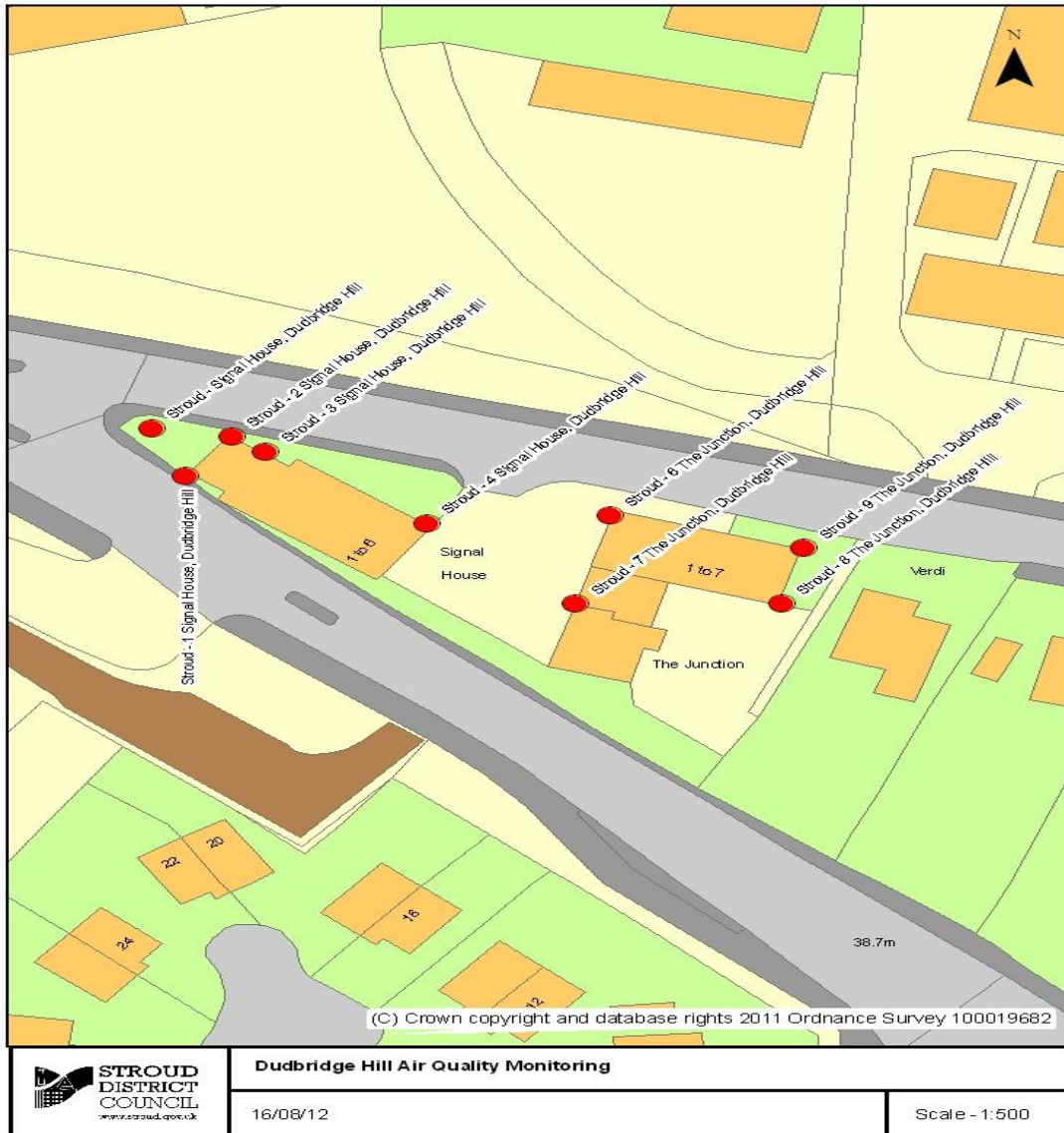
<https://laqm.defra.gov.uk/assets/airptrounds12to22jan2016oct20171.pdf>

This shows 100% efficiency for Somerset Scientific Services for AR012-16 covering 2016.

Appendix D: Map(s) of Monitoring Locations



Map of Non-Automatic Monitoring Sites



Detailed Map of Dudbridge Hill Diffusion Tube Sites

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 (µg/m³).

Glossary of Terms

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

Summary of Previous Reports

Stroud District Council has previously undertaken the following Review and Assessment reports, all of which are available at:

www.stroud.gov.uk/docs/environment/air_quality.asp

Updating and Screening Assessment 2003

- Progress Report 2004
- Progress Report 2005
- Updating and Screening Assessment 2006
- Progress Report 2007
- Progress Report 2008
- Updating and Screening Assessment 2009
- Progress Report 2010
- Progress Report 2011
- Updating and Screening Assessment 2012
- Progress Report 2013
- Progress Report 2014
- Updating and Screening Assessment 2015
- Annual Status Report 2016

There are no current AQMAs within our administrative area. A brief summary of the previous reports are below.

Conclusions of Updating and Screening Assessment 2006:

- This assessed that the objectives for Carbon Monoxide, Benzene, 1,3-butadiene, Lead, PM10, Sulphur Dioxide were unlikely to be exceeded at any location within the administrative area of Stroud District, and therefore no Detailed Assessments were required.
- The assessment has indicated that the 2005 Nitrogen Dioxide annual mean objective will not be exceeded at any location within the administrative area of Stroud District Council, and therefore a Detailed Assessment will not be required. The assessment also indicated that the 2005 NO₂ hourly objective is unlikely to be exceeded, and therefore a Detailed Assessment will not be required with respect to the hourly mean.

- No new roads or roads with significantly changed flows within the administrative area of Stroud District Council were identified since the last round of Review and Assessment.
- Seven additional small waste oil burners (PG 1/1 (95)) had been permitted in Stroud District Council since the last round of Review and Assessment. It is not considered that these processes would have a significant influence on local air quality within the authority.

Conclusions of Review and Assessment Progress Report 2007:

- From the evidence provided in this report, no exceedences of the air quality objectives are likely to occur at any location within Stroud District Council's area. As a result of this it was recommended that Stroud District Council undertake a Progress Report in 2008.
- No other exceedences of the air quality objectives for Ozone and Sulphur Dioxide are likely.
- Stroud District Council currently carries out no monitoring for Carbon Monoxide, Benzene, Lead and 1,3-butadiene.
- There are no new developments of significance that will influence air quality in the Stroud District Council area.

Conclusions of Review and Assessment Progress Report 2008:

- From the evidence provided in this report, no exceedences of the air quality objectives are likely to occur at any location within Stroud District Council's area. Therefore, Stroud District Council will undertake an Updating and Screening Assessment 2009.
- Stroud District Council currently carries out no monitoring for Carbon Monoxide,
- Benzene, Lead, 1,3-butadiene, PM10, SO₂ or Ozone.
- There are no new developments of significance that will influence air quality in the Stroud District Council area.

Conclusions of Updating and Screening Assessment Report 2009:

- From the evidence provided in this report, an exceedence of the air quality objectives for NO₂ was shown to occur at one location within Stroud District Council's area, at Cainscross - Stroud.

Stroud District Council

- Stroud District Council will undertake a full review of its diffusion tube locations with specific attention to the above location.
- Stroud District Council currently carries out no monitoring for Carbon Monoxide, Benzene, Lead, 1,3-butadiene, PM₁₀, SO₂ and Ozone.
- There are no new developments of significance that will influence air quality in the Stroud District Council area.
- Stroud District council will undertake a Progress Report in 2010.

Conclusions of Progress Report 2010:

- From the evidence provided in this report, no exceedence of the air quality objectives for NO₂ was shown to occur at Cainscross - Stroud.
- Stroud District Council will undertake a Detailed Assessment of the air quality at Dudbridge, Stroud.
- Stroud District Council currently carries out no monitoring for Carbon Monoxide, Benzene, Lead, 1,3-butadiene, PM₁₀, SO₂ and Ozone.
- There are no new developments of significance that will influence air quality in the Stroud District Council area.
- Stroud District council will undertake a Progress Report in 2011

Conclusions of Progress Report 2011:

- From the evidence provided in this report, no exceedence of the air quality objectives for NO₂ was shown to occur at Cainscross - Stroud.
- Increase the monitoring with diffusion tubes at Dudbridge in anticipation of moving to a Detailed Assessment.
- Stroud District Council will undertake a Detailed Assessment of the air quality at Dudbridge, Stroud.
- Stroud District Council currently carries out no monitoring for Carbon Monoxide, Benzene, Lead, 1,3-butadiene, PM₁₀, SO₂ and Ozone.
- There are no new developments of significance that will influence air quality in the Stroud District Council area.

Conclusions of Updating and Screening Assessment Report 2012:

- From the evidence provided in this report, no exceedence of the air quality objectives for NO₂ was shown to occur at Cainscross - Stroud.

- Increase the monitoring with diffusion tubes at Dudbridge in anticipation of moving to a Detailed Assessment.
- Stroud District Council will undertake a Detailed Assessment of the air quality at Dudbridge, Stroud.
- Stroud District Council currently carries out no monitoring for Carbon Monoxide, Benzene, Lead, 1,3-butadiene, PM₁₀, SO₂ and Ozone.
- There are no new developments of significance that will influence air quality in the Stroud District Council area.

Conclusions of Progress Report 2013

- Carry out a period of real time monitoring for NO₂ at Bowbridge and Dudbridge during 2013 to enable detailed assessments of these sites to be made.
- There are no new developments of significance that will influence air quality in the Stroud District Council area.
- Stroud District Council currently carries out no monitoring for Carbon Monoxide, Benzene, Lead, 1,3-butadiene, PM₁₀, SO₂ and Ozone.

Conclusions of Progress Report 2014

- 2013 diffusion tube results show one marginal exceedance of the 40 µg/m³ annual objective for NO₂. This was at Dudbridge.
- Realtime NO₂ monitoring will be carried out at Bowbridge in 2014 and the results reported back in the 2015 Updating and Screening Report
- Attempts were made to install continuous monitoring at Dudbridge to obtain more precise readings for that area; however a suitable power supply could not be obtained.
- NO₂ levels have fallen in 2013 such that there is only one marginal exceedance out of the ten NO_x tubes at the Dudbridge Hill site.
- There are no new developments of significance that will influence air quality in the Stroud District Council area.
- As a result of previous Updating and Screening assessments Stroud District Council does not carry out monitoring for Carbon Monoxide, Benzene, Lead, 1,3-butadiene, PM₁₀, SO₂ and Ozone.

Conclusions of Updating and Screening Report 2015

- There is a general trend of falling emissions levels across the district.
- The Air Quality across the District is generally very good
- The main influence on air quality within Stroud District is road traffic emissions
- The general downward trend in emissions levels is in keeping with that predicted nationally due to newer vehicles with tighter individual emission limits.
- NO₂ from traffic continues to be the primary pollutant of concern.

Conclusions of Annual Status Report 2016

- The main influence on air quality within Stroud District is road traffic emissions
- NO₂ from traffic continues to be the primary pollutant of concern.
- There are two monitoring sites 25C & 25D which are on or slightly over the national average mean NO₂. The levels at these sites, in keeping with the national trend, have fallen slightly since 2014. There are concerns that due to their location, one being on the corner of a building and the other next to a balanced flue, they may be over reading. The tubes will be re-sited prior to the next monitoring period (2016) to provide more accurate measurements of relevant exposure.