



## 2017 Air Quality Annual Status Report (ASR)

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

November 2017

**South Gloucestershire Council**

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## Executive Summary: Air Quality in Our Area

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<sup>1,2</sup>.

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion<sup>3</sup>.

The Council has a duty to review and assess air quality within its district under the Part IV of the Environment Act 1995 and this Annual Status Report has been prepared to fulfil this requirement.

Air pollutants can arise from a variety of sources, including transport and industry. Pollutant levels are assessed against health-based national air quality objectives. Where the objectives are not met, Air Quality Management Areas (AQMAs) must be declared and an Action Plan put in place to improve the air quality in these areas.

## Air Quality in South Gloucestershire

South Gloucestershire lies to the north and east of the city of Bristol with the River Severn forming the western boundary. The area is a diverse mix of urban and rural areas, including major residential, industrial and commercial developments. The road network within South Gloucestershire contains the major junction of the M4 and M5 motorways. The population of South Gloucestershire is estimated to be 277,600<sup>4</sup> and has grown by 13% on the number recorded in the 2001 census (245,600). The population is projected to continue to rise, meaning that managing future development and providing vital transport infrastructure is a key challenge.

The main air pollutant of concern locally is nitrogen dioxide (NO<sub>2</sub>), which originates primarily from road traffic emissions.

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<sup>1</sup> Environmental equity, air quality, socioeconomic status and respiratory health, 2010

<sup>2</sup> Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006

<sup>3</sup> Defra. Abatement cost guidance for valuing changes in air quality, May 2013

<sup>4</sup> Source: Office for National Statistics (ONS) Mid-year estimate 2016 (published 22 June 2017)

The air quality in South Gloucestershire is generally good. However, there are some areas in the district where the air quality does not meet the national air quality objective for nitrogen dioxide levels, mostly due to the combination of busy, congested roads and the close proximity of people living by these roads.

### **Air Quality Management Areas**

There are three AQMAs currently declared in South Gloucestershire in respect of the annual mean objective for nitrogen dioxide:

- Cribbs Causeway – adjacent to the M5 Junction 17 roundabout
- Staple Hill – in the centre around the Broad Street/ High Street/ Soundwell Road/ Victoria Street crossroads
- Kingswood – Warmley – from the Bristol/ South Gloucestershire boundary in Kingswood along the A420 to the junction with Goldney Avenue in Warmley.

Full details of these AQMAs are included in Table 2.1 of this report and maps are available in Appendix E. Further information on the AQMAs are available on the Council website at [www.southglos.gov.uk/airquality](http://www.southglos.gov.uk/airquality) and on the Defra website at [https://uk-air.defra.gov.uk/aqma/local-authorities?la\\_id=238](https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=238).

### **Trends in monitored concentrations**

There is no clear long-term trend in nitrogen dioxide concentrations at the diffusion tube monitoring sites across the district, although 2016 saw nitrogen dioxide concentrations increase at the majority (83%) of the monitoring sites. While the overall trend in nitrogen dioxide concentrations in the Kingswood – Warmley and Staple Hill AQMAs has been relatively stable over the past decade with a slight downward trend in recent years, in 2016 there was a general upward trend in monitored nitrogen dioxide concentrations from 2015 across 77% of monitoring sites in the Kingswood – Warmley AQMA and 85% of monitoring sites in the Staple Hill AQMA), mirroring that seen across the district as a whole. There is no obvious reason for this but pollutant concentrations can vary significantly from one year to another due to a number of factors, in particular the meteorological conditions, which can present unfavourable conditions for pollutant dispersion.

The Yate automatic monitoring site shows the annual mean nitrogen dioxide concentrations have been generally stable, although in 2016, there was an increase

in monitored concentrations from 21µg/m<sup>3</sup> in 2015 to 24µg/m<sup>3</sup>, this however remains well below the annual mean objective (40 µg/m<sup>3</sup>).

Particulate matter is also a pollutant of concern. This is also monitored at the Yate Automatic Monitoring site. The trend in particulate matter (PM<sub>10</sub>) concentrations at this site shows that annual mean concentrations have overall been slowly declining since 2006 at Yate. In 2016, the monitored concentration fell slightly to 14 µg/m<sup>3</sup>, having remained constant at 15 µg/m<sup>3</sup> between 2013 and 2015. The monitored PM<sub>10</sub> concentrations remain well below the annual mean and 24-hour mean objectives at this site.

The trends in the data from the Yate Automatic Monitoring station and within the AQMAs are discussed fully in Chapter 3 of the report and trend graphs are available in Appendix A.

### **Pollutant sources**

The following pollutant sources were considered as part of the review of air quality for this report, as detailed in the Defra LAQM Technical Guidance (LAQM.TG16)<sup>5</sup>.

- Road Traffic Sources
- Non-Road transport Sources
- Industrial Sources
- Commercial and Domestic Sources
- Fugitive and Uncontrolled Sources

No new major sources of emissions were identified. Full details are provided in Appendix D of the report.

### **How the Council works to manage local air quality**

South Gloucestershire Council is a unitary authority and Planning, Transport and Environmental Health are all within the same Directorate (Environment and Community Services) enabling close working between these teams. This has particularly allowed close working between Environmental Health, with their responsibilities for local air quality management and the Strategic Transport and Environment Policy Team, who currently lead on air quality action plan development

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<sup>5</sup> <http://laqm.defra.gov.uk/technical-guidance/>

and implementation. Furthermore, a close working relationship has been developed with Public Health, and their work on the built environment recognises the importance of aligning spatial planning and transport work with its associated impacts on air quality and health.

The council is continuing to revitalise its air quality governance and reporting arrangements in recognition of the public health aspects of poor air quality and to develop a more holistic approach across the Council to address air quality issues.

South Gloucestershire also works closely with other neighbouring authorities in the West of England (Bath and North East Somerset, Bristol City Council and North Somerset), particularly with regard to regional strategic work areas such as transport.

Also of importance is the West of England Combined Authority which was established in February 2017. The constituent councils are Bath and North East Somerset, Bristol and South Gloucestershire. Through the Combined Authority, more decisions will be made locally on areas such as transport, housing and skills, and crucially more funding will be available to improve transport infrastructure, create new jobs and improve adult education and skills. The West of England Combined Authority will continue to work closely with North Somerset. There is a legacy of successful joint working between the four authorities.

## Actions to Improve Air Quality

Key progress includes:

- Entire fleet of Council pool cars switched to electric in early 2017, with OLEV funding secured to switch 20% of other fleet vehicles to electric by 2021.
- Access funding secured to 2020, to enable the continuation of school, business and community travel planning measures to promote sustainable travel choices.
- Clean Bus Technology Funding (CBTF) awarded in December 2015 following a joint bid by Bristol, South Gloucestershire and Bath and North East Somerset Councils. The funding was used to upgrade 35 of the most polluting Euro II and III local buses by retrofitting Selective Catalytic Reduction Technology (SCRT) to achieve Euro Standard V/VI, thereby reducing tailpipe

NOx emissions on those services, all of which operate in the Bristol, Bath and South Gloucestershire AQMAs. The retrofitting was completed in 2017.

- A £4.79m Office for Low Emission Vehicles (OLEV) funding grant was awarded to the four West of England local authorities and First Bus in August 2017. This funding will help unlock a £28m investment by First, to potentially transform a significant part of their fleet (up to 110 vehicles) into bio-methane powered buses. The new buses, which could start running by 2019, will contribute to reducing air pollution levels across the West of England area, including the Staple Hill AQMA.
- A signing review of delivery bays was undertaken during 2015 in Kingswood. Implementation of remedial measures following that review were completed in October 2016, which will improve local enforcement.
- The local transport capital programme 2016/17 approved a wider parking management review of the extended Kingswood - Warmley AQMA. Recommendations from the review address parking issues along the A420 Hill Street/Deanery Road and in Warmley, and the two resulting schemes are due to be completed in 2018 and 2019 respectively.
- Completion of several schemes that improve the cycling infrastructure associated with the Bristol/Bath Railway Cycle Path which serves the Staple Hill AQMA.
- Successful joint bid with Bristol City Council as lead authority for a Clean Air Zone (CAZ) Feasibility Study with £498,600 at the end of 2016. Early work has indicated that if a Clean Air Zone were to be introduced in Bristol that this would impact sufficient “through” vehicle trips to also improve air quality in the Kingswood – Warmley and Staple Hill AQMAs.

Full details of progress in implementing the existing Air Quality Action Plan for Kingswood and Staple Hill are contained in Section 2.2 of this report.

Other actions being progressed on a wider West of England basis aimed at reducing traffic congestion which should contribute to improved air quality include:

- Metrobus - a rapid public transport system which will provide direct routes to key employment, education and leisure destinations around the area<sup>6</sup>. Further information is also provided in Appendix D.
- Cribbs Patchway Metrobus Extension<sup>7</sup> - an extension of the Metrobus scheme to serve the proposed Cribbs Patchway New Neighbourhood on the former Filton Airfield.
- MetroWest - improved rail services and infrastructure<sup>8</sup>.
- Cycle Ambition Fund – improvements to cycle routes to provide better door-to-door journeys<sup>9</sup>
- GoUltraLowWest<sup>10</sup> - a grant funded project by OLEV (Office for Low Emission Vehicles) for investment in the promotion of electric vehicles throughout the West of England region. The Government's aspiration is that by 2040, every new car in the UK will be an ultra-low emission vehicle.

## Conclusions and Priorities

Exceedances of the nitrogen dioxide annual mean objective remain, with the majority of these occurring in the Kingswood – Warmley and Staple Hill AQMAs, confirming the AQMAs are still required. However, there was one exceeding monitoring location on the Kingswood/Soundwell border (site 147) which was outside of the AQMAs. The 2017 monitoring results for this location will be reviewed and should a further exceedance be identified, further action will be taken as appropriate. Further details are provided in Chapter 3.

The monitoring results showed a rise in nitrogen dioxide concentrations at the majority (83%) of the Council's monitoring sites in 2016. Pollutant concentrations can vary significantly from one year to another however, due to a number of factors, in particular, the meteorological conditions.

Since the declaration of the Cribbs Causeway AQMA in 2010, the monitoring results have shown the nitrogen dioxide concentrations are below the annual mean objective at the façade of the single residential property within the AQMA. Defra recommended

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<sup>6</sup> <https://travelwest.info/metrobus>

<sup>7</sup> <https://travelwest.info/projects/cribbs-patchway-metrobus-extension>

<sup>8</sup> <https://travelwest.info/projects/metrowest>

<sup>9</sup> <https://travelwest.info/projects/cycle-ambition-fund>

<sup>10</sup> <https://travelwest.info/drive/electric-vehicles/go-ultra-low-west>



in their appraisal of the 2016 Air Quality Annual Status Report that revocation of the AQMA should be considered. This report confirms that there was no exceedance in 2016 within this AQMA, demonstrating compliance for the last six years.

Consequently, we propose to revoke the Cribbs Causeway AQMA. Further detail is provided in Chapter 3.

The on-going priority for the coming year is to review and update the Air Quality Action Plan for Kingswood and Staple Hill to incorporate the extension of the Kingswood AQMA to Warmley. Whilst some progress has been made, the work has taken longer than anticipated due to the complexity of the work involved and staff resource issues. Completion of the Action Plan is anticipated during 2018.

Work will continue in conjunction with Bristol City Council as appropriate, on the Clean Air Zone Feasibility Study to deliver improvements and compliance with air quality objectives in the shortest timescale possible.

However, it should be noted that the Council faces major challenges at a time of significant pressure on public finances, particularly in relation to local government funding, which could impact on delivering air quality improvements.

The transport system is subject to significant pressure within South Gloucestershire, due to the sheer level of travel demand generated by the current population and by people coming into the area on a daily basis to work, shop and for leisure reasons. These pressures are shown through traffic congestion on South Gloucestershire's road network and capacity problems on local rail services.

The provision for the housing requirement of 105,500 new homes by 2036 for the West of England area has been made in the Joint Spatial Plan<sup>11</sup> (JSP) which has been developed by the four West of England authorities. 32,500 of these new homes are likely to be built in South Gloucestershire.

Alongside the JSP, the four councils have developed a Joint Transport Study (JTS)<sup>12</sup>. The JTS is designed to help the region meet the growing travel demands that new growth will bring, as well as tackling existing pressure on road and public transport networks. This includes providing the key transport infrastructure needed to reduce reliance on cars and tackle congestion and measures to improve walking and cycling, better access to public transport and, where necessary, highway capacity

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<sup>11</sup> <https://www.jointplanningwofe.org.uk/consult.ti?>

<sup>12</sup> <https://www.jointplanningwofe.org.uk/consult.ti/JTSTransportVision>

improvements. This joint approach to planning and transport will ensure that future growth decisions are made with an understanding of the necessary transport investment needed to achieve sustainable communities.

## **Local Engagement and How to get involved**

A workshop carried out in November 2016, which included representatives from Environmental Health, Spatial Planning, Transport and Public Health within the Council, and external expertise in respiratory medicine and air pollution monitoring, including representatives from Public Health England and the University of the West of England, identified the need to raise public awareness of air quality locally.

As a result, a project, developed jointly with the University of the West of England will use public participatory research in a school adjacent to the Kingswood - Warmley AQMA. It will provide indicative monitoring of particulate matter (PM<sub>2.5</sub>) by using personal monitors to record levels of pollution to which children are exposed during travel to and from school. The project also aims to increase awareness of air pollution among children, parents and teachers and will be undertaken in early 2018. If successful, the project could be repeated in other locations within South Gloucestershire.

### **What you can do**

Everyone can help to improve air quality in South Gloucestershire and beyond. By making informed personal choices, particularly with regard to travel, we can help to improve air quality and improve our own health in the process.

- Substituting car use, if and when possible, with a bus or train journey, or preferably by walking or cycling, not only reduces air pollution but improves our health and wellbeing.
- If possible, sharing lifts with colleagues to work will save petrol money and as well as reducing the number of cars on the road.
- When looking to change your vehicle, take air pollution in consideration and opt for the cleanest vehicle you feasibly can. Low emission electric and /or hybrid vehicles are becoming more affordable and government funding and grants are available.

While most air pollution in South Gloucestershire is caused by road traffic, other measures that could be considered include:

- Upgrading boilers to newest and most efficient gas condensing boilers with lowest NO<sub>x</sub> (and carbon) emissions.
- “Clean” renewable energy generation, for example via solar photovoltaics.
- Using Defra approved appliances and smokeless fuels suitable for use in a smoke control area whether you are in a smoke control area or not.

There are decisions we can all make to reduce air pollution. Even relatively small changes can add up and make a real difference to the quality of the air we all breathe.

Further information is available on our website [www.southglos.gov.uk/airquality](http://www.southglos.gov.uk/airquality).

We also recommend you visit the Travel West<sup>13</sup> website (<https://travelwest.info/>) as this provides live information on public transport for journey planning as well as route information for walkers and cyclists. It also provides traffic reports, information on electric vehicle charging infrastructure and other information that simplifies travel choices.

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<sup>13</sup> <https://travelwest.info/>

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## 1 Local Air Quality Management

This report provides an overview of air quality in South Gloucestershire Council 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 South Gloucestershire 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 F.1 in Appendix F.

## 2 Actions to Improve Air Quality

### 2.1 Air Quality Management Areas

Air Quality Management Areas (AQMA) 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.

In 2010, three AQMA were declared in the centres of both Kingswood and Staple Hill and at Cribbs Causeway adjacent to the M5 Junction 17 roundabout. The Kingswood and Staple Hill AQMA were extended in 2012 following further assessment and the Council produced an Action Plan in 2012, focusing mainly on transport measures.

In 2014, a detailed assessment of air quality in Warmley along the A420 corridor identified new locations where the nitrogen dioxide annual mean objective was being exceeded. An extension of the Kingswood AQMA along the A420 to Warmley was proposed and the Kingswood - Warmley AQMA was subsequently declared in December 2015. The Air Quality Action Plan is being reviewed and updated and appropriate actions will be identified to cover the new extent of the AQMA.

Since the declaration of the Cribbs Causeway AQMA in 2010, the monitoring results have shown the nitrogen dioxide concentrations are below the annual mean objective at the façade of the single residential property within the AQMA. Defra recommended in their appraisal of the 2016 Air Quality Annual Status Report that revocation of the AQMA should be considered. This report confirms that there was no exceedance in 2016 within this AQMA. Consequently, we propose to revoke the Cribbs Causeway AQMA.

A summary of the current AQMA declared by South Gloucestershire Council can be found in Table 2.1. The monitoring undertaken within the AQMA has changed since the declaration of the AQMA in 2010 and the monitoring locations in 2016 are not directly comparable to those in 2010. Comparison between the exceedance levels at declaration in 2010 and in 2016 would not provide a true reflection of trends in nitrogen dioxide levels over that timeframe. For this reason, the corresponding columns in Table 2.1 have not been completed. The trends in annual mean nitrogen



dioxide concentrations in the Kingswood –Warmley and Staple Hill AQMAs and the situation regarding the Cribbs Causeway AQMA and the reasons for its proposed revocation are discussed in Section 3.2.1. Distance adjusted monitoring data has also been provided in Table B.1 in Appendix B.

Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online on the Council website at [www.southglos.gov.uk/airquality](http://www.southglos.gov.uk/airquality) and on the Defra website at [https://uk-air.defra.gov.uk/aqma/local-authorities?la\\_id=238](https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=238).

Alternatively, in Appendix E, maps of the current AQMAs are available in Figure E.1 to Figure E.3. Maps of the air quality monitoring locations in relation to the AQMAs are also available in Figure E.8 and Figure E.10 to Figure E.13.

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	City / Town	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance (maximum monitored/modelled concentration at a location of relevant exposure)		Action Plan (inc. date of publication)
						At Declaration	Now	
AQMA 1 Cribbs Causeway	Declared 14 April 2010	NO <sub>2</sub> Annual Mean	Bristol (North fringe) Cribbs Causeway	The area incorporates a single property (Hollywood Cottage, Blackhorse Hill) adjacent to the M5 Junction 17 Roundabout.	YES			No Action Plan as under objective
AQMA 2 Kingswood – Warmley	Declared 14 April 2010  Amended 25 May 2012  Amended 16 December 2015	NO <sub>2</sub> Annual Mean	Bristol (East fringe) Kingswood & Warmley	The area incorporates A420 road from South Gloucestershire /Bristol City Council boundary in Kingswood extending eastwards to junction of Goldney Avenue in Warmley; to the south along Hanham Road (up to and including The Folly); and to the south-east along Tower Road North to the junction of Crown Gardens; and includes any	NO			2012 Air Quality Action Plan for Kingswood and Staple Hill (March 2012) <a href="http://www.southglos.gov.uk/documents/cos120094.pdf">http://www.southglos.gov.uk/documents/cos120094.pdf</a> (The AQAP is being revised to include the AQMA extension to Warmley in Dec 2015).

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				properties that lie within the outlined boundary.				
AQMA 3 Staple Hill	Declared 14 April 2010  Amended 25 May 2012	NO <sub>2</sub> Annual Mean	Bristol (East fringe) Staple Hill	The area incorporates the Broad Street (A4175), High Street (B4465), Victoria Street and Soundwell Road (A4017) crossroads; along Broad Street to the junction with York Road; High Street (up to and including no's 40 and 49); Soundwell Road (up to and including no's 16a and 47); Victoria Street to the junction of Clarence Road; and includes any properties that lie within the outlined boundary.	NO			2012 Air Quality Action Plan for Kingswood and Staple Hill (March 2012) <a href="http://www.southglos.gov.uk/documents/cos120094.pdf">http://www.southglos.gov.uk/documents/cos120094.pdf</a>

☒ South Gloucestershire Council confirm the information on UK-Air regarding their AQMAs is up to date

## 2.2 Progress and Impact of Measures to address Air Quality in South Gloucestershire

Defra's appraisal of last year's ASR concluded the following:

*The report is well structured, detailed, and provides the information specified in the Guidance. It is noted that the Council have taken significant steps to clearly document the progress on measures to address local air pollution, and provide details of the most recent developments likely to impact on air quality. They have produced a well-documented report which is welcomed.*

- 1. The ASR report highlights there are now only continued exceedances within two of the existing AQMAs, for exceedance of the annual mean objective for Nitrogen Dioxide. (See point 3 below and the proposed revocation of the Cribbs Causeway AQMA).*
- 2. It will be important to ensure that future monitoring and assessment can continue to determine locations of exceedances of air quality objectives at locations of relevant exposure, which will verify which AQMA's need to remain in place, and which can be considered for revocation, where objectives remain below objective levels. (Actioned through the ongoing review of monitoring locations).*
- 3. The current monitoring results highlight that there has been evidence of continued improvements in local air quality at Cribb's Causeway AQMA over the last 5 years, suggesting that it may be appropriate to consider this AQMA for revocation. We acknowledge the current monitoring programme should continue to consider the impact of the new developments at this location. (Revocation of the Cribbs Causeway AQMA is proposed in this report).*
- 4. It will also be beneficial within the development of the new Action Plan, to review the level of further emissions reductions required at hotspot locations to achieve the air quality objectives, in order to inform the development of the measures within the AQAP, following the guidelines within the new Technical Guidance LAQM TG(16). (This point will be addressed in the review of the Air Quality Action Plan for Kingswood and Staple Hill).*

South Gloucestershire has taken forward a number of direct measures during the current reporting year of 2016 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2.

More detail on these measures can be found in the 2012 Air Quality Action Plan for Kingswood and Staple Hill<sup>14</sup> and also in related plans and strategies, such as the West of England Joint Local Transport Plan 3 (JLTP3) 2011 – 2026<sup>15</sup>, which is supported by various strategies on key issues such as public transport, smarter travel choices, cycling and walking.

Key completed measures are:

- Entire fleet of Council pool cars switched to electric in early 2017, with OLEV funding secured to switch 20% of other fleet vehicles to electric by 2021.
- Access funding secured to 2020, to enable the continuation of School, business and community travel planning measures to promote sustainable travel choices.
- Lighting installed along the Bristol/Bath railway cycle path during 2014/15 and 2015/16. These works will significantly improve conditions for cyclists along this major cycling corridor which also serves the Staple Hill AQMA.
- A major maintenance scheme to replace Teewell Hill Bridge adjacent to the cycle path, and undertake essential maintenance to the Staple Hill Bristol to Bath Railway Path, has also been completed, introducing a new shared use cycle facility and improving existing facilities, which supports cycling in Staple Hill.
- Delivery of a scheme which contributes to the action plan measures for Kingswood with improvements to pedestrian facilities at the A420 High Street/Alma Road junction by promoting walking. This work was completed in 2015.
- A package of safer routes to school measures has been introduced in 2015 at the Tynings School near to the Staple Hill AQMA.

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<sup>14</sup> <http://www.southglos.gov.uk/documents/cos120094.pdf>

<sup>15</sup> <https://travelwest.info/projects/joint-local-transport-plan>

- Implementation of the John Cabot School 20 mph scheme was completed in 2015.
- Clean Bus Technology Funding (CBTF) awarded in December 2015 following a joint bid by Bristol, South Gloucestershire and Bath and North East Somerset Councils. The funding was used to upgrade 35 of the most polluting Euro II and III local buses by retrofitting Selective Catalytic Reduction Technology (SCRT) to achieve Euro Standard V/VI, thereby reducing tailpipe NOx emissions on those services, all of which operate in the Bristol, Bath and South Gloucestershire AQMAs. The retrofitting was completed in 2017.
- Local Pinch Point Funding has enabled improvements to the M5 motorway junctions 16 and 17, in order to manage the impact of anticipated development and reduce congestion. Works were completed during 2015/16 and should be of benefit to the Cribbs Causeway AQMA and should help to maintain the nitrogen dioxide concentrations below the air quality objective.
- A signing review of delivery bays was undertaken during 2015 in Kingswood. Implementation of remedial measures following that review were completed in October 2016, which will improve local enforcement.
- The local transport capital programme 2016/17 approved a wider parking management review of the extended Kingswood - Warmley AQMA. Recommendations from the review address parking issues along the A420 Hill Street/Deanery Road and in Warmley, and the two resulting schemes are due to be completed in 2018 and 2019 respectively. This builds on the delivery of measure KS2 already delivered in the former Kingswood AQMA.
- A £4.79m Office for Low Emission Vehicles (OLEV) funding grant was awarded to the four West of England local authorities and First Bus in August 2017. This funding will help unlock a £28m investment by First, to potentially transform a significant part of their fleet (up to 110 vehicles) into bio-methane powered buses. The new buses, which could start running by 2019, will contribute to reducing air pollution levels across the West of England area, including the Staple Hill AQMA.

Also key progress is being made following the successful joint bid with Bristol City Council (BCC) as the Lead Authority, for a Clean Air Zone (CAZ) Feasibility Study.

Funding of £498,600 was awarded by the Joint Air Quality Unit (Defra and Department for Transport (DfT)) under the Air Quality Grant Programme 2016/17.

Consultants CH2M have been commissioned to undertake the feasibility study. Initial work was completed that identified options for further study but a legal challenge to the Government and Bristol City Council, resulted in a BCC Cabinet decision to proceed being deferred. Subsequently BCC has been mandated to comply with a Government Direction to improve air quality, so the project is in the process of being re-scoped to accommodate the direction and new guidance from the Joint Air Quality Unit (JAQU).

As South Gloucestershire Council has not been mandated by a government direction, guidance is being sought by BCC from JAQU on SGC's ongoing involvement in the CAZ Study, particularly as the initial sifting work on the project supported the view that compliance was expected in SGC by 2020 if a CAZ were to be implemented in central Bristol.

However SGC officers will continue to be involved in the project steering group for the Clean Air Zone Feasibility Study with Bristol City Council, to ensure that any issues concerning South Gloucestershire remain on the agenda.

Measures have also been taken to continue to more closely align the air quality agenda with public health outcomes. These include:

- The Joint Strategic Needs Assessment (JSNA) completed in 2016 recognised the close links between spatial planning, transport and air quality. Priority areas within the JSNA were identified for collective action. The impact of the built and natural environment on health scored highly. Consequently a specific action to 'establish a single, comprehensive Clean Air Strategy to reduce health impacts associated with air pollution and poor air quality' was included within the South Gloucestershire Joint Health and Wellbeing Strategy 2017-2021 which has recently been consulted on. The final strategy document will be available once approved by the Health and Wellbeing Board in early 2018.
- An Air Quality workshop was held in November 2016. Representatives from all council teams with an interest in air quality were invited to hear speakers from Public Health England and the University of the West of England. The workshop identified two local needs as a pre-requisite for further action:

- to raise public awareness of air quality locally, and;
  - to provide indicative monitoring for PM<sub>2.5</sub>.
- The needs identified at the workshop have been translated into action via the submission of business cases for public health funding. A project involving monitoring school children on their commute to school in one of the AQMAs, with associated public participatory research, will be undertaken in early 2018. In addition three “AQ Mesh” monitoring units have been funded by public health to provide indicative particulate monitoring in key areas. Further details are provided in Section 2.3.
- The continued commitment of resource from the Public Health team into built environment and air quality work, recognises the importance of this work in terms of public health. The team has lead on the inception of a council wide Air Quality Expert Reference Panel, bringing together Heads of Services which have an interest and/or impact on air quality; including Environmental Health, Spatial Planning, Development Control, Transport, Street Care and Strategic Communications. Officers from these disciplines also contributed to the NICE (National Institute for Health and Care Excellence) guidance consultation on outdoor air quality and baseline assessment for SGC.
- The strategic group of the Heads of Planning and Transport plus the Director of Public Health continue to meet regularly to consider strategic planning issues and public health. This group retains links to a wider West of England group to ensure that public health issues, including air quality continue to be considered within in the Joint Spatial Plan and Joint Transport Study process<sup>16</sup>.

South Gloucestershire Council’s priority for the coming year is to review and update the Air Quality Action Plan for Kingswood and Staple Hill to incorporate the extension of the Kingswood AQMA to Warmley.

The principal challenges and barriers to implementation that South Gloucestershire Council anticipates facing are:

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<sup>16</sup> <https://www.jointplanningwofe.org.uk/consult.ti>



- Continued significant pressure on local government funding, which could impact on delivering air quality improvements.
- The transport system within South Gloucestershire is under pressure, due to the travel demand generated by the current population and by people coming into the area on a daily basis to work, shop and for leisure reasons. These pressures are shown through traffic congestion on South Gloucestershire's road network and capacity problems on local rail services.

Progress on the review of the 2012 Air Quality Action Plan for Kingswood and Staple Hill, particularly to cover the extension of the Kingswood AQMA to Warmley, has been slower than expected. Whilst some progress has been made, in the form of a workshop to identify and refine a list of possible actions for inclusion in the revised Action Plan, the work has taken longer than anticipated due to the complexity of the work involved and staff resource issues.

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, South Gloucestershire Council anticipates that further additional measures not yet prescribed will be required in subsequent years to achieve compliance and enable the revocation of the Kingswood - Warmley and Staple Hill AQMAs.

However, early modelling work undertaken for the Clean Air Zone Feasibility Study indicated that if a Clean Air Zone was to be introduced in Bristol, it would impact sufficient "through" vehicle trips to achieve compliance in the Kingswood - Warmley and Staple Hill AQMAs.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
<b>Kingswood Action Plan</b>											
KS1	Travel Plan for Kingswood Civic Centre	Promoting Travel Alternatives	Workplace Travel Planning	South Gloucestershire Council Local Transport Capital Programme (LTCP)	2011/12	2012 onwards	<ul style="list-style-type: none"> <li>• Reduction in solo occupancy vehicles</li> <li>• Increased cycling levels</li> <li>• Increased walking levels</li> </ul>	No specific target emissions reduction.	Action complete. Implementation of travel plan is continuous process.	Completed	
KS2	Parking review (Kingswood)	Traffic Management	Workplace Parking Levy, Parking Enforcement on highway	South Gloucestershire Council LTCP	2012-14	2014 - 2018	<ul style="list-style-type: none"> <li>• Road safety benefits</li> <li>• Reduced congestion</li> </ul>	None, impact considered too small to be measurable.	Initial parking review implemented in 2015/16. 3 additional measures currently being consulted on.	Estimated 2018/19	
KS3	Ensure air quality is a priority in development of transport schemes (Kingswood)	Transport Planning and Infrastructure	Other	South Gloucestershire Council LTCP	2013/14	2013/14	Number of actions taken forward within Capital Programme	No specific target emissions reduction.	The prioritisation framework for the Local Transport Capital Programme (LTCP) was reviewed in 2013, and now includes an assessment of the contribution to meeting LTP carbon emissions/air quality goals.	Action completed 2013	
KS4	Bus partnership (Kingswood) Working with operators to address AQ issues	Vehicle Fleet Efficiency	Promoting Low Emission Public Transport	South Gloucestershire Council in partnership with bus operators and neighbouring local authorities OLEV Grant	2012/13	2013 onwards	Number of buses replaced for lower emission vehicles	No specific target emissions reduction.	£4.79m OLEV funding for bio-methane buses awarded to WoE and First Bus in Aug 2017 Successful Clean Bus Technology Fund (CBTF) bid in Dec 2015 to upgrade 35 Euro II and III buses by retrofitting with SCRT to achieve Euro Standard V/VI reducing NOx emissions.	Continuous process. SCRT retrofitting completed in 2017	
KS5	Review of Council Fleet to ensure lowest emission	Vehicle Fleet Efficiency	Other	South Gloucestershire Council OLEV Grant	2012/13	2013 onwards	Reduction in vehicle emissions	No specific target emissions reduction.	The Council continually assesses its in-house vehicle fleet requirements. OLEV funding received in January 2016, will ensure 20% of Council fleet will be	Continuous process	

## South Gloucestershire Council

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
	vehicles (Kingswood)								Low Emission vehicles by 2021. The entire fleet of pool cars at main SGC offices were electric from early 2017.		
KS6	Promotion of more efficient use of taxi ranks and bus stops (Kingswood)	Vehicle Fleet Efficiency	Driver training and ECO driving aids	South Gloucestershire Council in liaison with taxi operators and bus operators LTCP	2012/13	2013 onwards	Number of bus/taxi operators signed up to programme	No specific target emissions reduction.	Bus lay-by and taxi bay on Regent Street altered to improve traffic flow in June 2013. First Bus regularly review vehicle timing points to remove excessive idling times. The Council continues to work with local bus and taxi operators to encourage the transition of fleets to low emission vehicles.	Continuous process	
KS7	Ensure adequate landscaping is considered within new planning applications and urban designs (Kingswood)	Policy Guidance and Development Control	Other policy	South Gloucestershire Council Council Funds	2012/13	2013 onwards	Number of new trees planted. NB: Data relating to the indicator for this measure is not currently available.	No specific target emissions reduction.	Policies CS2 and CS9 within the Councils adopted Core Strategy set out how Green Infrastructure and the natural environment is to be planned, delivered and managed within proposed development. Planting schemes using Council own funds have been completed.	Action completed 2013.	
KS8	Promotion of VOSA Smoky Vehicle Hotline (Kingswood)	Public Information	Via the Internet	South Gloucestershire Council n/a	2012/13	2012/13	Number of vehicles reported to VOSA (data not currently available).	No specific target emissions reduction.	Information added to the Council's website on the Exhaust emissions testing and Improving air quality webpages.	Action completed 2013.	
KM1	School travel planning (Kingswood)	Promoting Travel Alternatives	School Travel Plans	South Gloucestershire Council in conjunction with local schools DFT Grant Funding	2012/13	2013 onwards	'Hands up' surveys within participating schools indicate mode share for pupils arriving at school.	No specific target emissions reduction.	A series of interventions undertaken annually with LSTF and STTY funding since 2013 to promote sustainable travel in schools. Access funding confirmed to continue this until 2020.	Continuous process.	Further progress subject to funding availability.

## South Gloucestershire Council

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
KM2	Travel planning for Kingswood Town Centre (Kingswood)	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	South Gloucestershire Council in conjunction with Kingswood Business Association DfT Grant Funding	2013/14	2014 onwards	Measured by increased: • Cycling levels • Bus patronage • Walking levels	No specific target emissions reduction.	.A series of measures to encourage sustainable travel offered to businesses and communities as part of LSTF and STTY projects. Access funding confirmed to continue measures until 2020.	Continuous process.	Further progress subject to funding availability.
KM3	Review bus terminals and timing points (Kingswood)	Vehicle Fleet Efficiency	Promoting Low Emission Public Transport	South Gloucestershire Council in conjunction with bus operators Undertaken by operators	2012/13	2013/14	Reduction in number of buses idling at bus stops	No specific target emissions reduction.	Review of bus network to reduce no. of services terminating in AQMA. Bus stop infrastructure and parking review schemes to improve traffic flow.	Action completed 2014/15	
KM4	Smarter Choices promotions/ roadshows (Kingswood)	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	South Gloucestershire Council DfT Grant Funding	2013/14	2014 - 2016	Measured by increased: • Cycling levels • Bus patronage • Walking levels Also measure by number of proactive events	No specific target emissions reduction.	The LSTF WEST programme has included a series of initiatives aimed at encouraging travel behaviour change and reducing the number of single occupancy car use journeys in the Kingswood area from 2014-16.	Continuous process.	Further progress subject to funding availability.
KM5	Cycling infrastructure (Kingswood)	Transport Planning and Infrastructure	Cycle network	South Gloucestershire Council LTCP and DfT Grant Funding	2012/13	2014 onwards	Increases in numbers of cyclists as measured as part of the Joint Local Transport Plan (JLTP3) Annual Progress Reports.	No specific target emissions reduction.	Cycle parking installed at John Cabot School as part of LSTF. No other cycle infrastructure schemes within the AQMA or surrounding area in recent years.  Cycle infrastructure is constantly under review as issues and possible measures are identified by Officers, Members and the public.	Continuous process.	Further progress subject to funding availability.
KL1	ECO Stars Fleet Recognition Scheme (Kingswood)	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	South Gloucestershire Council Unknown at Present	2012/13	2013/14	Membership numbers.	No specific target emissions reduction.	Not currently feasible to implement due to resource availability. Progression of this action is unlikely for the foreseeable future, but will be	Unknown at present.	Resource availability currently prevents implementation

## South Gloucestershire Council

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
									reviewed as part of AQAP update.		
KL2	Car club (Kingswood)	Alternatives to private vehicle use	Car Clubs	South Gloucestershire Council Unknown at Present	2012/13	2014/15	Car club membership	No specific target emissions reduction	Long term action - preparatory work has commenced. Progress dependant on results seen from the Car Clubs being established elsewhere in the Council area.	Unknown at present.	Action dependant on success of other car clubs
KL3	Restrict traffic turning movements onto A420 (Kingswood)	Traffic Management	UTC, Congestion management, traffic reduction	South Gloucestershire Council LTCP	2012/13	2016/17	Reduction in volume of traffic travelling towards and along A420	No specific target emissions reduction	Long term action - preparatory work has commenced. Micro-simulation model to test options commissioned to assess impact of LTCP and developer proposals upon air quality. Do Nothing model and further scenario testing planned for 2017/18.	Estimated 2019/2020.	
KL4	Review traffic signal numbers and operations (Kingswood)	Traffic Management	UTC, Congestion management, traffic reduction	South Gloucestershire Council LTCP	2012-14	2014/15	Improved traffic speeds and reduced congestion	No specific target emissions reduction.	MOVA signalling system has been installed at 3 junctions in the AQMA to improve traffic flow. A review of mid-block pedestrian signals within the AQMA was undertaken in 2014 and recommends the removal of 1 or 2 pedestrian crossings from Kingswood High Street. This scheme is subject to future funding bids.	Review completed. Implementation unknown	Implementation dependant on securing funding.
KL5	Review of delivery bays (Kingswood)	Freight and Delivery Management	Delivery and Service plans	South Gloucestershire Council LTCP	2012/13	2016/17	<ul style="list-style-type: none"> <li>• number of reported issues with delivery bays</li> <li>• reduced congestion</li> </ul>	No specific target emissions reduction	Entry and exit kerbing into delivery bays on the High Street have been adjusted to allow easier access and reduce delays and traffic queues. A signing review of delivery bays was completed in 2016.	Completed 2013/14	
KL6	Controlled deliveries/collections (Kingswood)	Freight and Delivery Management	Freight Consolidation Centre	South Gloucestershire Council Unknown at Present	2016/17	2019/20	Number of delivery & collection agreements made with businesses	No specific target emissions reduction	Long term action - no progress yet.	Estimated 2019/20	

## South Gloucestershire Council

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
KL7	Reclassify strategic routes and signing strategy (Kingswood)	Traffic Management	Other	South Gloucestershire Council Unknown at Present	2016/17	2019/20	Reduction in traffic volumes on and travelling towards A420	No specific target emissions reduction	Long term action - no progress yet.	Estimated 2019/20	
KL8	Taxi ranks (Kingswood)	Promoting Low Emission Transport	Taxi emission incentives	South Gloucestershire Council in conjunction with taxi operators Unknown at Present	2015/16	2019/20	Production of review report	No specific target emissions reduction	Long term action - no progress yet.	Estimated 2019/20	
CR39/2013	Improved pedestrian crossing facilities at High St/ Alma Rd	Promoting Travel Alternatives	Promotion of walking	South Gloucestershire Council LTCP	2014/15	2015/16	Implement infrastructure improvements to promote walking	No specific target emissions reduction	Scheme added to the Council's Local Transport Capital Programme using the scheme prioritisation framework (see Action KS3). Following design and public consultation the scheme was implemented in 15/16.	Completed 2015/16	
<b>Staple Hill Action Plan</b>											
SS1	Ensure air quality is a priority in development of transport schemes (Staple Hill)	Transport Planning and Infrastructure	Other	South Gloucestershire Council LTCP	2012/13	2013/14	Number of actions taken forward within Capital Programme	No specific target emissions reduction	The prioritisation framework for the Local Transport Capital Programme (LTCP) was reviewed in 2013, and now includes an assessment of the contribution to meeting LTP carbon emissions/air quality goals.	Action completed 2013	
SS2	Bus partnership (Staple Hill) Working with operators to address AQ issues	Vehicle Fleet Efficiency	Promoting Low Emission Public Transport	South Gloucestershire Council in partnership with bus operators OLEV Grant	2012/13	2013 onwards	Number of buses replaced for lower emission vehicles.	No specific target emissions reduction	£4.79m OLEV funding for bio-methane buses awarded to WoE and First Bus in Aug 2017. Successful Clean Bus Technology Fund (CBTF) bid in Dec 2015 to upgrade 35 Euro II and III buses by retrofitting with SCRT to achieve Euro Standard V/VI	Continuous process. SCRT retrofitting completed in 2017	

## South Gloucestershire Council

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
									reducing NOx emissions.		
SS3	Review of Council Fleet to ensure lowest emission vehicles (Staple Hill)	Vehicle Fleet Efficiency	Other	South Gloucestershire Council OLEV Grant	2012/13	2013 onwards	Reduction in vehicle emissions	No specific target emissions reduction.	The Council continually assesses its in-house vehicle fleet requirements. OLEV funding received in January 2016, will ensure 20% of Council fleet will be Low Emission vehicles by 2021. The entire fleet of pool cars at main SGC offices were electric from early 2017.	Continuous process	
SS4	Promotion of more efficient use of taxi ranks and bus stops (Staple Hill)	Vehicle Fleet Efficiency	Driver training and ECO driving aids	South Gloucestershire Council in liaison with taxi operators and bus operators LTCP	2012/13	2017/18	Number of bus/taxi operators signed up to programme	No specific target emissions reduction	The parking review as part of SM4 is complete and any subsequent issues have been addressed. First Bus regularly review vehicle timing points to remove excessive idling times. The Council continues to work with local bus and taxi operators to encourage the transition of fleets to low emission vehicles.	Continuous process	
SS5	Ensure adequate landscaping is considered within new planning applications and urban designs (Staple Hill)	Policy Guidance and Development Control	Other policy	South Gloucestershire Council Council Funds	2012/13	2014 onwards	Number of new trees planted. NB: Data relating to the indicator for this measure is not currently available.	No specific target emissions reduction.	Policies CS2 and CS9 within the Councils adopted Core Strategy set out how Green Infrastructure and the natural environment is to be planned, delivered and managed within proposed development. Planting schemes using Council own funds have been completed.	Action completed 2013.	
SS6	Promotion of VOSA Smoky Vehicle Hotline (Staple Hill)	Public Information	Via the Internet	South Gloucestershire Council n/a	2012/13	2012/13	Number of vehicles reported to VOSA (data not currently available).	No specific target emissions reduction.	Information added to the Council's website on the Exhaust emissions testing and Improving air quality webpages.	Action completed 2013.	

## South Gloucestershire Council

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
SM1	School travel planning (Staple Hill)	Promoting Travel Alternatives	School Travel Plans	South Gloucestershire Council in conjunction with local schools DfT Grant funding	2012/13	2013 onwards	'Hands up' surveys within participating schools indicate mode share for pupils arriving at school.	No specific target emissions reduction.	A series of interventions undertaken annually with LSTF and STTY funding since 2013 to promote sustainable travel in schools. Access funding confirmed to continue this until 2020.	Continuous process.	Further progress subject to funding availability.
SM2	Travel planning for Staple Hill Town Centre	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	South Gloucestershire Council in conjunction with Staple Hill Chamber of Trade DfT Grant funding	2013/14	2014 onwards	Measured by increased: • Cycling levels • Bus patronage • Walking levels	No specific target emissions reduction.	A series of measures to encourage sustainable travel offered to businesses and communities as part of LSTF and STTY projects. Access funding confirmed to continue measures until 2020.	Continuous process.	Further progress subject to funding availability.
SM3	Relocation of bus stops on Soundwell Road (Staple Hill)	Traffic Management	UTC, Congestion management, traffic reduction	South Gloucestershire Council LTCP	2012/13	2013/14	Measured by relocation of bus stop	No specific target emissions reduction.	Bus stop locations reviewed when the shelters were replaced, but due to site constraints a better location could not be found. Action closed, as the bus stops are unable to be re-located.	Action closed.	
SM4	Parking Review (Staple Hill)	Traffic Management	Workplace Parking Levy, Parking Enforcement on highway	South Gloucestershire Council LTCP	2013/14	2014/15	Measured by: • Road safety benefits • Reduced congestion	Impact of action considered too small to be measurable.	A review of parking restrictions within Staple Hill was undertaken. The resulting scheme was delivered as part of the 2014/15 local transport capital programme. Any subsequent issues have been addressed in a further review which is also now complete.	Completed 2014/15	
SM5	Smarter Choices promotions /roadshows (Staple Hill)	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	South Gloucestershire Council DfT Grant funding	2013/14	2014-16	Measured by increased: • Cycling levels • Bus patronage • Walking levels Also measure by number of	No specific target emissions reduction.	The LSTF WEST programme has included a series of initiatives aimed at encouraging travel behaviour change and reducing the number of single occupancy car use journeys in the AQMA area from 2014-16.	Continuous process.	Further progress subject to funding availability.



## South Gloucestershire Council

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
							proactive events				
SM6	Cycling infrastructure (Staple Hill)	Transport Planning and Infrastructure	Cycle network	South Gloucestershire Council DfT Grant funding	2012/13	2014 onwards	Increases in numbers of cyclists as measured as part of the Joint Local Transport Plan (JLTP3) Annual Progress Reports.	No specific target emissions reduction.	Two grant funded cycle route lighting schemes were implemented nearby between 2014 and 2016. Cycle infrastructure is constantly under review as issues and possible measures are identified by Officers, Members and the public.	Continuous process.	Further progress subject to funding availability.
SL1	ECO Stars Fleet Recognition Scheme (Staple Hill)	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	South Gloucestershire Council Unknown at present	2012/13	2013/14	Membership numbers.	No specific target emissions reduction.	Not currently feasible to implement due to resource availability. Progression of this action is unlikely for the foreseeable future, but will be reviewed as part of AQAP update.	Unknown at present.	Resource availability currently prevents implementation
SL2	Car club (Staple Hill)	Alternatives to private vehicle use	Car Clubs	South Gloucestershire Council Unknown at present	2012/13	2014/15	Car club membership	No specific target emissions reduction	Long term action - preparatory work has commenced. Progress dependant on results seen from the Car Clubs being established elsewhere in the Council area.	Unknown at present.	Action dependant on success of other car clubs
SL3	Review traffic signal numbers and operations (Staple Hill)	Traffic Management	UTC, Congestion management, traffic reduction	South Gloucestershire Council Defra Grant funding/ LTCP	2012/13	2013/14	Improved traffic speeds and reduced congestion	No specific target emissions reduction.	Traffic signals reviewed and amended at the junction of A4175 Broad Street/A4017 Victoria Street in 2012. Upgrading of the traffic signals at the Pendennis Road and Acacia Road junction was completed in 2013, using DEFRA grant funding.	Action completed and closed 2013/14	
SL4	Review of delivery bays (Staple Hill)	Freight and Delivery Management	Delivery and Service plans	South Gloucestershire Council LTCP	2012/13	Implementation 2014/15 as part of Parking Review (SM4)	Measured by • number of reported issues with delivery bays • Reduced congestion	No specific target emissions reduction	This action was programmed as part of the Local Transport capital programme. The parking review completed in 2013/14 under SM4 including the review of delivery bays.	Action completed 2013/14	

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Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
SL5	Restrict traffic turning movements at A4017 junction (Staple Hill)	Traffic Management	UTC, Congestion management, traffic reduction	South Gloucestershire Council Unknown at present	2016/17	2019/20	Measured by reduction in traffic volumes at A4017 junction	No specific target emissions reduction	Long term action – no progress yet. The impact of the signal improvement identified under measure SL3 will be monitored and further changes at this junction will be considered as necessary.	Estimated 2019/2020	
SL6	Controlled deliveries/collections (Staple Hill)	Freight and Delivery Management	Freight Consolidation Centre	South Gloucestershire Council Unknown at present	2016/17	2019/20	Measured by number of delivery & collection agreements made with businesses	No specific target emissions reduction	Long term action - no progress yet.	Estimated 2019/20	
SL7	Reclassify strategic routes and signing strategy (Staple Hill)	Traffic Management	Other	South Gloucestershire Council Unknown at present	2016/17	2019/20	Measured by reduction in traffic volumes on and travelling towards A4017.	No specific target emissions reduction	Long term action - no progress yet.	Estimated 2019/20	

## 2.3 PM<sub>2.5</sub> – 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<sub>2.5</sub> (particulate matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that PM<sub>2.5</sub> has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

The introduction of this role into local air quality management supports efforts to reduce exposure at national level and also links strongly to the public health agenda, in particular the Public Health Outcome Framework (PHOF)<sup>17</sup> which includes the following indicator:

- PHOF Indicator 3.01 Health Protection: Fraction of all cause adult mortality attributable to anthropogenic particulate air pollution (measured as fine particulate matter PM<sub>2.5</sub>).

Estimates of mortality burden are based on modelled annual average concentrations of fine particulate matter (PM<sub>2.5</sub>) originating from human activities in each local authority area. Local data on the adult population and adult mortality rates is also used. The estimates of the fraction of mortality attributable to long-term exposure to human-made particulate air pollution range from approximately 3.0% in some local authority areas to 6 - 7% in some London boroughs.

In 2015, the most recent year for which data is available, the estimated fraction of mortality in South Gloucestershire was 4.7%. This is comparable with England as a whole (also 4.7%), but higher than the South West region average (4.3%) and the other West of England unitary authorities; Bristol (4.4%), Bath and North East Somerset (4.1) and North Somerset (4.0). The estimated fractions of mortality have decreased for all the above mentioned areas when compared to the previously reported 2013 data when, for example, the estimated fraction for South Gloucestershire (and England as a whole) was 5.3%.

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<sup>17</sup> <http://www.phoutcomes.info/>

The Council's Joint Strategic Needs Assessment (JSNA)<sup>18</sup> also contains information on air quality impacts on the South Gloucestershire population, including data for attributable deaths and associated life years lost.

South Gloucestershire Council continues to recognise that local authorities are expected to work towards reducing emissions and concentrations of PM<sub>2.5</sub> in their area.

As mentioned in Section 2.2, a workshop carried out in November 2016, with a range of partners, including representatives from Environmental Health, Spatial Planning, Transport and Public Health within the Council, and external expertise in respiratory medicine and air pollution monitoring, including representatives from Public Health England and the University of the West of England, identified two local needs as a pre-requisite for further action; to raise public awareness of air quality locally and to provide indicative monitoring for PM<sub>2.5</sub>. This informed the development of two business cases which were successful in obtaining funding from the Director of Public Health.

1. A project, developed jointly with the University of the West of England will use public participatory research in a school adjacent to the Kingswood - Warmley AQMA. It will provide indicative monitoring of PM<sub>2.5</sub> by using personal monitors to record levels of pollution to which children are exposed during travel to and from school. The project also aims to increase awareness of air pollution among children, parents and teachers and will be undertaken in early 2018.
2. To provide further indicative monitoring of PM<sub>2.5</sub>, a second business case was successful in obtaining funding for the purchase of three "AQ Mesh" monitoring units. One monitor will be co-located with the existing automatic monitoring site in Yate; the second will be situated within the Kingswood - Warmley AQMA and the third monitor, at a location to be determined in the Patchway area, where several potential sources of PM<sub>2.5</sub> have been identified.

An update on these projects will be included in the 2018 ASR.

In terms of the current situation with regard to PM<sub>2.5</sub> concentrations locally, while there is no regulatory standard applied to the PM<sub>2.5</sub> role for local authorities, the EU

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<sup>18</sup> [Joint Strategic Needs Assessment](#)

Ambient Air Quality Directive<sup>19</sup> does however set out air quality standards for PM<sub>2.5</sub>, which can act as a guide:

- Annual average EU limit value of 25µg/m<sup>3</sup> by 2020.
- EU target value of 15% reduction in concentrations at urban background locations between 2010 and 2020.

South Gloucestershire Council does not locally monitor PM<sub>2.5</sub> but the local PM<sub>2.5</sub> concentrations have been estimated from the PM<sub>10</sub> concentrations measured at the Yate automatic monitoring site, using the method specified in Technical Guidance LAQM TG16 Box 7.7. The results of this are provided in Table A.9. The estimated concentrations compare reasonably well to the PM<sub>2.5</sub> annual mean concentrations measured at the nearest national Automatic and Urban Rural Network (AURN) monitoring site; Bristol St. Pauls. The estimated local PM<sub>2.5</sub> concentrations are below the annual average EU limit value and greater % reductions than the EU target value of 15% can already be seen in concentrations between 2010 and 2016.

South Gloucestershire Council is taking the following measures to address PM<sub>2.5</sub>:

- The progress made in implementing measures in the existing Air Quality Action Plan, as detailed in Section 2.2, will also contribute to reducing emissions and concentrations of PM<sub>2.5</sub>. While the measures are primarily aimed at reducing nitrogen dioxide, road traffic is also a source of particulate matter so the implementation of measures will have co-benefits.
- The wider regional transport initiatives, such as Metrobus<sup>20</sup>, (see Appendix D), will contribute to reducing emissions and concentrations of PM<sub>2.5</sub>. In addition to reduced exhaust emissions, by making traffic flows smoother, these schemes will reduce non-exhaust emissions from brake and tyre wear.
- Dust Management Plans (DMPs), which are usually incorporated into Construction Environmental Management Plans (CEMPs), are routinely conditioned on major development planning permissions to control and minimise the risk of construction dust impacts, and therefore PM<sub>2.5</sub>, on nearby receptors.

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<sup>19</sup> <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:152:0001:0044:EN:PDF>

<sup>20</sup> <https://travelwest.info/metrobus>

- Regular inspections of industrial processes permitted by the Council where combustion and non-combustion processes could lead to anthropogenic emissions of PM<sub>2.5</sub>.
- Alongside measures to tackle nitrogen dioxide in the updated Action Plan, consideration will also be given to reducing emissions and concentrations of PM<sub>2.5</sub>. The Council is mindful of the potential co-benefits of action plan measures on multiple pollutants of concern and will follow appropriate guidance, such as the LAQM Action Toolbox in Annex A of the Defra LAQM Technical Guidance (TG16), which indicates measures that will likely be beneficial to reducing PM<sub>2.5</sub> levels (in addition to other pollutants).
- Some of South Gloucestershire is covered by a Smoke Control Area<sup>21</sup> which allows only approved fuels and appliances to be used. Further extension of the smoke control areas could be considered in the updated Action Plan to better control particulate (and NO<sub>x</sub>) emissions from open fires and wood-burning stoves. The Council's Environmental Health team has produced an information sheet on Solid Fuel Appliances Smoke Control<sup>22</sup> and will investigate smoke complaints. Non-compliance with smoke control legislation can result in a fine of up to £1000. The Council will also look to promote new initiatives such as the recently launched "Ready to burn" scheme as information becomes available.

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<sup>21</sup><https://www.southglos.gov.uk/environment-and-planning/pollution/pollution-control-clean-air-act-approval/smoke-control-areas/>

<sup>22</sup><http://www.southglos.gov.uk/documents/Solid-Fuel-Appliances.pdf>

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

### 3.1 Summary of Monitoring Undertaken

This section sets out what monitoring has taken place and how it compares with objectives. Local authorities do not longer have to report on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead, unless local circumstances indicate there is a problem. National monitoring results are available on the Defra UK-AIR (Air Information Resource) website<sup>23</sup>.

#### 3.1.1 Automatic Monitoring Sites

South Gloucestershire Council undertook automatic (continuous) monitoring at one site in Yate during 2016. Nitrogen dioxide (NO<sub>2</sub>) is monitored using an API Model 200A chemiluminescent analyser and particulate matter (PM<sub>10</sub>) is monitored using a Met One BAM 1020 Beta-Attenuated Mass (BAM) Monitor (unheated). Table A.1 in Appendix A shows the details of the Yate automatic monitoring site.

The Kingswood and Filton automatic monitoring sites, which also monitored nitrogen dioxide and particulate matter (PM<sub>10</sub>), ceased operation in September 2010 and March 2014 respectively. The Badminton automatic monitoring site, which monitored ozone, ceased operation in 2015. Further details and previous monitoring results for these sites can be found in the 2015 Updating and Screening Assessment<sup>24</sup>.

Maps showing the location of the monitoring site are provided in Figure E.4 and Figure E.5 in Appendix E. Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C.

#### 3.1.2 Non-Automatic Monitoring Sites

South Gloucestershire Council undertook non- automatic (passive) monitoring of NO<sub>2</sub> at 99 sites during 2016. Table A.2 in Appendix A shows the details of the sites.

Triplicate monitoring (using three diffusion tubes) is undertaken at three of the monitoring locations; Yate, Station Road, where the tubes are co-located with the automatic monitoring station (sites 4, 5 and 6); in the Cribbs Causeway AQMA,

<sup>23</sup> <https://uk-air.defra.gov.uk/>

<sup>24</sup> <http://www.southglos.gov.uk/documents/Air-quality-management-updating-and-screening-assessment-2015.pdf>

Hollywood Cottage façade (sites 87A, B and C) and in Soundwell (sites 147A, B and C) to ensure robust monitoring datasets. The monitoring results are reported for 105 diffusion tubes in total.

In 2016, two additional diffusion tubes were set up at site 147 in Soundwell to provide triplicate monitoring at the receptor façade where concentrations have been borderline with the annual mean objective.

The following two diffusion tube sites ceased operation towards late 2015/ early 2016;

- Site 94 Kingswood – High Street, Kings Arms, ceased operation in October 2015 due to removal of the post that the tube was mounted on and there was no suitable alternative location to re-site the tube.
- Site 131 Bradley Stoke – 188 Oaktree Crescent, ceased operation April 2016 due to removal of the street furniture the tube was mounted on as part of Metrobus works. However, a replacement monitoring site (site 152) had been set up in 2015 in anticipation of this.

Maps showing the location of the diffusion tube monitoring sites are provided in Appendix E. 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 and “annualisation”. Distance corrected results are reported in Table B.1 (Appendix B). Further details on adjustments are provided in Appendix C.

### **3.2.1 Nitrogen Dioxide (NO<sub>2</sub>)**

Table A.3 in Appendix A compares the ratified and adjusted monitored NO<sub>2</sub> annual mean concentrations from the automatic and non-automatic (diffusion tube) monitoring sites for the past 5 years with the air quality objective of 40µg/m<sup>3</sup>.

#### **Automatic Monitoring Data**

The results of monitoring at the Yate automatic site show the NO<sub>2</sub> concentrations are well below the annual mean objective in 2016 and all other reported years (Table



A.3, Appendix A). The trend data presented in Figure A.1 (Appendix A) shows that annual mean nitrogen dioxide concentrations have been generally stable, although in 2016, there was an increase in monitored concentrations from  $21\mu\text{g}/\text{m}^3$  in 2015 to  $24\mu\text{g}/\text{m}^3$ , the same concentration as recorded in 2014.

Table A.4 in Appendix A compares the ratified continuous monitored  $\text{NO}_2$  hourly mean concentrations for the past 5 years with the air quality objective of  $200\mu\text{g}/\text{m}^3$ , not to be exceeded more than 18 times per year. There were no exceedances of the 1-hour mean ( $200\mu\text{g}/\text{m}^3$ ) recorded at the Yate automatic monitoring site during 2016 and the site has been below the hourly mean objective in all reported years.

### **Non-Automatic (Diffusion Tube) Monitoring Data**

The  $\text{NO}_2$  annual mean concentrations from the diffusion tube monitoring sites are provided in Table A.3 (Appendix A). The data reported in Table A.3 has been bias adjusted and annualised but not corrected for distance to the nearest relevant receptor so that the 2016 data can be fairly compared to the previously reported data for the years 2012 to 2015.

Bias adjusted, annualised and distance corrected diffusion tube monitoring data, including the full 2016 dataset of monthly mean values, is provided in Table B.1 (Appendix B).

### **Discussion of 2016 Diffusion Tube Monitoring Results**

#### **Exceeding Sites**

In 2016, exceedances of the annual mean objective were measured at eleven monitoring sites (compared to seven in 2015). Of these, five sites were within the Kingswood – Warmley AQMA (compared to four in 2015), and five were within the Staple Hill AQMA (compared to three in 2015). The one remaining exceeding location (site 147) on the Kingswood/Soundwell border falls outside of the AQMAs. There were no exceeding sites in the Cribbs Causeway AQMA. The exceeding sites are detailed below:

#### **Kingswood – Warmley AQMA**

- Site 67 Kingswood – 40 Regent Street Thomas Cook (lamppost at façade)
- Site 68 Kingswood – 26-32 Regent Street Store Twenty One (lamppost at façade)

- Site 116 Warmley - 14 High Street Webbs (lamppost at facade)
- Site 137 Warmley - 35 High Street (lamppost at façade)
- Site 146 Kingswood - 34 Hill Street (downpipe on façade)

### **Staple Hill AQMA**

- Site 61 Staple Hill – 1 Broad Street William Hill (lamppost mid pavement)
- Site 73 Staple Hill - 11 Soundwell Road Starlight (lamppost on roadside)
- Site 75 Staple Hill – 118 High Street Santander (lamppost at roadside)
- Site 78 Staple Hill – 9-11 Victoria Street (telegraph pole at roadside)
- Site 102 Staple Hill – 58 High Street CBS Consultants (traffic light post at façade)

Relevant exposure is slightly set back at four out of five of the exceeding sites in the Staple Hill AQMA so the results have been distance adjusted to the façade of the nearest receptor using the “Nitrogen dioxide fall off with distance” calculator<sup>25</sup>, which is the procedure specified in LAQM Technical Guidance (TG16). Details of the distance adjustment calculations for the exceeding sites are presented in Table C.6 (Appendix C).

The estimated concentrations at the façade of the nearest relevant receptors on distance adjustment were below the annual mean objective, although for three of the sites (61, 75 and 78), the concentrations within 10% of the objective, with the highest estimated concentration of 39.5 µg/m<sup>3</sup> at site 61. However, it should be noted that there is no relevant exposure at ground floor level in relation to sites 61, 73, 75 and 102 in the Staple Hill AQMA, and also site 67 and 68 in the Kingswood - Warmley AQMA.

It should be taken into consideration that the fall off with distance calculator has some uncertainty and provides an estimated concentration only. Where possible, the diffusion tubes will be relocated to relevant receptor façades. The monitoring locations in Staple Hill in particular were reviewed during 2017 and some façade monitoring was set up to better represent relevant exposure where this was possible.

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<sup>25</sup> <http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html>

Existing monitoring sites were retained to enable trend comparison for 2017 during the monitoring site relocations.

### Exceeding Site outside of the AQMAs

There was one exceeding monitoring location outside of the AQMAs:

- Site 147(A, B & C) Soundwell - 264 Soundwell Rd (façade)

This site marginally exceeded the annual mean objective in 2014 ( $40.6 \mu\text{g}/\text{m}^3$ ), however, in 2015 the concentration was below the objective, although still borderline at  $38.7 \mu\text{g}/\text{m}^3$ . Triplicate diffusion tube monitoring (147A, B and C) was set up in March 2016 to ensure more robust monitoring of the nitrogen dioxide concentrations at this location. The monitoring is at the façade and is representative of relevant exposure.

In 2016, the nitrogen dioxide concentration recorded at the existing site 147 (which in effect became one of the triplicate tubes (147A) was  $39.9 \mu\text{g}/\text{m}^3$ , which is marginally below the annual mean objective. This is in relation to a data capture of 92%.

However, due to the commencement of the triplicate monitoring in March and the loss of the whole set of triplicate tubes in December 2016, the data capture for the additional two tubes; 147B and C at the site dropped to 67%. With the data capture below 75%, this led to annualised means being calculated which were above the objective (147B  $46.5 \mu\text{g}/\text{m}^3$  and 147C  $46.6 \mu\text{g}/\text{m}^3$ ).

However, the 2016 raw monthly triplicate monitoring results showed good precision when checked using precision and accuracy LAQM spreadsheet tool<sup>26</sup> available on the Defra website and with the non-annualised results for 147B and C, an average bias adjusted annual mean of  $38.7 \mu\text{g}/\text{m}^3$  is attained which is below the objective.

No other exceedences or borderline results have been identified at the other worse-case monitoring sites (128 and 150) around the junction since 2013.

In light of the above, it is proposed to review the full 2017 results for the triplicate monitoring and should an exceedance be identified, further action will be undertaken as appropriate. This will be reported in the next Annual Status Report in 2018.

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<sup>26</sup> <http://laqm.defra.gov.uk/bias-adjustment-factors/local-bias.html>

No annual means greater than  $60\mu\text{g}/\text{m}^3$  were recorded at any of the diffusion tube monitoring sites, so exceedances of the 1-hour mean objective are considered unlikely.

### **Borderline Exceedances**

There were fifteen sites approaching the objective i.e. within 10% of the objective at  $36\mu\text{g}/\text{m}^3$  or above in 2016 (compared to twelve in 2015). Of these, seven sites are within the Kingswood – Warmley AQMA (sites 69, 92, 95, 96, 97, 138 and 139) and five are within the Staple Hill AQMA (sites 29, 62, 72, 76 and 79).

The other three borderline sites are outside of AQMAs. One of these is Site 147A which is discussed above. The other two borderline sites are detailed below:

- Site 134 Hambrook - Bristol Road Old Bakery façade ( $37.4\mu\text{g}/\text{m}^3$ )
- Site 151 Hambrook - Bristol Road Old Bakery FP Signpost ( $38.8\mu\text{g}/\text{m}^3$ )

All of the monitoring is either at the façade, or level with the façade in the case of site 151, apart from at sites 29, 72 and 79 in the Staple Hill AQMA and sites 96 and 97 in the Kingswood – Warmley AQMA. Distance adjustment of the sites not at façade to the nearest relevant receptor reduces the annual mean concentrations further below the objective. Details of the distance adjusted results are included in Table B.1 (Appendix B).

All the borderline sites represent relevant exposure, although it should be noted that there is no relevant exposure at ground floor level in relation to sites 29, 62, 69, 72, 76, 92, 95 and 96.

The results for the Hambrook Old Bakery sites (134 and 151) compare reasonably well and concerns that the concentrations at façade may be over-estimated because diffusion tube (site 134) is located in a corner of the building appear unfounded, with site 151 monitoring slightly higher nitrogen dioxide concentrations in 2016 than site 134. It should be noted that there were major long term roadworks during 2016 due to Metrobus works along the A4174 Ring Road at and near the junction with Bristol Road (B4058) (Hambrook Crossroads). These roadworks are likely to have adversely affected monitored concentrations due to additional traffic congestion in the area.

All the borderline sites will continue to be closely observed, especially with regard to planning or transport developments that may affect future nitrogen dioxide concentrations.

## **Discussion of Trends in Annual Mean Nitrogen Dioxide Concentrations in Kingswood - Warmley and Staple Hill Air Quality Management Areas**

The trends in annual mean nitrogen dioxide concentrations measured at diffusion tube monitoring sites in the AQMAs are shown in graphs in Appendix A. The trends within the Kingswood – Warmley AQMA are shown in Figure A.3 (Kingswood section) and Figure A.4 (Warmley section) and the trends in the Staple Hill AQMA in Figure A.5. For ease of reference and as previously recommended in the Defra appraisal of the 2015 USA, the diffusion tube monitoring results within the Kingswood – Warmley and Staple Hill AQMAs can be found in Table A.7 and Table A.8 respectively.

In the Kingswood – Warmley AQMA, five sites (67, 68, 116, 137 and 146) exceeded the annual mean objective in 2016, with the highest exceedance  $45.7 \mu\text{g}/\text{m}^3$  (site 146). In comparison to 2015 when there were four exceeding sites (68, 116, 137 and 146) and the highest exceedance was  $43.2 \mu\text{g}/\text{m}^3$  (site 137), this represents a slight increase in the number of exceeding sites and an increase in the extent of exceedance. However, it should also be noted that while there were exceedances at sites 67 and 68, as previously mentioned, there is no relevant exposure at ground floor level and concentrations would be further reduced at higher floors.

In the Staple Hill AQMA, there were also five exceeding sites (61, 73, 75, 78 and 102) in 2016, with the highest exceedance  $46.1 \mu\text{g}/\text{m}^3$  (site 75). In 2015, there were three exceeding sites (73, 75 and 78) with the highest exceedance also at Site 75 ( $44.8 \mu\text{g}/\text{m}^3$ ). As with the Kingswood – Warmley AQMA, this represents an increase in both the number of exceeding sites and the extent of the exceedance from 2015 to 2016. However, it should also be noted as previously discussed, that relevant exposure at four of the exceeding sites in 2016 is set back and when distance adjusted, the estimated concentrations are below the annual mean objective at the nearest receptor façades. Furthermore, there is no relevant exposure at ground floor level in relation to sites 61, 73, 75 and 102 and concentrations at higher floors would be further reduced.

While the overall trend in nitrogen dioxide concentrations in these AQMAs has been relatively stable over the past decade with a slight downward trend in recent years, in 2016 there was a general upward trend in monitored nitrogen dioxide concentrations from 2015 across most of the monitoring sites in these AQMAs (77% of monitoring

sites in the Kingswood – Warmley AQMA and 85% of monitoring sites in the Staple Hill AQMA).

Increases in monitored nitrogen dioxide concentrations in 2016 were observed as a general trend not just in the Kingswood – Warmley and Staple Hill AQMAs but across the majority of the monitoring sites in South Gloucestershire, with concentrations increasing to varying degrees at approximately 83% of monitoring locations. It is difficult to determine the reasons for this recent apparent upward trend which could be due to variation around the normal annual fluctuations that have ultimately seen concentrations remain relatively static over a longer period of time. Pollutant concentrations can vary from year to year due to a number of factors, in particular meteorological conditions, which can present unfavourable conditions for pollutant dispersion.

### **Proposed Revocation of the Cribbs Causeway AQMA**

Following the declaration of the Cribbs Causeway AQMA (see Figure E.1), a Further Assessment of air quality within the AQMA was undertaken. The Further Assessment Report 2011 concluded the 2010 nitrogen dioxide concentration ( $33.0 \mu\text{g}/\text{m}^3$ ) at monitoring site 87 located at the façade of the single property in the AQMA, was below the annual mean objective, indicating the AQMA was longer required. As a precaution, the recommendation was made to continue monitoring and review the 2011 results and if these results were also below the objective, then it would be appropriate to revoke the AQMA.

The 2011 result ( $34.0 \mu\text{g}/\text{m}^3$ ) also showed the annual mean nitrogen dioxide concentration at site 87 was below the objective. The revocation of the AQMA was proposed in the 2012 Updating and Screening Assessment, however, the Defra appraisal of the report recommended the AQMA be retained pending further monitoring results, as while 2010 and 2011 results were below the objective, pollutant concentrations can vary significantly from one year to another.

The Council accepted the recommendation to retain the AQMA and review further monitoring results. Triplicate diffusion tube monitoring, which is considered to be more robust, was set up at the façade of the single property within the AQMA in 2013. The average of the triplicate monitored concentrations in 2013 was  $32.3 \mu\text{g}/\text{m}^3$ , in 2014,  $34.5 \mu\text{g}/\text{m}^3$  and in 2015,  $28.9 \mu\text{g}/\text{m}^3$ . The significant decrease in

concentrations in 2015 could be due to the works completed at the M5 junction 17 in 2015/16 following the Local Pinch Point Funding secured in 2013.

The precision between the triplicate results in 2016 was checked using the precision and accuracy LAQM spreadsheet tool<sup>27</sup> available on the Defra website and the precision was shown to be good. The data capture for the triplicate tubes was 67% so being below 75%, the data was annualised in line with LAQM TG16. The 2016 average of the annualised triplicate results was 29.1 µg/m<sup>3</sup>, similar to that in 2015.

Since the declaration of the Cribbs Causeway AQMA in 2010, the nitrogen dioxide concentrations have been below the annual mean objective at the façade of the single residential property within the AQMA. An action plan has therefore not been required for this AQMA.

Defra recommended in their appraisal of the 2016 Air Quality Annual Status Report that revocation of the AQMA should be considered. Having also taken the 2016 monitoring results into account, this report confirms that there have been no exceedances of the nitrogen dioxide annual mean objective where there is relevant exposure for the last six years, which demonstrates sustained compliance with the objective. Consequently, we propose to revoke the Cribbs Causeway AQMA. Monitoring will remain in place to consider the impact of the new developments in the Cribbs Causeway/ Patchway New Neighbourhood at this location.

### **3.2.2 Particulate Matter (PM<sub>10</sub>)**

The PM<sub>10</sub> monitoring data from the Yate automatic site has been adjusted to gravimetric equivalent with the BAM data corrected for slope (see Appendix C).

Table A.5 in Appendix A compares the ratified and adjusted monitored PM<sub>10</sub> annual mean concentrations for the past 5 years with the air quality objective of 40µg/m<sup>3</sup>.

Table A.6 in Appendix A compares the ratified continuous monitored PM<sub>10</sub> daily (24-hour) mean concentrations for the past 5 years with the air quality objective of 50µg/m<sup>3</sup>, not to be exceeded more than 35 times per year.

The PM<sub>10</sub> concentrations measured at the Yate automatic site are well below the annual mean and 24-hour mean objectives in 2016 and all other reported years. The trend data presented in Figure A.2 (Appendix A) shows that annual mean PM<sub>10</sub>

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<sup>27</sup> <http://laqm.defra.gov.uk/bias-adjustment-factors/local-bias.html>

concentrations have overall been slowly declining since 2006 at Yate. In 2016, the monitored concentration fell slightly to 14  $\mu\text{g}/\text{m}^3$ , having remained constant at 15  $\mu\text{g}/\text{m}^3$  between 2013 and 2015.



## Appendices

Appendix A: Monitoring Results

Appendix B: Full Monthly Diffusion Tube Results for 2016

Appendix C: Air Quality Monitoring Data QA/QC

Appendix D: Supporting Technical Information

Appendix E: Maps

Appendix F: Summary of Air Quality Objectives in England

## Appendix A: Monitoring Results

**Table A.1 Details of Automatic Monitoring Sites**

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Inlet Height (m)
-	Yate Station Road	Roadside	370418	182525	NO <sub>2</sub>	NO	Chemiluminescent	N/A	6	1.6
					PM <sub>10</sub>		Gravimetric (BAM)			1.8

**Notes:**

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

(2) N/A if not applicable.

Table A.2 Details of Non-Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube collocated with a Continuous Analyser?	Height (m)
1	Yate - Station Road Motor Aids	Roadside	370721	182499	NO <sub>2</sub>	NO	5	2.5	NO	2.4
4	Yate - Station Road Co-Location 1	Roadside	370418	182525	NO <sub>2</sub>	NO	N/A	6	YES	2.4
5	Yate - Station Road Co-location 2	Roadside	370418	182525	NO <sub>2</sub>	NO	N/A	6	YES	2.4
6	Yate - Station Road Co-location 3	Roadside	370418	182525	NO <sub>2</sub>	NO	N/A	6	YES	2.4
10	Filton - 152 Gloucester Road North – Pizza Bello façade	Roadside	360266	179136	NO <sub>2</sub>	NO	0	3.5	NO	2.2
11	Thornbury – 48 High Street Morgan Stone	Roadside	363654	189893	NO <sub>2</sub>	NO	N/A	0.5	NO	2.6
12	Stoke Gifford - Church Road Rear of Aviva	Roadside	362161	179570	NO <sub>2</sub>	NO	N/A	1	NO	2.5
13	Filton - MOD Roundabout	Roadside	361523	178732	NO <sub>2</sub>	NO	N/A	1	NO	2.3
17	Kingswood - 79 Regent Street HSBC	Roadside	364830	173878	NO <sub>2</sub>	YES	N/A	2.5	NO	2.6
21	Downend – Boscombe Crescent St Augustines Church	Urban Background	365673	177475	NO <sub>2</sub>	NO	N/A	1.5	NO	2.6
22	Hanham – 44 High Street Lloyds Bank	Roadside	364116	172413	NO <sub>2</sub>	NO	N/A	3	NO	2.6
23	Kingswood - Cecil Road	Roadside	364854	173717	NO <sub>2</sub>	NO	16.5	1	NO	2.4

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Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube collocated with a Continuous Analyser?	Height (m)
26	Kingswood – 8 Gilbert Road	Urban Background	364846	174007	NO <sub>2</sub>	NO	5	1.5	NO	3.1
27	Kingswood - 90 Regent Street Nat West façade	Roadside	364866	173835	NO <sub>2</sub>	YES	0	2	NO	2.8
29	Staple Hill - 123 High Street Backhouse Bet	Roadside	364822	175932	NO <sub>2</sub>	YES	2	1	NO	2.7
34	Bradley Stoke – 109 Ormonds Close M4 East of Almondsbury Interchange	Roadside	362395	182544	NO <sub>2</sub>	NO	11	24.8 (M4 33)	NO	2.7
35	Bradley Stoke - Woodlands Lane M4 East of Almondsbury Interchange (Ip47)	Roadside	362118	183031	NO <sub>2</sub>	NO	9.8	3.3 (M4 22.5)	NO	2.5
36	Hambrook – Whiteshill M4 East of M32	Roadside	364556	178856	NO <sub>2</sub>	NO	20*	37 (M4)	NO	2.4
37	Almondsbury - Old Aust Road M4 West of Almondsbury Interchange	Roadside	361147	184846	NO <sub>2</sub>	NO	N/A	7 (M4)	NO	2.0
38	Severn Beach – Ableton Lane Severn Beach Primary School	Urban Background	354282	184653	NO <sub>2</sub>	NO	0	49	NO	2.8
42	Little Stoke -Braydon Ave	Urban Background	361418	181674	NO <sub>2</sub>	NO	8	1.5	NO	2.6
44	Stoke Gifford - Hatchet Road	Roadside	362061	180025	NO <sub>2</sub>	NO	14	4	NO	2.8
45	Bradley Stoke - Bradley Stoke Way	Roadside	363265	180539	NO <sub>2</sub>	NO	N/A	2.5	NO	2.8

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Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube collocated with a Continuous Analyser?	Height (m)
46	Winterbourne - High Street opp Winterbourne International Academy	Roadside	364852	180758	NO <sub>2</sub>	NO	16.5	1	NO	2.7
53	Hambrook – Bristol Road Rear of 17 Fenbrook Close	Roadside	363907	178389	NO <sub>2</sub>	NO	16	6.5	NO	2.0
54	Longwell Green - A431 / Aldermoor Way	Roadside	365256	171656	NO <sub>2</sub>	NO	N/A	1.5	NO	2.7
57	Coalpit Heath - Badminton Rd Frome Valley Kitchens	Roadside	367742	181160	NO <sub>2</sub>	NO	12	2	NO	2.3
58	Longwell Green - Kingsfield Lane/ Aspects Leisure Site (lp6)	Roadside	365327	172141	NO <sub>2</sub>	NO	27	31 (A4174)	NO	2.6
60	Downend - North Street Kustom Floors & Furniture	Roadside	365101	176688	NO <sub>2</sub>	NO	4	1	NO	2.6
61	Staple Hill Crossroads - 1 Broad Street William Hill	Roadside	364926	175926	NO <sub>2</sub>	YES	0.95	2.3	NO	2.5
62	Staple Hill Crossroads - 2 Broad Street 501 Bar façade	Roadside	364909	175908	NO <sub>2</sub>	YES	0	1.5	NO	2.4
63	Patchway – 28 Park Leaze	Roadside	359487	182479	NO <sub>2</sub>	NO	8	1.5	NO	2.6
67	Kingswood - 40 Regent Street Thomas Cook façade	Roadside	364671	173877	NO <sub>2</sub>	YES	0	2.5	NO	2.8
68	Kingswood - 26-32 Regent Street Store Twenty One façade	Roadside	364631	173886	NO <sub>2</sub>	YES	0	2.5	NO	2.9
69	Kingswood - 12 Regent Street Silver Brides façade	Roadside	364597	173892	NO <sub>2</sub>	YES	0	2.5	NO	2.5

# South Gloucestershire Council

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube collocated with a Continuous Analyser?	Height (m)
70	Kingswood - Two Mile Hill Road Job Centre Plus façade	Roadside	364533	173896	NO <sub>2</sub>	YES	0	2.5	NO	2.5
71	Staple Hill - 11 The Square Bunch Florist	Roadside	365075	175918	NO <sub>2</sub>	YES	0.5	6.5	NO	2.7
72	Staple Hill - 25 Broad Street Westbury Inks	Roadside	364990	175920	NO <sub>2</sub>	YES	6.5	1.5	NO	2.7
73	Staple Hill - 11 Soundwell Road Starlight	Roadside	364902	175843	NO <sub>2</sub>	YES	1.5	0.5	NO	2.4
74	Staple Hill - 29-31 Soundwell Road opp Page Comm Assoc	Roadside	364885	175772	NO <sub>2</sub>	YES	4	0.5	NO	2.5
75	Staple Hill - 118 High Street The Hope Project Shop	Roadside	364856	175917	NO <sub>2</sub>	YES	2.5	0.5	NO	2.5
76	Staple Hill - 84-86 High Street Staple Oak Pub façade	Roadside	364722	175926	NO <sub>2</sub>	YES	0	2	NO	2.7
78	Staple Hill - 9-11 Victoria Street	Roadside	364909	176016	NO <sub>2</sub>	YES	3.7	1.2	NO	2.6
79	Staple Hill - 27-29 Victoria Street	Roadside	364913	176067	NO <sub>2</sub>	YES	3.3	1.2	NO	2.6
83	Chipping Sodbury – 51A Broad Street façade	Roadside	372791	182241	NO <sub>2</sub>	NO	0	5.2	NO	1.8
87A	Cribbs Causeway – Blackhorse Hill Hollywood Cottage façade	Roadside	357739	181334	NO <sub>2</sub>	YES	0	13	NO	1.6
87B	Cribbs Causeway – Blackhorse Hill Hollywood Cottage façade	Roadside	357739	181334	NO <sub>2</sub>	YES	0	13	NO	1.6

# South Gloucestershire Council

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube collocated with a Continuous Analyser?	Height (m)
87C	Cribbs Causeway – Blackhorse Hill Hollywood Cottage façade	Roadside	357739	181334	NO <sub>2</sub>	YES	0	13	NO	1.6
90	Kingswood - Downend Road Junction with Boultons Road	Roadside	364665	173925	NO <sub>2</sub>	YES	5.5	1.5	NO	2.6
92	Kingswood - Regent Street Entertainment & Sports Club	Roadside	364968	173836	NO <sub>2</sub>	YES	0	2	NO	2.7
93	Kingswood - Hanham Road Exchange Court Flats	Roadside	364979	173801	NO <sub>2</sub>	YES	0	2	NO	3.0
95	Kingswood - 45 High Street Adam Lee	Roadside	365078	173846	NO <sub>2</sub>	YES	0	2.7	NO	2.5
96	Kingswood - 71 High Street Homeless Project	Roadside	365164	173832	NO <sub>2</sub>	YES	5.5	2.3	NO	2.7
97	Kingswood - 129 High Street	Roadside	365361	173804	NO <sub>2</sub>	YES	2	1.5	NO	2.5
98	Kingswood - High Street Sainsbury's Local façade	Roadside	365463	173785	NO <sub>2</sub>	YES	N/A	2.5	NO	2.7
101	Staple Hill - High Street Ip outside Beech House	Roadside	364546	175951	NO <sub>2</sub>	NO	9	1.5	NO	2.9
102	Staple Hill - 58 High Street CBS Consultants	Roadside	364637	175934	NO <sub>2</sub>	YES	0	1.5	NO	2.4
103	Staple Hill - Page Road Brookridge Court	Roadside	364751	175892	NO <sub>2</sub>	NO	4.5	2	NO	2.8
104	Staple Hill - Page Road Stars Pre-School	Roadside	364777	175817	NO <sub>2</sub>	NO	19	1.5	NO	2.7

# South Gloucestershire Council

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube collocated with a Continuous Analyser?	Height (m)
105	Staple Hill - North Street lp outside no 2	Roadside	364932	176147	NO <sub>2</sub>	YES	2.5	2	NO	2.7
106	Stoke Gifford - 73 Hambrook Lane façade	Other <sup>(3)</sup>	363112	179559	NO <sub>2</sub>	NO	0	10	NO	2.2
108	Patchway - 204 Gloucester Road rear façade	Other <sup>(3)</sup>	360613	181680	NO <sub>2</sub>	NO	0	12	NO	2.0
113	Patchway - 5 Falcon Close façade	Roadside	359112	181909	NO <sub>2</sub>	NO	0	7.5 (M5 45)	NO	2.0
114	Pilning - 23 Keens Grove façade	Roadside	355263	185351	NO <sub>2</sub>	NO	0	7	NO	2.7
115	Pilning - 2 Wick Road façade	Roadside	355212	185360	NO <sub>2</sub>	NO	0	8.5	NO	2.5
116	Warmley - 14 High Street Webbs (lp at façade)	Roadside	366882	173562	NO <sub>2</sub>	YES	0	2.2	NO	3.1
117	Filton Northville - 29 Gloucester Road North Blockbuster	Roadside	359874	178259	NO <sub>2</sub>	NO	2.5	2.9	NO	2.5
118	Filton Northville - 19 Gloucester Road North Dental Lab	Roadside	359875	178207	NO <sub>2</sub>	NO	3.4	4.7	NO	2.5
119	Filton - 137 Gloucester Road North	Roadside	360263	179250	NO <sub>2</sub>	NO	0.5	3.6	NO	2.5
122	Filton - 549 Filton Avenue	Roadside	360566	178229	NO <sub>2</sub>	NO	4.5	4	NO	2.3
123	Filton - 542 Filton Avenue Spar	Roadside	360575	178265	NO <sub>2</sub>	NO	5	4	NO	2.5



# South Gloucestershire Council

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube collocated with a Continuous Analyser?	Height (m)
124	Filton - 702a Filton Ave Way Ahead	Roadside	360918	178905	NO <sub>2</sub>	NO	6.6	1.9	NO	2.4
125	Filton - 71 Station Road	Roadside	360891	179005	NO <sub>2</sub>	NO	5.4	0.5 (A4174 9.3)	NO	2.5
128	Kingswood - 109 Downend Road	Roadside	364587	174431	NO <sub>2</sub>	NO	1.6	2	NO	2.4
129	Cribbs Causeway – 1 Holly Cottages façade	Roadside	357508	181059	NO <sub>2</sub>	NO	0	18 (M5 44)	NO	2.1
130	Cribbs Causeway – 2 Mayfield Cottages façade	Roadside	357488	181011	NO <sub>2</sub>	NO	0	17 (A4018 38)	NO	1.8
132	Hanham - 66 High St Café Bonjour	Roadside	364178	172337	NO <sub>2</sub>	NO	0.6	2.7	NO	2.5
133	Hambrook - 123 Old Gloucester Road façade (dp)	Roadside	363736	178507	NO <sub>2</sub>	NO	0	10.4 (A4174)	NO	2.1
134	Hambrook – Bristol Road, Old Bakery façade (dp)	Roadside	364048	178719	NO <sub>2</sub>	NO	0	2.4	NO	1.9
135	Frenchay – Harford Drive Dyrham Flats	Roadside	364029	178413	NO <sub>2</sub>	NO	12.5*	24.5 (A4174)	NO	2.5
136	Little Stoke – 26 Gipsy Patch Lane façade (dp)	Roadside	361242	180544	NO <sub>2</sub>	NO	0	12.0	NO	2.1
137	Warmley - 35 High Street (lp at façade)	Roadside	366984	173563	NO <sub>2</sub>	YES	0	1.9	NO	2.3
138	Warmley - 18 High Street façade (dp)	Roadside	366941	173558	NO <sub>2</sub>	YES	0	2.0	NO	2.6
139	Warmley - 14 High Street Webbs façade (dp)	Roadside	366890	173560	NO <sub>2</sub>	YES	0	2.3	NO	2.6

# South Gloucestershire Council

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube collocated with a Continuous Analyser?	Height (m)
140	Warmley - 2 Stanley Road façade (dp)	Roadside	366879	173594	NO <sub>2</sub>	NO	0	4.1	NO	1.5
141	Warmley - 41 Deanery Road façade (dp)	Roadside	366705	173581	NO <sub>2</sub>	YES	0	7.7	NO	2.7
142	Warmley - 33 Deanery Road Warmley Court façade (dp)	Roadside	366613	173597	NO <sub>2</sub>	YES	0	8.9 (A4174 18.2)	NO	2.1
143	Warmley - 1 High Street Ideal Pharmacy façade (dp)	Roadside	366815	173574	NO <sub>2</sub>	YES	0	5	NO	2.5
144	Warmley - 8 Tower Road North façade (dp)	Roadside	366913	173523	NO <sub>2</sub>	NO	0	4.3	NO	2.0
145	Warmley - 1 London Road (Cycle Path)	Roadside	367107	173531	NO <sub>2</sub>	YES	4.9*	5	NO	2.2
146	Kingswood - 34 Hill Street façade (dp)	Roadside	365910	173680	NO <sub>2</sub>	YES	0	1.6	NO	2.2
147A	Soundwell - 264 Soundwell Rd façade (dp)	Roadside	364586	174496	NO <sub>2</sub>	NO	0	2.6	NO	2.0
147B	Soundwell - 264 Soundwell Rd façade (dp)	Roadside	364586	174496	NO <sub>2</sub>	NO	0	2.6	NO	2.0
147C	Soundwell - 264 Soundwell Rd façade (dp)	Roadside	364586	174496	NO <sub>2</sub>	NO	0	2.6	NO	2.0
148	Filton – 109 Gloucester Road North façade (dp)	Roadside	360076	178901	NO <sub>2</sub>	NO	0	10.2	NO	1.9
149	Filton – 707 Southmead Road façade (dp)	Roadside	360050	179020	NO <sub>2</sub>	NO	0	9.8	NO	1.7

## South Gloucestershire Council

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube collocated with a Continuous Analyser?	Height (m)
150	Soundwell – 296 Soundwell Road façade (dp)	Roadside	364528	174425	NO <sub>2</sub>	NO	0	4.3	NO	1.8
151	Hambrook – Bristol Road Old Bakery FP signpost	Roadside	364048	178726	NO <sub>2</sub>	NO	0.9*	1	NO	2.2
152	Bradley Stoke -188 Oaktree Crescent Ip49	Roadside	360942	182833	NO <sub>2</sub>	NO	1*	12.2	NO	2.4
153	Bradley Stoke -141 Wheatfield Drive (façade)	Roadside	361841	182417	NO <sub>2</sub>	NO	0	8.2	NO	2.1
154	Bradley Stoke - 166 Ellan Hay Road (façade)	Roadside	363241	180724	NO <sub>2</sub>	NO	0	14	NO	2.2
155	Stoke Gifford - 3 Earl Close (façade)	Roadside	363324	179854	NO <sub>2</sub>	NO	0	N/A	NO	2.6
156	Stoke Gifford - Lancelot Road Ip1	Roadside	362400	177624	NO <sub>2</sub>	NO	21.2	1.8	NO	2.5
157	Hambrook - Bristol Road Poplars House (façade)	Roadside	364006	178517	NO <sub>2</sub>	NO	0	30.8	NO	2.4
158	Downend - 5 Wick Wick Close (façade)	Roadside	366156	178556	NO <sub>2</sub>	NO	0	20.2	NO	2.2

### Notes:

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on/adjacent to the façade of a residential property). \* Where the receptor is located off to the side of the monitor rather than behind the monitor.

(2) N/A if not applicable.

Table A.3 Annual Mean NO<sub>2</sub> Monitoring Results

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2016 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
						2012	2013	2014	2015	2016
-	Yate Station Road (Automatic)	Roadside	Automatic	n/a	98.9%	27	26	24	21	24
1	Yate - Station Road Motor Aids	Roadside	Diffusion Tube	n/a	100%	37.0	31.5	31.4	29.1	32.2
4	Yate - Station Road Co-Location 1	Roadside	Diffusion Tube	n/a	100%	29.6	25.5	25.0	22.7	24.7
5	Yate - Station Road Co-location 2	Roadside	Diffusion Tube	n/a	83%	30.3	25.6	24.3	23.0	22.7
6	Yate - Station Road Co-location 3	Roadside	Diffusion Tube	n/a	100%	27.8	25.0	24.6	22.8	24.7
10	Filton - 152 Gloucester Road North Pizza Bello façade	Roadside	Diffusion Tube	n/a	67%	39.5	31.7	38.1	33.2	34.1
11	Thornbury – 48 High Street Morgan Stone	Roadside	Diffusion Tube	n/a	100%	30.7	27.8	27.6	25.5	26.8
12	Stoke Gifford - Church Road Rear of Aviva	Roadside	Diffusion Tube	n/a	100%	34.5	32.7	31.0	28.6	29.7
13	Filton - MOD Roundabout	Roadside	Diffusion Tube	n/a	100%	36.7	35.3	33.7	32.1	34.6
17	Kingswood - 79 Regent Street HSBC	Roadside	Diffusion Tube	n/a	100%	31.3	25.8	24.1	24.0	25.7
21	Downend – Boscombe Crescent St Augustines Church	Urban Background	Diffusion Tube	n/a	100%	21.8	18.8	17.7	16.6	17.4
22	Hanham – 44 High Street Lloyds Bank	Roadside	Diffusion Tube	n/a	100%	34.9	32.5	31.5	28.7	30.7

# South Gloucestershire Council

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2016 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
						2012	2013	2014	2015	2016
23	Kingswood - Cecil Road	Roadside	Diffusion Tube	n/a	100%	35.4	30.1	26.0	25.2	27.6
26	Kingswood – 8 Gilbert Road	Urban Background	Diffusion Tube	n/a	100%	25.7	23.6	21.1	19.4	21.9
27	Kingswood - 90 Regent Street Nat West façade	Roadside	Diffusion Tube	n/a	100%	35.6	32.3	31.0	30.2	31.4
29	Staple Hill - 123 High Street Backhouse Bet	Roadside	Diffusion Tube	n/a	100%	43.6	35.2	35.2	31.2	36.2
34	Bradley Stoke – 109 Ormonds Close M4 East of Almondsbury Interchange	Roadside	Diffusion Tube	n/a	100%	33.6	33.5	31.5	28.9	31.0
35	Bradley Stoke - Woodlands Lane M4 East of Almondsbury Interchange (Ip47)	Roadside	Diffusion Tube	n/a	100%	35.3	33.3	32.0	27.9	32.0
36	Hambrook – Whiteshill M4 East of M32	Roadside	Diffusion Tube	n/a	100%	23.7	20.9	20.5	19.3	19.4
37	Almondsbury - Old Aust Road M4 West of Almondsbury Interchange	Roadside	Diffusion Tube	n/a	100%	34.5	37.0	31.3	31.5	32.2
38	Severn Beach – Ableton Lane Severn Beach Primary School	Urban Background	Diffusion Tube	n/a	100%	17.6	18.2	14.9	14.6	14.6
42	Little Stoke - Braydon Ave	Urban Background	Diffusion Tube	n/a	100%	28.1	27.0	23.1	22.2	23.9
44	Stoke Gifford - Hatchet Road	Roadside	Diffusion Tube	n/a	100%	36.9	31.5	31.5	29.8	31.9
45	Bradley Stoke - Bradley Stoke Way	Roadside	Diffusion Tube	n/a	83%	39.2	35.2	34.3	31.4	34.2

# South Gloucestershire Council

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2016 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
						2012	2013	2014	2015	2016
46	Winterbourne - High Street opp Winterbourne International Academy	Roadside	Diffusion Tube	n/a	100%	37.2	34.4	32.7	29.4	32.9
53	Hambrook – Bristol Road Rear of 17 Fenbrook Close	Roadside	Diffusion Tube	n/a	100%	33.6	39.4	34.7	30.0	33.7
54	Longwell Green - A431 / Aldermoor Way	Roadside	Diffusion Tube	n/a	100%	36.0	33.4	33.6	30.2	34.9
57	Coalpit Heath - Badminton Rd Frome Valley Kitchens	Roadside	Diffusion Tube	n/a	100%	34.0	32.9	32.4	29.0	28.7
58	Longwell Green - Kingsfield Lane/ Aspects Leisure Site (Ip6)	Roadside	Diffusion Tube	n/a	83%	19.4 <sup>a</sup>	24.2	20.8	20.4	22.4
60	Downend - North Street Kustom Floors & Furniture	Roadside	Diffusion Tube	n/a	100%	38.0	36.0	33.7	30.7	33.7
61	Staple Hill Crossroads - 1 Broad Street William Hill	Roadside	Diffusion Tube	n/a	100%	45.8	42.1	41.5	39.4	41.5
62	Staple Hill Crossroads - 2 Broad Street 501 Bar façade	Roadside	Diffusion Tube	n/a	100%	43.7	36.4	36.0	36.4	39.2
63	Patchway – 28 Park Leaze	Roadside	Diffusion Tube	n/a	100%	31.4	25.1	25.6	23.1	25.9
67	Kingswood - 40 Regent Street Thomas Cook façade	Roadside	Diffusion Tube	n/a	100%	47.6	40.9	40.2	38.1	40.7
68	Kingswood - 26-32 Regent Street Store Twenty One façade	Roadside	Diffusion Tube	n/a	100%	48.2	41.3	40.1	40.5	42.5
69	Kingswood - 12 Regent Street Silver Brides façade	Roadside	Diffusion Tube	n/a	92%	41.9	36.0	36.2	34.8	36.5

# South Gloucestershire Council

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2016 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
						2012	2013	2014	2015	2016
70	Kingswood - Two Mile Hill Road Job Centre Plus façade	Roadside	Diffusion Tube	n/a	100%	35.8	34.7	32.1	31.0	32.7
71	Staple Hill - 11 The Square Bunch Florist	Roadside	Diffusion Tube	n/a	100%	29.2	27.1	24.7	23.6	26.1
72	Staple Hill - 25 Broad Street Westbury Inks	Roadside	Diffusion Tube	n/a	100%	40.3	34.8	31.9	32.2	36.2
73	Staple Hill - 11 Soundwell Road Starlight	Roadside	Diffusion Tube	n/a	100%	40.6	39.3	39.9	40.4	40.2
74	Staple Hill - 29-31 Soundwell Road opp Page Community Association	Roadside	Diffusion Tube	n/a	92%	35.3	32.2	28.1	28.5	30.9
75	Staple Hill - 118 High Street The Hope Project Shop	Roadside	Diffusion Tube	n/a	100%	44.2	43.6	45.3	44.8	46.1
76	Staple Hill - 84-86 High Street Staple Oak Pub façade	Roadside	Diffusion Tube	n/a	100%	38.6	34.9	36.2	34.9	36.9
78	Staple Hill - 9-11 Victoria Street	Roadside	Diffusion Tube	n/a	100%	52.8	44.4	43.3	41.5	44.9
79	Staple Hill - 27-29 Victoria Street	Roadside	Diffusion Tube	n/a	83%	45.9 <sup>a</sup>	35.8	37.5	37.5	37.2
83	Chipping Sodbury – 51A Broad Street façade	Roadside	Diffusion Tube	n/a	100%	29.2	23.6	22.4	23.1	25.4
87A	Cribbs Causeway – Blackhorse Hill Hollywood Cottage façade	Roadside	Diffusion Tube	n/a	67%	35.0	32.7	34.9	28.4	28.3
87B	Cribbs Causeway – Blackhorse Hill Hollywood Cottage façade	Roadside	Diffusion Tube	n/a	67%	n/a	32.2	34.3	28.7	29.9
87C	Cribbs Causeway – Blackhorse Hill Hollywood Cottage façade	Roadside	Diffusion Tube	n/a	67%	n/a	32.1	34.3	29.5	29.3

# South Gloucestershire Council

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2016 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
						2012	2013	2014	2015	2016
90	Kingswood - Downend Road Junction with Boultons Road	Roadside	Diffusion Tube	n/a	92%	40.8	34.5	36.9	33.2	33.8
92	Kingswood - Regent Street Entertainment & Sports Club	Roadside	Diffusion Tube	n/a	100%	41.9	36.9	34.0	34.1	36.7
93	Kingswood - Hanham Road Exchange Court Flats	Roadside	Diffusion Tube	n/a	100%	34.8 <sup>a</sup>	32.0	29.5	29.2	31.1
95	Kingswood - 45 High Street Adam Lee	Roadside	Diffusion Tube	n/a	83%	42.6	37.4	34.5	34.3	39.6
96	Kingswood - 71 High Street Homeless Project	Roadside	Diffusion Tube	n/a	100%	43.9	38.3	36.0	34.2	37.0
97	Kingswood - 129 High Street	Roadside	Diffusion Tube	n/a	100%	39.0	37.4	34.9	32.3	36.1
98	Kingswood - High Street Sainsbury's Local façade	Roadside	Diffusion Tube	n/a	92%	40.2	37.9	37.1	37.0	35.3
101	Staple Hill - High Street Ip outside Beech House	Roadside	Diffusion Tube	n/a	100%	34.6	28.0	26.3	25.7	28.5
102	Staple Hill - 58 High Street CBS Consultants	Roadside	Diffusion Tube	n/a	100%	47.8	41.7	39.8	38.4	40.7
103	Staple Hill - Page Road Brookridge Court	Roadside	Diffusion Tube	n/a	92%	27.1	24.5	21.4	21.9	24.4
104	Staple Hill - Page Road Stars Pre-School	Roadside	Diffusion Tube	n/a	100%	29.5	24.6	20.0	21.2	21.7
105	Staple Hill - North Street Ip outside no 2	Roadside	Diffusion Tube	n/a	100%	32.1 <sup>a</sup>	28.1	27.3	26.7	29.8



# South Gloucestershire Council

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2016 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
						2012	2013	2014	2015	2016
106	Stoke Gifford - 73 Hambrook Lane façade	Other <sup>a</sup>	Diffusion Tube	n/a	100%	26.4	22.1	21.6	20.1	20.9
108	Patchway - 204 Gloucester Road rear façade	Other <sup>a</sup>	Diffusion Tube	n/a	100%	34.5	28.6	26.8	26.0	28.7
113	Patchway - 5 Falcon Close façade	Roadside	Diffusion Tube	n/a	100%	35.2	30.8	30.2	32.4	31.9
114	Pilning - 23 Keens Grove façade	Roadside	Diffusion Tube	n/a	83%	30.6	29.0	25.6	25.7	27.5
115	Pilning - 2 Wick Road façade	Roadside	Diffusion Tube	n/a	100%	30.3	27.6	25.9	24.9	25.5
116	Warmley - 14 High Street Webbs (lp at façade)	Roadside	Diffusion Tube	n/a	50%	50.0	44.3	40.8	42.9	40.2
117	Filton Northville - 29 Gloucester Road North Blockbuster	Roadside	Diffusion Tube	n/a	92%	35.6	35.1	32.7	31.0	34.2
118	Filton Northville - 19 Gloucester Road North Dental Lab	Roadside	Diffusion Tube	n/a	100%	34.2	32.7	31.3	30.4	32.8
119	Filton - 137 Gloucester Road North	Roadside	Diffusion Tube	n/a	83%	35.5	37.0	36.1	33.6	34.6
122	Filton - 549 Filton Avenue	Roadside	Diffusion Tube	n/a	100%	36.8	34.5	33.2	30.6	31.4
123	Filton - 542 Filton Avenue Spar	Roadside	Diffusion Tube	n/a	100%	33.6	33.6	31.9	30.1	31.2
124	Filton - 702a Filton Ave Way Ahead	Roadside	Diffusion Tube	n/a	100%	37.8	39.1	35.0	32.1	34.4
125	Filton - 71 Station Road	Roadside	Diffusion Tube	n/a	92%	33.1	29.5	26.7	25.8	26.7

# South Gloucestershire Council

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2016 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
						2012	2013	2014	2015	2016
128	Kingswood - 109 Downend Road	Roadside	Diffusion Tube	n/a	100%	36.6	35.3	32.9	33.2	34.6
129	Cribbs Causeway – 1 Holly Cottages façade	Roadside	Diffusion Tube	n/a	100%	32.4	32.2	29.9	29.5	33.4
130	Cribbs Causeway – 2 Mayfield Cottages façade	Roadside	Diffusion Tube	n/a	100%	31.0	29.7	27.3	26.8	28.9
132	Hanham - 66 High Street Café Bonjour	Roadside	Diffusion Tube	n/a	92%	36.7	36.1	31.9	29.2	31.6
133	Hambrook - 123 Old Gloucester Road façade (dp)	Roadside	Diffusion Tube	n/a	100%	28.8 <sup>a</sup>	32.5	27.6	28.4	30.7
134	Hambrook – Bristol Road Old Bakery façade (dp)	Roadside	Diffusion Tube	n/a	100%	n/a	41.9	39.4	36.0	37.4
135	Frenchay – Harford Drive Dyrham Flats	Roadside	Diffusion Tube	n/a	100%	n/a	32.0	27.0	26.8	28.5
136	Little Stoke – 26 Gipsy Patch Lane façade (dp)	Roadside	Diffusion Tube	n/a	100%	n/a	24.9 <sup>a</sup>	23.7	22.1	22.9
137	Warmley - 35 High Street (lp at façade)	Roadside	Diffusion Tube	n/a	75%	n/a	50.2 <sup>a</sup>	42.3	43.2	43.7
138	Warmley - 18 High Street façade (dp)	Roadside	Diffusion Tube	n/a	100%	n/a	41.1 <sup>a</sup>	39.2	37.5	37.3
139	Warmley - 14 High Street Webbs façade (dp)	Roadside	Diffusion Tube	n/a	50%	n/a	43.2 <sup>a</sup>	36.6	39.6	38.3
140	Warmley - 2 Stanley Road façade (dp)	Roadside	Diffusion Tube	n/a	100%	n/a	26.8 <sup>a</sup>	25.3	25.3	25.6

# South Gloucestershire Council

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2016 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
						2012	2013	2014	2015	2016
141	Warmley - 41 Deanery Road façade (dp)	Roadside	Diffusion Tube	n/a	100%	n/a	37.2 <sup>a</sup>	34.5	30.9	32.6
142	Warmley - 33 Deanery Road Warmley Court façade (dp)	Roadside	Diffusion Tube	n/a	100%	n/a	34.2 <sup>a</sup>	29.7	29.7	29.3
143	Warmley - 1 High Street Ideal Pharmacy façade (dp)	Roadside	Diffusion Tube	n/a	100%	n/a	29.3 <sup>a</sup>	26.1	25.6	27.1
144	Warmley - 8 Tower Road North façade (dp)	Roadside	Diffusion Tube	n/a	100%	n/a	28.7 <sup>a</sup>	26.6	26.5	25.7
145	Warmley - 1 London Road (Cycle Path)	Roadside	Diffusion Tube	n/a	100%	n/a	27.7 <sup>a</sup>	25.5	25.6	26.0
146	Kingswood - 34 Hill Street façade (dp)	Roadside	Diffusion Tube	n/a	100%	n/a	39.5 <sup>a</sup>	46.1	41.8	45.7
147A	Soundwell - 264 Soundwell Road façade (dp)	Roadside	Diffusion Tube	n/a	92%	n/a	33.7 <sup>a</sup>	40.6	38.7	39.9
147B	Soundwell - 264 Soundwell Road façade (dp)	Roadside	Diffusion Tube	89%	67%	n/a	n/a	n/a	n/a	46.5
147C	Soundwell - 264 Soundwell Road façade (dp)	Roadside	Diffusion Tube	89%	67%	n/a	n/a	n/a	n/a	46.6
148	Filton – 109 Gloucester Road North façade (dp)	Roadside	Diffusion Tube	n/a	83%	n/a	n/a	28.9	34.0	34.2
149	Filton – 707 Southmead Road façade (dp)	Roadside	Diffusion Tube	n/a	100%	n/a	n/a	30.4	29.4	31.3
150	Soundwell – 296 Soundwell Road façade (dp)	Roadside	Diffusion Tube	n/a	100%	n/a	n/a	30.9	29.4	32.7

## South Gloucestershire Council

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2016 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
						2012	2013	2014	2015	2016
151	Hambrook – Bristol Road Old Bakery FP signpost	Roadside	Diffusion Tube	n/a	100%	n/a	n/a	39.9	39.5	38.8
152	Bradley Stoke 188 Oaktree Crescent Ip49	Roadside	Diffusion Tube	n/a	100%	n/a	n/a	n/a	30.9 <sup>a</sup>	30.1
153	Bradley Stoke – 141 Wheatfield Drive (façade)	Roadside	Diffusion Tube	n/a	100%	n/a	n/a	n/a	18.2	22.2
154	Bradley Stoke - 166 Ellan Hay Road (façade)	Roadside	Diffusion Tube	n/a	100%	n/a	n/a	n/a	20.5	25.0
155	Stoke Gifford - 3 Earl Close (façade)	Roadside	Diffusion Tube	n/a	83%	n/a	n/a	n/a	17.2	21.8
156	Stoke Gifford - Lancelot Road Ip1	Roadside	Diffusion Tube	n/a	100%	n/a	n/a	n/a	19.9	23.2
157	Hambrook - Bristol Road Poplars House (façade)	Roadside	Diffusion Tube	n/a	100%	n/a	n/a	n/a	30.5 <sup>a</sup>	28.7
158	Downend - 5 Wick Wick Close (façade)	Roadside	Diffusion Tube	n/a	100%	n/a	n/a	n/a	28.4 <sup>a</sup>	29.6

☒ Diffusion tube data has been bias corrected

☒ Annualisation has been conducted where data capture is <75%

☐ If applicable, all data has been distance corrected for relevant exposure. (In order to allow comparison with previous data for 2012 -2015, the 2016 data has been reported without distance correction. See Table B.1 for distance corrected data)

### Notes:

**Exceedance** of the NO<sub>2</sub> annual mean objective of 40µg/m

**Borderline** within 10% of NO<sub>2</sub> annual mean objective (>36µg/m<sup>3</sup>)

NO<sub>2</sub> annual means exceeding 60µg/m<sup>3</sup>, indicating a potential exceedance of the NO<sub>2</sub> 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. (<sup>a</sup> denotes annualised results for previous years 2012 – 2015 where full calendar year data capture <75%, with exception of Warmley Detailed Assessment sites in 2013 with 75% data capture, which were also annualised).

**Table A.4 1-Hour Mean NO<sub>2</sub> Monitoring Results**

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2016 (%) <sup>(2)</sup>	NO <sub>2</sub> 1-Hour Means > 200µg/m <sup>3</sup> <sup>(3)</sup>				
						2012	2013	2014	2015	2016
-	Yate Station Road	Roadside	Automatic	n/a	98.9%	0	0	0	0	0

**Notes:**

Exceedances of the NO<sub>2</sub> 1-hour mean objective (200µg/m<sup>3</sup> not to be exceeded more than 18 times/year) are shown in **bold**.

(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) If the period of valid data is less than 85%, the 99.8<sup>th</sup> percentile of 1-hour means is provided in brackets.

Figure A.1 Trends in Annual Mean NO<sub>2</sub> Concentrations at Automatic Monitoring Sites

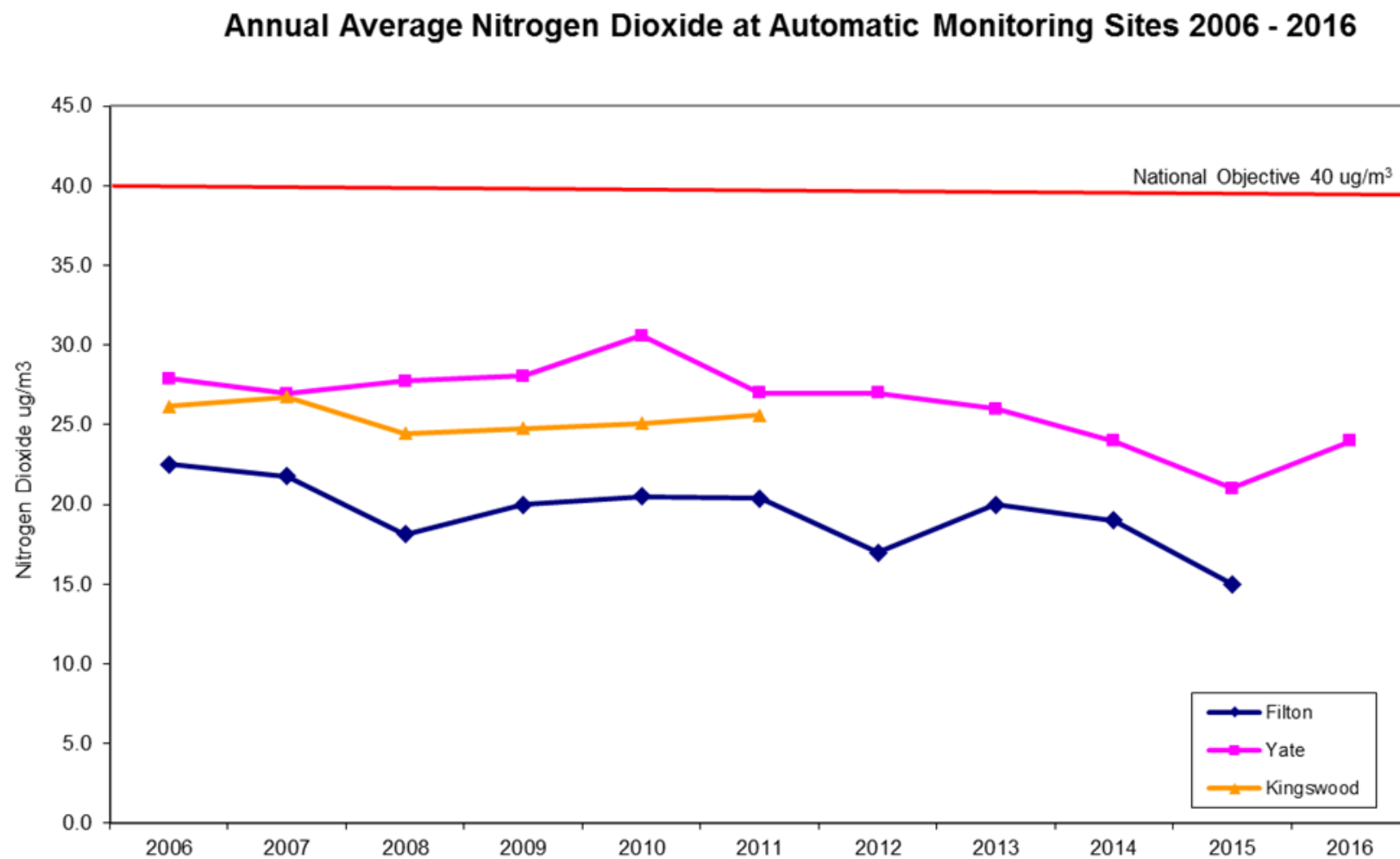


Table A.5 Annual Mean PM<sub>10</sub> Monitoring Results

Site ID	Site Name	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2016 (%) <sup>(2)</sup>	PM <sub>10</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
					2012	2013	2014	2015	2016
-	Yate Station Road	Roadside	n/a	98.9%	16	15	15	15	14

☑ Annualisation has been conducted where data capture is <75%. However data capture has been above 75% for all years shown so it has not been necessary to annualise the data.

**Notes:**

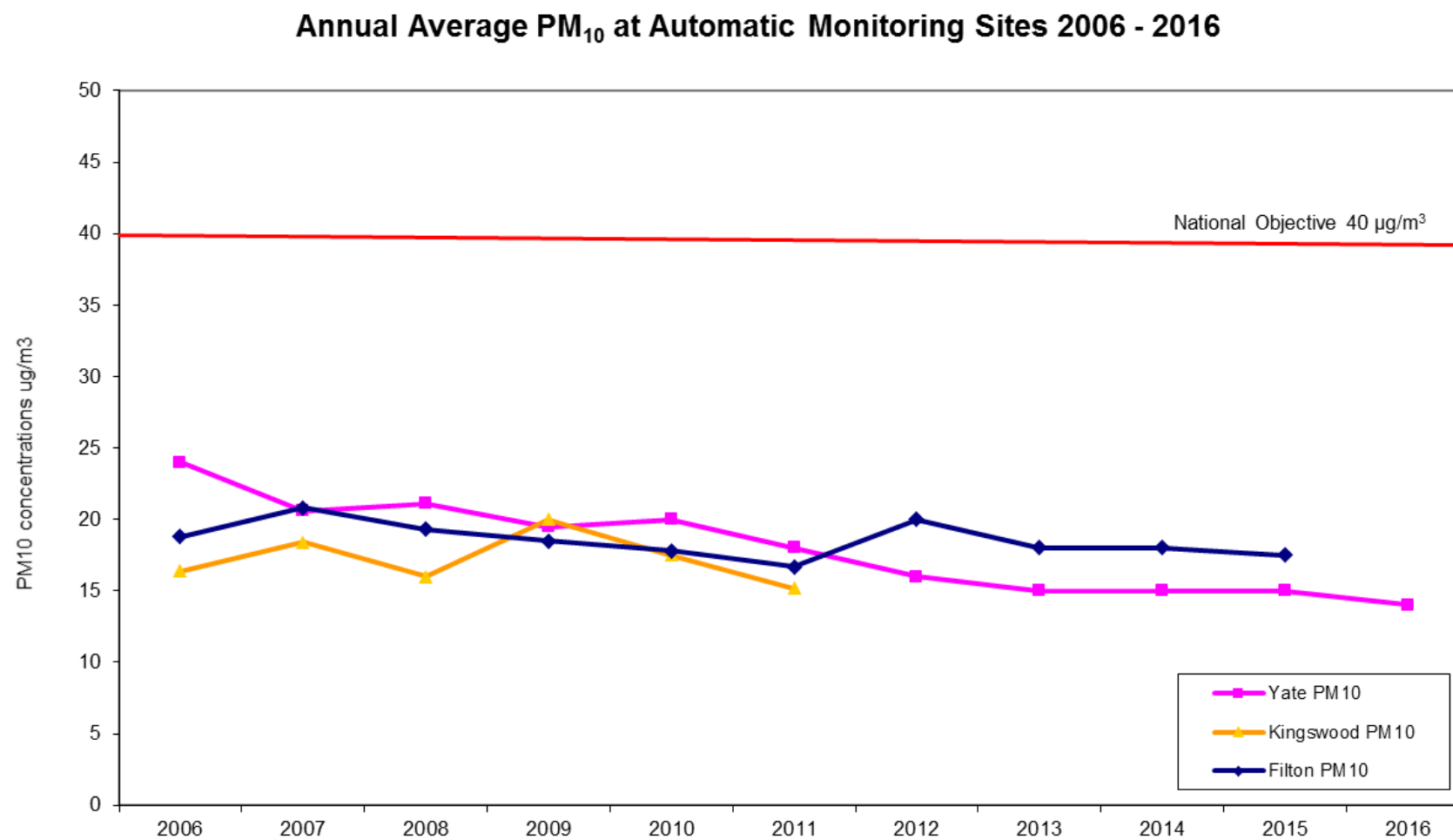
Exceedances of the PM<sub>10</sub> annual mean objective of 40µg/m<sup>3</sup> are shown in **bold**.

(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) All means have been “annualised” as per Boxes 7.9 and 7.10 in LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Figure A.2 Trends in Annual Mean PM<sub>10</sub> Concentrations at Automatic Monitoring Sites





**Table A.6 24-Hour Mean PM<sub>10</sub> Monitoring Results**

Site ID	Site Name	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2016 (%) <sup>(2)</sup>	PM <sub>10</sub> 24-Hour Means > 50µg/m <sup>3</sup> <sup>(3)</sup>				
					2012	2013	2014	2015	2016
-	Yate Station Road	Roadside	n/a	98.9%	0	0	1	4	0

**Notes:**

Exceedances of the PM<sub>10</sub> 24-hour mean objective (50µg/m<sup>3</sup> not to be exceeded more than 35 times/year) are shown in **bold**.

(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) If the period of valid data is less than 85%, the 90.4<sup>th</sup> percentile of 24-hour means is provided in brackets.

Table A.7 Kingswood- Warmley AQMA Annual Mean NO<sub>2</sub> Monitoring Results

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2016 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
						2012	2013	2014	2015	2016
17	Kingswood - 79 Regent Street HSBC	Roadside	Diffusion Tube	n/a	100%	31.3	25.8	24.1	24.0	25.7
27	Kingswood - 90 Regent Street Nat West façade	Roadside	Diffusion Tube	n/a	100%	35.6	32.3	31.0	30.2	31.4
67	Kingswood - 40 Regent Street Thomas Cook façade	Roadside	Diffusion Tube	n/a	100%	47.6	40.9	40.2	38.1	40.7
68	Kingswood - 26-32 Regent Street Store Twenty One façade	Roadside	Diffusion Tube	n/a	100%	48.2	41.3	40.1	40.5	42.5
69	Kingswood - 12 Regent Street Silver Brides façade	Roadside	Diffusion Tube	n/a	92%	41.9	36.0	36.2	34.8	36.5
70	Kingswood - Two Mile Hill Road Job Centre Plus façade	Roadside	Diffusion Tube	n/a	100%	35.8	34.7	32.1	31.0	32.7
90	Kingswood - Downend Road Junction with Boultons Road	Roadside	Diffusion Tube	n/a	92%	40.8	34.5	36.9	33.2	33.8
92	Kingswood - Regent Street Entertainment & Sports Club	Roadside	Diffusion Tube	n/a	100%	41.9	36.9	34.0	34.1	36.7
93	Kingswood - Hanham Road Exchange Court Flats	Roadside	Diffusion Tube	n/a	100%	34.8 <sup>a</sup>	32.0	29.5	29.2	31.1
95	Kingswood - 45 High Street Adam Lee	Roadside	Diffusion Tube	n/a	83%	42.6	37.4	34.5	34.3	39.6
96	Kingswood - 71 High Street Homeless Project	Roadside	Diffusion Tube	n/a	100%	43.9	38.3	36.0	34.2	37.0
97	Kingswood - 129 High Street	Roadside	Diffusion Tube	n/a	100%	39.0	37.4	34.9	32.3	36.1

# South Gloucestershire Council

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2016 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
						2012	2013	2014	2015	2016
98	Kingswood - High Street Sainsbury's Local façade	Roadside	Diffusion Tube	n/a	92%	40.2	37.9	37.1	37.0	35.3
116	Warmley - 14 High Street Webbs (lp at façade)	Roadside	Diffusion Tube	n/a	50%	50.0	44.3	40.8	42.9	40.2
137	Warmley - 35 High Street (lp at façade)	Roadside	Diffusion Tube	n/a	75%	n/a	50.2 <sup>a</sup>	42.3	43.2	43.7
138	Warmley - 18 High Street façade (dp)	Roadside	Diffusion Tube	n/a	100%	n/a	41.1 <sup>a</sup>	39.2	37.5	37.3
139	Warmley - 14 High Street Webbs façade (dp)	Roadside	Diffusion Tube	n/a	50%	n/a	43.2 <sup>a</sup>	36.6	39.6	38.3
141	Warmley - 41 Deanery Road façade (dp)	Roadside	Diffusion Tube	n/a	100%	n/a	37.2 <sup>a</sup>	34.5	30.9	32.6
142	Warmley - 33 Deanery Road Warmley Court façade (dp)	Roadside	Diffusion Tube	n/a	100%	n/a	34.2 <sup>a</sup>	29.7	29.7	29.3
143	Warmley - 1 High Street Ideal Pharmacy façade (dp)	Roadside	Diffusion Tube	n/a	100%	n/a	29.3 <sup>a</sup>	26.1	25.6	27.1
145	Warmley - 1 London Road (Cycle Path)	Roadside	Diffusion Tube	n/a	100%	n/a	27.7 <sup>a</sup>	25.5	25.6	26.0
146	Kingswood - 34 Hill Street façade (dp)	Roadside	Diffusion Tube	n/a	100%	n/a	39.5 <sup>a</sup>	46.1	41.8	45.7

☒ Diffusion tube data has been bias corrected

☒ Annualisation has been conducted where data capture is <75%

☐ If applicable, all data has been distance corrected for relevant exposure. (In order to allow comparison with previous data for 2012 -2015, the 2016 data has been reported without distance correction. See Table B.1 for distance corrected data)

**Notes:**

**Exceedance** of the NO<sub>2</sub> annual mean objective of 40µg/m

**Borderline** within 10% of NO<sub>2</sub> annual mean objective (>36µg/m<sup>3</sup>)

NO<sub>2</sub> annual means exceeding 60µg/m<sup>3</sup>, indicating a potential exceedance of the NO<sub>2</sub> 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. (<sup>a</sup> denotes annualised results for previous years 2012 – 2015 where full calendar year data capture <75%, with exception of Warmley Detailed Assessment sites in 2013 with 75% data capture, which were also annualised.

Figure A.3 Trends in Annual Mean Nitrogen Dioxide Concentrations in Kingswood Section of Kingswood - Warmley AQMA

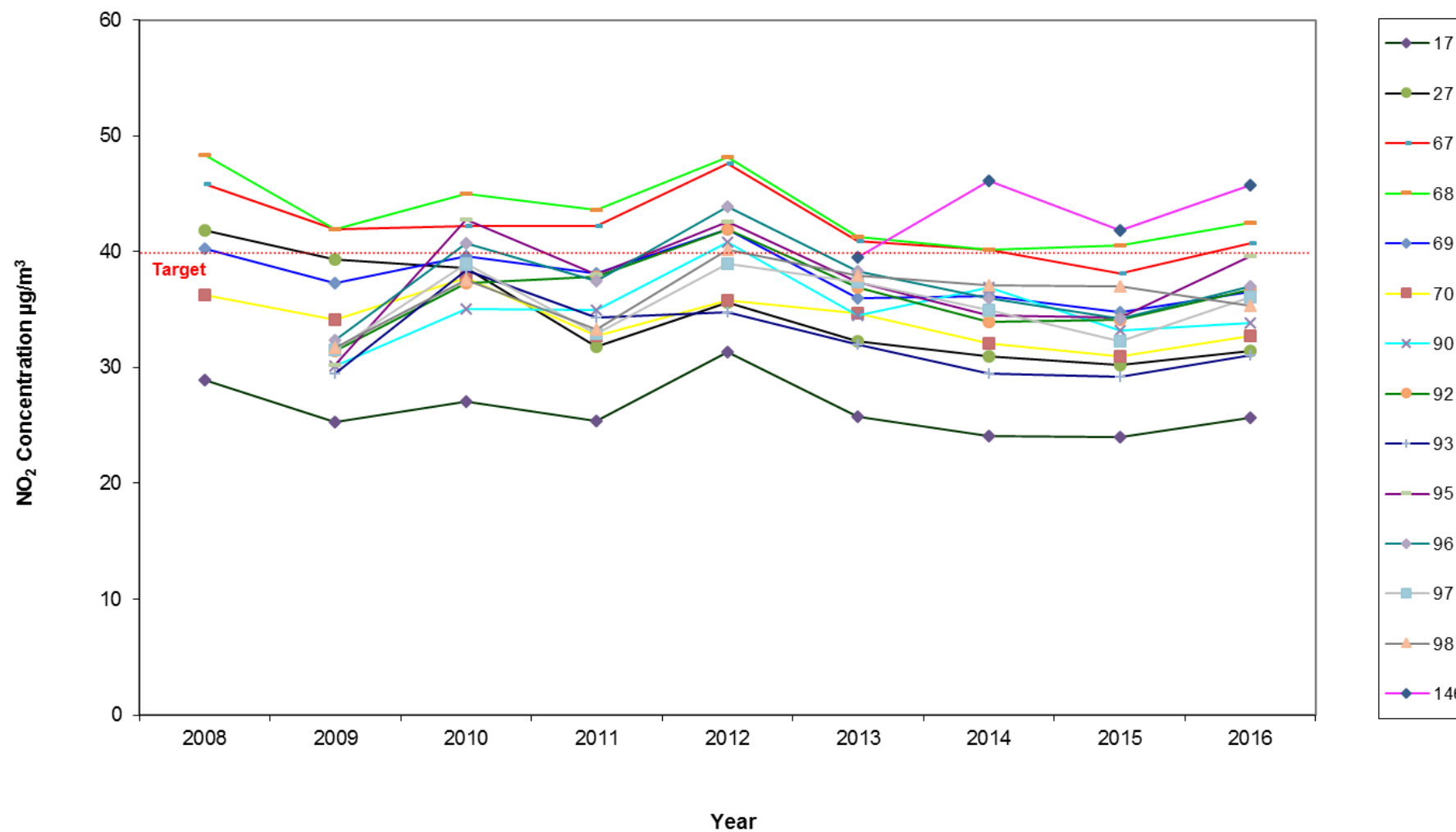


Figure A.4 Trends in Annual Mean Nitrogen Dioxide Concentrations in Warmley Section of Kingswood - Warmley AQMA

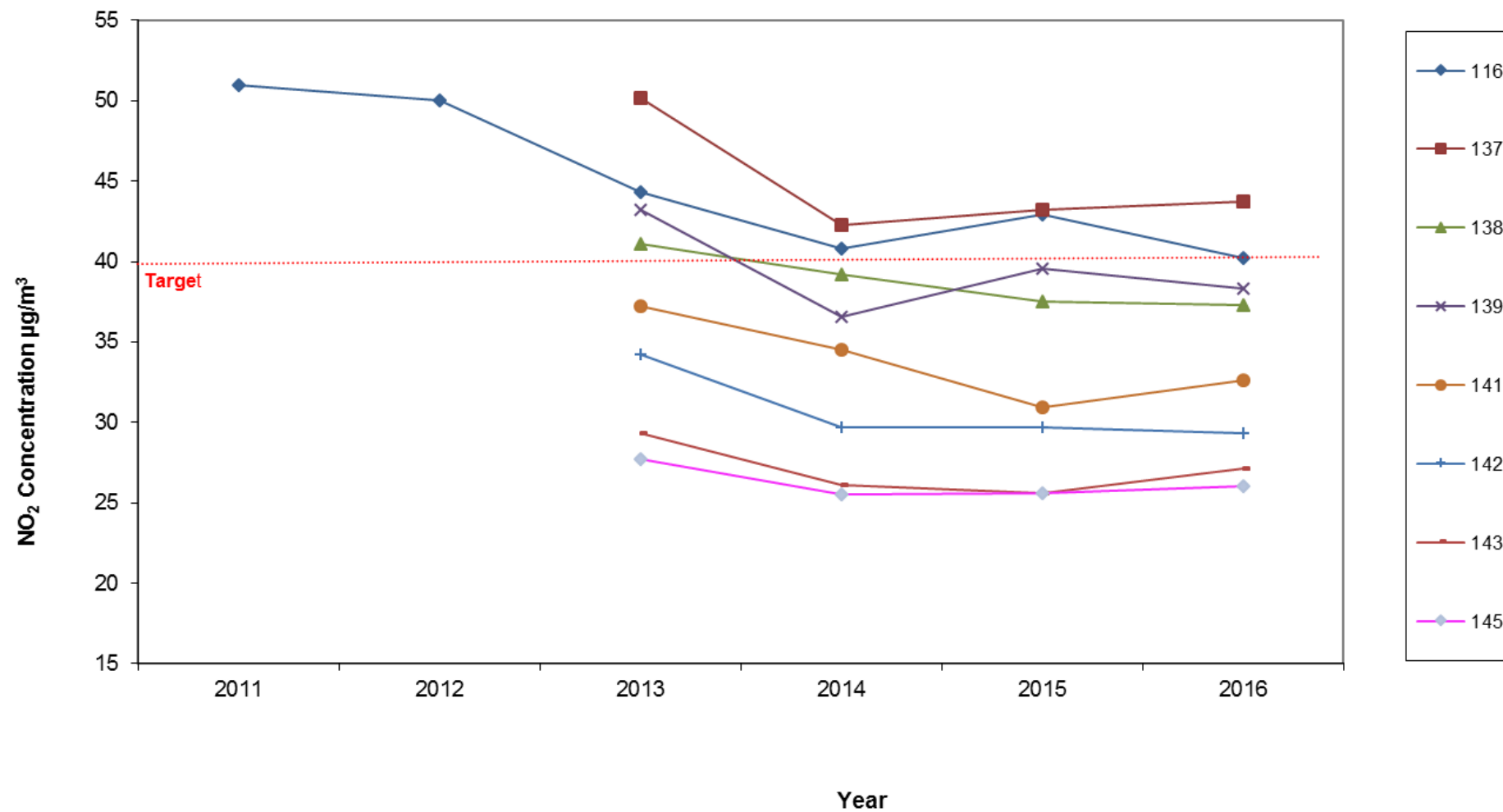


Table A.8 Staple Hill AQMA Annual Mean NO<sub>2</sub> Monitoring Results

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2016 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
						2012	2013	2014	2015	2016
29	Staple Hill - 123 High Street Backhouse Bet	Roadside	Diffusion Tube	n/a	100%	43.6	35.2	35.2	31.2	36.2
61	Staple Hill Crossroads - 1 Broad Street William Hill	Roadside	Diffusion Tube	n/a	100%	45.8	42.1	41.5	39.4	41.5
62	Staple Hill Crossroads - 2 Broad Street 501 Bar façade	Roadside	Diffusion Tube	n/a	100%	43.7	36.4	36.0	36.4	39.2
71	Staple Hill - 11 The Square Bunch Florist	Roadside	Diffusion Tube	n/a	100%	29.2	27.1	24.7	23.6	26.1
72	Staple Hill - 25 Broad Street Westbury Inks	Roadside	Diffusion Tube	n/a	100%	40.3	34.8	31.9	32.2	36.2
73	Staple Hill - 11 Soundwell Road Starlight	Roadside	Diffusion Tube	n/a	100%	40.6	39.3	39.9	40.4	40.2
74	Staple Hill - 29-31 Soundwell Road opp Page Community Association	Roadside	Diffusion Tube	n/a	92%	35.3	32.2	28.1	28.5	30.9
75	Staple Hill - 118 High Street The Hope Project Shop	Roadside	Diffusion Tube	n/a	100%	44.2	43.6	45.3	44.8	46.1
76	Staple Hill - 84-86 High Street Staple Oak Pub façade	Roadside	Diffusion Tube	n/a	100%	38.6	34.9	36.2	34.9	36.9
78	Staple Hill - 9-11 Victoria Street	Roadside	Diffusion Tube	n/a	100%	52.8	44.4	43.3	41.5	44.9
79	Staple Hill - 27-29 Victoria Street	Roadside	Diffusion Tube	n/a	83%	45.9 <sup>a</sup>	35.8	37.5	37.5	37.2
102	Staple Hill - 58 High Street CBS Consultants	Roadside	Diffusion Tube	n/a	92%	47.8	41.7	39.8	38.4	40.7

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2016 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
						2012	2013	2014	2015	2016
105	Staple Hill - North Street lp outside no 2	Roadside	Diffusion Tube	n/a	100%	32.1 <sup>a</sup>	28.1	27.3	26.7	29.8

☒ Diffusion tube data has been bias corrected

☒ Annualisation has been conducted where data capture is <75%

☐ If applicable, all data has been distance corrected for relevant exposure. (In order to allow comparison with previous data for 2012 -2015, the 2016 data has been reported without distance correction. See Table B.1 for distance corrected data)

**Notes:**

**Exceedance** of the NO<sub>2</sub> annual mean objective of 40µg/m

**Borderline** within 10% of NO<sub>2</sub> annual mean objective (>36µg/m<sup>3</sup>)

NO<sub>2</sub> annual means exceeding 60µg/m<sup>3</sup>, indicating a potential exceedance of the NO<sub>2</sub> 1-hour mean objective are shown in **bold and underlined**.

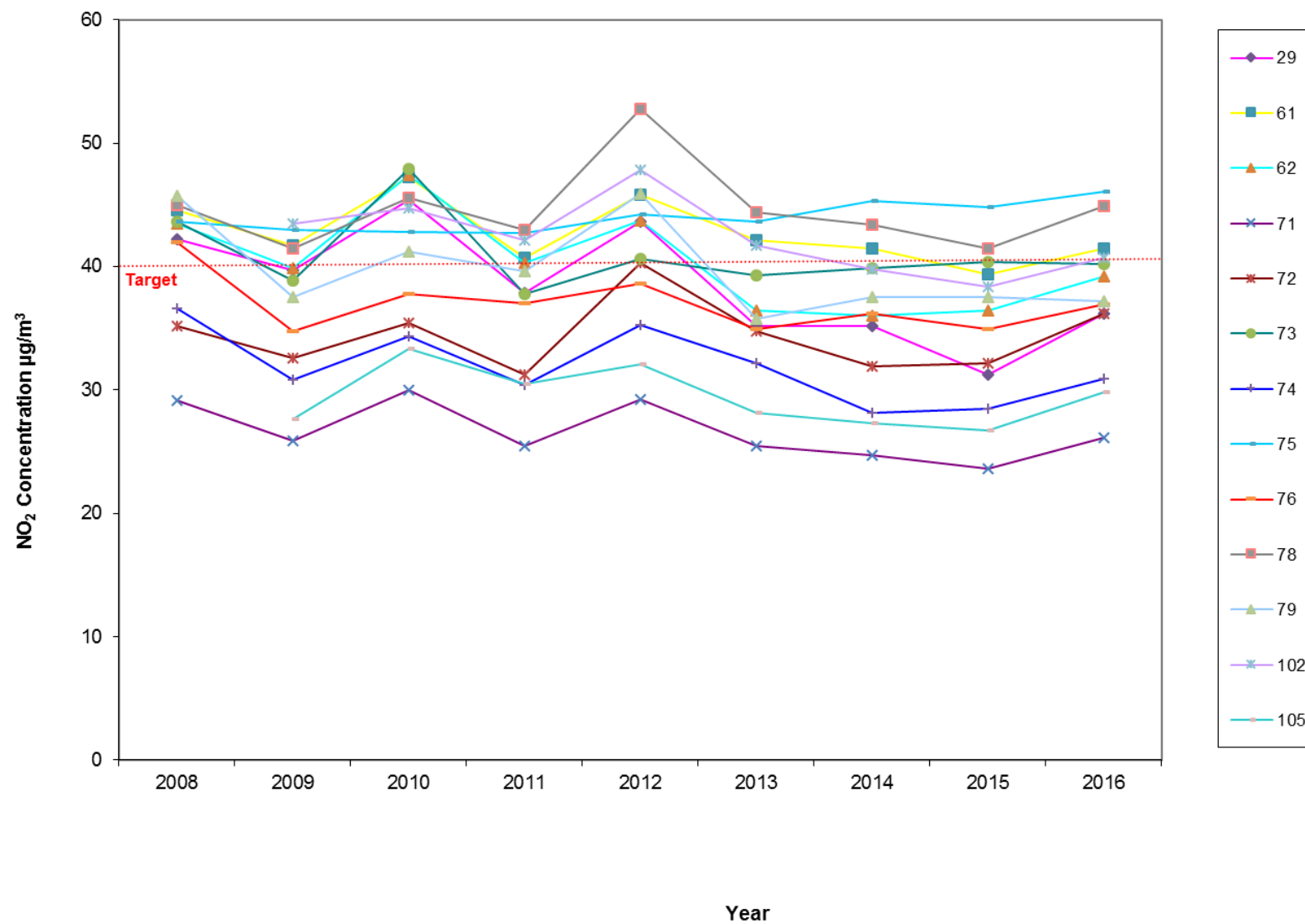
(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(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. (<sup>a</sup> denotes annualised results for previous years 2012 – 2015 where full calendar year data capture <75%).



Figure A.5 Trends in Annual Mean Nitrogen Dioxide Concentrations in Staple Hill AQMA



## Estimated PM<sub>2.5</sub> Concentrations

**Table A.9 Estimation of PM<sub>2.5</sub> concentrations and % reductions**

Year	Yate PM <sub>10</sub> Annual Means <sup>(1)</sup> (µg/m <sup>3</sup> )	Yate Estimated PM <sub>2.5</sub> Annual Means (PM <sub>10</sub> x 0.7) <sup>(2)</sup> (µg/m <sup>3</sup> )	Bristol St. Pauls (AURN) Monitored PM <sub>2.5</sub> Annual Means <sup>(3)</sup> (µg/m <sup>3</sup> )
2016	14	9.8	12
2015	15	10.5	10
2014	15	10.5	13
2013	15	10.5	13
2012	16	11.2	13
2011	18	12.6	15
2010	20	14	14
<b>% Reduction 2010 -2016</b>	<b>30%</b>	<b>30%</b>	<b>14%</b>

(1) As reported in Table A.5, Appendix A

(2) Estimated as per Technical Guidance LAQM TG16 Box 7.7

(3) Obtained from UK-AIR Data Archive Annual and Exceedance Statistics

<https://uk-air.defra.gov.uk/data/exceedence>

## Appendix B: Full Monthly Diffusion Tube Results for 2016

Table B.1 NO<sub>2</sub> Monthly Diffusion Tube Results – 2016

Site ID	Site Name	NO <sub>2</sub> Mean Concentrations (µg/m³)															
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean			
														Raw Data	Bias Adjust (0.88)	Annual Adjust <sup>(1)</sup>	Distance Corrected to Nearest Exposure <sup>(2)</sup>
1	Yate - Station Road Motor Aids	38.2	42.3	39.0	37.9	38.4	32.7	28.8	27.5	29.9	39.8	41.1	43.4	36.6	32.2		27.9
4	Yate - Station Road Co-Location 1	33.6	31.5	27.1	26.9	25.0	22.3	20.8	21.3	26.1	27.2	34.4	40.7	28.1	24.7		n/a
5	Yate - Station Road Co-location 2		32.1	27.9	26.8	25.4	21.3	22.7	20.1	23.3	27.0	31.3		25.8	22.7		n/a
6	Yate - Station Road Co-location 3	34.3	33.7	30.8	27.0	24.8	21.0	23.3	21.2	25.4	25.3	33.5	36.9	28.1	24.7		n/a
10	Filton - 152 Gloucester Road North Pizza Bello façade	44.3	46.9	45.0					34.5	40.2	41.5	46.0	49.5	43.5	38.3	34.1	34.1
11	Thornbury – 48 High Street Morgan Stone	33.3	33.7	33.0	31.3	27.2	25.7	26.7	21.9	27.4	29.6	35.7	39.9	30.4	26.8		n/a
12	Stoke Gifford - Church Road Rear of Aviva	36.2	46.4	39.0	36.8	23.9	30.4	19.5	24.1	30.8	36.2	39.1	42.3	33.7	29.7		n/a
13	Filton - MOD Roundabout	40.2	44.5	48.5	41.1	39.6	38.0	23.7	28.9	34.1	40.6	45.7	47.4	39.4	34.6		n/a
17	Kingswood - 79 Regent Street HSBC	30.1	32.2	35.7	25.7	23.5	23.3	22.9	31.0	22.4	29.9	35.3	38.0	29.2	25.7		n/a

# South Gloucestershire Council

Site ID	Site Name	NO <sub>2</sub> Mean Concentrations (µg/m <sup>3</sup> )															
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean			
														Raw Data	Bias Adjust (0.88)	Annual Adjust <sup>(1)</sup>	Distance Corrected to Nearest Exposure <sup>(2)</sup>
21	Downend – Boscombe Crescent St Augustines Church	22.0	24.2	24.4	19.5	18.5	13.8	10.3	10.8	14.7	21.6	25.9	31.4	19.8	17.4		n/a
22	Hanham – 44 High Street Lloyds Bank	36.3	36.3	34.3	37.2	31.9	29.0	27.3	27.6	30.4	36.4	40.7	50.9	34.8	30.7		n/a
23	Kingswood - Cecil Road	30.4	39.5	36.7	31.2	26.7	27.7	25.7	23.1	26.7	33.8	36.1	39.3	31.4	27.6		21.8
26	Kingswood – 8 Gilbert Road	26.1	28.1	26.5	24.3	23.2	20.8	16.4	15.8	19.3	27.9	32.2	37.8	24.9	21.9		20.4
27	Kingswood - 90 Regent Street Nat West façade	40.4	39.0	29.7	34.8	35.6	32.7	33.9	30.6	33.8	32.5	40.5	45.2	35.7	31.4		31.4
29	Staple Hill - 123 High Street Backhouse Bet	38.3	44.8	44.7	43.9	41.0	38.1	31.2	32.0	31.3	48.0	49.7	50.3	41.1	36.2		32.1
34	Bradley Stoke – 109 Ormonds Close M4 East of Almondsbury Interchange	31.5	40.6	43.0	39.2	35.6	35.6	20.9	24.7	28.1	39.8	39.6	44.9	35.3	31.0		29.0
35	Bradley Stoke - Woodlands Lane M4 East of Almondsbury Interchange (Ip47)	37.5	39.6	44.1	38.7	37.4	29.5	19.1	23.4	26.6	43.3	44.5	52.6	36.3	32.0		27.4
36	Hambrook – Whiteshill M4 East of M32	27.4	25.1	22.2	22.4	19.5	17.8	21.2	20.1	21.7	19.6	22.9	24.8	22.1	19.4		n/r
37	Almondsbury - Old Aust Road M4 West of Almondsbury Interchange	34.9	34.5	43.8	41.0	40.3	35.6	16.3	26.4	32.7	49.1	43.3	42.0	36.6	32.2		n/a

# South Gloucestershire Council

Site ID	Site Name	NO <sub>2</sub> Mean Concentrations (µg/m <sup>3</sup> )															
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean			
														Raw Data	Bias Adjust (0.88)	Annual Adjust <sup>(1)</sup>	Distance Corrected to Nearest Exposure <sup>(2)</sup>
38	Severn Beach – Ableton Lane Severn Beach Primary School	20.0	20.1	19.6	16.6	13.3	13.1	9.3	10.7	13.3	17.1	19.9	25.9	16.6	14.6		14.6
42	Little Stoke -Braydon Ave	33.4	32.8	30.5	27.6	21.4	21.1	16.7	17.7	23.2	28.2	33.5	40.1	27.2	23.9		21.5
44	Stoke Gifford - Hatchet Road	41.2	41.2	38.3	36.8	32.7	29.7	28.2	27.5	33.7	38.5	39.3	47.9	36.3	31.9		25.8
45	Bradley Stoke - Bradley Stoke Way		48.5	35.5	38.8	34.8	33.6	28.7	29.7		37.4	44.1	58.0	38.9	34.2		n/a
46	Winterbourne - High Street opp Winterbourne International Academy	39.7	44.1	42.4	37.5	36.2	33.6	24.4	26.4	32.3	37.5	44.0	51.3	37.4	32.9		24.4
53	Hambrook – Bristol Road Rear of 17 Fenbrook Close	40.6	42.2	48.5	39.2	41.5	36.8	18.0	22.5	28.3	39.1	45.7	57.2	38.3	33.7		29.1
54	Longwell Green - A431 / Aldermoor Way	37.9	42.8	41.3	40.1	39.0	34.5	32.6	29.7	35.2	41.9	45.9	54.3	39.6	34.9		n/a
57	Coalpit Heath - Badminton Rd Frome Valley Kitchens	36.1	34.6	36.3	31.2	23.7	27.7	23.9	24.8	29.1	33.9	40.5	50.0	32.6	28.7		22.6
58	Longwell Green - Kingsfield Lane/ Aspects Leisure Site (lp6)	28.5	29.1	31.3	17.6		21.3		14.6	19.7	27.5	28.5	35.9	25.4	22.4		n/r
60	Downend - North Street Kustom Floors & Furniture	42.5	43.6	41.6	42.0	38.5	34.5	27.3	24.9	33.7	41.9	38.2	50.8	38.3	33.7		28.3
61	Staple Hill Crossroads - 1 Broad Street William Hill	51.8	53.2	51.0	45.4	44.7	41.0	35.0	36.5	42.4	55.6	54.9	54.3	47.2	41.5		39.5

# South Gloucestershire Council

Site ID	Site Name	NO <sub>2</sub> Mean Concentrations (µg/m <sup>3</sup> )															
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean			
														Raw Data	Bias Adjust (0.88)	Annual Adjust <sup>(1)</sup>	Distance Corrected to Nearest Exposure <sup>(2)</sup>
62	Staple Hill Crossroads - 2 Broad Street 501 Bar façade	46.7	46.3	45.3	44.3	45.0	40.4	32.6	38.9	41.0	46.1	49.3	58.4	44.5	39.2		39.2
63	Patchway – 28 Park Leaze	30.5	31.9	33.8	31.4	22.6	26.7	22.5	21.6	25.2	29.4	35.6	42.2	29.4	25.9		24.1
67	Kingswood - 40 Regent Street Thomas Cook façade	49.0	48.0	44.6	48.0	43.9	35.6	41.4	40.6	42.7	45.2	50.2	65.4	46.2	40.7		40.7
68	Kingswood - 26-32 Regent Street Store Twenty One façade	60.1	49.4	45.3	48.6	49.6	41.0	47.3	42.2	45.1	44.3	53.0	53.7	48.3	42.5		42.5
69	Kingswood - 12 Regent Street Silver Brides façade	42.5	41.6	35.5	42.2	44.4	38.4	39.5		36.6	40.1	43.7	51.4	41.4	36.5		36.5
70	Kingswood - Two Mile Hill Road Job Centre Plus façade	39.1	38.4	38.7	37.1	31.6	34.3	26.5	27.1	34.0	40.3	45.0	53.3	37.1	32.7		32.7
71	Staple Hill - 11 The Square Bunch Florist	32.1	31.1	34.6	29.9	27.9	23.5	21.2	20.9	24.7	32.5	35.8	41.8	29.7	26.1		25.9
72	Staple Hill - 25 Broad Street Westbury Inks	45.4	45.5	45.3	40.0	43.4	36.0	32.7	30.1	33.2	45.1	46.2	50.9	41.2	36.2		29.5
73	Staple Hill - 11 Soundwell Road Starlight	42.7	49.3	51.8	43.5	49.1	44.3	28.6	32.0	40.2	57.5	55.5	53.7	45.7	40.2		34.7
74	Staple Hill - 29-31 Soundwell Road opp Page Comm Assoc	30.2		43.0	38.3	33.3	34.1	21.5	21.5	27.8	45.5	43.9	46.9	35.1	30.9		25.8
75	Staple Hill - 118 High Street The Hope Project Shop	57.1	52.9	52.7	53.7	52.5	45.3	48.3	46.4	47.6	54.8	57.8	59.6	52.4	46.1		37.2

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		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean			
														Raw Data	Bias Adjust (0.88)	Annual Adjust <sup>(1)</sup>	Distance Corrected to Nearest Exposure <sup>(2)</sup>
76	Staple Hill - 84-86 High Street Staple Oak Pub façade	43.7	45.5	42.8	38.2	40.0	39.0	41.5	37.4	38.4	41.4	44.0	50.6	41.9	36.9		36.9
78	Staple Hill - 9-11 Victoria Street	54.2	53.5	53.1	50.7	54.1	40.9	49.4	41.1	48.7	49.9	54.6	61.7	51.0	44.9		37.0
79	Staple Hill - 27-29 Victoria Street	46.2	50.2	47.6		43.6	34.5	38.1	33.6	38.6	43.1	46.6		42.2	37.2		31.9
83	Chipping Sodbury – 51A Broad Street façade	31.0	30.9	31.9	31.9	27.8	27.6	20.1	20.1	23.5	31.3	34.0	36.8	28.9	25.4		25.4
87A	Cribbs Causeway – Blackhorse Hill Hollywood Cottage façade	41.3	31.5	30.8	36.4	33.0	22.4			32.9			45.3	34.2	30.1	28.3	28.3
87B	Cribbs Causeway – Blackhorse Hill Hollywood Cottage façade	44.4	35.7	33.1	36.0	31.8	26.4			31.9			50.4	36.2	31.9	29.9	29.9
87C	Cribbs Causeway – Blackhorse Hill Hollywood Cottage façade	44.1	31.3	31.1	34.6	33.1	27.1			34.1			48.0	35.4	31.2	29.3	29.3
90	Kingswood - Downend Road Junction with Boultons Road	44.9	47.1	44.2	39.9	34.3	34.8	29.4	21.5	37.5	43.7	44.6		38.4	33.8		28.3
92	Kingswood - Regent Street Entertainment & Sports Club	49.7	46.3	42.2	40.3	40.6	35.5	43.6	36.9	34.6	38.4	44.4	48.1	41.7	36.7		36.7
93	Kingswood - Hanham Road Exchange Court Flats	37.1	37.3	39.2	32.0	38.1	33.8	23.8	25.7	30.4	40.8	40.3	45.2	35.3	31.1		31.1
95	Kingswood - 45 High Street Adam Lee	44.2	44.6	53.0	44.8	45.2	40.0	36.7			45.2	47.9	48.5	45.0	39.6		39.6

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														Raw Data	Bias Adjust (0.88)	Annual Adjust <sup>(1)</sup>	Distance Corrected to Nearest Exposure <sup>(2)</sup>
96	Kingswood - 71 High Street Homeless Project	46.3	42.6	46.6	44.7	37.4	38.4	35.1	30.2	36.4	42.6	50.5	53.7	42.0	37.0		30.8
97	Kingswood - 129 High Street	44.4	37.6	47.8	42.1	44.7	38.7	27.2	28.4	33.2	48.9	47.3	51.7	41.0	36.1		32.3
98	Kingswood - High Street Sainsbury's Local façade	47.3	41.2	39.0	40.7	39.5	38.3	33.1	33.9		39.6	44.1	44.4	40.1	35.3		35.3
101	Staple Hill - High Street Ip outside Beech House	31.8	35.1	35.0	31.0	31.3	23.8	24.2	24.2	26.0	36.3	39.1	50.6	32.4	28.5		24.0
102	Staple Hill - 58 High Street CBS Consultants	46.8	44.7	45.8	46.1	49.8	46.3	37.4	34.0	42.6	47.3	54.4	59.4	46.2	40.7		40.7
103	Staple Hill - Page Road Brookridge Court	31.5	30.1		27.6	28.8	21.7	17.7	16.9	21.2	32.4	35.5	41.7	27.7	24.4		22.6
104	Staple Hill - Page Road Stars Pre-School	27.9	28.4	26.9	23.1	19.7	19.4	14.9	14.6	19.6	29.4	32.7	39.0	24.6	21.7		19.5
105	Staple Hill - North Street Ip outside no 2	35.3	37.7	40.8	34.1	30.3	29.3	20.9	21.3	29.1	40.0	43.5	44.5	33.9	29.8		27.6
106	Stoke Gifford - 73 Hambrook Lane façade	28.1	28.4	26.9	19.3	20.5	19.8	13.9	14.2	20.3	24.2	31.0	38.6	23.8	20.9		20.9
108	Patchway - 204 Gloucester Road rear façade	37.2	37.1	36.9	34.3	28.6	27.5	19.3	22.2	25.9	35.3	37.7	49.6	32.6	28.7		28.7
113	Patchway - 5 Falcon Close façade	32.2	35.6	38.5	38.7	33.8	36.1	32.3	35.3	34.3	35.7	42.8	39.3	36.2	31.9		31.9



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														Raw Data	Bias Adjust (0.88)	Annual Adjust <sup>(1)</sup>	Distance Corrected to Nearest Exposure <sup>(2)</sup>
114	Pilning - 23 Keens Grove façade	28.6	32.1	36.7	34.8	30.4			22.8	23.4	31.2	34.5	38.4	31.3	27.5		27.5
115	Pilning - 2 Wick Road façade	29.7	30.2	30.3	29.1	26.0	25.9	20.6	24.5	26.4	28.6	32.5	44.1	29.0	25.5		25.5
116	Warmley - 14 High Street Webbs (lp at façade)		54.9	46.3	48.1	47.3	46.6						54.7	49.6	43.7	40.2	40.2
117	Filton Northville - 29 Gloucester Road North Blockbuster	44.6	43.1	41.1	41.2	37.9	37.3	28.9	28.1	34.0		44.1	47.6	38.9	34.2		31.3
118	Filton Northville - 19 Gloucester Road North Dental Lab	44.3	42.8	38.6	37.7	34.0	32.7	26.4	26.8	32.1	38.2	44.0	49.4	37.2	32.8		30.1
119	Filton - 137 Gloucester Road North	45.9			37.4	40.7	35.8	27.0	30.9	35.5	44.5	44.8	50.7	39.3	34.6		34.0
122	Filton - 549 Filton Avenue	42.1	42.5	41.8	37.6	32.5	25.5	21.3	23.4	30.5	38.9	39.1	52.5	35.6	31.4		28.4
123	Filton - 542 Filton Avenue Spar	43.9	40.6	43.5	32.9	31.4	30.9	21.6	22.2	31.0	38.6	41.6	47.6	35.5	31.2		28.0
124	Filton - 702a Filton Ave Way Ahead	41.6	43.2	44.4	40.0	42.5	31.6	21.8	25.5	32.2	45.4	46.5	54.8	39.1	34.4		28.4
125	Filton - 71 Station Road	41.6	33.4	30.5	30.7	26.7	24.0	19.0	22.4	25.3	30.7		48.7	30.3	26.7		22.5
128	Kingswood - 109 Downend Road	45.4	41.5	40.0	39.1	33.4	35.5	30.6	29.3	37.9	41.5	42.4	55.0	39.3	34.6		32.2
129	Cribbs Causeway – 1 Holly Cottages façade	37.4	45.7	42.0	40.1	37.5	32.6	27.1	32.7	33.2	36.8	43.0	47.3	37.9	33.4		33.4

# South Gloucestershire Council

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														Raw Data	Bias Adjust (0.88)	Annual Adjust <sup>(1)</sup>	Distance Corrected to Nearest Exposure <sup>(2)</sup>
130	Cribbs Causeway – 2 Mayfield Cottages façade	32.8	38.2	36.3	33.2	28.7	28.2	23.3	28.9	29.9	33.3	36.5	44.9	32.8	28.9		28.9
132	Hanham - 66 High St Café Bonjour		39.9	36.4	38.0	35.6	30.4	25.2	25.0	27.7	40.0	41.4	55.8	36.0	31.6		30.8
133	Hambrook - 123 Old Gloucester Road façade (dp)	29.7	36.9	41.1	35.6	40.8	35.5	23.5	27.5	27.4	40.5	37.4	42.9	34.9	30.7		30.7
134	Hambrook – Bristol Road, Old Bakery façade (dp)	43.4	47.8	47.2	43.6	43.6	43.6	36.0	32.7	35.5	45.8	42.2	49.2	42.6	37.4		37.4
135	Frenchay – Harford Drive Dyrham Flats	35.4	41.8	44.2	36.2	35.7	27.7	20.3	25.0	15.6	25.1	37.2	44.6	32.4	28.5		27.5
136	Little Stoke – 26 Gipsy Patch Lane façade (dp)	27.7	31.9	29.6	27.6	24.3	22.7	17.1	17.7	19.8	27.5	32.1	34.2	26.0	22.9		22.9
137	Warmley - 35 High Street (lp at façade)	51.6	56.5		53.3			40.4	43.7	34.7	53.5	51.7	61.2	49.6	43.7		43.7
138	Warmley - 18 High Street façade (dp)	50.3	45.7	37.4	44.9	42.2	34.5	42.1	38.4	41.9	39.4	43.5	48.2	42.4	37.3		37.3
139	Warmley - 14 High Street Webbs façade (dp)	48.6	46.5	40.7	44.4	38.8	43.5							43.7	38.5	38.3	38.3
140	Warmley - 2 Stanley Road façade (dp)	37.1	36.2	30.8	28.5	24.3	22.2	26.3	23.8	23.3	27.1	30.1	39.5	29.1	25.6		25.6
141	Warmley - 41 Deanery Road façade (dp)	39.7	41.6	37.4	38.4	31.8	32.5	33.8	32.3	32.5	37.4	37.5	49.0	37.0	32.6		32.6

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														Raw Data	Bias Adjust (0.88)	Annual Adjust <sup>(1)</sup>	Distance Corrected to Nearest Exposure <sup>(2)</sup>
142	Warmley - 33 Deanery Road Warmley Court façade (dp)	36.9	45.6	35.0	32.1	26.4	26.1	27.8	27.4	31.6	31.4	34.7	44.8	33.3	29.3		29.3
143	Warmley - 1 High Street Ideal Pharmacy façade (dp)	34.9	36.3	30.1	32.6	29.0	27.1	23.9	24.3	27.1	31.5	32.1	40.6	30.8	27.1		27.1
144	Warmley - 8 Tower Road North façade (dp)	37.8	33.6	27.8	28.4	26.9	24.3	26.3	22.4	24.7	28.7	32.1	37.0	29.2	25.7		25.7
145	Warmley - 1 London Road (Cycle Path)	35.7	31.8	29.6	32.1	25.7	26.4	28.3	25.2	26.3	28.6	31.5	33.9	29.6	26.0		26.7
146	Kingswood - 34 Hill St façade (dp)	57.6	53.7	46.3	49.6	50.5	46.3	48.9	47.2	47.1	50.6	51.4	74.0	51.9	45.7		45.7
147A	Soundwell - 264 Soundwell Rd façade (dp)	46.3	48.2	48.6	47.7	48.0	42.6	43.0	38.5	39.0	46.2	50.9		45.3	39.9		39.9
147B	Soundwell - 264 Soundwell Rd façade (dp)	N/O	N/O	N/O	48.2	47.1	40.1	40.5	37.4	43.5	44.9	49.4		43.9	38.6	46.5	46.5
147C	Soundwell - 264 Soundwell Rd façade (dp)	N/O	N/O	N/O	49.4	43.1	42.2	39.8	36.6	45.1	47.8	47.8		44.0	38.7	46.6	46.6
148	Filton – 109 Gloucester Road North façade (dp)	62.7	40.0	39.1	40.0			21.1	22.9	32.4	43.5	42.8	44.1	38.9	34.2		34.2
149	Filton – 707 Southmead Road façade (dp)	38.6	38.9	39.3	38.9	34.1	34.2	22.7	24.5	27.3	38.0	38.5	52.4	35.6	31.3		31.3
150	Soundwell – 296 Soundwell Road façade (dp)	31.7	40.0	42.8	39.0	40.3	37.3	22.2	23.5	27.6	49.5	40.7	51.3	37.2	32.7		32.7

# South Gloucestershire Council

Site ID	Site Name	NO <sub>2</sub> Mean Concentrations (µg/m <sup>3</sup> )															
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean			
														Raw Data	Bias Adjust (0.88)	Annual Adjust <sup>(1)</sup>	Distance Corrected to Nearest Exposure <sup>(2)</sup>
151	Hambrook – Bristol Road Old Bakery FP signpost	49.1	45.4	48.4	44.4	43.0	45.6	37.2	29.9	39.2	47.9	46.4	53.1	44.1	38.8		38.8
152	Bradley Stoke -188 Oaktree Crescent Ip49	33.8	45.3	42.8	35.0	34.5	32.0	21.9	23.4	22.8	38.3	38.0	42.5	34.2	30.1		30.2
153	Bradley Stoke -141 Wheatfield Drive (façade)	29.2	31.3	30.3	25.7	20.8	20.0	14.0	16.8	19.9	27.9	29.8	36.5	25.2	22.2		22.2
154	Bradley Stoke - 166 Ellan Hay Road (façade)	35.0	34.3	31.1	29.5	23.7	23.0	17.6	15.9	24.1	27.5	34.6	44.1	28.4	25.0		25.0
155	Stoke Gifford - 3 Earl Close (façade)	29.6	26.7	27.2	26.5			11.8	14.4	19.3	25.6	28.8	38.1	24.8	21.8		21.8
156	Stoke Gifford - Lancelot Road Ip1	34.2	31.0	31.7	29.3	21.1	23.4	11.2	14.5	20.3	26.7	33.2	39.9	26.4	23.2		20.1
157	Hambrook - Bristol Road Poplars House (façade)	35.2	36.9	35.8	34.6	28.6	27.2	26.3	26.7	28.8	30.0	37.8	43.4	32.6	28.7		28.7
158	Downend - 5 Wick Wick Close (façade)	30.3	38.3	40.6	39.5	34.9	30.6	21.6	24.5	25.5	38.3	38.4	41.7	33.7	29.6		29.6

☐ Local bias adjustment factor used

☒ National bias adjustment factor used

☒ Annualisation has been conducted where data capture is <75% (i.e. Sites 10, 87A, B & C, 116, 139 and 147B & C)

Notes:

**Exceedance** of the NO<sub>2</sub> annual mean objective of 40µg/m

**Borderline** within 10% of NO<sub>2</sub> annual mean objective (>36µg/m<sup>3</sup>)

NO<sub>2</sub> annual means exceeding 60µg/m<sup>3</sup>, indicating a potential exceedance of the NO<sub>2</sub> 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 (n/a where not applicable; n/r (no result) where distance adjustment could not be calculated)

N/O Not operational

## Appendix C: Air Quality Monitoring Data QA/QC

### QA/QC of Diffusion Tube Monitoring

The diffusion tubes are prepared and analysed by Somerset County Council Scientific Services. The tubes are prepared by the laboratory using 20% triethanolamine (TEA) in water. The laboratory participates in the AIR NO<sub>2</sub> Proficiency Testing (PT) Scheme. For nitrogen dioxide diffusion tubes, this involves analysis of four diffusion tubes spiked with a known amount of nitrite every three months and comparison of the results of the participating laboratories. The results from the four AIR NO<sub>2</sub> PT rounds (AR012, 013, 015 and 016) during 2016 for Somerset Scientific Services were 100% satisfactory<sup>28</sup>.

### Data Ratification and Bias Adjustment

The diffusion tube results are examined on a monthly basis to identify any spurious data and any suspect data is investigated further. Trends in monitored levels across the diffusion tube sites are compared to take into account seasonal factors, such as changing weather patterns and increased traffic flows, and to detect any local changes at the sites, such as road works. The monthly raw data is then averaged for the calendar year to give an annual mean.

While diffusion tubes provide a simple, cost-effective way of monitoring a wide range of locations, the accuracy of the tubes can be variable depending on the laboratory preparation, handling and analysis. To overcome this, a Bias Adjustment Factor, is applied to the raw mean for the relevant monitoring period. This factor is calculated from monitoring sites where triplicate diffusion tubes are co-located with an automatic NO<sub>x</sub> analyser by comparing results of the two measurement methods.

### Diffusion Tube Bias Adjustment Factors

#### National Bias Adjustment Factor

During 2016, the Council operated a co-location study at the Yate automatic monitoring site and the study was included in the national bias adjustment factors database provided by the LAQM Helpdesk. Combined bias adjustment factors from

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<sup>28</sup> <https://laqm.defra.gov.uk/assets/airptounds12to22jan2016oct20171.pdf>

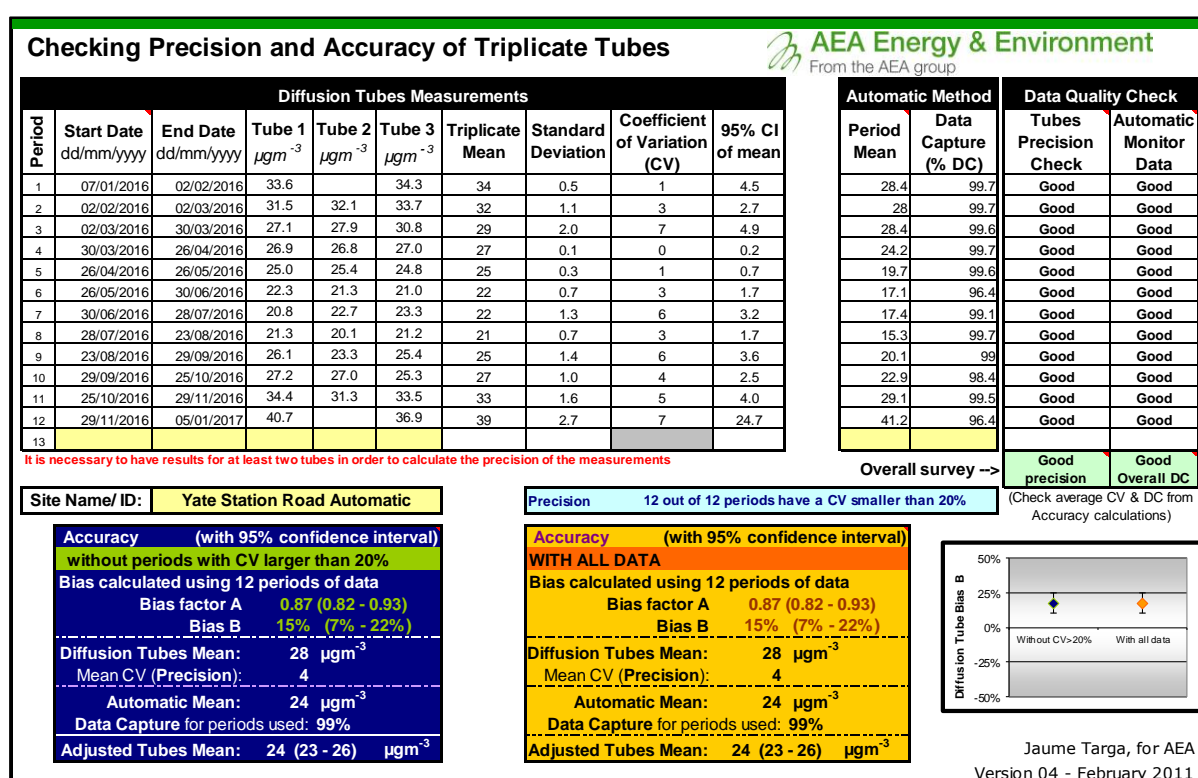
the local authority co-location studies are calculated for each laboratory that analyse diffusion tubes<sup>29</sup>.

The 2016 national bias-adjustment factor for Somerset Scientific Services obtained at the time the data was compiled for this report was 0.88 (spreadsheet version 03/16v2).

The co-location results show good tube precision (ability for a measurement to be consistently reproduced) in 2016 as detailed in the Summary of Precision Results for Nitrogen Dioxide Diffusion Tube Co-location Studies, by Laboratory<sup>30</sup>.

### Factor from Local Co-location Study

The precision and accuracy spreadsheet available on the LAQM Tools Defra webpage<sup>31</sup> was used to compare the triplicate co-located diffusion tubes with the automatic monitor in Yate and calculate a local bias adjustment factor for 2016 of 0.87 as shown in Figure C.1.



**Figure C.1 2016 Precision and Accuracy spreadsheet for Yate Co-location Study**

<sup>29</sup> <http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html>

<sup>30</sup> <https://laqm.defra.gov.uk/diffusion-tubes/precision.html>

<sup>31</sup> <http://laqm.defra.gov.uk/bias-adjustment-factors/local-bias.html>

## Discussion of Choice of Factor to Use

For 2016, the national bias adjustment factor (0.88) and local bias adjustment factor (0.87) compare well, with the national bias adjustment factor being slightly more conservative. Overall, and in order to be consistent with previous reports, it was considered more robust to use the national factor for 2016.

## Short-term to Long-term Data adjustment

In 2016, data capture was less than 75% at the following diffusion tube monitoring sites; 10, 87A, B & C, 116, 139 and 147B & C due to various combinations of missing tubes, access issues and monitoring starting part way through 2016. The results for these sites have been annualised as detailed in LAQM TG16.

Long-term data from four urban background monitoring sites from the national Automatic Urban and Rural Network (AURN)<sup>32</sup> was used to calculate adjustment factors to annualise the short term data. The annual and period mean concentrations from the AURN monitoring sites, along with the average factor used to adjust the short term data, are shown in Table C.1 to Table C.5. Data was used where data capture for the relevant periods was greater than 85%. The annual mean for each AURN station was calculated for the diffusion tube exposure year and the period means were calculated for the actual diffusion tube exposure periods at each of the monitoring sites.

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<sup>32</sup> [https://uk-air.defra.gov.uk/data/data\\_selector](https://uk-air.defra.gov.uk/data/data_selector)



**Table C.1 Data used to adjust short-term NO<sub>2</sub> monitoring data to 2016 annual mean for Site 10**

Site 10	Filton – 152 Gloucester Road North Pizza Bello façade Period: 2016 Jan – Mar; Aug – Dec			Raw Mean (µg/m <sup>3</sup> )	Annualised Mean 2016 (µg/m <sup>3</sup> )	Bias Adjusted Annualised Mean (µg/m <sup>3</sup> )
AURN Site	Annual Mean (µg/m <sup>3</sup> )	Period Mean (µg/m <sup>3</sup> )	Ratio			
Bristol St Paul's	27.4	30.9	0.881			
Cardiff Centre	23.2	25.3	0.920			
Cwmbran	13.0	15.2	0.855			
Newport	21.9	23.9	0.912			
		<b>Average Ratio</b>	<b>0.892</b>	43.5	38.8	<b>34.1</b>

**Table C.2 Data used to adjust short-term NO<sub>2</sub> monitoring data to 2016 annual mean for Sites 87A, B & C**

Site 87A, B & C	Cribbs Causeway – Blackhorse Hill Hollywood Cottage façade Period: 2016 Jan – Jun; Sept; Dec			Raw Mean (µg/m <sup>3</sup> )	Annualised Mean 2016 (µg/m <sup>3</sup> )	Bias Adjusted Annualised Mean (µg/m <sup>3</sup> )
AURN Site	Annual Mean (µg/m <sup>3</sup> )	Period Mean (µg/m <sup>3</sup> )	Ratio			
Bristol St Paul's	27.4	29.1	0.937			
Cardiff Centre	23.2	24.3	0.959			
Cwmbran	13.0	14.1	0.918			
Newport	21.9	23.1	0.944			
		<b>Average Ratio</b>	<b>0.939</b>			
			<b>Site 87A</b>	34.2	32.1	<b>28.3</b>
			<b>Site 87B</b>	36.2	34.0	<b>29.9</b>
			<b>Site 87C</b>	35.4	33.3	<b>29.3</b>

**Table C.3 Data used to adjust short-term NO<sub>2</sub> monitoring data to 2016 annual mean for Site 116**

Site 116	Warmley – 14 High Street Webbs (lp at façade) Period: 2016 Feb – Jun; Dec			Raw Mean (µg/m <sup>3</sup> )	Annualised Mean 2016 (µg/m <sup>3</sup> )	Bias Adjusted Annualised Mean (µg/m <sup>3</sup> )
AURN Site	Annual Mean (µg/m <sup>3</sup> )	Period Mean (µg/m <sup>3</sup> )	Ratio			
Bristol St Paul's	27.4	29.8	0.913			
Cardiff Centre	23.2	24.6	0.945			
Cwmbran	13.0	14.3	0.910			
Newport	21.9	23.8	0.919			
		<b>Average Ratio</b>	<b>0.922</b>	49.6	45.7	<b>40.2</b>

**Table C.4 Data used to adjust short-term NO<sub>2</sub> monitoring data to 2016 annual mean for Site 139**

Site 139	Warmley – 14 High Street Webbs (façade dp) Period: 2016 Jan – Jun			Raw Mean (µg/m <sup>3</sup> )	Annualised Mean 2016 (µg/m <sup>3</sup> )	Bias Adjusted Annualised Mean (µg/m <sup>3</sup> )
AURN Site	Annual Mean (µg/m <sup>3</sup> )	Period Mean (µg/m <sup>3</sup> )	Ratio			
Bristol St Paul's	27.4	27.0	1.008			
Cardiff Centre	23.2	24.3	0.958			
Cwmbran	13.0	12.4	1.045			
Newport	21.9	22.4	0.975			
		<b>Average Ratio</b>	<b>0.997</b>	43.7	43.6	<b>38.3</b>

**Table C.5 Data used to adjust short-term NO<sub>2</sub> monitoring data to 2016 annual mean for Sites 147B & C**

Site 147B & C	Soundwell – 264 Soundwell Road (façade) Period: 2016 Apr – Nov			Raw Mean (µg/m <sup>3</sup> )	Annualised Mean 2016 (µg/m <sup>3</sup> )	Bias Adjusted Annualised Mean (µg/m <sup>3</sup> )
AURN Site	Annual Mean (µg/m <sup>3</sup> )	Period Mean (µg/m <sup>3</sup> )	Ratio			
Bristol St Paul's	27.4	22.4	1.218			
Cardiff Centre	23.2	20.3	1.145			
Cwmbran	13.0	9.9	1.311			
Newport	21.9	19.2	1.138			
		Average Ratio	1.203			
			Site 147B	43.9	52.8	46.5
			Site 147C	44.0	52.9	46.6

**Distance Adjustment to façade**

In 2016, there were four diffusion tube monitoring sites with measured exceedences (Sites 61, 73, 75 and 78) where the relevant exposure is set back from the monitoring sites. All of these sites are located within the Staple Hill AQMA. The monitoring results have been adjusted to the façade of the nearest relevant receptor using the nitrogen dioxide distance adjustment calculator on the LAQM Tools Defra webpage. Rather than represent the calculations for each site, the data and results from the calculator are presented in Table C.6. When the results are adjusted for distance, none of the sites are estimated to exceed at the façade, although site 61 is close to the objective. However, there is no relevant exposure at ground floor level in relation to this site.

The distance adjusted results were also calculated in the same way for the other monitoring sites where monitoring is not directly at a location of relevant exposure (i.e. façade) and are reported in Table B.1 in Appendix B, apart from site 36, where the measured annual mean NO<sub>2</sub> concentration was less than the local annual mean background NO<sub>2</sub> concentration and site 58, where the receptor was more than 50m away from the kerb so the distance calculator could not estimate the concentrations.

Table C.6 Adjustment of nitrogen dioxide to the façade of the nearest receptors

Site No.	Site Name	Monitor distance to kerb (m)	Receptor distance to kerb (m)	Background NO <sub>2</sub> 2016 (µg/m <sup>3</sup> )	Annual mean concentrations 2016 (µg/m <sup>3</sup> ) adjusted for bias	Adjusted to façade (µg/m <sup>3</sup> )
61	Staple Hill Crossroads – 1 Broad Street William Hill	2.3	3.25	17.9	41.5	39.5
73	Staple Hill – 11 Soundwell Road Starlight	0.5	2.0	17.9	40.2	34.7
75	Staple Hill – 118 High Street Santander	0.5	3.0	17.9	46.1	37.2
78	Staple Hill – 9-11 Victoria Street	1.2	4.9	18.1	44.9	37.0

**Exceedance** of NO<sub>2</sub> annual mean objective (40µg/m<sup>3</sup>)

**Borderline** within 10% of NO<sub>2</sub> annual mean objective (>36µg/m<sup>3</sup>)

## QA/QC of Automatic Monitoring

The automatic monitoring sites follow the QA/QC programme outlined below:

- Daily checks on the data to ensure analysers and communications are operating correctly and faults are reported as soon as possible
- Four-weekly calibration checks on the analysers using nationally traceable standard gases by Bristol City Council (BCC) under contract to South Gloucestershire Council
- Ad-hoc site inspections to check equipment operational status, site security, detect equipment malfunction and to change inlet filters
- Repairs as required and planned six monthly servicing and re-calibration of the analysers by EnviroTechnology Services under contract to South Gloucestershire Council.

### Calibration methods

Calibration procedures are carried out four-weekly by BCC. The methodology for the calibration procedure, which includes a two point zero/span calibration check, is derived from the manufacturers' instruction handbooks and from the AURN Site Operator's Manual as follows:

- Pre-calibration check - the site condition and status of the analyser is recorded prior to the zero/span check being conducted
- Zero check – the response of the analyser to the absence of the gas being monitored
- Span check – the response of the analyser to the presence of the gas of a known concentration
- Post calibration check - the site condition and status of the analyser on completion of all checks.

Each analyser zero/span check is fully documented and the calibration factors are calculated in Google sheets and the records are kept centrally using Google sheets. The calibration factors are used in the data scaling and ratification process. The two point calibration is conducted on the NO<sub>x</sub> analysers using a zero air scrubber and a reference nitric oxide (NO) mixture at a concentration of approximately 470 ppb,

which is supplied and certified by BOC. The contents of the portable scrubber used for zero air generation (hopcalite, activated charcoal, purafil and drierite) are changed when necessary or at least every six months.

### **Equipment Servicing and Maintenance**

The automatic analysers and associated equipment are serviced and maintained on a planned schedule following manufacturers' instructions. A six monthly full service and multi-point recalibration is carried out on the Yate NO<sub>x</sub> analyser under contract by the equipment suppliers; EnviroTechnology Services. The multi-point calibration involves the use of zero air, NO and NO<sub>2</sub> calibration gases, which are again traceable to national standards, enabling the analyser data slope and offset factors to be reset. A check on the efficiency of the molybdenum converter is undertaken during the services.

The contract also covers unscheduled site visits and repairs, for example in the event of equipment failure, within a specified period of time to minimise data loss. Results of the servicing, calibrations and repairs are fully documented and stored centrally.

### **Data Processing, Validation and Ratification**

Raw data from the Yate analysers is downloaded automatically twice a day to a designated PC via a modem and telephone line from the site. All data is collected by Opsis EnviMan software. The ComVisioner and Reporter modules of the EnviMan software allow full data manipulation and frequent checks on data measurements. The data outputs from the analysers are visually screened regularly in-house using EnviMan ComVisioner to check for obvious erroneous data and equipment faults.

The data is then validated, scaled and ratified. This work is undertaken on behalf of South Gloucestershire Council by Air Quality Data Management (AQDM). Data validation involves visual examination of the monitoring data to check for any spurious or unusual measurements, such as large spikes, 'flat-lines' and excessive negative data. Suspicious data is "flagged" for further investigation. The data is scaled against the four weekly and full six monthly calibration data.

Data ratification involves a critical review of all the information relating to the dataset and monitoring location to amend, verify or delete data, as appropriate. Any initial spurious data that was flagged is re-examined during this process and removed if deemed appropriate. The original raw dataset is kept enabling any amendments to

the data to be traced and allows the data to be re-examined if necessary. Data is compared to weekly trends at nearby AURN sites. The ratified data is the final data presented in this report.

### **PM<sub>10</sub> Monitoring Adjustment**

The PM<sub>10</sub> data measured by the Beta Attenuation Monitor (BAM) at the Yate automatic monitoring site have been adjusted to gravimetric equivalent by using a factor of 0.833.

## Appendix D: Supporting Technical Information

### Screening of potential pollution sources

The following potential pollution sources, as detailed in LAQM TG16, have been considered to identify whether there are any new or significantly changed sources, or any new exposure near existing sources, since the 2016 Annual Status Report.

### Road Traffic Sources

No additional road traffic sources have been identified. This includes the following:

- Narrow congested streets with residential properties close to the kerb
- Busy streets where people may spend 1 hour or more close to traffic
- Roads with a high flow of heavy duty vehicles
- Junctions
- New roads constructed or proposed since last review and assessment
- Roads with significantly changed traffic flows
- Bus and coach stations

However, in terms of traffic generating proposals, there are a number of large scale developments likely, some of which have already come forward. All significant developments have been or will be fully assessed through the planning system to ensure that the potential impacts on air quality are quantified and fully understood.

To update from the 2016 ASR, information on current major road transport projects in South Gloucestershire is included below.

### Metrobus

Metrobus is a joint project for the West of England region between South Gloucestershire Council, Bristol City Council and North Somerset Council to provide a rapid, high capacity public transport system by using a combination of segregated busways, bus lanes, priority at junctions and off-bus ticketing. Metrobus will speed up journey times, relieve congestion and reduce levels of pollution and the 50km Metrobus network will give people improved access to key employment, education



and leisure destinations. Construction works started in early 2015 and are nearing completion along the length of the route in South Gloucestershire.

Figure D.1 shows the completed new bridge over the M32 motorway which will facilitate a bus only junction onto the motorway when the Metrobus services start operating.



**Figure D.1 New Bridge Constructed over M32 Motorway**

The Metrobus services are expected to start in 2018. Euro VI as a minimum is being specified for the Metrobus vehicles for the first two years, then improvements on those standards moving forward.

In 2015, seven new diffusion tube monitoring sites (sites 152 – 158) were set up to monitor the potential impacts of the Metrobus scheme. The 2016 monitoring results show nitrogen dioxide concentrations to be well below the annual mean objective at all of these sites. The monitoring will continue and be reviewed as necessary. No further work is required at this stage.

Further information about Metrobus can be found on the Travel West website<sup>33</sup>.

### **Stoke Gifford Transport Link**

Construction of this new road, which runs from Parkway North in Stoke Gifford to the A4174 Ring Road at Harry Stoke, is nearing completion. This new road should

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<sup>33</sup> <http://travelwest.info/metrobus>

significantly ease congestion around Filton and Abbey Wood and forms part of the Metrobus network.

Monitoring of the potential impacts of the Metrobus Scheme, including the Stoke Gifford Transport Link, commenced in 2015. The monitoring will continue and be reviewed as necessary, for example if any new relevant exposure is introduced through residential development adjacent to road once it is completed and operational. Consequently, no further work is required at this stage.

## **Non-Road Transport Sources**

No additional non-road transport sources have been identified since the 2016 ASR. This includes the following:

- Airports
- Railways
- Ports
- Non-Road Mobile Machinery (NRMM)

To update from the 2016 ASR, the following information is included:

### **Electrification of Great Western Railway Line**

The Department of Transport announced plans to electrify the Great Western Main Line to Cardiff via Bristol Parkway, and to Bath and Bristol Temple Meads in March 2011<sup>34</sup>. A brand new fleet of Inter City Express trains were also given the go-ahead as part of the Intercity Express Programme (IEP). This will bring about faster journey times between Bristol and London. Electrified railways are quieter and more reliable than non-electrified railways and particularly benefit air quality as no air pollutants are emitted at the trackside because electric trains have zero emissions at the point of use.

The electrification project has been running behind schedule and is now due for completion in 2018/19.

Non-road mobile machinery (NRMM) was specified as a new potential pollution source in LAQM TG16. As a result of this, the example measures of how NRMM

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<sup>34</sup> <http://www.dft.gov.uk/news/press-releases/dft-press-20110301/>

emissions from construction sites may be minimised, as specified in paragraph 7.25 of LAQM TG16, are recommended as a planning condition to Planning Officers, where appropriate.

## **Industrial Sources**

Industrial sources include the following:

- Industrial Installations
- Major Petrol Storage Depots
- Petrol Stations
- Poultry Farms

Industrial sources are controlled by the Environment Agency (EA) and by local authorities under the Pollution Prevention and Control Regulations and through the Clean Air Act. Details of the EA permitted installations (Part A1) in South Gloucestershire are available on the EA website<sup>35</sup>. Details of the Part A2 and B installations permitted by South Gloucestershire Council are available on our website<sup>36</sup>.

There were three new Part B industrial process in 2016; a cement batching plant (Permit Ref. LAEP B 082), a mobile stone crushing plant (Permit Ref. LAEP B 083) and a printing premises (Permit Ref. LAEP B 084). These new processes were assessed as part of the permitting process and are not likely to give rise to significant pollution emissions.

One Part A2 industrial process ceased operating; a printing premises (LAEP A2 001) and one Part B industrial processes relocated; a dry cleaners (Permit Ref. LAEP DC 010).

No additional industrial sources in South Gloucestershire have been identified since the 2016 ASR other than the Severnside Energy Recovery Centre (see below).

### **Severnside Energy Recovery Centre (PT09/5982/F)**

Further to information provided in the 2016 ASR, the Severnside Energy Recovery Centre (SERC) began operating in December 2016 after a three year construction

<sup>35</sup> <https://environment.data.gov.uk/public-register/industrial-installations/registration?easting=&northing=&name-search=&number-search=&local-authority=South+Gloucestershire&address-search=&postcode=&dist=1>

<sup>36</sup> <http://www.southglos.gov.uk/documents/List-of-IPC-permits.pdf>

and commissioning programme. The SERC is regulated by the Environment Agency (Permit Ref: ZP3937KL).

SITA UK was granted planning permission to construct the energy from waste plant on land adjacent to Seabank Power Station and the former Terra Nitrogen plant at Severnside on appeal to the Secretary of State in September 2011.

The Severnside Energy Recovery Centre (SERC) has a consented capacity of 400,000 tonnes a year of non-recycled waste and will export around 34 megawatts of electricity, or enough to power the equivalent of 50,000 homes.

## **Commercial and Domestic Sources**

Commercial and domestic sources include the following:

- Gas-Fired CHP combustion – Individual Installations
- Biomass Combustion – Individual Installations
- Biomass Combustion – Combined Installations
- Other Solid Fuel Combustion

Apart from Biomass Combustion – Combined Installations, there were no new commercial and domestic sources identified in 2016, which required screening.

### **Biomass Combustion – Combined Installations**

Numerous small biomass combustion units, while acceptable individually, may have a cumulative impact on PM<sub>10</sub> concentrations. Some of South Gloucestershire is covered by a Smoke Control Area<sup>37</sup> which allows only approved fuels and appliances to be used.

The Council's Building Control Department collated the notifications of solid fuel equipment installations in South Gloucestershire during 2016 provided by HETAS; the official body recognised by the Government to approve solid fuel domestic heating appliances. The 2016 installations were considered in addition to the 2011 - 2015 installations to assess the cumulative impacts of the total known installations. Information on the type of fuel used was not available so it has been assumed that the installations could burn both biomass (wood) and other solid fuel. The installations were mapped using GIS (Geographical Information System). A 500m

<sup>37</sup><https://www.southglos.gov.uk/environment-and-planning/pollution/pollution-control-clean-air-act-approval/smoke-control-areas/>

grid was derived from this data and a total figure for PM<sub>10</sub> emission per year was calculated according to the guidance in Box 7.3 LAQM TG16. The appliance type was assumed to be a stove. The PM<sub>10</sub> emissions for the appliances were taken from the LAQM Tools Defra webpage<sup>38</sup>. The updated factors were applied retrospectively for all years considered. The fuel type was assumed to be biomass (wood) as this is the mostly likely fuel to be burnt, because the smoke control area only covers part of South Gloucestershire. Emissions per household were therefore 34.7 kg per year.

The emissions per 500m grid square were compared with the annual PM<sub>10</sub> emission threshold in the Biomass Emissions Screening Tool (v7) for combined Installations available on the LAQM Tools Webpage<sup>39</sup> which replaced the previously used nomogram 5.22 in LAQM TG(09). The 2016 maximum PM<sub>10</sub> background concentration in South Gloucestershire from the background maps is 18.05 µg/m<sup>3</sup>. Use of the maximum PM<sub>10</sub> background concentration for the whole district ensures a robust approach and maintains consistency with previous biomass combined installation screening assessments. The highest emitting grid square (with 33 appliances) is located in Staple Hill, adjacent to the AQMA. Using the assumptions above, this grid square would emit 1145 kg per year. From the screening tool, the threshold for the maximum 18.05 µg/m<sup>3</sup> background PM<sub>10</sub> concentration (as worse case) would be approximately 6359 kg PM<sub>10</sub> per year, so the actual emissions are estimated to be well below the threshold. Even if each appliance was assumed to be a stove with “other solid fuel” as the primary fuel; the worse-case scenario at 39 kg per year per household, the maximum grid would emit 1287 kg PM<sub>10</sub> per year, which is still well under the threshold.

Most of the addresses listed appear to be domestic properties. It is quite probable that there is under-reporting of the number of properties burning solid fuel or biomass, due to people not notifying Building Control of work to their property to enable this. However, the threshold emission rate is high enough for PM<sub>10</sub> to make this not a significant concern, although with the highest number of appliances located in a grid square adjacent to the AQMA, consideration will be given to including appropriate action(s) to reduce this potential pollution source in the review of the Air Quality Action Plan.

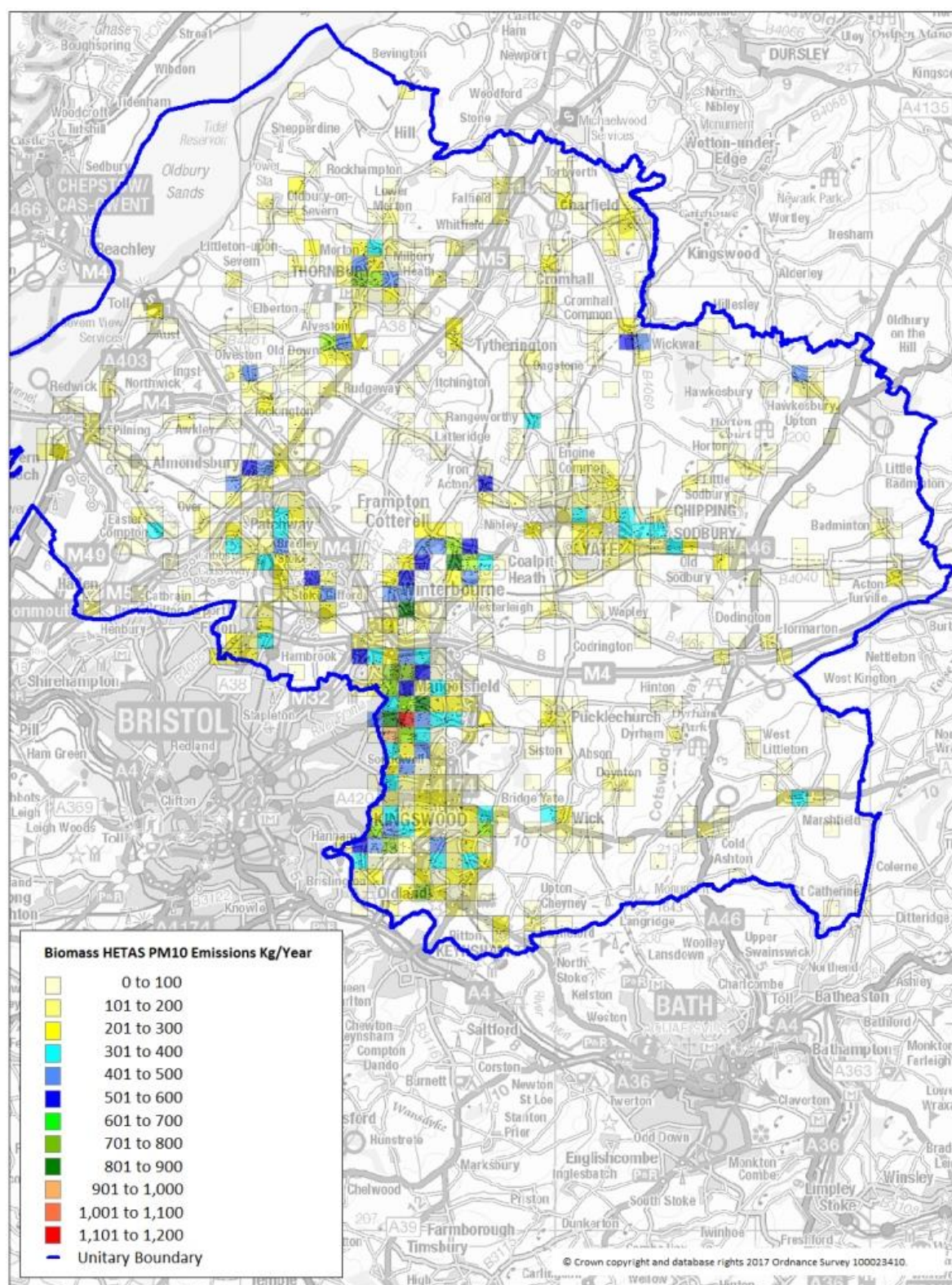
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<sup>38</sup> <http://laqm.defra.gov.uk/review-and-assessment/tools/combustion-emission-factors.html>

<sup>39</sup> <https://laqm.defra.gov.uk/review-and-assessment/tools/emissions.html#biomass>

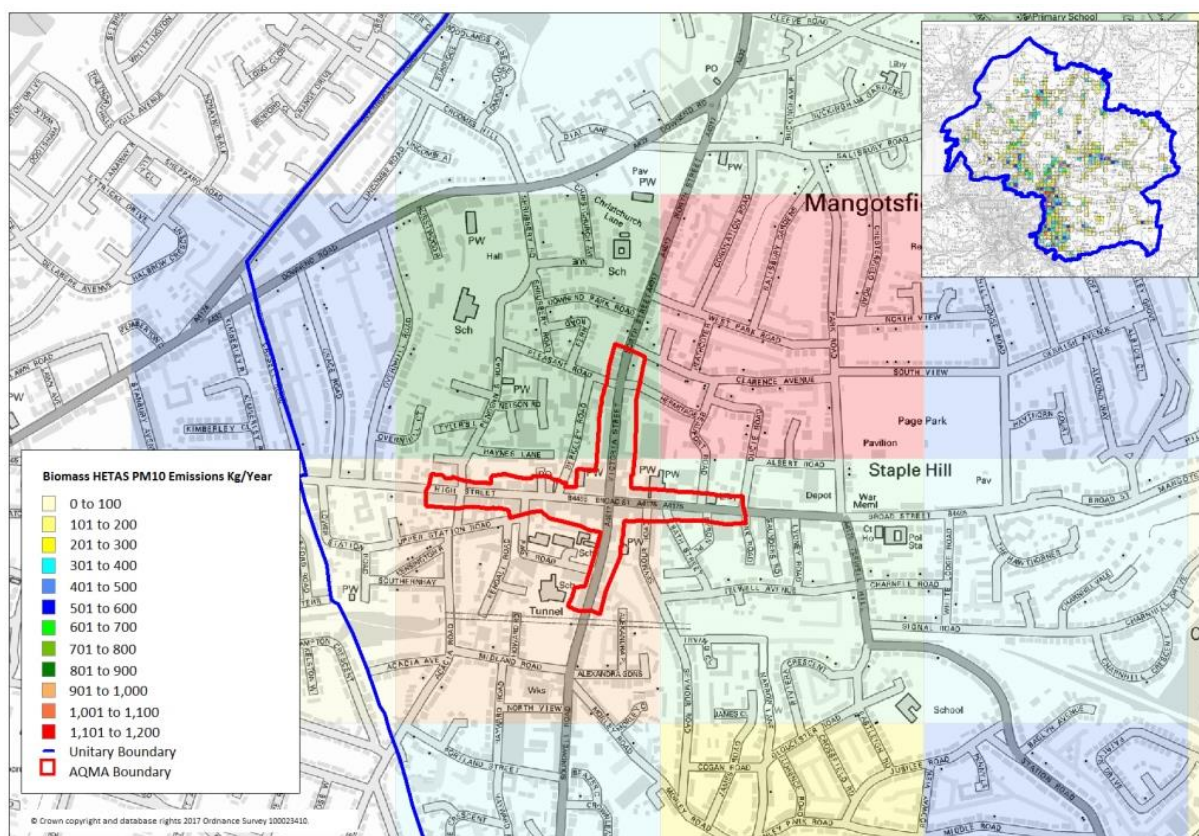


A map showing the individual solid fuel installations and PM<sub>10</sub> emissions (assuming biomass (wood) as the fuel) per 500m grid square is provided in Figure D.2. A Map showing the location of the highest emitting grid square, which is adjacent to the Staple Hill AQMA is provided in Figure D.3.



**Figure D.2 Individual Solid Fuel Installations and PM<sub>10</sub> Emissions per 500m Grid Square (Biomass as fuel)**





**Figure D.3 Location of highest emitting 500m Grid Square - Individual Solid Fuel Installations and PM<sub>10</sub> Emissions (Biomass as fuel)**

## Fugitive or uncontrolled sources

Dust emissions from a range of fugitive or uncontrolled sources can give rise to elevated PM<sub>10</sub> concentrations. Dust may arise from sources such as quarries, landfill sites, stockyards, construction sites and waste management sites, particularly from the handling of dusty materials, the passage of vehicles over unpaved roads, process dust, e.g. concrete cutting and wind-blown dust from stockpiles and dusty surfaces.

Fugitive emissions from quarries and landfill sites have been previously assessed and any complaints received are addressed under the procedures for permitted activities.

Dust Management Plans (DMPs), which are usually incorporated into Construction Environmental Management Plans (CEMPs), are routinely conditioned on major development planning permissions to control and minimise the risk of construction dust impacts on nearby sensitive receptors.

There were no new fugitive or uncontrolled sources identified in 2016.

## Appendix E: Maps of Monitoring Locations and AQMAs

### Maps of Current Air Quality Management Areas

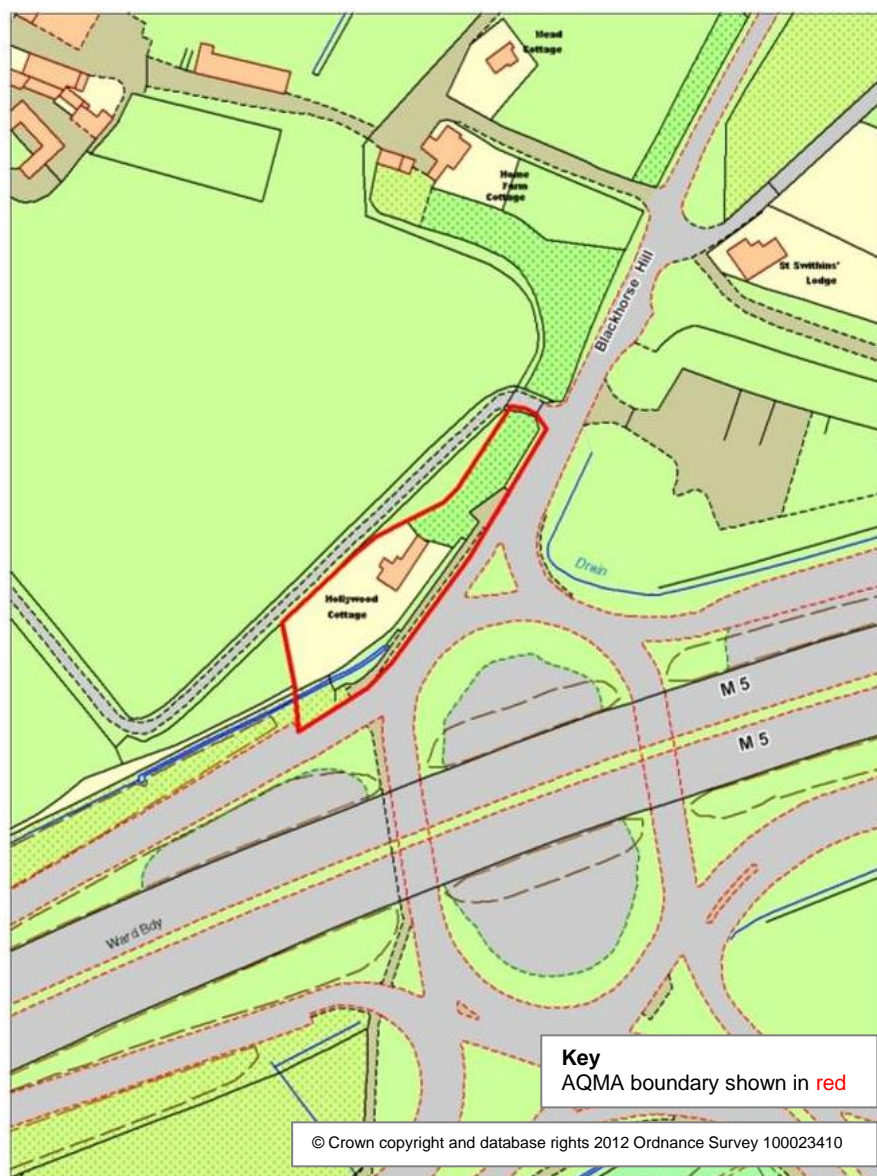


Figure E.1 Cribbs Causeway AQMA (Declared 2010)



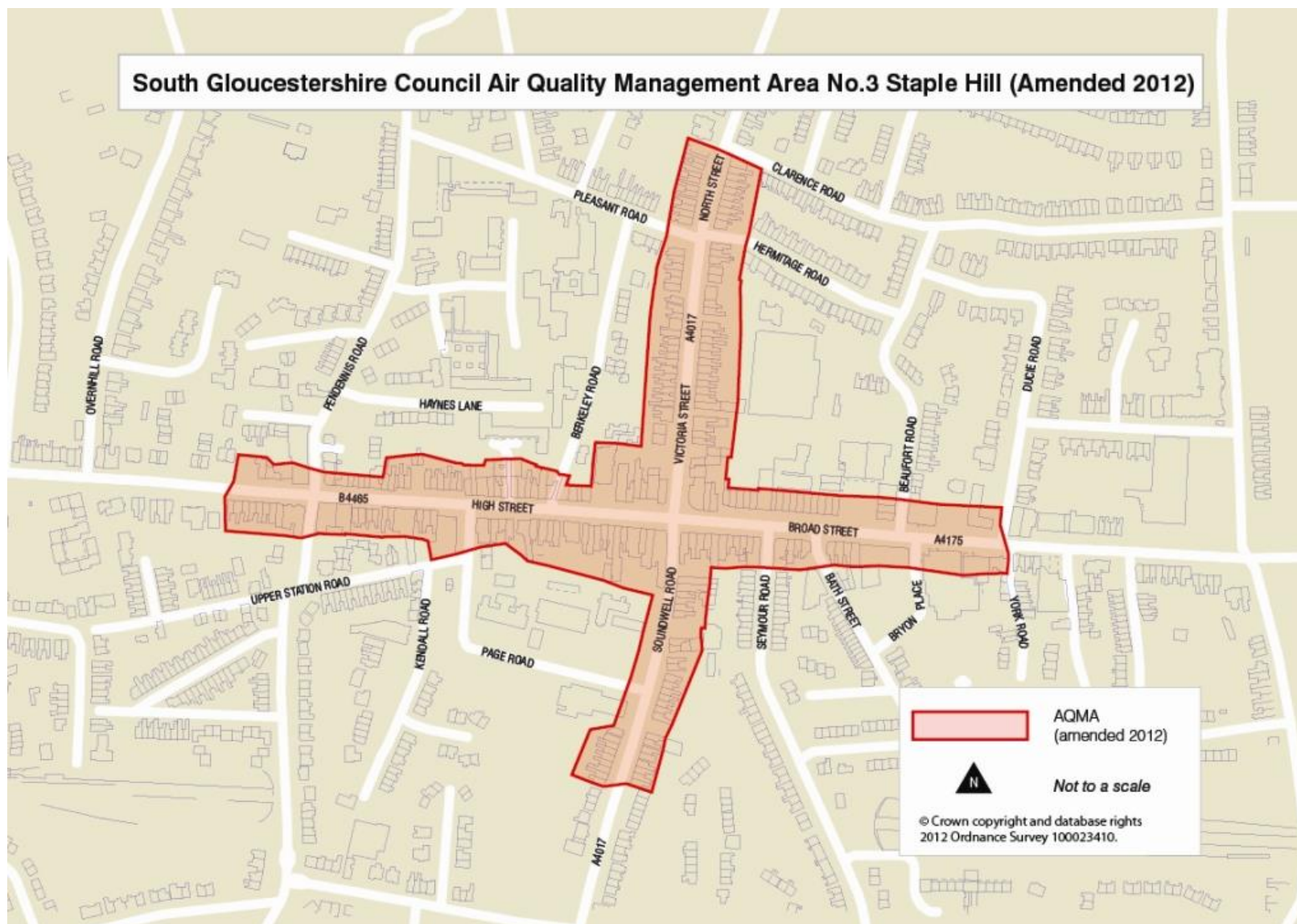
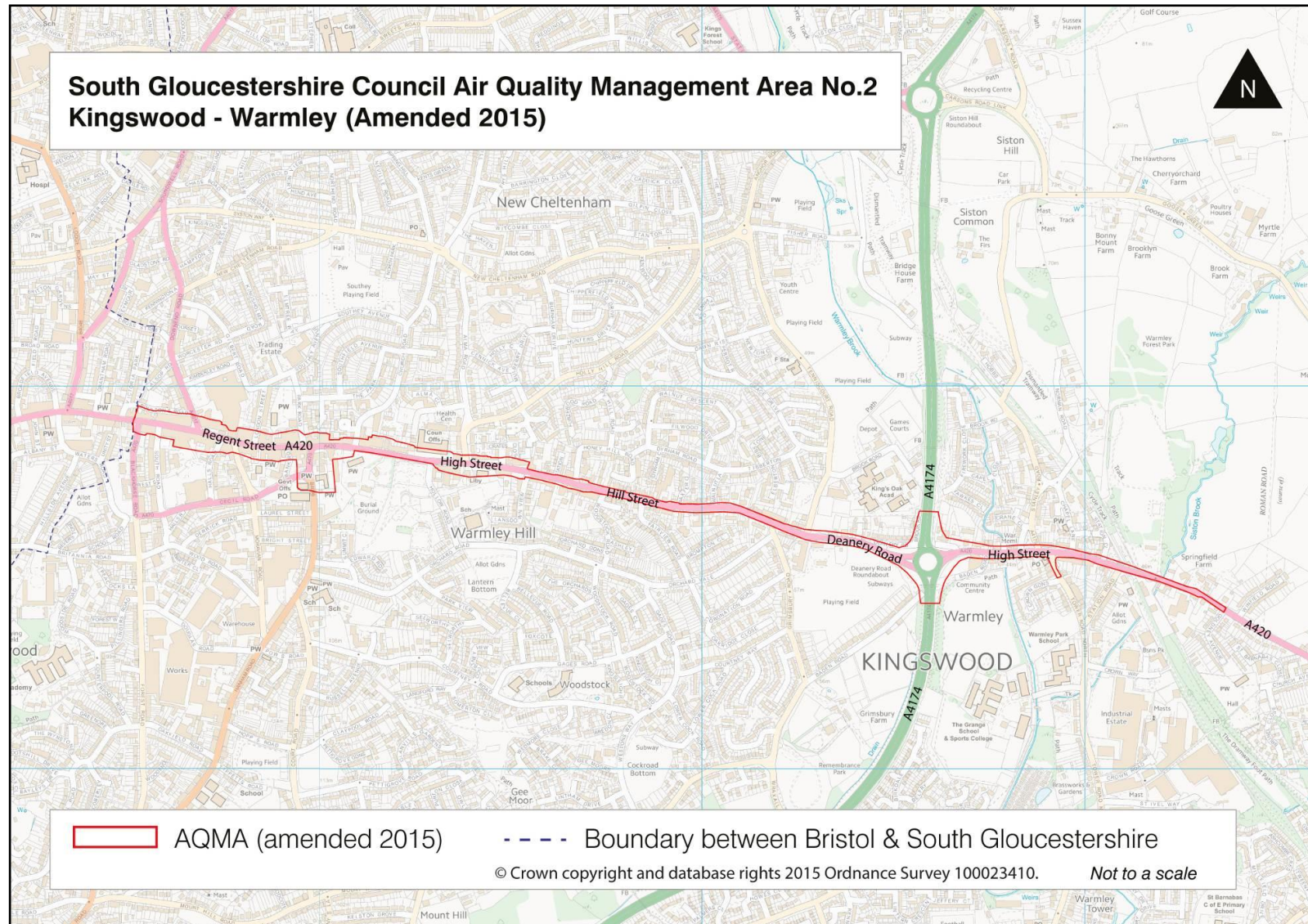


Figure E.2 Staple Hill AQMA (Amended 2012)





**Figure E.3 Kingswood – Warmley AQMA (Amended 2015)**

## Maps of Monitoring Locations

### Maps of Automatic Monitoring Site

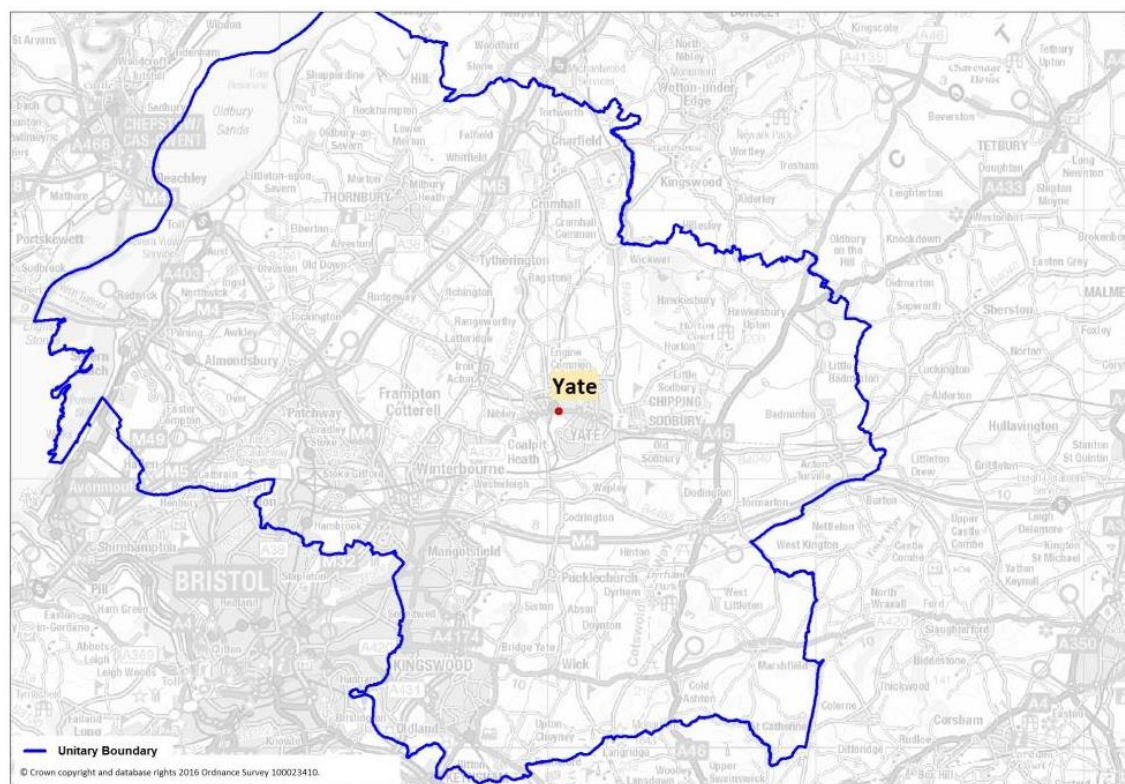


Figure E.4 Automatic Monitoring Site in South Gloucestershire – Yate

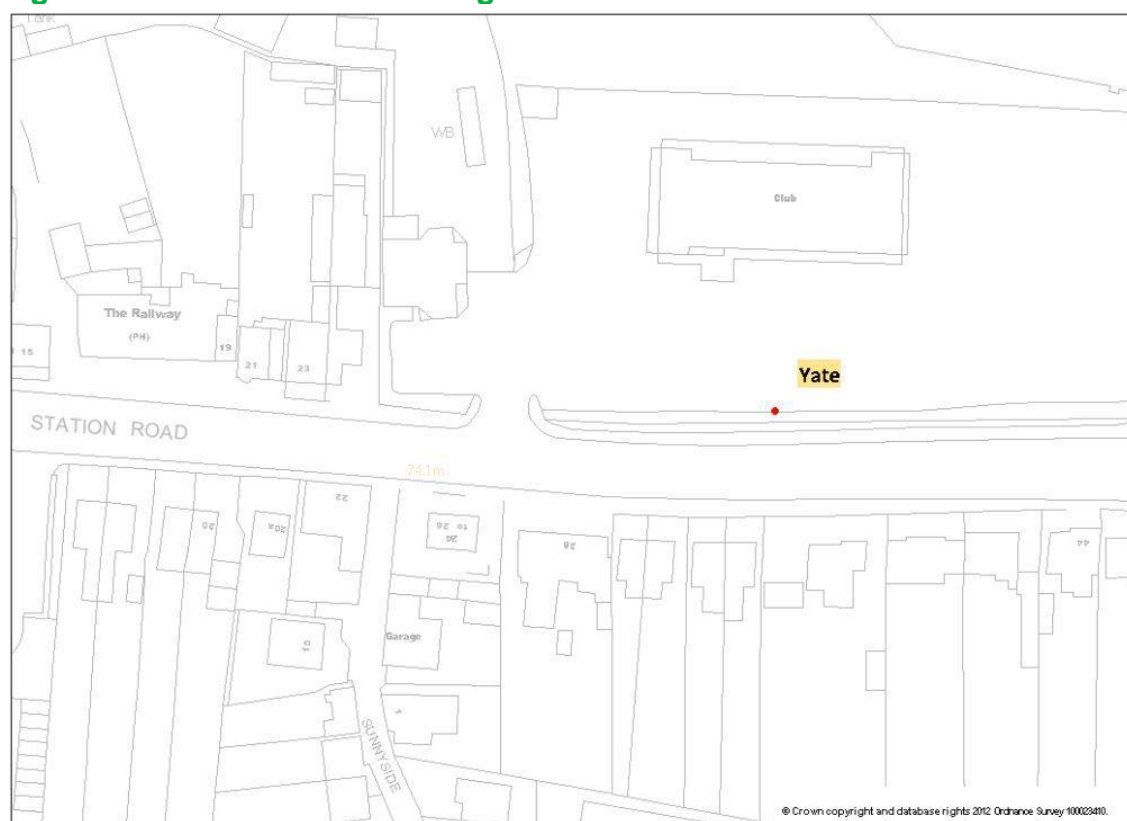


Figure E.5 Automatic Monitoring Site Yate - Station Road



# Maps of Diffusion Tube Monitoring Sites

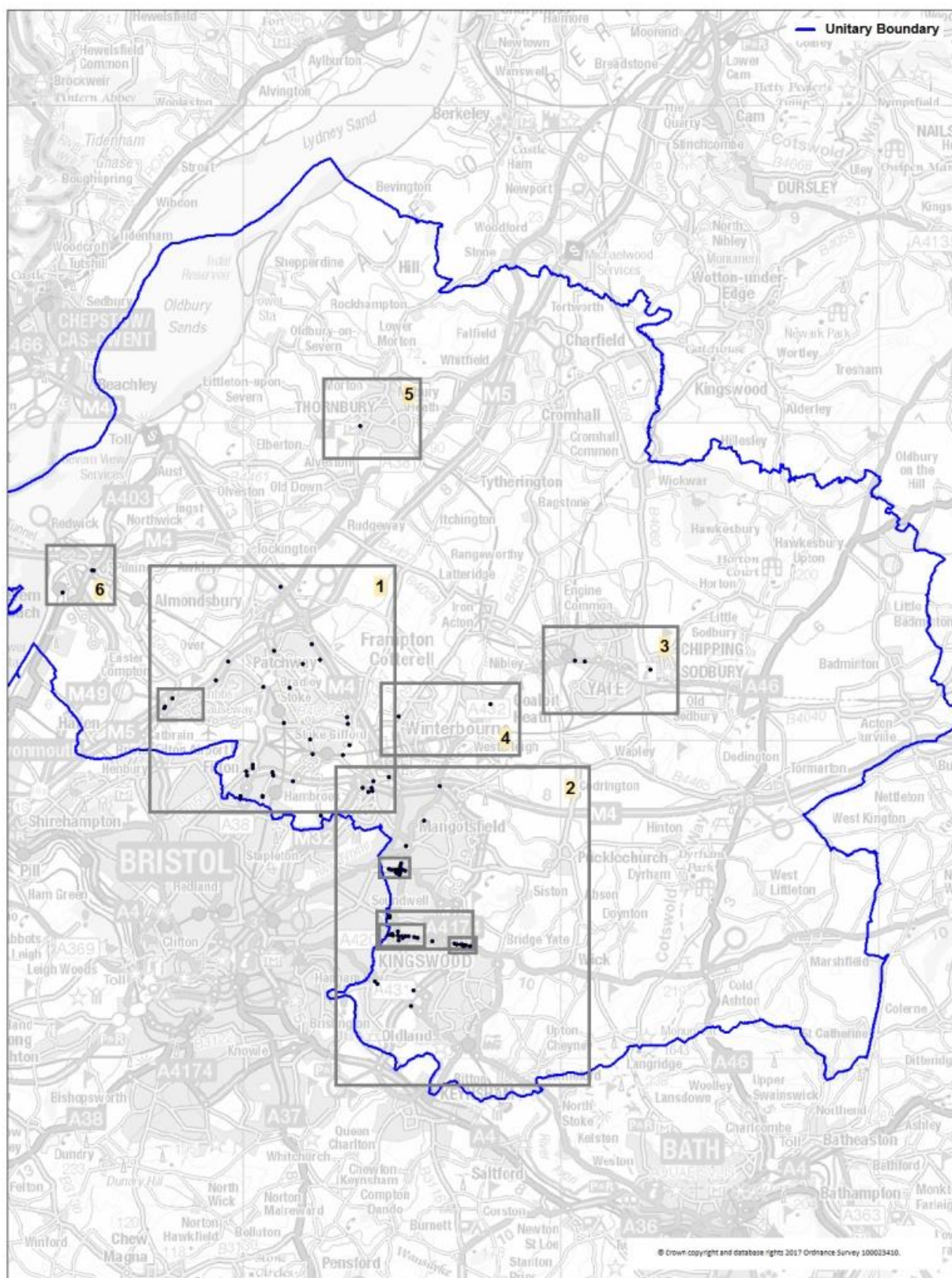


Figure E.6 All Diffusion Tube Sites showing locations of following Figures



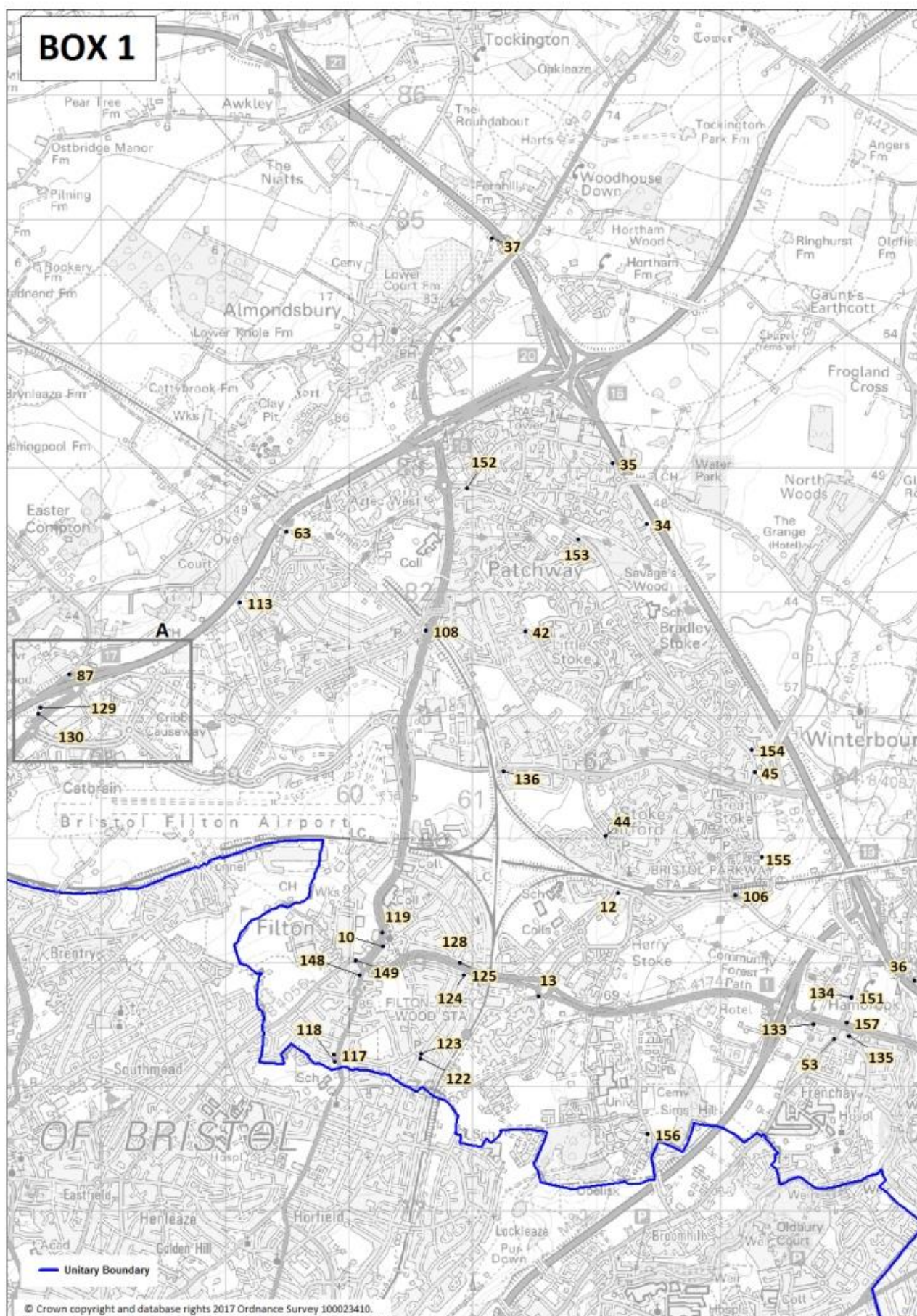


Figure E.7 Diffusion Tube Sites in Bristol North (Box 1 Figure E.6)

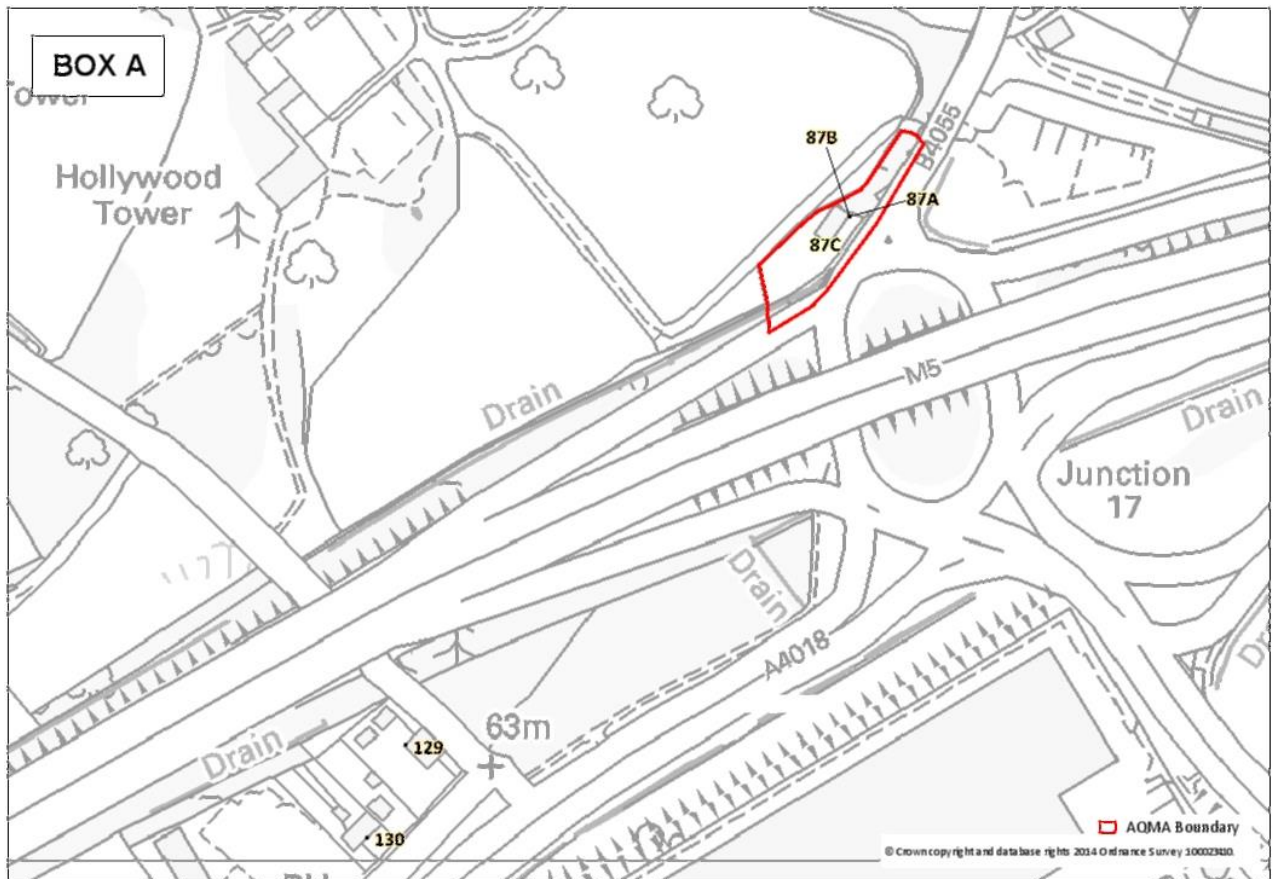


Figure E.8 Diffusion Tube Sites in Cribbs Causeway (Box A Figure E.7)



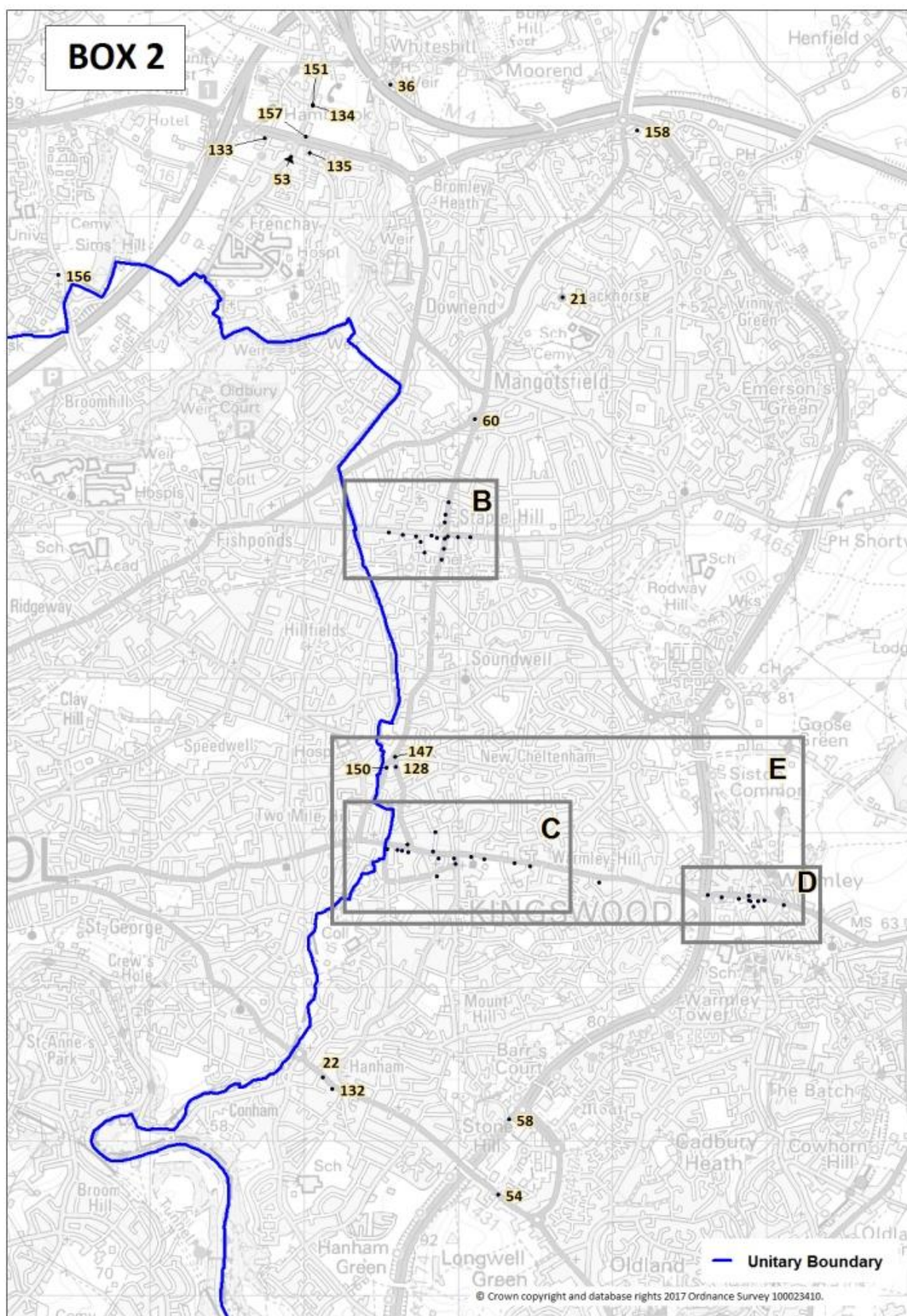


Figure E.9 Diffusion Tube Sites in Bristol East (Box 2 Figure E.6)



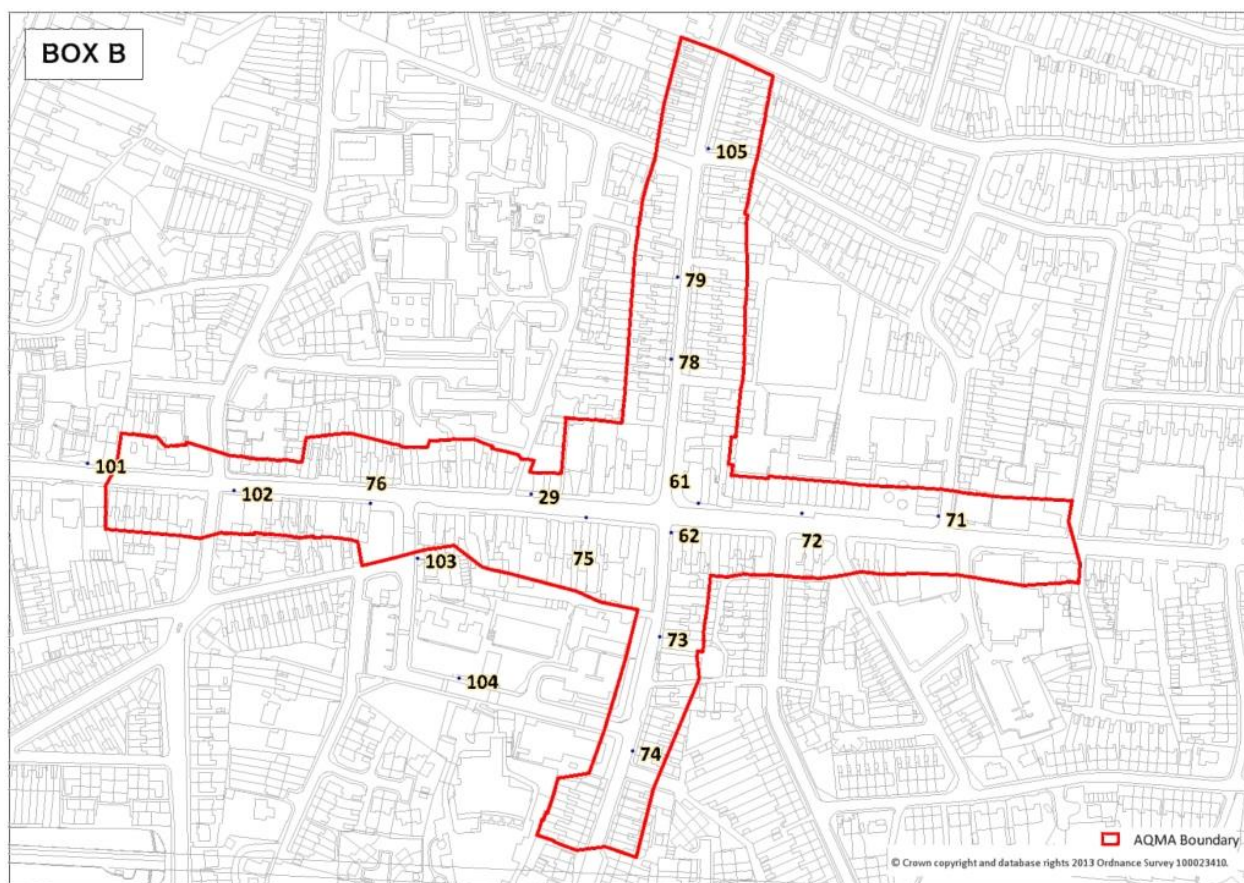


Figure E.10 Diffusion Tube Sites in Staple Hill (Box B Figure E.9)

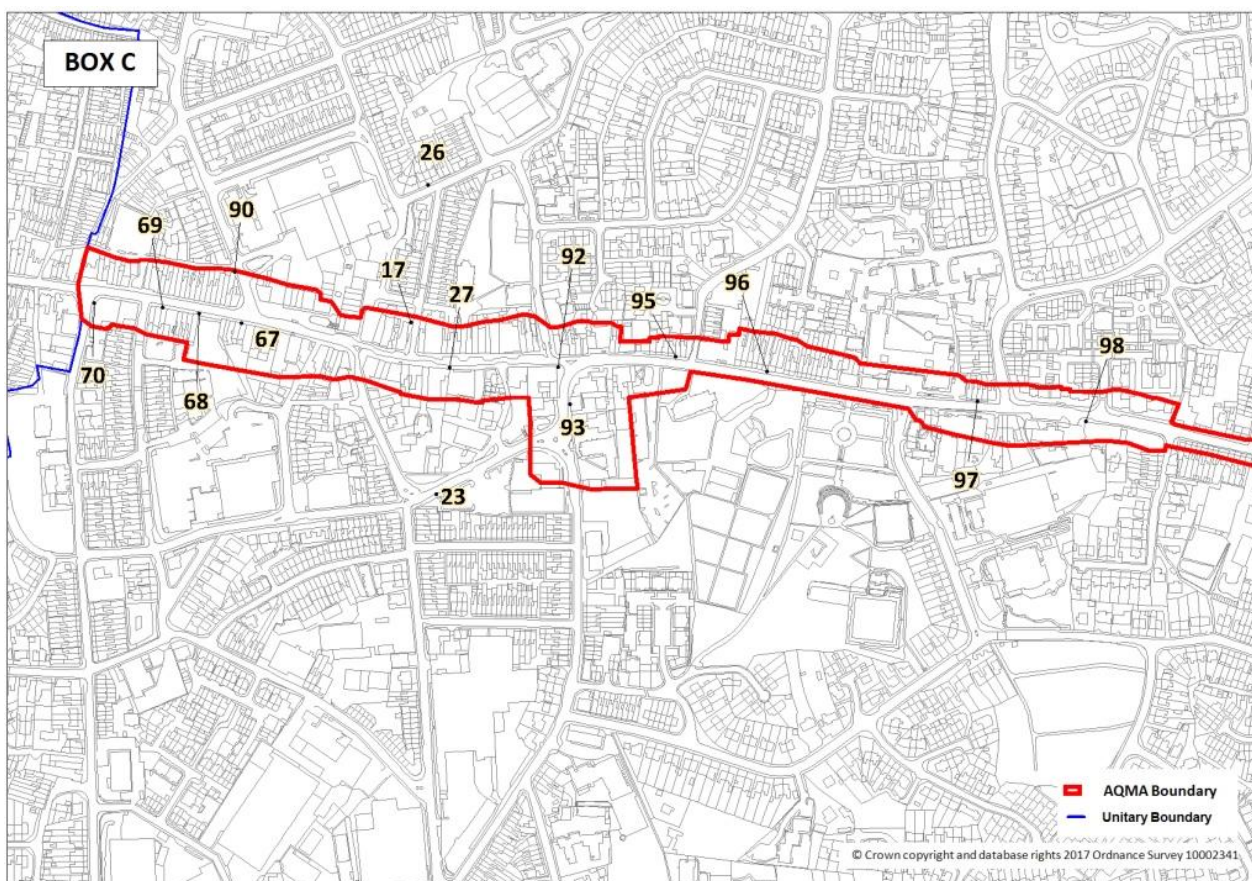


Figure E.11 Diffusion Tube Sites in Kingswood (Box C Figure E.9)



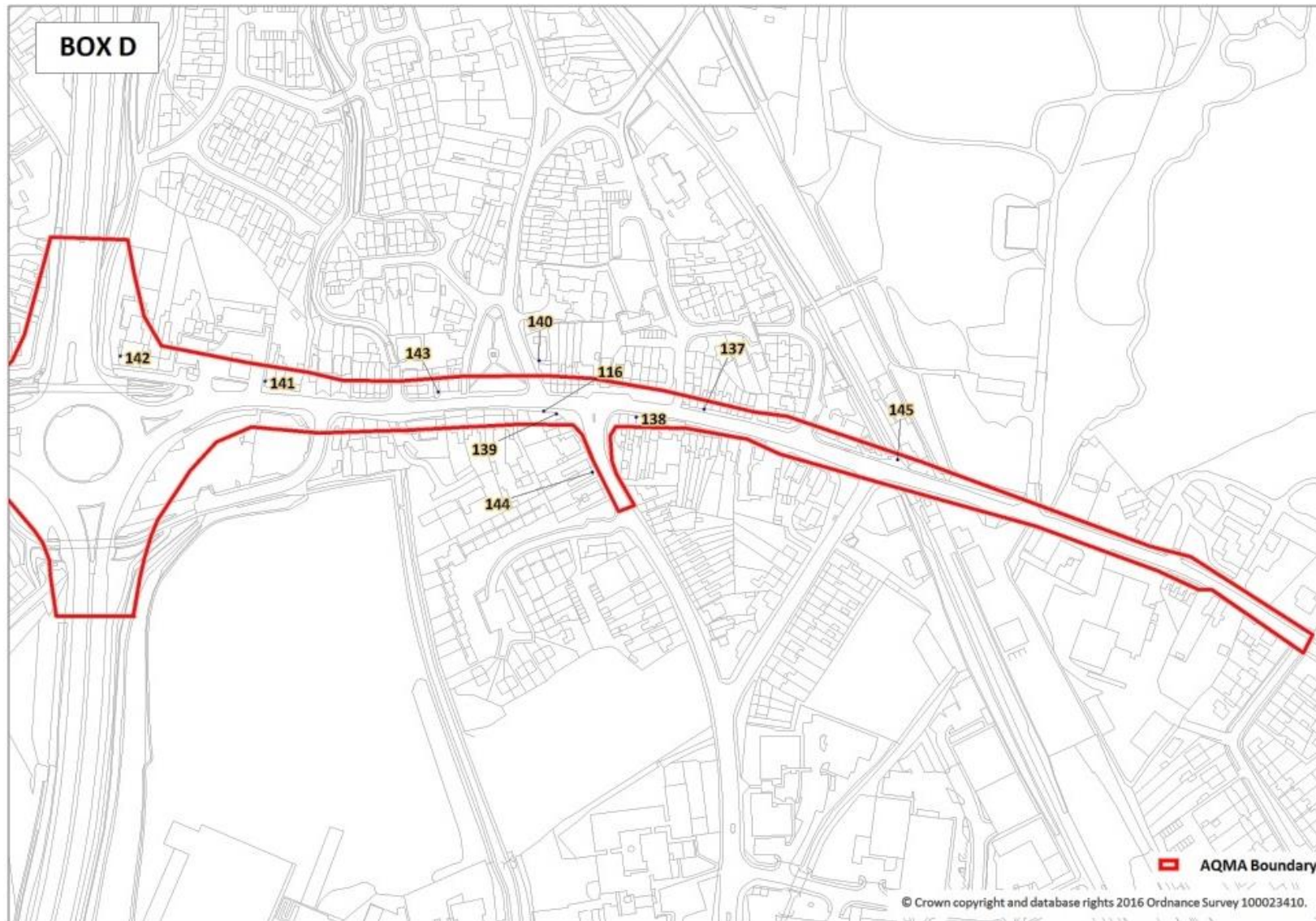


Figure E.12 Diffusion Tube Sites in Warmley (Box D Figure E.9)



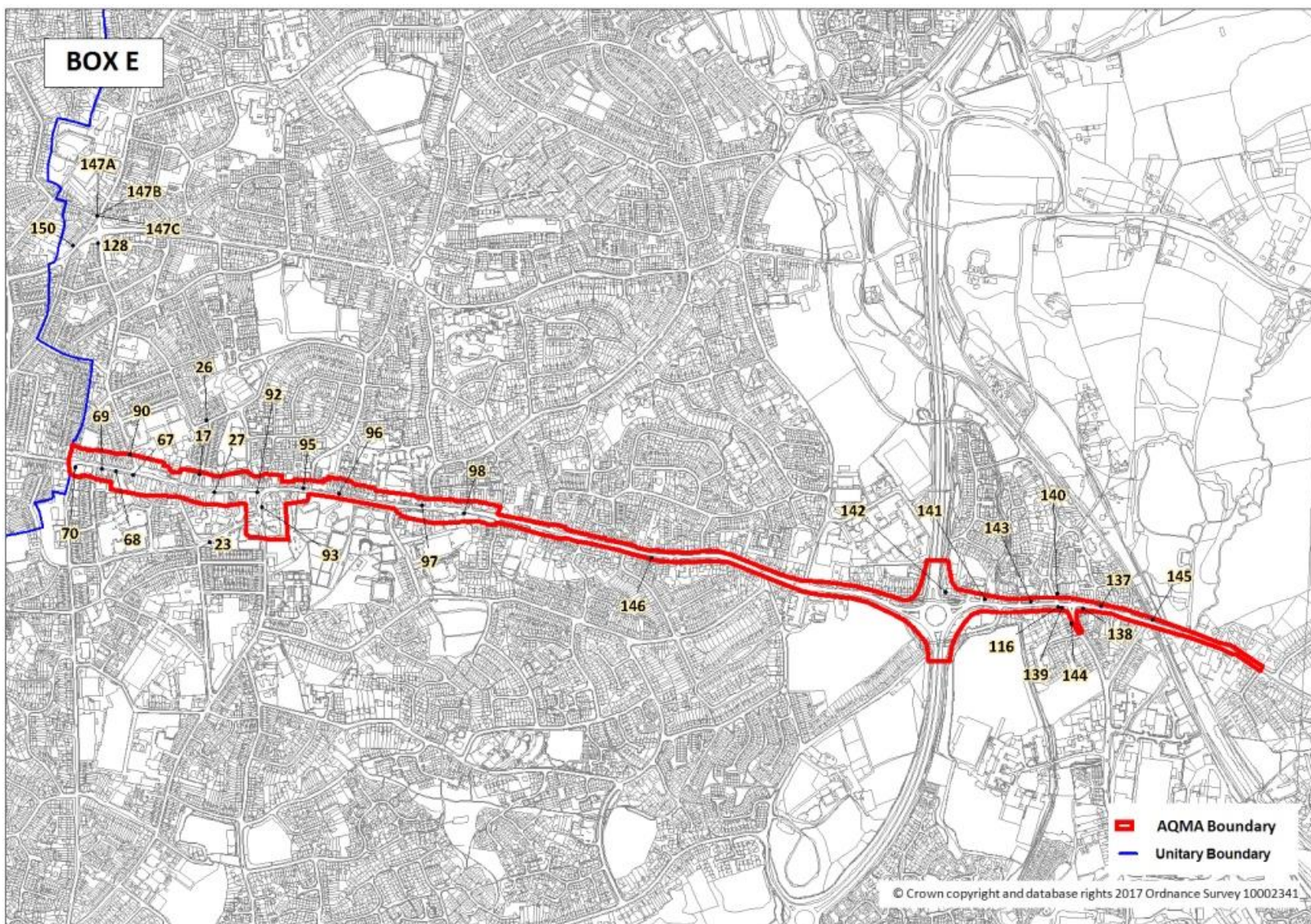


Figure E.13 Diffusion Tube Sites in Kingswood & Warmley (Box E Figure E.9)



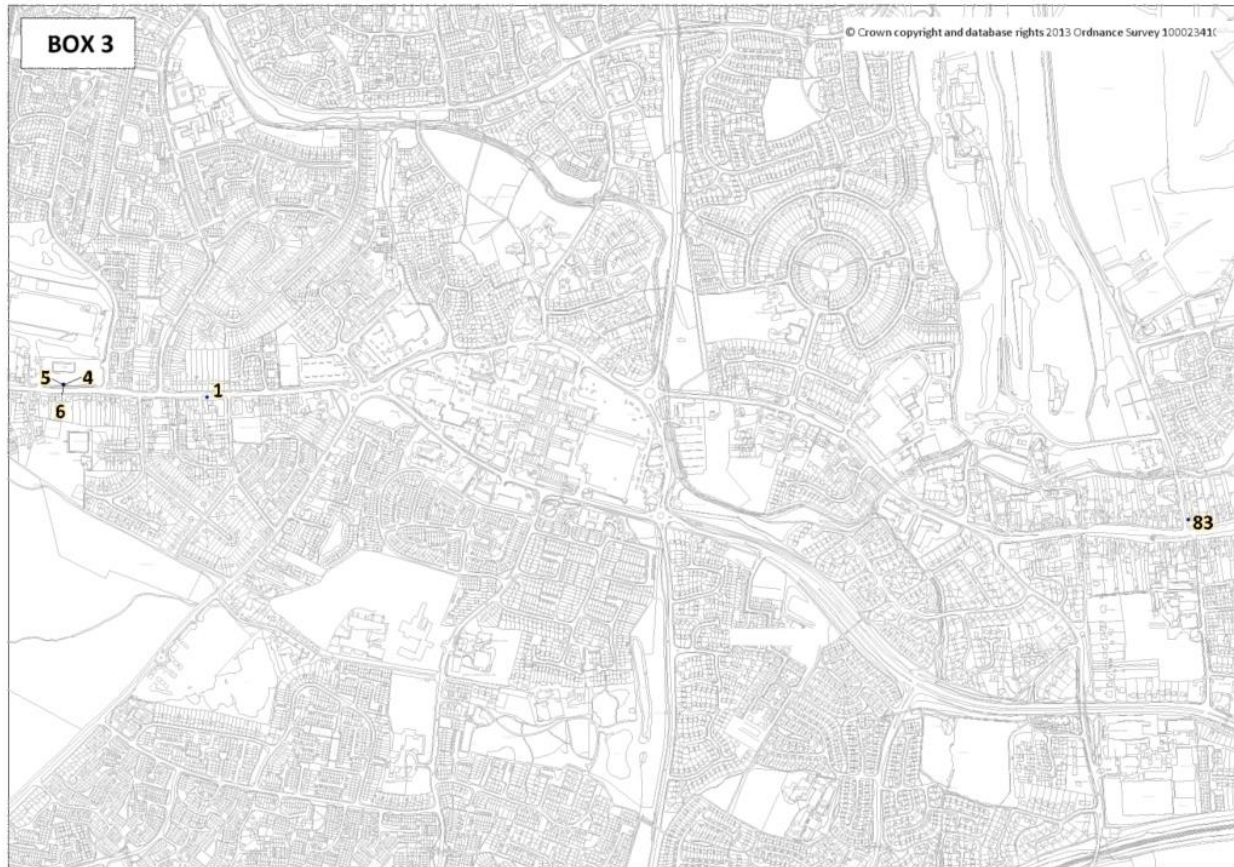


Figure E.14 Diffusion Tube Sites in Yate and Chipping Sodbury (Box 3 Figure E.6)



Figure E.15 Diffusion Tube Sites in Winterbourne & Coalpit Heath (Box 4 Figure E.6)



Figure E.16 Diffusion Tube Site in Thornbury (Box 5 Figure E.6)



Figure E.17 Diffusion Tube Sites in Severn Beach and Pilning (Box 6 Figure E.6)

## Appendix F: Summary of Air Quality Objectives in England

Table F.1 Air Quality Objectives in England

Pollutant	Air Quality Objective <sup>40</sup>	
	Concentration	Measured as
Nitrogen Dioxide (NO <sub>2</sub> )	200 µg/m <sup>3</sup> not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m <sup>3</sup>	Annual mean
Particulate Matter (PM <sub>10</sub> )	50 µg/m <sup>3</sup> , not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m <sup>3</sup>	Annual mean
Sulphur Dioxide (SO <sub>2</sub> )	350 µg/m <sup>3</sup> , not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m <sup>3</sup> , not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m <sup>3</sup> , not to be exceeded more than 35 times a year	15-minute mean

<sup>40</sup> The units are in microgrammes of pollutant per cubic metre of air (µg/m<sup>3</sup>).



## 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
AURN	Automatic Urban and Rural Network – a national automatic monitoring network
BAM	Beta Attenuation Monitor (for PM <sub>10</sub> measurement)
Defra	Department for Environment, Food and Rural Affairs
EU	European Union
Exceedance	A period of time where the concentration of a pollutant is greater than the appropriate air quality objective
JLTP	Joint Local Transport Plan
LAQM	Local Air Quality Management
NO <sub>2</sub>	Nitrogen Dioxide
NO <sub>x</sub>	Nitrogen Oxides
PM <sub>10</sub>	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
PM <sub>2.5</sub>	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO <sub>2</sub>	Sulphur Dioxide
WoE	West of England Authorities (Bath & North East Somerset, Bristol City Council, North Somerset and South Gloucestershire Council)
µg/m <sup>3</sup>	Microgrammes per cubic metre

## References

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- South Gloucestershire Council, 2011b. [Further Assessment of Air Quality in the Cribbs Causeway, Staple Hill and Kingswood AQMAs](#)
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- South Gloucestershire Council, 2014. [Detailed Assessment of Warmley A420 2014](#)
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- West of England, 2017. [Joint Spatial Plan](#)
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