2018 Air Quality Annual Status Report (ASR)

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

June 2018

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Executive Summary: Air Quality in Our Area

Air Quality in Woking Borough Council

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

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

Woking Borough Council (WBC) has completed all past rounds of Review and Assessment. This Annual Status Report (ASR) considers all new monitoring data and assesses the data against the Air Quality Strategy Objectives (AQOs). It also considers any changes that may have an impact on air quality. Progress on measures to improve air quality are identified, as well as WBC's approach to reducing emissions and/or concentrations of fine particulates ($PM_{2.5}$), which has increased focus in the ASR as a result of emerging evidence of the health impacts.

Dispersion modelling in the 2012 Detailed Assessment[4] identified predicted exceedances of the annual mean nitrogen dioxide (NO_2) AQO at the façade of properties at the top of Anchor Hill. Contour plots showed that concentrations at the three main housing blocks at the top of Anchor Hill exceeded the objective or were within 10% of the objective. Due to the historical trend of high pollution levels at this location and the modelled exceedances it was recommended that WBC declared an Air Quality Management Area (AQMA) as a result of exceedances of the annual mean NO_2 AQO at Anchor Hill.

[1] Environmental equity, air quality, socioeconomic status and respiratory health, 2010
[2] Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006
[3] Defra. Abatement cost guidance for valuing changes in air quality, May 2013
[4] Bureau Veritas. Woking Borough Council Anchor Hill LAQM Detailed Assessment, October 2012

Based on the results of the Anchor Hill Further Assessment in January 2015[5] it was recommended that the AQMA should remain in place as both monitoring and modelling results show that although in some places the objective was being achieved, concentrations in some places were above the AQO.

An Air Quality Action Plan (AQAP) was produced for the Anchor Hill AQMA in July 2015[6]. The plan determined that the upgrade of traffic signals at the Anchor Hill junction is likely to improve traffic flow and reduce NO_2 concentrations so that the annual mean AQO is no longer exceeded in the AQMA. The progress towards compliance is currently being tracked using monitoring data collected by WBC and being reported in the ASRs. The AQMA will be revoked when monitoring results from three consecutive years show no exceedances of the AQO, so that a permanent improvement in air quality can be demonstrated. NO_2 levels complied with the AQO at every Anchor Hill monitoring site in 2016 and 2017 as shown in this report.

Exceedances of the annual mean AQO for NO_2 were recorded in 2012, 2013, 2014 and 2015 at diffusion tubes located at Guildford Road. Additional monitoring in the area around Guildford Road commenced in 2014 and recorded exceedances of the AQO at five locations in 2015. A Detailed Assessment was carried out in November 2016 for the junction between Guildford Road, Constitution Hill and Mount Hermon Road. This assessment indicated that concentrations at some receptor locations with relevant exposure were exceeding the AQO because of road traffic emissions around Guildford Road. It was recommended that an AQMA should be declared on Guildford Road. Further monitoring was recommended around the junctions where Guildford Road meets York Road and Station Approach to confirm if the NO_2 annual mean AQO is exceeded where there is relevant exposure. Consequently, the Guildford Road AQMA was declared in May 2017.

The 2017 ASR[7] determined that monitoring and analysis of concentrations at all locations included in the monitoring programme should continue, with specific consideration on Anchor Hill and Guildford Road.

[5] Amec Foster Wheeler Environment & Infrastructure UK Ltd. Air quality further assessment for Woking Borough Council, May 2015
[6] Amec Foster Wheeler Environment & Infrastructure UK Ltd. Woking Borough Council – Anchor Hill AQMA – Air Quality Action Plan, 2015
[7] Amec Foster Wheeler Environment & Infrastructure UK Ltd. 2017 Air Quality Annual Status Report, May 2017

Annual mean NO_2 concentrations in Guildford Road AQMA were exceeding the AQO at four sites in 2016 and at two sites in 2017. However, following distance correction to the nearest relevant exposure, all concentrations were below the AQO in 2016 and 2017. In 2017 the highest annual mean NO_2 concentration predicted at a location of relevant exposure following distance correction was 30.7 μgm^{-3} (diffusion tube CH).

Local Highways have advised that the particularly high NO_2 concentrations monitored in the Guildford Road area in 2015 were likely to be due to roadworks in the Town Centre causing diversions in the area, which resulted in increased traffic along Guildford Road. WBC have confirmed that there is likely to be increased development occurring in the Town Centre over the next few years and therefore concentrations around Guildford Road are likely to vary but remain high during times of traffic diversion. It is recommended that the Guildford Road AQMA remain until there is evidence over three consecutive years that concentrations are below the AQO at relevant receptor locations.

Actions to Improve Air Quality

The Further Assessment of the Anchor Hill AQMA included recommendations to improve air quality at the junction. As a result of the recommendations, Surrey County Council (SCC) have updated the Traffic Signals in operation at the junction of Anchor Hill and High Street, Knaphill. In August 2016, a Microprocessor Optimised Vehicle Actuation (MOVA) scheme was introduced on Anchor Hill. No data on the effects that this has had is available yet, however no exceedance of the NO_2 AQO were recorded in 2016 and in 2017 in Anchor Hill AQMA.

Following declaration of Guildford Road AQMA in May 2017, an AQAP was prepared. Measures included were focused on managing the increase in traffic that may be diverted down the road, as increased development is anticipated in this area in future years.

Conclusions and Priorities

WBC has declared two AQMAs at Anchor Hill and Guildford Road as a result of exceedance of the annual mean NO_2 AQO. Although 2016 and 2017 monitoring results indicate that the NO_2 AQO are not exceeded at relevant locations in the AQMAs, these remain the main priority locations for improving air quality.

The priorities for WBC following this ASR are as follows:

- Continue monitoring of NO_2 to confirm if concentrations remain below the annual mean AQO at locations of relevant exposure and in the Anchor Hill and Guildford Road AQMAs.

Local Engagement and How to get Involved

The following sources of information are available on WBC's website for improving air quality in the borough and seeking further information:

- List of AQMAs in the borough: https://www.woking.gov.uk/airquality
- The Air Quality Action Plan for the Anchor Hill AQMA: http://aqma.defra.gov.uk/action-plans/woking-borough-council_aqap_final.pdf
- airAlert service warning local residents who have respiratory problems of whenever the air pollution in Woking is going to be high. This is a free subscription service which individuals, who suffer from asthma, COPD, emphysema or other respiratory illnesses, can sign up to, and they will receive either an email, text message or voicemail giving an advanced warning of high pollution levels: http://airalert.info/Surrey/Default.aspx

Table of Contents

List of Tables

List of Figures

1 Local Air Quality Management

This report provides an overview of air quality in Woking Borough during 2017. 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 Woking Borough Council (WBC) to improve air quality and any progress that has been made.

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

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an Air Quality Objective (AQO). 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.

A summary of AQMAs declared by WBC can be found in Table 2.1. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=317. Alternatively, see Appendix D: Map(s) of Monitoring Locations and AQMAs, which provides for a map of air quality monitoring locations in relation to the AQMAs.

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		
						At Declaration	Now	Name	Date of Publication	Link
AQMA for Anchor Hill	01/02/2014	NO_2 Annual Mean	Knaphill, Woking	A small area covering a 4-way junction at the top of a steep hill.	NO	41.5 µg/m^3	34.6 µg/m^3 (distance corrected)	Anchor Hill Air Quality Action Plan	2015	http://aqma.defra.gov.uk/action-plans/woking-borough-council_aqap_final.pdf
AQMA Order 2 Guildford Road AQMA	15/05/2017	NO_2 Annual Mean	Woking	AQMA incorporates a small section of Guildford Road to the south of Constitution Hill junction and to the north of the Junction with Ashdown Close.	NO	42.2 µg/m^3 (modelled)	30.7 µg/m^3 (distance corrected)	Guildford Road AQMA Air Quality Action Plan	2017	Not yet available

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

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

Defra's appraisal of the 2017 ASR suggested that maps of the monitoring locations within each AQMA should be included. It was also suggested that graphs of the trends of NO_2 monitored at the diffusion tubes within the AQMAs should be included. These suggestions have been taken into consideration and the graphs and maps have been included in Appendix A and D respectively.

WBC has taken forward a number of direct measures during the current reporting year of 2017 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 WBC's Anchor Hill AQAP and Guildford Road AQAP as well as in the Surrey Transport Plan: Air Quality Strategy[8]

WBC works in line with the Surrey Transport Plan (LTP3). A twin-track strategy is proposed to address air quality in Surrey County Council (SCC), which focuses on AQMAs and synergies with other strategies to deliver countywide air quality improvements. Measures to improve air quality are included in a "Strategy Toolkit" within the Air Quality Strategy.

Key completed measures are:

- Installation of a Microprocessor Optimised Vehicle Actuation (MOVA) system in August 2016 at the junction between Anchor Hill and High Street. This measure will likely have an impact on NO_2 levels from road traffic in the Anchor Hill AQMA.
- Improvement of cycling and walking infrastructure. These measures will likely reduce road traffic congestion and improve air quality.

Additionally, 11 local authorities across Surrey and the SCC, including public health professionals, have set up an Air Quality Alliance. The Surrey Air Alliance (SAA) is working on a Surrey Action Plan. The alliance is also planning dispersion modelling of $PM_{2.5}$ and NO_2 concentrations across the borough, which will identify the sources

[8] Surrey County Council. Surrey Transport Plan Air Quality Strategy. January 2016

of these pollutants. This will help develop target measures to reduce pollution from the relevant sources.

WBC anticipates that the measures stated above and in Table 2.2 will achieve compliance in the Anchor Hill and Guildford Road AQMAs.

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, WBC anticipates that further additional measures not yet prescribed will be required in subsequent years to achieve compliance and enable the revocation of the Anchor Hill and Guildford Road 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
1	Urban Traffic Management and Control (UTMC)	Traffic Management	UTC, Congestion Management, Traffic Reduction	SCC / WBC	2015	2015	Restrain or reduce traffic volumes in AQMA	Y	MOVA installed and in operation since August 2016 at the busy junction in the Anchor Hill AQMA.	01/08/2016	N/a
2	New and/or improved cycle lane and track	Transport Planning & Infrastructure	Cycle Network	SCC / WBC	N/a	2008 - 2011	Restrain or reduce traffic volumes in AQMA	Y	Shared cycle and pedestrian path, West Byfleet recreation ground. Additional bicycle pump stands and cycle parking in Woking Town Centre and cycle stands donated to other local premises (leisure centre, the Mosque, day centres). Footpath link created between the Hoe Valley Scheme path and the playground at Willow Reach (the former Westfield Tip development site). Disabled ramp to fishing platform at Goldsworth Park. Existing shared path 19, Horsell has been widened, surfaced and landscaping and low level lighting added. Surrey County Council's website provides information on cycle and walking improvements in Woking completed by March 2016 (www.travelsmartsurrey.info/achievements/cycling-and-walking-improvements-in-	Ongoing	N/a
3	New and/or improved cycle track	Transport Planning & Infrastructure	Cycle Network	SCC / WBC	N/a	2008 – 2011	Restrain or reduce traffic volumes in AQMA	Y		Ongoing	N/a

									Surrey). In addition, a new cycle path will link the Broadway, Albion Square, High Street and the new link road in Woking. Town Centre Engineering team have fitted additional stainless steel cycle racks on Gloucester Walk and Commercial Way.		
4	Cycle parking	Transport Planning & Infrastructure	Cycle Network	SCC / WBC	N/a	2008 - 2011	Restrain or reduce traffic volumes in AQMA	Y	Various improvements made under Cycle Woking 2008 – 2011. In 2015 the Cycle Hub was installed at Woking station providing storage for over 200 cycles and encouraging cycle / rail integration. New cycle storage compound implemented at Brookwood station in 2016. These storage facilities have been funded by Department for Transport funding secured by South West Trains together with WBC S106 funding contributions.	01/08/2016	N/a
5	Cycle infrastructure and storage improvement	Transport Planning & Infrastructure	Cycle Network	WBC/SCC	2018	N/a	Restrain or reduce traffic volumes in AQMA	Y	Further cycle infrastructure and storage improvements planned as part of the Woking Integrated Transport Project including improved cycle links to Woking Railway Station. (https://www.woking.gov.uk/planning/majordevelopments/wokingitp) Bid package to be submitted to EM3 at the end of June 2018. A planning application has been submitted for the erection of a new pedestrian/cycle bridge and walkway over the Basingstoke canal next to the Chobham Road Bridge, including re-alignment works linking the existing towpaths over the canal and associated landscaping. This will provide part of a strategic cycle route. See application reference PLAN/2017/1226.	Ongoing	N/a

6	Park and ride	Alternatives to Private Vehicle Use	Bus based Park & Ride	SCC / WBC	N/a	2012	Restrain or reduce traffic volumes in AQMA	Y	Following on from Cycle Woking, Surrey County Council's TravelSmart initiative won further Department for Transport Local Sustainable Transport Fund monies for the period from 2012 until 2015, with over £18 million to spend on schemes like improving and installing cycle lanes, investing in interactive and live travel information and encouraging and supporting more people in travelling sustainably. To deliver its programme of improvements, Travel SMART worked closely with borough councils, residents, community groups and businesses. (https://www.travelsmartsurrey.info/about)	Ongoing	N/a
7	Park and stride	Alternatives to Private Vehicle Use	Other	SCC / WBC	N/a	2012	Restrain or reduce traffic volumes in AQMA	Y		Ongoing	N/a
8	Infrastructure to support the use of hybrid/electric vehicles	Traffic Management	Other	SCC / WBC	N/a	2015	Reduce tailpipe emissions in AQMA	Y	The Council currently has 18 Electric Vehicle (EV) charging points focused in Woking Town Centre. There is currently much change in national Government policy and market developments around EVs and EV infrastructure. In this context, officers have prepared a position statement taking account of emerging policy and market changes in order to inform next steps. (http://www.woking.gov.uk/transport/parking/carparks/chargepoints)	Ongoing	N/a
9	Car clubs	Alternatives to private vehicle use	Car Clubs	SCC / WBC	N/a	N/a	Restrain or reduce traffic volumes in AQMA	Y	The Council has a car club arrangement with Enterprise Rent A Car Ltd for staff business use – the CarShare scheme – see more info on 'ewokplus'. Enterprise recently acquired City Car Club who recently won the contract to operate Surrey County Council's car club scheme that is also available for the public. In Woking, there are cars available in Guildford Road and at Quadrant Court.	Ongoing	N/a

									(https://www.travelsmartsurrey.info/driving/car-clubs)		
10	Workplace travel planning	Promoting Travel Alternatives	Personalised Travel Planning	SCC / WBC	N/a	N/a	Restrain or reduce traffic volumes in AQMA	Y	The Council has its own Staff Transport Plan including various initiatives to encourage alternative modes of transport to the car. Criteria has been applied to lease cars in order to lower emissions and air pollution associated with this fleet. Environmental standards also apply to cash alternative vehicles.	Ongoing	N/a
11	Differential parking charges	Traffic Management	Emission based parking or permit charges	SCC / WBC	N/a	N/a	Reduce tailpipe emissions in AQMA	Y	Differential parking charges. The cost of a season ticket is based on a vehicle's CO2 emission rating (determined by the Vehicle Certification Agency). A 50% discount is applied for vehicles that produce the lowest emissions (CO2 band A) and a 25% discount for band B vehicles. Those with a band G rating (the highest band) pay a 25% surcharge. (http://www.woking.gov.uk/transport/parking/season)	Ongoing	N/a
12	Encourage boroughs and districts to consider adopting minimum emissions standards or vehicle	Promoting Low Emission Transport	Taxi Licensing conditions	SCC / WBC	N/a	2014	Reduce tailpipe emissions in AQMA	Y	With effect from the 4th of January 2014, WBC have required all Private Hire Vehicles and all non-wheelchair compliant Hackney Carriages to meet the Euro Emissions V (five) Criteria. As wheelchair accessible vehicles tend to be larger and more van-like, it is unrealistic for us to expect them to meet the low emissions criteria. However – there are at least 540 private hire vehicles in Woking – all of which are at least Euro Emissions V (five). Some even are Euro Emissions VI (six). Euro Emission Standard VI (six) has been applied to manufactures of new vehicles from September 2014 and they are given	Ongoing	N/a

	age restrictions into taxi licensing procedures								12 months to comply. This means that from September 2015 no new vehicle (passenger car) should be being produced that is not Euro VI. Our policy is stating that as Euro Emissions VI (six) is to be applied to manufacturers from September 2014, it will therefore apply to new and renewal vehicles presented to Woking Borough Council from 20th of January 2022. With effect from the 20th of January 2022 there will be no Euro Emissions V (five) vehicles licenced by Woking Borough Council.		

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

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

WBC is working to address $PM_{2.5}$ through implementation of the measures to improve air quality detailed in Table 2.2.

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

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

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

WBC does not undertake any automatic (continuous) monitoring.

3.1.2 Non-Automatic Monitoring Sites

WBC undertook non-automatic (passive) monitoring of NO_2 at 36 sites during 2017. Table A.1 in Appendix A shows the details of the sites.

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

3.2 Individual Pollutants

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

3.2.1 Nitrogen Dioxide (NO2)

Table A.2 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

For diffusion tubes, the full 2017 dataset of monthly mean values is provided in Appendix B.

After bias adjustment, exceedances of the annual mean 40 µg/m^3 objective limit were recorded at three locations in 2017, as shown in bold in Table A.2. However, after distance correction to predict concentrations at locations of relevant exposure, no exceedance is shown.

The monitoring site at the M25 is located on a bridge over the motorway. The site has recorded high concentrations of NO_2 as would be expected close to a motorway. Previous rounds of Review and Assessment have determined this site is not representative of relevant exposure[9]. This site was still not representative of relevant exposure in 2017. The monitoring site at Victoria Way has also recorded exceedances of the NO_2 AQO over a number of years and has been confirmed to be non-representative of relevant exposure as the properties in the locality are all commercial. In 2017 the annual mean did not exceed the AQO.

The Anchor Hill monitoring sites are located on a steep hill leading to a traffic light controlled junction. This site had a Detailed Assessment carried out in 2012 and a Further Assessment carried out in 2015. The results in the 2015 Further Assessment highlighted the need to consider options to reduce exposure of nearby residential receptors[10]. Due to exceedances of the AQO at diffusion tubes AH and AH6 along Anchor Hill, it was recommended that the AQMA remain in place until further monitoring consistently records concentrations below the AQO. In 2017 there were no exceedance of the AQO at any of the sites within the Anchor Hill AQMA.

Exceedances of the AQO had been recorded since 2012 at monitoring site CH consequently this part of Guildford Road was declared an AQMA in May 2017. A map of the Guildford Road AQMA is included in Appendix D.

Before distance correction two diffusion tubes in Guildford Road AQMA (CH2 and CH3), recorded exceedances of the AQO in 2017. Using distance correction to predict concentrations at locations of nearest relevant exposure, all locations of relevant exposure on Guildford Road showed NO_2 concentrations below the AQO.

Analysis of UK continuous NO_2 monitoring data has shown that it is unlikely that the hourly mean NO_2 objective, of 18 hourly means over 200 µg/m^3, would be exceeded where the annual mean objective is below 60 µg/m^3. There was one exceedance of 60 µg/m^3 in 2015 at the diffusion tube located near the M25, which is not representative of relevant exposure. In 2017 no exceedances of 60 µg/m^3 were recorded.

[9] Woking Council (2014). Air quality progress report for Woking Council.

[10] Amec Foster Wheeler Environment & Infrastructure UK Ltd (2015). Air quality further assessment for Woking Borough Council.

3.2.2 Particulate Matter (PM10)

WBC does not undertake any PM_{10} monitoring.

3.2.3 Particulate Matter (PM2.5)

WBC does not undertake any $PM_{2.5}$ monitoring.

3.2.4 Sulphur Dioxide (SO2)

WBC does not undertake any SO_2 monitoring.

Appendix A: Monitoring Results

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

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
BD	Bitterne Drive	Roadside	498025	158949	NO_2	NO	6.0*	2.0*	NO	-
TW	Tresta Walk	Roadside	498435	159451	NO_2	NO	9.5*	1.5*	NO	-
AH	Anchor Hill 1	Kerbside	496618	158699	NO_2	YES	69	1	NO	-
AH2	Anchor Hill 2	Roadside	496615	158696	NO_2	YES	0	5	NO	-
AH3	Anchor Hill 3	Roadside	496646	158750	NO_2	NO	0	5	NO	-
AH4	Anchor Hill 4	Roadside	496679	158767	NO_2	NO	6	2	NO	-
AH5	Anchor Hill 5	Roadside	496594	158698	NO_2	YES	0	5	NO	-
AH6	Anchor Hill 6	Roadside	496586	158686	NO_2	NO	0	2	NO	-
LGR	Lower Guildford Rd	Roadside	496601	158668	NO_2	YES	0	3	NO	-
BR	Bagshot Road	Kerbside	495821	157793	NO_2	NO	15	1	NO	-
BR1	Bagshot Road	Roadside	495852	157188	NO_2	NO	21	1.5	NO	-
GR	Goldsworth Road	Kerbside	499952	158545	NO_2	NO	6	1	NO	-
YR	York Road	Kerbside	500450	158278	NO_2	NO	12*	1*	NO	-
YR1	York Road	Kerbside	500447	158256	NO_2	NO	18*	1*	NO	-
LTK	Constitution Hill 1	Kerbside	500437	158120	NO_2	NO	3	1	NO	-

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
LT1	Constitution Hill 1	Kerbside	500453	158100	NO_2	NO	15	1	NO	-
CH	Constitution Hill 4	Roadside	500417	158102	NO_2	YES	4	1.5	NO	-
CH2	Constitution Hill 5	Kerbside	500367	158073	NO_2	YES	12	1	NO	-
CH3	Constitution Hill 6	Roadside	500330	158012	NO_2	YES	14	1.5	NO	-
CH4	Constitution Hill 7	Kerbside	500332	157983	NO_2	NO	17	1	NO	-
RC	Rosebery Crescent	Kerbside	500946	157110	NO_2	NO	10	1	NO	-
LD	Lincoln Drive	Kerbside	503244	159659	NO_2	NO	12	1	NO	-
PR	Dartnell Avenue (previously Parvis Road)	Kerbside	504926	161063	NO_2	NO	12	1	NO	-
M25	M25	Other	505611	161180	NO_2	NO	N/a	0	NO	-
TC	The Cedars	Roadside	506731	161229	NO_2	NO	24.0*	4	NO	-
CR	Church Road	Kerbside	506401	160504	NO_2	NO	6.0*	1.0*	NO	-
WL	Woodham Lane	Kerbside	502854	161062	NO_2	NO	31	1	NO	-
MR	Monument Road	Roadside	501611	159645	NO_2	NO	4	2	NO	-
MR2	Monument Road	Roadside	501613	159646	NO_2	NO	18	2	NO	-
OR	Oriental Road	Roadside	501679	159148	NO_2	NO	26.0*	3	NO	-
VW	Victoria Way	Kerbside	500510	159030	NO_2	NO	N/a	1	NO	-

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
VW2	Victoria Way 2	Roadside	500281	158827	NO_2	NO	N/a	8	NO	-
VW3	Victoria Way 3	Roadside	500270	158731	NO_2	NO	N/a	3	NO	-
VW4	Victoria Way 4	Roadside	500425	158584	NO_2	NO	N/a	5.5	NO	-
CW	Cavell Way	Roadside	496215	157991	NO_2	NO	5.0*	2.0*	NO	-
BW	Broadway	Kerbside	495875	157972	NO_2	NO	18.7	1	NO	-

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).

(2) N/A if not applicable.

* Distances estimated from online mapping sources.

Table A.2 – Annual Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2017 (%) [2]	NO_2 Annual Mean Concentration (µg/m^3) [3]				
					2013	2014	2015	2016	2017
BD	Roadside	Diffusion Tube	92	92	17.8	13.9	17	18.0 (16.5)	15.6 (14.5)
TW	Roadside	Diffusion Tube	75	75	-	-	-	-	13.3 (12.4)
AH	Kerbside	Diffusion Tube	100	100	**41.5**	37.1	**44.1**	36	34.6
AH2	Roadside	Diffusion Tube	100	100	36.5	29.1	36.7	34.9	31.6
AH3	Roadside	Diffusion Tube	100	100	30.7	20.7	27.1	23.3	22.5
AH4	Roadside	Diffusion Tube	100	100	32	24.6	34.5	31.6 (25.9)	27.3 (22.3)
AH5	Roadside	Diffusion Tube	92	92	32	26.3	34	29.4	26.3
AH6	Roadside	Diffusion Tube	92	92	32	33.5	**40.9**	34.7	29.2
LGR	Roadside	Diffusion Tube	83	83	32.3	25.2	32	26.2	23.7
BR	Kerbside	Diffusion Tube	100	100	30.6	24.5	31.6	28.4 (19.7)	24.5 (16.8)
BR1	Roadside	Diffusion Tube	75	75	-	23.1*	26.2	24.4 (17.5)	22.8 (15.6)
GR	Kerbside	Diffusion Tube	100	100	32.2	23.6	26.8	27.3 (22.5)	26.0 (20.8)
YR	Kerbside	Diffusion Tube	83	83	-	-	-	-	23.9 (19.9)
YR1	Kerbside	Diffusion Tube	83	83	-	-	-	-	25.0 (19.8)
LTK	Kerbside	Diffusion	92	92	36	31	**40.7**	23.6 (22.2)	24.3 (22.1)

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 Annual Mean Concentration (µg/m^3) (3)				
					2013	2014	2015	2016	2017
		Tube							
LT1	Kerbside	Diffusion Tube	100	100	27.4	17.8	24.9	33.9 (25.3)	33.9 (24.1)
CH	Roadside	Diffusion Tube	100	100	**43.9**	34.2	**48.8**	**43.3** (36.2)	36.5 (30.7)
CH2	Kerbside	Diffusion Tube	100	100	-	**40.6***	**51.6**	**47.6** (32.6)	**41.3** (28.4)
CH3	Roadside	Diffusion Tube	83	83	-	37.9*	**51.5**	**45.4** (31.6)	**41.0** (28.4)
CH4	Kerbside	Diffusion Tube	100	100	-	34.5*	**42.4**	**40.0** (25.2)	37.6 (23)
RC	Kerbside	Diffusion Tube	92	92	21.4	17.7*	16.5	16.6 (15.3)	18.0 (15.3)
LD	Kerbside	Diffusion Tube	100	100	19.8	16.3	20.7	18.7 (16.5)	16.7 (14.4)
PR	Kerbside	Diffusion Tube	100	100	26.8	23.3	28.4	25.9 (21.0)	22.2 (18.2)
M25	Other	Diffusion Tube	83	83	**52.1**	**50.3**	**61**	**51.4**	**42.2**
TC	Roadside	Diffusion Tube	100	100	-	-	-	29.9 (21.6)	26.3 (21.5)
CR	Kerbside	Diffusion Tube	92	92	-	-	-	-	20.7 (18.8)
WL	Kerbside	Diffusion Tube	67	67	33.3	26.4	29	30.5 (19.0)	23.5* (15.4)
MR	Roadside	Diffusion Tube	92	92	33.3	27.1*	35	37.8 (32.1)	31.3 (26.9)
MR2	Roadside	Diffusion Tube	100	100	34	29.3	35.7	32.5 (23.5)	28 (20.4)
OR	Roadside	Diffusion Tube	100	100	-	-	-	27.6 (22.6)	25.2 (18.6)

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 Annual Mean Concentration (µg/m^3) (3)				
					2013	2014	2015	2016	2017
VW	Kerbside	Diffusion Tube	100	100	**40.4**	27.4	**43.2**	35.7	31.2
VW2	Roadside	Diffusion Tube	100	N/a	-	-	-	-	18.0
VW3	Roadside	Diffusion Tube	100	N/a	-	-	-	-	19.8
VW4	Roadside	Diffusion Tube	100	N/a	-	-	-	-	23.4
CW	Roadside	Diffusion Tube	100	100	28.1	21.5	23.5	22.3 (19.5)	21.2 (18.4)
BW	Kerbside	Diffusion Tube	83	83	28.0	19.2	21.9	20.1 (15.7)	21.2 (14.9)

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

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

Notes:

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

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

Distance corrected concentrations are shown in (bracket).

(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.

*Means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Figure A.1 – Trends in Annual Mean NO_2 Concentrations within Anchor Hill AQMA (before distance correction)

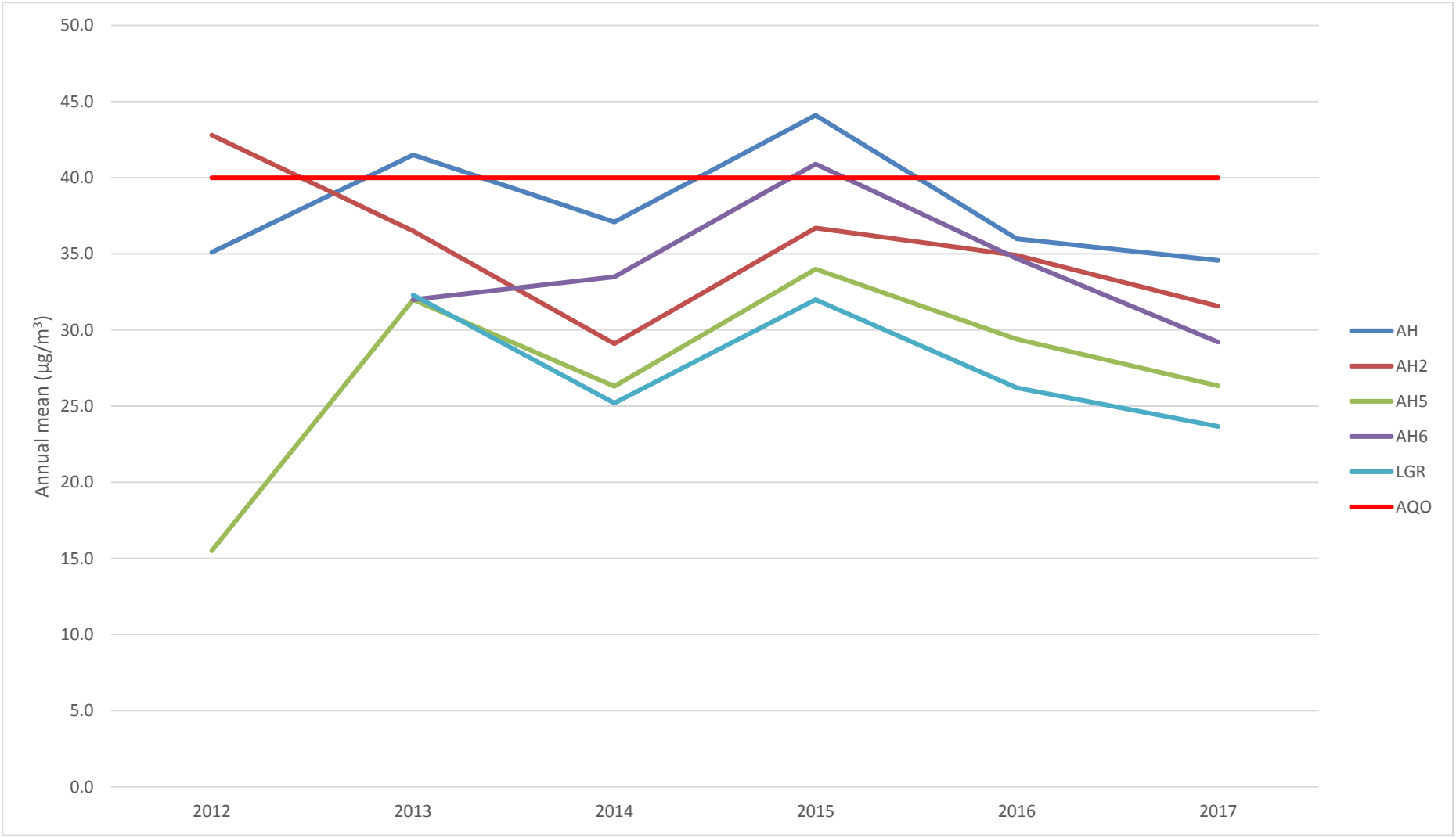
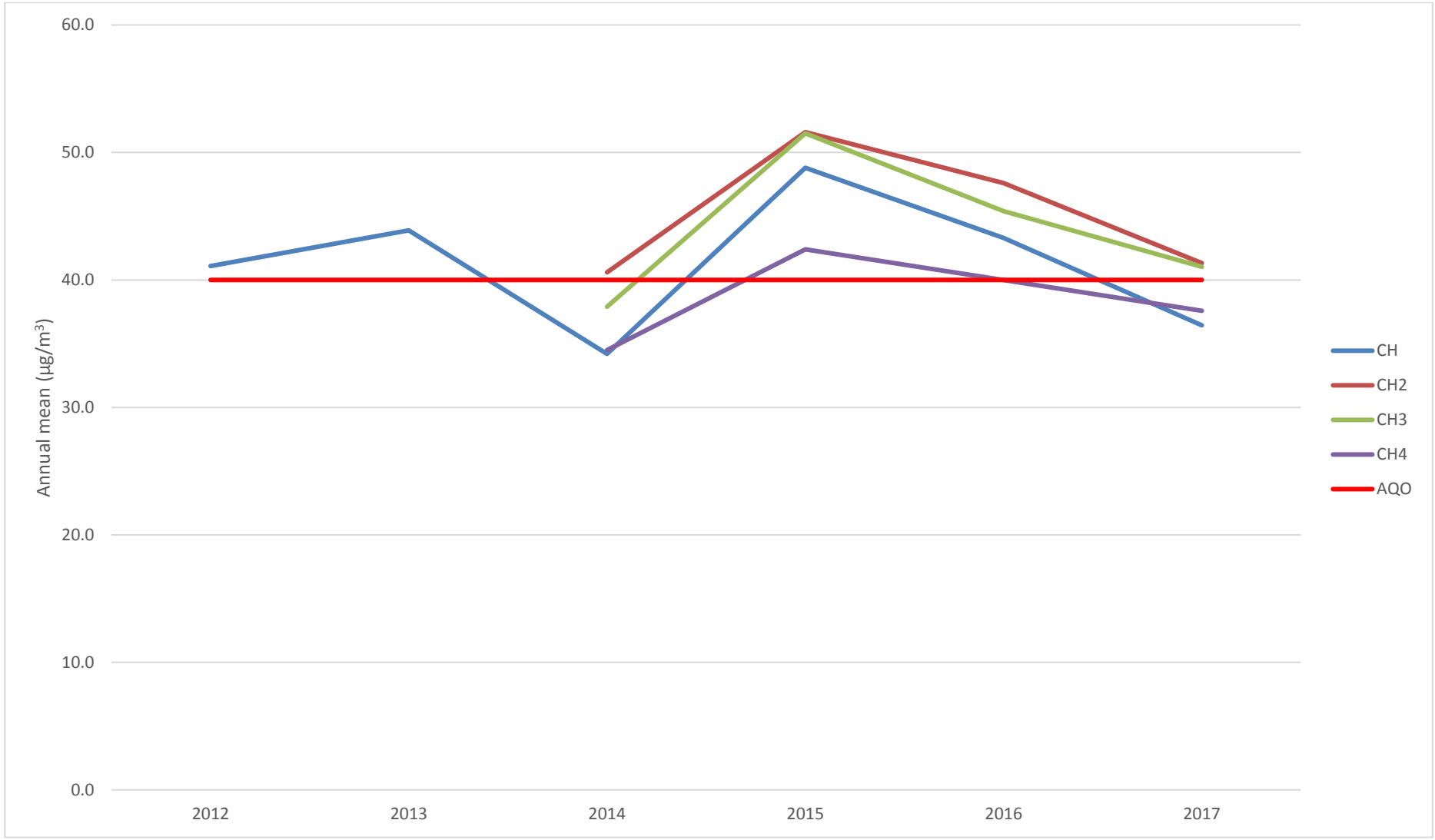


Figure A.2 – Trends in Annual Mean NO_2 Concentrations within Guildford Road AQMA (before distance correction)



Appendix B: Full Monthly Diffusion Tube Results for 2017

Table B.1 – NO_2 Monthly Diffusion Tube Results - 2017

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (0.90) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
BD	25.0	22.0	19.0	12.0	27.0	14.0	11.0	-	14.0	16.0	14.0	17.0	17.4	15.6	14.5
TW	-	-	18.0	12.0	21.0	15.0	10.0	10.0	14.0	-	16.0	17.0	14.8	13.3	12.4
AH	58	43	47	34	19	42	37	27	40	32	40	42	38.4	34.6	N/a
AH2	49	48	30	29	18	39	34	28	35	45	37	29	35.1	31.6	N/a
AH3	39	27	28	20	20	24	20	21	25	25	29	22	25.0	22.5	N/a
AH4	46	37	37	26	25	26	25	25	28	30	33	26	30.3	27.3	22.3
AH5	46	34	31	-	19	28	24	24	28	27	38	23	29.3	26.3	N/a
AH6	52	-	40	26	15	30	28	23	37	38	30	38	32.5	29.2	N/a
LGR	43	31	-	-	15	30	24	21	26	25	26	22	26.3	23.7	N/a
BR	53	35	25	22	17	32	20	27	32	18	23	22	27.2	24.5	16.8
BR1	32	30	25	-	28	32	-	-	18	23	22	18	25.3	22.8	15.6
GR	42	28	31	23	37	24	22	21	32	28	29	29	28.8	26.0	20.8
YR	-	-	30	19	21	27	25	22	33	30	30	28	26.5	23.9	19.9
YR1	-	-	31	28	6	31	21	24	33	33	31	40	27.8	25.0	19.8
LTK	70	-	25	23	31	19	17	17	23	23	31	18	27.0	24.3	22.1

LT1	56	39	40	30	43	35	36	27	39	37	36	34	37.7	33.9	24.1
CH	61	51	45	35	35	43	39	29	40	38	38	32	40.5	36.5	30.7
CH2	76	56	54	57	11	44	43	33	42	45	40	50	45.9	41.3	28.4
CH3	75	62	44	42	13	-	49	-	44	50	38	39	45.6	41.0	28.4
CH4	64	47	46	23	47	46	41	31	42	39	39	36	41.8	37.6	23.0
RC	26	22	19	13	22	14	45	11	16	15	17	-	20.0	18.0	15.3
LD	30	22	21	16	17	19	11	15	17	17	19	19	18.6	16.7	14.4
PR	35	27	28	19	20	27	21	24	25	26	22	22	24.7	22.2	18.2
M25	34	65	56	48	27	55	-	38	46	47	53	-	46.9	42.2	N/a
TC	53	27	22	27	14	31	27	23	31	27	41	28	29.3	26.3	21.5
Church	38	29	26	-	18	14	17	22	20	18	26	25	23.0	20.7	18.8
WL	43	30	30	24	18	-	24	-	-	-	30	30	28.6	23.5	15.4
MR	59	-	37	32	24	45	36	26	35	28	30	31	34.8	31.3	26.9
MR2	53	31	32	26	10	32	25	28	38	25	35	38	31.1	28.0	20.4
OR	44	36	25	24	23	33	19	25	26	26	28	27	28.0	25.2	18.6
VW	51	42	34	32	26	38	25	28	36	36	35	33	34.7	31.2	N/a
VW2	-	-	-	-	-	-	-	-	-	-	-	20	20.0	18.0	N/a
VW3	-	-	-	-	-	-	-	-	-	-	-	22	22.0	19.8	N/a
VW4	-	-	-	-	-	-	-	-	-	-	-	26	26.0	23.4	N/a
CW	32	42	25	19	18	21	17	16	22	22	22	26	23.5	21.2	18.4
BW	35	25	18	38	-	-	16	18	20	24	24	18	23.6	21.2	14.9

☐ Local bias adjustment factor used

☒ National bias adjustment factor used

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

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

Notes:

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

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

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

(2) Distance corrected to nearest relevant public exposure.

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

Diffusion tube bias adjustment factors

The diffusion tubes for 2017 were supplied by Lambeth Scientific Services, and prepared using a 50% triethanolamine (TEA)/Acetone method.

The bias adjustment factor has been taken from Defra's UK national bias adjustment spreadsheet (Spreadsheet Version Number: 03/18) and is based on the results of one study in the UK. As only one study was used, caution should be taken when using the bias correction factor produced. The bias adjustment factor for 2017 monitored data is 0.90. Table 3 below details the bias adjustment factors for the period 2013 through 2017 used to adjust WBC monitoring data.

Table C.1 – Bias adjustment factors

Year	National Bias Adjustment Factor
2013	0.87
2014	0.80
2015	1.07
2016	0.94
2017	0.90

QA/ QC of diffusion tube monitoring

Lambeth Scientific Services are a UKAS accredited laboratory, complying with the requirements of ISO/IEC 17025

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

Figure D.1 – WBC 2017 monitoring locations

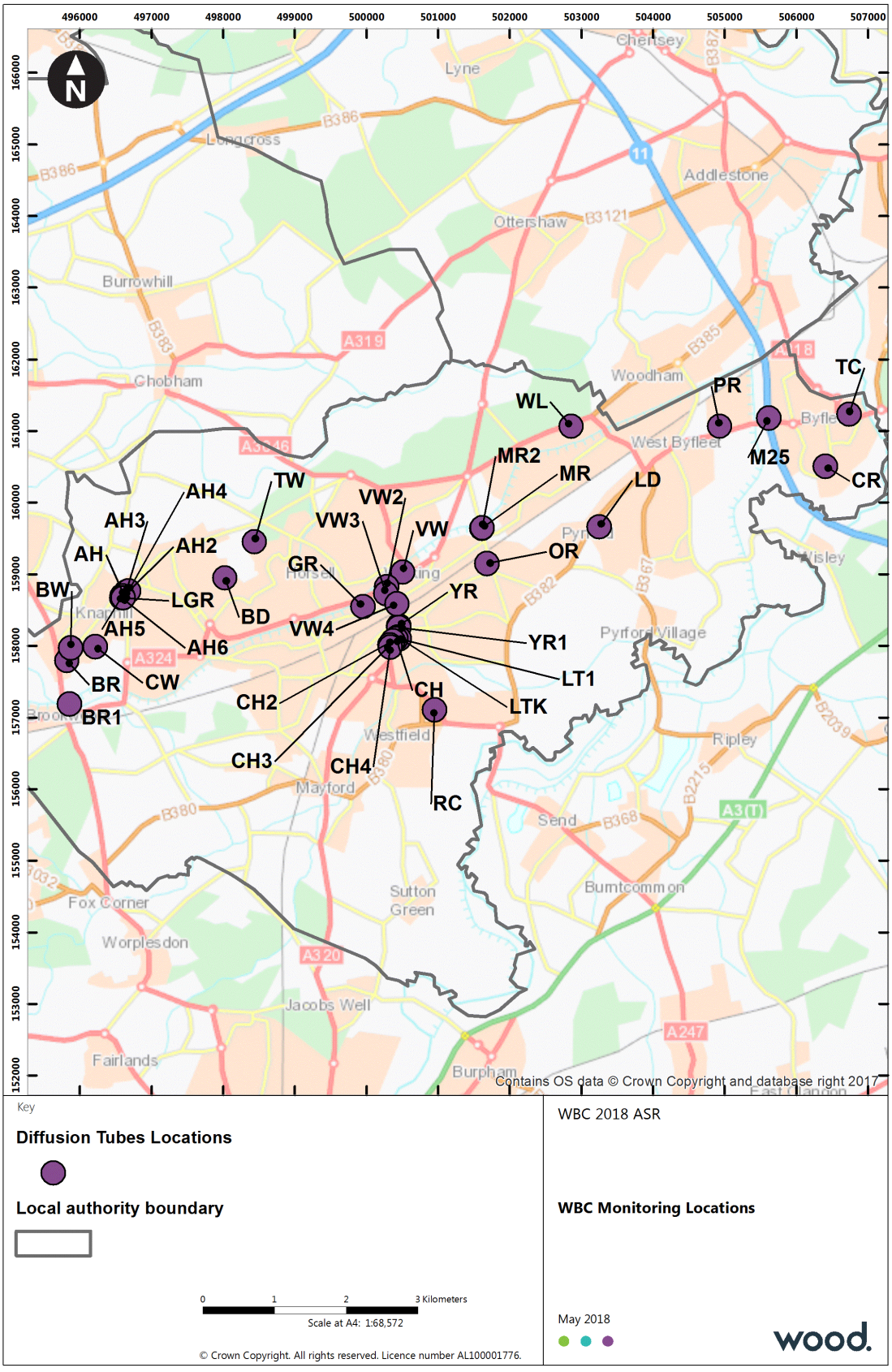


Figure D.2 – Anchor Hill AQMA and monitoring locations

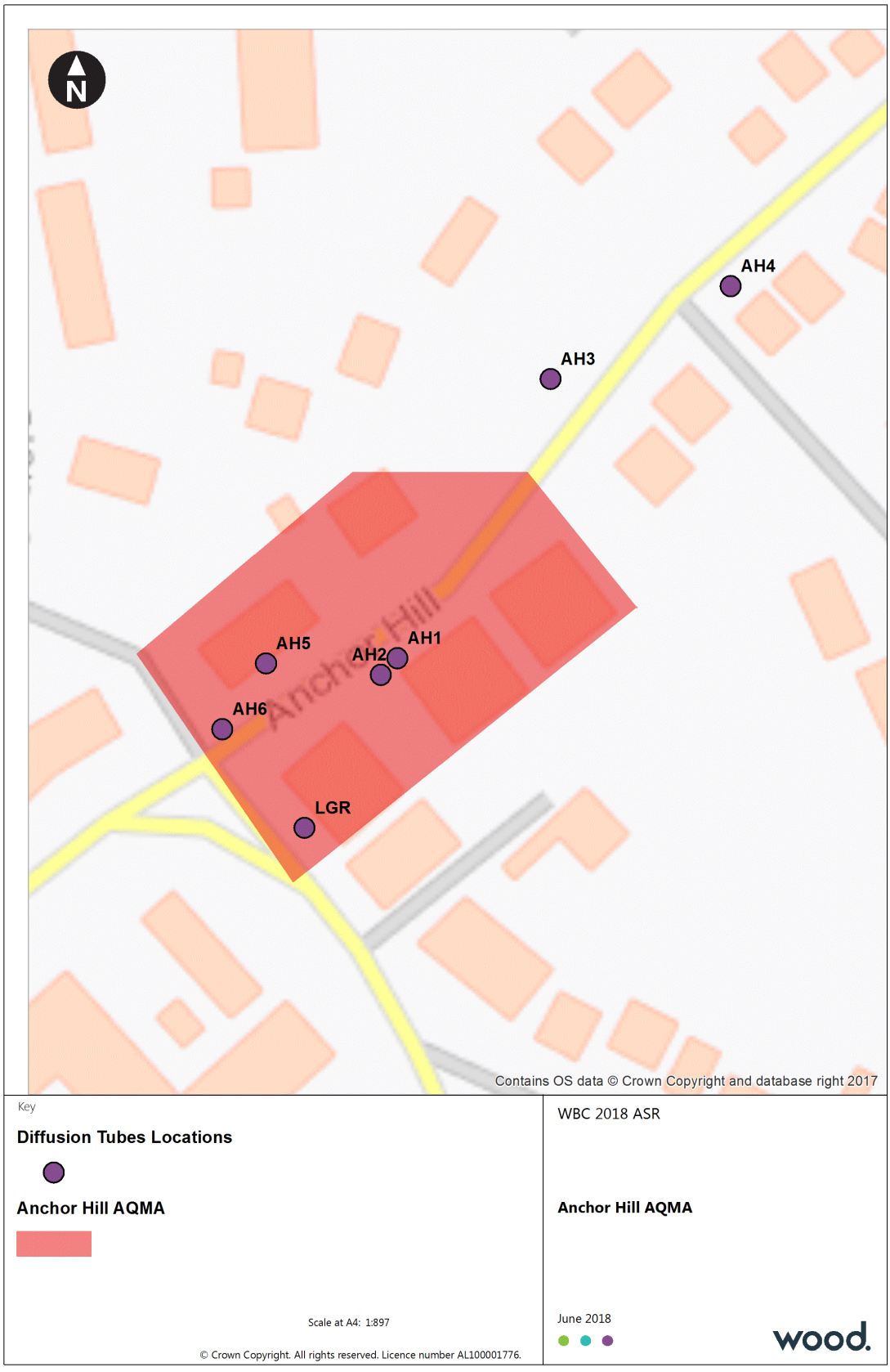


Figure D.3 – Guildford Road AQMA and monitoring locations

Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[11]	
	Concentration	Measured as
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m^3	Annual mean
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

[11] The units are in microgrammes of pollutant per cubic metre of air (µg/m^3).

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Air quality Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO_2	Sulphur Dioxide

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