



## 2016 Air Quality Annual Status Report (ASR)

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

January 2017

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## Executive Summary: Air Quality in Our Area

### Air Quality in Worthing 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<sup>1</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>2</sup>. Improving air quality can benefit those who may find their conditions are made worse through exposure to air pollution, for example people with heart or lung conditions. More information about the health effects of air pollution can be found at:

<https://www.adur-worthing.gov.uk/environmental-health/pollution/air-quality-and-pollution/whats-the-problem/>

This report covers monitoring and actions during 2015. There is one air quality management area within the Worthing Borough Council area: Worthing Borough Council AQMA No. 2. This was enlarged in 2014 to take in a larger area along the Upper Brighton Road and Warren Road (A27) and encompass Lyons Farm. This was declared for exceedances of the annual mean objective for Nitrogen Dioxide (NO<sub>2</sub>).

In 2015 NO<sub>2</sub> concentrations exceeded the annual objective at one location along the A27 close to the large roundabout at Grove Lodge. Elsewhere within the AQMA and throughout the Borough, NO<sub>2</sub> concentrations tended to decrease and were typically the lowest measured over the five year period 2010-15. This widespread reduction is to be welcomed, particularly within the AQMA. However the continued exceedance at one location within the AQMA remains a cause for concern.

Worthing Borough Council has an air quality action plan which aims to reduce emissions from traffic. The Council works closely with neighbouring councils, West Sussex County Council (WSCC) and Highways England (HE) to deliver the plan. The

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<sup>1</sup> Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006

<sup>2</sup> Defra. Abatement cost guidance for valuing changes in air quality, May 2013

action plan was published in late 2015 following consultation. Work progressed on a number of measures during 2015, particularly with respect to staff travel and work with developers to achieve improvements to infrastructure and traffic flow as and when developments came forward. This achieved mixed results.

## Actions to Improve Air Quality

Measures to improve air quality relate primarily to reducing traffic emissions and these include:

- A27 Highway Improvements and revision of the road network
- Improving walking and cycling infrastructure
- Behaviour change programmes
- Low Emission Zone Feasibility
- Electric vehicles / infrastructure
- Worthing Car Club
- Working with developers to achieve improvements to infrastructure and traffic flow
- WBC & WSCC Staff Travel Planning

## Local Priorities and Challenges

Priority areas for action are firstly increasing public awareness and involvement in the solutions to poor air quality, secondly increasing multi-agency involvement in seeking solutions and thirdly bringing through improvements via the planning process as development sites are brought forward. Specific priority actions include discussions with developers to embed air quality mitigation within local development schemes, (thus far with mixed results), the establishment of new and improvement of existing walking and cycling schemes across the Borough and the promotion of alternatives to conventionally fuelled vehicles (electric vehicles, public transport, etc.).

In addition, through attempting to influence decisions made by members of the public with regard to daily transport mode selection, reductions in emissions can be achieved resulting in health benefits to all.

The A27 remains a particular challenge with severe congestion for large parts of the day at Lyons Farm, Grove Lodge and the junction with the A24. Highways England has a major role in the delivery of our air quality action plan and they intend to

publish proposals for improvements along the A27 through Worthing. However these pose challenges as the carriageway is restricted by residential properties on both sides.

## **How to Get Involved**

Road vehicles are a major source of many pollutants in urban areas. They produce over 50 per cent of the emissions of nitrogen oxides in the UK.

### Before using your car, ask yourself:

- do I really need to make this journey?
- could I walk or cycle instead of taking the car?
- could I take a bus or train?
- are the levels of air pollution already too high today? (See our website for forecasts: <https://www.adur-worthing.gov.uk/environmental-health/pollution/air-quality-and-pollution/air-quality-monitoring/#airalert>)

Plan your journey using the West Sussex Journey Planner,  
<http://www.travelwestsussex.co.uk/>

### If you must drive:

- drive smoothly. You'll save fuel, and your engine will also pollute less;
- don't rev your engine unnecessarily;
- maintain your car. Keep the engine properly tuned and the tyres at the right pressure; and
- turn off the engine when your car is stationary.

### At home

- Buy water-based or low-solvent paints, varnishes, glues and wood preservatives.
- Avoid burning solid fuels if possible. If you do burn please use special smokeless fuels. Whilst Worthing has no smoke control areas burning special smokeless fuels reduces particulate emissions and avoids neighbour nuisance.
- Avoid lighting bonfires, but if you must don't light them when pollution levels are high or while the weather is still and cold. Only burn dry material and never burn

household waste, especially plastic, rubber, foam or paint. Levels of pollution can be quite high on bonfire night and other events/festivals with bonfires, and sensitive people, including people with respiratory conditions, may notice some effects. However exposure can be considerably reduced by remaining indoors and keeping windows closed.

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## 1 Local Air Quality Management

This report provides an overview of air quality in Worthing Borough Council during 2015. 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 Worthing Borough Council to improve air quality and any progress that has been made.

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

## 2 Actions to Improve Air Quality

### 2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority must prepare an Air Quality Action Plan (AQAP) within 12-18 months setting out measures it intends to put in place in pursuit of the objectives.

A summary of the AQMA declared by Worthing Borough Council can be found in Table 2.1. Further information relating to declared or revoked AQMAs, including maps of AQMA boundaries are available online at

<https://www.adur-worthing.gov.uk/environmental-health/pollution/air-quality-and-pollution/local-air-quality-management/#local-aqma>

**Table 2.1 – Declared Air Quality Management Area**

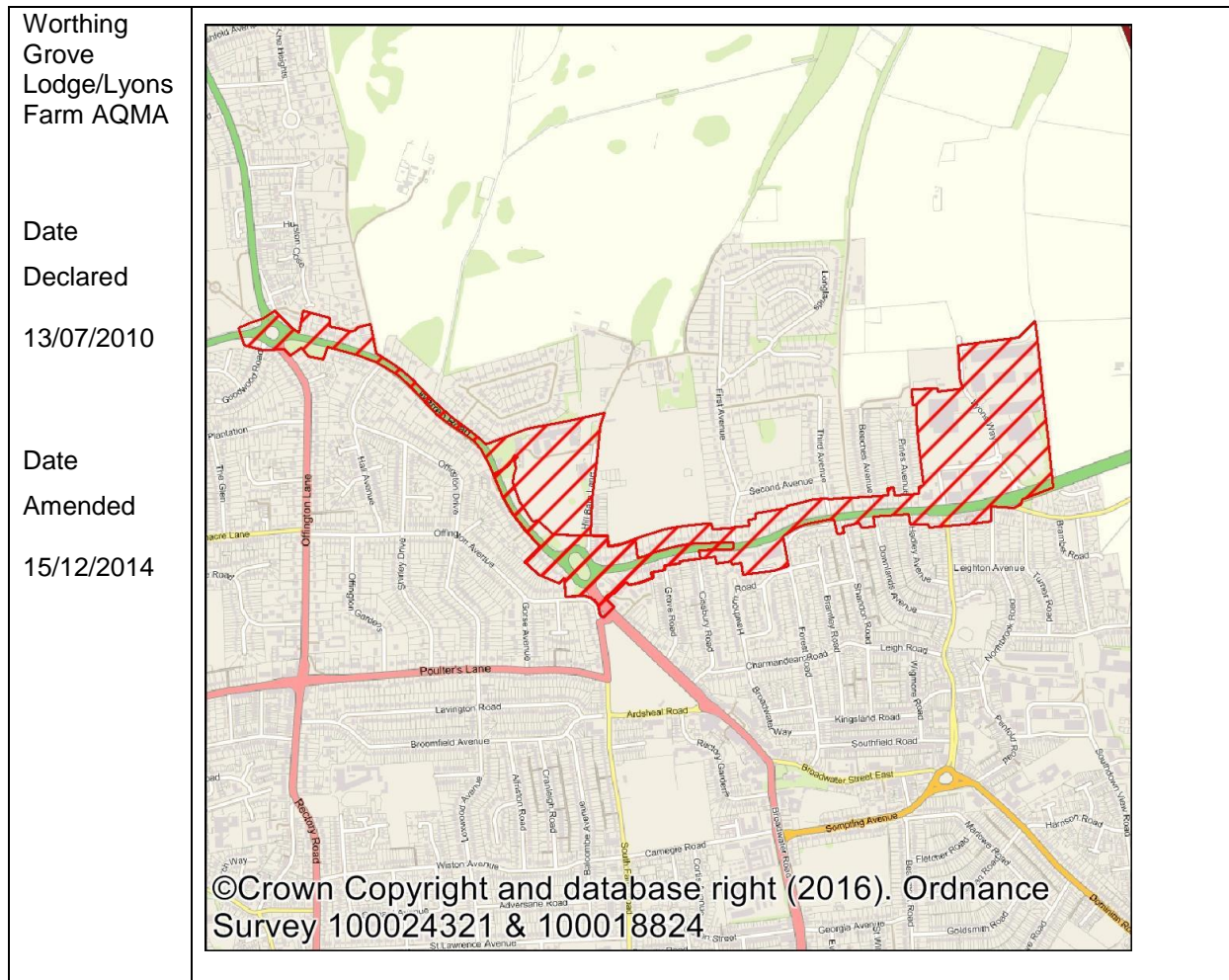
AQMA Name	Pollutants and Air Quality Objectives	City / Town	One Line Description	Action Plan
Worthing Borough Council AQMA No. 2	NO <sub>2</sub> annual mean	Worthing	The area incorporates the eastern end of Crockhurst Hill from the eastern boundary of Durrington Cemetery towards Offington Corner Roundabout, Offington Corner Roundabout, Warren Road, 1-3 Warren Farm Place, 1 Links Road, Hill Barn Lane, 17 Mansfield Court Sanditon Way, Grove Lodge Roundabout, Grove Lodge, 1-2 Grove Lodge Cottages, 22-27 Lamorna Grove, Upper Brighton Road leading onto the Sompting Bypass, up to and including the Downlands Retail Centre, and Lyons Way	Worthing Air Quality Action Plan 2015 <a href="https://www.adur-worthing.gov.uk/media/media,138133,en.pdf">https://www.adur-worthing.gov.uk/media/media,138133,en.pdf</a>

The AQMAs are also shown on the LAQM website:

[https://uk-air.defra.gov.uk/aqma/details?aqma\\_id=1060](https://uk-air.defra.gov.uk/aqma/details?aqma_id=1060)

and presented in Figure 2-1

**Figure 2-1 Air Quality Management Areas in Worthing Borough Council**



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

Worthing Borough Council has taken forward a number of measures during the current reporting year of 2015 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 their respective Action Plans. Key completed measures are:

- In 2014 the Department for Transport (DfT) recognised that congestion along the A27 was causing delays, separating communities, harming business and resulting in elevated levels of pollution. They subsequently commissioned the A27 Corridor Feasibility Study. The results of this study were published in

2015 and have informed the DfT Road Investment Strategy. The study concluded that improvements to the capacity of the road and junctions along the stretch of single carriageway in Worthing were being considered alongside sustainable transport measures. The extent and scale of the improvements, including the option of full dualling, are to be agreed with WSCC and the public. Worthing Borough Council has pushed for a full air quality assessment and mitigation as part of the outcomes. This is important as it presents the biggest single opportunity to reduce air pollution, reduce congestion and improve traffic flow in the AQMA. However this has to be balanced with other effects such as noise.

- ✓ We have embedded the Air Quality Emissions Mitigation Planning Guidance for Sussex into the planning process. The guidance is signposted by our planning department and is also on our website (under air quality and planning).
- ✓ Working with our partners at West Sussex County Council, planning policy and development control we continue to seek air quality mitigation from development sites as and when schemes come forward. Travel plans, electric vehicle charging infrastructure, highway improvements and public transport improvements are sought in conjunction with West Sussex County Council. Success has been mixed with some resistance from developers to contribute funds to mitigation measures (we are competing for funding with other 'causes'). For example the new Bohunt School in Broadwater submitted an Emissions Mitigation Strategy which was subsequently incorporated into their travel plan. This focussed on walking and cycling, with elements related to renewable fuel and energy generation projects, although electric vehicle charge points and the provision of/links to existing bus services were also sought, but alas unsuccessful.
- ✓ Improve emissions from the Council's vehicle fleet. A grant bid was submitted to OLEV (Office for Low Emission Vehicles). The bid consisted of funding for two electric vehicles to replace the mayoral car and our courier van (which operates between various Council sites). The bid was accepted and a fleet review was commenced by the Energy Saving Trust. Unfortunately the funding offer was subsequently withdrawn. The Council continues to review its

fleet and consider cost effective alternatives to diesel vehicles. Pool cars (petrol) were provided for staff to use for work related journeys (through Enterprise Leasing). As the number of pool cars increases we hope to add electric or hybrid vehicles to the fleet.

- ✓ The Air Quality Action Plan was successfully embedded into the draft Public Health Plan in 2015, giving it more prominence and hopefully more teeth.
- ✓ Attempts were made to secure suitable sites for inclusion within the Energise EV charging network, through Sussex-air. The criteria was within a mile of the A27 and numerous local land owners were approached; however they were unable to commit within the required timeframe and at the time, suitable Council owned sites were not available for the period of ownership required.
- ✓ The Council's website was updated to include more information on air quality and the links to public health. We embedded air pollution forecasts (from Sussex-air) into our website to allow the public to make informed choices about activity and transport where pollution was forecast to be high.
- ✓ The Council's continuous monitoring site at Grove Lodge was shortlisted for affiliation into the Defra Automatic Urban Rural Network (AURN). The AURN is the UK's largest automatic monitoring network and is the main network used by the Government for compliance reporting against the Ambient Air Quality Directives. Discussions on the suitability of the site for affiliation began in late 2015. Benefits of affiliation include proper auditing of the site, improved data capture and reliability and the possibility of additional monitoring equipment funded by Defra rather than the local authority. See:

<https://uk-air.defra.gov.uk/networks/network-info?view=aurn>.

Worthing Borough Council expects the following measures to be completed over the course of the next reporting year:

- ✓ Engage with Highways England on the A27 improvement study outcomes.
- ✓ Investigate the viability and affordability of a Worthing (and Adur) Car Club, in an attempt to reduce private car use.

- ✓ Continue and hopefully agree affiliation of the Worthing Air Quality Monitoring Station (AQMS) into the Defra AURN.
- ✓ Embark on improvements to the existing electric vehicle charging network in Worthing and consider the provision of additional charge points, including rapid charge points, across the Borough.
- ✓ Work with West Sussex County Council to deliver improvements to the walking and cycling network across Worthing.
- ✓ Low Emission Zone feasibility study for the A27 in Worthing (pending Highways England's A27 review outcomes).

Worthing Borough Council's priorities for the coming year are

- ✓ Continue to work with developers and WSCC as and when sites come forward for development in order to minimise impacts on the existing AQMA and the Borough as a whole and avoid creating new AQMA's. Also to agree air quality mitigation (such as electric vehicle charge points, improvements to public transport, travel plans, etc.);
- ✓ Promote low emission vehicles, the government grants available and attempt to expand the electric vehicle charging network.
- ✓ Promote alternatives to cars, particularly cycling.
- ✓ Defra AURN affiliation of the Grove Lodge AQMS.
- ✓ Work with businesses and local public transport providers to improve sustainable travel options for Worthing.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
1	A27 Highway Improvements	Traffic Management	Strategic Highway Improvements	Highways England	2015	2021/22		High	This stretch of the A27 has been earmarked for improvements. <u>Awaiting consultation on options</u>	2021/22	
2	Cut Engine, Cut Pollution Signs	Traffic Management	Anti idling enforcement	HE/WSCC	2016	2016/17		Low/Med	Discussions with WSCC on feasibility; AQMA signs on hold pending HE improvements consultation.	2017	Discussions with land owners planned for 2017
3	LEZ Feasibility	Promoting Low Emission Transport	Low Emission Zone	WBC	2016	2017 onwards		High	Yet to progress.	2017	
4	Embed Air Quality Emissions Mitigation Planning Guidance for Sussex into the planning process	Policy Guidance & Development	AQ Planning & Policy Guidance	WBC	2014	2015		Low	Guidance used in connection with major applications within Adur & Worthing.	Ongoing	Revision due 2017
5	Planning Policies	Policy Guidance & Development	AQ Planning & Policy Guidance	WBC	2015	Ongoing		Low/Med	New Local Plan due 2017	2017	Discussions with planning policy ongoing
6	EV vehicles and infrastructure	Promoting Low Emission Transport	EV recharging	WBC	2015	Ongoing		Low/Med	Work with Sussex-air to locate suitable rapid charge point sites - discussions with local landowners for Sussex-air Energise network unsuccessful.	Ongoing	
7	Worthing Car Club	Alternatives to private vehicle use	Car Clubs	WBC	2015	2016/17		Low	AQ grant funding application unsuccessful	2017/18	Efforts continue, seed funding problematic



# Worthing Borough Council

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
8	Public transport improvement	Promoting travel Alternatives/Transport Planning & Infrastructure	Rail/bus route improvements; public transport improvements	WSCC	Ongoing	Ongoing		Low	Ongoing discussions with bus operators to improve fleets	Ongoing	
9	WBC Staff Travel Planning	Promoting Travel Alternatives	Workplace travel planning	WBC	Ongoing	Ongoing		Low	Pool cars provided for casual user staff	Ongoing	
10	Improve Emissions from Council's Vehicle fleet	Promoting Low Emission Transport	Company Vehicle Procurement	WBC	2015	Ongoing		Low	OLEV EV grant application submitted for mayor's vehicle and courier vehicle,, fleet review initiated . OLEV then withdrew funding.	Ongoing	Investigate other options for funding.
11	Increase availability of AQ information in relation to impacts on Public Health	Public Information	Via the internet	WBC	2015	Ongoing		Low	Website reviewed and pages updated. Real time forecasts (Sussex-air) embedded into website.	Ongoing	
12	Embedding AQ in Adur & Worthing Public Health Plan	Policy Guidance & Development	Other policy	WBC	2015	2016		Low	Air Quality Action Plans included within first version of Adur & Worthing Public Health Plan.	Ongoing	
13	Promotion of Air Alert	Public Information	Via the internet/leaflets	WBC	2014	Ongoing		Low	Air alert information included on website; local GP's sent leaflets (via Sussex-air)	Ongoing	
14	Re-assess traffic light sequencing in AQMA	Traffic Management	UTC	HE/WSCC	Ongoing	Ongoing		Low	Ongoing optimisation by HE	Ongoing	
15	Safe Cycling and Walking Routes	Transport Planning & Infrastructure	Cycle network	HE/WSCC	Ongoing	Ongoing		Low/Med	Discussions with developers as sites come forward. Sustrans involvement. Bohunt school.	Ongoing	
16	Travel plans for significant/major developments	Promoting Travel Alternatives	Workplace travel planning	WSCC/WBC	Ongoing	Ongoing		Low	New Bohunt school travel plan agreed.	Ongoing	
17	Car Sharing	Alternatives to private vehicle use	Car & lift sharing schemes	WSCC/WBC	Ongoing	Ongoing		Low	None as yet. Links to WBC and WSCC staff travel plans.	Ongoing	

## Worthing Borough Council

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
18	Encouraging alternative transport modes	Alternatives to private vehicle use	Other	WBC/WSCC	Ongoing	Ongoing		Low	WBC and WSCC staff travel plans encourage alternatives. Bohunt school travel plan encourages alternatives.	Ongoing	Measure to be considered for removal as duplicates other measures
19	Cycling & Walking promotion	Promoting Travel Alternatives	Promotion of Cycling, Walking	WSCC/WBC	Ongoing	Ongoing		Low	Nothing as yet, hopefully 2016	Ongoing	
20	WSCC staff travel planning	Promoting Travel Alternatives	Workplace travel planning	WSCC	2014	Ongoing		Low	Pool cars provided for casual user staff	Ongoing	
21	School Travel Plans	Promoting Travel Alternatives	School Travel Plans	WSCC	Ongoing	Ongoing		Low	Bohunt school travel plan agreed. Others reviewed.	Ongoing	
22	Business Travel Plans	Promoting Travel Alternatives	Workplace travel planning	WBC	2017	2018 on		Low		Ongoing	
23	Worthing College Travel Plan Review	Promoting Travel Alternatives	School Travel Plans	WBC/WSCC	2015/16	2016/17		Low/Med	Not yet commenced	Ongoing	
24	HGV/LGV assessment	Freight & delivery Mgt	Route Mgt plans/Strategic routing for HGV's	WBC	2016/17	2016/17		N/A	Not yet commenced	Ongoing	
25	Ecostars for Local Fleet Operators	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	WBC	2016/17	2016/17		Low/Med	Not yet commenced	Ongoing	
26	Increase and improve availability of WBC Air Quality Monitoring results	Public Information	Via the internet	WBC	2015	2015		Low	Website information improved.	Ongoing	

# Worthing Borough Council

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
27	Leaflets to promote sustainable/active travel modes (e.g. car sharing, cycling, public transport)	Public Information	Via leaflets	WBC	Ongoing	Ongoing		Low	None	Ongoing	Move toward digital provision of information and reduced space for leaflets means this measure may be reviewed.
28	WSCC website and multi-modal journey planner (Travel West Sussex)	Promoting Travel Alternatives	Personalised travel Planning	WSCC	2014	2015		Low	Website up and running.	Ongoing	

## 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.

Work carried out by Public Health England as part of the Public Health Outcomes Framework (PHOF) shows that the mortality associated with particulate air pollution within Worthing Borough Council is 4.3 %. This information is available from the following web link:

<http://www.phoutcomes.info/search/air#page/1/gid/1/pat/6/par/E12000008/ati/101/are/E07000229/iid/30101/age/230/sex/4>

Figure 2-2 shows that the mortality calculated for Worthing Borough Council is less than that calculated for south east England (4.9 %) and England (5.1 %) as a whole.

**Figure 2-2 Fraction of mortality attributed to particulate air pollution in Worthing Borough Council**



Worthing Borough Council is currently developing its approach to address PM<sub>2.5</sub> in partnership with public health local authority officers.

## **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.

Worthing Borough Council undertook automatic (continuous) monitoring at one site during 2015. Table A.1 in Appendix A shows the details of the sites. NB. Local authorities do not have to report annually on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead, unless local circumstances indicate there is a problem. National monitoring results are available at: <http://www.sussex-air.net/>

Maps showing the location of the monitoring sites are provided in Appendix D. 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

Worthing Borough Council undertook non- automatic (passive) monitoring of NO<sub>2</sub> at forty two sites during 2015. Table A.2 in Appendix A shows the details of the sites.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in Appendix C.

## 3.2 Individual Pollutants

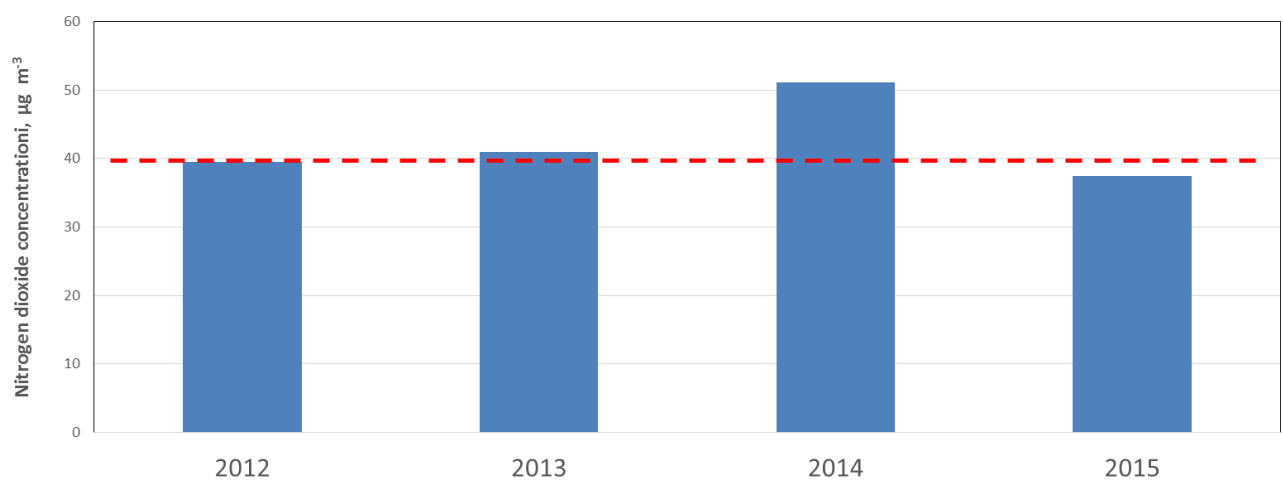
The air quality monitoring results presented in this section are, where relevant, adjusted for “annualisation” and bias. The data capture rates were high within borough, with all apart from a new location adjacent to the Aquarena, showing a data capture greater than 75 % so annualisation was not required.

### 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 concentration.

Figure 3-1 shows the annual average NO<sub>2</sub> measured at the automatic monitoring site located on the A27 at Grove Lodge since 2012. This road is a strategic road through Worthing and traffic speeds tend to be low at peak periods. NO<sub>2</sub> peaked at 51.4 µg in 2014, but decreased to 37.4 µg m<sup>-3</sup> in 2015. The reason for the disparity has yet to be determined. The new Worthing College site adjacent to the AQMA opened in Autumn 2013 and it was thought the increase in 2014 may have been a result of increased traffic related to the college (the site had been vacant for a number of years prior to the college opening).

**Figure 3-1 Annual average NO<sub>2</sub> concentrations measured at automatic monitoring sites at Grove Lodge in 2015**



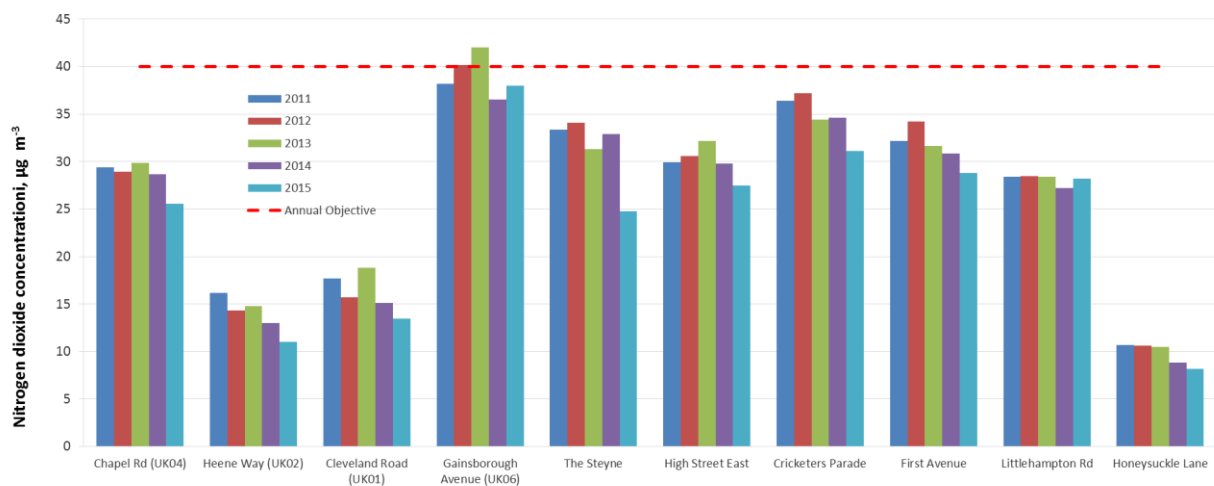
For diffusion tubes the full 2015 dataset of monthly mean values is provided in Appendix B. Figures 3.2 to 3.5 shows the trends in NO<sub>2</sub> concentration measured by diffusion tubes from 2011 to 2015. The highest NO<sub>2</sub> concentration ( $66.1 \mu\text{g m}^{-3}$ ) was measured at Grove Lodges Cottages (N30 A) on the A27. This site has been the highest of all diffusion tube sites for many years and was part of the reason for the original AQMA declaration. As the tube is located at a point of relevant exposure there continues to be an exceedance of the annual objective concentration for NO<sub>2</sub> within the AQMA.

The triplicate samples (outside 21 Upper Brighton Road N44A/N44B/N44C) collocated with the automatic analyser are measuring close to annual objective concentrations, but as the nearest point of relevant exposure is some 21m from the road, concentrations fall significantly below the annual objective (concentration at N44B is estimated to fall from  $40.3$  to  $26.9 \mu\text{g m}^{-3}$ ). The fall-off of NO<sub>2</sub> concentration with distance from kerbside is described in Appendix C.

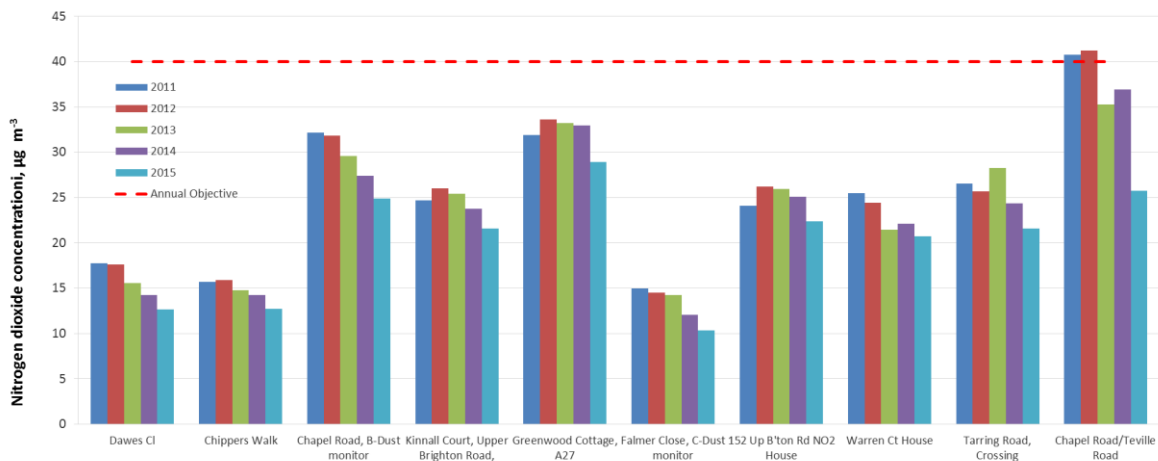
Elsewhere within the AQMA and indeed throughout the Borough, NO<sub>2</sub> concentrations tended to decrease and were typically the lowest measured over the five year period.

Our Further Assessment in 2013 identified the area around Lyndhurst Road near the gas holder station as a potential site of exceedance. A decision was made to erect a diffusion tube here and the results will be published in the 2017 report.

**Figure 3-2 Annual average NO<sub>2</sub> concentrations measured by diffusion tube in Worthing Borough Council from 2011 to 2015 (first ten listed in Table A.3)**

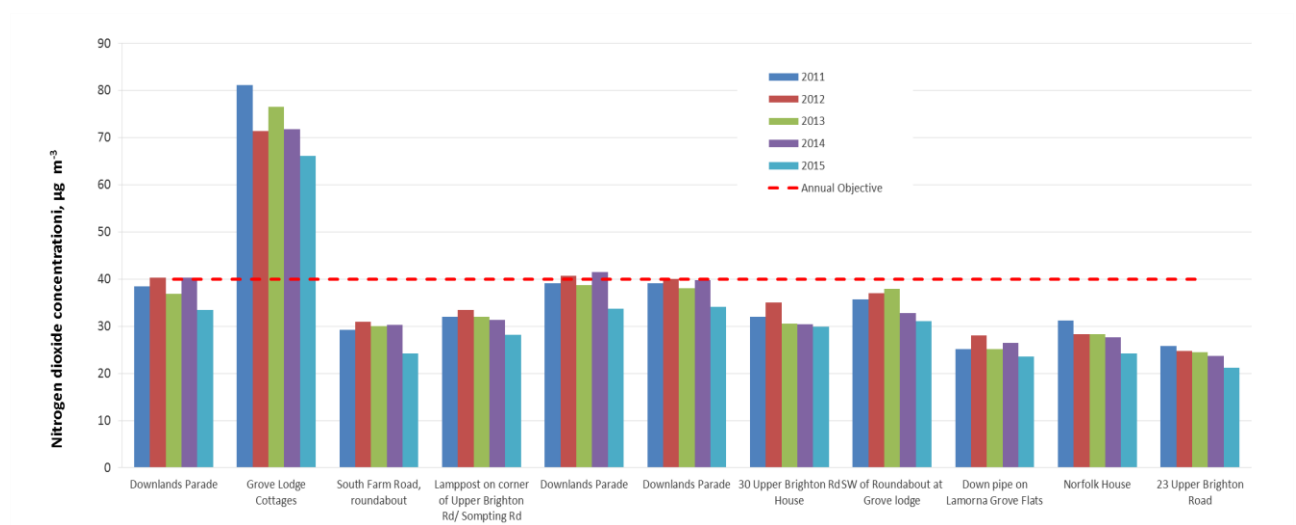


**Figure 3-3 Annual average NO<sub>2</sub> concentrations measured by diffusion tube in Worthing Borough Council from 2011 to 2015 (next ten listed in Table A.3)**





**Figure 3-4 Annual average NO<sub>2</sub> concentrations measured by diffusion tube in Worthing Borough Council from 2011 to 2015 (next eleven listed in Table A.3)**



**Figure 3-5 Annual average NO<sub>2</sub> concentrations measured by diffusion tube in Worthing Borough Council from 2011 to 2015 (next eleven sites listed in Table A.3). Note triplicate tubes at 21 Upr Brighton Road**

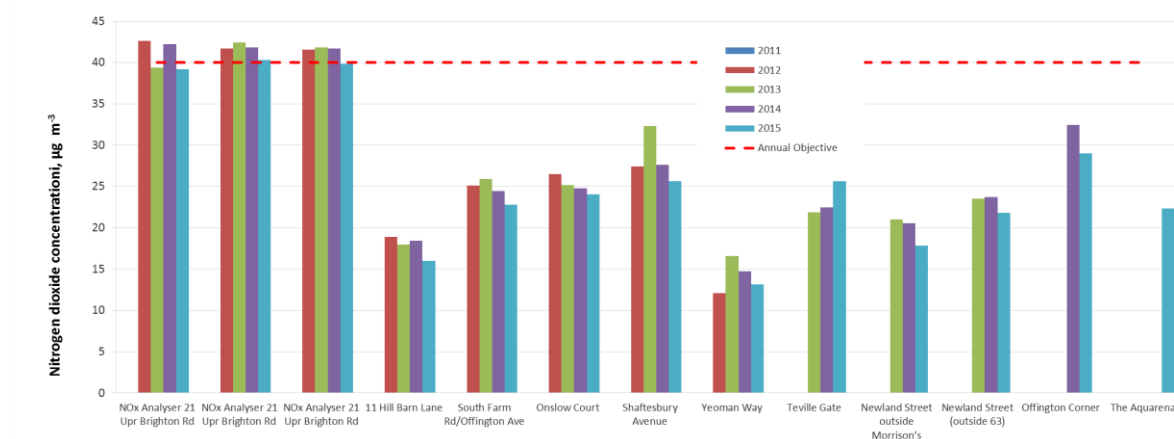


Table A.4 in Appendix A compares the ratified continuous monitored NO<sub>2</sub> hourly mean concentrations for 2015 with the air quality objective of 200 µg m<sup>-3</sup>, not to be exceeded more than 18 times per year. There were only 2 exceedances of the 200

$\mu\text{g m}^{-3}$  threshold in 2015, significantly less than the 14 exceedances measured the year before.

### **3.2.2      Particulates (PM<sub>10</sub>)**

The Council's PM<sub>10</sub> 'Osiris' continuous particulate monitors were closed in 2011 as they were repeatedly failing to retain monitored data within their memory. We have yet to replace or reinstate these.

## 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)(3)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Inlet Height (m)
WT2	Grove Lodge	Roadside	514184	104963	NO <sub>2</sub>	Y	Chemiluminescence	21	2.5	1.75

(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.

(3) This is the distance to the nearest receptor on that side of the carriageway.

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

(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.

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)
1N	Chapel Rd (UK04)	Roadside	514835	102887	NO <sub>2</sub>	N	9	1.5	N	1.5
4N	Heene Way (UK02)	Urban Background	513591	102543	NO <sub>2</sub>	N	4	1.5	N	1.5
5N	Cleveland Road (UK01)	Urban Background	512711	105550	NO <sub>2</sub>	N	6	2	N	2
6N	Gainsborough Avenue (UK06)	Roadside	515191	105121	NO <sub>2</sub>	N	11	2	N	2
N1	The Steyne	Kerbside	515102	102662	NO <sub>2</sub>	N	3	0.5	N	0.5
N1C	High Street East	Façade	515115	102667	NO <sub>2</sub>	N	0	2	N	2
N3	Cricketers Parade	Roadside	514502	104545	NO <sub>2</sub>	N	16	3.5	N	3.5
N5	First Avenue	Roadside	514494	105019	NO <sub>2</sub>	N	15	1.5	N	1.5
N8	Littlehampton Rd	Roadside	513227	104648	NO <sub>2</sub>	N	10	3.5	N	3.5
N9	Honeysuckle Lane	Urban Background	511965	106807	NO <sub>2</sub>	N	13	5	N	5
N11	Dawes Cl	Urban Background	515811	103314	NO <sub>2</sub>	N	8	1.5	N	1.5
N15	Chippers Walk	Urban	512721	103929	NO <sub>2</sub>	N	4	0.5	N	0.5

Worthing Borough 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)
		Background								
N17	Chapel Road, B-Dust monitor	Kerbside	514784	103130	NO <sub>2</sub>	N	5	0.5	N	0.5
N18A	Kinnall Court, Upper Brighton Road,	Façade	515314	105141	NO <sub>2</sub>	N	0	11.5	N	11.5
N21	Greenwood Cottage, A27	Roadside	509764	105693	NO <sub>2</sub>	N	7	3	N	3
N22	Falmer Close, C-Dust monitor	Urban Background	511013	102226	NO <sub>2</sub>	N	13	1.5	N	1.5
N24	152 Up B'ton Rd NO2 House	Façade	515150	105108	NO <sub>2</sub>	N	0	9	N	9
N25	Warren Ct House	Façade	513846	105183	NO <sub>2</sub>	N	0	15	N	15
N27	Tarring Road, Crossing	Façade	513378	103350	NO <sub>2</sub>	N	0	2.5	N	2.5
N28	Chapel Road/Teville Road	Roadside	514731	103186	NO <sub>2</sub>	N	1	2.5	N	2.5
N29	Downlands Parade	Façade	515014	105098	NO <sub>2</sub>	N	0	4	N	4
N30 A	Grove Lodge Cottages	Roadside	514178	104947	NO <sub>2</sub>	Y	0	2.5	N	2.5
N31	South Farm Road, roundabout	Roadside	514316	103327	NO <sub>2</sub>	N	3	2.5	N	2.5
N32	Lamppost on corner of Upper Brighton Rd/ Sompting Rd	Roadside	515086	105092	NO <sub>2</sub>	N	8	3	N	3
N33	Downlands Parade	Façade	515014	105098	NO <sub>2</sub>	N	0	2	N	2
N34	Downlands Parade	Façade	515014	105098	NO <sub>2</sub>	N	0	2	N	2

Worthing Borough 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)
N35	30 Upper Brighton Rd House	Facade	514266	104961	NO <sub>2</sub>	Y	0	11.5	N	11.5
N39	SW of Roundabout at Grove lodge	Roadside	514098	104898	NO <sub>2</sub>	Y	42	4	N	4
N41	Down pipe on Lamorna Grove Flats	Façade	514136	104918	NO <sub>2</sub>	Y	0	10	N	10
N42	Norfolk House	Façade	514739	103236	NO <sub>2</sub>	N	0	2	N	2
N43	23 Upper Brighton Road	Façade	514200	104981	NO <sub>2</sub>	Y	0	20	N	20
N44 A	NOx Analyser 21 Upr Brighton Rd	Roadside	514185	104963	NO <sub>2</sub>	Y	17	4	Y	4
N44 B	NOx Analyser 21 Upr Brighton Rd	Roadside	514185	104963	NO <sub>2</sub>	Y	17	4	Y	4
N44 C	NOx Analyser 21 Upr Brighton Rd	Roadside	514185	104963	NO <sub>2</sub>	Y	17	4	Y	4
N45	11 Hill Barn Lane	Façade	514125	105066	NO <sub>2</sub>	Y	0	13	N	13
N46	South Farm Rd/Offington Ave	Roadside	514129	104828	NO <sub>2</sub>	N	13	3	N	3
N47	Onslow Court	Roadside	516894	103130	NO <sub>2</sub>	N	8.5	2.5	N	2.5
N48	Shaftesbury Avenue	Roadside	512078	103369	NO <sub>2</sub>	N	33.5	2	N	2
N49	Yeoman Way	Suburban	510752	103910	NO <sub>2</sub>	N	N	1.5	N	1.5
N50	Teville Gate	Urban Centre	514695	103238	NO <sub>2</sub>	N	45m	23m	N	23m
N51	Newland Street outside Morrison's	Kerbside	514870	103349	NO <sub>2</sub>	N	4.3	0.3m	N	0.3m

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)
N52	Newland Street (outside 63)	Kerbside	514963	103333	NO <sub>2</sub>	N	4.1	0.5	N	0.5
N53	Offington Corner	Roadside	513273	105625	NO <sub>2</sub>	Y	15	5	N	5
N54	The Aquarena	Roadside	515707	102727	NO <sub>2</sub>	N	5	3	N	3

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

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2015 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
					2011	2012	2013	2014	2015
WT2	Grove Lodge	Automatic	94	94		39.5	<b>40.9</b>	<b>51.1</b>	37.4
1N	Chapel Rd (UK04)	Diffusion tube	100	100	29.4	28.9	29.9	28.6	25.5
4N	Heene Way (UK02)	Diffusion tube	100	100	16.1	14.3	14.8	13.0	11.0
5N	Cleveland Road (UK01)	Diffusion tube	100	100	17.7	15.7	18.8	15.1	13.4
6N	Gainsborough Avenue (UK06)	Diffusion tube	100	100	38.2	40.2	42.0	36.5	38.0
N1	The Steyne	Diffusion tube	92	92	33.4	34.1	31.3	32.9	24.8
N1C	High Street East	Diffusion tube	100	100	29.9	30.6	32.1	29.8	27.5
N3	Cricketers Parade	Diffusion tube	100	100	36.4	37.2	34.4	34.6	31.1
N5	First Avenue	Diffusion tube	83	83	32.2	34.2	31.6	30.8	28.8
N8	Littlehampton Rd	Diffusion tube	67	67	28.4	28.5	28.4	27.2	28.2
N9	Honeysuckle Lane	Diffusion tube	67	67	10.7	10.6	10.5	8.8	8.2
N11	Dawes Cl	Diffusion tube	100	100	17.7	17.6	15.6	14.2	12.7
N15	Chippers Walk	Diffusion tube	92	92	15.7	15.9	14.8	14.2	12.7
N17	Chapel Road, B-Dust monitor	Diffusion tube	83	83	32.2	31.8	29.6	27.4	24.9
N18A	Kinnall Court, Upper Brighton Road,	Diffusion tube	100	100	24.7	26.0	25.4	23.8	21.6
N21	Greenwood Cottage, A27	Diffusion tube	100	100	31.9	33.6	33.2	33.0	28.9
N22	Falmer Close, C-Dust monitor	Diffusion tube	100	100	15.0	14.5	14.3	12.0	10.4
N24	152 Up B'ton Rd NO2 House	Diffusion tube	100	100	24.1	26.2	26.0	25.1	22.4
N25	Warren Ct House	Diffusion tube	100	100	25.5	24.4	21.5	22.1	20.7
N27	Tarring Road, Crossing	Diffusion tube	100	100	26.5	25.7	28.3	24.4	21.6



Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2015 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
					2011	2012	2013	2014	2015
N28	Chapel Road/Teville Road	Diffusion tube	83	83	40.8	41.2	35.3	36.9	25.7
N29	Downlands Parade	Diffusion tube	100	100	38.5	<b>40.3</b>	36.9	<b>40.3</b>	33.5
N30 A	Grove Lodge Cotages	Diffusion tube	100	100	<b>81.1</b>	<b>71.4</b>	<b>76.5</b>	<b>71.7</b>	<b>66.1</b>
N31	South Farm Road, roundabout	Diffusion tube	100	100	29.3	31.0	30.0	30.3	24.3
N32	Lamppost on corner of Upper Brighton Rd/ Sompting Rd	Diffusion tube	100	100	32.0	33.4	32.1	31.3	28.1
N33	Downlands Parade	Diffusion tube	100	100	39.1	<b>40.7</b>	38.7	<b>41.5</b>	33.7
N34	Downlands Parade	Diffusion tube	100	100	39.2	<b>40.1</b>	38.1	39.7	34.2
N35	30 Upper Brighton Rd House	Diffusion tube	92	92	32.0	35.1	30.5	30.4	29.9
N39	SW of Roundabout at Grove lodge	Diffusion tube	100	100	35.7	37.0	37.9	32.8	31.1
N41	Down pipe on Lamorna Grove Flats	Diffusion tube	100	100	25.1	28.0	25.1	26.4	23.5
N42	Norfolk House	Diffusion tube	92	92	31.3	28.3	28.4	27.6	24.2
N43	23 Upper Brighton Road	Diffusion tube	100	100	25.8	24.7	24.5	23.7	21.2
N44 A	NOx Analyser 21 Upr Brighton Rd	Diffusion tube	100	100		<b>42.6</b>	39.4	<b>42.2</b>	39.2
N44 B	NOx Analyser 21 Upr Brighton Rd	Diffusion tube	100	100		<b>41.7</b>	<b>42.4</b>	<b>41.9</b>	<b>40.3</b>
N44 C	NOx Analyser 21 Upr Brighton Rd	Diffusion tube	100	100		<b>41.6</b>	<b>41.8</b>	<b>41.7</b>	39.8
N45	11 Hill Barn Lane	Diffusion tube	100	100		18.9	18.0	18.4	16.0
N46	South Farm Rd/Offington Ave	Diffusion tube	100	100		25.1	25.9	24.5	22.8
N47	Onslow Court	Diffusion tube	100	100		26.5	25.2	24.8	24.0
N48	Shaftesbury Avenue	Diffusion tube	92	92		27.4	32.3	27.6	25.6
N49	Yeoman Way	Diffusion tube	83	83		12.1	16.6	14.7	13.1

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2015 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
					2011	2012	2013	2014	2015
N50	Teville Gate	Diffusion tube	100	100			21.8	22.5	25.6
N51	Newland Street outside Morrison's	Diffusion tube	100	100			21.0	20.6	17.8
N52	Newland Street (outside 63)	Diffusion tube	92	92			23.6	23.7	21.8
N53	Offington Corner	Diffusion tube	100	100				32.5	29.0
N54	The Aquarena	Diffusion tube	67	67					22.4

Notes: Exceedances of the NO<sub>2</sub> annual mean objective of 40µg/m<sup>3</sup> are shown in **bold**.

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 Technical Guidance LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Where a cell is blank for the year no monitoring took place at this location during that year.

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

Site ID	S Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	NO <sub>2</sub> 1-Hour Means > 200µg/m <sup>3</sup> (3)				
					2011	2012	2013	2014	2015
WT2, Grove Lodge	Roadside	Automatic	94	94		0 (104)	0 (108)	14 (180)	2 (153)

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 90%, the 99.8<sup>th</sup> percentile of 1-hour means is provided in brackets.

## Appendix B: Full Monthly Diffusion Tube Results for 2015

Table B.1 – NO<sub>2</sub> Monthly Diffusion Tube Results - 2015

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 Adjusted <sup>(1)</sup>
1N	Chapel Rd (UK04)	31.4	30.0	28.5	26.7	20.4	24.0	24.1	27.4	29.5	31.2	27.5	22.2	26.9	25.5
4N	Heene Way (UK02)	16.3	15.1	13.8	14.7	9.7	10.8	9.7	9.8	3.9	16.2	9.5	9.6	11.6	11.0
5N	Cleveland Road (UK01)	19.6	17.6	18.7	10.4	10.8	10.3	10.6	12.4	12.3	19.2	14.8	13.2	14.2	13.4
6N	Gainsborough Avenue (UK06)	51.9	45.7	47.0	43.1	33.9	38.4	32.8	40.3	37.6	45.0	39.4	25.0	40.0	38.0
N1	The Steyne	33.2	34.4	31.7	39.2	5.2	22.7	30.2	29.9	27.1		1.9	31.3	26.1	24.8
N1C	High Street East	31.3	31.1	29.7	32.9	23.7	27.3	24.7	30.9	36.1	37.7	22.8	18.5	28.9	27.5
N3	Cricketers Parade	41.9	30.2	35.3	28.8	28.7	29.4	28.6	32.6	36.6	36.0	34.2	30.5	32.7	31.1
N5	First Avenue	38.7	31.1	29.9	24.6	28.8	30.7	30.9	29.0	30.0	32.8	33.1	24.3	30.3	28.8
N8	Littlehampton Rd	36.1	28.8	30.5	30.4	20.2	33.3	27.1	28.4	30.2	33.6	31.5	26.1	29.7	28.2
N9	Honeysuckle Lane	13.5	9.6	10.4	8.7	5.7	6.2	6.4	7.2	6.8	11.7	8.2	8.9	8.6	8.2
N11	Dawes Cl	16.9	15.8	15.1	14.1	9.5	11.3	8.5	11.3	12.5	18.2	14.2	12.6	13.3	12.7
N15	Chippers Walk	22.5	16.3	15.4	12.5	9.1	10.6		9.9	8.3	16.8	14.1	12.0	13.4	12.7
N17	Chapel Road, B-Dust monitor	30.3	30.5	29.8	28.1	20.8	19.8	19.0	25.5		33.3	25.2		26.2	24.9
N18A	Kinnall Court, Upper Brighton Road,	31.2	26.9	29.1	17.6	21.1	21.5	18.6	20.6	23.6	27.1	21.0	14.4	22.7	21.6
N21	Greenwood Cottage, A27	39.8	29.9	34.7	23.1	24.2	29.1	24.9	33.1	32.9	38.2	29.3	25.9	30.4	28.9
N22	Falmer Close, C-Dust monitor	18.2	14.3	5.7	12.9	8.3	8.5	8.0	8.6	10.4	16.4	11.2	8.5	10.9	10.4
N24	152 Up B'ton Rd NO2 House	29.2	26.5	24.8	24.7	19.9	20.4	19.6	24.2	24.2	28.9	22.2	18.7	23.6	22.4
N25	Warren Ct House	30.9	24.5	24.0	22.6	19.0	18.7	18.8	17.3	19.0	23.6	23.8	19.7	21.8	20.7
N27	Tarring Road, Crossing	28.2	29.0	27.6	22.7	14.6	19.5	16.7	22.4	24.6	31.3	19.0	17.2	22.7	21.6

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 Adjusted <sup>(1)</sup>
N28	Chapel Road/Teville Road	40.6	35.7	33.4	33.5	29.4		15.6	18.4	19.8	26.8		17.7	27.1	25.7
N29	Downlands Parade	37.2	35.7	36.1	38.3	34.2	34.2	29.5	37.9	33.8	36.6	35.4	34.6	35.3	33.5
N30 A	Grove Lodge Cotages	79.3	71.0	67.7	57.7	68.2	67.4	78.7	74.0	63.2	72.9	64.2	70.8	69.6	66.1
N31	South Farm Road, roundabout	29.3	26.3	27.8	27.6	23.2	23.9	25.0	27.0	23.6	15.4	28.5	28.7	25.5	24.3
N32	Lamppost on corner of Upper Brighton Rd/ Sompting Rd	37.0	32.5	29.1	28.1	29.8	28.8	24.7	22.5	28.6	35.5	32.5	26.3	29.6	28.1
N33	Downlands Parade	37.4	37.2	36.4	37.3	34.3	33.4	32.9	38.9	32.0	40.3	32.8	33.5	35.5	33.7
N34	Downlands Parade	36.8	37.5	34.5	40.7	31.0	34.1	32.4	37.4	34.2	38.9	36.2	38.0	36.0	34.2
N35	30 Upper Brighton Rd House	31.7	30.8	30.6		55.8	28.9	25.7	26.9	26.7	29.7	30.7	29.2	31.5	29.9
N39	SW of Roundabout at Grove lodge	37.4	40.0	36.7	35.2	25.7	32.1	27.0	29.3	40.8	41.0	27.4	20.8	32.8	31.1
N41	Down pipe on Lamorna Grove Flats	31.4	27.1	27.3	21.6	24.1	20.7	22.3	23.3	24.6	25.3	26.0	23.7	24.8	23.5
N42	Norfolk House	27.3	25.7	26.8	31.6	24.3	25.4	22.2		23.0	31.6	22.2	20.5	25.5	24.2
N43	23 Upper Brighton Road	27.5	23.8	13.5	21.2	20.2	21.8	23.4	20.7	21.7	25.1	26.4	22.5	22.3	21.2
N44 A	NOx Analyser 21 Upr Brighton Rd	45.3	39.8	40.1	41.0	41.1	41.6	39.6	43.6	40.4	47.4	39.6	35.8	41.3	39.2
N44 B	NOx Analyser 21 Upr Brighton Rd	46.2	44.9	42.6	44.0	40.9	43.8	40.3	41.1	42.3	47.4	41.6	34.3	42.4	40.3
N44 C	NOx Analyser 21 Upr Brighton Rd	48.4	39.8	43.6	39.7	42.9	42.2	38.7	45.2	45.6	41.3	37.1	38.5	41.9	39.8
N45	11 Hill Barn Lane	20.8	20.4	17.6	13.4	10.7	15.3	14.3	16.1	15.0	19.0	21.0	18.3	16.8	16.0
N46	South Farm Rd/Offington Ave	29.9	26.6	26.9	26.2	22.3	20.4	21.6	22.3	17.6	26.1	24.9	22.6	24.0	22.8
N47	Onslow Court	28.8	27.3	33.4	26.6	19.9	22.1	18.7	24.4	22.1	34.0	24.7	21.5	25.3	24.0
N48	Shaftesbury Avenue		31.9	28.3	23.0	17.9	26.6	25.2	27.2	26.2	31.7	31.1	27.5	27.0	25.6

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 Adjusted <sup>(1)</sup>
N49	Yeoman Way	20.5	14.9	14.8	11.1	11.9	9.6	10.9			17.8	14.1	12.9	13.8	13.1
N50	Teville Gate	24.1	25.2	23.5	26.6	15.4	16.9	32.3	34.9	37.4	37.5	18.4	31.6	27.0	25.6
N51	Newland Street outside Morrison's	25.6	22.7	19.1	19.7	14.1	15.7	15.6	18.7	17.5	21.1	19.6	16.1	18.8	17.8
N52	Newland Street (outside 63)	32.9	25.4		22.3	18.2	21.8	19.7	20.7	21.9	23.6	24.3	21.6	22.9	21.8
N53	Offington Corner	32.7	31.0	27.1	20.2	30.3	31.5	36.1	30.5	25.6	27.9	37.3	36.2	30.5	29.0
N54	The Aquarena	31.2			23.6	18.5	22.2	21.6			31.6	23.0	16.4	23.5	22.4

(1) See Appendix C for details on bias adjustment

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

### Diffusion Tube Bias Adjustment Factors

NO<sub>2</sub> diffusion tubes are provided and analysed by Gradko laboratory. The NO<sub>2</sub> tube preparation method used is 50% triethanolamine (TEA) in Acetone.

Data from the NO<sub>2</sub> diffusion tubes has been compared and bias corrected to the factors produced from the UK co-location data-base available from Defra <http://laqm.defra.gov.uk/bias-adjustment-factors/bias-adjustment.html>

The bias adjustment factor used for 2015, obtained via tools at the aforementioned website, was 0.95.

### QA/QC of diffusion tube monitoring

All diffusion monitoring data has been ratified following the methods described in LAQM.TG(16). A quality assurance / quality control (QA/QC) programme including field duplicates and blanks, and instrument calibration with standard gases has been followed (AEAT, 2000).

### QA/QC of automatic monitoring

The automatic monitoring station in Grove Lodge consists of a Monitor Labs ML9841b NO<sub>x</sub> Analyser. All automatic monitoring data is managed by Kings College London (KCL ERG) and validated against local site operator's (LSO) calibration results. The unit is calibrated fortnightly by an Officer of the Council (the LSO), the results of which are then sent directly to KCL for checking. Servicing and maintenance of the unit during 2015 was by ESU1 Ltd.

Below is a screen shot fall-off of NO<sub>2</sub> concentration with distance from kerb calculator spreadsheet (downloaded from LAQM website 20<sup>th</sup> January 2017).

The annual local mean background concentration was derived from values measured at the six urban background sites within the Borough.

Site ID	Site Name	NO <sub>2</sub> 2015 µg m <sup>-3</sup>
4N	Heene Way (UK02)	11.0
5N	Cleveland Road (UK01)	13.4
N9	Honeysuckle Lane	8.2
N11	Dawes Cl	12.7
N15	Chippers Walk	12.7
N22	Falmer Close, C-Dust monitor	10.4
Average:		11.4

Distance correction for Grove Lodge Cottages (N30A)

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Enter data into the red cells

Step 1	How far from the KERB was your measurement made (in metres)?	2.5 metres
Step 2	How far from the KERB is your receptor (in metres)?	2.5 metres
Step 3	What is the local annual mean background NO <sub>2</sub> concentration (in µg/m <sup>3</sup> )?	11.4 µg/m <sup>3</sup>
Step 4	What is your measured annual mean NO <sub>2</sub> concentration (in µg/m <sup>3</sup> )?	66.1 µg/m <sup>3</sup>
Result	The predicted annual mean NO <sub>2</sub> concentration (in µg/m <sup>3</sup> ) at your receptor	66.1 µg/m <sup>3</sup>

Distance correction for Grove Lodge Cottages (N30A) for one the triplicate concentrations that measured above 40.0 µg m<sup>-3</sup>.

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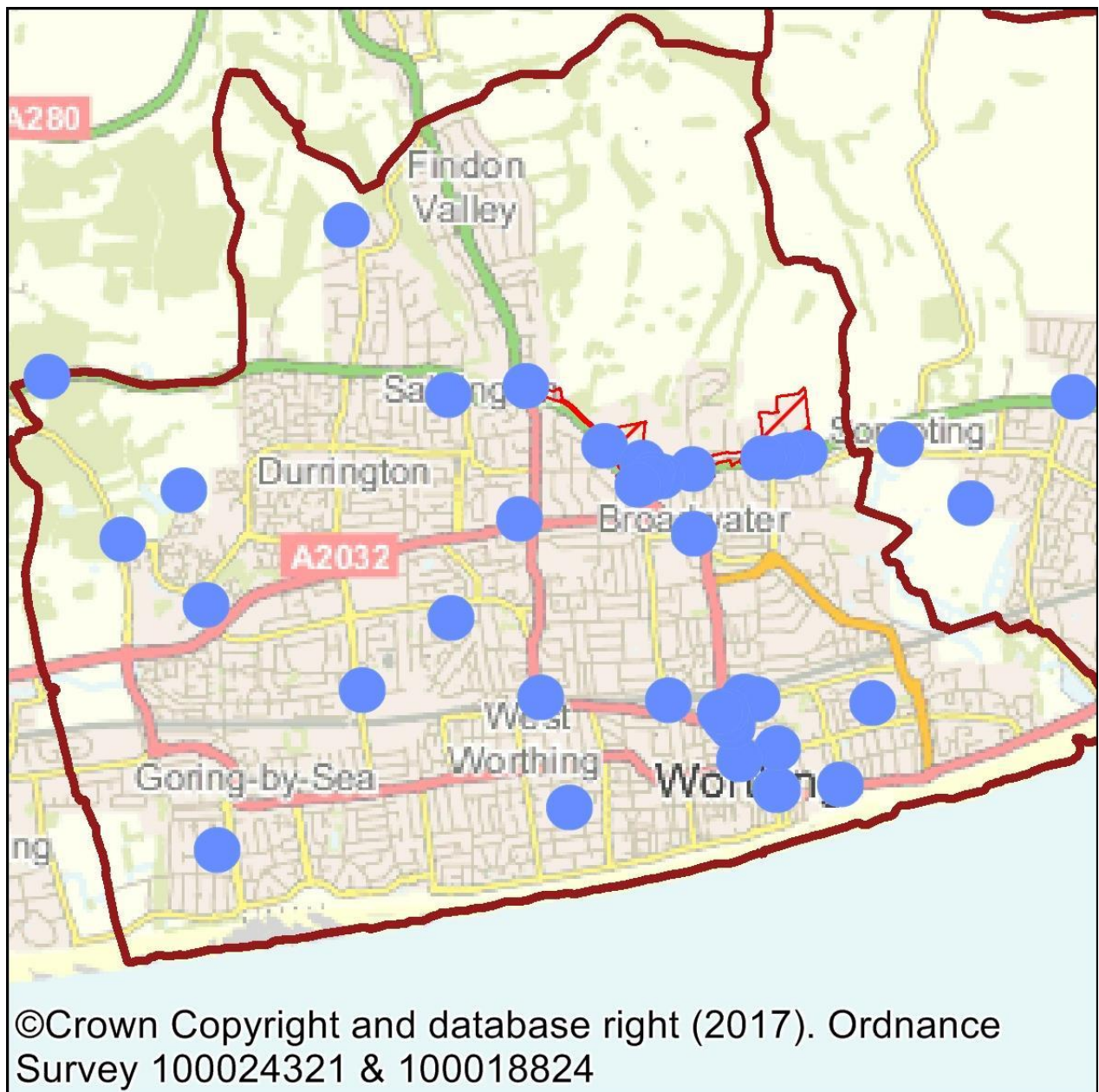
Enter data into the red cells

Step 1	How far from the KERB was your measurement made (in metres)?	4 metres
Step 2	How far from the KERB is your receptor (in metres)?	21 metres
Step 3	What is the local annual mean background NO <sub>2</sub> concentration (in µg/m <sup>3</sup> )?	11.4 µg/m <sup>3</sup>
Step 4	What is your measured annual mean NO <sub>2</sub> concentration (in µg/m <sup>3</sup> )?	40.3 µg/m <sup>3</sup>
Result	The predicted annual mean NO <sub>2</sub> concentration (in µg/m <sup>3</sup> ) at your receptor	26.9 µg/m <sup>3</sup>





## Appendix D: Map(s) of Monitoring Locations



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

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective <sup>3</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>3</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
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EU	European Union
EV	Electric Vehicle(s)
FDMS	Filter Dynamics Measurement System
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

## References

Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006, Department of Environment, Food and Rural Affairs, Report Number AEAT/ENV/R/2170. Available from UK-AIR [https://uk-air.defra.gov.uk/assets/documents/reports/cat09/0701110944\\_AQinequalitiesFNL\\_AEAT\\_0506.pdf](https://uk-air.defra.gov.uk/assets/documents/reports/cat09/0701110944_AQinequalitiesFNL_AEAT_0506.pdf)

Defra. Abatement cost guidance for valuing changes in air quality, May 2013. Available from [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/197898/pb13912-airquality-abatement-cost-guide.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/197898/pb13912-airquality-abatement-cost-guide.pdf)

NO<sub>2</sub> Fall-Off with Distance Calculator available from:  
<http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html>