



WORTHING BOROUGH COUNCIL



2017 Air Quality Annual Status Report (ASR)

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

November 2017

Worthing Borough Council

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Executive Summary: Air Quality in Our Area

Air Quality in Worthing

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

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

This report covers monitoring and actions during 2016. There is one Air Quality Management Area (AQMA) within the Worthing Borough Council area: Worthing AQMA No.2 on the A27/A24 in Worthing, declared for exceeding the annual mean objective for Nitrogen Dioxide (NO₂) of 40µg/m³.

Monitoring during 2016 showed 3 monitoring sites exceeded the annual mean objective for NO₂ (5 tubes and the continuous monitor, all within the Grove Lodge AQMA). However only one measurement was at a site of relevant exposure, a residential façade at Grove Lodge Cottages. The other monitoring sites were roadside locations and when the measured levels were predicted back to residential facades, they were well below the annual mean objective. The Grove Lodge Cottages site exceeded 60µg/m³ again, suggesting it may also exceed the 1-hour mean objective of 200µg/m³.

Elsewhere within the Borough measured NO₂ concentrations remained below the annual mean objective. Passive monitoring of NO₂ using diffusion tubes took place at 39 sites during 2016.

Monitoring also took place via our continuous monitor adjacent to Grove Lodge. This site was affiliated into Defra's national Automatic Urban and Rural Network (AURN) in 2016. Results showed the annual mean objective was exceeded at the roadside in

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

2016 - $48\mu\text{gm}^{-3}$. However when predicted back to the nearest façade (residential) this level drops to $30.5\mu\text{gm}^{-3}$, well below the annual mean objective.

The Worthing air quality action plan (AQAP) was published in 2015. The plan relies on partnership work with Highways England (for the A27) and West Sussex County Council to deliver actions to improve traffic flows, encourage alternatives to driving conventional vehicles and therefore improve air quality. We continue to engage with West Sussex County Council to explore alternatives to car use, such as cycling and walking and bringing through improvements throughout the Borough.

More information is available on our website at <https://www.adur-worthing.gov.uk/environmental-health/pollution/air-quality-and-pollution/local-air-quality-management/#page-content>

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 (pending)
- Improving walking and cycling infrastructure
- Behaviour change programmes
- Electric vehicles / infrastructure
- Car Clubs
- Work with developers to achieve improvements to infrastructure and traffic flow and progress the Action Plan
- WBC & WSCC Staff Travel Planning

Worthing Borough Council has continued to ensure the Sussex Air Quality Emissions Mitigation Planning Guidance is used as part of the planning process. Working with our partners at West Sussex County Council, planning policy and development control we have attempted to engage with developers at any early stage, achieving mixed results to date. Discussions with developers were progressing into 2017.

We continue to work with West Sussex County Council to explore improvements to cycling and walking provision throughout the Borough. In late 2016 the Local Strategic Partnership 'Waves Ahead' held a conference themed on sustainable

transport across Worthing (and Adur), exploring what can be done together in the community to improve transport and achieve better social, economic and environmental sustainability in our transport networks.

The Council has embarked on an electric vehicle charge point strategy for Worthing (and Adur), giving consideration to the provision of charge points across the area to encourage residents and visitors to switch to electric vehicles.

Conclusions and Priorities

Measured concentrations of NO₂ remained below the annual objective at most sites during 2016. However, Grove Lodge Cottages within the AQMA remains a cause for concern.

We work hard to ensure the air quality impacts of major developments are assessed and use the Sussex Planning and Emissions Mitigation Guidance to assist us - <https://www.adur-worthing.gov.uk/media/media,121587,en.pdf>. The Guidance is signposted in the Local Plans but is not a Supplementary Planning Document.

Priority areas for action include increasing multi-agency involvement in solutions to poor air quality; bringing through improvements to infrastructure as development sites are brought forward in order to minimise the impacts on the AQMA and around the Borough, thus avoiding creating new hotspots; to agree effective emissions mitigation (such as electric vehicle charge points, improvements to public transport, etc.); increasing public awareness and public involvement in the solutions to poor air quality; to expand the local electric vehicle charging network at Council owned sites and promote the use of low emission vehicles alongside any government grants available; to work with Defra's appointed agents to implement monitoring for the measurement of PM_{2.5}'s at the Worthing Grove Lodge AURN monitoring site; to liaise with Highways England on any draft proposals for the A27 (Worthing) highway improvements.

Local Engagement and How to get Involved

We are engaging with interested parties in the Borough, including local community groups, elected members, transport planners (WSCC and Highways England), planning policy and other interested parties. We are active members of the Sussex Air Quality Partnership. The Partnership provides assistance to members and

information to the public via their web-site with air quality data, news updates, educational resources, links and other services such as airAlert. Please see <http://www.sussex-air.net/> for more information.

The Council is interested in hearing from residents who may have innovative ideas to reduce traffic congestion/air pollution in and around the Borough. You may contact us using our online form at <https://www.adur-worthing.gov.uk/environmental-health/pollution/air-quality-and-pollution/local-air-quality-management/#have-your-say>.

Road vehicles are a major source of 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:

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

You can plan your journey using the West Sussex Journey Planner, <http://www.travelwestsussex.co.uk/>. This allows you to plan journeys using different modes of transport.

If you must drive:

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

At home

- Buy water-based or low-solvent paints, varnishes, glues and wood preservatives.
- Avoid burning solid fuels where possible. If you must burn solid fuel we recommend using smokeless fuels. Whilst Worthing is not a smoke control area, smokeless fuels

are less polluting and less likely to cause a nuisance to your neighbours. Wood should be properly seasoned so it has low moisture content – see

<https://woodsurre.co.uk/firewood-ready-to-burn/>.

- Try to avoid lighting bonfires. If you must have a bonfire only burn dry material and never burn household waste, particularly 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. See our website <https://www.adur-worthing.gov.uk/environmental-health/pollution/air-quality-and-pollution/bonfires-and-smoke/>.

Information on Air Quality, including reports and monitoring results, is available on our website at <https://www.adur-worthing.gov.uk/environmental-health/pollution/air-quality-and-pollution/>. Information is also available at <http://www.sussex-air.net/>.

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1 Local Air Quality Management

This report provides an overview of air quality in Worthing during 2016. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by 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.2 in Appendix E.

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

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

A summary of AQMAs declared by Worthing Borough Council 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://www.adur-worthing.gov.uk/environmental-health/pollution/air-quality-and-pollution/local-air-quality-management/#local-aqma> and the LAQM website https://uk-air.defra.gov.uk/aqma/details?aqma_id=1060 .

Appendix D: Map(s) of Monitoring Locations and AQMAs, provides a map of air quality monitoring locations in relation to the AQMA.

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	City / Town	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance (maximum monitored/modelled concentration at a location of relevant exposure)		Action Plan (inc. date of publication)
						At Declaration	Now	
Worthing Borough Council AQMA No. 2	Declared 13/07/2010, Amended 15/12/2014	NO2 Annual Mean	Worthing	From Crockhurst Hill incorporating Offington Corner Roundabout, Warren Road, Grove Lodge Roundabout, Upper Brighton Road up to and including the Downlands Retail Centre, and Lyons Way	YES	71.5	64.1	Worthing Air Quality Action Plan November 2015 https://www.adur-worthing.gov.uk/media/media,138133,en.pdf

Worthing BC 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 Worthing

Defra's appraisal of last year's ASR concluded

1. *"The details within the main Action Plan clearly indicate a high level of engagement between Worthing Borough Council, West Sussex County Council, and Highways England, which is welcomed. We note that any significant actions to address the traffic emissions influencing the pollution hotspot are directly linked to the options for schemes influencing traffic on the A27, the remit of Highways England, and the A24 under West Sussex County Council."*
2. *"The latest monitoring results indicate only a single point of exceedance at Grove Lodge at the junction with the Grove Lodge Roundabout on the A27. It is noted that the exceedance also breaches the hourly mean objective by exceeding 60ug/m³. Consideration should be given to declaring the AQMA for exceedance of the hourly mean objective for nitrogen dioxide."*

Worthing Borough Council is looking at this further.

3. *"Examination of the area surrounding Grove Lodge Roundabout, suggests there may be additional locations of relevant exposure close to the roundabout, which should also be investigated if this has not already taken place."*

Worthing Borough Council has monitored extensively around the Grove Lodge roundabout over the last decade and, taking account of the distances

of relevant receptors from the kerbside, we have not found exceedances elsewhere.

4. *“We acknowledge the statement in the Action Plan, ”that since the level at Grove Lodge Cottages is substantially higher than the annual mean objective, only a significant reduction in either vehicle emissions or the volume of traffic will result in the annual mean objective being met”. Thus the outcome of the Feasibility study to examine options for the A27, has acknowledged that there is an aim, “aim is to address congestion at key hotspots, the delays for road users, separation of communities – notably in Arundel, Worthing and Lancing – air pollution, and an above average number of accidents.”*
5. *“Further plans for developing schemes to address congestion hotspots should be subject to air quality assessments.”*

Worthing Borough Council is in discussions with Highways England to ensure air quality assessments are completed.

6. *“The distance correction calculations on p31 are unclear, both corrections labelled as N30A, we assume the second correction applies to N44B. Referencing these points on a map suggests that N30A may not represent relevant exposure as recorded in TableA.2. Please can this be confirmed, and the results amended as required.”*

The calculation headings have been amended; the second distance correction was for N44B. We can confirm that N30A is representative of relevant exposure.

7. *“Results presented for comparison to air quality objectives should all be corrected for distance as detailed in the latest LAQM Technical Guidance TG(16).”*

We have included distance corrections for 2016 in Table B.1 of this report.

8. *“The details of the 2014 AQMA extension are not recorded on the Defra database, please can the Council arrange to upload the details via the RSW web pages.”*

Worthing Borough Council confirms the details are recorded on the Defra database.

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

Key completed measures are:

- We have continued to use (and refine our use of) the Sussex Air Quality Emissions Mitigation Planning Guidance as part of the planning process. The aim is to ensure mitigation is included in all major developments. Working with our partners at West Sussex County Council, planning policy and development control we have achieved mixed results to date and discussions with developers were progressing into 2017. The guidance is signposted within the Adur Local Plan and also on our website.
- Embarked on devising an electric vehicle charge point strategy for Adur (and Worthing). This outlines the Council’s approach to the expansion of charge points across the District to encourage residents and visitors to switch to electric vehicles. This will be split into several phases, with Council owned sites being targeted first and existing charge points being replaced.
- We continued to liaise with West Sussex County Council to explore alternatives to car use, such as cycling and walking improvements through the Borough.
- In November 2016 the West Sussex Walking & Cycling Strategy was published. The strategy contains a prioritised list of over 300 potential walking and cycling improvements suggested by a range of stakeholders and organisations. Subject to available funding, availability of land and other constraints they could be implemented during the strategy period. Worthing BC will support the County Council to bring forward improvements wherever

possible. See <https://www.westsussex.gov.uk/about-the-council/strategies-plans-and-policies/roads-and-travel-plans-and-policies/west-sussex-walking-and-cycling-strategy-2016-2026/>

- In November 2016 the Local Strategic Partnership 'Waves Ahead' held a conference focussed on sustainable transport across Adur & Worthing. Delegates were asked to 're-think transport'. The conference set to explore what can be done together in the community to improve transport and achieve better social, economic and environmental sustainability in our transport networks. In particular, looking at cycling, walking and public transport as an alternative to the car. Attendees included representatives from local cycling forums, local government, businesses (see <http://www.wavesahead.org.uk/get-involved/annual-conference/>).
- Improve emissions from the Council's vehicle fleet. The Council continues to review its fleet and consider cost effective alternatives to diesel vehicles. The number of pool cars (petrol) was proposed to be increased for staff to use for work related journeys (through Enterprise Leasing). As the number of pool cars increases we hope to add electric and/or hybrid vehicles to the fleet.

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

- The provision of electric vehicle charge points at key Council owned sites in the Borough, in line with the Council's emerging draft electric vehicle chargepoint strategy.
- The provision of electric vehicle charge points at key development sites in the Borough, as and when these sites come forward for planning approval.
- Expansion of the Council's pool car provision leading to a reduction in journeys made by Council staff in their own vehicles, allowing the Council to control the fuel type.
- The addition of low emission/hybrid vehicles to the Council's pool car fleet.
- Further implementation and refinement of the Sussex Air Quality Guidance and delivery of effective and meaningful emissions mitigation at local major developments.

Worthing Borough Council's priorities for the coming year (2017) are

- To work with developers as and when sites come forward for major development in order to minimise impacts on the existing AQMA and avoid creating new hotspots; and to agree effective emissions mitigation (such as electric vehicle charge points, improvements to public transport, cycling provision, etc.);
- To expand the local electric vehicle charging network at Council owned sites and promote the use of low emission vehicles alongside any government grants available.
- To work with Defra's appointed agents to implement monitoring for the measurement of PM_{2.5}'s at the Worthing Grove Lodge AURN monitoring site.
- Liaise with Highways England on any draft proposals for the A27 (Worthing) highway improvements.

The principal challenges and barriers to implementation that Worthing Borough Council anticipates facing are

- As the A27 is controlled by Highways England we have limited scope to bring about improvements in the Worthing AQMA.
- The number and scale of developments planned for the sub-region will result in additional traffic on the road network and is likely to affect air quality, particularly on the A259 and A27, at least in the short-medium term.
- Obtaining appropriate and meaningful mitigation from major developments is proving challenging.
- The limited resources available to the Council (financial and personnel) associated with increasing demands to deliver air quality improvements, particularly in light of heightened political and public interest in the subject.

Progress on the following measures has been slower than expected due to:

- A27 Highway Improvements – Highways England consultation now expected in 2017;
- Cut Engine Cut pollution signs – we are targeting queuing traffic at Lyons Farm, discussions with Highways England and landowners delayed;

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- LEZ/CAZ Feasibility studies – complicated by Highways England A27 consultation, also finance and enforcement are an issue;
- Worthing Car Club – identifying seed funding has been an issue, funding likely to come from new developments;
- HGV/LGV & Ecostars Assessments – identifying suitable funding is delaying progress with these.

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, Worthing Borough Council anticipates that further additional measures not yet prescribed will be required in subsequent years to achieve compliance and enable the revocation of Worthing Borough Council AQMA No. 2.

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	A27 Highway Improvements	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	Highways England	2015	2021/22		High	This stretch of the A27 has been earmarked for improvements. Consultation on options Summer 2017	2022/23	Progress will be reported in the 2018 ASR.
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 A27 consultation outcome.	2018	Discussions with land owners now planned for 2018
3	LEZ/CAZ Feasibility	Promoting Low Emission Transport	Low Emission Zone (LEZ)	WBC	2016	2017 onwards		High	Yet to progress. A27 consultation delaying progress.	2018 on	As a HE road any CAZ/LEZ problematic. Finance and Enforcement also an issue.
4	Embed Air Quality Emissions Mitigation Planning Guidance for Sussex into the planning process	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	WBC	2014	2015		Low	Used in connection with major applications in Worthing, as per the terms of the Guidance.	Ongoing	Revision in progress, due end 2017

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5	Planning Policies	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	WBC	2015	Ongoing		Low/Med	Draft Local Plan – consultation now due Sumer 2018	2019	Discussions will take place with planning policy to ensure AQ is sufficiently embedded into the new Local Plan.
6	EV vehicles and infrastructure	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	WBC	2015	Ongoing		Low/Med	Emerging plans for EV chargepoints on WBC owned land..	Ongoing	WBC car parks tasked with replacing existing outdated charge points first, other land to follow as and when funding allows.
7	Worthing Car Club	Alternatives to private vehicle use	Car Clubs	WBC	2015	2016/17		Low	Early discussions with developers to introduce car clubs in certain major developments, e.g West Durrington, via s106 agreements.	2017/18	Efforts continue, seed funding continues to be an issue
8	Public transport improvement	Transport Planning and Infrastructure	Public transport improvements-interchanges stations and services	WSCC	Ongoing	Ongoing		Low	Ongoing discussions with bus operators to improve fleets as and when OLEV funding arises	Ongoing	No progress with Southern Rail.
9	WBC Staff Travel Planning	Promoting Travel Alternatives	Workplace Travel Planning	WBC	Ongoing	Ongoing		Low	Increased no. of pool cars provided for casual user staff.	Ongoing	Plans to incorporate low emission vehicles (hybrids or pure ev's) to pool car fleet. Introduction of HiyaCar proposed for 2017.
10	Improve Emissions from Council's Vehicle fleet	Promoting Low Emission Transport	Company Vehicle Procurement	WBC	2015	Ongoing		Low	Funding streams identified. Unsuccessful bid to OLEV for two EV to replace mayor's vehicle and courier van. Replacement programme agreed.	Ongoing	Incorporate low emission vehicles (hybrids or pure ev's) to pool car provision. Investigate other options for funding. Council to demonstrate leadership.
11	Increase availability of AQ information in	Public Information	Via the Internet	WBC	2015	Ongoing		Low	Website reviewed and diffusion tube data added. Drive to push airAlert via WS Public Health	Ongoing	

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	relation to impacts on Public Health								(through Sussex-air).		
12	Embedding AQ in Adur & Worthing Public Health Plan	Policy Guidance and Development Control	Other policy	WBC	2015	2016		Low	Air Quality Action Plans included within revised Adur & Worthing Public Health Plan.	Ongoing	
13	Promotion of Air Alert	Public Information	Via the Internet	WBC	2014	Ongoing		Low	Air alert information included on website; local GP's sent leaflets (via Sussex-air). Drive to push airAlert via WS Public Health (through Sussex-air)	Ongoing	
14	Re-assess traffic light sequencing in AQMA	Traffic Management	UTC, Congestion management, traffic reduction	HE/WSCC	Ongoing	Ongoing		Low	Ongoing optimisation by HE	Ongoing	
15	Safe Cycling and Walking Routes	Transport Planning and Infrastructure	Cycle network	WSCC/HE	Ongoing	Ongoing		Low/Med	West Sussex Walking & Cycling Strategy published Nov.2016. Discussions with developers as sites come forward. Sustrans involvement.	Ongoing	
16	Travel plans for significant/major developments	Promoting Travel Alternatives	Other	WSCC/WBC	Ongoing	Ongoing		Low	No major developments. Discussions ongoing with developers for forthcoming 'major' developments.	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	

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18	Encouraging alternative transport modes	Alternatives to private vehicle use	Other	WBC/WSCC	Ongoing	Ongoing		Low	WBC and WSCC staff travel plans encourage alternatives.	Ongoing	Measure to be considered for removal as duplicates other measures
19	Cycling & Walking promotion	Promoting Travel Alternatives	Promotion of cycling	WSCC/WBC	Ongoing	Ongoing		Low	West Sussex Walking & Cycling Strategy published Nov.2016.	Ongoing	Work to implement the listed improvements ongoing, subject to available funding and availability of land.
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		Ongoing	
22	Business Travel Plans	Promoting Travel Alternatives	Workplace Travel Planning	WBC	2017	2018 on		Low	Local Strategic Partnership conference focused on sustainable travel – attended by local businesses. The hope is that this will make businesses think about travel options.	Ongoing	
23	Worthing College Travel Plan Review	Promoting Travel Alternatives	School Travel Plans	WBC/WSCC	2015/16	2016/17		Low/Med	College travel survey in 2016 suggested over 70% did not travel to/from the College by car.	Ongoing	5 year travel survey due 2017/18
24	HGV/LGV assessment	Transport Planning and Infrastructure	Route Mgt plans/Strategic routing for HGV's	WBC	2016/17	2016/17		N/A	Not yet commenced	Ongoing	Subject to identification of suitable funding streams.
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	Subject to identification of suitable funding streams

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26	Increase and improve availability of WBC Air Quality Monitoring results	Public Information	Via the Internet	WBC	2015	2015		Low	Website information improved. Diffusion tube results now on website.	Ongoing	
27	Leaflets to promote sustainable/active travel modes (e.g. car sharing, cycling, public transport)	Public Information	Via leaflets	WBC	Ongoing	Ongoing		Low	None	Deleted	Move toward digital provision of information and reduced space for leaflets means this measure will not be pursued further
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_{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.

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 %.

Figure 2-1 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 2-1 Fraction of mortality attributed to particulate air pollution in Worthing Borough Council



Worthing Borough Council is currently developing its approach to address PM_{2.5} in partnership with West Sussex Public Health and other local authority officers. We hope to monitor PM_{2.5} levels through our AURN continuous monitoring station at Grove Lodge (A27), subject to negotiations with Defra.

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 2016. Table A.5 in Appendix A shows the details of the site.

In the Autumn of 2016 the site became affiliated to Defra's Automatic Urban and Rural (Monitoring) Network (AURN). As part of the affiliation Defra provided a new NO_x monitoring device for the site and it is hoped that particulate monitoring equipment can be added in the near future. The Council retains ownership of the site and all associated equipment.

Defra's appointed consultants download the monitoring results and add them to the UK Air website - <https://uk-air.defra.gov.uk/data/>. Monitoring results are also available at www.sussex-air.net/.

Monitoring results for this site prior to 2016 and results for other sites across Sussex are available at www.sussex-air.net/.

A map showing the location of the monitoring site is provided in Appendix D. Further details on how the monitor is calibrated and how the data has been adjusted are included in Appendix C.

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.

3.1.2 Non-Automatic Monitoring Sites

Worthing Borough Council undertook non- automatic (passive) monitoring of NO₂ at 41 sites during 2016. Table A.6 in Appendix A shows the details of the sites.

Seven diffusion tubes at 5 sites were removed at the end of 2015, many within the AQMA where we felt we had sufficient monitoring – N32, N33, N34, N41, N46, N47 and N49.

Four sites were added at the start of 2016, identified due to either possible development or to measure in areas not previously looked at – N55 Varey Road/Fulbeck Ave, N56 Titnore Way, N57 Lyndhurst Road, N58 Yeoman Road

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)

All monitoring sites showed an increase in measured levels over the 2015 results. In total there were 3 monitoring sites that exceeded the annual mean objective for NO₂ (5 tubes 6N, N30A and N44A/B/C and the continuous monitoring site WT2, all within the Grove Lodge AQMA). However only one measurement was at a site of relevant exposure, a residential façade at Grove Lodge Cottages (N30A).

Automatic Continuous monitoring

Fig A1.1 shows the annual average NO₂ since 2012, measured at the automatic monitoring site located on the A27 at Grove Lodge. This is a strategic road through Worthing and traffic speeds tend to be low for prolonged periods during the day. NO₂ peaked at 51.4µgm⁻³ in 2014 and decreased to 37.4µgm⁻³ in 2015. Measured concentrations increased again in 2016 to 48µgm⁻³. It is not known why concentrations fluctuate so wildly. The new Worthing College site adjacent to the AQMA opened in Autumn 2013 and it was suspected the increase in 2014 may have been a result of traffic related to the college (the site had been vacant for a number of years prior to the college opening). However the large drop in 2015

appeared to counter this view. We have looked at traffic data from Highways England for 2015 and 2016. However they implemented a change of database during 2015 meaning there is no directly comparable data that covers the calendar years 2015 and 2016 with which to align with our annual monitoring data.

Therefore we will review traffic data for 2016 and 2017 in our 2017 ASR.

When the level measured at the roadside is predicted back to the closest relevant exposure (a residential facade), the exposure reduces to $30.5\mu\text{g m}^{-3}$.

Diffusion tubes

NO₂ concentrations at all monitoring sites increased during 2016. The full 2016 dataset of monthly mean values is provided in Appendix B.

All measured exceedances of the annual mean objective were at sites within the AQMA. As in previous years the highest NO₂ concentration was measured at Grove Lodge Cottages (N30A) alongside the A27. As this tube is located at a point of relevant exposure, there continues to be an exceedance of the annual objective for NO₂ within the AQMA.

Any site exceeding $60\mu\text{g m}^{-3}$ is also likely to exceed the 1-hour mean objective of $200\mu\text{g m}^{-3}$. This site has exceeded $60\mu\text{g m}^{-3}$ for many years and feedback from Defra following last year's report advised the Council to consider declaring the existing AQMA to incorporate exceedance of the hourly mean objective for NO₂. However as we measure using a diffusion tube at this location there is a margin of error to be taken into account. Worthing Borough Council will consider this matter in the coming year.

The other tubes (at two sites) were roadside locations, 6N Gainsborough Avenue and N44A/B/C co-located with the continuous analyser. When predicted to the nearest relevant exposure (residential facades) the level at 6N reduced to $29.1\mu\text{g m}^{-3}$, whereas N44A/B/C fall to $29\mu\text{g m}^{-3}$, well below the annual objective.

All other sites measured levels below the annual mean objective.

Fall-off calculations of NO₂ concentration with distance from kerbside are shown in Appendix C.

Figures A1.2 to A1.4 in Appendix A show the trends in NO₂ concentration from 2012 to 2016 at the diffusion tube sites exceeding the objective.

Fig A.1.5 shows the trend in measured NO₂ levels at monitoring sites within the AQMA since 2011.

Our Further Assessment in 2013 identified the area around Lyndhurst Road near the gas holder station as a potential site of exceedance. We therefore erected a diffusion tube here in 2016. The measured level for 2016 was 27.6µg m⁻³. As this is a residential façade the level is well below the annual mean objective. We will report on the 2017 results next year, but early indications suggest this is not an area of concern.

Table A.7 in Appendix A compares the ratified and adjusted monitored NO₂ annual mean concentrations for the past 5 years with the air quality objective of 40µg/m³.

Fig.A.2.5 Tube site 6N Gainsborough Avenue

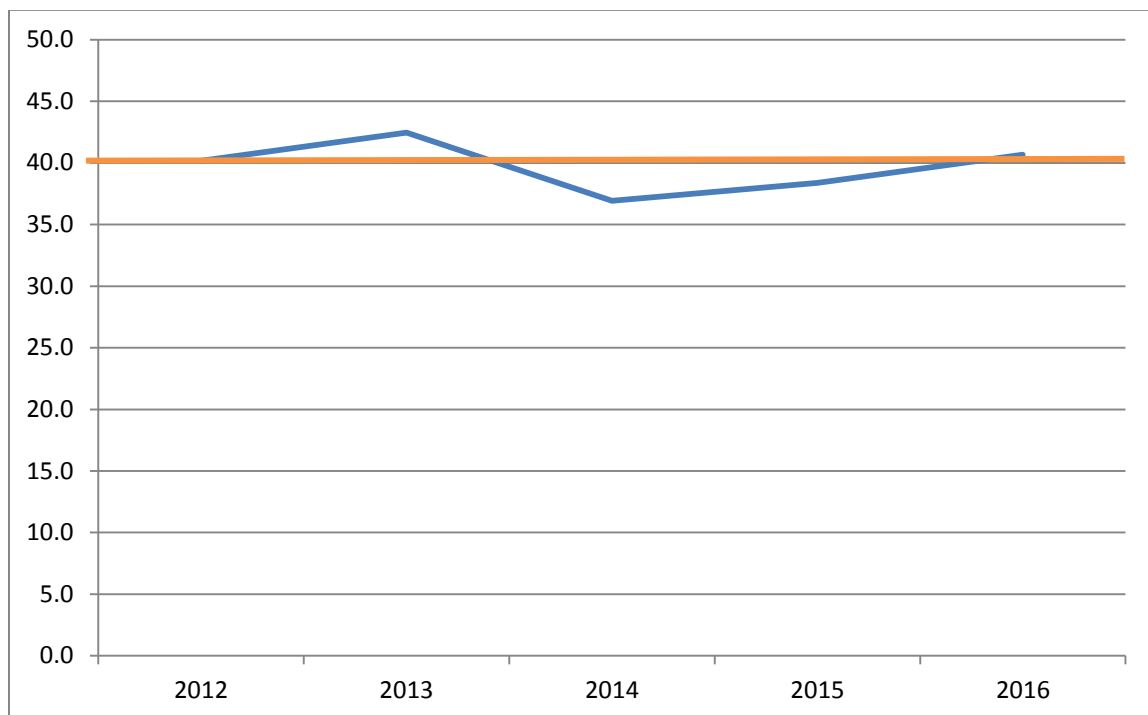
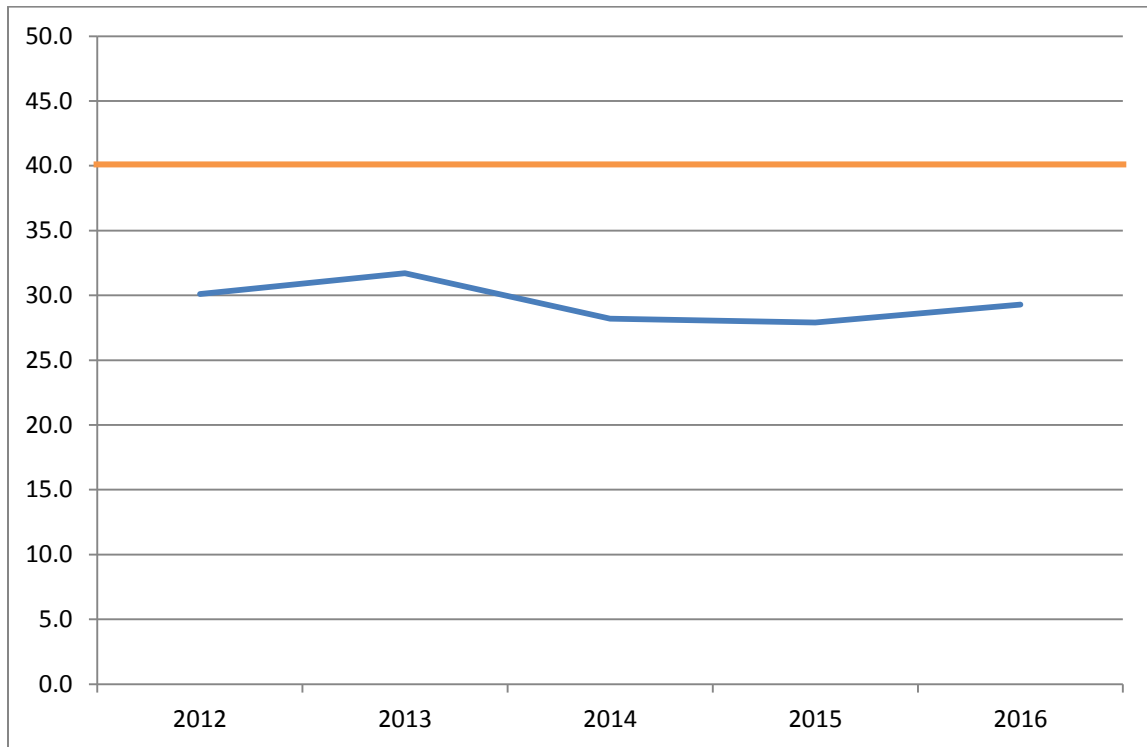


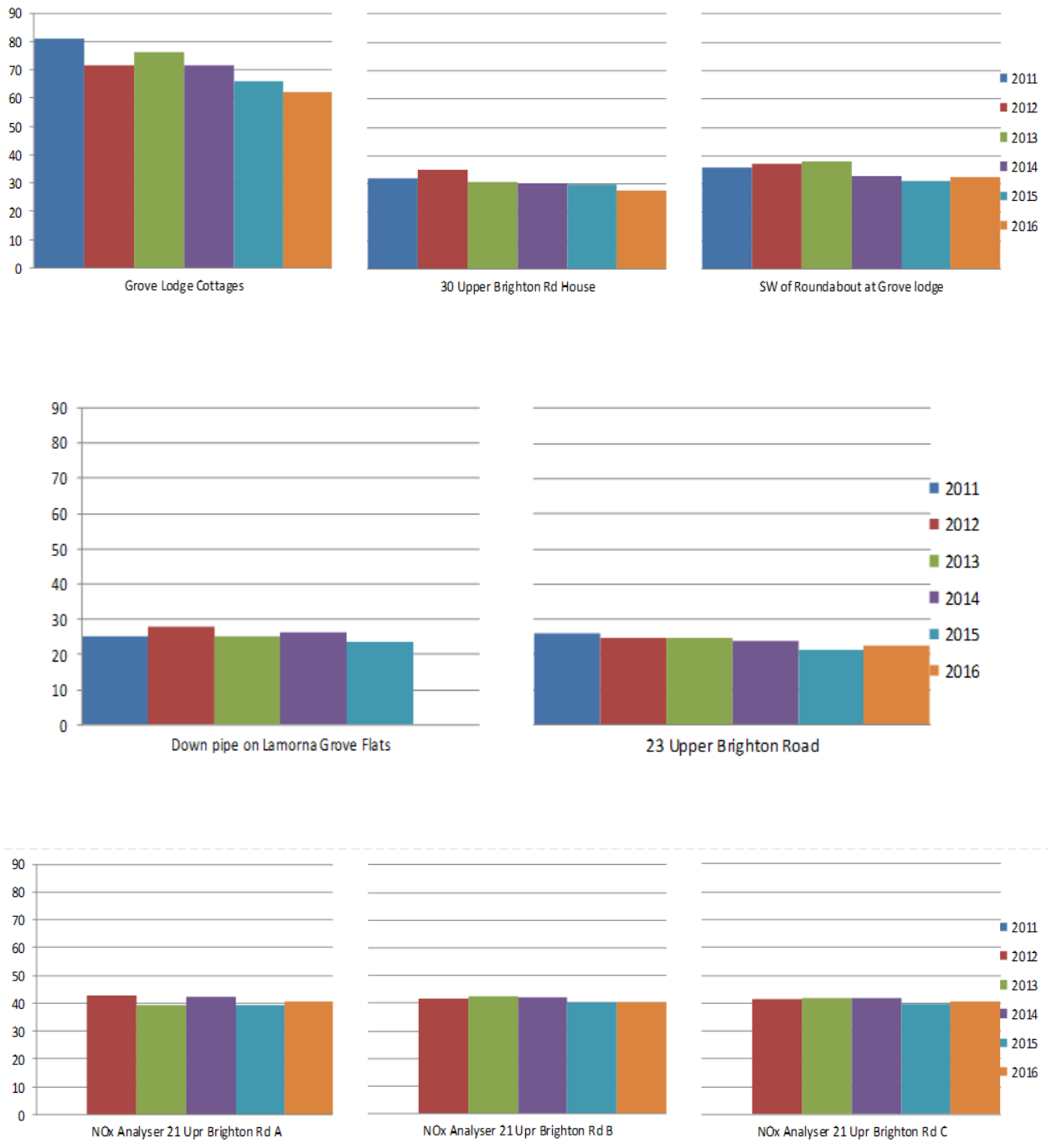
Fig.A.2.6 Tube site 6N Gainsborough Avenue when predicted back to nearest relevant exposure

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Fig.A.2.7 Graphs showing annual average NO₂ concentrations measured by diffusion tubes in the Worthing AQMA from 2011 to 2016 (note: only Grove Lodge Cottages and Lamorna Grove flats represent relevant exposure).



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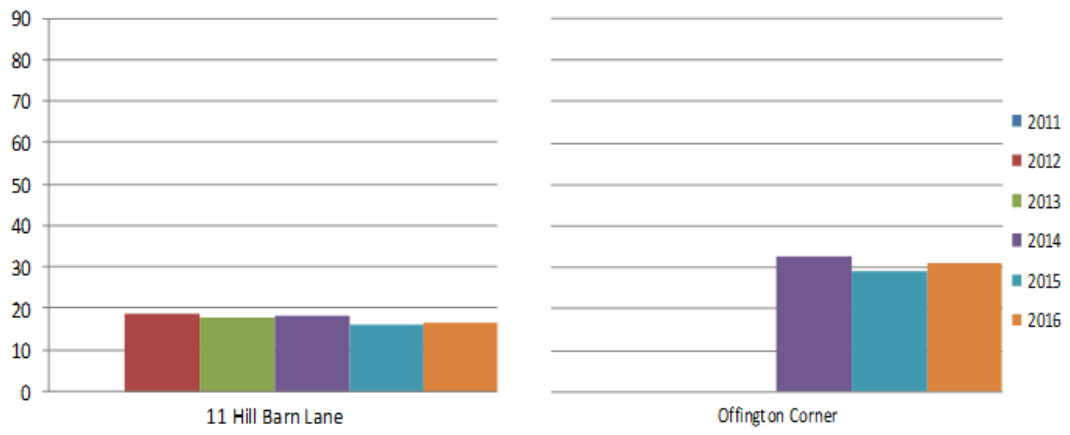


Table A.8 in Appendix A compares the ratified continuous monitored NO₂ hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m³, not to be exceeded more than 18 times per year.

Appendix A: Monitoring Results

Table A.5 – 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) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Inlet Height (m)
WT2	Grove Lodge	Roadside	514184	104963	NO2	YES	Chemiluminescence	18.3	2.9	1.8

Table A.6 – 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)
1N	Chapel Rd (UK04)	Roadside	514836	102889	NO ₂	NO	10.1	3.1	NO	1.5
4N	Heene Way (UK02)	Urban Background	513610	102556	NO ₂	NO	7.2	1.9	NO	1.5
5N	Cleveland Road (UK01)	Urban Background	512702	105562	NO ₂	NO	6.3	2.4	NO	2.0
6N	Gainsborough Avenue (UK06)	Roadside	515190	105122	NO ₂	NO	8.7	1.9	NO	2.0
N1	The Steyne	Kerbside	515102	102664	NO ₂	NO	2.6	2.8	NO	2.0
N1C	High Street East	Urban Centre	515114	102670	NO ₂	NO	0.0	3.3	NO	2.0
N3	Cricketers Parade	Roadside	514501	104549	NO ₂	NO	21.8	2.8	NO	3.5
N5	First Avenue	Roadside	514495	105020	NO ₂	NO	14.8	2.4	NO	1.5
N8	Littlehampton Rd	Roadside	513226	104651	NO ₂	NO	14.4	1.2	NO	3.5
N9	Honeysuckle Lane	Urban Background	511962	106810	NO ₂	NO	11.0	4.2	NO	2.0
N11	Dawes Cl	Urban Background	515811	103309	NO ₂	NO	6.4	3.4	NO	1.5
N15	Chippers Walk	Urban Background	512720	103933	NO ₂	NO	4.2	1.7	NO	2.0
N17	Chapel Road, B-Dust monitor	Kerbside	514790	103121	NO ₂	NO	3.4	2.4	NO	2.0
N18A	Kinnall Court, Upper	Suburban	515315	105141	NO ₂	NO	0.0	11.7	NO	2.0

	Brighton Road,									
N21	Greenwood Cottage, A27	Roadside	509777	105697	NO ₂	NO	2.5	5.3	NO	3.0
N22	Falmer Close, C-Dust monitor	Urban Background	511011	102226	NO ₂	NO	9.1	2.0	NO	1.5
N24	152 Up B'ton Rd NO2 House	Roadside	515150	105108	NO ₂	NO	0.0	9.1	NO	2.0
N25	Warren Ct House	Suburban	513846	105183	NO ₂	NO	0.0	19.5	NO	2.0
N27	Tarring Road, Crossing	Roadside	513378	103350	NO ₂	NO	0.0	3.2	NO	2.5
N28	Chapel Road/Teville Road	Roadside	514740	103173	NO ₂	NO	1.4	3.2	NO	2.5
N29	Downlands Parade	Roadside	515014	105098	NO ₂	NO	0.0	4.4	NO	4.0
N30 A	Grove Lodge Cottages	Roadside	514183	104948	NO ₂	YES	0.2	2.3	NO	2.5
N31	South Farm Road, roundabout	Roadside	514317	103328	NO ₂	NO	4.0	1.0	NO	2.5
N35	30 Upper Brighton Rd House	Roadside	514266	104961	NO ₂	YES	0.0	11.6	NO	2.0
N39	SW of Roundabout at Grove lodge	Roadside	514092	104906	NO ₂	YES	47.5	2.5	NO	4.0
N42	Norfolk House	Roadside	514742	103233	NO ₂	NO	0.0	3.7	NO	2.0
N43	23 Upper Brighton Road	Suburban	514199	104982	NO ₂	YES	0.0	19.0	NO	2.0

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N44 A	NOx Analyser 21 Upr Brighton Rd	Roadside	514185	104963	NO ₂	YES	18.3	2.9	YES	2.0
N44 B	NOx Analyser 21 Upr Brighton Rd	Roadside	514185	104963	NO ₂	YES	18.3	2.9	YES	2.0
N44 C	NOx Analyser 21 Upr Brighton Rd	Roadside	514185	104963	NO ₂	YES	18.3	2.9	YES	2.0
N45	11 Hill Barn Lane	Suburban	514126	105063	NO ₂	YES	0.0	13.0	NO	2.0
N48	Shaftesbury Avenue	Roadside	512080	103361	NO ₂	NO	29.4	2.2	NO	2.0
N50	Teville Gate	Urban Centre	514699	103233	NO ₂	NO	4.0	20.2	NO	2.0
N51	Newland Street outside Morrison's	Kerbside	514870	103352	NO ₂	NO	3.9	0.9	NO	2.0
N52	Newland Street (outside 63)	Kerbside	514974	103338	NO ₂	NO	1.8	2.9	NO	2.0
N53	Offington Corner	Roadside	513278	105624	NO ₂	YES	19.4	6.8	NO	2.0
N54	The Aquarena	Roadside	515593	102707	NO ₂	NO	18.8	3.4	NO	3.0
N55	Varey Road / Fulbeck Ave	Suburban	510766	104875	NO ₂	NO	66.0	3.2	NO	3.0
N56	Titnore Way	Roadside	510318	104506	NO ₂	NO	11.2	1.2	NO	3.0
N57	Lyndhurst Road	Roadside	515114	102975	NO ₂	NO	0.0	3.5	NO	2.5
N58	Yeoman Road	Kerbside	510931	104026	NO ₂	NO	18.9	2.3	NO	3.0

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).

Table A.7 – Annual Mean NO₂ Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2016 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2012	2013	2014	2015	2016
WT2	Roadside	Automatic	94	94	39.5	40.9	51.1	37.4	48
1N	Roadside	Diffusion tube	100	100	28.9	30.2	28.9	25.8	29.2
4N	Urban Background	Diffusion tube	100	100	14.3	14.9	13.1	11.1	13.8
5N	Urban Background	Diffusion tube	92	92	15.7	19.0	15.2	13.6	16.0
6N	Roadside	Diffusion tube	100	100	40.2	42.5	36.9	38.4	40.7
N1	Kerbside	Diffusion tube	75	75	34.1	31.7	33.2	25.0	29.2
N1C	Urban Centre	Diffusion tube	100	100	30.6	32.5	30.1	27.7	30.3
N3	Roadside	Diffusion tube	100	100	37.2	34.7	34.9	31.4	34.0
N5	Roadside	Diffusion tube	100	100	34.2	32.0	31.1	29.1	30.2
N8	Roadside	Diffusion tube	100	100	28.5	28.7	27.5	28.5	30.0
N9	Urban Background	Diffusion tube	100	100	10.6	10.6	8.9	8.3	9.3
N11	Urban Background	Diffusion tube	100	100	17.6	15.7	14.4	12.8	15.5
N15	Urban Background	Diffusion tube	100	100	15.9	14.9	14.4	12.9	14.2
N17	Kerbside	Diffusion tube	92	92	31.8	29.8	27.7	25.2	26.5
N18A	Suburban	Diffusion tube	92	92	26.0	25.7	24.0	21.8	25.3

N21	Roadside	Diffusion tube	92	92	33.6	33.6	33.3	29.2	34.1
N22	Urban Background	Diffusion tube	100	100	14.5	14.4	12.2	10.5	13.3
N24	Roadside	Diffusion tube	100	100	26.2	26.2	25.4	22.6	25.8
N25	Suburban	Diffusion tube	100	100	24.4	21.7	22.3	21.0	22.2
N27	Roadside	Diffusion tube	100	100	25.7	28.6	24.6	21.8	25.7
N28	Roadside	Diffusion tube	100	100	41.2	35.6	37.3	26.0	21.5
N29	Roadside	Diffusion tube	100	100	40.3	37.3	40.8	33.9	34.6
N30 A	Roadside	Diffusion tube	92	92	<u>71.4</u>	<u>77.3</u>	<u>72.5</u>	<u>66.8</u>	<u>64.1</u>
N31	Roadside	Diffusion tube	92	92	31.0	30.3	30.6	24.5	27.5
N35	Roadside	Diffusion tube	100	100	35.1	30.8	30.7	30.2	28.6
N39	Roadside	Diffusion tube	100	100	37.0	38.3	33.1	31.5	33.5
N42	Roadside	Diffusion tube	83	83	28.3	28.7	27.9	24.5	25.9
N43	Suburban	Diffusion tube	100	100	24.7	24.7	24.0	21.4	23.1
N44 A	Roadside	Diffusion tube	92	92	42.6	39.8	42.7	39.6	42.0
N44 B	Roadside	Diffusion tube	100	100	41.7	42.8	42.3	40.7	41.5
N44 C	Roadside	Diffusion tube	83	83	41.6	42.3	42.1	40.2	41.6
N45	Suburban	Diffusion tube	100	100	18.9	18.2	18.6	16.1	17.2
N48	Roadside	Diffusion tube	100	100	27.4	32.6	27.9	25.9	30.1

N50 ^a	Urban Centre	Diffusion tube	67	67	<u>N/A</u>	22.1	22.7	25.9	31.0
N51	Kerbside	Diffusion tube	100	100	<u>N/A</u>	21.2	20.8	18.0	20.4
N52	Kerbside	Diffusion tube	92	92	<u>N/A</u>	23.8	23.9	22.0	24.9
N53	Roadside	Diffusion tube	92	92	<u>N/A</u>	<u>N/A</u>	32.8	29.3	32.1
N54	Roadside	Diffusion tube	92	92	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	22.6	26.0
N55	Suburban	Diffusion tube	100	100	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	15.0
N56	Roadside	Diffusion tube	100	100	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	25.2
N57	Roadside	Diffusion tube	100	100	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	27.6
N58	Kerbside	Diffusion tube	100	100	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	22.8

Diffusion tube data has been bias corrected

^a Annualisation has been conducted where data capture is <75%

Notes:

Exceedances of the NO₂ annual mean objective of 40µg/m³ are shown in **bold**.

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

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

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

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

Figures A.2 – Trends in Annual Mean NO₂ Concentrations for Monitoring Sites Exceeding The Objective (with the objective marked as an orange line).

Fig.A.2.1 Tube site N30A Grove Lodge Cottages – level at relevant exposure

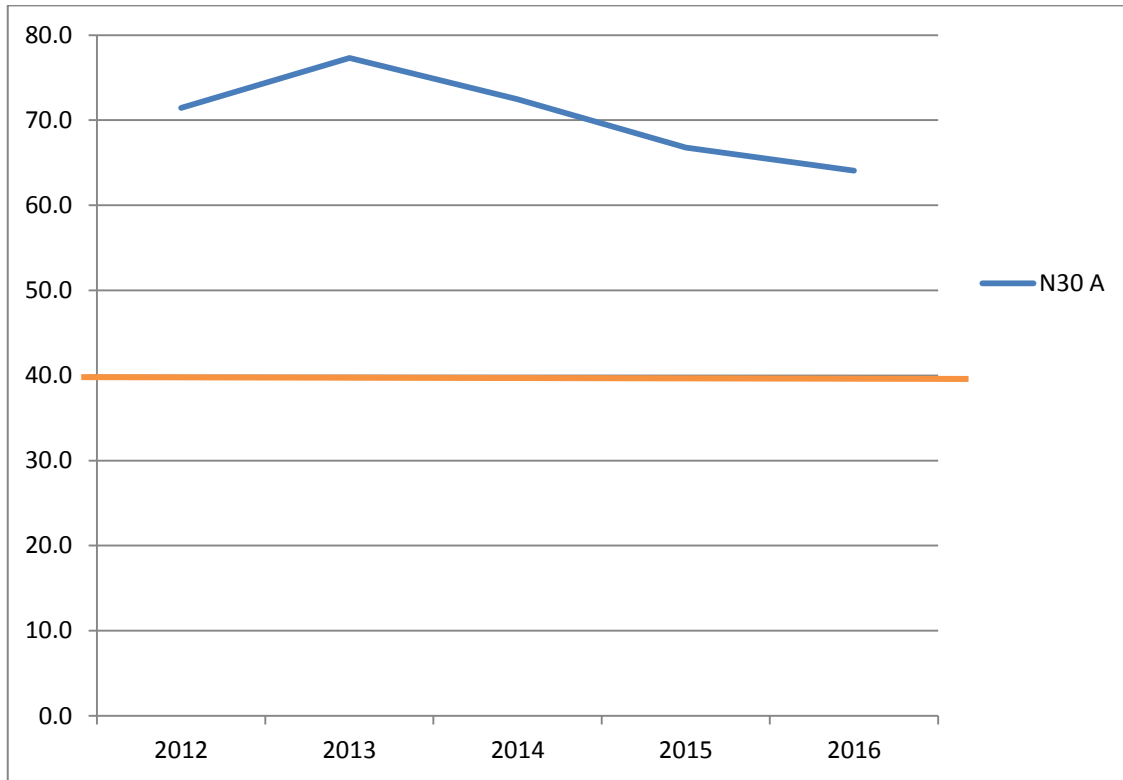


Fig.A.2.2 Tube site N44 A/B/C (co-located with continuous analyser)

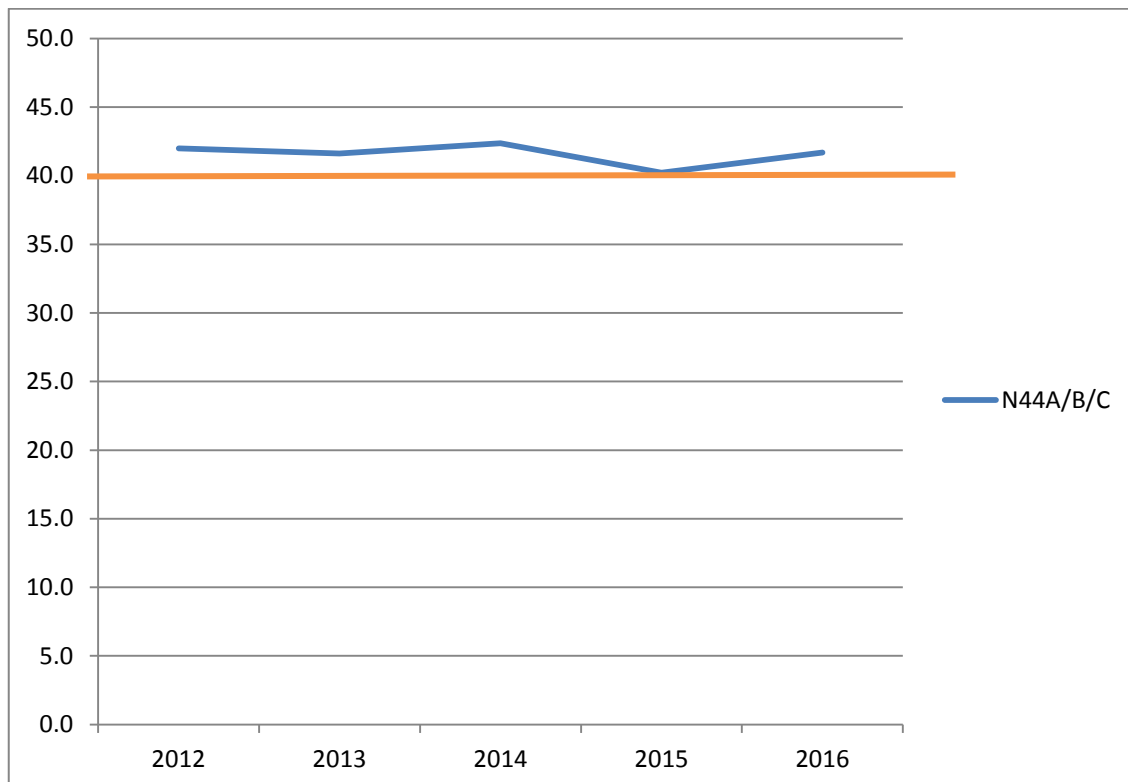


Fig.A.2.3 Automatic Monitoring Site, WT2

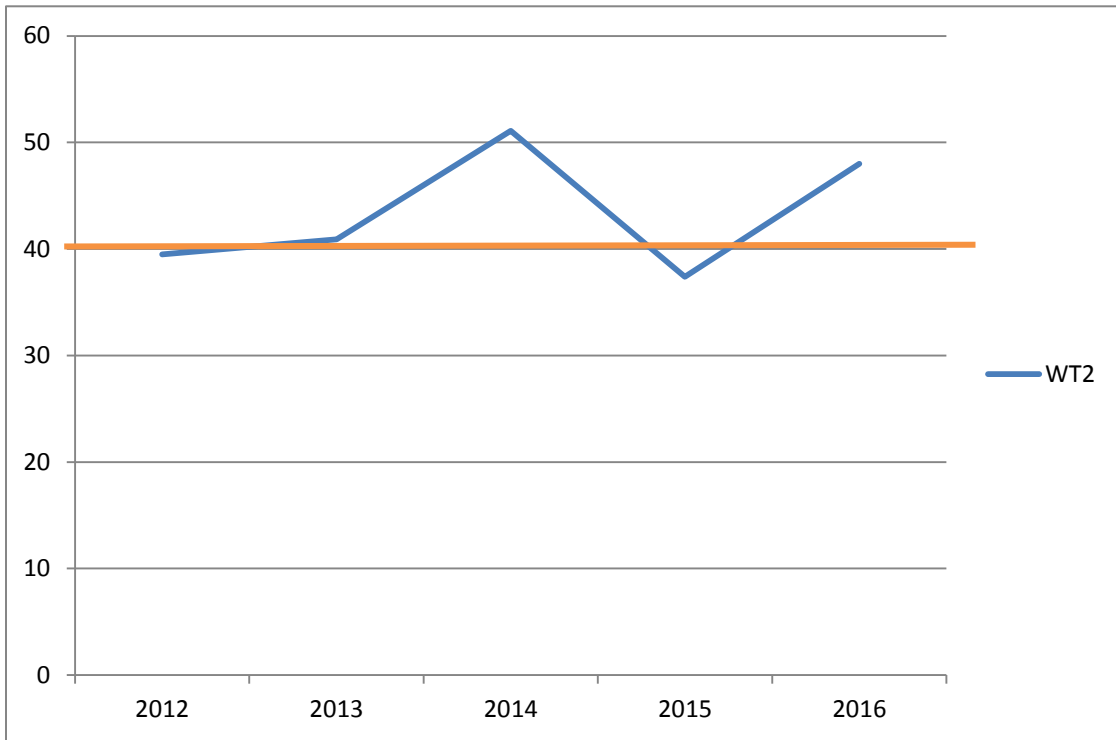


Fig.A.2.4 Automatic Monitoring Site WT2 when predicted back to nearest relevant exposure

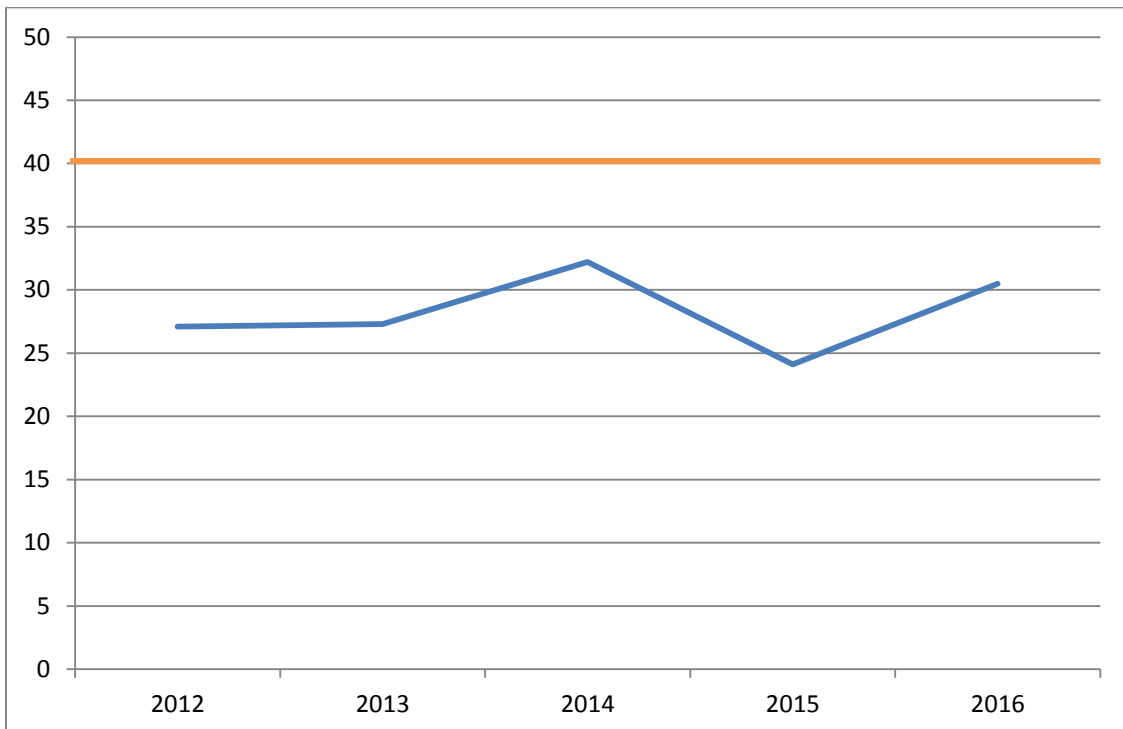


Fig.A.2.5 Tube site 6N Gainsborough Avenue

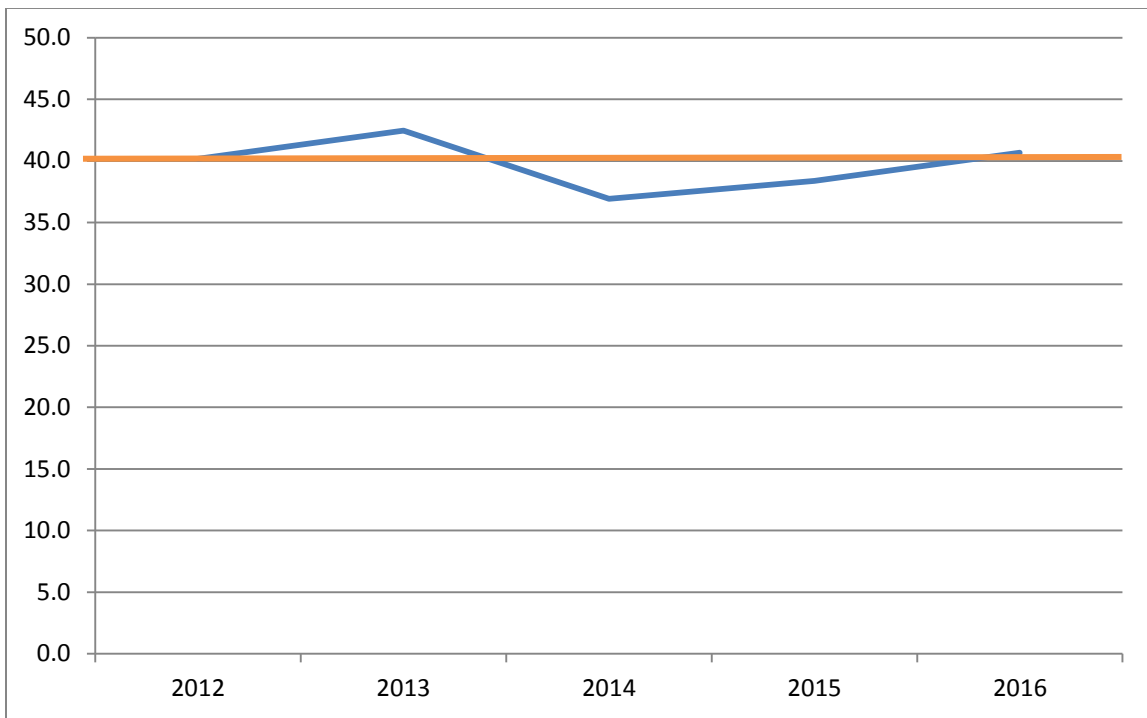
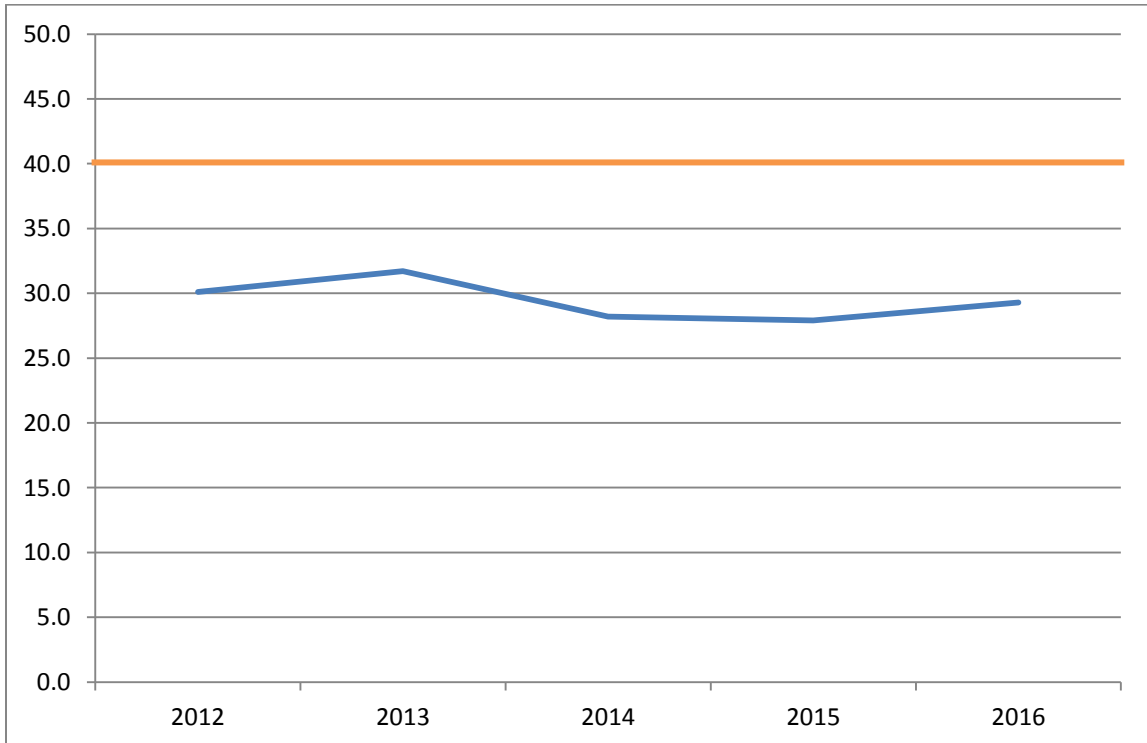
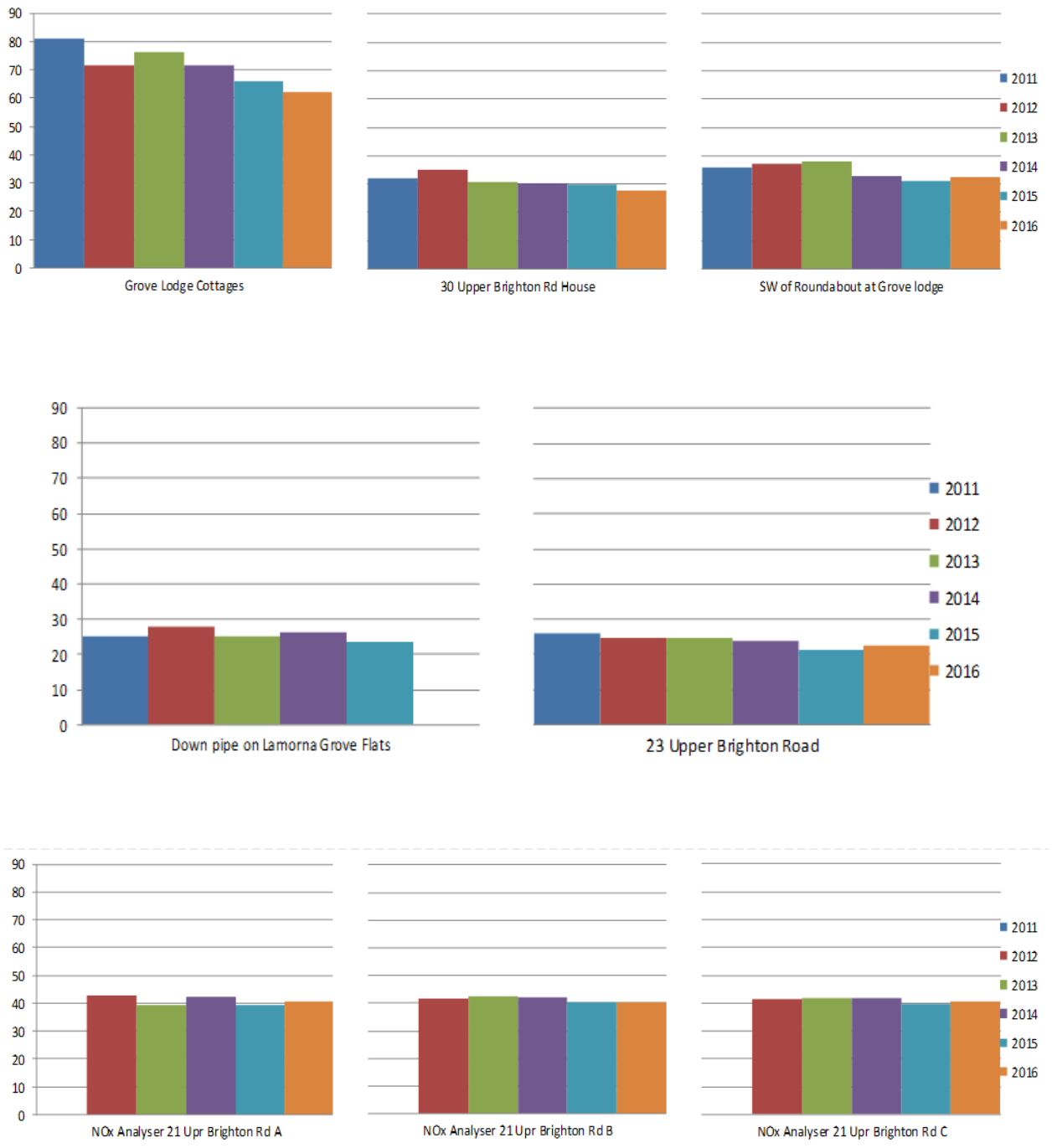


Fig.A.2.6 Tube site 6N Gainsborough Avenue when predicted back to nearest relevant exposure



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Fig.A.2.7 Graphs showing annual average NO₂ concentrations measured by diffusion tubes in the Worthing AQMA from 2011 to 2016 (note: only Grove Lodge Cottages and Lamorna Grove flats represent relevant exposure).



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Table A.8 – 1-Hour Mean NO₂ Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2016 (%) ⁽²⁾	NO ₂ 1-Hour Means > 200µg/m ³ ⁽³⁾				
					2012	2013	2014	2015	2016
WT2, Grove Lodge	Roadside	Automatic	n/a	94	0	0	14	2	10

Notes:

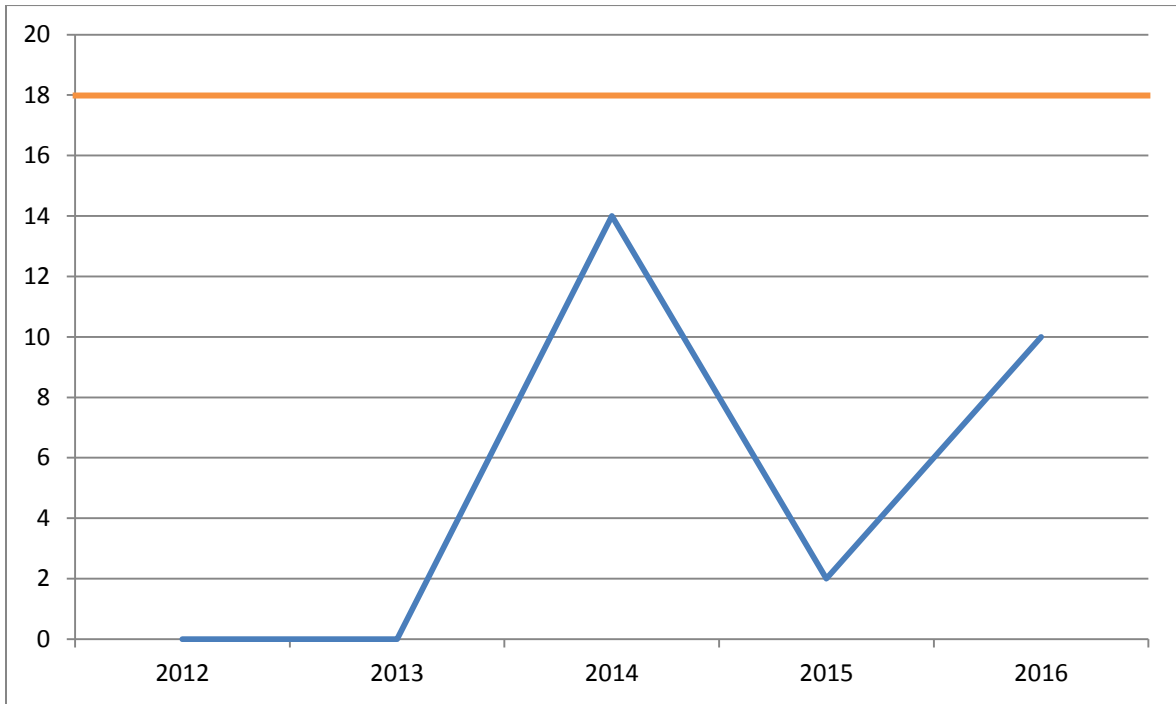
Exceedances of the NO₂ 1-hour mean objective (200µg/m³ not to be exceeded more than 18 times/year) are shown in **bold**.

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

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

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

Fig A.3 – Trend in Number of NO₂ 1-Hour Means > 200µg/m³ 2012-16 (from monitoring site WT2)



Appendix B: Full Monthly Diffusion Tube Results for 2016

Table B.2 – NO₂ Monthly Diffusion Tube Results - 2016

Site ID	NO ₂ Mean Concentrations (µg/m ³)												Annual Mean		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted (1.03) and Annualised ⁽¹⁾	Distance Corrected to Nearest Exposure ⁽²⁾
1N	28.0	33.2	23.8	27.5	28.6	30.0	23.3	25.0	27.8	28.7	29.6	34.7	28.3	29.2	23.2
4N	13.0	14.7	14.5	10.9	12.4	11.1	8.8	7.6	11.8	17.3	17.4	21.6	13.4	13.8	13.3
5N	15.8	15.6	13.8	N/A	13.5	13.0	10.1	10.7	13.7	18.2	20.2	26.8	15.6	16.0	14.9
6N	35.2	41.0	46.1	36.3	38.5	36.7	29.5	30.7	35.1	47.6	45.2	52.0	39.5	40.7	29.3
N1	30.2	N/A	31.5	11.3	23.9	30.6	N/A	26.9	32.9	29.8	N/A	38.4	28.4	29.2	26.3
N1C	22.0	31.6	26.6	26.2	33.8	28.5	22.9	25.2	29.8	35.4	31.3	39.4	29.4	30.3	30.3
N3	34.8	39.2	31.3	34.5	32.5	29.6	25.8	28.3	31.7	29.6	35.4	43.7	33.0	34.0	23.1
N5	32.6	27.9	22.2	26.6	28.5	29.0	27.5	29.4	31.4	27.7	31.4	38.0	29.4	30.2	21.3
N8	30.7	26.6	28.8	26.3	29.7	28.2	25.2	23.8	29.2	26.4	33.8	40.7	29.1	30.0	20.8
N9	9.1	9.6	8.0	6.4	8.0	11.8	5.2	5.9	7.5	10.3	10.9	15.2	9.0	9.3	9.3
N11	16.0	16.5	13.7	13.4	13.0	12.7	9.7	8.8	13.3	17.9	21.1	24.3	15.0	15.5	14.9
N15	15.8	16.2	11.8	10.7	12.0	10.9	8.3	8.7	11.6	16.2	18.7	24.5	13.8	14.2	13.5
N17	25.4	29.4	29.2	29.1	3.1	25.6	18.5	20.3	N/A	27.6	35.1	40.4	25.8	26.5	23.9
N18A	21.3	27.1	N/A	22.4	22.2	25.1	19.8	21.4	22.8	26.0	33.2	28.7	24.5	25.3	25.3
N21	30.2	34.8	33.3	30.8	30.9	30.8	29.4	30.9	36.8	35.5	N/A	40.9	33.1	34.1	31.6

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N22	12.2	15.0	13.3	10.5	9.5	15.1	7.1	7.2	10.8	15.2	17.4	21.3	12.9	13.3	12.5
N24	23.7	25.6	27.3	21.2	24.4	23.3	17.7	19.5	24.3	30.5	30.7	32.4	25.0	25.8	25.8
N25	24.5	23.7	21.6	18.4	19.9	18.2	16.3	15.8	22.0	22.7	26.0	29.5	21.5	22.2	22.2
N27	22.1	30.6	24.7	19.6	30.8	20.2	14.8	16.6	23.9	31.4	30.3	34.3	24.9	25.7	25.7
N28	20.8	23.6	29.6	17.8	24.9	1.3	12.9	14.0	21.2	26.3	26.0	32.5	20.9	21.5	20.8
N29	34.5	32.6	31.1	27.0	36.0	33.8	28.4	29.2	34.9	35.8	35.1	44.6	33.6	34.6	34.6
N30A	N/A	<u>61.4</u>	53.8	<u>61.4</u>	56.5	<u>70.8</u>	<u>67.6</u>	53.5	<u>66.4</u>	54.4	<u>65.2</u>	<u>73.4</u>	<u>62.2</u>	<u>64.1</u>	<u>63.1</u>
N31	28.3	N/A	23.7	23.2	23.0	25.7	23.0	21.9	31.1	25.4	29.5	38.6	26.7	27.5	23.3
N35	31.9	28.2	28.4	26.6	23.0	25.7	26.3	23.1	29.8	28.2	31.5	31.0	27.8	28.6	28.6
N39	27.1	33.2	29.8	29.7	33.7	29.8	24.1	26.5	32.3	42.2	38.3	44.2	32.6	33.5	19.3
N42	23.7	27.2	28.4	21.2	N/A	25.8	16.8	20.9	N/A	26.6	26.9	34.4	25.2	25.9	25.9
N43	23.3	23.7	23.0	20.8	21.7	21.9	20.0	18.8	21.7	21.4	24.5	28.7	22.5	23.1	23.1
N44 A	44.1	44.6	34.2	39.0	46.8	39.9	37.7	36.0	41.1	41.2	N/A	44.0	40.8	42.0	27.9
N44 B	37.9	39.8	39.9	42.2	41.4	41.3	37.1	36.0	41.0	44.2	40.1	42.8	40.3	41.5	27.6
N44 C	43.5	40.0	32.1	37.0	43.8	45.4	40.7	34.6	N/A	40.9	45.5	N/A	40.4	41.6	27.7
N45	18.9	17.4	15.0	14.2	14.3	15.8	14.9	13.4	18.5	15.0	18.4	24.1	16.7	17.2	17.2
N48	30.0	27.9	25.7	24.4	23.6	27.5	25.8	24.2	34.4	30.4	37.1	39.7	29.2	30.1	18.4
N50 ³	35.5	27.9	N/A	29.7	N/A	35.8	31.4	N/A	33.8	33.7	39.1	N/A	33.4	31.0	31.0
N51	23.3	21.5	18.6	15.7	16.7	22.3	14.2	13.4	18.1	19.5	23.9	31.0	19.8	20.4	18.5
N52	24.4	24.7	20.8	22.2	20.5	N/A	17.4	17.8	26.2	27.8	29.9	34.2	24.2	24.9	23.6
N53	36.4	28.7	27.2	27.4	27.0	32.4	31.9	N/A	41.8	18.7	31.3	40.1	31.2	32.1	23.5
N54	23.6	32.5	22.7	23.2	23.3	22.2	19.5	21.0	N/A	25.5	31.2	33.1	25.2	26.0	19.0
N55 ⁴	13.1	19.6	17.5	9.6	13.3	15.3	8.1	8.5	13.9	19.7	16.3	19.7	14.5	15.0	N/A
N56	24.6	25.6	21.0	17.8	23.1	28.3	26.4	23.4	25.9	22.8	24.5	30.7	24.5	25.2	18.0
N57	23.9	27.0	25.8	22.4	25.0	28.4	17.6	23.0	27.1	30.5	33.5	37.8	26.8	27.6	27.6
N58	26.3	26.7	21.1	19.7	19.0	22.3	17.7	17.4	21.2	17.0	24.9	33.0	22.2	22.8	16.1

National bias adjustment factor used

Annualisation has been conducted where data capture is <75%

Notes:

Exceedances of the NO₂ annual mean objective of 40µg/m³ are shown in **bold**.

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

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

(2) Distance corrected to nearest relevant public exposure.

(3) Annualised data and distance correction not possible as monitor >10m further from kerb than receptor

(4) Receptor >50m from monitoring site so out of parameters of distance correction tool

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

Diffusion Tube Bias Adjustment Factors

NO₂ diffusion tubes are provided and analysed by Gradko laboratory. The NO₂ tube preparation method used is 50% triethanolamine (TEA) in Acetone.

Data from the NO₂ 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 2016, obtained via tools at the aforementioned website, was **1.03**.

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).

Table C.1 - Annualisation data for NO₂ at N50, Teville Gate



	Brighton Preston Park AURN	Eastbourne AURN	Portsmouth AURN	Average ratio
Annual mean 2016	17µg m ⁻³ (dc 89%)	12 µg m ⁻³ (dc 99%)	20 µg m ⁻³ (dc 94 %)	
Period mean	17.9 µg m ⁻³	13.8 µg m ⁻³	22.6 µg m ⁻³	
Ratio	0.95	0.87	0.88	0.90

Measured Annual Mean at N50 = 34.4µg m⁻³
 Annualised Mean = 33.4 x 0.90 = 30.1µg m⁻³
 Bias adjusted annual mean = 30.1x1.03 = **31.0µg m⁻³**

Fall off with Distance Calculations

Screen shots of the falloff of NO₂ concentration with distance from kerb calculator (downloaded from the LAQM website) are shown below for 4 sites.



Fig.C.1 Fall-off calculation for N30A

Enter data into the red cells

Step 1	How far from the KERB was your measurement made (in metres)?	2.3	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 ₂ concentration (in µg/m ³)?	14.3	µg/m ³
Step 4	What is your measured annual mean NO ₂ concentration (in µg/m ³)?	64.1	µg/m ³
Result	The predicted annual mean NO ₂ concentration (in µg/m ³) at your receptor	63.1	µg/m ³



Fig.C.2 Fall-off calculation for 6N

Enter data into the red cells

Step 1	How far from the KERB was your measurement made (in metres)?	1.9	metres
Step 2	How far from the KERB is your receptor (in metres)?	10.6	metres
Step 3	What is the local annual mean background NO ₂ concentration (in µg/m ³)?	12.1	µg/m ³
Step 4	What is your measured annual mean NO ₂ concentration (in µg/m ³)?	40.7	µg/m ³
Result	The predicted annual mean NO ₂ concentration (in µg/m ³) at your receptor	29.3	µg/m ³



Fig.C.3 Fall-off calculation for WT2

Enter data into the red cells

Step 1	How far from the KERB was your measurement made (in metres)?	2.9	metres
Step 2	How far from the KERB is your receptor (in metres)?	21.2	metres
Step 3	What is the local annual mean background NO ₂ concentration (in µg/m ³)?	13.75	µg/m ³
Step 4	What is your measured annual mean NO ₂ concentration (in µg/m ³)?	48	µg/m ³
Result	The predicted annual mean NO ₂ concentration (in µg/m ³) at your receptor	30.5	µg/m ³

Fig.C.4 Fall-off calculation for N50 (note the warning in red)

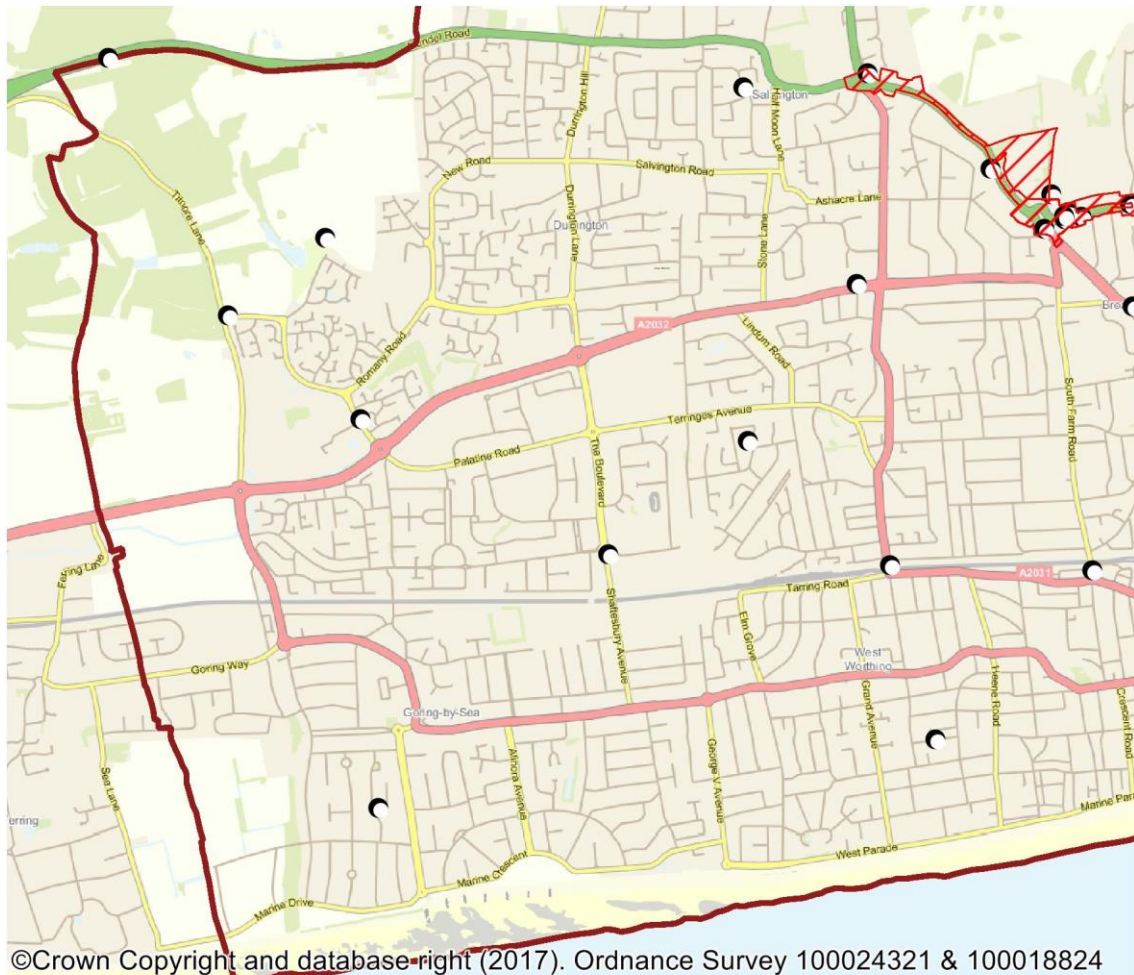
Enter data into the red cells

Step 1	How far from the KERB was your measurement made (in metres)?	24.2	metres
Step 2	How far from the KERB is your receptor (in metres)?	4	metres
Step 3	What is the local annual mean background NO ₂ concentration (in µg/m ³)?	14.5	µg/m ³
Step 4	What is your measured annual mean NO ₂ concentration (in µg/m ³)?	31	µg/m ³
Result	The predicted annual mean NO ₂ concentration (in µg/m ³) at your receptor	47.7	µg/m ³

Warning: your monitor is more than 10m further from the kerb than your receptor, treat result with caution

Appendix D: Map(s) of Monitoring Locations and AQMAs, 2016

Fig.D.1.Worthing East






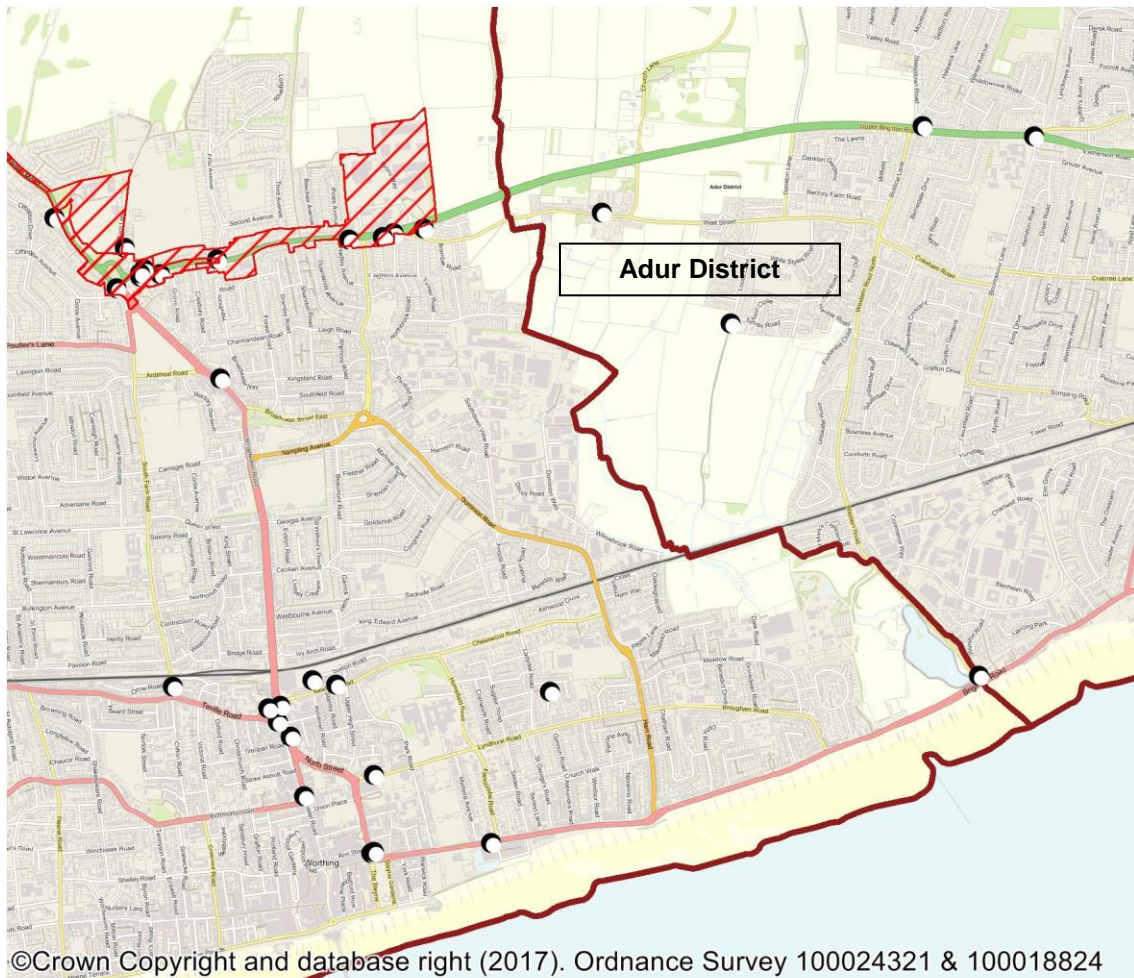



-  Air Quality Management Areas
 -  Air Quality Monitoring Sites 2016
 -  Adur Worthing Boundary
- Boundaries

Fig.D.2. Worthing West



-  Air Quality Management Areas
 -  Air Quality Monitoring Sites 2016
 -  Adur Worthing Boundary
- Boundaries

Appendix E: Summary of Air Quality Objectives in England

Table E.2 – Air Quality Objectives in England

Pollutant	Air Quality Objective ⁴	
	Concentration	Measured as
Nitrogen Dioxide (NO ₂)	200 µg/m ³ not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m ³	Annual mean
Particulate Matter (PM ₁₀)	50 µg/m ³ , not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m ³	Annual mean
Sulphur Dioxide (SO ₂)	350 µg/m ³ , not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m ³ , not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m ³ , not to be exceeded more than 35 times a year	15-minute mean

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

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Air quality Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxides
PM ₁₀	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
PM _{2.5}	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO ₂	Sulphur Dioxide

References

Estimates of mortality in local authority areas, associated with air pollution

<https://www.gov.uk/government/news/estimates-of-mortality-in-local-authority-areas-associated-with-air-pollution>

Local Air Quality Management Technical Guidance (TG16), Defra

Available from <https://laqm.defra.gov.uk/documents/LAQM-TG16-April-16-v1.pdf>

Local Air Quality Management Policy Guidance (PG16), Defra

Available from

https://consult.defra.gov.uk/communications/laqm_changes/supporting_documents/LAQM%20Policy%20Guidance%202016.pdf

Air Quality and Emission Mitigation Guidance for Sussex (2013)

Available from <https://www.adur-worthing.gov.uk/environmental-health/pollution/air-quality-and-pollution/air-quality-and-planning/>

NO₂ Fall-Off with Distance Calculator available from:

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

Defra Background Maps for Worthing

<https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2015>