



Winchester  
City Council

## 2017 Air Quality Annual Status Report (ASR)

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

July, 2017

**Winchester City Council**

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Report Reference number	-
Date	July 2017

## Executive Summary: Air Quality in Our Area

### Air Quality in Winchester

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

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

Winchester City Council's administrative area comprises the city of Winchester and wider district area. The main source of air pollution in the borough is road traffic emissions from major roads, including the M3, A34, A31 and A303. Other pollution sources, including commercial, industrial and domestic sources, also make a contribution to background pollution concentrations.

The main pollutant of concern in Winchester is nitrogen dioxide (NO<sub>2</sub>), which currently exceeds the annual mean air quality objective close to busy roads within the city centre. In 2003 an Air Quality Management Area (AQMA) was designated for exceedances of the annual mean NO<sub>2</sub> objective and 24-hr PM<sub>10</sub> objective. The 24-hr PM<sub>10</sub> AQMA was later revoked in 2013 after a number of years of measured concentrations remaining below objective levels. Details of the current AQMA are available online at [https://uk-air.defra.gov.uk/aqma/local-authorities?la\\_id=314](https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=314).

Winchester City Council currently monitors NO<sub>2</sub> concentrations at various locations throughout Winchester. Results from the monitoring network of diffusion tubes show that there are still areas adjacent to the main roads within the AQMA that fail to meet the UK annual mean objective. These failures are centred within the one way system around the city centre and on Romsey Road.

Between the years 2011-2015, a decreasing trend in NO<sub>2</sub> concentrations has been observed at the majority of monitoring locations. There are some year-to-year

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

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

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

variations in concentrations, which are likely due to meteorological influences. In 2016 this trend continued at around half of the sites. Further data will be needed to confirm any long term significant trend changes.

In 2016, monitoring of pollutant PM<sub>10</sub> was carried out at a roadside site in the city centre. Concentrations have remained relatively stable and have been below the objectives at this site over the last 5 years. At present, no monitoring of pollutant PM<sub>2.5</sub> is carried out within Winchester.

In the wider district, pollutant concentrations are all below the national air quality objectives.

In May 2017 Winchester City Council issued a new Air Quality Action Plan, with the aim of tackling the remaining hotspots in the city centre. This new action plan replaces the previous action plan which ran from 2006 to 2016.

## **Actions to Improve Air Quality**

The 2017 Air Quality Action Plan (AQAP) outlines nine high impact core actions aimed at improving air quality and working towards meeting the relevant air quality objectives within Winchester district. Due to the main source of pollution within the AQMA being road traffic, some of the key actions in the new AQAP aim to reduce congestion and vehicle emissions in the city centre, with the focus on improving NO<sub>2</sub> concentrations.

The core actions are:

1. Review current car parking charges and increase the cost to park in central car parks;
2. Review and consider introducing restrictions of delivery vehicles by time of day;
3. Introduce a Park and Ride site in the North of Winchester;
4. Introduce new parking charges to limit diesel and high polluting petrol cars parking in central car parks;
5. Reduce emissions from lorries and buses in the city centre by 2020;
6. Reduce emissions from all Council owned, leased or contracted vehicles by 2020;
7. Put in place requirements to integrate air quality fully into the planning process;

8. Continue to work with and lobby Hampshire County Council to identify and deliver additional projects;
9. Monitor the performance of the plan and reassess the need to introduce additional measures to achieve the objective

There is also a range of complementary measures that mainly relate to the continued support for ongoing softer measures such as supporting walking, cycling and travel plan initiatives.

Two new air quality monitoring sites are now in place in St George's Street and Chesil Street. Currently these sites have equipment in place to monitor NO<sub>2</sub>. These new sites will contribute to the review of the new AQAP.

Hampshire County Council is the lead local authority for transport in Winchester District. Policies to improve transport, and encourage sustainable transport have been set out within the Local Transport Plan for Hampshire<sup>4</sup>. Winchester City Council is working with the County to deliver their AQAP. For example, they have recently been involved in a new joint school engagement programme, which will involve the use of basic particle monitors.

## **Conclusions and Priorities**

This Annual Status Report confirms that concentrations within the AQMA within the centre of Winchester continue to exceed the NO<sub>2</sub> annual mean air quality objective. No significant changes in emissions sources within the Council's area have been identified in the last year.

The priorities for the coming year will be to deliver progress on the core measures outlined within the new AQAP and to progress the development of parallel strategies for delivering identified number of complementary measures.

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

Members of the public can take simple measures to help improve air quality, the main ones being, where possible, making short trips and journeys on foot or by bike instead of by car. Traffic congestion can further be reduced by the general public car sharing or by using public transport including the park and ride buses to access the

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<sup>4</sup> Hampshire County Council LTP Implementation Plan 2014-2017 <https://www.hants.gov.uk/transport/strategies/transportstrategies>

city centre. A new Winchester car share club has recently been launched and is currently being actively promoted. Members of the public are also encouraged to get involved in local events within the district, such as the UK's first ever National Clean Air Day which took place on 15<sup>th</sup> June this year.

Winchester City Council provides information on air quality on their website <http://www.winchester.gov.uk/environment/air-quality/> and air quality monitoring data from Winchester can be viewed on UK Air Quality net <http://www.ukairquality.net/>.

Further information on air quality can be found on Defra's Local Air Quality Management (LAQM) website<sup>5</sup>.

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<sup>5</sup> Defra LAQM website: <http://laqm.defra.gov.uk/>

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## 1 Local Air Quality Management

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

Winchester City Council has declared one AQMA, summary details can be found in Table 2.1. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at [https://uk-air.defra.gov.uk/aqma/local-authorities?la\\_id=314](https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=314) . Alternatively, see Appendix D: Maps of Monitoring Locations and AQMAs, which provides a map of air quality monitoring locations in relation to the AQMA.

The current designated AQMA is in respect to the annual mean nitrogen dioxide (NO<sub>2</sub>) objective. An AQMA with the same extent, designated in respect to the particulate matter 24-hr mean objective, was revoked in 2013. A Detailed Assessment undertaken in 2015 recommended the designation of three additional AQMA's within the centre, for exceedances of the nitrogen dioxide hourly mean objective. The Council is currently reviewing this situation.

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	
Winchester Town Centre AQMA	Declared 14/11/2003	NO <sub>2</sub> Annual Mean	Winchester	Area surrounded by the town centre one way system and the town centre end of the major roads feeding into it.	NO	>40µg/m <sup>3</sup> at multiple locations	56.6µg/m <sup>3</sup> at Diffusion tube site 24, Romsey Rd	Winchester City Council Air Quality Action Plan , 2006, <a href="http://www.winchester.gov.uk/environment/air-quality/historical-air-quality-reports-government/">http://www.winchester.gov.uk/environment/air-quality/historical-air-quality-reports-government/</a>  Winchester City Council Air Quality Action Plan, 2017, <a href="https://winchester.citizenspace.com/licensing/air-quality/supporting_documents/Winchester%20AQAP_Final%20Draft_16012017.pdf">https://winchester.citizenspace.com/licensing/air-quality/supporting_documents/Winchester%20AQAP_Final%20Draft_16012017.pdf</a>

Winchester City Council 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 Winchester

Defra's appraisal of last year's ASR concluded that the conclusions reached were acceptable for all sources and pollutants and that the next step for Winchester City Council would be to update their action plan. Winchester City Council have now updated and submitted their new action plan. Winchester City Council has purchased new automatic monitoring equipment and will complete the review of their AQMA following analysis of data from these sites. Following Defra's comments Winchester City Council have reviewed the distance to relevant exposure of sites and have distance corrected concentrations or provided further comments as appropriate.

Winchester City Council has taken forward a number of direct measures during the current reporting year of 2017 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2.

Measures already delivered in Winchester as part of the previous action plan which ran from 2006 to 2016 include Park and Ride facilities, variable message signs for car parks, improving the emissions of the bus fleet and a number of schemes to encourage public transport use through the Winchester Town Access Plan (WTAP). More detail on these measures can be found in the Winchester City Council Air Quality Action Plan 2006 and in the new Winchester City Council Air Quality Action Plan 2017.

Winchester City Council's priorities for the coming year are to deliver progress on the nine core measures outlined within the new AQAP and to progress the development of parallel strategies for delivering the additional nine complementary measures.

The principal challenges and barriers to implementation that Winchester City Council anticipates facing include a current lack of data to be able to effectively monitor progress of actions. However, Hampshire County Council, as the Transport Authority, has now committed to work with the City Council to develop a Transport Movement Strategy for Winchester and data is currently being collected. In addition, further traffic management measures will be considered as part of the Winchester Movement Strategy in 2017.

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, Winchester City Council anticipates that further additional measures not

yet prescribed maybe required in subsequent years to achieve compliance and enable the revocation of Winchester AQMA.

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	Build on existing car park pricing differentiation strategy	Traffic Management	Other	WCC - Engineering & Transport & Parking Services	2017	May-17	1. Annual mean NO <sub>2</sub> 2. Car park patronage 3. Preferential responses	2% reduction in NOx emissions	Existing car parking pricing structure for central, inner and outer Winchester is being reviewed.	tbc	Integrate into new Parking Strategy due for revision in 2018
2	Review enforcement of goods deliveries by time of day and enforce	Freight and Delivery Management	Quiet & out of hours delivery	WCC - Parking Services	2017	Apr-18	1. Annual mean NO <sub>2</sub> 2. PCNs issued 3. Change in delivery hours	2% reduction in NOx emissions	This is being reviewed and is subject to existing TRO's. Additional work is needed	Ongoing	
3	Introduce a Park and Ride site in the north of Winchester	Alternatives to private vehicle use	Bus based Park & Ride	WCC but informed by City of Winchester Movement Strategy	2017	tbc	1. Bus patronage 2. Traffic flow 3. Use and satisfaction of P&R	3% reduction in NOx emissions	Investigation of suitable sites underway	tbc	P&R lite already proposed for Barton Farm
4	Introduce new parking charges/incentives to reduce diesel car parking and high pollution petrol cars (older than Euro 4) from parking in central car parks in favour of	Traffic Management	Emission based parking or permit charges	WCC - Parking Services Engineering & Transport	2017/2018	Jun-18	1. Traffic flow and speed 2. Increase in petrol /ULEVs using car parks 3. Preferential responses	10% reduction in NOx emissions	This will be subject to a dedicated Task and Finish Group to determine issues surrounding delivery.	Apr-19	

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Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
	low emission vehicles										
5	Ensure that all heavy duty vehicles that enter the AQMA meet Euro VI Stage II standard by 2020	Promoting Low Emission Transport	Low Emission Zone (LEZ)	WCC	2017	2020	1. Annual mean NO <sub>2</sub> 2. Number of Euro VI entering AQMA 3. PCNs issued	10% reduction in NOx emissions	This will be subject to a dedicated Task and Finish Group to determine issues surrounding delivery.	Ongoing but subject to confirmation of above	May be achieved through a voluntary CAZ strategy
6	Ensure that all Council-owned, leased, contracted or influence vehicles that enter the AQMA meet the OLEV standards for ULEVs and are not diesel fuelled by 2020	Promoting Low Emission Transport	Company Vehicle Procurement - Prioritising uptake of low emission vehicles	WCC	2017	2020	1. Low emission vehicles in fleet 2. Number of trips entering AQMAS	2% reduction in NOx emissions	This will be subject to a dedicated Task and Finish Group to determine issues surrounding delivery.	2020	
7	Development of air quality supplementary planning document	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	WCC	2017	2017	1. Annual mean NO <sub>2</sub> 2. Planning applications showing regard for SPG	N/A	To be developed during 2017 in conjunction with regional partners	2018	May develop a regional SPD with neighbouring authorities but to be a stand-alone document

## Winchester City Council

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
8	Continue to work with and lobby Hampshire County Council to identify projects to improve air quality	Policy Guidance and Development Control	Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	WCC/HCC	2017	tbc	1. Annual mean NO <sub>2</sub>	N/A	Currently working with HCC on the detailed delivery of the Movement Strategy.	Ongoing	
9	Monitor the performance of the action plan and reassess whether additional measures are required to meet the objective	Public Information	Other	WCC	2017	2018	1. Annual mean NO <sub>2</sub> 2. Modelling of actual emissions reductions	See Core Actions	To be undertaken as part of annual reporting requirements (ASR due in June each year)	Ongoing	
10	Work with authorities towards adoption of a regional LES	Policy Guidance and Development Control	Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	WCC with SCC, EBC	2017	2020	1. Adoption of strategy	N/A	Planning phase 2017	Ongoing	
11	Seek to commit to introduce more electric vehicle	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission	WCC	2017	2017 & beyond	1. Number of points installed	N/A	Planning phase 2017	tbc	

## Winchester City Council

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
	charging points within car parks		Vehicles, EV recharging, Gas fuel recharging								
12	Ensure that air quality is a standard consideration as part of procurement practice and is reflected in the Council's Procurement Policy;	Promoting Low Emission Transport	Company Vehicle Procurement - Prioritising uptake of low emission vehicles	WCC	2017	2018	1. Adoption of procurement policy 2. Uptake of LEVs (as per core action)	See core action 6	Planning phase 2017	tbc	
13	Continue to improve public access to live parking information and signage and better signage to encourage drivers to use the car park best suited to their journey.	Public Information	Via other mechanisms	WCC	2017	Apr-19	1. Utilisation of central car parks	N/A	Planning phase 2017	Ongoing	These messaging signs are already in place for central car parks



## Winchester City Council

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
14	To continue to work on the delivery and promotion of car club schemes operating in the city	Alternatives to private vehicle use	Car Clubs	WCC	2017	Apr-18	1. Number of car club members	N/A	Planning phase 2017	Ongoing	
15	Consider the introduction and promotion of additional cycle stands, in consultation with local cycling groups, as part of planned developments in the AQMA	Promoting Travel Alternatives	Promotion of cycling	WCC	2017	2017	1. Number of cycle parking 2. Number of cyclists as a modal share (through surveys)	N/A	Planning phase 2017	tbc	
16	Work with stakeholder organisations and maintain a programme of regular communication to encourage behaviour	Promoting Travel Alternatives	Other	WCC	2017	2017	tbc	N/A	Planning phase 2017	Ongoing	

## Winchester City Council

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
	al change										
17	Review and refresh the Council Travel Plan to promote more sustainable travel for staff	Promoting Travel Alternatives	Workplace Travel Planning	WCC	2017	Apr-18	1. Number of staff travelling to work by car (surveys)	N/A	Planning phase 2017	Apr-18	
18	Provide web based information and sign posting to resources that will assist and encourage workplaces and schools in the City to adopt Travel Plans	Promoting Travel Alternatives	Workplace Travel Planning	WCC	2017	Apr-18	1. Number of travel plans adopted	N/A	Planning phase 2017	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.

Winchester City Council is taking a number of measures to address PM<sub>2.5</sub>. Measures include working with Public Health colleagues, adopting transport initiatives included in The Local Transport Plan for Hampshire and local planning policies supporting the implementation of the Winchester Air Quality Action Plan. These measures were reviewed in the Council's 2016 ASR<sup>6</sup> and no additional measures have been introduced this year.

Defra mapped background PM<sub>2.5</sub> concentrations in Winchester district in 2016 were projected to be between 9.4 µg/m<sup>3</sup> and 12.5 µg/m<sup>3</sup>. Therefore PM<sub>2.5</sub> concentrations would be expected to be well below the limit proposed by the EU Ambient Air Quality Directive<sup>7</sup>. All measures outlined in Table 2.2 that aim to reduce NO<sub>x</sub> and PM<sub>10</sub> will also have a beneficial impact on PM<sub>2.5</sub>.

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<sup>6</sup> Winchester City Council 2016 Annual Status Report, [www.winchester.gov.uk/assets/files/28866/Winchester-2016-ASR-J2494-F2.pdf](http://www.winchester.gov.uk/assets/files/28866/Winchester-2016-ASR-J2494-F2.pdf)

<sup>7</sup> Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe

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

### 3.1 Summary of Monitoring Undertaken

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

#### 3.1.1 Automatic Monitoring Sites

Winchester City Council undertook automatic (continuous) monitoring at one site during 2016. This site is a roadside site located at the Echo Office in St George's Street. Until 2015, Winchester City Council operated an additional automatic monitoring site at Godson House. Table A.1 in Appendix A shows the details of the sites. National monitoring results are available at <http://www.ukairquality.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.

The current roadside site at the Echo Office was decommissioned in May 2017, as the area is marked for improvement as part of a refurbishment scheme. Two new roadside sites were installed in March 2017 to monitor NO<sub>2</sub> only. Both sites have room for a particulate matter monitor, should future resources and demand dictate. The locations for these sites are on St George's Street and on Chesil Street by Station Approach. Further information and data from these sites will be provided in next year's ASR.

#### 3.1.2 Non-Automatic Monitoring Sites

Winchester City Council undertook non-automatic (passive) monitoring of NO<sub>2</sub> at 34 sites during 2016, 26 of these were within the city and eight monitoring sites were within the wider district area. 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. The only change in locations for 2015 was site 19, which was relocated from Andover Road to Burma Road following concerns expressed regarding traffic congestion between the hospital and university.

Further details on Quality Assurance/Quality Control (QA/QC) for the diffusion tubes, including bias adjustments and any other adjustments applied 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 (NO<sub>2</sub>)

Table A.3 in Appendix A compares the ratified and adjusted monitored NO<sub>2</sub> annual mean concentrations for the past 5 years with the air quality objective of 40µg/m<sup>3</sup>.

For diffusion tubes, the full 2016 dataset of monthly mean values is provided in Appendix B.

For the second year running, the roadside automatic monitoring site is in compliance with the annual mean NO<sub>2</sub> objectives.

The diffusion tube results show that four sites recorded exceedances of the annual mean NO<sub>2</sub> objective in 2016 at sites 8, 9, 10 and 24. These sites are all located within the current AQMA within the one way system around the city centre and Romsey Road.

Sites 8 and 9 are located on St George’s Street. Exceedances at these sites have occurred over the last 5 years, however a trend in decreasing concentrations is evident and measured concentrations in 2016 are lower than those measured in 2015.

Measured concentrations at site 10, located on Jewry Street and site 24 located on Romsey Road show increases compared to 2015. These diffusion tubes are located on building facades and are representative of relevant exposure. The new drafted AQAP aims to tackle these remaining hotspots.

All diffusion tube measured concentrations for 2016 are below 60 µg/m<sup>3</sup>; the criteria above which exceedances of the 1-hour mean objective are likely to occur.

Table A.4 in Appendix A compares the ratified continuous monitored NO<sub>2</sub> hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m<sup>3</sup>,

not to be exceeded more than 18 times per year. This objective has been met in each of these years.

The district wide diffusion tube sites remain in compliance with the annual mean NO<sub>2</sub> objective. Measured concentrations in 2016 are generally higher than 2015 measured concentrations and therefore do not support the decreasing trend noted in previous years (see Figure A1.2 in Appendix A). Further data will be needed to confirm any long term trend changes.

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

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

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

The results show there were no exceedances of the 24 hour PM<sub>10</sub> objective or the annual mean PM<sub>10</sub> objective in 2016 at the Echo Office automatic monitoring site.

## Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Inlet Height (m)
Echo Office	Echo Office	Roadside	448212	129510	NO <sub>2</sub> ; PM <sub>10</sub>	YES	Chemiluminescent; BAM	N/A	2.75	2.65
Godson House	Godson House	Urban Background	448509	129539	NO <sub>2</sub> (until March 2015); PM <sub>10</sub> (until 2014)	YES	Chemiluminescent	N/A	18	2.8
St George's Street	St George's Street	Roadside	448062	129537	NO <sub>2</sub> (from March 2017)	YES	Chemiluminescent	0	2.25	2.2
Station Approach (Chesil St)	Station Approach (Chesil St)	Roadside	448664	129257	NO <sub>2</sub> (from March 2017)	YES	Chemiluminescent	0	4.6	2.2

**Notes:**

(1) 0 m 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 or available.

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

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube collocated with a Continuous Analyser?	Height (m)
Site 1 (City Study)	10 Eastgate St	Roadside	448563	129391	NO <sub>2</sub>	YES	0	5.55	NO	1.7
Site 2 (City Study)	Greyfriars	Roadside	448566	129560	NO <sub>2</sub>	YES	0	9.7	NO	1.75
Site 3 (City Study)	Friarsgate	Roadside	448426	129523	NO <sub>2</sub>	YES	4.6	4.25	NO	2.4
Site 4 (City Study)	Upper Brook St (Echo)	Roadside	448227	129504	NO <sub>2</sub>	YES	9.2	8	NO	2.45
Site 5 (City Study)	Roadside Monitor	Roadside	448213	129504	NO <sub>2</sub>	YES	0	3.1	YES	1.7
Site 6 (City Study)	Roadside Monitor	Roadside	448213	129504	NO <sub>2</sub>	YES	0	3.1	YES	1.7
Site 7 (City Study)	Roadside Monitor	Roadside	448213	129504	NO <sub>2</sub>	YES	0	3.1	YES	1.7
Site 8 (City Study)	St Georges St Bed	Roadside	448106	129541	NO <sub>2</sub>	YES	0	4.05	NO	2.45
Site 9 (City Study)	St Georges St Lad	Roadside	448163	129512	NO <sub>2</sub>	YES	0	3.6	NO	2.4
Site 10 (City Study)	Jewry St	Roadside	448046	129692	NO <sub>2</sub>	YES	0	4.05	NO	2.4
Site 11 (City Study)	Southgate St DV	Roadside	447918	129413	NO <sub>2</sub>	YES	0	3.65	NO	2.6
Site 12 (City Study)	Sussex St	Roadside	447804	129741	NO <sub>2</sub>	YES	2.4	3.6	NO	2.6
Site 13 (City Study)	City Road	Roadside	447963	129875	NO <sub>2</sub>	YES	0	6.55	NO	3
Site 14 (City Study)	74 Northwalls	Roadside	448297	129789	NO <sub>2</sub>	YES	10.2	3.7	NO	2.3
Site 15 (City Study)	Wales St	Roadside	448842	129820	NO <sub>2</sub>	YES	0	1.7	NO	2.45



Site 16 (City Study)	Alresford Rd (M3)	Other	449563	129439	NO <sub>2</sub>	NO	24	N/A (M3)	NO	1.5
Site 17 (City Study)	Chesil St	Roadside	448679	129068	NO <sub>2</sub>	YES	0	1.3	NO	2.6
Site 18 (City Study)	Stockbridge Rd	Roadside	447534	130006	NO <sub>2</sub>	YES	10	5.4	NO	2
Site 19 (City Study)	Burma Road	Roadside	447025	129222	NO <sub>2</sub>	NO	N/A*	N/A	NO	1.8
Site 20 (City Study)	Worthy Rd 1	Roadside	448092	130411	NO <sub>2</sub>	YES	3.7	2.2	NO	2.5
Site 21 (City Study)	Worthy Rd 2	Roadside	448092	130411	NO <sub>2</sub>	YES	3.7	2.2	NO	2.5
Site 22 (City Study)	Worthy Rd 3	Roadside	448092	130411	NO <sub>2</sub>	YES	3.7	2.2	NO	2.5
Site 23 (City Study)	St Cross Rd	Roadside	447842	129050	NO <sub>2</sub>	YES	6	2.4	NO	2.2
Site 24 (City Study)	Romsey Road	Roadside	447495	129511	NO <sub>2</sub>	YES	0	1.1	NO	2.5
Site 25 (City Study)	Andover Rd	Roadside	447898	130065	NO <sub>2</sub>	YES	0	4.2	NO	2.15
Site 26 (City Study)	Bus Station	Other	448427	129401	NO <sub>2</sub>	YES	N/A**	N/A	NO	2.4
Site 1 (District Study)	High St, Twyford	Roadside	448046	124296	NO <sub>2</sub>	NO	0	0.9	NO	N/A
Site 2 (District Study)	Southdown Road, Otterbourne	Other	446680	124644	NO <sub>2</sub>	NO	N/A***	N/A	NO	N/A
Site 3 (District Study)	Church Green Close, Kings Worthy	Other	449162	132293	NO <sub>2</sub>	NO	N/A***	N/A	NO	N/A
Site 4 (District Study)	West St/Broad St, New Alresford	Roadside	458826	132719	NO <sub>2</sub>	NO	N/A***	Centre of Road	NO	N/A
Site 5 (District Study)	Hambledon Rd,	Roadside	465917	112050	NO <sub>2</sub>	NO	N/A***	1.2	NO	N/A

Study)	Denmead									
Site 6 (District Study)	Winchester Rd, Wickham	Roadside	457199	111391	NO <sub>2</sub>	NO	N/A***	0.8	NO	N/A
Site 7 (District Study)	Winchester Rd, Bishops Waltham	Roadside	455330	117406	NO <sub>2</sub>	NO	N/A***	1	NO	N/A
Site 8 (District Study)	Whiteley Lane, Whiteley	Other	453680	108312	NO <sub>2</sub>	NO	N/A***	N/A	NO	N/A

**Notes:**

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

(2) N/A if not applicable or available. \* Burma Rd was installed at a location where there is no close long term exposure location for annual mean. It is being used as an indicator of hourly mean exposure for students. \*\* Site 26 is for an indication of hourly mean exposure at the bus station. \*\*\*A number of the district wide sites are measuring roadside locations as a worst case scenario for comparison of trends.

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 2016 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
					2012	2013	2014	2015	2016
Echo Office	Roadside	Automatic	97.4	97.4	<b>46.0</b>	<b>47.0</b>	<b>41.0</b>	38.0	38.0
Godson House	Urban Background	Automatic	0	0	26	25	24	20	-
Site 1 (City Study)	Roadside	Diffusion Tube	83	83	<b>49.3</b>	<b>41.5</b>	<b>44.6</b>	37.6	36.8
Site 2 (City Study)	Roadside	Diffusion Tube	100	100	38.2	37.1	34.1	31.5	30.0
Site 3 (City Study)	Roadside	Diffusion Tube	100	100	32.2	33	28.4	25.9	26.9
Site 4 (City Study)	Roadside	Diffusion Tube	100	100	<b>47.4</b>	<b>45.1</b>	39	37.6	37.1
Site 5 (City Study)	Roadside	Diffusion Tube	100	100	<b>46.4</b>	<b>47.6</b>	<b>40.3</b>	38.2	37.2
Site 6 (City Study)	Roadside	Diffusion Tube	100	100	<b>46.4</b>	<b>47.6</b>	<b>40.3</b>	38.2	38.6
Site 7 (City Study)	Roadside	Diffusion Tube	100	100	<b>46.4</b>	<b>47.6</b>	<b>40.3</b>	38.2	37.7
Site 8 (City Study)	Roadside	Diffusion Tube	92	92	<b><u>65.6</u></b>	<b><u>63</u></b>	<b>54.7</b>	<b>50.2</b>	<b>49.8</b>
Site 9 (City Study)	Roadside	Diffusion Tube	92	92	<b><u>67.5</u></b>	<b><u>62.1</u></b>	<b>57.1</b>	<b>52.6</b>	<b>48.9</b>
Site 10 (City Study)	Roadside	Diffusion Tube	100	100	<b>53.7</b>	<b>52.5</b>	<b>47.1</b>	<b>40.6</b>	<b>41.7</b>
Site 11 (City Study)	Roadside	Diffusion Tube	92	92	38.3	<b>44.8</b>	38	37.7	37
Site 12 (City Study)	Roadside	Diffusion Tube	92	92	<b>42.4</b>	<b>40.6</b>	36.1	33.9	37.3
Site 13 (City Study)	Roadside	Diffusion Tube	92	92	<b>43.4</b>	<b>41.8</b>	38.1	36.7	33.8

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2016 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
					2012	2013	2014	2015	2016
Site 14 (City Study)	Roadside	Diffusion Tube	100	100	<b>42</b>	34.6	31.1	30	29.7
Site 15 (City Study)	Roadside	Diffusion Tube	92	92	27.8	37.5	31.2	30.5	31.5
Site 16 (City Study)	Other	Diffusion Tube	92	92	<b>42.5</b>	<b>43.1</b>	<b>41.3</b>	37	38.4
Site 17 (City Study)	Roadside	Diffusion Tube	100	100	<b>46.2</b>	<b>44.1</b>	<b>42.8</b>	36.4	39.9
Site 18 (City Study)	Roadside	Diffusion Tube	100	100	34	28.2	25	21.2	24.8
Site 19 (City Study)	Roadside	Diffusion Tube	100	100	N/A	N/A	N/A	N/A	19.3
Site 20 (City Study)	Roadside	Diffusion Tube	100	100	33.4	33.2	29.3	24.2	22.8
Site 21 (City Study)	Roadside	Diffusion Tube	100	100	33.4	33.2	29.3	24.2	23.8
Site 22 (City Study)	Roadside	Diffusion Tube	100	100	33.4	33.2	29.3	24.2	22.9
Site 23 (City Study)	Roadside	Diffusion Tube	83	83	37.8	37	33.4	35.3	33.4
Site 24 (City Study)	Roadside	Diffusion Tube	100	100	<b><u>66.8</u></b>	<b><u>65.9</u></b>	<b>57.2</b>	<b>48.8</b>	<b>56.6</b>
Site 25 (City Study)	Roadside	Diffusion Tube	100	100	<b>41.2</b>	<b>40.5</b>	36.4	33.5	32.9
Site 26 (City Study)	Other	Diffusion Tube	100	100	<b>44.6</b>	<b>41.8</b>	35.9	33.7	30.4
Site 1 (District Study)	Roadside	Diffusion Tube	92	92	35.8	33.8	29.4	27.7	28.4
Site 2 (District Study)	Other	Diffusion Tube	83	83	35.1	35.2	28.8	28.5	29.4
Site 3 (District Study)	Other	Diffusion	92	92	31.8	28	24.3	25.5	25.5

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2016 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
					2012	2013	2014	2015	2016
Study)		Tube							
Site 4 (District Study)	Roadside	Diffusion Tube	92	92	34.1	37.3	30.1	30.1	33.8
Site 5 (District Study)	Roadside	Diffusion Tube	100	100	29.4	21.7	20.6	18.4	19.9
Site 6 (District Study)	Roadside	Diffusion Tube	75	75	34.5	33.2	29.3	28.8	30.6
Site 7 (District Study)	Roadside	Diffusion Tube	100	100	34.3	34.4	29.6	29.6	32.5
Site 8 (District Study)	Other	Diffusion Tube	100	100	30.1	29.9	23.7	21.8	22.6

Diffusion tube data has been bias corrected

Annualisation has been conducted where data capture is <75% (note data capture was above this value for all sites)

If applicable, all data has been distance corrected for relevant exposure

#### Notes:

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

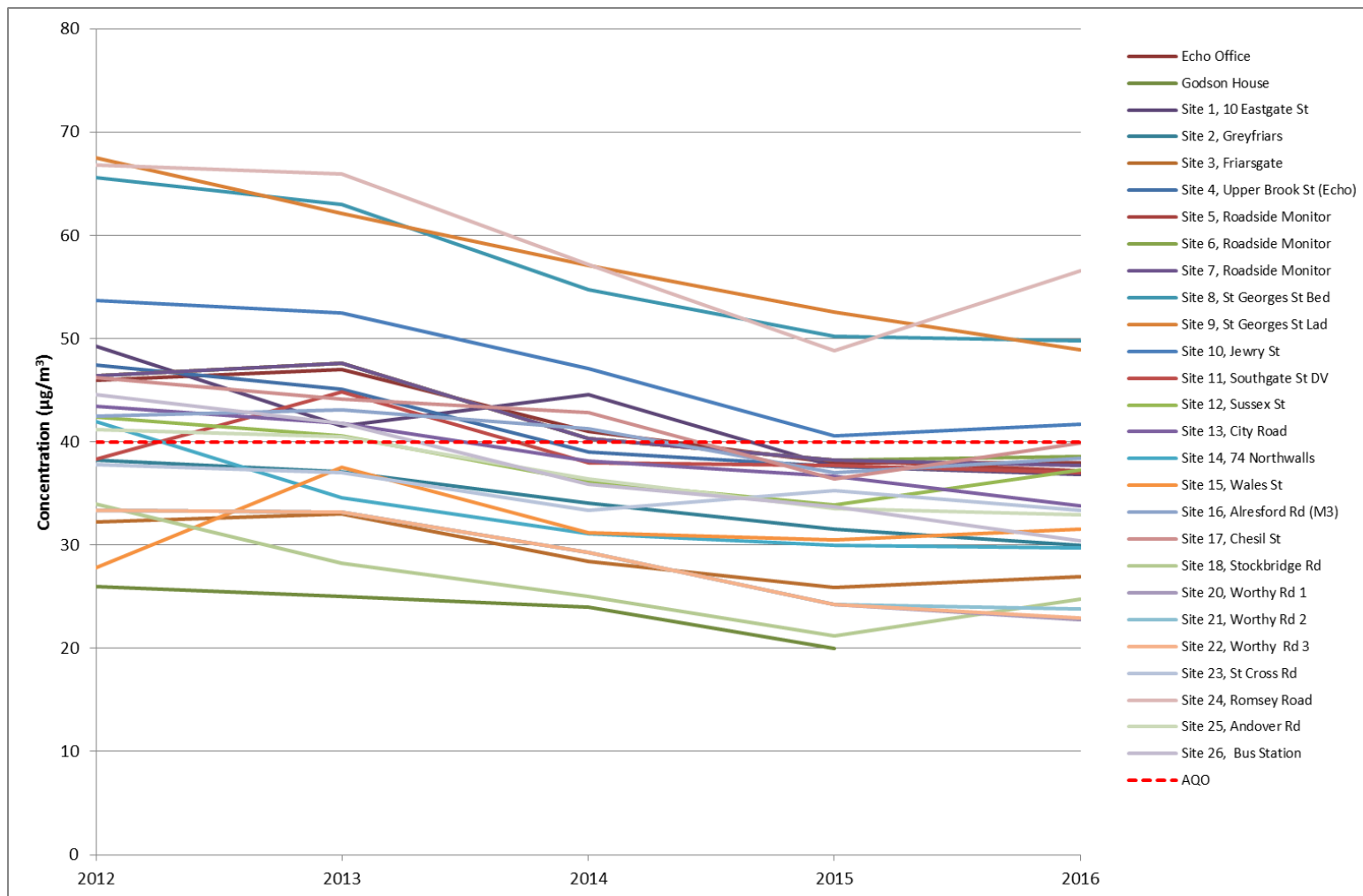
NO<sub>2</sub> annual means exceeding 60µg/m<sup>3</sup>, indicating a potential exceedance of the NO<sub>2</sub> 1-hour mean objective are shown in **bold and underlined**.

(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 Boxes 7.9 and 7.10 in LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Figure A.1 – Trends in Annual Mean NO<sub>2</sub> Concentrations – City wide DT study and automatic monitoring sites



AQO = Air Quality Objective. Note new site 19 is not shown as data is only available for 2016.

Figure A.2 – Trends in Annual Mean NO<sub>2</sub> Concentrations – District wide DT study

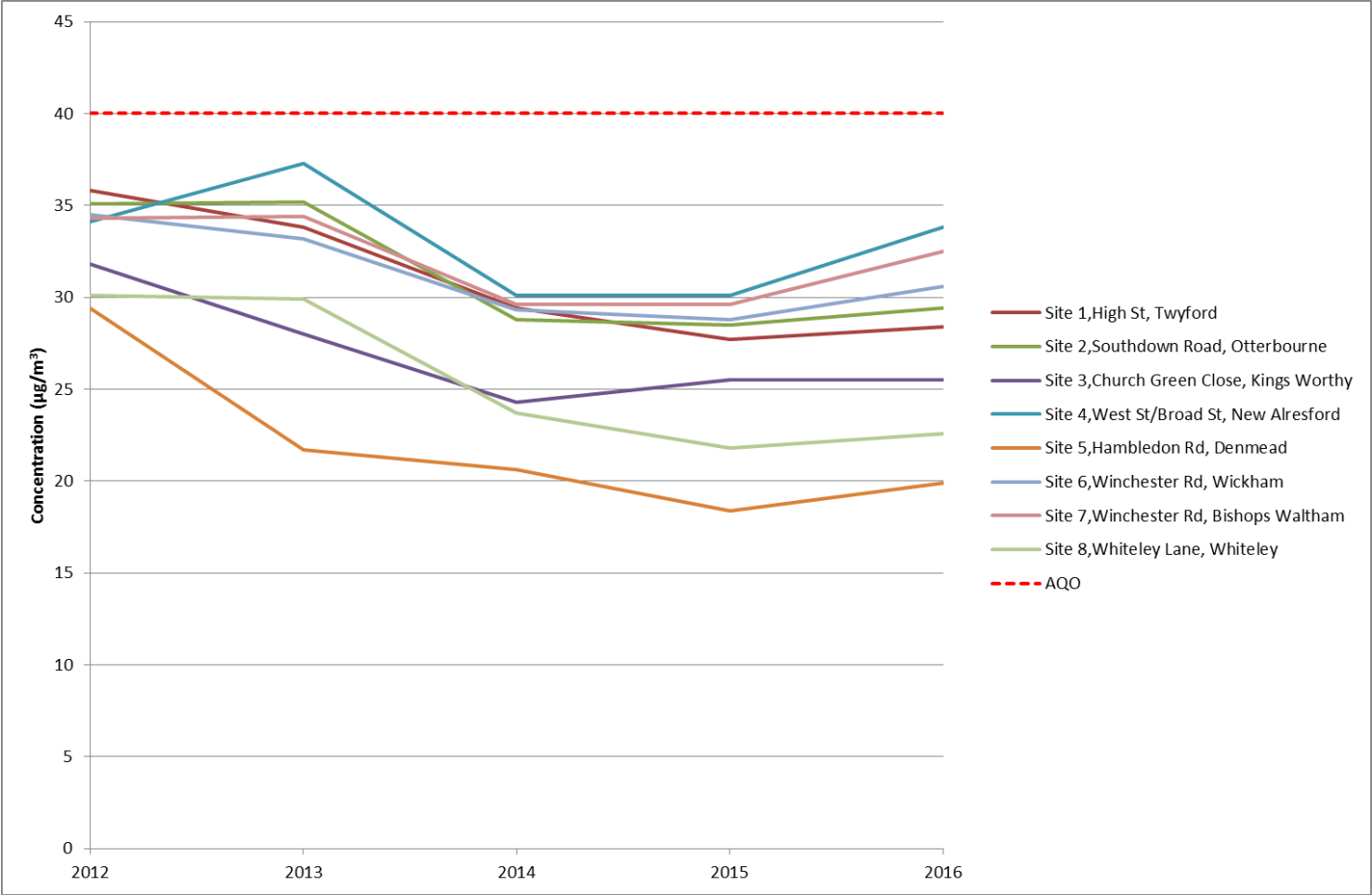


Table A.4 – 1-Hour Mean NO<sub>2</sub> Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2016 (%) <sup>(2)</sup>	NO <sub>2</sub> 1-Hour Means > 200µg/m <sup>3</sup> <sup>(3)</sup>				
					2012	2013	2014	2015	2016
Echo Office	Roadside	Automatic	97.4	97.4	0	1	0	1	1
Godson House	Urban Background	Automatic	-	-	0	0	0	0 (50)	-

**Notes:**

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

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

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

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



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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2016 (%) <sup>(2)</sup>	PM <sub>10</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
				2012	2013	2014	2015	2016
Echo Office	Roadside	93.9	93.9	29	31	29	32	31
Godson House	Urban Background	-	-	20	23	18	-	-

Annualisation has been conducted where data capture is <75% (note data capture was above this value for all sites)

**Notes:**

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

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

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

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

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2016 (%) <sup>(2)</sup>	PM <sub>10</sub> 24-Hour Means > 50µg/m <sup>3</sup> <sup>(3)</sup>				
				2012	2013	2014	2015	2016
Echo Office	Roadside	93.9	93.9	16	15	19	23	26
Godson House	Urban Background	-	-	1	3	1 (38)	-	-

**Notes:**

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

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

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

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

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

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

Site ID	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 (0.95) and Annualised <sup>(1)</sup>	Distance Corrected to Nearest Exposure <sup>(2)</sup>
Site 1 (City Study)		41.5	44.9	38.2	36.5	34.0	32.6	33.3		39.9	46.8	40.0	38.8	36.8	36.8
Site 2 (City Study)	34.0	36.4	30.6	22.5	34.8	28.5	29.5	29.6	31.4	32.5	34.0	35.2	31.6	30.0	30.0
Site 3 (City Study)	34.1	24.8	32	25.9	25.1	22.4	21.3	21.5	30.1	32.2	33.7	36.8	28.3	26.9	24.4
Site 4 (City Study)	41.8	40.8	45.6	33.9	45.7	37.9	31.3	29.8	37.6	40.9	42.3	41.3	39.1	37.1	31.3
Site 5 (City Study)	39.1	39.8	47.1	35.9	44	36.8	29.9	36.5	38	41.4	37.2	44.1	39.1	37.2	37.2
Site 6 (City Study)	39.4	44.1	50.6	35.3	43.1	41.3	31.1	36.3	38.6	41.9	44.1	41.2	<b>40.6</b>	38.6	38.6
Site 7 (City Study)	39.1	40.9	50.6	38.7	41.7	34	31.8	34.9	38.5	41.1	40.5	43.9	39.6	37.7	37.7

Site ID	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 (0.95) and Annualised <sup>(1)</sup>	Distance Corrected to Nearest Exposure <sup>(2)</sup>
Site 8 (City Study)	60.4		64.2	51.6	58.8	46.9	44.8	48.5	50	52.9	47.4	50.8	<b>52.4</b>	<b>49.8</b>	<b>49.8</b>
Site 9 (City Study)	56.7	53.9	46.1	52.3	54.9	43.7	54.5	52.8	51	49.8		50.8	<b>51.5</b>	<b>48.9</b>	<b>48.9</b>
Site 10 (City Study)	57.3	43.2	50.6	38.8	40.7	39.3	34.4	35.1	48.5	42.5	45.4	50.6	<b>43.9</b>	<b>41.7</b>	<b>41.7</b>
Site 11 (City Study)	42.7	34.5	45.7	33.8	41.6	35.3	34.8	35.1		34.4	44.2	46.5	39.0	37.0	37.0
Site 12 (City Study)	45.9	35	51.5		37.2	36.7	28.5	29.3	36.2	43.4	42.5	45.7	39.3	37.3	34.2
Site 13 (City Study)	42.9	35.2	33.5	31.1	35.3		34.2	30.9	37	32.2	38.1	41.5	35.6	33.8	33.8
Site 14 (City Study)	43.5	34.2	32.2	24.2	30.1	23.3	28.6	26.6	31.9	30	35.3	35.3	31.3	29.7	24.4
Site 15 (City Study)		37.2	40.1	31.9	33.1	27.3	28	27.6	31.8	36.1	32	40	33.2	31.5	31.5
Site 16 (City Study)	39	43	43.1	38.4	43.6	45.8	33	36	42.4	41.7	38.8		<b>40.4</b>	38.4	N/A

Site ID	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 (0.95) and Annualised <sup>(1)</sup>	Distance Corrected to Nearest Exposure <sup>(2)</sup>
Site 17 (City Study)	51.3	41.9	41.5	40.6	37.9	37.1	36.9	38.9	43.5	41.5	40.6	52.4	<b>42.0</b>	39.9	39.9
Site 18 (City Study)	27.4	25.7	27.9	18.4	24.1	20.3	15.5	15.6	22.3	27.8	29.7	58.6	26.1	24.8	21.7
Site 19 (City Study)	24.5	21.3	26	18.6	20	14.6	10	11	18.9	25	24.9	29.3	20.3	19.3	N/A
Site 20 (City Study)	28.9	26.5	28.3	20.4	21	19.1	17.7	17.8	23.7	25.7	27.9	30.6	24.0	22.8	20.4
Site 21 (City Study)	34.4	25.7	24.8	22	22.2	19	18.5	18	23.5	25.5	26.6	40.4	25.0	23.8	21.2
Site 22 (City Study)	31.6	25.5	26.2	21.5	21.3	17.9	18.1	17.9	25	26.4	26.8	30.9	24.1	22.9	20.5
Site 23 (City Study)	42.6	36.1	45.7	33.5	34.9	28.8	26.3	28.4	34.7			40.1	35.1	33.4	27.8
Site 24 (City Study)	63	62.6	60.7	48.1	65.4	65.5	55.2	53.1	57.9	64.5	56.7	61.8	<b>59.5</b>	<b>56.6</b>	<b>56.6</b>
Site 25 (City Study)	48	34.4	33.4	28.5	33.6	26.9	30.5	28.6	39.6	36.7	34.7	40.5	34.6	32.9	32.9

Site ID	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 (0.95) and Annualised <sup>(1)</sup>	Distance Corrected to Nearest Exposure <sup>(2)</sup>
Site 26 (City Study)	33.8	30.4	38.8	29.1	35.1	27.2	24.6	26.7	32.3	34.5	35	37	32.0	30.4	N/A
Site 1 (District Study)	32.6	30.6	37		27.8	24.7	22.2	21.3	29.2	31.6	34.5	37.4	29.9	28.4	28.4
Site 2 (District Study)	31.7	36.8	38	30.4		29.3	26	25.5	28.9	29.8	33.2		31.0	29.4	N/A
Site 3 (District Study)	37	30.4	30.2		21.1	19.3	21.3	21.2	25.9	25.7	28.7	34	26.8	25.5	N/A
Site 4 (District Study)	38.9	38	45.3	30.6		32.2	29.1	25.7	34.4	40.8	37.2	38.8	35.5	33.8	N/A
Site 5 (District Study)	27.6	19	19	18.7	15.9	15.5	15.3	15.6	20.2	31.2	24.7	28.5	20.9	19.9	N/A
Site 6 (District Study)	40.6	36.6	34.7		33.4		24.4	26		17.3	33.9	42.7	32.2	30.6	N/A
Site 7 (District Study)	42	38.3	33.8	31.7	31.7	29.9	29.9	27.6	35.4	31.2	32.8	43.5	34.2	32.5	N/A
Site 8 (District Study)	31.9	23.9	22.1	22.3	21.3	19.4	17.2	20.4	25.2	22.9	27.1	31.9	23.8	22.6	N/A

Local bias adjustment factor used

National bias adjustment factor used

Annualisation has been conducted where data capture is <75% (note data capture was above this value for all sites)

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

(2) Distance corrected to nearest relevant public exposure. Distance corrections may be not applicable (marked N/A) as explained in Table A.2.

Exposure periods are slightly different from the suggested LAQM calendar for Jan - Apr. Periods are as follows:

Jan 31/12/15 - 29/01/16, Feb 29/01/16 - 26/02/16, Mar 26/02/16 - 24/03/2016, Apr 24/03/16 - 29/04/16, May 29/04/16 - 26/05/16, Jun 26/05/16 - 28/06/16, Jul 28/06/16 - 26/07/16, Aug 26/07/16 - 26/08/16, Sep 26/08/16 - 28/09/16, Oct 28/09/16 - 27/10/16, Nov 27/10/16 - 30/11/16, Dec 30/11/16 - 20/01/17

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

### Automatic Monitoring Data

Data collection efficiency for the roadside site instruments in 2016 was greater than the required 85% (97.4% for NO<sub>2</sub> and 93.9% for PM<sub>10</sub>). Therefore no annualisation of data was required.

PM<sub>10</sub> results use an unheated BAM 1024 analyser and have therefore had a correction factor applied as recommended, data being divided by 1.21. All data from previous years has had the same correction factor applied.

All results have been zero and span corrected with readings taken approximately every 2 weeks in accordance with Defra guidance. All gases used for calibration have been independently certified. All instruments were fully serviced every six months by external contractors (ESU1). All real data was polled and ratified by an external air quality consultant (AQDM).

### Diffusion Tube Data

All diffusion tubes were from Gradko and used a mixture of 20% TEA in water preparation method. Gradko International Ltd is a UKAS accredited laboratory. Gradko participates in the AIR Proficiency Testing (PT) scheme for diffusion tubes, operated by LGC Standards and supported by the Health and Safety Laboratory (HSL), which provides a Quality Assurance / Quality Control (QA/QC) framework for local authorities carrying out diffusion tube monitoring as a part of their local air quality management process. The percentage of results submitted by Gradko International Ltd that were subsequently determined to be satisfactory was 100% for all tests in AIR-PT Rounds AR012-AR016 (January 2016 -October 2016)<sup>8</sup>.

The results have been adjusted by using a bias adjustment factor using the procedure detailed in DEFRA guidance document Technical Guidance LAQM TG(16).<sup>9</sup> This was calculated by locating three diffusion tubes adjacent to the

<sup>8</sup> Summary of Laboratory Performance in AIR NO<sub>2</sub> Proficiency Testing Scheme. Available at: [https://laqm.defra.gov.uk/documents/AIR-PT-Rounds-6-to-16-\(Jan-2015---Oct-2016\).pdf](https://laqm.defra.gov.uk/documents/AIR-PT-Rounds-6-to-16-(Jan-2015---Oct-2016).pdf)  
<sup>9</sup> Defra LAQMTG(16). Available at <https://laqm.defra.gov.uk/documents/LAQM-TG16-April-16-v1.pdf>



roadside real time analyser and comparing results. The local bias adjustment factor calculated and used was 0.95.

Two of the sites have triplicate samples to investigate the precision of the tubes. The data for 2016 shows all sites have 'good' precision with coefficients of variation for all sampling periods and locations being less than 20% (with only one result above 10%) with annual averages of 3.9 and 5.0 for the two triplicate sites.

The national bias adjustment factor was also calculated in accordance with LAQM TG(16). The factor for 2016 was found to be 0.94 from 21 studies. The local and national factors do not vary significantly from each other, and the co-location site was found to have 'good' precision for the diffusion tubes, therefore use of the local bias adjustment factor was deemed suitable.

Data capture for all diffusion tube sites was greater than 75% therefore no annualisation of results was necessary.

Distance correction was carried out for those sites where the site was known to be situated a set distance away from relevant exposure. The NO<sub>2</sub> concentration at the nearest location relevant for exposure was estimated using the NO<sub>2</sub> fall-off with distance calculator available on the LAQM Support website<sup>10</sup>.

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<sup>10</sup> <http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html>

## Appendix D: Maps of Monitoring Locations and AQMAs

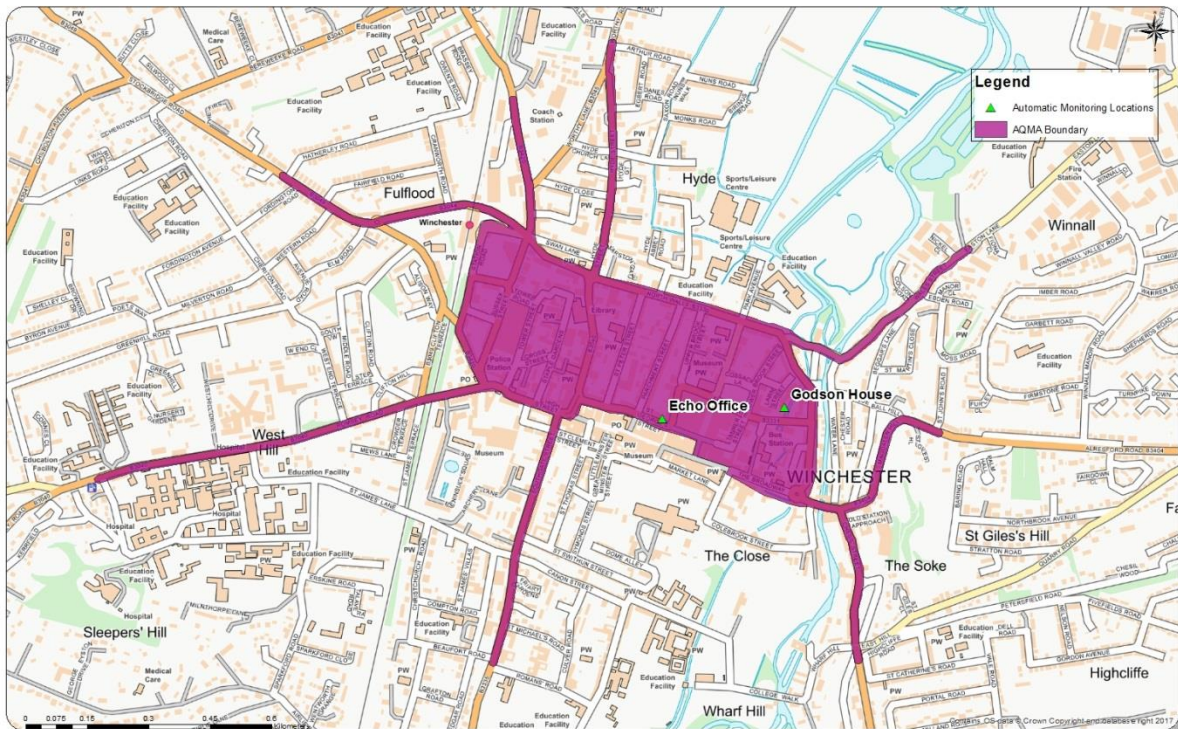


Figure 1: Map of Automatic Monitoring Sites & AQMA Boundary

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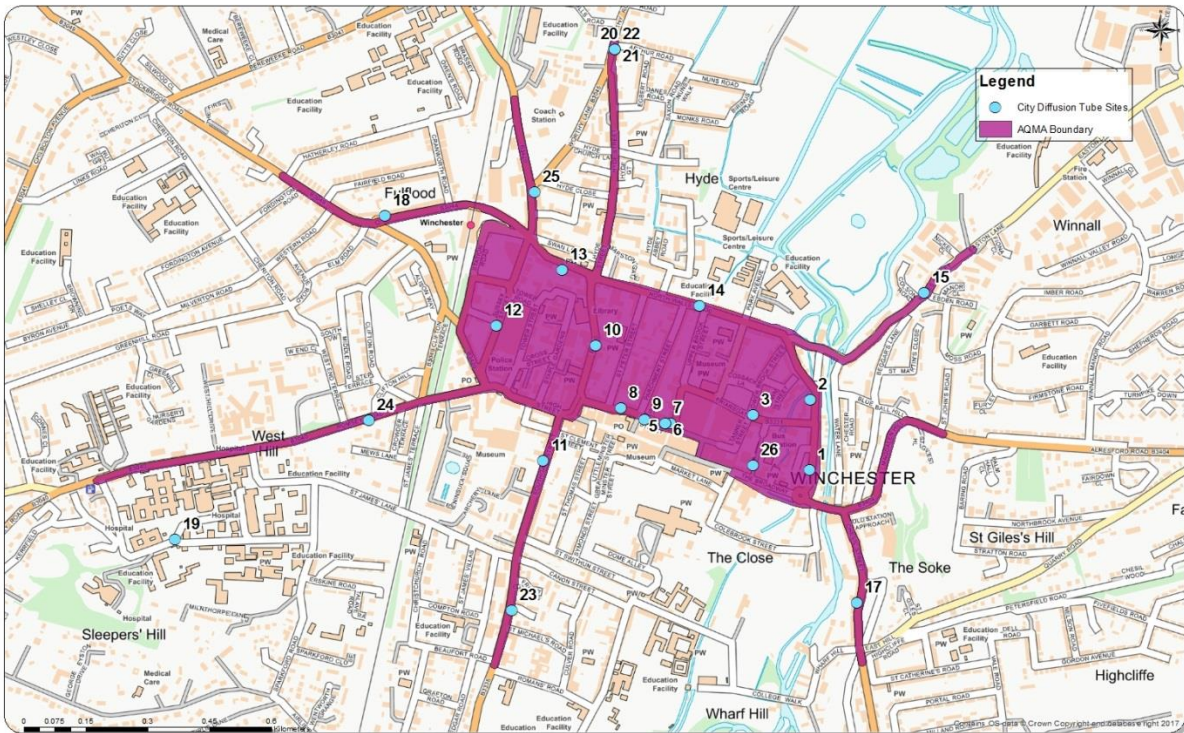


Figure 2: Map of City wide Diffusion Tube Sites & AQMA Boundary

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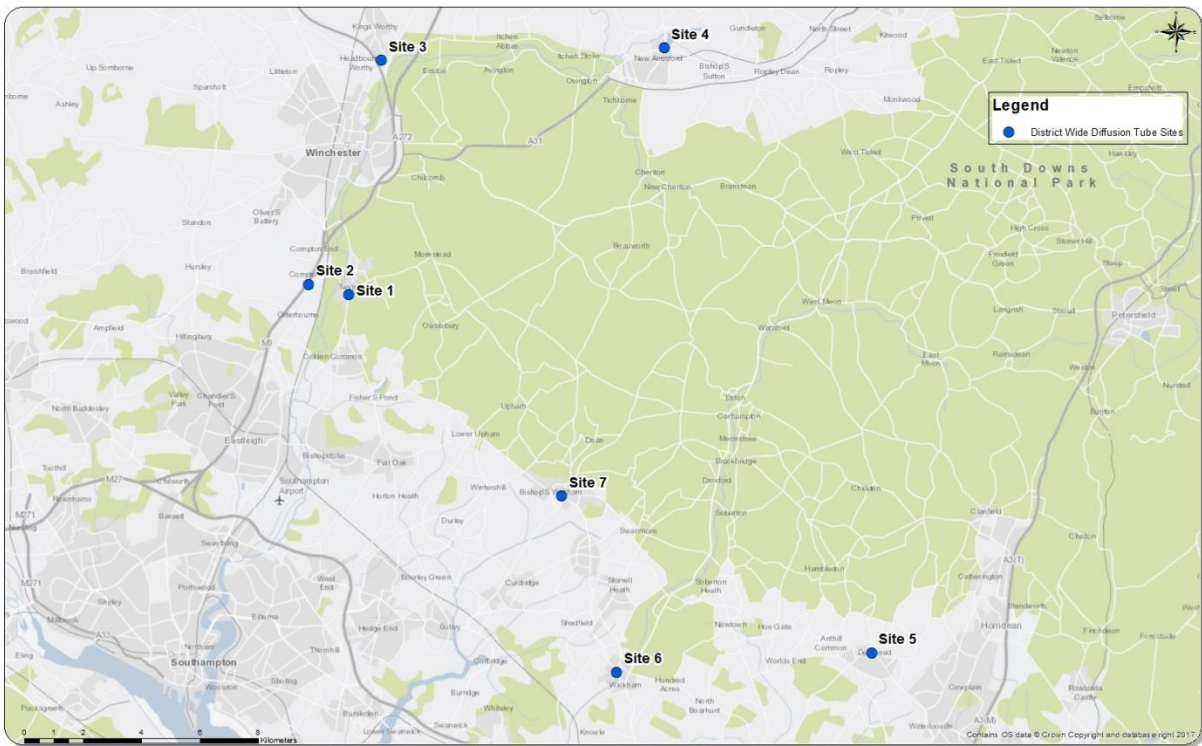


Figure 3: Map of District wide Diffusion Tube Sites

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

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective <sup>11</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>11</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
BAM	Beta attenuation monitoring - a widely used air monitoring technique
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
HCC	Hampshire County Council
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
WCC	Winchester City Council

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3. Department for Environment, Food and Rural Affairs. Abatement cost guidance for valuing changes in air quality, May 2013
4. Hampshire County Council Local Transport Plan - Implementation Plan 2014-2017. Available for download at <https://www.hants.gov.uk/transport/strategies/transportstrategies>
5. Department for Environment, Food and Rural Affairs Local Air Quality Management website: <http://laqm.defra.gov.uk/>
6. Winchester City Council 2016 Air Quality Annual Status Report, [www.winchester.gov.uk/assets/files/28866/Winchester-2016-ASR-J2494-F2.pdf](http://www.winchester.gov.uk/assets/files/28866/Winchester-2016-ASR-J2494-F2.pdf)
7. Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe
8. Summary of Laboratory Performance in AIR NO<sub>2</sub> Proficiency Testing Scheme. Available at: [https://laqm.defra.gov.uk/documents/AIR-PT-Rounds-6-to-16-\(Jan-2015---Oct-2016\).pdf](https://laqm.defra.gov.uk/documents/AIR-PT-Rounds-6-to-16-(Jan-2015---Oct-2016).pdf)
9. Department for Environment, Food and Rural Affairs LAQM.TG (16). Available at <https://laqm.defra.gov.uk/documents/LAQM-TG16-April-16-v1.pdf>
10. Department for Environment, Food and Rural Affairs. NO<sub>2</sub> fall off with distance calculator <http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html>