



*Lichfield District Council*  
***Annual Status Report 2017***

*Bureau Veritas*



*February 2018*

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## 2017 Air Quality Annual Status Report (ASR)

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

February 2018

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## Executive Summary: Air Quality in Our Area

### Air Quality in Lichfield District Council

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

Lichfield District Council (LDC) is situated in the north of the West Midlands, close to some highly industrialised parts of the UK. To the south west lie Walsall and Birmingham. LDC is only moderately industrialized, but there are a number of major roads in the region, including the M6 Toll, A38 and A5. Consequently, road traffic is the main source of air pollution in the area. Burntwood and Lichfield are the two largest urban areas in the District.

AQMA no. 1 was declared in August 2008 and encompasses the traffic dense area of the A5 Muckley Corner Roundabout, together with several of the surrounding buildings. Following the 2015 Detailed Assessment of the area surrounding the A38 up to the northern boundary of the district, LDC declared AQMA No.2 which came into force in August 2016.

During 2016, there were a total of thirteen sites where the annual mean NO<sub>2</sub> objective was exceeded. Sites A38-2A/B, MUC-1A/B/C and MUC-1 exceeded the annual mean objective with reported concentrations of 45.1µg/m<sup>3</sup>, 49.4µg/m<sup>3</sup> and 47.2µg/m<sup>3</sup> respectively. All three monitoring sites were at locations representing relevant exposure and therefore distance correction was not required.

The annual mean concentrations at the exceeding sites, A38-1, A38-4A/B, A38-5A/B, A5-1A, A5-2B, MUC-6, MUC-2, MUC-3, MUC-4 and MUC-5 were all distance corrected to estimate the concentration at relevant exposure. Of the sites that were

<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

distance corrected; only MUC-3 and MUC-4 were still found to be exceeding the annual mean NO<sub>2</sub> objective at the receptor façade, with reported concentrations of 46.0µg/m<sup>3</sup> and 44.1µg/m<sup>3</sup> respectively.

The planned HS2 project will pass through the Lichfield Council area, although at this stage it is not considered likely to cause any adverse air quality impacts at present as detailed in Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC.

## **Actions to Improve Air Quality**

The Council is preparing an AQAP to tackle the air quality issue within the AQMAs. The plan is to be finalised within February 2018 according to LDC's Forward Plan, dated 26<sup>th</sup> October 2017<sup>4</sup>. The following main actions were identified ahead of the AQAP, based on the area and type of effects that may be achieved:

- Reduce traffic numbers on A5 and A38, either total volume or only HGVs depending on future M6 toll use;
- EcoStars - upgrade commercial vehicles (buses, HGVs and LGV) to euro V/VI; and
- Upgrade to expressways - either/a combination of either reducing length of any junction links; increasing speed on free flow or amending road widths in some areas.

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<sup>4</sup> <https://www.lichfielddc.gov.uk/Council/Live-meetings/Forward-plan-for-council-decisions.aspx>



In addition to the AQAP, the Local Plan (2008-2029) and Integrated Transport Strategy (2015-2029) include policies and actions in relation to sustainable transport within the District. The core actions are:

- Improve everyone’s access to public transport, their ability to walk and cycle, minimising the need to travel by car and reducing levels of congestion;
- Improve transport infrastructure; and
- Continue and improve partnership working between operators, developers and public sector agencies.



## Local Priorities and Challenges

There are two AQMAs declared within the District for exceedances of the annual mean NO<sub>2</sub> objective with road traffic being the major source. Given the need to meet the NO<sub>2</sub> annual mean objective, the focus will be on reducing the annual mean concentrations of NO<sub>2</sub>. The key priorities and challenges for the coming year will be

- To produce an air quality action plan to determine the best policies and intervention measures to put in place in order to reduce local NO<sub>2</sub> concentrations; and
- To install additional monitoring locations at the A38 Rykneld Street near Croxhall Road and near A5127/A39 junction to confirm existing concentrations.

## How to Get Involved

Due to the main source of air pollution within Lichfield District Council being from transport sources, the easiest way for the public to get involved with helping improving air quality within the area would be to look at alternatives to the way they usually travel.



The following are suggested alternatives to private travel that would contribute to improving the air quality within the District:

- Use public transport where available – This reduces the number of private vehicles in operation reducing pollutant concentration through the number of vehicles and reducing congestion;
- Walk or cycle if your journey allows – From choosing to walk or cycle for your journey the number of vehicles is reduced and also there is the added benefit of keeping fit and healthy. In addition many of the cycle routes are off-road meaning you are not in close proximity to emissions from road traffic sources;
- Car/lift sharing – Where a number of individuals are making similar journeys, such as travelling to work or to school car sharing reduces the number of vehicles on the road and therefore the amount of emissions being released. This can be promoted via travel plans through the workplace and within schools; and
- Alternative fuel / more efficient vehicles – Choosing a vehicle that meets the specific needs of the owner, fully electric, hybrid fuel and more fuel efficient cars are available and all have different levels benefits by reducing the amount of emissions being released.

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## 1 Local Air Quality Management

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

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

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

## 2 Actions to Improve Air Quality

### 2.1 Air Quality Management Areas

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

A summary of AQMAs declared by Lichfield District 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://uk-air.defra.gov.uk/aqma/list>. Alternatively, see Appendix D: Map(s) of Monitoring Locations and AQMAs, which provides for a map of air quality monitoring locations in relation to the AQMAs.

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

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	City / Town	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance (maximum monitored/modelled concentration at a location of relevant exposure)		Action Plan (inc. date of publication)
						At Declaration	Now	
A5 Muckley Corner AQMA No.1	01/08/2008	NO <sub>2</sub> annual mean	Lichfield	An area encompassing the Muckley Corner Roundabout on the A5 along with a number of surrounding buildings.	No	51.0µg/m <sup>3</sup>	59.9µg/m <sup>3</sup>	-
AQMA No.2	01/08/2016	NO <sub>2</sub> annual mean	Lichfield	A38, Wall Island to Alrewas	No	35.7µg/m <sup>3</sup>	43.0µg/m <sup>3</sup>	-

## 2.2 Progress and Impact of Measures to address Air Quality in Lichfield District Council

Lichfield District Council has progressed a number of measures during the current reporting year of 2016 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2. More details on the measures can be found in the Local Plan (2008-2029) and Integrated Transport Strategy (2015-2029) .

Key completed measures are:

- Public transport services have been maintained and improved with more bus services linking to Burntwood and Tamworth, and more frequent services to Burton on Trent; and
- The A5/A5148 Wall Island improvement scheme was required due to traffic congestion and queuing problems during peak periods. Works were delivered in 2014 as part of the Highways Agency's Pinch Point Programme. Traffic signals were introduced on two junction approaches with gap closures and carriageway widening works. This has helped to alleviate daily traffic congestion and reduce journey times as well as improving road safety at the junction.

Lichfield District Council expects the following measures to be completed over the course of the next reporting year:

- Finalise AQAP;
- Continue to work with partners to improve accessibility, by enhancing sustainable transport opportunities and encouraging development that, reduces the need to travel, and changes to travel behaviour through a balance of transport measures; and
- Future development within the District will be focused on the most accessible settlements and locations to reduce the need to travel.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
1	Ecostars	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	Lichfield DC and supported by Third Party	-	On-going	Reduction in fuel consumption & emissions	-	On-going	On-going	<a href="http://www.ecostars-uk.com/">http://www.ecostars-uk.com/</a>
2	Staffordshire Air Quality Forum	Policy Guidance and Development Control	Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	County-wide	Completed	On-going	-	-	On-going	On-going	
3	Improvement of A38	Traffic Management	Strategic highway improvements	Lichfield DC	Completed	On-going	-	-	On-going	On-going	Muckley Corner has AQMA order imposed on it
4	Increase the Volume of through traffic using M6 Toll	Traffic Management	UTC, Congestion management, traffic reduction	Lichfield DC	Planning	-	-	-	-	-	-
5	Upgrading to Expressways	Traffic Management	UTC, Congestion management, traffic reduction	Lichfield DC	Planning	-	Reduction in traffic congestion	-	-	-	-
6	Improvements to Lichfield Trent Valley rail station	Promoting Travel Alternatives	Promote use of rail and inland waterways	Lichfield DC	Completed	On-going	-	-	On-going	On-going	-
7	The A5/A5148 Wall Island improvement scheme	Traffic Management	UTC, Congestion management, traffic reduction	Lichfield DC	Completed	Completed	Reduction in journey time	-			



## 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.

Particulate matter, or PM, is the term used to describe particles found in the air, including dust, dirt and liquid droplets. PM comes from both natural and man-made sources, including traffic emissions and Saharan-Sahel dust. These particles can be suspended in the air for long periods of time, and can travel across large distances.

PM less than 10 micrometers in diameter (PM<sub>10</sub>) pose a health concern because they can be inhaled into and accumulate in the respiratory system. PM less than 2.5 micrometers in diameter (PM<sub>2.5</sub>) are referred to as "fine" particles and are believed to pose the greatest health risks, as they can lodge deeply into the lungs and also pass into the bloodstream.

PM<sub>2.5</sub> is the pollutant which has the biggest impact on public health and on which the Public Health Outcomes Framework (PHOF) indicator 3.015 is based.

The Royal College of Physicians (RCP) undertook a review in February 2016 where they found that long term exposure to air pollution impairs lung function growth in children, and that outdoor exposure is linked to lung cancer in adults. Within Staffordshire it is estimated that 5% of all deaths can be attributed to exposure to PM<sub>2.5</sub>, which is above the 4.7% level currently recorded across England (40,000 deaths annually). Overall, the estimated cost to individuals and society is more than £20 billion annually for the UK. The Public Health Outcomes Framework indicator for the fraction of deaths attributable to PM<sub>2.5</sub> in Lichfield District Council alone is 4.6%, which is below national average of 4.7%.

### 2.3.1 Particulate Matter (PM<sub>2.5</sub>) Levels in Staffordshire and Stoke-on-Trent

Lichfield District Council does not currently undertake any monitoring of PM<sub>10</sub> or PM<sub>2.5</sub>, and consequently there are currently no specific measures in place to address PM<sub>2.5</sub> concentrations within Lichfield District Council.

LAQM.TG16 Table A.1 Action Toolbox provides a list of measures that can be implemented to tackle PM<sub>2.5</sub>.

Lichfield District Council will review these actions with the County Council Public Health Team to consider whether any specific actions are required.

A number of the Staffordshire Authorities currently monitor locally for PM<sub>10</sub>. Defra's Automatic Urban and Rural Network (AURN) site Stoke-on-Trent Centre has a dedicated PM<sub>2.5</sub> monitor. Data on the local level of PM<sub>2.5</sub> annual mean concentrations for the Staffordshire Authorities is available in Appendix F. Where the data is derived from PM<sub>10</sub> monitoring this has been adjusted by applying a correction factor of 0.7 to derive the PM<sub>2.5</sub> component. The correction factor has been derived from the average of all ratios of PM<sub>2.5</sub>/PM<sub>10</sub> for the years from 2010 to 2014 for forty sites within the Automatic Urban and Rural Network (AURN) where these substances are measured on an hourly basis and follows the guidance published in LAQM (TG16). As can be seen from the results, concentrations of PM<sub>2.5</sub> within the Staffordshire Authorities are below the 2020 EU limit value of 25µg/m<sup>3</sup>.

### **2.3.2 PM<sub>2.5</sub> in Staffordshire & Stoke-on-Trent - Next steps**

As PM<sub>2.5</sub> is an issue requiring collaboration between the district, county and city authorities within Staffordshire, the following actions had been proposed in addition to those outlined in the action plan. However progress on these and the action plan has been limited and it is intended that they will be reported on in the 2018 ASR.

- To agree a target for reducing Fraction of All Cause Mortality from PM<sub>2.5</sub> in each district, city and county authority by 2020
- To agree a target for reducing PM<sub>2.5</sub> exposure (calculated from PM<sub>10</sub> exposure / background maps / local monitoring where available)
- To maintain compliance with the 2020 EU limit value of 25µg/m<sup>3</sup>
- To include Public Health Outcome Framework Indicator 3.01 in the Staffordshire and District Authority and City Council Joint Strategic Needs Assessment for 2017/2018 onwards and to report progress to the relevant Health and Wellbeing Boards.
- To continue to identify risks affecting PM<sub>2.5</sub> which need to be addressed at a national level.

## **Lichfield District Council**

- A number of authorities within Staffordshire are receiving applications for STOR (Short Term Operating Reserve) sites to supplement power to the National Electricity Grid at times of peak demand. These sites typically operate during the autumn / winter months and can be high emitters of PM. There is currently a conflict in national policy which is seeking security of energy supply and the drive to reduce anthropogenic PM<sub>2.5</sub>. Recent approaches to DEFRA have revealed a lack of suitable guidance to local authorities and STOR operators.
- To lobby for a suitable damage cost calculation to reflect the cost to society from PM<sub>2.5</sub> and to support this through local and national planning policies.

## **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.

Lichfield District Council did not undertake any automatic (continuous) monitoring during 2016.

#### **3.1.2 Non-Automatic Monitoring Sites**

Lichfield District Council undertook non - automatic (passive) monitoring of NO<sub>2</sub> at 23 sites during 2016. Table A.1 in Appendix A shows the details of the sites. There was one new site included in 2016 (LT – Lichfield Town) which commenced data capture from October 2016. There was therefore three months of data available only for 2016 at this site and it was anticipated that, although the site saw exceedances due to its roadside location, the relevant receptors that the Diffusion Tube was installed for have not yet been built (residential development on the Ford Garage site). The LT site for the 2017 ASR has therefore not been distance corrected to nearest exposure. Additional data capture will be provided within the 2018 ASR, whereupon relevant exposure may be available.

The monitoring locations include six duplicate sites and one triplicate site as follows:

- A38–2 and A38-2(1);
- A38-2A and A38-2B;
- A38-4A and A38-4B;
- A38-4(X) and A38-4(Y);
- A38-5A and A38-5B;
- A38-A and A38-6B; and
- MUC-1A, MUC-1B and MUC-1C.

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

The diffusion tubes are supplied and analysed by Staffordshire Scientific Services utilising the 20% triethanolamine (TEA) in water preparation method. Quality control procedures, including bias adjustment, are discussed in Appendix A.

## **3.2 Individual Pollutants**

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

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

Table A.2 in Appendix A compares the ratified and adjusted monitored NO<sub>2</sub> annual mean concentrations for the past 5 years with the annual mean air quality objective of 40µg/m<sup>3</sup>. As discussed, Site LT is excluded due to only three months' of data being available for 2016.

The full 2016 dataset of monthly mean values is provided in Appendix B.

Data capture for 2016 was good (all above 75%), with no established sites requiring short to long term adjustment (annualisation). One site, LT, was only installed in October 2016 and was therefore deemed to have too small of a data set to annualise and consider for the NO<sub>2</sub> annual mean results for 2016.

Results for year 2016 have been bias adjusted using a national bias adjustment factor of 0.91. Full details of the bias adjustment and QA/QC procedure are provided in Appendix A.

For the full term 2016 data set there were thirteen sites where the annual mean NO<sub>2</sub> objective was exceeded. In addition, the LT site exceeded NO<sub>2</sub> concentrations in each of the three month's that were measured. The highest annual mean NO<sub>2</sub> concentration was observed at the site MUC-3.

**Figure 1– Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites Outside AQMAs**

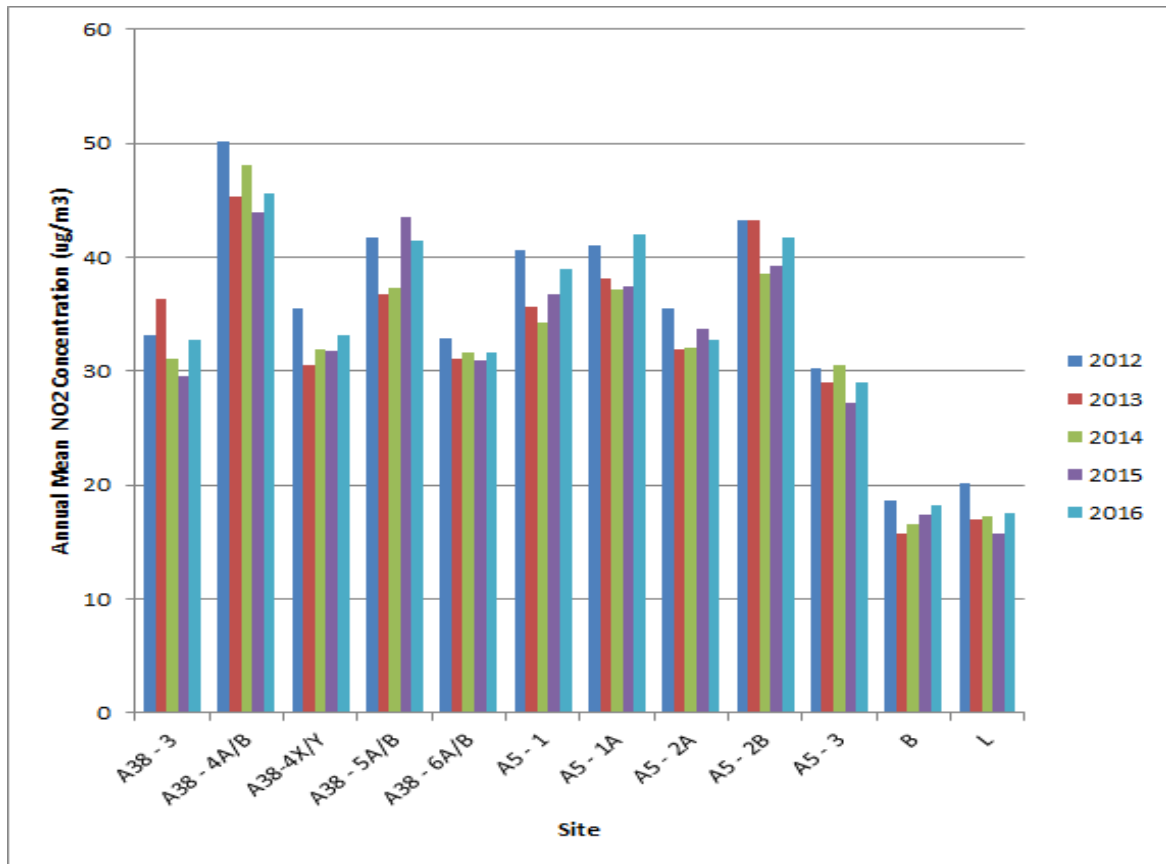


Figure 1 shows the trend across the diffusion tube monitoring locations outside the AQMAs in Lichfield District Council from 2012 to 2016. The annual mean objective for NO<sub>2</sub> has been met at the majority of the locations over the past five years. During 2016, the following four sites outside of the current AQMAs recorded an exceedance of the annual mean objective:

- A38-4A/B–Canwell (45.6µg/m<sup>3</sup>);
- A38-5A/B–Canwell (41.4µg/m<sup>3</sup>);
- A5 – 1A-Muckley Corner (42.0µg/m<sup>3</sup>); and
- A5 – 2B-Muckley Corner (41.7µg/m<sup>3</sup>).

All four sites are not located at relevant exposure, therefore distance correction was carried out on the exceeding monitoring locations. The calculated concentration at a location of relevant exposure (façade of a residential property), fell to below the objective at site A38-4A/B and A38-5A/B with the results of 37.3µg/m<sup>3</sup> and 27.9µg/m<sup>3</sup> respectively in 2016. Sites A5 – 1A and A5 – 2B also fell below the objective to

32.4 $\mu\text{g}/\text{m}^3$  and 33.9 $\mu\text{g}/\text{m}^3$  respectively; following distance correction (see Figure C.1).

**Figure 2 – Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites within AQMAs**

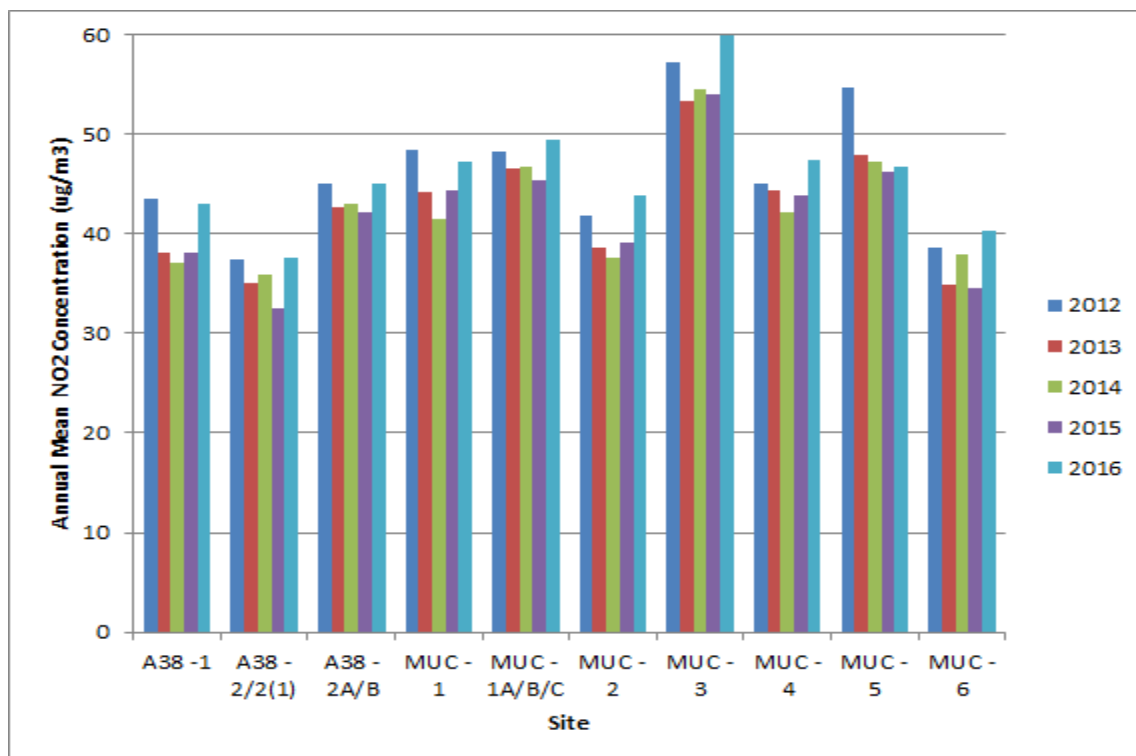


Figure 2 shows that nine of these sites have recorded an exceedance of the annual mean objective within the existing AQMAs:

- A38-1: Alrewas (within AQMA No.2, 47.2 $\mu\text{g}/\text{m}^3$ );
- A38-2A/B: Fradley (within AQMA No.2, 45.1 $\mu\text{g}/\text{m}^3$ );
- MUC-1: Muckley Corner Hotel Ground Floor (within AQMA No.1, 47.2 $\mu\text{g}/\text{m}^3$ );
- MUC-1A/B/C: Muckley Corner Hotel First Floor (within AQMA No.1, 49.4 $\mu\text{g}/\text{m}^3$ );
- MUC-2: Muckley Corner A5 Westbound (within AQMA No.1, 43.9 $\mu\text{g}/\text{m}^3$ );
- MUC-3: Muckley Corner A461 Southbound (within AQMA No.1, 59.9 $\mu\text{g}/\text{m}^3$ );
- MUC-4: Muckley Corner A5 Westbound (within AQMA No.1, 47.5 $\mu\text{g}/\text{m}^3$ );
- MUC-5: Muckley Corner A5 Eastbound (within AQMA No.1, 46.8 $\mu\text{g}/\text{m}^3$ ); and
- MUC-6: Muckley Corner A461 Southbound (within AQMA No.1, 40.4 $\mu\text{g}/\text{m}^3$ ).

Of the AQMA sites highlighted; A38-1, MUC-2, MUC-3, MUC-4, MUC-5 and MUC-6 were distance corrected to estimate the concentration at relevant exposure (see Figure C.1). The sites MUC-3 and MUC-4 exceeded the objective at the receptor façade with reported concentrations of  $46.0\mu\text{g}/\text{m}^3$  and  $44.1\mu\text{g}/\text{m}^3$  respectively. Sites A38-1, MUC-2, MUC-5 and MUC-6 met the objective at the receptor façade, however all were within 10% of the Air Quality Objective. All sites have shown exceedances in previous years; as such an AQMA continues to be necessary.

It is also notable, that AQMA No 1 has remained at an annual mean  $\text{NO}_2$  concentration of  $47\mu\text{g}/\text{m}^3$  since 2012. AQMA No2 has seen a slight increase in local concentration from  $45\mu\text{g}/\text{m}^3$  in 2012 to  $45.1\text{ g}/\text{m}^3$  in 2016.



Table 3.1 provides information on distance corrected sites to the nearest relevant exposure façade. Details of fall-off distance correction of sites exceeding the NO<sub>2</sub> annual mean objective are present in Appendix C.

**Table 3.1–Fall-off with Distance Correction of Sites Exceeding the NO<sub>2</sub> Annual Mean Objective**

Site ID	In AQMA?	Distance Kerb-Receptor (m)	Distance Kerb-Monitor (m)	Bias Adjusted Annual Mean (µg/m <sup>3</sup> )	Distance Corrected Annual Mean (µg/m <sup>3</sup> )
A38-1 - Alrewas	Y	9	1	<b>43.0</b>	31.2
A38-4A/B - Canwell	N	10	6.85	<b>45.6</b>	37.3
A38 -5A/B- Canwell	N	35	10	<b>41.4</b>	27.9
A5–2B- Muckley Corner	N	6	2	<b>41.7</b>	33.9
MUC-2- Muckley Corner	Y	9	5	<b>43.9</b>	35.8
MUC-3- Muckley Corner	Y	10	5.0	<b>59.9</b>	<b>46.0</b>
MUC-4-Muckley Corner	Y	2.0	4.0	<b>47.5</b>	<b>44.1</b>
MUC-5 -Muckley Corner	Y	5.0	2.0	<b>46.8</b>	38.2
MUC-6- Muckley Corner	Y	5.0	2.0	<b>40.4</b>	33.7
A5-1A-Muckley Corner	N	6.0	1.0	<b>42.0</b>	32.4

With respect to the hourly NO<sub>2</sub> objective, there could be a potential risk of exceedance where the annual mean concentration is greater than 60µg/m<sup>3</sup>. For the 2016 results there are no sites where the annual mean is greater than 60µg/m<sup>3</sup>; therefore it is unlikely that the hourly mean objective will be exceeded at any of the monitoring sites.

## Appendix A: Monitoring Results

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

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube collocated with a Continuous Analyser?	Height (m)
A38 - 1	Alrewas	Roadside	417101	314180	NO <sub>2</sub>	Y	9	1	N	2
A38 - 2/2(1)	Fradley	Roadside	416295	313186	NO <sub>2</sub>	Y	10	5	N	2
A38 - 2A/B	Fradley	Roadside	416290	313175	NO <sub>2</sub>	Y	0	6	N	2
A38 - 3	Lichfield	Roadside	412891	306817	NO <sub>2</sub>	N	6	2	N	2
A38 - 4A/B	Canwell	Roadside	413978	300834	NO <sub>2</sub>	N	10	6.85	N	2
A38-4X/Y	Canwell	Roadside	413989	300869	NO <sub>2</sub>	N	0	15	N	2
A38 - 5A/B	Canwell	Roadside	413950	300574	NO <sub>2</sub>	N	35	10	N	2
A38 - 6A/B	Canwell	Roadside	413961	300539	NO <sub>2</sub>	N	10	25	N	2
A5 - 1	Muckley Corner	Roadside	407208	306513	NO <sub>2</sub>	N	>200	4	N	2
A5 - 1A	Muckley Corner	Roadside	407895	306516	NO <sub>2</sub>	N	6	1	N	2
A5 - 2A	Muckley Corner	Roadside	408893	306549	NO <sub>2</sub>	N	12	5	N	2
A5 - 2B	Muckley Corner	Roadside	408667	306500	NO <sub>2</sub>	N	6	2	N	2
A5 - 3	Lichfield	Roadside	412063	305379	NO <sub>2</sub>	N	13	10	N	2
B	Burntwood	Urban Background	405086	309344	NO <sub>2</sub>	N	127	N/A	N	2
L	Lichfield	Urban Background	410544	310760	NO <sub>2</sub>	N	42	N/A	N	2
MUC - 1	Muckley Corner Hotel Ground Floor	Roadside	408164	306513	NO <sub>2</sub>	Y	N/A	5	N	2
MUC-1A/B/C	Muckley Corner Hotel First Floor	Roadside	408164	306513	NO <sub>2</sub>	Y	0	5	N	2
MUC - 2	Muckley Corner A5 Westbound	Roadside	408165	306487	NO <sub>2</sub>	Y	9	5	N	2
MUC - 3	Muckley Corner A461 Southbound	Roadside	408097	306468	NO <sub>2</sub>	Y	10	5	N	2

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)
MUC - 4	Muckley Corner A5 Westbound	Roadside	408029	306501	NO <sub>2</sub>	Y	2	4	N	2
MUC - 5	Muckley Corner A5 Eastbound	Roadside	408030	306516	NO <sub>2</sub>	Y	5	2	N	2
MUC - 6	Muckley Corner A461 Southbound	Roadside	408161	306556	NO <sub>2</sub>	Y	5	2	N	2
LT <sup>(3)</sup>	Lichfield Town	Roadside	411792	309161	NO <sub>2</sub>	NO	N/A	N/A	NO	2

(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.

(3) Monitoring recorded was between Oct – Dec, 2016 only and not deemed sufficient data capture for the 2016 annual mean results or possess a relevant exposure at time of monitoring.

Table A.2 – 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
A38 - 1	Roadside	Diffusion Tube	100	100	<b>43.5</b>	38.1	37.1	38.2	<b>43.0</b>
A38 - 2/2(1)	Roadside	Diffusion Tube	100	100	37.4	35.1	35.9	32.6	37.6
A38 - 2A/B	Roadside	Diffusion Tube	100	100	<b>45.0</b>	<b>42.7</b>	<b>43.1</b>	<b>42.2</b>	<b>45.1</b>
A38 - 3	Roadside	Diffusion Tube	100	100	33.1	36.4	31.1	29.5	32.7
A38 - 4A/B	Roadside	Diffusion Tube	83	83	<b>50.1</b>	<b>45.3</b>	<b>48.1</b>	<b>44.0</b>	<b>45.6</b>
A38-4X/Y	Roadside	Diffusion Tube	100	100	35.5	30.5	31.9	31.8	33.2
A38 - 5A/B	Roadside	Diffusion Tube	100	100	<b>41.7</b>	36.8	37.3	<b>43.5</b>	<b>41.4</b>
A38 - 6A/B	Roadside	Diffusion Tube	100	100	32.9	31.1	31.7	30.9	31.7
A5 - 1	Roadside	Diffusion Tube	92	92	<b>40.6</b>	35.6	34.3	36.8	38.9
A5 - 1A	Roadside	Diffusion Tube	100	100	<b>41.1</b>	38.1	37.2	37.5	<b>42.0</b>
A5 - 2A	Roadside	Diffusion Tube	100	100	35.5	31.9	32.1	33.7	32.7
A5 - 2B	Roadside	Diffusion Tube	100	100	<b>43.3</b>	<b>43.2</b>	38.5	39.3	<b>41.7</b>
A5 - 3	Roadside	Diffusion Tube	92	92	30.2	29.0	30.5	27.2	29.0
B	Urban background	Diffusion Tube	100	100	18.6	15.8	16.6	17.4	18.2
L	Urban background	Diffusion Tube	100	100	20.1	17.0	17.3	15.7	17.6
MUC - 1	Roadside	Diffusion Tube	100	100	<b>48.4</b>	<b>44.2</b>	<b>41.5</b>	<b>44.4</b>	<b>47.2</b>
MUC - 1A/B/C	Roadside	Diffusion Tube	100	100	<b>48.3</b>	<b>46.6</b>	<b>46.8</b>	<b>45.4</b>	<b>49.4</b>
MUC - 2	Roadside	Diffusion Tube	100	100	41.9	38.7	37.6	39.1	<b>43.9</b>
MUC - 3	Roadside	Diffusion Tube	100	100	<b>57.2</b>	<b>53.3</b>	<b>54.6</b>	<b>54.1</b>	<b>59.9</b>
MUC - 4	Roadside	Diffusion Tube	92	92	<b>45.1</b>	<b>44.4</b>	<b>42.1</b>	<b>43.9</b>	<b>47.5</b>
MUC - 5	Roadside	Diffusion Tube	100	100	<b>54.8</b>	<b>48.0</b>	<b>47.2</b>	<b>46.3</b>	<b>46.8</b>
MUC - 6	Roadside	Diffusion Tube	100	100	38.7	34.9	38.0	34.5	<b>40.4</b>

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. Relevant means have been “annualised” as per Technical Guidance LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

## 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> )												Annual Mean		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted <sup>(1)</sup>	Distance Corrected to Nearest Exposure <sup>(2)</sup>
A38 - 1	47.8	54.5	43.8	39	44.1	35.4	44.4	37.8	44.2	50.4	73.9	51.4	<b>47.2</b>	<b>43.0</b>	31.2
A38 - 2/2(1)	38.8	40.5	40.8	34.0	34.0	37.7	25.9	32.3	43.0	51.4	43.9	56.9	<b>40.3</b>	37.6	-
A38 - 2A/B	52.1	57.0	44.1	42.9	46.4	47.9	44.3	41.6	49.3	53.5	52.7	63.4	<b>49.6</b>	<b>45.1</b>	-
A38 - 3	33.6	39.7	37.3	38.8	34	37	19.8	24.9	29.7	44.0	40.4	51.7	35.9	32.7	-
A38 - 4A/B	45.8	55.0		30.2	40.5	53.2	57.3	44.3	46.2	57.0	58.3	60.1	<b>50.1</b>	<b>45.6</b>	37.3
A38-4X/Y	37.6	41.2	34.7	33.7	32.7	31.9	35.7	29.6	36.1	36.4	42.0	46.2	36.5	33.2	-
A38 - 5A/B	52.4	50.6	42.3	36.4	35.9	39.5	45.0	38.2	46.2	40.9	50.0	68.3	<b>45.5</b>	<b>41.4</b>	27.9
A38 - 6A/B	39.7	43.2	35.5	29.9	27.4	27.5	34.1	29.0	36.2	29.1	41.1	46.0	34.9	31.7	-
A5 - 1	52.1	48.2	33.5	34.8	31	37.7	46.0	32.2	38.9	41.6		74.6	42.8	38.9	-
A5 - 1A	46.9	90.8	30.7	35.6	34.8	33.6	42.6	41.5	46.3	36.2	51.7	63	46.1	<b>42.0</b>	32.4
A5 - 2A	44.9	38	31.3	28.8	25.1	26	36.4	34.7	32.5	31.8	45.5	56.6	36.0	32.7	
A5 - 2B	43.7	49.1	47.5	46.8	46	43.2	45	39.1	41.5	30.3	54.5	62.8	45.8	<b>41.7</b>	33.9
A5 - 3	34	37.8	31.8	32	28.6	30	24.1		28.2	10	44.7	49.6	31.9	29.0	-
B	20.9	41.4	19.1	3.8	14.3	13.1	13.2	11.9	18.1	16.6	27.8	39.4	20.0	18.2	-
L	23.4	24.4	20.6	16.4	15.1	13.6	12.5	12.7	17.0	19.8	26.0	31.1	19.4	17.6	-
MUC - 1	46.2	56.8	51.1	53.1	31.6	56.2	45.5	50.4	47.2	67.8	57	59.9	51.9	<b>47.2</b>	-
MUC - 1A/B/C	47.6	59.7	48.8	50.4	55.9	57.0	47.8	52.5	46.5	63.8	59.4	63.5	54.3	<b>49.4</b>	-
MUC - 2	42.5	55.1	48	50.6	42.7	46.4	44.9	41.3	43	57.3	59.2	47.3	48.2	<b>43.9</b>	35.8
MUC - 3	59.1	72.6	59.4	62.3	65.5	61.2	64.9	59.3	65.7	74	77.1	69.4	65.9	<b>59.9</b>	<b>46.0</b>
MUC - 4		60.9	47.6	58.5	47.2	48.2	39.5	40.5	43.3	59.2	59.1	70	52.2	<b>47.5</b>	<b>44.1</b>
MUC - 5	55.5	51.6	40.6	51.7	51.3	46	53.1	49.7	46	45.7	55.9	70.5	51.5	<b>46.8</b>	38.2
MUC - 6	44.9	40.7	37.5	32.3	30.2	28.8	47.7	40.1	49.5	45.6	60.6	74.8	44.4	<b>40.4</b>	33.7
LT										41.9	49.0	67.2	52.7	<b>48.0</b>	-

(1) (2) See Appendix C for details on bias adjustment and distance correction.

Key: Missing Tubes No Monitoring

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

### Diffusion Tube Bias Adjustment Factors

The diffusion tubes are supplied and analysed by Staffordshire Scientific Services utilising the 20% triethanolamine (TEA) in water preparation method.

As there are no automatic monitoring stations within Lichfield District, a national bias adjustment factor has not been calculated. A bias adjustment of 0.91 for the year 2016 based on 13 studies; has been obtained from the national bias adjustment calculator. National bias adjustment factors were also used in the previous years.

For previous data, years 2012 to 2015, the bias adjustment factors have been taken from the Council's previous LAQM annual reports. The factors used were 0.86 (2012), 0.87 (2013), 0.83 (2014) and 0.85 (2015).

### Short to Long Term Adjustment

There were no monitoring sites requiring annualisation in 2016. One site was monitored for three months only in 2016 and it was deemed too slight a data capture (25%) to establish valid results.

### QA/QC of Diffusion Tube Monitoring

Staffordshire Scientific Services is a UKAS accredited laboratory and participates in the in the new AIR-PT Scheme (a continuation of the Workplace Analysis Scheme for Proficiency (WASP)) for NO<sub>2</sub> tube analysis and the Annual Field Inter-Comparison Exercise. These provide strict performance criteria for participating laboratories to meet, thereby ensuring NO<sub>2</sub> concentrations reported are of a high calibre. The lab follows the procedures set out in the Harmonisation Practical Guidance. In 2016, Staffordshire Scientific Services scored 75% in the AIR-PT rounds AR 012 (January to February 2016) and AR013 (April to May 2016), 100% in AR 015 (July to August 2016) and no results were provided for AR016 (September to October 2016). The percentage score reflects the results deemed to be satisfactory based upon the z-score of  $< \pm 2$ . Based on 14 diffusion tube studies, all local Authority co-location studies in 2016 were rated as 'satisfactory' (tubes are considered to have "satisfactory" precision where the coefficient of variation of duplicate or triplicate diffusion tubes for eight or more periods during the year is less or equal to 20%).

## Monitoring Results – Distance Correction

Figure C.1- Distance with Fall off Calculator

Site Name/ID	Distance (m)		NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> )		
	Monitoring Site to Kerb	Receptor to Kerb	Background	Monitored at Site	Predicted at Receptor
A38-1	1.0	10.0	17.6	43.0	31.2
A38 4A/B	6.9	16.9	17.6	45.6	37.3
A38 5A/B	10.0	45.0	17.6	41.4	27.9
A5 2B	2.0	8.0	17.6	41.7	33.9
MUC-6	2.0	7.0	17.6	40.4	33.7
MUC 2	5.0	14.0	17.6	43.9	35.8
MUC 3	5.0	15.0	17.6	59.9	46.0
MUC 4	4.0	6.0	17.6	47.5	44.1
A5 1A	1.0	7.0	17.6	42.0	32.4
MUC 5	2.0	7.0	17.6	46.8	38.2

### New Developments

High Speed 2 (HS2) is a planned high-speed railway in the United Kingdom linking London, Birmingham, the East Midlands, Leeds, Sheffield and Manchester. It would be the second high-speed rail line in Britain, after High Speed 1 (HS1) which connects London to the Channel Tunnel.

Phase one is a north westerly to route between London Euston onto the northbound classic WCML just north of Lichfield in Staffordshire taking service to the North West of England and Scotland.

Phase two will create two branch lines from Birmingham running north either side of the Pennines creating a "Y" network. Phase 2 is split into two phases, phase 2a and 2b. Phase 2a is the section from Lichfield to Crewe on the western section of the "Y" and phase 2b the remainder of phase 2.

Although the HS2 project will pass through the Lichfield Council area it is not considered likely to cause any adverse air quality impacts at present.

A development approved in 2014 consists of an area close to the A38, where currently 8 diffusion tubes are located. The development will consist of a large scale demolition and construction of up to 750 dwellings, a school, community centre, retail development, care home, water drainage and a car park containing 75 parking spaces<sup>5</sup>. The potential effects to consider are construction dust and construction traffic, increased population and increased traffic along the A38.

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<sup>5</sup> <https://planning.lichfielddc.gov.uk/online-applications/applicationDetails.do?activeTab=summary&keyVal=M6MXTQJE05C00>



# Appendix D: Map(s) of Monitoring Locations

Figure D. 1 – Map of Non-Automatic Monitoring Sites: Muckley Corner

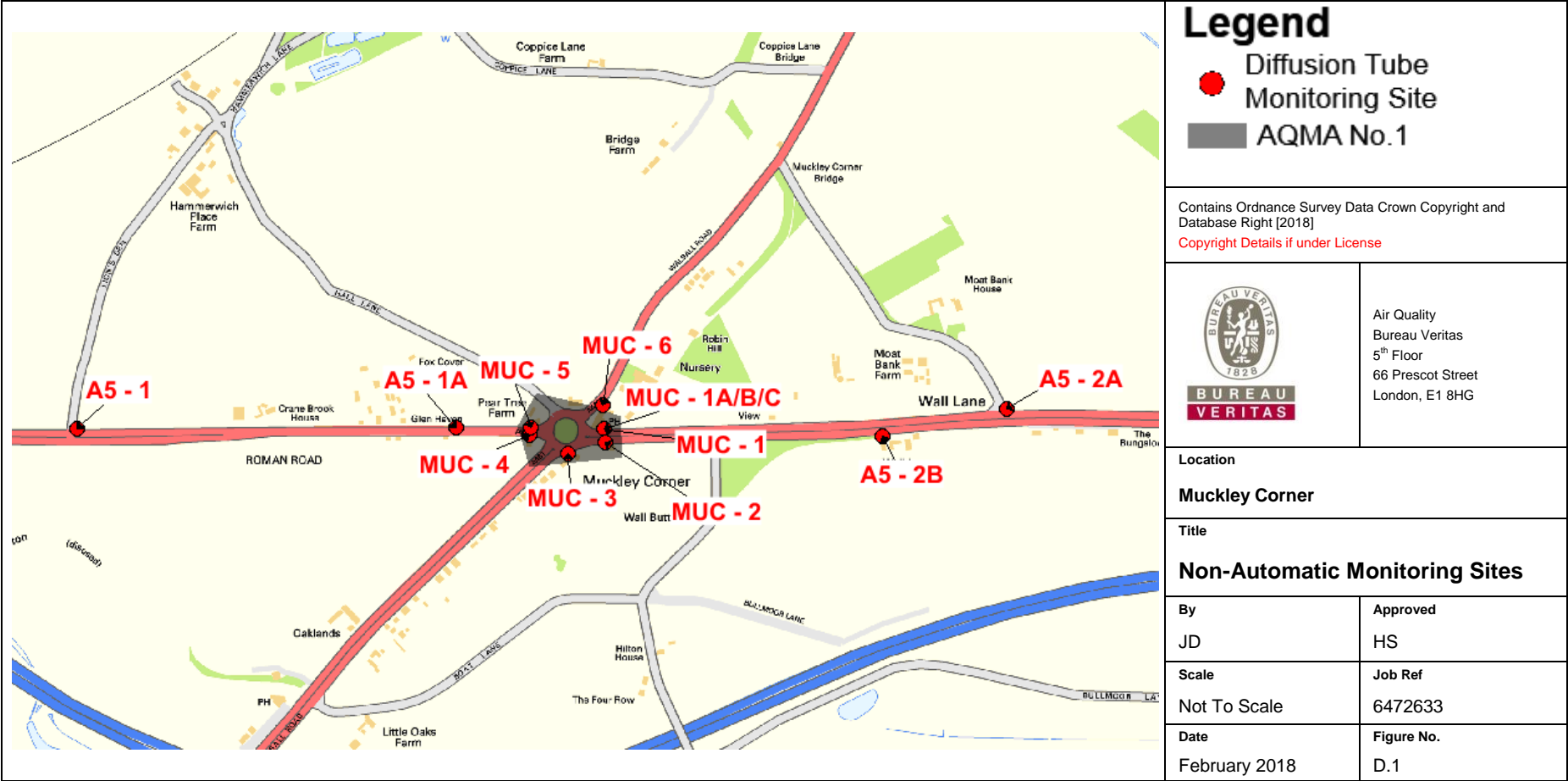
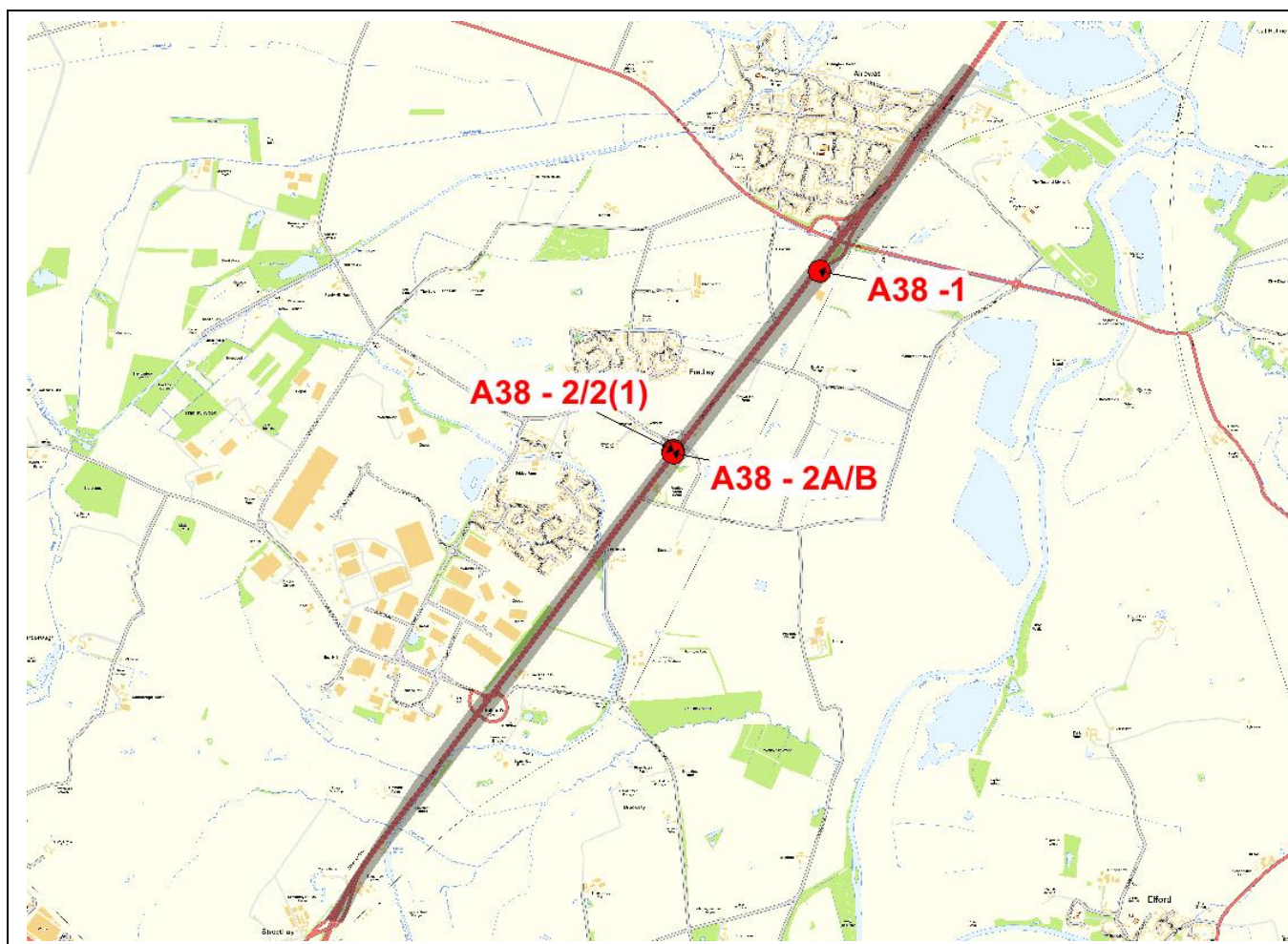


Figure D. 2 – Map of Non-Automatic Monitoring Sites: Alrewas and Fradley



### Legend

- Diffusion Tube Monitoring Site
- AQMA No.2

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Copyright Details if under License



Air Quality  
Bureau Veritas  
5<sup>th</sup> Floor  
66 Prescott Street  
London, E1 8HG

#### Location

**Alrewas and Fradley**

#### Title

**Non-Automatic Monitoring Sites**

<b>By</b>	<b>Approved</b>
JD	HS
<b>Scale</b>	<b>Job Ref</b>
Not To Scale	6472633
<b>Date</b>	<b>Figure No.</b>
February 2018	D.2

Figure D. 3 – Map of Non-Automatic Monitoring Sites: Canwell

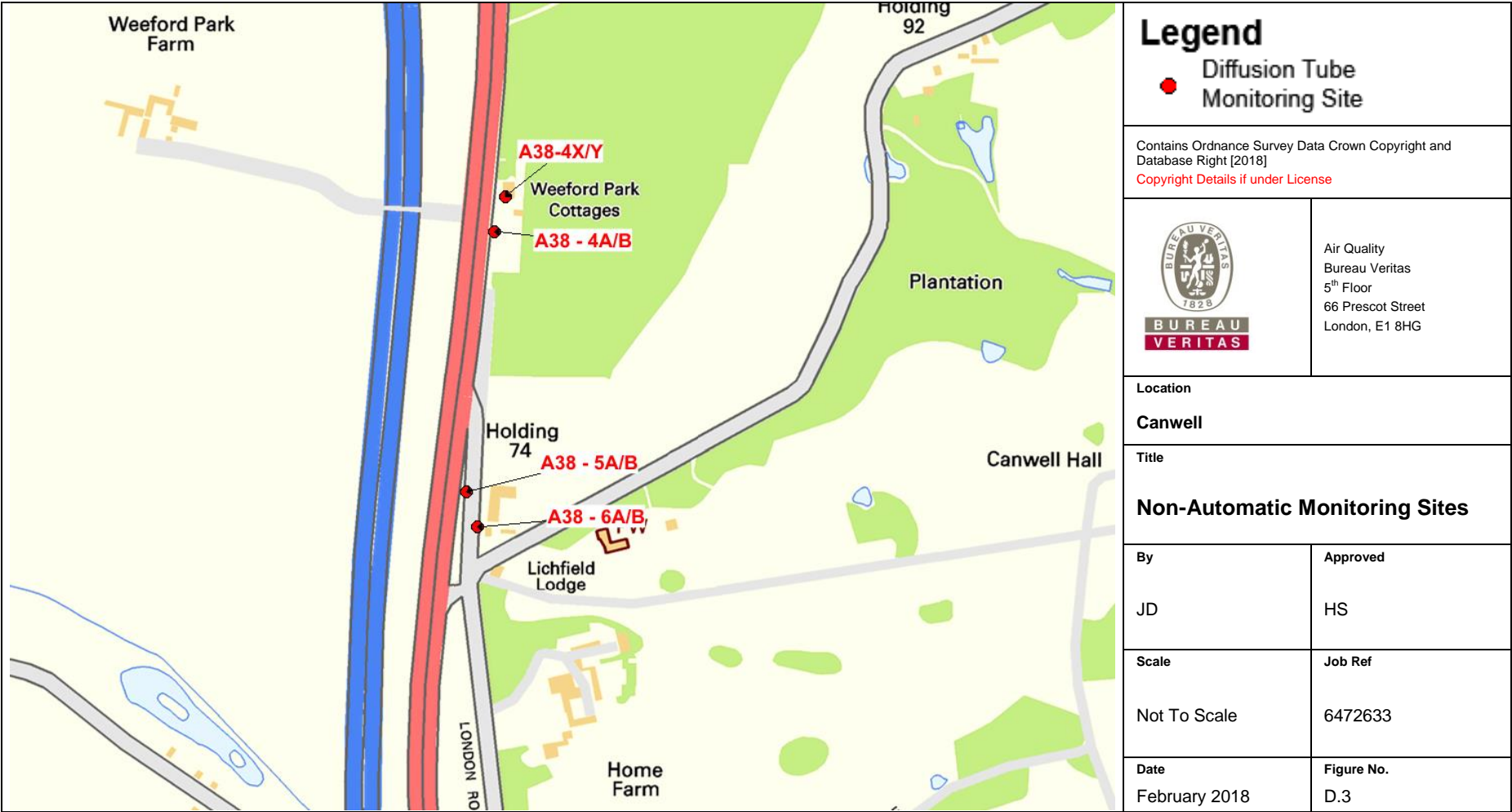


Figure D. 4 – Map of Non-Automatic Monitoring Sites: Lichfield




<p><b>Legend</b></p> <p>● Diffusion Tube Monitoring Site</p>	
<p>Contains Ordnance Survey Data Crown Copyright and Database Right [2018]                  Copyright Details if under License</p>	
	<p>Air Quality                  Bureau Veritas                  5<sup>th</sup> Floor                  66 Prescot Street                  London, E1 8HG</p>
<p>Location  <b>Lichfield</b></p>	
<p>Title  <b>Non-Automatic Monitoring Sites</b></p>	
<p>By                  JD</p>	<p>Approved                  HS</p>
<p>Scale                  Not To Scale</p>	<p>Job Ref                  6472633</p>
<p>Date                  February 2018</p>	<p>Figure No.                  D.4</p>

Figure D. 5 – Map of Non-Automatic Monitoring Sites. A5 –Roman Road

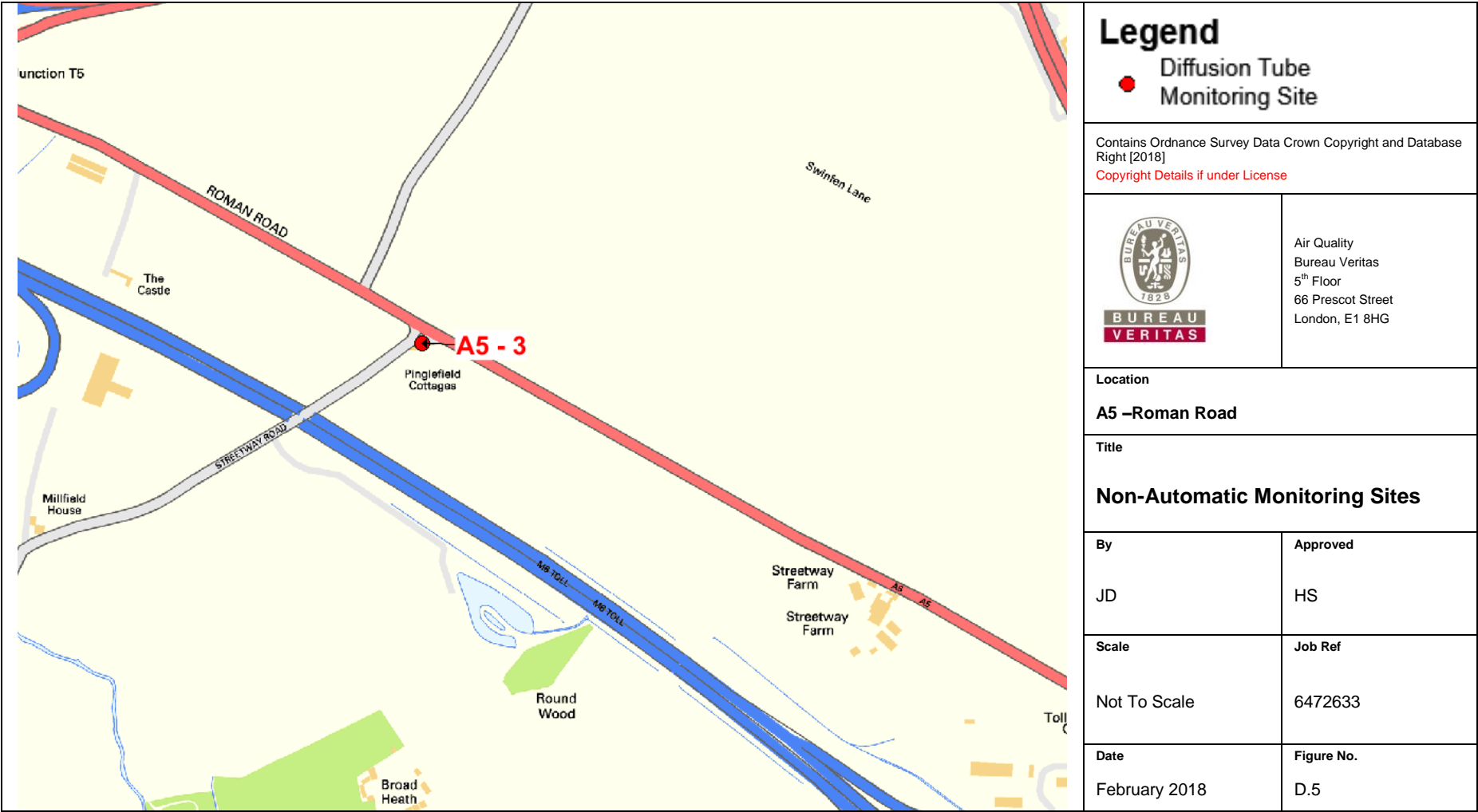
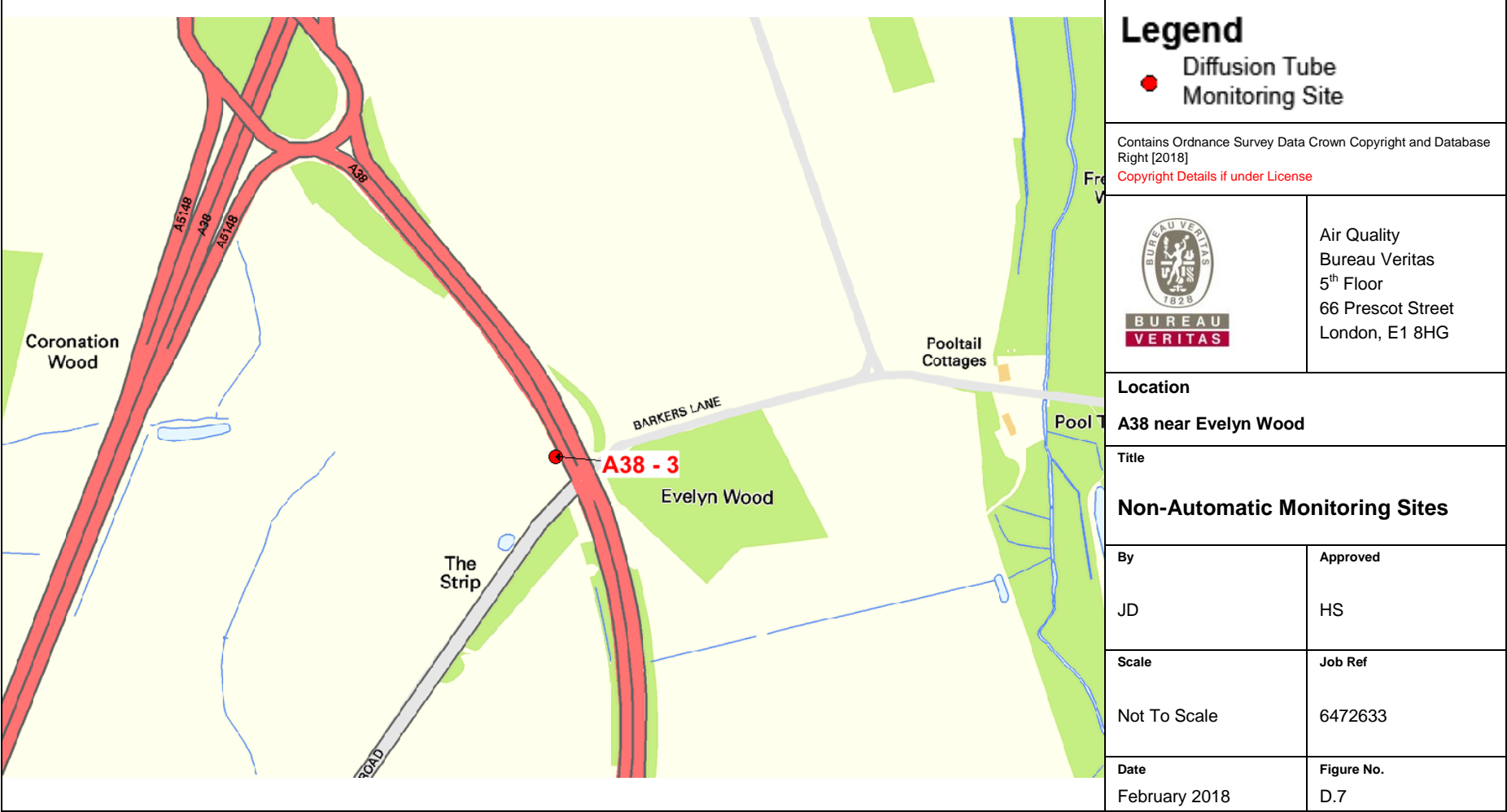


Figure D. 6 – Map of Non-Automatic Monitoring Sites: Burntwood



Figure D. 7 – Map of Non-Automatic Monitoring Sites: A38 near Evelyn Wood



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

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective <sup>6</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>6</sup> The units are in microgrammes of pollutant per cubic metre of air (µg/m<sup>3</sup>).



## Appendix F: Annual Mean PM<sub>10</sub> and PM<sub>2.5</sub> Results of monitoring by Staffordshire Authorities 2011 to 2016

Local Authority	Site Type	Monitor Location	OS Grid Ref		Year				
					2012	2013	2014	2015	2016
Newcastle under Lyme	Roadside	Queen`s Gardens	E385057	PM <sub>10</sub>	14.9	22.5	22	22.9	(6)
			N346137	PM <sub>2.5</sub>	10.43 <sup>(1)</sup>	15.75 <sup>(1)</sup>	15.4 <sup>(1)</sup>	16 <sup>(1)</sup>	(6)
Cannock Chase	Roadside	Watling St	SJ980086	PM <sub>10</sub>	23	21	19.6	(2)	(2)
		Bridgetown		PM <sub>2.5</sub>	16.1 <sup>(1)</sup>	14.7 <sup>(1)</sup>	13.7 <sup>(1)</sup>		
Stoke on Trent	Roadside	A50 Meir Tunnel	E392548	PM <sub>10</sub>	-	-	-	20 <sup>(3)</sup>	20
			N342572	PM <sub>2.5</sub>	-	-	-	14 <sup>(3)</sup>	14
	Urban Background	Stoke on Trent Central	E388351 N347895	PM <sub>2.5</sub>	11	10	10	12	12
	Roadside	Middleport	E385780	PM <sub>10</sub>	24	25	24	22	-
N349376			PM <sub>2.5</sub>	17 <sup>(1)</sup>	18 <sup>(1)</sup>	17 <sup>(1)</sup>	15 <sup>(1)</sup>	(4)	
East Staffordshire	Roadside	Derby Tum	E424671 N324019	PM <sub>10</sub>	25.4	29	31	23	(5)
				PM <sub>2.5</sub>	17.8 <sup>(1)</sup>	20.3 <sup>(1)</sup>	21.7 <sup>(1)</sup>	16.1 <sup>(1)</sup>	(5)

Notes: <sup>(1)</sup>PM<sub>2.5</sub> results are derived from PM<sub>10</sub> monitored results corrected with a 0.7 correction factor in accordance with TG16 Annex B: Derivation of PM<sub>2.5</sub> to PM<sub>10</sub> Ratio. All other results are directly monitored.  
<sup>(2)</sup>Cannock Chase Watling Street Bridgetown PM<sub>10</sub> monitor decommissioned  
<sup>(3)</sup> Valid data capture for 2015 was 59%. The site was commissioned on 22 May 2015.  
<sup>(4)</sup> Middleport monitor was decommissioned at the end 2015  
<sup>(5)</sup> East Staffordshire`s monitors were decommissioned 2016  
<sup>(6)</sup> To be provided

## 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 <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
HGV	Heavy Goods Vehicle
LGV	Light Goods Vehicle
Lichfield DC	Lichfield District Council
WCML	West Coast Main Line

## References

- Local Air Quality Management Technical Guidance LAQM.TG (16). Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- Local Air Quality Management Policy Guidance LAQM.PG (16). Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- NO<sub>2</sub> Fall off With Distance Tool, available at <http://laqm.defra.gov.uk/toolsmonitoring-data/no2-falloff.html>
- National Diffusion Tube Bias Adjustment Spreadsheet, version 06/16 published in June 2016.
- <https://laqm.defra.gov.uk/diffusion-tubes/ga-gc-framework.html> Rounds-12-22-(Jan 2016 - Oct 2017)-NO<sub>2</sub>-report.pdf
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- <https://www.staffordshire.gov.uk/transport/transportplanning/localtransportplan/Lichfield-District-Integrated-Transport-Strategy-Nov-2015.pdf>
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