2015 Air Quality Annual Status Report (ASR)

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

Date (July, 2016)

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Executive Summary: Air Quality in Our Area

Air Quality in Birmingham

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

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

The main air quality issue in Birmingham is elevated levels of nitrogen dioxide (NO_2), particularly within the City Centre area as a result of road traffic emissions. Consequently a city wide air Quality Management Area (AQMA) was declared in 2005. Details can be found on the following webpage https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=18.

In December 2015 DEFRA published its Air Quality plans to demonstrate how the UK will achieve compliance with the EU limit values for NO2 (https://uk-air.defra.gov.uk/library/no2ten/). The document highlighted areas of non-compliance within Birmingham, principally 2 stretches of the A38 in the City Centre. As a result Birmingham is in the process of being directed to implement a Clean Air Zone (CAZ). Current thinking is that this would need to be a Category C CAZ with access restrictions applying to buses, taxis, heavy and light duty goods vehicles. Despite this, there is expected to be a 'compliance gap' and further work will be required to consider additional measures to bridge that compliance gap.

Work undertaken by Birmingham City Council has highlighted other areas where air pollution is above the legal limit, particularly in the vicinity of Moor Street Queensway; although at present there is considered to be no relevant exposure at this location.

Birmingham City Centre is undergoing significant regeneration with several major projects either underway or planned for the near future including at Paradise Circus,

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[1] Environmental equity, air quality, socioeconomic status and respiratory health, 2010
[2] Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006
[3] Defra. Abatement cost guidance for valuing changes in air quality, May 2013

Curzon Street (HS2), and Smithfield. As a result the city centre area is in near constant state of flux and as a result it is considered that the best way to address air quality issues is through the adoption of an area based strategy, and through working in collaboration with partner organisations such as the Low Emissions Towns and Cities Partnership, DEFRA, the West Midlands Combined Authority, the Integrated Transport Authority, Highways England, and CENTRO.

Figure 1: A new Euro VI bus introduced as a result of the SBQP.

Partnership working can deliver the introduction of cleaner vehicles into the right location, such as the introduction of cleaner Euro VI buses into the city centre via the Statutory Bus Quality Partnership scheme.

Actions to Improve Air Quality

A number of actions have been implemented under Birmingham City Council's Air Quality Action Plan with the aim of improving air quality, such as increasing the number of park and ride schemes, the provision of charging infrastructure to encourage the take up of electric vehicles, and, in partnership with CENTRO, improvements to the bus fleet under the Statutory Bus Quality Partnership (SBQP).

Several other projects have been undertaken with the aid of funding through DEFRA's Air Quality Grant Scheme;

- 2011-2012 Air Quality Grant - £120,000 for a regional Low Emissions Zone Technical feasibility Study. The final work package (WP2) was completed in 2015, covering a health and economic assessment of the viability of a Low Emission Zone in Birmingham City Centre and across the M6 / M6 Toll. A copy of the study is available upon request to pollution.team@birmingham.gov.uk

- 2012-2013 Air Quality Grant - £150,000 to support implementation of ongoing work items commissioned through the West Midlands regional Low Emissions Towns and Cities Programme (LETCP). A number of studies remain works in progress but funding has been directed to supporting the deployment of automatic number plate recognition cameras around Birmingham's A4540 ring road, linked in to supporting software to gain updated fleet information and assess the practical operations of a low emissions / clean air zone. The cameras are in place and data is being obtained.

- 2014-2015 Air Quality Grant - £32,443 for the Birmingham Region Updated Monitoring (BRUM) project. This project provides hardware and software updates for the air quality modelling infrastructure to update the baseline position and more accurately assess interventions proposed under the developing Clean Air Zone. The new hardware is in place and the software updates due to be completed early summer.

Local Priorities and Challenges

The main priority for the coming year will be the implementation of a Clean Air Zone within the city centre in order to encourage the uptake of low emission vehicles and reduce NO2 emissions.

How to Get Involved

The easiest way to help reduce air pollution and improve air quality is by driving less:

- Consider whether a journey is really necessary; and try not to use cars for short trips
- Walk, cycle or use public transport instead of taking the car

If you do need to use your car then consider the following:

- Don't sit in your vehicle with the engine idling, switch off the engine when your car is stationary
- If you are able, consider replacing your car with a less polluting model

Figure 2: On-street charging of an electric vehicle.

If you wish to contact the air quality service within Birmingham City Council's Environmental Protection Team then you may do so:

Postal Address: Environmental Health, Manor House, PO Box 16977, Birmingham, B2 2AE
✉: pollution.team@birmingham.gov.uk
@: www.birmingham.gov.uk/eh

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1   Local Air Quality Management

This report provides an overview of air quality in Birmingham during 2015. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by Birmingham 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 (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 Birmingham City 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/local-authorities?la_id=18.

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Pollutants and Air Quality Objectives	City / Town	One Line Description	Action Plan
Birmingham AQMA	NO_2 annual mean	Birmingham	Whole City	Birmingham City Council Air Quality Action Plan 2011

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

Birmingham City Council has taken forward a number of measures up to and including the current reporting year of 2015 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2. More detail on these measures can be found in their respective Action Plans. Key completed measures are:

- Action 2010/1 - Low Emission Zone within the City Centre
- Action 2010/2 – Biomass in Birmingham Schools
- Action 2010/3 – Red Routes
- Action 2010/4 – New Roads
- Action 2010/5 – Air Quality & Planning
- Action 2010/6 – Control of Industry

- Action 2010/7 – Control of Bonfires and other Unauthorised Fires
- Action 2010/8 – Park & Ride
- Action 2010/9 – Improvement of the Council Fleet
- Action 2010/10 – Introduction of low carbon/electric Vehicles
- Action 2010/11 – Improvement of the Public Service Fleet
- Action 2010/12 – Taxi Emission Strategy

Birmingham City Council's priorities for the coming year (2016) are:

➢ We will review and refresh our Air Quality Action Plan (AQAP), updating existing actions and building in new actions which are relevant to current challenges faced by the Council and better reflective of initiatives both proposed and underway which seek to address those challenges.

➢ We will progress all necessary actions pursuant to delivering the introduction of a Clean Air Zone as mandated by Defra. For 2016 this involves commencement of a scoping study to ascertain the baseline position, followed by consideration of relevant interventions which can deliver compliance with the limit values as soon as possible and by 2020 at the latest.

➢ We will establish an Air Quality Steering Group comprising key senior officers who report to relevant elected members. All air quality matters which specifically relate to delivering legislative compliance and driving forward public health gains will be raised and directed by this group.

➢ We will develop our existing working arrangements between Environmental Health and the Director of Public Health to ensure that we maximise benefits in delivering air quality improvements arising from key pollutants, namely nitrogen dioxide and fine particles.

➢ We will continue our representation on the project board of the Low Emissions Towns and Cities Programme (LETCP)[4], and will contribute to ongoing, developing and proposed work streams in partnership with other members to seek air quality gains at a regional level.

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[4] The LETCP comprises air quality specialists from the West Midlands Local Authorities, namely Birmingham City Council, Coventry City Council, Dudley Metropolitan Borough Council, Sandwell Metropolitan Borough Council, Solihull Metropolitan Borough Council, Walsall Council and Wolverhampton City Council.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure code	Description	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
Action 2010/1	FS into a Low Emission Zone within the City Centre	Promoting Low Emission Transport	Low Emission Zone (LEZ)	BCC – TS	2011-2013	2013-2015	Completion of the FS	No target	FS Complete	Complete	Superseded by CAZ
Action 2010/2	Detailed study on introducing Biomass in Birmingham Schools	Policy Guidance and Development Control	Other policy	BCC – EH	NK	NK	Completion of the study	No target	Study complete	Complete	Led to introduction of a Biomass Emissions Policy by Council
Action 2010/3	Extend the Red Route network and assess effectiveness	Traffic Management	Other	BCC – TS	NK	NK	Improved journey times and less congestion in specific areas	No target	Red routes have been implemented on 6 major routes into and out of the city centre (Stratford Rd, Tyburn Rd, Walsall Rd. A4540 ring road, A38, A45)	Complete	Implementation and enforcement of the red route in the worst polluted area has shown a reduction in measured NO2 to below the objective in 2013.

Measure code	Description	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
Action 2010/4	Build New Roads and modify existing to promote effective traffic management	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	BCC – TS	NK	NK	Improved journey times and less congestion in specific areas	No target	The Selly Oak New Road phase 1a is complete. Phase 1b is funded through Local Growth Fund.	2018	Monitoring has shown that in the most congested part of the street the new road has reduced NO2 concentrations from above 50 to 38ug/m3. Completion of the scheme will reduce this further.
Action 2010/5	Policy on Air Quality & Planning	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	BCC - EH	2005-2007 / 2011-2012	2012 - 2014	Strategic, consistent and transparent approach to assessing planning applications on AQ grounds	No target	Extremely difficult to develop (commenced 2005-2007). Revisited within the LETCP. Best Practice Guide (BPG) issued by LETCP in 2014. Development of BDP and DM DPD both of which will have AQ links.	Deemed complete	BPG embedding within the Council. Integration with emerging Development Management Development Plan Document (DPD)
Action 2010/6	Control of Industry	Environmental Permits	Other measure through permit systems and economic instruments	BCC – EH	n/a	1995 to current	Annual Defra return	No target	All processes inspected annually in accord with direction from Defra	Ongoing - annual	Processes regulated to ensure emissions remain within specified limits

Measure code	Description	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
Action 2010/7	Control of Bonfires and other Unauthorised Fires			BCC – EH	n/a	Historic to current	Response to complaints about bonfires	No target	Complaints responded as and when generated	Ongoing	None
Action 2010/8	To increase the number and use of park & ride schemes in accord with the CENTRO Environment Strategy 2009-2014	Alternatives to private vehicle use	Rail based Park & Ride	BCC – TS	2008-2011	2018	Increase in park and ride usage	No target	New site proposed at Longbridge. Feasibility study on decking of car parks e.g. Four Oaks. Proposals related to Bus rapid Transit Routes.	2017	The Centro park and ride scheme provides over 7500 places with plans to add a further 1000. Many of the car parks are located at the edge of the city and reduce the number of vehicles on the commuter roads into the city centre.
Action 2010/9	All vehicles procured by Birmingham City Council will by 2015 be either electrically powered or run on liquified petroleum gas.	Promoting Low Emission Transport	Company Vehicle Procurement - Prioritising uptake of low emission vehicles	BCC - S	2011	2012-2014	Replacement of council fleet vehicles through procurement strategy	No target	Green Fleet Review completed. Identified all vehicles, mileage, fuel costs, etc.	NK	Need to update action
Action 2010/10	Introduction of low carbon/electric Vehicles	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	BCC – S	2011	2012-2016	Infrastructure to encourage the use of electric and gas powered vehicles	No target	Green Fleet Review completed. Identified infrastructure requirements, gaps and barriers.	NK	Need to update action

Measure code	Description	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
Action 2010/11	Improvement of the Public Service Fleet - Birmingham City Council will support the programme for replacement buses asoutlined by CENTRO's Environmental Strategy 2009 – 2014.	Promoting Low Emission Transport	Public Vehicle Procurement - Prioritising uptake of low emission vehicles	BCC - TS	2011	2012-2022	Replacement of the bus fleet with low emitting vehicles	No target	SBQP introduced and now under review	2015-2016	Most buses in the city centre are EURO III or greater
Action 2010/12	Birmingham City Council will seek to reduce the overall age of the taxi fleet and Encourage the use of less polluting vehicles.	Promoting Low Emission Transport	Public Vehicle Procurement - Prioritising uptake of low emission vehicles	BCC - L	2011-2015	2016-2020	Replacement of taxi fleet with vehicles with low emissions	No target	The City Council has a taxi age policy of hackney carriage not older than 14 years and private hire not older than 8 years and is developing a specific emissions related policy	2015	With the replacement of the fleet the emissions from the 6800 vehicles in the fleet will improve. Many of the vehicles operate extensively within the City Centre.

Lead Authority: EH = Environmental Health; TS = Transportation Strategy; S = Sustainability; L = Licensing

2.3   PM$_{2.5}$ – Local Authority Approach to Reducing Emissions and or Concentrations

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

Birmingham City Council is taking the following measures to address PM$_{2.5}$:

- The primary emission source for PM$_{2.5}$ within Birmingham is from the exhausts of road vehicles. Accordingly action taken to reduce vehicle usage and incentivise the uptake of cleaner vehicle technology will deliver reductions in PM$_{2.5}$. The actions will be set out in the revised AQAP (see section 2.2).

- The newly established Air Quality Steering Group will include the Director of Public Health to ensure that duties arising from the Public Health Outcomes Framework, including those relevant to PM$_{2.5}$ are captured at the highest level and built into future key policies.

- A working group comprising Environmental Health, Public Health and Transportation Policy has been established to produce information at a local level around pollution and health with a view to informing politicians about the health issues within their areas where they arise from traffic pollution. This work will seek to consider the impacts arising from key pollutants, namely NO$_2$ and PM$_{2.5}$.

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.

Automatic (continuous) monitoring was undertaken at 6 sites in Birmingham during 2015. Table A.1 in Appendix A shows the details of the sites. National monitoring results are available at https://uk-air.defra.gov.uk/data/.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C.

3.1.2 Non-Automatic Monitoring Sites

Birmingham City Council undertook non- automatic (passive) monitoring of NO_2 at 60 sites during 2015.

Table A.2 in Appendix A shows the details of the sites.

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

3.2 Individual Pollutants

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

3.2.1   Nitrogen Dioxide (NO$_2$)

Table A.3 in Appendix A compares the ratified and adjusted monitored NO$_2$ annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

For diffusion tubes, the full 2015 dataset of monthly mean values is provided in Appendix B.

Table A.4 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past 5 years with the air quality objective of $200\mu g/m^3$, not to be exceeded more than 18 times per year.

The annual mean for NO2 exceeded the air quality objective at the automatic monitoring sites at Tyburn Roadside and Moor Street Queensway. There were no exceedances of the hourly mean air quality objective at any of the automatic monitoring sites. Overall the results from the automatic monitoring sites show a downward trend over the past 5 years.

The annual mean was also exceeded at many of the non-automatic (diffusion tube) monitoring sites including within the city centre (particularly at Corporation Street, Moor Street Queensway, Broad Street, and adjacent to the Children's Hospital), and at Tyburn Road. The overall trend for sites located outside of the city centre is for declining concentrations. Sites located within the ring road present a mixed picture. Some sites, e.g. those located on Corporation Street to the southwest of the junction with Bull Street, have shown a marked reduction in concentrations and are now below the objective. This is most likley due to the fact that that vehicle numbers have reduced significantly along this road link due the the Midland Metro extension. Elsewhere in the city centre reduced concentrations have also been recorded, although some monitoring sites have seen a noticible increase; e.g. the northern end of High Street, and on Moor Street Queensway. The change in recorded concentrations is illustrated on Figure 3.

NO_2 levels exceeded $60\mu g/m^3$ at 1 non-automatic monotoing site, located near to the junction of Moor Street Queensway and Moor Street indicating that levels at this location may exceed the 1-hour mean air quality objective at this location. It is considered unlikley that a receptor would spend 60 minutes at this location. Furthermore continuous monitoring undertaken at the automatic monitoing site at Moor street Queensway, located 190 metres to the northeast has not recorded any exceedances of the 1-hour mean air quality objective.

The results of NO_2 monitoring have not resulted in the declaration of any new AQMAs. There is already a city-wide AQMA in place for NO_2.

Changes in NO2 concentrations in Birmingham City Centre
Green = decrease or no change
Amber = Increase

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3.2.2 Particulate Matter (PM$_{10}$)

Table A.5 in Appendix A compares the ratified and adjusted monitored PM$_{10}$ annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

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

There have been no monitored exceedances of the annual mean or daily mean air quality objectives for PM$_{10}$ during the monitoring period.

3.2.3   Particulate Matter (PM$_{2.5}$)

Table A.7 in Appendix A presents the ratified and adjusted monitored PM$_{2.5}$ annual mean concentrations for the past 5 years.

Monitoring for PM$_{2.5}$ is undertaken at 3 locations, Acocks Green, Tyburn, and Tyburn Roadside, with respective annual means of 12 µg/m^3, 13 µg/m^3, and 12 µg/m^3 being recorded. The concentrations are generally lower than in previous years where monitoring results are available.

3.2.4   Sulphur Dioxide (SO$_2$)

Table A.8 in Appendix A compares the ratified continuous monitored SO$_2$ concentrations for year 2015 with the air quality objectives for SO$_2$.

There have been no eceedances of the air qulaity objectives for SO$_2$ within the monitoring period.

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) [1]	Distance to kerb of nearest road (m) [2]	Inlet Height (m)
	Birmingham Tyburn Roadside	Urban Traffic	411577	290491	NO_2; PM_{10} $PM_{2.5}$, o_3	Y	Chemiluminescent; FDMS	10	6	2.0
	Birmingham Tyburn	Urban background	411592	290440	NO_2; PM_{10} $PM_{2.5}$, o_3, SO_2	Y	Chemiluminescent; FDMS	27	65	2.0
	New Hall	Urban background	414574	296724	NO_2	Y	Chemiluminescent	41	20	2.0
	Stratford Road	Urban Traffic	408820	284591	NO2	Y	Chemiluminescent	5	5	2.0
	Bristol Road	Urban Traffic	404545	283020	NO2	Y	Chemiluminescent	27	9	2.0
	Moor Street Queensway	Urban Traffic	407435	286891	NO2	Y	Chemiluminescent	65	6	2.0
	Acocks Green	Urban background	411649	282207	NO2, O3, PM2.5	Y	Chemiluminescent; FDMS	43	65	2.0

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

(2) N/A if not applicable.

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) [1]	Distance to kerb of nearest road (m) [2]	Tube collocated with a Continuous Analyser?	Height (m)
	Fore St AQ station	Urban background	407060	286868	NO_2	Y	30	5	Y	2
	Fore St AQ station	Urban background	407060	286868	NO_2	Y	30	5	Y	2
	Corporation St SuperDrug	Urban background	407114	286906	NO_2	Y	9	3		2
	Corporation St Lampost	Urban background	407060	286868	NO_2	Y	26	4		2
	Corporation St Taxi rank sign	Urban background	407205	287065	NO_2	Y	45	4		2
	Bull Street Lampost	Urban background	407154	287104	NO_2	Y	26	4		2
	Corporation St Wayfinder post	Urban background	407217	287132	NO_2	Y	43	4		2
	Corporation St LP corner Old Square	Urban Traffic	407259	287110	NO_2	Y	50	4		2
	Priory Queensway LP adjacent Car park	Urban Traffic	407407	287092	NO_2	Y	68	3		2
	Priory Queensway LP adjacent Argos	Urban Traffic	407399	287078	NO_2	Y	83	3		2
	Moor St Queensway Post adjacent Masshouse	Urban Traffic	407548	287107	NO_2	Y	50	3		2
	Masshouse Lane post adjacent Masshouse	Urban Traffic	407611	287110	NO_2	Y	24	3		2

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) [1]	Distance to kerb of nearest road (m) [2]	Tube collocated with a Continuous Analyser?	Height (m)
	Masshouse Lanepost lighting shop	Urban Traffic	407628	287121	NO$_2$	Y	31	2		2
	Albert St post adjacent Masshouse		407603	287033	NO$_2$	Y	42	6		2
	Masshouse Lane post adjacent Masshouse	Urban Traffic	407547	287050	NO$_2$	Y	14	3		2
	Moor St Queensway post	Urban Traffic	407488	287023	NO$_2$	Y	83	3		2
	Moor St Queensway LP adjacent car park	Urban Traffic	407510	286963	NO$_2$	Y	110	3		2
	Moor St Queensway post adjacent car park	Urban Traffic	407455	286989	NO$_2$	Y	110	4		2
	Moor St Queensway post in central reservation	Urban Traffic	407433	286922	NO$_2$	Y	60	3		2
	Moor St Queensway LP adjacent car park	Urban Traffic	407439	286886	NO$_2$	Y	71	3		2
	Moor St Queensway post in central reservation	Urban Traffic	407372	286844	NO$_2$	Y	70	3		2
	Moor St Queensway Post adjacent station	Urban Traffic	407355	286769	NO$_2$	Y	140	3		2
	Moor St Queensway post above entrace to Pavillions	Urban Traffic	407320	286756	NO$_2$	Y	115	5		2

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Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) [1]	Distance to kerb of nearest road (m) [2]	Tube collocated with a Continuous Analyser?	Height (m)
	Moor St Queensway post corner of Moor St	Urban Traffic	407348	286722	NO_2	Y	150	3		2
	New Meeting St lampost adjacent Church	Urban Traffic	407377	286896	NO_2	Y	18	8		2
	High St Clintons Cards		407242	286822	NO_2	Y	24	4		2
	High St Corner of Carrs Lane	Urban Traffic	407255	286862	NO_2	Y	39	4		2
	Dale End Corner of Lower Bull St	Urban background	407278	286931	NO_2	Y	29	4		2
	Lower Bull St post adjacent shop	Urban background	407233	286982	NO_2	Y	28	3		2
	St Phillips Churchyard	Urban background	406919	287037	NO_2	Y	92	12		2
	Snow Hill Station Courtyard	Urban Traffic	407033	287196	NO_2	Y	103	13		2
	Aston University Post	Urban Traffic	407509	287226	NO_2	Y	86	4		2
	Waterstones near ramp	Urban background	406973	286751	NO_2	Y	70	3		2
	11 Fox Green Crescent	Urban background	411211	282756	NO_2	Y	0	8		2
	Langleys Road	Urban background			NO_2	Y	0	8		2
	28 High Street	Urban Traffic	407386	282131	NO_2	Y	11	2		2
	81 High Street	Urban Traffic	407404	282011	NO_2	Y	6	2		2

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) [1]	Distance to kerb of nearest road (m) [2]	Tube collocated with a Continuous Analyser?	Height (m)
	458 Stratford Road **	Urban Traffic	409128	284124	NO_2	Y	12	2		2
	505 Stratford Road	Urban Traffic	409168	283997	NO_2	Y	5	2		2
	The Brasshouse, Broad Street	Urban Traffic	406113	286633	NO_2	Y	61	3		2
	O' Neills Broad Street **	Urban Traffic	406014	286469	NO_2	Y	62	4		2
	37 Shelley Drive **	Urban background	408618	291351	NO_2	Y	0	27		2
	Childrens Hospital	Urban Traffic	407321	287531	NO_2	Y	0	4		2
	Stratford Road outside Aldi	Urban Traffic	408819	284592	NO_2	Y	31	5	Y	2
	Stratford Road outside Aldi	Urban Traffic	408819	284592	NO_2	Y	31	5	Y	2
	Stratford Road outside Aldi	Urban Traffic	408819	284592	NO_2	Y	31	5	Y	2
	Tyburn Road AURN 581 Tyburn Road	Urban Traffic	411592	290438	NO_2	Y	47	58	Y	2
	Tyburn Road AURN 581 Tyburn Road	Urban Traffic	411592	290438	NO_2	Y	47	58	Y	2
	Tyburn Road AURN 581 Tyburn Road	Urban Traffic	411592	290438	NO_2	Y	47	58	Y	2
	Copeley Hill	Urban background	409493	290310	NO_2	Y	9	11		2
	237 George Road	Urban background	409345	291286	NO_2	Y	12	3		2

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) [1]	Distance to kerb of nearest road (m) [2]	Tube collocated with a Continuous Analyser?	Height (m)
	Drake Road	Urban background	408974	291056	NO_2	Y	11	3		2
	Willowsbrook road (363)	Urban background	407126	292441	NO_2	Y	0	52		2
	Grindleford Road (56)	Urban background	406733	293217	NO_2	Y	6	4		2
	Queslett (25)	Urban background	405686	294338	NO_2	Y	19	4		2
	Tyburn Road (39)	Urban Traffic	409987	290001	NO_2	Y	15	2		2
	Tyburn Road (40)	Urban Traffic	410419	290021	NO_2	Y	13	2		2
	Chillingholme Road (114)	Urban background	412733	289923	NO_2	Y	6	73		2
	Bristol Rd AQ station	Urban Traffic	404544	283019	NO_2	Y	25	2	Y	2
	641 Bristol Road	Urban Traffic	404448	282890	NO_2	Y	25	2		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.

Table A.3 – Annual Mean NO₂ Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2015 (%) [2]	NO₂ Annual Mean Concentration (µg/m³) [3]				
					2011	2012	2013	2014	2015
Birmingham Tyburn Roadside	Urban Traffic	Automatic		97	**45**	**46**	**42**	**43**	**42**
Birmingham Tyburn	Urban background	Automatic		96	34	32	29	31	30
New Hall	Urban background	Automatic		99	19	19	17	17	16
Stratford Road	Urban Traffic	Automatic		92	36	35	31	36	33
Bristol Road	Urban Traffic	Automatic		99	33	30	34	34	29
Moor Street Queensway	Urban Traffic	Automatic		99	N/A	N/A	**44**	**43**	**45**
Acocks Green	Urban background	Automatic		98	23	32	29	N/A	18
Fore St AQ station	Urban background	Non-Automatic		83%	**48**	**53**	35	36	33
Fore St AQ station	Urban background	Non-Automatic		83%	**49**	**48**	35	37	36
Corporation St SuperDrug	Urban background	Non-Automatic		75%	**42**	**41**	33	31	30
Corporation St Lampost	Urban background	Non-Automatic		83%	**72**	<u>**61**</u>	35	36	32
Corporation St Taxi rank sign	Urban background	Non-Automatic		83%	**66**	**66**	**44**	**50**	**46**
Bull Street Lampost	Urban background	Non-Automatic		67%	37	**41**	32	30	29
Corporation St Wayfinder post	Urban background	Non-Automatic		67%	**55**	**54**	**48**	**53**	**51**
Corporation St LP corner Old Square	Urban Traffic	Non-Automatic		83%	<u>**61**</u>	**50**	**43**	**47**	**42**

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2015 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3]				
					2011	2012	2013	2014	2015
Priory Queensway LP adjacent Car park	Urban Traffic	Non-Automatic		67%	**56**	**60**	**49**	**50**	**49**
Priory Queensway LP adjacent Argos	Urban Traffic	Non-Automatic		75%	**54**	**62**	**50**	**55**	**50**
Moor St Queensway Post adjacent Masshouse	Urban Traffic	Non-Automatic		83%	**62**	**56**	**41**	**45**	**42**
Masshouse Lane post adjacent Masshouse	Urban Traffic	Non-Automatic		83%	**51**	**53**	**42**	**45**	**43**
Masshouse Lanepost lighting shop	Urban Traffic	Non-Automatic		75%	**47**	**47**	39	**48**	**46**
Albert St post adjacent Masshouse	Urban Traffic	Non-Automatic		58%	**57**	**57**	**56**	**55**	**54**
Masshouse Lane post adjacent Masshouse	Urban Traffic	Non-Automatic		67%	**41**	**45**	**52**	**58**	**59**
Moor St Queensway post	Urban Traffic	Non-Automatic		83%	**60**	**61**	**50**	**56**	**49**

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2015 (%) [2]	NO$_2$ Annual Mean Concentration (µg/m^3) [3]				
					2011	2012	2013	2014	2015
Moor St Queensway LP adjacent car park	Urban Traffic	Non-Automatic		83%	49	51	42	45	44
Moor St Queensway post adjacent car park	Urban Traffic	Non-Automatic		75%	49	51	45	49	47
Moor St Queensway post in central reservation	Urban Traffic	Non-Automatic		83%	55	59	54	58	55
Moor St Queensway LP adjacent car park	Urban Traffic	Non-Automatic		67%	47	52	51	52	51
Moor St Queensway post in central reservation	Urban Traffic	Non-Automatic		67%	66	62	54	57	56
Moor St Queensway Post adjacent station	Urban Traffic	Non-Automatic		83%	65	50	59	57	54
Moor St Queensway post above entrace to Pavillions	Urban Traffic	Non-Automatic		83%	60	57	55	56	52
Moor St Queensway post corner of Moor St	Urban Traffic	Non-Automatic		75%	68	74	67	66	61
New Meeting St lampost adjacent Church	Urban Traffic	Non-Automatic		75%	44	48	41	43	41

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2015 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3]				
					2011	2012	2013	2014	2015
High St Clintons Cards	Urban Traffic	Non-Automatic		25%	**40**	**42**	37	38	33
High St Corner of Carrs Lane	Urban Traffic	Non-Automatic		75%	35	39	**43**	**46**	**43**
Dale End Corner of Lower Bull St	Urban background	Non-Automatic		83%	37	**46**	40	**47**	**47**
Lower Bull St post adjacent shop	Urban background	Non-Automatic		83%	**44**	**49**	**43**	**45**	**41**
St Phillips Churchyard	Urban background	Non-Automatic		83%	39	**43**	34	36	39
Snow Hill Station Courtyard	Urban Traffic	Non-Automatic		83%	**46**	**49**	38	39	**40**
Aston University Post	Urban Traffic	Non-Automatic		67%	**40**	**42**	33	33	36
Waterstones near ramp	Urban background	Non-Automatic		83%	**57**	**59**	**45**	**41**	**36**
11 Fox Green Crescent	Urban background	Non-Automatic		100%	19	22	19	17	17
Langleys Road	Urban background	Non-Automatic		100%	19	20	18	17	17
28 High Street	Urban Traffic	Non-Automatic		100%	**46**	**47**	**40**	**41**	38

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2015 (%) [2]	NO$_2$ Annual Mean Concentration (µg/m^3) [3]				
					2011	2012	2013	2014	2015
81 High Street	Urban Traffic	Non-Automatic		92%	**48**	**47**	**47**	43	36
458 Stratford Road **	Urban Traffic	Non-Automatic		100%	**41**	**42**	39	**40**	36
505 Stratford Road	Urban Traffic	Non-Automatic		58%	**46**	**45**	39	**40**	38
The Brasshouse, Broad Street	Urban Traffic	Non-Automatic		100%	**55**	**52**	**48**	**49**	**45**
O' Neills Broad Street **	Urban Traffic	Non-Automatic		100%	**58**	**52**	**47**	**49**	**41**
37 Shelley Drive **	Urban background	Non-Automatic		92%	**50**	**47**	37	**41**	**40**
Childrens Hospital	Urban Traffic	Non-Automatic		92%	<u>**60**</u>	**56**	52	**55**	**55**
Stratford Road outside Aldi	Urban Traffic	Non-Automatic		92%	34	37	35	36	33
Stratford Road outside Aldi	Urban Traffic	Non-Automatic		100%	35	36	35	36	34
Stratford Road outside Aldi	Urban Traffic	Non-Automatic		100%	37	36	35	36	33
Tyburn Road AURN 581 Tyburn Road	Urban Traffic	Non-Automatic		100%	33	33	29	30	31
Tyburn Road AURN 581 Tyburn Road	Urban Traffic	Non-Automatic		100%	33	35	29	30	31
Tyburn Road AURN 581 Tyburn Road	Urban Traffic	Non-Automatic		100%	33	39	30	31	31

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2015 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3]				
					2011	2012	2013	2014	2015
Copeley Hill	Urban background	Non-Automatic		100%	-	-	39	**43**	34
237 George Road	Urban background	Non-Automatic		33%	-	-	27	30	32
Drake Road	Urban background	Non-Automatic		33%	-	-	31	35	38
Willowsbrook road (363)	Urban background	Non-Automatic		100%	-	-	32	37	34
Grindleford Road (56)	Urban background	Non-Automatic		33%	-	-	27	32	31
Queslett (25)	Urban background	Non-Automatic		33%	-	-	30	32	35
Tyburn Road (39)	Urban Traffic	Non-Automatic		92%	-	-	**41**	**42**	**43**
Tyburn Road (40)	Urban Traffic	Non-Automatic		100%	-	-	**45**	**47**	**44**
Chillingholme Road (114)	Urban background	Non-Automatic		25%	-	-	31	32	31
Bristol Rd AQ station	Urban Traffic	Non-Automatic		83%	-	-	n/a	32	28

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2015 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3]				
					2011	2012	2013	2014	2015
641 Bristol Road	Urban Traffic	Non-Automatic		83%	-	-	n/a	37	35

Notes: Exceedances of the NO_2 annual mean objective of 40$\mu g/m^3$ are shown in **bold**.

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

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

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

(3) Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per Technical Guidance LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Table A.4 – 1-Hour Mean NO₂ Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	NO₂ 1-Hour Means > 200µg/m³ (3)				
					2011	2012	2013	2014	2015
Birmingham Tyburn Roadside	Urban Traffic	Automatic		98	0	0	0	0	0
Birmingham Tyburn	Urban background	Automatic		96	0	0	0	0	0
Acocks Green	Urban background	Automatic		97	0	0	0	0	0
New Hall	Urban background	Automatic		99	0	0	0	0	0
Stratford Road	Urban Traffic	Automatic		92	0	0	0	0	0
Bristol Road	Urban Traffic	Automatic		99	0	0	0	0	0
Moor Street Queensway	Urban Traffic	Automatic		99	0	0	0	0	0

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

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

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

(3) If the period of valid data is less than 90%, the 99.8th percentile of 1-hour means is provided in brackets.

Table A.5 – Annual Mean PM$_{10}$ Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2015 (%) [2]	PM$_{10}$ Annual Mean Concentration (µg/m^3) [3]				
				2011	2012	2013	2014	2015
Birmingham Tyburn	Urban traffic		61	23	19	18	19	19
Birmingham Tyburn Roadside	Urban background		95	24	22	19	20	17

Notes: Exceedances of the PM$_{10}$ annual mean objective of 40µg/m^3 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 Technical Guidance 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$_{10}$ Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2015 (%) [2]	PM$_{10}$ 24-Hour Means > 50µg/m^3 [3]				
				2011	2012	2013	2014	2015
Birmingham Tyburn	Urban traffic		61	18	9	7	6	3
Birmingham Tyburn Roadside	Urban background		95	18	13	9	8	6

Notes: Exceedances of the PM$_{10}$ 24-hour mean objective (50µg/m^3 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 90%, the 90.4[th] percentile of 24-hour means is provided in brackets.

Table A.7 – PM$_{2.5}$ Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2015 (%) [2]	PM$_{2.5}$ Annual Mean Concentration (µg/m³) [3]				
				2011	2012	2013	2014	2015
Birmingham Acocks Green	Urban Background		64	N/A	11	13	12	12
Birmingham Tyburn	Urban traffic		61	16	14	14	13	13
Birmingham Tyburn Roadside	Urban background		96	17	13	16	14	12

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

Table A.8 – SO$_2$ Monitoring Results

Site ID	Site Type	Valid Data Capture for monitoring Period (%) [1]	Valid Data Capture 2014 (%) [2]	Number of Exceedances (percentile in bracket) [3]		
				15-minute Objective (266 µg/m³)	1-hour Objective (350 µg/m³)	24-hour Objective (125 µg/m³)
Birmingham Tyburn	Urban Background	87	95	0	0	0

Notes: Exceedances of the SO$_2$ objectives are shown in **bold** (15-min mean = 35 allowed a year, 1-hour mean = 24 allowed a year, 24-hour mean = 3 allowed a year)

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

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

(3) If the period of valid data is less than 90%, the relevant percentiles are provided in brackets.

Appendix B: Full Monthly Diffusion Tube Results for 2015

Table B.1 – NO$_2$ Monthly Diffusion Tube Results - 2015

Site ID	NO$_2$ Mean Concentrations (µg/m^3)												Annual Mean	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted [1]
Fore St AQ station	55	52	48	44	32	36	37	-	-	53	52	41	45	33
Fore St AQ station	50	58	52	50	44	45	45	-	-	60	49	39	49	36
Corporation St SuperDrug	45	44	41	42	33	31		-	-	44	45	36	40	30
Corporation St Lampost	46	49	43	50	38	37	37	-	-	56	46	36	44	32
Corporation St Taxi rank sign	75	69	65	68	59	58	55	-	-	72	54	41	62	46
Bull Street Lampost	43	42	42	40	33	31	34	-	-	51			39	29
Corporation St Wayfinder post	77	69	65	68	-	-	68	-	-	73	75	60	69	51
Corporation St LP corner Old Square	66	62	62	61	50	48	54	-	-	67	52	41	56	42
Priory Queensway LP adjacent Car park	74	71	-	55		58	61	-	-	72	76	64	66	49
Priory Queensway LP adjacent Argos	81	74	-	75	65	58	66	-	-	69	66	54	68	50
Moor St Queensway Post adjacent Masshouse	71	56	61	61	53	49	47	-	-	63	58	46	56	42
Masshouse Lane post adjacent Masshouse	56	65	62	64	54	48	50	-	-	61	66	48	58	43
Masshouse Lanepost lighting shop	74	56	67	62	54	50	54	-	-	73	64	m	62	46
Albert St post adjacent Masshouse	95	66	74	73	73	65		-	-	65	-	-	73	54
Masshouse Lane post adjacent Masshouse	82	87	82	81	72	68	76	-	-	93	-	-	80	59

Site ID	NO$_2$ Mean Concentrations (µg/m^3)												Annual Mean	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted [1]
Moor St Queensway post	68	68	74	73	60	63	57	-	-	83	67	55	67	49
Moor St Queensway LP adjacent car park	72	68	65	61	51	50	52	-	-	67	64	45	60	44
Moor St Queensway post adjacent car park	70	71	72	67	58	54	55	-	-	77		50	64	47
Moor St Queensway post in central reservation	84	77	74	77	72	69	72	-	-	81	85	59	75	55
Moor St Queensway LP adjacent car park	72	78	71	-	-	55	60	-	-	74	73	64	68	51
Moor St Queensway post in central reservation	84	80	83	81	74	67	70	-	-			66	75	56
Moor St Queensway Post adjacent station	85	84	76	74	72	58	71	-	-	80	76	59	73	54
Moor St Queensway post above entrace to Pavillions	81	80	77	80	65	63	69	-	-	80	67	48	71	52
Moor St Queensway post corner of Moor St	m	97	81	85	85	78	88	-	-	76	76	75	82	61
New Meeting St lampost adjacent Church	56	63	56	61	45	-	46	-	-	63	56	47	55	41
High St Clintons Cards	53	45	-	-	-	-	35	-	-	-	-	m	44	33
High St Corner of Carrs Lane	58	62	63	66	53	50	45	-	-	-	84	42	58	43
Dale End Corner of Lower Bull St	65	64	66	63	49	62	52	-	-	76	71	66	63	47
Lower Bull St post adjacent shop	59	60	58	57	53	57	60	-	-	74	36	37	55	41
St Phillips Churchyard	53	54	58	49	47	50	43	-	-	56	66	59	53	39
Snow Hill Station Courtyard	52	54	61	54	45	43	42	-	-	60	75	54	54	40
Aston University Post	54	53	-	45	-	34	37	-	-	42	69	61	49	36
Waterstones near ramp	63	58	57	53	41	43	53	-	-	56	31	33	49	36

Site ID	NO$_2$ Mean Concentrations (µg/m^3)												Annual Mean	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted (1)
11 Fox Green Crescent	17	27	26	25	22	15	13	15	17	23	28	21	21	17
Langleys Road	17	24	23	25	23	14	14	15	16	25	30	20	21	17
28 High Street	38	50	55	53	51	46	48	48	46	50	53	47	50	38
81 High Street	36	45	53	52	53	42	37		53	49	53	52	48	36
458 Stratford Road **	36	44	49	54	61	40	43	44	42	61	63	42	49	36
505 Stratford Road	38	50	59	51	52	49	51	45	-	-	-	-	51	38
The Brasshouse, Broad Street	45	66	70	68	54	55	54	55	51	64	76	62	61	45
O' Neills Broad Street **	41	54	70	54	47	40	46	48	52	66	69	60	56	41
37 Shelley Drive **	40	50	66	52	49	55	46	53	51	45	-	58	54	40
Childrens Hospital	55	74	77	-	76	68	63	62	66	76	78	83	74	55
Stratford Road outside Aldi	33	m	51	48	50	36	33	39	38	53	56	47	45	33
Stratford Road outside Aldi	34	46	52	47	50	40	34	35	40	49	57	47	46	34
Stratford Road outside Aldi	33	45	47	40	48	34	31	33	37	56	58	45	44	33
Tyburn Road AURN 581 Tyburn Road	31	43	48	40	36	26	27	29	28	35	43	51	38	31
Tyburn Road AURN 581 Tyburn Road	31	35	44	39	36	29	26	30	32	41	44	51	38	31
Tyburn Road AURN 581 Tyburn Road	31	39	41	39	37	30	26	28	29	40	45	48	37	31
Copeley Hill	34	43	55	44	43	37	33	36	40	49	50	63	47	34
237 George Road	32	50	44	41	36	-	-	-	-	-	-	-	42	32

Site ID	NO$_2$ Mean Concentrations (µg/m^3)												Annual Mean	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted (1)
Drake Road	38	50	62	48	42	-	-	-	-	-	-	-	50	38
Willowsbrook road (363)	34	34	50	45	45	41	39	44	42	43	48	52	45	34
Grindleford Road (56)	31	*45*	50	36	34	-	-	-	-	-	-	-	41	31
Queslett (25)	35	53	55	42	36	-	-	-	-	-	-	-	46	35
Tyburn Road (39)	43	*m*	68	62	58	54	46	53	55	63	62	61	58	43
Tyburn Road (40)	44	58	60	62	64	55	55	55	54	64	53	61	59	44
Chillingholme Road (114)	31	46	46	-	35	-	-	-	-	-	-	-	42	31
Bristol Rd AQ station	28	38	39	42	-	-	31	31	32	38	49	38	38	28
641 Bristol Road	35	55	32	50	-	-	42	45	40	50	52	53	47	35

(1) See Appendix C for details on bias adjustment

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

<u>**Screening Assessment**</u>

No screening assessments have been undertaken in the reporting year. Birmingham City Council is satisfied that there have been no significant changes to sources of emissions, and since the existing AQMA covers the whole of the City area, any changes would not result in the declaration of a new AQMA. Traffic flows on roads within the City Centre area have been, or will be, subject to some changes due to ongoing or proposed regeneration schemes, or other transport projects such as the Midland Metro extension. Any effects of emissions as a result of any such changes should be addressed through actions already planned; i.e. the implementation of the CAZ.

<u>**Dispersion Modelling**</u>

Birmingham City Council operates a pollution modelling system known as Airviro. This system collects real-time data from any number of air quality stations, provides for validation of those data sets and their subsequent presentation in a variety of formats. The Airviro system also includes a module known as an Emissions Database (EDB). This database contains information on all major sources of pollution, such as roads, airports and industrial sites. The emission values for each of the sources are based on a dynamic emission, that is, time based. The EDB underpins the entire computer modelling and forecasting of current and future pollution concentrations across the city.

No new air quality modelling has been undertaken within the reporting year. However diffusion tube monitoring undertaken with the city centre area has highlighted discrepancies between measured NO_2 concentrations and those predicted by the existing model (see Figure 4). Birmingham City Council has commissioned work to update the EDB in the Airviro system so that the models can be re-run to obtain an

up to date forecast of predicted concentrations. It is also antcipated that modelling of a number of scenarios will be undetraken to support the development of the CAZ.
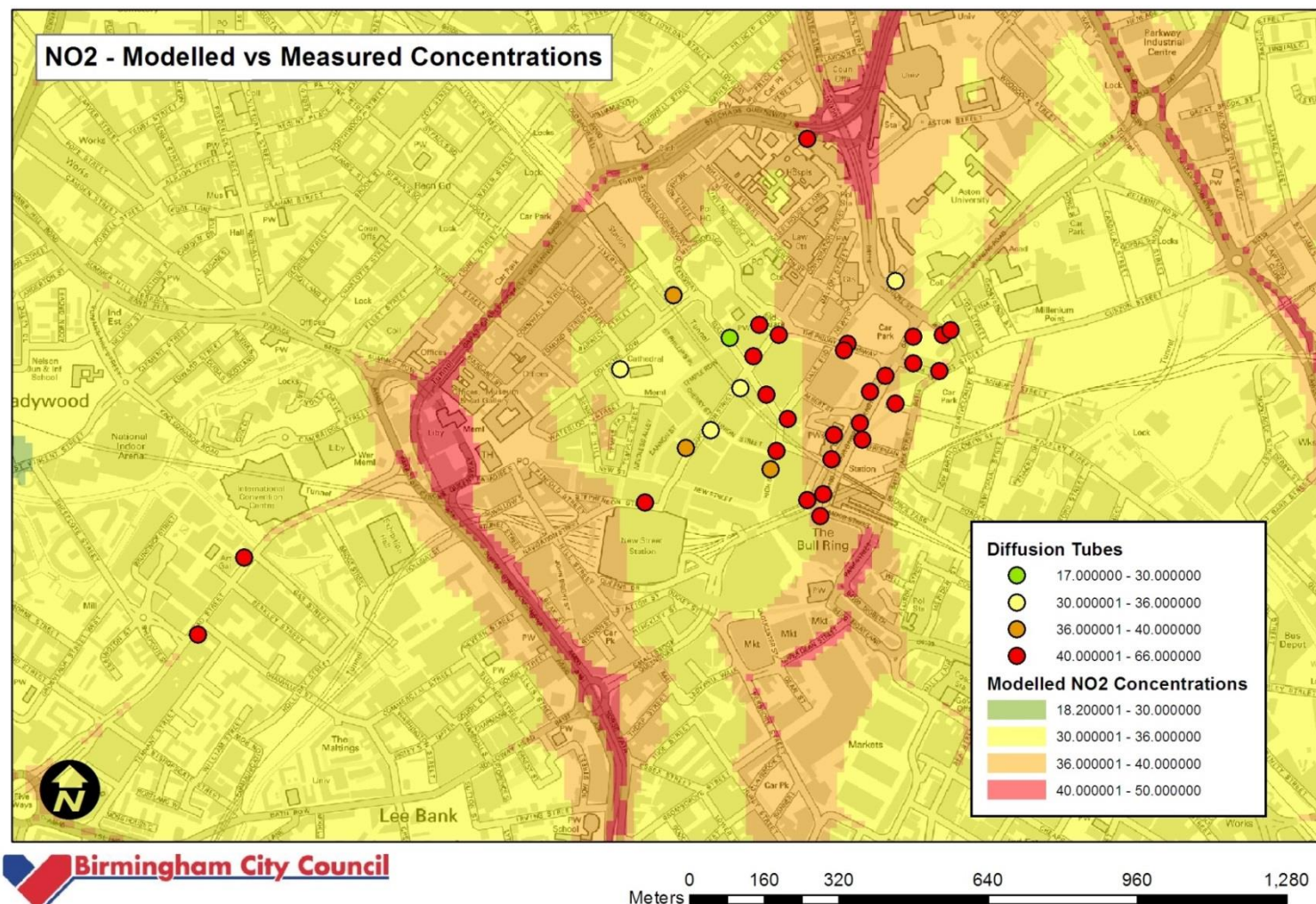
Figure 4. A comparison of modelled and predicted NO2 concentrations in the City Centre.

QA/QC

Checking Precision and Accuracy of Triplicate Tubes

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 μgm^{-3}	Tube 2 μgm^{-3}	Tube 3 μgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
				Diffusion Tubes Measurements					
1	08/01/2015	05/02/2015	43.0	35.0	39.0	39	4.0	10	9.9
2	05/02/2015	03/03/2015	48.0	44.0	41.0	44	3.5	8	8.7
3	03/03/2015	02/04/2015	40.0	39.0	39.0	39	0.6	1	1.4
4	02/04/2015	29/04/2015	36.0	36.0	37.0	36	0.6	2	1.4
5	29/04/2015	27/05/2015	26.0	29.0	30.0	28	2.1	7	5.2
6	27/05/2015	30/06/2015	27.0	26.0	26.0	26	0.6	2	1.4
7	30/06/2015	28/07/2015	29.0	30.0	28.0	29	1.0	3	2.5
8	28/07/2015	04/09/2015	28.0	32.0	29.0	30	2.1	7	5.2
9	04/09/2015	01/10/2015	35.0	41.0	40.0	39	3.2	8	8.0
10	01/10/2015	28/10/2015	43.0	44.0	45.0	44	1.0	2	2.5
11	28/10/2015	02/12/2015	51.0	51.0	48.0	50	1.7	3	4.3
12	02/12/2015	07/01/2015	46.0	46.0	39.0	44	4.0	9	10.0
13									

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
Automatic Method		Data Quality Check	
39	100	Good	Good
38	99	Good	Good
35	100	Good	Good
33	100	Good	Good
25	100	Good	Good
22	100	Good	Good
24	87	Good	Good
26	91	Good	Good
34	85	Good	Good
38	100	Good	Good
32	100	Good	Good
25	96	Good	Good

Overall survey --> | Good precision | Good Overall DC

(Check average CV & DC from Accuracy calculations)

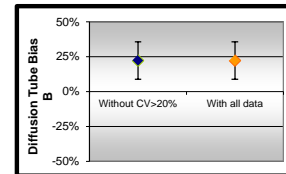**Site Name/ ID:**

Precision   12 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval)
without periods with CV larger than 20%

Bias calculated using 12 periods of data
- **Bias factor A**   0.83 (0.74 - 0.93)
- **Bias B**   21% (7% - 34%)

- **Diffusion Tubes Mean:**   37 μgm^{-3}
- Mean CV (**Precision**):   5

- **Automatic Mean:**   31 μgm^{-3}
- **Data Capture** for periods used: 97%

- **Adjusted Tubes Mean:**   31 (28 - 35) μgm^{-3}

Accuracy (with 95% confidence interval)
WITH ALL DATA

Bias calculated using 12 periods of data
- **Bias factor A**   0.83 (0.74 - 0.93)
- **Bias B**   21% (7% - 34%)

- **Diffusion Tubes Mean:**   37 μgm^{-3}
- Mean CV (**Precision**):   5

- **Automatic Mean:**   31 μgm^{-3}
- **Data Capture** for periods used: 97%

- **Adjusted Tubes Mean:**   31 (28 - 35) μgm^{-3}

Chart: Diffusion Tube Bias B — Without CV>20%, With all data (range -50% to 50%)

Jaume Targa, for AEA
Version 04 - February 2011

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 μgm^{-3}	Tube 2 μgm^{-3}	Tube 3 μgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	08/01/2015	05/02/2015	46.0	45.0		46	0.7	2	6.4
2	05/02/2015	03/03/2015	51.0	52.0	47.0	50	2.6	5	6.6
3	03/03/2015	02/04/2015	48.0	47.0	40.0	45	4.4	10	10.8
4	02/04/2015	29/04/2015	50.0	50.0	48.0	49	1.2	2	2.9
5	29/04/2015	27/05/2015	36.0	40.0	34.0	37	3.1	8	7.6
6	27/05/2015	30/06/2015	33.0	34.0	31.0	33	1.5	5	3.8
7									
8	28/07/2015	04/09/2015	38.0	40.0	37.0	38	1.5	4	3.8
9	04/09/2015	01/10/2015	53.0	49.0	56.0	53	3.5	7	8.7
10	01/10/2015	28/10/2015	56.0	57.0	58.0	57	1.0	2	2.5
11	28/10/2015	02/12/2015	47.0	47.0	45.0	46	1.2	2	2.9
12	02/12/2015	07/01/2015	45.0	53.0	52.0	50	4.4	9	10.8
13									

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Automatic Method / Data Quality Check

Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
36	100	Good	Good
35	100	Good	Good
38	100	Good	Good
41	100	Good	Good
21	95	Good	Good
25	78	Good	Good
31	77	Good	Good
40	100	Good	Good
45	100	Good	Good
31	100	Good	Good
29	96	Good	Good

Overall survey --> | Good precision | Good Overall DC

(Check average CV & DC from Accuracy calculations)

Site Name/ ID:

Precision — 11 out of 11 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval)
without periods with CV larger than 20%
Bias calculated using 11 periods of data
- Bias factor A: 0.74 (0.67 - 0.82)
- Bias B: 35% (22% - 49%)
- Diffusion Tubes Mean: 46 μgm^{-3}
- Mean CV (**Precision**): 5
- Automatic Mean: 34 μgm^{-3}
- Data Capture for periods used: 95%
- Adjusted Tubes Mean: 34 (31 - 38) μgm^{-3}

Accuracy (with 95% confidence interval)
WITH ALL DATA
Bias calculated using 11 periods of data
- Bias factor A: 0.74 (0.67 - 0.82)
- Bias B: 35% (22% - 49%)
- Diffusion Tubes Mean: 46 μgm^{-3}
- Mean CV (**Precision**): 5
- Automatic Mean: 34 μgm^{-3}
- Data Capture for periods used: 95%
- Adjusted Tubes Mean: 34 (31 - 38) μgm^{-3}

Diffusion Tube Bias B — Without CV>20% / With all data (50%, 25%, 0%, -25%, -50%)

Jaume Targa, for AEA
Version 04 - February 2011

Bias Adjustment

All diffusion tube data contained in this report have been adjusted using the appropriate correction as calculated within the spreadsheets given above. Only local bias applied as the council uses many of its chemiluminescence analyser sites for the colocation comparisons, at all site types. 2 bias adjustment factors have been used to correct results from diffusion tube monitoring. One for tubes classed as Urban Traffic sites, and one for tubes classed Urban Background sites. Urban traffic sites are bias adjusted against the automatic monitoring station at Stratford Road, and Urban Background sites against the Birmingham Tyburn automatic monitoring station.

Appendix D: Map(s) of Monitoring Locations

Automatic monitoring locations

Figure 5. Locations of automatic monitoring sites.

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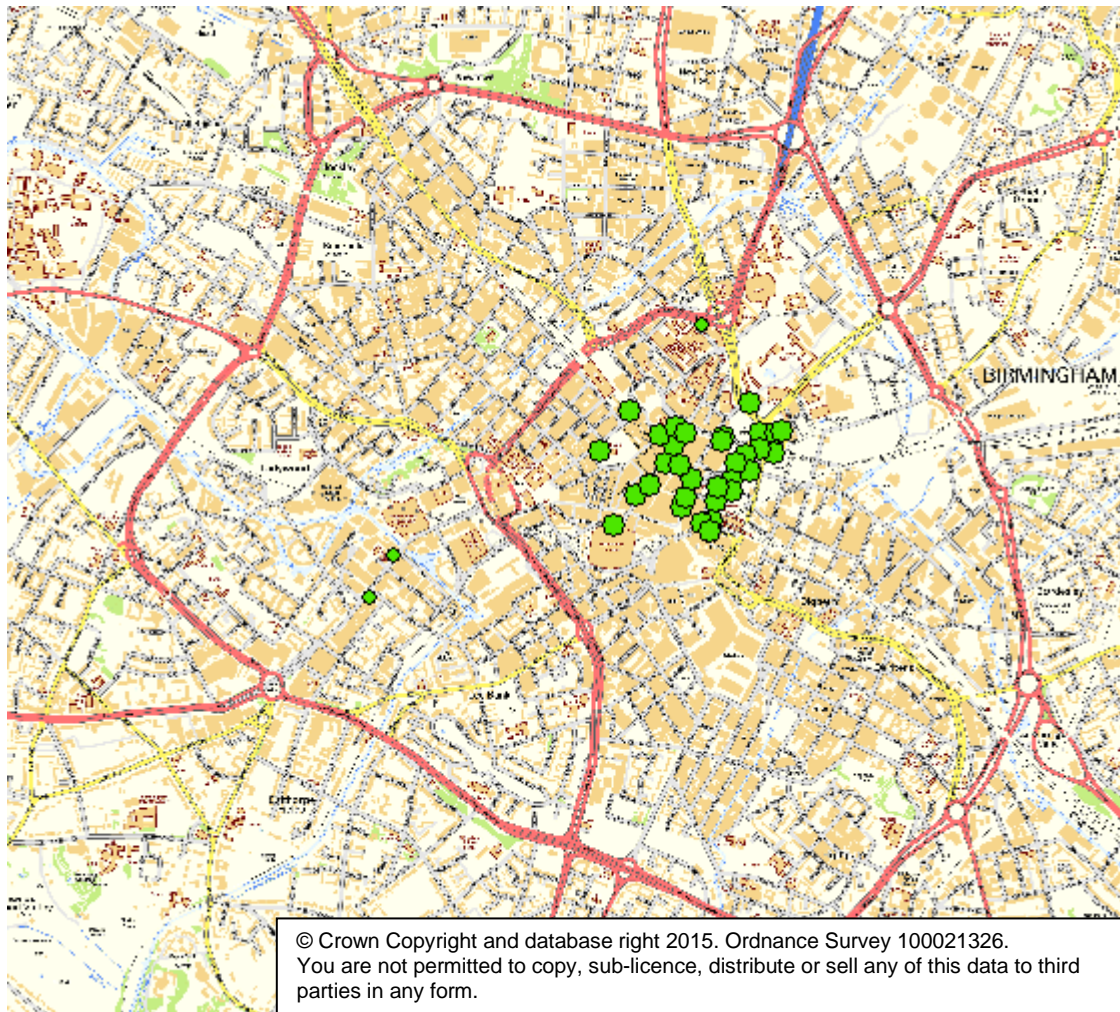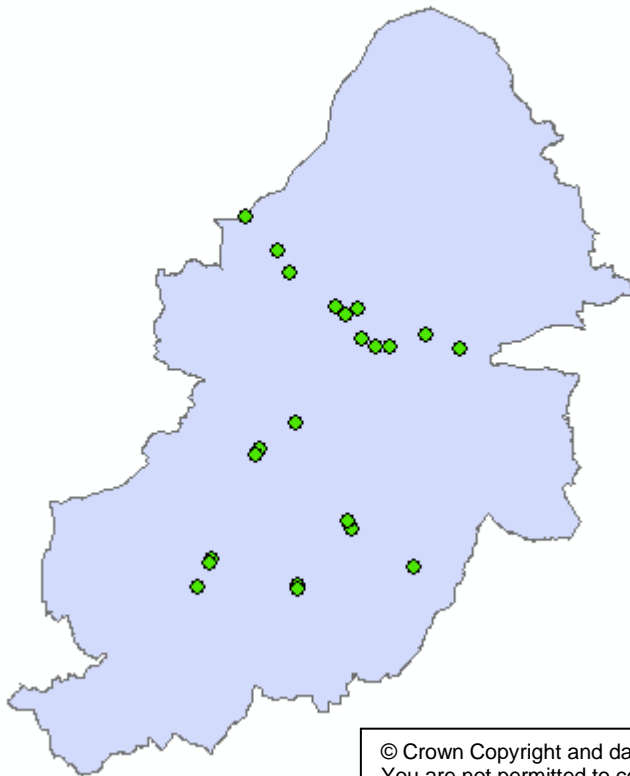You are not permitted to copy, sub-licence, distribute or sell any of this data to third parties in any form.

Figure 6. Non-automatic monitoing locations (diffusion tubes) within Birmingham City Centre.

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Figure 7. Non-automatic monitoring locations (diffusion tubes) in the wider City.

Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

| Pollutant | Air Quality Objective[5] | |
	Concentration	Measured as
Nitrogen Dioxide (NO$_2$)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m^3	Annual mean
Particulate Matter (PM$_{10}$)	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m^3	Annual mean
Sulphur Dioxide (SO$_2$)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

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

Glossary of Terms

Please add a description of any abbreviation included in the ASR – An example is provided below.

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