Worcestershire
Regulatory Services
Supporting and protecting you

2015 Air Quality Annual Status Report (ASR) for Worcester City Council

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

December 2015

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Overview of Air Quality in Our Area

Why air quality matters

Clean air is vital for our health and the environment and essential for making sure our city is a welcoming place for all to live and work now and in the future. Everyone has a part to play in improving air quality, starting with the way we behave. Simple things like walking to work or school will benefit air quality as well as have knock-on benefits for your health and the environment. Think before you make a journey and ask yourself if it is necessary. Local Authorities and the communities who live within them are key to improving the air we breathe. What we do locally can also benefit regional air quality and help meet air quality limit values and objectives as set out in European and UK law.

The Local Air Quality Management (LAQM) system, as set out in Part IV of the Environment Act 1995, 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 exceedances are considered likely, the local authority must declare an Air Quality Management Area (AQMA) and prepare an Action Plan setting out the measures it intends to put in place in pursuit of the objectives.

Air quality in Worcester City

Worcestershire Regulatory Services (WRS) is a shared service formed from the Environmental Health and Licensing departments of the six Worcestershire District Councils. Responsibility for managing (monitoring and reporting of) local air quality transferred from the partnership councils to WRS in April 2011.

Monitoring results within Worcester City Council (WCC) area demonstrate there has been a general reduction in NO_2 concentrations between 2013 and 2014 across the district but there is no discernible upward or downward trend in concentrations over the 5 year period 2010-14.

Three Air Quality Management Areas (AQMA's) were declared by WCC in 2009 for exceedances of the annual average mean objective for nitrogen dioxide (NO_2):

- Dolday/Bridge Street AQMA declared 1st March 2009;
- Lowesmoor/Rainbow Hill AQMA declared 1st March 2009; and
- Newtown Road AQMA declared 1st March 2009.

The requirement for declaration of an additional AQMA in the St Johns area of the city has been considered by WCC following the outcome of a Detailed Assessment in 2010. Measured concentrations in 2012 did not show any exceedance of the annual mean objective for NO_2, and the decision to declare an AQMA was put on hold pending further monitoring results. Annual average results of monitoring in 2013 confirmed exceedances of the annual mean objective for NO_2 and WCC subsequently declared the new St Johns AQMA on 26th September 2014.

However, there have been no measured exceedances of NO_2 in the Newtown Road AQMA since 2007, and the AQMA was revoked by WCC on 30th July 2014.

In 2014, there continue to be exceedances of the annual mean objective for NO_2 within the Dolday/Bridge Street and St Johns AQMAs which therefore must remain in place.

No exceedances of the objective were recorded within the Lowesmoor/Rainbow Hill AQMA in 2014 when taking concentrations at nearest receptor into consideration. WRS on behalf of WCC will continue to monitor concentrations within the AQMA in 2015/16.

A Detailed Assessment is currently underway of Foregate Street, The Tything and The Butts to determine if declaration of a new AQMA in the city centre is required. Eight new monitoring locations were erected in 2014 to provide additional data for this assessment.

A decision whether to proceed with further assessment of the London Road and Sidbury area will be undertaken following the publication and consideration of new policy guidance and monitoring evidence later in 2016.

In 2013, WRS produced a countywide Air Quality Action Plan (AQAP) for Worcestershire which was adopted by WCC on 13th November 2013. The AQAP is available to download via the following link:
http://www.worcsregservices.gov.uk/pollution/air-quality/air-quality-action-plan.aspx

WRS submitted an update, the 'Air Quality Action Plan Progress Report for Worcestershire April 2013-2015', to Defra in November 2015. A copy of this is also available via http://www.worcsregservices.gov.uk/pollution/air-quality/air-quality-action-plan.aspx.

WRS set up the Worcestershire Air Quality Steering Group to facilitate progressing implementation of actions identified in the AQAP. At the inaugural Steering Group meeting, on 18th June 2014, it was agreed to establish a number of subgroups. The Worcester Urban Sub Group covers the Dolday/Bridge Street, Lowesmoor/Rainbow Hill and the St. John's AQMAs plus the wider Worcester City centre area. The sub-group currently comprises representatives of WRS, the Worcestershire County Council Air Quality Liaison Officer, and local County and district Councillors.
More information on the set up of the Steering Group can be found in the 'Air Quality Action Plan Progress Report for Worcestershire April 2013-2015' and the minutes at http://www.worcsregservices.gov.uk/pollution/air-quality/air-quality-steering-group.aspx

Actions to improve air quality

Worcester City Council and Worcestershire County Council have taken forward a number of measures during the year to end of April 2015 in pursuit of improving local air quality, most are on-going. Examples include:

Measure	EU Measure Category	Focus	Progress to date
Alteration to Traffic Light Phasing in and around Dolday	Traffic Management	Improved flow of traffic around Dolday. Reduction in queuing times.	Completed: County Council data demonstrates reduction in queuing times.
Alteration to phasing of traffic light systems in Lowesmoor	Traffic Management	Enforcement of existing Traffic regulation order. Improved flow of traffic through Lowesmoor. Reduced congestion.	Completed: Installation of bus gate discourages non-permitted vehicles from accessing city centre via Lowesmoor. Initial data indicates a 90% reduction in non-permitted vehicles using the bus gate and a 74% reduction in non-permitted vehicles travelling along Lowesmoor during restricted peak times.
Installing electric vehicle charging points	Policy Guidance and Development Control	Increase in availability of EV charging points and corresponding increase in use of electric vehicles	On-going: Installation of EV charging points recommended for inclusion on relevant planning consents. Two EV charging points are available in St Martins Gate City Council car park.
Travel Planning	Promoting Travel Alternatives	Increase in uptake of personal travel planning services. Change in behaviour towards more sustainable modes of transport.	Due 2016: Worcestershire County Council are developing a personal travel planning service for Worcestershire residents and developers.
Encourage car sharing	Alternatives to private vehicle use	Increase in number of people car sharing	Worcestershire County Council are launching a new website, Liftshare, which promotes and facilitates Car Share use.

Lowesmoor pre Traffic Regulation Enforcement

Lowesmoor post Traffic Regulation Enforcement

Local Priorities and Challenges

Congestion and poor accessibility in Worcester are directly linked to air quality. In a small cathedral city with a limited road network we see AQMAs and emerging areas of poor air quality along arterial routes in and out of the city centre where poor accessibility and congestion are daily problems. Solving the issue of accessibility is key to solving the problem of air quality in the city. Currently there is no transport or accessibility strategy that focuses on the city centre itself. The Worcester Urban Area (Steering) sub-group agree that a detailed city centre transport plan or Masterplan, setting out how the city centre should be developed and accessed for all modes of transport, is key to tackling poor air quality within the central AQMAs and identified areas of poor air quality.

Worcestershire County Council currently has plans to invest in a city centre micro-simulation model to enable various interested parties to test alternative options for managing traffic and access within the city centre. The sub-group will actively engage with the development of the city centre transport strategy or Masterplan as it moves forward.

WRS on behalf of WCC continue to monitor existing locations in 2015 to assess any improvements or degradation in NO_2 concentrations. The data gathered will assist in further assessment of areas of poor air quality outside the current AQMA’s. It is anticipated a detailed assessment of the Foregate Street/ The Tything/The Butts area, including automatic monitoring, will be completed by end of 2016. Further update on monitoring and action progress will be provided in 2016 Annual Status Report.

How to get involved

There are a number of ways members of the public can help to improve local air quality:

- Walk or cycle around the city centre instead of driving;
- Worcestershire County Council have launched a car sharing website, LiftShare, to help people find others journeying to the same destinations to share journeys and costs, and reduce traffic and emissions. Visit this link for more information: https://worcestershire.liftshare.com/
- General travel planning advice is available on Worcestershire County Council's website (including walking, cycling and bus maps and timetables).

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1 Local Air Quality Management

This report provides an overview of air quality in Worcester City during 2014. 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 Worcester 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 D.1 in Annex D.

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 current AQMAs declared by Worcester 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 http://www.worcsregservices.gov.uk/pollution/air-quality/air-quality-management-areas.aspx.

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Pollutants and Air Quality Objectives	City / Town	One Line Description	Action Plan
Bridge Street/Dolday	NO_2 annual mean	Worcester	City Centre one way system	Air Quality Action Plan Progress Report for Worcestershire April 2013-2015
Lowesmoor/ Rainbow Hill			A key bus and commuter corridor into City	
St Johns			Key corridor on west side of river crossing	To be completed by 26th March 2016

2.2 Progress and Impact of Measures to address Air Quality in Worcester City

The Action Plan for Worcestershire identified a large number of potential actions for each of the Worcestershire AQMAs. It is recognised that it is not feasible to progress all of the identified actions simultaneously. In 2014 WRS carried out a prioritisation procedure for each AQMA in order to identify “priority actions” to progress first. The priority actions established for Worcester City are outlined in Table 2.2 below. NB no priority actions are shown for St Johns AQMA as the prioritisation process was undertaken prior to the declaration of that AQMA:

Table 2.2 Priority actions for Dolday/Bridge Street, Lowesmoor and Rainbow Hill areas

AQMA/Area	AQAP Action no.	Action
Dolday/Bridge Street AQMA	5.1.7	Improvement of Signage to avoid AQMA
	5.2.2	Freight Quality Partnership
	DD3/5.1.1	Alteration to traffic light phasing
	DD5/5.2.1	Bus Quality Partnership
Lowesmoor	5.1.1/LRH5	Loading and unloading restrictions during peak times
	5.1.7	Improvement of signage to avoid AQMA
	5.2.1	Bus Quality Partnership
	5.2.2	Freight Quality Partnership
Rainbow Hill	5.2.1	Bus Quality Partnership
	5.1.1/LRH5	Loading and unloading restrictions during peak times
	5.3.4	Promote Flexible Working Arrangements
	5.1.4	Variable Message Signage

In November 2014 Worcestershire County Council produced a technical discussion paper for the Worcester urban area which presented a number of transport-focused options for each area, with the focus on improving air quality. It is apparent from the technical discussion paper that the problem of air quality in the city centre is tied in with farther reaching issues involving local transport strategy and accessibility in Worcester city centre. In light of this the sub-group considers that the progression of one or two of the priority actions as identified above in Table 2.2 would be ineffectual and that the focus should be on securing the inclusion of these, and other actions, in a wider low emission strategy for Worcester city, linked to, or forming part of, a city centre transport strategy or Masterplan. Further information, including a copy of the technical discussion document, is available within the 'Air Quality Action Plan Progress Report for Worcestershire April 2013-2015' via http://www.worcsregservices.gov.uk/pollution/air-quality/air-quality-action-plan.aspx.

WCC has taken forward a number of measures during the current reporting year of 2015 in pursuit of improving local air quality. Details of progressed actions to 30th April 2015 are set out in Table 2.3. Full details on all these and non-progressed or feasible measures can be found in the 'Air Quality Action Plan Progress Report for Worcestershire April 2013-2015' at http://www.worcsregservices.gov.uk/pollution/air-quality/air-quality-action-plan.aspx.

In addition to the AQAP measures there are a number of actions being undertaken by Worcestershire County Council as part of Local Transport Plan that, although not designed to provide specific improvements in AQMA's, will have general air quality benefits in Worcester. These are set out in Table 2.4 below.

Key completed measures for last 12 months to 30th April 2015 are:

- 'Implementation of the Lowesmoor Improvement Scheme' – completed 11th January 2015 by Worcestershire County Council. Key Outcomes – Enforcement of existing Traffic Regulation Order to reduce traffic and congestion within AQMA. Initial results indicates achieved reductions of 74% in vehicles travelling eastbound out of the city centre during afternoon peak times and 90% reduction in vehicles travelling westwards along Lowesmoor and using the bus gate to access the city centre.

- 'Alteration of traffic light phasing in Dolday/Bridge Street AQMA' – completed late 2014 by Worcestershire County Council. Key outcomes – County Council data demonstrates reduction in queuing times.

- 'Variable Message Signage' for car parking availability in city – completed in 2014 by Worcestershire County Council. Key outcomes - direct drivers to car parks with free spaces reducing the number and length of trips drivers make on city centre

- 'Availability of air quality information' – completed in 2014 by Worcestershire Regulatory Services. Key outcomes – annual air quality reports to Defra since 2010, plans of AQMA and declarations or revocations, countywide AQAP and update, Steering group minutes made available to view and download from WRS website. Finalised version of future documents will be added as they are produced.

Priorities for 2015/16 for air quality improvements in Worcester City as at 30th April 2015 are:

- Promoting requirement and gaining political agreement for a ‘Worcester City centre transport strategy and Masterplan’ incorporating a ‘Lowering Emissions Strategy’.

- Submitting a ‘bid to the Low Emissions Bus Scheme’ (LEBS) to retrofit lower Euro standard buses on city centre routes or replace with Ultra Low Emission Vehicles (ULEV). Subject to support of local bus operators a major LEBS bid will be submitted by end of October 2015.

- Supporting proposals for a joint bid between Birmingham City Council and Bromsgrove & Redditch Borough Councils for funding from the Office of Low Emission Vehicles (OLEV) to carry out ‘feasibility studies for the installation of a compressed natural gas filling facility’ in Worcestershire, and three sites in Birmingham. Although, not specifically applicable to WCC such a facility could have a beneficial impact across the county.

- Completion and adoption of ‘Supplementary Planning Document for Air Quality’ to enshrine current air quality recommendations in policy.

Table 2.3 - Progress on Select Measures to Improve Air Quality to 30th April 2015

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
5.1.1/DD3	Alteration to Traffic Light Phasing in and around Dolday	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, inc Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	Worcestershire County Council	2014	2014	Improved flow of traffic around Dolday. Reduction in queuing times.	1-2%	Action completed by Worcestershire County Council in 2014. County Council data demonstrates reduction in queuing times.
5.1.1	Alteration to phasing of traffic light systems (Lowesmoor)	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, inc Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	Worcestershire County Council	2013-2014	2014-2015	Improved flow of traffic through Lowesmoor. Reduced congestion. Reduced volume of traffic.	5-10%	Implementation of bus gate enforcement went live on 11th January 2015. Vehicles not fitted with appropriate transponder are held at traffic lights for 10 mins discouraging them from using the bus lane to access city centre via Lowesmoor. Initial data indicates a 90% reduction in non-permitted vehicles using the bus gate and a 74% reduction in non-permitted vehicles travelling along Lowesmoor during restricted peak times.
5.1.4	Variable Message Signage (includes traffic info, car park info, bus and rail connection info etc.)	Traffic Management	UTC, Congestion Management, Traffic Reduction	County Council, District Council	2016 onwards	2017 onwards	Increase in number of VMS boards, increased uptake of alternative modes of transport	1-2%	Worcestershire County Council has installed VMS boards to direct drivers to car parks with free spaces in 2014. This has reduced the number of trips being made between car parks as drivers look for spaces. Inclusion of VMS real time travel information boards has been secured as part of development of a new Waitrose on London Road. County Council currently progressing scheme to provide VMS boards in bus stops along major routes in the city to provide real time travel information.
5.1.5/LRH5	Loading and unloading restrictions during peak traffic times (Lowesmoor)	Traffic Management	UTC, Congestion Management, Traffic Reduction	Worcestershire County Council, District Council	2015-2016	2018-2019	Introduction and implementation of TRO during peak times. Reduced incidence of loading and unloading during peak times and therefore improved flow/reduced congestion.	5-10%	Identified as priority action following completion of WRS prioritisation matrix. Discussed by Steering Group who agreed action to be investigated further.

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
5.1.7	Improvement of signage for traffic to avoid AQMA	Traffic Management	UTC, Congestion Management, Traffic Reduction	Worcestershire County Council	2013	2014-2031	Decrease in traffic flows through AQMA. Decrease in number of strategic journeys through AQMA	5-10%	This action forms part of wider Worcester A4440 improvement works. The A4440 improvement works are currently underway
5.2.1	Bus Quality Partnership (as part of a City Centre Accessibility Masterplan Strategy and combined Low Emission Strategy) or via Low Emission Bus Scheme bid	Vehicle Fleet Efficiency	Vehicle Retrofitting programmes	Worcestershire County Council	2015 – LEBS Bid 2016-2017 For voluntary BQP if LEBS bid is unsuccessful	2016-2017 If LEBS bid successful 2018 onwards For voluntary BQP is LEBS bid is unsuccessful	Elimination of lower Euro standard buses on city centre routes (which Euro Standards to be agreed should political support for such an action be secured) by as yet unknown date. Major conversion of fleet to ULEVs.	5-25%	The Sub-Group has considered a number of potential ideas for bus provision in Worcester City including removal of the bus station and introduction of a City Centre Bus Loop. The Sub Group identified root issue for Worcester City is a lack of a Masterplan for the City Centre. The Group agree that best way forward is to promote and facilitate the development and implementation of a Masterplan for Worcester City with a combined Low Emission Strategy to incorporate provision for bus quality partnerships. Initiation of LEBS bid process Apr 2015. Subject to support of local operators a major LEBS bid will be submitted by end October 2015.
5.2.2	Freight Quality Partnership (work with sat nav providers)	Traffic Management	UTC, Congestion management, traffic reduction	Worcestershire County Council	2015	2016 onwards	Significant reduction of strategic freight diverted away from AQMA.	5-25%	Steering Group identified that use of Worcestershire County Council Lorry Route Advisory Map has declined significantly in recent years due to now almost universal use of sat nav systems. Group agree should focus on working with sat nav data providers to ensure that HGVs are routinely routed around AQMAs.
5.2.4	Railway Enhancements	Transport Planning & Infrastructure	Public transport improvements – interchanges stations and services	Worcestershire County Council, Network Rail	2013	2018	Completion of new Worcester Parkway rail station. Increased use of Worcester Foregate Street station following refurbishment.	<1%	Refurbishment of Worcester Foregate Street train station has recently taken place and a new Railway Station - to be called Worcester Parkway - has been approved and is scheduled to be completed in 2017.

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
5.2.5	Greening Council and Business Fleets	Promoting Low Emission Transport	Public Vehicle Procurement – Prioritising uptake of low emission Vehicles	Worcestershire County Council, in combination with the District Councils	2015-2016	2016 onwards	Increase in number of Council and business fleet vehicles of higher Euro Standard and/or utilising alternative fuels	<1%	Steering Group supporting proposals for a joint OLEV bid between Birmingham City Council and Bromsgrove & Redditch Borough Councils for funding to carry out feasibility studies for the installation of a compressed natural gas filling facility in Worcestershire, and three sites in Birmingham. Although not specifically applicable to WCC such a facility may offer the opportunity for improvements to other Districts.
5.2.10	Installing electric vehicle charging points	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	Worcester City Council, Worcestershire County Council	2013	2014 onwards	Increase in availability of EV charging points and corresponding increase in use of electric vehicles	1.50%	Installation of EV charging points are routinely recommended by WRS for inclusion on relevant planning consents to all LPAs in Worcestershire. Two EV charging points are available in St Martins Gate City Council car park. Worcestershire Regulatory Services is currently working towards formalising air quality recommendations as policy with the various Worcestershire LPAs
5.3.1	Travel Planning	Promoting Travel Alternatives	Personalised Travel Planning	Worcestershire County Council	2014-2015	Easter 2015 onwards.	Increase in uptake of personal travel planning services. Change in behaviour towards more sustainable modes of transport.	<1%	Based on success of Choose How You Move campaigns Worcestershire County Council are currently developing the provision of personal travel planning service for roll out across the County. The service will charge developers for the delivery of travel plans at new developments rolling out with the South Worcester Development Plan developments from Easter 2015
5.3.2	Encourage car sharing	Alternatives to private vehicle use	Car & lift sharing schemes	Worcestershire County Council	2014-2015	Autumn 2015 onwards.	Increase in number of people car sharing	<1%	Worcestershire County Council is developing a new website, Liftshare, which promotes and facilitates Car Share use. Liftshare is successfully operating in many other parts of the Midlands.
5.3.7	Install secure cycle parking shelters	Promoting Travel Alternatives	Promotion of cycling	Worcestershire County Council	2015-2016	2015 onwards	Increase in number of secure cycle parking shelters in City, increase in use of secure cycle parking shelters	<1%	Worcestershire County Council has advised whilst WCC currently has excellent provision of secure cycle parking shelters they are at capacity and more are required. Additional secure cycle parking shelters are being installed in Worcester City Centre as part on on-going and upcoming developments. In 2015 additional cycle parking will be installed as part of the Cattle Market development and options to increase capacity at Worcester Foregate Street rail station are being explored.

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
5.3.8	Promote and support walking and cycling initiatives in Worcestershire	Promoting Travel Alternatives	Personalised Travel Planning	County Council, District Council, Climate Change Officer	2015-2016	Easter 2015 onwards	Change in behaviour to more sustainable modes of transport e.g. walking, cycling, public transport	1%	Based on success of Choose How You Move campaigns Worcestershire County Council are currently developing the provision of personal travel planning service for roll out across the County.
5.3.9	Smarter Choices - Choose How You Move marketing initiatives	Promoting Travel Alternatives	Personalised Travel Planning	Worcestershire County Council, in combination with Worcester City Council.	2002-2003	2004	Change in behaviour towards more sustainable modes of transport.	<1%	Based on success of Choose How You Move campaigns Worcestershire County Council are currently developing the provision of personal travel planning service for roll out across the County from Easter 2015
5.4.4	Make air quality information more available and accessible	Public Information	Via the Internet	WRS	2013 onwards	2013 onwards	Improved availability of air quality information. More information proactively published on website.	<1%	All LAQM reports to DEFRA from 2010 now available via WRS website along with general air quality information, steering group information and information about the AQMAs.
5.4.5	Raise the profile and increase awareness of air quality within the region	Public Information	Via other mechanisms	Worcester City Council, Worcestershire County Council	2013	2014 onwards	Increased awareness at District, County and general public levels of air quality issues across the County	<1%	The inception of the Air Quality Steering Group and on-going liaison with Worcestershire County Council has resulted in increased awareness of air quality issues and what they mean within the district and county councils. Work undertaken at Lowesmoor in Worcester City following the inception of the Lowesmoor "Air Pollution Control Zone" and associated enforcement of existing TROs resulted in local press coverage and a general increase in awareness of air quality issues with the general public.
5.5.1	Produce Air Quality Supplementary Planning Document	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	WRS	2014	2015 onwards	Formally adopted and utilised AQ SPD at all six LPAs across Worcestershire	<1%	Development of SPD for Air Quality started and on-going

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
5.5.3	Encourage uptake of employer and residential travel plans for major employers and new developments to area	Promoting Travel Alternatives	Other	Worcestershire County Council, Worcester City Council	2015-2016	Easter 2015 onwards.	Increase in uptake of personal travel planning services. Change in behaviour towards more sustainable modes of transport.	<1%	Based on success of Choose How You Move campaigns Worcestershire County Council are currently developing the provision of personal travel planning service for roll out across the County. The service will charge developers for the delivery of travel plans at new developments rolling out with the South Worcester Development Plan developments from Easter 2015
5.5.4	Encourage developers to provide sustainable transport facilities and links serving new developments	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	Worcester City Council, Worcestershire County Council	2013	2014 onwards	Greater provision of sustainable transport facilities and links servicing new developments	<1%	Installation of electric vehicle charging points, or EV ready points and provision of secure cycle stores is routinely recommended by WRS through the planning consultation process. In addition Worcestershire County Council are rolling out a personalised travel planning service to new developments from Easter 2015
5.6.3	Air Quality Networks	Policy Guidance and Development Control	Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	Worcester City Council, WRS	2014	2014 onwards	Improved cross boundary working between local authorities in Worcestershire	<1%	WRS represents the air quality interests of the six district authorities across Worcestershire. This has allowed for better management of data, reporting and action planning across the county by allowing a more cohesive approach.
5.6.8	Forge closer links with local health agencies	Policy Guidance and Development Control	Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	Worcester City Council, WRS	2014	2014 onwards	Participation of relevant health agencies in the Worcestershire Air Quality Steering Group	<1%	Relevant health agencies continue to be invited to participate in the Worcestershire Air Quality Steering Group. Following initial interest there has been no representation at the Steering Group to date
5.6.9	Development of a Low Emission Strategy for Worcestershire	Policy Guidance and Development Control	Low Emission Strategy	Worcestershire County Council and Worcester City Council	2014 onwards	currently unknown due to infancy of scheme	Formal adoption and implementation of Low Emission Strategy	Currently unknown - dependant on what measures are included in any Low Emission Strategy and if political support for a Low Emission Strategy can be secured.	Worcestershire County Council Highways technical discussion paper received and reviewed. Identified wider transport planning issues with Worcester City centre which are intrinsically linked to air quality. Sub Group support proposal for a Worcester City Centre Masterplan with a combined Low Emission. Work towards promoting such a strategy with the aim of securing political support is in its infancy. In February 2015 air quality issues were promoted at the City Council Congestion Review & Scrutiny Group and the idea of a combined Masterplan and Low Emission Strategy mooted. There was general agreement with this approach.

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
NAWC1	Develop and implement Worcester City Centre Masterplan and combined Low Emission Strategy	Policy Guidance and Development Control	Low Emission Strategy	Worcester City Council with Worcestershire County Council	2014 onwards	Currently unknown due to infancy of scheme	Formal adoption and implementation of City Centre Masterplan and Low Emission Strategy	Currently unknown - will depend on the measures put in place as part of the Low Emission Strategy and wider Masterplan. Estimate emission reduction could be as high as 40%	Sub Group identified root issue for Worcester City is a lack of a Masterplan for the City Centre. The Group agree that best way forward is to promote and facilitate the development and implementation of a Masterplan for Worcester City with a combined Low Emission Strategy to incorporate provision for bus quality partnerships. Work towards promoting such a strategy with the aim of securing political support is in its infancy
LRH6	Number of bus routes and non pull-in stops in AQMA	Transport planning & Infrastructure	Bus route improvements	Worcestershire County Council	2015	2016	Location of bus stops changed to minimise congestion and traffic flow problems	1-5%	Bus stops temporarily moved out of Lowesmoor onto Lowesmoor Terrace, therefore outside of AQMA. Steering Group involved in on-going discussions about appropriate location of bus stops within the Lowesmoor AQMA.
LRH7	Traffic lights onto Lowesmoor Terrace cause congestion	Traffic Management	UTC, Congestion management, traffic reduction	Worcestershire County Council	2014	2015	Decreased in non-permitted vehicles along Lowesmoor at restricted times resulting in reduced volume of traffic and reduced congestion.	5-10%	As part of County Council Lowesmoor improvement scheme enforcement of existing TRO restricting access to buses and cycles during afternoon peak hours has been progressed. Vehicles other than buses and cycles are prohibited from travelling outbound along Lowesmoor. This reduces the volume of traffic, and therefore congestion, along Lowesmoor during afternoon peaks, a time which has been noted as being particularly bad for the area.

Table 2.4 – Local Transport Plan measures benefitting local air quality progress to 30th April 2015

Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date
Introduction of a Journey Time Management System (JTMS) around A4440.	Traffic Management	UTC, Congestion management, traffic reduction	Worcestershire County Council	2014	2015	Reduction in number of strategic trips through the city centre	1%-5%	JTMS planned as part of wider A4440 improvement works. Will be installed by June 2016
Worcester City Centre Transport Model	Transport planning & Infrastructure	Other	Worcestershire County Council	2014	2015	Development of Worcester City Centre Transport Model	0%	Worcestershire County Council developing a bid for a Worcester City Centre Transport Model to inform development of a Worcester City Centre Masterplan and combined Low Emission Strategy
Installation of noise and pollution bund along A4440 at Whittington	Transport planning & Infrastructure	Other	Worcestershire County Council	2014-2015	2031	Installation of appropriate noise and pollution bund. Improvement in monitoring NO2 levels at properties protected by bund.	1-2%	Funding obtained for installation of bund. Installation of bund confirmed in wider A4440 improvement plans.
Signal improvements along Barbourne Road and The Tything	Traffic Management	UTC, Congestion management, traffic reduction	Worcestershire County Council	2015-2016	2017	Improved flow of traffic along arterial route into city centre. Reduced congestion and queuing time.	currently unknown	Upgrading of signal system incorporated into County Plan and funding available.
Improvement/enhancement of highway network within vicinity of Shrub Hill rail station.	Traffic Management	UTC, Congestion management, traffic reduction	Worcestershire County Council	medium-term	medium-term	Improved flow of traffic on local network, reduced congestion and queuing time.	currently unknown	Improvement/enhancement work forms part of medium-term plan for County Council

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

Local Authorities are expected under Chapter 7 of Policy Guidance LAQM.PG(16) to work towards reducing emissions and/or concentrations of pollutant $PM_{2.5}$. There is clear evidence that particulate matter ($PM_{2.5}$) has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

There are no automatic $PM_{2.5}$ monitoring stations currently within Worcestershire and the nearest AURN $PM_{2.5}$ monitoring station is Birmingham Acocks Green site situated approximately 33km north east to Worcester City Council's boundaries.

Therefore, WCC has reviewed Defra's national background maps to identify projected $PM_{2.5}$ concentrations within the Local Authority's boundary in the calendar year for 2014. The average of total $PM_{2.5}$ at 32 locations (centre points of 1km x 1km grids) within Worcester City is 10.77µg/m^3 with a minimum of 9.96µg/m^3 and a maximum of 12.46µg/m^3. This indicates that $PM_{2.5}$ concentrations in Worcester City are well below the annual average EU limit value for $PM_{2.5}$ of 25µg/m^3 (NB there is no regulatory standard for local authorities with respect to $PM_{2.5}$).

Table 2.1 and A.1 of LAQM.TG16 gives examples of measures that can be implemented to tackle $PM_{2.5}$. The following measures identified within the AQAP as priorities and shown in Table 2.2 above have synergies with the measures identified in LAQM.TG16:

Table 2.5 Progressed AQAP measures that reduce $PM_{2.5}$

Measure no	AQAP Measure	Measure Category	EU Measure Classification
5.3.1	Travel planning	Traffic Management	UTC, Congestion management, traffic reduction
5.3.9	Smarter Choices – Choose how you Move Marketing Initiatives	Promoting Travel Alternatives	Personalised Travel Planning
5.3.8	Promote and support walking and cycling initiatives in Worcestershire	Promoting Travel Alternatives	Promotion of Cycling
5.3.8	Promote and support walking and cycling initiatives in Worcestershire	Promoting Travel Alternatives	Promotion of Walking
5.2.4	Railway Enhancements	Transport Planning & Infrastructure	Public transport improvements – interchanges stations and services
5.3.7	Install secure cycle parking shelters	Transport Planning & Infrastructure	Cycle network
5.3.2	Encourage Car Sharing	Alternatives to private use	Car & Lift sharing schemes
5.69	Development of a Low Emission Strategy for Worcestershire	Policy Guidance and Development Control	Low Emissions Strategy
5.2.2	Freight Quality Partnership (work with sat nav providers)	Freight and Delivery Management	Route Management Plans/Strategic routing strategy for HGV's
5.2.1	Bus Quality Partnership (as part of a City Centre Accessibility Masterplan Strategy and combined Low Emission Strategy) or via Low Emission Bus Scheme bid	Vehicle Fleet Efficiency	Promoting low emission public transport
5.2.1	Bus Quality Partnership (as part of a City Centre Accessibility Masterplan Strategy and combined Low Emission Strategy) or via Low Emission Bus Scheme bid	Vehicle Fleet Efficiency	Promoting low emission public transport

At the time of writing this report, the above Policy Guidance is currently at consultation stage and the role for local authorities in reducing emissions of $PM_{2.5}$ is not yet established. Therefore, WCC has not yet determined what additional, if any, measures the Council, in collaboration with other stakeholders, could implement to reduce emissions at this time. It is anticipated the Council will address this issue more fully in 2016.

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

Worcester City Council did not operate any automatic (continuous) monitoring sites during 2014. There are no national monitoring sites (e.g. AURN) within Worcestershire.

3.1.2 Non-Automatic Monitoring Sites

WCC undertook non- automatic (passive) monitoring of NO_2 at 35 sites during 2014. Table A.1 in Appendix A shows the details of the sites.

Maps showing the locations of the monitoring sites are provided as Figures A.1 to A.8 in Appendix A. 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)

For diffusion tubes, the full 2014 dataset of monthly mean values is provided in Table B.1 Appendix B. Table B.2 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.

Table 3.1 below provides a summary of measured exceedances in 2014 (annualised where necessary) or borderline locations, whether representative of relevant exposure and within an existing AQMA or not.

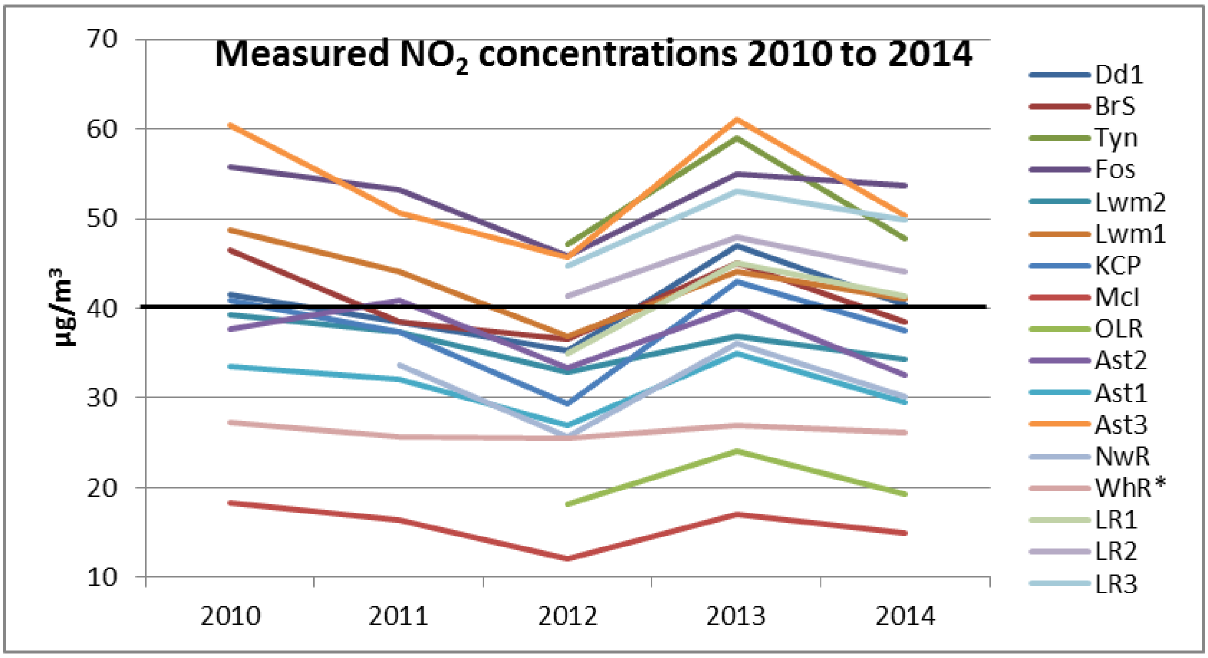
Table 3.1 Summary of measured exceedances and borderline results in 2014

Site ID	Within AQMA Y/N	Bias Adjusted Measurement ($\mu g/m^3$)	Adjusted for distance to relevant exposure ($\mu g/m^3$)
But 1	N	**48.74**	**48.74**
But2	N	**47.36**	**47.36**
DD1	Y – Dolday/Bridge Street	**40.39**	N/A
DDASH	Y – Dolday/Bridge Street	**41.86**	37.8
BrS	Y – Dolday/Bridge Street	38.41	32.1
BrS2	Y – Dolday/Bridge Street	**48.92**	**48.92**
Tyn3	N	38.82	38.82
Tyn2	N	**50.98**	**49.8**
Tyn	N	**47.71**	**46.0**
Fos2	N	39.05	38.5
Fos	N	**53.61**	**48.6**
Lwm1	Y – Lowesmoor/Rainbow Hill	**41.09**	38.1
StJ1	Y – St Johns	**46.06**	**45.0**
StJ3	Y – St Johns	**41.18**	39.8
Ast3	Y – Lowesmoor/Rainbow Hill	**50.30**	37.6
WhR	N	**41.30**	25.9
LR1	N	39.21	35.3
LR2	N	**44.14**	37.0
LR3	N	**49.88**	**47.9**
LR5	N	**45.51**	**45.51**
LR4	N	39.58	34.0
SidFG	N	**42.13**	35.6

The table above indicate there have been exceedances of the annual average air quality objective (AQO) for NO_2 or concentrations recorded within 5% of the AQO at 22 of the 35 monitoring locations in 2014. However, when taking into consideration the proximity to relevant exposure only 9 locations demonstrate exceedances with 4 more within 5% of the AQO in 2014. Of these, 4 locations are within existing AQMA's, 7 are located in a city centre area (Foregate Street/The Tything/The Butts) currently subject of an on-going Detailed Assessment and 2 locations are in an area, London Road, that will be subject to further assessment in the latter half of 2016.

Figure 3.1 below demonstrates the five year trend for NO_2 concentrations where available.

Figure 3.1 – Long Term Trend Graph of NO_2 concentrations at monitoring locations of 3 years or greater.



*WhR – trend shown of concentrations after calculating back to relevant receptor

Figure 3.1 demonstrates there has been a general reduction in 2014 from 2013 across the district but overall there is no discernible trend in concentrations.

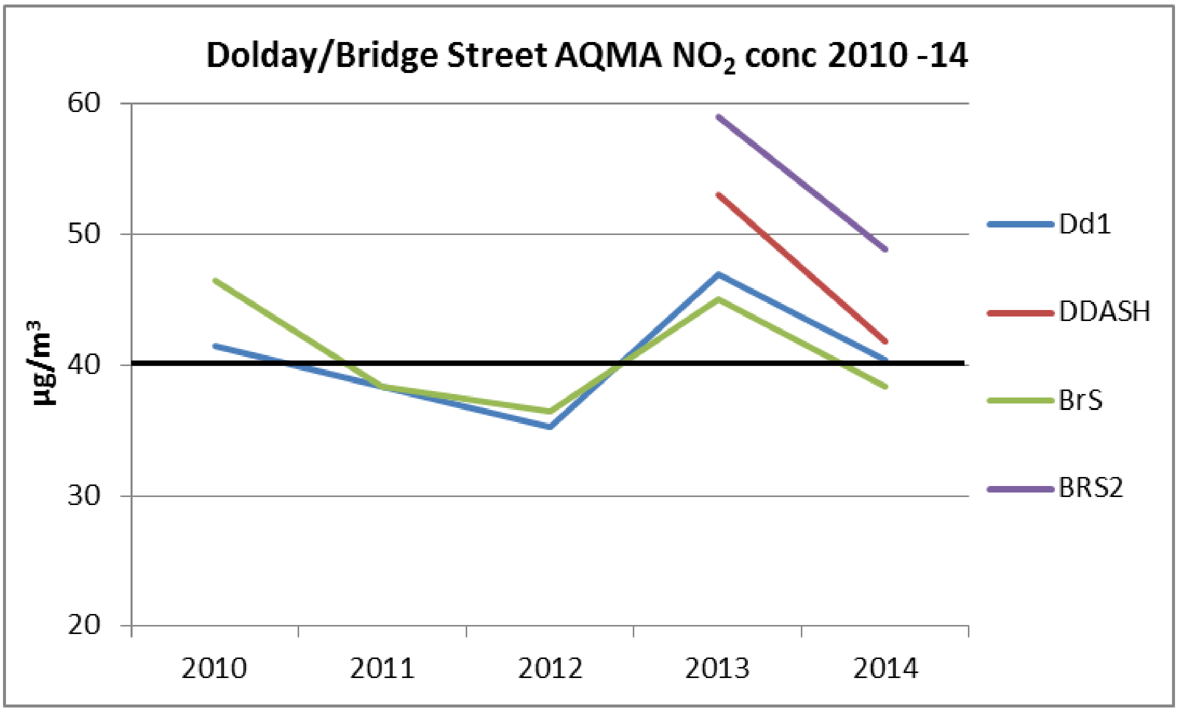
No annual means greater than 60µg/m^3 have been recorded indicating it is unlikely there have been any exceedances of the 1-hour mean objective at these sites.

Dolday/Bridge Street AQMA

Exceedances have been recorded at two of the four monitoring locations within the AQMA in 2014 although only one of these, Loc. BrS2, is representative of relevant exposure.

Figure 3.2 below demonstrates the five year trend for concentrations within the AQMA.

Figure 3.2 – Long Term Trend Graph of NO_2 concentrations in Dolday/Bridge Street AQMA

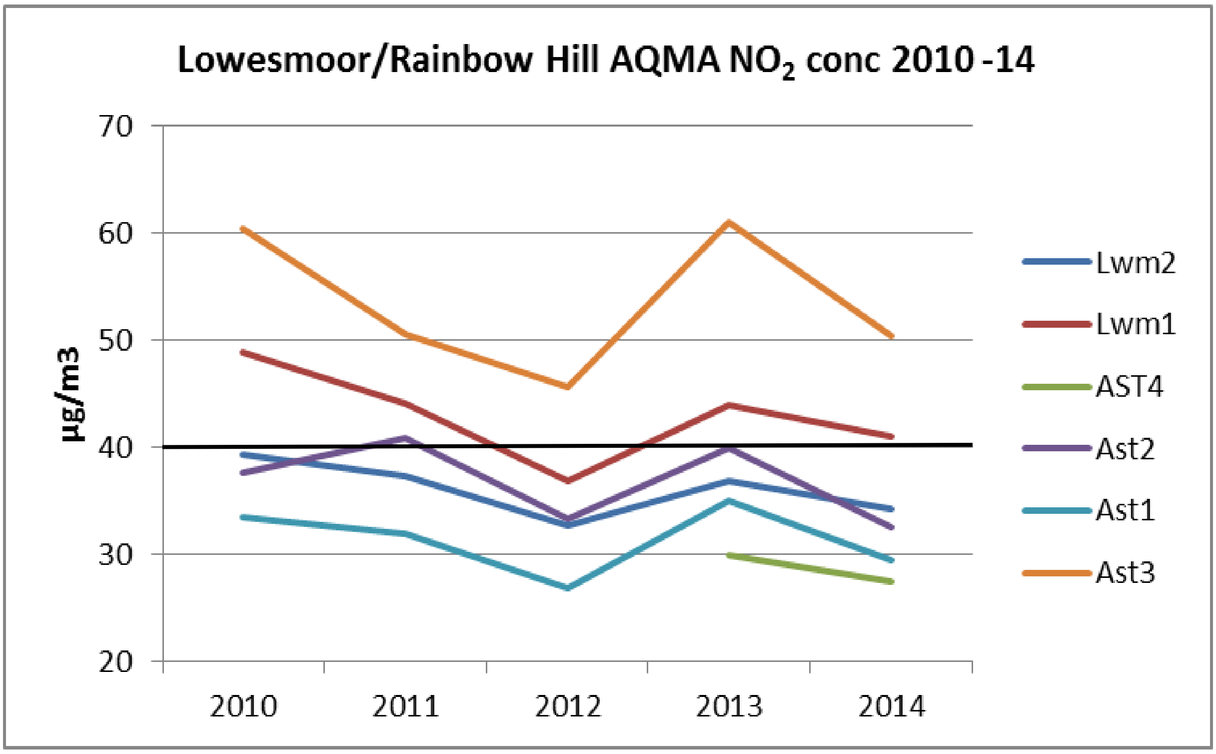


Concentrations within the AQMA demonstrate a similar picture to the overall trend across the district, a reduction from 2013 highs but no discernable trend across a longer timeline.

Lowesmoor/Rainbow Hill AQMA

No exceedances have been recorded within this AQMA in 2014, when taking concentrations at nearest releveant receptor into consideration, and the highest recorded concentration of 38.1µg/m^3, Loc. Lwm1, is just within 5% of the AQO. Figure 3.3 below demonstrates the five year trend for bias adjusted measured concentrations (not adjusted for nearest receptor) within the AQMA. Again this demonstrates a reduction from highs recorded in the previous year but no discernable long term trend.

Figure 3.3 – Long Term Trend Graph of NO_2 concentrations in Lowesmoor/Astwood Road AQMA



St Johns AQMA

Two of the five monitoring locations, StJ1 and StJ3, within this new AQMA have measured an exceedance or concentration within 5% of the objective in 2014. Four of the five monitoring locations were only introduced for 2014, thus no direct comparison with previous years can be made. The five year trend data for Loc. KCP is included in Table B.2 in Appendix B. The data demonstrates a reduction from highs recorded in 2013 but no other discernable long term trend at this location.

Foregate Street/The Tything/The Butts, Worcester Study Area

A Detailed Assessment is currently underway of these city centre streets, located to the north of Dolday/Bridge Street AQMA, to determine if declaration of a new AQMA is required. In preparation for the planned assessment eight new monitoring locations were erected for 2014 and retained in 2015. Of the current ten locations within the Study area five demonstrated exceedances and two more measured concentrations within 5% of the AQO in 2014 when proximity to nearest receptors is taken into consideration. Long term trends for the established monitoring positions of Loc.Tyn and Fos are demonstrated in Figure 3.1 above. The detailed assessment has been delayed due to difficulties in establishing an automatic monitoring site within the study area to provide accurate data. This has now been resolved and monitoring within Foregate Street began in November 2015 and will run to end of June 2016. The assessment will be completed in the latter part of 2016.

London Road/Sidbury, Worcester Area

Two of the six monitoring locations demonstrated exceedances of the AQO in London Road, Worcester in 2014 after taking consideration of proximity to relevant receptors. Two of the monitoring locations were only erected for 2014 and the remaining four were established in 2012-13 thus no long term trend is discernable at this time. However, all six locations demonstrate a reduction in concentrations from 2013 as seen across the district. Results from previous years are included within Table B.2 of Appendix B.

A detailed assessment of the area, including automatic monitoring, was planned for the latter part of 2016 after completion of the Foregate Street monitoring period. However, at the time of writing there is emerging policy guidance from Defra introducing the possibility of fast tracking AQMA declarations. Thus, a decision on whether detailed assessment is required, or not, will be undertaken following the publication and consideration of new policy guidance and monitoring evidence later in 2016.

3.2.2 Particulate Matter (PM_{10})

Worcester City Council did not undertake any monitoring for PM_{10} within the local authority boundary and have not identified any new specific sources of particulates at this time.

Appendices

Appendix A: Monitoring Locations

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) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?
But1	Magdala Court, The Butts	Roadside	384776	255107	NO_2	N	0m	1.15m	N
But2	Magdala Court, The Butts	Roadside	384724	255086	NO_2	N	0m	1.67m	N
Dd1	Ambirak, Dolday 1 opposite bus station (WR1 3PL)	Roadside	384652	254986	NO_2	Y	N/A	2.18m	N
DDASH	Dolday unnumbered lampost opp All Saints House	Roadside	384682	254924	NO_2	Y	2m	2.33m	N
BrS	Bridge Street lamppost outside John Gwen House	Kerbside	384666	254818	NO_2	Y	2m	0.66	N
BRS2	Bridge Street Street Sign Opposite John Gwyne House	Roadside	384695	254840	NO_2	Y	0.25m	1.96m	N
Tyn3	No. 26 Upper Tything (LP opp KwikFit)	Roadside	384679	255998	NO_2	N	0.1m	2m	N
Tyn2	Lamp & Flag PH Upper Tything (LP) 934	Roadside	384767	255606	NO_2	N	FF 1.29m	2.28m	N
Tyn	925 - HAMMERCHILDS, Castle Street/The Tything	Roadside	384833	255461	NO_2	N	FF 1.29m	1.63m	N

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?
Fos2	Hewitt Recruitment, 35 Foregate Street (downpipe)	Roadside	384866	255367	NO_2	N	FF 1.36m	3.20m	N
Fos3	Café Mela, 22 Foregate Street (downpipe)	Roadside	384899	255329	NO_2	N	FF 1.03m	2.21m	N
Fos	Foregate Street at junction with Shaw Street (WR1 3QQ)	Kerbside	384941	255140	NO_2	N	FF 1.44m	1.0m	N
Crs1	My Coffee, 29 The Cross (downpipe)	Roadside	384967	255012	NO_2	N	FF 1.33m	3.35m	N
Swth1	Scope shop, St. Swithin's Street (downpipe	Roadside	385013	254987	NO_2	N	FF 1.33m	2.06m	N
Lwm2	Lowesmoor 2 Town End. Adj private shop	Roadside	385164	255134	NO_2	Y	FF 1.0m	1.86m	N
Lwm1	Lowesmoor 1 Rainbow Hill End outside 4 Seasons	Roadside	385268	255191	NO_2	Y	FF 1.0m	1.43m	N
Stj1	Scott of Tattoo, 1A St. Johns (downpipe)	Roadside	384137	254510	NO_2	N	FF 1.48m	2.7m	N
Brm2	10 Bromyard Road (downpipe)	Urban Background	383967	254481	NO_2	N	0m		N
KCP	King Charles Place outside bakery Lampost 5372 (WR2 5AJ)	Roadside	384016	254399	NO_2	N	0.25m	2.2m	N
Stj2	The Fortune House, 65 St. Johns (downpipe)	Roadside	384013	254356	NO_2	N	FF 1.53m	2.22m	N
Stj3	The Bell, 35 St. Johns (downpipe)	Roadside	384046	254424	NO_2	N	FF 1.53m	2.05m	N
McI	McIntyre Road lamppost outside last	Urban Background	383454	254606	NO_2	N	4.5m	1.24m	N

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?
	house before cemetary								
OLR	Oldbury Road junction with Henwick opp Co op	Roadside	383908	255353	NO_2	N	17m	2.22m	N
AST4	246 Astwood Road	Roadside	386097	256565	NO_2	N	0m	9.85m	N
Ast2	Astwood Road 2 lamppost between Green Lane/Church St	Roadside	385990	256365	NO_2	Y	4m	1.4m	N
Ast1	Astwood Road 1 lampost 125 at cemetary at junction New Chequers/Tintern	Roadside	386064	256518	NO_2	N	2m	1.53m	N
Ast3	Astwood Road 3 Rainbow Hill (WR3 8EU)	Roadside	385764	255968	NO_2	Y	6.62m	1.68m	N
NwR	Newtown Road 1 lamppost (7570) in hedgeline after bus stop prior to hospital roundabout junction of B4636 and B4638 (WR5 1SL)	Roadside	387867	254970	NO_2	Y	3.38m	2.48m	N
WhR	Whittington Road lamppost 12449 in layby LHS	Roadside	387512	252845	NO_2	N	20m	1.25m	N
LR1	London Road Lampost 6569 by Bargain Booze (WR5 1EY)	Roadside	385636	254158	NO_2	N	2.9m	1.63m	N
LR2	London Road Lampost	Roadside	385428	254238	NO_2	N	3m	1.45m	N

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?
	6561 by Royal Court (WR5 2DL)								
LR3	London Road traffic sign 572 for A58(City) (WR5 2DL)	Roadside	385357	254272	NO_2	N	0.5m	1.77m	N
LR5	London Road Bus stop SL6554 opp Bath Road (WR1 2HY)	Roadside	385325	254329	NO_2	N	0.25m	1.45m	N
LR4	London Road SL6565 adj No 61 (WR5 2DU)	Roadside	385525	254219	NO_2	N	3.1m	1.86m	N
SIDFG	Sidbury Street Sign outside Fisher German Estate Agents (WR1 2NT)	Roadside	385146	254474	NO_2	N	FF 3.94m	2.30m	N

(1) 0 if the monitoring site is at a location of exposure (e.g. installed on/adjacent to the façade of a residential property). FF indicates distance estimated to first floor receptors where applicable

(2) N/A if not applicable.

Maps of Monitoring Locations

Figure A.1 – Dolday/Bridge Street AQMA and The Butts Monitoring Locations

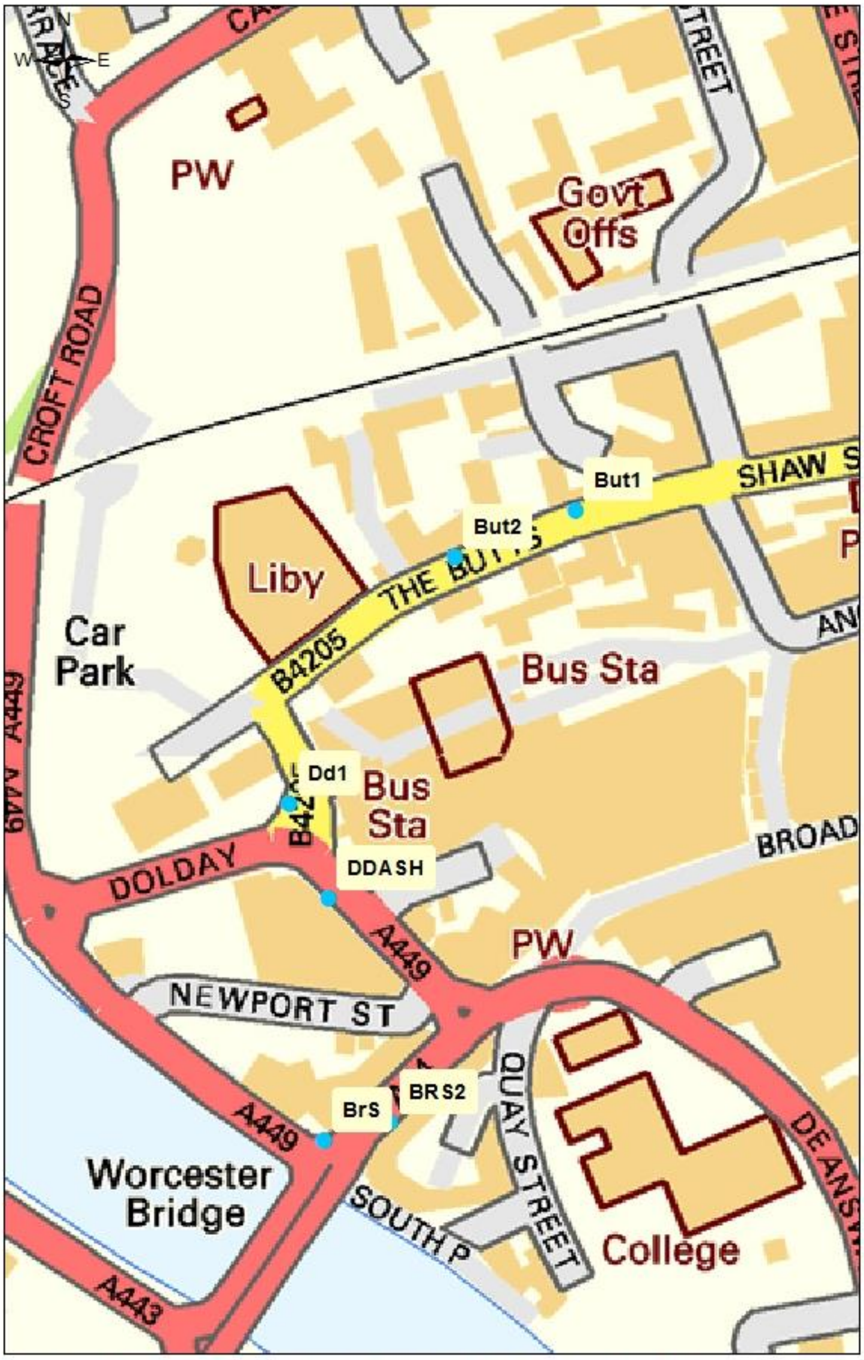


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Figure A.2 – The Tything Monitoring Locations

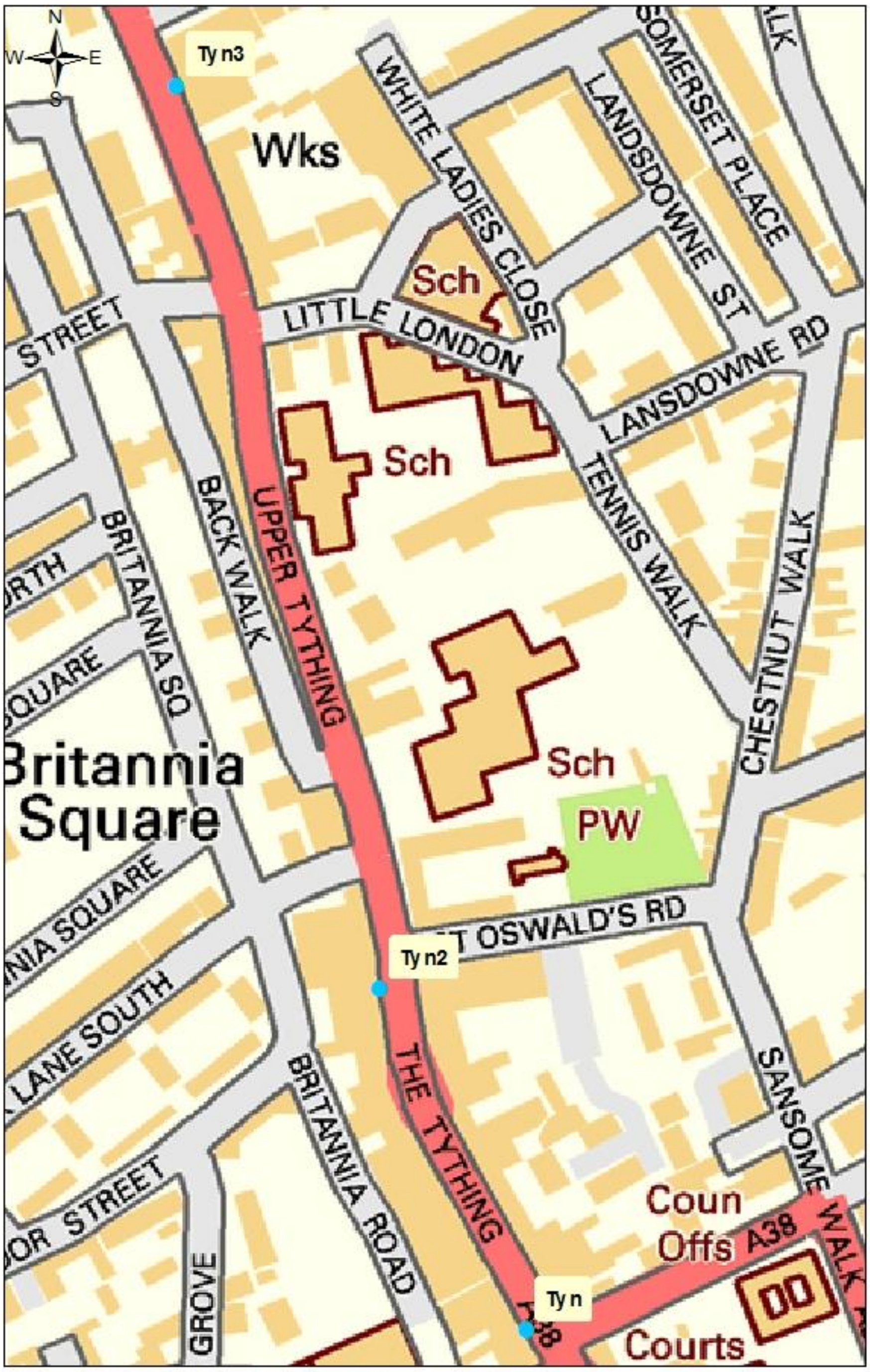

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Figure A.3 – Foregate Street and Lowesmoor AQMA Monitoring Locations

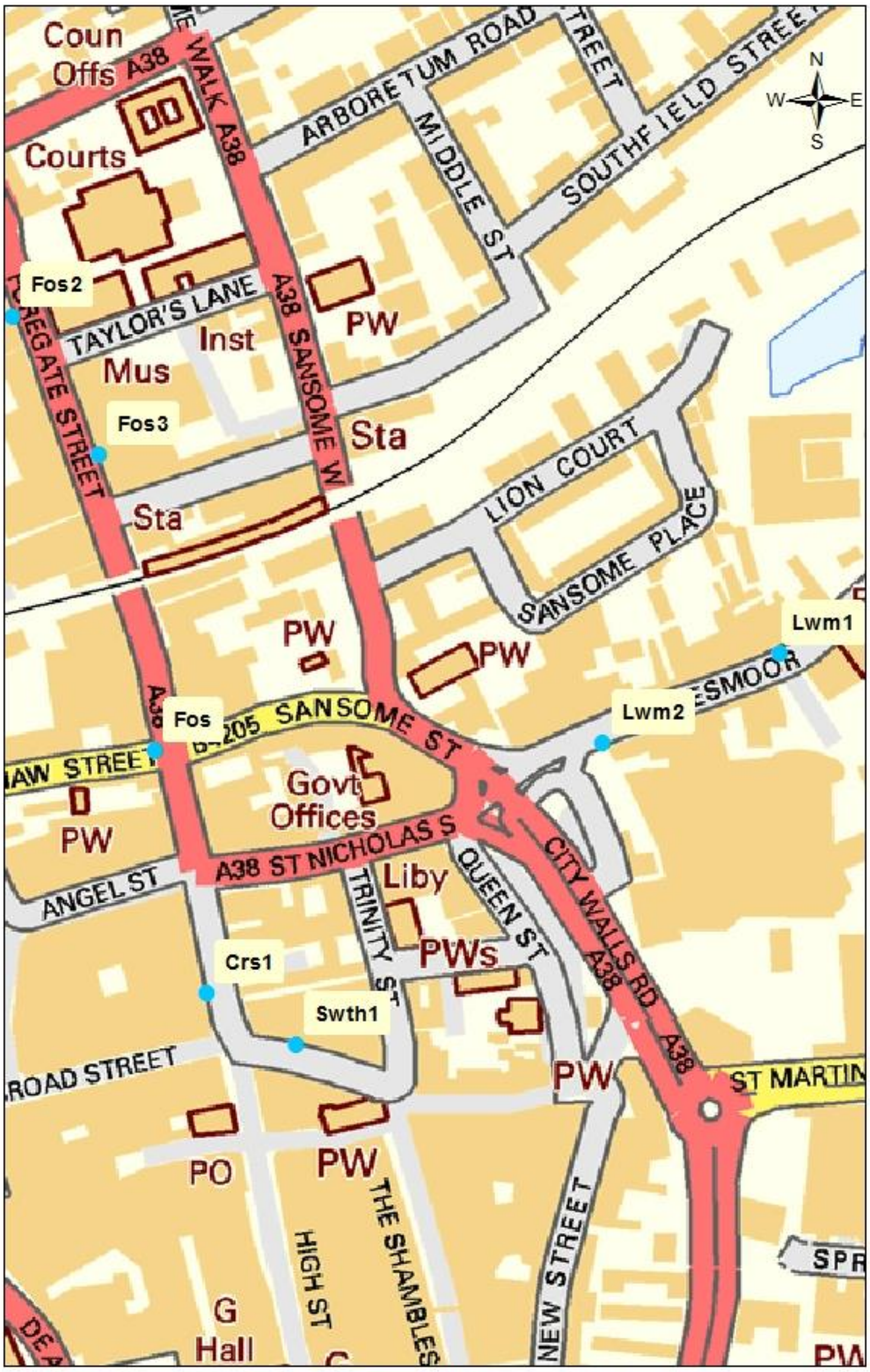

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Figure A.4 – St Johns AQMA Monitoring Locations

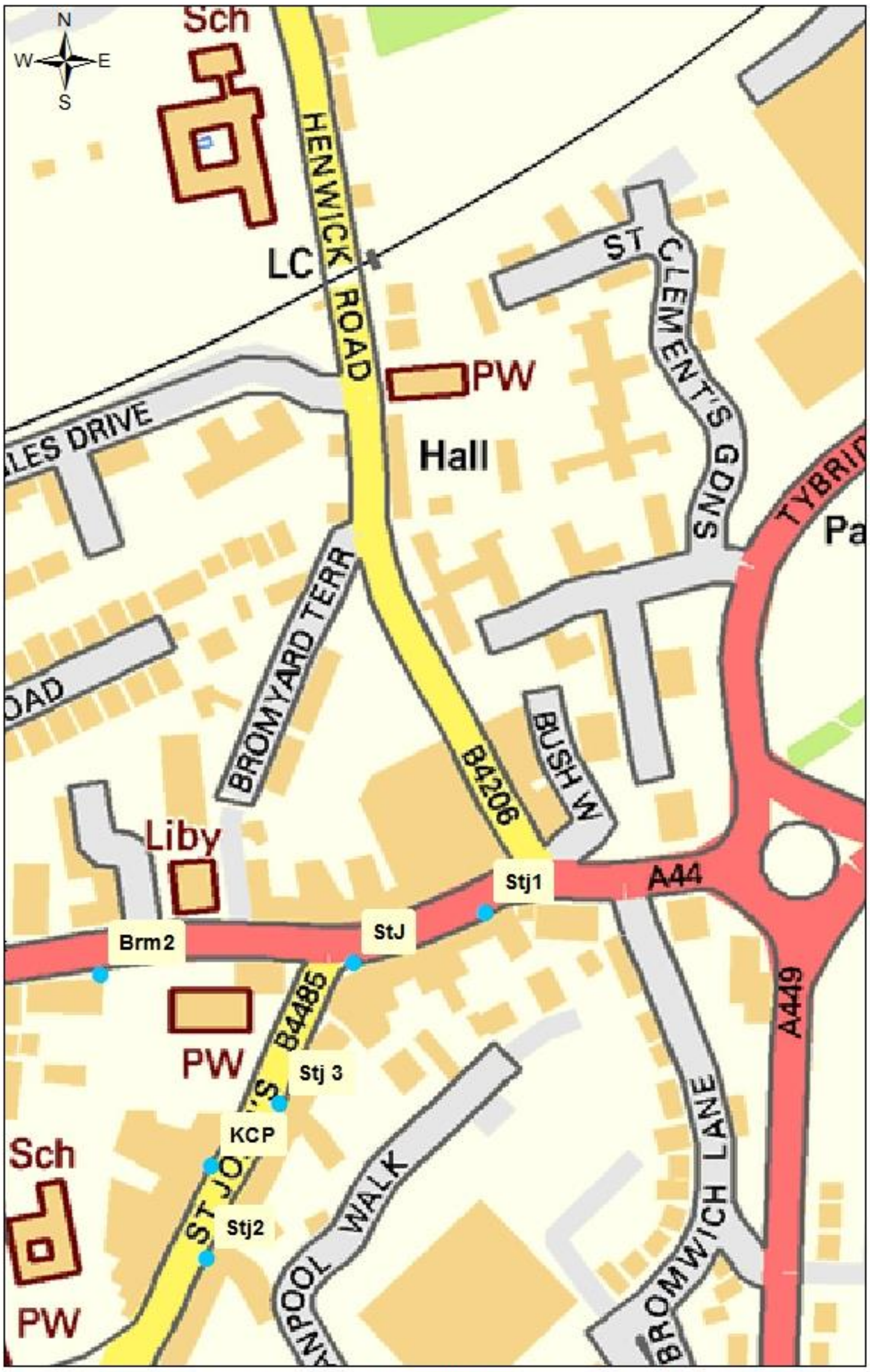

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Figure A.5 – McIntyre Road and Oldbury Road (West Worcester) Monitoring Location

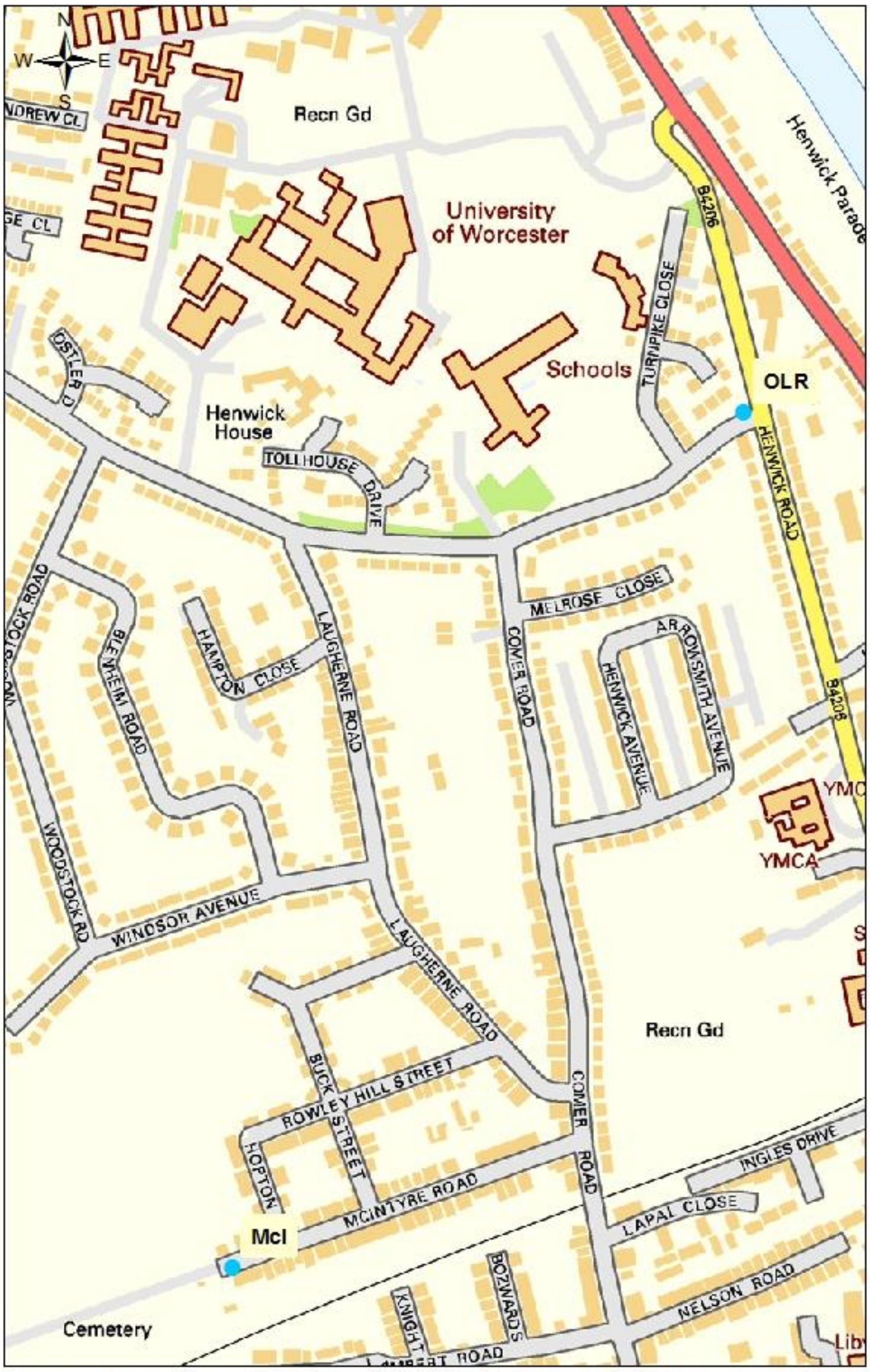

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Figure A.6 – Rainbow Hill AQMA Monitoring Locations

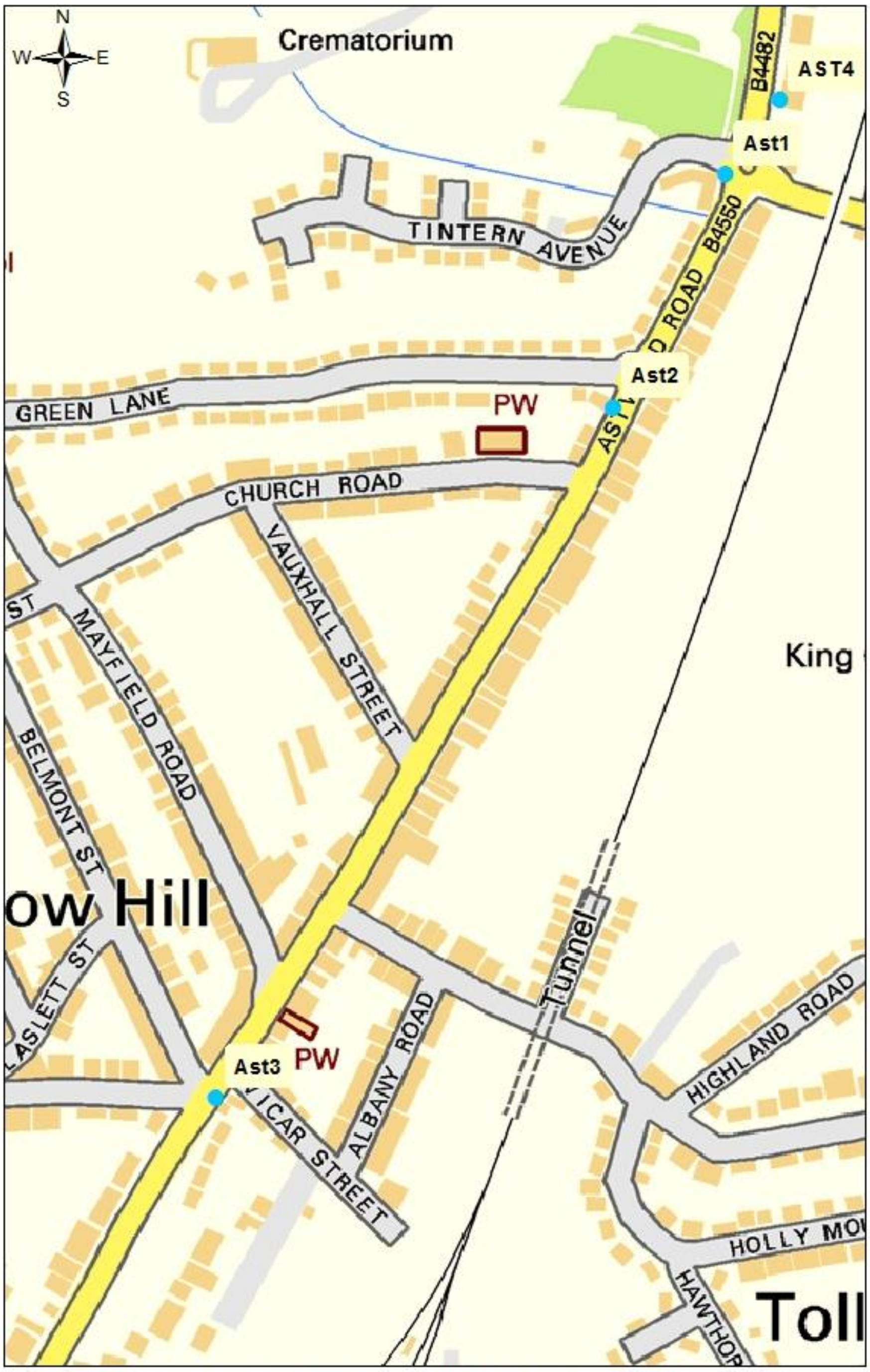

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Figure A.7 – Newtown Road and Whittington Road (East Worcester) Monitoring Locations

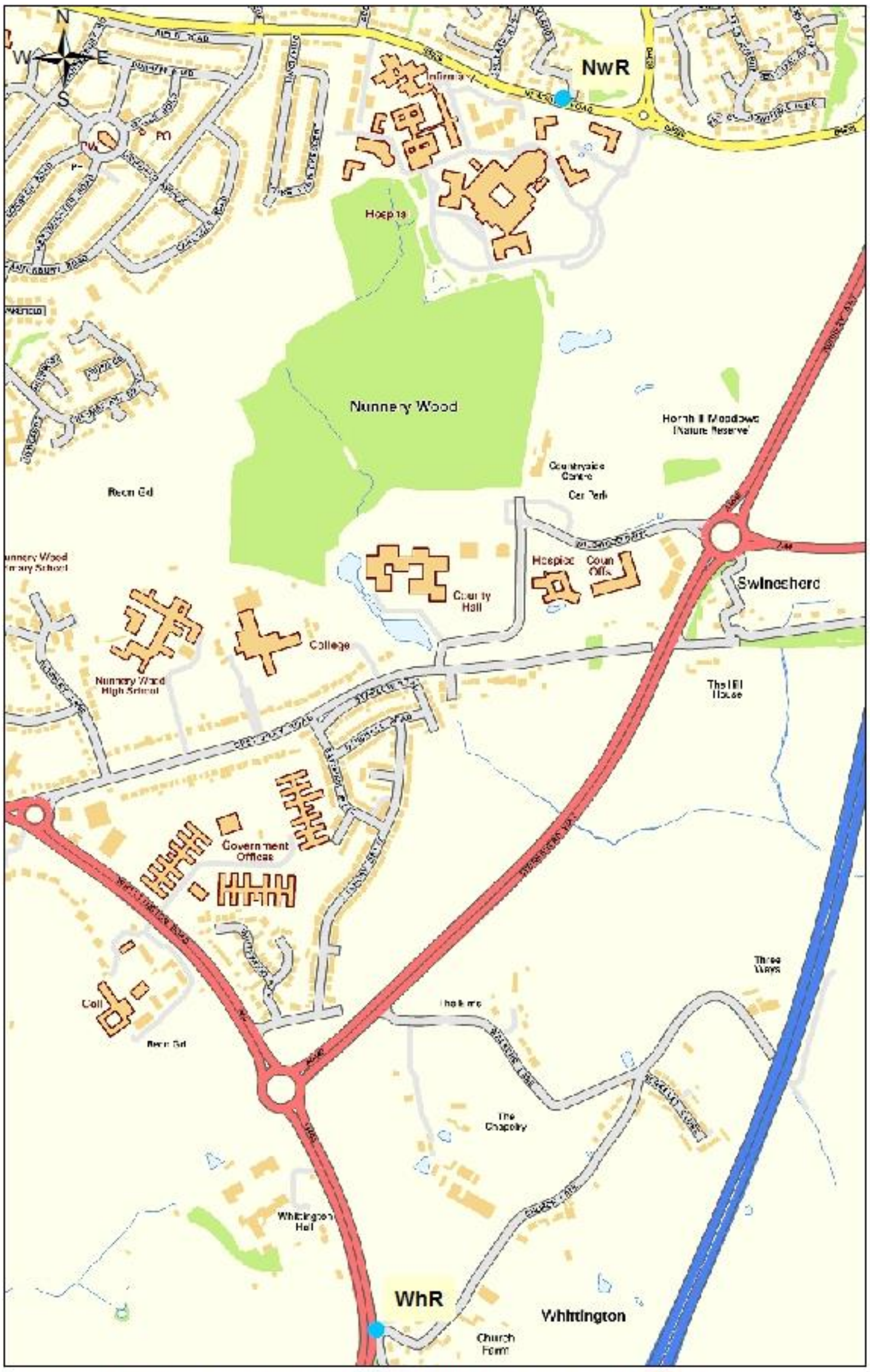

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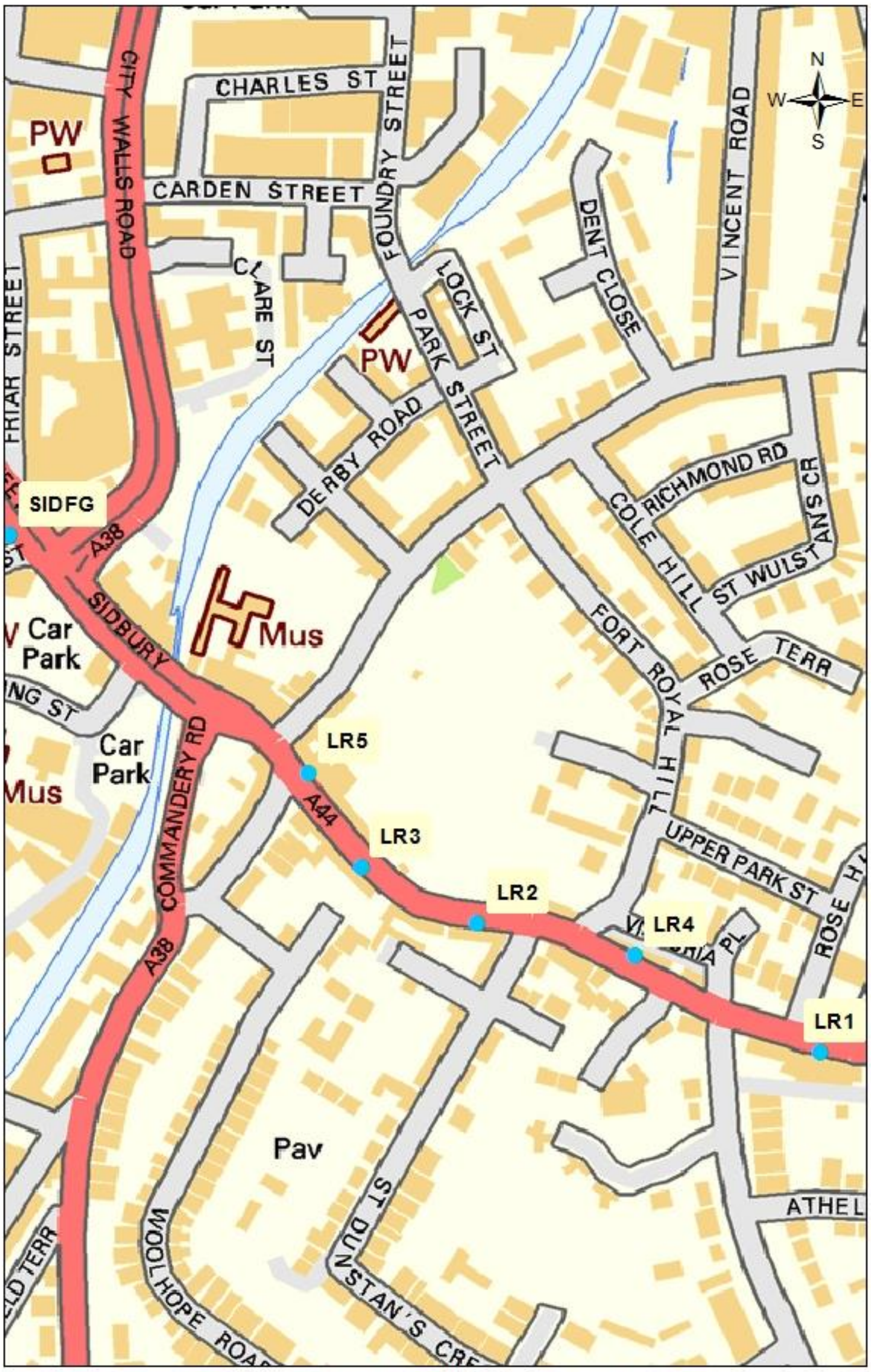
Figure A.8 – London Road and Sidbury Monitoring Locations



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Appendix B: Diffusion Tube Results

Table B.1 – NO_2 Monthly Diffusion Tube Results - 2014

Site ID	NO_2 Mean Concentrations (µg/m^3)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
													Raw Data	Bias Adjusted (1)
But1	40.88	43.72	69.59	60.32	36.98	57.87	60.35	47.31	68.59	54.58	58.95	58.04	54.76	**48.74**
But2	54.60	44.32	68.13	61.47						59.82	59.40	54.41	57.45	**51.13**
Dd1	41.74		51.67	50.29	45.63		45.01	33.94	50.31	43.56	46.89	44.79	45.38	**40.39**
DDASH	41.80	41.38	51.48		54.45	39.23	43.82	42.49	48.62		52.92	54.12	47.03	**41.86**
BrS	41.86	23.67	50.46	43.61	46.43	45.46	44.95	34.28	55.25	37.78	52.69	41.45	43.16	38.41
BrS2		45.03	66.32	46.57	59.83		54.76	41.30	62.46	53.08	63.30	56.96	54.96	**48.92**
Tyn3	54.29	40.94	54.33	46.82	45.57	40.48	41.86	30.03	46.95	39.24		39.29	43.62	38.82
Tyn2	67.61	50.64	64.99	61.34	60.00	49.73	48.40	48.16	50.41	63.36	59.76	63.00	57.28	**50.98**
Tyn	63.93	49.99	60.75	53.31	58.91	52.34	52.92	53.60	27.54	55.27	53.64	61.14	53.61	**47.71**
Fos2	54.96	41.65	54.03	45.60	44.08	35.18	34.73	36.94	37.22	43.79	54.05	44.34	43.88	39.05
Fos3		36.80		44.38	37.90	38.11	33.36	25.44	42.31	41.17	47.39	33.40	38.02	33.84
Fos	55.37	50.80	75.28	62.76	67.44	59.45	59.58	51.78	61.23	56.21	70.01	52.89	60.23	**53.61**
Crs1	46.92	46.06	53.24	42.33	36.52	26.26	31.81	37.17	39.64	38.89	54.32	48.91	41.84	37.24
Swth1		31.79	42.52	33.01	24.38	30.91	28.36	24.14		26.42	49.16	34.97	32.57	28.98
Lwm2	43.63	37.45	47.85	39.63	33.09	31.28	31.93	26.23	44.04	37.09	51.15	39.43	38.57	34.32
Lwm1	42.53		57.42	29.99	45.28	46.20	52.27	42.32	51.30	36.39	55.91	48.27	46.17	**41.09**
StJ1	42.22	69.18			51.09	46.02	42.89	44.72	56.66	64.08	50.24	50.39	51.75	**46.06**
Brm	51.91	47.14	45.50	36.45	29.49	27.77	14.85	28.61	34.38	42.62	44.01	44.01	37.23	33.13
KCP	44.16	41.23	43.80	45.06	35.45	39.83	40.25	32.22	48.06	48.22	44.44	42.23	42.08	37.45
StJ2		34.63	44.18	37.40	24.32		31.79	23.85	41.45	41.23	47.27	31.73	35.78	31.85
StJ3	51.91	42.02	52.63	49.69	43.52	41.73	39.70		53.49	50.49	47.41	36.38	46.27	**41.18**
McI	22.82	19.13	20.84	17.63	11.07	11.00	9.88	8.49	16.14	18.31	30.30	16.52	16.84	14.99
OLR	25.95	17.55	27.61	23.54	16.61	12.38	28.17	11.47	23.70	22.92	29.25	19.49	21.55	19.18
Ast4	38.45	34.18	35.44	30.76	24.36	23.39	24.51	22.17	33.06	34.17	39.93	30.01	30.87	27.47
Ast2	31.60		43.21	41.18	34.16	31.73	32.89	29.10	45.16	40.18	35.96		36.52	32.50

Site ID	NO_2 Mean Concentrations (µg/m^3)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
													Raw Data	Bias Adjusted (1)
Ast1	39.27	26.34	42.03	36.09	26.45	29.58	24.20	26.00	36.09	34.70	40.99	35.09	33.07	29.43
Ast3	66.18	56.84	66.94	65.79	52.14	55.50	50.81	43.35	51.72	61.69	58.39	49.09	56.54	**50.32**
NwR	37.95	36.32	42.09	49.22	29.87	23.20	25.98	27.59	38.09	31.66	34.28	29.58	33.82	30.10
WhR	55.68	47.76	51.54			41.35	31.49		42.63	50.79	54.65	41.76	46.40	**41.30**
LR1	48.95	45.23	52.61	41.18	43.00	40.11		35.62		44.49		45.34	44.06	39.21
LR2	57.57	51.71	54.31	56.26	52.96	49.63	39.01	44.97	41.02	52.77		45.39	49.60	**44.14**
LR3	62.91	52.56		53.71		46.20	40.80					45.96	50.36	**44.82**
LR5	54.48	40.49	62.11	59.81	46.28	53.68	52.94	38.01	59.19	44.61	63.66	38.31	51.13	**45.51**
LR4	43.67	36.72	55.44	46.28	44.43	46.26		34.20	48.04	44.49	49.57	40.08	44.47	39.58
SidFG	50.71			51.10	50.10	45.12	48.48	40.58	44.74	43.21	52.01		47.34	**42.13**

(1) See Appendix C for details on bias adjustment

Table B.2 – Annual Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2014 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)				
					2010	2011	2012	2013	2014
But1	Roadside	Diffusion Tube	100	100	-	-	-	-	**48.74**
But2	Roadside	Diffusion Tube	58	58	-	-	-	-	**47.36**
Dd1	Roadside	Diffusion Tube	83	83	**41.5**	38.4	35.2	**47**	**40.39**
DDASH	Roadside	Diffusion Tube	83	83	-	-	-	**53**	**41.86**
BrS	Kerbside	Diffusion Tube	100	100	**46.5**	38.4	36.5	**45**	38.41
BRS2	Roadside	Diffusion Tube	83	83	-	-	-	**59**	**48.92**
Tyn3	Roadside	Diffusion Tube	92	92	-	-	-	-	38.82
Tyn2	Roadside	Diffusion Tube	100	100	-	-	-	-	**50.98**
Tyn	Roadside	Diffusion Tube	100	100	-	-	**47.2**	**59**	**47.71**
Fos2	Roadside	Diffusion Tube	100	100	-	-	-	-	39.05
Fos3	Roadside	Diffusion Tube	83	83	-	-	-	-	33.84
Fos	Kerbside	Diffusion Tube	100	100	**55.7**	**53.2**	**45.9**	**55**	**53.61**
Crs1	Roadside	Diffusion Tube	100	100	-	-	-	-	37.24
Swth1	Roadside	Diffusion Tube	83	83	-	-	-	-	28.98
Lwm2	Roadside	Diffusion Tube	100	100	39.3	37.4	32.8	36.8	34.32
Lwm1	Roadside	Diffusion Tube	92	92	**48.8**	**44.1**	36.9	**44**	**41.09**
Stj1	Roadside	Diffusion Tube	83	83	-	-	-	-	**46.06**
Brm2	Urban Background	Diffusion Tube	100	100	-	-	-	-	33.13
KCP	Roadside	Diffusion Tube	100	100	**40.9**	37.4	29.4	**43**	37.45
Stj2	Roadside	Diffusion Tube	83	83	-	-	-	-	31.85
Stj3	Roadside	Diffusion Tube	92	92	-	-	-	-	**41.18**
McI	Urban Background	Diffusion Tube	100	100	18.3	16.4	12.1	17	14.99
OLR	Roadside	Diffusion Tube	100	100	-	-	18.2	24	19.18
AST4	Roadside	Diffusion Tube	100	100	-	-	-	30	27.47
Ast2	Roadside	Diffusion Tube	83	83	37.6	**40.8**	33.4	**40**	32.50
Ast1	Roadside	Diffusion Tube	100	100	33.5	32	26.9	35	29.43
Ast3	Roadside	Diffusion Tube	100	100	**60.4**	**50.6**	**45.7**	**61**	**50.32**

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2014 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)				
					2010	2011	2012	2013	2014
NwR	Roadside	Diffusion Tube	100	100	-	33.6	25.7	36	30.10
WhR	Roadside	Diffusion Tube	75	75	**44**	39.9	39.5	**43**	**41.30**
LR1	Roadside	Diffusion Tube	75	75	-	-	34.9	**45**	**41.30**
LR2	Roadside	Diffusion Tube	92	92	-	-	**41.3**	**48**	**44.14**
LR3	Roadside	Diffusion Tube	50	50	-	-	**44.7**	**53**	**49.88**
LR5	Roadside	Diffusion Tube	100	100	-	-	-	-	**45.51**
LR4	Roadside	Diffusion Tube	92	92	-	-	-	-	39.58
SIDFG	Roadside	Diffusion Tube	75	75	-	-	-	**50**	**42.13**

Notes: Exceedances of the NO_2 annual mean objective of 40µg/m3 are shown in **bold**.

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **<u>bold and underlined.</u>**

(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 LAQM.TG (16) if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

Sources of pollution

Worcester City Council have not identified any new or significant changes to sources as described in Chapter 7, section1 of Technical Guidance LAQM.TG(16).

Diffusion Tube Bias Adjustment Factors

The following UKAS accredited company provides Redditch Borough Council with nitrogen dioxide diffusion tubes and analysis:

Somerset Scientific Services,
The Crescent
County Hall
Taunton
TA1 4DY
0300 123 2224
somersetscientific@somerset.gov.uk

The 20% Triethanolamine (TEA) / De-ionised Water preparation method is used.

The bias adjustment factor applied to the results in 2014 was 0.89 (Spreadsheet Version No. 03/15) which were derived from the national studies.

QA/QC of Diffusion Tube Monitoring

Under the WASP Scheme Somerset Scientific Services performed 100% satisfactory for all periods in 2014. Tube precision was generally ‘Good’ throughout 2014.

Short-term to Long-term Data Adjustment

Annualisation calculation for But2 and LR3 are shown below in Tables C.1 and C.2.

Table C.1 Annualisation calculations for But2 - The Butts, Worcester

Site	Site Type	Annual Mean	Period Mean	Ratio
Birmingham Acocks Green	Background Urban	43.09658157	44.06674634	0.977984198
Birmingham Tyburn	Background Urban	29.84605318	33.98467434	0.878220956
Walsall Woodlands	Background Urban	25.2599895	27.37511899	0.922735332
			Average	0.926313495
			But2 result	51.13
			But2 annualised	**47.36**

Table C.2 Annualisation calculations for LR3 - London Road traffic sign 572 for A58(City), Worcester

Site	Site Type	Annual Mean	Period Mean	Ratio
Birmingham Acocks Green	Background Urban	43.09658157	34.61530565	1.245015197
Birmingham Tyburn	Background Urban	29.84605318	29.72386348	1.004110828
Walsall Woodlands	Background Urban	25.2599895	23.18999664	1.089262319
			Average	1.112796114
			LR3 result	44.82
			LR3 annualised	**49.88**

Estimates of concentrations at the nearest receptor

If an exceedance is measured at a monitoring site (or close to the air quality objective) which is not representative of public exposure, the procedure specified in Technical Guidance LAQM.TG(16) has been used to estimate the concentration at the nearest receptor where applicable. The results are presented in Figures C.1 to C.16 below.

Figure C.1 – Loc. DDASH - Distance from road to relevant exposure calculation

This calculator allows you to predict the annual mean NO_2 concentration for a location ("receptor") that is close to a monitoring site, but nearer or further the kerb than the monitor. The next sheet shows your results on a graph.

Air Quality CONSULTANTS

Enter data into the yellow cells

Step 1	**How far from the KERB was your measurement made (in metres)?**	(Note 1)	**2.33**	metres
Step 2	**How far from the KERB is your receptor (in metres)?**	(Note 1)	**4.33**	metres
Step 3	**What is the local annual mean background NO_2 concentration (in µg/m^3)?**	(Note 2)	**14.99**	µg/m^3
Step 4	**What is your measured annual mean NO_2 concentration (in µg/m^3)?**	(Note 2)	**41.86**	µg/m^3
Result	**The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor**	(Note 3)	**37.8**	µg/m^3

Note 1: In some cases the term "kerb" may be taken to be the edge of the trafficked road - see the FAQ at http://laqm2.defra.gov.uk/FAQs/Monitoring/Location/index.htm for further details. Distances should be measured horizontally from the kerb and assumes that the monitor and receptor have similar elevations. Each distance should be greater than 0.1m and less than 50m (In practice, using a value of 0.1m when the monitor is closer to the kerb than this is likely to be reasonable). The receptor is the location for which you wish to make your prediction. The monitor can either be closer to the kerb than the receptor, or further from the kerb than the receptor. The closer the monitor and the receptor are to each other, the more reliable the prediction will be. When your receptor is further from the kerb than your monitor, it is recommended that the receptor and monitor should be within 20m of each other. When your receptor is closer to the kerb than your monitor, it is recommended that the receptor and monitor should be within 10m of each other.

Note 2: The measurement and the background must be for the same year. The background concentration could come from the national maps published at www.airquality.co.uk, or alternatively from a nearby monitor in a background location.

Note 3: The calculator follows the procedure set out in Box 2.3 of LAQM TG(09). The results will have a greater uncertainty than the measured data. More confidence can be placed in results where the distance between the monitor and the receptor is small than where it is large.

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Figure C.2 – Loc. BrS - Distance from road to relevant exposure calculation

This calculator allows you to predict the annual mean NO_2 concentration for a location ("receptor") that is close to a monitoring site, but nearer or further the kerb than the monitor. The next sheet shows your results on a graph.

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Enter data into the yellow cells

Step 1	**How far from the KERB was your measurement made (in metres)?**	(Note 1)	**0.6**	metres
Step 2	**How far from the KERB is your receptor (in metres)?**	(Note 1)	**2.6**	metres
Step 3	**What is the local annual mean background NO_2 concentration (in µg/m^3)?**	(Note 2)	**14.99**	µg/m^3
Step 4	**What is your measured annual mean NO_2 concentration (in µg/m^3)?**	(Note 2)	**38.41**	µg/m^3
Result	**The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor**	(Note 3)	**32.1**	µg/m^3

Note 1: In some cases the term "kerb" may be taken to be the edge of the trafficked road - see the FAQ at http://laqm2.defra.gov.uk/FAQs/Monitoring/Location/index.htm for further details. Distances should be measured horizontally from the kerb and assumes that the monitor and receptor have similar elevations. Each distance should be greater than 0.1m and less than 50m (In practice, using a value of 0.1m when the monitor is closer to the kerb than this is likely to be reasonable). The receptor is the location for which you wish to make your prediction. The monitor can either be closer to the kerb than the receptor, or further from the kerb than the receptor. The closer the monitor and the receptor are to each other, the more reliable the prediction will be. When your receptor is further from the kerb than your monitor, it is recommended that the receptor and monitor should be within 20m of each other. When your receptor is closer to the kerb than your monitor, it is recommended that the receptor and monitor should be within 10m of each other.

Note 2: The measurement and the background must be for the same year. The background concentration could come from the national maps published at www.airquality.co.uk, or alternatively from a nearby monitor in a background location.

Note 3: The calculator follows the procedure set out in Box 2.3 of LAQM TG(09). The results will have a greater uncertainty than the measured data. More confidence can be placed in results where the distance between the monitor and the receptor is small than where it is large.

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Figure C.3 – Loc. Tyn2. Distance from road to relevant exposure calculation

This calculator allows you to predict the annual mean NO_2 concentration for a location ("receptor") that is close to a monitoring site, but nearer or further the kerb than the monitor. The next sheet shows your results on a graph.

Enter data into the yellow cells

Step 1	**How far from the KERB was your measurement made (in metres)?**	(Note 1)	**2.28**	metres
Step 2	**How far from the KERB is your receptor (in metres)?**	(Note 1)	**2.61**	metres
Step 3	**What is the local annual mean background NO_2 concentration (in µg/m^3)?**	(Note 2)	**14.99**	µg/m^3
Step 4	**What is your measured annual mean NO_2 concentration (in µg/m^3)?**	(Note 2)	**50.98**	µg/m^3
Result	**The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor**	(Note 3)	**49.8**	µg/m^3

Note 1: In some cases the term "kerb" may be taken to be the edge of the trafficked road - see the FAQ at http://laqm2.defra.gov.uk/FAQs/Monitoring/Location/index.htm for further details. Distances should be measured horizontally from the kerb and assumes that the monitor and receptor have similar elevations. Each distance should be greater than 0.1m and less than 50m (In practice, using a value of 0.1m when the monitor is closer to the kerb than this is likely to be reasonable). The receptor is the location for which you wish to make your prediction. The monitor can either be closer to the kerb than the receptor, or further from the kerb than the receptor. The closer the monitor and the receptor are to each other, the more reliable the prediction will be. When your receptor is further from the kerb than your monitor, it is recommended that the receptor and monitor should be within 20m of each other. When your receptor is closer to the kerb than your monitor, it is recommended that the receptor and monitor should be within 10m of each other.

Note 2: The measurement and the background must be for the same year. The background concentration could come from the national maps published at www.airquality.co.uk, or alternatively from a nearby monitor in a background location.

Note 3: The calculator follows the procedure set out in Box 2.3 of LAQM TG(09). The results will have a greater uncertainty than the measured data. More confidence can be placed in results where the distance between the monitor and the receptor is small than where it is large.

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Figure C.4 – Loc. Tyn. Distance from road to relevant exposure calculation

This calculator allows you to predict the annual mean NO_2 concentration for a location ("receptor") that is close to a monitoring site, but nearer or further the kerb than the monitor. The next sheet shows your results on a graph.

Enter data into the yellow cells

Step 1	**How far from the KERB was your measurement made (in metres)?**	(Note 1)	**1.63**	metres
Step 2	**How far from the KERB is your receptor (in metres)?**	(Note 1)	**2.07**	metres
Step 3	**What is the local annual mean background NO_2 concentration (in µg/m^3)?**	(Note 2)	**14.99**	µg/m^3
Step 4	**What is your measured annual mean NO_2 concentration (in µg/m^3)?**	(Note 2)	**47.71**	µg/m^3
Result	**The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor**	(Note 3)	**46.0**	µg/m^3

Note 1: In some cases the term "kerb" may be taken to be the edge of the trafficked road - see the FAQ at http://laqm2.defra.gov.uk/FAQs/Monitoring/Location/index.htm for further details. Distances should be measured horizontally from the kerb and assumes that the monitor and receptor have similar elevations. Each distance should be greater than 0.1m and less than 50m (In practice, using a value of 0.1m when the monitor is closer to the kerb than this is likely to be reasonable). The receptor is the location for which you wish to make your prediction. The monitor can either be closer to the kerb than the receptor, or further from the kerb than the receptor. The closer the monitor and the receptor are to each other, the more reliable the prediction will be. When your receptor is further from the kerb than your monitor, it is recommended that the receptor and monitor should be within 20m of each other. When your receptor is closer to the kerb than your monitor, it is recommended that the receptor and monitor should be within 10m of each other.

Note 2: The measurement and the background must be for the same year. The background concentration could come from the national maps published at www.airquality.co.uk, or alternatively from a nearby monitor in a background location.

Note 3: The calculator follows the procedure set out in Box 2.3 of LAQM TG(09). The results will have a greater uncertainty than the measured data. More confidence can be placed in results where the distance between the monitor and the receptor is small than where it is large.

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Figure C.5 – Loc. Fos2. Distance from road to relevant exposure calculation

This calculator allows you to predict the annual mean NO_2 concentration for a location ("receptor") that is close to a monitoring site, but nearer or further the kerb than the monitor. The next sheet shows your results on a graph.

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Enter data into the yellow cells

Step 1	**How far from the KERB was your measurement made (in metres)?**	(Note 1)	**3.2**	metres
Step 2	**How far from the KERB is your receptor (in metres)?**	(Note 1)	**3.48**	metres
Step 3	**What is the local annual mean background NO_2 concentration (in μg/m³)?**	(Note 2)	**14.99**	μg/m³
Step 4	**What is your measured annual mean NO_2 concentration (in μg/m³)?**	(Note 2)	**39.05**	μg/m³
Result	**The predicted annual mean NO_2 concentration (in μg/m³) at your receptor**	(Note 3)	**38.5**	μg/m³

Note 1: In some cases the term "kerb" may be taken to be the edge of the trafficked road - see the FAQ at http://laqm2.defra.gov.uk/FAQs/Monitoring/Location/index.htm for further details. Distances should be measured horizontally from the kerb and assumes that the monitor and receptor have similar elevations. Each distance should be greater than 0.1m and less than 50m (In practice, using a value of 0.1m when the monitor is closer to the kerb than this is likely to be reasonable). The receptor is the location for which you wish to make your prediction. The monitor can either be closer to the kerb than the receptor, or further from the kerb than the receptor. The closer the monitor and the receptor are to each other, the more reliable the prediction will be. When your receptor is further from the kerb than your monitor, it is recommended that the receptor and monitor should be within 20m of each other. When your receptor is closer to the kerb than your monitor, it is recommended that the receptor and monitor should be within 10m of each other.

Note 2: The measurement and the background must be for the same year. The background concentration could come from the national maps published at www.airquality.co.uk, or alternatively from a nearby monitor in a background location.

Note 3: The calculator follows the procedure set out in Box 2.3 of LAQM TG(09). The results will have a greater uncertainty than the measured data. More confidence can be placed in results where the distance between the monitor and the receptor is small than where it is large.

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Figure C.6 – Loc. Fos. Distance from road to relevant exposure calculation

This calculator allows you to predict the annual mean NO_2 concentration for a location ("receptor") that is close to a monitoring site, but nearer or further the kerb than the monitor. The next sheet shows your results on a graph.

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Enter data into the yellow cells

Step 1	**How far from the KERB was your measurement made (in metres)?**	(Note 1)	**1**	metres
Step 2	**How far from the KERB is your receptor (in metres)?**	(Note 1)	**1.9**	metres
Step 3	**What is the local annual mean background NO_2 concentration (in μg/m³)?**	(Note 2)	**14.99**	μg/m³
Step 4	**What is your measured annual mean NO_2 concentration (in μg/m³)?**	(Note 2)	**53.61**	μg/m³
Result	**The predicted annual mean NO_2 concentration (in μg/m³) at your receptor**	(Note 3)	**48.6**	μg/m³

Note 1: In some cases the term "kerb" may be taken to be the edge of the trafficked road - see the FAQ at http://laqm2.defra.gov.uk/FAQs/Monitoring/Location/index.htm for further details. Distances should be measured horizontally from the kerb and assumes that the monitor and receptor have similar elevations. Each distance should be greater than 0.1m and less than 50m (In practice, using a value of 0.1m when the monitor is closer to the kerb than this is likely to be reasonable). The receptor is the location for which you wish to make your prediction. The monitor can either be closer to the kerb than the receptor, or further from the kerb than the receptor. The closer the monitor and the receptor are to each other, the more reliable the prediction will be. When your receptor is further from the kerb than your monitor, it is recommended that the receptor and monitor should be within 20m of each other. When your receptor is closer to the kerb than your monitor, it is recommended that the receptor and monitor should be within 10m of each other.

Note 2: The measurement and the background must be for the same year. The background concentration could come from the national maps published at www.airquality.co.uk, or alternatively from a nearby monitor in a background location.

Note 3: The calculator follows the procedure set out in Box 2.3 of LAQM TG(09). The results will have a greater uncertainty than the measured data. More confidence can be placed in results where the distance between the monitor and the receptor is small than where it is large.

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Figure C.7 – Loc. Lwm1. Distance from road to relevant exposure calculation

This calculator allows you to predict the annual mean NO_2 concentration for a location ("receptor") that is close to a monitoring site, but nearer or further the kerb than the monitor. The next sheet shows your results on a graph.

Enter data into the yellow cells

Step 1	**How far from the KERB was your measurement made (in metres)?**	(Note 1)	**1.43**	metres
Step 2	**How far from the KERB is your receptor (in metres)?**	(Note 1)	**2.43**	metres
Step 3	**What is the local annual mean background NO_2 concentration (in µg/m^3)?**	(Note 2)	**14.99**	µg/m^3
Step 4	**What is your measured annual mean NO_2 concentration (in µg/m^3)?**	(Note 2)	**41.09**	µg/m^3
Result	**The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor**	(Note 3)	**38.1**	µg/m^3

Note 1: In some cases the term "kerb" may be taken to be the edge of the trafficked road - see the FAQ at http://laqm2.defra.gov.uk/FAQs/Monitoring/Location/index.htm for further details. Distances should be measured horizontally from the kerb and assumes that the monitor and receptor have similar elevations. Each distance should be greater than 0.1m and less than 50m (In practice, using a value of 0.1m w hen the monitor is closer to the kerb than this is likely to be reasonable). The receptor is the location for w hich you w ish to make your prediction. The monitor can either be closer to the kerb than the receptor, or further from the kerb than the receptor. The closer the monitor and the receptor are to each other, the more reliable the prediction w ill be. When your receptor is further from the kerb than your monitor, it is recommended that the receptor and monitor should be w ithin 20m of each other. When your receptor is closer to the kerb than your monitor, it is recommended that the receptor and monitor should be w ithin 10m of each other.

Note 2: The measurement and the background must be for the same year. The background concentration could come from the national maps published at w w w .airquality.co.uk, or alternatively from a nearby monitor in a background location.

Note 3: The calculator follow s the procedure set out in Box 2.3 of LAQM TG(09). The results w ill have a greater uncertainty than the measured data. More confidence can be placed in results w here the distance betw een the monitor and the receptor is small than w here it is large.

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Figure C.8 – Loc. StJ1. Distance from road to relevant exposure calculation

This calculator allows you to predict the annual mean NO_2 concentration for a location ("receptor") that is close to a monitoring site, but nearer or further the kerb than the monitor. The next sheet shows your results on a graph.

Enter data into the yellow cells

Step 1	**How far from the KERB was your measurement made (in metres)?**	(Note 1)	**2.7**	metres
Step 2	**How far from the KERB is your receptor (in metres)?**	(Note 1)	**3.08**	metres
Step 3	**What is the local annual mean background NO_2 concentration (in µg/m^3)?**	(Note 2)	**14.99**	µg/m^3
Step 4	**What is your measured annual mean NO_2 concentration (in µg/m^3)?**	(Note 2)	**46.06**	µg/m^3
Result	**The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor**	(Note 3)	**45.0**	µg/m^3

Note 1: In some cases the term "kerb" may be taken to be the edge of the trafficked road - see the FAQ at http://laqm2.defra.gov.uk/FAQs/Monitoring/Location/index.htm for further details. Distances should be measured horizontally from the kerb and assumes that the monitor and receptor have similar elevations. Each distance should be greater than 0.1m and less than 50m (In practice, using a value of 0.1m w hen the monitor is closer to the kerb than this is likely to be reasonable). The receptor is the location for w hich you w ish to make your prediction. The monitor can either be closer to the kerb than the receptor, or further from the kerb than the receptor. The closer the monitor and the receptor are to each other, the more reliable the prediction w ill be. When your receptor is further from the kerb than your monitor, it is recommended that the receptor and monitor should be w ithin 20m of each other. When your receptor is closer to the kerb than your monitor, it is recommended that the receptor and monitor should be w ithin 10m of each other.

Note 2: The measurement and the background must be for the same year. The background concentration could come from the national maps published at w w w .airquality.co.uk, or alternatively from a nearby monitor in a background location.

Note 3: The calculator follow s the procedure set out in Box 2.3 of LAQM TG(09). The results w ill have a greater uncertainty than the measured data. More confidence can be placed in results w here the distance betw een the monitor and the receptor is small than w here it is large.

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Figure C.9 – Loc. StJ3. Distance from road to relevant exposure calculation

This calculator allows you to predict the annual mean NO_2 concentration for a location ("receptor") that is close to a monitoring site, but nearer or further the kerb than the monitor. The next sheet shows your results on a graph.

Air Quality CONSULTANTS

Enter data into the yellow cells

Step 1	**How far from the KERB was your measurement made (in metres)?**	(Note 1)	**2.05**	metres
Step 2	**How far from the KERB is your receptor (in metres)?**	(Note 1)	**2.56**	metres
Step 3	**What is the local annual mean background NO_2 concentration (in µg/m^3)?**	(Note 2)	**14.99**	µg/m^3
Step 4	**What is your measured annual mean NO_2 concentration (in µg/m^3)?**	(Note 2)	**41.18**	µg/m^3
Result	**The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor**	(Note 3)	**39.8**	µg/m^3

Note 1: In some cases the term "kerb" may be taken to be the edge of the trafficked road - see the FAQ at http://laqm2.defra.gov.uk/FAQs/Monitoring/Location/index.htm for further details. Distances should be measured horizontally from the kerb and assumes that the monitor and receptor have similar elevations. Each distance should be greater than 0.1m and less than 50m (In practice, using a value of 0.1m when the monitor is closer to the kerb than this is likely to be reasonable). The receptor is the location for which you wish to make your prediction. The monitor can either be closer to the kerb than the receptor, or further from the kerb than the receptor. The closer the monitor and the receptor are to each other, the more reliable the prediction will be. When your receptor is further from the kerb than your monitor, it is recommended that the receptor and monitor should be within 20m of each other. When your receptor is closer to the kerb than your monitor, it is recommended that the receptor and monitor should be within 10m of each other.

Note 2: The measurement and the background must be for the same year. The background concentration could come from the national maps published at www.airquality.co.uk, or alternatively from a nearby monitor in a background location.

Note 3: The calculator follows the procedure set out in Box 2.3 of LAQM TG(09). The results will have a greater uncertainty than the measured data. More confidence can be placed in results where the distance between the monitor and the receptor is small than where it is large.

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Figure C.10 – Loc. Ast3. Distance from road to relevant exposure calculation

This calculator allows you to predict the annual mean NO_2 concentration for a location ("receptor") that is close to a monitoring site, but nearer or further the kerb than the monitor. The next sheet shows your results on a graph.

Air Quality CONSULTANTS

Enter data into the yellow cells

Step 1	**How far from the KERB was your measurement made (in metres)?**	(Note 1)	**1.68**	metres
Step 2	**How far from the KERB is your receptor (in metres)?**	(Note 1)	**8.3**	metres
Step 3	**What is the local annual mean background NO_2 concentration (in µg/m^3)?**	(Note 2)	**14.99**	µg/m^3
Step 4	**What is your measured annual mean NO_2 concentration (in µg/m^3)?**	(Note 2)	**50.32**	µg/m^3
Result	**The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor**	(Note 3)	**37.6**	µg/m^3

Note 1: In some cases the term "kerb" may be taken to be the edge of the trafficked road - see the FAQ at http://laqm2.defra.gov.uk/FAQs/Monitoring/Location/index.htm for further details. Distances should be measured horizontally from the kerb and assumes that the monitor and receptor have similar elevations. Each distance should be greater than 0.1m and less than 50m (In practice, using a value of 0.1m when the monitor is closer to the kerb than this is likely to be reasonable). The receptor is the location for which you wish to make your prediction. The monitor can either be closer to the kerb than the receptor, or further from the kerb than the receptor. The closer the monitor and the receptor are to each other, the more reliable the prediction will be. When your receptor is further from the kerb than your monitor, it is recommended that the receptor and monitor should be within 20m of each other. When your receptor is closer to the kerb than your monitor, it is recommended that the receptor and monitor should be within 10m of each other.

Note 2: The measurement and the background must be for the same year. The background concentration could come from the national maps published at www.airquality.co.uk, or alternatively from a nearby monitor in a background location.

Note 3: The calculator follows the procedure set out in Box 2.3 of LAQM TG(09). The results will have a greater uncertainty than the measured data. More confidence can be placed in results where the distance between the monitor and the receptor is small than where it is large.

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Figure C.11 – Loc. Whr. Distance from road to relevant exposure calculation

This calculator allows you to predict the annual mean NO_2 concentration for a location ("receptor") that is close to a monitoring site, but nearer or further the kerb than the monitor. The next sheet shows your results on a graph.

Air Quality CONSULTANTS

Enter data into the yellow cells

Step 1	**How far from the KERB was your measurement made (in metres)?**	(Note 1)	**1.25**	metres
Step 2	**How far from the KERB is your receptor (in metres)?**	(Note 1)	**20**	metres
Step 3	**What is the local annual mean background NO_2 concentration (in $\mu g/m^3$)?**	(Note 2)	**14.99**	$\mu g/m^3$
Step 4	**What is your measured annual mean NO_2 concentration (in $\mu g/m^3$)?**	(Note 2)	**41.3**	$\mu g/m^3$
Result	**The predicted annual mean NO_2 concentration (in $\mu g/m^3$) at your receptor**	(Note 3)	**25.9**	$\mu g/m^3$

Note 1: In some cases the term "kerb" may be taken to be the edge of the trafficked road - see the FAQ at http://laqm2.defra.gov.uk/FAQs/Monitoring/Location/index.htm for further details. Distances should be measured horizontally from the kerb and assumes that the monitor and receptor have similar elevations. Each distance should be greater than 0.1m and less than 50m (In practice, using a value of 0.1m when the monitor is closer to the kerb than this is likely to be reasonable). The receptor is the location for which you wish to make your prediction. The monitor can either be closer to the kerb than the receptor, or further from the kerb than the receptor. The closer the monitor and the receptor are to each other, the more reliable the prediction will be. When your receptor is further from the kerb than your monitor, it is recommended that the receptor and monitor should be within 20m of each other. When your receptor is closer to the kerb than your monitor, it is recommended that the receptor and monitor should be within 10m of each other.

Note 2: The measurement and the background must be for the same year. The background concentration could come from the national maps published at www.airquality.co.uk, or alternatively from a nearby monitor in a background location.

Note 3: The calculator follows the procedure set out in Box 2.3 of LAQM TG(09). The results will have a greater uncertainty than the measured data. More confidence can be placed in results where the distance between the monitor and the receptor is small than where it is large.

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Figure C.12 – Loc. LR1. Distance from road to relevant exposure calculation

This calculator allows you to predict the annual mean NO_2 concentration for a location ("receptor") that is close to a monitoring site, but nearer or further the kerb than the monitor. The next sheet shows your results on a graph.

Air Quality CONSULTANTS

Enter data into the yellow cells

Step 1	**How far from the KERB was your measurement made (in metres)?**	(Note 1)	**1.63**	metres
Step 2	**How far from the KERB is your receptor (in metres)?**	(Note 1)	**4.52**	metres
Step 3	**What is the local annual mean background NO_2 concentration (in $\mu g/m^3$)?**	(Note 2)	**14.99**	$\mu g/m^3$
Step 4	**What is your measured annual mean NO_2 concentration (in $\mu g/m^3$)?**	(Note 2)	**41.3**	$\mu g/m^3$
Result	**The predicted annual mean NO_2 concentration (in $\mu g/m^3$) at your receptor**	(Note 3)	**35.3**	$\mu g/m^3$

Note 1: In some cases the term "kerb" may be taken to be the edge of the trafficked road - see the FAQ at http://laqm2.defra.gov.uk/FAQs/Monitoring/Location/index.htm for further details. Distances should be measured horizontally from the kerb and assumes that the monitor and receptor have similar elevations. Each distance should be greater than 0.1m and less than 50m (In practice, using a value of 0.1m when the monitor is closer to the kerb than this is likely to be reasonable). The receptor is the location for which you wish to make your prediction. The monitor can either be closer to the kerb than the receptor, or further from the kerb than the receptor. The closer the monitor and the receptor are to each other, the more reliable the prediction will be. When your receptor is further from the kerb than your monitor, it is recommended that the receptor and monitor should be within 20m of each other. When your receptor is closer to the kerb than your monitor, it is recommended that the receptor and monitor should be within 10m of each other.

Note 2: The measurement and the background must be for the same year. The background concentration could come from the national maps published at www.airquality.co.uk, or alternatively from a nearby monitor in a background location.

Note 3: The calculator follows the procedure set out in Box 2.3 of LAQM TG(09). The results will have a greater uncertainty than the measured data. More confidence can be placed in results where the distance between the monitor and the receptor is small than where it is large.

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Figure C.13 – Loc. LR2. Distance from road to relevant exposure calculation

This calculator allows you to predict the annual mean NO_2 concentration for a location ("receptor") that is close to a monitoring site, but nearer or further the kerb than the monitor. The next sheet shows your results on a graph.

Air Quality CONSULTANTS

Enter data into the yellow cells

Step 1	**How far from the KERB was your measurement made (in metres)?**	(Note 1)	**1.45**	metres
Step 2	**How far from the KERB is your receptor (in metres)?**	(Note 1)	**4.45**	metres
Step 3	**What is the local annual mean background NO_2 concentration (in µg/m³)?**	(Note 2)	**14.99**	µg/m³
Step 4	**What is your measured annual mean NO_2 concentration (in µg/m³)?**	(Note 2)	**44.14**	µg/m³
Result	**The predicted annual mean NO_2 concentration (in µg/m³) at your receptor**	(Note 3)	**37.0**	µg/m³

Note 1: In some cases the term "kerb" may be taken to be the edge of the trafficked road - see the FAQ at http://laqm2.defra.gov.uk/FAQs/Monitoring/Location/index.htm for further details. Distances should be measured horizontally from the kerb and assumes that the monitor and receptor have similar elevations. Each distance should be greater than 0.1m and less than 50m (In practice, using a value of 0.1m when the monitor is closer to the kerb than this is likely to be reasonable). The receptor is the location for which you wish to make your prediction. The monitor can either be closer to the kerb than the receptor, or further from the kerb than the receptor. The closer the monitor and the receptor are to each other, the more reliable the prediction will be. When your receptor is further from the kerb than your monitor, it is recommended that the receptor and monitor should be within 20m of each other. When your receptor is closer to the kerb than your monitor, it is recommended that the receptor and monitor should be within 10m of each other.

Note 2: The measurement and the background must be for the same year. The background concentration could come from the national maps published at www.airquality.co.uk, or alternatively from a nearby monitor in a background location.

Note 3: The calculator follows the procedure set out in Box 2.3 of LAQM TG(09). The results will have a greater uncertainty than the measured data. More confidence can be placed in results where the distance between the monitor and the receptor is small than where it is large.

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Figure C.14 – Loc. LR3. Distance from road to relevant exposure calculation

This calculator allows you to predict the annual mean NO_2 concentration for a location ("receptor") that is close to a monitoring site, but nearer or further the kerb than the monitor. The next sheet shows your results on a graph.

Air Quality CONSULTANTS

Enter data into the yellow cells

Step 1	**How far from the KERB was your measurement made (in metres)?**	(Note 1)	**1.77**	metres
Step 2	**How far from the KERB is your receptor (in metres)?**	(Note 1)	**2.27**	metres
Step 3	**What is the local annual mean background NO_2 concentration (in µg/m³)?**	(Note 2)	**14.99**	µg/m³
Step 4	**What is your measured annual mean NO_2 concentration (in µg/m³)?**	(Note 2)	**49.88**	µg/m³
Result	**The predicted annual mean NO_2 concentration (in µg/m³) at your receptor**	(Note 3)	**47.9**	µg/m³

Note 1: In some cases the term "kerb" may be taken to be the edge of the trafficked road - see the FAQ at http://laqm2.defra.gov.uk/FAQs/Monitoring/Location/index.htm for further details. Distances should be measured horizontally from the kerb and assumes that the monitor and receptor have similar elevations. Each distance should be greater than 0.1m and less than 50m (In practice, using a value of 0.1m when the monitor is closer to the kerb than this is likely to be reasonable). The receptor is the location for which you wish to make your prediction. The monitor can either be closer to the kerb than the receptor, or further from the kerb than the receptor. The closer the monitor and the receptor are to each other, the more reliable the prediction will be. When your receptor is further from the kerb than your monitor, it is recommended that the receptor and monitor should be within 20m of each other. When your receptor is closer to the kerb than your monitor, it is recommended that the receptor and monitor should be within 10m of each other.

Note 2: The measurement and the background must be for the same year. The background concentration could come from the national maps published at www.airquality.co.uk, or alternatively from a nearby monitor in a background location.

Note 3: The calculator follows the procedure set out in Box 2.3 of LAQM TG(09). The results will have a greater uncertainty than the measured data. More confidence can be placed in results where the distance between the monitor and the receptor is small than where it is large.

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Figure C.15 – Loc. LR4. Distance from road to relevant exposure calculation

This calculator allows you to predict the annual mean NO_2 concentration for a location ("receptor") that is close to a monitoring site, but nearer or further the kerb than the monitor. The next sheet shows your results on a graph.

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Enter data into the yellow cells

Step 1	**How far from the KERB was your measurement made (in metres)?**	(Note 1)	**1.86**	metres
Step 2	**How far from the KERB is your receptor (in metres)?**	(Note 1)	**4.96**	metres
Step 3	**What is the local annual mean background NO_2 concentration (in µg/m^3)?**	(Note 2)	**14.99**	µg/m^3
Step 4	**What is your measured annual mean NO_2 concentration (in µg/m^3)?**	(Note 2)	**39.58**	µg/m^3
Result	**The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor**	(Note 3)	**34.0**	µg/m^3

Note 1: In some cases the term "kerb" may be taken to be the edge of the trafficked road - see the FAQ at http://laqm2.defra.gov.uk/FAQs/Monitoring/Location/index.htm for further details. Distances should be measured horizontally from the kerb and assumes that the monitor and receptor have similar elevations. Each distance should be greater than 0.1m and less than 50m (In practice, using a value of 0.1m when the monitor is closer to the kerb than this is likely to be reasonable). The receptor is the location for which you wish to make your prediction. The monitor can either be closer to the kerb than the receptor, or further from the kerb than the receptor. The closer the monitor and the receptor are to each other, the more reliable the prediction will be. When your receptor is further from the kerb than your monitor, it is recommended that the receptor and monitor should be within 20m of each other. When your receptor is closer to the kerb than your monitor, it is recommended that the receptor and monitor should be within 10m of each other.

Note 2: The measurement and the background must be for the same year. The background concentration could come from the national maps published at www.airquality.co.uk, or alternatively from a nearby monitor in a background location.

Note 3: The calculator follows the procedure set out in Box 2.3 of LAQM TG(09). The results will have a greater uncertainty than the measured data. More confidence can be placed in results where the distance between the monitor and the receptor is small than where it is large.

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Figure C.16 – Loc. SidFG. Distance from road to relevant exposure calculation

This calculator allows you to predict the annual mean NO_2 concentration for a location ("receptor") that is close to a monitoring site, but nearer or further the kerb than the monitor. The next sheet shows your results on a graph.

Air Quality CONSULTANTS

Enter data into the yellow cells

Step 1	**How far from the KERB was your measurement made (in metres)?**	(Note 1)	**2.3**	metres
Step 2	**How far from the KERB is your receptor (in metres)?**	(Note 1)	**6.24**	metres
Step 3	**What is the local annual mean background NO_2 concentration (in µg/m^3)?**	(Note 2)	**14.99**	µg/m^3
Step 4	**What is your measured annual mean NO_2 concentration (in µg/m^3)?**	(Note 2)	**42.13**	µg/m^3
Result	**The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor**	(Note 3)	**35.6**	µg/m^3

Note 1: In some cases the term "kerb" may be taken to be the edge of the trafficked road - see the FAQ at http://laqm2.defra.gov.uk/FAQs/Monitoring/Location/index.htm for further details. Distances should be measured horizontally from the kerb and assumes that the monitor and receptor have similar elevations. Each distance should be greater than 0.1m and less than 50m (In practice, using a value of 0.1m when the monitor is closer to the kerb than this is likely to be reasonable). The receptor is the location for which you wish to make your prediction. The monitor can either be closer to the kerb than the receptor, or further from the kerb than the receptor. The closer the monitor and the receptor are to each other, the more reliable the prediction will be. When your receptor is further from the kerb than your monitor, it is recommended that the receptor and monitor should be within 20m of each other. When your receptor is closer to the kerb than your monitor, it is recommended that the receptor and monitor should be within 10m of each other.

Note 2: The measurement and the background must be for the same year. The background concentration could come from the national maps published at www.airquality.co.uk, or alternatively from a nearby monitor in a background location.

Note 3: The calculator follows the procedure set out in Box 2.3 of LAQM TG(09). The results will have a greater uncertainty than the measured data. More confidence can be placed in results where the distance between the monitor and the receptor is small than where it is large.

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Appendix D: Summary of Air Quality Objectives in England

Table D.1 Summary of Air quality objectives in England

Pollutant	Air Quality Objective[1]	
	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

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

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the LA 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
AQO	Air Quality Objective
ASR	Air quality Annual Status Report
AURN	Automatic Urban and Rural Network (UK air quality monitoring network)
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
LAQM	Local Air Quality Management
LEBS	Low Emission Bus Scheme
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
OLEV	Office of Low Emission Vehicles
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
ULEV	Ultra Low Emission Vehicles
WCC	Worcester City Council
WRS	Worcestershire Regulatory Services

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