

Worcestershire Regulatory Services

Supporting and protecting you

2016 Air Quality Annual Status Report (ASR)

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

December 2016



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Report Reference number	BDC/2016/01
Date	December 2016

Executive Summary: Air Quality in Our Area

Why air quality matters

Air pollution is associated with a number of adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Additionally, air pollution particularly affects the most vulnerable in society: children and older people, and those with heart and lung conditions. There is also often a strong correlation with equalities issues, because areas with poor air quality are also often the less affluent areas^{1,2}. The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion³.

Air Quality in Bromsgrove District Council

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 the Bromsgrove District (BDC) area demonstrate no discernible trend in concentrations across the district in 2015 or over the 5 year period 2011 – 2015.

Four Air Quality Management Areas (AQMA's) had been declared by Bromsgrove District Council by 2011 for exceedances of the annual average mean objective for nitrogen dioxide (NO₂):

- Lickey End Bromsgrove AQMA declared 26th July 2001
- Kidderminster Road Hagley AQMA declared 17th February 2010
- Redditch Road Bromsgrove AMQA declared 17th February 2010
- Worcester Road Bromsgrove AQMA declared 24th October 2011

Details of declaration and plans of the AQMAs can be found on the following pages of WRS website: <http://www.worcsregservices.gov.uk/pollution/air-quality/air-quality-management-areas.aspx>

¹ Environmental equity, air quality, socioeconomic status and respiratory health, 2010

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

³ Defra. Abatement cost guidance for valuing changes in air quality, May 2013

Lickey End, Bromsgrove AQMA in 2015

Following bias-adjustment of the monitoring data and calculation back to relevant exposure where necessary there are no exceedances of the annual average mean objective for NO₂ within the Lickey End AQMA. In addition no levels within 5% of the annual mean objective have been recorded in 2015.

Concentrations of NO₂ between 2011 and 2015 suggest monitoring and review should continue in 2016. The Lickey End AQMA should remain in place at this time.

Kidderminster Road, Hagley AQMA in 2015

No exceedances of the annual mean objective were recorded within the Kidderminster Road, Hagley AQMA in 2015. No monitoring points in this location were within 5% of the annual average mean objective for NO₂.

WRS on behalf of BDC continue to monitor concentrations within the AQMA in 2016 and will review in 2017. Following review of 2016 monitoring data BDC will consider undertaking a detailed study of the AQMA in order to determine whether the AQMA can be revoked.

Redditch Road, Bromsgrove AQMA in 2015

No exceedances of the annual mean objective were recorded within the Redditch Road, Bromsgrove AQMA in 2015. No monitoring points in this location were within 5% of the annual average mean objective for NO₂.

WRS on behalf of BDC continue to monitor concentrations within the AQMA in 2016 and will review in 2017. Following review of 2016 monitoring data BDC will consider undertaking a detailed study of the AQMA in order to determine whether the AQMA can be revoked.

Worcester Road, Bromsgrove AQMA in 2015

Two exceedances of the annual mean objective for NO₂ have been recorded in the Worcester Road, Bromsgrove AQMA in 2015.

Concentrations of NO₂ between 2011 and 2015 suggest monitoring and review should continue in 2016. The Worcester Road AQMA should remain in place at this time.

Other Areas Monitored within the District

No exceedances of the annual mean objective for NO₂, or any concentrations within 5% of that objective, have been recorded at any other location in the District in 2015.

Actions to Improve Air Quality

In 2013, WRS produced a countywide Air Quality Action Plan (AQAP) for Worcestershire which was adopted by WCC on 13th November 2013. WRS have produced two updates to the AQAP, the latest in September 2016. For details of all measures completed, in progress or planned, please refer to the 'Air Quality Action Plan Progress Report for Worcestershire April 2015-2016'. A copy of this, the previous update and the AQAP is available to download via

<http://www.worcsregservices.gov.uk/pollution/air-quality/air-quality-action-plan.aspx>

In 2014, WRS set up the Worcestershire Air Quality Steering Group and sub-groups to facilitate progressing implementation of prioritised actions identified in the AQAP. The Bromsgrove Urban (Steering) Sub-Group includes the Lickey End, Redditch Road, and Worcester Road AQMAs. A separate sub-group covers the Kidderminster Road, Hagley AQMA. The sub-groups currently comprise representatives of WRS, the Worcestershire County Council Air Quality Liaison Officer, and local County and district Councillors.

Local Priorities and Challenges

There are a number of major roads passing through Bromsgrove District including the M42, M5, A38, A456, A435, A441, A448 and the A491. The main source of air pollution in the District is emissions from vehicular traffic. The historic town centre of Bromsgrove, and routes to it, have a finite capacity, which are now being reached on occasion. The high demand of vehicular traffic on main arterial routes (such as the

A38 - Redditch Road AQMA and M42 - Lickey End AQMA) lead to congestion and poor air quality. The highway network is in need of development to meet this demand.

Worcestershire County Council is currently in the process of completing the fourth Local Transport Plan (LTP4), which is due out for consultation later this year. Draft LTP4 includes the Bromsgrove Transport Strategy which comprises a series of packages for the Bromsgrove area. One of the stated aims of LTP4 will be the remediation of the Worcester Road, Redditch Road and Lickey End AQMAs. The most pertinent packages are as follows:

- Worcester Road/Rock Hill Key Corridor of Improvement (including Worcester Road AQMA remediation)
- Bromsgrove Eastern Bypass Key Corridor of Improvement Major Scheme (A38) (including remediation of the Redditch AQMA)
- Lickey End (M42 Junction 1) Major Enhancement Scheme and Lickey End AQMA Remediation

Worcestershire Regulatory Services will continue to liaise with the County Council in the development of these packages to ensure that remediation of the AQMAs remains a strategic transport priority. Over the past five years WRS has experienced closer working ties with the County Council's Strategic Transport Team and it is anticipated that collaboration on their strategic policies and improvement schemes at the early planning stages will ensure that air quality improvements remain a priority across all of Worcestershire infrastructure.

WRS is currently being consulted on the draft business case for the Bromsgrove Eastern Bypass Key Corridor (A38) Major Improvement Scheme and has provided comment in relation to the proposals and the remediation of the relevant AQMAs in the area. Worcestershire County Council currently have £1.8m allocated for detailed review and redesign of the bus network in Bromsgrove.

Further information relating to air quality action planning and progress made for Bromsgrove and the wider Worcestershire area can be found at

<http://www.worcsregservices.gov.uk/pollution/air-quality/air-quality-action-plan.aspx>

How to Get Involved

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

- Walk or cycle 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).
- If you have to drive follow fuel efficient driving advice, often known as 'Smarter Driving Tips', to save on fuel and reduce your emissions. A number of websites promote such advice including:
 - <http://www.energysavingtrust.org.uk/travel/driving-advice>
 - <http://www.theaa.com/driving-advice/fuels-environment/drive-smart>
 - <http://www.dft.gov.uk/vca/fcb/smarter-driving-tips.asp>

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1 Local Air Quality Management

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

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

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

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

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

A summary of AQMAs declared by Bromsgrove District Council can be found in Table 2.1. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at

<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
Kidderminster Road, Hagley AQMA	NO ₂ annual mean	Hagley	Conjunction of two major A roads between a busy gyratory at the southern end and a busy traffic light junction at the northern end	Air Quality Action Plan for Worcestershire http://www.worcsregservices.gov.uk/pollution/air-quality/air-quality-action-plan.aspx
Lickey End AQMA	NO ₂ annual mean	Bromsgrove	Residential properties along four roads emanating from the Junction 1 M42	
Redditch Road AQMA	NO ₂ annual mean	Bromsgrove	Long stretch of the A38 including a number of residential properties	
Worcester Road AQMA	NO ₂ annual mean	Bromsgrove	Comprises mainly the B4091 Worcester Road single carriageway southwest of the town centre	

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

Bromsgrove District Council has taken forward a number of measures during the current reporting year of 2016 in pursuit of improving local air quality. Worcestershire Regulatory Services have produced a document entitled *Air Quality Action Plan Progress Report for Worcestershire April 2015-2016* which includes details of all measures completed, in progress or planned to be undertaken, for all of the above AQMAs. This report can be accessed via the following link:-

<http://www.worcsregservices.gov.uk/media/2294583/WRS-AQAP-Progress-Report-2015-16.pdf>

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

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

There are currently no automatic PM_{2.5} monitoring stations in Worcestershire. The nearest AURN PM_{2.5} monitoring station is the Birmingham Acocks Green site approximately 19km to the north east of Bromsgrove.

WRS has reviewed the DEFRA national background maps to determine projected PM_{2.5} concentrations with the Bromsgrove District for the 2015 calendar year. The average total PM_{2.5} at 218 locations (centre points of 1km x 1km grids) across Bromsgrove is 9.67µg/m³, with a minimum concentration of 9.88µg/m³ and a maximum concentration of 12.36µg/m³.

This indicates that PM_{2.5} concentrations within the Bromsgrove District are well below the annual average EU limit value for PM_{2.5} of 25µg/m³.

As outlined in Policy Guidance LAQM.PG16 WRS have discussed the role of the DoPH, and the details of PM_{2.5} levels across the County, with the Director of Public Health for Worcestershire County Council. The DoPH has not confirmed to WRS

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that they are advocating or supporting any specific actions to reduce PM_{2.5} concentrations across the County at this time.

In light of the above no additional actions are currently planned by Bromsgrove District Council in relation to the reduction of PM_{2.5} levels. However it is anticipated that any actions taken to improve NO₂ levels across the district will likely result in a linked improvement in PM_{2.5} levels.

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

No automatic (continuous) monitoring was undertaken within the district during 2015.

3.1.2 Non-Automatic Monitoring Sites

Bromsgrove District Council undertook non- automatic (passive) monitoring of NO₂ at 43 sites during 2015. Table A.1 in Appendix A shows the details of the sites. Table A.2 shows results at each monitoring location from 2011-2015.

Maps showing the location of the monitoring sites and AQMA boundaries are provided in Appendix D, along with graphs depicting the long-term trends in each area. Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes and fall off with distance calculations 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 (NO₂)

During 2015, Bromsgrove District Council monitored annual mean nitrogen dioxide concentrations using forty three passive diffusion tubes at thirty five locations across the area. This was the same number of sites monitored in 2014.

Monitoring locations 13 – Wilkes Associates Ltd, 485 Birmingham Road, Marlbrook, and WL – Street light near 112 Wildmoor Lane, Catshill, were decommissioned prior

to January as part of the 2015 rationalisation of monitoring sites as these had measured significantly below the objective for at least six years.

Two new locations were established at FL1 – 2C Fox Lane behind the Greyhound PH, and FL2 – Lamppost next to new houses close to road on Fox Lane near to Rock Hill junction. FL1 was introduced to monitor an area of regular congestion and FL2 due to a number of new houses being developed very close to the road. Both of these locations were found to be below the annual objective; FL1 measuring $19.81\mu\text{g}/\text{m}^3$ and FL2 $33.86\mu\text{g}/\text{m}^3$.

Exceedances of the annual mean objective of $40\mu\text{g}/\text{m}^3$ for nitrogen dioxide were measured at four monitoring locations during 2015. All of these exceedances were recorded within the Lickey End and Worcester Road, Bromsgrove AQMAs. However the two locations within the Lickey End AQMA fall below the objective when calculated back to relevant exposure.

No exceedances were recorded within the Kidderminster Road, Hagley or Redditch Road, Bromsgrove AQMAs. No exceedances of the NO_2 objectives were recorded outside of any existing AQMAs where annual mean concentrations of nitrogen dioxide ranged from $19.35\mu\text{g}/\text{m}^3$ at RES3 – 104 Kidderminster Road South, to $33.86\mu\text{g}/\text{m}^3$ at FL2 – Fox Lane near to Rock Hill junction.

Kidderminster Road, Hagley AQMA

No exceedances were recorded within or in the vicinity of the AQMA in the monitoring year 2015. Concentrations ranged from $19.35\mu\text{g}/\text{m}^3$ at RES3 (104 Kidderminster Road South) to $32.7\mu\text{g}/\text{m}^3$ at RES4 (23 Worcester Road). The 2013 Progress Report identified a single exceedance at 9a/9b/9c measuring $40.2\mu\text{g}/\text{m}^3$. No exceedances were recorded in 2014. Historical data shows the only other exceedance within the AQMA was in 2010 at the same location and measured $40\mu\text{g}/\text{m}^3$.

Following validation of 2016 monitoring data Bromsgrove District Council will consider undertaking a detailed study of the AQMA, in line with paragraphs 3.46 – 3.48 of LAQM Technical Guidance (LAQMTG.16), in order to determine whether the

AQMA can be revoked. It is noted that prevailing meteorological conditions will require detailed consideration within any study as the UK has experienced warmer than usual winters over the past three years.

Lickey End, Bromsgrove AQMA

Concentrations were found to exceed the annual mean objective within the Lickey End AQMA at two monitored locations. LE4 (Harvester/Forest Inn PH) measured $52.67\mu\text{g}/\text{m}^3$ and F1/F2/F3 (Lickey End, Forest Inn Island) measured $54.45\mu\text{g}/\text{m}^3$. However both of these monitoring points are located some distance from the nearest relevant receptor point. The procedure specified in Technical Guidance LAQM.TG(16) has been used to estimate the concentration at the nearest receptor point of relative exposure.

Given the distance to relevant exposure associated with tube LE4 (11m) and F1/F2/F3 (15m) the NO_2 fall-off with distance calculator has been used to better understand the estimated levels of NO_2 where relevant exposure exists, and whether further consideration is warranted in relation to the hourly mean objective for NO_2 .

The background NO_2 level used in the calculator was obtained from the national background maps published by DEFRA, recorded as $15.19\mu\text{g}/\text{m}^3$.

The calculator estimated NO_2 levels where relevant exposure exists to be $37.1\mu\text{g}/\text{m}^3$ at F1/F2/F3 and $36\mu\text{g}/\text{m}^3$ at LE4. Therefore the estimated levels of NO_2 calculated at the nearest receptor point fall below the average annual mean concentration limit. It is not currently considered necessary to further assess compliance with the hourly mean objective in this area based on the calculated figures.

Bromsgrove District Council will continue to monitor the situation in these locations. Details of these calculations are shown in Appendix C.

Table 3.1 below shows the concentrations at the monitored location and the estimated concentration when worked back to relevant exposure

Table 3.1 Summary of Monitored and Relevant Exposure Figures

Site ID	Within AQMA Y/N	Measurement ($\mu\text{g}/\text{m}^3$) at Monitoring Location (bias-adjusted)	Measurement ($\mu\text{g}/\text{m}^3$) at Relevant Exposure (bias-adjusted and calculated back to relevant exposure)
LE4	Y	52.67	37.1
F1/F2/F3	Y	54.45	36

Redditch Road, Bromsgrove AQMA

No exceedances of the objective were recorded within the AQMA in 2015.

Concentrations ranged from $24.84\mu\text{g}/\text{m}^3$ at 255 (255 Worcester Road) to $35.4\mu\text{g}/\text{m}^3$ at 19/19a/19b (93 Redditch Road, Bunsford Hill). The 2013 Progress Report identified two exceedances, one at location 18 measuring $41\mu\text{g}/\text{m}^3$, the other at 19/19a/19b measuring $43\mu\text{g}/\text{m}^3$. Historical data shows the last exceedances prior to 2013 were in 2010.

Following validation of 2016 monitoring data Bromsgrove District Council will consider undertaking a detailed study of the AQMA, in line with paragraphs 3.46 – 3.48 of LAQM Technical Guidance (LAQMTG.16), in order to determine whether the AQMA can be revoked. It is noted that prevailing meteorological conditions will require detailed consideration within any study as the UK has experienced warmer than usual winters over the past three years.

Worcester Road, Bromsgrove AQMA

Concentrations continue to exceed the annual mean objective within the Worcester Road AQMA. BCX (16 Worcester Road) measured $43.03\mu\text{g}/\text{m}^3$, and BC (Ye Olde Black Cross, Worcester Road) measured $47.59\mu\text{g}/\text{m}^3$. It is therefore necessary for this AQMA to remain in place. The levels recorded are such that there is unlikely to be a breach of the hourly mean objective for NO_2 .

Table A.2 in Appendix A compares the ratified and bias-adjusted monitored NO_2 annual mean concentrations for the past 5 years with the air quality objective of $40\mu\text{g}/\text{m}^3$.

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

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Appendix A: Monitoring Results

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

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?	Height (m)
Kidderminster Road, Hagley										
HL	20 B'ham Rd, Hagley	Roadside	391551	280999	NO ₂	Y	13	2	N	1.88
KR62	62 K'minster Rd, Hagley	Roadside	391182	280631	NO ₂	Y	0	7	N	1.98
8	9 Market Way, Hagley	Roadside	391452	280947	NO ₂	Y	0	15.3	N	1.88
9/9a/9b	78 K'minster Rd, Hagley	Roadside	391210	280668	NO ₂	Y	0	8.3	N	1.98
10	77 Park Road, Hagley	Roadside	391137	280638	NO ₂	Y	0	17	N	1.93
11	74 Worcs Rd, Hagley	Roadside	390295	280043	NO ₂	N	0	2.5	N	1.88
RES1	26 St'bridge Rd, Hagley	Roadside	391449	281169	NO ₂	Y	0	15	N	2.1
RES2	21 B'ham Rd,	Roadside	391552	281038	NO ₂	Y	0	15	N	2.2

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Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?	Height (m)
	Hagley									
RES3	104 K'minster Rd South	Roadside	389825	279587	NO ₂	N	0	14.3	N	2
RES4	23 Worcs Rd, Hagley	Roadside	390022	279761	NO ₂	N	0	14.5	N	2.1
Lickey End, Bromsgrove										
1	3A Alcester Rd, Lickey End	Roadside	396999	272979	NO ₂	Y	4	15	N	1.84
LE4	Harvester PH Lickey End	Roadside	396935	272949	NO ₂	Y	11	1.4	N	2.13
LE5	5 Old B'ham Rd, Lickey End	Roadside	396999	273143	NO ₂	Y	0	6.5	N	1.94
F1/F2/F3	Lickey End Island	Roadside	397010	273112	NO ₂	Y	15	2.5	N	1.96
LE6	5 Old B'ham Rd, Lickey End	Roadside	396999	273143	NO ₂	Y	0	6.53	N	2.13

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Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?	Height (m)
LE7	308 B'ham Rd, Lickey End	Roadside	396958	273157	NO ₂	Y	0	18.3	N	2.1
Redditch Road, Bromsgrove										
HR	52 Hanbury Rd, Stoke Heath	Roadside	394772	268441	NO ₂	Y	0	5	N	2.2
255	255 Worcs Rd	Roadside	394408	268417	NO ₂	N	0	12	N	2.31
18	84 Redditch Rd	Roadside	395180	268549	NO ₂	Y	0	2	N	2.01
19/19a/ 19b	93 Redditch Rd	Roadside	395188	268564	NO ₂	Y	0	2.9	N	1.93
16	58 Redditch Rd	Roadside	394701	268444	NO ₂	Y	0	2.8	N	2.16
Worcester Road, Bromsgrove										
WR2	159 Worcs Rd	Roadside	395511	270180	NO ₂	Y	0	2.2	N	2.21
WR3	138 Worcs Rd	Roadside	395501	270190	NO ₂	Y	0	5	N	2.49

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Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?	Height (m)
BC	Ye Olde Black Cross	Roadside	395685	270424	NO ₂	Y	0	2.5	N	2.29
BCX	16 Worcs Rd	Roadside	395807	270549	NO ₂	Y	0	2.5	N	2.31
WR/WRa /WRb	10 Hannover St	Roadside	395702	270423	NO ₂	Y	0	6.4	N	1.37
WR4	188 Worcs Rd	Roadside	395312	269938	NO ₂	Y	0	7.5	N	2.2
Other Areas										
RH	8 Rockhill	Roadside	395243	269844	NO ₂	N	0	6.25	N	2.15
BR	35 B'ham Rd	Roadside	396292	271210	NO ₂	N	0	4	N	2.17
BG1	Davenhall House, B'ham Rd	Roadside	396238	271118	NO ₂	N	0	2.3	N	2.57
BG3	Finstall Primary School	Background	396755	270400	NO ₂	N	0	N/A	N	1.96
SR	2 Stoke Rd	Roadside	396780	269450	NO ₂	N	0	4.9	N	1.88

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?	Height (m)
TS	Smallholdings, Wildmoor Lane	Roadside	396613	275085	NO ₂	N	0	50	N	1.8
FL1	2c Fox Lane	Roadside	395079	269797	NO ₂	N	0	6.96m	N	2.13
FL2	Fox Lane / Fox Hill Junction	Roadside	395118	269721	NO ₂	N	0	1.60m	N	2.13

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

(2) N/A if not applicable.

Table A.2 – Annual Mean NO₂ Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2015 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2011	2012	2013	2014	2015
Kidderminster Road, Hagley									
HL	Roadside	Diffusion Tube	100	100	-	21	34	25	26
KR62	Roadside	Diffusion Tube	100	100	-	28	33	32	32
8	Roadside	Diffusion Tube	100	100	22	16	27	20	20
9/9a/9b	Roadside	Diffusion Tube	100	100	37	28	40	34	32
10	Roadside	Diffusion Tube	100	100	38	30	37	32	30
11	Roadside	Diffusion Tube	100	100	32	25	33	30	28
RES1	Roadside	Diffusion Tube	100	100	-	-	-	20	21
RES2	Roadside	Diffusion Tube	100	100	-	-	-	30	32
RES3	Roadside	Diffusion Tube	100	100	-	-	-	17	19
RES4	Roadside	Diffusion Tube	100	100	-	-	-	30	33
Lickey End, Bromsgrove									
1	Roadside	Diffusion Tube	100	100	32	21	31	30	26

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2015 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2011	2012	2013	2014	2015
LE4	Roadside	Diffusion Tube	92	92	-	48	67	51	53
LE5	Roadside	Diffusion Tube	100	100	-	-	47	35	35
F1/F2/F3	Roadside	Diffusion Tube	100	100	53	54	50	60	54
LE6	Roadside	Diffusion Tube	100	100	-	-	-	31	31
LE7	Roadside	Diffusion Tube	100	100	-	-	-	33	31
Redditch Road, Bromsgrove									
HR	Roadside	Diffusion Tube	100	100	-	29	37	32	31
255	Roadside	Diffusion Tube	83	83	-	22	30	25	25
18	Roadside	Diffusion Tube	100	100	36	31	41	35	35
19/19a/ 19b	Roadside	Diffusion Tube	100	100	38	32	43	37	35
Worcester Road, Bromsgrove									
16	Roadside	Diffusion Tube	100	100	38	34	35	35	32

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2015 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2011	2012	2013	2014	2015
WR2	Roadside	Diffusion Tube	100	100	39	32	42	41	36
WR3	Roadside	Diffusion Tube	100	100	34	27	38	33	33
BC	Roadside	Diffusion Tube	100	100	49	43	56	46	48
BCX	Roadside	Diffusion Tube	100	100	48	40	58	49	43
WR/WR a/WRb	Roadside	Diffusion Tube	100	100	43	33	47	39	37
WR4	Roadside	Diffusion Tube	100	100	-	-	-	32	31
Other Areas									
RH	Roadside	Diffusion Tube	100	100	-	-	-	33	33
BR	Roadside	Diffusion Tube	100	100	32	25	33	29	29
BG1	Roadside	Diffusion Tube	100	100	33	30	36	32	32
BG3	Background	Diffusion Tube	75	75	22	17	26	18	20
SR	Roadside	Diffusion Tube	100	100	27	21	31	26	27

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2015 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2011	2012	2013	2014	2015
TS	Roadside	Diffusion Tube	100	100	30	22	32	28	25
FL1	Roadside	Diffusion Tube	83	83	-	-	-	-	20
FL2	Roadside	Diffusion Tube	92	92	-	-	-	-	34

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

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

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

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

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

Appendix B: Full Monthly Diffusion Tube Results for 2015

Table B.1 – NO₂ Monthly Diffusion Tube Results - 2015

Site ID	NO ₂ Mean Concentrations (µg/m ³)												Annual Mean	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted ⁽¹⁾
FL1			28.73	26.92	14.48	17.93	18.74	21.76	26.02	34.27	18.39	20.44	22.8	19.81
FL2		29.33	50.28	45.16	39.53	37.60	40.24	25.29	27.01	43.11	44.76	45.79	38.9	33.86
RH1	43.84	40.75	39.97	39.85	33.17	34.88	35.22	35.27	38.49	41.89	37.34	38.60	38.3	33.30
WR4	50.17	40.04	40.71	40.09	28.75	30.25	28.67	27.44	33.81	37.91	34.85	32.29	35.4	30.81
WR2	58.43	48.91	46.99	46.45	28.69	36.09	32.15	34.94	40.88	46.63	39.51	41.19	41.7	36.31
WR3	48.61	43.00	39.79	38.20	29.51	32.52	30.88	31.96	39.17	49.72	38.03	29.89	37.6	32.72
BC	72.21	58.14	57.81	56.52	47.32	50.72	54.58	48.78	54.46	54.31	53.76	47.85	54.7	47.59
BCX	60.07	56.07	55.42	56.77	37.89	44.74	34.96	47.79	50.30	49.23	48.04	52.20	49.5	43.03
WR	52.18	52.11	43.33	49.13	36.12	35.33	33.24	39.63	39.06	39.74	39.92	46.63	42.2	36.71
WRa	49.28	49.15	47.91	45.29	37.59	33.15	31.32	39.96	45.14	42.94	40.80	44.33	42.2	36.75
WRb	50.39	48.44	48.22	45.65	36.88	38.60	34.13	37.42	44.05	46.75	43.93	45.79	43.4	37.72
BG1	47.42	42.05	40.71	37.65	24.41	31.90	28.59	33.67	34.79	45.76	36.05	38.06	36.8	31.98
BR	44.66	39.68	38.57	33.56	26.05	28.07	21.45	26.61	33.75	40.51	31.16	30.77	32.9	28.63
1	41.53	32.88	36.19	31.97	24.52	26.06	20.69	22.78	33.86	34.22	24.35	22.87	29.3	25.51
LE4	77.05	71.75	65.99	52.31	58.03	62.42	48.53	58.82	68.57		53.92	48.59	60.5	52.67
LE7	38.11	38.21	41.38	42.66	28.00	33.21	22.60	32.36	41.04	45.92	31.82	26.56	35.2	30.58
F1	66.92	74.53	66.20	62.81	61.21	62.23	59.93	64.77	63.62	46.96	66.30	69.37	63.7	55.45
F2	74.66	65.42	69.73	58.66	60.68	62.02	58.02	58.82	65.55	43.05	69.39	72.01	63.2	54.96
F3	73.17	65.83	71.81	59.64	59.09	58.84	56.74	40.07	65.13	44.21	68.60	67.07	60.9	52.94
LE5	50.02	50.10	44.00	38.57	36.18	37.69	32.54	35.55	41.51	39.63	40.84	38.16	40.4	35.15
LE6	44.36	40.57	36.92	34.05	31.18	31.61	29.16	32.46	34.17	32.06	40.29	34.39	35.1	30.54
TS	34.09	35.43	34.67	34.78	20.20	20.37	17.37	24.68	30.16	37.69	29.33	32.58	29.3	25.47
10	38.18	43.12	38.88	38.32	22.82	29.23	26.46	33.18	34.38	41.28	34.26	36.74	34.7	30.22
11	34.97	40.45	29.91	37.22	19.96	26.61	23.02	29.33	35.51	43.92	33.24	27.69	31.8	27.68

Site ID	NO ₂ Mean Concentrations (µg/m ³)													Annual Mean	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted ⁽¹⁾	
	HL	36.77	33.94	37.05	32.95	27.72	25.35	22.12	28.01	31.52	37.20	23.11			21.72
8	33.34	29.91	30.89	23.48	17.37	18.10	15.17	18.15	23.40	31.90	17.91	16.40	23.0	20.01	
9	50.32	46.26	45.46	36.00	30.77	29.89	30.23	33.02	37.60	44.43	36.74	31.11	37.7	32.76	
9a	43.40	49.22	45.40	39.24	32.71	24.50	31.06	32.36	37.97	44.26	36.79	29.40	37.2	32.36	
9b	48.01	45.91	42.29	36.19	31.94	25.35	31.57	37.31	37.97	42.39	34.76	30.57	37.0	32.21	
KR62	48.83	42.76	44.30	38.63	34.71	32.66	28.44	34.67	36.20	37.36	34.30	30.92	37.0	32.17	
RES 1	31.48	29.32	26.86	23.60	18.43	18.05	17.02	22.94	21.32	26.65	24.26	23.38	23.6	20.54	
RES 2	47.49	43.36	42.35	39.61	33.94	35.94	33.67	35.66	36.56	43.61	32.14	20.64	37.1	32.26	
RES 3	24.31	27.01	25.52	26.84	17.96	17.50	14.72	20.36	23.01	28.69	22.05	18.95	22.2	19.35	
RES 4	49.74	44.78	45.95	42.48	33.01	31.75	29.09	35.33	37.19	44.54	32.14	25.09	37.6	32.70	
BG3	31.88		28.90	22.44	17.92			17.55	22.86	24.60	24.10	18.58	23.2	20.18	
SR	39.21	35.81	36.78	27.98	27.26	24.70	25.00	29.08	32.79	40.21	27.56	23.37	30.8	26.80	
18	43.88	50.92	47.98	38.59	33.99	34.23	32.83	37.23	43.33	53.16	38.06	28.95	40.3	35.03	
19	45.90	48.72	48.28	39.42	36.97	34.92	35.93	42.08	41.87	49.34	39.92	31.88	41.3	35.90	
19a	49.21	49.09	45.96	38.06	37.56	33.27	35.93	40.76	41.58	52.05	35.08	32.06	40.9	35.57	
19b	43.71	48.02	42.56	39.36	34.10	33.37	35.03	41.39	43.05	49.45	36.70	33.73	40.0	34.83	
HR	40.10	43.05	43.27	32.46	30.34	30.57	29.20	34.01	36.19	47.69	31.22	24.16	35.2	30.62	
16	43.41	46.07	40.47	33.64	29.88	34.96	32.24	38.11	33.17	45.57	34.74	32.47	37.1	32.24	
255	33.53	36.19	34.40	26.09	23.13	19.99	23.19	24.31	29.15	35.55			28.55	24.84	

(1) See Appendix C for details on bias adjustment

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

QA/QC Data

Factor from Local Co-location Studies (if available)

No local co-location studies for nitrogen dioxide have been undertaken in 2015.

Diffusion Tube Bias Adjustment Factors

The following UKAS accredited company provides Bromsgrove District 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 2015 was 0.87 (Spreadsheet Version No. 03/15) which were derived from the national studies.

Short-term to Long-term Data Adjustment

Data capture was of a level that no annualisation was necessary.

QA/QC of Automatic Monitoring

No Automatic Monitoring Data is available for 2015.

QA/QC of Diffusion Tube Monitoring

Under the WASP Scheme Somerset Scientific Services performed 100% satisfactory for all periods in 2015. Tube precision was generally 'Good' throughout 2015.

Figure C.1 F1/F2/F3 Harvester PH Lickey End Bromsgrove

BUREAU VERITAS

Air Quality CONSULTANTS

Enter data into the red cells

Step 1	How far from the KERB was your measurement made (in metres)?	2.5	metres
Step 2	How far from the KERB is your receptor (in metres)?	15	metres
Step 3	What is the local annual mean background NO ₂ concentration (in µg/m ³)?	15.19	µg/m ³
Step 4	What is your measured annual mean NO ₂ concentration (in µg/m ³)?	54.45	µg/m ³
Result	The predicted annual mean NO ₂ concentration (in µg/m ³) at your receptor	37.1	µg/m ³

Figure C.2 – LE4 Lickey End Island Bromsgrove

BUREAU VERITAS

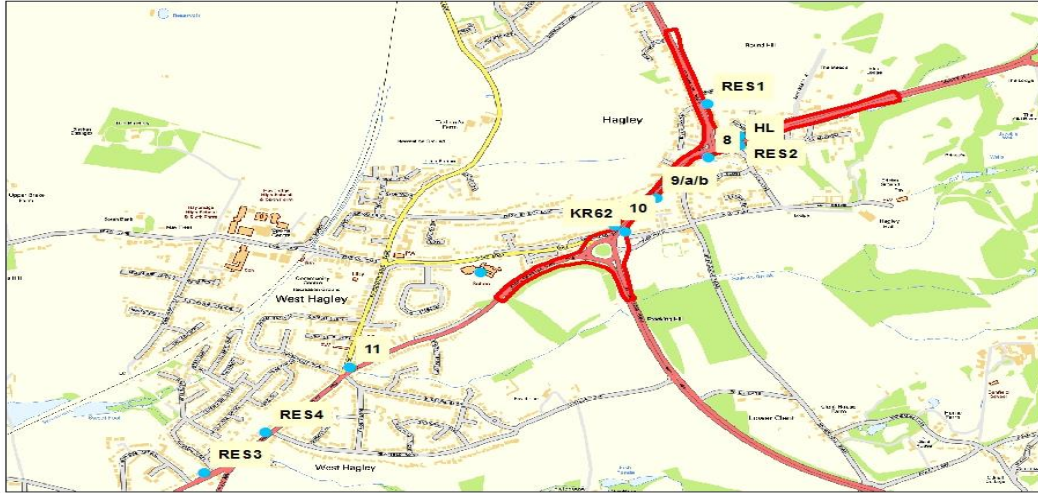
Air Quality CONSULTANTS

Enter data into the red cells

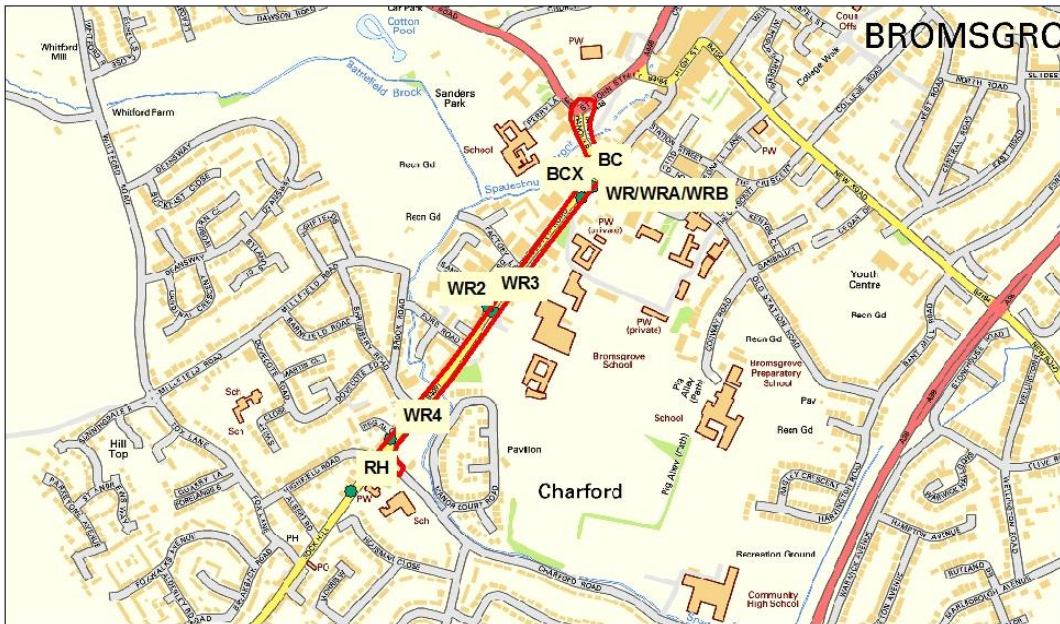
Step 1	How far from the KERB was your measurement made (in metres)?	1.4	metres
Step 2	How far from the KERB is your receptor (in metres)?	11	metres
Step 3	What is the local annual mean background NO ₂ concentration (in µg/m ³)?	15.19	µg/m ³
Step 4	What is your measured annual mean NO ₂ concentration (in µg/m ³)?	52.67	µg/m ³
Result	The predicted annual mean NO ₂ concentration (in µg/m ³) at your receptor	36.0	µg/m ³

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

Kidderminster Road, Hagley AQMA and monitoring locations



Worcester Road AQMA and monitoring locations

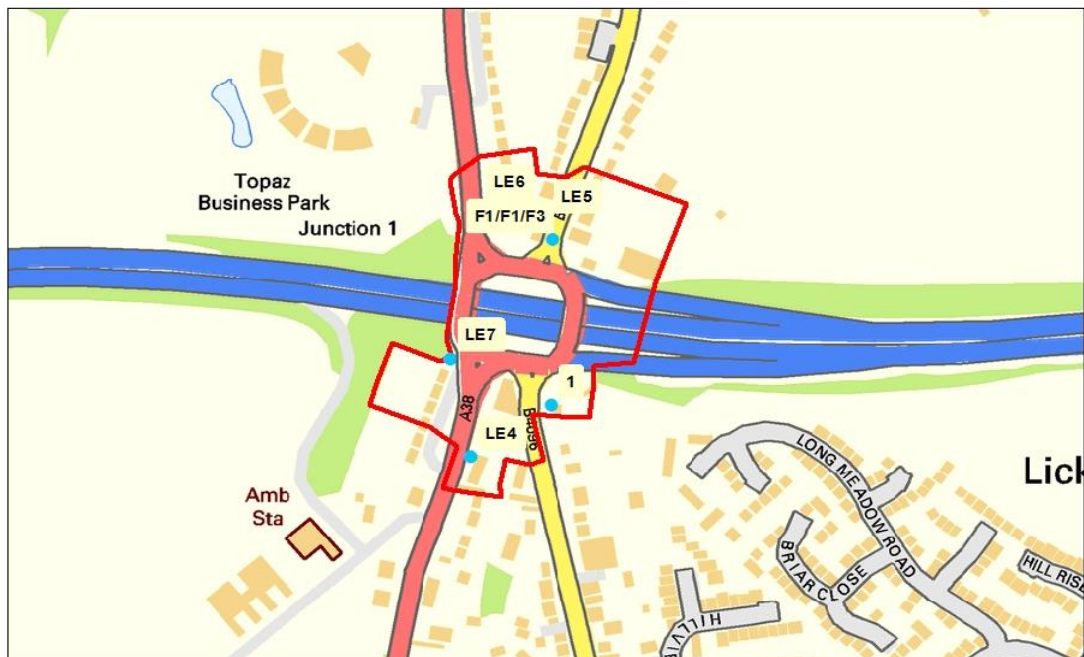


Redditch Road AQMA and monitoring locations



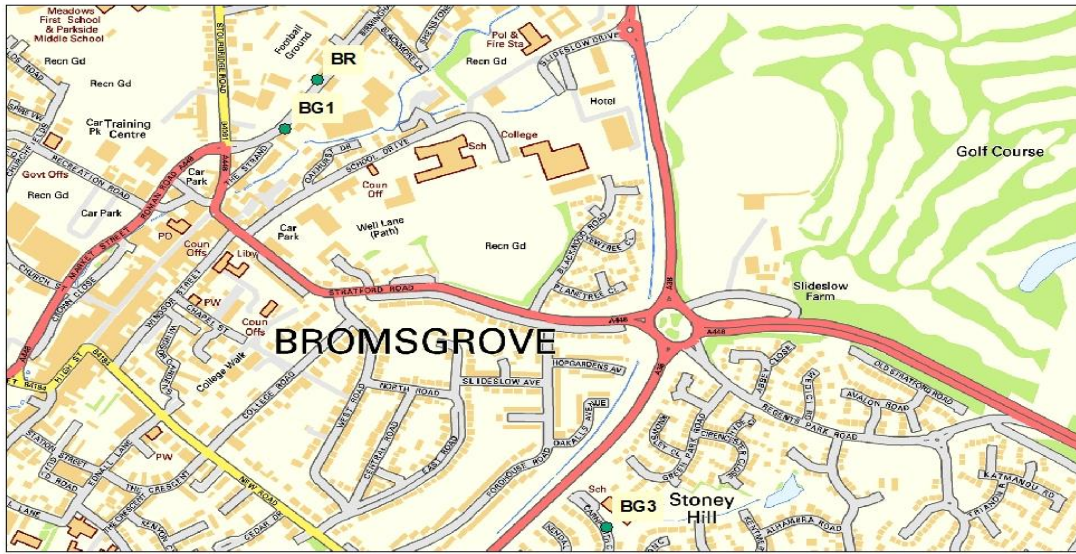
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Lickey End AQMA and monitoring locations

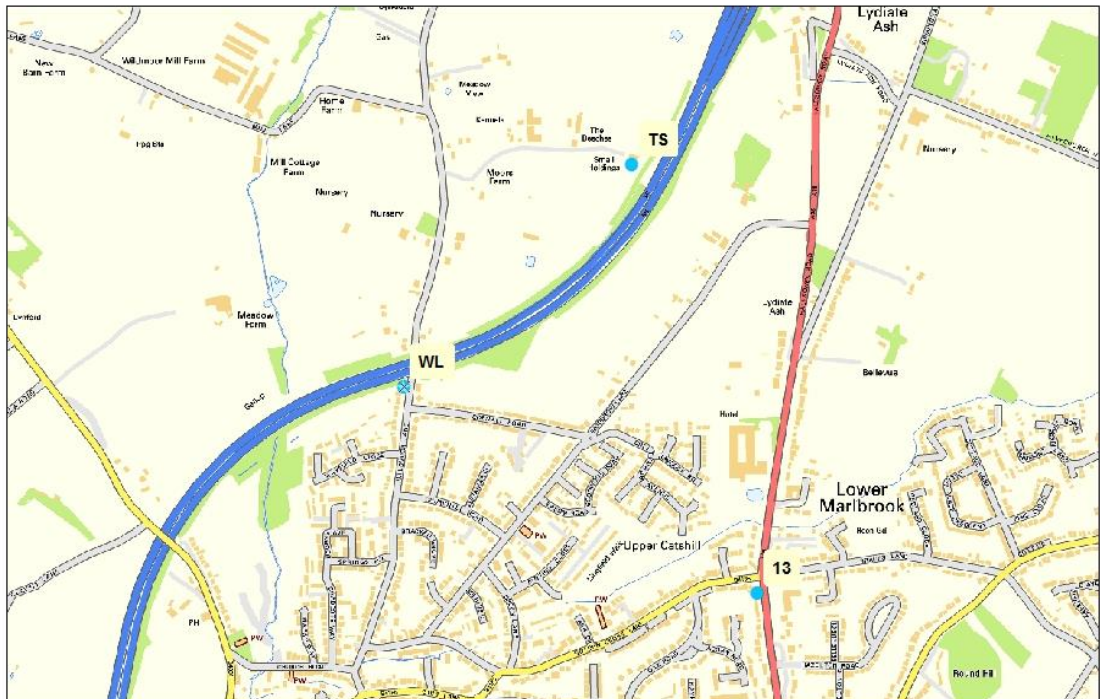


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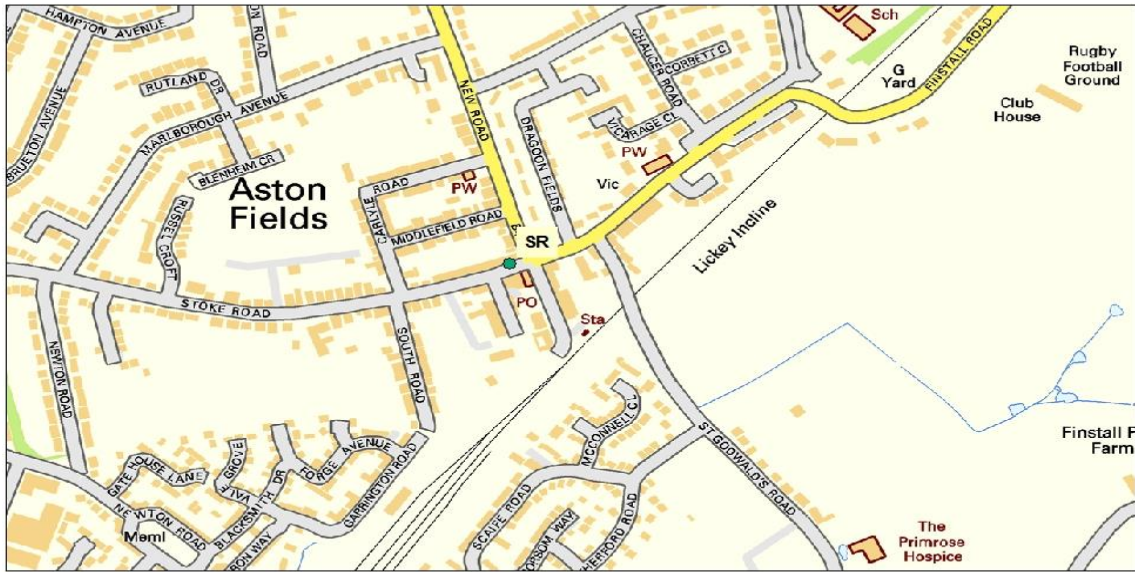
Monitoring Locations outside of AQMAs



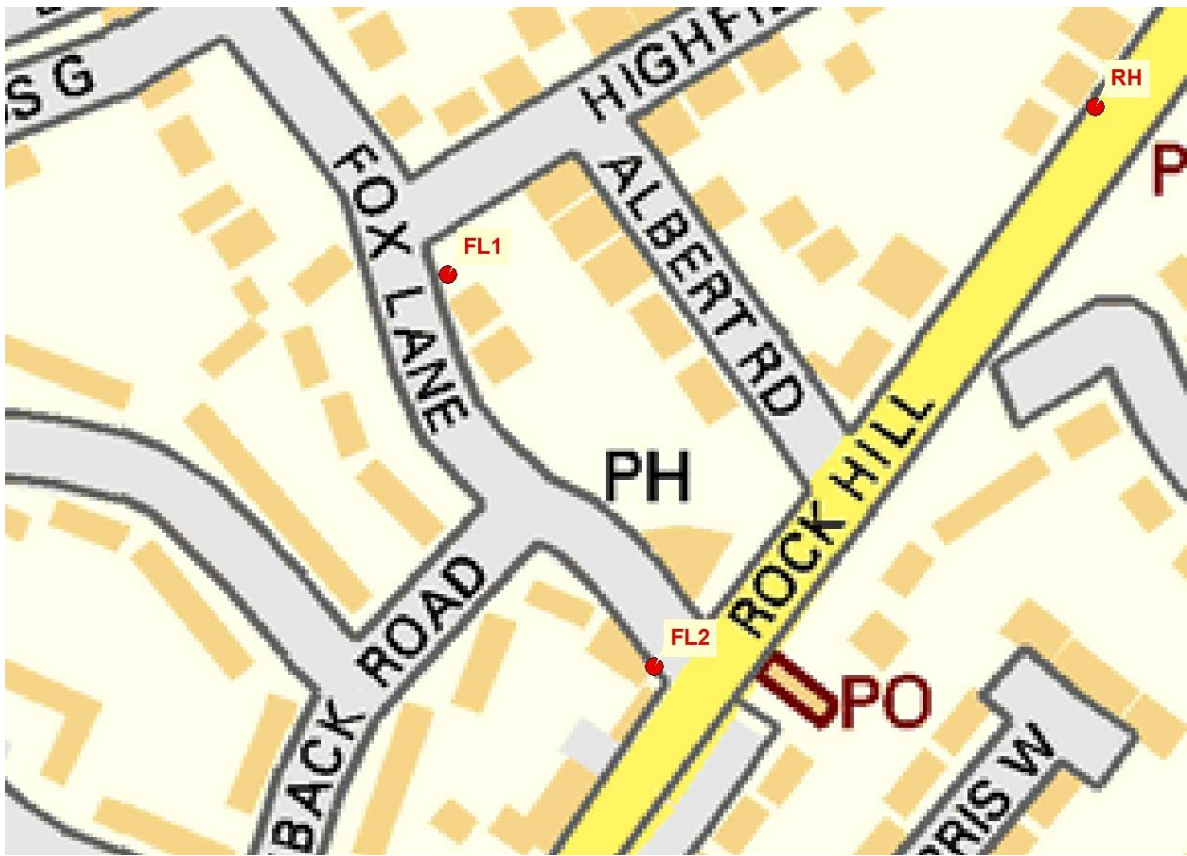
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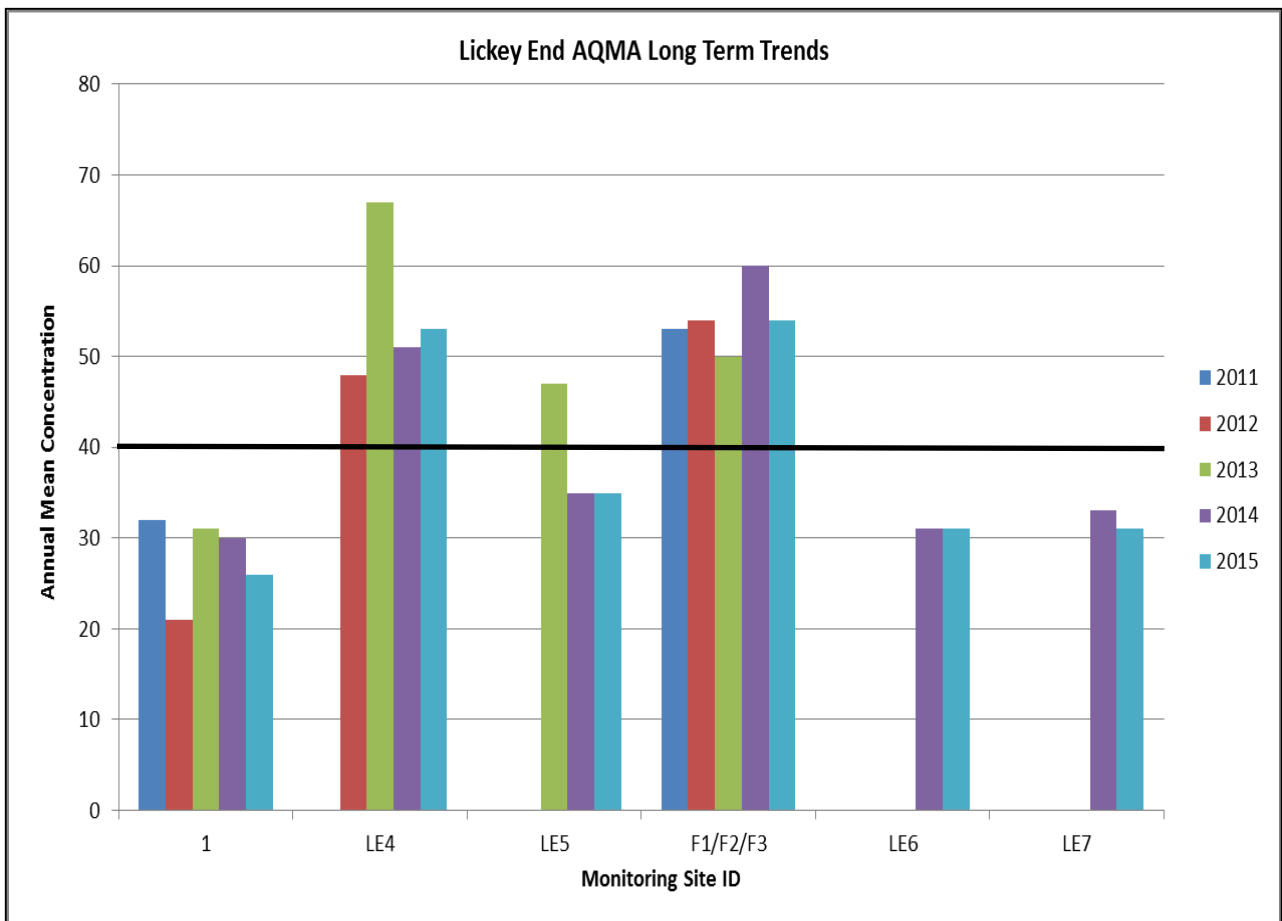
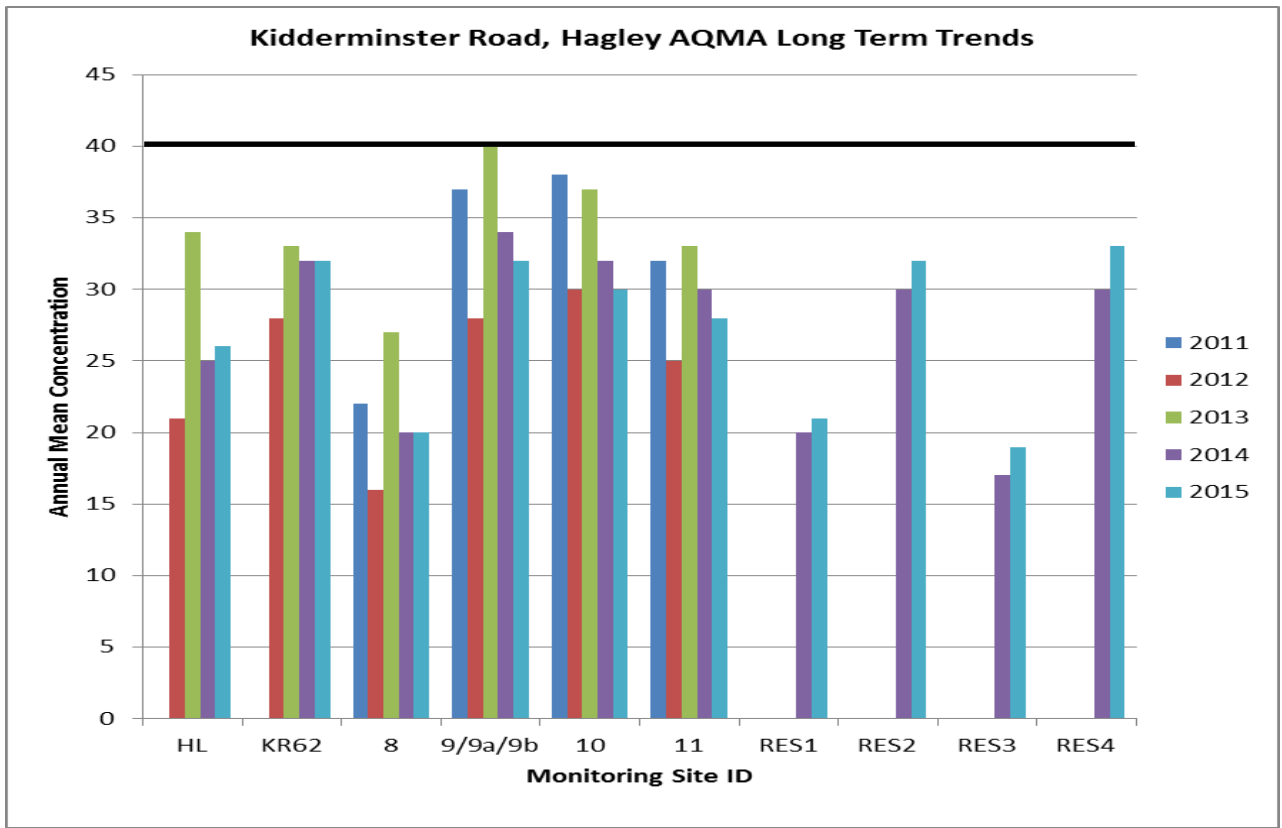
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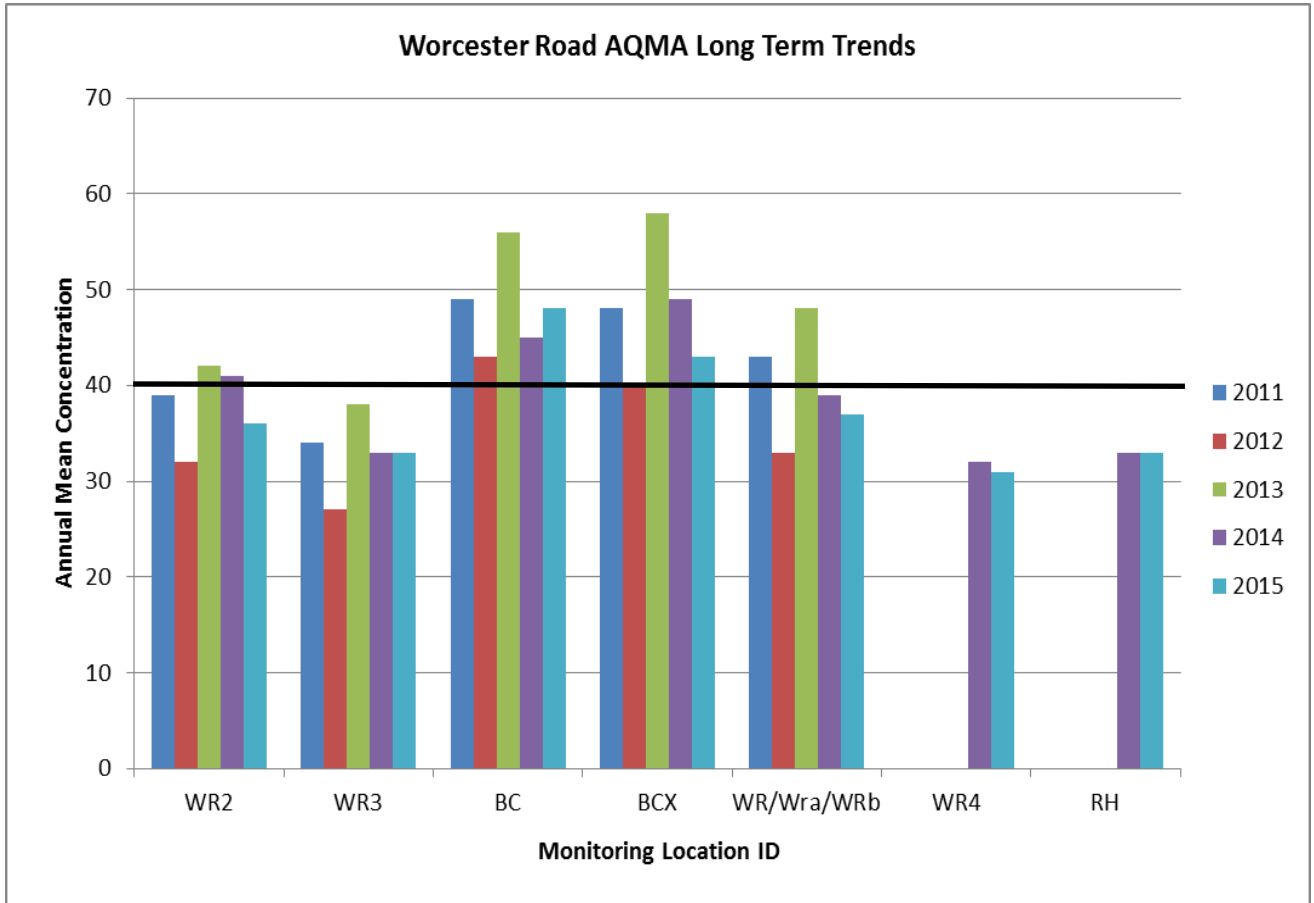
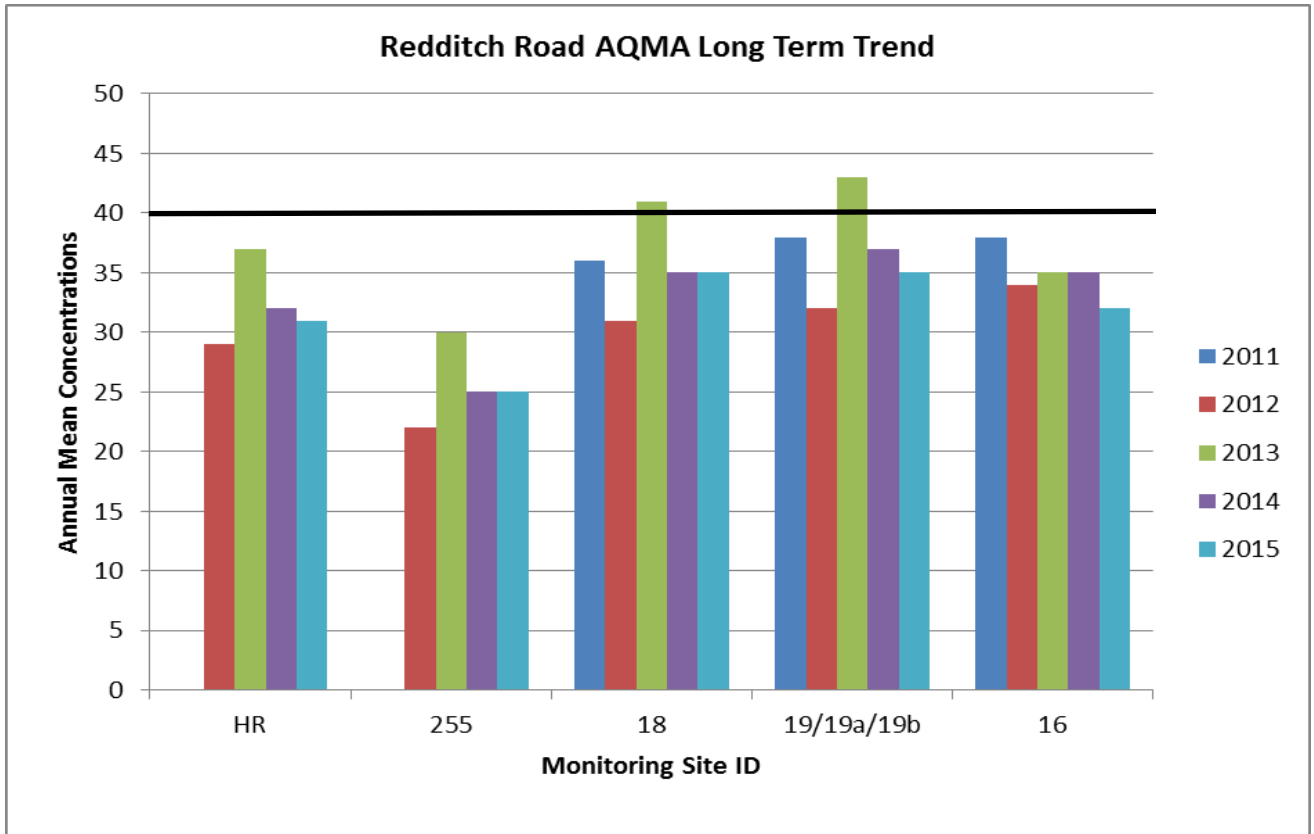


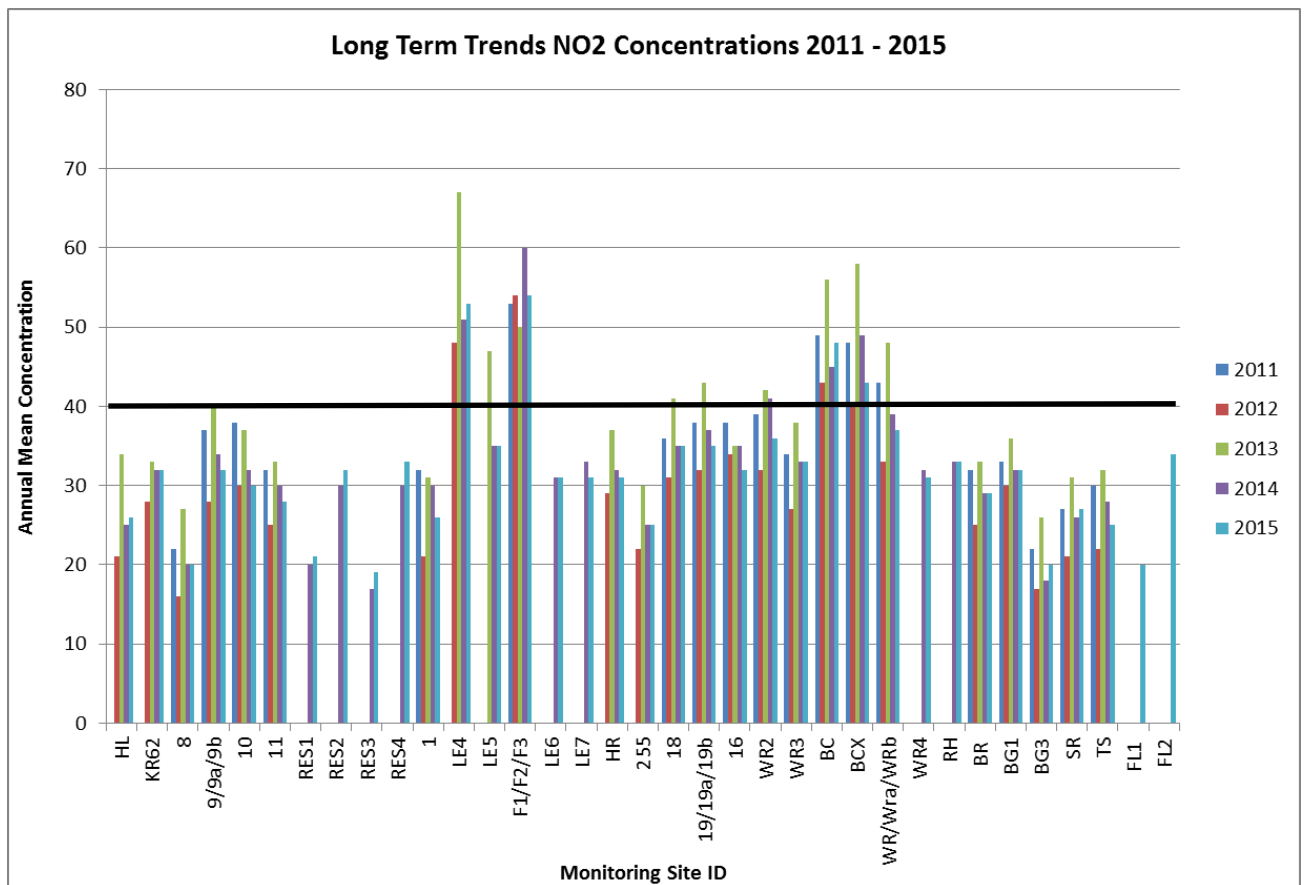
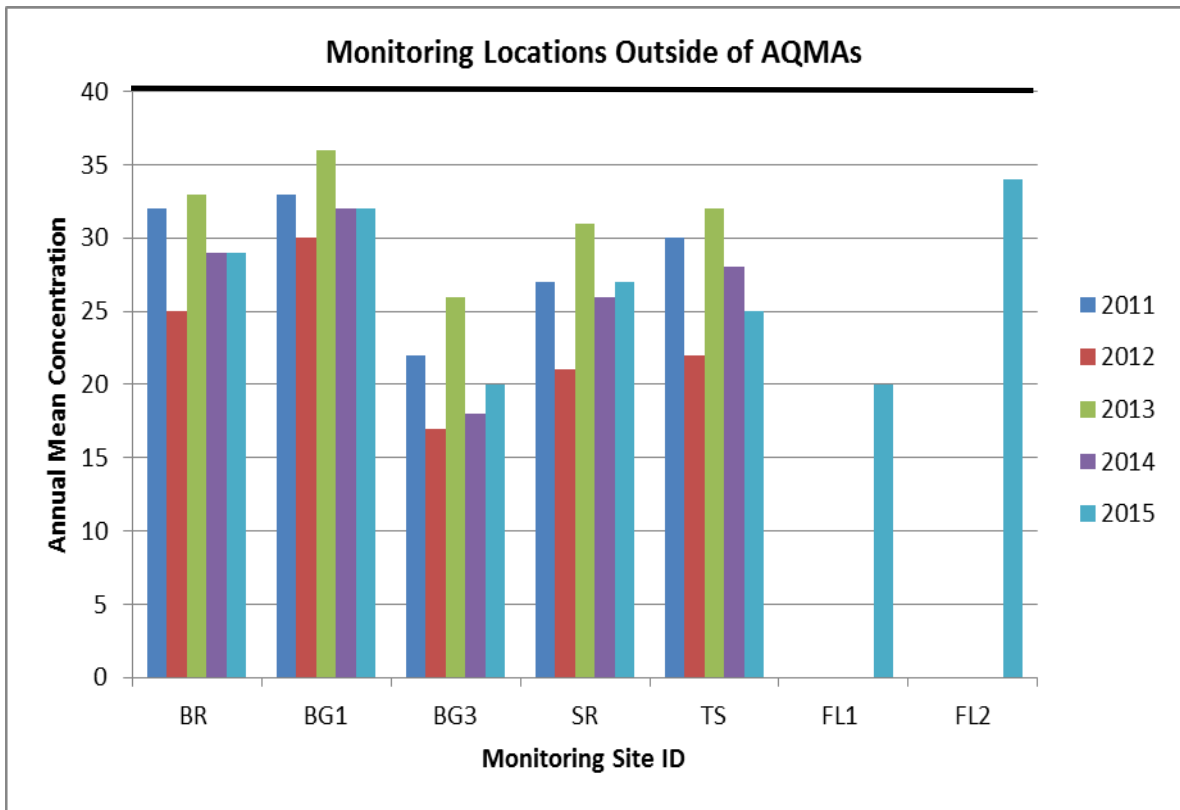
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Long Term Trend Graphs







Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

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

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

Glossary of Terms

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

References

1. DEFRA (2016) 'Local Air Quality Management Policy Guidance LAQM PG.(16)'
2. DEFRA (2016) 'Local Air Quality Management Technical Guidance LAQM TG.(16)'
3. DEFRA (2016) 'National Diffusion Tube Bias Adjustment Factor Spreadsheet v.03/16'
4. Worcestershire Regulatory Services (2013) 'Air Quality Action Plan for Worcestershire'
5. Worcestershire Regulatory Services (2015) 'Air Quality Action Plan Progress Report for Worcestershire April 2013-April 2015'
6. Worcestershire Regulatory Services (2016) 'Air Quality Action Plan Progress Report for Worcestershire April 2015 – March 2016'