Worcestershire
Regulatory Services
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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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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 issues of equality, because areas with poor air quality are also often the less affluent areas[1,2]. The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion[3].

Air Quality in Malvern Hills District

There are currently no AQMAs declared in the Malvern Hills District.

Monitoring data shows that there have been reductions in NO_2 at some locations between 2014 and 2015 but increases in NO_2 levels at other locations. Overall there is no discernible trend in concentrations between 2011 and 2015 across the District.

No annual means greater than 60ug/m3 have been recorded indicating that it is unlikely that there have been any exceedences of the 1-hour mean objective for NO_2 at these sites.

[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

There is no requirement to declare any AQMA in the Malvern Hills district at this time. Malvern Hills District Council will continue to monitor nitrogen dioxide levels across its area in 2016.

Actions to Improve Air Quality

In 2013, WRS produced a countywide Air Quality Action Plan (AQAP) for Worcestershire which was adopted by Malvern Hills District Council (MHDC) on 29th October 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 view or download at

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. To date the Malvern Hills area does not form a specific part of the AQAP as there is no current AQMA in the area. However the general actions to improve air quality detailed in the AQAP apply across Worcestershire as a whole, including the Malvern Hills area.

Local Priorities and Challenges

There are currently no AQMAs declared in the Malvern Hills District.

The priorities for Malvern Hills District Council in 2016 are to continue to monitor nitrogen dioxide at key points across the area. To that end additional tubes will be added to the monitoring network for 2016 to target areas that have not previously

been monitored where relevant exposure is present and regular congestion is observed.

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 District 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 Malvern Hills District during 2015. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

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

There are currently no declared AQMAs in the Malvern Hills District.

2.2 Progress and Impact to of Measures to address Air Quality in Malvern Hills District

No specific actions have been progressed to improve air quality in the Malvern Hills District as there is currently no declared AQMA in the area. However the general actions to improve air quality detailed in the AQAP apply across Worcestershire as a whole, including the Malvern Hills area.

Please refer to the Air Quality Action Plan Progress Report for Worcestershire 2015-2016, available at http://www.worcsregservices.gov.uk/pollution/air-quality/air-quality-action-plan.aspx for details relevant to this section.

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 40 miles to the north east of the Malvern Hills District.

WRS has reviewed the DEFRA national background maps to determine projected $PM_{2.5}$ concentrations with the Malvern Hills District for the 2015 calendar year. The average total $PM_{2.5}$ at 577 locations (centre points of 1km x 1km grids) across the Malvern Hills District is 9.66ug/m3, with a minimum concentration of 8.57ug/m3 and a maximum concentration of 12.12ug/m3.

This indicates that $PM_{2.5}$ concentrations within the Malvern Hills District are well below the annual average EU limit value for $PM_{2.5}$ of 25ug/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 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 Malvern Hills District Council in relation to the reduction of $PM_{2.5}$ levels. However it is anticipated that any actions taken to improve NO_2 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 monitoring has been undertaken in the Malvern Hills district during 2015.

3.1.2 Non-Automatic Monitoring Sites

Malvern Hills District Council undertook non- automatic (passive) monitoring of NO_2 at 14 sites during 2015. Table A.1 in Appendix A shows the details of the sites.

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

3.2 Individual Pollutants

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

3.2.1 Nitrogen Dioxide (NO_2)

Table A. in Appendix A compares the ratified and annualised monitored NO_2 annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

Table A.3 in Appendix A summarises monitoring data at those locations where calculation back to relevant exposure is required. The monitoring data in this table is ratified, annualised and calculated back to relevant exposure and compared to the air quality objective of 40µg/m^3.

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

Figure 3.1 – Long Term Trends NO_2 Concentrations 2011 – 2014

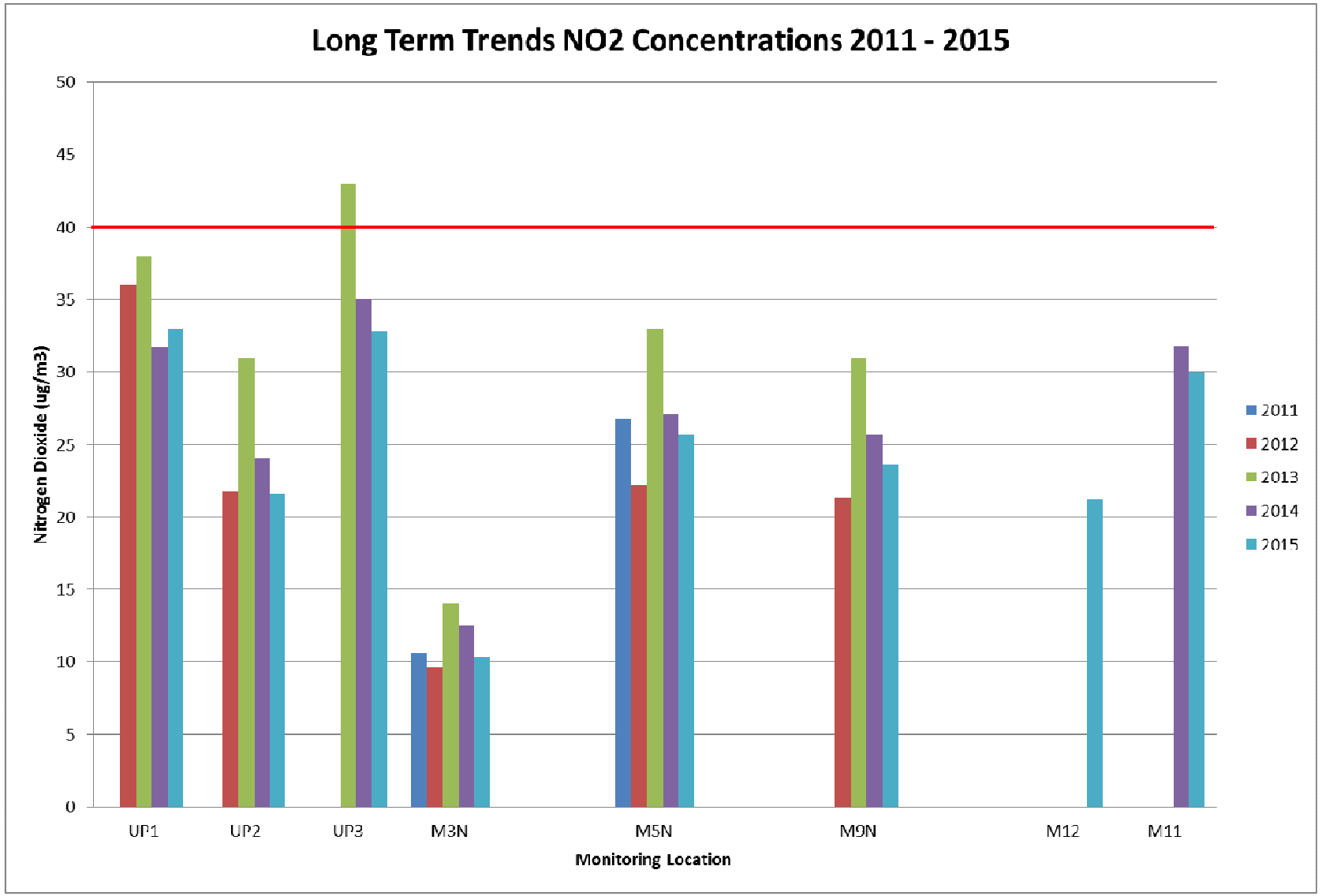

Figure 3.1 above shows the five year trend for NO_2 concentrations, annualised, adjusted for bias and calculated back to relevant exposure where appropriate, at all diffusion tube locations across the Malvern Hills District. The figure demonstrates that there have been reductions in NO_2 at some locations between 2014 and 2015 but increases in NO_2 levels at other locations. Overall there is no discernible trend in concentrations between 2011 and 2015 across the District.

No annual means greater than 60ug/m3 have been recorded indicating that it is unlikely that there have been any exceedences of the 1-hour mean objective for NO_2 at these sites.

There is no requirement to declare any AQMA in the Malvern Hills district at this time.

Malvern Hills District Council will continue to monitor nitrogen dioxide levels across its area in 2016. The 2016 monitoring network of diffusion tubes will be extended to enable monitoring in areas that have not previously been the subject of monitoring and where relevant exposure is present in combination with regular observed congestion. The results of the 2016 monitoring will be reported in 2017.

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)
UPTON										
UP1	2 Old Street, Upton upon Severn	Roadside	385171	240555	NO_2	N	0	2	N	2.10m
UP2	Junction London Lane/High Street Upton upon Severn	Roadside	385201	240646	NO_2	N	0	1.5	N	2.18m
UP3	15 Old Street, Upton upon Severn	Roadside	385157	240508	NO_2	N	0	1.3	N	1.98m
MALVERN										

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)
M3N	Teme Avenue, Malvern	Urban Background	379790	245677	NO_2	N	7	1	N	2.2m
M5N (triplicate)	Richmond Road, Malvern	Roadside (junction)	378520	247753	NO_2	N	0	4.5	N	2.3
M9N (triplicate)	188 Worcester Road, Malvern	Roadside	378771	247926	NO_2	N	0	4	N	2.1
M12 (triplicate)	Church Street, Malvern (previously M10N, lamppost moved)	Roadside	377657	245958	NO_2	N	0	1.6	N	2.1
POWICK										

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)
M11	Old Post Office, Powick	Roadside	383231	251684	NO_2	N	7	2.1	N	2.1

(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 NO_2 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
UPTON									
UP1	Roadside	Diffusion Tube	92	92	-	36.02	38	31.73	32.99
UP2	Roadside	Diffusion Tube	100	100	-	21.75	31	24.07	21.65
UP3	Roadside	Diffusion Tube	100	100	-	-	43	35.07	32.80
MALVERN									
M3N	Urban Background	Diffusion Tube	100	100	10.6	9.6	14	12.5	10.34
M5N (triplicate average)	Roadside (junction)	Diffusion Tube	100	100	26.8	22.2	33	27.1	25.68
M9N (triplicate average)	Roadside	Diffusion Tube	92	92	-	21.3	31	25.7	23.68
M12 (triplicate average)	Roadside	Diffusion Tube	83	83	-	-	-	-	21.17
POWICK									
M11	Roadside	Diffusion Tube	100	100	-	-	-	31.8	29.99

Notes: Exceedances of the NO_2 annual mean objective of 40µg/m^3 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 **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 – NO_2 Monthly Diffusion Tube Results - 2015

Site ID	NO_2 Mean Concentrations ($\mu g/m^3$)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
													Raw Data	Bias Adjusted (1)
UPTON														
UP1	43.43	42.69	43.95	-	32.30	32.05	34.31	36.84	34.75	42.82	37.03	36.93	37.9	32.99
UP2	31.80	30.26	32.83	23.27	18.87	20.52	18.12	22.34	24.87	31.68	22.59	21.38	24.9	21.65
UP3	38.59	44.78	51.02	43.82	28.84	30.99	28.79	36.54	37.46	47.67	31.85	31.98	37.7	32.80
MALVERN														
M3N	12.31	13.72	14.32	8.60	5.45	5.76	6.77	9.15	10.46	35.71	10.02	10.41	11.9	10.34
M5N (triplicate average)	34.22	34.57	34.44	28.11	26.35	25.04	24.49	28.28	29.69	34.62	29.42	24.98	29.52	25.68
M9N (triplicate average)	27.34	32.81	36.36	27.18	19.40	22.40	20.19	26.01	25.68	33.53	26.39	23.95	27.22	23.68
M12 (triplicate average)	28.69	32.46	32.65	25.56	23.82	21.41	17.72	19.92	30.62	35.69	24.39	21.17	26.63	23.17
POWICK														
M11	38.53	38.53	44.41	28.40	26.76	27.50	26.01	31.75	36.14	46.52	35.59	33.45	34.5	29.99

(1) See Appendix C for details on bias adjustment

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

Sources of pollution

Malvern Hills District Council has not identified any new or significant changes to sources as described in Chapter 7, section 1 of Technical Guidance LAQM.TG(16)

Diffusion Tube Bias Adjustment Factors

The following UKAS accredited company provides Malvern Hills District Council with nitrogen dioxide diffusion tubes and analysis:

Somerset Scientific Services

The Crescent

County Hall

Taunton

TA1 4DY

Tel: 0300 123 2224

Email: somersetscientific@somerset.gov.uk

The 20% Triethanolamine (TEA) / Deionised Water preparation method is used.

The bias adjustment factor applied to the results in 2015 was 0.87 (Spreadsheet Version No: 03/16) which was 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 2015 to November 2015. Tube precision was “Good” throughout 2015.

Short-term to Long-term Data Adjustment

No annualisation calculations were required for monitoring locations in Malvern Hills during 2015.

Estimates of concentrations at nearest receptor

There were no measured exceedences across the Malvern Hills district in 2015, therefore there is no requirement to estimate concentrations at nearest receptors where monitoring locations are located away from relevant exposure.

Appendix D: Map(s) of Monitoring Locations

Figure D.1 Powick Tube Location Plan

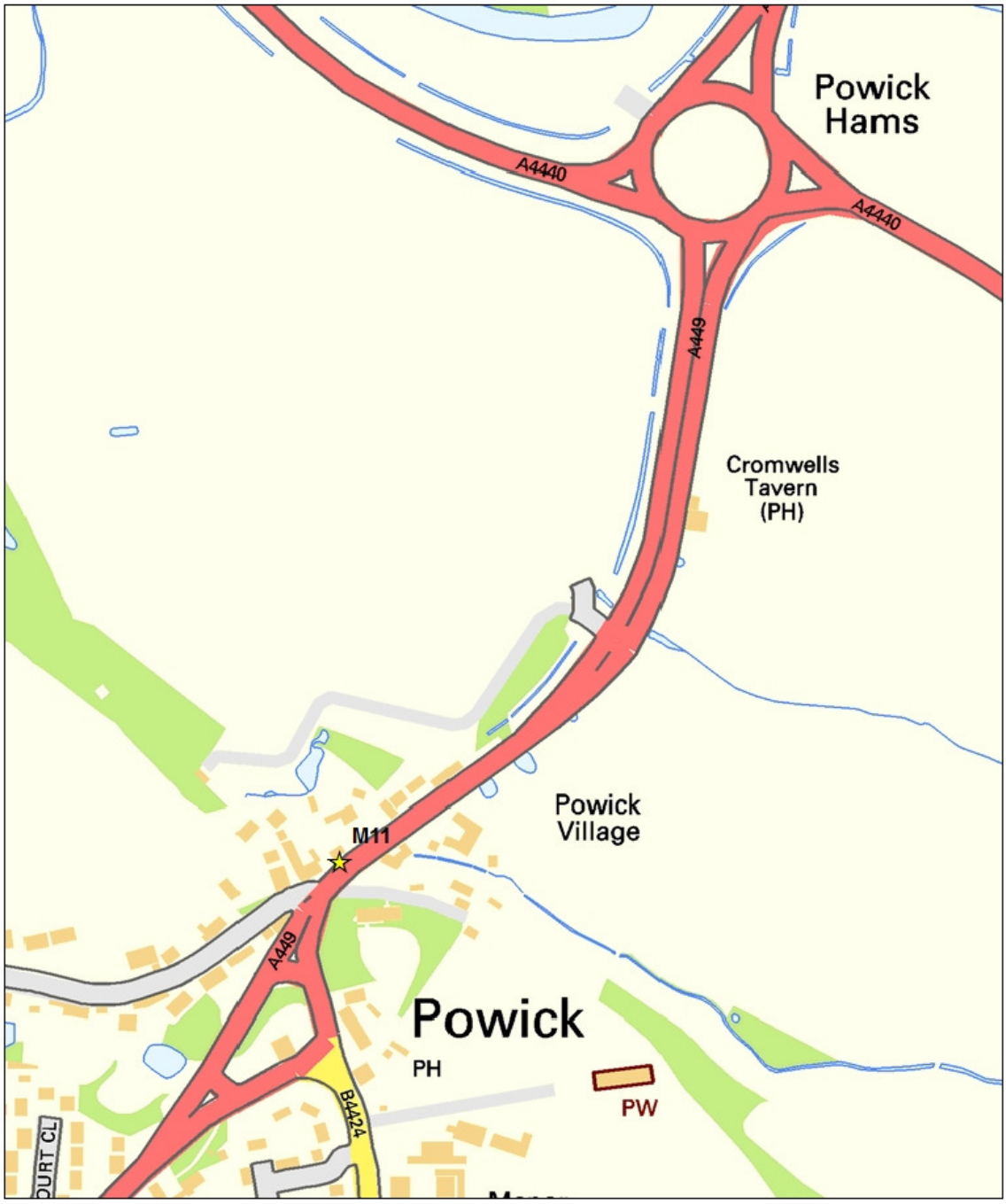

Figure D.2 Upton-Upon-Severn Tubes Location Plan

Figure D.3 Great Malvern Tubes Location Plan

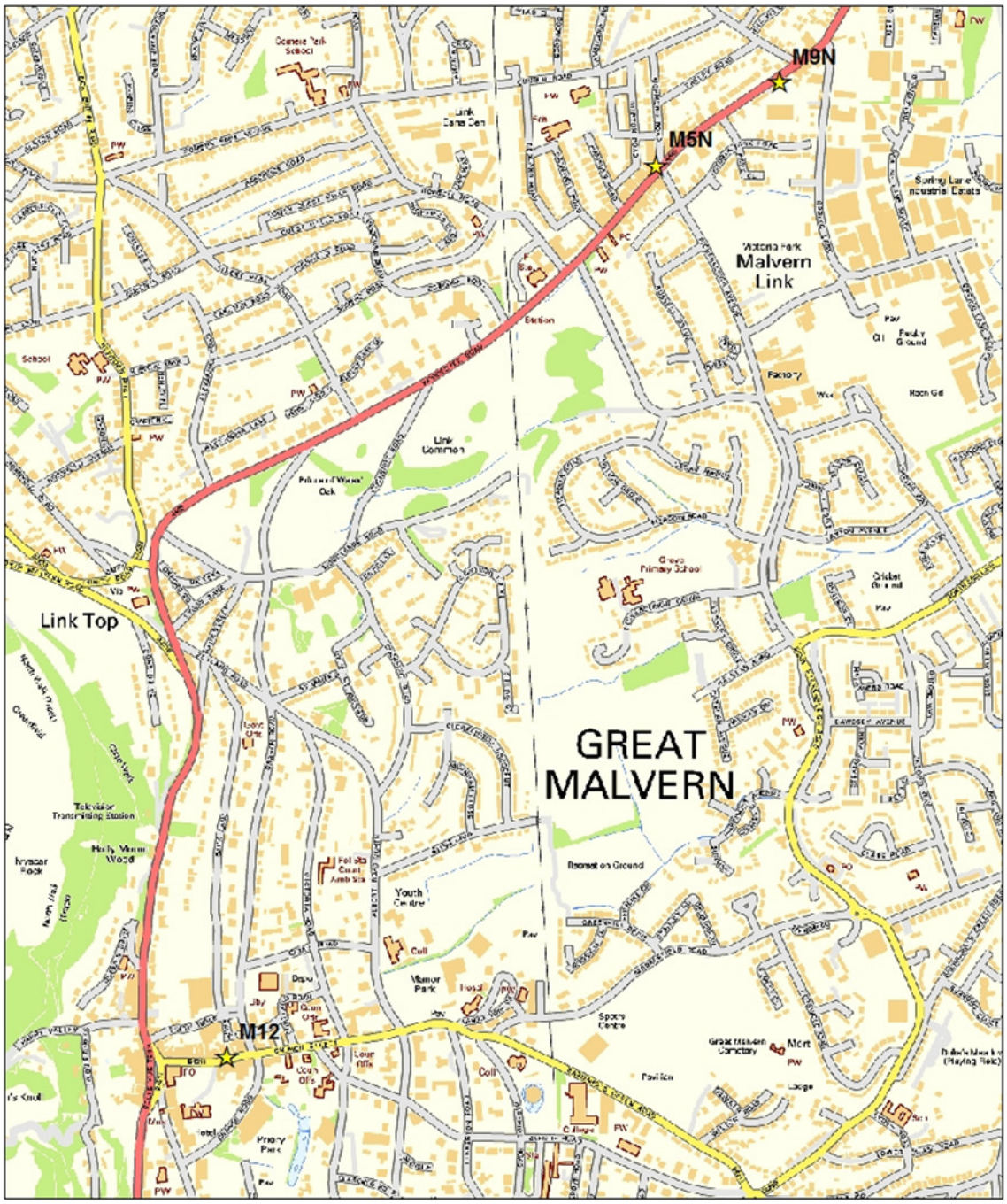

Figure D.4 Great Malvern Tube M3N Location Plan

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

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'