

Worcestershire **Regulatory Services**

Supporting and protecting you

2017 Air Quality Annual Status Report (ASR)

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

November 2017

Malvern Hills District Council

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Executive Summary: Air Quality in Our Area

Air Quality in Malvern Hills District

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.

No AQMA's have been declared in the Malvern Hills District.

Monitoring data shows that there is a slight increase in NO₂ concentrations at all locations when comparing 2016 results with those from 2015. The highest concentration of NO₂ was monitored at location UP1 with a value of 35.9µg/m³. This is greater than 10% below the annual mean objective of 40µg/m³ for nitrogen dioxide. The lowest monitored concentration recorded in the district was 11.64ug/m³ at urban background location M3N.

No annual means greater than 60ug/m³ have been recorded indicating that it is very unlikely that there have been any exceedances of the 1-hour mean objective for NO₂ at any monitoring sites.

Four additional monitoring locations were installed prior to the start of 2016 to target areas not previously monitored. These locations had been identified from local knowledge as residential streets with significant traffic flow often obstructed by

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

vehicles or narrow in nature. All of these new monitoring locations recorded concentrations well below the annual mean objective for NO₂.

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.

Conclusions and Priorities

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

The priorities for Malvern Hills District Council are to continue to monitor nitrogen dioxide at key points across the area. To this end the tube rationalisation conducted at the end of 2016 led to decommissioning of a number of tubes where concentrations had been recorded well below the annual mean objective. An additional location was also established in an area identified as having significant traffic flow and relevant receptors that had not been previously monitored. Malvern Hills District Council will continue to review and assess air quality within the area.

Local Engagement and 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 Council area 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 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 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 compliance with the objectives.

There is no history of any AQMA being declared in the Malvern Hills District. Concentrations continue to fall well below the annual mean objective for nitrogen dioxide.

For reference, maps of all monitoring locations within the Malvern Hills District area are available in Appendix D.

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

There have been no exceedances of the annual mean objective for nitrogen dioxide at any monitoring location across the Malvern Hills District in 2016. Concentrations have remained well below the objective.

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-qualityaction-plan.aspx>

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.

WRS has reviewed the DEFRA national background maps to determine projected PM_{2.5} concentrations within the Malvern Hills District for the 2016 calendar year. The average total PM_{2.5} at 582 locations (centre points of 1km x 1km grids) across the Malvern Hills District is 8.17µg/m³, with a minimum concentration of 7.09µg/m³ and a maximum concentration of 10.55µg/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 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 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 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 monitoring has been undertaken in the Malvern Hills district during 2016.

3.1.2 Non-Automatic Monitoring Sites

Malvern Hills District Council undertook non-automatic (passive) monitoring of NO₂ at 12 sites during 2016. Table A. in Appendix A shows the details of the sites. This represents an increase of four monitoring locations on the previous year. Triplicate locations M5N, M9N and M12 were reduced from three co-located tubes to single tubes. Given that monitored concentrations at these locations were significantly below the objective for the duration of monitoring a single tube was considered sufficient.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on Quality Assurance/Quality Control (QA/QC) for the diffusion tubes, including bias adjustments and any other adjustments applied (e.g. “annualisation” and/or distance correction), are included in Appendix C.

3.2 Individual Pollutants

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

3.2.1 Nitrogen Dioxide (NO₂)

During 2016 Malvern Hills District Council monitored annual mean nitrogen dioxide concentrations using twelve passive diffusion tubes at different locations. This was an increase of four locations to the previous year.

New locations were established on Pickersleigh Road (M13), Worcester Road (M14), Upper Howsell Road (M15), and Newtown Road (M16) in Malvern. Queuing traffic,

vehicular obstructions, or narrow streets had been observed at these locations and had not been previously monitored.

No exceedance of the annual mean objective for NO₂ was recorded. The highest concentration of NO₂ was in location UP1 with a value of 35.9µg/m³ which is greater than 10% below the objective. The lowest value of 11.64µg/m³ was recorded at background location M3N. All new monitoring locations were recorded well below the objective with a highest value of 24.01µg/m³ at M13.

Table A.2 in Appendix A compares the ratified and adjusted monitored NO₂ annual mean concentrations for the past 5 years with the air quality objective of 40µg/m³.

For diffusion tubes, the full 2016 dataset of monthly mean values is provided in Appendix B.

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)
UP1	2 Old Street	Roadside	385171	240555	NO ₂	No	0	2	No	2.10m
UP2	Junction of London lane/High Street	Roadside	385201	240646	NO ₂	No	0	1.5	No	2.18m
UP3	15 Old Street, Upton	Roadside	385157	240508	NO ₂	No	0	1.25	No	1.98m
M3N	Teme Avenue	Background	379790	245677	NO ₂	No	7	1	No	2.20m
M12	Church Street	Roadside	377657	245958	NO ₂	No	0	1.6	No	2.10m
M5N	Richmond Road	Roadside	378520	247753	NO ₂	No	0.5	4.5	No	2.30m
M9N	188 Worcester Road	Roadside	378771	247926	NO ₂	No	0	4	No	2.10m
M11	Old Post Office, Powick	Roadside	383231	251684	NO ₂	No	7	2.1	No	2.10m
M13	Lampost near 417 Pickersleigh Road, Malvern	Roadside	378813	245730	NO ₂	No	5	1.2	No	2.2m
M14	278 Worcester Road, Malvern, WR14 1BD	Roadside	379156	248248	NO ₂	No	0	5.85	No	3.2m
M15	19 Upper Howsell Road, Malvern, WR14 1TL	Roadside	377911	248026	NO ₂	No	0	4	No	2m
M16	77 Newtown Road, Malvern, WR14 1PD	Roadside	377453	247135	NO ₂	No	0	2.5	No	1.8m

Notes:

(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 2016 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2012	2013	2014	2015	2016
UP1	Roadside	Diffusion Tube	100	100	36.02	38	31.73	32.99	35.9
UP2	Roadside	Diffusion Tube	100	100	21.75	31	24.07	21.65	25.3
UP3	Roadside	Diffusion Tube	100	100		43	35.07	32.80	34.8
M3N	Background	Diffusion Tube	100	100	9.47	14	12.46	10.34	11.6
M12	Roadside	Diffusion Tube	91.67	91.67			26.15	23.17	26
M5N	Roadside	Diffusion Tube	91.67	91.67	22.19	33	27.05	25.68	27.5
M9N	Roadside	Diffusion Tube	100	100			25.74	23.68	25.3
M11	Roadside	Diffusion Tube	100	100			31.76	29.99	33.6
M13	Roadside	Diffusion Tube	100	100					24
M14	Roadside	Diffusion Tube	100	100					23
M15	Roadside	Diffusion Tube	100	100					17.8
M16	Roadside	Diffusion Tube	100	100					20.2

Diffusion tube data has been bias corrected

Annualisation has been conducted where data capture is <75%

Notes: UP3 2013 was based on 6 months monitoring data July to December and annualised

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

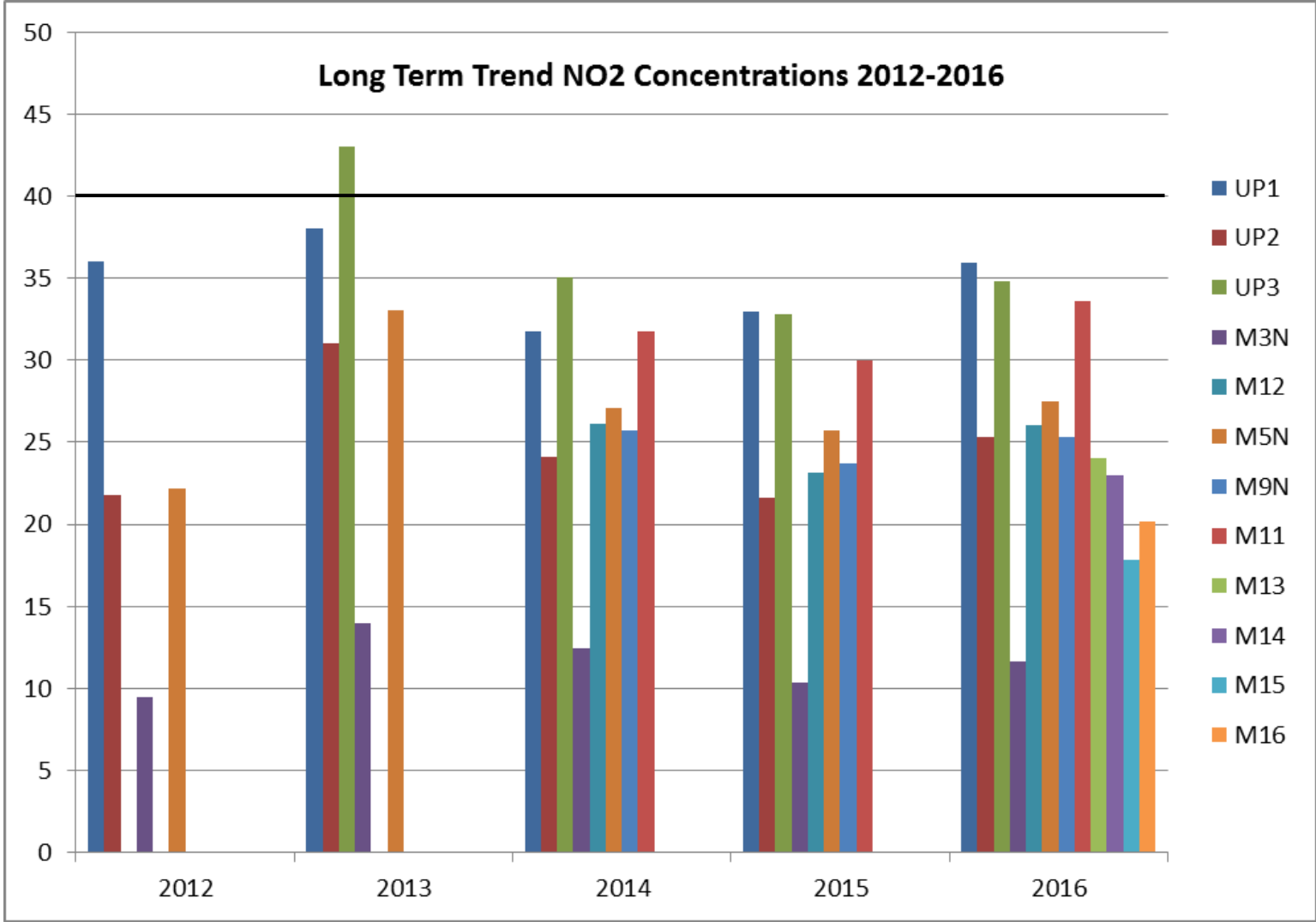
NO₂ annual means exceeding 60µg/m³, indicating a potential exceedance of the NO₂ 1-hour mean objective are shown in **bold and underlined**.

(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 Boxes 7.9 and 7.10 in LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Figure A.1 – Trends in Annual Mean NO₂ Concentrations



Appendix B: Full Monthly Diffusion Tube Results for 2016

Table B.1 – NO₂ Monthly Diffusion Tube Results - 2016

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 (0.89) and Annualised ⁽¹⁾	
	UP1	39.40	43.77	41.37	40.20	39.44	40.28	35.62	37.83	40.19	37.65	47.55			40.78
UP2	25.71	28.53	31.87	41.14	25.24	24.90	19.08	21.66	24.98	28.11	34.80	35.50	28.46	25.33	
UP3	36.87	47.87	49.10	8.83	44.11	45.15	28.74	33.48	38.26	46.27	49.37	41.25	39.11	34.81	
M3N	9.93	13.87	10.80	27.95	10.01	8.67	4.62	6.95	9.59	15.59	19.85	19.13	13.08	11.64	
M12	26.32	30.02	31.76	27.53	31.25	24.42		23.09	23.83	34.04	37.10	31.63	29.18	25.97	
M5N	31.14	34.65	33.82		31.82	26.40	25.63	25.91	26.99	30.96	37.85	34.52	30.88	27.48	
M9N	27.58	25.34	37.66	28.38	31.89	24.34	17.64	21.14	23.65	31.70	36.59	34.90	28.40	25.28	
M11	38.31	45.73	43.73	36.35	37.48	36.87	24.00	25.33	35.19	39.98	46.59	43.24	37.73	33.56	
M13	26.81	29.18	28.09	23.91	28.34	22.63	16.57	20.01	28.64	30.77	32.95	35.92	26.98	24.01	
M14	22.76	29.79	30.64	24.04	26.63	23.38	14.82	19.70	23.23	29.02	32.96	33.50	25.87	23.02	
M15	20.93	23.74	23.03	18.20	18.35	16.39	12.88	12.33	17.74	20.74	27.48	28.44	20.02	17.82	
M16	21.16	27.30	25.05	20.92	23.96	20.29	14.32	15.41	21.13	24.90	29.96	28.40	22.73	20.23	

- Local bias adjustment factor used
- National bias adjustment factor used
- Annualisation has been conducted where data capture is <75%

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) See Appendix C for details on bias adjustment and annualisation.

(2) Distance corrected to nearest relevant public exposure.

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

QA/QC of Diffusion Tube Monitoring

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

0300 123 2224

somersetscientific@somerset.gov.uk

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

Under the WASP scheme Somerset Scientific Services performed 100% satisfactory for all periods between January 2016 and February 2017. Tube precision was “Good” throughout 2016.

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

Figure D.1 Powick Tube Location Plan

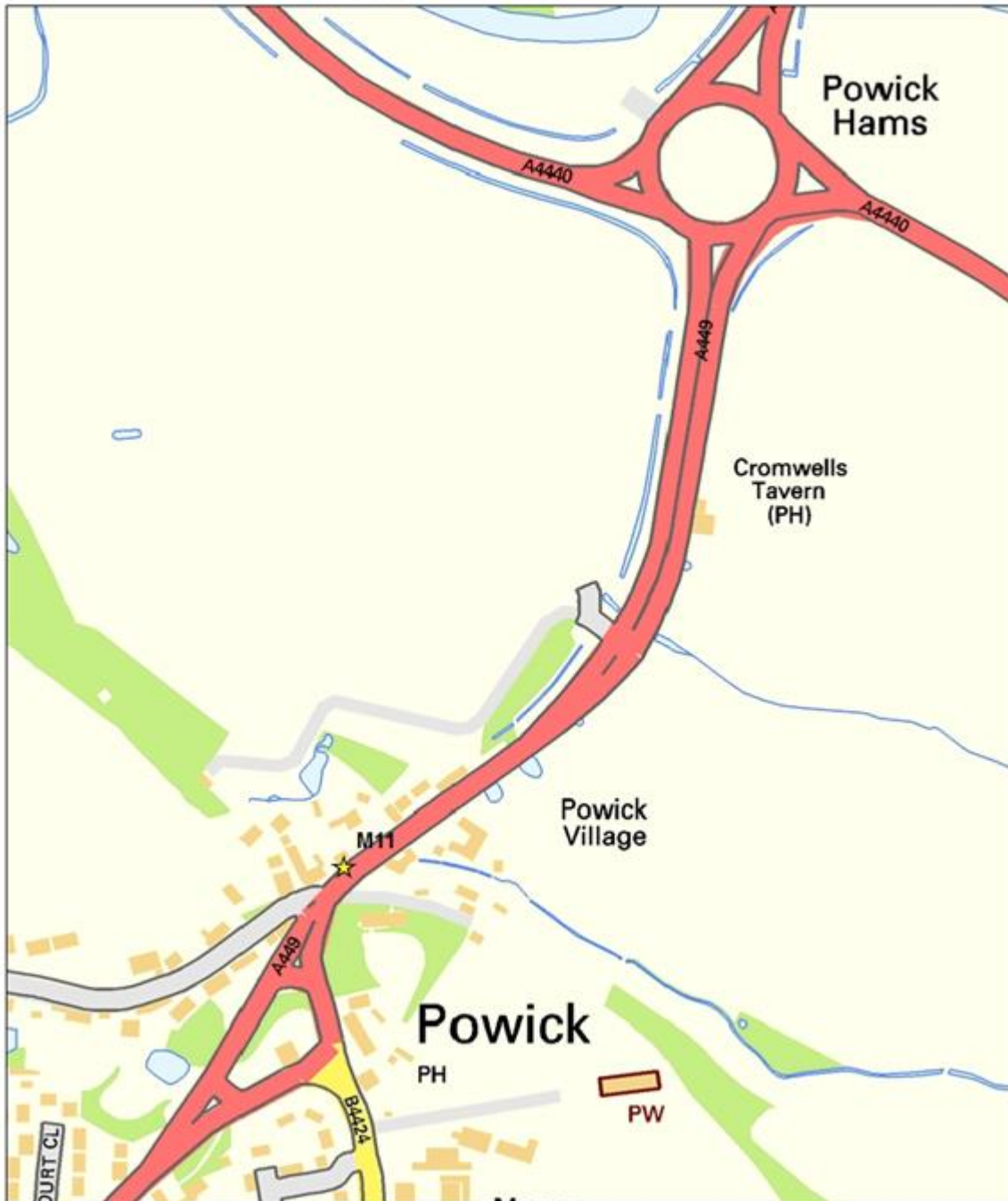
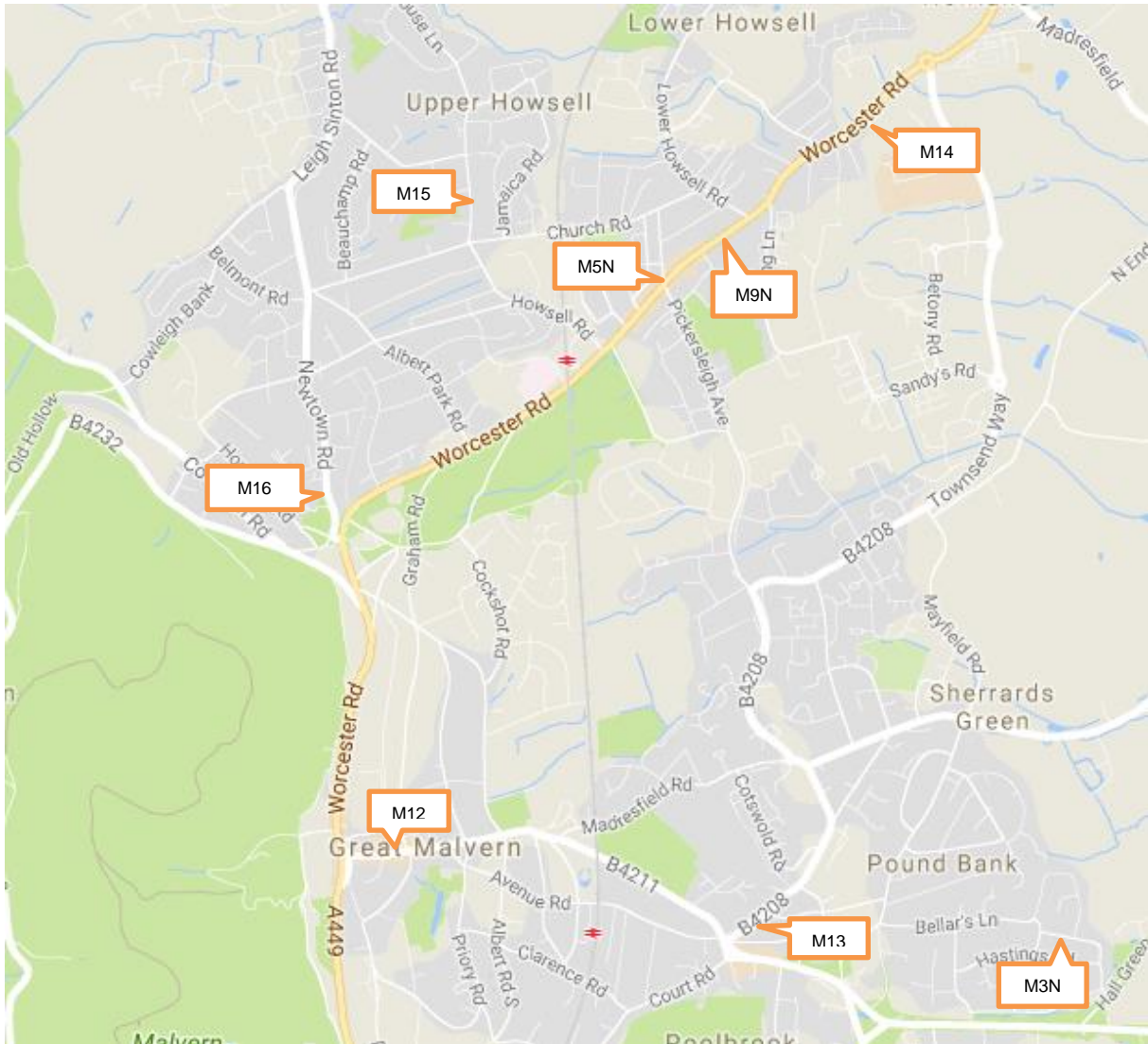


Figure D.2 Upton-Upon-Severn Tubes Location Plan



Figure D.3 Malvern Tube Locations M3N, M5N, M9N, M12, M13, M14, M15 & M16



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
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'
7. Worcestershire Regulatory Services (2016) 'Malvern Hills District Council Annual Status Report 2016'