



2020 Air Quality Annual Status Report (ASR)

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

June 2020

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.

Air quality across the Malvern Hills District is generally considered to be good. No Air Quality Management Area's have ever been declared in the Malvern Hills District to date. Monitoring data over previous years carried out at numerous locations, identified as representing worst case conditions, has been well below the national objectives.

Monitoring data shows that there is a decrease in NO₂ concentrations at all locations when comparing the 2019 results with those from 2018. To some extent this is likely due to the low bias adjustment factor of 0.78 applied to the data in 2019. The highest concentration of NO₂ was monitored at location UP1 with a value of 30.94µg/m³. This is well below the annual mean objective of 40µg/m³ for nitrogen dioxide. The lowest monitored concentration recorded in the district was 8.19µg/m³ at urban background location M3N.

Given that all monitored concentrations are well below the annual mean objective for NO₂ it is highly unlikely that there have been any exceedances of the 1-hour mean objective for NO₂ at any monitoring sites.

Three new locations were added to the network for the 2019 monitoring year. Worcestershire County Council approached WRS at the end of 2018 to discuss undertaking monitoring at Church Road, Malvern, following implementation of a series of traffic calming measures. Deterioration in air quality was raised as a

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

concern due to these measures and so two monitoring points were established along Church Road (MAL1 and MAL2). Concentrations were recorded of 11.86µg/m³ at MAL1 and 15.31µg/m³ at MAL2 (concentration of 11.3µg/m³ when worked back to relevant exposure) only slightly above background levels. A monitoring location was also installed at Cross Street, Tenbury (TEN1) as no monitoring had previously been undertaken in the town. A concentration of 22.89µg/m³ was recorded in 2019 which is well below the objective. No locations were decommissioned in 2019 from those of 2018.

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 no AQMA has been declared 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. Concentrations at identified worse case scenario locations have been recorded well below the objectives for nitrogen dioxide.

The priorities for Malvern Hills District Council are to continue to monitor nitrogen dioxide at key points across the area. WRS, on behalf of the district council, will continue to review and comment on planning applications where air quality is a relevant concern.

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://liftshare.com/uk/community/worcestershire>
- General travel planning advice is available on Worcestershire County Council's website (including walking, cycling and bus maps and timetables) and Government website:
 - http://www.worcestershire.gov.uk/info/20007/travel_and_roads
 - <https://www.gov.uk/government/publications/smarter-choices-main-report-about-changing-the-way-we-travel>
- 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/transport/driving-advice>
 - <https://www.theaa.com/driving-advice/fuels-environment/drive-smart>
 - <https://www.vehicle-certification-agency.gov.uk/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 2019. 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 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.

Malvern Hills District currently does not have any AQMAs. Concentrations continue to fall well below the annual mean objective for nitrogen dioxide at measured locations. For reference, maps of Malvern Hills District's monitoring locations are available in Appendix D.

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

Defra's appraisal of last year's ASR concluded

'The report is well structured, detailed, and provides the information specified in the Guidance. The following comments are designed to help inform future reports.'

- 1. It is noted in the report that the increase in measured NO₂ concentration for 2018 was due to the national bias adjustment factor being higher in 2018 than 2017. Even though this is likely to be the reason for the increase for this reporting year, the council should consider other possible causes of concentration changes in future reporting years.*
- 2. Even though annual mean NO₂ concentrations are well below the AQO, it is still recommended that concentrations are distance corrected for sites not located at relevant exposure locations'.*

In response to the comments made by Defra's appraisal of the 2019 ASR WRS have undertaken distance corrections for sites not located at relevant exposure and included these in this years report. However where the monitored concentrations are so low and far below the objective the merits of calculating back to relevant exposure are questionable.

There have been no exceedances of the annual mean objective for nitrogen dioxide at any monitoring location across the Malvern Hills District in 2019. Concentrations have remained well below the objective with the highest recorded value being 30.94µg/m³ at UP1. This is well below the annual mean objective of 40µg/m³ for nitrogen dioxide. The lowest monitored concentration recorded in the district was 8.19µg/m³ at urban background location M3N (recorded as 7µg/m³ when calculated back to relevant exposure).

Given that all monitored concentrations are well below the annual mean objective for NO₂ it is highly unlikely that there have been any exceedances of the 1-hour mean objective for NO₂ at any monitoring sites.

Three new locations were added to the network for the 2019 monitoring year. Worcestershire County Council approached WRS at the end of 2018 to discuss

undertaking monitoring at Church Road, Malvern, following implementation of a series of traffic calming measures. Deterioration in air quality was raised as a concern due to these measures and consequently two monitoring points were established along Church Road (MAL1 and MAL2). Concentrations were recorded of $11.86\mu\text{g}/\text{m}^3$ at MAL1 and $15.31\mu\text{g}/\text{m}^3$ at MAL2 (concentration of $11.3\mu\text{g}/\text{m}^3$ when worked back to relevant exposure) only slightly above background levels. A monitoring location was also installed at Cross Street, Tenbury (TEN1) as no monitoring had previously been undertaken in the town. A concentration of $22.89\mu\text{g}/\text{m}^3$ was recorded in 2019 which is well below the objective. No locations were decommissioned in 2019 from those of 2018.

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/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.

A new Air Quality Partnership led by the DoPH, and supported by WRS Land and Air Quality Team, was set up in 2019 to discuss potential actions to improve air quality across the County and determine an action plan for implementation. The group comprises officers from the County and District authorities from public health, air quality, strategic planning, sustainability, highways and transport disciplines, and also representatives from the NHS and Highways England. The group met initially in May 2019 to discuss terms and references and in September to discuss potential actions. Further discussions and work to formalise an action plan are continuing in 2020.

WRS has reviewed the DEFRA national background maps to determine projected PM_{2.5} concentrations within the Malvern Hills District for the 2019 calendar year. The average total PM_{2.5} at 577 locations (centre points of 1km x 1km grids) across the Malvern Hills District is 7.32µg/m³, with a minimum concentration of 6.61µg/m³ and a maximum concentration of 9.18µg/m³. This indicates that PM_{2.5} concentrations within the Malvern Hills District are well below the annual average EU limit value of 25µg/m³.

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 2018.

3.1.2 Non-Automatic Monitoring Sites

Malvern Hills District Council undertook non- automatic (passive) monitoring of NO₂ at 10 sites during 2019. Table A. 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) 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 bias⁴, “annualisation” (where the data capture falls below 75%), and distance correction⁵. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO₂)

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. Note that the concentration data presented in Table A.2 represents the concentration at the location of the monitoring site, following the application of bias adjustment and annualisation, as required (i.e. the values are exclusive of any consideration to fall-off with distance adjustment).

For diffusion tubes, the full 2019 dataset of monthly mean values is provided in Appendix B. Note that the concentration data presented in Table B.1 includes distance corrected values, only where relevant.

⁴ <https://laqm.defra.gov.uk/bias-adjustment-factors/bias-adjustment.html>

⁵ Fall-off with distance correction criteria is provided in paragraph 7.77, LAQM.TG(16)

Appendix A: Monitoring Results

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

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	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, Upton WR8 0HA	Roadside	385171	240555	NO2	NO	0	2	NO	2.10m
UP3	15 Old Street, Upton	Roadside	385157	240508	NO2	NO	0	1.25	NO	1.98m
M3N	10 Teme Avenue, Malvern	Urban Background	379790	245677	NO2	NO	7	1	NO	2.20m
M2	Junction Howsell Rd/ Worcs Rd	Roadside	378320	247570	NO2	NO	5	1	NO	2.20m
M5N	Richmond Road - Link Wines	Roadside	378520	247753	NO2	NO	0.5	4.5	NO	2.30m
M11	Old Post Office, Powick	Roadside	383231	251684	NO2	NO	7	2.1	NO	2.10m
M14	278 Worcester Road, Malvern	Roadside	379156	248248	NO2	NO	0	5.85	NO	3.2m
MAL 1	50 Church Road, Malvern	Roadside	378488	247968	NO2	NO	0	5.8	NO	2.1m
MAL 2	Lampost opp St. Matthias Church	Roadside	378383	247947	NO2	NO	6.5	1	NO	2.2m
TEN 1	opp Kings Head Public House, Cross Street	Roadside	359475	268053	NO2	NO	0	1	NO	2m

Notes:

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

(2) N/A if not applicable.

Table A.2 – Annual Mean NO₂ Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2019 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ^{(3) (4)}				
							2015	2016	2017	2018	2019
UP1	385171	240555	Roadside	Diffusion Tube	100	100	32.99	35.90	30.10	33.71	30.94
UP3	385157	240508	Roadside	Diffusion Tube	100	100	32.80	34.80	28.66	32.36	26.26
M3N	379790	245677	Urban Background	Diffusion Tube	100	100	10.34	11.60	8.09	9.99	8.19
M2	378320	247570	Roadside	Diffusion Tube	100	100			17.57	24.37	19.10
M5N	378520	247753	Roadside	Diffusion Tube	100	100	25.68	27.50	22.76	26.34	21.15
M11	383231	251684	Roadside	Diffusion Tube	100	100	29.99	33.60	25.95	31.39	25.20
M14	379156	248248	Roadside	Diffusion Tube	100	100		23.00	17.67	22.17	18.82
MAL 1	378488	247968	Roadside	Diffusion Tube	100	100					11.86
MAL 2	378383	247947	Roadside	Diffusion Tube	100	100					15.31
TEN 1	359475	268053	Roadside	Diffusion Tube	100	100					22.89

Diffusion tube data has been bias corrected

Annualisation has been conducted where data capture is <75%

Reported concentrations are those at the location of the monitoring site (bias adjusted and annualised, as required), i.e. prior to any fall-off with distance adjustment

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**.

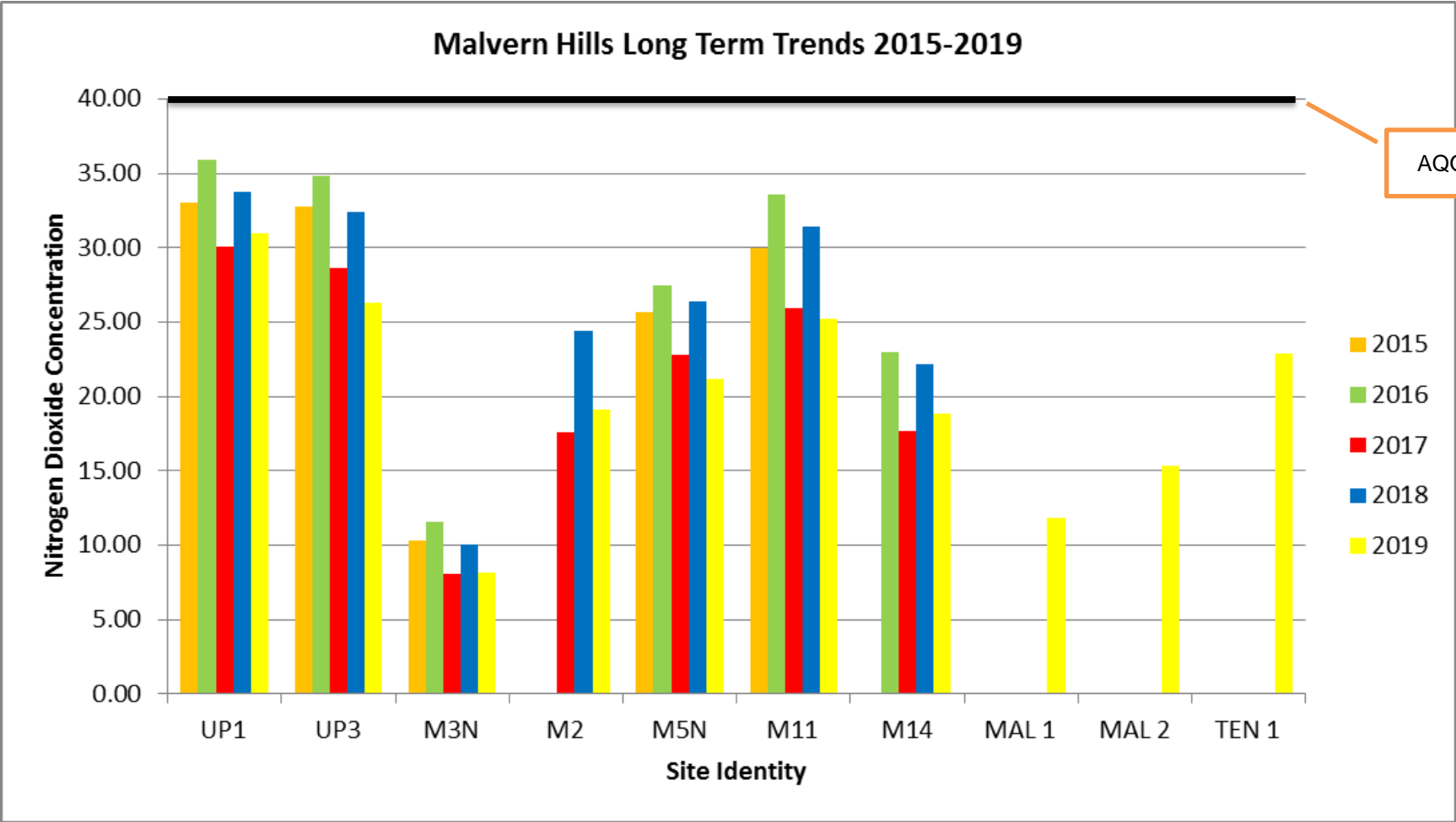
(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(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 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.

(4) Concentrations are those at the location of monitoring and not those following any fall-off with distance adjustment.

Figure A.1 – Trends in Annual Mean NO₂ Concentrations



Appendix B: Full Monthly Diffusion Tube Results for 2019

Table B.1 - NO₂ Monthly Diffusion Tube Results - 2019

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	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 (0.78) and Annualised ⁽¹⁾	Distance Corrected to Nearest Exposure ⁽²⁾
UP1	385171	240555	39.02	38.93	32.23	33.06	32.12	31.62	32.42	25.38	34.05	60.65	81.72	34.84	39.67	30.94	
UP3	385157	240508	33.70	32.57	28.75	43.73	33.67	32.35	29.41	26.07	31.11	36.24	44.35	32.09	33.67	26.26	
M3N	379790	245677	14.84	14.63	7.60	14.50	6.20	7.16	5.69	6.44	8.38		17.30	12.71	10.50	8.19	7
M2	378320	247570	23.68	28.14	20.51	37.55		20.55	20.24	15.29	24.73	23.60	31.68	23.39	24.49	19.1	14.2
M5N	378520	247753	31.02	31.85	28.05	31.62	23.03	23.47	16.22	25.68	24.10	28.98	32.07	29.29	27.11	21.15	
M11	383231	251684	35.35	41.58	26.62	38.88	25.35	32.10	24.13	27.12	25.44	35.51	38.66	36.96	32.31	25.2	18.3
M14	379156	248248	24.41	27.81	17.97	34.63	21.24	19.98	25.32	16.95	20.04	24.97	32.85	23.32	24.13	18.82	
MAL 1	378488	247968	16.25	19.33	11.43	20.02	9.24			8.49	11.39	15.83	23.20	16.81	15.20	11.86	
MAL 2	378383	247947	22.44	24.03	16.56	24.08	15.48	14.42	14.89	16.95	17.10	22.66	28.03	18.86	19.63	15.31	11.3
TEN 1	359475	268053	32.28	30.52	24.90	41.95	26.37	27.36	20.06	20.94	28.35	31.85	38.17		29.34	22.89	

- Local bias adjustment factor used
- National bias adjustment factor used
- Annualisation has been conducted where data capture is <75%
- Where applicable, data has been distance corrected for relevant exposure in the final column

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 Data

Factor from Local Co-location Studies (if available)

No local co-location studies for nitrogen dioxide have been undertaken in 2019.

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,
Unit 2A,
Westpark 26
Chelston
Wellington
Somerset
TA21 9AD

01823 355906

sssmailbox@somerset.gov.uk

The 20% Triethanolamine (TEA) / De-ionised Water preparation method is used. The bias adjustment factor applied to the results in 2019 was 0.78 (Spreadsheet Version No. 03/20) which were derived from the national studies.

QA/QC of Automatic Monitoring

No Automatic Monitoring Data is available for 2019.

QA/QC of Diffusion Tube Monitoring

Under the AIR NO₂ Proficiency Testing Scheme Somerset Scientific Services performed 100% satisfactory for the period January to November 2019. Tube precision was 'Good' throughout 2019.

Fall-off with Distance Calculations

Site Name/ID	Distance (m)		NO ₂ Annual Mean Concentration (µg/m ³)		
	Monitoring Site to Kerb	Receptor to Kerb	Background	Monitored at Site	Predicted at Receptor
M3N	1.0	8.0	5.4	8.2	7.0
M2	1.0	6.0	5.4	19.1	14.2
M11	2.1	9.1	5.4	25.2	18.3
MAL2	1.0	7.5	5.4	15.3	11.3

Appendix D: Map(s) of Monitoring Locations



Monitoring locations in Malvern Link



Monitoring Location at Powick



Monitoring Location Malvern Background



Monitoring Locations Upton upon Severn



Monitoring Locations Tenbury

Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective ⁶	
	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

⁶ 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
MHDC	Malvern Hills District Council
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
WCC	Worcestershire County Council
WRS	Worcestershire Regulatory Services

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 (2020) 'National Diffusion Tube Bias Adjustment Factor Spreadsheet V 03/20.'
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 (2018) 'Malvern Hills District Council Annual Status Report 2018'
8. Worcestershire Regulatory Services (2019) 'Malvern Hills District Council Annual Status Report 2018'