2023 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995 Local Air Quality Management, as amended by the Environment Act 2021

June 2023

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Executive Summary: Air Quality in Our Area

Air Quality in Malvern Hills District Council Area

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, the elderly, and those with existing heart and lung conditions. There is also often a strong correlation with equalities issues because areas with poor air quality are also often less affluent areas[1,2].

The mortality burden of air pollution within the UK is equivalent to 29,000 to 43,000 deaths at typical ages[3], with a total estimated healthcare cost to the NHS and social care of £157 million in 2017[4].

Worcestershire Regulatory Services (WRS) have been responsible for managing (monitoring and reporting of) local air quality in the six Worcestershire District Councils since April 2011.

The Malvern Hills District area generally experiences good levels of air quality. No Air Quality Management Areas (AQMAs) have been declared in the Malvern Hills District since the review and assessment process started. No exceedances of the air quality objective for Nitrogen Dioxide (NO_2) have been recorded at any locations, where monitoring has been undertaken for the full calendar year, since monitoring began. These locations have been representative of worst-case conditions and have generally been well below the national objectives. The only exception was at UP3 (15 Old Street, Upton) which recorded a concentration of 43µg/m^3 in 2013 however this value was based on only 6 months data and was subject to annualisation so reliability was questionable. During the years that followed concentrations have been well below the objective at this location being at least 10% below the objective. The highest concentration recorded in the district historically is 38µg/m^3 at UP1 in 2013. At all other times monitoring results at all locations have been greater than 10% below the objective.

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[1] Public Health England. Air Quality: A Briefing for Directors of Public Health, 2017

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

[3] Defra. Air quality appraisal: damage cost guidance, January 2023

[4] Public Health England. Estimation of costs to the NHS and social care due to the health impacts of air pollution: summary report, May 2018

In 2022 concentrations of NO_2 were monitored at 8 locations across the Malvern Hills District. The highest recorded concentrations were 27.4µg/m^3 at UP3 and 27.2µg/m^3 at UP1. Both are located in Old Street, Upton-upon-Severn. The next highest concentration was 25.4µg/m^3 at M11 in Powick. The lowest concentration was 7.7µg/m^3 at M3N which is an urban background site in Teme Lane, Malvern. The results demonstrate that NO_2 concentrations within the Malvern Hills District area are well below the NO_2 air quality objective of 40µg/m^3 in 2022.

Concentrations have increased at all locations in 2022 when compared to the previous year, 2021. This is not surprising given the restrictions that were in place during that year due to Covid-19. The largest increase of 4.7µg/m^3 occurred at UP3 and represents an increase of 20.4%. There is an average increase of approximately 17% at all locations. Concentrations from 2022 appear to be very similar to the pre-pandemic levels recorded in 2019 but are lower than 2018 results.

Long term trend analysis over the 5-year period, 2018 to 2022, generally shows a decrease at all locations from 2018 to 2020 and then an increase from 2020 to 2022.

No annual means greater than 60ug/m^3 have been recorded indicating that it is extremely unlikely that there have been any exceedances of the 1-hour mean objective for NO_2 at any monitoring sites. The 60ug/m^3 value is a surrogate figure to indicate exceedances of the 1-hour objective based on annual average concentrations. The concentrations recorded across the district in 2022 are all greater than 50% below that value.

Location TEN1 was decommissioned at the end of 2022 following an average concentration of 20ug/m^3 being recorded in the 4 years it was in operation. A new location has been established near to the signalised crossroads at Graham Road/Church Street Great Malvern in early 2023 . Historical monitoring has taken place in that area over a number of years to 2016 and has not highlighted a problem. However, following concerns raised by members of the public the monitoring location has been reinstated to ascertain current conditions at the site.

Actions to Improve Air Quality

Whilst air quality has improved significantly in recent decades, there are some areas where local action is needed to protect people and the environment from the effects of air pollution.

The Environmental Improvement Plan[5] sets out actions that will drive continued improvements to air quality and to meet the new national interim and long-term $PM_{2.5}$ targets. The National Air Quality Strategy, published in April 2023, will provide more information on local authorities' responsibilities to work towards these new targets and reduce $PM_{2.5}$ in their areas. The Road to

[5] Defra. Environmental Improvement Plan 2023, January 2023

Zero[6] details the approach to reduce exhaust emissions from road transport through a number of mechanisms; this is extremely important given that the majority of Air Quality Management Areas (AQMAs) are designated due to elevated concentrations heavily influenced by transport emissions.

No specific actions have been progressed to improve air quality in the Malvern Hills District as there are currently no AQMAs declared in the area. However, the general actions to improve air quality detailed in the current Worcestershire Air Quality Action Plan apply across Worcestershire as a whole, including the Malvern Hills area.

In 2013, WRS produced a countywide Air Quality Action Plan (AQAP) for Worcestershire. 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: Air Quality Action Plan Progress report for Worcestershire 2015/16

Air Quality Actions Plan and Air Quality Strategy

A new Air Quality Action Plan is required for Worcestershire in accordance with the Environment Act 2021 and revised guidance published in August 2022 (LAQM.TG22 and PG22). The COVID19 pandemic, unfortunately, led to the suspension of previous district air quality working groups and public health action groups programmes in 2020. In September 2022, WRS began discussions with Worcestershire County Council colleagues with a view to forming a new Steering Group and producing a new plan of actions to improve air quality across the County, to comply with recent legislative changes.

The group membership has expanded considerably at the beginning of 2023 and is currently progressing a programme of works, outlined below, which will be reported on in the next ASR (2024). The group currently comprises officers from the County and District authorities from public health, air quality, strategic planning, sustainability, highways, and transport disciplines, and representatives from the NHS.

The Action Plan will incorporate an improving Air Quality Strategy applicable across the County including the Malvern Hills District area and other districts that currently have no AQMAs in place, in accordance with the updated legislation and guidance.

Whilst Malvern Hills has no AQMAs in place further work is required across the county to help inform the Air Quality Strategy and Action Plan process. The first step in action planning is to determine the contribution of sources of air pollution (source apportionment) to inform future

[6] DfT. The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy, July 2018

actions. Some source apportionment has been undertaken across the county, but further work is required. The initial Steering Group work is focussed on actions informed by the available source apportionment work in addition to countywide actions applicable to all districts. Traffic surveys have been undertaken in 2023 to enable source apportionment work to be completed in Spring 2024 when the relevant years' worth of monitoring data will be available in line with technical guidance.

The timeline for the various stages and delivery of the Air Quality Strategy and Action Plan is set out below.

Timeline	Phase
Feb – Dec 2023	Identification of potential overarching Worcestershire County Council actions and Worcester City Council Specific actions, feasibility filter of measures, cost benefit analysis, determination of impact, timelines and funding sources, drafting of countywide action plan
Jan – Mar 2024	Submission of Draft for review by Senior Management Team and approval by Political Committees at Worcester City Council and Worcestershire County Council and revisions
March 2024	Submission of Draft countywide AQAP inc. local AQ strategy and Worcester City Council specific actions to DEFRA
April- June 2024	3-month Public Consultation on Draft countywide AQAP following revisions
July - Sept 2024	Revisions and finalisation of countywide AQAP inc. local AQ strategy and Worcester City Council specific actions
	Consideration for revocation of AQMAs and source apportionment work for other AQMAs in 1) Bromsgrove DC 2) Wyre Forest DC 3) Wychavon DC
Sept – Oct 2024	Submission of Finalised AQAP for review by Senior Management Team and approval by Political Committees at Worcester City Council and Worcestershire County Council and revisions
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Nov 2024	Publication of Finalised countywide AQAP inc. local AQ strategy & Worcester City chapter and submission to DEFRA

Real-time Air Quality Monitoring Project

In September 2022 officers from WRS submitted an application to Defra's Air Quality Grant Scheme 2022/23. The scope of the bid was to establish an enhanced real-time air quality monitoring network across the main areas of air quality concern in Worcestershire for purposes of informing the public and vulnerable groups of the status of air pollution. The scheme would see the installation of approximately 24 low-cost 'Air Quality Monitors' (with EA MCERTS standard accreditation as indicative ambient particulate matter devices) across the county which measure NO_2, PM_{10}, and $PM_{2.5}$. The results of monitoring would then be used to inform decision making and requirements for further action as necessary.

In February 2023 Defra announced that the WRS bid had been successful and the requested £248,400 was awarded. An additional 10% of funds will also be provided by each district council in Worcestershire, as per the match-funding requirement of the scheme, which equates to £27,600. Giving a grand total of £276,000 for the project.

At the time of writing the project is at the procurement stage, with the tender specification close to completion. Once a successful supplier has been appointed, exact monitoring locations will be agreed, and equipment installed. This is anticipated to be in the latter stages of 2023.

Three of the air quality monitors are to be deployed within the Malvern Hills District Council area. Locations are currently to be confirmed but are expected to represent worst case conditions in relation to road traffic and impacts from agriculture and solid fuel burning.

Malvern Hills District currently does not have any declared AQMAs. A local Air Quality Strategy is currently under development as part of the countywide action plan work. A draft version of this document is anticipated to be released in Spring 2024 with a finalised version following later that year after the consultation process is completed.

Malvern Hills District Council currently have the following policies in place in relation to tacking climate change and destination zero.

Tackling climate change - Malvern Hills District Council

Destination Zero.pdf (malvernhills.gov.uk)

Worcestershire County Council Highways Department have also progressed the following major schemes within the Malvern Hills District during 2022.

Upton Crossroads A38/A4104 - The scheme provides a new 4-arm roundabout to replace the existing staggered junction arrangement, with the western A4104 approach from Upton realigned to tie into the proposed roundabout; facilities for non-motorised users are improved with the provision of crossing locations on all arms of the roundabout and 3m wide shared footway/cycleways. The scheme opened in Feb 2023.

South Worcestershire Local Plan Review - Collaboration with South Worcestershire on the review of their local plan which includes detailed policy for the strategic sites and new settlements, including prioritisation of active travel and corridor improvements, policy requirements for travel and to address the impact of air pollution from new development. Due to be submitted to the Secretary of State for DLUHC summer 2023.

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.

Malvern Hills District Council has not identified any significant new sources of air pollution within the area for the reporting year of 2022. A number of planning applications for large developments have been made within the district during 2022. The proposals have been assessed as part of the

planning process and are not expected to have a significant impact on local air quality when they are operational. Details of the significant applications are listed in New or Changed Sources Identified Within Malvern Hills District Council Area During 2022.

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.

As referred to in the previous section a real-time air quality monitoring network will be set up in the latter part of 2023. This will provide important data in respect of PM_{10} and $PM_{2.5}$ for which monitoring across the county has been very limited previously, as well as NO_2. Real-time information will enable a better understanding of air quality in the district and help quantify the impacts from road traffic and other sources, such as solid fuel burning, agriculture and industry. The system will also provide an alert in the event of poor air quality so that vulnerable groups can be informed and limit exposure.

Work will continue with development of a countywide Air Quality Strategy and Action Plan. Publication of the draft document is anticipated in Spring 2024 with a finalised version later that year following the necessary consultation process. This is to remain a 'live' document that can be added to and revised on a regular basis as things evolve.

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**: Leaving your car at home and walking or cycling instead will benefit in three ways - increased exercise, reduced pollution exposure and will reduce your own pollution emissions.
- **Turn off your engine when stationary or parked,** don't 'idle', particularly outside sensitive receptors such as schools, hospitals, care homes and residential properties.
- **General travel planning advice** is available on Worcestershire County Council's website (including walking, cycling and bus maps and timetables) and Government website:
    - Travel and Roads | Worcestershire County Council
    - Smarter choices: changing the way we travel - GOV.UK (www.gov.uk)
- **Hold meetings by Conference Call** by phone or video conference via Teams, Zoom, Skype or Facetime rather than driving to meetings. This reduces fuel and other travel costs, vehicle maintenance and hire cost, increases productivity through reduction in hours lost through unnecessary travel.

- **Facilitate Flexible Working Arrangements** for non-front-line staff to work remotely from home or nearer home facilities for one or more days a week thus removing or reducing any journey to work. This reduces congestion which has beneficial impacts for delivery times, reduced business costs and thus economic benefits. Additionally, provides social benefits through improved work life balance for employees, reduces local air quality and reduced emergency vehicle response times.
- **Switch Fleet to Low Emission Vehicles**: The government is currently providing grants for up to 75% of Electric Vehicle (EV) charging points, up to 40 charge points. Eligible businesses, charities and public sector organisations with off street parking for staff or vehicles fleets can apply for vouchers to redeem costs of electric vehicle charge-points. There is a limit of 1 voucher per applicant; however, applicants with a 'franchise' may apply for up to 20 franchisees. There is an approved charge points list and a list of authorised installers

  Workplace Charging Scheme: guidance for applicants - GOV.UK (www.gov.uk)
- 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:
  - Save money and emissions through ecodriving - Energy Saving Trust
  - How to drive economically - Eco-driving tips | AA (theaa.com)
  - Fuel Consumption & CO2 Databases | Vehicle Certification Agency (vehiclecertification-agency.gov.uk)
- **Reduce air pollution from open fires and wood-burning stoves**: Advice is available from Defra on choosing the right stove, using the right fuels and maintenance, enabling householders to reduce their impact on their health and air quality from open fires and wood burning stoves. Further information is available on the Smokeless Zones and Public Advice pages on WRS website.

Air pollution can affect all of us over our lifetime however certain groups will be more sensitive to the effects of air pollution. Vulnerable groups include adults and children with lung or heart conditions such as asthma, chronic bronchitis, emphysema and chronic obstructive lung disease (COPD)[7,8]. Senior citizens are more likely to be affected by respiratory diseases and children are more likely to

[7] http://www.breathelondon.org/

[8] https://www.londonair.org.uk/LondonAir/guide/MyActionsForMe.aspx

be affected by air pollution due to relatively higher breathing and metabolic rates as well as a developing lung and immune system.

Vulnerable individuals and groups can keep informed of:

- Current levels and forecasts of air pollution from Defra at: https://uk-air.defra.gov.uk/.
- If you are sensitive to the effects of air pollution, it may be appropriate to limit the length of time spent in areas of local poor air quality – see advice from Defra at https://uk-air.defra.gov.uk/air-pollution/daqi
- If you are on social media, sign up to the WRS Twitter feed. WRS tweet when pollution is forecast by Defra to be moderate to very high.

Further information for the general public on reducing your family's exposure to poor air quality in Worcestershire and how individuals, business and schools can assist with reducing their impact on local air quality is available at Protecting Me and Others from Air Pollution | Worcestershire Regulatory Services (worcsregservices.gov.uk) .

Local Responsibilities and Commitment

Prior to the pandemic WRS had enjoyed a good working relationship with the County Council's Strategic Transport Team and developed closer working ties with Public Health, Planning and Sustainability colleagues within the County Council. Unfortunately, the COVID-19 pandemic, led to the suspension of existing action groups in 2020 and delayed air quality improvement projects. Additionally, there have been significant personnel turnover within the WRS and County Council teams in the interim period.

As we have emerged from the pandemic during 2022-23, WRS are seeking to re-engage with those teams and new colleagues from the different disciplines that have a role in improving air quality.

This ASR was prepared by Worcestershire Regulatory Services Technical Services Department on behalf of Malvern Hills District Council with the support and agreement of officers from the following organisations:

Worcestershire Regulatory Services

Malvern Hills District Council

Worcestershire County Council

This ASR has been signed off by the Director of Public Health with the following comments:

"We welcome the submission of these reports, continued focus on improving air quality, and installation of new real time air quality monitors which will provide 'information for action' across the system. We recommend inclusion in future reports to recognise ageing population and increasing long term conditions sensitive to poor air quality".

If you have any comments on this ASR, please send them to:

Technical Pollution Team

Worcestershire Regulatory Services

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Finepoint Way

Kidderminster

Worcestershire

DY11 7WF

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email - wrsenquiries@worcsregservices.gov.uk

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1 Local Air Quality Management

This report provides an overview of air quality in Malvern Hills District during 2022. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995), as amended by the Environment Act (2021), 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 order to achieve and maintain the objectives and the dates by which each measure will be carried out. 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 are presented in Table E.1.

2 Actions to Improve Air Quality

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 should prepare an Air Quality Action Plan (AQAP) within 18 months. The AQAP should specify how air quality targets will be achieved and maintained and provide dates by which measures will be carried out.

Malvern Hills District currently does not have any declared AQMAs. A local Air Quality Strategy is currently under development as part of the countywide action plan work. A draft version of this document is anticipated to be released in Spring 2024 with a finalised version following later that year after the consultation process is completed.

Malvern Hills District Council currently have the following policies in place in relation to tacking climate change and destination zero.

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Concentrations continue to be 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: Map(s) of Monitoring Locations and AQMAs.

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

Defra's appraisal of last year's ASR concluded that "*the report was generally well structured, detailed and provided the information specified in the Guidance, including the following comments:*

1. Appendix D contains clear figures showing the locations of the eight passive, non-automatic diffusion tube monitoring locations within the district.

2. The observed trends in air quality are presented and discussed in detail in the Executive Summary. This is encouraged, however this discussion could also be present in Section 3.2.1 Nitrogen Dioxide (NO2).

3. The Council provides numerous suggestions as to how members of the public can get involved to help to improve local air quality in the Executive Summary.

4. Care should be taken to ensure there are no formatting errors in the ASR as there are two "Error! Reference source not found" present in Section 3.1 (Summary of Monitoring Undertaken).

5. The Public Health Outcomes Framework was discussed in reference to the fraction of mortality attributable to particulate air pollution through comparison of the Worcestershire figure to the national and West Midlands figures. This is appreciated".

The above points are noted. The commentary on observed trends has been included in Section 3.2.1 Nitrogen Dioxide of this report. Care has also been taken to remove the reference errors.

No specific actions have been progressed to improve air quality in the Malvern Hills District as there is currently no declared AQMAs in the area and therefore no requirement to do so previously. However, the general actions to improve air quality detailed in the previous Air Quality Action Plan have applied across Worcestershire as a whole, including the Malvern Hills area.

Air Quality Actions Plan and Air Quality Strategy

A new Air Quality Action Plan is now required for Worcestershire in accordance with the Environment Act 2021 and revised guidance published in August 2022 (LAQM.TG22 and PG22). The COVID19 pandemic, unfortunately, led to the suspension of previous district air quality working groups and public health action groups programmes in 2020. In September 2022, WRS began discussions with Worcestershire County Council colleagues with a view to forming a new Steering Group and producing a new plan of actions to improve air quality across the County, in order to comply with the legislative changes.

The group membership has expanded considerably at the beginning of 2023 and is currently progressing a programme of works, outlined below, which will be reported on in the next ASR (2024). The group currently 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 the University of Worcester.

The Action Plan will incorporate an Air Quality Strategy applicable across the County including the Malvern Hills District area and other districts that currently have no AQMAs in place, in accordance with the updated legislation and guidance.

Whilst Malvern Hills has no recorded exceedances of air quality objectives, and therefore no AQMAs in place, further work is required across the county to help inform the Air Quality Strategy and Action Plan process. The first step in action planning is to determine the contribution of sources of air pollution (source apportionment) to inform future actions in areas where there are exceedances. Some source apportionment has been undertaken but further work is required across the county. The initial Steering Group work is focussed on actions informed by the available source apportionment work in addition to countywide actions applicable to all districts. Traffic surveys have been undertaken in 2023 to enable source apportionment work to be completed in Spring 2024 when the relevant years' worth of monitoring data will be available in line with technical guidance.

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Nov 2024	Publication of Finalised countywide AQAP inc. local AQ strategy & Worcester City chapter and submission to DEFRA
Mar - May 2025	Annual review for any amendments requiring further work.

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

As detailed in Policy Guidance LAQM.PG22 (Chapter 8), 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 that are recognised by Defra for measuring against ambient air quality directives. The nearest AURN $PM_{2.5}$ monitoring station is the Birmingham Ladywood site approximately 48km to the north-east of the Malvern Hills District. However, WRS have assisted the Defra AURN expansion project team with potential locations for two $PM_{2.5}$ monitors in Worcestershire, and it is hoped these will be in place within the next 6 to 12 months

WRS has reviewed the 2018 based DEFRA national background maps to determine projected $PM_{2.5}$ concentrations with the Malvern Hills District for the 2022 calendar year. The average total $PM_{2.5}$ at 577 locations (centre points of 1km x 1km grids) across the Malvern Hills District is 7.18µg/m^3, with a minimum concentration of 6.41µg/m^3 and a maximum concentration of 8.99µg/m^3. This indicates that $PM_{2.5}$ concentrations within the Malvern Hills District is below the proposed annual average limit value for $PM_{2.5}$ target of 10µg/m^3 to be met across England by 2040.

The Air Quality Partnership led by the Director of Public Health at Worcestershire County council, and supported by WRS, was set up in May 2019 to discuss potential actions to improve air quality across the County and determine an action plan for implementation. The group comprised 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 work of the group, however, was postponed indefinitely due to the Covid-19 pandemic. Work recommenced in summer 2022 when WRS met with colleagues from Public Health numerous times to discuss the ongoing situation with air quality, relevant changes, and workstreams going forward. The DoPH represents a key partner in the ongoing development of the Air Quality Strategy and Action Plan work and has several representatives sitting on the steering group.

WRS has reviewed the fraction of mortality attributable to particulate air pollution (indicator D01) as published by Public Health England as part of the Public Health Outcomes Framework[9]. The

[9] Public Health Outcomes Framework - OHID (phe.org.uk)

fraction of mortality attributable to particulate emissions in Malvern Hills District in 2021 (the most recent year available) was 4.8% MHDC. This falls below the national figure for England (5.5% in 2021) and below the figure for the West Midlands region (5.5% in 2021). Recent trend data is not available for the district due to a lack of data points with valid values.

More information on the Public Health Outcomes Frameworks that examines indicators that help us understand trends in public health can be found at Public Health Outcomes Framework - OHID (phe.org.uk)

The successful bid for funding from the Defra Air Quality Grant 2022/23 to establish a real time monitoring network across Worcestershire will allow for particulate monitoring in the district for the first time. It is anticipated that approximately 3 low-cost, real-time air quality monitors will be installed within the Malvern Hills District area at worst case locations representative of heavy traffic, agriculture, solid fuel burning and other sources. The project is ongoing, and it is anticipated that the monitors will be fully operational within the next 12 months.

There are currently no declared smoke control areas operating within the Malvern District Council area.

More information, maps and guides on the type of fuels that can be used can be found at:

Smoke Control Areas | Worcestershire Regulatory Services (worcsregservices.gov.uk)

WRS hold no record of complaints of nuisance from smoke, dust or fumes in the Malvern Hills District in 2022.

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 as part of the revised future countywide AQAP will likely result in a linked improvement in $PM_{2.5}$ levels. Additionally, the new countywide AQAP will include the local air quality strategy for all Worcestershire districts and have due regard for the new responsibilities on local authority for $PM_{2.5}$ outlined within the revised national Air Quality Strategy (28 April 2023) published at the time of producing this report.

3 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance

This section sets out the monitoring undertaken within 2022 by Malvern Hills District Council and how it compares with the relevant air quality objectives. In addition, monitoring results are presented for a five-year period between 2018 and 2022 to allow monitoring trends to be identified and discussed.

Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

Malvern Hills District Council did not undertake any automatic monitoring during 2022.

3.1.2 Non-Automatic Monitoring Sites

Malvern Hills District Council undertook non- automatic monitoring of NO_2 at eight sites during 2022 utilising passive diffusion tubes. Table A.1 in Appendix A presents the details of the non-automatic 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 QA/QC of Automatic Monitoring.

Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias, annualisation (where the annual mean data capture is below 75% and greater than 25%), and distance correction. Further details on adjustments are provided in Appendix C.

3.2 Nitrogen Dioxide (NO_2)

Table A.2 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past five years with the air quality objective of 40µg/m^3. Note that the concentration data presented 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 2022 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.

In 2022 concentrations of NO_2 were monitored at 8 locations across the Malvern District. The highest recorded concentrations were 27.4µg/m^3 at UP3 and 27.2µg/m^3 at UP1. Both of these are located in Old Street, Upton-upon-Severn. The next highest concentration was 25.4µg/m^3 at M11 in Powick. The lowest concentration was 7.7µg/m^3 at M3N which is an urban background site in Teme Lane, Malvern. The results demonstrate that NO_2 concentrations within the Malvern Hills District area are well below the NO_2 air quality objective of 40µg/m^3 in 2022.

Concentrations have increased at all locations in 2022 when compared to the previous year, 2021. This is not surprising given the restrictions that were in place during that year due to Covid-19. The largest increase of 4.7µg/m^3 occurred at UP3 and represents an increase of 20.4%. There is an average increase of approximately 17% at all locations. Concentrations from 2022 appear to be very similar to the pre-pandemic levels recorded in 2019 but are lower than 2018 results.

Long term trend analysis over the 5-year period, 2018 to 2022, generally shows a decrease at all locations from 2018 to 2020 and then an increase from 2020 to 2022.

No annual means greater than 60µg/m^3 have been recorded indicating that it is extremely unlikely that there have been any exceedances of the 1-hour mean objective for NO_2 at any monitoring sites. The 60µg/m^3 value is a surrogate figure to indicate exceedances of the 1-hour objective based on annual average concentrations. The concentrations recorded across the district in 2022 are all greater than 50% below that value.

Location TEN1 was decommissioned at the end of 2022 following an average concentration of 20µg/m^3 being recorded in the 4 years it was in operation. A new location has been established near to the signalised crossroads at Graham Road/Church Street Great Malvern in early 2023. Historical monitoring has taken place in that vicinity over a number of years to 2016 and has not highlighted a problem. However, following concerns raised by members of the public the monitoring location has been reinstated to ascertain current conditions at the site.

3.2.1 Particulate Matter (PM_{10})

PM_{10} concentrations have not been monitored within the district in 2022.

3.2.2 Particulate Matter ($PM_{2.5}$)

$PM_{2.5}$ concentrations have not been monitored within the district in 2022.

3.2.3 Sulphur Dioxide (SO_2)

SO_2 concentrations have not been monitored within the district in 2022.

Appendix A: Monitoring Results

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

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
UP1	2 Old Street,Upton WR8 0HA	Roadside	385171	240555	NO2	no	0.0	2.0	No	2.1
UP3	15 Old Street, Upton WR8 0HA	Roadside	385157	240508	NO2	no	0.0	1.3	No	2.0
M3N	Teme Avenue, WR14 2XA Street Light o/s no 10	Urban Background	379790	245677	NO2	no	7.0	1.0	No	2.2
M2	Howsell Rd / Worcs Rd (o/s Santler Court)	Roadside	378320	247570	NO2	no	5.0	1.0	No	2.2
M5N	Richmond Road - Link Wines WR14 1NE	Roadside	378520	247753	NO2	no	0.5	4.5	No	2.3
M11	Old Post Office, Powick	Roadside	383231	251684	NO2	no	7.0	2.1	No	2.1
M14	278 Worcester Road, Malvern	Roadside	379156	248248	NO2	no	0.0	5.9	No	3.2
TEN1	Opp Kings Head PH, Cross Street, Tenbury	Roadside	359480	268075	NO2	no	0.0	1.0	No	2.0

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 NO_2 Monitoring Results: Non-Automatic Monitoring (µg/m^3)

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2022 (%) (2)	2018	2019	2020	2021	2022
UP1	385171	240555	Roadside	100	100.0	33.7	30.9	21.5	23.0	27.2
UP3	385157	240508	Roadside	100	100.0	32.4	26.3	20.9	22.7	27.4
M3N	379790	245677	Urban Background	100	100.0	10.0	8.2	6.6	6.5	7.7
M2	378320	247570	Roadside	90.4	90.4	24.4	19.1	15.7	17.3	20.2
M5N	378520	247753	Roadside	92.3	92.3	26.3	21.1	16.4	18.7	22.3
M11	383231	251684	Roadside	100	100.0	31.4	25.2	20.7	21.4	25.4
M14	379156	248248	Roadside	100	100.0	22.2	18.8	13.5	16.1	17.7
TEN1	359480	268075	Roadside	84.6	84.6		22.9	16.6	18.9	21.5

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22.**

☒ **Diffusion tube data has been bias adjusted.**

☒ **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 correction.**

Notes: The annual mean concentrations are presented as µg/m^3. 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**.

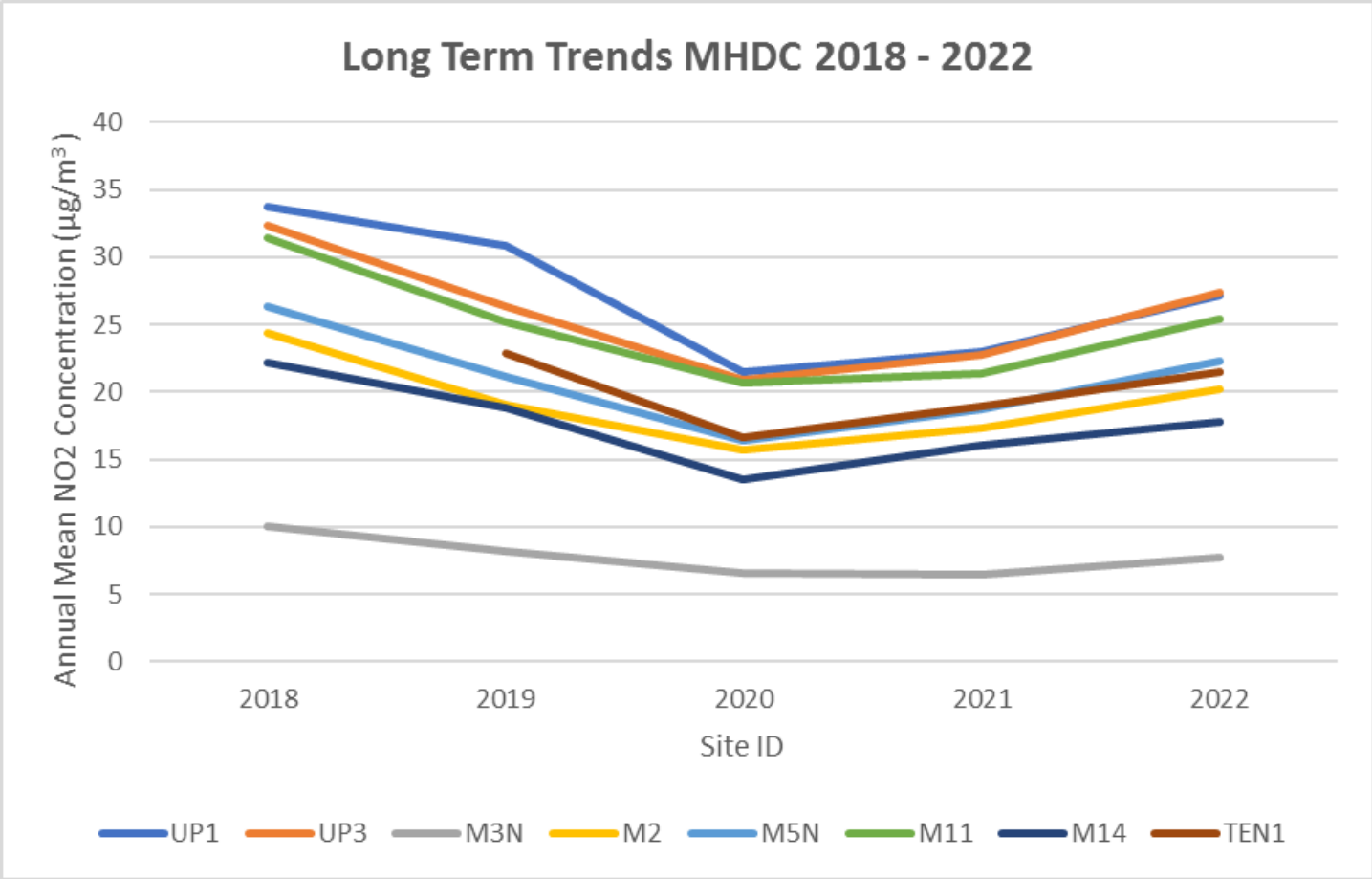
Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per LAQM.TG22 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

(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%).

Figure A.1 – Trends in Annual Mean NO_2 Concentrations



Appendix B: Full Monthly Diffusion Tube Results for 2022

Table B.1 – NO_2 2022 Diffusion Tube Results ($\mu g/m^3$)

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.97)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
UP1	385171	240555	34.8	26.7	27.5	24.7	24.9	24.5	30.0	29.0	28.0	19.4	33.1	33.6	28.0	27.2	-	
UP3	385157	240508	32.1	23.5	30.2	28.3	24.6	23.7	30.6	30.3	28.0	27.0	28.2	32.3	28.2	27.4	-	
M3N	379790	245677	12.8	5.7	11.4	7.1	4.3	3.9	6.1	6.1	6.7	7.0	8.9	15.1	7.9	7.7	-	
M2	378320	247570	23.4	13.3	27.7	22.4	16.0	14.1	20.0	22.9	22.7		21.8	24.9	20.8	20.2	-	
M5N	378520	247753	29.7	23.4	26.1	22.4	20.4	18.1	20.1	21.3		22.2	23.7	26.2	23.0	22.3	-	
M11	383231	251684	31.0	23.8	28.7	25.0	20.6	20.4	21.4	20.8	24.6	30.6	33.9	33.5	26.2	25.4	-	
M14	379156	248248	21.5	12.5	27.5	19.6	14.1	12.6	16.6	18.9	17.9	16.6	18.3	23.5	18.3	17.7	-	
TEN1	359480	268075	26.0			25.8	16.7	16.8	28.5	11.3	21.9	20.6	25.6	28.3	22.1	21.5	-	

☒ **All erroneous data has been removed from the NO_2 diffusion tube dataset presented in Table B.1.**

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22).**

☒ **Local bias adjustment factor used.**

☐ **National bias adjustment factor used.**

☒ **Where applicable, data has been distance corrected for relevant exposure in the final column.**

☒ **Malvern Hills District Council confirm that all 2022 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System.**

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**.

See Appendix C for details on bias adjustment and annualisation.

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

New or Changed Sources Identified Within Malvern Hills District Council Area During 2022

Malvern Hills District Council has not identified any new sources impacting air quality within the reporting year of 2022.

Applications for a number of new developments have been identified within the Malvern Hills District area. The proposals have been assessed as part of the planning process and are not expected to have a significant impact on local air quality should they become operational.

Details of applications for significant developments received by Malvern Hills District Council in 2022 are as follows:-

Planning Ref	Address	Proposal	Date	Status
M/22/01093/OUT	Napleton Lane, Kempsey, WR5 3PZ	Mixed use development comprising up to 150 dwellings, with up to 40% affordable housing; land for primary education facilities; together with vehicular access from the A38, green infrastructure, sustainable drainage systems, and associated infrastructure.	25.08.2022	Refused
M/22/00573/OUT	Land At (Os 8044 6965), B4196 Astley, DY13 0HY	Outline application for the erection of up to 145 dwellings, public open space, landscaping, and sustainable drainage systems (SuDS) and vehicular access point. All matters reserved except for access.	21.06.22	Refused
M/22/00776/RM	Land At (Os 8205 5395), Claphill Lane, Rushwick, WR2 5GU	Reserved Matters application for 120 dwellings following outline approval 19/01378/OUT (allowed on Appeal Ref. APP/J1860/W/21/3267054) to include details of appearance, landscaping, layout, and scale.	08.06.2022	Approved
22/00289/OUT	Land At (Os 5993 6704), Terrills Farm, Tenbury Wells, WR15 8DD	Outline planning permission (all matters reserved, except access) for the provision of up to 125 residential dwellings and associated works.	24.03.2022	Pending
M/22/00043/OUT	Land At (OS 7938 4954), Newland Grange, Stocks Lane, Newland	Outline planning application for the erection of up to 130 dwellings (including 40% affordable housing) alongside a new access road, landscaping, drainage and other associated works (all matters reserved except for access).	07.02.2022	Pending

Additional Air Quality Works Undertaken by Malvern Hills District Council During 2022

Malvern Hills District Council has not completed any additional works within the reporting year of 2022.

QA/QC of Diffusion Tube Monitoring

The following UKAS accredited company provided Malvern Hills District Council with nitrogen dioxide diffusion tubes and analysis in 2022:

Gradko International Limited
St. Martins House
77 Wales Street
Winchester
SO23 0RH
diffusion@gradko.com

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

Gradko International Limited participate in the AIR NO_2 Proficiency Testing Scheme (AIR-PT).

All monitoring undertaken has been completed in accordance with the 2022 Diffusion Tube Monitoring Calendar, i.e. on or within ± 2 days of the specified date.

Diffusion Tube Annualisation

All diffusion tube monitoring locations within Malvern Hills District recorded data capture in excess of 75% therefore it was not required to annualise any monitoring data. In addition, any sites with a data capture below 25% do not require annualisation.

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2022 ASR have been corrected for bias using an adjustment factor. Bias represents the overall tendency of the diffusion tubes to under or over-read relative to the reference chemiluminescence analyser. LAQM.TG22 provides guidance with regard to the application of a bias adjustment factor to correct diffusion tube monitoring. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data taken from NO_x/NO_2 continuous analysers. Alternatively, the national

database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

Malvern Hills District Council have applied a local bias adjustment factor of 0.97 to the 2022 monitoring data. A summary of bias adjustment factors used by Malvern Hills District Council over the past five years is presented in Table C.2

WRS has determined the appropriate local bias adjustment factor utilising the Diffusion Tube Data Processing Tool v3.0. The site used was the colocation study at Wyre Forest House, Kidderminster. The local bias adjustment factor has been used as it is more conservative compared with the national bias adjustment factor (0.83, Defra published National Diffusion Tube Bias Adjustment Spreadsheet Version 03/23), following consultation with Defra LAQM helpdesk and technical guidance.

Table C.1 – Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2022	Local	-	0.97
2021	National	03/22	0.84
2020	National	03/21	0.81
2019	National	03/20	0.78
2018	National	03/19	0.89

Table C.2 – Local Bias Adjustment Calculation

	Local Bias Adjustment Input 1	Local Bias Adjustment Input 2	Local Bias Adjustment Input 3	Local Bias Adjustment Input 4	Local Bias Adjustment Input 5
Periods used to calculate bias	11				
Bias Factor A	0.97 (0.92 - 1.04)				
Bias Factor B	3% (-4% - 9%)				
Diffusion Tube Mean (µg/m^3)	13.0				
Mean CV (Precision)	2.7%				
Automatic Mean (µg/m^3)	12.7				
Data Capture	100%				
Adjusted Tube Mean (µg/m^3)	13 (12 - 14)				

Notes: A single local bias adjustment factor has been used to bias adjust the 2022 diffusion tube results.

NO_2 Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO_2 concentration at the nearest location relevant for exposure has been estimated using the Diffusion Tube Data Processing Tool/NO_2 fall-off with distance calculator available on the LAQM Support website. Where appropriate, non-automatic annual mean NO_2 concentrations corrected for distance are presented in Table B.1.

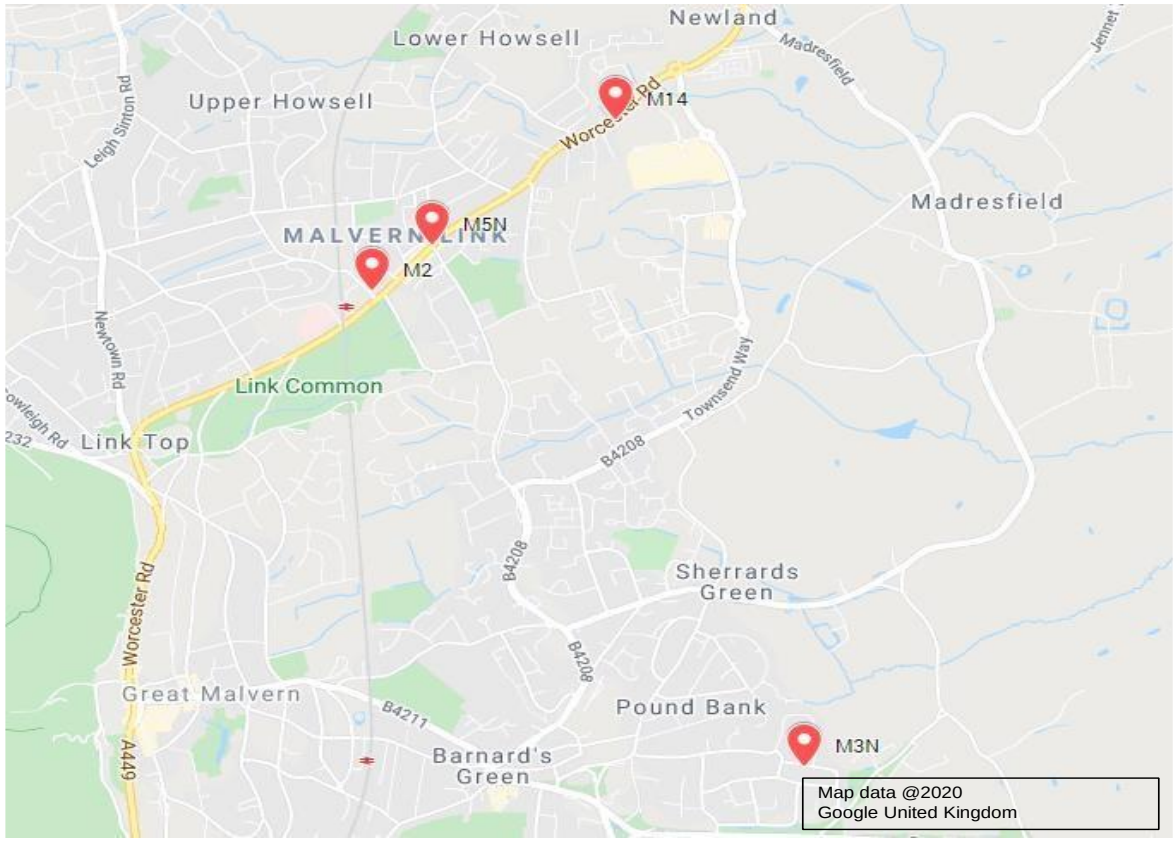
No diffusion tube NO_2 monitoring locations within Malvern Hills District required distance correction during 2022.

QA/QC of Automatic Monitoring

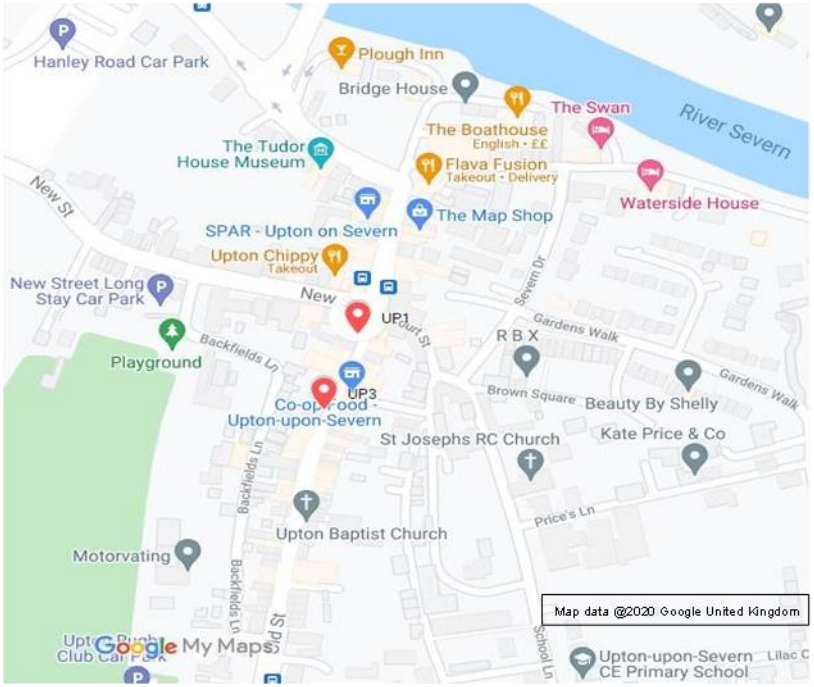
No automatic monitoring has been undertaken.

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

Figure D.1 – Maps of Non-Automatic Monitoring Sites




M11
Murco
The Rusty Star Cake Company
Delivery
Daybrook House
King's End Rd
The Red Lion
Malvern Rd
B4424
Malvern Rd
L H Wynn


Hanley Road Car Park
Plough Inn
Bridge House
The Swan
River Severn
The Boathouse
English · ££
The Tudor House Museum
Flava Fusion
Takeout · Delivery
Waterside House
New St
SPAR - Upton on Severn
The Map Shop
Upton Chippy
Takeout
New Street Long Stay Car Park
New
UP1
Court St
Severn Dr
Gardens Walk
R B X
Playground
Backfields Ln
UP3
Co-op Food - Upton-upon-Severn
Brown Square
Beauty By Shelly
Gardens Walk
St Josephs RC Church
Kate Price & Co
Upton Baptist Church
Price's Ln
Motorvating
Backfields Ln
IS Pl
Map data ©2020 Google United Kingdom
Google My Maps
School Ln
Upton-upon-Severn CE Primary School


Tenbury Swimming Pool
Market St
B4204
Cralves Mead
Blush Health &
Beauty Salon
Shamraj
Berrington Rd
TEN1
Tenbury Museum
Orchard Ct
Pembroke Ave
Pembroke House
Bog Ln
Berrington Rd
Cross St
Kyre Brook
iGo Driving School
Tenbury/Ludlow
Morningside
Oldwood Rd
Burleigh Cl
Your Coop Food

Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England[10]

Pollutant	Air Quality Objective: Concentration	Air Quality Objective: Measured as
Nitrogen Dioxide (NO_2)	200µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
Nitrogen Dioxide (NO_2)	40µg/m^3	Annual mean
Particulate Matter (PM_{10})	50µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
Particulate Matter (PM_{10})	40µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
Sulphur Dioxide (SO_2)	125µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
Sulphur Dioxide (SO_2)	266µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

[10] 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'
AQAPSG	Air Quality Action Plan Steering Group
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	Annual Status Report
AURN	Automatic Urban and Rural Network (Defra) - UK's largest automatic monitoring network and is the main network used for compliance reporting against the Ambient Air Quality Directives (by Gov't)
Defra	Department for Environment, Food and Rural Affairs
DoPH	Director of Public Health
LAQM	Local Air Quality Management
MCERTS	Monitoring Certification Scheme (Environment Agency) - certification of equipment that monitors pollution in the ambient air.
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm 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
WRS	Worcestershire Regulatory Services

References

- DEFRA (2023) National Diffusion Tube Bias Adjustment Factor Spreadsheet v.03/23
- DEFRA (2018) Background Mapping for Local Authorities
- Local Air Quality Management Technical Guidance LAQM.TG22. August 2022. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- Local Air Quality Management Policy Guidance LAQM.PG22. August 2022. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- Worcestershire Regulatory Services (2013) 'Air Quality Action Plan for Worcestershire'
- Worcestershire Regulatory Services (2015) 'Air Quality Action Plan Progress Report for Worcestershire April 2013-April 2015'
- Worcestershire Regulatory Services (2016) 'Air Quality Action Plan Progress Report for Worcestershire April 2015 – April 2016'
- Worcestershire Regulatory Services (2022) Air Quality Annual Status Report for Malvern Hills District Council