



2020 Air Quality Annual Status Report (ASR)

Wychavon District Council

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

June 2020

Local Authority Officer	Laura Carradine
Department	Land & Air Quality Team
Address	Wyre Forest House Finepoint Way Kidderminster Worcestershire DY11 7WF
Telephone	01905 822799
E-mail	enquiries@worcsregs services.gov.uk
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Executive Summary: Air Quality in Our Area

Air Quality in Wychavon District Council

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.

Worcestershire Regulatory Services (WRS) is a shared service formed from the Environmental Health and Licensing departments of the six Worcestershire District Councils. Responsibility for managing (monitoring and reporting of) local air quality transferred from the partnership councils to WRS in April 2011.

Monitoring across the Wychavon District focuses on nitrogen dioxide via a network of diffusion tubes. Tubes are located in the main urban centres of Evesham, Pershore and Droitwich with additional tubes located within close proximity to strategic roads in Wychbold and Whittington.

There has been no exceedance of the nitrogen dioxide annual mean objective at relevant exposure across the Wychavon District in 2019.

A comparison of monitored levels of nitrogen dioxide across the Wychavon District between 2018 and 2019 shows a general decrease across the District. An average decrease in concentration of 18.1% ($6.0\mu\text{g}/\text{m}^3$) can be observed across the District 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

whole. However it should be noted that the low national bias-adjustment factor of 0.78 for 2019 has the affect of lowering results and is therefore not necessarily representative of local trends. A similarly low national bias-adjustment factor was published for 2017 data and had a similar affect on results.

In light of the above long-term trends for the five year period 2015 – 2019 have been used to determine if levels of nitrogen dioxide are increasing or decreasing across the Wychavon area. An average of available 2015-2018 bias-adjusted results has been compared with bias-adjusted 2019 results for the same tubes. An average decrease of 16.2% ($4.9\mu\text{g}/\text{m}^3$) can be observed across the District between the period 2015-2018 and 2019.

These trends are discussed further in [Section 3.2](#) of this report.

There is currently one Air Quality Management Area (AQMA) in the Wychavon District. This AQMA was declared for the Worcester Road, Wychbold area on 1st May 2018 due to monitored and modelled exceedances of the annual mean objective for nitrogen dioxide (NO₂).

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

A full list of declared and revoked AQMAs can be viewed at <http://uk-air.defra.gov.uk/aqma/list>

Nitrogen Dioxide in the Worcester Road, Wychbold AQMA during 2019

No exceedance of the annual mean objective for nitrogen dioxide has been recorded at relevant exposure in the Worcester Road, Wychbold AQMA in 2019.

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The highest recorded concentration of nitrogen dioxide at relevant exposure within the AQMA in 2019 was $32.2\mu\text{g}/\text{m}^3$ at EPS56 (façade of Post Office, Worcester Road). It should be noted that the ground floor of this building is commercial. The tube height at this location is 2.13m with relevant residential exposure somewhat higher at first floor level.

The next highest recorded concentration of nitrogen dioxide at relevant exposure within the AQMA in 2019 was $31.1\mu\text{g}/\text{m}^3$ at WyAQ1 (when corrected for distance to relevant exposure). It should be noted that the concentration monitored at this roadside monitoring location was $41.5\mu\text{g}/\text{m}^3$ when not corrected for distance. It should be noted that relevant residential exposure at this location is at ground floor level.

A comparison of 2018 and 2019 levels of nitrogen dioxide (not corrected for distance to relevant exposure) shows an average decline in levels of 19.1% ($7.5\mu\text{g}/\text{m}^3$) within the Wychbold AQMA. This indicates a significant improvement in levels of nitrogen dioxide between 2018 and 2019. However it should be noted that the low national bias-adjustment factor of 0.78 for 2019 has the affect of lowering results and is therefore not necessarily representative of local trends. A similarly low national bias-adjustment factor was published for 2017 data and had a similar affect on results.

In light of the above trends for the five year period 2015 – 2019 have been used to further assess whether levels of nitrogen dioxide are generally increasing or decreasing in the Wychbold area. Monitored concentrations from the period 2015 - 2018 at two locations (i.e. those locations with sufficiently long datasets) have been averaged and compared with an average of the same two locations in 2019. This comparison shows an average decrease of 21.0% ($8.8\mu\text{g}/\text{m}^3$) between the period average for 2015 – 2018 and the 2019 average.

These trends are discussed further in [Section 3.2](#) of this report.

A source apportionment exercise was undertaken for the A38 Worcester Road in 2018 to inform the development of an Air Quality Action Plan for the Wychbold AQMA. This exercise concluded that diesel cars, LGVs and HGVs contribute the most to local traffic

emissions. The full source apportionment exercise was submitted as part of the Wychavon 2019 ASR.

At the time of the writing of this 2020 ASR report an Options Appraisal is being developed for the AQMA, see [Section 2.2](#) of this report for further details.

Nitrogen Dioxide in the former Port Street, Evesham AQMA area in 2019

The Port Street AQMA was revoked in May 2018 following a detailed Revocation Screening Assessment which reviewed monitoring data for the ten year period 2006 – 2016. A full copy of this report was submitted to DEFRA with the Wychavon 2017 ASR.

Wychavon District Council continues to monitor nitrogen dioxide levels in the area.

In 2019 there were no exceedances of the nitrogen annual mean objective at relevant exposure. In addition no monitored concentrations were within 10% of the nitrogen dioxide annual mean objective.

The highest concentration monitored in the area in 2019 was $34.5\mu\text{g}/\text{m}^3$ at EPS14b located on a kerbside road sign.

A comparison of 2018 and 2019 levels of nitrogen dioxide shows an average decline in levels of 15.6% ($6.4\mu\text{g}/\text{m}^3$) within the Port Street, Evesham area. This indicates a significant improvement in levels of NO_2 between 2018 and 2019. However it should be noted that the low national bias-adjustment factor of 0.78 for 2019 has the affect of lowering results and is therefore not necessarily representative of local trends. A similarly low national bias-adjustment factor was published for 2017 data and had a similar affect on results.

There has been no exceedance of the nitrogen dioxide annual mean objective in the Port Street, Evesham area since 2013.

Other areas across the District in 2019

No exceedences of the annual mean objective for nitrogen dioxide, or any concentrations within 10% of that objective, have been recorded at any other location in the District in 2019.

Actions to Improve Air Quality

Wychavon District generally enjoys good air quality. However like many parts of the UK, where poor air quality in Wychavon has been observed it has been linked to areas with high volumes of traffic, congestion or 'street canyon' landscapes (where height of buildings is greater than width of road). Worcestershire County Council has responsibility for strategic transport issues in the county and published the fourth Local Transport Plan in 2019 WRS continues to liaise with the County Council in the development of countywide plans to ensure that remediation of the AQMAs remain a strategic transport priority. Over the past seven years WRS has experienced closer working ties with the County Council's Strategic Transport Team and it is anticipated that collaboration on their strategic policies and improvement schemes at the early planning stages will continue to ensure that air quality improvements remain a priority across all of Worcestershire infrastructure.

WRS has also experienced increased liaison with the Director of Public Health (DoPH) department within the County Council in the last three years. A new Air Quality Partnership led by the Director of Public Health at Worcestershire County council, and supported by WRS, 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 agree terms of reference and in September to discuss potential actions. Further discussions and work to formalise an action plan are continuing in 2020.

At the time of writing of this 2020 ASR an Options Appraisal for the Worcester Road, Wychbold AQMA is being produced. The Options Appraisal will summarise monitoring undertaken to date, discuss the significant improvement in levels that have been observed in the area in recent years, consider a number of potential options for the area and determine actions and priorities for the area going forward. This is discussed further in [Section 2.2](#) of this report.

Wychavon District Council has installed a total of 24 electric vehicle charging points in car parks in towns across the District including Evesham, Pershore, Droitwich and Broadway. Twenty of these are new 7Kw charges that have been installed in the last 6 months. Further details are provided in [Section 2.2](#) of this report.

Wychavon District Council is in the process of finalising and adopting its Intelligently Green Plan. The plan commits the Council to a range of actions over the next five to ten years, many of which will have a positive impact on general air quality across the District. The main commitments included in the plan are detailed in [Section 2.2](#) of this report.

Conclusions and Priorities

In 2019 there were no identified exceedances of the nitrogen dioxide annual mean objective in the Worcester Road, Wychbold AQMA and the Wychavon District as a whole.

Long-term trends show a significant downward trend in nitrogen dioxide concentrations in the Worcester Road, Wychbold AQMA.

Long-term trends show a downward trend in nitrogen dioxide concentrations across the Wychavon District as a whole.

The main priorities for Wychavon over the next 12 months are:

- Completion of the Options Appraisal for the Worcester Road, Wychbold AQMA,

- Consultation relating to preferred options arising from the Options Appraisal with relevant stakeholders.
- The implementation of the preferred option(s) from the Options Appraisal. The current anticipated preferred option will be the upgrade of the monitoring programme in the area via the installation of a chemiluminescent analyser, combined with a change of diffusion tube supplier. This approach will allow Wychavon District Council to gather a robust dataset in order to better understand the impact of various factors which are likely to have resulted in the observed significant improvements in nitrogen dioxide concentrations in the AQMA since 2017. This dataset can then be used to draw better informed and robust conclusions as to whether the nitrogen dioxide annual mean objective is still being exceeded in the AQMA, and if it is allow better informed decisions to be made relating to appropriate mitigation.

The long-term trends in nitrogen dioxide concentrations observed across the District and within the Worcester Road, Wychbold AQMA are discussed in further detail in [Section 3.2](#) of this report.

Options Appraisal for the Worcester Road, Wychbold AQMA is discussed in further detail in [Section 2.2](#) of this report.

Local Engagement and How to get Involved

Following direct contact WRS were invited by Defra LAQM Team to join their Local Authority Air Quality Advisory Group (LAQAG), formed in 2017. The group consists of a network of local authority officials acting as an informal sounding board by Defra to enable development of better informed strategy and policy proposals across the two areas of work in air quality- local authorities and domestic combustion. It is an advisory body and not a decision-making body.

WRS is also a member of Central England Environmental Protection Managers Group (CEEPG) which provides a strategic overview and direction for the delivery of

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Environmental Protection Services across the area of Central England covered by participating authorities. CEEPG responsibilities covers all environmental health matters regarding air quality, noise, contaminated land and LAPPC/IPPC including cooperation and coordination with the Environment Agency and Public Health England.

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

- **Walk or cycle, leave you car at home:** Leaving your car at home and walking or cycling instead will benefit in three ways - increased exercise, reduced pollution exposure and will reduce individual's pollution emissions;
- 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/>;
- Contact Worcestershire County Council for help and advice on a **Travel Plan** for your business. General travel planning advice is available on Worcestershire County Council's website (including walking, cycling and bus maps and timetables);
- **Hold meetings by Conference Call** by phone or Skype 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 providing £80m funding to encourage installation of EV charging 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.

- <https://www.gov.uk/government/collections/government-grants-for-low-emission-vehicles#workplace-charging-scheme>
- 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>

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)^{4,5}. Senior citizens are more likely to be affected by respiratory diseases and children are more likely to 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/daqj>.
- 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.

⁴ <http://www.breathelondon.org/>

⁵ <https://www.londonair.org.uk/LondonAir/guide/MyActionsForMe.aspx>

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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 can currently be found at <http://www.worcsregservices.gov.uk/pollution/air-quality/public-advice.aspx> .

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1 Local Air Quality Management

This report provides an overview of air quality in Wychavon District Council 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 Wychavon 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.

A summary of AQMAs declared by Wychavon District Council can be found in Table 2.1. Further information related to declared AQMAs, including maps of AQMA boundaries are available online at <https://worcsregservices.gov.uk/pollution/air-quality/air-quality-management-areas.aspx> Alternatively, see Appendix D: Map(s) of Monitoring Locations and AQMAs, which provides for a map of air quality monitoring locations in relation to the AQMA(s).

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	City / Town	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance (maximum monitored/modelled concentration at a location of relevant exposure)				Action Plan		
						At Declaration		Now		Name	Date of Publication	Link
Worcester Road, Wychbold	1 st May 2018	NO2 Annual Mean	Wychbold	An area encompassing a number of properties surrounding strategic road network around Junction 5 M5 and A38	Yes	44.6 ^{a,b}	µg/m ³	32.2	µg/m ³	Currently being developed	N/A	N/A

Wychavon District Council confirm the information on UK-Air regarding their AQMA(s) is up to date

^a note concentration reported in 2019 ASR was incorrect due to an administrative error, corrected and updated in this 2020 ASR.

^b figure represents concentration based on chemiluminescent analyser data collected during 2016, annualised and calculated back to relevant exposure. This figure is considered to be the most accurate measure of nitrogen dioxide concentrations at the time when considering inherent model error and diffusion tube variance

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

Defra's appraisal of last year's ASR concluded:

1. *AQAP is yet to be published and ideally should have been published within 12 months of declaring a new AQMA. Therefore, this should be published ASAP and commentary on actions be included in the 2020 ASR.*
2. *Draft AQAP measures could have been included within Table 2.2 to indicate provisional progress towards the implementation of measures, and as a reassurance that the Council is progressing with the production of the AQAP. If the AQAP has still not been published in the next reporting year, this approach is encouraged within the 2020 ASR.*
3. *The main contributors to NO₂ identified within the Source Apportionment submitted as an Appendix to the ASR should be used to guide the development of the AQAP measures. The Source Apportionment exercise itself will be formally appraised in more detail on submittal of the AQAP.*
4. *More commentary around decisions to remove/move monitoring locations between reporting years would be welcomed.*
5. *The Council could consider referencing the Public Health England Outcomes Framework indicator to estimate the Fraction of mortality attributable to particulate air pollution in their District.*
6. *It is recommended that as a minimum the distance correction need only be applied to all monitoring locations that record an annual mean concentration that is above the NO₂ annual objective of 40µg/m³. Consideration may also be given to applying the calculation to monitoring locations that record an annual mean concentration that is within 10% of the objective (i.e. above 36µg/m³), to account for monitoring uncertainty.*

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7. *Though not on this occasion, the processing of the Council's monitoring data within the excel template submitted may lead to manual errors in future. Formulae could be updated to count months, rather than input manually, to prevent this.*

The points above are noted and addressed as required through out this 2020 ASR report.

Update on actions for the Worcester Road, Wychbold AQMA

An Air Quality Action Plan for the Worcester Road, Wychbold AQMA has not yet been produced. WRS is in the process of preparing an Options Appraisal for the area for Wychavon District Council.

The Options Appraisal will review all available monitoring data, explore the monitored improvements in nitrogen dioxide levels observed in recent years and present Wychavon District Council with a number of options prior moving forward with any necessary action planning.

Monitored concentrations of nitrogen dioxide in the AQMA have indicated significant improvements since 2017.

There has only been one monitored exceedance of the annual mean objective at relevant exposure in the AQMA between 2017 and 2019: 40µg/m³ was monitored at EPS56 in 2018, where it should also be noted that relevant exposure is at first floor level and not the ground floor level represented by the height of the tube.

Long-term trends for the AQMA are discussed in further detail in [Section 3.2](#) of this report.

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Between 2012 and 2016 concentrations of nitrogen dioxide in the AQMA consistently exceeded the NO₂ annual mean objective. Since 2017 there has only been one marginal exceedance of the objective. WRS is currently unable to determine with any confidence whether this improvement is attributable to actual improvements in the area or to significant variance in recent diffusion tube monitoring results. It is likely that the observed improvement is the result of a combination of both factors.

This monitored improvement in concentrations is considered to be attributable to a combination of several factors:

- Variance in diffusion tube data: the impact of low published national bias-adjustment factors for the Council's tube supplier applied to monitoring data in 2017 and 2019 indicates that the significant decrease in concentrations observed in 2017 and 2019 cannot be relied upon as indicative of local trends.
- The weather: meteorological conditions during this period resulted in milder winters which generally result in lower concentrations of nitrogen dioxide over the winter months
- Strategic road network improvements: the completion of significant Major Scheme enhancement works to the strategic road network in the area in 2017. The Scheme included the upgrade of the M5 between junctions 6 and 4a to a SMART motorway along with improved 'off-slip' capacity and the introduction of traffic signal control on the A38 at junction 5 in the AQMA. The scheme is discussed further in [Section 3.2](#) of this report.
- Bus improvements: WRS understand the main bus provider using the A38 through Wychbold has over the past 18-24 months retrofitted the buses on its 144 route (Birmingham – Worcester – Birmingham) to Euro 6 standards in order to comply with the upcoming introduction of a Clean Air Zone in Birmingham. This improvement will have had some positive impact on emissions in the AQMA and will need to be included in any update to the Source Apportionment exercise originally undertaken for the area in 2018.

- National vehicle fleet improvements: general improvements to the national vehicle fleet. There has been a reduction in the number of diesel vehicles in UK car fleet following a move towards petrol and LEVs/ULEVs. The most recent statistics published by the DfT show that between 2017 and 2018 there was a 0.3% drop in the proportion of diesel cars in the national fleet. If this national figure translates locally to the AQMA this 0.3% drop will be contributing to the observed improvement in levels of nitrogen dioxide because source apportionment shows that diesel cars on the A38 contribute approximately 44% of emissions. DfT statistics also show a 0.1% drop in petrol cars in the national fleet between 2017 and 2018, along with a 0.4% increase in low emission vehicles (which now make up 2% of the national car fleet).

Due to these factors there is currently a lack of confidence in trend data for recent years. This has resulted in limited confidence in the understanding of current concentrations of nitrogen dioxide in the area, and the relationship of the factors above to those concentrations.

In light of the above it is considered necessary for Wychavon District Council to improve confidence in monitoring data in the AQMA in order to better understand the relationship between the observed changes in the area, i.e. strategic road network improvements, and improvements in concentrations of nitrogen dioxide. This is considered to be necessary ahead of carrying out detailed action planning in order to ensure that robust decisions are made.

It is therefore anticipated that the preferred option in the options appraisal will be a recommendation to upgrade the monitoring programme in the area with the installation of a chemiluminescent analyser, which would provide more accurate and robust monitoring data, combined with a change of diffusion tube supplier.

Automatic monitoring data provides higher resolution datasets that are more accurate than diffusion tube data. Tube data has an inherent variance of up to 25%, making it difficult to determine whether levels are exceeding an Objective or not where recorded diffusion tube concentrations are close to the Objective.

This provisional preferred option approach would allow Wychavon District Council to gather a robust dataset in order to better understand the impact of the various factors which may have resulted in improvements in nitrogen dioxide concentrations (such as the completion of significant changes to the strategic road network) in the AQMA. This dataset can then be used to draw better informed and robust conclusions as to whether the nitrogen dioxide annual mean objective is still being exceeded at relevant exposure in the area.

If it is concluded that the Objective is still being exceeded in the area a more reliable and robust dataset will allow Wychavon District Council to make better informed decisions relating to the degree of improvement currently required and appropriate mitigating actions to achieve the required level of improvement.

Update on schemes indirectly improving air quality across the District

Air Quality Partnership for Worcestershire

A new Air Quality Partnership led by the Director of Public Health at Worcestershire County council, and supported by WRS, 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 2019 to discuss potential actions. Further discussions and work to formalise an action plan are continuing in 2020.

Evesham Transport Strategy

Phase I of the Evesham Transport Strategy has now been completed. The objective of Phase I was to ensure that maximum capacity is being achieved from the towns existing road network. This has resulted in the easing of traffic flows and reduction of congestion within existing constraints. Measures delivered as part of Phase I include the installation

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of more efficient traffic signal controllers, painting of box junctions and the extension of parking restriction to improve traffic flow on the towns key north-south corridor.

Funding is currently being sought for Phase 2 of the Strategy. Phase 2 includes the following:

- The creation of a walking and cycling network in Evesham. Worcestershire County Council notes that a lot of trips in Evesham are relatively short, i.e. starting and finishing within the town. The created of a walking and cycling network will give people the opportunity to swap some of these short trips currently being made in cars for 'active travel' such as walking and cycling. The benefits of this include obvious benefits for health along with reductions in congestion and associated levels of air pollution.
- Capacity improvements for the A46 and the associated route into and out of Evesham town. Worcestershire County Council is currently working in partnership with Midlands Connect to assess what can be done to improve the Evesham stretch of the A46.
- Bringing state of the art traffic monitoring to Evesham. Evesham's traffic signal monitoring and respond to traffic demand. Currently this monitoring cannot distinguish between different types of vehicles. New technology now allows each unique traffic movement to be captured which will allow traffic flows to be managed more effectively in the town along with allowing the effectiveness of each transport scheme that is implemented to be captured.

Full details relating to the Evesham Transport Strategy can be viewed on the Worcestershire County Council website at

http://www.worcestershire.gov.uk/info/20629/evesham_transport_strategy/1820/evesham_transport_strategy

Planned improvements for the Former Port Street, Evesham AQMA area

Worcestershire County Council confirms that a number of elements are currently being developed for the enhancement of Port Street, Evesham. These include:

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- Updating of traffic signals at the junction of Port Street, Waterside and Bridge Street to improve efficiency and provide pedestrian crossing.
- A Public Realm Enhancement Scheme to improve Port Streets footways
- The development of cycle routes to link local routes and the National Cycle Network to Port Street.

These three measures overlap with the Evesham Transport Strategy.

Electric Vehicle Charging

Wychavon District Council has installed a total of 24 electric vehicle charging points in car parks in towns across the District including Evesham, Pershore, Droitwich and Broadway. Twenty of these are new 7Kw charges that have been installed in the last 6 months.

Further information can be found at <https://www.wychavon.gov.uk/news-and-alerts/150-000-for-new-electric-vehicle-chargers>

In addition Wychavon District Council provide an electric pool car for staff use and are also currently investigating the replacement of a number of other council fleet vehicles with low emission alternatives.

Wychavon District Council Draft Intelligently Green Plan

Wychavon District Council is in the process of finalising and adopting its Intelligently Green Plan. The plan commits the Council to a range of actions over the next five to ten years, many of which will have a positive impact on general air quality across the District. The main commitments included in the plan are listed below:

- Reduce council-related staff travel through agile working and switch to lower emission vehicles for our small fleet.
- Work with the other Worcestershire district councils to develop a taxi licensing policy to encourage the take-up of electric and other low emission vehicles and to discourage higher polluting older vehicles.

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- Ensure that cycling and walking options are an intrinsic part of all plans for new settlements in Wychavon.
- Increase car parking provision at Droitwich Spa, Honeybourne and Pershore railway stations by 31 March 2024.
- Improve connectivity between the railway stations and the towns and between Worcestershire Parkway and the surrounding areas through improving signage and piloting one or more bike hire schemes by 31 March 2022.
- Promote an already established carpooling scheme, such as BlaBla Car.
- Appoint an active travel project officer to lead work with partners on new cycle routes and the development of cycling and walking plans by 31 March 2023.
- Investigate a work place parking levy offering discounts for low carbon transport initiatives i.e. EV charge points, bike scheme, car sharing and renewable energy installations.
- Promote the development of at least one electric forecourt in the district.
- Review EV charging points in Council owned car parks and encourage and incentivise others to install them including making installation of EV charging points a condition of grant funding for new village halls or other new community buildings and encouraging businesses and tourist destinations to consider installing EV charge points and to convert to lower emission vehicles.
- Deliver a programme of funding, mentoring and advice to improve and increase the range of community based transport options available across the district including the ticket to ride project by 31 March 2023.
- Move all of the Council's waste and street cleaning contractor fleet to low emission vehicles when technology and energy infrastructure permits.

Further details relating to Wychavon District Council's Intelligently Green Plan can be found at <https://www.wychavon.gov.uk/community-and-living/intelligently-green>

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 2017 based DEFRA national background maps to determine projected PM_{2.5} concentrations with the Wychavon District for the 2019 calendar year. The average total PM_{2.5} at 657 locations (centre points of 1km x 1km grids) across the Wychavon District is 7.93µg/m³, with a minimum concentration of 7.26µg/m³ and a maximum concentration of 9.67µg/m³.

This indicates that PM_{2.5} concentrations within the Wychavon 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 has discussed the role of the DoPH, and the details of PM_{2.5} levels across the County, with the Director of Public Health at Worcestershire County Council. A new Air Quality Partnership led by the Director of Public Health at Worcestershire County council, and supported by WRS, 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.

No additional actions are currently planned by Wychavon 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 PM2.5 levels.

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

3.1 Summary of Monitoring Undertaken

3.1.1 Non-Automatic Monitoring Sites

Wychavon District Council undertook non- automatic (passive) monitoring of NO₂ at 23 locations during 2019. Table A.1 in Appendix A shows the details of the monitoring locations.

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 bias⁶, “annualisation” (where the data capture falls below 75%), and distance correction⁷. 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 nitrogen dioxide 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

⁶ <https://laqm.defra.gov.uk/bias-adjustment-factors/bias-adjustment.html>

⁷ Fall-off with distance correction criteria is provided in paragraph 7.77, LAQM.TG(16)

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.

Changes to Diffusion Tube Monitoring Network in 2019

Two additional diffusion tube locations have been commissioned within the Worcester Road, Wychbold AQMA in 2019:

- WMD2 at the end of Walkmill Drive, Wychbold close to the M5 southbound carriageway. The aim of this tube is to estimate nitrogen dioxide concentrations at residential properties closest to the M5 carriageway. Following communication with local residents WRS were not able to secure the installation of a diffusion tube on the façade of the two properties closest to the M5 carriageway, nor anywhere at the M5 end of Walkmill Drive closest to the motorway (Walkmill Drive is a private road). The tube is therefore located on the motorway embankment as the only viable alternative currently available.
- CROW1 at the junction of Worcester Road, Wychbold and Crown Lane. The aim of this tube is to monitor nitrogen dioxide levels within Wychbold along the A38 to inform understanding of how levels change with distance from the M5 junction. Following a number of failed attempts to communicate with residents and secure a residential façade location this tube was located as close as possible to residential facades on a road sign.

In addition to the above, tube BG at West View, Broomhall Green, Norton roundabout has been reported for the Wychavon District in 2019. This tube has been in place for a number of years however it has historically been reported as being within the Worcester City Council boundary. A recent review confirms that this location falls just within the Wychavon District Council boundary where the boundaries of Worcester City Council, Malvern Hills District Council and Wychavon District Council converge. As such this tube will be reported as part of the Wychavon District monitoring network going forward.

Exceedances of the Air Quality Objectives in 2019

There have been no exceedances on the annual mean nitrogen dioxide objective at relevant exposure in 2019.

A concentration of $41.5\mu\text{g}/\text{m}^3$ was recorded at WychAQ1 within the Worcester Road, Wychbold AQMA, however when this concentration is corrected for distance to representative relevant exposure the reported concentration is $31.1\mu\text{g}/\text{m}^3$.

Trends across the Wychavon District

Figure A1 Chart 1 presents nitrogen dioxide concentrations at monitoring locations across the Wychavon District between 2015 and 2019. Please note that the concentrations presented have been bias-adjusted and annualised where necessary, they have not been corrected for distance where the locations are not representative of relevant exposure.

A comparison of monitored levels of nitrogen dioxide across the Wychavon District between 2018 and 2019 shows a general decrease across the District. An average decrease in concentration of 18.1% ($6.0\mu\text{g}/\text{m}^3$) can be observed across the District as a whole. However it should be noted that the low national bias-adjustment factor of 0.78 for 2019 has the affect of lowering results and is therefore not necessarily representative of local trends. A similarly low national bias-adjustment factor was published for 2017 data and had a similar affect on results.

Given the above the average District concentration for the five year period 2015 – 2019 has been used to further assess whether levels of nitrogen dioxide are generally increasing or decreasing across the Wychavon area. Where suitably long datasets are available an average of 2015-2018 bias-adjusted results has been compared with an average of 2019 bias-adjusted results for the same tubes. An average decrease of 16.2% ($4.9\mu\text{g}/\text{m}^3$) can be observed across the District as a whole between the period 2015-2018 and 2019.

Comparison 2015-2018 Average District NO2 Concentration with 2019 Average District NO2 Concentration								
	2015	2016	2017	2018	2015-2018 Average	2019	Difference	% Change
EPS8	26.3	28.6	22.9	26.9	26.2	21.9	-4.3	-16.3%
EPS9	11.9	13.3	10.5	12.0	11.9	10.0	-1.9	-15.9%
EPS14	40.4	40.8	35.2	40.9	39.3	33.4	-5.9	-15.0%
EPS14a	41.3	42.0	37.0	42.0	40.6	34.4	-6.2	-15.3%
EPS14b	40.7	41.8	36.2	40.9	39.9	34.5	-5.4	-13.4%
EPS27	44.8	44.5	39.5	41.5	42.6	34.4	-8.1	-19.1%
EPS33	30.0	32.6	24.5	29.9	29.3	23.9	-5.3	-18.1%
EPS43	31.2	33.8	27.3	33.3	31.4	27.3	-4.1	-12.9%
EPS44	31.1	35.3	28.4	31.1	31.5	27.5	-3.9	-12.5%
EPS52	31.1	33.8	30.8	31.6	31.8	26.3	-5.5	-17.4%
EPS53	29.4	30.0	25.8	27.7	28.2	23.4	-4.8	-16.9%
EPS56	45.1	45.6	36.4	40.0	41.8	32.2	-9.6	-22.9%
EPS60	16.0	16.6	15.3	15.8	15.9	13.9	-2.1	-13.0%
EPS61	30.0	29.6	27.2	29.7	29.1	25.0	-4.2	-14.3%
EPS62	33.5	34.4	29.6	32.8	32.6	27.2	-5.3	-16.3%
EPS63	24.5	24.9	18.9	24.8	23.3	18.5	-4.8	-20.5%
BG	17.4	24.3	22.3	26.1	22.5	20.0	-2.5	-11.3%

District Average 2015 - 2018 (ug/m3)	30.5
District Average 2019 (ug/m3)	25.5
Difference (ug/m3)	-4.9
% Change	-16.2%

Trends in the Worcester Road, Wychbold AQMA

Figure A1 Chart 2 presents nitrogen dioxide concentrations at monitoring locations in the Worcester Road, Wychbold AQMA between 2012 and 2019. Please note that the concentrations presented have been bias-adjusted and annualised where necessary, they have not been corrected for distance where monitoring locations are not representative of relevant exposure.

Figure A1 Chart 3 presents nitrogen dioxide concentrations at monitoring locations in the Worcester Road, Wychbold AQMA between 2012 and 2019. The concentrations here have been bias-adjusted, annualised where necessary and also been corrected for distance where monitoring locations are not representative of relevant exposure. This is to illustrate concentrations in relation to the nitrogen dioxide annual mean air quality objective, i.e. to demonstrate where concentrations exceed the objective at relevant exposure.

No exceedance of the annual mean objective for nitrogen dioxide has been recorded at relevant exposure in the Worcester Road, Wychbold AQMA in 2019.

The highest recorded concentration of nitrogen dioxide at relevant exposure within the AQMA in 2019 was $32.2\mu\text{g}/\text{m}^3$ at EPS56 (façade of Post Office, Worcester Road). It should be noted that the ground floor of this building is commercial. The tube height at this location is 2.13m with relevant residential exposure somewhat higher at first floor level.

The next highest recorded concentration of nitrogen dioxide at relevant exposure within the AQMA in 2019 was $31.1\mu\text{g}/\text{m}^3$ at WyAQ1 (when corrected for distance to relevant exposure). It should be noted that the concentration monitored at this roadside monitoring location was $41.5\mu\text{g}/\text{m}^3$ when not corrected for distance.

A comparison of 2018 and 2019 levels of nitrogen dioxide (not corrected for distance to relevant exposure) shows an average decline in levels of 19.1% ($7.5\mu\text{g}/\text{m}^3$) within the Wychbold AQMA. This indicates a significant improvement in levels of nitrogen dioxide between 2018 and 2019. However it should be noted that the low national bias-adjustment factor of 0.78 for 2019 has the affect of lowering results and is therefore not necessarily representative of local trends. A similarly low national bias-adjustment factor was published for 2017 data and had a similar affect on results.

Given the above trends for the five year period 2015 – 2019 have been used to further assess whether levels of nitrogen dioxide are generally increasing or decreasing in the AQMA. Monitored concentrations from the period 2015 - 2018 at two locations (i.e. those locations with sufficiently long datasets) have been averaged and compared with an average of the same two locations in 2019. This comparison shows an average decrease of 21.0% ($8.8\mu\text{g}/\text{m}^3$) between the period average for 2015 – 2018 and the 2019 average.

Comparison 2015-2018 Average AQMA NO2 Concentration with 2019 Average AQMA NO2 Concentration								
	2015	2016	2017	2018	2015-2018 Average	2019	Difference	% Change
EPS27	44.8	44.5	39.5	41.5	42.6	34.4	-8.1	-19.1%
EPS56	45.1	45.6	36.4	40.0	41.8	32.2	-9.6	-22.9%

AQMA Average 2015 - 2018 (ug/m3)	42.2
AQMA Average 2019 (ug/m3)	33.3
Difference (ug/m3)	-8.8
% Change	-21.0%

The above demonstrates a significant downward trend in levels of nitrogen dioxide in the AQMA. This downward trend appears to be most significant from 2017 onwards with a single monitored exceedance of the annual mean objective at relevant exposure recorded between 2017 and 2019 (40µg/m³ was monitored at EPS56 in 2018, where it should also be noted that relevant exposure is at first floor level and not the ground floor level represented by the height of the tube).

This monitored improvement in concentrations is considered to be attributable to a combination of several factors:

- Variance in diffusion tube data: the impact of low published national bias-adjustment factors for the Council's tube supplier applied to monitoring data in 2017 and 2019 indicates that the significant decrease in concentrations observed in 2017 and 2019 cannot be relied upon as indicative of local trends. However it can be seen that there is also an observable downward trend when 2018 monitored concentrations are compared with concentrations measured between 2012 and 2016.
- The weather: meteorological conditions during this period resulted in milder winters which generally result in lower concentrations of nitrogen dioxide over the winter months

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- Road network improvements: By mid-2017 the completion of Major Scheme enhancement works to the strategic road network in the area were completed. The scheme included the upgrade of the M5 between Junctions 4a and 6 to a SMART motorway along with improved 'off-slip' capacity and the introduction of traffic signal control at Junction 5, located within the AQMA.

Worcestershire County Council have advised that whilst the Major Scheme works were taking place there was significant constraint on traffic flow on the M5 causing a proportion of strategic traffic to re-route onto local and regional roads including Worcester Road, Wychbold. Worcestershire County Council advise that this constraint is now gone and that the completion of the works has resulted in significant improvements to traffic flow and journey time reliability on the M5. In addition Worcestershire County Council advises that greater capacity delivered on the strategic road network as a result of the scheme has greatly diminished the incentive for strategic traffic to seek alternative local routes.

Highways England was contacted with the aim of obtaining the conclusions of any post-completion evaluation of the SMART motorway scheme. Highways England confirmed that this evaluation is due to be completed at the end of 2020, subject to traffic levels returning to normal following the current Covid-19 lockdown restrictions on travel.

- Bus improvements: WRS understand the main bus provider using the A38 through Wychbold has over the past 18-24 months retrofitted the buses on its 144 route (Birmingham – Worcester – Birmingham) to Euro 6 standards in order to comply with the upcoming introduction of a Clean Air Zone in Birmingham. This improvement will have had some positive impact on emissions in the AQMA and will need to be included in any update to the Source Apportionment exercise originally undertaken for the area in 2018.
- National vehicle fleet improvements: general improvements to the national vehicle fleet. There has been a reduction in the number of diesel vehicles in UK car fleet following a move towards petrol and LEVs/ULEVs. The most recent statistics published by the DfT show that between 2017 and 2018 there was a 0.3% drop in the proportion of diesel cars in the national fleet. If this national figure translates locally to the AQMA this 0.3% drop will be contributing to the observed improvement in levels of nitrogen dioxide because source apportionment shows

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that diesel cars on the A38 contribute approximately 44% of emissions. DfT statistics also show a 0.1% drop in petrol cars in the national fleet between 2017 and 2018, along with a 0.4% increase in low emission vehicles (which now make up 2% of the national car fleet).

In addition to the above Wychavon District Council has granted planning consent to a proposal to redevelop the existing petrol filling station, lorry and café at Swan Garage, Upton Warrant adjacent to AQMA. WRS understand that the re-development of the site will remove any facility for lorry parking at the site and will involve the upgrading of the existing petrol filling station and the development of a drive-through café with associated car parking. An Air Quality Assessment undertaken to support the proposal concluded that changes in air quality with development range from moderate beneficial to negligible impact. As such it is anticipated that the redevelopment of the existing lorry park and Swan Service Station site will result in a reduction in HGV movement through the AQMA and consequently will likely result in further improvements in air quality in the area. Full details for the proposal can be viewed via the Wychavon District Council Planning Portal at <https://plan.wychavon.gov.uk/plandisp.aspx?recno=99640>

In light of the above combination of factors WRS is currently undertaking an Options Appraisal for the area. The Options Appraisal is discussed in further detail in [Section 2.2](#) of this report.

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)
EPS8	40 High Street Street Light 8, Pershore	Kerbside	395048	245527	NO2	No	2	0.5	NO	2.27
EPS9	St. Andrews Road Street light 139, Pershore	Suburban	394571	245377	NO2	No	6	2.98	NO	2.26
EPS14	Port Street Road Sign, Evesham	Kerbside	404128	243630	NO2	No	1.7	0.73	NO	2.35
EPS14a	Port Street Road Sign, Evesham	Kerbside	404128	243630	NO2	No	1.7	0.73	NO	2.35
EPS14b	Port Street Road Sign, Evesham	Kerbside	404128	243630	NO2	No	1.7	0.73	NO	2.35
EPS27	Worcester Rd, Wychbold	Roadside	392031	265624	NO2	Yes (Worcester Rd, Wychbold)	15.5	2.31	NO	2.13
EPS33	High Street Street light LP 32, Evesham	Roadside	403753	244068	NO2	No	2.5	3.5	NO	2.3

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EPS43	Long Stay opp cinema, Port St, Evesham	Roadside	404222	243598	NO2	No	0	1.85	NO	2.35
EPS44	Camera Post opp 33, Port St, Evesham	Roadside	404183	243611	NO2	No	2.6	1.18	NO	2.45
EPS52	The Bungalow, Whittington	Roadside	387598	252511	NO2	No	0	12	NO	1.99
EPS53	Hillview Cottage, Whittington	Suburban	387595	252533	NO2	No	0	22	NO	1.68
EPS56	Post Office, Worcester Rd, Wychbold	Roadside	391983	265688	NO2	Yes (Worcester Rd, Wychbold)	0 (residential at first floor)	8.08	NO	2.13
EPS58a	Façade 2 Rose Villas, Worcester Road, Wychbold	Roadside	392027	265770	NO2	Yes (Worcester Rd, Wychbold)	0	8.1	NO	2.27
EPS60	Corner of Rynal Street & De La Bere Close, Evesham SL2	Roadside	403914	244046	NO2	No	5.5	1.1	NO	2.13
EPS61	1-6 The Old Dairy, Swan Lane, Evesham	Roadside	403796	244006	NO2	No	0	1.9	NO	2
EPS62	Bengal Dreams No 53 Façade, Evesham	Roadside	403729	243971	NO2	No	0 (residential at first floor)	5.38	NO	2.18
EPS63	60 Mayflower Road, Droitwich	Roadside	390708	262863	NO2	No	0	2.46	NO	1.93
WMD1	Walk Mill Drive, Wychbold LP363	Roadside	392050	265790	NO2	Yes (Worcester Rd, Wychbold)	4.9	2.3	NO	2.14
WyAQ1	Lampost outside Rose Dene, Worcester	Roadside	392019	265736	NO2	Yes (Worcester Rd,	9.91	1.93	NO	2.22

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	Road, Wychbold					Wychbold				
WychAD	Lampost between BP Garage and Mill Lane Junction	Roadside	392384	266195	NO2	Yes (Worcester Rd, Wychbold)	n/a	1.53	NO	2.13
WychCH	Lampost outside 6 Council Houses, Worcester Road, Wychbold	Roadside	392160	265937	NO2	Yes (Worcester Rd, Wychbold)	7.5	2.14	NO	2.26
WychSC	Street light on A38 within vicinity of property on Sheldon Close	Roadside	392022	265702	NO2	Yes (Worcester Rd, Wychbold)	19.6	1.2	NO	1.2
WMD2	Highways England land at end of Walkmill Drive adj M5, off Worcester Road, Wychbold	Roadside	391871	265859	NO2	Yes (Worcester Rd, Wychbold)	13.5	21.5	NO	1.82
CROW1	Road sign outside Ou Est Elle, 1 Crown Lane, Wychbold, WR9 7PT	Roadside	392257	266043	NO2	Yes (Worcester Rd, Wychbold)	4.3	1.28	NO	2.34
BG	West View, Broomhall Green, Norton roundabout	Urban Background	386297	252150	NO2	No	0	36.0	NO	1.9

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
EPS8	395048	245527	Roadside	Diffusion Tube	92%	92%	26.3	28.6	22.9	26.9	21.9
EPS9	394571	245377	Suburban	Diffusion Tube	83%	83%	11.9	13.3	10.5	12.0	10.0
EPS14	404128	243630	Kerbside	Diffusion Tube	92%	92%	40.4	40.8	35.2	40.9	33.4
EPS14a	404128	243630	Kerbside	Diffusion Tube	92%	92%	41.3	42.0	37.0	42.0	34.4
EPS14b	404128	243630	Kerbside	Diffusion Tube	92%	92%	40.7	41.8	36.2	40.9	34.5
EPS14/a/b/ Average	404128	243630	Kerbside	Diffusion Tube	92%	92%	40.8	41.5	36.2	41.3	34.1
EPS27	392031	265624	Roadside	Diffusion Tube	100%	100%	44.8	44.5	39.5	41.5	34.4
EPS33	403753	244068	Roadside	Diffusion Tube	100%	100%	30.0	32.6	24.5	29.9	23.9
EPS43	404222	243598	Roadside	Diffusion Tube	100%	100%	31.2	33.8	27.3	33.3	27.3
EPS44	404183	243611	Roadside	Diffusion Tube	92%	92%	31.1	35.3	28.4	31.1	27.5
EPS52	387598	252511	Roadside	Diffusion Tube	100%	100%	31.1	33.8	30.8	31.6	26.3
EPS53	387595	252533	Suburban	Diffusion Tube	100%	100%	29.4	30.0	25.8	27.7	23.4
EPS56	391983	265688	Roadside	Diffusion Tube	100%	100%	45.1	45.6	36.4	40.0	32.2
EPS58a	392027	265770	Roadside	Diffusion Tube	100%	100%				35.1	26.9
EPS60	403914	244046	Roadside	Diffusion Tube	83%	83%	16.0	16.6	15.3	15.8	13.9

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EPS61	403796	244006	Roadside	Diffusion Tube	100%	100%	30.0	29.6	27.2	29.7	25.0
EPS62	403729	243971	Roadside	Diffusion Tube	83%	83%	33.5	34.4	29.6	32.8	27.2
EPS63	390708	262863	Roadside	Diffusion Tube	83%	83%	24.5	24.9	18.9	24.8	18.5
WMD1	392050	265790	Roadside	Diffusion Tube	83%	83%		46.3	40.2	40.2	33.2
WyAQ1	392019	265736	Roadside	Diffusion Tube	75%	75%		52.0	44.2	49.6	41.5
WychAD	392384	266195	Roadside	Diffusion Tube	83%	83%				36.8	29.7
WychCH	392160	265937	Roadside	Diffusion Tube	100%	100%				35.8	29.3
WychSC	392022	265702	Roadside	Diffusion Tube	92%	92%				39.4	30.9
WMD2	391871	265859	Roadside	Diffusion Tube	100%	100%					25.2
CROW1	392257	266043	Roadside	Diffusion Tube	92%	92%					22.7
BG	386297	252150	Urban Background	Diffusion Tube	83%	83%	17.41	24.26	22.28	26.13	20.4

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**.

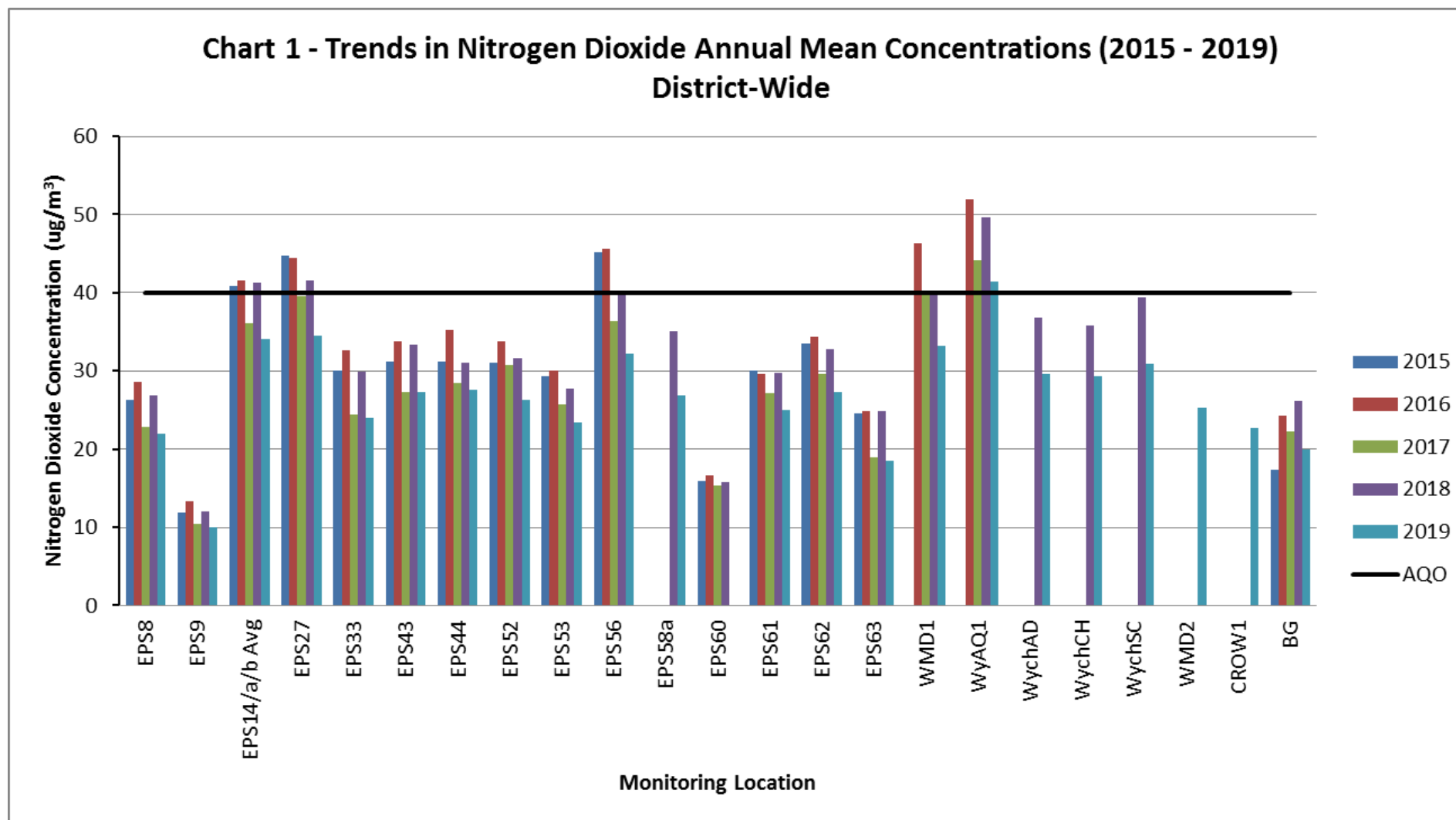
(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(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



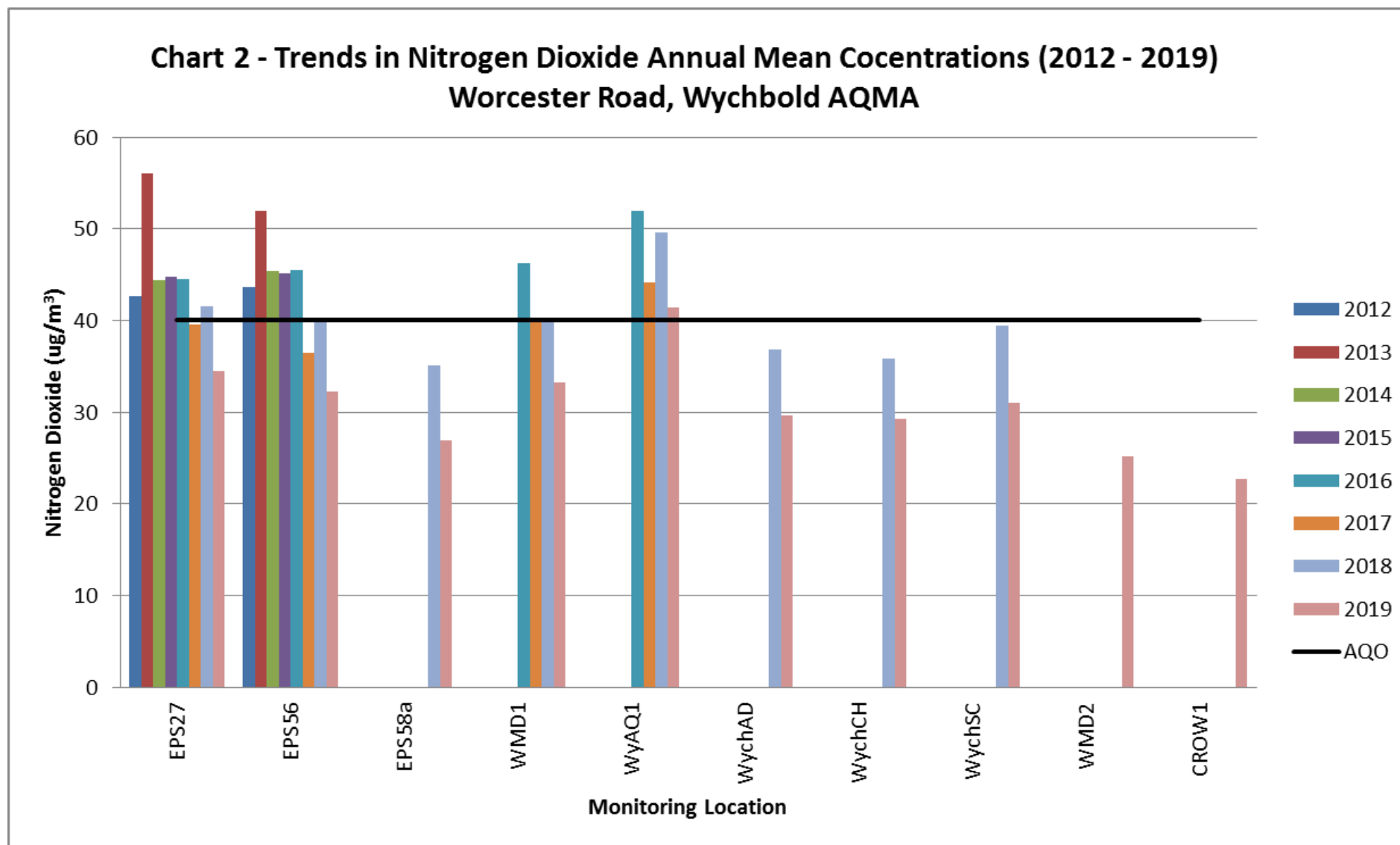
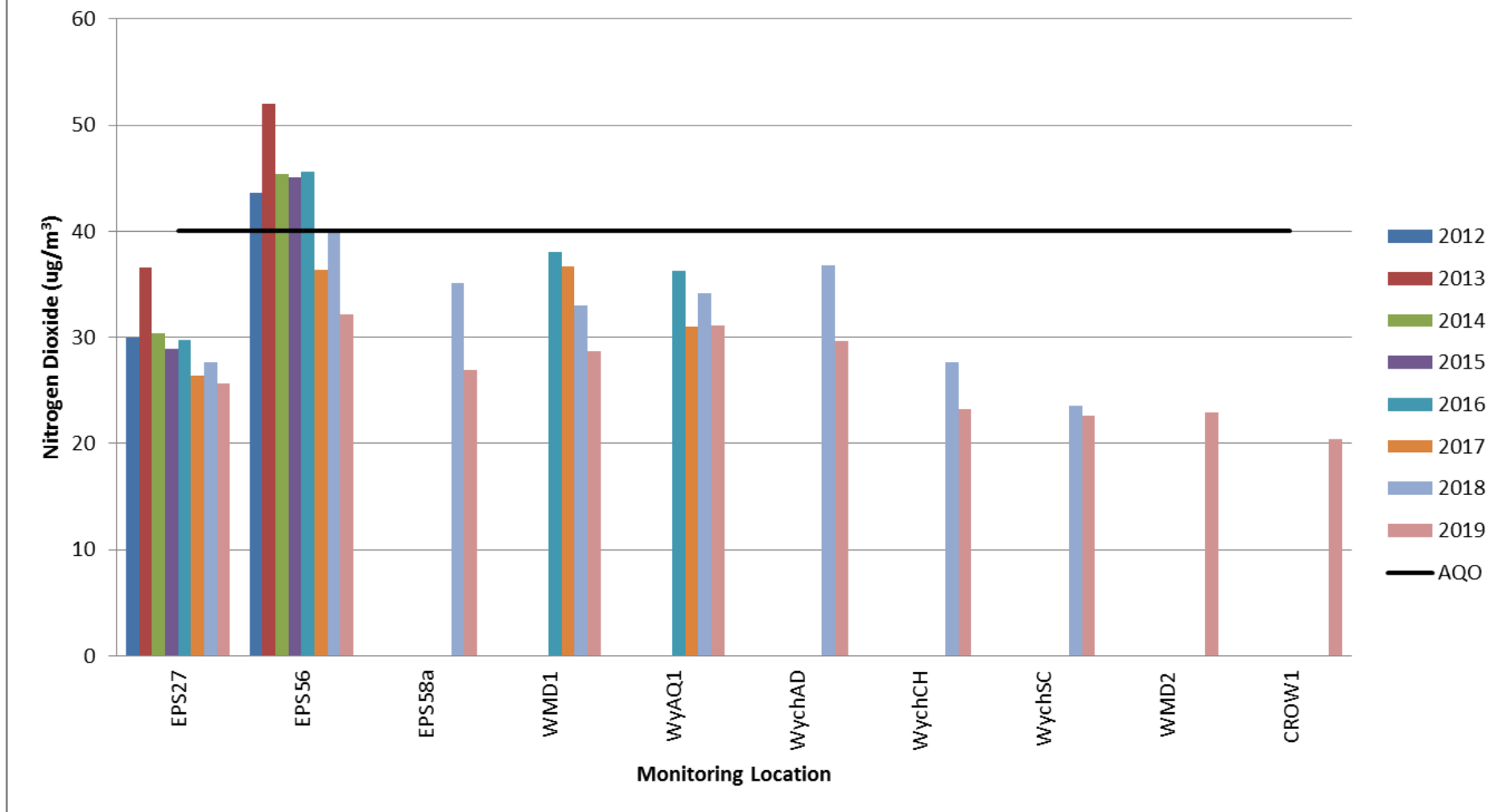


Chart 3 - Trends in Nitrogen Dioxide Annual Mean Concentrations (2012 - 2019)

Worcester Road, Wychbold AQMA

concentrations calculated back to relevant exposure



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)															Annual Mean		
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted (0.78) and Annualised ⁽¹⁾	Distance Corrected to Nearest Exposure ⁽²⁾			
EPS8	395048	245527	39.5	31.9		25.5	26.2	22.9	24.8	22.7	24.9	28.1	34.5	28.1	28.1	21.9				
EPS9	394571	245377	17.7	17.1		13.0	8.2	9.1	9.0	7.9	10.7	14.0	21.7		12.8	10.0				
EPS14	404128	243630	49.5	48.1	46.8	41.0	38.8	41.1	36.2		38.5	39.8	44.7	47.1	42.9	33.4				
EPS14a	404128	243630	50.1	54.2	48.0	41.9	37.6	44.5	37.8		39.0	42.7	43.3	45.9	44.1	34.4				
EPS14b	404128	243630	51.6	49.4	47.5	42.9	39.3	43.2	38.5		39.3	40.4	46.7	48.1	44.3	34.5				
EPS14/a/b/ Average	404128	243630	50.4	50.5	47.4	41.9	38.6	43.0	37.5		38.9	41.0	44.9	47.0	43.7	34.1				
EPS27	392031	265624	55.7	52.4	46.6	41.0	36.4	39.7	38.3	44.3	40.9	42.7	45.5	46.4	44.2	34.4				
EPS33	403753	244068	34.4	33.2	25.7	36.3	27.7	25.9	24.2	24.5	28.6	33.1	41.0	33.7	30.7	23.9				
EPS43	404222	243598	46.1	37.9	35.7	39.5	31.5	29.1	31.4	26.2	35.0	34.3	40.5	33.3	35.0	27.3				
EPS44	404183	243611	40.5	33.8	33.2	35.6	31.7	30.2	31.1		40.6	33.4	44.3	34.1	35.3	27.5				
EPS52	387598	252511	43.2	43.4	36.8	30.7	27.6	27.2	28.4	30.3	32.3	34.7	35.7	34.0	33.7	26.3				
EPS53	387595	252533	40.6	37.6	30.6	26.3	25.2	23.3	24.7	28.0	28.4	29.8	35.6	30.2	30.0	23.4				
EPS56	391983	265688	45.6	49.0	40.8	37.9	39.9	37.7	36.3	40.2	37.1	44.9	45.2	40.7	41.3	32.2				
EPS58a	392027	265770	38.1	40.1	31.2	33.6	33.2	31.2	29.6	32.0	32.8	37.3	40.3	34.2	34.5	26.9				
EPS60	403914	244046	23.7	23.0	15.0	14.7	12.2		10.4	13.4	16.3	20.2	28.8		17.8	13.9				
EPS61	403796	244006	36.7	38.6	34.3	26.6	27.5	28.9	28.2	33.6	27.8	31.0	34.2	36.8	32.0	25.0				

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EPS62	403729	243971	44.2	41.5	37.3	28.4	25.7	30.4	31.4			33.2	40.3	36.9	34.9	27.2	
EPS63	390708	262863	26.9	31.6	17.8			19.3	17.3	17.0	22.2	25.8	33.4	26.0	23.7	18.5	
WMD1	392050	265790	45.5	57.3		40.7	37.9	37.3	34.5	40.8	38.6	44.9		48.2	42.6	33.2	
WyAQ1	392019	265736	59.7	57.3	50.2		50.7	45.8	46.9	50.6			64.1	53.3	53.2	41.5	31.1
WychAD	392384	266195	46.4	41.7	36.3	41.9	34.0		30.8	31.5	38.7	34.9		44.2	38.0	29.7	
WychCH	392160	265937	50.0	46.4	38.8	37.8	32.6	31.1	28.5	32.1	30.8	39.9	44.9	38.1	37.6	29.3	
WychSC	392022	265702	51.0	47.2	46.1	46.3	34.1	30.9	26.0		32.3	33.4	46.0	43.0	39.7	30.9	
WMD2	391871	265859	36.7	39.3	36.9	20.9	31.6	26.4	31.8	37.9	31.3	32.2	28.5	34.5	32.3	25.2	
CROW1	392257	266043		37.1	27.8	31.5	23.1	24.0	22.0	25.6	27.2	30.5	37.3	33.5	29.0	22.7	
BG	386279	252150	34.6	30.9			19.1	18.8	17.7	17.6	19.9	28.0	36.9	38.1	26.2	20.4	

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.

NB – as per DEFRA Appraisal Team feedback distance correction has only been reported where monitored annual mean concentrations exceed 36µg/m³

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

Diffusion Tube Bias Adjustment Factor

The following UKAS accredited company provided Wychavon District Council with nitrogen dioxide diffusion tubes and analysis in 2019:

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. 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.

The bias-adjustment factor applied to 2019 nitrogen dioxide diffusion tube data is 0.78. This bias-adjustment factor is the national bias-adjustment factor for Somerset Scientific Services as published by DEFRA (Spreadsheet Version No. 03/20). No local bias-adjustment factor is available for 2019 as no local automatic monitoring has been undertaken.

Annualisation

Annualisation calculations were not required for any dataset in 2019. Data capture at all diffusion tube monitoring locations was 75% or higher.

Distance Correction Calculations

As advised by DEFRA’s appraisal of the 2019 Wychavon ASR distance correction calculations have only been carried out for diffusion tubes where the NO2 bias-adjusted annual mean for 2019 is 36µg/m3 or higher. This was the case at a single location, WychAQ1 in the Worcester Road, Wychbold AQMA.

Distance correction calculations for this location were carried out using the Bureau Veritas NO2 Fall-Off with Distance Calculator (version 4.2). Background NO2 concentrations were obtained using the Estimated Background Air Pollution Maps (base year 2017) published by DEFRA. A copy of the Fall-Off with Distance Calculator input and output screen for location WychAQ1 is provided below:

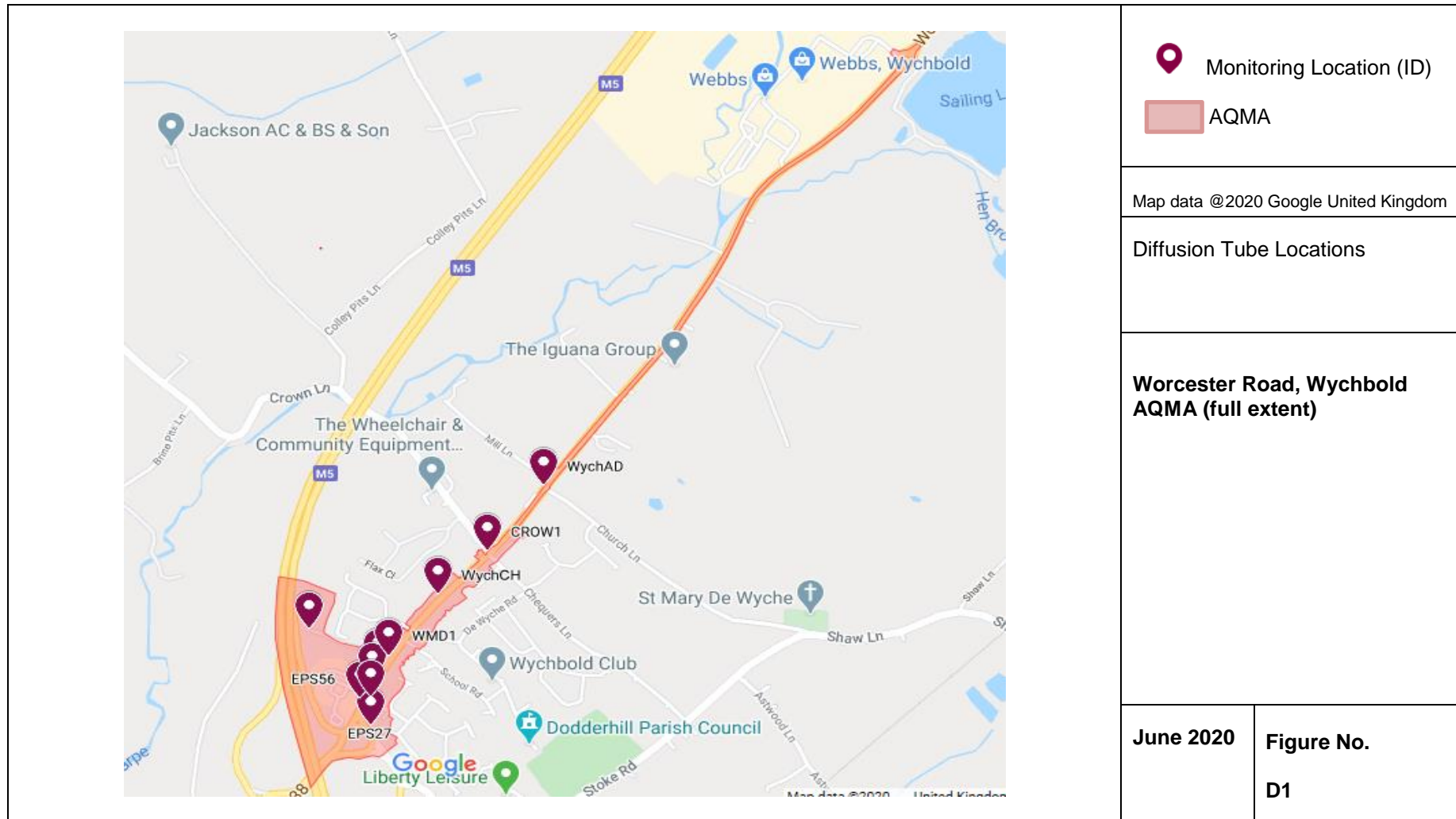
WychAQ1

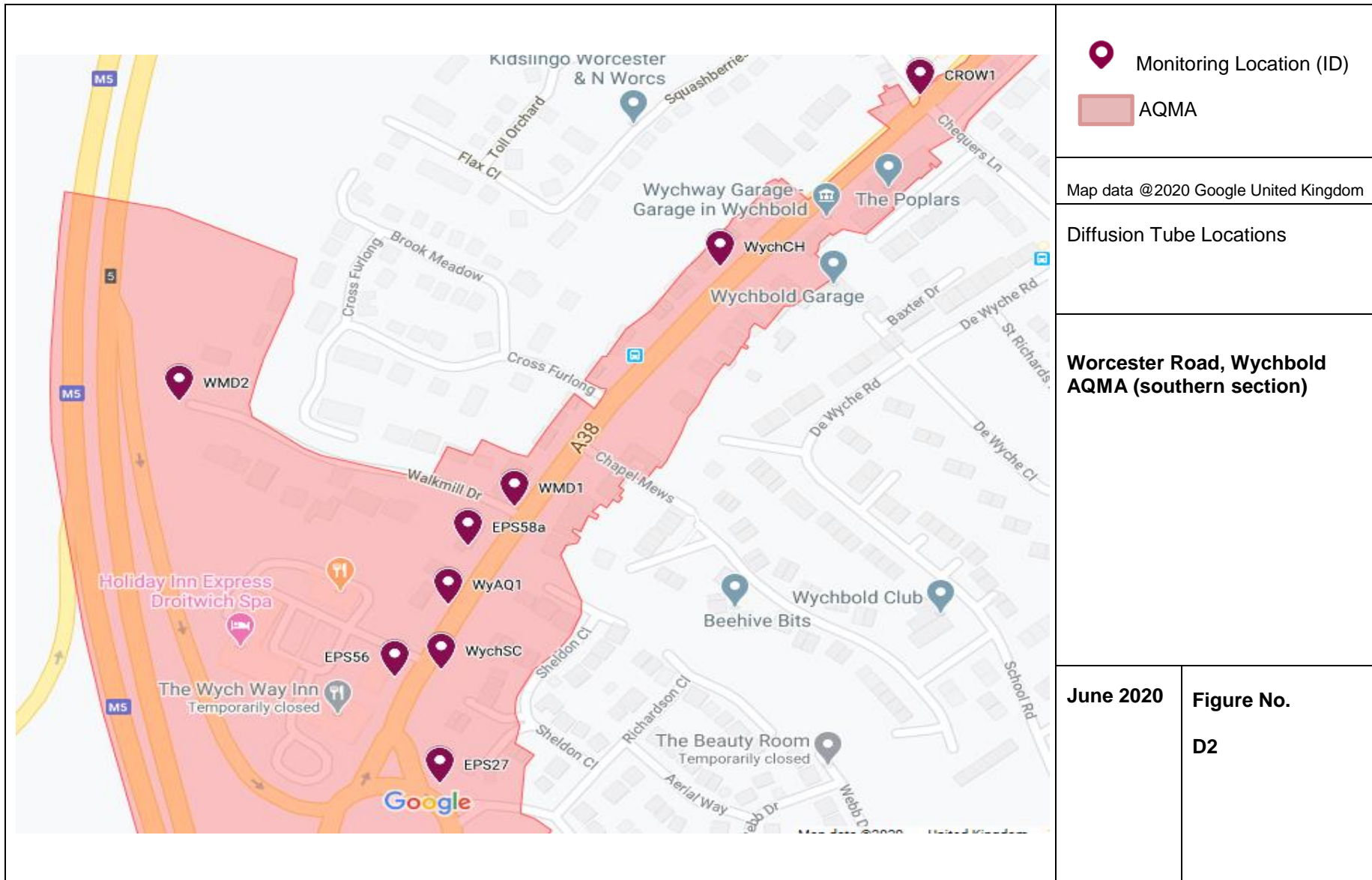
Enter data into the pink cells

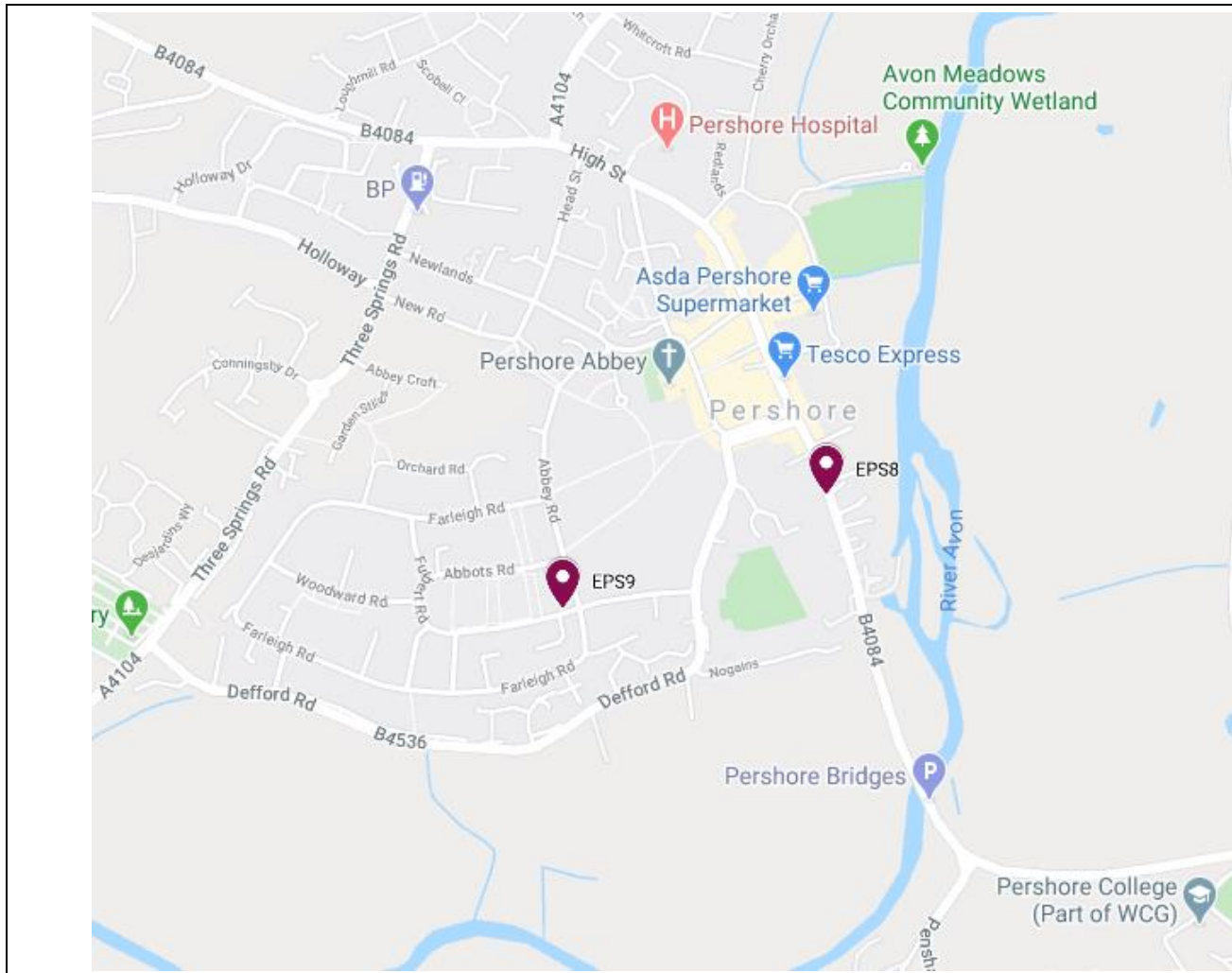
Step 1	How far from the KERB was your measurement made (in metres)?	1.93	metres
Step 2	How far from the KERB is your receptor (in metres)?	11.84	metres
Step 3	What is the local annual mean background NO ₂ concentration (in µg/m ³)?	16.88	µg/m ³
Step 4	What is your measured annual mean NO ₂ concentration (in µg/m ³)?	41.48	µg/m ³
Result	The predicted annual mean NO ₂ concentration (in µg/m ³) at your receptor	31.1	µg/m ³


NB: Worcester Road, Wychbold appears to fall on the boundary of the 1km x 1km squares used in Defra’s Estimated Background Air Pollution Maps. It is noted that this results in different background concentrations for tubes which are located very close to one another. In light of this, and based on local knowledge, WRS has used the highest (most conservative) background concentration for the area when carrying out distance correction calculations.

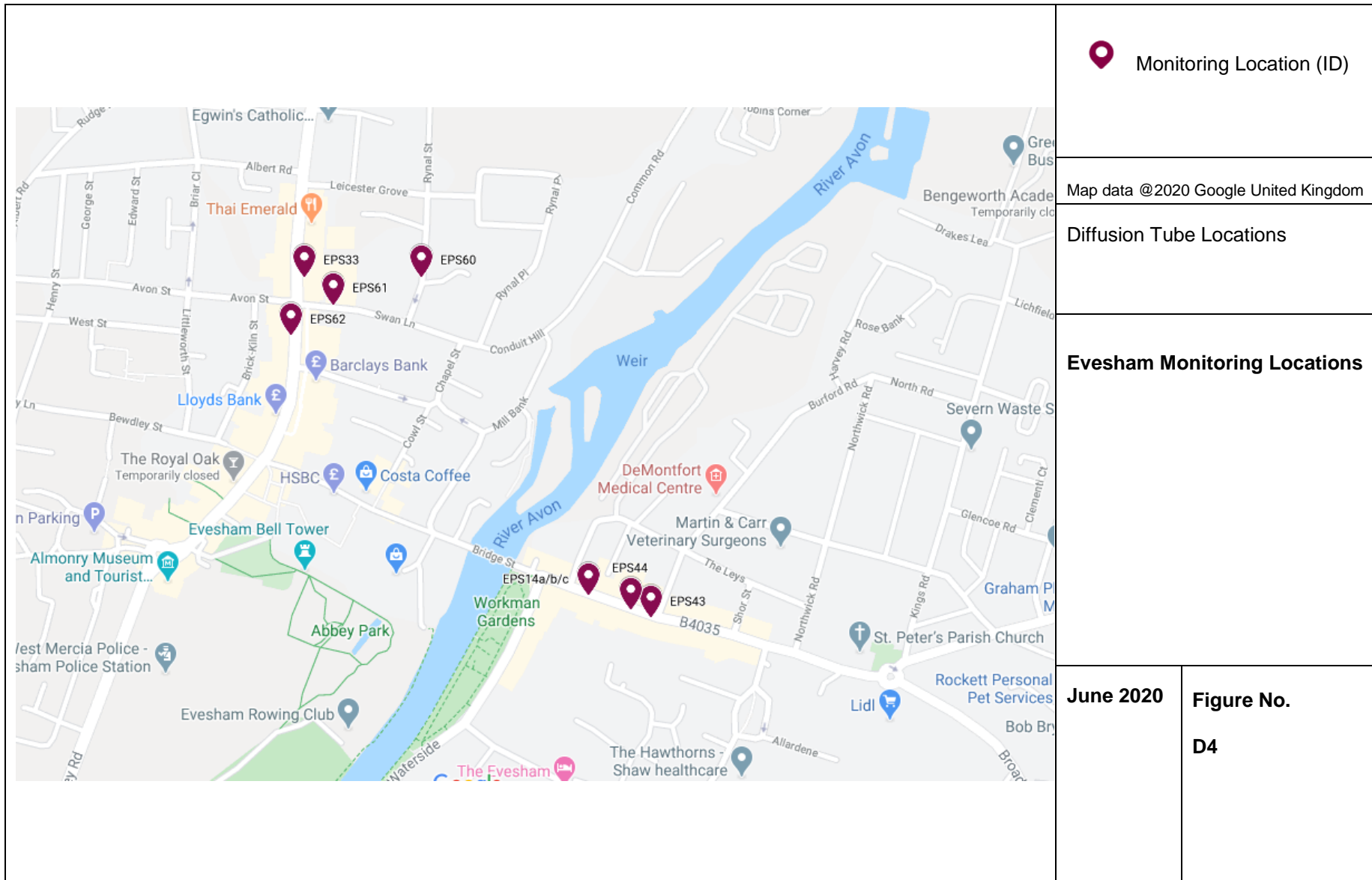
Appendix D: Map(s) of Monitoring Locations and AQMAs



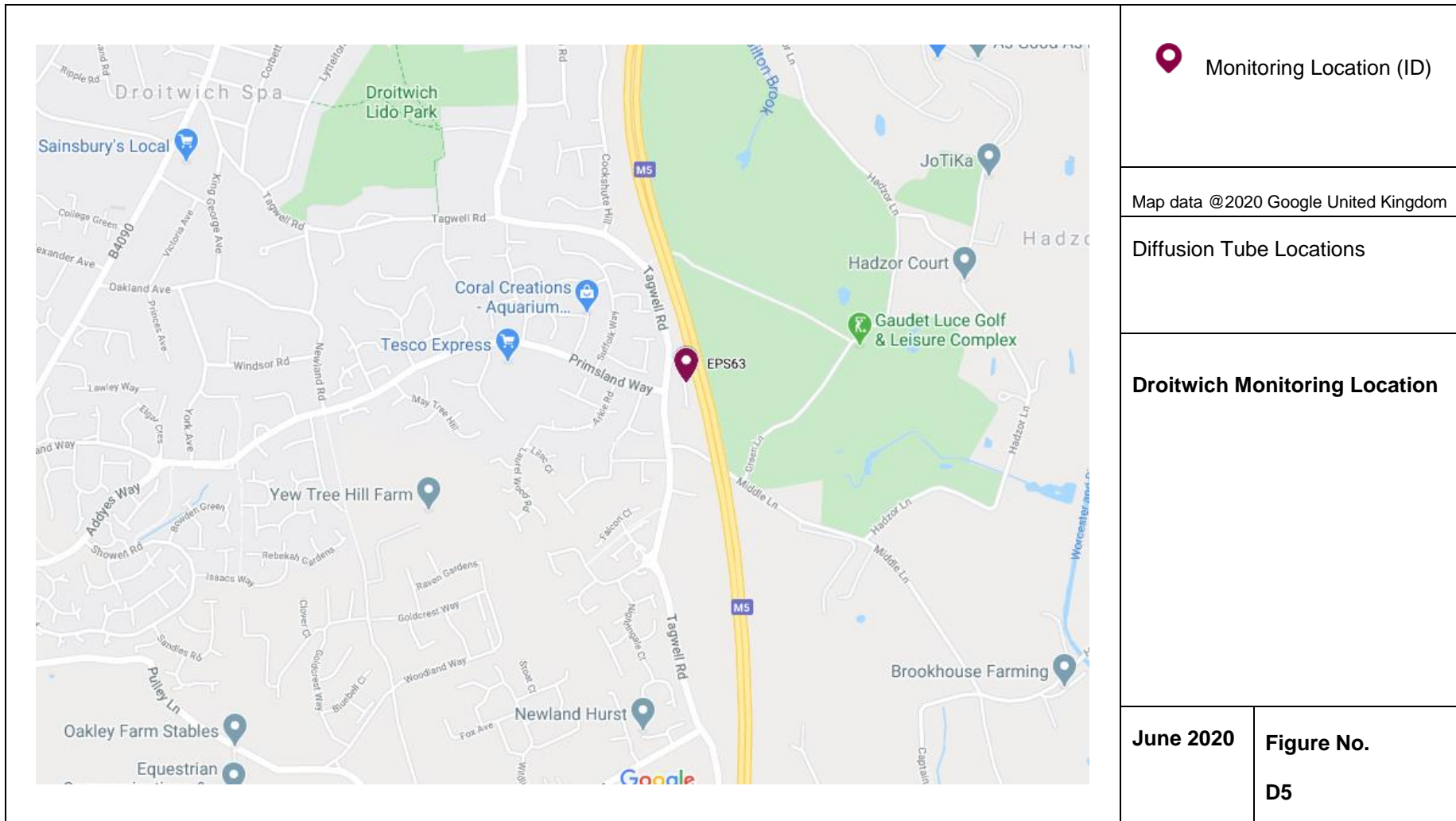


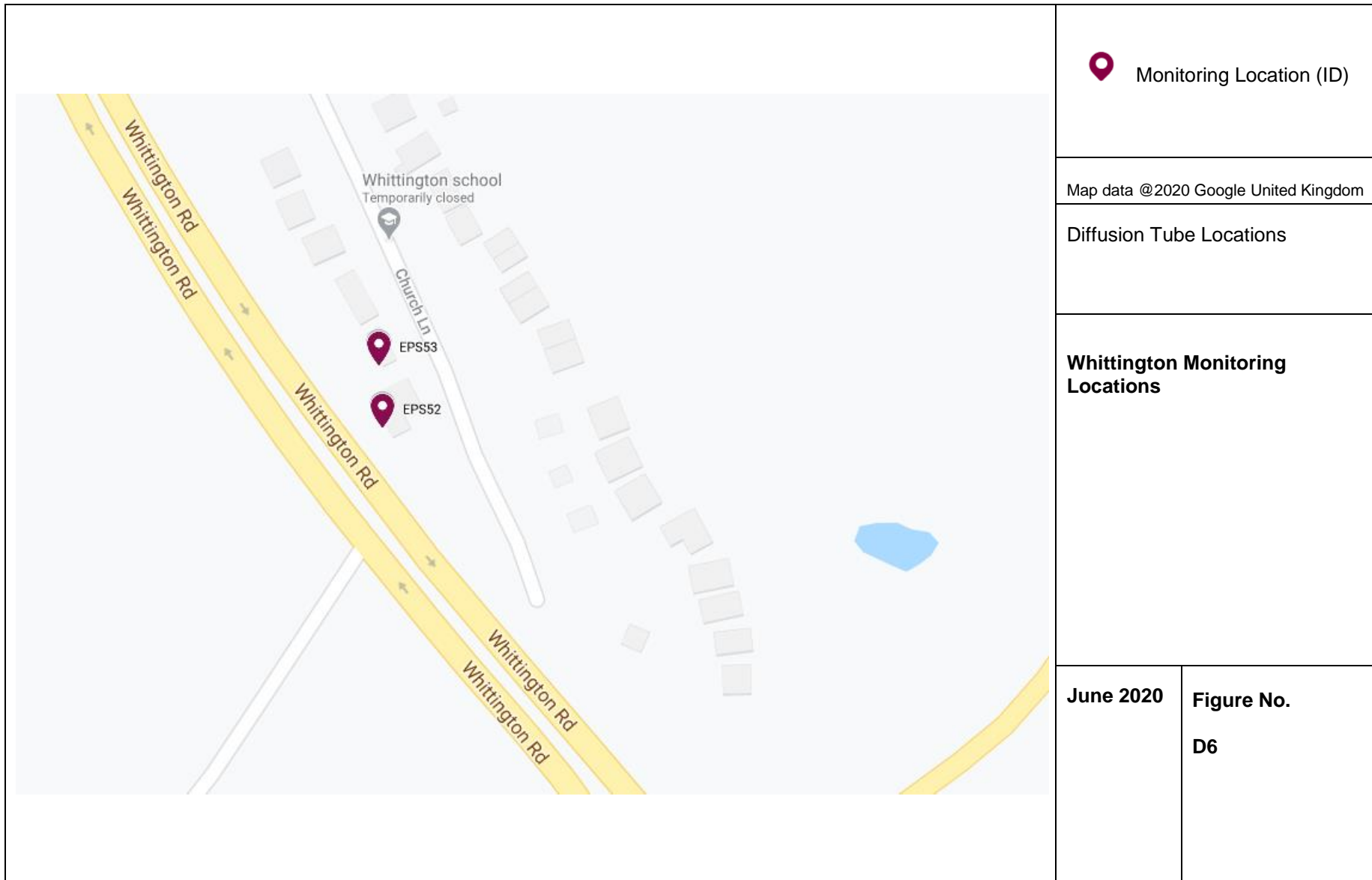


 Monitoring Location (ID)	
Map data ©2020 Google United Kingdom	
Diffusion Tube Locations	
<p>Pershore Monitoring Locations</p>	
June 2020	Figure No. D3

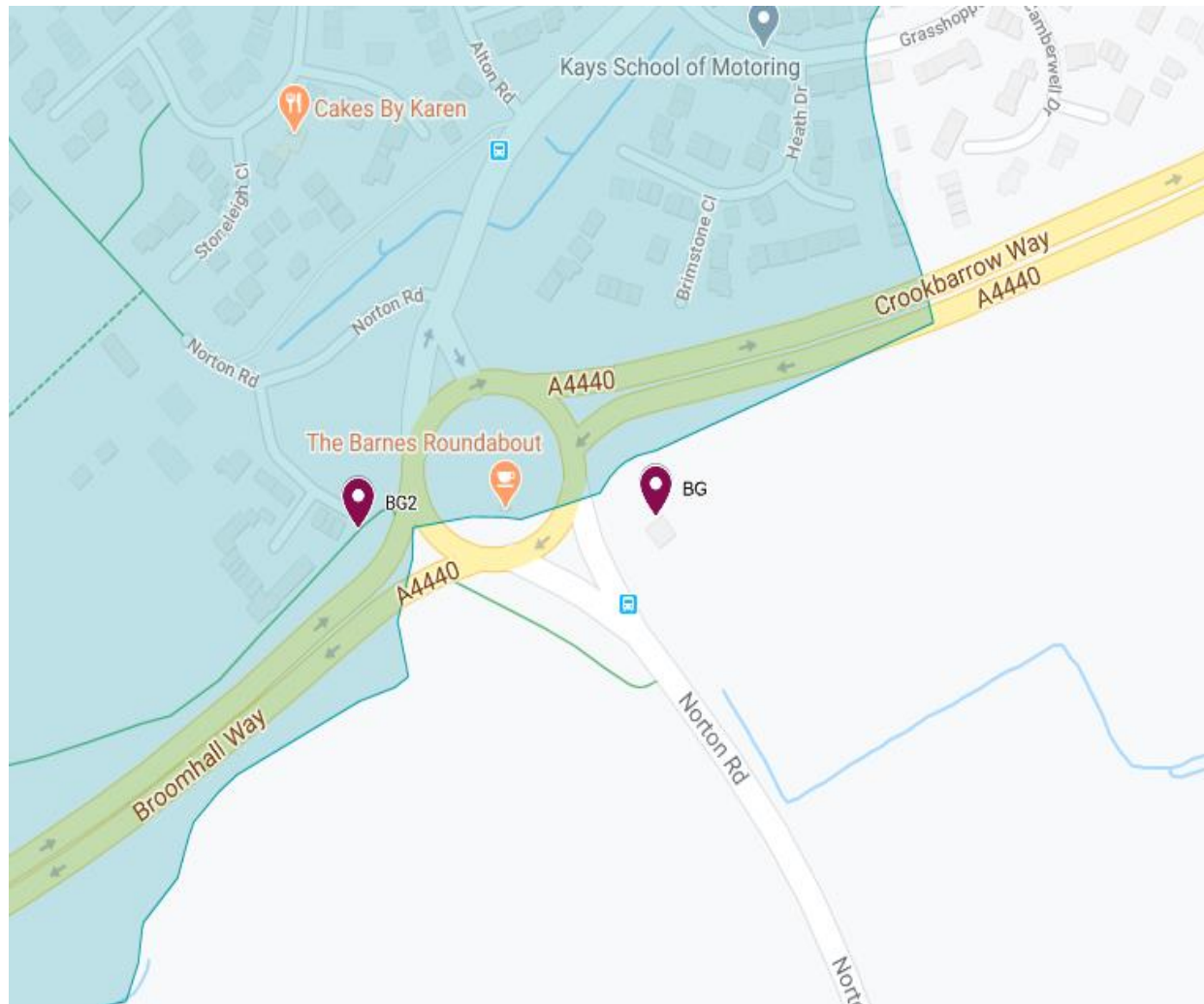



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




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 Monitoring Location (ID)

 Worcester City Council
City-wide AQMA

Map data ©2020 Google United Kingdom

Diffusion Tube Locations

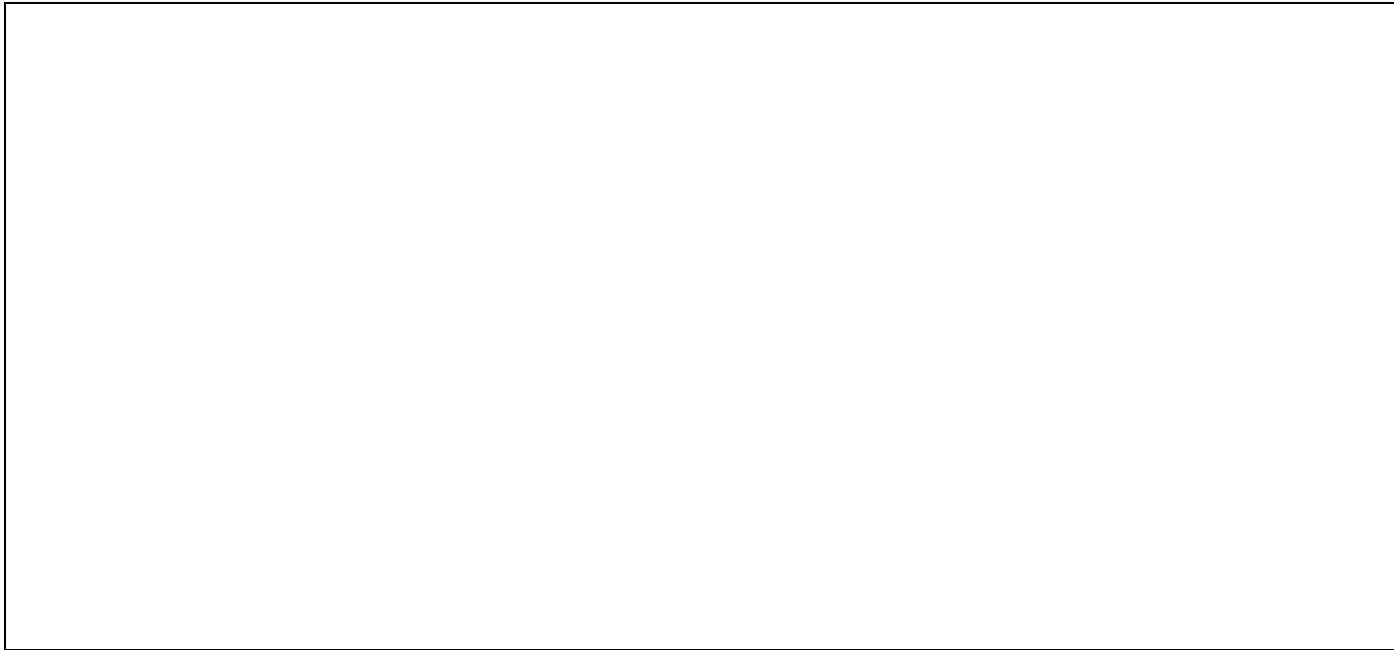
Norton Road Monitoring Location

NB: Monitoring Location BG2 falls within the boundary of Worcester City Council

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Figure No.

D7



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective ⁸	
	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

⁸ 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
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
DoPH	Department of Public Health
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
LEV	Low Emission Vehicle
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxides
PHE	Public Health England
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

ULEV	Ultra Low Emission Vehicle
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References

DEFRA (2016) 'Local Air Quality Management Policy Guidance LAQM PG.(16)'

DEFRA (2016) 'Local Air Quality Management Technical Guidance LAQM TG.(16)'

Worcestershire County Council Evesham Transport Strategy

https://www.worcestershire.gov.uk/info/20629/evesham_transport_strategy/1820/evesham_transport_strategy

Worcestershire Regulatory Services (2017) 'Worcester Road, Wychbold Dispersion Modelling Assessment 2016

Worcestershire Regulatory Services (2018) 'Worcester Road, Wychbold Source Apportionment Exercise'

Worcestershire Regulatory Services (2019) '2018 Annual Air Quality Status Report' WDC/ASR/2018

Wychavon District Council (2020) Intelligently Green Plan (Draft)