2022 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995

Local Air Quality Management

Date: June 2022

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Executive Summary: Air Quality in Our Area

Air Quality in Redditch Borough 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, 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 28,000 to 36,000 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.

There are currently no Air Quality Management Areas (AQMAs) in the Redditch Borough Council area. Concentrations continue to fall below the annual mean objective for nitrogen dioxide at measured locations.

Monitoring across the Redditch Borough area focuses on nitrogen dioxide (NO_2) via a network of passive diffusion tubes, the tubes are located in the main urban centre of Redditch. No changes were made to monitoring locations for the 2020 monitoring year.

Monitoring results within the Redditch Borough area demonstrate that there were no exceedances of the NO_2 air quality objective of 40µg/m^3 in 2021. Results show there were increases in NO_2 concentrations at all but one monitoring locations between 2020 and 2021. This is likely to have been caused by the increase in traffic following the easing of

[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, July 2021

[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

'lockdowns' in 2020 caused by the Covid-19 pandemic. However, NO_2 concentrations at all monitoring stations decreased in 2021 relative to 2019.

There is no discernible upward or downward trend in concentrations over the 5-year period 2017- 2021.

No annual means greater than 60ug/m^3 have been recorded indicating that it is very unlikely that there have been any exceedances of the 1-hour mean objective for NO_2 at any monitoring sites.

Actions to Improve Air Quality

Whilst air quality has improved significantly in recent decades, and will continue to improve due to national policy decisions, there are some areas where local action is needed to improve air quality further.

The 2019 Clean Air Strategy[5] sets out the case for action, with goals to reduce exposure to harmful pollutants. The Road to Zero[6] sets out 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.

In 2013, WRS produced a countywide Air Quality Action Plan (AQAP) for Worcestershire which was adopted by Redditch Borough Council on 15th October 2013. WRS have produced two updates to the AQAP, the latest in September 2016. For details of all measures completed, in progress or planned, please refer to the 'Air Quality Action Plan Progress Report for Worcestershire April 2015-2016'. A copy of this, the previous update, and the AQAP are available to view or download at:

http://www.worcsregservices.gov.uk/pollution/air-quality/air-quality-action-plan.aspx

In 2014, WRS set up the Worcestershire Air Quality Steering Group and sub-groups to facilitate progressing implementation of prioritised actions identified in the AQAP. To date the Redditch Borough area does not form a specific part of the AQAP as there is no

[5] Defra. Clean Air Strategy, 2019

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

current AQMA in the area. However, the general actions to improve air quality detailed in the AQAP apply across Worcestershire as a whole, including the Redditch Borough area.

Redditch Borough Council has published a strategy for ultra-low emission vehicles to help inform the development of appropriate infrastructure in the area to enable more people to use ultra-low emission vehicles (ULEVs). The document is available at:

https://www.redditchbc.gov.uk/living/getting-around/electric-vehicles.aspx#strategy

In 2020 Redditch Borough Council in collaboration with micro-mobility operator Bird started running an e-scooter trial across Redditch Town Centre as part of the Department for Transport's e-scooter trials. Information on the scheme can be found at:

e-scooters - redditchbc.gov.uk

A new Air Quality Partnership led by the officers of the Director of Public Health (DoPH), and supported by WRS Land and Air Quality Team, was set up in 2019 to discuss potential actions to improve air quality across the County and determine an action plan for implementation. The group comprises officers from the County and District authorities from public health, air quality, strategic planning, sustainability, highways and transport disciplines, and also representatives from the NHS and Highways England. The group is largely driven by DoPH so, due to Covid-19 taking priority, the business of the partnership has been postponed indefinitely.

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

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.

Conclusions and Priorities

There are currently no Air Quality Management Areas (AQMAs) in the Redditch Borough area. Over the past five years monitoring results have consistently remained below the air quality objective.

Monitoring results within the Redditch Borough Council area demonstrate that there were no exceedances of the air quality objective of 40µg/m^3 in 2021. Results demonstrate an increase in NO_2 concentrations at all but one monitoring locations in 2021. This is likely to have been caused by the increase in traffic following the easing of 'lockdowns' in 2020 caused by the Covid-19 pandemic. However, NO_2 concentrations at all monitoring stations decreased in 2021 relative to 2019.

There were two significant residential developments granted planning permission in 2021; 832 dwellings on land at Brockhill East, Weights Lane and 92 dwellings adjacent to the Alexandra Hospital**,** work on them is expected to start on them in 2022. There were no significant commercial/industrial developments or highway infrastructure works within the Borough in 2021. WRS on behalf of Redditch Borough Council will continue to monitor locations in 2022 to assess any improvements or degradation in NO_2 concentrations. The data gathered will assist in further assessment of areas of poor air quality within the Borough. Further update on monitoring and action progress will be provided in the 2023 Annual Status Report.

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, leave your 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;
- **Turn off your engine when stationary or parked,** don't 'idle', particularly outside sensitive receptors such as schools, hospitals, care homes and residential properties;
- 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 Video conference via Skype, Facetime, Zoom or other services 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 Electric Vehicle (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.theaa.com/driving-advice/fuels-environment/drive-smart

  http://www.dft.gov.uk/vca/fcb/smarter-driving-tips.asp

- 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 smoke-control-areas and protecting-me-and-others-from-air-pollution 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 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 can currently be found at http://www.worcsregservices.gov.uk/pollution/air-quality/public-advice.aspx .

Local Responsibilities and Commitment

This ASR was prepared by of Ricardo PLC on behalf of Worcestershire Regulatory Services for Redditch Borough Council with the support and agreement of the following officers and departments:

Neil Kirby / Stephen Williams – Land and Air Quality Team, Technical Services, Worcestershire Regulatory Services

Emily Barker - Worcestershire County Council Highways Department

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

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

Redditch Borough Council

This ASR has been approved by Worcestershire Regulatory Services

This ASR has not been signed off by a Director of Public Health.

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

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1 Local Air Quality Management

This report provides an overview of air quality in Redditch Borough Council during 2021. 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 Redditch Borough Council 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

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 should prepare an Air Quality Action Plan (AQAP) within 12 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

Redditch Borough Council currently does not have any declared AQMAs. Concentrations continue to be below the annual mean objective for nitrogen dioxide at all locations.
For reference, maps of Redditch Borough Council's monitoring locations are available in Appendix D.

2.2 Progress and Impact of Measures to address Air Quality in Redditch Borough Council

Defra's appraisal of last year's ASR concluded the report is well structured, detailed, and provides the information specified in the Guidance. The following comments are designed to help inform future reports:

1. The monitoring strategy remains limited, with 5 diffusion tube sites in a limited set of locations. It's recommended that monitoring is commissioned at a wider range of locations across the Borough as there is a risk that congested or busy roads may be resulting in high concentrations in areas that are not being monitored.
2. The discussion of the impact of Covid-19 is detailed and thorough, including quantitative discussion of traffic flows.
3. The Council described measures to improve air quality, including recent measures, but little was mentioned about priorities for the coming year. It's preferred that priorities are clearly signposted in the text.
4. The change in diffusion tube suppliers has been appropriately recorded, and the data dealt with appropriately. QA/QC was detailed, with evidence provided for all procedures applied.
5. The charts and maps presented are clear and help in the understanding of the data presented.

No specific actions have been progressed to improve air quality in the Redditch Borough area as there is currently no declared AQMA. However, the general actions to improve air quality detailed in the AQAP apply across Worcestershire as a whole, including the Redditch Borough Council area. Eight measures are included within Table 2.1, with the type of measure and the progress Redditch Borough Council have made on the measures are also presented.

Given Defra's recommendation we have highlighted the following priorities for the coming year:

- Increase monitoring in congested areas
- Continue to promote electric vehicle charging points for new developments through the planning regime.

More detail on these measures can be found in the Air Quality Action Plan for Worcestershire at:

http://www.worcsregservices.gov.uk/pollution/air-quality/air-quality-action-plan.aspx

Redditch Borough Council has published a strategy for ultra-low emission vehicles to help inform the development of appropriate infrastructure in the area to enable more people to use ULEVs. The document is available at:

https://www.redditchbc.gov.uk/living/getting-around/electric-vehicles.aspx#strategy

In 2020 Redditch Borough Council in collaboration with micro-mobility company Bird started running an e-scooter trial across Redditch Town as part of the Department for Transport's e-scooter trials. More information can be found at:

e-scooters - redditchbc.gov.uk

Table 2.1 – Progress on Measures to Improve Air Quality

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
1	Promote flexible working arrangements	Promoting Travel Alternatives	Encourage / Facilitate homeworking	2017	-	WCC & RBC		NO	Not Funded		Implementation	<1%	Increase in uptake of personal travel planning services. Change in behaviour towards more sustainable modes of transport	Implementation ongoing	
2	Installing electric vehicle charging points	Promoting Low Emission Transport	Procuring alternative refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	2014	-	WRS & RBC	-	NO	Not Funded	-	Implementation	1%	Increase in availability of EV charging points and corresponding increase in use of electric vehicles	Recommendations for installation of EV Charging Points routinely recommended by WRS on relevant planning consents.	WRS technical guidance note for planning (v.5.1), produced on behalf of Worcestershire local authorities
3	Travel Planning	Promoting Travel Alternatives	Personalised Travel Planning	2017	2018	WCC		NO	Not Funded		Completed	<1%	Increased uptake of alternative modes of transport	WCC have developed a “one-stop-shop” online travel portal	
4	Car Sharing	Alternatives to private vehicle use	Car & lift sharing schemes	2015	2016	WCC		NO	Not Funded		Completed	<1%	Increase in number of people car sharing	LiftShare booking is available on the WCC Website	
5	Produce Air Quality Supplementary Planning Document	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	2017	2021	WRS & District Councils	N/A	NO	Not Funded	-	Completed	<1%	Formally adopted and utilised SPD at all six LPAs across County	Formally adopted by North Worcestershire Strategic Planning. Currently being formulated by South Worcestershire Strategic Planning	
6	Encourage developers to provide sustainable transport facilities and links serving new developments	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	2017	2021	WRS & District Councils	N/A	NO	Not Funded	-	Completed	<1%	Formally adopted and utilised SPD at all six LPAs across County	Formally adopted by North Worcestershire Strategic Planning. Currently being formulated by South Worcestershire Strategic Planning	
7	Air Quality Networks	Policy Guidance and Development Control	Regional Groups Coordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	2014	-	RBC & WRS	N/A	NO	Not Funded	-	Implementation	1%	Improved cross boundary working between local authorities in Worcestershire	WRS are members of the Midlands Joint Advisory Council (MJAC). Provision of AQ services to Tewkesbury Borough Council & Gloucester City Council	On-going
8	Forge closer links with local health agencies	Other	Other	2019	-	WRS, District Councils & WCC	N/A	NO	Not Funded	-	Completed	,1%	Participation of relevant health agencies in the Worcestershire Air Quality Steering Group	Director of Public Health at Worcestershire County Council set up an air quality group in 2019 to discuss air quality issues in the County	On-going

2.3 $PM_{2.5}$ – Local Authority Approach to Reducing Emissions and/or Concentrations

As detailed in Policy Guidance LAQM.PG16 (Chapter 7), local authorities are expected to work towards reducing emissions and/or concentrations of $PM_{2.5}$ (particulate matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that $PM_{2.5}$ has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

There are currently no automatic $PM_{2.5}$ monitoring stations in Worcestershire. The nearest AURN $PM_{2.5}$ monitoring station is the Birmingham Acocks Green site approximately 22 kilometres to the north-east of the Redditch Borough Council area. WRS has reviewed the DEFRA national background maps to determine projected $PM_{2.5}$ concentrations within the Redditch Borough area for the 2021 calendar year. The average total $PM_{2.5}$ at 54 locations (centre points of 1km x 1km grids) across Redditch Borough Council is 7.83µg/m^3, with a minimum concentration of 7.21µg/m^3 and a maximum concentration of 8.72µg/m^3. This indicates that $PM_{2.5}$ concentrations within Redditch Borough are well below the annual average EU limit value for $PM_{2.5}$ of 25µg/m^3 and is below the proposed annual average limit value for $PM_{2.5}$target of 10µg/m^3 to be met across England by 2040.

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 fraction of mortality attributable to particulate emissions in Worcestershire in 2020 (the most recent year available) was 5.0%. This falls below the national figure for England (5.6% in 2020) and below the figure for the West Midlands region (5.4% in 2020). Recent trend data is not available for Worcestershire 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 - PHE

A new Air Quality Partnership led by the DoPH and supported by WRS Land and Air Quality Team was set up in 2019 to discuss potential actions to improve air quality

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

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. The group is largely driven by DoPH so, due to Covid-19 taking priority in 2020, the business of the partnership has been postponed indefinitely.

In light of the above no additional actions are currently planned by Redditch Borough 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 Borough will likely result in a linked improvement in $PM_{2.5}$ levels.

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

This section sets out the monitoring undertaken within 2021 by Redditch Borough Council and how it compares with the relevant air quality objectives. In addition, monitoring results are presented for a five-year period between 2017 and 2021 to allow monitoring trends to be identified and discussed.

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

No automatic (continuous) monitoring was undertaken within the Redditch Borough Council area during 2021

3.1.2 Non-Automatic Monitoring Sites

Redditch Borough Council undertook non- automatic (i.e. passive) monitoring of NO_2 at five sites during 2021. 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 Appendix C.

3.2 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.

3.2.1 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 2021 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.

Redditch Borough Council currently does not have any declared AQMAs. Figure A.1 in Appendix A demonstrates that there have been no exceedances of the annual average Air Quality Objective (AQO) for NO_2 concentrations recorded at all monitoring locations for the five-year period 2017 to 2021. There was an average increase in NO_2 concentrations of 18.4% (3.6µg/m^3) across the Borough between 2020 and 2021. The increase between 2020 and 2021 monitoring data should not be considered as indicative of local trends. This increase is likely to have been caused by the increase in traffic following the easing of 'lockdowns' in 2020 due to the Covid-19 pandemic.

It should be noted that diffusion tubes OR4, OR5 and OR6 is a triplicate location (Misty Florist, Other Road), when averaged and bias adjusted the NO_2 concentration for this location is 27.5µg/m^3. Overall, there is no discernible trend in NO_2 concentrations.

3.2.2 Particulate Matter (PM_{10})

PM_{10} is not monitored within Redditch Borough Council.

3.2.3 Particulate Matter ($PM_{2.5}$)

$PM_{2.5}$ is not monitored within Redditch Borough Council.

3.2.4 Sulphur Dioxide (SO_2)

SO_2 is not monitored within Redditch Borough Council.

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)
OR1	Other Road Street Lamp 2237	Roadside	404599	267542	NO_2	No	3.0	1.5	No	2.4
OR2 (26N)	14 Other Road	Roadside	404620	267495	NO_2	No	0.0	3.0	No	2.1
OR4 (28N), OR5 (29N), OR6	Other Road Misty Florist	Roadside	404629	267467	NO_2	No	0.0	4.0	No	2.0
SS	7 Summer Street	Suburban	404376	267242	NO_2	No	0.0	2.6	No	2.0
STOR	Lamppost opposite 18 Washford Lane	Urban Background	406603	265783	NO_2	No	14.6	0.8	No	2.2

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 2021 (%) (2)	2017	2018	2019	2020	2021
OR1	404599	267542	Roadside	92.3	92.3	30.6	35.1	29.4	26.1	26.3
OR2 (26N)	404620	267495	Roadside	92.3	92.3	28.9	38.2	31.8	24.4	28.8
OR4 (28N), OR5 (29N), OR6	404629	267467	Roadside	100.0	100.0	28.6	36.9	28.5	23.0	27.5
SS	404376	267242	Suburban	84.6	84.6	17.3	19.2	15.8	14.2	13.2
STOR	406603	265783	Urban Background	82.7	82.7	-	12.9	10.6	8.9	9.3

☒ **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**.

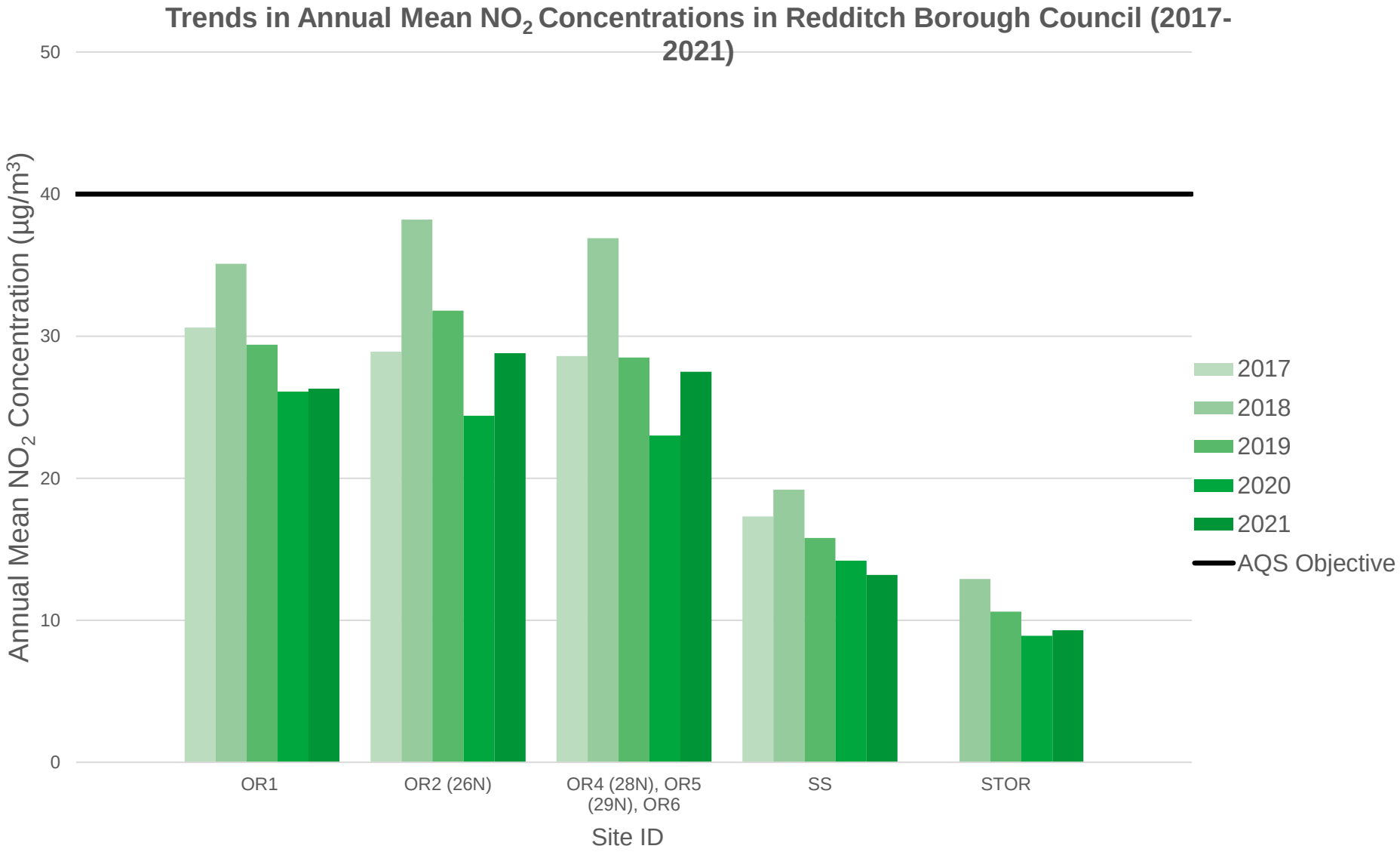
Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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 2021

Table B.1 – NO_2 2021 Diffusion Tube Results (µg/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 (0.84)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
OR1	404599	267542	33.14	34.73	29.17	31.4	34.1	29.05	26.95	27.03	37.33	32.92	-	28.98	31.3	26.3	-	
OR2 (26N)	404620	267495	31.2	38.09	28.8	42.45	34.81	32.73	33.05	31.9	40.5	31.86	-	31.86	34.3	28.8	-	
OR4 (28N)	404629	267467	33.69	34.39	30.29	42.53	32.82	32.33	32.96	30.57	31.16	28.62	28.7	28.65	32.2	27.1	-	Triplicate Site with OR4 (28N), OR5 (29N) and OR6 - Annual data provided for OR6 only
OR5 (29N)	404629	267467	31.2	34.1	31.53	41.91	31.74	34.03	30.81	30.57	38.41	-	27.87	28.06	32.7	27.5	-	Triplicate Site with OR4 (28N), OR5 (29N) and OR6 - Annual data provided for OR6 only
OR6	404629	267467	31.07	32.76	30.63	39.98	32.56	-	44.9	30.61	34.08	31.58	30.31	27.95	33.3	28.0	-	Triplicate Site with OR4 (28N), OR5 (29N) and OR6 - Annual data provided for OR6 only
SS	404376	267242	-	-	14.88	18.21	14.47	12.41	15.14	12.37	17.01	16.4	18.86	16.96	15.7	13.2	-	
STOR	406603	265783	16.64	13.36	-	-	8.26	9	9.61	8.03	10.29	10.6	13.96	11.3	11.1	9.3	-	

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

☒ **National bias adjustment factor used.**

☒ **Redditch Borough Council confirm that all 2021 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 Redditch Borough Council During 2021

Redditch Borough Council has not identified any new sources relating to air quality within the reporting year of 2021.

Additional Air Quality Works Undertaken by Redditch Borough Council During 2021

Redditch Borough Council has not completed any additional works within the reporting year of 2021.

QA/QC of Diffusion Tube Monitoring

In 2021 Redditch Borough Council changed used the same tube supplier for nitrogen dioxide diffusion tubes and analysis:

Gradko International Ltd
St. Martins House
77 Wales Street
Winchester SO23
0RH

01962 860 331

Diffusion@gradko.com

The 20% Triethanolamine (TEA) / De-ionised Water preparation method was used. Monitoring has been completed in adherence with the 2021 Diffusion Tube Monitoring Calendar, i.e. on or within ± 2 days of the specified date.

Diffusion Tube Annualisation

All diffusion tube monitoring locations within Redditch Borough Council recorded data capture 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.TG16 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.

Redditch Borough Council have applied a national bias adjustment factor of 0.84 to the 2021 monitoring data. A summary of bias adjustment factors used by Redditch Borough Council over the past five years is presented in WRS has determined the appropriate national bias adjustment factor using Version 03/22 of the Defra published National Diffusion Tube Bias Adjustment Spreadsheet using 32 Gradko studies for the relevant diffusion tubes (20% TEA in water) for 2021

Table C.1. WRS has determined the appropriate national bias adjustment factor using Version 03/22 of the Defra published National Diffusion Tube Bias Adjustment Spreadsheet using 32 Gradko studies for the relevant diffusion tubes (20% TEA in water) for 2021

Table C.1 – Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2021	National	03/22	0.84
2020	National	03/21	0.81
2019	National	03/20	0.78
2018	National	03/19	0.89
2017	National	09/18	0.77

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 Redditch Borough Council required distance correction during 2021.

QA/QC of Automatic Monitoring

No Automatic Monitoring was completed in Redditch Borough Council in 2021.

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

Figure D.1 – Map of Non-Automatic Monitoring Site

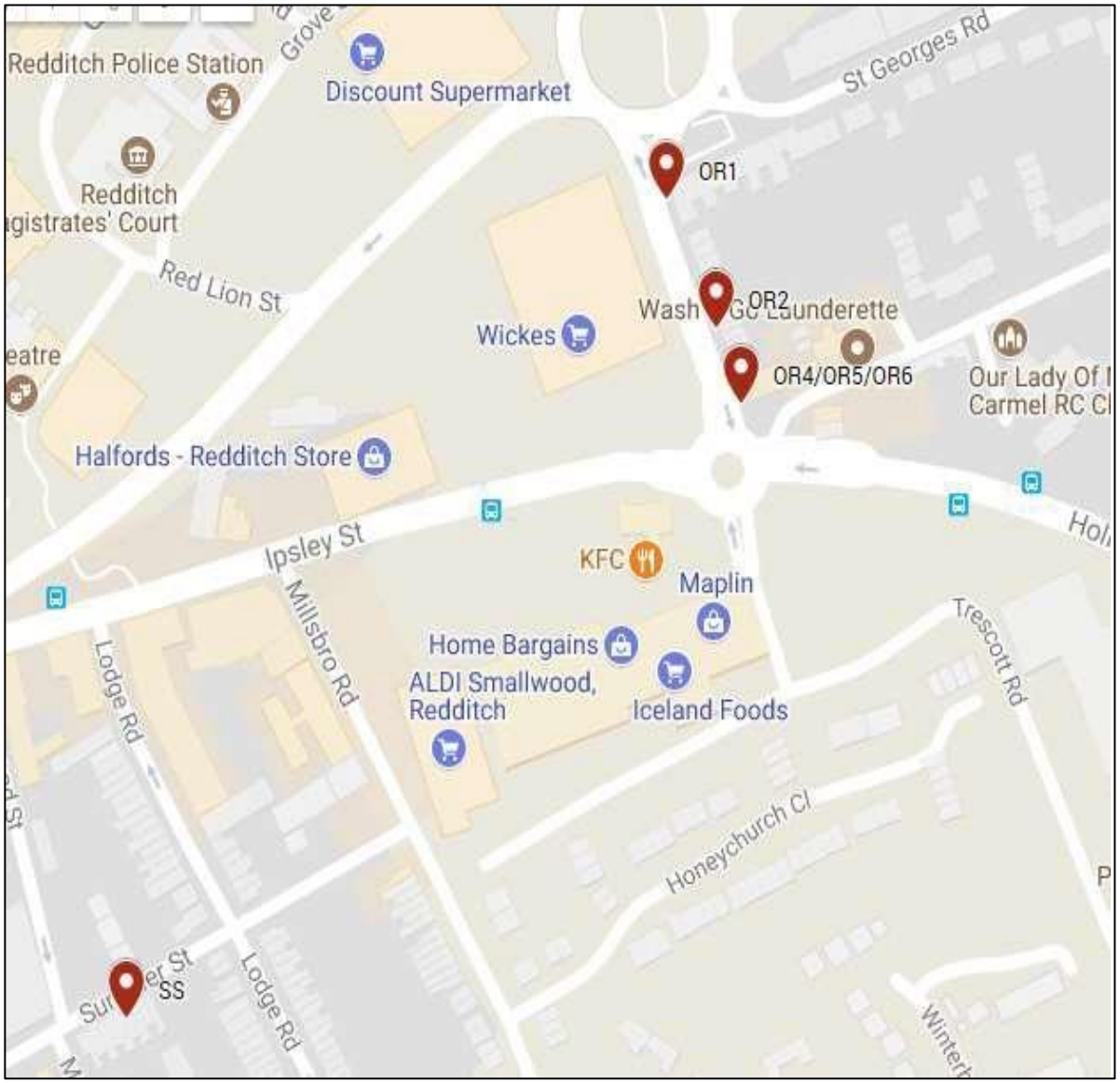


Figure D.2 – Map of STOR Urban Background Non-Automatic Monitoring Site

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'
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
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by National Highways
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO_2	Sulphur Dioxide

References

- Local Air Quality Management Technical Guidance LAQM.TG16. April 2021. 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.PG16. May 2016. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- DEFRA (2022) National Diffusion Tube Bias Adjustment Factor Spreadsheet v.03/22
- DEFRA (2018) Background Mapping for Local Authorities
- 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'
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- Worcestershire Regulatory Services (2021) Air Quality Annual Status Report for Redditch Borough Council
- Public Health Outcomes Framework. 2022. Public Health England.