



**WATFORD
BOROUGH
COUNCIL**

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 Watford

Watford is a concentrated urban area situated to the North West of London. The latest estimated population of Watford is 96,623 (mid-2020) (Source: ONS, Estimates of the population for the UK, England and Wales, Scotland and Northern Ireland). It has a well-established regional shopping centre with major rail and road communication links. It has both mainline and underground train stations, the M1 lies along the northern boundary of the borough and the M25 is situated to the west. The borough is also served by several major trunk roads, including the A41, A411, A412 and A405.

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 ages³, with a total estimated healthcare cost to the NHS and social care of £157 million in 2017⁴.

Watford suffers from traffic congestion. The main pollutants of concern in the Borough are NO₂, PM₁₀ and PM_{2.5}. These are mainly associated with road traffic. NO₂ is formed during the combustion process when Nitrogen in the air bonds with Oxygen. Road vehicles emit particulate matter from their exhaust and from non-exhaust sources such as brake, tyre and road surface wear and the resuspension of road dust.

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

The latest monitoring data shows a general trend of decreasing concentrations of NO₂. This is in line with the national trend. Defra recently reported that “between 2007 and 2019 inclusive, the annual mean NO₂ concentration at roadside sites reduced by an average of 1.8 µg/m³ each year. This reduction was observed at most long-running monitoring sites across the UK; which could be a consequence of the large reduction in road transport emissions of NO₂ over the same period in the UK, as newer vehicles subject to stricter emissions standards enter the transport fleet”.

In 2021, NO₂ concentrations increased at most sites, when compared to 2020 (including in the Council’s existing AQMAs). However, there is a general trend of reduction over the last 5 years. There are no new major sources of emissions in the Borough. The Council has not introduced any new AQMAs, Action Plans or strategies. The Council is in the process of drafting a new AQAP. The new Action Plan is currently in its third draft.

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 Strategy⁵ sets out the case for action, with goals to reduce exposure to harmful pollutants. The Road to Zero⁶ 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.

New Local Plan

The new Watford Local Plan was submitted to the Secretary of State for examination on 6th August 2021. The new Local Plan will guide new development – including housing, employment, infrastructure and transport – up to 2036.

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

Sustainable Transport Strategy

Watford Borough Council's Cabinet have approved a strategy and 20-year programme to help transform how people travel to, from and around the town, with planned activities taking place over the next two years to start fulfilling the proposals to make it easier for people to walk, cycle and use public transport.

The programme of scheduled projects follows Watford Borough Council and Hertfordshire County Council's consultation on their 'Transforming Travel in Watford 2021-2041' strategy, which showed the majority of the 1,000 people who provided feedback were supportive of the need for change to the way people travel, as well as the proposals put forward to do so.

To start implementing the strategy, the key projects that will take place include relaunching an expanded 'Watford Car Club' to provide more residents with short-term car rental services without the hassle of owning a vehicle, as well as the implementation of further phases of public realm improvements in the town centre, starting with the bus gate to reduce traffic entering High Street, and improvements to cycle and walking routes around the town centre.

Additional works that will also be taking place include continuing sustainable travel projects already underway, such as installing more electric vehicle chargers around the town to help the shift towards less polluting vehicles, and providing more cycle parking facilities to help people travel around the town more easily.

The coming years will also see further investigation into the future delivery of schemes such as new cycle infrastructure on key routes across the town, measures to reduce delays for buses at congestion hotspots such as the ring road, alternative uses of the disused railway line between Watford and Croxley, and also the introduction of 'Town Centre Sustainable Transport Hub' which will allow easy interchange between different types of transport.

The strategy is underpinned by six key themes including: increasing active travel opportunities, improving public transport for longer journeys, providing alternatives to petrol car, making the town centre more pedestrian and cycle friendly, supporting change and making moving goods more sustainable. For more information, including all the proposals within the 20-year programme, please visit www.watford.gov.uk/futuretravel.

Sustainability Strategy

The Council's Sustainability Strategy 2020 to 2023 contains 6 key strands. One of these strands is Improving Transport & Air Quality. The section of the strategy entitled Improving Transport & Air Quality, highlights the health impacts of air pollution and the cost to society, and describes the Council's LAQM activities and highlights of progress so far.

Local initiatives

Green Transport

EV charging points

There are now more than forty electric vehicle charging points around the town where drivers can charge their vehicles from 32p per kilowatt.

E-car club

Residents can take advantage of the Council's Unbeego EV car sharing scheme.

Grants

The Council's website provides information regarding applying for a discount on the price of a brand new low emission vehicle through a grant that the government gives to vehicles dealerships and manufacturers. The Council also provides information to businesses who may qualify for grants to switch to greener low-emissions vehicles. These grants include the following Low Carbon Workspace Grant, Eastern New Energy Grant, eCargo Bike Grant, Plug-in vehicle Grant etc.

Cycling in Watford

Watford cycle hub

Watford cycle hub offers cycle repair services, maintenance courses and cycle training. It also accepts old bikes and recycles them.

Beryl bike hire scheme

The bikes and e-bikes are available to hire 24/7 (via Beryl Bays across Watford) all year round through a user friendly smartphone app. Rides are charged per-minute, daily, or through a variety of economical prepaid riding passes.

ArrivaClick

Seven small fifteen-seater buses (accessible and DDA complaint) from ArrivaClick provide a flexible bus service that, unlike others does not follow a fixed route at fixed times – but responds to demand from the passengers and the routes they want to take.

Watford Travel app

Free to download and use, the travelWatford app, is available on IOS and Android. It brings together all of Watford's transport options and let people choose the best options for a given journey based on cost, waiting time and environmental impact.

Conclusions and Priorities

NO₂ concentrations increased at most sites, when compared to 2020 (including at Chalk Hill in AQMA 3A). However, there is a general trend of reduction over the last 5 years.

There were no exceedances with respect to the 1-hour objective.

The annual mean concentration at Chalk Hill (WF44) was 45.6 ug/m³. Following fall-off with distance correction, this concentration was 36.9 ug/m³. The concentration is within 10% of the annual mean objective for NO₂.

There were no exceedances of the air quality objectives for PM₁₀, relating to both annual mean and daily mean objectives.

There were no exceedances of the Exposure Reduction Objective (25ug/m³) for PM_{2.5}.

The Council commenced monitoring of PM_{2.5} in 2015. The highest annual mean concentration was recorded in 2016. There was a 57.1% reduction in concentrations between 2016-2020.

Adopting the Council's new AQAP is a priority for 2022/2023.

Local Engagement and How to get Involved

Residents, businesses and visitors to the Borough can play a role in improving air quality, for example, walking, cycling or using public transport instead of driving. For those who need to use a car, replacing it with a greener vehicle such as an electric one is a great way of improving air quality. If individuals or businesses are not ready to replace their existing vehicles, they should ensure that they are serviced regular and in particular, tyre

pressures are at the appropriate level as doing so will help lower emissions as well as saving money.

Local Responsibilities and Commitment

This ASR was prepared by the Environmental Health Department of Watford Borough Council.

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 the Environmental Health Team at:

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Table of Contents

Executive Summary: Air Quality in Our Area	i
Air Quality in Watford.....	i
Actions to Improve Air Quality	ii
Conclusions and Priorities	v
Local Engagement and How to get Involved.....	v
Local Responsibilities and Commitment	vi
1 Local Air Quality Management.....	1
2 Actions to Improve Air Quality.....	2
2.1 Air Quality Management Areas	2
2.2 Progress and Impact of Measures to address Air Quality in Watford	4
PM _{2.5} – Local Authority Approach to Reducing Emissions and/or Concentrations	9
3 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance	12
Summary of Monitoring Undertaken	12
3.1.1 Automatic Monitoring Sites	12
3.1.2 Non-Automatic Monitoring Sites	12
Individual Pollutants	13
3.1.3 Nitrogen Dioxide (NO ₂)	13
3.1.4 Particulate Matter (PM ₁₀)	14
3.1.5 Particulate Matter (PM _{2.5}).....	15
Appendix A: Monitoring Results	16
Appendix B: Full Monthly Diffusion Tube Results for 2021	36
Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC	38
New or Changed Sources Identified Within Watford During 2021	38
Additional Air Quality Works Undertaken by Watford Borough Council During 2021	38
QA/QC of Diffusion Tube Monitoring	38
Diffusion Tube Annualisation.....	39
Diffusion Tube Bias Adjustment Factors	39
NO ₂ Fall-off with Distance from the Road.....	39
QA/QC of Automatic Monitoring	40
PM ₁₀ and PM _{2.5} Monitoring Adjustment	40
Automatic Monitoring Annualisation	40
NO ₂ Fall-off with Distance from the Road.....	40
Appendix D: Map(s) of Monitoring Locations and AQMAs	43
Appendix E: Summary of Air Quality Objectives in England.....	46
Glossary of Terms	47

References	48
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Figures

Figure A.1 – Trends in Annual Mean NO ₂ Concentrations	24
Figure A.2 – Trends in Annual Mean NO ₂ Concentrations at WF43/AQMA 2	25
Figure A.3 – Trends in Annual Mean NO ₂ Concentrations at WF29/AQMA 3A	26
Figure A.4 – Trends in Annual Mean NO ₂ Concentrations at WF44/AQMA 3A	27
Figure A.5 – Trends in Annual Mean NO ₂ Concentrations at WF48/AQMA 3A	28
Figure A.7 – Trends in Annual Mean PM ₁₀ Concentrations	31
Figure A.8 – Trends in Number of 24-Hour Mean PM ₁₀ Results > 50µg/m ³	33
Figure A.9 – Trends in Annual Mean PM _{2.5} Concentrations	35
Figure D.1 – Map of Non-Automatic Monitoring Sites	43
Figure D.2: Map showing Vicarage Road Air Quality Management Area No.2	44
Figure D.3: Map showing Pinner Road Air Quality Management Area No.3A	45

Tables

Table 2.1 – Declared Air Quality Management Areas	3
Table 2.2 – Progress on Measures to Improve Air Quality	7
Table A.1 – Details of Automatic Monitoring Sites	16
Table A.2 – Details of Non-Automatic Monitoring Sites	18
Table A.3 – Annual Mean NO ₂ Monitoring Results: Automatic Monitoring (µg/m ³)	20
Table A.4 – Annual Mean NO ₂ Monitoring Results: Non-Automatic Monitoring (µg/m ³)	21
Table A.5 – 1-Hour Mean NO ₂ Monitoring Results, Number of 1-Hour Means > 200µg/m ³	29
Table A.6 – Annual Mean PM ₁₀ Monitoring Results (µg/m ³)	30
Table A.7 – 24-Hour Mean PM ₁₀ Monitoring Results, Number of PM ₁₀ 24-Hour Means > 50µg/m ³	32
Table A.8 – Annual Mean PM _{2.5} Monitoring Results (µg/m ³)	34
Table B.1 – NO ₂ 2021 Diffusion Tube Results (µg/m ³)	36
Table C.1 – Bias Adjustment Factor	39
Table C.4 – NO ₂ Fall off With Distance Calculations (concentrations presented in µg/m ³)	42
Table E.1 – Air Quality Objectives in England	46

1 Local Air Quality Management

This report provides an overview of air quality in Watford 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 Watford 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 (AQMA(s)) 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.

A summary of AQMA(s) declared by Watford Borough Council can be found in Table 2.1. The table presents a description of the two AQMA(s) that are currently designated within Watford. Appendix D: Map(s) of Monitoring Locations and AQMA(s) provides maps of AQMA(s) and also the air quality monitoring locations in relation to the AQMA(s). The air quality objectives pertinent to the current AQMA designation(s) are as follows:

- NO₂ annual mean.

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	One Line Description	Is air quality in the AQMA influenced by roads controlled by National Highways?	Level of Exceedance: Declaration	Level of Exceedance: Current Year	Name and Date of AQAP Publication	Web Link to AQAP
AQMA 2 Vicarage Road	Declared 01/02/2006, Amended 10/04/2019	NO2 Annual Mean	A predominately residential area with a cluster of commercial buildings within and as well as close to the vicinity. Queuing traffic.	NO	58	34	Watford Borough Council Air Quality Action Plan, 2011	https://www.airqualityengland.co.uk/local-authority/hnb-reports
AQMA 3A Aldenham Road, Chalk Hill	Declared 01/02/2006, Amended 10/04/2019	NO2 Annual Mean	A combination of residential and commercial buildings along a main road within close proximity to Bushey Station. Queuing traffic.	NO	56.8	36.9	Watford Borough Council Air Quality Action Plan, 2011	https://www.airqualityengland.co.uk/local-authority/hnb-reports

- ☒ **Watford Borough Council confirm the information on UK-Air regarding their AQMA(s) is up to date.**
- ☒ **Watford Borough Council confirm that all current AQAPs have been submitted to Defra.**

2.2 Progress and Impact of Measures to address Air Quality in Watford

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. Last year, the Council undertook a review of its diffusion tube locations and identified new locations based on congestion and traffic count information. The plan to deploy them has been delayed because of the pandemic. But it is encouraged for the Council to continue reviewing diffusion tube locations and to relocate tubes if deemed appropriate (i.e. relocate from areas where low concentrations are continually recorded). For example, additional monitoring in AQMA 2 could help support future claims to revoke the AQMA if the current downward trend continues.
2. It appears as though in Table A.4, the "Valid Data Capture for Monitoring Period (%)" column isn't filled correctly. Values in that column should not be lower than the ones in the "Valid Data Capture 2020 (%)" column. As PM_{2.5} are measured in the borough, it would be good to add the standard for them in Table E.1.
3. Overall the Council have provided a good and detailed ASR. They play an active role in monitoring air quality within the borough and in the management of their AQMAs. The action plan table has been fully filled and impacts of Covid-19 on certain actions have been clearly identified. The Council are encouraged to continue their good work.

The Council has addressed the matters raised following Defra's appraisal:

1. In March 2022, the Council deployed thirteen additional diffusion tubes and relocated two diffusion tubes. This brings the total number of diffusion tubes deployed around the Borough to thirty-two. There are now five tubes deployed in AQMA 3A and four in AQMA 2. There are three diffusion tubes collocated with the analyser at our roadside site. The Council intends to review monitoring locations on a periodic basis.
2. This was corrected prior to the report being published. Information regarding the objectives and targets relating to PM_{2.5} was added to the report before it was published.

Watford Borough Council has taken forward a number of direct measures during the current reporting year of 2021 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2. Fifteen measures are included within Table 2.2, with the type of measure and the progress Watford Borough Council have made during the reporting year of 2021 presented. Where there have been, or continue to be, barriers restricting the implementation of the measure, these are also presented within Table 2.2.

More detail on these measures can be found in Watford Borough Council Air Quality Action Plan 2011. Completed measures are:

- Implement the Intalink project Increase the integration of public and sustainable transport movements – on-going;
- Watford Junction interchange improvement Increase the accessibility of the rail station – on-going;
- Promotion of car sharing scheme. Increase car sharing to ease congestion – complete/on-going;
- Promotion of Travel Plans. Increase in sustainable transport - complete/on-going;
- Annual Council vehicle fleet review. Maintain clean Council vehicle fleet - complete/on-going;
- Promote air quality within the Borough. Increase awareness of AQ as a health issue - complete/on-going;
- Continue to monitor air quality. Maintenance of air quality monitors and data management - complete/on-going;
- Undertake feasibility studies. To investigate the air quality impact of any potential future schemes - complete/on-going;
- Enforcement of parking policy. Minimise emissions due to reduced traffic flow caused by obstructions - complete/on-going;
- Installation of EV charging points. Encourage the uptake of electric vehicles - complete/on-going;
- Implement bus strategy. Encourage the increase of bus patronage - complete/on-going;
- Promotion of TravelSmart. Personalised travel planning to reduce car use - complete/on-going;
- Promotion of cycling and walking. Increase sustainable transport - complete/on-going.

Watford Borough Council expects the following measures to be completed over the course of the next reporting year:

- Road Infrastructure Improvements Ease congestion in St Albans Road AQMA.
Further improvements are recommended in the Congestion study - On-going
- Develop Supplementary Planning Document for Air Quality. Develop SPD on AQ for inclusion in the 2011 Development Plan Document – in progress

Watford Borough Council priority for the coming year is to adopt the Council's new AQAP.

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, Watford Borough Council anticipates that further additional measures not yet prescribed will be required in subsequent years to achieve compliance and enable the revocation of AQMA 2 and AQMA 3A.

Table 2.2 – 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	Road Infrastructure Improvements Ease congestion in St Albans Road AQMA. Further improvements are recommended in the Congestion study	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	2011	2016	HCC/WBC	HCC/WBC	NO	Funded	£100k - £500k	Implementation	Ease congestion and reduce emissions	Schemes completed	On-going	WBC is investing £400,000 on new street furniture, improved paving, tree planting, more cycle friendly routes etc. The planned maintenance and refurbishment works were paused as a result of the COVID-19 pandemic. In 2021, the first phase of the works was completed.
2	Implement the Intalink project Increase the integration of public and sustainable transport movements	Transport Planning and Infrastructure	Public transport improvements- interchanges stations and services	2011	2016	HCC/WBC	HCC/WBC	NO	Funded	£100k - £500k	Implementation	Reduce private car use and so reduce emissions.	Bus and rail patronage, number of cyclists and pedestrians	On-going	The Herts Boroughs and Districts have agreed a Memorandum of Understanding setting out the roles of district and borough councils following establishment of the Intalink Enhanced Partnership Plan and Scheme for Hertfordshire. The Intalink Bus Strategy was published in February 2020.
3	Watford Junction interchange improvement Increase the accessibility of the rail station	Transport Planning and Infrastructure	Public transport improvements- interchanges stations and services	2011	2016	HCC/WBC	HCC/WBC	NO	Funded	£100k - £500k	Implementation	Medium impact.	Completed scheme	Complete /on-going	The planned upgrade to Watford Junction station forecourt was paused due to the COVID-19 pandemic. The forecourt transformation has now been completed.
4	Promotion of car sharing scheme. Increase car sharing to ease congestion	Alternatives to private vehicle use	Car & lift sharing schemes	2011	2016	WBC	WBC	NO	Funded	£10k - 50k	Completed	Registered members on liftshare. Number of private schemes	High in the vicinity of the junction	Complete / on-going	On-going promotion through council's commuting officer
5	Promotion of Travel Plans. Increase in sustainable transport	Transport Planning and Infrastructure	Public transport improvements- interchanges stations and services	2011	2016	WBC	WBC	NO	Funded	£10k - 50k	Completed	Number of travel plans in schools and businesses	Low	Complete / on-going	On-going promotion through council's commuting officer
6	Annual Council vehicle fleet review. Maintain clean Council vehicle fleet	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	2011	2016	WBC	WBC	NO	Funded	£10k - 50k	Completed	Age and Euro standard of Council vehicle fleet	Low	Complete / on-going	Civil engineering contractors using vehicles of Euro 6 standard.
7	Promote air quality within the Borough. Increase awareness of AQ as a health issue.	Public Information	Other	2011	2016	WBC	WBC	NO	Funded	< £10k	Completed	"Hits" on Herts & Beds Air Quality website	Low	Complete / on-going	This is being considered across Hertfordshire and HCC Public Health Director has committed funding. We have worked with HCC and other LA's to draft a Hertfordshire Air Quality Strategy. http://www.hertfordshire.gov.uk/docs/pdf/a/airqualitystrategicplan.pdf
8	Continue to monitor air quality. Maintenance of air quality monitors and data management.	Public Information	Other	2011	2016	WBC	WBC	NO	Funded	£50k - £100k	Completed	Number of operational monitors	Low	Complete / on-going	Despite budgetary pressures Watford has continued to fund existing monitoring and has also funded the maintenance of new PM 2.5 monitors.

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
9	Undertake feasibility studies. To investigate the air quality impact of any potential future schemes	Policy Guidance and Development Control	Other policy	2011	2016	WBC	WBC	NO	Funded	£10k - 50k	Implementation	Not applicable	Low	Ongoing-	Site allocation traffic light system put in place with planning policy. Constraint information for developers included in planning information.
10	Enforcement of parking policy. Minimise emissions due to reduced traffic flow caused by obstructions.	Traffic Management	Other	2011	2016	WBC	WBC	NO	Funded	£50k - £100k	Completed	Number of warnings, fines and prosecutions for such offences	Not applicable	Complete / on-going	The Police have retained powers to issue Fixed Penalty Notices to vehicles causing an obstruction
11	Installation of EV charging points. Encourage the uptake of electric vehicles.	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	2011	2016	HCC/WBC	HCC/WBC	NO	Funded	£100k - £500k	Completed	Number of charging points installed	Low	Complete / on going	There are now more than 40 electric vehicle charging points across Watford.
12	Implement bus strategy. Encourage the increase of bus patronage.	Alternatives to private vehicle use	Other	2011	2016	HCC/WBC	HCC/WBC	NO	Funded	£50k - £100k	Completed	Bus patronage	Low	Complete / on-going	Local Sustainable Transport Fund. On-going partnerships and promotion with local bus companies through council.
13	Promotion of Travelsmart. Personalised travel planning to reduce car use.	Alternatives to private vehicle use	Other	2011	2016	WBC	WBC	NO	Funded	£10k - 50k	Completed	Uptake numbers.	Medium	Complete / on-going	Travelsmart continues to be promoted.
14	Promotion of cycling and walking. Increase sustainable transport.	Promoting Travel Alternatives	Promotion of walking	2011	2016	WBC/HCC	WBC/HCC	NO	Funded	£10k - 50k	Completed	Number of cyclists and pedestrians	Low	Complete / on-going	New cycle route along St. Albans Road. Ebury Road route planned Grand union canal route planned New road signs with pedestrian info being implemented SW Herts cycling strategy Permanent loop monitoring planned
15	Develop Supplementary Planning Document for Air Quality. Develop SPD on AQ for inclusion in the 2011 Development Plan Document.	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	2011	2016	WBC	WBC	NO	Funded	< £10k	Implementation	Publication of SPD; Number of planning applications made using the guidance.	Low	Council to prepare SPD	HCC Public Health Director has expressed wish for there to be a county wide strategy. As part of the Local Plan Strategy we will be considering the need for supplementary planning guidance.

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.

Exposure to high concentrations of particulate matter can exacerbate lung and heart conditions, significantly affecting quality of life, increasing hospital admissions and deaths. Children, the elderly and those with pre-existing respiratory and cardiovascular disease, are known to be more susceptible to the health impacts from air pollution.

Inhalation of particulate matter can have adverse impacts on human health, the greatest impact is believed to be from long term exposure to PM_{2.5}, which increase age-specific mortality risk, particularly from cardiovascular causes.

The following is taken from the Hertfordshire Local Authorities Report on Particulate Matter (PM_{2.5}) in Ambient Air in 2020 for Hertfordshire County Council Public Health:

Poor air quality is considered to be the largest environmental risk to the public's health and contributes to:

- Cardiovascular disease;
- Lung cancer;
- Respiratory diseases;
- Increased chance of hospital admissions and visits to Emergency Departments.

There is growing evidence that air pollution is a significant contributor to preventable ill health and early death.

Whilst legal limits are in place, evidence suggests that health effects can still occur below these limits. This is recognised by the World Health Organisation, which sets lower pollutant exceedance thresholds than some EU limits adopted into UK legislation.

The only specific indicator for air pollution is included within the Public Health Outcomes Framework and relates to particulate matter (PM) with a diameter of 2.5µm or smaller (Public Health Outcome Indicator (PHOI) 3.01).

PHOI 3.01 is 'the fraction of annual all-cause mortality attributable to long-term exposure to current levels of anthropogenic particulate pollution.' The indicator is based on an estimated amount of PM_{2.5} derived by Defra modelling from local measurement, one site in Borehamwood, Hertfordshire and another in Sandy, Bedfordshire. That data is then adjusted by way of population to give a population weighted figure before its use in deriving the PHOI.

The PM_{2.5} focussed PHOI reflects the adverse impact that this type of air pollution can have on public health as a result of the fine particles being carried deep into the lungs where they can cause inflammation and a worsening of heart and lung diseases.

However, it is important to recognise that the figures published for PHOI 3.01 are estimates and therefore cannot be used for performance monitoring; they can only provide an indication of the scale of the issue. Further information on the use of health related air quality data is available at

<https://www.hertshealthevidence.org/documents/thematic/airqualitydatafaq-briefing-2019-07.pdf>.

It is for this reason that this report no longer makes direct reference to the PHOI figures, but uses the population weighted Defra modelled PM_{2.5} concentrations in their place.

The fraction of mortality attributable to particulate air pollution (new method) for England (2020) is 5.6%. The PHOF data is available at:

https://fingertips.phe.org.uk/profile/public-health-outcomes-framework/data#page/4/gid/1000043/pat/159/par/K02000001/ati/15/are/E92000001/iid/93861/age/230/sex/4/cat/-1/ctp/-1/yr/1/cid/4/tbm/1/page-options/ovw-do-0_car-ao-1_car-do-0.

Watford Borough Council is taking the following measures to address PM_{2.5}:

The Council monitors PM_{2.5} concentrations at its automatic monitoring station. Monitoring data is reported in the Council's Annual Status Report and in the Hertfordshire Local Authorities Report on Particulate Matter (PM_{2.5}) in Ambient Air.

An Officer of the Council attends the Hertfordshire and Bedfordshire Air Quality Forum.

The Council will ensure compliance with the Environmental Permitting Regulations and will promote the use of cleaner fuels in wood burning stoves to help reduce PM_{2.5} concentrations.

The Air Quality (Domestic Solid Fuels Standards (England) Regulations 2020 are to be enforced by the relevant local authority. Hertfordshire County Council are the relevant local authority.

The Council will require that developers follow good construction practice to minimise fugitive dusts.

Under the Clean Air Act 1993, Watford has been declared a Smoke Control Area.

It is anticipated that:

- Measures to reduce emissions of NO_x by encouraging a move away from internal combustion engine vehicles to ultra-low emission vehicles (ULEV) will reduce PM_{2.5} emissions from exhausts;
- Measures to reduce road travel altogether will reduce PM_{2.5} emissions from brake and tyre wear and dust re-suspension.

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

This section sets out the monitoring undertaken within 2021 by Watford 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.

Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

Watford Borough Council undertook automatic (continuous) monitoring at one site during 2021. Table A.1 in Appendix A shows the details of the automatic monitoring sites. NB. Local authorities do not have to report annually on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead, unless local circumstances indicate there is a problem. The https://www.airqualityengland.co.uk/local-authority/?la_id=408 page presents automatic monitoring results for Watford Borough Council, with automatic monitoring results also available through the UK-Air website.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C.

3.1.2 Non-Automatic Monitoring Sites

Watford Borough Council undertook non- automatic (i.e. passive) monitoring of NO₂ at nineteen sites during 2021. Table A.2 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.

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.

3.1.3 Nitrogen Dioxide (NO₂)

Table A.3 and Table A.4 in Appendix A compare the ratified and adjusted monitored NO₂ annual mean concentrations for the past five years with the air quality objective of 40µg/m³. 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.

Figure A.1 presents trends in NO₂ annual mean concentrations at diffusion tube sites WF02 to WF50 between the years 2017 to 2021. In 2021, a single exceedance of the annual mean objective was recorded at WF44. There was an increase in concentrations at most sites, when compared to 2020. However, there is a general trend of reduction over the last 5 years.

Figure A.2 presents trends in NO₂ annual mean concentrations at diffusion tube location WF43 in AQMA 2 between the years 2017 to 2021. In 2021, there were no exceedances of the annual mean objective. There was an increase in concentrations at this site, when compared to 2020. However, there is a general trend of reduction over the last 5 years.

Figure A.3 presents trends in NO₂ annual mean concentrations at diffusion tube location WF29 in AQMA 3A between the years 2017 to 2021. In 2021, there were no exceedances of the annual mean objective. There was an increase in concentrations at this site, when compared to 2020. However, there is a general trend of reduction over the last 5 years.

Figure A.4 presents trends in NO₂ annual mean concentrations at diffusion tube location WF44 in AQMA 3A between the years 2017 to 2021. In 2021, there was an exceedance of the annual mean objective. However, there is a general trend of reduction over the last 5 years.

Figure A.5 presents trends in NO₂ annual mean concentrations at diffusion tube location WF48 in AQMA 3A between the years 2017 to 2021. In 2021, there were no exceedances of the annual mean objective. There was an increase in concentrations at this site, when compared to 2020. However, there is a general trend of reduction over the last 5 years.

Table A.5 in Appendix A compares the ratified continuous monitored NO₂ hourly mean concentrations for the past five years with the air quality objective of 200µg/m³, not to be exceeded more than 18 times per year.

The annual mean concentration at Chalk Hill (WF44) was 45.6 ug/m³. Following fall-off with distance correction, this concentration was 36.9 ug/m³. The concentration is within 10% of the annual mean objective for NO₂.

There were no exceedances with respect to the 1-hour objective.

There will be no changes to existing AQMAs or the declaration of a new AQMA.

In March 2022, the Council deployed thirteen additional diffusion tubes and relocated two diffusion tubes. This brings the total number of diffusion tubes deployed around the Borough to thirty-two. There are now five tubes deployed in AQMA 3A and four in AQMA 2. There are three diffusion tubes collocated with the analyser at our roadside site. The Council intends to review monitoring locations on a periodic basis.

3.1.4 Particulate Matter (PM₁₀)

Table A.6 in Appendix A: Monitoring Results compares the ratified and adjusted monitored PM₁₀ annual mean concentrations for the past five years with the air quality objective of 40µg/m³.

Table A.7 in Appendix A compares the ratified continuous monitored PM₁₀ daily mean concentrations for the past five years with the air quality objective of 50µg/m³, not to be exceeded more than 35 times per year.

Figure A.7 presents trends in PM₁₀ annual mean concentrations at the Watford Town Hall roadside site between the years 2017 to 2021. There were no exceedances of the annual mean objective in 2021 and there is a general trend of reduction experienced at this site.

Figure A.8 presents trends in the number of 24-hour mean PM₁₀ concentrations that exceed 50ug/m³ at the Watford Town Hall roadside site between the years 2017 to 2021.

The number of exceedances had increased in 2019, however, there were no exceedances of the objective in 2020 and 2021.

There were no exceedances of the air quality objectives for PM₁₀, relating to both annual mean and daily mean objectives.

There will be no changes to existing AQMAs or the declaration of a new AQMA.

There are no proposed changes to the monitoring network.

3.1.5 Particulate Matter (PM_{2.5})

Table A.8 in Appendix A presents the ratified and adjusted monitored PM_{2.5} annual mean concentrations for the past five years.

Figure A.9 presents trends in PM_{2.5} annual mean concentrations at the Watford Town Hall roadside site between the years 2017 to 2021. There were no exceedances of the Exposure Reduction Objective (25ug/m³). The Council commenced monitoring of PM_{2.5} in 2015. The highest annual mean concentration was recorded in 2016. There was a 57.1% reduction in concentrations between 2016 and 2020. There is a general trend of reduction experienced at this site.

Appendix A: Monitoring Results

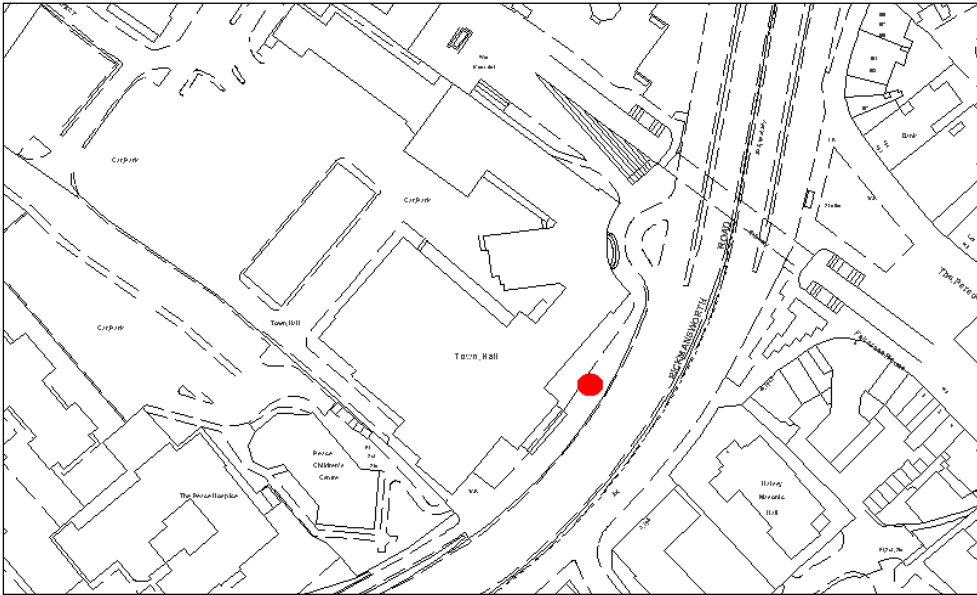
Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Inlet Height (m)
WF1	Watford Town Hall	Roadside	510540	1967870	NO ₂ , PM _{2.5} , PM ₁₀	No	API M200E chemiluminescence NO/NO ₂ /NOX analyser and a Palas Fidas 200 for monitoring PM ₁₀ and PM _{2.5}	N/A	10m	1.5m

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



Location of Watford Town Hall automatic monitoring station.



Photograph showing the automatic monitoring site at Watford Town Hall.

Table A.2 – 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)
WF02	Grove Pumping Station	Urban Background	508700	198950	NO2	No	0.0	0.0	No	2.0
WF03	Hospital Vicarage Road	Kerbside	510570	195800	NO2	No	0.0	4.0	No	2.4
WF06	Woodside Playing Fields	Urban Background	510985	200710	NO2	No	0.0	0.0	No	3.0
WF29	Pinner Road	Kerbside	511940	195320	NO2	Yes-AQMA 3A	6.0	2.0	No	2.1
WF36	Ravenscroft	Industrial	512240	199910	NO2	No	8.0	0.0	No	2.2
WF37	St Albans Road	Kerbside	510970	198535	NO2	No	5.0	1.0	No	2.4
WF38	A405 Horseshoe Lane	Kerbside	511680	200700	NO2	No	2.0	4.0	No	3.0
WF39	Balmoral Road	Kerbside	511000	198270	NO2	No	0.0	1.0	No	2.4
WF40	Salisbury Road	Kerbside	510930	198000	NO2	No	0.0	2.0	No	2.4
WF41	Leavesden Road	Kerbside	510850	197780	NO2	No	0.0	1.0	No	2.5
WF42	Queens Road	Kerbside	511160	197000	NO2	No	4.0	1.0	No	2.4
WF43	Farraline Road	Kerbside	510800	196020	NO2	Yes-AQMA 2	4.0	2.0	No	2.4

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)
WF44	Chalk Hill	Kerbside	511920	195450	NO2	Yes-AQMA 3A	6.0	2.0	No	2.1
WF45	Wellington Road	Kerbside	510750	197230	NO2	No	10.0	4.0	No	2.3
WF46	Town Hall	Roadside	510565	196800	NO2	No	0.0	6.0	Yes	2.0
WF47	Willow Lane	Kerbside	510335	195610	NO2	No	3.0	1.0	No	2.4
WF48	Lower High Street	Kerbside	511725	195619	NO2	Yes-AQMA 3A	4.0	1.0	No	2.4
WF49	Gammons Lane	Kerbside	510499	198454	NO2	No	5.0	1.0	No	2.4
WF50	Eastbury Road	Kerbside	511057	194895	NO2	No	0.0	2.7	No	2.9

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.3 – Annual Mean NO₂ Monitoring Results: Automatic Monitoring (µg/m³)

Site 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
WF1	510540	1967870	Roadside	85.99	85.99	34	32	30	21	21

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16.**

☒ **Reported concentrations are those at the location of the monitoring site (annualised, as required), i.e. prior to any fall-off with distance correction.**

Notes:

The annual mean concentrations are presented as µg/m³.

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

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%).

Table A.4 – Annual Mean NO₂ Monitoring Results: Non-Automatic Monitoring (µg/m³)

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
WF02	508700	198950	Urban Background	100.0	100.0	15.9	16.0	13.5	10.9	13.2
WF03	510570	195800	Kerbside	100.0	100.0	32.7	30.6	28.9	21.9	23.3
WF06	510985	200710	Urban Background	92.3	92.3	20.0	18.2	18.8	14.9	13.7
WF29	511940	195320	Kerbside	100.0	100.0	40.4	38.6	34.7	26.1	32.0
WF36	512240	199910	Industrial	100.0	100.0	26.6	27.0	25.5	17.7	18.6
WF37	510970	198535	Kerbside	100.0	100.0	34.2	32.5	30.0	25.4	27.2
WF38	511680	200700	Kerbside	100.0	100.0	34.3	32.9	30.7	23.2	23.3
WF39	511000	198270	Kerbside	84.6	84.6	33.9	29.9	30.4	24.1	25.5
WF40	510930	198000	Kerbside	100.0	100.0	33.5	32.7	25.1	25.5	25.8
WF41	510850	197780	Kerbside	90.4	90.4	37.4	34.5	34.2	26.9	27.1
WF42	511160	197000	Kerbside	75.0	75.0	31.1	27.4	29.8	20.7	22.3
WF43	510800	196020	Kerbside	100.0	100.0	52.7	51.1	42.2	34.9	38.3
WF44	511920	195450	Kerbside	100.0	100.0	<u>61.6</u>	53.2	49.0	39.5	45.6

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
WF45	510750	197230	Kerbside	100.0	100.0	37.1	32.6	32.5	27.0	29.8
WF46	510565	196800	Roadside	100.0	100.0	30.2	26.8	26.3	20.2	21.7
WF47	510335	195610	Kerbside	100.0	100.0	28.8	26.8	26.3	19.6	21.4
WF48	511725	195619	Kerbside	90.4	90.4	46.5	42.3	41.7	34.6	35.1
WF49	510499	198454	Kerbside	100.0	100.0	35.0	32.8	31.5	23.7	24.4
WF50	511057	194895	Kerbside	100.0	100.0	34.4	32.2	31.1	23.3	24.4

☒ Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16.

☒ 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 $\mu\text{g}/\text{m}^3$.

Exceedances of the NO₂ annual mean objective of $40\mu\text{g}/\text{m}^3$ are shown in **bold**.

NO₂ annual means exceeding $60\mu\text{g}/\text{m}^3$, indicating a potential exceedance of the NO₂ 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%).

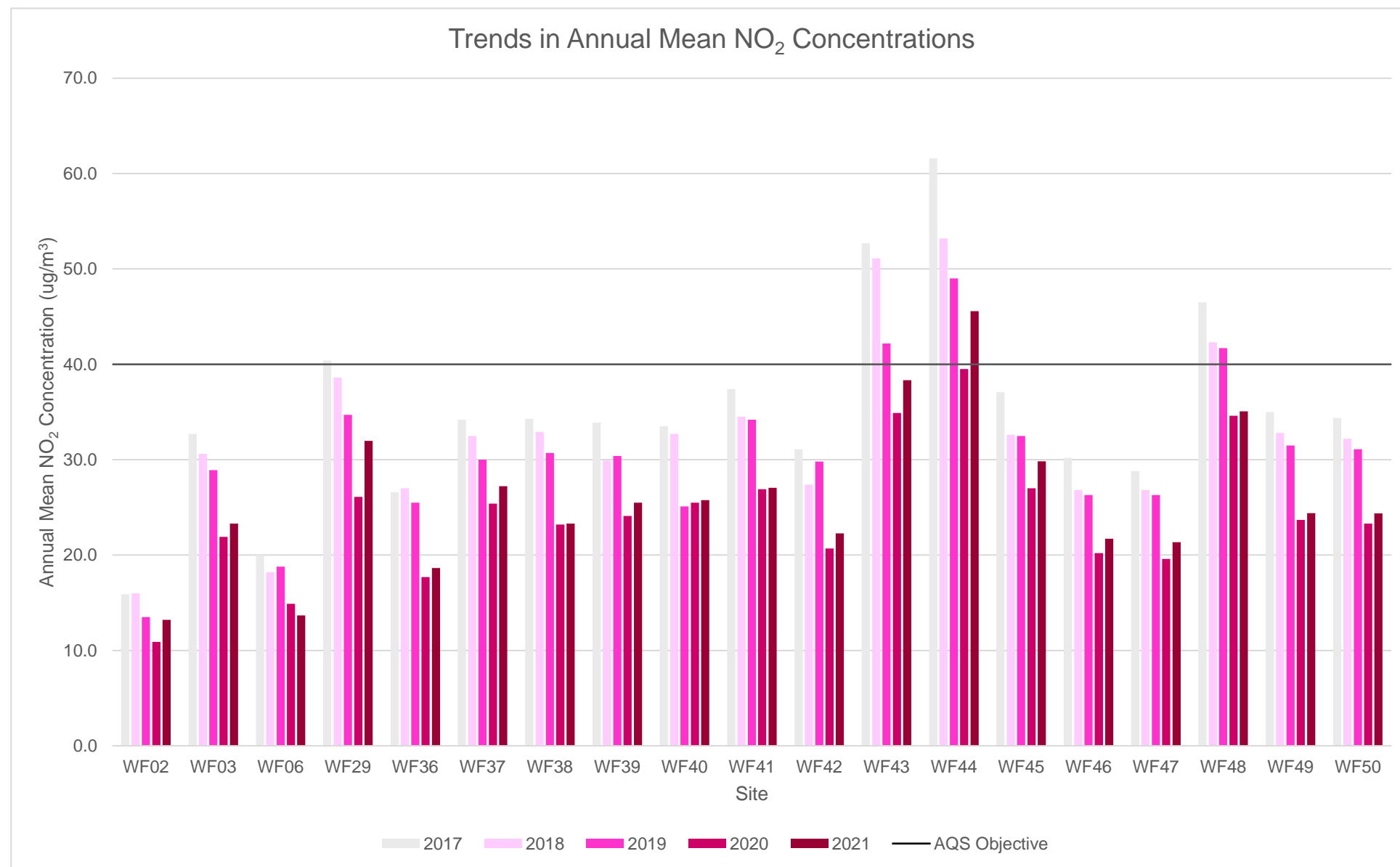
Figure A.1 – Trends in Annual Mean NO₂ Concentrations

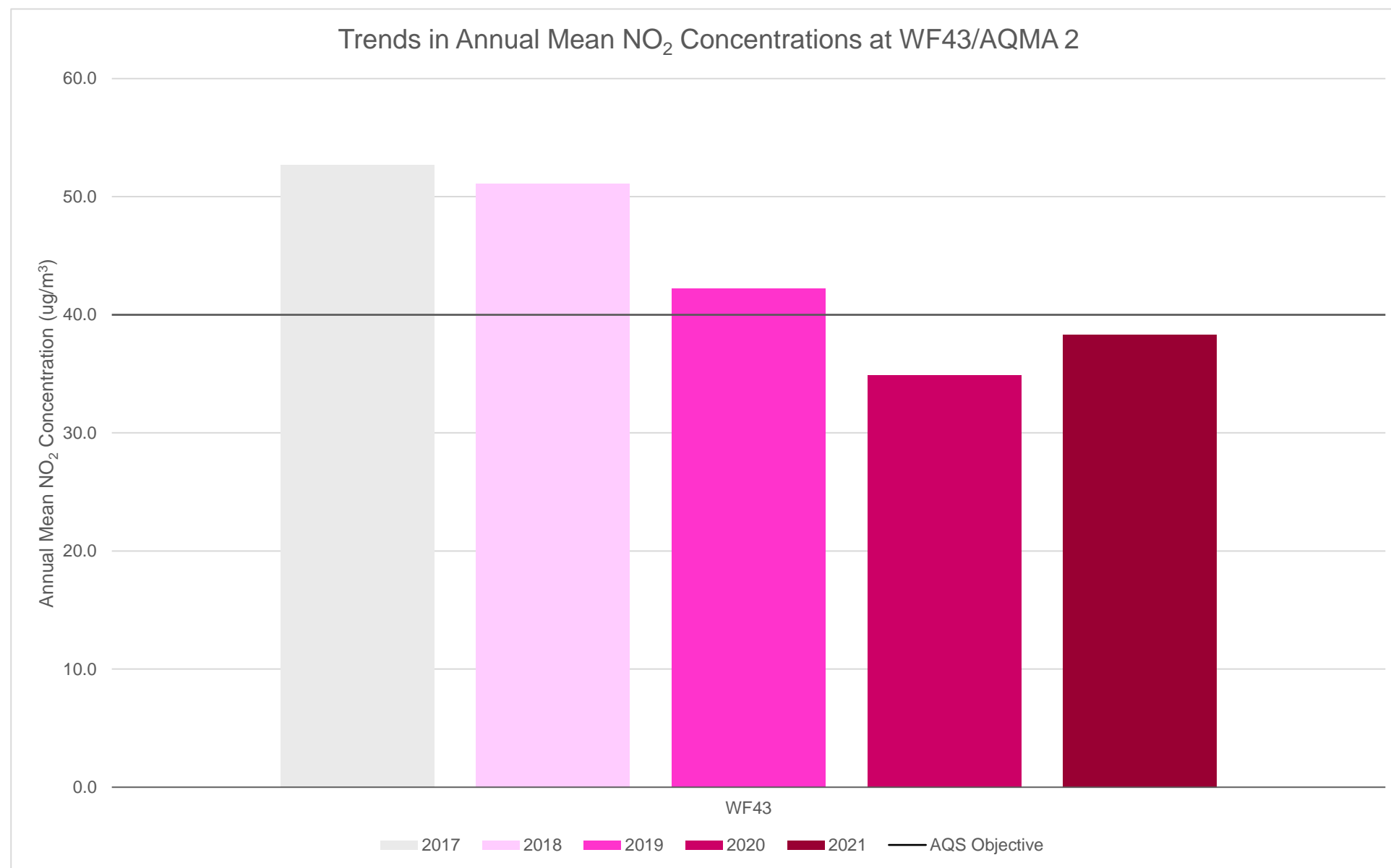
Figure A.2 – Trends in Annual Mean NO₂ Concentrations at WF43/AQMA 2

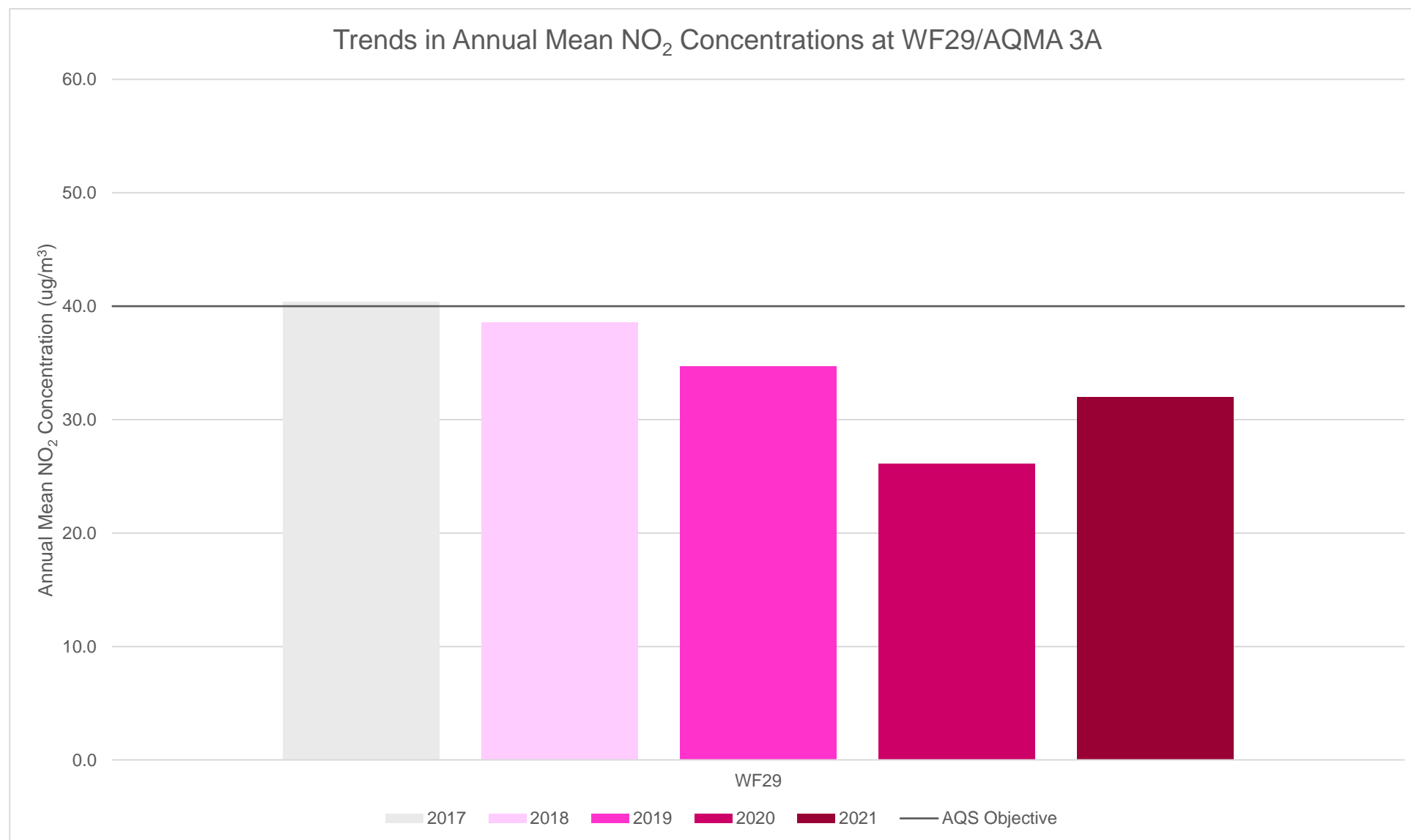
Figure A.3 – Trends in Annual Mean NO₂ Concentrations at WF29/AQMA 3A

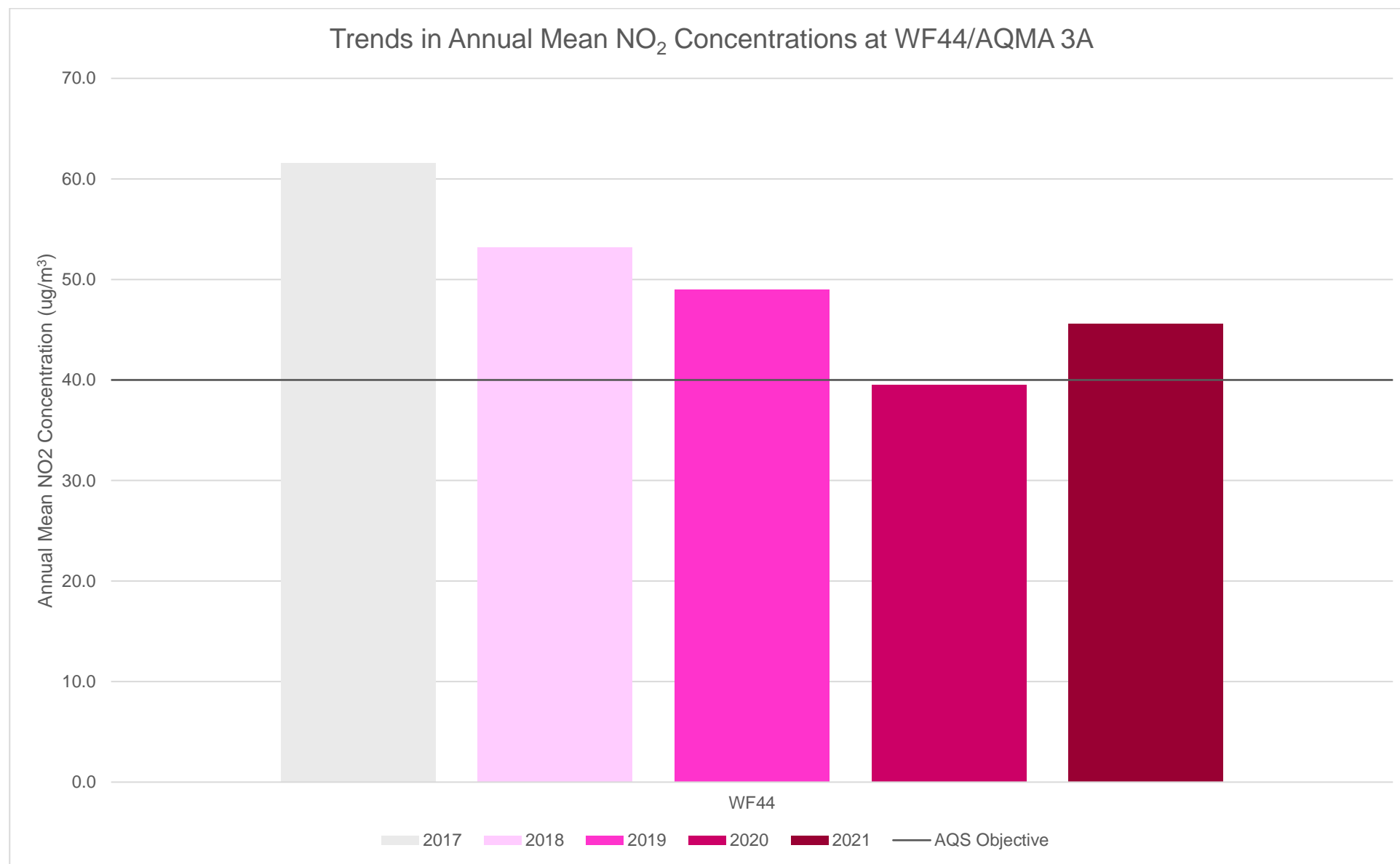
Figure A.4 – Trends in Annual Mean NO₂ Concentrations at WF44/AQMA 3A

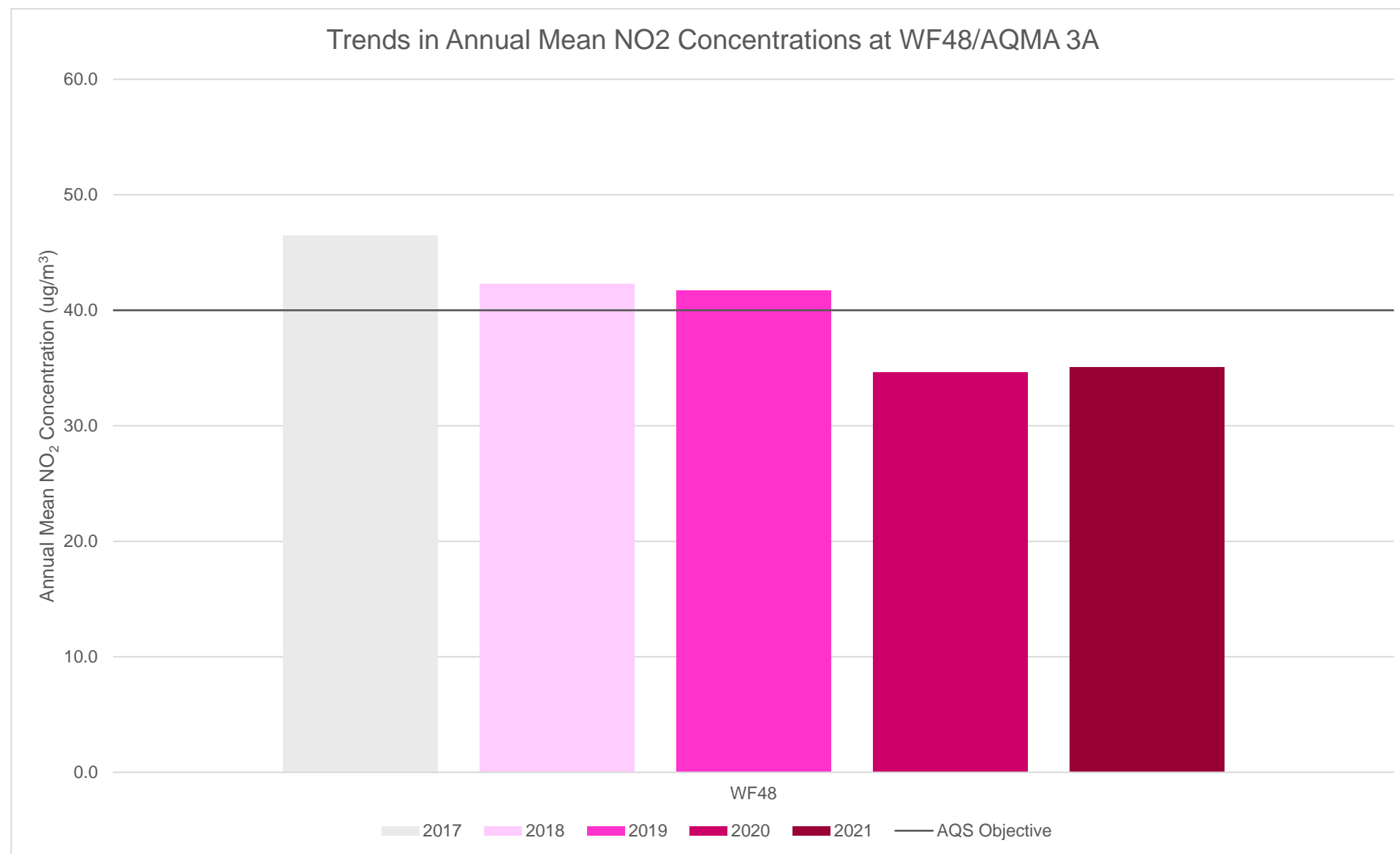
Figure A.5 – Trends in Annual Mean NO₂ Concentrations at WF48/AQMA 3A

Table A.5 – 1-Hour Mean NO₂ Monitoring Results, Number of 1-Hour Means > 200µg/m³

Site 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
WF1	510540	196780	Roadside	85.99	85.99	0	0	0	0	0

Notes:

Results are presented as the number of 1-hour periods where concentrations greater than 200µg/m³ have been recorded.

Exceedances of the NO₂ 1-hour mean objective (200µg/m³ not to be exceeded more than 18 times/year) are shown in **bold**.

If the period of valid data is less than 85%, the 99.8th percentile of 1-hour means is provided in brackets.

(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%).

Table A.6 – Annual Mean PM₁₀ Monitoring Results (µg/m³)

Site 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
WF1	510540	196780	Roadside	99.82	99.82	15	15	15	13	13

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16.**

Notes:

The annual mean concentrations are presented as µg/m³.

Exceedances of the PM₁₀ annual mean objective of 40µg/m³ are shown in **bold**.

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.

(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%).

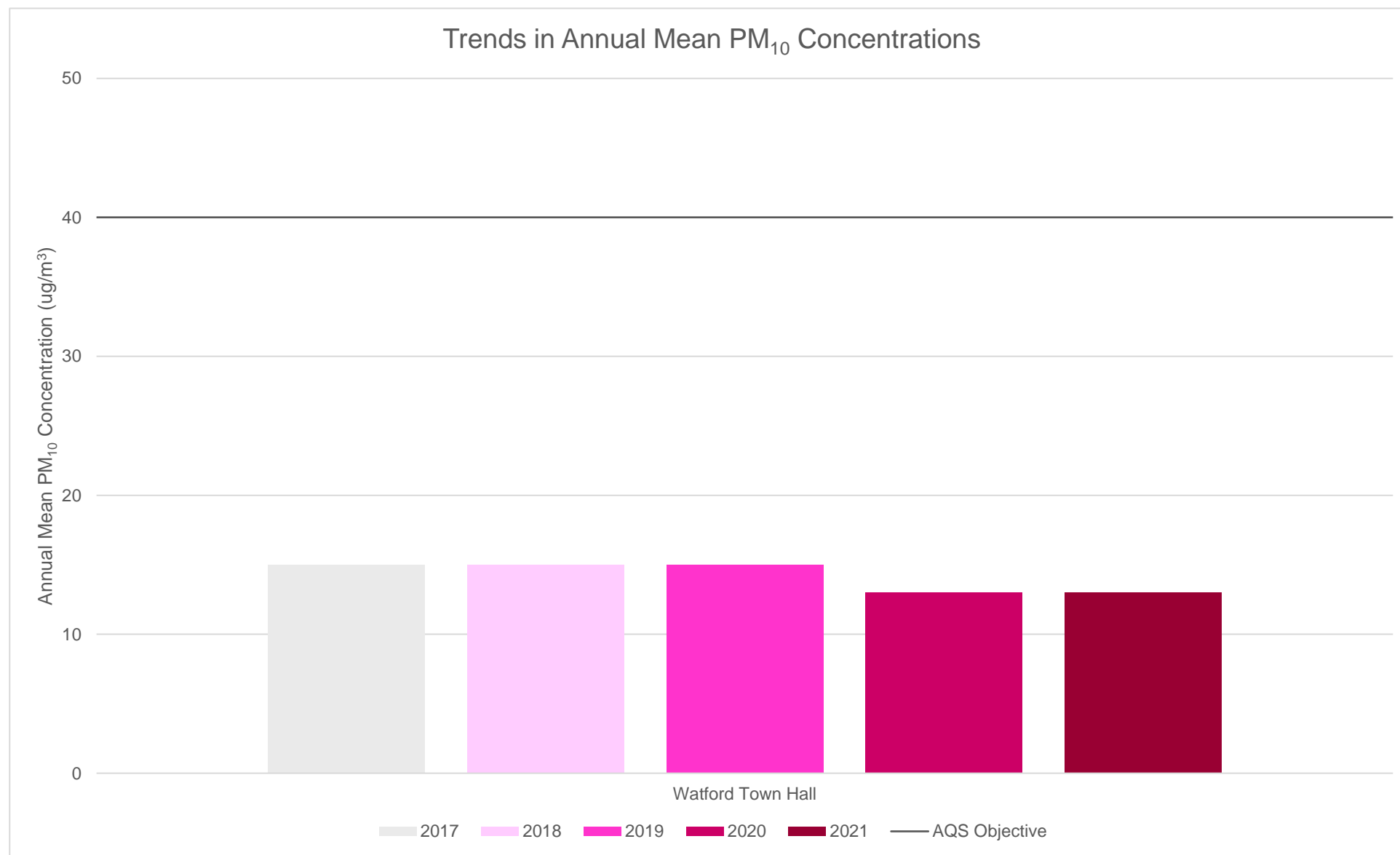
Figure A.7 – Trends in Annual Mean PM₁₀ Concentrations

Table A.7 – 24-Hour Mean PM₁₀ Monitoring Results, Number of PM₁₀ 24-Hour Means > 50µg/m³

Site 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
WF1	510540	196780	Roadside	99.82	99.82	3	1	4	0	0

Notes:

Results are presented as the number of 24-hour periods where daily mean concentrations greater than 50µg/m³ have been recorded.

Exceedances of the PM₁₀ 24-hour mean objective (50µg/m³ not to be exceeded more than 35 times/year) are shown in **bold**.

If the period of valid data is less than 85%, the 90.4th percentile of 24-hour means is provided in brackets.

(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.8 – Trends in Number of 24-Hour Mean PM₁₀ Results > 50µg/m³

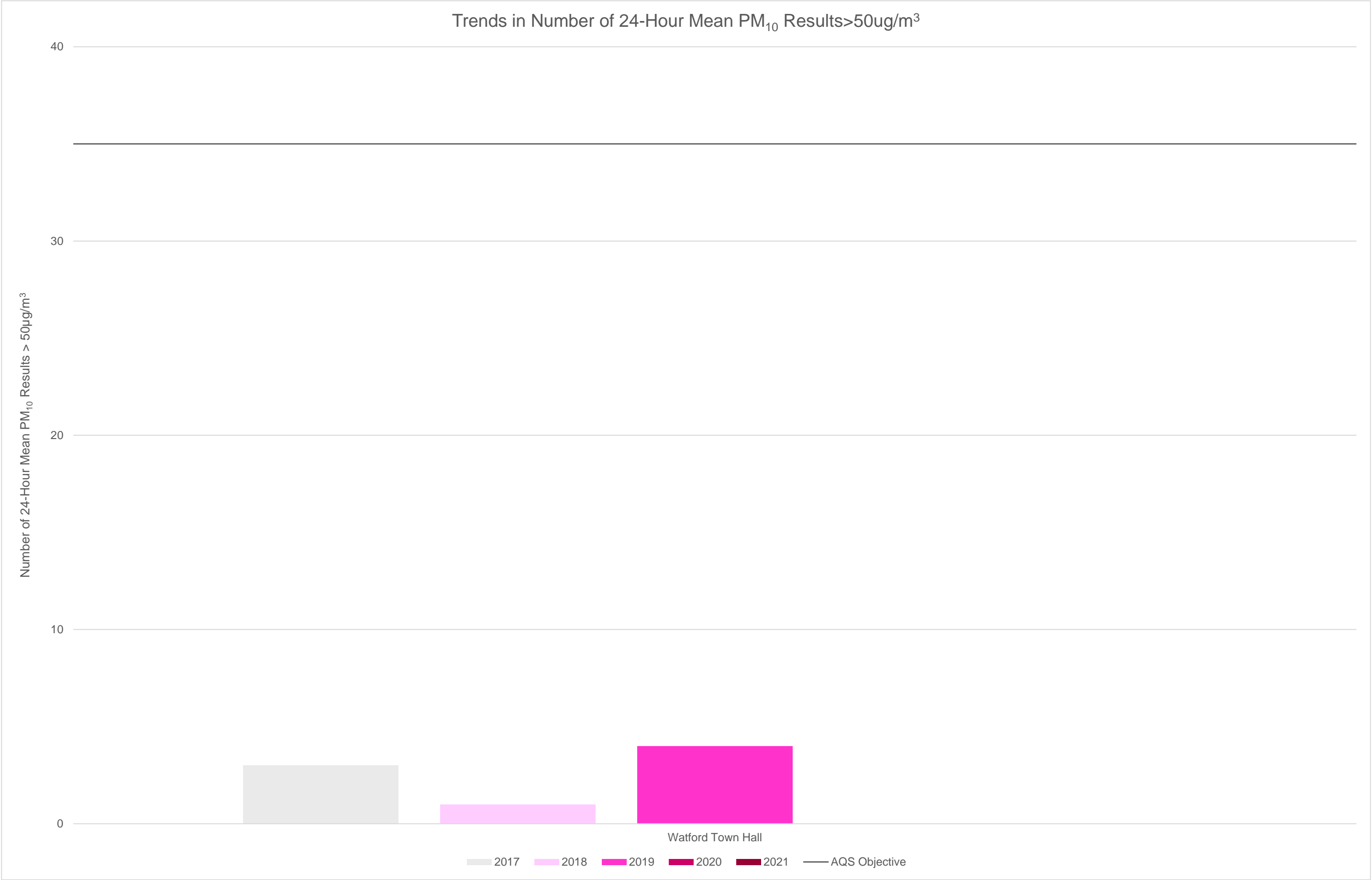


Table A.8 – Annual Mean PM_{2.5} Monitoring Results (µg/m³)

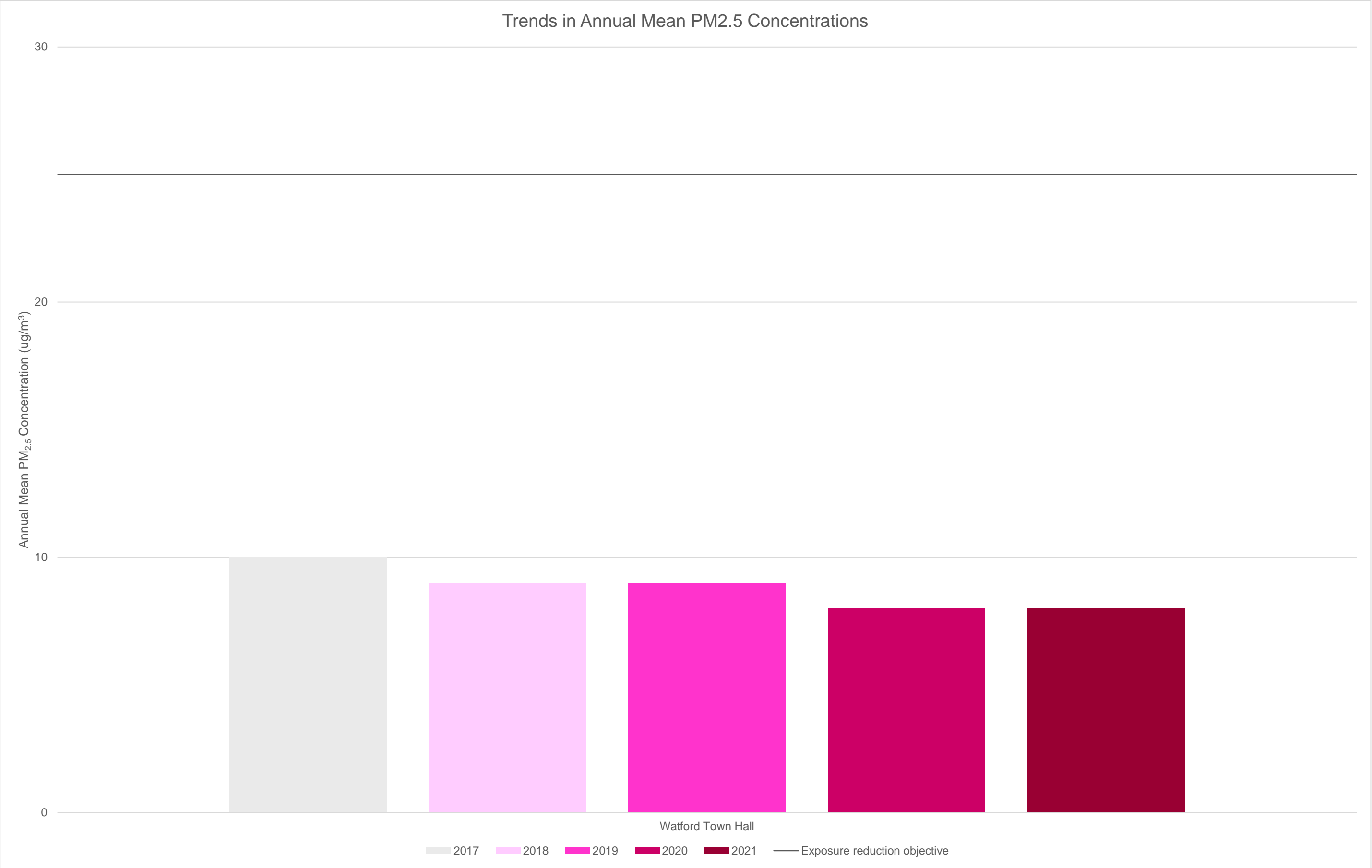
Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2021 (%) ⁽²⁾	2017	2018	2019	2020	2021
WF1	510540	196780	Roadside	99.82	99.82	10	9	9	8	8

☒ Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16.

Notes:

- The annual mean concentrations are presented as µg/m³.
- 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.
- (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.9 – Trends in Annual Mean PM_{2.5} Concentrations



Appendix B: Full Monthly Diffusion Tube Results for 2021

Table B.1 – NO₂ 2021 Diffusion Tube Results (µg/m³)

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Easting)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.78)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
WF02	508700	198950	17.8	18.7	14.0	33.5	8.5	11.2	11.2	12.2	15.4	26.8	16.9	16.9	16.9	13.2	-	
WF03	510570	195800	36.1	35.1	32.3	15.4	27.0	26.2	25.9	19.1	36.8	33.1	36.6	34.8	29.9	23.3	-	
WF06	510985	200710	22.3	21.5	18.8	16.0	11.4		12.8	9.0	18.6	19.1	22.3	20.9	17.5	13.7	-	
WF29	511940	195320	43.6	40.8	43.8	48.5	35.5	38.1	36.5	29.4	43.5	39.6	48.9	43.8	41.0	32.0	-	
WF36	512240	199910	25.9	30.4	24.0	25.0	20.9	21.0	19.0	16.7	27.5	23.4	26.2	26.8	23.9	18.6	-	
WF37	510970	198535	41.3	39.3	34.2	37.5	28.8	29.4	29.9	25.3	41.5	35.1	38.9	37.7	34.9	27.2	-	
WF38	511680	200700	32.5	24.6	31.6	28.9	26.4	27.1	20.4	24.7	39.7	33.6	34.4	34.4	29.9	23.3	-	
WF39	511000	198270	38.7			32.0	28.1	27.5	28.7	19.4	40.1	37.1	37.7	37.6	32.7	25.5	-	
WF40	510930	198000	40.9	36.4	38.9	34.4	29.3	22.8	28.5	21.9	31.8	36.3	40.1	35.1	33.0	25.8	-	
WF41	510850	197780	39.6	38.8	35.4	36.2	33.1	28.3	31.1	20.8	39.5	38.8	39.9		34.7	27.1	-	
WF42	511160	197000	33.7				23.6	20.6	23.5	18.8	30.1	34.5	35.5	36.7	28.6	22.3	-	
WF43	510800	196020	52.2	50.9	50.1	50.3	47.8	51.1	49.0	31.7	55.1	49.3	58.1	44.2	49.2	38.3	34.0	
WF44	511920	195450	55.3	56.5	58.7	63.1	56.3	60.1	55.3	45.2	68.3	50.8	69.8	61.7	58.4	45.6	36.9	
WF45	510750	197230	41.5	29.9	40.9	41.0	37.1	33.6	37.8	36.6	43.4	35.8	44.1	37.3	38.3	29.8	-	
WF46	510565	196800	31.1	26.4	28.5	25.6	24.8	22.0	29.7	18.8	32.9	28.3	34.8	31.1	27.8	21.7	-	
WF47	510335	195610	31.3	28.4	31.5	29.5	16.7	24.1	22.9	19.8	33.1	28.1	32.6	30.6	27.4	21.4	-	
WF48	511725	195619	38.8	41.8	50.6	40.7	45.9	37.3	43.2	37.5	54.7	51.0	53.1		45.0	35.1	-	
WF49	510499	198454	37.2	30.7	30.7	29.1	26.2	23.9	26.2	22.2	39.6	33.7	39.9	35.9	31.3	24.4	-	
WF50	511057	194895	29.0	39.6	36.0	32.9	24.9	23.5	23.7	23.0	37.7	30.9	37.4	36.2	31.2	24.4	-	

- ☒ All erroneous data has been removed from the NO₂ diffusion tube dataset presented in Table B.1.
- ☒ Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16.
- ☒ National bias adjustment factor used.
- ☒ Where applicable, data has been distance corrected for relevant exposure in the final column.
- ☒ Watford Borough Council confirm that all 2021 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System.

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**.

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 Watford During 2021

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

Additional Air Quality Works Undertaken by Watford Borough Council During 2021

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

QA/QC of Diffusion Tube Monitoring

Diffusion tubes were supplied by SOCOTEC in 2021. The method of preparation used was 50% TEA (triethanolamine) in acetone.

SOCOTEC are UKAS accredited. Diffusion Tubes were analysed in accordance with SOCOTEC's standard operating procedure ANU/SOP/1015. This method meets the guidelines set out in DEFRA's 'Diffusion Tubes For Ambient NO₂ Monitoring: Practical Guidance.'

SOCOTEC participate in the AIR PT intercomparison scheme for comparing spiked Nitrogen Dioxide diffusion tubes. SOCOTEC currently holds the highest rank of a satisfactory laboratory.

In the most recent round (AIR PT AR042 January-March 2021), 100% of results submitted were determined to be satisfactory.

SOCOTEC were considered to have good diffusion tube precision in 2020.

Monitoring was completed in adherence with the 2021 Diffusion Tube Monitoring Calendar.

Diffusion Tube Annualisation

All diffusion tube monitoring locations within Watford 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 2020 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/NO₂ continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

Watford Borough Council have applied a national bias adjustment factor of 0.78 to the 2021 monitoring data. A summary of bias adjustment factors used by Watford Borough Council over the past five years is presented in Table C.1.

The national bias adjustment factor was taken from spreadsheet version no. 03/22. Twenty-three studies are applicable to the factor.

Table C.1 – Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2021	National	03/22	0.78
2020	National	03/21	0.77
2019	National	Not recorded	0.75
2018	National	Not recorded	0.76
2017	National	Not recorded	0.77

NO₂ Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO₂ concentration at the nearest location relevant for exposure has been estimated using the Diffusion Tube Data Processing Tool/NO₂ fall-off with

distance calculator available on the LAQM Support website. Where appropriate, non-automatic annual mean NO₂ concentrations corrected for distance are presented in Table B.1.

Fall-off-with-distance calculations were required for WF43 and WF44, the bias adjusted annual mean concentration was within 10% of the objective at WF44. The output from the Diffusion Tube Data Processing Tool are presented in Table C.4.

QA/QC of Automatic Monitoring

Ricardo Energy & Environment complete data management and Local Site Operator (LSO) duties for the Council's automatic monitoring site.

Calibrations are carried out monthly, UKAS ISO 17025 QC audits are undertaken twice yearly. Servicing and maintenance is carried out by Enviro Technology Services Ltd.

Monitoring data is ratified in accordance with The Air Quality Data Validation and Ratification Process used for the UK Automatic Urban and Rural Monitoring Network (AURN). The monitoring data presented within the ASR is ratified.

Live and historic data is available at https://www.airqualityengland.co.uk/local-authority/?la_id=408.

PM₁₀ and PM_{2.5} Monitoring Adjustment

The type of PM₁₀/PM_{2.5} monitor(s) utilised within Watford Borough Council do not required the application of a correction factor.

Automatic Monitoring Annualisation

All automatic monitoring locations within Watford Borough Council recorded data capture of greater than 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.

NO₂ Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO₂ concentration at the nearest location relevant for exposure has been estimated using the NO₂ fall-off with distance calculator available on the LAQM Support website. Where appropriate, non-automatic annual mean NO₂ concentrations corrected for distance are presented in Table B.1.

No automatic NO₂ monitoring locations within Watford Borough Council required distance correction during 2021.

Table C.4 – NO₂ Fall off With Distance Calculations (concentrations presented in µg/m³)

Site ID	Distance (m): Monitoring Site to Kerb	Distance (m): Receptor to Kerb	Monitored Concentration (Annualised and Bias Adjusted)	Background Concentration	Concentration Predicted at Receptor	Comments
WF43	2.0	6.0	38.3	21.3	34.0	
WF44	2.0	8.0	45.6	18.9	36.9	Predicted concentration at Receptor within 10% the AQS objective.

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

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

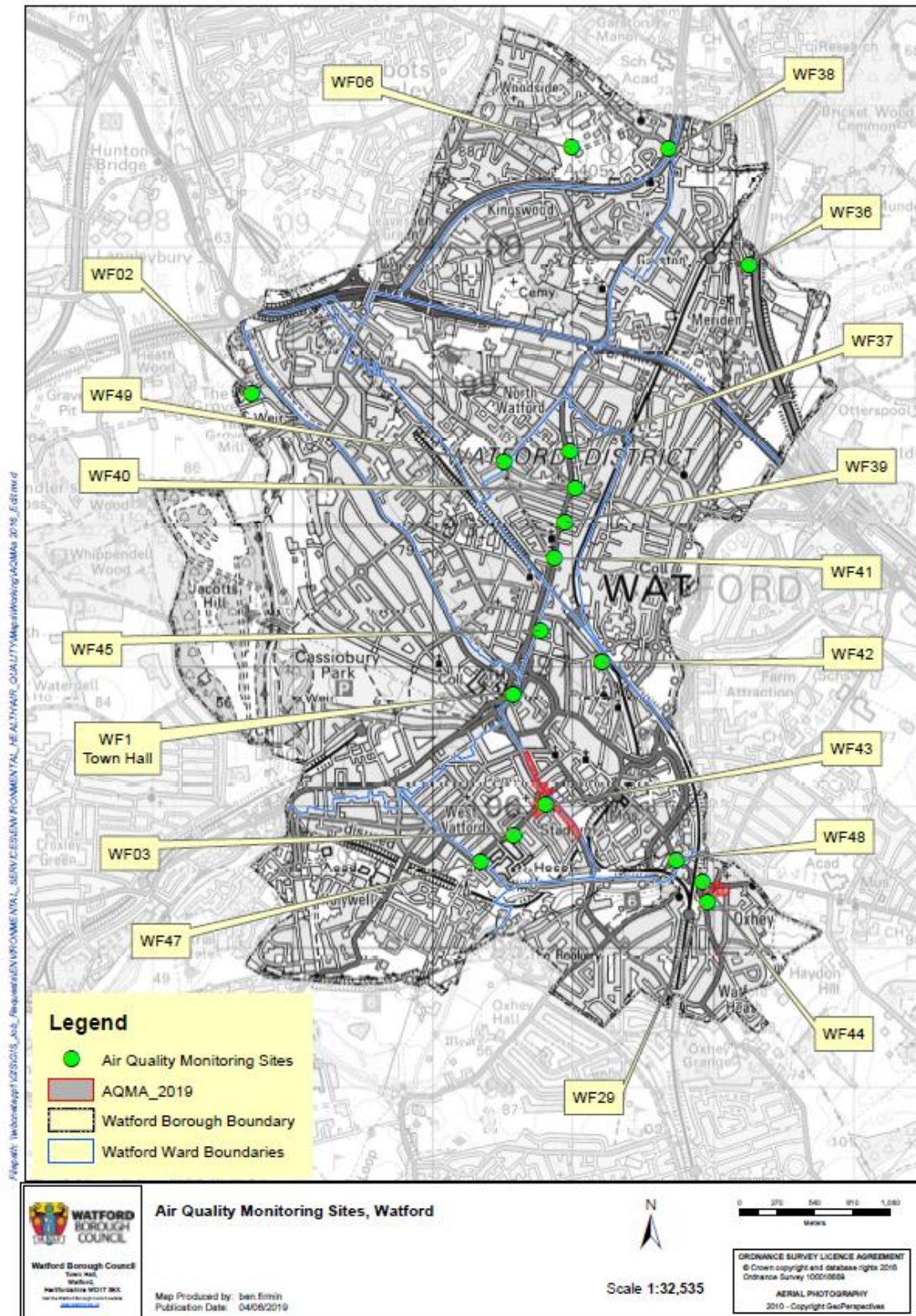


Figure D.2: Map showing Vicarage Road Air Quality Management Area No.2

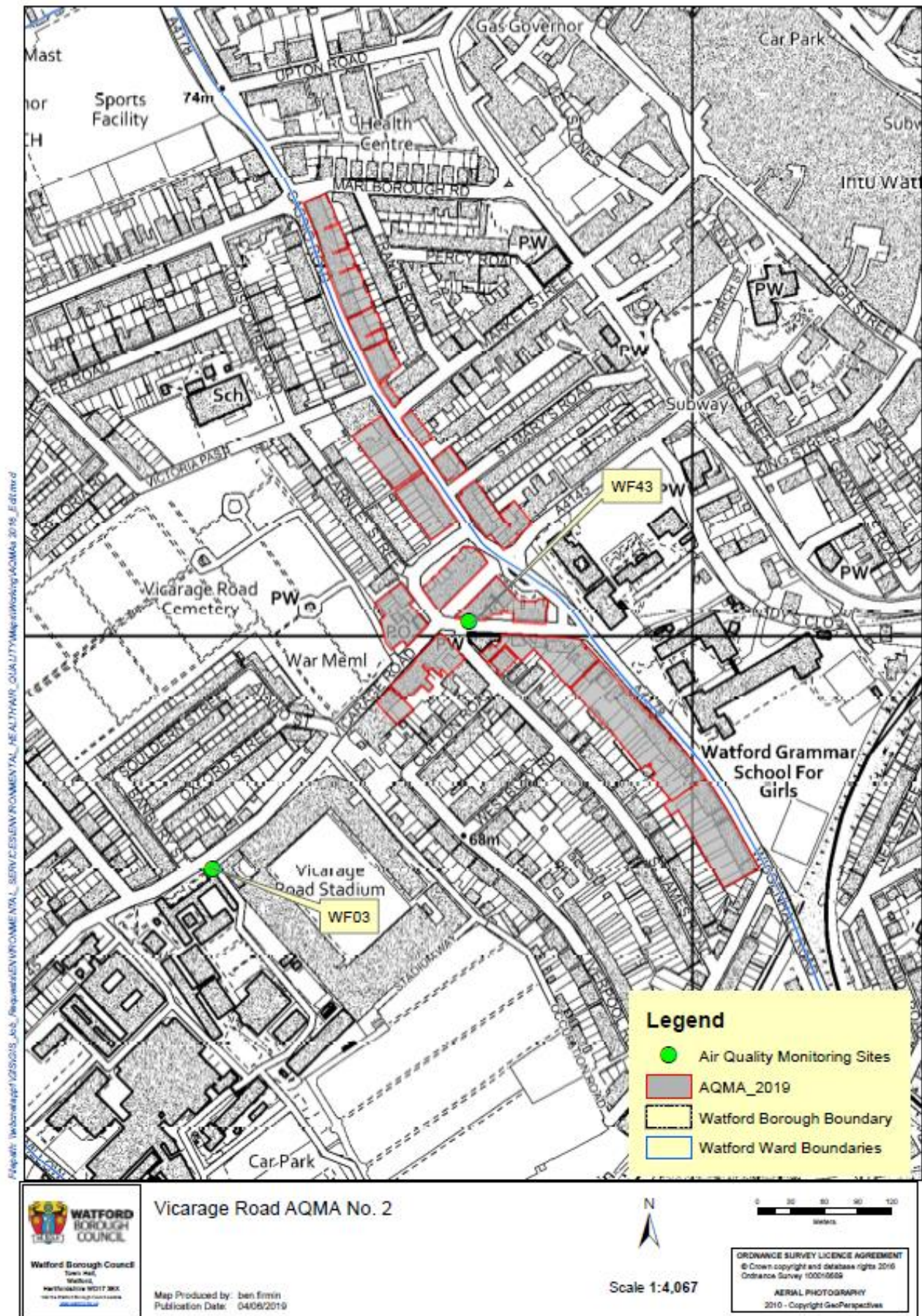
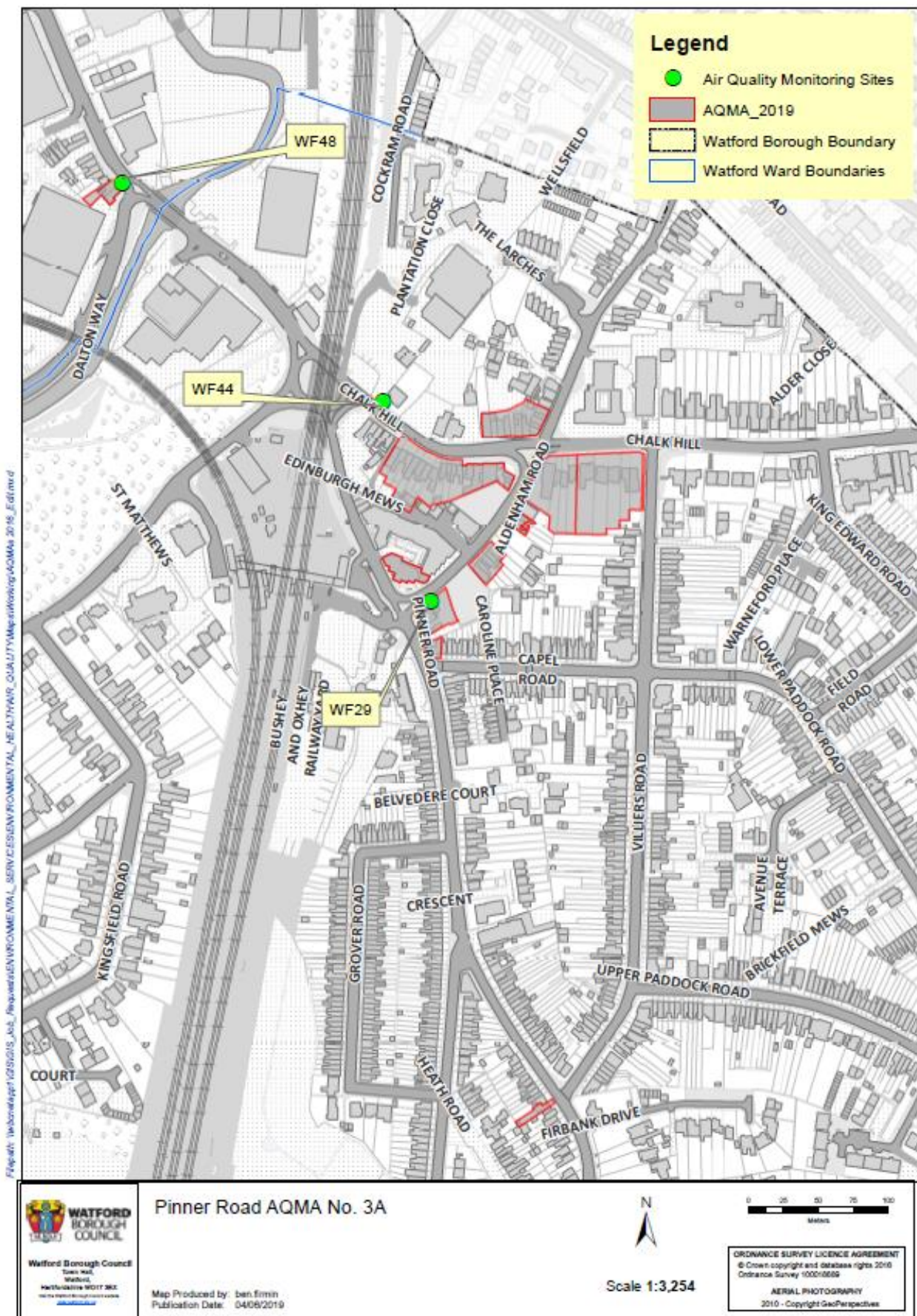


Figure D.3: Map showing Pinner Road Air Quality Management Area No.3A



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England⁷

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

*The current air quality objectives are set out in the Air Quality (England) Regulations 2000, as amended by the Air Quality (England) Regulations 2002. These regulations provide the statutory basis for the air quality objectives under LAQM in England. There is not currently an air quality objective for PM_{2.5}.

Local Authorities in England have a role in working towards reducing emissions and concentrations of PM_{2.5}. There is an exposure reduction objective for PM_{2.5} of 25ug/m³ as an annual mean (to be achieved by 2020 and maintained thereafter). There is also a target of a 15% reduction in concentrations at urban background sites between 2010 and 2020. These objectives were included in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland published in 2007.

⁷ 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	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

References

Carr, D. (2022) Hertfordshire Local Authorities Report on Particulate Matter (PM_{2.5}) in Ambient Air in 2020 for Hertfordshire County Council Public Health. Available from: <https://www.airqualityengland.co.uk/local-authority/hnb-reports>.

Conlon, B. (2011) *Watford Borough Council Air Quality Action Plan April 2011*. AEA Group. Report Ref. ED4800001-Issue 1.

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