Calderdale Metropolitan Borough Council

Annual Status Report 2022

Bureau Veritas

June 2022

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Document Control Sheet

Identification	
Client	Calderdale Metropolitan Borough Council
Document Title	Calderdale Metropolitan Borough Council – 2022 Annual Status Report
Bureau Veritas Ref No.	AIR14631114

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Configuration				
Version	**Date**	**Author**	**Reason for Issue/Summary of Changes**	**Status**
V1	01/06/2022	C Danby	Draft for comment	Draft
V2	21/06/2022	C Danby	Incorporating client comments	Final

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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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Date	June 2022

Executive Summary: Air Quality in Our Area

Air Quality in Calderdale

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].

In Calderdale, the air quality is generally good, owing to the large amount of rural land. However, there are some areas where the NO_2 annual mean objective is exceeded, as vehicle emissions are trapped in the small space created by buildings near roads ('street canyons'). Currently, Calderdale has eight Air Quality Management Areas (AQMAs), all of which have been declared alongside major roads in response to exceedances of the annual mean objective for NO_2. The most recent AQMA (Calderdale No.8 New Bank) was declared on 26th February 2020 along the A58 at New Bank. Additional information including further assessment reports is available on Calderdale Metropolitan Borough Council's AQMA page.

In 2021, the measured concentration of NO_2 increased within five of the eight AQMAS, and is likely reflective of the increased travel activity relative to 2020, when there was more COVID-19 restrictions. Indeed, compared to 2019 when travel activity was at pre-pandemic levels, the concentrations in 2021 within the eight AQMAs is lower in all but one AQMA. Therefore, excluding the 2020 COVID-19 impacts, the concentrations within AQMAs is

[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

decreasing. However, it should be noted that some COVID-19 restrictions were still in place at the start of 2021 and could likely have impacted pollutant concentrations.

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.

Calderdale Metropolitan Borough Council's 2019 Air Quality Action Plan (AQAP) outlines a number of key actions that are being undertaken to tackle sources of air pollution. A source appointment exercise (carried out in 2017) identified that road traffic was the main source of air pollution within the eight declared AQMAs. Therefore, the main focus points include:

- Promoting low emission transport by encouraging the uptake and use of ultra-low emission vehicles (ULEVs).
- Facilitating the use of public transport by increasing the interconnectivity of the transport hub to control urban traffic congestion, prioritising public transport.
- Encouraging active travel by improving infrastructure (i.e. developing cycleways).
- Promoting the use of alternative fuels by providing electrical vehicle (EV) charging points and offering incentives such as discounted parking for EVs.
- Providing accessible information to the public to influence behaviour change.

Transport and infrastructure projects feature prominently within the 2019 AQAP, as road traffic is the main source of pollution within the borough (particularly in AQMAs). As vehicle standards are beyond the control of Calderdale Metropolitan Borough Council, the AQAP is designed to influence other aspects of the road transport system. For example, the primary

[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

focus is on enhancing infrastructure that will reduce congestion, improve the flow of traffic and encourage people to use a more active form of travel (i.e. walking/cycling). Therefore, the AQAP directly targets road traffic, which is the main source of pollution in each AQMA.

Conclusions and Priorities

During 2021, the annual mean NO_2 concentration increased at 30 diffusion tube sites, the majority of which are in AQMAs. As road traffic is the main source of air pollution in the eight AQMAs, this is likely reflective of the increased travel activity compared to 2020 when there were more COVID-19 restrictions in place. Indeed, compared to 2019 (not impacted by COVID-19), the NO_2 annual mean is lower in 2021 in each of the AQMAs, except for AQMA No.1 (Salterhebble). The maximum annual mean NO_2 concentration was 53.2 µg/m^3 (before distance correction) at site LV-NBN, which is within AQMA No.8 (New Bank). Based upon the latest monitoring, Calderdale Metropolitan Borough Council do not plan to revoke any of the eight AQMAs. The PM_{10} and $PM_{2.5}$ monitoring completed within the borough continues to show compliance with the relevant annual mean and short-term objectives. Therefore, the NO_2 annual mean continues to be the primary concern.

In order to tackle the exceedance of the NO_2 annual mean objective of 40 µg/m^3, the 2019 AQAP mainly focuses on methods to reduce vehicle emissions. One key priority is to bid for funding to install EV charging points that facilitate the use of ULEVs. Calderdale Metropolitan Borough Council are therefore committed to actively finding ways to encourage a more active form of travel that reduces the dependence on private vehicle use. By promoting travel alternatives, the NO_2 annual mean concentration within AQMAs should start to decrease.

Local Engagement and How to get Involved

Calderdale Metropolitan Borough Council are committed to raising the awareness of the impacts of poor air quality with the public. For example, improvements to public engagement are underway, ranging from web page improvements to making live monitoring data publicly available. As well as raising awareness, Calderdale Metropolitan Borough Council intend to involve public engagement into policy decisions that impact upon travel. Indeed, Priority 4 in the 2019 AQAP is to encourage public engagement and interest through improved communication and community involvement. Calderdale libraries obtained funding for a project named ‘Something in the Air?’ which, in partnership with local organisations and academic researchers, aims to educate the public on the impacts of air pollution. The project

involves the public in air quality issues in an attempt to make them think more deeply and consider the changes they could make. The focus of the initial project was to engage members of the public in the Sowerby Bridge (AQMA No.2) area, however following the success of the project, this is to move to the town of Hebden Bridge (AQMA No.3) in 2022.

Local Responsibilities and Commitment

This ASR was prepared by the Bureau Veritas on behalf of Calderdale Metropolitan Borough Council with the support and agreement of the following officers and departments:

Derek Benn (Community Safety Partnership Manager)

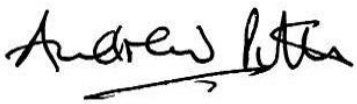
Kate Ryley (Senior Environmental Health Manager)

Arron Hanson (Pollution Control Officer)

Environmental Health & Community Protection Team

This ASR has been approved by:

Andrew Pitts (Assistant Director, Neighbourhoods)



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

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1 Local Air Quality Management

This report provides an overview of air quality in Calderdale 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 Calderdale Metropolitan 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.

A summary of AQMAs declared by Calderdale Metropolitan Borough Council can be found in Table 2.1. The table presents a description of the eight AQMAs that are currently designated within Calderdale. Appendix D: Maps of Monitoring Locations and AQMAs provides maps of the AQMAs and also the air quality monitoring locations in relation to the AQMAs. The air quality objectives pertinent to the current AQMA designations is for the NO_2 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
Calderdale No. 1 Salterhebble	Declared October 2005, amended April 2014	NO_2 Annual Mean	Stretch of the A629 south of Dryclough Lane	YES	46 µg/m^3	53.1 µg/m^3	AQAP 2019	AQAP 2019
Calderdale No.2 Sowerby Bridge	Declared July 2006	NO_2 Annual Mean	A58 through central Sowerby Bridge	YES	53 µg/m^3	37.0 µg/m^3	AQAP 2019	AQAP 2019
Calderdale No.3 Hebden Bridge	Declared August 2006	NO_2 Annual Mean	A646 through town centre	YES	48 µg/m^3	42.6 µg/m^3	AQAP 2019	AQAP 2019
Calderdale No.4 Luddendenfoot	Declared July 2007, amended March 2014	NO_2 Annual Mean	A646 through town centre	YES	50 µg/m^3	32.0 µg/m^3	AQAP 2019	AQAP 2019
Calderdale No.5 Stump Cross	Declared July 2007	NO_2 Annual Mean	A58 at junction of Leeds Road and Bradford Road	YES	58 µg/m^3	32.3 µg/m^3	AQAP 2019	AQAP 2019
Calderdale No.6 Brighouse	Declared July 2007, amended March 2014	NO_2 Annual Mean	Encircling town centre	YES	51 µg/m^3	43.6 µg/m^3	AQAP 2019	AQAP 2019
Calderdale No.7 Hipperholme	Declared March 2014	NO_2 Annual Mean	A58 Leeds Road close to junction with Brighouse Road	YES	47 µg/m^3	42.3 µg/m^3	AQAP 2019	AQAP 2019
Calderdale No.8 New Bank	Declared February 2020	NO_2 Annual Mean	A58 east of Halifax town centre	YES	42 µg/m^3	53.2 µg/m^3	AQAP 2019	AQAP 2019

☒ **Calderdale Metropolitan Borough Council confirm the information on UK-Air regarding their AQMAs is up to date.**

☒ **Calderdale Metropolitan Borough Council confirm that all current AQAPs have been submitted to Defra.**

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

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

"Calderdale Metropolitan Borough Council have reviewed their AQMA designations. Whilst AQMAs 4 and 5 are now compliant and have been for two and four consecutive years respectively, the Council are not considering revocation at this time. If these AQMAs continue to show low concentrations (less than 36 µg/m^3), the Council should consider revocation. The Mytholmroyd area has seen exceedances in past years but did not exceed in 2020. The Council are not declaring an AQMA here but are instead monitoring closely. The Councils review of AQMAs is supported, and an update is expected in the 2022 ASR".

- Although the maximum NO_2 annual mean concentration in AQMA No.4 (32.0 µg/m^3) and No.5 (32.3 µg/m^3) is below the air quality objective in 2021, there is currently no plans by Calderdale Metropolitan Borough Council to revoke these AQMAs. This is owing to the unprecedented reductions caused by COVID-19 restrictions. However, this will be considered over the next year. The NO_2 annual mean limit was also not exceeded in the Mytholmroyd area, therefore no AQMA is to be declared in this area.

"The report mentions a planning application and a new access route identified as potential new or changed sources of pollution in the borough. This is encouraged, and the next ASR should provide an update to this".

- The NO_2 annual mean concentration at the five diffusion tubes in the Mytholmroyd area was lower in 2021 than in 2020, suggesting that the new access route has eased congestion (i.e. less stopping and starting of vehicles).

"Trends have been presented, with a robust comparison to the air quality objective. The Council have also discussed how COVID-19, and flooding as a result of Storms Ciara and Dennis, have impacted road traffic and pollution within the Borough. This analysis demonstrates the Councils commitment to understanding trends within the Borough and is commended".

- Both long-term (2017-2021) and short-term (2020-2021) trends have been discussed in the 2022 ASR, whilst making reference to the relevant air quality objectives.

"Graphs displaying trends in pollutant concentrations have been included to support the reports trend analysis. However, annual mean NO_2 results from the three continuous

monitors (AQS2, 3 and 4) have not been presented. It would be beneficial to include this for completeness in future reports".

- Automatic data has been presented and graphed, relative to the 5-year trend.

"Table 2.2 is missing information regarding funding status and cost of measures".

- Information on the funding status of each measure to improve air quality has been included in the 2022 ASR.

"AQC1, 2 and 3 appears to be one triplicate (three tubes are one location) as the OS grid reference coordinates are the same. However, results for each tube have been presented individually. This is a possible source of confusion and should be clarified. If AQC1, 2 and 3 is a single triplicate location, an average of the three diffusion tubes would suffice".

- AQC1, 2 and 3 has been classified as a triplicate location in the diffusion tube data processing tool (DTDPT), and therefore an average of the three tubes is provided.

"A local bias adjustment factor has been calculated and applied to the monitoring data. The national bias adjustment factor could be presented for comparison".

- Both the national and local bias adjustment factor are presented in the 2022 ASR, with a justification provided for which was used to bias adjust the diffusion tube data.

Calderdale Metropolitan 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. 29 measures are included within Table 2.2, with the type of measure and the progress Calderdale Metropolitan 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 their respective Action Plans (see Calderdale 2019 Air Quality Action Plan).

Key completed measures are:

- *Travel Alternatives:* Installation of EV charging points at 10 locations, including Bethel Street car park in Brighouse, Market Place car park in Hebden Bridge and West Street car park in Sowerby Bridge. Over 70 cycle storage facilities (stands, shelters and lockers) have been installed across the borough, with the majority in key areas such as AQMAs (i.e. in Brighouse, Hebden Bridge and Sowerby Bridge).
- *Public Information:* Live automatic monitoring data is now available online, freely accessible to members of the public.

- *School Streets:* Introduced at over 10 schools in July 2020 as part of an initial trial, with more added in 2021 (i.e. Trinity Academy, effective from 28th June 2021).

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

- The 'Clean Air for All in Calderdale' strategy (currently in draft format), with strategies to be agreed. This strategy was formed following the completion of the 2021 ASR.
- The 'Active Calderdale' campaign which promotes alternative forms of travel.

Calderdale Metropolitan Borough Council's priorities for the coming year are:

- Priority 1: Promoting alternatives to private vehicle use, recognising the contribution of diesel vehicles and bidding for ULEV funding whenever possible.
- Priority 2: Improving the transport network infrastructure, as set out in Calderdale Metropolitan Borough Council's Transport Strategy and Local Plan.
- Priority 3: Developing awareness of impacts and remedies, and integrating the priorities of other strategies and frameworks, such as public health (active travel), sustainability (carbon reduction strategy) and local planning (sustainable development).
- Priority 4: Encouraging public engagement and interest through improved communication and community involvement.

Alongside the four priorities listed in the AQAP, Calderdale Metropolitan Borough Council aim to obtain funding via the West Yorkshire Low Emissions Strategy (WYLES) group for initiatives that will help reduce air pollution.

Progress on implementing some of the measures has been slower than expected due to COVID-19. This is because staff were absent due to either contracting COVID-19 or being allocated with COVID-19 duties. Calderdale Metropolitan Borough Council are however committed to progressing these measures during the current reporting year.

Calderdale Metropolitan Borough Council anticipates that the measures stated below in Table 2.2 will achieve compliance in all of the eight AQMAs that are currently declared. This is owing to the fact that the measures are directed towards road traffic emissions, which is the main source of pollution in the AQMAs. Therefore, by implementing the measures in Table 2.2, the NO_2 annual mean should begin to comply with the air quality objective.

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
AQAP 1 (1)	Achieve better understanding of local air quality, including monitoring and source appointment	Transport and Planning Infrastructure	Other	2009 – 2020	Ongoing	Calderdale MBC, neighbouring authorities, tools from Defra, WYCA	Calderdale MBC, neighbouring authorities, tools from Defra, WYCA	No	Partially funded	< £10k	Implementation	Neutral	Data collection	Monitoring contracts extended. Live data now on website air quality dashboard	Funding ended 2019
AQAP 1 (2)	Traffic flow and network improvements	Traffic Management	UTC, congestion management, traffic reduction	Current	Ongoing	CMBC, Highways England, neighbouring authorities, WYCA	CMBC, Highways England, neighbouring authorities, WYCA	No	Partially funded	< £10k	Implementation	Neutral	Improved traffic flows and reduced queue lengths at key network points	Implementation ongoing	Funding
AQAP 1 (3)	Urban Traffic Control (UTC) Improvements	Traffic Management	UTC, congestion management, traffic reduction	Current	To be included in major projects and corridor improvement plans. Further VMS included in Phase 4 scheme for A629	Calderdale MBC, neighbouring authorities	Calderdale MBC, neighbouring authorities	No	Not funded	< £10k	Implementation	Some reduction due to improved flows of traffic	Improved traffic flows and reduced queue lengths at key network points, less parking space hunting	Proposal to link all signals in centralised system (UTC) based in Leeds. Variable message Signs giving route-specific messages now established. Development of a new parking strategy commended. Draft strategy completed. APPY parking technology now in use in town centres.	Modified since original action plan
AQAP 1 (4)	Handling Emissions Data (Emissions Factor Toolkit)	Transport planning and infrastructure	Other	Current	Ongoing	Calderdale MBC, tools from Defra	Calderdale MBC, tools from Defra	No	Not funded	< £10k	Implementation	Neutral	Effectiveness of predictions	Informs annual status report	N/A
AQAP 2 (1)	Improve air quality web pages – access to live data	Public Information	Via the internet	2019	September 2019	Calderdale MBC	Calderdale MBC	No	Not funded	< £10k	Completed	Indirect, may influence behavioural change	Web traffic / customer satisfaction	Web pages updated – live data now online	N/A
AQAP 2 (2)	Clean Air Campaign	Public Information	Via the internet / social media / other	June 2019	Ongoing	Calderdale MBC	Calderdale MBC	No	Not funded	< £10k	Implementation	Moderate impact behaviour change	Social media analytics	Successful event including branded messaging launched in June 2019	N/A
AQAP 2 (3)	Investigate Freight Partnership	Freight and Delivery Management	Freight partnerships for city centre deliveries	2019 onwards	2021	Kirklees MBC, Calderdale MBC, Highways England	Kirklees MBC, Calderdale MBC, Highways England	No	Partially funded	< £10k	Planning	Significant improvements in longer term	Number of partners signed up	Preliminary work with operators	Resources to engage with potential partners
AQAP 3 (1)	Promote high occupancy travel	Transport Planning and Infrastructure	Strategic highways improvement, re-prioritising	Ongoing	Ongoing	Calderdale MBC, neighbouring authorities	Calderdale MBC, neighbouring authorities	No	Not funded	< £10k	Planning	Modest reduction in road emissions	Reduction in vehicle numbers	Campaign 2018	Resource and partner commitments
AQAP 3 (2)	Cycling infrastructure improvements and facilities	Promoting Travel Alternatives	Promotion of cycling	2018 onwards	Ongoing	Calderdale MBC	Calderdale MBC	No	Not funded	< £10k	Implementation	Significant improvements in longer term	Increases in numbers cycling and reduction in car use, kilometres of new cycle paths	Calderdale Cycling Forum (CCF) reports into the cabinet transport working party, CCF meets regularly made up of Calderdale cycle reps council officers, members, schools & other stakeholders. Upgrade of Upper Valley Towpath complete to Hebden Bridge – further work planned in Phase 2 to Todmorden is underway. Hebble Trail extension plan now developed. Now incorporated into the WYTF Phase 4	Funding and staffing resources. Land ownership

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
AQAP 3 (3)	Active Calderdale Campaign	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	Ongoing	2022	Calderdale MBC	Calderdale MBC	No	Not funded	< £10k	Implementation	Low impact on emissions, but reduced exposure	Increases in cycling and walking – most active borough in the North by 2024	Cycling infrastructure installed in key areas (Brighouse, Sowerby Bridge). LCWIP to be used in development	Commitment from communities
AQAP 3 (4)	Metro travel card pool scheme	Alternatives to Private Vehicle Use	Other	Ongoing	Ongoing	Calderdale MBC, Metro	Calderdale MBC, Metro	No	Partially funded	< £10k	Implementation	Low initial impact	Increase in public transport use, number of staff car journeys replaced	Calderdale's first LCWIP is complete (Halifax for Walking and Brighouse for cycling)	Further cards purchased 2018
AQAP 3 (5)	20pmh areas	Traffic Management	Reduction of speed limits, 20mph zones	2017	Completed 2017	Calderdale MBC	Calderdale MBC	No	Not funded	< £10k	Completed	Possible small reduction in road traffic emissions	Number of 20mph zones	Zones completed	Opportunities for further extension
AQAP 3 (6)	Car sharing promotion	Alternatives to Private Vehicle Use	Car & lift sharing schemes	2009 – 2020	Ongoing	Calderdale MBC	Calderdale MBC	No	Not funded	< £10k	Implementation	Small reduction, behaviour change	Reduced private car use, number of car sharing partners	Car sharing scheme up and running – featured in Clean Air Day 2018. Car club up and running for 5-years	Growing interest
AQAP 4 (1)	ULEV Procurement	Promoting Low Emission Transport	Company vehicle procurement – prioritising uptake of low emission vehicles	2023 onwards	After 2023	Calderdale MBC	Calderdale MBC	No	Not funded	< £10k	Implementation	Reduction in emissions around schools	Reduce number of petrol and diesel cars and increase number of chargers (% ULEV in vehicle fleet)	30 ULEVs ordered for Calderdale fleet. Project team set up to deliver EV charging infrastructure across multiple sites	Funding availability
AQAP 4 (2)	EV recharging provision	Promoting Low Emission Transport	Procuring alternative refuelling infrastructure to promote Low Emission Vehicles, EV recharging, gas fuel recharging	Current	Ongoing	Calderdale MBC, supported by OLEV etc.	Calderdale MBC, supported by OLEV etc.	No	Partially funded	< £10k	Implementation	Reduced vehicle emissions	Number of EV charging points	EV charging points installed in 10 locations (i.e. Brighouse, Hebden Bride and Sowerby Bridge)	Funding availability
AQAP 4 (3)	Retrofit school bus fleet	Promoting Low Emission Transport	Public vehicle procurement – promoting uptake of low emission vehicles	2017	Ongoing	Calderdale MBC, neighbouring authorities	Calderdale MBC, neighbouring authorities	No	Not funded	< £10k	Implementation	Reduced vehicle emissions	Proportion of fleet retrofitted	Implementation ongoing	N/A
AQAP 5 (1)	Travel plans	Promoting Travel Alternatives	Workplace travel planning	Current	Ongoing	Calderdale MBC, neighbouring authorities	Calderdale MBC, neighbouring authorities	No	Not funded	< £10k	Implementation	Potential moderate in long-term	Number of workplaces with travel plans	Planning condition for travel plans created	Enforcement
AQAP 5 (2)	School travel Plans	Promoting Travel Alternatives	School travel plans	2020 onwards	2020	Calderdale MBC, neighbouring authorities	Calderdale MBC, neighbouring authorities	No	Not funded	< £10k	Implementation	Mainly behavioural influence	Number of schools with travel plans	Plan completed pre 2019	Many schools not with Local Authority
AQAP 5 (3)	Local Plan Air Quality Policies	Policy Guidance and Development Control	Air quality planning and policy guidance	2017 onwards	2021	Calderdale MBC	Calderdale MBC	No	Not funded	< £10k	Implementation	Significant improvements in longer-term	Consistent approach to air quality in planning guidance	WYLES adopted and used. Currently being revised by WYLES delivery group	WYLES includes air quality guidance for developers
AQAP 5 (4)	Promote update of electric vehicles e.g. taxis	Promoting Low Emission Transport	Taxi emission incentives	2017 onwards	Ongoing	Calderdale MBC	Calderdale MBC	No	Not funded	< £10k	Implementation	Moderate, especially in town centres	Reduction in number of petrol and/or diesel taxis	1 operating further promotion in place	Engagement of licence trade
AQAP 5 (5)	Promote and support use of public transport and improve infrastructure	Promoting Low Emission Transport	Public vehicle procurement – promoting uptake of low emission vehicles	2018	2019	Calderdale MBC, WYCA	Calderdale MBC, WYCA	No	Partially funded	< £10k	Completed / Implementation	Potentially moderate in the longer term	Passenger journeys on public transport	Clean Bus Technology grants awarded and fleet being upgraded. Development of station at Elland included access and parking (delivery expected 2022/23). Implemented the community rail partnership to encourage more train travel.	Funding

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
AQAP 5 (6)	Promote good practices is domestic burning	Policy Guidance and Development Control	Other	Current	Ongoing	Calderdale MBC, Defra	Calderdale MBC, Defra	No	Partially funded	< £10k	Implementation	Significant local impact	Number of complaints about smoke from chimneys	Published on website	Enforcement
AQAP 6 (1)	Community renewable energy scheme	Promoting Low Emission Plant	Public procurement of stationary combustion sources	2019 onwards	Ongoing	Calderdale MBC	Calderdale MBC	No	Not funded	< £10k	Implementation	Significant improvements in longer term	Number of schemes approved	Feasibility modelling done	Funding
AQAP 6 (2)	Promote locally grown food, goods and services	Freight and Delivery Management	Other	2018 onwards	Ongoing	Calderdale MBC, local partners including 'Incredible Edible'	Calderdale MBC, local partners including 'Incredible Edible'	No	Partially funded	< £10k	Implementation	Significant improvements in longer term	Policies applied to all developments	Council policy agreed and land use for growing promoted	Ongoing community take up
AQAP 6 (3)	Improved energy efficiency	Other	Other			Calderdale MBC	Calderdale MBC	No	Not funded	< £10k	Implementation		Number of developments incorporating energy efficiency measures		N/A
AQAP 6 (4)	Compliance checks for environmental permit	Promoting Low Emission Plant	Environmental Permits	Current	Ongoing	Calderdale MBC, Environment Agency	Calderdale MBC, Environment Agency	No	Partially funded	< £10k	Implementation	Significant impact locally	Level of compliance with permit conditions	Part A1, A2, B and Schedule 9 and 13 permits in place	N/A
AQAP 6 (5)	Introduction of green screens	Transport/ Planning/ Infrastructure	Other	Current	Ongoing	Calderdale MBC	Calderdale MBC	No	Not funded	< £10k	Implementation	Moderate local impact	NO_2 monitoring, protection of children in playground from NO_2 and PM	First installation May 2019	Finance
AQAP 6 (6)	Pilot school road closure	Transport/ Planning/ Infrastructure	Other	Current	Ongoing	Calderdale MBC, schools	Calderdale MBC, schools	No	Not funded	< £10k	Completed/ Implementation	Significant local impact	Air quality monitored	12 in place – more in planning stages. 20% modal shift – following 12-month survey. Expansion around school areas to create Active Travel Neighbourhoods	Community support
AQAP 6 (7)	Tackle idling vehicles	Traffic Management	Congestion Management/Traffic Reduction	Current	Ongoing	Calderdale MBC	Calderdale MBC	No	Not funded	< £10k	Completed/ Implementation	Moderate local impact	Number of idling vehicles in key destinations	Confirming legal orders. Within AQMAs, buses given priority and removal of parked cars to improve the flow of traffic/reduce the stopping and starting of traffic on the key route network	Compliance and resource

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.

Calderdale Metropolitan Borough Council is taking the following measures to address $PM_{2.5}$:

- **Biomass Combustion (including domestic wood burning):** Guidance is provided on the appropriate selection of fuels on Calderdale Metropolitan Borough Council's web pages, and support is provided to the information campaign by Defra surrounding domestic emissions. The latest announcement to phase out coal burning and other fuels has also been made available. A green waste collection service is also in operation to discourage the burning of garden waste. As large parts of Calderdale (especially urban areas) are covered by Smoke Control Areas, households are advised on how to comply with these measures and where additional information can be obtained from.
- **Industrial Sources:** Calderdale Metropolitan Borough Council are engaging with local operators who hold environmental permits for combustion plant to ensure that emissions are within limits and, where possible, reduced even further. A number of premises burning waste below the permitted threshold have been identified, and advice is being provided on obtaining a U4 exemption and, more importantly, reducing the smoke emissions from their appliances. Calderdale Metropolitan Borough Council is also working with the Environment Agency to identify and regularise waste burning in the borough.
- **Public Information:** The public are informed by Calderdale Metropolitan Borough Council on less polluting ways of travel, in particular avoiding private vehicle use where possible. Encouraging the use of alternative modes of transport (i.e. walking and cycling) is hoped to assist in reducing fine particles from brake and tyre wear.

A Climate Change Operational Group has been formed within Calderdale Metropolitan Borough Council, alongside the Air Quality Operational Group to develop ideas that can be implemented to reduce the overall concentration of $PM_{2.5}$ across the borough.

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

This section sets out the monitoring undertaken within 2021 by Calderdale Metropolitan 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

Calderdale Metropolitan Borough Council undertook automatic (continuous) monitoring at three sites during 2021. Table A.1 in Appendix A shows the details of the automatic monitoring sites. The Dataworks page presents automatic monitoring results for Calderdale. Maps showing the location of the monitoring sites with reference to the current AQMAs 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

Calderdale Metropolitan Borough Council undertook non-automatic (i.e. passive) monitoring of NO_2 at 57 sites during 2021. One site is however a triplicate, resulting in 59 diffusion tubes being deployed each month – an increase from the 54 that made up the monitoring network in 2020. 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: Maps of Monitoring Locations and AQMAs. 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.

The results presented from the passive diffusion tube monitoring network should however be treated with caution. This is because the maximum data capture at a single site was 35%, with diffusion tubes either not deployed or overexposed for a large part of the year, especially at the beginning (January – July and December). Therefore, only four months data has been used (August – November) and annualisation has been applied to all tubes.

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.3 and Table A.4 in Appendix A compare 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).

During 2021, the average NO_2 annual mean concentration increased in five of the eight AQMAs. Relative to 2020, the greatest change was seen in AQMA No.1 (Salterhebble), where the annual mean NO_2 concentration increased by 13%. As in 2020, the greatest average NO_2 annual mean concentration was in AQMA No.8 (New Bank) at 43.9 µg/m^3, with a single diffusion tube (LV-NBN) measuring a NO_2 concentration as high as 53.2 µg/m^3. However, following distance correction, this fell to below the air quality objective. With the exception of AQMA No.4 (Luddendenfoot) and AQMA No.5 (Stump Cross), all AQMAs had a diffusion tube site that exceeded, or was within 10% of, the NO_2 annual mean air quality objective of 40 µg/m^3. Outside of AQMAs, the NO_2 annual mean objective was exceeded at two sites (LV-AT: 41.5 µg/m^3 and NB-GL: 43.5 µg/m^3). No AQMA is however needed to be declared as these tubes are not located in areas of relevant exposure, as following distance correction the NO_2 annual mean concentrations were 31.6 µg/m^3 (LV-AT) and 26.7 µg/m^3 (NB-GL). Across the three automatic monitoring sites in Calderdale, an NO_2 annual mean concentration of 35.5 µg/m^3 (AQS2), 32.8 µg/m^3 (AQS3) and 33.0 µg/m^3 (AQS4) were recorded in 2021. Relative to the previous reporting year, this is an average increase of approximately 4 µg/m^3, and is likely reflective of the increased travel activity, with less COVID-19 restrictions in 2021 than there were in 2020.

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.

Table A.5 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past five years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year.

No single diffusion tube site recorded a concentration greater than 60 µg/m^3, indicating that the 1-hr mean objective of 200 µg/m^3 (not to be exceeded more than 18 times per year) was not likely to be breached at these sites. Indeed, this is supported by the three automatic monitoring stations, that recorded zero 1-hr means greater than 200 µg/m^3, with a maximum NO_2 1-hr mean being 155 µg/m^3 (AQS2), 166 µg/m^3 (AQS3) and 159 µg/m^3 (AQS4).

3.2.2 Particulate Matter (PM_{10})

Table A.6 in Appendix A: Monitoring Results compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past five years with the air quality objective of 40µg/m^3.

The PM_{10} monitoring site (AQS4), situated within AQMA No.2 (Sowerby Bridge), recorded an annual mean PM_{10} concentration of 24.5 µg/m^3. This follows the trend of the last five years, where the PM_{10} concentration has been relatively stable at around 24 – 26 µg/m^3.

Table A.7 in Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations for the past five years with the air quality objective of 50µg/m^3, not to be exceeded more than 35 times per year.

The 24-hr (daily) limit of 50 µg/m^3 was exceeded 11 times in 2021, which is significantly lower than the 20 times which the daily air quality limit for PM_{10} was breached in 2020.

3.2.3 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.

$PM_{2.5}$ is measured by the two remaining automatic montiroing stations (AQS2 and AQS3) that do not record PM_{10}. An annual mean $PM_{2.5}$ concentration of 10.0 µg/m^3 and 8.5 µg/m^3 was recorded at site AQS2 and AQS3, respectively. The concentration at the Huddersfield Road site (AQS2) was higher than that recorded in 2020 (9.6 µg/m^3), whilst that recorded at the Hebden Bridge site (AQS3) was lower than the concentration in 2020 (11.0 µg/m^3).

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)
AQS2	Huddersfield Road	Roadside	409485	423430	NO_2, $PM_{2.5}$	YES; AQMA No.1 (Salterhebble)	Chemiluminescent; BAM	N/A	3	1.5
AQS3	Hebden Bridge	Roadside	398990	427210	NO_2, $PM_{2.5}$	YES; AQMA No.3 (Hebden Bridge)	Chemiluminescent; BAM	N/A	3	1.5
AQS4	Sowerby Bridge	Roadside	406075	423615	NO_2, PM_{10}	YES; AQMA No.2 (Sowerby Bridge)	Chemiluminescent; BAM	N/A	3	1.5

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 – 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)
AQ21	AQ21	Roadside	409822	423167	NO_2	Yes: AQMA No.1 (Salterhebble)	2.0	2.0	No	2.5
AQC1, AQC2, AQC3	AQC1, AQC2, AQC3	Roadside	409485	423431	NO_2	Yes: AQMA No.1 (Salterhebble)	2.0	2.0	Yes	1.5
CRH1	CRH1	Roadside	409767	423011	NO_2	Yes: AQMA No.1 (Salterhebble)	0.0	2.0	No	2.5
SB1	SB1	Roadside	406135	423639	NO_2	Yes: AQMA No.2 (Sowerby Bridge)	0.0	2.0	No	2.5
SB15	SB15	Roadside	406707	423824	NO_2	Yes: AQMA No.2 (Sowerby Bridge)	1.0	2.0	No	2.0
SB16	SB16	Roadside	406638	423836	NO_2	Yes: AQMA No.2 (Sowerby Bridge)	0.0	2.0	No	2.5
SB22	SB22	Roadside	405823	423395	NO_2	Yes: AQMA No.2 (Sowerby Bridge)	0.0	2.0	No	2.0
SB3	SB3	Roadside	405961	423571	NO_2	Yes: AQMA No.2 (Sowerby Bridge)	0.0	2.0	No	2.5
SB-AQ	SB-AQ	Roadside	406075	423615	NO_2	Yes: AQMA No.2 (Sowerby Bridge)	0.5	1.5	Yes	2.0
BS1 HB	BS1 HB	Roadside	398990	427210	NO_2	Yes: AQMA No.3 (Hebden Bridge)	8.0	3.0	Yes	1.5
HB6	HB6	Roadside	399502	427041	NO_2	Yes: AQMA No.3 (Hebden Bridge)	0.0	4.0	No	2.0
HQ1	HQ1	Roadside	398794	427237	NO_2	Yes: AQMA No.3 (Hebden Bridge)	0.0	3.0	No	2.0
HQ9	HQ9	Roadside	399236	427176	NO_2	Yes: AQMA No.3 (Hebden Bridge)	0.0	2.0	No	2.5
LF1	LF1	Roadside	403810	424977	NO_2	Yes: AQMA No.4 (Luddendenfoot)	0.0	2.0	No	2.5
LF2	LF2	Roadside	403738	425110	NO_2	Yes: AQMA No.4 (Luddendenfoot)	0.0	1.0	No	2.5

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)
SC5	SC5	Roadside	410823	426265	NO_2	Yes: AQMA No.5 (Stump Cross)	0.0	3.0	No	3.0
BE2	BE2	Roadside	414385	422457	NO_2	Yes: AQMA No.6 (Brighouse)	0.0	2.0	No	2.5
BE4	BE4	Roadside	414478	422692	NO_2	Yes: AQMA No.6 (Brighouse)	0.0	1.0	No	2.5
BH3	BH3	Roadside	414671	422740	NO_2	Yes: AQMA No.6 (Brighouse)	3.0	1.5	No	2.5
HXR1	HXR1	Roadside	414218	422957	NO_2	Yes: AQMA No.6 (Brighouse)	0.0	4.0	No	2.0
LV-BRD	LV-BRD	Roadside	414683	423155	NO_2	Yes: AQMA No.6 (Brighouse)	5.0	2.0	No	2.0
WR2	WR2	Roadside	415090	422817	NO_2	Yes: AQMA No.6 (Brighouse)	0.0	4.0	No	2.5
HH-1A	HH-1A	Roadside	412593	425497	NO_2	Yes: AQMA No.7 (Hipperholme)	0.0	1.5	No	2.5
HH-LT	HH-LT	Roadside	412450	425435	NO_2	Yes: AQMA No.7 (Hipperholme)	0.0	3.0	No	2.5
HH-TC	HH-TC	Roadside	412718	425556	NO_2	Yes: AQMA No.7 (Hipperholme)	5.0	1.5	No	2.5
LV-NBN	LV-NBN	Roadside	409715	425754	NO_2	Yes: AQMA No.8 (New Bank)	40.0	1.0	No	2.5
LV-NBS	LV-NBS	Roadside	409708	425737	NO_2	Yes: AQMA No.8 (New Bank)	25.0	2.0	No	2.5
LV-NBX	LV-NBX	Roadside	409602	425797	NO_2	Yes: AQMA No.8 (New Bank)	30.0	1.0	No	2.5
NB-GR	NB-GR	Roadside	409957	425642	NO_2	Yes: AQMA No.8 (New Bank)	4.0	3.0	No	2.0
NB-NB1	NB-NB1	Roadside	409663	425740	NO_2	Yes: AQMA No.8 (New Bank)	2.0	2.0	No	2.5
AQ20	AQ20	Roadside	409483	423337	NO_2	No	0.0	5.0	No	2.0
AT-BR	AT-BR	Suburban	411514	419548	NO_2	No	6.0	1.0	No	2.0
AT-MR	AT-MR	Roadside	411581	419373	NO_2	No	10.0	0.5	No	2.5

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)
CL1	CL1	Roadside	413261	420686	NO_2	No	0.0	2.0	No	2.5
HTAH	HTAH	Suburban	411494	419594	NO_2	No	0.0	2.0	No	2.0
LV-62E	LV-62E	Roadside	416717	422113	NO_2	No	25.0	4.0	No	2.5
LV-62W	LV-62W	Roadside	416172	422282	NO_2	No	6.0	3.0	No	2.5
LV-AT	LV-AT	Roadside	411533	419358	NO_2	No	14.0	4.0	No	2.5
LV-EWB	LV-EWB	Roadside	410104	421516	NO_2	No	250.0	1.0	No	2.5
LV-LEE	LV-LEE	Roadside	417698	420709	NO_2	No	200.0	3.0	No	2.0
LV-SAA	LV-SAA	Roadside	411201	419429	NO_2	No	11.0	0.0	No	2.5
LV-SCA	LV-SCA	Roadside	405911	416597	NO_2	No	150.0	10.0	No	1.0
MY01	MY01	Roadside	401431	425995	NO_2	No	0.0	1.0	No	2.5
MY02	MY02	Urban Background	401275	426046	NO_2	No	20.0	10.0	No	2.5
MY03	MY03	Roadside	401204	426041	NO_2	No	0.0	2.0	No	2.5
MY-04	MY-04	Roadside	401059	426179	NO_2	No	12.0	2.0	No	2.5
MY-05	MY-05	Roadside	401040	426186	NO_2	No	19.0	2.0	No	2.5
NB-GL	NB-GL	Roadside	410367	425975	NO_2	No	17.0	2.0	No	2.5
SB23	SB23	Roadside	405701	423223	NO_2	No	3.0	1.5	No	2.5
WV-SR1	WV-SR1	Roadside	409598	421167	NO_2	No	0.0	2.0	No	2.5
WV-SR2	WV-SR2	Roadside	409608	421160	NO_2	No	3.0	2.0	No	2.5
SB40	SB40	Roadside	405814	422611	NO_2	No	35.0	0.5	No	2.0
SB41	SB41	Roadside	405727	422878	NO_2	No	5.0	0.0	No	2.0
SB42	SB42	Roadside	404938	422699	NO_2	No	10.0	2.0	No	2.0
SB43	SB43	Roadside	405082	422999	NO_2	No	8.0	1.5	No	2.0
SB44	SB44	Roadside	405234	423022	NO_2	No	30.0	0.0	No	2.0
SB45	SB45	Roadside	405780	423349	NO_2	No	20.0	1.5	No	2.0

Notes:

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

(2) N/A if not applicable.

Table A.3 – Annual Mean NO_2 Monitoring Results: Automatic Monitoring (µg/m^3)

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
AQS2	409485	423430	Roadside	97	97	-	38.6	39.7	32.1	35.5
AQS3	398990	427210	Roadside	84	84	-	35.0	34.3	26.7	32.8
AQS4	406075	423615	Roadside	99	99	-	38.1	36.0	29.6	33.0

☒ **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/m^3.

Exceedances of the NO_2 annual mean objective of 40µg/m^3 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 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
AQ21	409822	423167	Roadside	35.4	35.4	**48.0**	**45.0**	**44.0**	**43.0**	**53.1**
AQC1, AQC2, AQC3	409485	423431	Roadside	35.4	35.4	**41.7**	36.0	39.3	32.8	37.1
CRH1	409767	423011	Roadside	35.4	35.4	**52.0**	**52.0**	**42.0**	38.4	38.9
SB1	406135	423639	Roadside	35.4	35.4	**45.0**	**46.0**	**42.0**	**40.2**	37.0
SB15	406707	423824	Roadside	35.4	35.4	37.0	34.0	34.0	27.9	30.6
SB16	406638	423836	Roadside	27.2	27.2	38.0	**40.0**	36.0	31.2	25.4
SB22	405823	423395	Roadside	35.4	35.4	**42.0**	**45.0**	**40.0**	34.1	33.5
SB3	405961	423571	Roadside	35.4	35.4	**40.0**	**43.0**	35.0	35.9	37.0
SB-AQ	406075	423615	Roadside	35.4	35.4	-	-	-	33.5	31.6
BS1 HB	398990	427210	Roadside	35.4	35.4	38.0	37.0	33.0	29.7	30.5
HB6	399502	427041	Roadside	35.4	35.4	35.0	31.0	30.0	26.0	28.5
HQ1	398794	427237	Roadside	35.4	35.4	**50.0**	**46.0**	**44.0**	38.4	**42.6**
HQ9	399236	427176	Roadside	35.4	35.4	36.0	39.0	35.0	29.9	29.8
LF1	403810	424977	Roadside	35.4	35.4	39.0	**41.0**	34.0	33.9	32.0
LF2	403738	425110	Roadside	35.4	35.4	35.0	34.0	29.0	26.3	27.2
SC5	410823	426265	Roadside	35.4	35.4	38.0	39.0	35.0	34.1	32.3
BE2	414385	422457	Roadside	35.4	35.4	38.0	37.0	35.0	31.8	36.5
BE4	414478	422692	Roadside	35.4	35.4	**47.0**	**45.0**	**42.0**	33.6	**43.2**
BH3	414671	422740	Roadside	35.4	35.4	**46.0**	**42.0**	**43.0**	38.2	**42.7**
HXR1	414218	422957	Roadside	35.4	35.4	**49.0**	**49.0**	**42.0**	**43.0**	**43.6**
LV-BRD	414683	423155	Roadside	35.4	35.4	31.0	28.0	27.0	23.4	24.1
WR2	415090	422817	Roadside	35.4	35.4	38.0	36.0	33.0	30.9	31.1
HH-1A	412593	425497	Roadside	35.4	35.4	-	-	-	31.8	31.5

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
HH-LT	412450	425435	Roadside	35.4	35.4	**51.0**	**48.0**	**41.0**	**40.7**	**42.3**
HH-TC	412718	425556	Roadside	35.4	35.4	36.0	35.0	33.0	26.0	27.7
LV-NBN	409715	425754	Roadside	35.4	35.4	**66.0**	**64.0**	**55.0**	**53.5**	**53.2**
LV-NBS	409708	425737	Roadside	35.4	35.4	**42.0**	**44.0**	**41.0**	34.0	**40.7**
LV-NBX	409602	425797	Roadside	35.4	35.4	**43.0**	39.0	39.0	36.3	36.9
NB-GR	409957	425642	Roadside	35.4	35.4	**53.0**	**53.0**	**46.0**	**49.4**	**51.9**
NB-NB1	409663	425740	Roadside	35.4	35.4	**44.0**	**42.0**	**40.0**	35.2	36.6
AQ20	409483	423337	Roadside	35.4	35.4	24.0	24.0	22.0	18.7	18.5
AT-BR	411514	419548	Suburban	35.4	35.4	35.0	30.0	28.0	20.4	23.4
AT-MR	411581	419373	Roadside	35.4	35.4	34.0	27.0	25.0	19.9	23.9
CL1	413261	420686	Roadside	27.2	27.2	34.0	33.0	29.0	27.0	28.2
HTAH	411494	419594	Suburban	27.5	27.5	35.0	31.0	27.0	21.1	26.3
LV-62E	416717	422113	Roadside	35.4	35.4	**40.0**	38.0	36.0	32.2	31.8
LV-62W	416172	422282	Roadside	35.4	35.4	**40.0**	**40.0**	37.0	30.4	39.2
LV-AT	411533	419358	Roadside	35.4	35.4	**47.0**	**47.0**	**45.0**	34.7	**41.5**
LV-EWB	410104	421516	Roadside	35.4	35.4	27.0	27.0	27.0	21.2	19.8
LV-LEE	417698	420709	Roadside	35.4	35.4	32.0	30.0	27.0	25.0	26.9
LV-SAA	411201	419429	Roadside	35.4	35.4	33.0	30.0	25.0	23.7	22.4
LV-SCA	405911	416597	Roadside	35.4	35.4	**48.0**	**46.0**	37.0	33.6	37.1
MY01	401431	425995	Roadside	35.4	35.4	28.0	**52.0**	**44.0**	35.6	33.7
MY02	401275	426046	Urban Background	35.4	35.4	**42.0**	24.0	21.0	18.8	14.9
MY03	401204	426041	Roadside	35.4	35.4	-	**42.0**	39.0	34.8	32.4
MY-04	401059	426179	Roadside	35.4	35.4	-	29.0	27.0	23.5	20.6
MY-05	401040	426186	Roadside	27.2	27.2	-	33.0	28.0	24.9	22.4
NB-GL	410367	425975	Roadside	27.5	27.5	**57.0**	**52.0**	**49.0**	**47.6**	**43.5**
SB23	405701	423223	Roadside	35.4	35.4	-	-	-	23.4	23.4

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
WV-SR1	409598	421167	Roadside	35.4	35.4	39.0	38.0	38.0	32.8	33.2
WV-SR2	409608	421160	Roadside	35.4	35.4	29.0	31.0	28.0	25.7	22.9
SB40	405814	422611	Roadside	27.5	27.5	-	-	-	-	7.9
SB41	405727	422878	Roadside	27.5	27.5	-	-	-	-	7.9
SB42	404938	422699	Roadside	27.5	27.5	-	-	-	-	23.0
SB43	405082	422999	Roadside	27.5	27.5	-	-	-	-	9.0
SB44	405234	423022	Roadside	27.5	27.5	-	-	-	-	11.5
SB45	405780	423349	Roadside	27.5	27.5	-	-	-	-	27.3

☒ **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 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 (Automatic Monitoring)

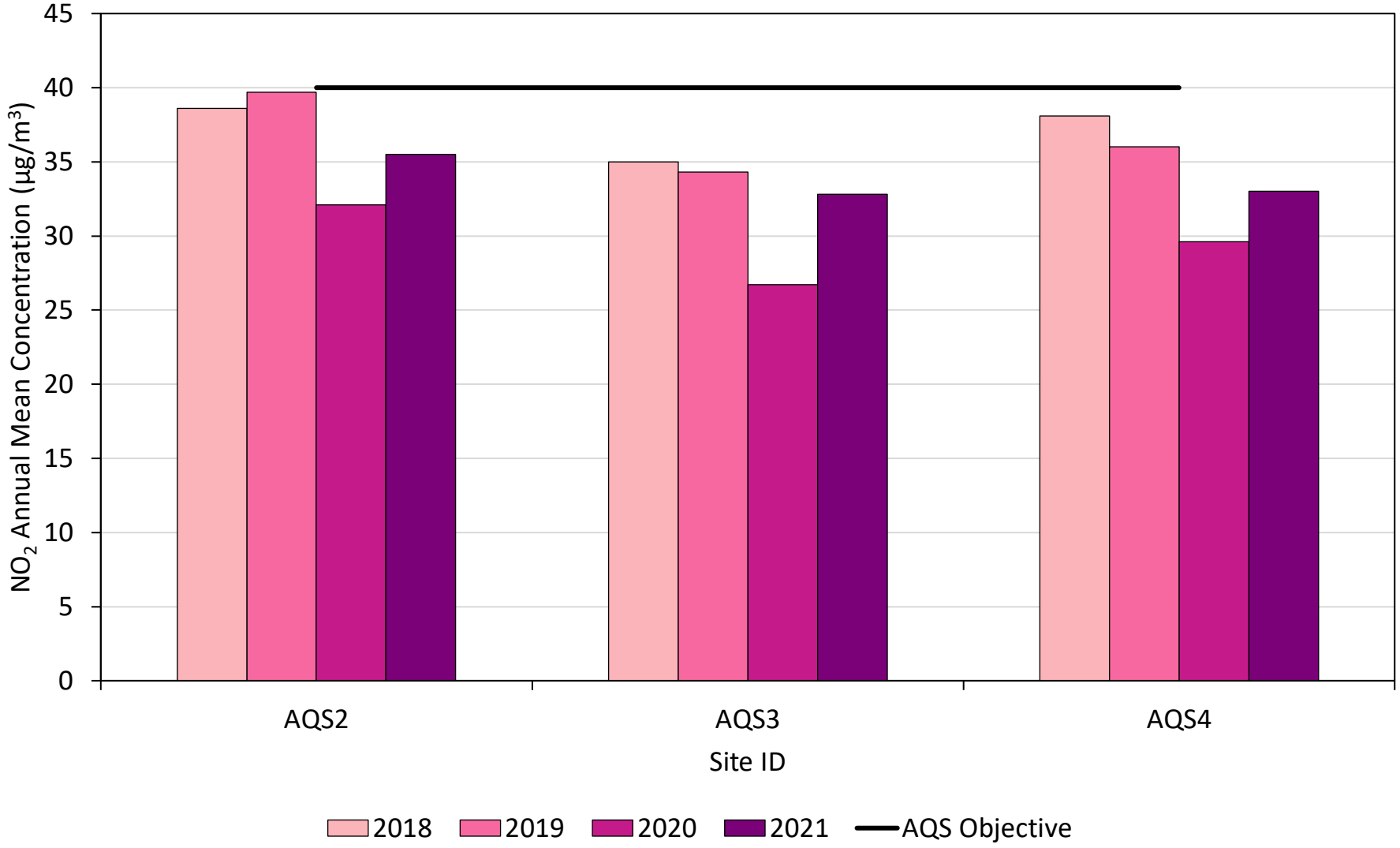


Figure A.2 – Trends in Annual Mean NO_2 Concentrations at Salterhebble (AQMA No.1)

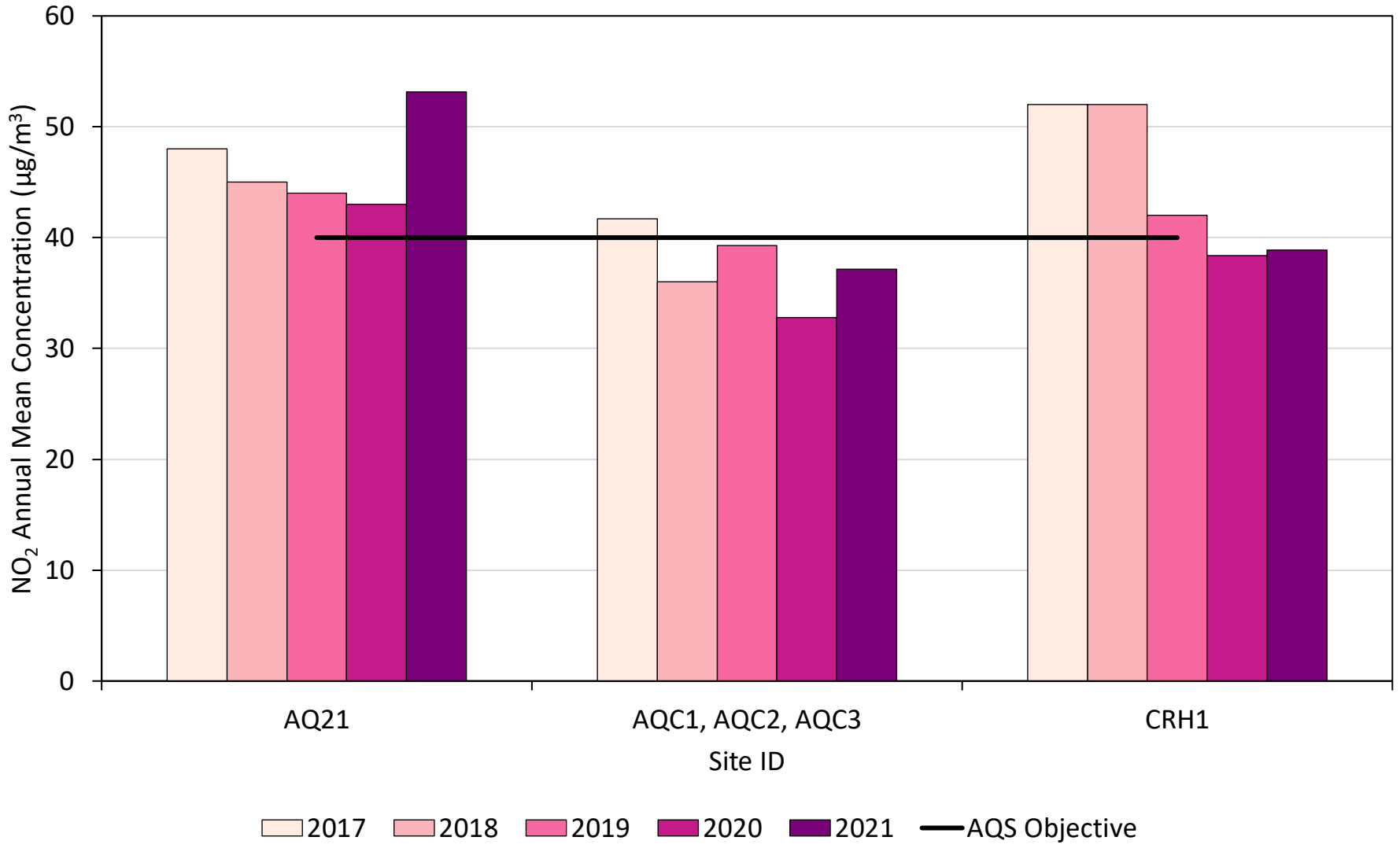


Figure A.3 – Trends in Annual Mean NO_2 Concentrations at Sowerby Bridge (AQMA No.2)

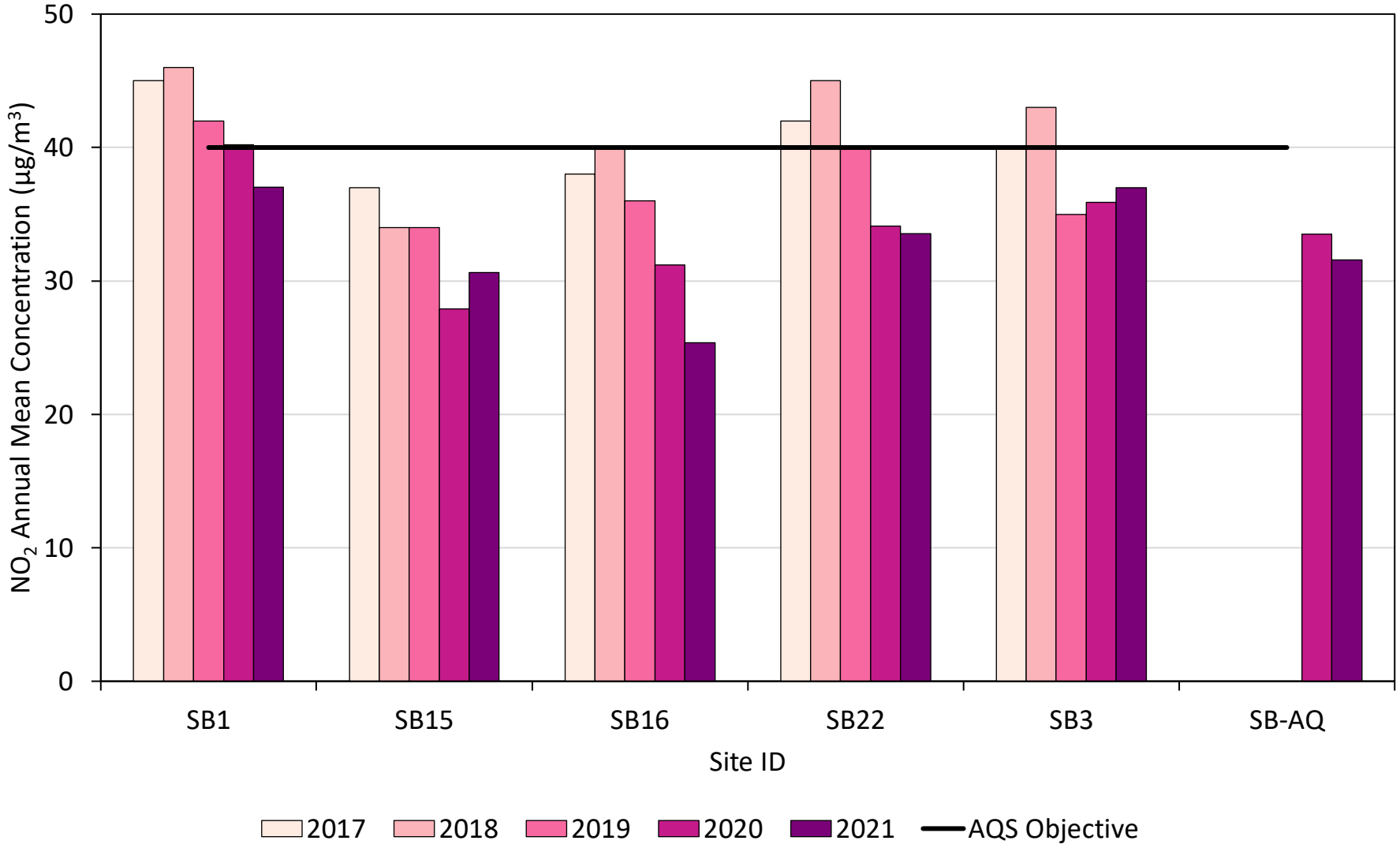


Figure A.4 – Trends in Annual Mean NO_2 Concentrations at Hebden Bridge (AQMA No.3)

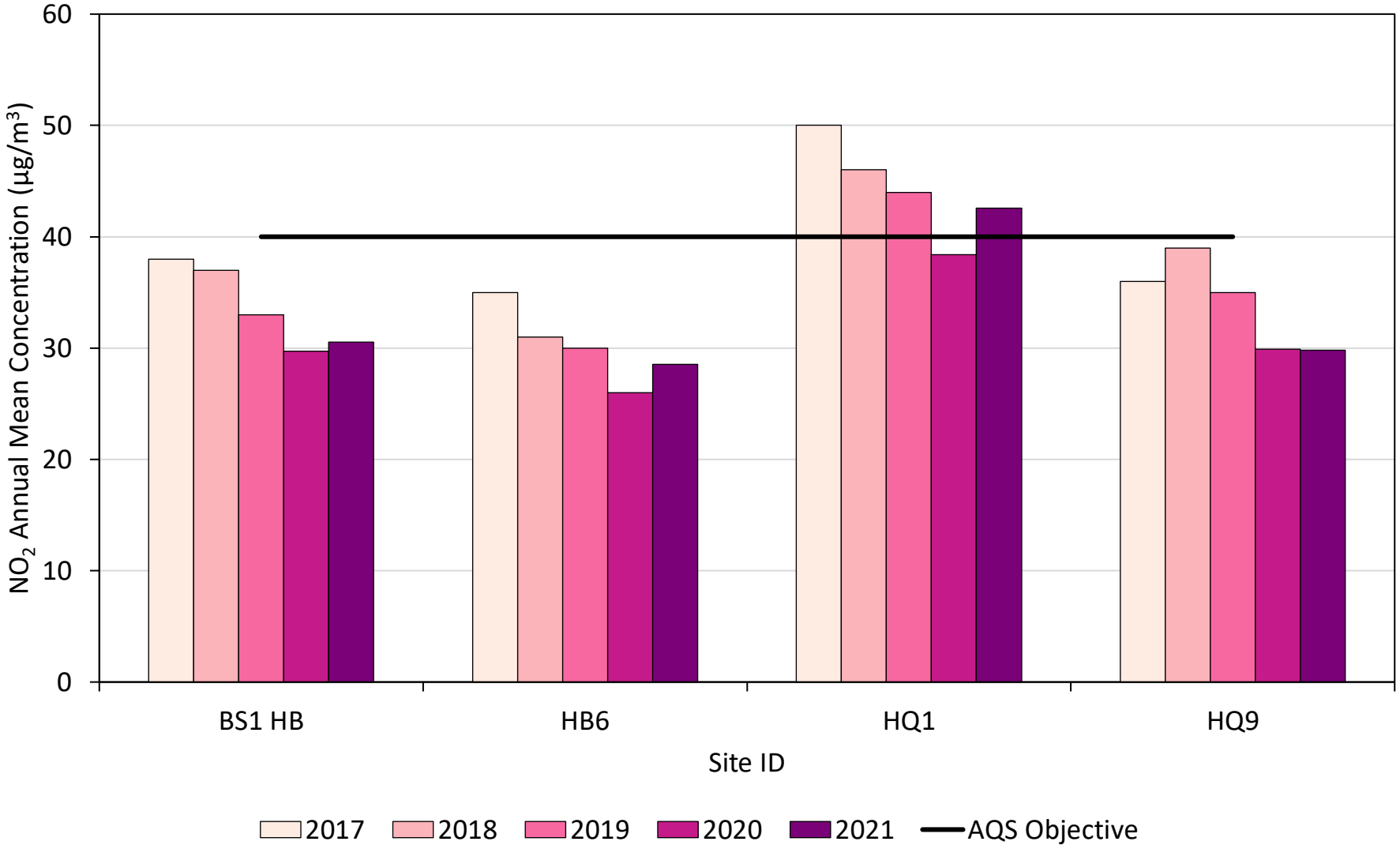


Figure A.5 – Trends in Annual Mean NO_2 Concentrations at Luddendenfoot (AQMA No.4)

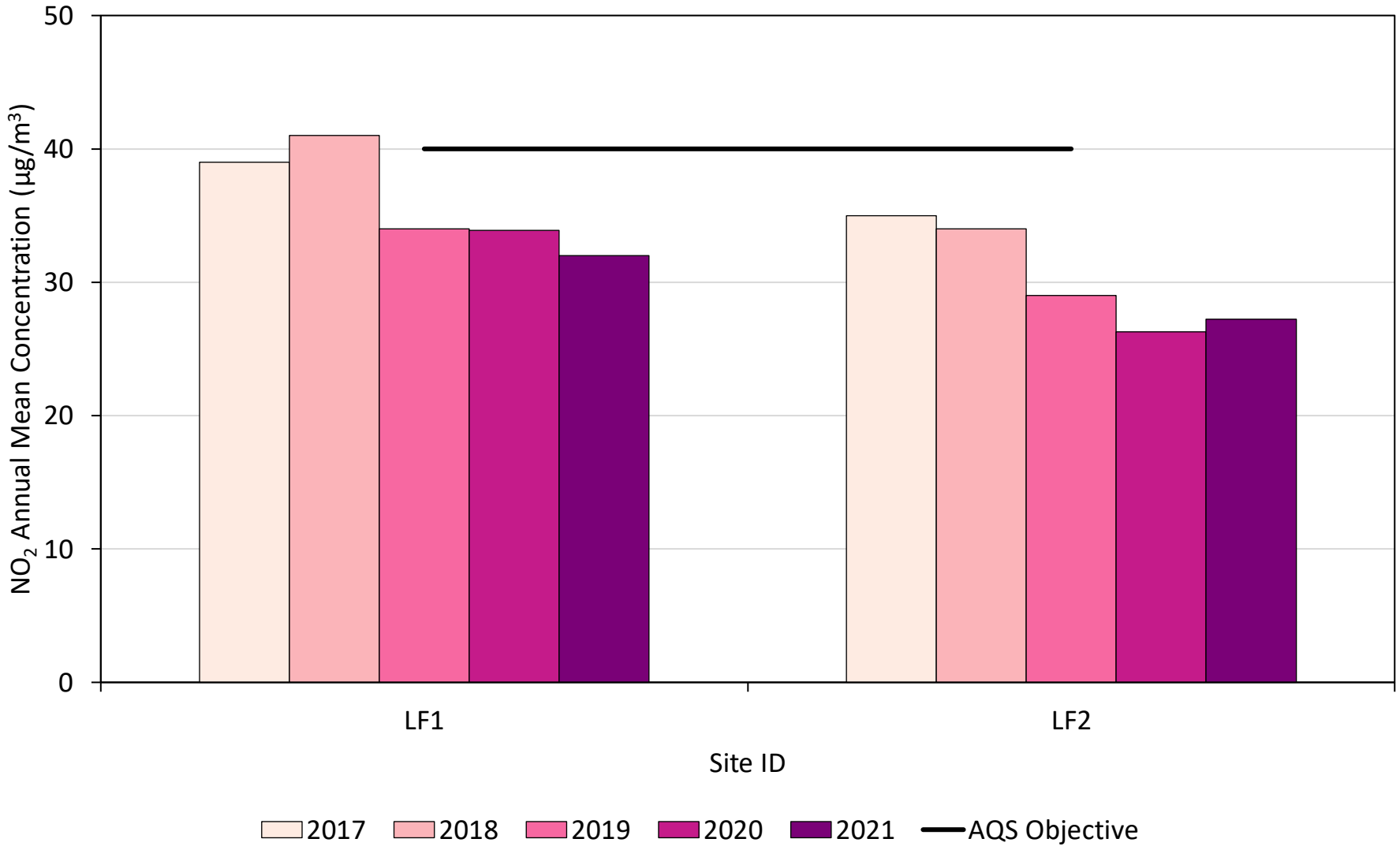


Figure A.6 – Trends in Annual Mean NO_2 Concentrations at Stump Cross (AQMA No.5) & New Bank (AQMA No.8)

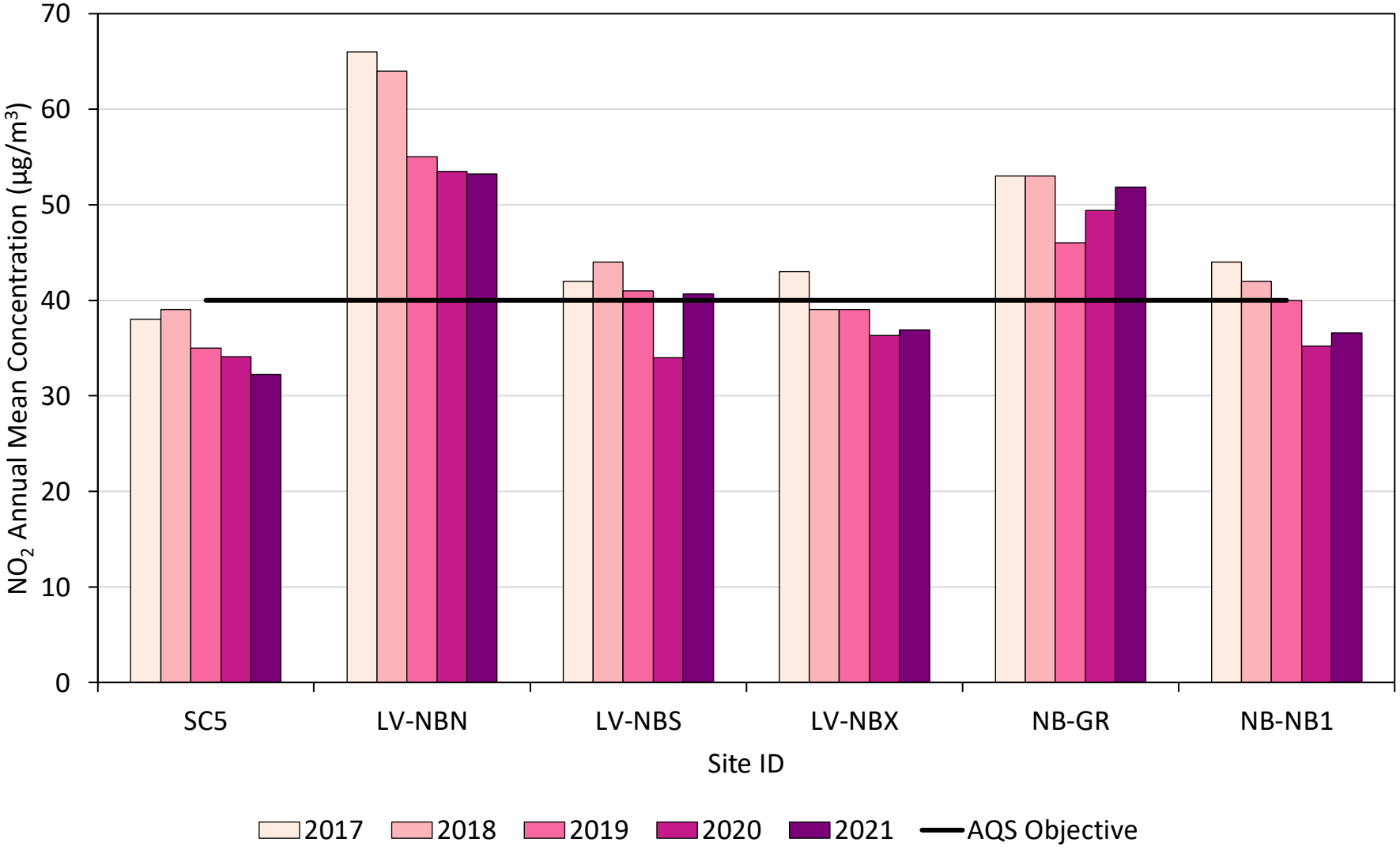


Figure A.7 – Trends in Annual Mean NO_2 Concentrations at Brighouse (AQMA No.6)

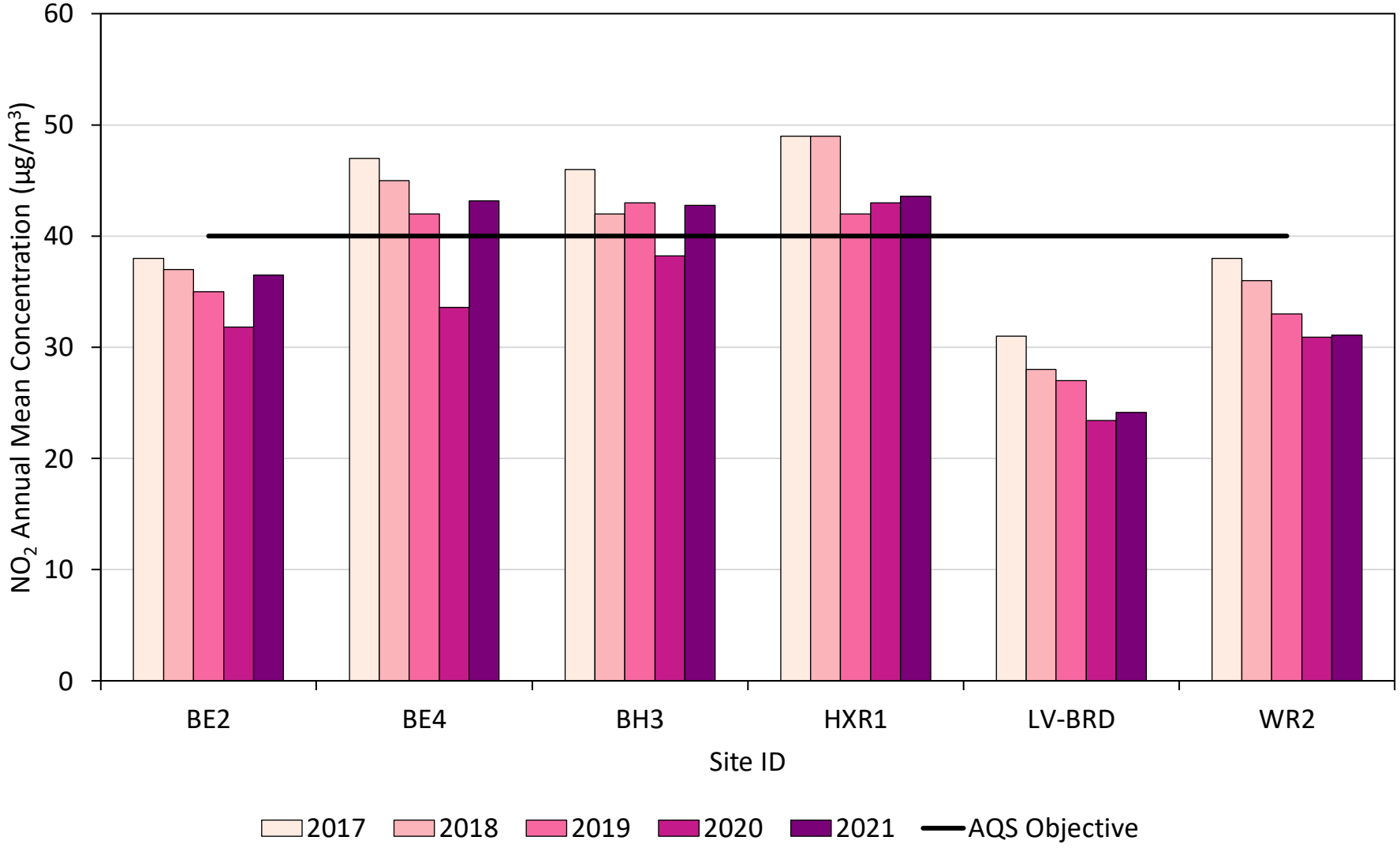


Figure A.8 – Trends in Annual Mean NO_2 Concentrations at Hipperholme (AQMA No.7)

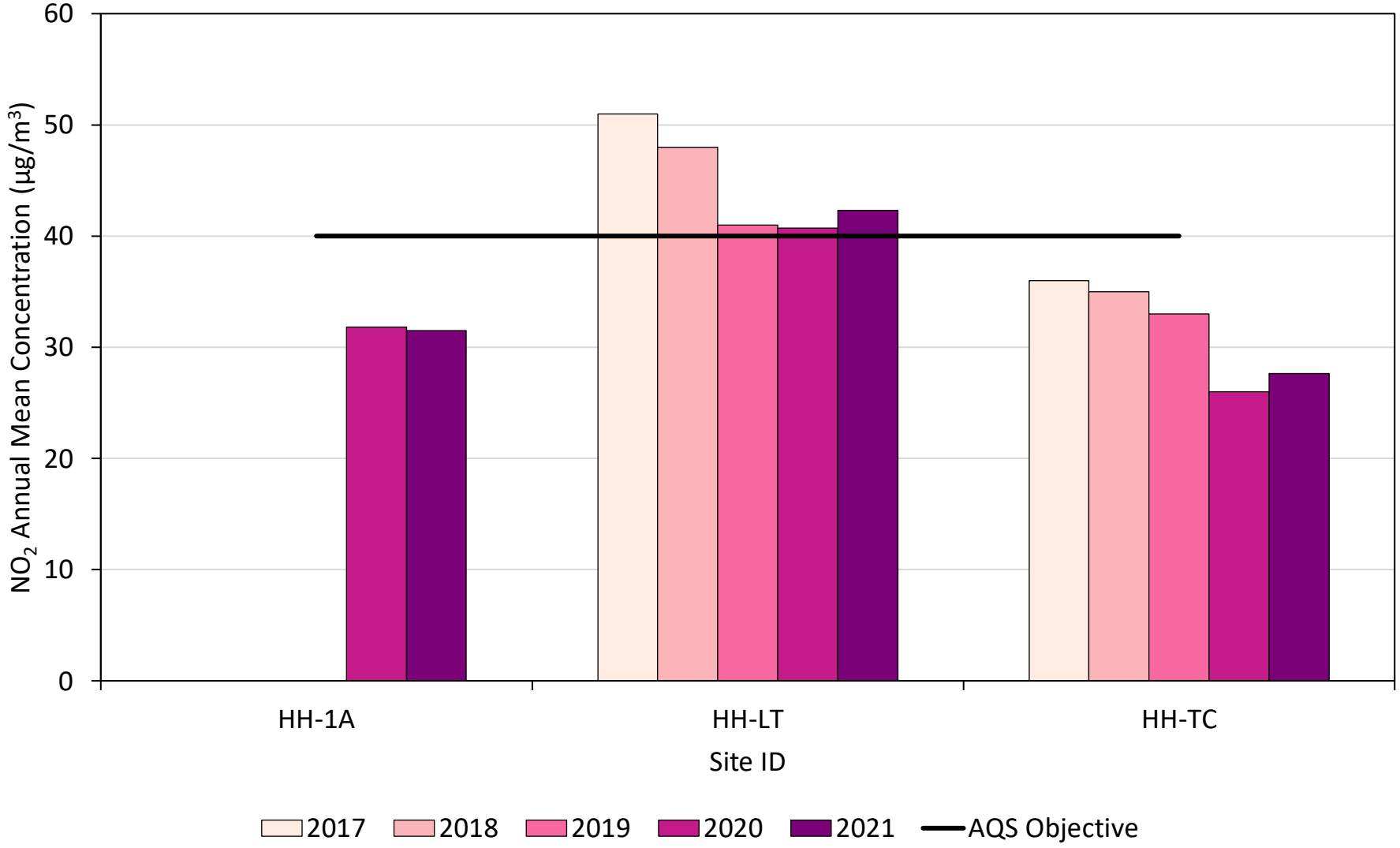


Figure A.9 – Trends in Annual Mean NO_2 Concentrations Outside of AQMAs (Ainley Top & Rastrick)

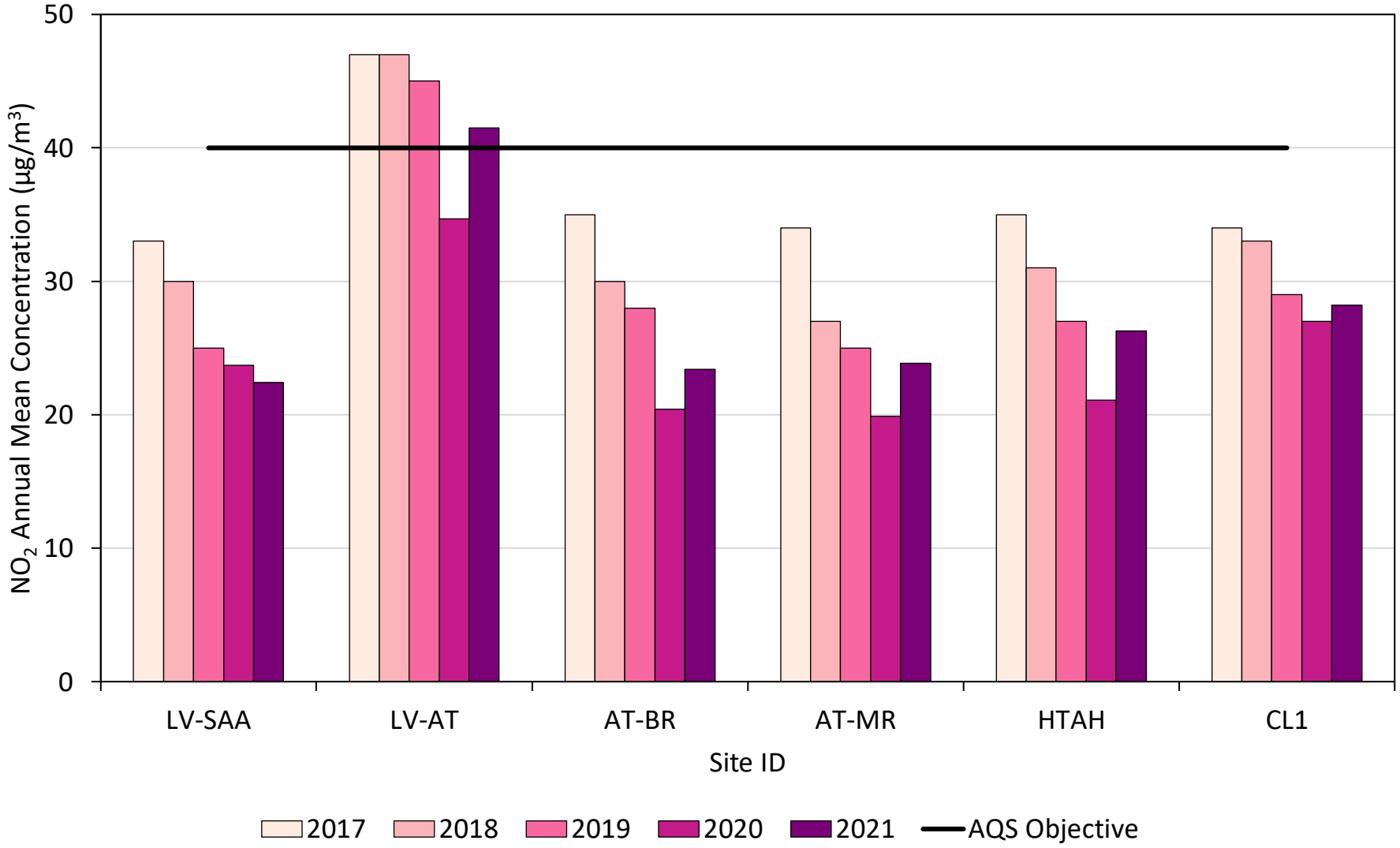


Figure A.10 – Trends in Annual Mean NO_2 Concentrations Outside of AQMAs (Mytholmroyd & West Vale)

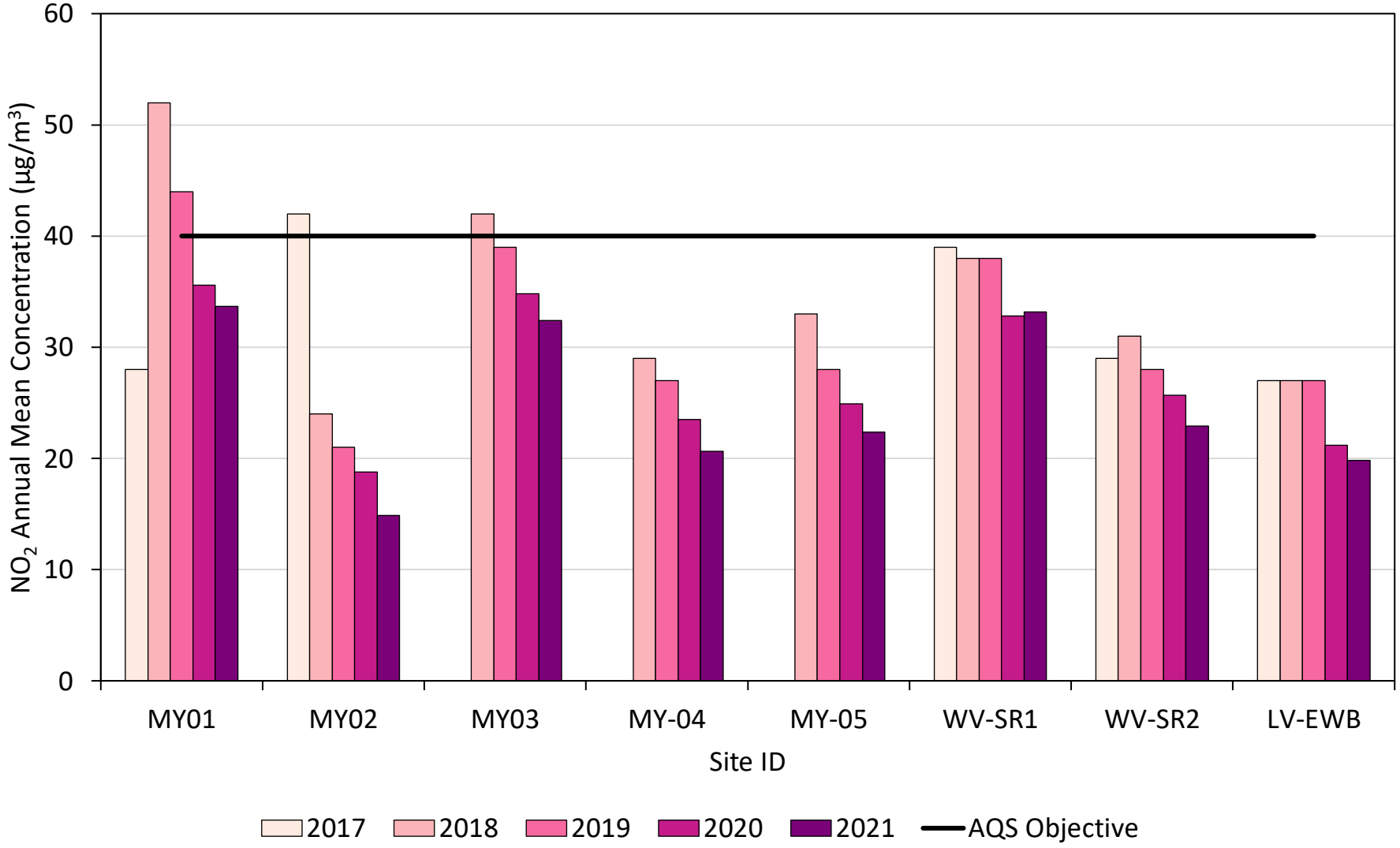


Figure A.11 – Trends in Annual Mean NO_2 Concentrations Outside of AQMAs (Salterhebble, Brighouse South, Scammonden & New Bank)

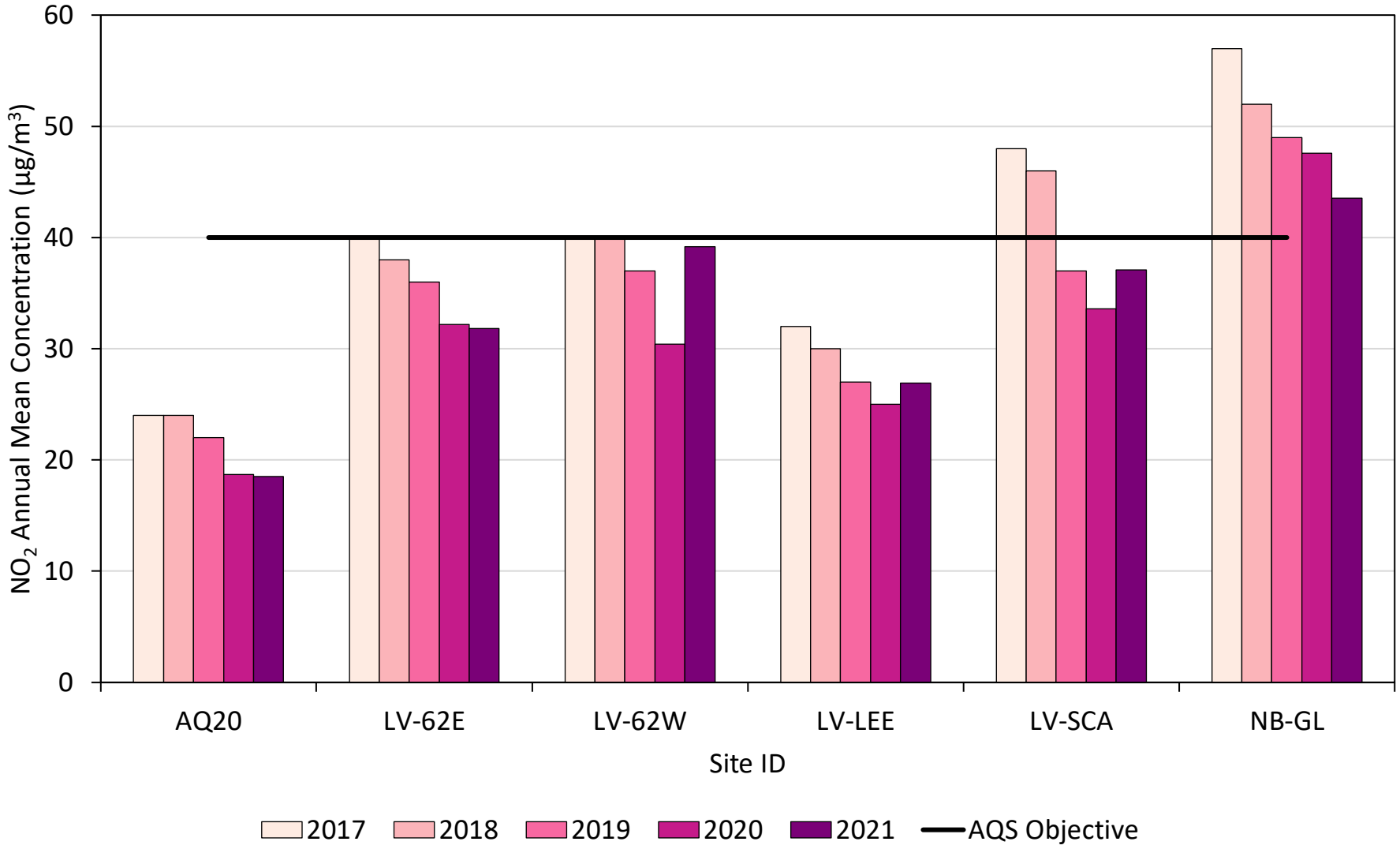


Figure A.12 – Trends in Annual Mean NO_2 Concentrations Outside of AQMAs (Sowerby Bridge)

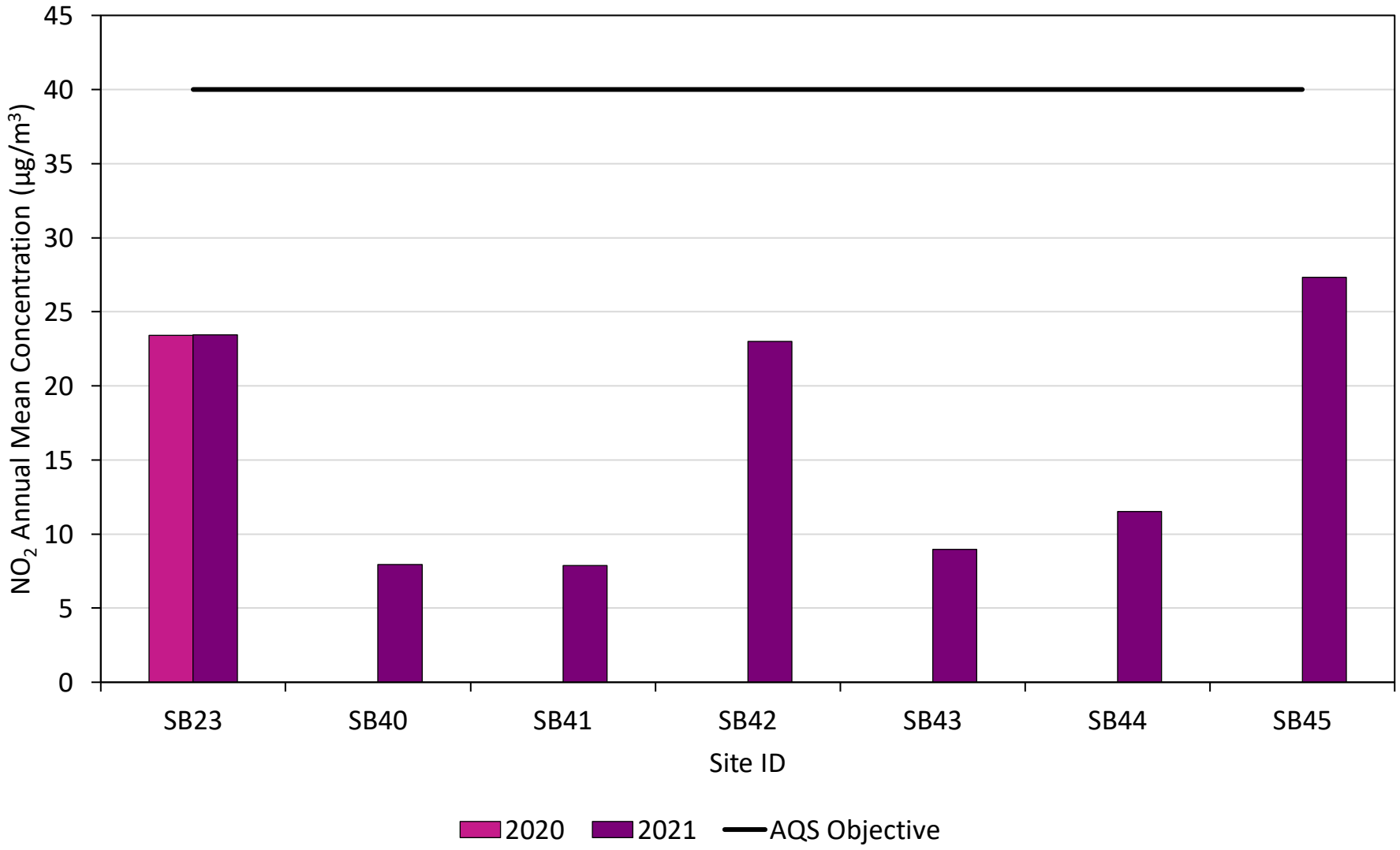


Table A.5 – 1-Hour Mean NO_2 Monitoring Results, Number of 1-Hour Means > 200µg/m^3

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
AQS2	409485	423430	Roadside	97	97	0	4	4 (133.7)	0	0
AQS3	398990	427210	Roadside	84	84	0	0	0	0 (98.8)	0 (99.6)
AQS4	406075	423615	Roadside	99	99	0	1	1	0	0

Notes:

Results are presented as the number of 1-hour periods where concentrations greater than 200µg/m^3 have been recorded.

Exceedances of the NO_2 1-hour mean objective (200µg/m^3 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 PM_{10} Monitoring Results (µg/m^3)

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
AQS4	406075	423615	Roadside	80	80	23.0	25.0	24.0	26.4	24.5

☒ **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/m^3.

Exceedances of the PM_{10} annual mean objective of 40µg/m^3 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.13 – Trends in Annual Mean PM_{10} Concentrations

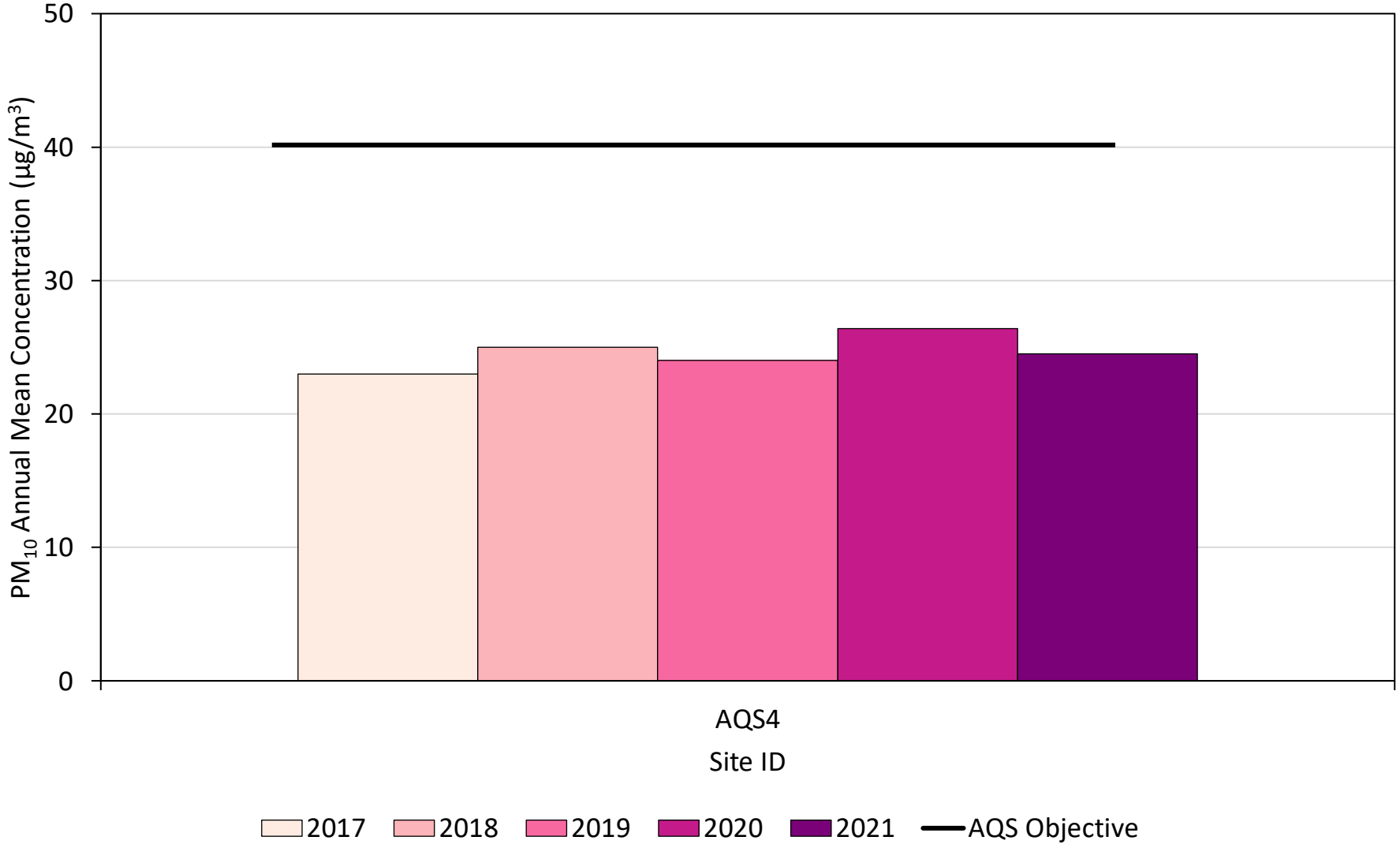


Table A.7 – 24-Hour Mean PM_{10} Monitoring Results, Number of PM_{10} 24-Hour Means > 50µg/m^3

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
AQS4	406075	423615	Roadside	80	80	8	12	19	20	11 (42)

Notes:

Results are presented as the number of 24-hour periods where daily mean concentrations greater than 50µg/m^3 have been recorded.

Exceedances of the PM_{10} 24-hour mean objective (50µg/m^3 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%).

Table A.8 – Annual Mean $PM_{2.5}$ Monitoring Results (µg/m^3)

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
AQS2	409485	423430	Roadside	80	80	13	13	11	9.6	10.0
AQS3	398990	427210	Roadside	80	80	15	17	20	11.0	8.5

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

Notes:

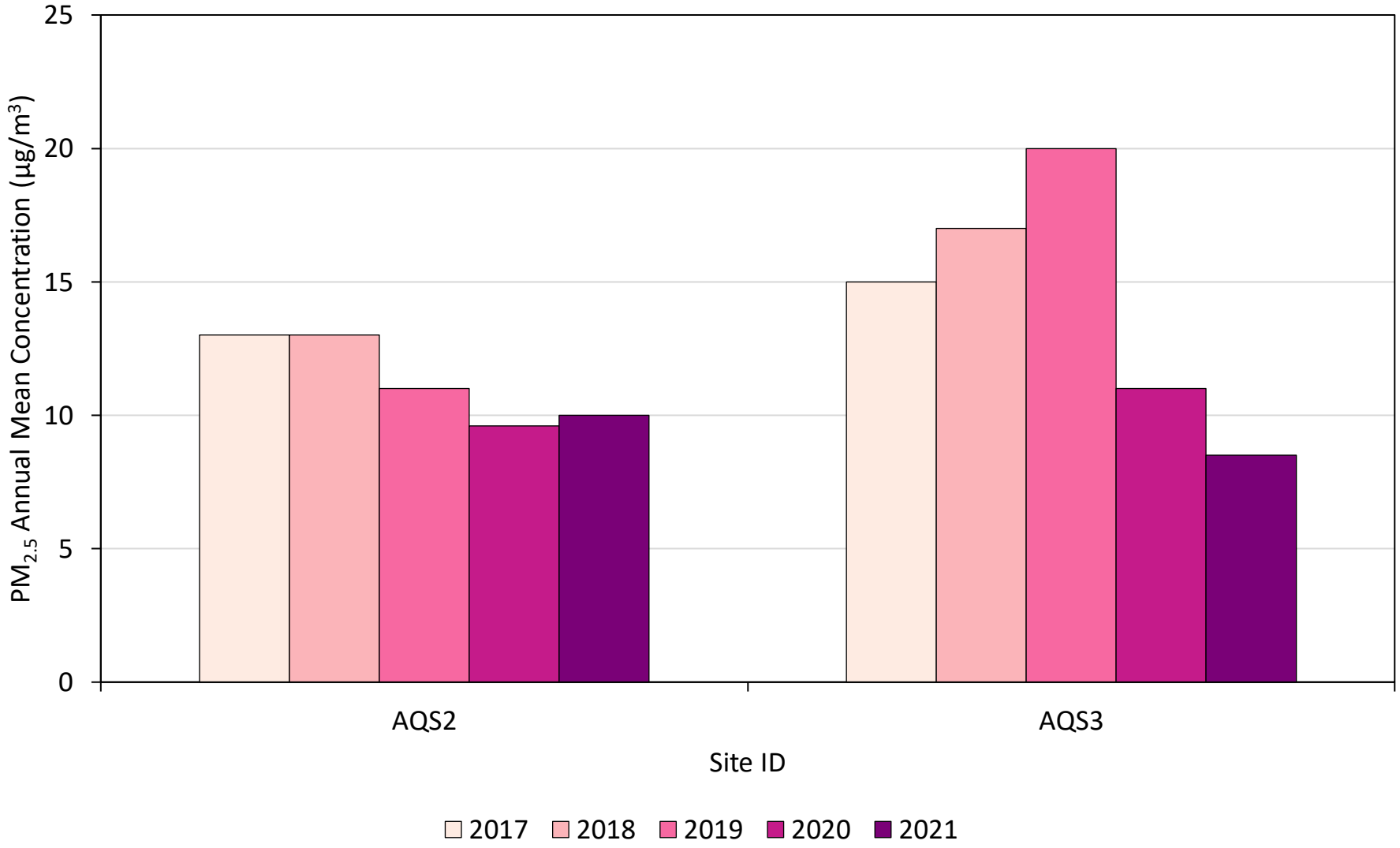
The annual mean concentrations are presented as µg/m^3.

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.14 – Trends in Annual Mean $PM_{2.5}$ Concentrations



Appendix B: Full Monthly Diffusion Tube Results for 2021

Table B.1 – NO_2 2021 Diffusion Tube Results ($\mu g/m^3$)

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Time-Weighted Annual Mean			Comment
															Raw Data	Annualised and Bias Adjusted (0.78)	Distance Corrected to Nearest Exposure	
AQ21	409822	423167								55.6	67.0	69.4	77.3		66.4	**53.1**	**46.6**	
AQC1	409485	423431								39.2	42.1	43.4	52.9					Triplicate Site with AQC1, AQC2 and AQC3 - Annual data provided for AQC3 only.
AQC2	409485	423431								39.8	47.0	51.3	56.7					Triplicate Site with AQC1, AQC2 and AQC3 - Annual data provided for AQC3 only.
AQC3	409485	423431								43.0	45.5	49.9	52.0		46.4	37.1	33.3	Triplicate Site with AQC1, AQC2 and AQC3 - Annual data provided for AQC3 only.
CRH1	409767	423011								42.4	46.7	50.2	57.0		48.6	38.9		
SB1	406135	423639								36.9	51.5	49.0	51.1		46.3	37.0		
SB15	406707	423824								33.9	35.9	41.3	43.4		38.3	30.6		
SB16	406638	423836								20.7	37.6		38.6		31.1	25.4		
SB22	405823	423395								40.3	41.0	44.4	42.5		41.9	33.5		
SB3	405961	423571								44.5	47.7	46.2	47.2		46.2	37.0		
SB-AQ	406075	423615								34.4	43.7	41.7	39.9		39.5	31.6		
BS1 HB	398990	427210								36.3	35.6	41.3	40.0		38.2	30.5		
HB6	399502	427041								32.2	33.9	35.8	41.8		35.7	28.5		
HQ1	398794	427237								43.0	48.3	59.7	65.1		53.2	**42.6**		
HQ9	399236	427176								34.1	36.8	38.1	41.0		37.2	29.8		
LF1	403810	424977								38.6	40.1	43.5	38.3		40.0	32.0		
LF2	403738	425110								26.3	34.3	36.7	41.5		34.1	27.2		
SC5	410823	426265								44.1	39.3	33.8	42.8		40.3	32.3		
BE2	414385	422457								41.0	46.0	49.7	47.3		45.6	36.5		
BE4	414478	422692								43.1	54.3	59.1	63.1		54.0	**43.2**		
BH3	414671	422740								46.5	49.1	58.1	62.2		53.4	**42.7**	36.2	
HXR1	414218	422957								54.5	53.8	56.2	53.3		54.5	**43.6**		
LV-BRD	414683	423155								25.7	30.2	34.0	32.2		30.2	24.1		
WR2	415090	422817								31.1	37.3	43.0	46.7		38.9	31.1		
HH-1A	412593	425497								36.1	43.1	42.7	36.7		39.3	31.5		
HH-LT	412450	425435								41.7	55.5	54.5	63.7		52.9	**42.3**		
HH-TC	412718	425556								32.0	33.3	34.7	39.1		34.6	27.7		
LV-NBN	409715	425754								63.3	72.8	61.1	70.2		66.5	**53.2**	24.9	
LV-NBS	409708	425737								45.9	50.7	53.1	55.4		50.9	**40.7**	25.3	
LV-NBX	409602	425797								41.3	44.6	48.2	51.9		46.1	36.9	22.0	
NB-GR	409957	425642								62.6	61.3	64.8	71.3		64.8	**51.9**	**43.9**	
NB-NB1	409663	425740								43.3	50.3	53.8	36.4		45.7	36.6	33.1	
AQ20	409483	423337								20.7	21.9	23.6	27.2		23.2	18.5		
AT-BR	411514	419548								26.3	27.6	30.3	33.8		29.3	23.4		
AT-MR	411581	419373								22.9	28.6	31.9	38.2		29.8	23.9		
CL1	413261	420686								35.1	32.5		35.9		34.6	28.2		
HTAH	411494	419594								30.5		32.2	37.0		33.0	26.3		
LV-62E	416717	422113								35.4	37.1	40.0	47.9		39.8	31.8		

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Time-Weighted Annual Mean			Comment
															Raw Data	Annualised and Bias Adjusted (0.78)	Distance Corrected to Nearest Exposure	
LV-62W	416172	422282								37.5	64.5	47.6	50.6		49.0	39.2	33.5	
LV-AT	411533	419358								51.2	49.2	47.3	60.0		51.9	**41.5**	31.6	
LV-EWB	410104	421516								24.0	24.7	25.2	25.6		24.8	19.8		
LV-LEE	417698	420709								25.9	34.6	36.2	40.6		33.7	26.9		
LV-SAA	411201	419429								27.0	26.6	26.8	32.1		28.0	22.4		
LV-SCA	405911	416597								38.1	55.4	43.1	51.9		46.4	37.1		
MY01	401431	425995								34.3	42.7	46.5	47.5		42.1	33.7		
MY02	401275	426046								12.8	18.8	21.1	23.6		18.6	14.9		
MY03	401204	426041								35.9	41.8	44.3	41.6		40.5	32.4		
MY-04	401059	426179								20.5	25.9	25.4	33.1		25.8	20.6		
MY-05	401040	426186								22.7	28.5	28.7			26.2	22.4		
NB-GL	410367	425975								48.9		62.6	54.2		54.6	**43.5**	26.7	
SB23	405701	423223								25.5	28.2	29.4	35.3		29.3	23.4		
WV-SR1	409598	421167								29.6	44.9	45.4	50.1		41.5	33.2		
WV-SR2	409608	421160								21.6	31.2	31.7	32.6		28.7	22.9		
SB40	405814	422611								7.4		10.8	12.5		10.0	7.9		
SB41	405727	422878								7.7		9.8	12.8		9.9	7.9		
SB42	404938	422699								20.7		33.6	34.9		28.8	23.0		
SB43	405082	422999								8.3		13.1	13.3		11.2	9.0		
SB44	405234	423022								9.4		17.1	18.5		14.4	11.5		
SB45	405780	423349								29.8		36.8	37.7		34.3	27.3		

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

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

☐ **Local bias adjustment factor used.**

☒ **National bias adjustment factor used.**

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

☒ **Calderdale Metropolitan 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.

Table B.2 – NO_2 June 2021 (Excluded) Diffusion Tube Results (µg/m^3)

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	June
AQ21	409822	423167	54.8
AQC1	409485	423431	38.7
AQC2	409485	423431	41.4
AQC3	409485	423431	40.7
CRH1	409767	423011	45.3
SB1	406135	423639	44.5
SB15	406707	423824	-
SB16	406638	423836	34.4
SB22	405823	423395	25.9
SB3	405961	423571	45.0
SB-AQ	406075	423615	42.3
BS1 HB	398990	427210	28.0
HB6	399502	427041	31.3
HQ1	398794	427237	38.0
HQ9	399236	427176	35.6
LF1	403810	424977	40.1
LF2	403738	425110	28.9
SC5	410823	426265	39.9
BE2	414385	422457	36.0
BE4	414478	422692	34.6
BH3	414671	422740	40.4
HXR1	414218	422957	39.8
LV-BRD	414683	423155	23.9
WR2	415090	422817	28.5
HH-1A	412593	425497	35.6
HH-LT	412450	425435	43.8
HH-TC	412718	425556	25.7
LV-NBN	409715	425754	62.1
LV-NBS	409708	425737	41.8
LV-NBX	409602	425797	32.9
NB-GR	409957	425642	58.3
NB-NB1	409663	425740	23.9

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	June
AQ20	409483	423337	20.7
AT-BR	411514	419548	24.4
AT-MR	411581	419373	19.0
CL1	413261	420686	31.4
HTAH	411494	419594	28.6
LV-62E	416717	422113	36.5
LV-62W	416172	422282	28.7
LV-AT	411533	419358	46.7
LV-EWB	410104	421516	21.3
LV-LEE	417698	420709	28.0
LV-SAA	411201	419429	23.0
LV-SCA	405911	416597	27.8
MY01	401431	425995	33.6
MY02	401275	426046	11.9
MY03	401204	426041	35.4
MY-04	401059	426179	19.2
MY-05	401040	426186	22.6
NB-GL	410367	425975	49.2
SB23	405701	423223	22.1
WV-SR1	409598	421167	37.3
WV-SR2	409608	421160	30.0
SB40	405814	422611	-
SB41	405727	422878	-
SB42	404938	422699	-
SB43	405082	422999	-
SB44	405234	423022	-
SB45	405780	423349	-

Notes:

June values were excluded from the annual mean calculation as they were exposed beyond the 4-5 week recommendation of TG.16.

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

New or Changed Sources Identified Within Calderdale During 2021

Calderdale Metropolitan Borough Council has not identified any new sources relating to air quality within the reporting year of 2021. However, to ensure that any new development would not adversely impact air pollution, an air quality assessment was requested for the following planning applications:

- 21/00985/MIN: North Westerly extension to the currently operational Pasture House Quarry.
- 21/00839/FUL: Installation of a battery storage facility (7 battery containers along with 6 inverters, a switchgear container and a DNO substation).
- 21/00662/FUL: The proposed installation of a replacement MCPD compliant, natural gas fired CHP to generate electricity approximately 3.2 MW of electricity following the proposed decommissioning of the existing CHP currently operating at the site.
- 21/00207/FUL: Proposed amendment to contours for final restoration scheme at Clockface Quarry.
- 21/00017/LAA: Elland access package - construction of x2 pedestrian and cycleway bridges in Elland and West Vale.
- 20/01310/WAM: Change of use of existing buildings to install bio mass boilers to be fuelled by waste wood and associated processing of wood chip and timber material for fuel.
- 20/00907/FUL: Installation of three identical 295 kW biomass boilers and the development of a plant room to house boiler plant and heat exchange equipment.

Additional Air Quality Works Undertaken by Calderdale Metropolitan Borough Council During 2021

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

QA/QC of Diffusion Tube Monitoring

The diffusion tubes are supplied and analysed by SOCOTEC Didcot using the 50% TEA (triethanolamine) in acetone preparation method. SOCOTEC Didcot, a UKAS accredited laboratory, participate in the AIR-PT scheme for NO_2 diffusion tube analysis and Annual Field Intercomparison Exercise. These provide strict criteria relating to performance that participating laboratories must meet, thereby ensuring that the reported NO_2 concentrations are of a high calibre. In the first round of results during 2021, running from January – March (AIR-PT AR042), SOCOTEC Didcot were awarded a score of 100% – the percentage score is an indication of the results deemed satisfactory based upon the z-score of < ±2. At the time of writing this report, the AIR-PT results for April – December 2021 were not available.

For all observations in 2021, the precision of NO_2 diffusion tubes supplied by SOCOTEC Didcot was classified as 'good' for all but three. The precision is an indication of the laboratory's performance and consistency in both the preparation, analysis and handling of the diffusion tubes. Full details of the precision summary results are available here.

During 2021, the diffusion tubes were not deployed in line with the monitoring calendar, owing primarily to staff shortages caused by COVID-19 absences. As a result, there is no diffusion tube data for the first half of the monitoring period (January – May, and July). The diffusion tubes for June were overexposed beyond the recommended 4-5 weeks, and therefore the data has been excluded (but is shown in Table B.2 for complete transparency). In the latter half of the year (i.e. August onwards), there was less disruption to the changing of diffusion tubes, hence there is a more continual set of data between August – November.

Diffusion Tube Annualisation

Owing to the disruption caused by staff shortages, all diffusion tube sites were required to be annualised during 2021, with data capture ranging from 27% to 35%. Annualisation was carried out in accordance with TG.16 by calculating an average annualisation factor from four background monitoring sites within a 50-mile radius. The background monitoring sites used are all part of the Automatic Urban and Rural Network (AURN); Dewsbury Ashworth Grove, Leeds Centre, Manchester Piccadilly and Barnsley Gawber. Results of the calculations, including the average annualisation factor, are provided in Table C.3.

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.

Calderdale Metropolitan 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 Calderdale Metropolitan Borough Council over the past five years is presented in Table C.1.

A co-location study is carried out at the Huddersfield Road (AQS2) automatic monitoring station, where three diffusion tubes (AQC1, AQC2 and AQC3) are co-located within 30cm of the monitoring inlet. The local bias adjustment factor was calculated at 0.74 as shown in Table C.2. However, owing to the poor data capture of these three sites (35%), the more conservative national factor of 0.78 (spreadsheet 03/22) was used to bias adjust the data.

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	Local	-	0.87
2019	National	03/19	0.80
2018	National	03/18	0.78
2017	Local	-	0.84

Table C.2 – Local Bias Adjustment Calculation

	Local Bias Adjustment Input 1
Periods used to calculate bias	4
Bias Factor A	0.74 (0.72 – 0.77)
Bias Factor B	35% (30% - 40%)
Diffusion Tube Mean (µg/m^3)	46.9
Mean CV (Precision)	6%
Automatic Mean (µg/m^3)	34.8
Data Capture	100%
Adjusted Tube Mean (µg/m^3)	35 (34 – 36)

Notes:

Although not used to bias adjust the 2021 data, the results of the co-location study as presented for transparency.

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.

The NO_2 annual mean concentration was corrected for distance to relevant exposure at 11 diffusion tube sites in 2021. These sites were subject to such calculation as the annual mean concentration was greater than 36 µg/m^3 and the monitoring site is not located at a point of relevant exposure. Site LV-SCA was not distance corrected as the diffusion tube is over 150m to the nearest point of relevant exposure and therefore an accurate estimation could not be achieved. A summary is provided in Table C.4.

QA/QC of Automatic Monitoring

The three automatic monitors are covered by a maintenance and callout contract, allowing six monthly maintenance visits and callouts for any instrument faults. Each site is visited every two weeks by a contractor to routinely monitor and detect any faults whilst checking the instrument nitrogen oxide span and zeros. Data from all three automatic monitoring sites is collected using WinAQMS and Airodis software, then checked for erroneous readings and backed up to Calderdale Metropolitan Borough Council's secure network. The raw values are checked for inconsistencies before using the span and zero values obtained on site each week to scale the data. Calderdale Metropolitan Borough Council's 2021 automatic air quality monitoring site data has been ratified by Air Quality Data Management to the LAQM TG.16 standards.

PM_{10} and $PM_{2.5}$ Monitoring Adjustment

Measurements of particulate matter are made using a beta attenuation monitor (BAM) with the appropriate inlets for PM_{10} and $PM_{2.5}$ and the data is collected using the same system as the NO_2 analysers. The BAM tape is changed by Council staff when required. Sections of the record where there is a consistent amount of missing data may need to be removed from the data as they are likely to be affected by instrument faults (something which is not normally detected during routine checks). Similarly, a period of known instrument faults is also removed. Once the data is in a suitable format, it can be imported into the open source

software package “openair”. Calderdale Metropolitan Borough Council has chosen to use “openair” primarily due to the range of analysis tools and ease of data manipulation.

Automatic Monitoring Annualisation

All automatic monitoring locations within Calderdale 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.

NO_2 Fall-off with Distance from the Road

No automatic NO_2 monitoring locations within Calderdale required distance correction during 2021.

Table C.3 – Annualisation Summary (concentrations presented in µg/m^3)

Site ID	Annualisation Factor Dewsbury Ashworth Grove	Annualisation Factor Leeds Centre	Annualisation Factor Manchester Piccadilly	Annualisation Factor Barnsley Gawber	Average Annualisation Factor	Raw Data Time-Weighted Annual Mean	Annualised Data Time-Weighted Annual Mean	Comments
AQ21	1.0559	0.9538	0.9723	1.1203	1.0256	66.4	68.1	
AQC1	1.0559	0.9538	0.9723	1.1203	1.0256	-	-	Triplicate Site with AQC1, AQC2 and AQC3 - Annual data provided for AQC3 only.
AQC2	1.0559	0.9538	0.9723	1.1203	1.0256	-	-	Triplicate Site with AQC1, AQC2 and AQC3 - Annual data provided for AQC3 only.
AQC3	1.0559	0.9538	0.9723	1.1203	1.0256	46.4	47.6	Triplicate Site with AQC1, AQC2 and AQC3 - Annual data provided for AQC3 only.
CRH1	1.0559	0.9538	0.9723	1.1203	1.0256	48.6	49.8	
SB1	1.0559	0.9538	0.9723	1.1203	1.0256	46.3	47.5	
SB15	1.0559	0.9538	0.9723	1.1203	1.0256	38.3	39.3	
SB16	1.0872	0.9978	0.9867	1.1132	1.0462	31.1	32.5	
SB22	1.0559	0.9538	0.9723	1.1203	1.0256	41.9	43.0	
SB3	1.0559	0.9538	0.9723	1.1203	1.0256	46.2	47.4	
SB-AQ	1.0559	0.9538	0.9723	1.1203	1.0256	39.5	40.5	
BS1 HB	1.0559	0.9538	0.9723	1.1203	1.0256	38.2	39.1	
HB6	1.0559	0.9538	0.9723	1.1203	1.0256	35.7	36.6	
HQ1	1.0559	0.9538	0.9723	1.1203	1.0256	53.2	54.6	
HQ9	1.0559	0.9538	0.9723	1.1203	1.0256	37.2	38.2	
LF1	1.0559	0.9538	0.9723	1.1203	1.0256	40.0	41.0	
LF2	1.0559	0.9538	0.9723	1.1203	1.0256	34.1	34.9	
SC5	1.0559	0.9538	0.9723	1.1203	1.0256	40.3	41.4	
BE2	1.0559	0.9538	0.9723	1.1203	1.0256	45.6	46.8	
BE4	1.0559	0.9538	0.9723	1.1203	1.0256	54.0	55.4	
BH3	1.0559	0.9538	0.9723	1.1203	1.0256	53.4	54.8	
HXR1	1.0559	0.9538	0.9723	1.1203	1.0256	54.5	55.9	
LV-BRD	1.0559	0.9538	0.9723	1.1203	1.0256	30.2	30.9	
WR2	1.0559	0.9538	0.9723	1.1203	1.0256	38.9	39.9	
HH-1A	1.0559	0.9538	0.9723	1.1203	1.0256	39.3	40.4	

Site ID	Annualisation Factor Dewsbury Ashworth Grove	Annualisation Factor Leeds Centre	Annualisation Factor Manchester Piccadilly	Annualisation Factor Barnsley Gawber	Average Annualisation Factor	Raw Data Time-Weighted Annual Mean	Annualised Data Time-Weighted Annual Mean	Comments
HH-LT	1.0559	0.9538	0.9723	1.1203	1.0256	52.9	54.2	
HH-TC	1.0559	0.9538	0.9723	1.1203	1.0256	34.6	35.5	
LV-NBN	1.0559	0.9538	0.9723	1.1203	1.0256	66.5	68.2	
LV-NBS	1.0559	0.9538	0.9723	1.1203	1.0256	50.9	52.2	
LV-NBX	1.0559	0.9538	0.9723	1.1203	1.0256	46.1	47.3	
NB-GR	1.0559	0.9538	0.9723	1.1203	1.0256	64.8	66.5	
NB-NB1	1.0559	0.9538	0.9723	1.1203	1.0256	45.7	46.9	
AQ20	1.0559	0.9538	0.9723	1.1203	1.0256	23.2	23.7	
AT-BR	1.0559	0.9538	0.9723	1.1203	1.0256	29.3	30.0	
AT-MR	1.0559	0.9538	0.9723	1.1203	1.0256	29.8	30.6	
CL1	1.0872	0.9978	0.9867	1.1132	1.0462	34.6	36.2	
HTAH	1.0522	0.9523	0.9516	1.1326	1.0222	33.0	33.7	
LV-62E	1.0559	0.9538	0.9723	1.1203	1.0256	39.8	40.8	
LV-62W	1.0559	0.9538	0.9723	1.1203	1.0256	49.0	50.2	
LV-AT	1.0559	0.9538	0.9723	1.1203	1.0256	51.9	53.2	
LV-EWB	1.0559	0.9538	0.9723	1.1203	1.0256	24.8	25.4	
LV-LEE	1.0559	0.9538	0.9723	1.1203	1.0256	33.7	34.5	
LV-SAA	1.0559	0.9538	0.9723	1.1203	1.0256	28.0	28.8	
LV-SCA	1.0559	0.9538	0.9723	1.1203	1.0256	46.4	47.5	
MY01	1.0559	0.9538	0.9723	1.1203	1.0256	42.1	43.2	
MY02	1.0559	0.9538	0.9723	1.1203	1.0256	18.6	19.1	
MY03	1.0559	0.9538	0.9723	1.1203	1.0256	40.5	41.5	
MY-04	1.0559	0.9538	0.9723	1.1203	1.0256	25.8	26.4	
MY-05	1.1005	1.0117	1.0768	1.1863	1.0938	26.2	28.7	
NB-GL	1.0522	0.9523	0.9516	1.1326	1.0222	54.6	55.8	
SB23	1.0559	0.9538	0.9723	1.1203	1.0256	29.3	30.0	
WV-SR1	1.0559	0.9538	0.9723	1.1203	1.0256	41.5	42.5	
WV-SR2	1.0559	0.9538	0.9723	1.1203	1.0256	28.7	29.4	
SB40	1.0522	0.9523	0.9516	1.1326	1.0222	10.0	10.2	
SB41	1.0522	0.9523	0.9516	1.1326	1.0222	9.9	10.1	
SB42	1.0522	0.9523	0.9516	1.1326	1.0222	28.8	29.5	
SB43	1.0522	0.9523	0.9516	1.1326	1.0222	11.2	11.5	
SB44	1.0522	0.9523	0.9516	1.1326	1.0222	14.4	14.8	
SB45	1.0522	0.9523	0.9516	1.1326	1.0222	34.3	35.0	

Table C.4 – NO_2 Fall off With Distance Calculations (concentrations presented in µg/m^3)

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
AQ21	2.0	4.0	53.1	13.2	**46.6**	Predicted concentration at Receptor above AQS objective.
AQC1, AQC2, AQC3	2.0	4.0	37.1	13.2	33.3	
BH3	1.5	4.5	42.7	15.4	36.2	Predicted concentration at Receptor within 10% the AQS objective.
LV-NBN	1.0	41.0	53.2	15.4	24.9	
LV-NBS	2.0	27.0	40.7	15.4	25.3	
LV-NBX	1.0	31.0	36.9	15.4	22.0	
NB-GR	3.0	7.0	51.9	15.4	**43.9**	Predicted concentration at Receptor above AQS objective.
NB-NB1	2.0	4.0	36.6	15.4	33.1	
LV-62W	3.0	9.0	39.2	19.2	33.5	
LV-AT	4.0	18.0	41.5	18.0	31.6	
LV-SCA	10.0	160.0	37.1	-	-	Not distance corrected as site is over 150m from nearest point of relevant exposure.
NB-GL	2.0	19.0	43.5	11.6	26.7	

Appendix D: Maps of Monitoring Locations and AQMAs

Figure D.1 – Map of Non-Automatic & Automatic Monitoring Sites in Salterhebble (AQMA No.1)

Figure D.2 – Map of Non-Automatic & Automatic Monitoring Sites in Sowerby Bridge (AQMA No.2)

Figure D.3 – Map of Non-Automatic & Automatic Monitoring Sites in Hebden Bridge (AQMA No.3)

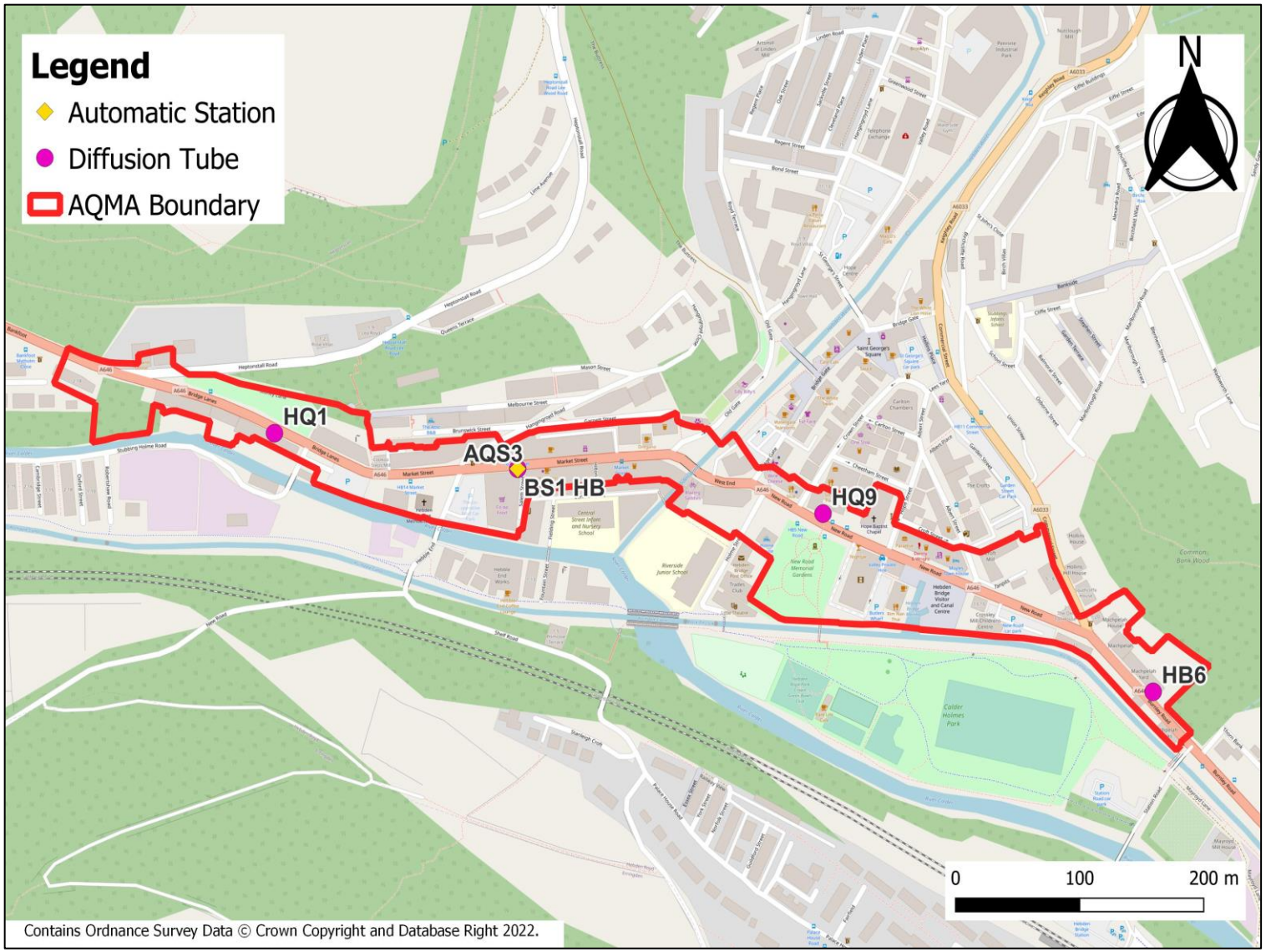


Figure D.4 – Map of Non-Automatic Monitoring Sites in Luddendenfoot (AQMA No.4)

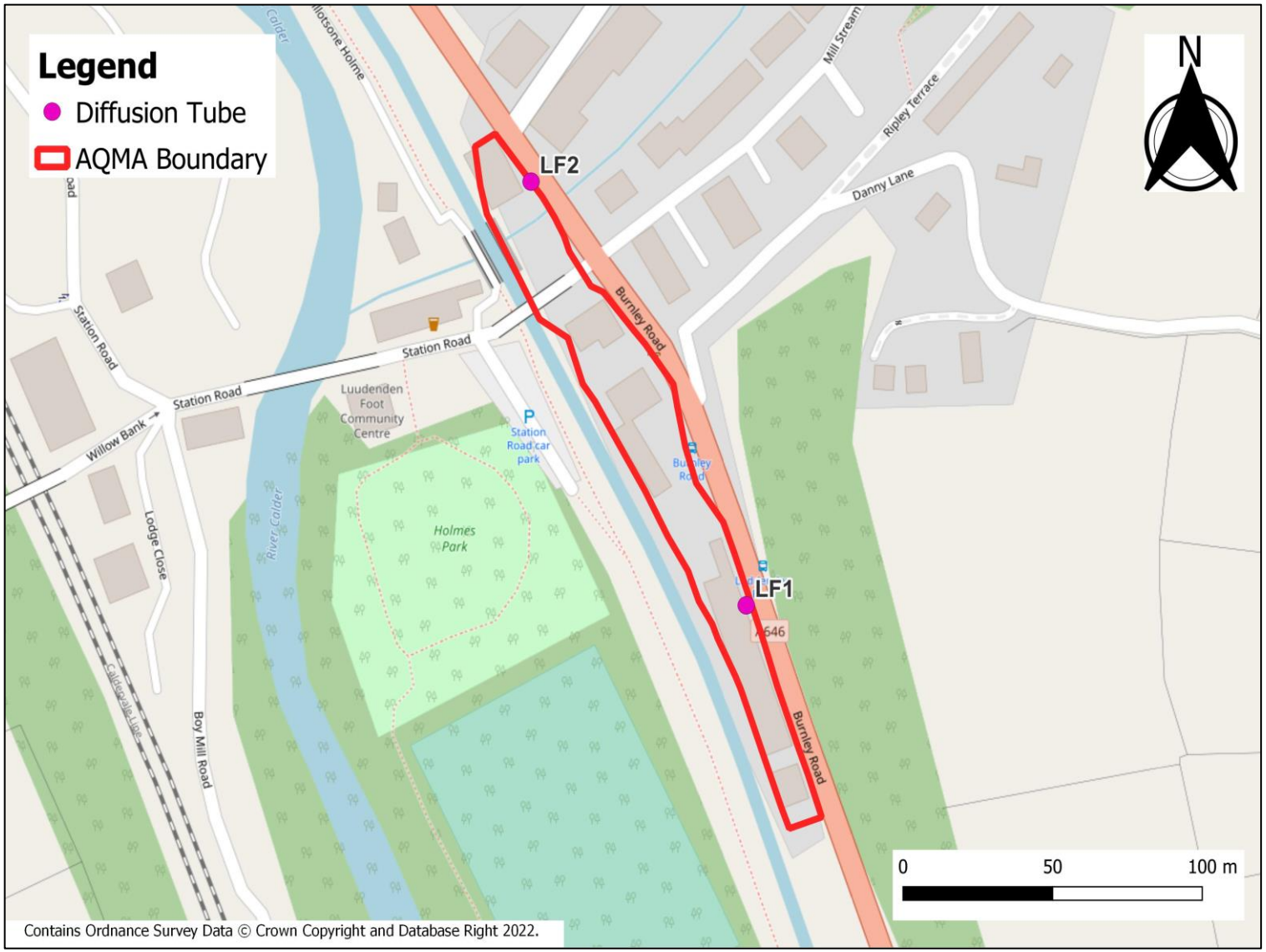


Figure D.5 – Map of Non-Automatic Monitoring Sites in Stump Cross (AQMA No.5) & New Bank (AQMA No.8)

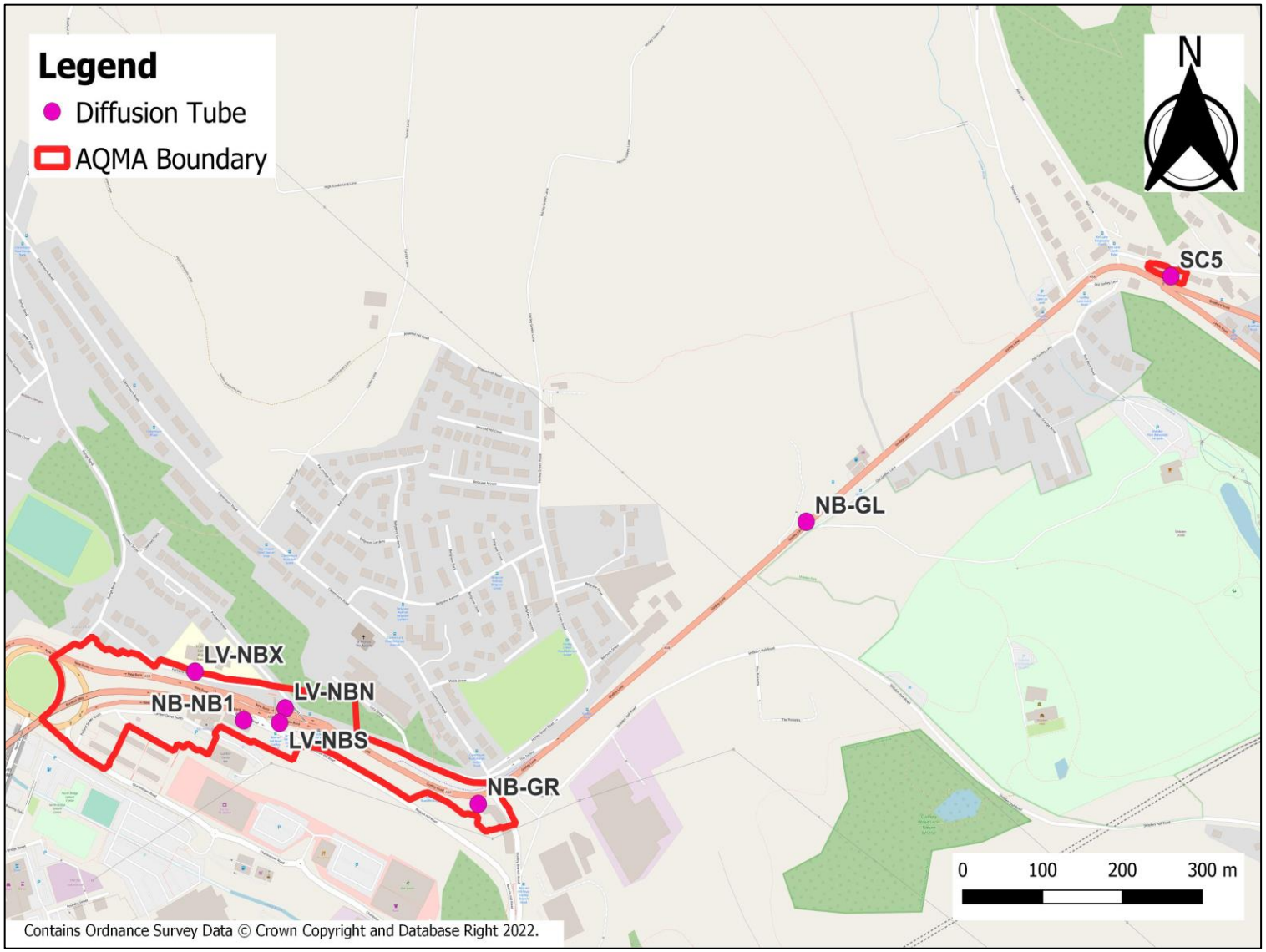


Figure D.6 – Map of Non-Automatic Monitoring Sites in Brighouse (AQMA No.6)

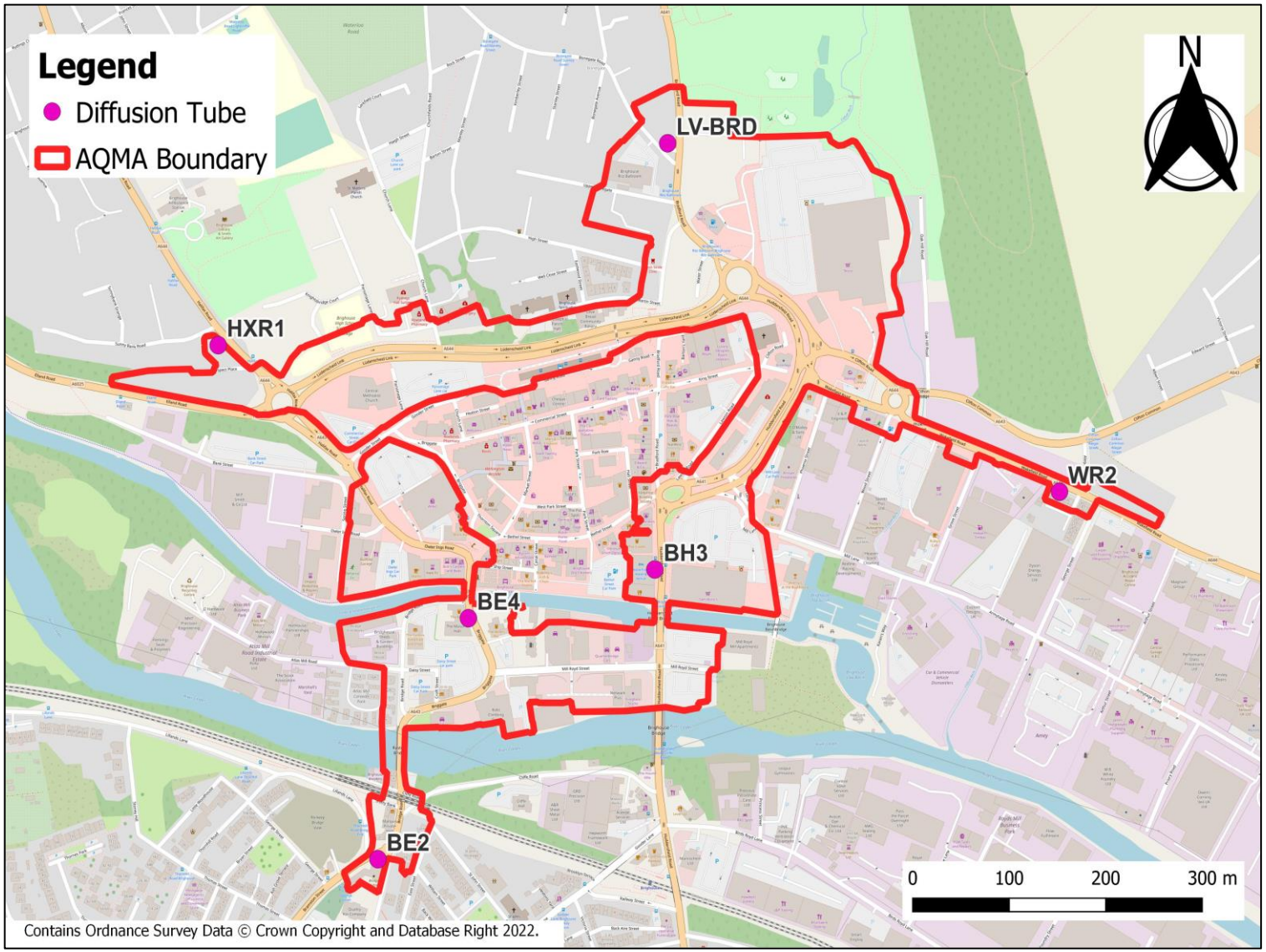


Figure D.7 – Map of Non-Automatic Monitoring Sites in Hipperholme (AQMA No.7)

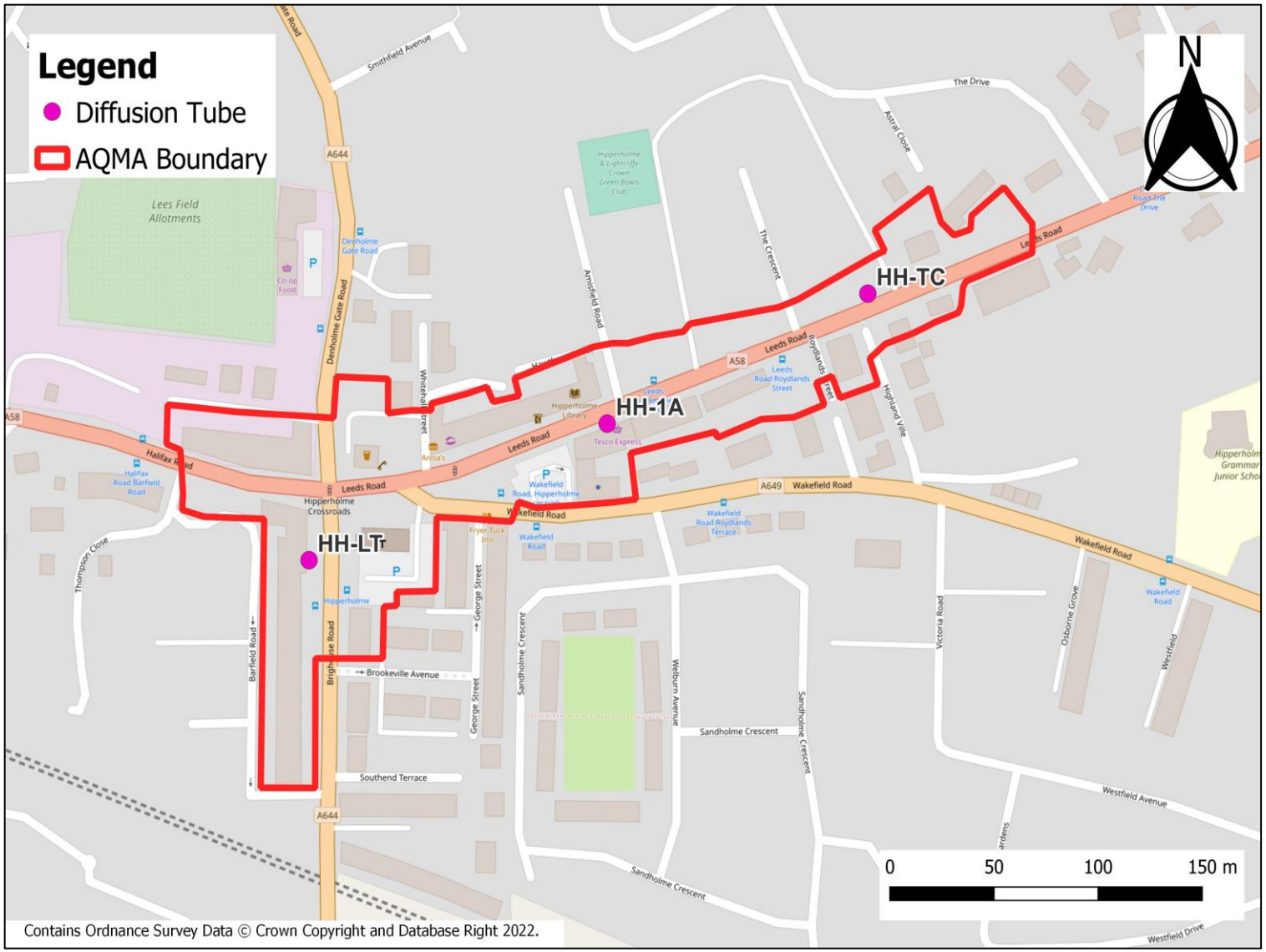


Figure D.8 – Map of Non-Automatic Monitoring Sites in Mytholmroyd

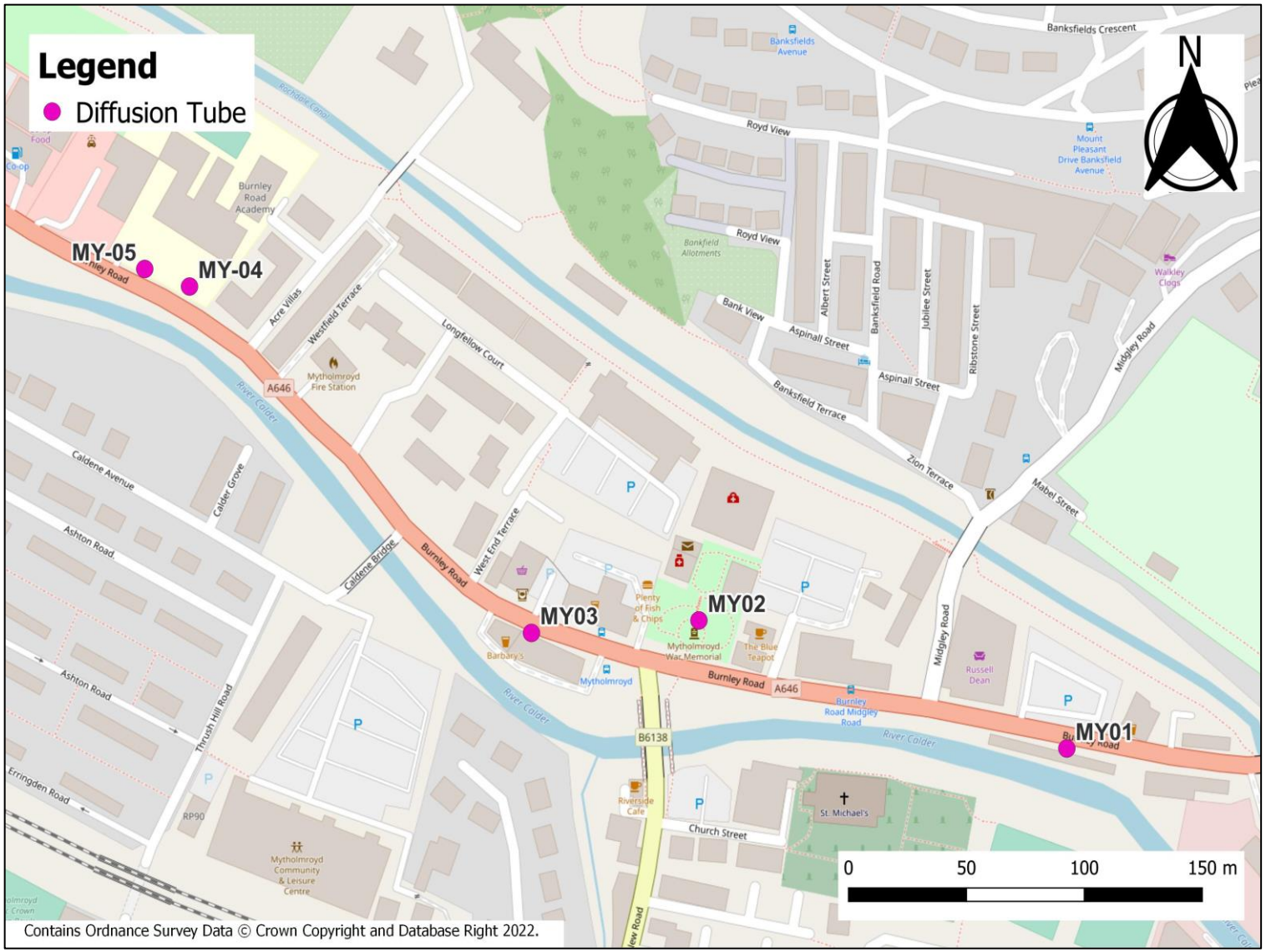


Figure D.9 – Map of Non-Automatic Monitoring Sites in West Vale, Ainley Top & Rastrick

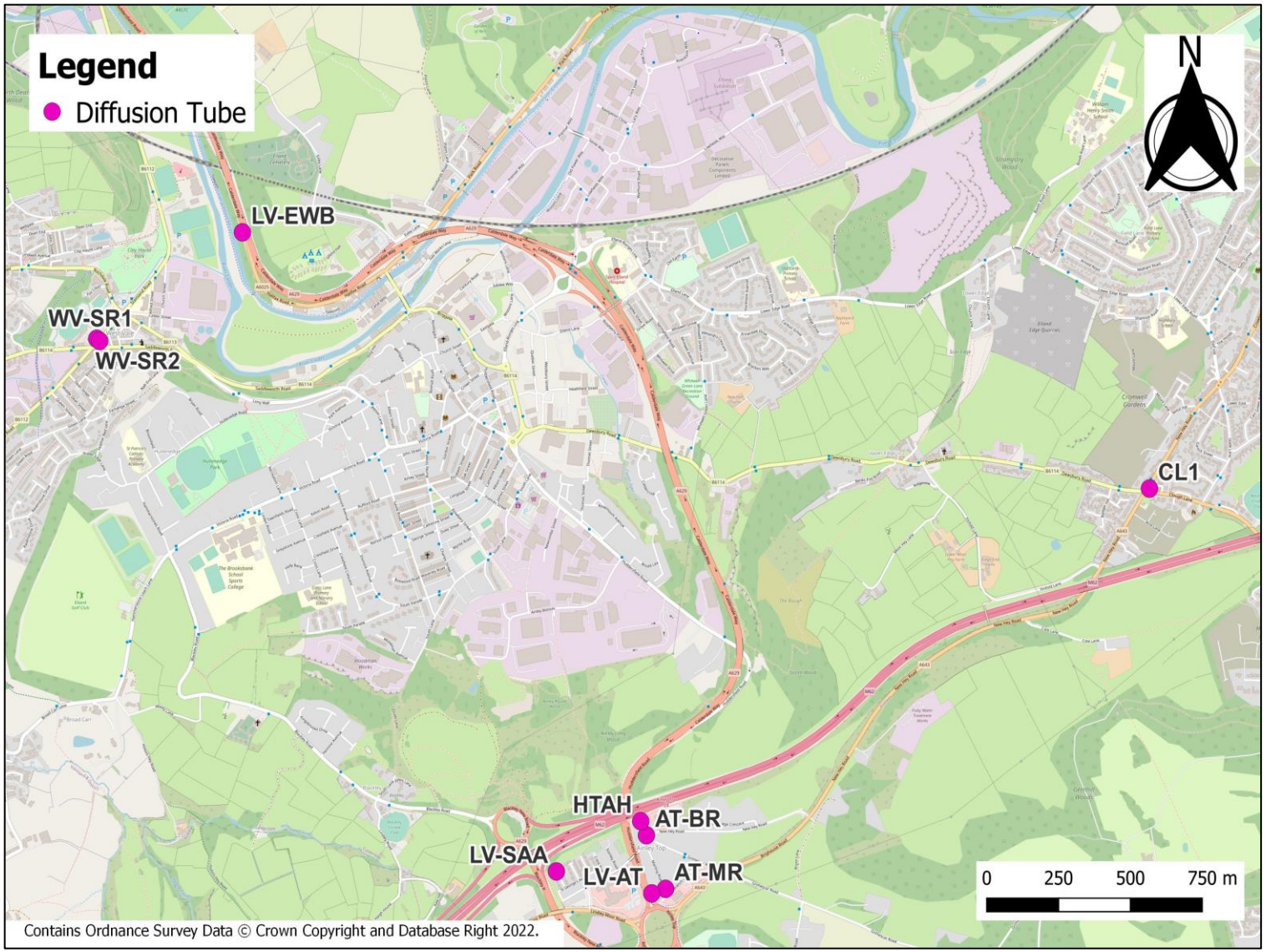


Figure D.10 – Map of Non-Automatic Monitoring Sites in Brighouse South & Cooper Bridge

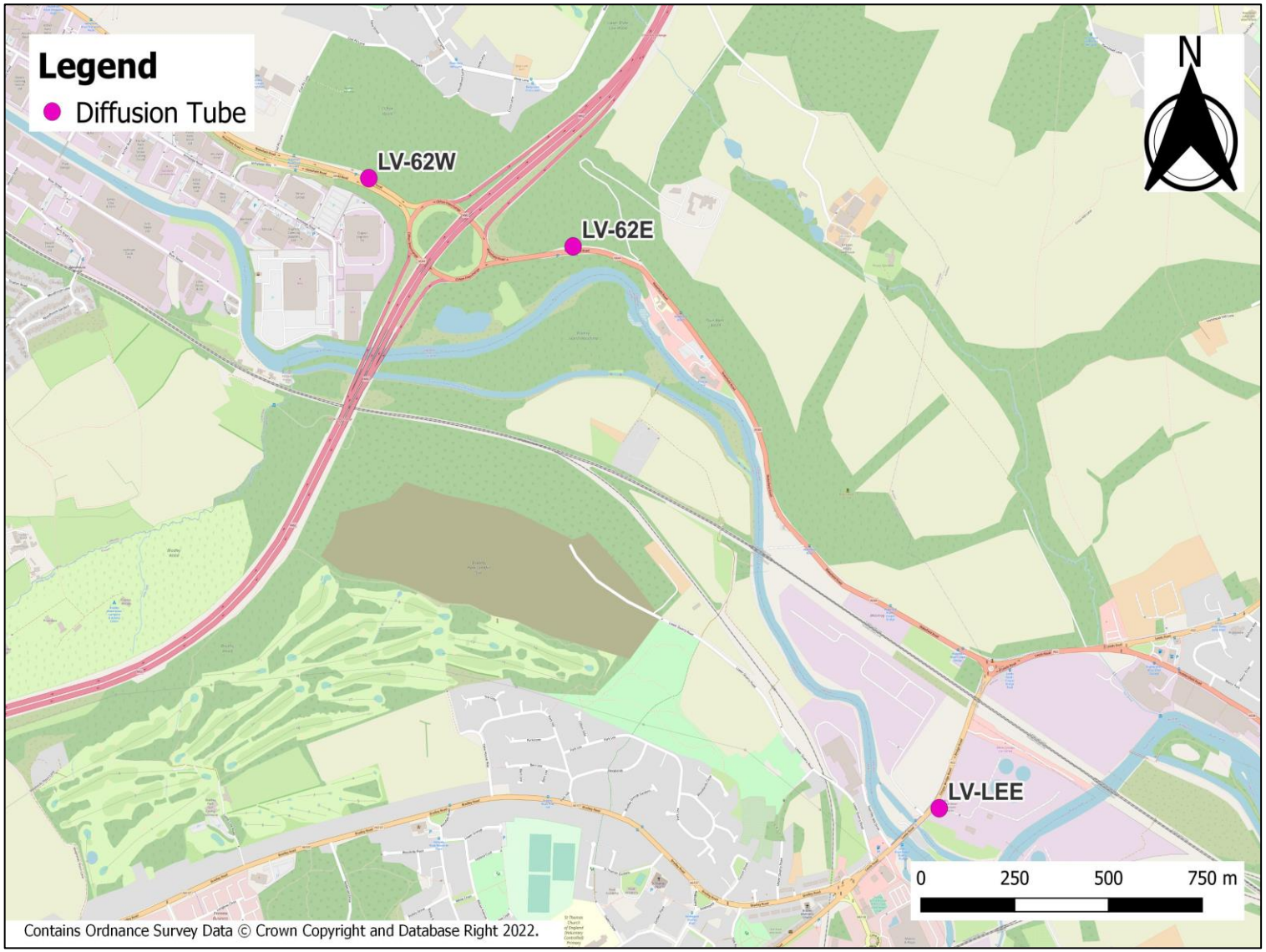


Figure D.11 – Map of Non-Automatic Monitoring Sites in Sowerby Bridge

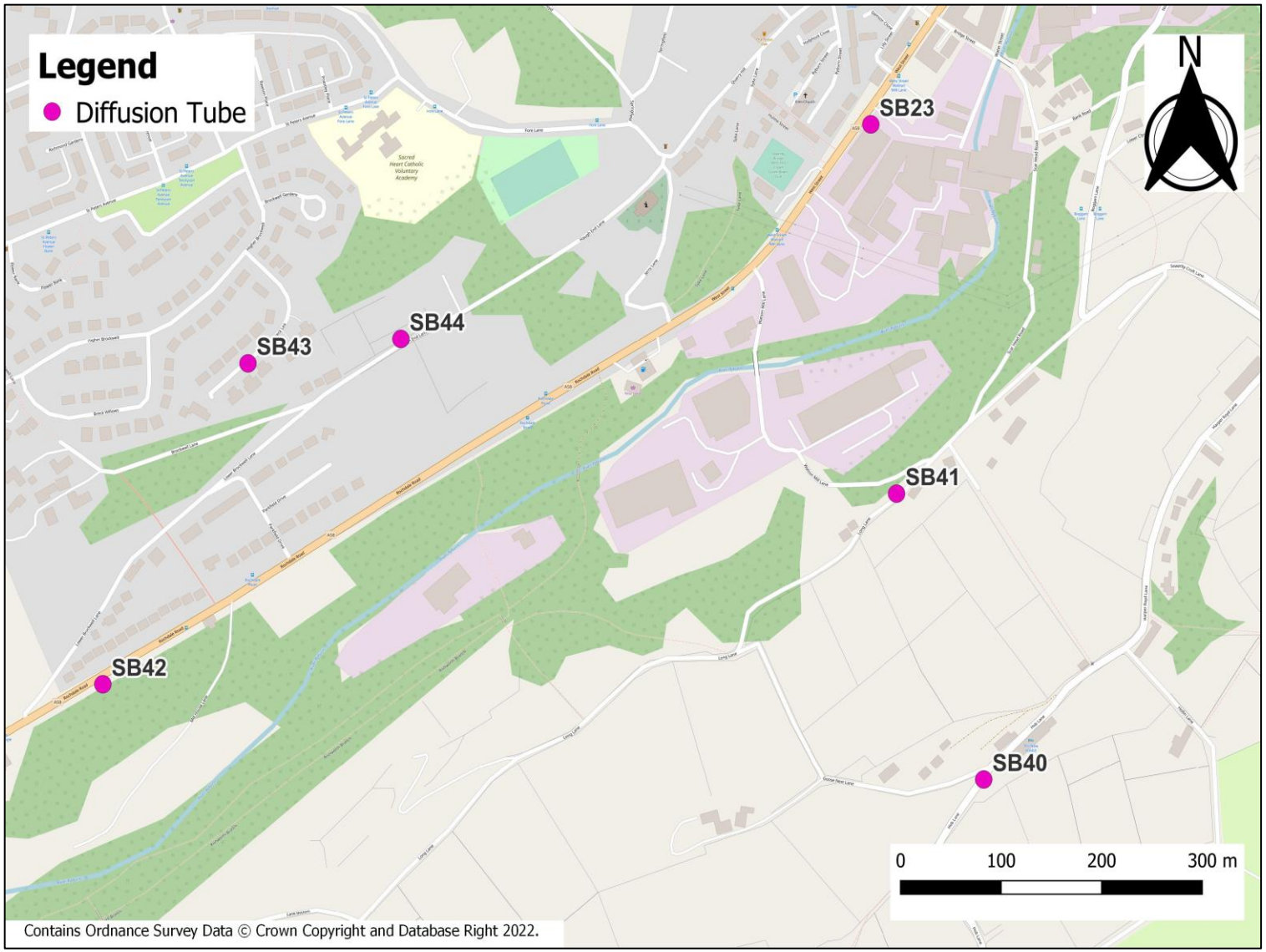
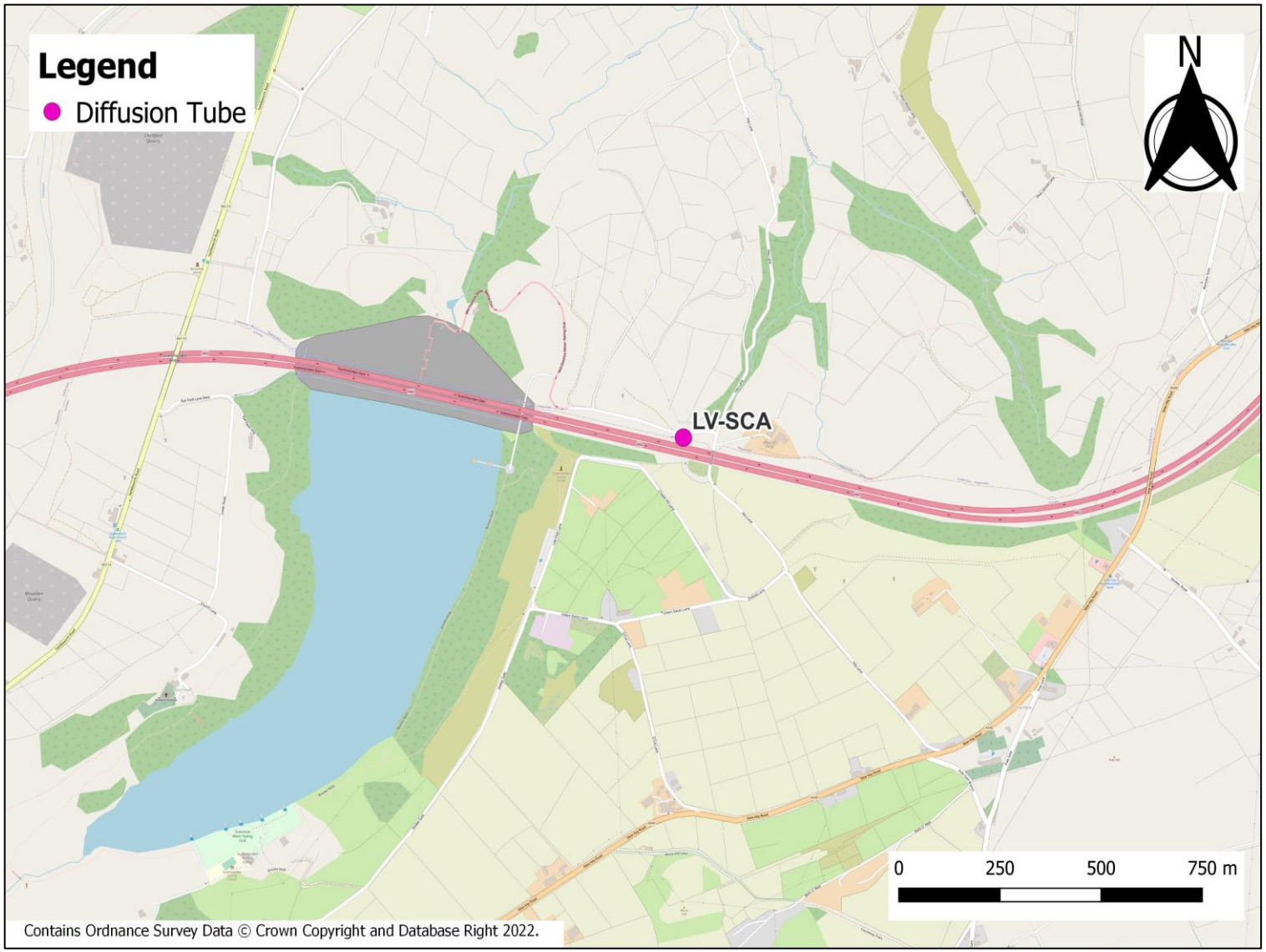


Figure D.12 – Map of Non-Automatic Monitoring Sites in Scammonden



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England[7]

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

[7] 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
AURN	Automatic Urban and Rural Network
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.
- Calderdale Air Quality Action Plan 2019. May 2019. Published by Calderdale Metropolitan Borough Council.