City of
BRADFORD
METROPOLITAN DISTRICT COUNCIL

2020 Air Quality Annual Status Report (ASR)

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

December, 2020

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Executive Summary: Air Quality in Our Area

Air Quality in Bradford

Air pollution is associated with a number of adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Additionally, air pollution particularly affects the most vulnerable in society: children and older people, and those with heart and lung conditions. There is also often a strong correlation with equalities issues, because areas with poor air quality are also often the less affluent areas[1,2].

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion[3].

Actions to Improve Air Quality

The air pollutants of concern in Bradford are nitrogen dioxide (NO_2) and particulate matter (PM). A significant source of these pollutants is traffic but industry, heat and power generation, domestic sources and natural activities also contribute.

Bradford has areas of high levels of deprivation and significant levels of health inequality. 27% of the Bradford district population live in areas classed as the 10% most deprived in England[4]. There are above average numbers of deaths from smoking, cancer, heart disease and strokes and it is estimated that emissions of man-made fine particles, $PM_{2.5}$ cause 4.6% of total mortality[5]. Improving public health outcomes and reducing deprivation are significant challenges for City of Bradford MDC.

Poor air quality is closely linked to poor health and is frequently identified in the most deprived wards of the city. City of Bradford MDC fully recognises that improving local air quality is essential to deliver better health outcomes for all. This is particularly important for the above national average numbers of young people in the district (23.8% of the total population are under 16) whom are particularly sensitive to the

[1] Environmental equity, air quality, socioeconomic status and respiratory health, 2010
[2] Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006
[3] Defra. Abatement cost guidance for valuing changes in air quality, May 2013
[4] https://ubd.bradford.gov.uk/media/1450/briefing-poverty-and-deprivation-october-2018.pdf
[5] https://fingertips.phe.org.uk/search/particulate#page/0/gid/1/pat/6/par/E12000003/ati/102/are/E08000032

effects of poor air quality. They may experience life-long impacts resulting from pollutant exposure in their early years.

For some pollutants the government has set health based objective levels which Local Authorities must comply with. Where these objectives are not met, Local Authorities must declare **Air Quality Management Areas (AQMAs)** and draw up **Air Quality Action Plans (AQAPs)** to improve air quality.

Air Quality Management Areas in Bradford

Bradford has declared four Air Quality Management Areas (AQMAs). These are located close to the city centre at Manningham Lane, Thornton Road, Mayo Avenue / Manchester Road and Shipley Airedale Road. All the AQMAs were originally declared for exceedance of both the annual average and hourly objectives for NO_2. Since the declarations air quality has improved in some areas. At Thornton Road and Mayo Avenue only the annual average objective is still considered to be at risk of exceedance.

There are a number of other locations where NO_2 concentrations are known to be elevated. Monitoring is on-going at these locations and further AQMA declarations may become necessary in the future.

The approximate location of the AQMAs and other areas of concern identified by City of Bradford MDC are shown in Figure 1.

The detailed boundaries of the current AQMAs are shown in Figure 2.

This report presents air quality data for Bradford MDC for the 2019 calendar year.

During 2019 the annual average NO_2 objective continued to be breached at relevant receptor points in the Manningham Lane and Shipley Airedale Road AQMAs. There were no exceedances of the annual average NO_2 objective in the Mayo Avenue and Thornton Road AQMAs during 2019.

The hourly NO_2 objective was not exceeded in any of the AQMAs during 2019. This has been the case for the past five years.

Figure 1: Current AQMAs and additional areas of air quality concern in Bradford

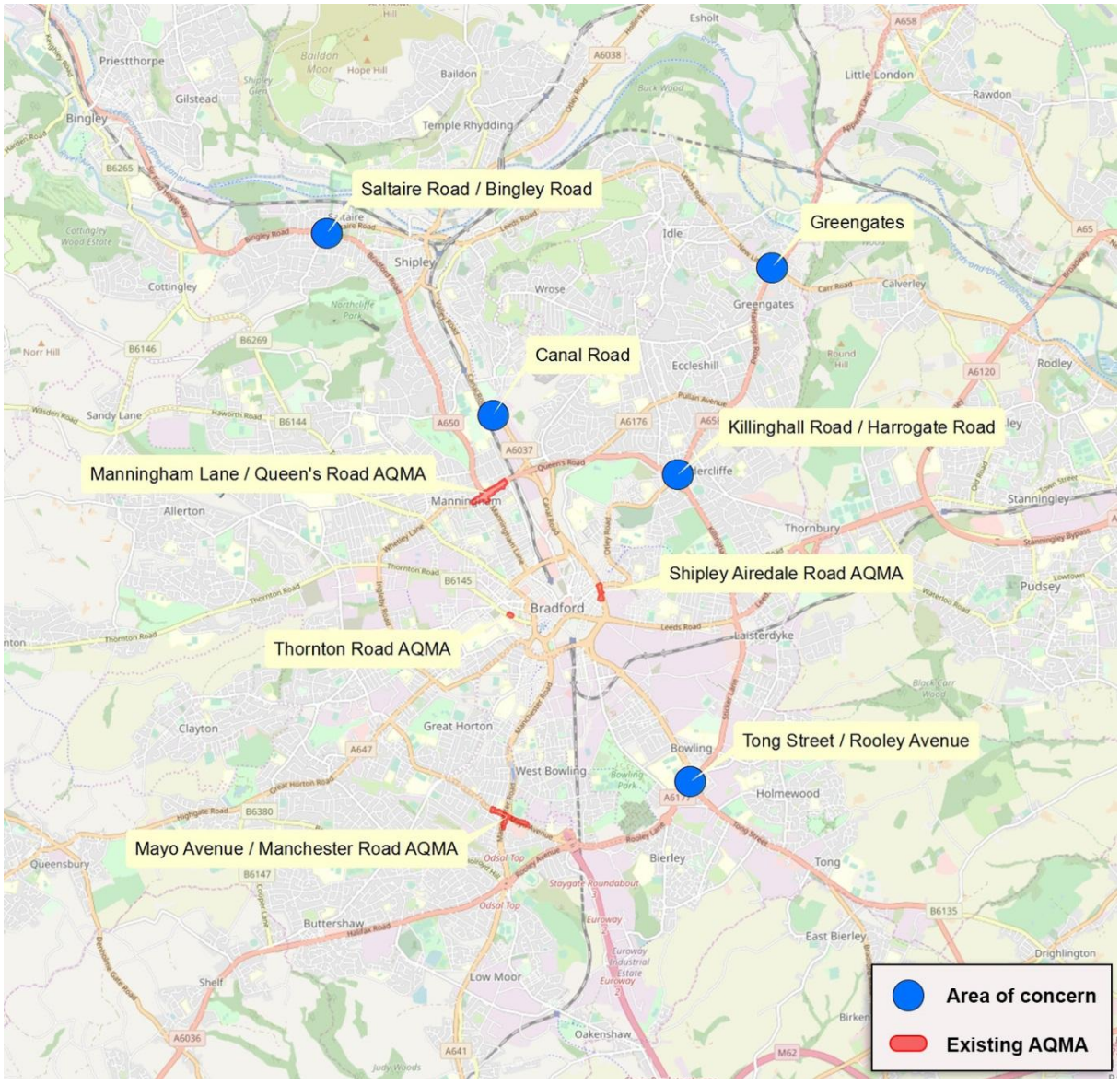
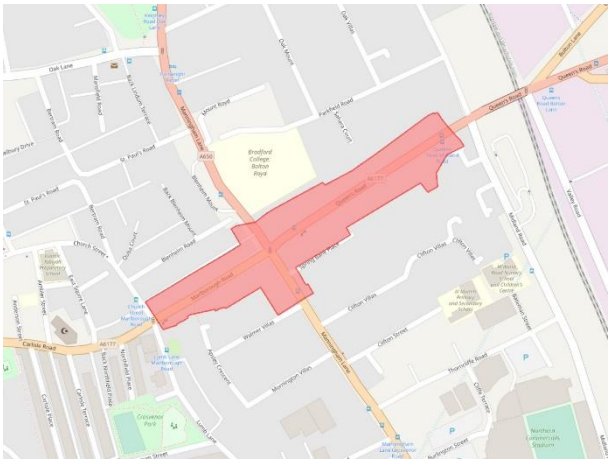
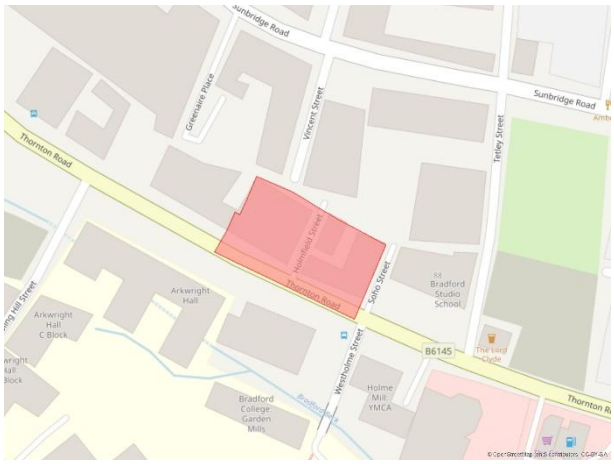


Figure 2: Bradford AQMA boundaries

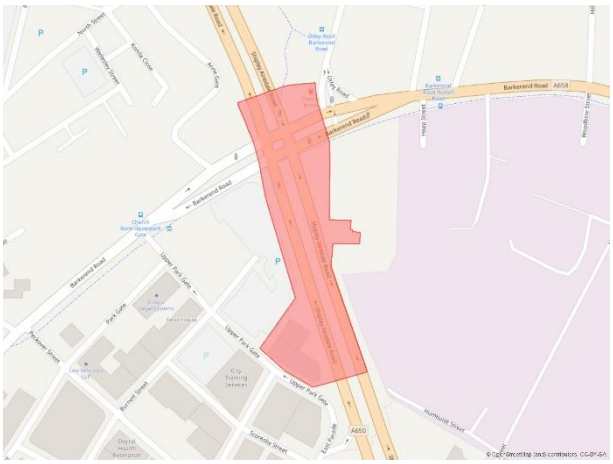
Mayo Avenue / Manchester Road – Order 1



Manningham Lane / Queen's Road – Order 2



Thornton Road – Order 3



Shipley Airedale Road – Order 4

Air quality trends in the AQMAs

Manningham Lane

The annual average NO_2 objective continued to be exceeded at a relevant receptor point within the Manningham Lane AQMA during 2019. The hourly objective may have been approached on occasions.

There is no evidence of air quality improvement in the Manningham Road AQMA during the past five years. The AQMA declaration for the annual average NO_2 objective remains necessary in this AQMA.

Shipley Airedale Road

The annual average NO_2 objective continued to be exceeded at a relevant receptor point within the Shipley Airedale Road AQMA during 2019. The hourly objective may have been approached on occasions.

There is some evidence of improving air quality within this area over the past five years. The AQMA declaration for the annual average NO_2 objective remains necessary in this AQMA.

Mayo Avenue / Manchester Road

During 2019 there were no exceedances of the annual average NO_2 objective, or the hourly NO_2 objective, at relevant locations within the Mayo Avenue AQMA. All monitoring sites within this AQMA recorded a decrease from 2018 to 2019. When viewed over a five year period the long term trend is unclear. The AQMA declaration for the annual average NO_2 objective will remain in place until City of Bradford MDC is certain there is no further risk of the annual average NO_2 objective being exceeded.

Thornton Road

There were no exceedances of the annual average NO_2 objective, or the hourly NO_2 objective, at relevant locations within the Thornton Road AQMA during 2019. The diffusion tube measurements undertaken within the Thornton Road AQMA have been consistently below the annual average NO_2 objective for the past three years. Due to a previous fault on the Thornton Road real time analyser (reported in the 2019 ASR) it is unclear what the long term air quality trend is within this AQMA. The AQMA

declaration for the annual average NO_2 objective will remain in place until City of Bradford MDC is certain there is no further risk of the annual average NO_2 objective being exceeded.

Background air quality

There were no exceedances of the annual average NO_2 objective, or the hourly NO_2 objective, at any of the background monitoring locations across the Bradford district during 2019. When viewed over a five period most of the background monitoring sites show a general improvement in air quality.

Additional areas of air quality concern in Bradford

Since the declaration of the current AQMAs, City of Bradford MDC has previously identified five additional areas of elevated NO_2 concentration. These are located at:

- Saltaire Road / Bingley Road junction
- Rook Lane / Rooley Lane / Tong Street area
- Harrogate Road / Killinghall Road/ Dudley Hill Road crossroads
- Canal Road
- Greengates crossroads

The 2019 monitoring results indicate that the annual average NO_2 objective continues to be at risk of exceedance at some locations on Bingley Road and Rooley Lane. Annual average NO_2 concentrations in the other areas have improved in recent years and were below the annual average objective in 2019. Further information about current air quality in each of these areas is detailed in section 3 of this report.

Mandated Technical Feasibility Study and Bradford Clean Air Plan (B-CAP) Business Case

In addition to the national air quality objectives (which local authorities have a duty to work towards) the UK Government has a legal duty to meet EU air quality standards. The UK has failed to meet these standards in many of its cities. As a result the EU commenced infraction proceedings against the UK in spring 2015.

In April 2015 the UK Government was subject to a Supreme Court Action ruling relating to air quality. Subsequent court challenges have resulted in further rulings against the Government and a requirement to develop new plans to resolve the UK's air quality problems.

A national NO_2 reduction plan was produced in 2017 which mandated cities with the worst air quality to undertake technical feasibility studies to identify further measures to improve air quality. The document was challenged in the High Court and subsequently deemed 'illegally inadequate'. The Government was required to undertake further revisions to the plan to ensure that it is taking all possible steps to deliver the EU air quality objectives in the shortest possible timeframe.

In March 2018, City of Bradford MDC was mandated by Ministerial Direction to complete a technical feasibility study to identify interventions that might bring forward Bradford's compliance with the EU limit values for NO_2. Bradford was one of several 'third wave' local authorities required to undertake this type of study.

Bradford's mandated technical feasibility study was submitted to Defra in July 2018. It concluded that a scheme incorporating a form of vehicular access control would be required to bring forward compliance.

The full report can be viewed here:

https://uk-air.defra.gov.uk/library/assets/documents/no2ten/Bradford_FINAL.pdf

Subsequent to the outcomes of this initial study Government served a further Ministerial Direction on City of Bradford MDC. This required further consideration of the options shortlisted in the initial study and the development of a detailed business case for a new Bradford Clean Air Plan (B-CAP) to bring forward compliance in the shortest possible timeframe. The Direction required that the local authority produced an outline business case by 31st October 2019.

The outline B-CAP business case was submitted and approved in December 2019. It incorporates proposals for a Clean Air Zone (CAZ) in which only the cleanest vans, lorries, buses, HGVs and taxis will be able to enter free of charge. Older vehicles will have to pay a charge to enter. Under the current proposals the CAZ charges will not apply to private cars.

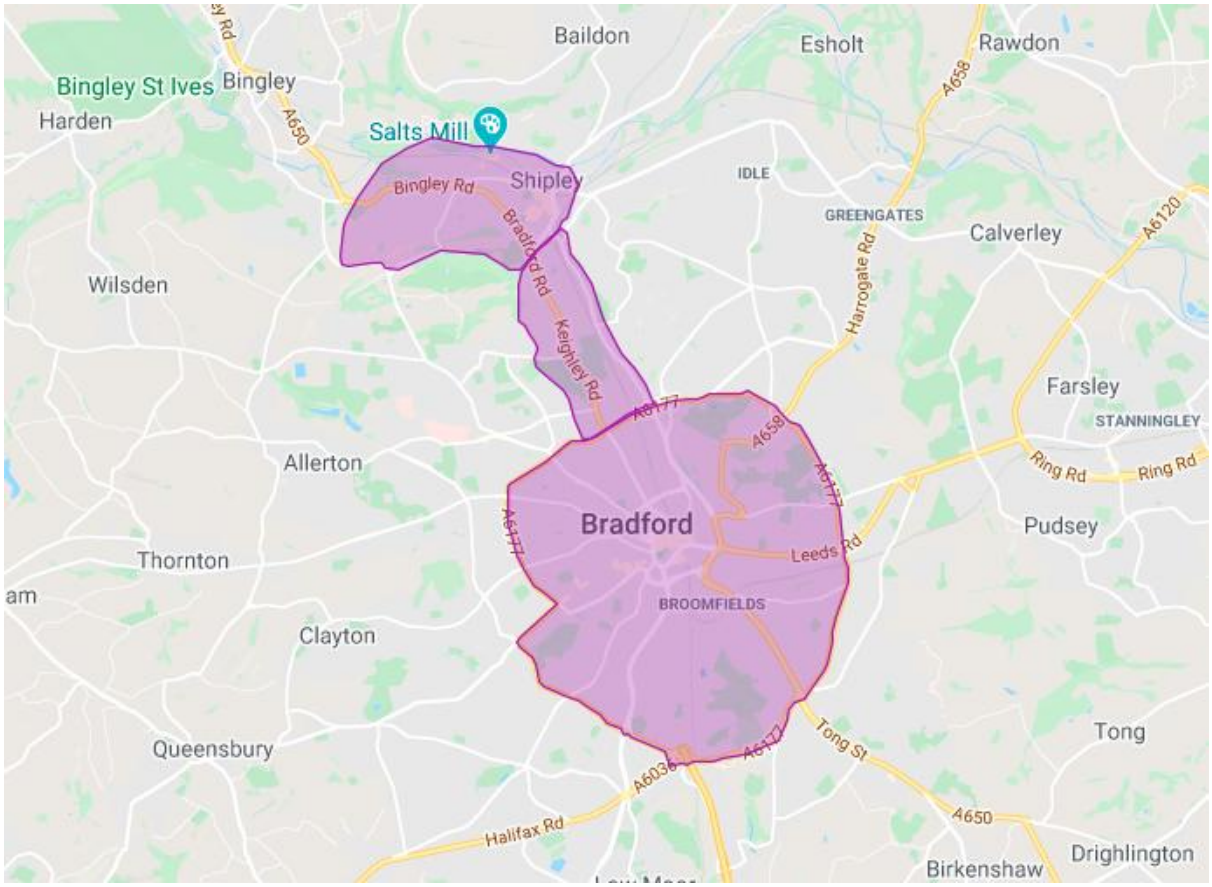
The B-CAP is funded by central government and includes a package of support and exemptions for local companies who will be affected; there is also support available to encourage local taxis and other businesses to embrace alternative low emission fuels such as electric and bio-methane.

Consultation on the proposed CAZ (Figure 3) was undertaken in March 2020 and the final business case and delivery plans are now being finalised. It is anticipated that the CAZ will come into force in October 2021.

City of Bradford MDC is working with health researchers at Born in Bradford (BiB), to evaluate the health change associated with the B-CAP. It is the only local authority in the UK to be undertaking this type of research. The research is funded through a £1m National Institute for Health Research (NIHR) bid.

More details about the B-CAP and further information available to the public can be found on the dedicated website;
https://www.bradford.gov.uk/breathe-better-bradford/breathe-better-bradford/

Figure 3 – Extent of proposed CAZ in Bradford



City of Bradford MDC has decided to delay revocation of existing AQMAs, or the creation of any new AQMAs, until the plans for the CAZ have been approved and the anticipated outcomes are identified. This will enable limited air quality resources to be fully concentrated on developing the B-CAP, preventing any unnecessary AQMA declarations or revocations. All currently declared AQMAs are included within the proposed CAZ boundary.

Significant challenges to improving air quality in Bradford

Significant key challenges to improving air quality in Bradford are:

- Failure of vehicle manufacturers to reduce emissions as quickly as was previously anticipated. This is considered to be a direct result of inadequate emission control tests for new vehicles and the use of emission test defeat strategies by a number of vehicle manufacturers. Consequently 'on the road emissions' of NO_x from many modern vehicles, particularly Euro 5 diesel cars, are much higher than consumers have previously been led to believe.
- The increased uptake of diesel vehicles in the general vehicle fleet, driven by previous central government taxation polices designed to encourage their purchase.
- Development related "emissions creep", arising from additional vehicle trips linked to development in the city and associated combustion sources for heating and industry.
- Bradford has seen an increase in domestic wood burning, biomass and local electricity generation (CHP and STOR).

Actions to Improve Air Quality in Bradford

The measures currently being taken by the City of Bradford MDC to improve air quality are detailed in the following documents:

- Air Quality Action Plan (2009)
- Air Quality Strategy (2011)
- Bradford Low Emission Strategy (2013)
- West Yorkshire Low Emission Strategy (WYLES)

These documents can be viewed at:

https://www.bradford.gov.uk/environmental-health-and-pollution/air-quality/air-quality-in-the-bradford-district/

The current approaches to improving air quality in Bradford are;

a) **Trip reduction** – measures which aim to reduce the overall numbers of journeys taken in motor vehicles across the district. This includes investment in sustainable transport measures, enabling more people to walk, cycle or use public transport. It also incorporates measures that encourage people to share vehicles (such as car share schemes and car clubs) and measures that encourage working or studying from home.

b) **Emission reduction measures** – these are measures that aim to reduce the total emissions from individual vehicles. This can be achieved by fitting emission abatement equipment to existing vehicles, replacing older vehicles with newer ones or by completely changing the technology and fuels used. For example, ultra-low emission vehicles fuelled by electric or gas are much cleaner than those that use diesel. Procuring low emission goods and services is a significant element of this strategy

c) **Planning measures** - these are measures designed to reduce the emission impact of future developments in Bradford, primarily in terms of traffic pollution, but also incorporating heating and other combustion sources, dust generation and industrial processes. The aim is to limit any additional trips to a minimum and ensure that the planning approval process assists in the delivery of an infrastructure required to support the future use of sustainable transport or ultra-low emission vehicles. For example, a developer may be required to provide a new cycle lane and / or electric vehicle recharging points for a new development.

d) **Education and research** - measures that help the local population understand the sources of pollutants, how they impact on their health and how emissions and exposure to air pollutants can be reduced or avoided.

The policy document facilitating air quality improvement and associated emission reductions in Bradford during 2019 was the **Bradford Low Emission Strategy (LES)** adopted in 2013. The strategy ensures that low emission measures and the

requirement to improve air quality are at the heart of local decision making processes, driving air quality improvements and attracting inward investment for sustainable transport and low emission technology projects. Progress on delivery of the Bradford LES is reported to the Health and Well Being board, ensuring achievement of the best possible air quality and health outcomes for the whole of the Bradford population is a key objective, not solely compliance with air quality objectives.

Table 1 summarises current air quality improvement measures in Bradford.

Some of the air quality improvement measures undertaken in Bradford during 2019 are outputs from the West Yorkshire Low Emission Strategy (WYLES). This document was fully adopted in Bradford (December 2016) and the strategy is now being delivered across the whole West Yorkshire region. The document can be viewed in full at https://www.bradford.gov.uk/media/3590/west-yorkshire-low-emissions-strategy.pdf

Future actions to improve air quality in Bradford will be included in the new Bradford Clean Air Plan (B-CAP) which is currently being finalised. An update on progress will be provided in the 2021 ASR report.

Table 1.0 Bradford Air Quality Improvement Measures

Strategy / Policy Area	Measures undertaken up to and including 2019	Planned progress for 2020
Bradford Low Emission Strategy (LES)	An over-arching City of Bradford MDC internal strategy to improve air quality through integrated policy development focusing on measures to reduce vehicle emissions. Adopted by Full Council, 5th November 2013.	The status and relevance of the Bradford LES will be reviewed following the completion of the new Bradford Clean Air Plan (B-CAP).
West Yorkshire Low Emission Strategy	Bradford MDC has secured funding for, and co-ordinated the development of, the West Yorkshire Low Emission Strategy (WYLES) in partnership with all the West Yorkshire Councils, West Yorkshire Combined Authority (WYCA) and PHE. This is an over-arching county wide strategy to improve air quality in the West Yorkshire region through integrated policy development. Following adoption of the WYLES by City of Bradford MDC in December 2016 the following measures were progressed in 2019.	Progress with implementing the WYLES and consequent updating of local policies has been slower than initially planned due to a number of the West Yorkshire authorities having to complete mandated feasibility studies and develop clean air plan business cases during 2018 and 2019. During 2020 the following WYLES based measures will be progressed: • regional electric taxi infrastructure project will

	• New WYLES project manager appointed in June 2019 • Continued growth of the West Yorkshire Eco-stars scheme • Continued delivery of regional bus retrofit project • Implementation of electric taxi EV charging project commenced through regional partnership working. • CAZ feasibility study in Bradford • Continued consistent low emission mitigation measures applied through the planning process	continue to be implemented • regional WYLES policies will continue to be reviewed and updated. • regional low cost analyser study will be undertaken
Environmental Health & Public Health	In 2015 the results of an innovative Low Emission Zone (LEZ) feasibility study were reported to Bradford Council Elected Members and a decision was taken to investigate the feasibility of implementing a LEZ in Bradford. The decision on whether to implement a LEZ in Bradford has now been superceded by the development of the B-CAP business case which will determine future air quality improvement policy in Bradford. Development of the B-CAP business case was on going throughout 2019 School workshops and idling emission awareness raising undertaken on Clean Air Day 2019 Funding obtained to work with health partners including Born In Bradford and national evidence team at Defra to evaluate the B-CAP.	Completion of the B-CAP final business case and submission to DEFRA (including Clean Air Fund application for delivery of B-CAP measures) Consultation events for Bradford Clean Air Zone Establishment of 'Breathe Better Bradford' public information campaign Continued working with Public Health England to develop the air quality work programme for PHE. Through representation on the Local Air Quality Advisory Group (LAQAG at Defra) Bradford are assisting with proposed changes to the Clean Air Act and Air Quality Strategy implementation.
Highways Management & Transport	On-going partnership work with First Bus to encourage minimum Euro emission standards for commercial buses beyond CAZ standards. On-going operation of car club in Bradford. Following new sites added in 2019: • Manchester Road • Appleton Road (130 Barkerend Road) • South Street, Keighley • Priestley Court, Railway Road, Ilkley Opening of new railway stations at Apperley Bridge (December 2015) and Low Moor (April 2017). Opening of Bradford Canal Road Cycleway in May 2019 providing a missing link in the Cycle Super-Highway (Bradford-Leeds).	Additional car club vehicles to be provided at: • Exhibition Road Saltaire • Crown Court, Bradford • Burnetts St car park, Little Germany https://www.bradford.gov.uk/transport-and-travel/public-transport/car-club/ Planning for new car club locations Park and Ride planning application Development and adoption of a Bradford EV charging strategy Investigating options for neighbourhood EV charging to support areas with limited off street parking (this is in

	https://www.cyclecityconnect.co.uk/our-routes/bradford-canal-road-cycleway/	addition to the on-going rapid charging for taxis project – see below)
Development Control	Continued implementation of Bradford LES low emission planning policies to ensure emission mitigation measures are implemented at the design stage, including the consideration of damage costs for major schemes. Required measures include: • Plug-in vehicle recharging on all schemes where practical – by the end of 2019 in excess of 7000 charging points had been secured on new development schemes (since policy adoption in 2013) • Introduction of checklist approach to construction dust management plans • Low emission travel plans • Low Emission Strategies/fleet emission standards on commercial schemes • Cycle and walking infrastructure • EV vehicle provision	Continued implementation of Bradford and WYLES planning guidance on every relevant application. Continued input from Public Health to support air quality and health through the planning process Review of Bradford LES planning guidance (delayed due to B-CAP development)
Bradford Council Fleet Management	Measures introduced / completed : • Whole life costs considered in vehicle purchasing • Hybrid electric cars, electric pool cars and vans incorporated into council fleet • Feasibility study of introducing gas/bio-methane infrastructure for Refuse collection vehicles (RCV) fleet • Monthly fuel reports for client departments • Assessment of City of Bradford MDC fleet under Eco-stars fleet recognition scheme Council aim that all council fleet cars & vans less than 3.5 tonnes to be replaced with 100% electric by 2024. A review of the fleet has been carried out and the process to procurement of charging & vehicles has started.	Proposals for compressed gas station to serve council fleet vehicles over 3.5 tonnes to be taken to executive in July 2020. Corporate cycle to work scheme limit raised to £2000 in 2020 so that staff can purchase greater range of vehicles including electric bikes.
Procurement	Vehicle emission assessment matrix developed and incorporated into all relevant tender evaluations through Social Value procurement policy Vehicle emission standards accorded 5% of evaluation score for relevant contract awards	On-going application of vehicle emissions procurement standards in line WY procurement guidance and The Cleaner Road Transport Vehicles Regulations 2020.
Taxi Licensing	Ultra-Low Emission Taxi Study as part of OLEV	Continued delivery of EV charging points

	funded EST study across West Yorkshire undertaken in 2015 Measures include consideration of new West Yorkshire wide emission standards to be integrated into the taxi licensing system in accordance with the WYLES A successful regional bid for an Ultra-Low Emission Vehicle taxi scheme was submitted during 2016. Project will include provision of 88 electric vehicle recharging points at railway stations and city centre locations across the region to support the uptake of EVs by the taxi trade. Scheme due for completion in 2021. https://www.westyorks-ca.gov.uk/projects/local-transport-plan-and-other-dft-funding/ulev/ Procurement of supplier for Ultra Low Emission Vehicle taxi scheme completed in 2018. 7 charging points installed during 2019. Each charging point can serve two parking bays with one reserved for exclusive use by taxis.	to support transition to electric taxis. A further 15 sites planned to be operational by end of 2020 Consultation with taxi trade on CAZ proposals
Freight & logistics	Measures to improve vehicle emissions include: • Continued consideration of vehicle emissions through Social Value public procurement • Continued requirement for fleet standards on some new commercial development schemes • Formal launch of Eco-stars scheme completed in 2017.	Continued implementation of fleet procurement and low emission planning fleet requirements. Continued operation of WY Eco-stars scheme Planning for CAZ-C in Bradford (including funding bid to support local fleet improvement)

Conclusions and Priorities

In the period since the declaration of the AQMAs in 2006, peak hour concentrations of NO_2 across the city have reduced significantly. Peak hour concentrations now rarely exceed the hourly objective level of 200µg/m^3. Annual average NO_2 concentrations have also improved with only two of the AQMAs (Manningham Lane and Shipley Airedale Road) experiencing breaches of the annual average objective during 2019.

A decision has been taken to postpone any further AQMA declarations or revocations until final submission and approval of the B-CAP business case in 2020. At that point there will be a greater certainty around improvement measures and the consequential longer term air quality conditions across the city.

Bradford has always engaged in a proactive and innovative approach to local air quality management. It was one of the first local authorities in the UK to adopt a Low Emission Strategy (in 2013) and has well established low emission planning and procurement policies. Bradford secured the funding, project managed and led the development and adoption of the West Yorkshire Low Emission Strategy to deliver a low emission strategy approach across the wider region.

There has already been significant local investment in the retrofitting of service and school buses, development of a cycle superhighway and the opening of new railway stations, all reducing the impact of vehicle emissions. City of Bradford MDC also continues to reduce emissions from its own vehicle fleet and is encouraging private partners to match this through the West Yorkshire Eco-stars scheme and new initiatives to reduce taxi emissions. A car club is already well established in the city and continues to expand.

During 2019 Bradford was mandated by the Government to develop a detailed business plan for a new Bradford Clean Air Plan (B-CAP). The outline business case was submitted and approved in December 2019. The outline business case documents the additional local measures required to meet the NO_2 air quality objectives at all locations in Bradford and includes proposals for a Clean Air Zone (CAZ).

During 2020 City of Bradford MDC has commenced consultation on the B-CAP (including CAZ proposals) and submitted a final business case to DEFRA. The final

business case sets out the detailed proposals for the CAZ and the evidential base to support it. A funding request has been submitted to Defra to support local delivery of the B-CAP measures based on the evidence presented in the final business case.

Finalising the B-CAP business case, commencing consultation on the proposed CAZ and obtaining funding streams to support delivery of the B-CAP have been the primary air quality priorities for Bradford MDC in 2020.

In summary the next steps to be taken by City of Bradford MDC are:

- Finalisation of the B-CAP business case and delivery plans
- Agree level of Defra funding to be provided for implementation of the B-CAP
- Introduction of a dedicated team to deliver B-CAP measures
- Continuation of the delivery of the EV taxi rapid charge project
- Further expansion of car club scheme
- Progress proposals for a compressed gas re-fuelling station to support council vehicles over 3.5 tonnes
- Progress proposal for further electrification of council vehicle fleet
- Submission of a planning application for a Park and Ride scheme in South Bradford
- Continuation of air quality monitoring within the current AQMAs and other areas of concern and provision of a further update on concentrations in the 2021 ASR report.

Local engagement and how to get involved

In order to improve air quality in Bradford and reduce exposure to pollution, Bradford MDC advises residents to make simple changes to their everyday life;

- If able, reduce your vehicle use by walking and cycling for shorter journeys, highlighting the value for health and the environment. Consider using the 'walk it' app (https://walkit.com/) which helps plan journeys in Bradford (and other cities). Try and pick routes which are not as heavily trafficked (e.g. through parks and lesser used streets) to reduce the amount of pollution exposure.
- Make the most of public transport as an alternative to using a car, this can save money and reduce impact on the environment. Check out the information on the Council website for local transport provision and see if it can help better plan journeys - https://www.bradford.gov.uk/transport-and-travel/public-transport/public-transport/
- If you have children who are travelling to school consider the advice on the Council website to help make this journey more sustainable and improve their health; https://www.bradford.gov.uk/education-and-skills/travel-assistance/sustainable-travel-to-school/
- Think about how homes are heated and to ensure compliance with the legal requirements for smokeless zones. Residents are advised that if they fail to comply they could risk a fine of up to £1,000 per offence

  https://www.gov.uk/smoke-control-area-rules
- If you live in an urban area, consider buying a 'low nitrogen oxide' boiler the next time it requires replacement.
- If you own a vehicle which is regularly driven in urban areas, think about the impact on the environment when the time comes to replace it. Consider low emission alternatives, such as hybrids and electric vehicles. Although the initial purchase price may seem high in the longer term they may prove more cost effective through reduced fuel and tax costs. Government grants are available to help with the purchase of some low emission vehicles. https://www.gov.uk/plug-in-car-van-grants/eligibility

Whatever vehicle you drive the Council encourages drivers to try and follow the green driving tips below;

Green driving tips

Car Share

Check if it is possible to share your vehicle or take a lift to reduce the impact of journeys. Consider using the West Yorkshire car share scheme to help with this; https://wy.liftshare.com/

Check your tyres

Under-inflated tyres mean an engine has to work harder and will produce more emissions.

Clear the clutter

Remove unnecessary clutter from your boot and reduce engine workload.

Stick to the speed limit

High speeds produce more emissions. At 70mph a driver could be using up to 15 per cent more fuel than at 50mph.

Slow down as you approach traffic jams

Stop-start traffic jams use more fuel. Slow down early and take your foot off the accelerator.

Don’t over-rev

Changing up a gear early can reduce revs. For diesel cars change up when the rev counter reaches 2000rpm. For petrol cars, change up at 2500rpm.

Switch off your engine

If likely to be at a standstill for more than three minutes switch off your engine.

Close windows

Keeping windows closed at higher speeds will use less fuel.

Cut down on air-conditioning

Air-conditioning increases fuel consumption and produces more emissions.

If you would like to see more done to improve air quality in your area then you could contact the local Councillor or MP and tell them about your concerns or ideas. To find out who your local Councillor or MP is and how to contact them;

https://bradford.moderngov.co.uk/mgMemberIndex.aspx?bcr=1

http://www.parliament.uk/mps-lords-and-offices/mps/

For more information on national campaigns to improve air quality and opportunities to undertake your own monitoring visit;

https://www.cleanairday.org.uk/

http://www.clientearth.org/

https://www.foe.co.uk/page/air-pollution-campaign-clean-air

http://cleanair.london/

Daily national air quality updates, pollution forecasts and advice about how to protect yourself from the impacts of poor air quality can be found at:

https://uk-air.defra.gov.uk/

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1 Local Air Quality Management

This report provides an overview of air quality in City of Bradford MDC during 2019. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by City of Bradford MDC to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England can be found in Table E.1 in Appendix E.

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority must prepare an Air Quality Action Plan (AQAP) within 12-18 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

A summary of AQMAs declared by City of Bradford MDC can be found in Table 2.1. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at https://www.bradford.gov.uk/environmental-health-and-pollution/air-quality/review-and-assessment-of-air-quality-in-the-bradford-metropolitan-district/

Alternatively, see Appendix D: Map(s) of Monitoring Locations and AQMAs, which provides for a map of air quality monitoring locations in relation to the AQMA(s).

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	City / Town	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance (maximum monitored/modelled concentration at a location of relevant exposure)				Action Plan		
						At Declaration		Now		Name	Date of Publication	Link
Mayo Avenue / Manchester Road (Order 1)	2006	NO2 Annual Mean	Bradford	Terrace housing	NO	57	µg/m3	37	µg/m3	Bradford Air Quality Action Plan, Bradford Low Emission Strategy , West Yorkshire Low Emission Strategy	2009,2013, 2016	https://www.bradford.gov.uk/environmental-health-and-pollution/air-quality/air-quality-in-the-bradford-district/
Manningham Lane / Queen's Road (Order 2)	2006	NO2 Annual Mean	Bradford	Mixed housing	NO	33	µg/m3	57	µg/m3	Bradford Air Quality Action Plan, Bradford Low Emission Strategy , West Yorkshire Low Emission Strategy	2009,2013, 2016	https://www.bradford.gov.uk/environmental-health-and-pollution/air-quality/air-quality-in-the-bradford-district/
Thornton Road (Order 3)	2006	NO2 Annual Mean	Bradford	Student housing	NO	35	µg/m3	39	µg/m3	Bradford Air Quality Action Plan, Bradford Low Emission Strategy , West Yorkshire Low Emission Strategy	2009,2013, 2016	https://www.bradford.gov.uk/environmental-health-and-pollution/air-quality/air-quality-in-the-bradford-district/

Shipley Airedale Road (Order 4)	2006	NO2 Annual Mean	Bradford	Apartments	NO	68	µg/m3	49	µg/m3	Bradford Air Quality Action Plan, Bradford Low Emission Strategy , West Yorkshire Low Emission Strategy	2009,2013, 2016	https://www.bradford.gov.uk/environmental-health-and-pollution/air-quality/air-quality-in-the-bradford-district/
Mayo Avenue / Manchester Road (Order 1)	2006	NO2 1 Hour Mean	Bradford	Terrace housing	NO	unknown	µg/m3	170 (at monitor	µg/m3	Bradford Air Quality Action Plan, Bradford Low Emission Strategy , West Yorkshire Low Emission Strategy	2009,2013, 2016	https://www.bradford.gov.uk/environmental-health-and-pollution/air-quality/air-quality-in-the-bradford-district/
Manningham Lane / Queen's Road (Order 2)	2006	NO2 1 Hour Mean	Bradford	Mixed housing	NO	unknown	µg/m3	159 (at monitor)	µg/m3	Bradford Air Quality Action Plan, Bradford Low Emission Strategy , West Yorkshire Low Emission Strategy	2009,2013, 2016	https://www.bradford.gov.uk/environmental-health-and-pollution/air-quality/air-quality-in-the-bradford-district/

Thornton Road (Order 3)	2006	NO2 1 Hour Mean	Bradford	Student housing	NO	unknown	µg/m3	145 (at monitor)	µg/m3	Bradford Air Quality Action Plan, Bradford Low Emission Strategy , West Yorkshire Low Emission Strategy	2009,2013, 2016	https://www.bradford.gov.uk/environmental-health-and-pollution/air-quality/air-quality-in-the-bradford-district/
Shipley Airedale Road (Order 4)	2006	NO2 1 Hour Mean	Bradford	Apartments	NO	unknown	µg/m3	166 (at monitor)	µg/m3	Bradford Air Quality Action Plan, Bradford Low Emission Strategy , West Yorkshire Low Emission Strategy	2009,2013, 2016	https://www.bradford.gov.uk/environmental-health-and-pollution/air-quality/air-quality-in-the-bradford-district/

x City of Bradford MDC confirm the information on UK-Air regarding their AQMA(s) is up to date

2.2 Progress and Impact of Measures to address Air Quality in City of Bradford MDC

Defra's appraisal of last year's ASR concluded that the report was well structured, detailed, and provided all the information specified in the Guidance.

The following recommendations were made for future reports:

1. **The approach to section 3 of the report was considered extremely comprehensive and a similar approach was requested in future reports.**

   As requested the same approach has been used in this report.

2. **In future reports distance correction should only be applied when concentrations are above or within 10% of the objective and sites are not representative of relevant exposure.**

   For the purpose of this report distance correction has only been applied when concentrations are above or within 10% of the objective and sites are not representative of relevant locations.

3. **The council could consider operating co-located diffusion tubes alongside its continuous monitors to enable the determination of local bias adjustment factors.**

   The majority of the Bradford real time monitoring sites are small roadside cabinets with caged inlet points which are within easy reach of members of the public. Establishing triplicate diffusion tube monitoring points would require tubes to be placed inside the cages. This would add to the time needed to change the tubes and may attract increased levels of vandalism. There would also be additional officer time associated with calculating the local bias correction factor. Bradford has limited resources and budgets for air pollution monitoring and considers it is more important to continue monitoring at the current locations of concern rather than re-directing funding and officer time to the establishment of triplicate bias monitoring sites. Due to the closure of West Yorkshire Analytical Services in March 2020 the diffusion tube contract has been moved to Gradko International Ltd. There are considerably more local authorities already contributing to the bias correction factors for this laboratory than there were for the previous supplier.

4. **Comments from the previous appraisal were not included, this is encouraged to be included in next year's report.**

   City of Bradford MDC did not receive any feedback on its 2018 ASR report. The comments on the 2019 ASR report have been incorporated into this report.

City of Bradford MDC has taken forward a number of direct measures during the current reporting year of 2019 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2.

More detail on these measures can be found in following documents:

- Air Quality Action Plan (2009)
- Air Quality Strategy (2011)
- Bradford Low Emission Strategy (2013)
- West Yorkshire Low Emission Strategy (WYLES)

These documents can be viewed at:

https://www.bradford.gov.uk/environmental-health-and-pollution/air-quality/air-quality-in-the-bradford-district/

In March 2018, City of Bradford MDC was mandated by Ministerial Direction to complete a technical feasibility study to identify interventions that might bring forward Bradford's compliance with the EU limit values for NO_2. Bradford was one of several 'third wave' local authorities required to undertake this type of study.

Bradford's mandated technical feasibility study was submitted to DEFRA in July 2018. It concluded that a scheme incorporating a form of vehicular access control would be required to bring forward compliance.

The full report can be viewed here:

https://uk-air.defra.gov.uk/library/assets/documents/no2ten/Bradford_FINAL.pdf

Following the outcomes of this initial study Government served a further Ministerial Direction on City of Bradford MDC. This required further consideration of the options shortlisted in the initial study and the development of a detailed business case for a new Bradford Clean Air Plan (B-CAP) to bring forward compliance in the shortest possible timeframe. The Direction required that the local authority produced an outline business case by 31st October 2019. The outline business case was

submitted and approved in December 2019 and incorporated proposals for a Clean Air Zone (CAZ), where only the cleanest vans, lorries, buses, HGVs and taxis will be given free access, older vehicles will be subject to charging. Under the current proposals charges will not be applied to private cars.

The implementation of the plan is funded by central government and includes a package of support and exemptions for local companies who will be affected; there is also support to encourage local taxis and other businesses to switch over to alternative low emission fuels such as electric and biomethane.

Consultation on the proposed CAZ has commenced and a final business case and delivery plans are now being drawn up. It is anticipated that the CAZ will come into force in October 2021.

More details of progress with the B-CAP and information available to the public can be found on the dedicated website;

https://www.bradford.gov.uk/breathe-better-bradford/breathe-better-bradford/

Key air quality improvement measures already completed by City of Bradford MDC (prior to B-CAP development) are:

- Adoption of Bradford Low Emission Strategy (2013) and West Yorkshire Low Emissions Strategy in (2017). Together these two strategies have resulted in:
    - Application of low emission planning guidance (since 2013) requiring EV charging facilities and construction dust management plan conditions on most planning applications. In addition wider emission mitigation and travel planning is required on larger developments.
    - Bio-methane / natural gas feasibility study for refuse vehicles (2013)
    - Whole life costing for council fleet vehicle purchases resulting in introduction of hybrid and full electric vans and cars into City of Bradford MDC fleet (since 2014)
    - Completion of West Yorkshire Low Emission Zone feasibility study in 2015 (superceded by Government mandated technical feasibility studies and development of clean air plan business cases across West Yorkshire).

- £400k secured through Clean Vehicle Technology Fund (CVTF, DfT, 2014/15) to retrofit 26 Euro III commercial, diesel buses with selective catalytic reduction and particle traps (SCRT) in 2015 in partnership with First Bus and Transdev.
- Enterprise car club introduction in Bradford during 2015 and on-going expansion (including an electric vehicle).
- Retrofitting of 165 Euro III school buses across West Yorkshire in partnership with West Yorkshire Combined Authority (WYCA) using Clean Bus/Vehicle Technology Fund (DfT) completed in 2016
- Partnership work with First Bus to encourage minimum Euro IV Standard for commercial buses from 2018, with further improved standards for 2020 and beyond, commenced during 2016. First operate 86% of commercial bus routes in Bradford.
- Launch of West Yorkshire Eco-stars scheme in 2017 and continued growth
- West Yorkshire Electric Vehicle Strategy
- Vehicle emission assessment matrix developed and incorporated into all relevant tender evaluations through Social Value procurement policy

Other significant infrastructure improvements in Bradford to assist with sustainable transport provision include:

- Opening of £19 million Cycle Super-Highway (Bradford-Leeds) in 2016 providing 14km of segregated cycle path. A further stretch of the cycle super highway between Shipley and Bradford (Canal Road) was opened in May 2019.
- Opening of new railway stations at Apperley Bridge (December 2015) and Low Moor (April 2017)

In addition City of Bradford MDC has supported a number of public health research projects relating to air quality and health.

City of Bradford MDC expects the following measures to be completed over the course of the next reporting year:

- Finalise the B-CAP business case and delivery plans
- Agree level of Defra funding to be provided for delivery of the B-CAP
- Introduce a dedicated team to deliver B-CAP measures
- Provide additional car club vehicles at:
  - Exhibition Road Saltaire
  - Crown Court, Bradford
  - Burnetts St car park, Little Germany

  https://www.bradford.gov.uk/transport-and-travel/public-transport/car-club/
- Provide an additional 15 rapid EV charging points to encourage transition to electric taxi fleets

  ULEV Taxi Scheme - Combined Authority | Unlocking potential, accelerating growth (westyorks-ca.gov.uk)
- Increase cycle to work scheme limit to £2000 so that staff can purchase a greater range of cycles (including electric bikes)

City of Bradford MDC expects to pursue the following measures over the course of the next reporting year:

- Progress decision on proposals for a compressed gas re-fuelling station to support council vehicles over 3.5 tonnes
- Progress further electrification of council vehicle fleet
- Submission of a planning application for a Park and Ride scheme in South Bradford
- Investigate options for neighbourhood EV charging to support electric vehicle uptake in areas with limited off street parking.
- Continuation of air quality monitoring within the current AQMAs and other areas of concern and provision of a further update on concentrations in the 2021 ASR report.

The principal challenges and barriers to implementation of the above schemes are related to the timescales required to obtain funding for major schemes and the obtaining of planning approvals (where necessary).

City of Bradford MDC anticipates that the measures stated above (and in Table 2.2) will help to maintain continued compliance with the NO_2 air quality objectives in the Thornton Road and Mayo Avenue AQMAs (these AQMAs were already in compliance during 2019).

Long term compliance with the NO_2 objectives in the Manningham Lane and Shipley Airedale Road AQMAs is expected to be delivered through a combination of the measures in Table 2.2 and delivery of the B-CAP (including the introduction of a CAZ by October 2021). The B-CAP is also expected to deliver further air quality improvement within the Thornton Road and Mayo Avenue AQMAs. All of Bradford's current AQMAs lie within the proposed CAZ boundary.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Date measure introduced	Organisations involved	Funding source	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
1	On-going implementation and review of the Bradford LES	Policy Guidance and Development Control	Low Emissions Strategy	Policy adopted November 2013	City of Bradford MDC	DEFRA air quality grant 2011 £102,0000	Update and review of Bradford LES by end of 2017	Emissions from all existing and new sources to be reduced as far as possible using policy measures within Bradford LES.	Live document subject to on-going delivery and review in response to national, regional and local policy developments on-going implementation	on-going implementation	Current measures within the Bradford LES continue to be implemented at a local level. A further full review of the Bradford LES will be undertaken on completion of the B-CAP to ensure the documents are fully compatible.
2	Adoption of West Yorkshire Low Emission Strategy	Policy Guidance and Development Control	Low Emissions Strategy	Policy adopted December 2016	City of Bradford MDC in conjunction with City of Leeds Council, Wakefield City Council, Calderdale Council and Kirklees Council.	DEFRA air quality grant 2012 £150,0000	Adoption of WYLES by City of Bradford MDC by end of 2016	Emissions from all existing and new sources to be reduced as far as possible across West Yorkshire region using measures within the WYLES.	Live document subject to on-going delivery and review in response to national, regional and local policy developments on-going implementation	on-going implementation	The development of the WYLES has been led by City of Bradford MDC. Many of the incorporated ideas and concepts have their origins within the Bradford LES. Full delivery of the WYLES measures has been delayed due to the requirement for several WY authorities to under mandated feasibility studies and develop clean air plans over the last few years. A new WYLES manager was appointed in 2019 and a new programme of works is currently being developed.
3	Low emission planning guidance	Policy Guidance and Development Control	Clean Air Planning and Policy Guidance	Policy adopted November 2013	City of Bradford MDC	DEFRA air quality grant 2011 £102,0000	Number of EV charging points delivered on new development	Emissions from all new developments to be reduced as far as practically possible and opportunities for increased exposure to air pollution minimised. Emission reduction measures are applied and conditioned in a bespoke manner to individual planning applications. It is difficult to quantify	LES planning guidance routinely applied to all planning applications since 2014 Number of EV charging points conditioned currently estimated at 6000+ on-going	on-going implementation	Since implementation the LES planning guidance has resulted in the conditioning of over 6000 EV charging points on new developments and numerous other low emission fleet measures. The Bradford LES planning policy is currently being reviewed to align it with the WYLES planning guidance.

								the overall impact of the LES planning guidance.	implementation.		
4	LEZ feasibility study	Promoting Low Emission Transport	Low Emission Zone (LEZ)	Study completed and reported to members in 2015	City of Bradford MDC in conjunction with City of Leeds Council, Wakefield City Council, Calderdale Council and Kirklees Council.	DEFRA air quality grant 2012 £150,0000	Not applicable – feasibility only	The LEZ feasibility study indicated that an LEZ could reduce NO_x emissions within the outer ring road by 195.6 tonnes. The more recent B-CAP proposals are expected to achieve full compliance with the NO_2 objectives across the whole district by 2023.	Project superceded by Bradford Clean Air Plan (B-CAP) development and proposals for a CAZ-C Final B-CAP business case and delivery plans (to include CAZ-C) in final stages of development.	CAZ C expected to be in place by Oct 2021	Final funding for B-CAP delivery still to be confirmed
5	WYLES procurement guidance	Promoting Low Emission Transport	Company Vehicle Procurement - Prioritising uptake of low emission vehicles	Guidance adopted in 2016	City of Bradford MDC in conjunction with City of Leeds Council, Wakefield City Council, Calderdale Council and Kirklees Council.	DEFRA air quality grant 2012 £150,0000	Routine application of policy to all procurement contracts	Emissions in relation to all new procurement contracts to be reduced as far as practically possible. Operators to be rewarded for LEV practices. Contracts assessed on an individual basis. Overall impact difficult to quantify.	LEV procurement policy 5% of award decision as part of procurement policy (social values)	On-going implementation	All procurement decisions (including delivery of goods and services) with a transport or heating impact to be considered in relation to the emissions matrix
6	Identifying barriers to walking to school	Promoting Travel Alternatives	School Travel Plans	Completed December 2017	City of Bradford MDC / Bradford Institute of Health Research / Born in Bradford	Research partnership funding	Development of school travel plan toolkit by Dec 2017	School travel plan aims to reduce emissions in all areas, in particular around school gates and playgrounds. Around 27.4% of children currently travel to school by car or taxi in Bradford.	Bradford School travel plan published in Dec 2017 https://www.bradford.gov.uk/media/2397/sustainable-travel-to-school-strategy.pdf	Completed 2017	This work was completed in partnership with Born in Bradford and the Bradford Institute of Health Research (NHS). Papers were published in 2018.
7	Bus retrofit projects	Vehicle Fleet Efficiency	Vehicle Retrofitting programmes	completed 2015	City of Bradford MDC in partnership with local bus operators	CVTF £400,000	n/a	Real world (PEMS) emission testing of the buses showed retrofit achieved a 95% reduction in NO_x emissions. Improvements in air	25 buses successfully retrofitted, 11 in the city centre and 14 on Manningham Lane	Completed 2015	CAZ-C implementation will set minimum emission standards for all local bus services.

								quality in Manningham Lane.			
8	Car clubs	Alternatives to private vehicle use	Car Clubs	Established 2015	City of Bradford MDC / WYCA / Enterprise	No funding is provided to Enterprise to run the scheme. The original contract provided upfront promotion and vehicle leasing funding only (WYCA Local Transport Plan ITB funding).	Number of registered car club owners In September 2020 there were 363 individuals and 1618 corporate members registered with the Enterprise car scheme across West Yorkshire and York.	Enterprise Car Club estimate that each round trip in one of their car share vehicles replaces 10.5 other vehicles. Enterprise car club vehicles are also estimated to produce 43% less CO2 from tailpipe emissions than the average UK car	Scheme operational since 2015	Scheme currently operating from 11 sites in Bradford and more planned during 2020	Bradford recently supported a successful £50,000 bid to expand car club across West Yorkshire. The project aims to double the number of car club vehicles across West Yorkshire by 2020. Vehicles are available to business and residents, the vehicles are all low emission.
9	Cycle Super Highway	Transport Planning and Infrastructure	Cycle network	opened June 2016	City of Bradford MDC / WYCA (Metro)/ City Connect Partnership	DfT £18m £11m of local funding.	n/a	An estimated one million journeys have been made on the cycle superhighway since it opened in 2016. Actual pollutant savings have not yet been quantified.	Main scheme opened in 2016 Additional Shipley to Bradford (Canal Road) section opened May 2019	Main delivery completed 2016 Additional improvements on going	Further information on West Yorkshire cycle routes can be found here https://www.cyclecityconnect.co.uk/our-routes/bradford-leeds-cycle-superhighway/
10	Staff Travel Plan	Promoting Travel Alternatives	Workplace Travel Planning	Corporate travel plan published 2015	City of Bradford MDC	Developed in house	Reduce single occupancy car trips by 5% over 5 years Reduce car commuter trips by staff from 62% (2014) to 57% by 2029	Not yet quantified	Implemented 2015	2019 review overdue	First review of staff travel plan delayed due to loss of key staff
11	Eco-stars Fleet Recognition Scheme	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	Scheme launched 2017	WYLES steering group / City of Bradford MDC / ECO-stars scheme	WYLES funded	Number of Bradford fleets joining the scheme	The ECO stars scheme claims a typical van operator could see its annual output of carbon dioxide fall by six tonnes per year (see	Scheme implemented	On-going implementation and development.	The introduction of the West Yorkshire ECO-stars scheme is a measure in the WYLES. Scheme is funded by West Yorkshire Combined Authority. Scheme will continue to be funded in 2020.

								http://www.ecostars-uk.com/about-eco-stars/why-join/			
12	CNG	Vehicle Fleet Efficiency	City CNG Station	Under development	City of Bradford MDC	Feasibility study funded from Bradford Defra LES funding	n/a	77 tonnes NO_x saving predicted (from 2013 feasibility study)	Feasibility study completed. Vehicle trial completed	Decision on implementation to be taken in 2020	Report to be taken to Council Executive for a decision in 2020
13	Low emission procurement policies for City of Bradford MDC fleet	Promoting Low Emission Transport	Public Vehicle Procurement - Prioritising uptake of low emission vehicles	Policy adopted 2016	City of Bradford MDC	Internal project	n/a	Reduction of 332t/CO2e 2014/15-2015/16 via procurement of 7 electric vans and 2 electric pool cars with 3 additional charging stations	Policy implemented	On-going procurement of low emission vehicles into council fleet.	Whole life costs have been introduced into vehicle procurement considerations including air quality damage costs
14	Voluntary emission standards for buses	Promoting Low Emission Transport	Other	2015	City of Bradford MDC / (WYLES / Bus operators	n/a	Current target is 70% of buses to be Euro VI by 2021 and 100% by 2026.	24.7 tonnes of NOx reduction estimated for previous target of Euro IV by 2018. Revised figure for new target not yet available.	On-going implementation by bus operators	Current CAZ proposals for Bradford likely to accelerate uptake of Euro VI buses in Bradford District to 2021/22	Final compliance dates for Euro VI buses in Bradford CAZ to be finalised. CAZ currently anticipated to come into force in October 2021 but a sunset period to allow for upgrading may be required.
15	Delivery of new railway stations at Apperley Bridge and Low Moor	Transport Planning and Infrastructure	Public transport improvements -interchanges stations and services	Apperley Bridge opened Dec 2015 Low Moor opened May 2017	WYLES	Apperley Bridge £8 million (WYCA) Low Moor £10.8 million (WYCA)	Apperley Bridge 20,000 per month (pre-Covid 19 restrictions) Low Moor 133,060 (opening year) and expected to grow to 500,000 per annum. (pre-Covid 19 restrictions)	Not quantified	Policy implemented	complete	Passenger numbers at both stations are expected to grow further in the future (subject to lifting of Covid-19 restrictions).
16	Encouraging uptake of low emission taxis	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel	2018 - 2020	City of Bradford MDC / WYCA/ ENGIE	OLEV £2 million WYCA and partner LAs £1.2 million match funding	88 rapid EV chargers with dedicated taxi bays to be installed across West Yorkshire Region.	Around 500 diesel taxis and private hire cars forecast to be converted to hybrid and pure electric as a result of the charging point scheme. If 5.1% of WY taxis are replaced with electric this will equate to an	Implementation of charging points on going	2021	Project has experienced some delays due to Covid 19 restrictions.

			recharging					18% reduction in NO_x emissions and a health cost saving of £189,000 per annum (WYCA)			
17	Public awareness	Public Information	Via other mechanisms	2016 onwards	City of Bradford MDC / NHS / Born in Bradford/ Universities	Various projects have taken place using a variety of funding sources	n/a	Not quantified	On-going activities	On-going activities	Activities to date have included raising public awareness through the use of street infographics on air pollution stations, air quality and health online petition in partnership with Doctors and academics at the University of Leeds, workshops held in schools for Clean Air Day 2019 and a schools anti-idling campaign launched in 2020. The Clean Air Plan / CAZ development is supported by the Breathe Better Bradford website https://www.bradford.gov.uk/breathebetterbradford
18	Health and air quality economics	Public Information	Via other mechanisms	2016	NHS (Health Improvement Academy)/ University of York (Health Economics) City of Bradford MDC /	Research funded	Final toolkit publication and and workshops to share with stakeholders	n/a	completed	completed	Development of CAPTOR toolkit and published papers to quantify the health impact of Low Emission Policy change in partnership with NHS and economics experts at University of York https://pure.york.ac.uk/portal/en/publications/costeffectiveness-of-air-pollution-reduction-model-captor-toolkit-parameterisation-and-user-guide(fa9b08ec-cec0-4163-9dba-4864c2c00b76).html
19	Identifying barriers to Low Emission Policy change	Public Information	Via other mechanisms	2018	City of Bradford MDC / NHS	Research funded	Published papers	n/a	completed	completed	Academic research project to identify the barriers to policy change
20	Public health reporting of Air Quality	Public Information	Via other mechanisms	On-going	City of Bradford MDC	n/a	Improved awareness of air quality issues across all key council departments and regular reporting of AQ status	n/a	On-going	On-going	Air quality issues included in the local JSNA, directors PH report, Health and Well Being Strategy and Transformation Plan. Progress on air quality improvement and policy development regularly reported to the Health and Well Being Board.
21	Bradford bus retrofit project	Vehicle fleet efficiency	Vehicle Retrofitting programmes		City of Bradford MDC/ WYCA/ bus operators	CVTF (2014) £394,998	Bradford retrofit project target - 26 Euro III buses fitted with	Bradford retrofit project target to	completed	completed	Retrofitted buses operational in Bradford

				2014			SCRT	reduce NO_x emissions from 26 Euro III buses by 80%			
22	WY Bus retrofit project	Vehicle fleet efficiency	Vehicle Retrofitting programmes	2018	WYCA / bus operators	DEFRA / funding £4.21milion CBTF (2019) £2.9 million	Total of 479 buses across WY to be retrofitted	560 tonnes of NO_x to be removed annually across the WY region	On-going	2020	200 retrofits had been completed by October 2019 – retrofit programme is on-going

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

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

In Bradford, emissions of man-made fine particles $PM_{2.5}$ are estimated to cause 4.6% of total mortality, representing 2,300 years of life lost. Road transport emissions are the most significant source of fine particulates but locally elevated concentrations can also arise from biomass combustion, heating, industry and wind-blown dust. The World Health Organisation (WHO) classifies diesel exhaust emissions as carcinogenic.

No areas within the Bradford district are considered likely to exceed the EU Limit Value for $PM_{2.5}$ (annual average concentration of 25µg/m^3) but there are areas, near to major roads, experiencing concentrations of $PM_{2.5}$ which exceed the recommended World Health Organisation (WHO) target level of 10µg/m^3.

There are marked differences in people's health within the Bradford district indicating the existence of significant health inequalities. For example, people living in Wharfedale to the north of the district typically live five years longer than people living in Tong in the south. Similarly, when the Bradford district is compared to the rest of the UK, average life expectancy is reduced. In Bradford there are more deaths as a resulting from smoking, cancer, heart disease, and strokes, and higher rates of mortality in children, than in many other cities.

Figure 4[4] shows historic under 75 mortality rate from all respiratory disease in Bradford. The latest figures for under 75 mortality for all respiratory disease and emergency admissions for asthma (ages 0 to 19) are shown in Tables 2.3 and 2.4.[5]

Bradford District continues to have a higher mortality rate from respiratory disease than Yorkshire & Humber and England.

[4] JSNA report on Respiratory Disease Mortality in Bradford, City of Bradford MDC (2018) https://jsna.bradford.gov.uk/documents/Public%20Health%20Intelligence%20resources/Public%20Health%20Intelligence%20Bulletins/Under%2075%20Respiratory%20Disease%20mortality%20-%20December%202018.pdf

[5] These figures are pre-Covid 19 pandemic in 2020

The gap between England and Bradford District for this measure has increased over time.

Figure 4: Under 75 mortality rate from all respiratory disease

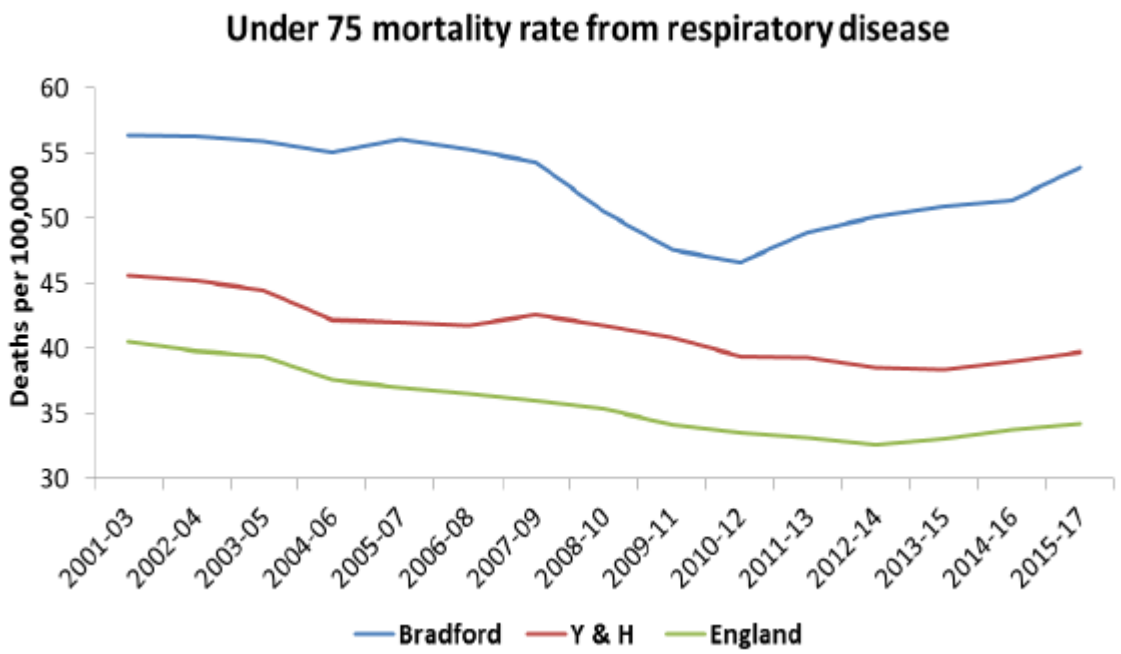


Table 2.3 – Latest under 75 mortality rate from all respiratory disease

Year	Bradford		Y&H	England
	Number	Rate per 100,000	Rate per 100,000	Rate per 100,000
2016-18	591	50.7	41.2	34.7

Table 2.4 - Emergency hospital admissions for asthma in 0-19 year olds

Year	Bradford		Y&H	England
	Number	Rate per 1000	Rate per 1000	Rate per 1000
2018-19	415	2.8	1.6	1.8

Through research carried out by environmental epidemiologists at the Bradford Institute of Health Research (BIHR) many of these illnesses have been proven to have direct linkages to local air pollution exposure. The data demonstrates that Bradford has a higher rate of 'at risk' people whom will be more vulnerable to the ill-health effects associated with air pollution exposure.

Within the City of Bradford MDC, air quality and public health specialists collaborate to deliver the key outcomes in the Bradford LES and the WYLES (as detailed in table 1). They are supported by colleagues from other Council departments such as transport, planning, highways, fleet management and procurement. There is a strong emphasis on improving the understanding of how air pollution impacts on health, and effectively communicating this to other professionals and members of the public.

City of Bradford MDC Public Health Department has funded $PM_{2.5}$ monitoring at three of the existing air pollution stations (Bingley, Keighley and Shipley Airedale Road). The data is used to inform major research programmes (such as the 'Born in Bradford (BiB)' and daily updates are provided to the public via the council's website.

Born in Bradford is one of the largest and most important medical research studies currently being undertaken in the UK. It is tracking the lives of 13,500 Bradford born babies (and their families) to ascertain more about the causes of childhood illness. The work has already identified a number of important linkages between air pollution exposure and health as detailed in the info-graphic below (figure 5).

The Bradford LES and WYLES measures which aim to reduce emissions from diesel vehicles and biomass boilers are currently the most effective at reducing local $PM_{2.5}$ emissions (as these are the main sources of this pollutant in Bradford).

In addition to the LES and WYLES controls City of Bradford MDC also has the following measures in place to reduce $PM_{2.5}$ emissions:

Smoke Control Areas

Large areas of Bradford are designated as Smoke Control Areas (SCAs). Within these areas it is an offence to emit visible smoke from a chimney unless using an authorised fuel or using an exempt appliance.

Maps showing the extent of Smoke Control Areas (SCAs) in Bradford can be found here:

https://cbmdc.maps.arcgis.com/home/item.html?id=67067784bd7c46a19fc8b1007f984856

More information on smoke control rules can be found here:

https://www.gov.uk/smoke-control-area-rules

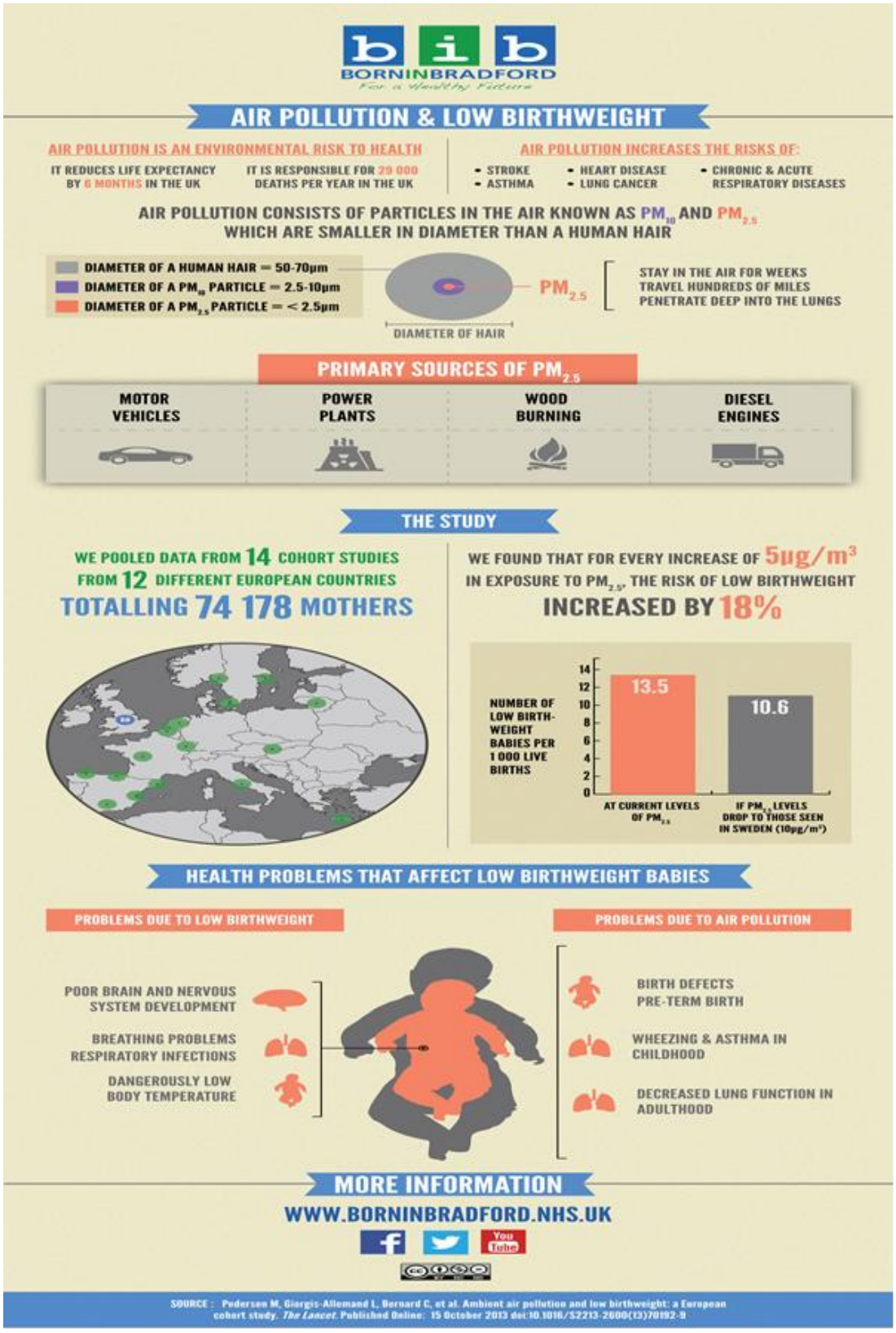
Bonfires

Bonfires can be another significant source of $PM_{2.5}$ emissions. City of Bradford MDC has recently updated its advice to residents on bonfires.

https://www.bradford.gov.uk/environmental-health-and-pollution/bonfires/nuisance-bonfires/

Additional air quality improvement measures incorporated in the Bradford B-CAP (including the CAZ) will further reduce $PM_{2.5}$ emissions in the future.

Figure 5: Outcomes from BiB study



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

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

This section sets out what monitoring has taken place and how it compares with objectives.

City of Bradford MDC undertook automatic (continuous) monitoring at 7 sites during 2019. Table A.1 in Appendix A shows the details of the 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.

National monitoring results are available at https://uk-air.defra.gov.uk/interactive-map

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. This section sets out what monitoring has taken place and how it compares with objectives.

3.1.2 Non-Automatic Monitoring Sites

City of Bradford MDC undertook non- automatic (passive) monitoring of NO_2 at 55 sites during 2018. Table A.2 in Appendix A details the 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

The air quality monitoring results presented in this section are, where relevant, adjusted for bias[6], “annualisation” (where the data capture falls below 75%), and distance correction[7]. Further details on adjustments are provided in Appendix C.

[6] https://laqm.defra.gov.uk/bias-adjustment-factors/bias-adjustment.html
[7] Fall-off with distance correction criteria is provided in paragraph 7.77, LAQM.TG(16)

3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias, "annualisation" and distance correction. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO_2)

Table A.3 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3. Note that the concentration data presented in Table A.3 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 2019 dataset of monthly mean values is provided in Appendix B. Note that the concentration data presented in Table B.1 includes distance corrected values, only where relevant.

Table A.4 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year.

Results for Manningham Lane AQMA (2019)

Map 2 in Annex D details the location of the monitoring undertaken in the Manningham Lane AQMA during 2019. The results from these sites are as follows:

Site	Type	Bias corrected annual average concentration at monitoring point (µg/m^3)	Bias corrected annual average concentration at nearest relevant receptor point (distance corrected) (µg/m^3)	Maximum hourly concentration at monitoring point (µg/m^3)	Number of exceedances of hourly objective at monitoring point	Does tube data suggest breaches of hourly objective (annual average>60µg /m^3)?
CM3	Real Time	**43**	36	159	0	n/a
DT71	Diffusion Tube	**36**	31	n/a	n/a	no
DT72	Diffusion Tube	**57**	Tube at relevant receptor not corrected	n/a	n/a	no

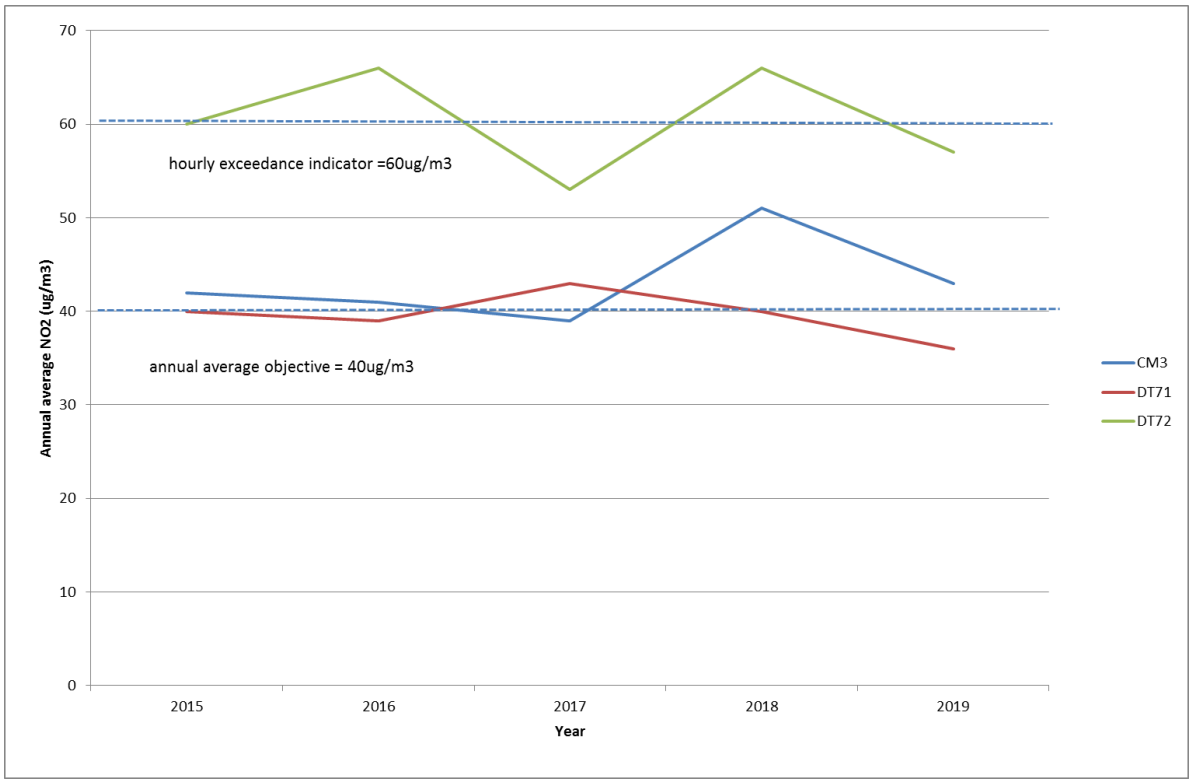
The annual average NO_2 concentration measured at the Manningham Lane air pollution station during 2019 was 43µg/m^3. This value is similar to those recorded in the four years prior to 2018 but significantly lower than the value of 51µg/m^3 reported for 2018. As detailed in the 2019 ASR report, the Manningham Lane monitoring site suffered fire damage during 2018. This resulted in low data capture during 2018 (40.2%) and a requirement for the data to be annualised. The 2019 data indicates that the annualisation of the 2018 data resulted in an overestimate of the annual average for that year.

The nearest relevant receptor point to the real time monitoring site (and tube DT71) is a house façade located approximately 4m back from the monitoring position. The distance corrected results for CM3 and DT71 for 2019 are 36µg/m^3 and 31µg/m^3 respectively. Both these results indicate that the annual average NO_2 objective was met at the nearest relevant receptor point during 2019. The hourly objective was also met.

The other diffusion tube located within this AQMA (DT72) recorded a concentration of 57µg/m^3 during 2019. This tube is located at a relevant location (post directly in line with front façade of the nearest residential property) and does not require distance correction. The value of 57µg/m^3 was lower than the value of 66µg/m^3 measured in 2018 but higher than the value of 53 µg/m^3 recorded in 2017. Annual average concentrations >60 µg/m^3 are indicative of breaches of the hourly as well as the annual average objective. The results for tube DT72 indicate that the annual average NO_2 objective is still being exceeded at some relevant receptor points within this AQMA and may approach the hourly objective on some occasions.

Figure 6 summarises the Manningham Lane AQMA monitoring results (at the monitoring position) for the last 5 years . There is little evidence of any major improvement in air quality within this AQMA during this period. The AQMA declaration at Manningham Lane remains necessary for the annual average objective.

Figure 6 – Manningham Lane 5 year trend



Results for Shipley Airedale Road AQMA (2019)

Map 3 in Annex D details the location of the monitoring undertaken in the Shipley Airedale Road AQMA during 2019. The results from these sites are as follows:

Site	Type	Bias corrected annual average concentration at monitoring point ($\mu g/m^3$)	Bias corrected annual average concentration at nearest relevant receptor point (distance corrected) ($\mu g/m^3$)	Maximum hourly concentration at monitoring point ($\mu g/m^3$)	Number of exceedances of hourly objective at monitoring point	Does tube data suggest breaches of hourly objective (annual average>60 $\mu g/m^3$)?
CM6	Real Time	**46**	**42**	166	0	n/a
DT12	Diffusion Tube	**52**	**49**	n/a	n/a	no

Both the monitoring sites within the Shipley Airedale Road AQMA recorded concentrations above the annual average objective for NO_2 in 2019. When corrected

for distance to the nearest relevant receptors the concentrations remained above the annual average objective.

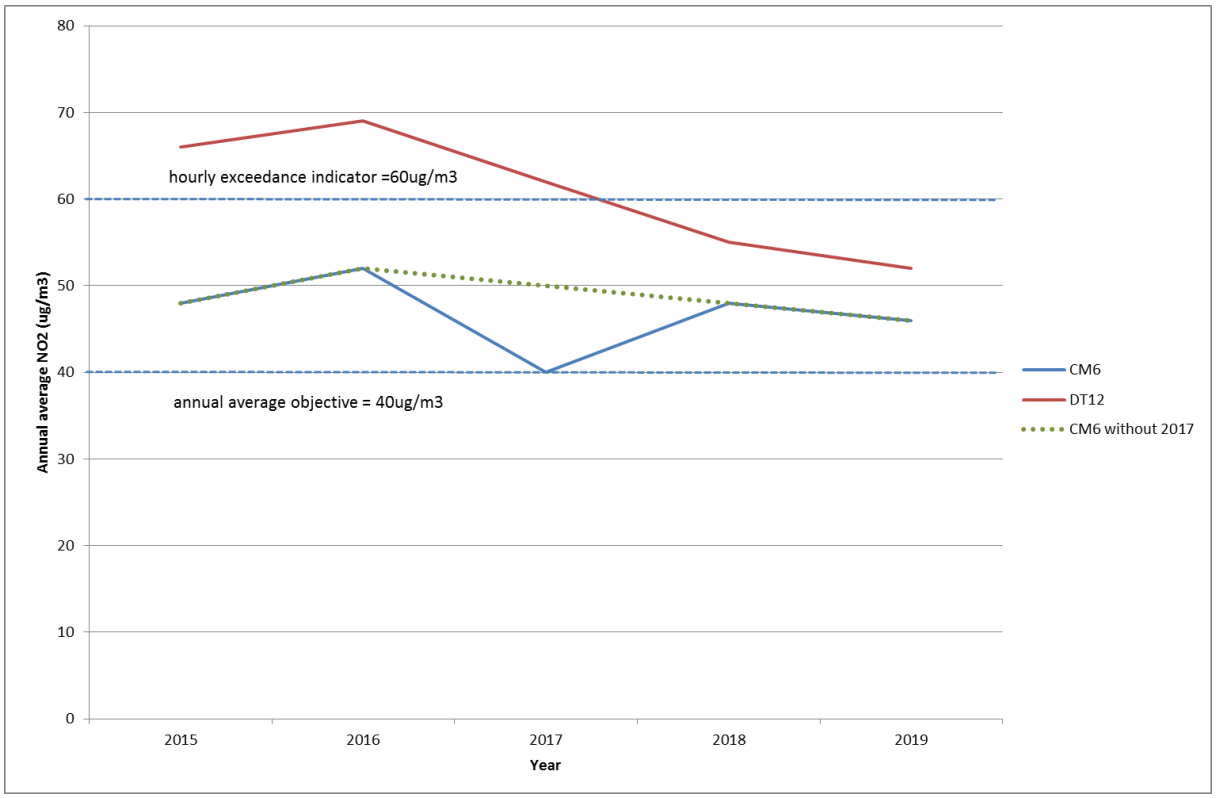
The annual average NO_2 concentration recorded at the Shipley Airedale Road real time monitoring site (CM6) in 2019 was 46µg/m^3 . This is slightly lower than the value of 48 µg/m^3 measured in 2018 but higher than the value of 40 µg/m^3 measured in 2017. Data capture at the Shipley Airedale Road site in 2017 was low requiring annualisation of the data. The reasons for this were reported in the 2018 ASR report.

Data from the diffusion tube site (DT12) shows a reduction in NO_2 concentration during 2019 compared with the previous 4 years. The results from this site remain significantly above the annual average objective at 52µg/m^3 (objective level = 40 µg/m^3). A diffusion tube reading of >60µg/m^3 is considered indicative of hourly objective breaches. It is unlikely the hourly objective was breached at site DT12 during 2019.

Figure 7 details the 5 year trend for the monitoring sites in the Shipley Airedale Road AQMA (at the monitoring locations). Diffusion tube data from site DT12 indicates evidence of a downward trend in NO_2 concentration in this AQMA in recent years. If the annualised real time data for 2017 is removed from the real time data set a similar trend is evident.

The AQMA declaration at Shipley Airedale Road for the annual average NO_2 is still considered relevant. It is unlikely the hourly objective was exceeded at any relevant receptor points within the Shipley Airedale Road AQMA in 2019.

Figure 7 - Shipley Airedale Road 5 year trend



Results for Mayo Avenue AQMA (2019)

Map 4 in Annex D details the location of the monitoring undertaken in the Mayo Avenue / Manchester Road AQMA during 2019.

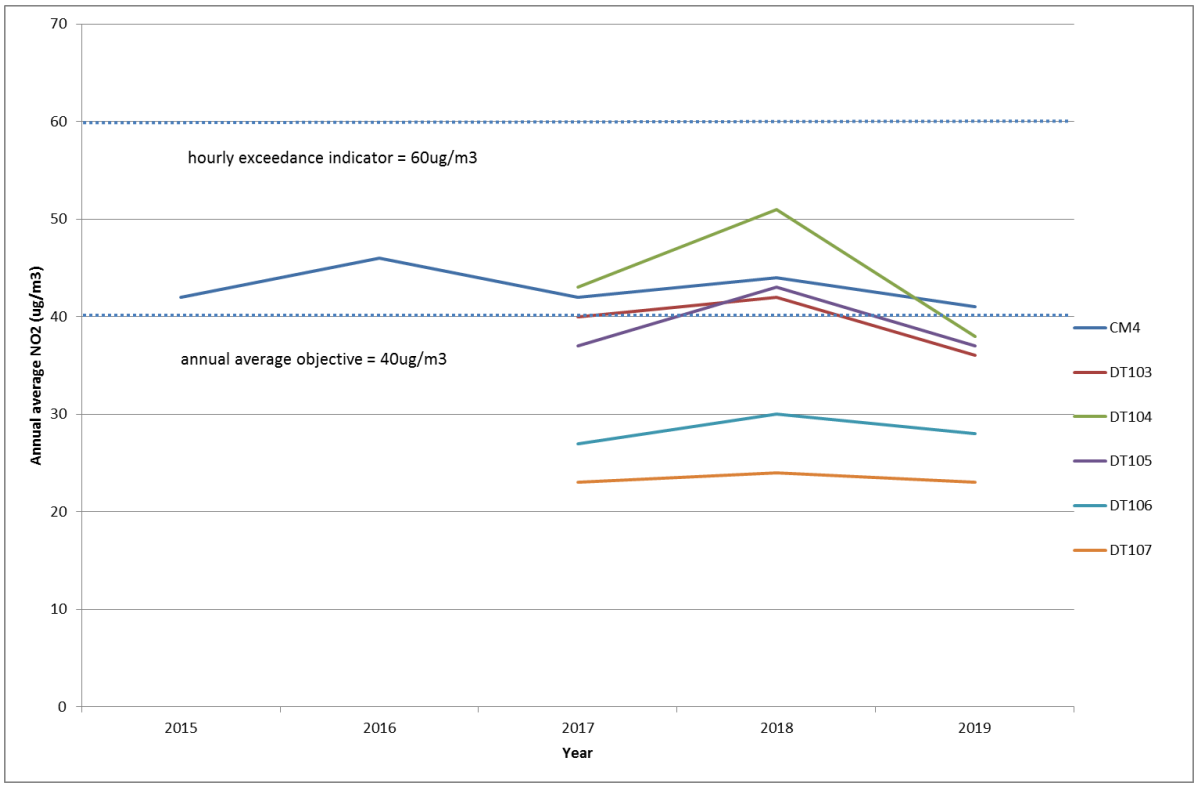
The results from all the current monitoring locations within the Mayo Avenue AQMA are as follows:

Site	Type	Bias corrected annual average concentration at monitoring point ($\mu g/m^3$)	Bias corrected annual average concentration at nearest relevant receptor point (distance corrected) ($\mu g/m^3$)	Maximum hourly concentration at monitoring point ($\mu g/m^3$)	Number of exceedances of hourly objective at monitoring point	Does tube data suggest breaches of hourly objective (annual average>60 $\mu g/m^3$)?
CM4	Real time	**41**	37	170	0	n/a
DT103	Diffusion tube	34.5	Measured value below 10% of objective not corrected	n/a	n/a	no
DT104	Diffusion tube	38	33	n/a	n/a	no
DT105	Diffusion tube	37	Tube at relevant receptor not corrected	n/a	n/a	no
DT106	Diffusion tube	28	Measured value below 10% of objective not corrected	n/a	n/a	no
DT107	Diffusion tube	23	Measured value below 10% of objective not corrected	n/a	n/a	no

During 2019 there were no exceedances of the annual average NO_2 objective within the Mayo Avenue AQMA. For all sites the 2019 concentrations were lower than those measured in 2018, but similar to those measured in 2017. The highest recorded concentrations in 2019 were at the real time monitoring site (CM4) and the diffusion tubes located either side of it (DT103 and DT104). When corrected for distance to the front façade of the terrace housing located behind these monitoring sites all the results were below the 40 $\mu g/m^3$ objective level. The other diffusion tubes within this AQMA (DT105, DT106 and DT107) also returned results below the 40$\mu g/m^3$ objective level.

Figure 8 details the 5 year trend for the real time monitoring site (CM4) and three year trend for the more recently established diffusion tube locations. Air quality has not significantly improved at the Mayo Avenue real time monitoring site during the past 5 years. The current long term trend is unclear but all sites recorded a decrease from 2018 to 2019.

Figure 8 - Mayo Avenue 5 year trend



There were no exceedances of the hourly NO_2 objective within the Mayo Avenue AQMA during 2019.

On the basis of these results the AQMA declaration for the annual average NO_2 objective at Mayo Avenue is still considered relevant and will remain in place subject to further review in the 2021 ASR.

Results for Thornton Road AQMA (2019)

Map 5 in Annex D details the location of the monitoring undertaken in the Thornton Road AQMA during 2019.

The table below shows the concentrations of NO_2 monitored in the Thornton Road area during 2019.

Site	Type	Bias corrected annual average concentration at monitoring point ($\mu g/m^3$)	Bias corrected annual average concentration at nearest relevant receptor point (distance corrected) ($\mu g/m^3$)	Maximum hourly concentration at monitoring point ($\mu g/m^3$)	Number of exceedances of hourly objective at monitoring point	Does tube data suggest breaches of hourly objective (annual average>60$\mu g/m^3$)?
CM5	Real time	39	Monitor at receptor façade - not corrected	145	0	n/a
DT108	Diffusion tube	32	Measured value below 10% of objective not corrected	n/a	n/a	no
DT109	Diffusion tube	31	Measured value below 10% of objective not corrected	n/a	n/a	no
DT110 (adjacent to AQMA)	Diffusion tube	27	Measured value below 10% of objective not corrected	n/a	n/a	no

In the 2019 ASR it was reported that the annual average concentration of NO_2 recorded at the Thornton Road real time site (CM5) was significantly higher in 2018 than it had been in the previous three years. The reason for this increase was traced to a long term fault on the analyser which was corrected in August 2018.

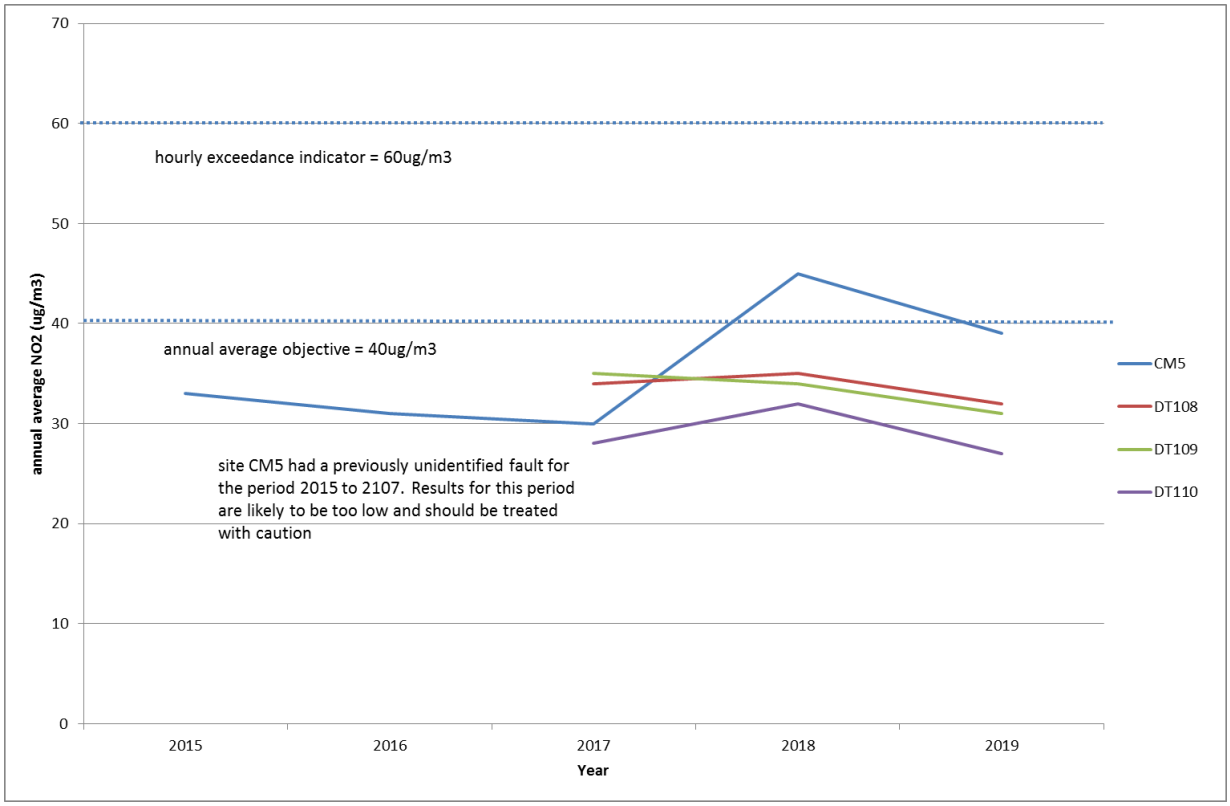
The annual average NO_2 concentration measured at CM5 during 2019 was lower than that in 2018 but still higher than the results recorded prior to the fault rectification. This confirms that the results prior to 2018 were impacted on by the fault and should be considered an underestimation of actual concentrations.

There were no recorded exceedances of the annual average NO_2 objective or the hourly NO_2 objective in the Thornton Road AQMA during 2019. The diffusion tube measurements undertaken within the Thornton Road AQMA have been consistently below the annual average NO_2 objective for the past three years.

Figure 9 details the 5 year trend for the real time monitoring site (CM4) and three year trend for the additional monitoring sites on Thornton Road. The results for CM4 are likely to be underestimated for the 2015 to 2017 period.

Due to the previous fault on the real time analyser (CM5) it is still unclear what the long term air quality trend is within the Thornton Road AQMA. Whilst there were no exceedances of the annual average NO_2 objective in 2019 the AQMA will not be revoked until the council is confident that the air quality objectives are consistently being met at site CM5.

Figure 9 - Thornton Road 5 year trend



Trends in urban background air quality in Bradford

Urban background air pollution levels in Bradford have previously been reported for two real time locations, Keighley and Bingley. The Bingley site was relocated to a roadside location on Tong Street in 2016 to help investigate possible exceedances of the annual average NO_2 objective in this area.

The Keighley real time monitoring site (CM2) is representative of an urban centre being located about 5m back from the nearest road in the centre of Keighley. There are three diffusion tubes co-located with the inlet (DT68, DT69, DT70).

In addition to the Keighley urban centre site (CM2) there is a long term background diffusion tube monitoring site (DT21) located on Prospect Street. This tube is located at a significant distance from the major road network and is representative of a sub-urban background concentration.

In August 2018 a further sub-urban background monitoring location was established on Frizley Gardens (DT 128) as part of a baseline monitoring programme for a highways project. This tube is located within a residential housing estate on a cul-de-sac. It is closer to the city centre of Bradford than tube DT21.

The 2019 results for background monitoring sites in Bradford are detailed in the table below.

The location of the Keighley monitoring sites are shown on map 6 in Annex D.

The location of the Prospect Street diffusion tube (DT21) is shown on map 6 in Annex 6.

The location of the Frizley Gardens diffusion tube (DT 128) is shown on map 15 in Annex 6

Site	Type	Bias corrected annual average concentration at monitoring point ($\mu g/m^3$)	Bias corrected annual average concentration at nearest relevant receptor point (distance corrected) ($\mu g/m^3$)	Maximum hourly concentration at monitoring point ($\mu g/m^3$)	Number of exceedances of hourly objective at monitoring point	Does tube data suggest breaches of hourly objective (annual average>60$\mu g/m^3$)?
CM2	Real time	24	n/a	115	0	n/a
DT68	Diffusion tube	25	Measured value below 10% of objective not corrected	n/a	n/a	no
DT69	Diffusion tube	28	Measured value below 10% of objective not corrected	n/a	n/a	no
DT70	Diffusion tube	28	Measured value below 10% of objective not corrected	n/a	n/a	no
DT21	Diffusion tube	10	Measured value below 10% of objective not corrected	n/a	n/a	no
DT128	Diffusion tube	15	Measured value below 10% of objective not corrected	n/a	n/a	n/a

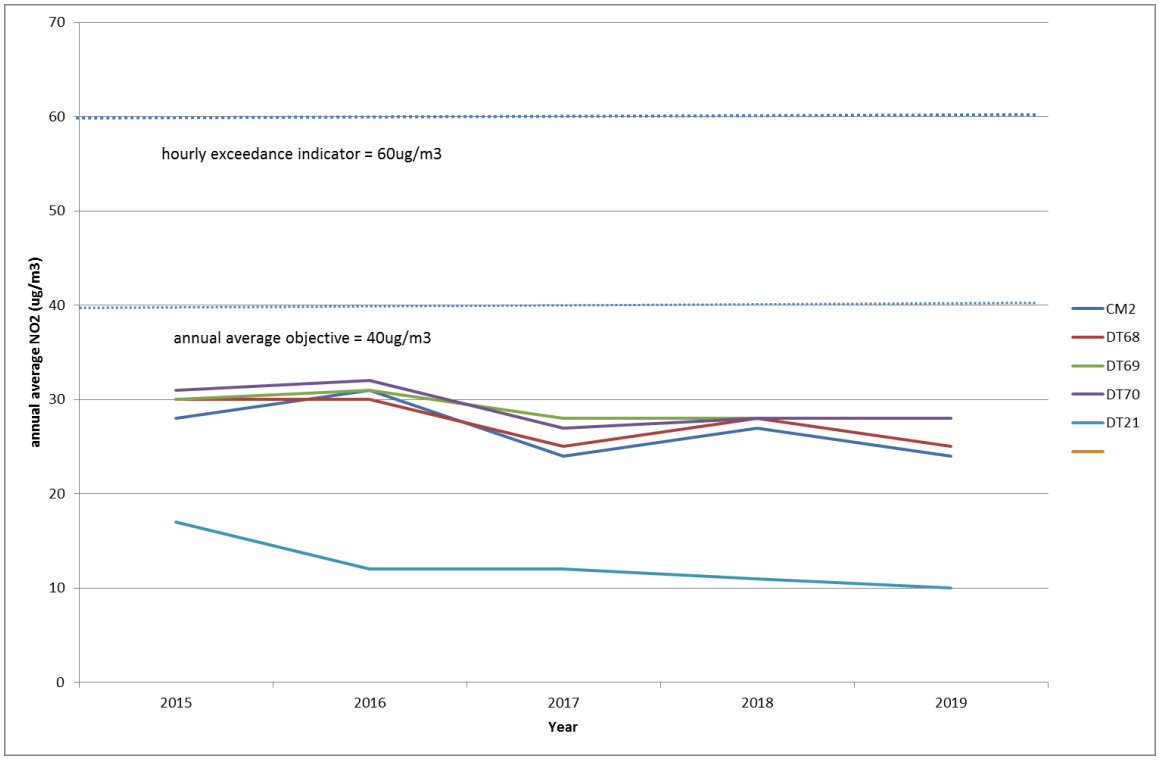
During 2019 there was good correlation between the real time analyser (CM2) and the three co-located diffusion tubes (DT68, DT69 and DT70). The levels recorded at these sites were either the same, or slightly lower, than those recorded at the same positions in 2018.

The 2019 annual average NO_2 concentration measured at the Prospect Street diffusion tube site (DT21) was similar to that recorded in the last three years and continues on a downward trend.

The result for the new sub-urban background site (DT128) was 15$\mu g/m^3$. This is within the expected range of values for this site which is much further away from a main road than the Keighley site, but closer to the city centre then the Prospect Street site.

The five year trend for the longer term background sites is displayed in Figure 10 below.

Figure 10 – Background 5 year trend



There were no exceedances of the annual average or hourly objectives at any of the background monitoring locations during 2019.

When viewed over a 5 year period the results for the background sites in Keighley show a general improvement in urban background concentrations of NO_2.

Compliance with NO_2 hourly objective (diffusion tubes)

There were no relevant diffusion tube locations with a concentration greater than 60µg/m^3 in 2019. The highest concentration recorded was 57µg/m^3 (Queen's Road). This tube is located adjacent to a residential façade and does not require distance correcting. The monitoring site is close to traffic lights at a major junction and on an incline. The site has a history of high readings and is already located within the Manningham Lane AQMA.

Compliance with annual average NO_2 objective (diffusion tubes)

The diffusion tube monitoring undertaken in 2019 identified the following sites as having an exceedance of the 40 µg/m^3 annual average objective at relevant receptor points (based on distance corrected results as shown in table B.1).

Site ID	Location	2019 value at relevant receptor point µg/m^3	Has this tube exceeded the annual average objective previously?	Is it in an AQMA?
DT12	Treadwell Mills	**48**	yes	yes
DT50	203 Bradford Road	**42**	yes	no
DT72	Queen's Road	**57**	yes	yes

The diffusion tube monitoring undertaken during 2019 did not highlight any additional areas of air quality concern in Bradford (over and above those identified in the 2019 ASR)

Update on areas of air quality concern in Bradford (outside AQMAs)

The 2019 ASR report identifies the following additional areas of air quality concern.

- Saltaire Road / Bingley Road junction
- Rook Lane / Rooley Lane / Tong Street area
- Harrogate Road / Killinghall Road/ Dudley Hill Road crossroads
- Canal Road
- Greengates junction

Current situation Saltaire Road / Bingley Road junction

Map 7 (Appendix D) displays the location of the diffusion tubes around the Saltaire Road / Bingley Road junction. As previously reported the number of monitoring sites in this area was increased during 2017 to investigate the extent of the exceedance of the annual average NO_2 objective along Bingley Road.

The 2019 results for these sites are shown in the table below:

Site	Type	Bias corrected annual average concentration at monitoring point ($\mu g/m^3$)	Bias corrected annual average concentration at nearest relevant receptor point (distance corrected) ($\mu g/m^3$)	Maximum hourly concentration at monitoring point ($\mu g/m^3$)	Number of exceedances of hourly objective at monitoring point	Does tube data suggest breaches of hourly objective (annual average>60 $\mu g/m^3$)?
DT30	Diffusion tube	**31**	Measured value below 10% of objective not corrected	n/a	n/a	no
DT31	Diffusion tube	**42**	34	n/a	n/a	no
DT49	Diffusion tube	27	Measured value below 10% of objective not corrected	n/a	n/a	no
DT50	Diffusion tube	**49**	**42.3**	n/a	n/a	no
DT91	Diffusion tube	29	Measured value below 10% of objective not corrected	n/a	n/a	no
DT101	Diffusion tube	**34**	Measured value below 10% of objective not corrected	n/a	n/a	no
DT102	Diffusion tube	38	30	n/a	n/a	no

Roadside concentrations remain elevated in this area. There was one exceedance of the annual average objective at a relevant location during 2019 (site DT50). Site DT50 is located on a post outside a parade of shops with residential properties above the shops. The distance correction calculation assumes the receptor point it is at the same height as the monitoring location (approx 2.5m). Actual concentrations at the first floor flats are likely to be lower than those predicted by the distance calculation as pollutant concentrations tend to reduce with height.

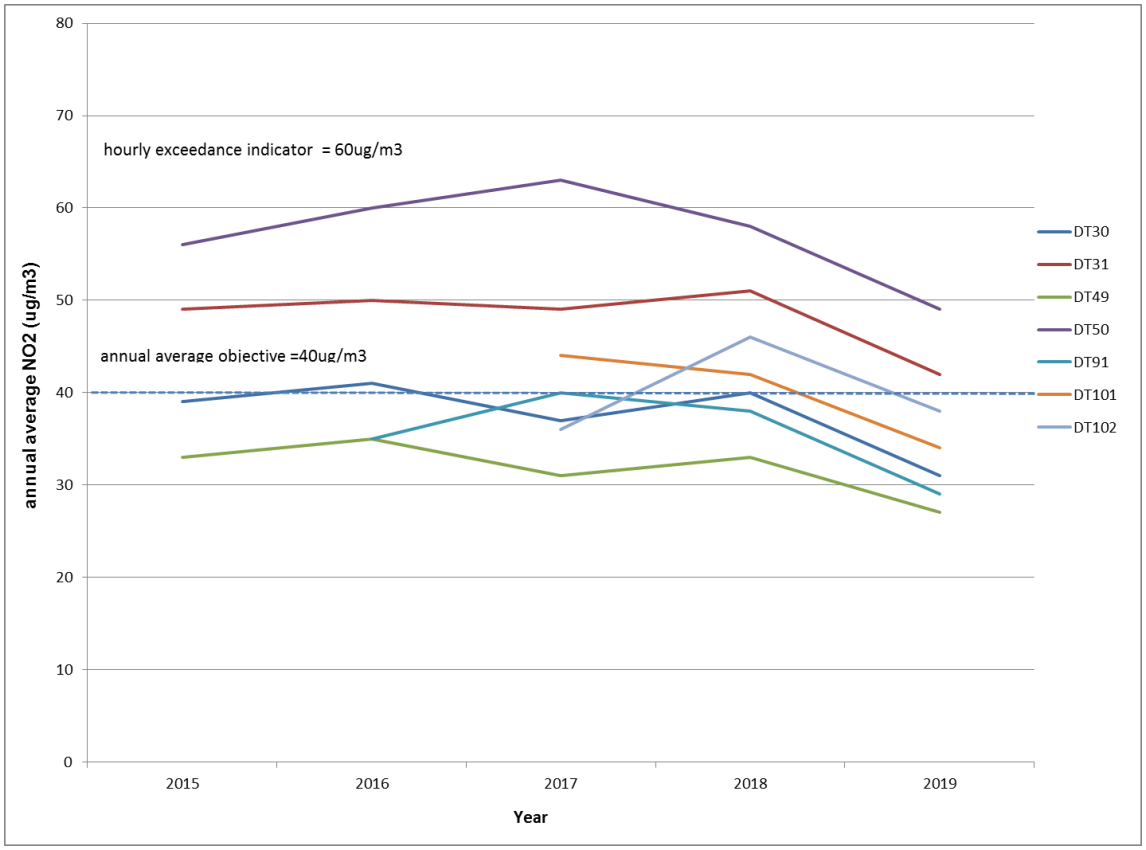
Figure 11 details the bias corrected measured value at monitoring sites in the Saltaire Road / Bingley Road area (with no distance correction applied) over a 5 year period. Between 2018 and 2019 there was a marked improvement in air quality at all monitoring locations in this area. Gradual changes have been made to the traffic signal timings in this area to try and reduce congestion and improve air quality.

The area around the Saltaire Road and Bingley Road is included in the modelling work undertaken as part of the B-CAP business case study. The types of measures being considered in this study have the potential to reduce concentrations of NO_2 in this area further and bring it into full compliance.

There is no immediate stand-alone solution to improve air quality in this area which could be implemented ahead of the measures being developed in the B-CAP. The declaration of a further AQMA whilst the B-CAP business case development is on-going would create unnecessary bureaucracy during a period when Bradford is already working towards the identification of a holistic air quality solution for the city. If air quality issues are predicted to remain in this area, irrespective of measures in the final B-CAP, then it will be appropriate to declare an AQMA at that time.

A further update on air quality in this area will be provided in the 2021 ASR report.

Figure 11 - Trends around Saltaire Road / Bingley Road junction



Current situation Rook Lane / Rooley Lane /Tong Street area

The distance corrected results for diffusion tube monitoring in this area during 2019 are shown in the table below. The locations of these tubes are shown on map 8 (Annex D).

Site	Type	Bias corrected annual average concentration at monitoring point ($\mu g/m^3$)	Bias corrected annual average concentration at nearest relevant receptor point (distance corrected) ($\mu g/m^3$)	Maximum hourly concentration at monitoring point ($\mu g/m^3$)	Number of exceedances of hourly objective at monitoring point	Does tube data suggest breaches of hourly objective (annual average>60$\mu g/m^3$)?
CM7	Real time	38	36	145	0	n/a
CM8	Real time	33	Measured value below 10% of objective not corrected	132	0	n/a
DT45	Diffusion tube	27	Measured value below 10% of objective not corrected	n/a	n/a	no
DT76	Diffusion tube	26	Measured value below 10% of objective not corrected	n/a	n/a	no
DT88	Diffusion tube	26	Measured value below 10% of objective not corrected	n/a	n/a	no
DT89	Diffusion tube	29	Measured value below 10% of objective not corrected	n/a	n/a	no
DT64	Diffusion tube	34	Measured value below 10% of objective not corrected	n/a	n/a	no

During 2019 there were no exceedances of the annual average NO_2 objective or the hourly NO_2 objective in this area.

Figure 12 - Trends around Rook Lane / Rooley Lane /Tong Street area

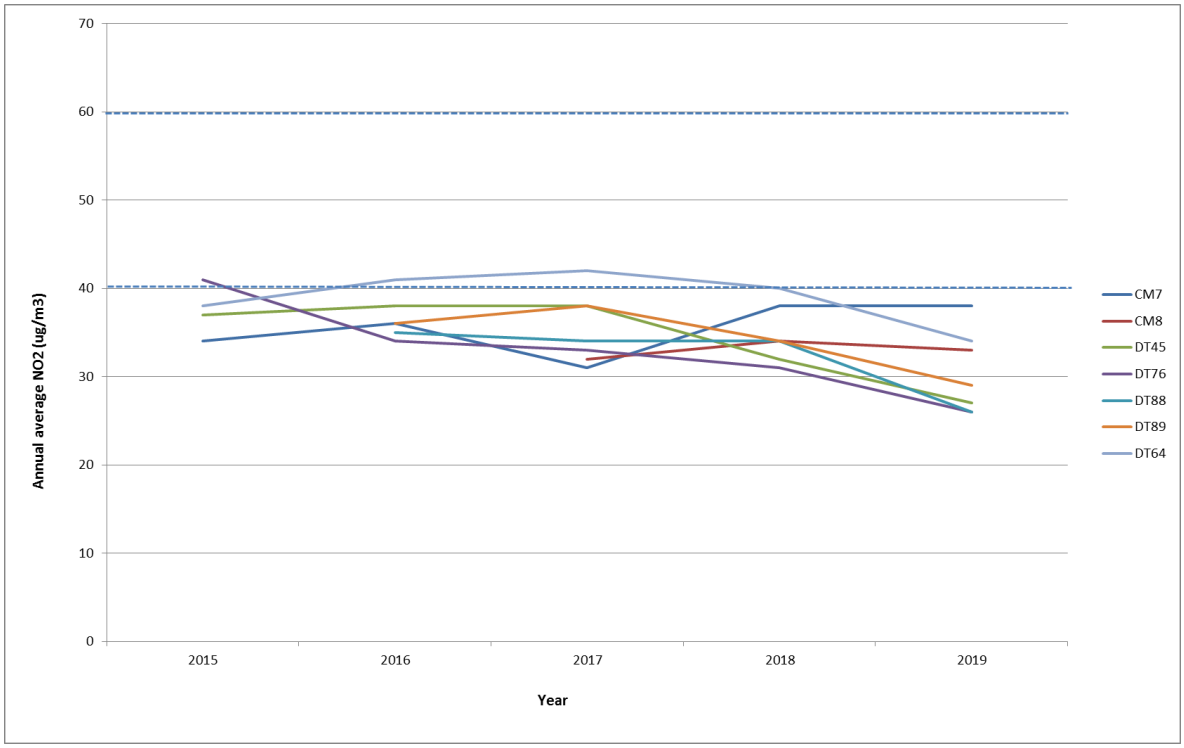


Figure 12 details the bias corrected measured values at monitoring locations in the Rook Lane / Rooley Lane /Tong Street area over a five year period. With the exception of the monitoring site CM7 on Rooley Avenue (near Rook Lane) there has been a general improvement in air quality from 2017 onwards.

Based on the most recent monitoring data there is currently no requirement to declare an AQMA in this area. Monitoring will be continued during 2020 and a further update provided in the 2021 ASR.

Current situation Harrogate Road / Killinghall Road

The 2016 ASR report identified exceedance of the annual average NO_2 in the vicinity of the Harrogate Road / Killinghall Road junction. As previously reported additional monitoring was introduced into this area in 2017 to consider the extent of this exceedance.

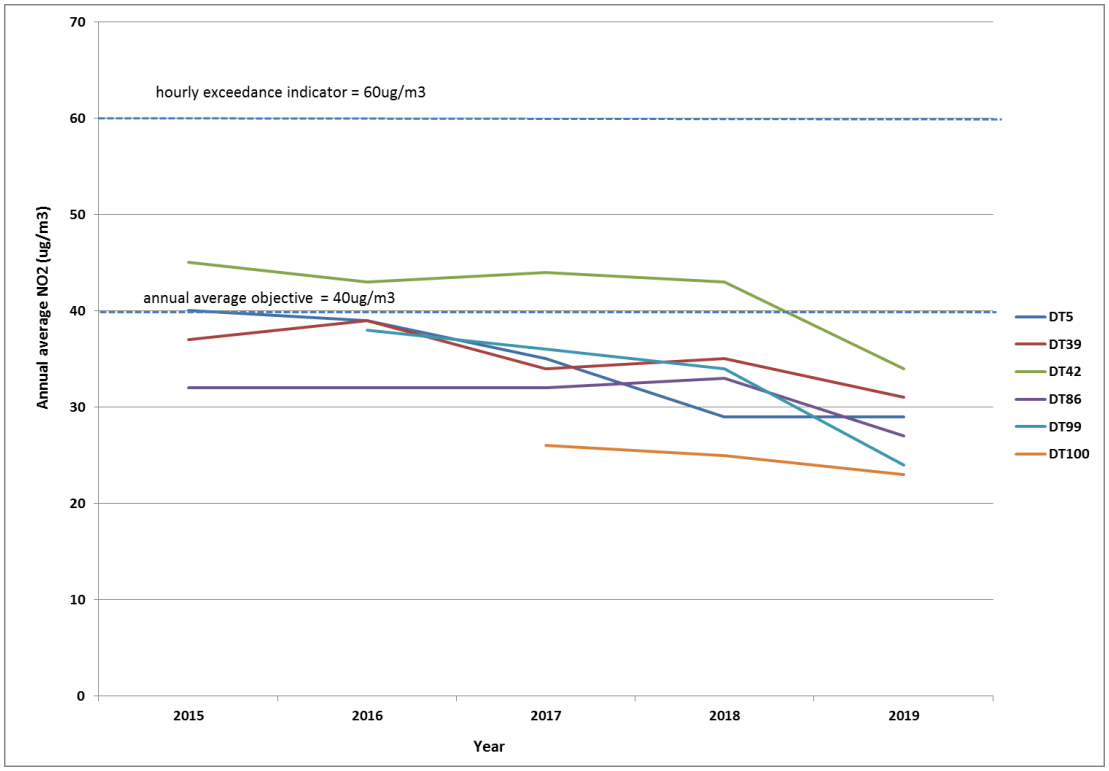
The distance corrected results for each of these sites during 2019 are detailed in the table below. The locations of these tubes are shown on Map 9 (Annex D).

Site	Type	Bias corrected annual average concentration at monitoring point ($\mu g/m^3$)	Bias corrected annual average concentration at nearest relevant receptor point (distance corrected) ($\mu g/m^3$)	Maximum hourly concentration at monitoring point ($\mu g/m^3$)	Number of exceedances of hourly objective at monitoring point	Does tube data suggest breaches of hourly objective (annual average>60 $\mu g/m^3$)?
DT5	Diffusion tube	29	Measured value below 10% of objective not corrected	n/a	n/a	no
DT39	Diffusion tube	31	Measured value below 10% of objective not corrected	n/a	n/a	no
DT42	Diffusion tube	34	Measured value below 10% of objective not corrected	n/a	n/a	no
DT86	Diffusion tube	27	Measured value below 10% of objective not corrected	n/a	n/a	no
DT99	Diffusion tube	24	Measured value below 10% of objective not corrected	n/a	n/a	no
DT100	Diffusion tube	23	Measured value below 10% of objective not corrected	n/a	n/a	no

During 2019 there were no exceedances of the annual average NO_2 objective or the hourly NO_2 objective in this area.

Figure 13 details the trend in measured annual average NO_2 concentration around the Killinghall Road / Harrogate Road junction (at measurement position not distance corrected).

Figure 13 - Trends around Killinghall Road / Harrogate Road junction



During the last five years air quality in this area has generally improved. All sites showed a further reduction in annual average NO_2 concentration between 2018 and 2019 (with the exception of site DT5 which remained the same).

Based on the long term trend and the concentrations measured in 2019 the declaration of a further AQMA in this area is no longer considered necessary. An update on concentrations in this area will be provided in the 2020 ASR report.

Current situation Canal Road

The national PCM air pollution model operated on behalf of Defra has identified potential exceedance of EU limit values in the Canal Road area (as well as in other areas of the city). Monitoring was established in the Canal Road area in 2016 close to the site of a large mixed use planning application. This monitoring was extended in 2017 to include further relevant locations in the area. Monitoring at these sites continued throughout 2019.

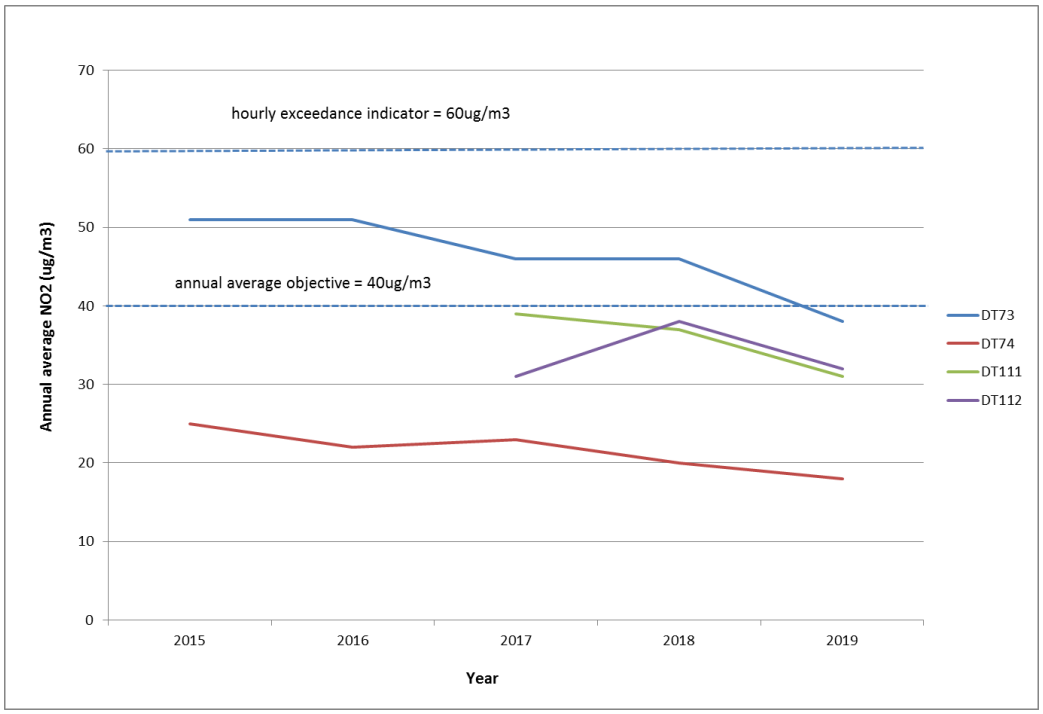
The results of the 2019 monitoring in the Canal Road area are detailed in the table below. A map of the monitoring sites can be found in Appendix D (Map10).

Site	Type	Bias corrected annual average concentration at monitoring point ($\mu g/m^3$)	Bias corrected annual average concentration at nearest relevant receptor point (distance corrected) ($\mu g/m^3$)	Maximum hourly concentration at monitoring point ($\mu g/m^3$)	Number of exceedances of hourly objective at monitoring point	Does tube data suggest breaches of hourly objective (annual average>60$\mu g/m^3$)?
DT73	Diffusion tube	38	No relevant receptor present	n/a	n/a	no
DT74	Diffusion tube	18	Measured value below 10% of objective not corrected	n/a	n/a	no
DT111	Diffusion tube	31	Measured value below 10% of objective not corrected	n/a	n/a	no
DT112	Diffusion tube	32	Measured value below 10% of objective not corrected	n/a	n/a	no

During 2019 there were no exceedances of the annual average NO_2 objective in this area. The highest recorded concentration was 38µg/m^3 at site DT73 but there is currently no relevant exposure at this location.

Figure 14 details the trend in measured annual average NO_2 concentration in the Canal Road area (at measurement position not distance corrected).

Figure 14 - Trends around Canal Road area



During the last five years air quality in this area has generally improved. All sites showed a reduction in annual average NO_2 concentration between 2018 and 2019.

Based on the 2019 monitoring data there is no requirement to declare an AQMA on Canal Road at present. A further update on concentrations in this area will be provided in the 2020 ASR report.

Current situation Greengates crossroads

In the 2017 ASR report it was reported that elevated concentrations of NO_2 had been observed around the Greengates junction following the installation of monitoring to support a planning application for a major junction improvement scheme.

The junction improvement was approved in 2018 (planning reference17/00916/FUL). Works commenced in July 2020 and are currently on-going.

The results of the monitoring at Greengates crossroads during 2019 are shown in the table below. The monitoring site locations are shown in Appendix D (map 11).

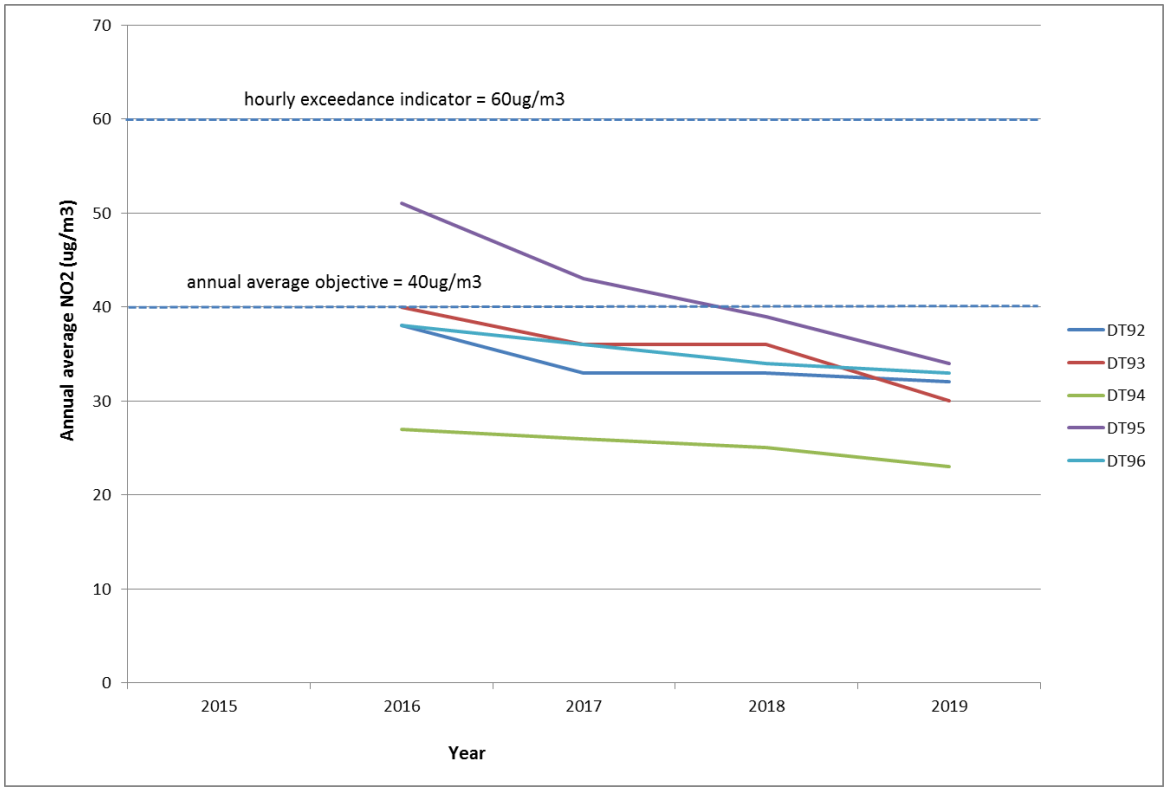
Site	Type	Bias corrected annual average concentration at monitoring point ($\mu g/m^3$)	Bias corrected annual average concentration at nearest relevant receptor point (distance corrected) ($\mu g/m^3$)	Maximum hourly concentration at monitoring point ($\mu g/m^3$)	Number of exceedances of hourly objective at monitoring point	Does tube data suggest breaches of hourly objective (annual average>60 $\mu g/m^3$)?
DT92	Diffusion tube	32	Measured value below 10% of objective not corrected	n/a	n/a	no
DT93	Diffusion tube	30	Measured value below 10% of objective not corrected	n/a	n/a	no
DT94	Diffusion tube	23	Measured value below 10% of objective not corrected	n/a	n/a	no
DT95	Diffusion tube	34	Measured value below 10% of objective not corrected	n/a	n/a	no

DT96	Diffusion tube	33	Measured value below 10% of objective not corrected	n/a	n/a	no

During 2019 none of the Greengates junction monitoring sites exceeded the annual average objective for NO_2. All sites showed an improvement compared to the previous year.

Figure 15 details the trend in measured annual average NO_2 concentration in the Greengates area (at measurement position not distance corrected).

Figure 15 - Trends around Greengates crossroads



Since the scheme baseline monitoring began air quality has generally improved in this area. The air quality impact assessment prepared for the junction improvement scheme indicates that further air quality improvement is expected once the works are complete. Monitoring work will be continued until the full impact of the junction improvement scheme is known.

Based on the 2019 monitoring data there is no requirement to declare an AQMA in the Greengates area at present. A further update on concentrations in this area will be provided in the 2020 ASR report.

3.2.2 Particulate Matter (PM_{10})

Table A.5 in Appendix A compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

Table A.6 in Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations for the past 5 years with the air quality objective of 50µg/m^3, not to be exceeded more than 35 times per year.

All PM_{10} data has been verified and ratified by Air Quality Data Management Services (www.aqdm.co.uk) on behalf of City of Bradford MDC.

Compliance with annual average objective

There were no exceedances of the annual average air quality objective for PM_{10} recorded at any of the continuous monitoring sites in Bradford during 2019.

The annual average background level of PM_{10} recorded at CM2 (Keighley) in 2019 was slightly lower than the 2018 concentration. When viewed over a 5 year period the overall trend in background PM_{10} at Keighley shows a general increase.

During 2019 annual average PM_{10} concentrations at both Shipley Airedale Road and Tong Street were slightly higher than those recorded in recent years. Since 2017 there has been a gradual increase in annual average PM_{10} at the Shipley Airedale Road monitoring site. There is currently no clear trend at the Tong Street monitoring site which was established in 2017.

Figure A.1 in Appendix A shows the trends in annual mean PM_{10} concentrations.

Compliance with daily mean objective

Table A.6 in Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations for the previous 5 years with the air quality objective of 50µg/m^3, which is not to be exceeded more than 35 times per year.

There were 4 exceedances of the 50µg/m^3 daily mean objective at CM2 (Keighley) during 2019. Gravimetric PM_{10} was Moderate at CM2 on 24th, 25th, 26th, and 28th February 2019 with a daily mean reaching 61µg/m^3.

There were 12 exceedances of the 50µg/m^3 daily mean objective at CM6 (Shipley Airedale Road) during 2019. Gravimetric PM_{10} was Moderate on 15th, 22nd, 23rd and 28th Feb and 18th, 19th, and 20th April 2020 with a daily mean reaching 74 µg/m^3 and .

High on 14th, 24th, 25th, 26th and 27th Feb with a daily mean reaching 91 µg/m^3. The number of daily exceedances of the 50µg/m^3 daily mean objective at this monitoring site during 2019 was significantly higher than in the previous 5 years.

There were 5 exceedances of the 50µg/m^3 daily mean objective at CM8 (Tong Street) during 2019. Gravimetric PM_{10} was Moderate on 24th, 25th, 27th and 28th February 2020 and 5th November 2020 with a daily mean reaching 61µg/m^3.

As 35 exceedances of the 50µg/m^3 objective are allowed at any one site per annum the 24 hour daily mean objective was complied with at all Bradford PM_{10} monitoring sites during 2019.

3.2.3 Particulate Matter ($PM_{2.5}$)

Error! Reference source not found. in Appendix A presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for the past 5 years.

All $PM_{2.5}$ data has been verified and ratified by Air Quality Data Management Services (www.aqdm.co.uk) on behalf of City of Bradford MDC.

The annual average background level of $PM_{2.5}$ recorded at CM2 (Keighley) in 2019 was slightly lower than that recorded in 2018.

The $PM_{2.5}$ annual average concentations measured at CM6 (Shipley Airedale Road) and CM8 (Tong Street) were both slightly higher than those measured in 2018.

Some variation in annual average background $PM_{2.5}$ concentration is expected due to the influence of weather conditions. There has not been a signifcant change in $PM_{2.5}$ concetnration across the district over the last five years.

Figure A.5 in Appendix A shows the trends in annual mean $PM_{2.5}$ concentrations.

$PM_{2.5}$ concentrations in Bradford are well below the EU target value of 25µg/m^3 but in some locations the World Health Organisation (WHO) guideline of 10µg/m^3 is exceeded. The WHO guideline is currently exceeded in most urban centres in the UK but there is currently no statutory obligation for local authorities to meet either of these PM2.5 targets.

3.2.4 Sulphur Dioxide (SO_2)

Table A.8 in Appendix A compares the ratified continuous monitored SO_2 concentration for 2019 at CM2 (Keighley) with the air quality objectives for SO_2.

The SO_2 data has been verified and ratified by Air Quality Data Management Services (www.aqdm.co.uk) on behalf of City of Bradford MDC.

There were no exceedances of the SO_2 air quality objectives at CM2 (Keighley) during 2019.

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 ?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
CM2	Keighley	Urban Centre	406058	441273	NO2; PM10	NO	Chemiluminescent	n/a	5	2.7
CM3	Manningham Lane	Roadside	415582	434457	NO2	YES	Chemiluminescent	4	1.5	1.5
CM4	Manchester Road / Mayo Avenue	Roadside	415933	430569	NO2	YES	Chemiluminescent	2	2	1.5
CM5	Thornton Road	Roadside	415887	433047	NO2	YES	Chemiluminescent	0	2	1.5
CM6	Shipley Airedale Road	Roadside	416974	433245	NO2; PM10	YES	Chemiluminescent	2	2	2.7
CM7	Rook Lane	Roadside	417860	430705	NO2	YES	Chemiluminescent	1	1.5	1.5
CM8	Tong Street	Roadside	419188	430213	NO2; PM10	NO	Chemiluminescent	0	5.8	2.7

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

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
DT5	Harrogate Road	Kerbside	417982	434886	NO2	NO	0	1	NO	2.5 - 2.6
DT39	Harrogate Road	Roadside	417927	434799	NO2	NO	2	2	NO	2.5 - 2.6
DT42	Killinghall	Kerbside	417902	434751	NO2	NO	1.3	1	NO	2.5-2.6
DT12	Treadwell Mills	Roadside	416967	433268	NO2	YES	1	1.5	NO	2.5 - 2.6
DT45	Rook Lane lampost 17	Roadside	417877	430717	NO2	NO	0	1.5	NO	2.5 - 2.6
DT30	29 Saltaire Road	Roadside	413861	437772	NO2	NO	2	2	NO	2.5 - 2.6
DT31	Lampost 233 80 Bradford Road	Roadside	413527	437713	NO2	NO	4	1.5	NO	2.5 - 2.6
DT49	9 Moorhead Lane	Roadside	413604	437658	NO2	NO	4	1.5	NO	2.5 - 2.6
DT50	203 Bradford Road	Roadside	413510	437732	NO2	NO	2.5	2	NO	2.5 - 2.6
DT68	Co-Located at AQ Station	Roadside	406060	441274	NO2	NO	n/a	5	YES	3
DT69	Co-Located at AQ Station	Roadside	406060	441274	NO2	NO	n/a	5	YES	3
DT70	Co-Located at AQ Station	Roadside	406060	441274	NO2	NO	n/a	5	YES	3
DT64	Tong Street	Roadside	419379	430091	NO2	NO	0	1.5	NO	2.5 - 2.6
DT21	12 Prospect Street, Keighley	Background	404719	440613	NO2	NO	0	>5	NO	2.5 - 2.6

DT71	Post 53 Manningham Lane adj ST Nox unit	Roadside	415585	434455	NO2	YES	4	1.5	NO	2.5 - 2.6
DT72	Post 2 Queens Rd (traffic lights)	Roadside	415573	434521	NO2	YES	0	2	NO	2.5 - 2.6
DT73	Post 61 Canal Rd (opp garden centre)	Kerbside	415448	435812	NO2	NO	n/a	1	NO	2.5 - 2.6
DT74	Post 4 Gaisby Ln (above cycle path)	Kerbside	415549	435918	NO2	NO	n/a	<0.5	NO	2.5 - 2.6
DT76	Post 12 junc Rook Ln/Tong St	Kerbside	418268	430732	NO2	NO	3.5	0.5	NO	2.5 - 2.6
DT78	Post 11 Aireworth Road KLY	Kerbside	407380	441811	NO2	NO	3	1	NO	2.5 - 2.6
DT79	Centenary Square	Urban Background	416282	432966	NO2	NO	0	70	NO	2.5 - 2.6
DT80	Lampost 40 City Exchange	Kerbside	416388	432817	NO2	NO	1	1	NO	2.5 - 2.6
DT81	Lampost 5 Interchange bus entrance	Kerbside	416413	432674	NO2	NO	1	1	NO	2.5 - 2.6
DT84	Wilton St- Omar Khan's	Kerbside	416054	432675	NO2	NO	5	<1	NO	2.5 - 2.6
DT86	Otley Rd lamp post no 2	Roadside	417894	434753	NO2	NO	0	2	NO	2.5 - 2.6
DT88	Tong Street lamp post no 181	Roadside	418829	430399	NO2	NO	0	2	NO	2.5 - 2.6
DT89	Tong St/Broadstone Way Car Park	Roadside	419188	430213	NO2	NO	3	3	NO	2.5 - 2.6

DT91	Dove Street / Saltaire Road	Roadside	413697	437723	NO2	NO	0	1.5	NO	2.5 - 2.6
DT92	Harrogate Rd (Greengates)	Roadside	419006	437217	NO2	NO	n/a	1.5	NO	2.5 - 2.6
DT93	New Line (former school)	Kerbside	419003	437308	NO2	NO	0	1	NO	2.5 - 2.6
DT94	Stockhill Rd (school)	Roadside	419103	437337	NO2	NO	2.5	3.5	NO	2.5 - 2.6
DT95	Harrogate Rd	Kerbside	419111	437322	NO2	NO	n/a	1	NO	2.5 - 2.6
DT96	New Line (ped crossing)	Kerbside	419152	437209	NO2	NO	7	1	NO	2.5 - 2.6
DT99	Charnwood Grove/Harrogate Rd LP below junc	Roadside	418033	434970	NO2	NO	0	7.5	NO	2.5 - 2.6
DT100	Killinghall Rd opp car park LP former soc ser	Roadside	417949	434693	NO2	NO	0	2.4	NO	2.5 - 2.6
DT101	Bingley Rd Saltaire LP 37 nearest shops	Roadside	413418	437725	NO2	NO	8	1.4	NO	2.5 - 2.6
DT102	Bingley Rd Saltaire LP nr house 43	Roadside	413338	437720	NO2	NO	7.7	2.4	NO	2.5 - 2.6
DT103	Mayo Ave first LP left of AQMS	Roadside	415925	430572	NO2	YES	4.9	3.6	NO	2.5 - 2.6
DT104	Mayo Ave first LP right of AQMS	Roadside	415961	430558	NO2	YES	4.9	4.4	NO	2.5 - 2.6
DT105	Manchester Rd LP nearest house 793	Roadside	415780	430504	NO2	YES	0	6.8	NO	2.5 - 2.6
DT106	Smiddles Lane LP nearest fence to Bankfoot School	Roadside	415702	430702	NO2	YES	2.4	4	NO	2.5 - 2.6

DT107	Broadway Ave off Manch Rd adj City bathrooms	Roadside	415833	430837	NO2	NO	0	5.2	NO	2.5 - 2.6
DT108	Thornton Rd LP 24 after Street Nox	Roadside	415858	433061	NO2	YES	0.6	4.5	NO	2.5 - 2.6
DT109	Thornton Rd LP below Street Nox	Roadside	415891	433045	NO2	YES	0.5	3	NO	2.5 - 2.6
DT110	Thornton Rd Lp adj to student accom	Roadside	415806	433061	NO2	NO	1.7	4.4	NO	2.5 - 2.6
DT111	Canal Rd/ Midland Terr LP nr post box	Roadside	416015	435028	NO2	NO	3.5	3.1	NO	2.5 - 2.6
DT112	Canal Rd LP nearest flats by car wash	Kerbside	415024	436743	NO2	NO	9.16	0.7	NO	2.5 - 2.6
DT113	Young Street lp1	Roadside	414014	433357	NO2	NO	0	2.6	NO	2.5 - 2.6
DT115	Buller Street lp4	Urban Background	418421	432214	NO2	NO	0	n/a	NO	2.5 - 2.6
DT116	Sticker Lane lp41	Roadside	418564	432218	NO2	NO	0	3	NO	2.5 - 2.6
DT117	Parry lane lp4	Kerbside	418192	432208	NO2	NO	0	0.7	NO	2.5 - 2.6
DT118	Fearnville Drive lp1	Roadside	418666	432470	NO2	NO	4	4.1	NO	2.5 - 2.6
DT119	Laisterdyke LP5 adj NO9	Roadside	418626	432945	NO2	NO	0.5	2.4	NO	2.5 - 2.6
DT120	Leeds Rd St Marys School	Roadside	417991	432926	NO2	NO	0	4	NO	2.5 - 2.6
DT128	Frizley Gardens	Urban Background	415331	435796	NO2	NO	0	n/a	NO	2.5 - 2.6

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

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3) (4)				
							2015	2016	2017	2018	2019
CM2	406058	441273	Urban Centre	Automatic	n/a	97.1	28	31	24	27	24
CM3	415582	434457	Roadside	Automatic	n/a	94.6	**42**	**41**	39	**51**	**43**
CM4	415933	430569	Roadside	Automatic	n/a	95.9	**42**	**46**	**42**	**44**	**41**
CM5	415887	433047	Roadside	Automatic	n/a	96.5	33	31	30	**45**	39
CM6	416974	433245	Roadside	Automatic	n/a	89.9	**48**	**52**	**40**	**48**	**46**
CM7	417860	430705	Roadside	Automatic	n/a	91.3	34	36	31	38	38
CM8	419188	430213	Roadside	Automatic	n/a	90.7	no data	no data	32	34	33
DT5	417982	434886	Kerbside	Diffusion tube	n/a	100	**40**	39	**35**	29	29
DT39	417927	434799	Roadside	Diffusion tube	n/a	100	**37**	**39**	34	35	31
DT42	417902	434751	Kerbside	Diffusion tube	n/a	100	**45**	**43**	**44**	**43**	34
DT12	416967	433268	Roadside	Diffusion tube	n/a	100	**66**	**69**	**62**	**55**	**52**
DT45	417877	430717	Roadside	Diffusion tube	n/a	83.3	37	38	38	32	27
DT30	413861	437772	Roadside	Diffusion tube	n/a	100	39	**41**	37	**40**	31
DT31	413527	437713	Roadside	Diffusion tube	n/a	83.3	**49**	**50**	**49**	**51**	**42**
DT49	413604	437658	Roadside	Diffusion tube	n/a	100	33	35	31	33	27

DT50	413510	437732	Roadside	Diffusion tube	n/a	100	**56**	**60**	**63**	**58**	**49**
DT68	406060	441274	Roadside	Diffusion tube	n/a	91.67	30	30	25	28	25
DT69	406060	441274	Roadside	Diffusion tube	n/a	91.67	30	31	28	28	28
DT70	406060	441274	Roadside	Diffusion tube	n/a	100	31	32	27	28	28
DT64	419379	430091	Roadside	Diffusion tube	n/a	100	38	**41**	**42**	**40**	34
DT21	404719	440613	Background	Diffusion tube	n/a	100	17	12	12	11	10
DT71	415585	434455	Roadside	Diffusion tube	n/a	100	**40**	39	**43**	**40**	36
DT72	415573	434521	Roadside	Diffusion tube	n/a	83.3	**60**	**66**	**53**	**66**	**57**
DT73	415448	435812	Kerbside	Diffusion tube	n/a	83.3	**51**	**51**	**46**	**46**	38
DT74	415549	435918	Kerbside	Diffusion tube	n/a	100	25	22	23	20	18
DT76	418268	430732	Kerbside	Diffusion tube	n/a	100	**41**	34	33	31	26
DT78	407380	441811	Kerbside	Diffusion tube	n/a	100	27	23	23	20	21
DT79	416282	432966	Urban Background	Diffusion tube	n/a	91.67	33	29	33	32	27
DT80	416388	432817	Kerbside	Diffusion tube	n/a	100	34	33	33	36	31
DT81	416413	432674	Kerbside	Diffusion tube	n/a	91.67	36	34	37	35	27
DT84	416054	432675	Kerbside	Diffusion tube	n/a	75	32	32	32	33	28
DT86	417894	434753	Roadside	Diffusion tube	n/a	100	no data	32	28	31	27
DT88	418829	430399	Roadside	Diffusion tube	n/a	100	no data	35	34	34	26
DT89	419188	430213	Roadside	Diffusion tube	n/a	100	no data	36	38	34	29
DT91	413697	437723	Roadside	Diffusion tube	n/a	75	no data	35	**40**	38	29

DT92	419006	437217	Roadside	Diffusion tube	n/a	100	no data	38	33	33	32
DT93	419003	437308	Kerbside	Diffusion tube	n/a	100	no data	**40**	36	36	30
DT94	419103	437337	Roadside	Diffusion tube	n/a	91.67	no data	27	26	25	23
DT95	419111	437322	Kerbside	Diffusion tube	n/a	91.67	no data	**51**	**43**	39	34
DT96	419152	437209	Kerbside	Diffusion tube	n/a	100	no data	38	36	34	33
DT99	418033	434970	Roadside	Diffusion tube	n/a	100	no data	no data	25	25	24
DT100	417949	434693	Roadside	Diffusion tube	n/a	100	no data	no data	26	25	23
DT101	413418	437725	Roadside	Diffusion tube	n/a	91.67	no data	no data	**44**	**42**	34
DT102	413338	437720	Roadside	Diffusion tube	n/a	100	no data	no data	36	**46**	38
DT103	415925	430572	Roadside	Diffusion tube	n/a	100	no data	no data	**40**	**42**	35
DT104	415961	430558	Roadside	Diffusion tube	n/a	100	no data	no data	**43**	**51**	38
DT105	415780	430504	Roadside	Diffusion tube	n/a	100	no data	no data	37	**43**	37
DT106	415702	430702	Roadside	Diffusion tube	n/a	100	no data	no data	27	30	28
DT107	415833	430837	Roadside	Diffusion tube	n/a	100	no data	no data	23	24	23
DT108	415858	433061	Roadside	Diffusion tube	n/a	100	no data	no data	34	33	32
DT109	415891	433045	Roadside	Diffusion tube	n/a	100	no data	no data	35	34	31
DT110	415806	433061	Roadside	Diffusion tube	n/a	100	no data	no data	28	32	27
DT111	416015	435028	Roadside	Diffusion tube	n/a	83.3	no data	no data	39	37	31
DT112	415024	436743	Kerbside	Diffusion tube	n/a	100	no data	no data	31	38	32
DT113	414014	433357	Roadside	Diffusion tube	n/a	100	no data	no data	24	22	20

DT115	418421	432214	Urban Background	Diffusion tube	n/a	91.67	no data	no data	23	24	20
DT116	418564	432218	Roadside	Diffusion tube	n/a	91.67	no data	no data	28	27	24
DT117	418192	432208	Kerbside	Diffusion tube	n/a	100	no data	no data	**no data**	26	23
DT118	418666	432470	Roadside	Diffusion tube	n/a	100	no data	no data	31	27	27
DT119	418626	432945	Roadside	Diffusion tube	100	50	no data	no data	34	35	34
DT120	417991	432926	Roadside	Diffusion tube	n/a	91.67	no data	no data	**no data**	35	31
DT128	415331	435796	Urban background	Diffusion tube	n/a	100	no data	no data	no data	no data	15

☒ **Diffusion tube data has been bias corrected**

☒ **Annualisation has been conducted where data capture is <75%**

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

Notes:

Exceedances of the 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.**

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

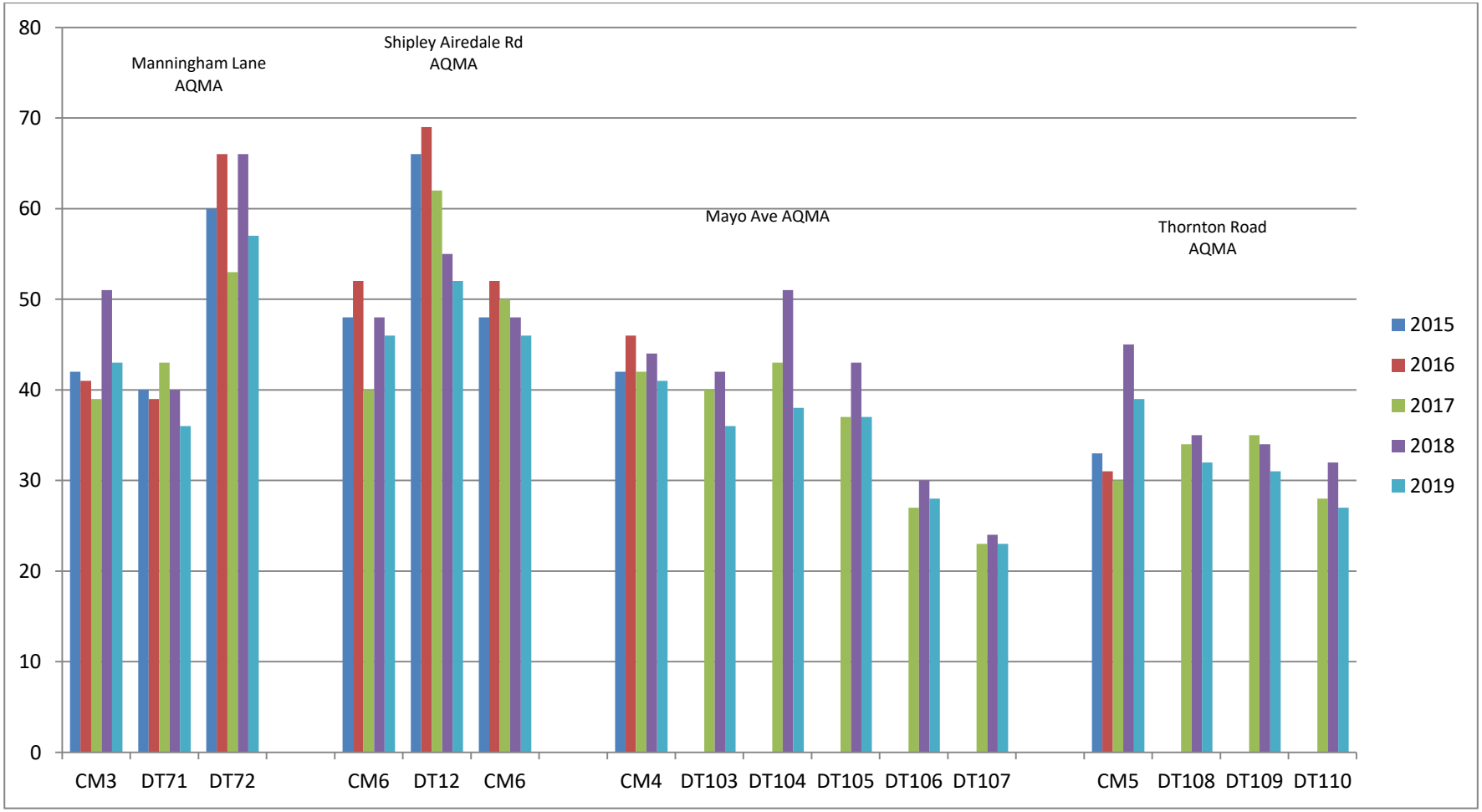
(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

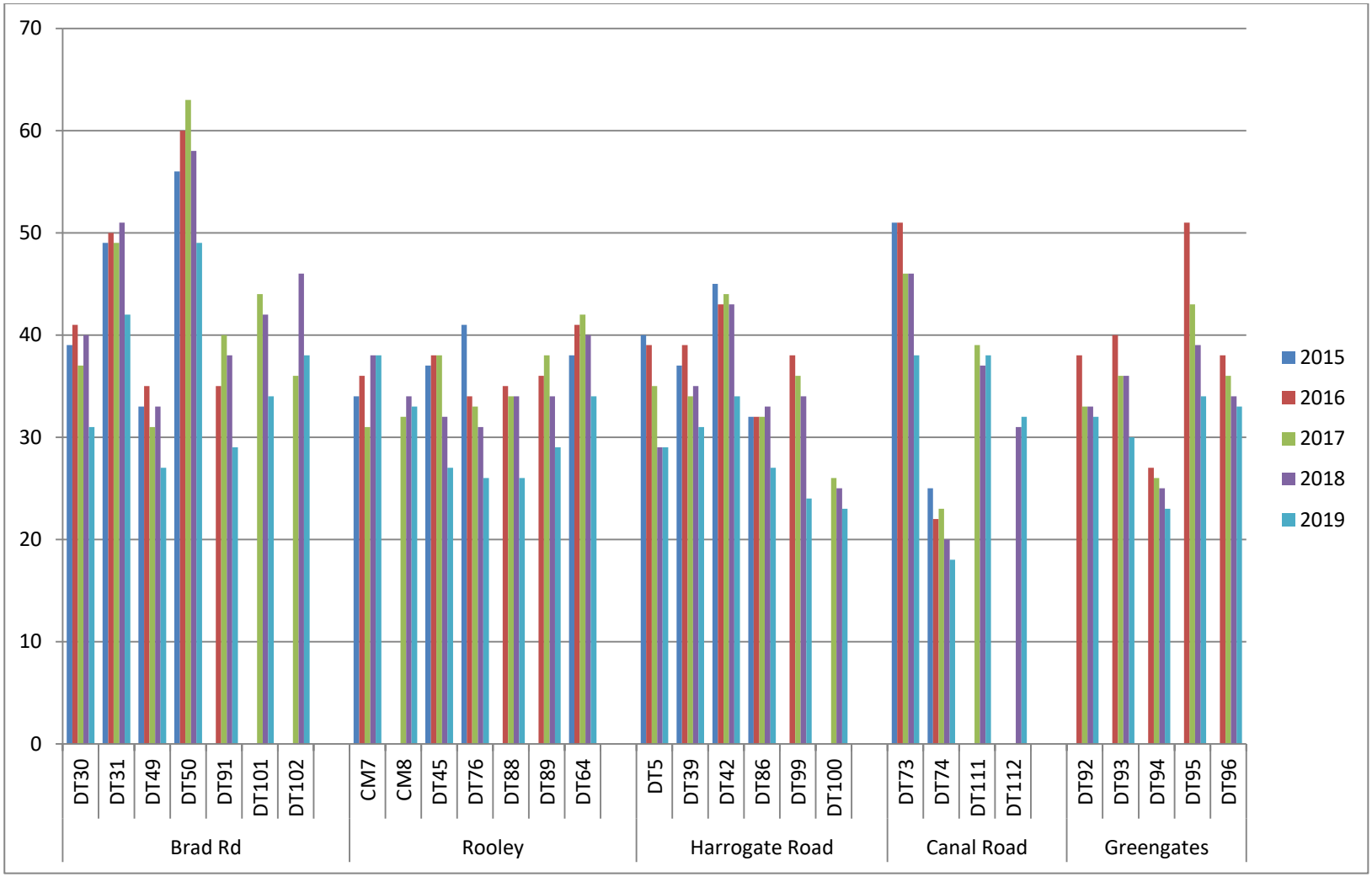
(4) Concentrations are those at the location of monitoring and not those following any fall-off with distance adjustment.

Figure A.2 – Trends in Annual Mean NO_2 Concentrations

A.1.1 Trend in annual mean NO_2 in AQMAs



A.1.2 Trend in annual mean NO_2 in areas with previously elevated concentrations



A.1.3 Trend in annual mean NO_2 in other monitored locations

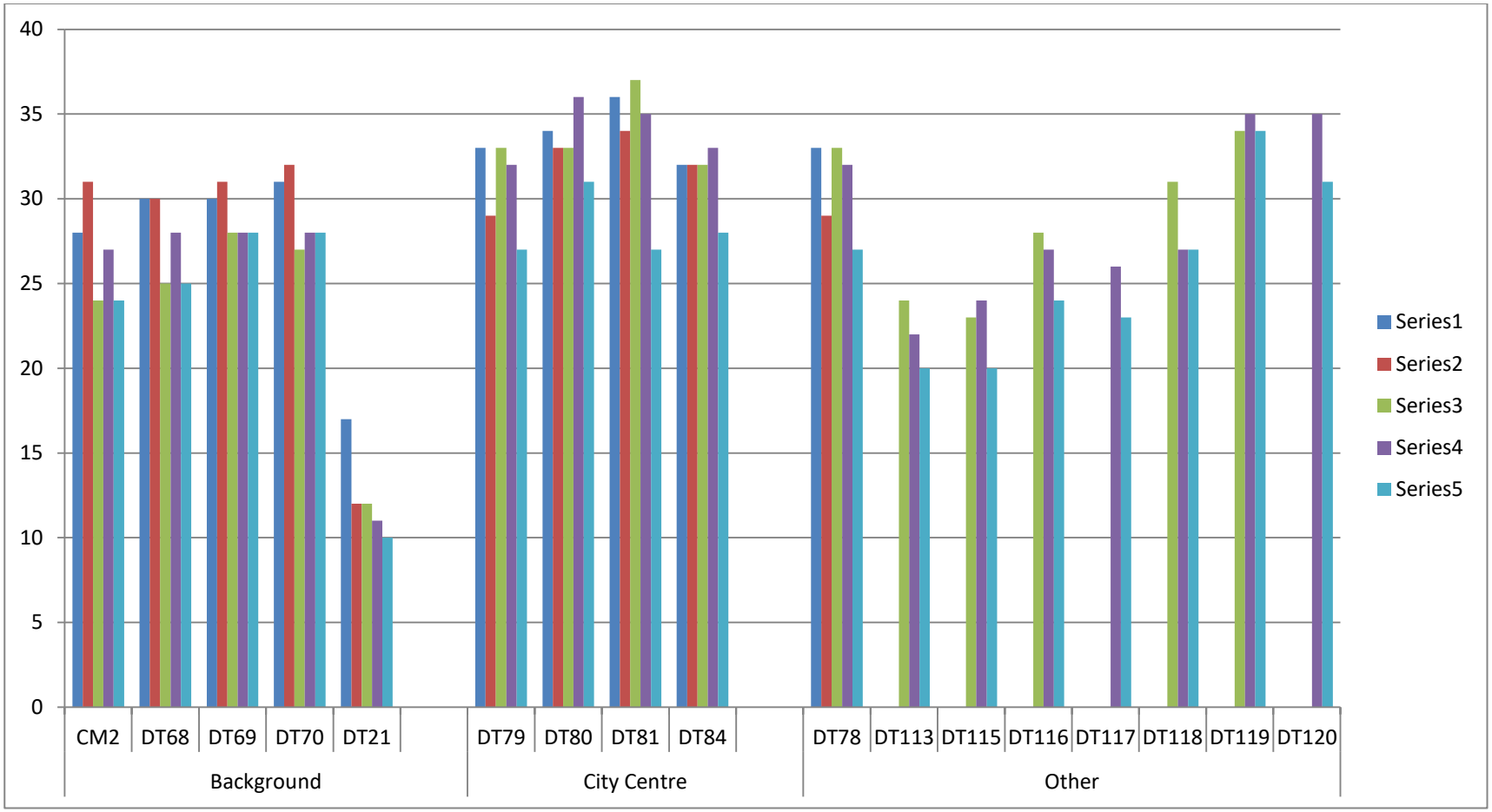


Table A.4 – 1-Hour Mean NO_2 Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
							2015	2016	2017	2018	2019
CM2	406058	441273	Urban Centre	Automatic	n/a	97.1	0	0	4	0	0
CM3	415582	434457	Roadside	Automatic	n/a	94.6	0	0 (114.3)	0 (100.0)	0 (133.9)	0
CM4	415933	430569	Roadside	Automatic	n/a	95.9	0	2	0	0	0
CM5	415887	433047	Roadside	Automatic	n/a	96.5	0	0	0	0	0
CM6	416974	433245	Roadside	Automatic	n/a	89.9	0	0	0 (138.0)	0	0
CM7	417860	430705	Roadside	Automatic	n/a	91.3	0	0	0	0	0
CM8	419188	430213	Roadside	Automatic	n/a	90.7	no data	no data	0	0	0

Notes:

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.**

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

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

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

Table A.5 – Annual Mean PM_{10} Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	PM_{10} Annual Mean Concentration (µg/m^3) (3)				
						2015	2016	2017	2018	2019
CM2	406058	441273	Urban Centre	n/a	79.6	14	15.5	14.2	16.5	16
CM6	416974	433245	Roadside	n/a	85.6	n/a	21.2	18.6	21.2	23
CM8	419188	430213	Roadside	n/a	89.0	n/a	n/a	16.3	15.6	17

☒ **Annualisation has been conducted where data capture is <75%**

Notes:

Exceedances of the PM_{10} annual mean objective of 40µg/m^3 are shown in **bold.**

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

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Figure A.3 – Trends in Annual Mean PM_{10} Concentrations

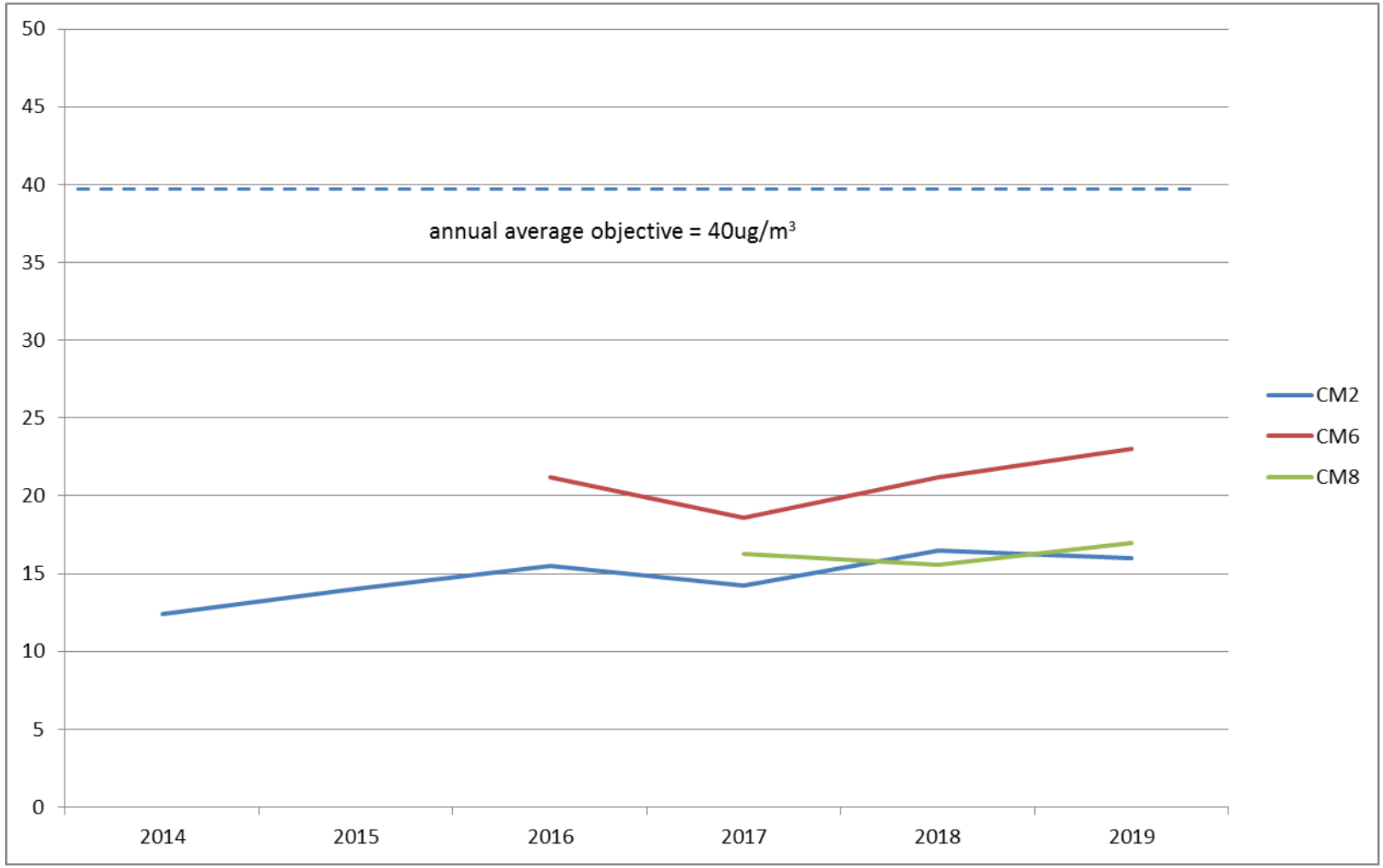


Table A.6 – 24-Hour Mean PM_{10} Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
						2015	2016	2017	2018	2019
CM2	406058	441273	Urban Centre	n/a	79.6	1	1	2	4	4
CM6	416974	433245	Roadside	n/a	85.6	2	8	5	4	12
CM8	419188	430213	Roadside	n/a	89.0	n/a	n/a	4	1	5

Notes:

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.**

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

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

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

Table A.7 – $PM_{2.5}$ Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	$PM_{2.5}$ Annual Mean Concentration ($\mu g/m^3$) (3)				
						2015	2016	2017	2018	2019
CM2	406058	441273	Urban Centre	n/a	79.1	9.5	9.3	8.9	10.6	10
CM6	416974	433245	Roadside	n/a	80.2	13.1	13	12.2	13.5	14
CM8	419188	430213	Roadside	n/a	87.5	n/a	n/a	10.4	10.2	12

☒ **Annualisation has been conducted where data capture is <75%**

Notes:

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

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Figure A.4 – Trends in Annual Mean $PM_{2.5}$ Concentrations

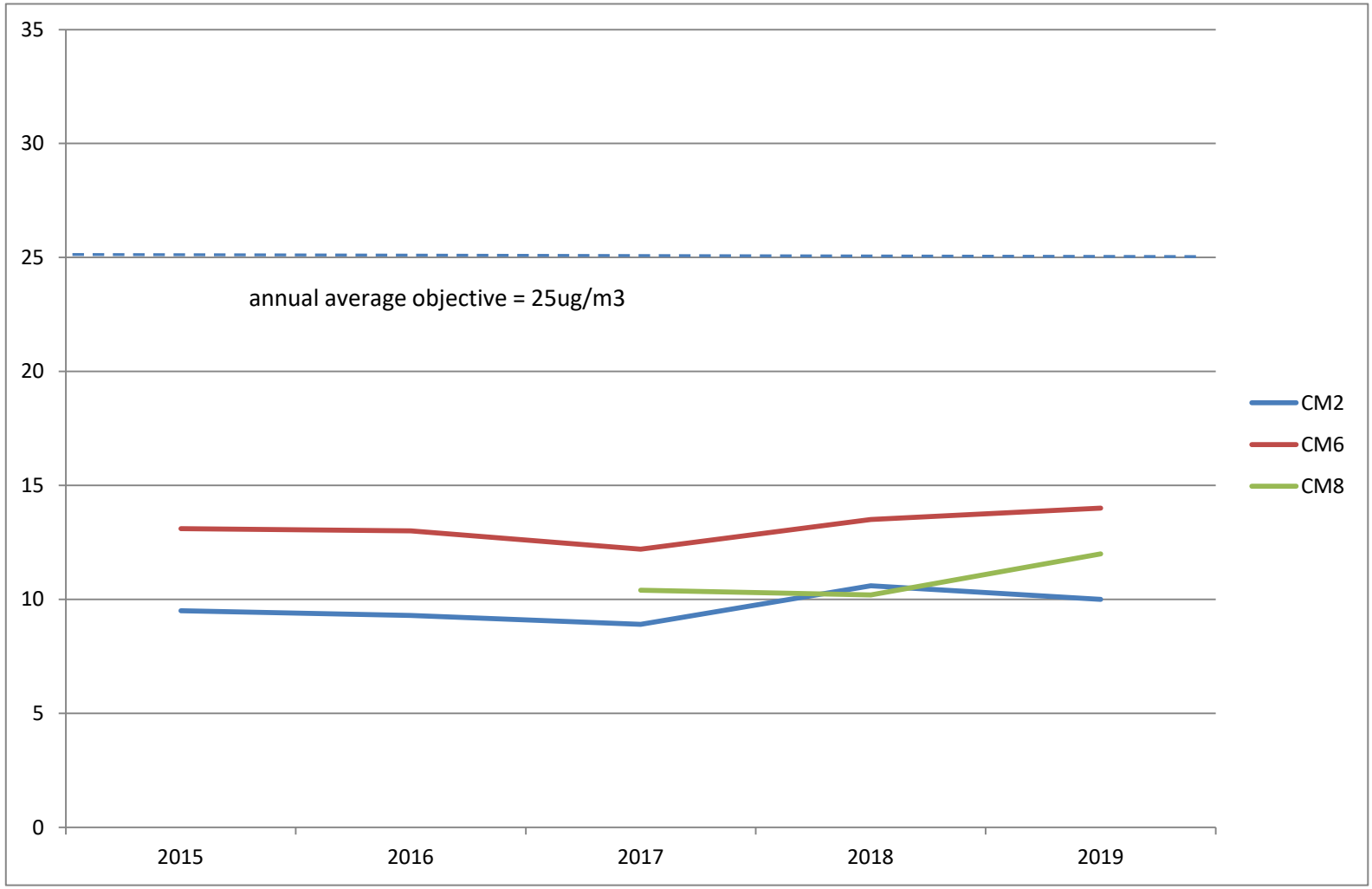


Table A.8 – SO_2 Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	Number of Exceedances 2019 (percentile in bracket) (3)		
						15-minute Objective (266 µg/m^3)	1-hour Objective (350 µg/m^3)	24-hour Objective (125 µg/m^3)
CM2	Urban Centre	406058	441273	n/a	95.1%	32	24	19

Notes:

Exceedances of the SO_2 objectives are shown in **bold** (15-min mean = 35 allowed a year, 1-hour mean = 24 allowed a year, 24-hour mean = 3 allowed a year)

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

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) If the period of valid data is less than 85%, the relevant percentiles are provided in brackets.

Appendix B: Full Monthly Diffusion Tube Results for 2019

Table B.1 - NO_2 Monthly Diffusion Tube Results – 2019 – still to do

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	NO_2 Mean Concentrations (µg/m^3)														
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
															Raw Data	Bias Adjusted (0.80) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
DT5	417982	434886	40	58	37	34	36	25	32	33	35	29	38	44	37	29.4	-
DT39	417927	434799	35	57	35	32	42	40	35	37	31	32	46	36	38	30.5	-
DT42	417902	434751	47	63	40	49	46	2	48	46	39	35	46	46	**42**	33.8	-
DT12	416967	433268	65	90	77	60	68	56	53	67	67	57	72	40	**64**	**51.5**	48.1
DT45	417877	430717	42	48	36	25		24	34		30	26	29	39	33	26.6	-
DT30	413861	437772	50	58	37	57	42	39	42	36	11	45	35	19	39	31.4	-
DT31	413527	437713	58	69	62	37	54		58	45		45	53	40	**52**	**41.7**	33.8
DT49	413604	437658	42	41	34	44	30	23	31	28	28	32	46	23	34	26.8	-
DT50	413510	437732	76	83	63	67	68	44	63	58	47	39	65	61	**61**	**48.9**	**42.3**
DT68	406060	441274	45		34	36	30	26	26	25	33	26	30	36	32	25.2	-
DT69	406060	441274	40	54	36	40	29	25	26	25	35		46	35	36	28.4	-
DT70	406060	441274	48	54	36	35	30	31	21	25	33	25	44	36	35	27.9	-
DT64	419379	430091	55	50	33	46	48	40	41	42	40	33	40	34	**42**	33.5	-
DT21	404719	440613	3	23	14	14	9	9	6	9	12	12	22	17	13	10	-
DT71	415585	434455	48	51	45	44	51	47	46	44	33	37	56	43	**45**	36.3	30.9

DT72	415573	434521	74	75	67	93	71	74		62		58	83	59	**72**	**57.3**	-
DT73	415448	435812	62	62	35		49		47	37	35	43	69	32	**47**	37.7	-
DT74	415549	435918	35	40	21	25	15	15	22	18	17	19	24	25	23	18.4	-
DT76	418268	430732	42	44	29	35	28	36	35	24	29	32	35	22	33	26.1	-
DT78	407380	441811	37	40	29	22	19	21	23	25	24	17	26	32	26	21.0	-
DT79	416282	432966	55	39	35		32	26	28	30	26	21	39	36	33	26.7	-
DT80	416388	432817	47	50	34	56	40	32	39	34	21	25	44	36	38	30.5	-
DT81	416413	432674	46	36	27	50	39	35		31	25	30	32	24	34	27.3	-
DT84	416054	432675	41				39	35	30	32	31	24	41	38	35	27.6	-
DT86	417894	434753	40	42	30	45	34	29	34	25	33	30	35	32	34	27.3	-
DT88	418829	430399	32	5	35	45	40	33	21	33	40	29	43	28	32	25.6	-
DT89	419188	430213	11	51	41	35	38	36	40	41	44	31	28	33	36	28.6	-
DT91	413697	437723	54				40	34	38	33	27	27	38	37	36	29.2	-
DT92	419006	437217	52	48	40	36	40	37	42	38	32	39	45	25	**40**	31.6	-
DT93	419003	437308	44	54	39	4	42	46	38	35	42	33	54	22	38	30.2	-
DT94	419103	437337	38	48	18	27	25	23	22	27	29	29		27	28	22.8	-
DT95	419111	437322	54	59	26	40	42	27	47	46		32	51	42	**42**	33.9	-
DT96	419152	437209	48	53	43	38	43	36	40	43	42	28	30	53	**41**	33.1	-
DT99	418033	434970	41	43	30	23	26	26	25	27	28	22	37	30	30	23.9	-
DT100	417949	434693	45	41	31	24	25	21	27	23	22	22	33	28	29	22.8	-
DT101	413418	437725	59	57	48	44	41	35	39	33		29	49	34	**43**	34.0	-
DT102	413338	437720	75	64	60	52	43	48	37	40	27	33	55	39	**48**	38.2	29.7
DT103	415925	430572	40	47	40	53	50	38	40	49	50	36	41	34	**43**	34.5	-
DT104	415961	430558	50	59	51	46	58	35	44	55	37	43	53	33	**47**	37.6	33.4
DT105	415780	430504	50	64	22	77	51	50	29	54	50	39	47	26	**47**	37.3	-
DT106	415702	430702	37	33	31	49	29	27	30	32	36	28	49	35	35	27.7	-

DT107	415833	430837	30	37	22	39	27	28	23	24	28	25	35	24	29	22.8	-
DT108	415858	433061	43	54	36	47	39	37	36	34	30	29	53	45	**40**	32.2	-
DT109	415891	433045	43	56	31	49	41	31	36	33	28	30	50	39	39	31.1	-
DT110	415806	433061	48	50	36	29	33	29	32	33	28	22	34	28	34	26.8	-
DT111	416015	435028	49	58	45		47	27	33	25	26		57	14	38	30.5	-
DT112	415024	436743	54	55	37	52	30	31	36	39	25	36	52	34	**40**	32.1	-
DT113	414014	433357	34	38	25	29	22	17	21	22	20	16	36	22	25	20.1	-
DT115	418421	432214	39	40	20	26	21	11	20	20		21	31	20	24	19.6	-
DT116	418564	432218	41	51	29	24	28	25	27	25	22		31	26	30	23.9	-
DT117	418192	432208	46	40	34	25	26	24	28	24	17	27	30	23	29	22.9	-
DT118	418666	432470	55	45	37	34	33	25	37	29	23	30	34	29	34	27.4	-
DT119	418626	432945	56	56	42	34	36	33							**43**	33.9	-
DT120	417991	432926	57	45	46	19	38	30		36	23	39	40	46	38	30.5	-
DT128	415331	435796	22	27	16	24	15	18	13	13	11	14	34	16	19	14.9	-

x National bias adjustment factor used (bias correction 0.8 from April 2020 spreadsheet

X Annualisation has been conducted where data capture is <75%

X Where applicable, data has been distance corrected for relevant exposure in the final column

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.**

(1) See Appendix C for details on bias adjustment and annualisation.

(2) Distance corrected to nearest relevant public exposure.

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

C 1.0 Diffusion tube preparation

All diffusion tubes used in conjunction with this report were prepared by West Yorkshire Analytical services using 50% TEA in acetone.

WYAS participate in the Inter-laboratory comparison scheme AIR PT. This is an independent analytical proficiency-testing (PT) scheme, operated by LGC Standards and supported by the Health and Safety Laboratory (HSL). AIR PT is a new scheme, started in April 2014, which combines two long running PT schemes: LGC Standards STACKS PT scheme and HSL WASP PT scheme. AIR PT offers a number of test samples designed to test the proficiency of laboratories undertaking analysis of chemical pollutants in ambient indoor, stack and workplace air. One such sample is the AIR NO_2 test sample type that is distributed to participants in a quarterly basis. The results of this scheme are published annually.

The AIR PT NO_2 diffusion tube results for WYAS for the period covered by this progress report are shown in Table C.1

Table C.1 AIR PT NO2 diffusion tube results for WYAS (2019)

AIR round	Result for WYAS
January – February 2019	100%
April – May 2019	100%
July – August 2019	100%
September– October 2019	50%

The average WASP result for the 2019 period was 87.5%.

C 2.0 Nitrogen Dioxide Bias Factors

Local NO_2 diffusion tube bias factors are not available from the Bradford district monitoring network. The NO_2 tube results reported within this report have been corrected for bias using the April 2020 factors provided on the LAQM support website

(DEFRA spreadsheet version 04/20). These factors are derived from co-location studies in other areas using WYAS tubes.

The bias factor used in this report was **0.80**

C 3.0 PM Monitoring Adjustment

The PM_{10} and $PM_{2.5}$ data within this report was collected using PM_{10}/ $PM_{2.5}$ FDMS measurement systems. It has been subject to ratification and verification checks, but has not been corrected for volatility as this is not necessary for FDMS measurements.

C 4.0 QA/QC of Automatic Monitoring

The City of Bradford Metropolitan District Council's air quality analysers are type approved as recommended in LAQM.TG1 (00) *Review and Assessment: Monitoring air quality* and LAQM.TG4 (00) *Review and assessment: Pollutant specific guidance.*

The Council's own automatic network is operated by council officers trained by the instrument supplier. Signal Group provide routine maintenance and emergency repair services. All the real time data provided in this report is from council operated analysers with the exception of the Mayo Avenue site (CM4) which is affiliated to the AURN network and operated by DEFRA.

Bradford MDC air quality staff provide local site operator duties at the Mayo Avenue monitoring station on behalf of DEFRA. Annual auditing of this site and data management is managed by DEFRA using their own contractors.

Data ratification of all the other Bradford sites for 2019 was provided under contract by Air Quality Data Management http://aqdm.co.uk/Geoff%20Broughton.html

The City of Bradford MDC monitoring sites have a programme of routine operational checks and programmed fortnightly site visits which include:

- Daily checks on data transfer, telephone lines and analyser operation
- Carrying out of repairs under a service agreement with the equipment supplier (Signal Group).
- Fortnightly manual calibration checks, site inspections of equipment status, site safety and security (by Bradford MDC staff).

- Programmed six-monthly servicing and calibration by equipment suppliers under service agreement (Signal Group)

Maintenance systems

The Council's monitoring network of automatic continuous monitors is maintained in accordance with a schedule which is essentially similar to that employed for the AURN and affiliated sites. All analysers are maintained and serviced according to manufacturer's specifications and have a six-monthly service and recalibration by Signal Ambitech, the suppliers of the equipment. The servicing, calibration, and repair documentation is kept in a central record. Routine maintenance is carried out at the two-weekly calibration site visit, and any faults are recorded with the calibration log for the visit. These records are kept on site and centrally at the Environmental Health Services Scientific and Technical Services Team office.

Calibration Routines

A zero and span calibration check is performed during the site inspection visit. The methodology used is essentially that found in the AURN Local Site Operators Manual issued by NETCEN, and the manufacturer's instruction manual.

The basic steps are:

- Pre-calibration check of the general site condition and status of the analyser, before the zero and span checks are performed.
- Zero check to verify the performance of the analyser in the absence of the gas being monitored.
- Span check to verify the response of the analyser to gas of a known concentration.
- Post calibration check of the general site condition and status of the analyser on completion of all calibration routines.

A record of each analyser zero and span check is fully documented and a record kept on site and also centrally.

Calibration Gas Standards

The gases used for onsite span calibration checks at the Bradford owned air pollution stations are supplied by Air Liquide Ltd. Calibration gases for the Mayo Avenue site

operated by DEFRA are supplied by BOC Ltd. Calibration gases are traceable via European Accreditation DIN EN 45001 and DIN EN ISO 900. The tolerance of the nitrogen dioxide and nitric oxide in air mixes is typically ±5%, and for a sulphur dioxide in air mix, it is typically ±5%. Zero air is generated internally in the Ambirak, and the scrubbers are changed when necessary in accordance with manufacturer's recommendations and the NETCEN LSO Site Manual for the Ambirak.

Data scaling, validation and ratification

Unscaled data is gathered every hour by an Ambidesk system located in the Scientific and Technical Services Team office. Scaling factors are applied automatically by the Ambidesk software using factors derived during the fortnightly calibration check and the daily automatic internal calibration checks at the Ambirak.

A daily report is generated to enable unusual readings to be identified. Monthly reports are produced for further checks on data capture rates, and any other unusual variations in measured scaled data. The original raw unscaled data is retained on disk at the Ambirak in the event of anomalous scaled data events.

All scaled hourly results for 2018 downloaded from the Ambirak system have been independently ratified by Air Quality Data Management prior to use in this report. http://aqdm.co.uk/Geoff%20Broughton.html

Short-term to Long-term Data Adjustment

No short to long term data adjustment was required for the real time NO_2 data for the purpose of this report.

No short to long term data adjustment was required for the PM_{10} or $PM_{2.5}$ data used in this report.

Distance correction calculations

Distance correction has been carried out in line with paragraphs 7.77 – 7.79 of LAQM.TG (16). Local annual mean background NO_2 concentrations for individual sites have been taken from DEFRA background maps and used in the fall-off with distance calculator.

https://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html

Table C.2 below shows the information used to undertake distance correction at all sites which were above the air quality objective at the monitoring location (or within 10% of the objective level) and where a relevant location is present.

Distance correction has not been undertaken where:

- concentration at the measured location was less than 10% of the objective level
- monitoring point is located at a relevant receptor point
- there is no relevant receptor point

All locations shown in table C.2 are already contained within Air Quality Management Area boundaries (with the exception of tube D50 which is not located at a relevant location for the purposes of LAQM).

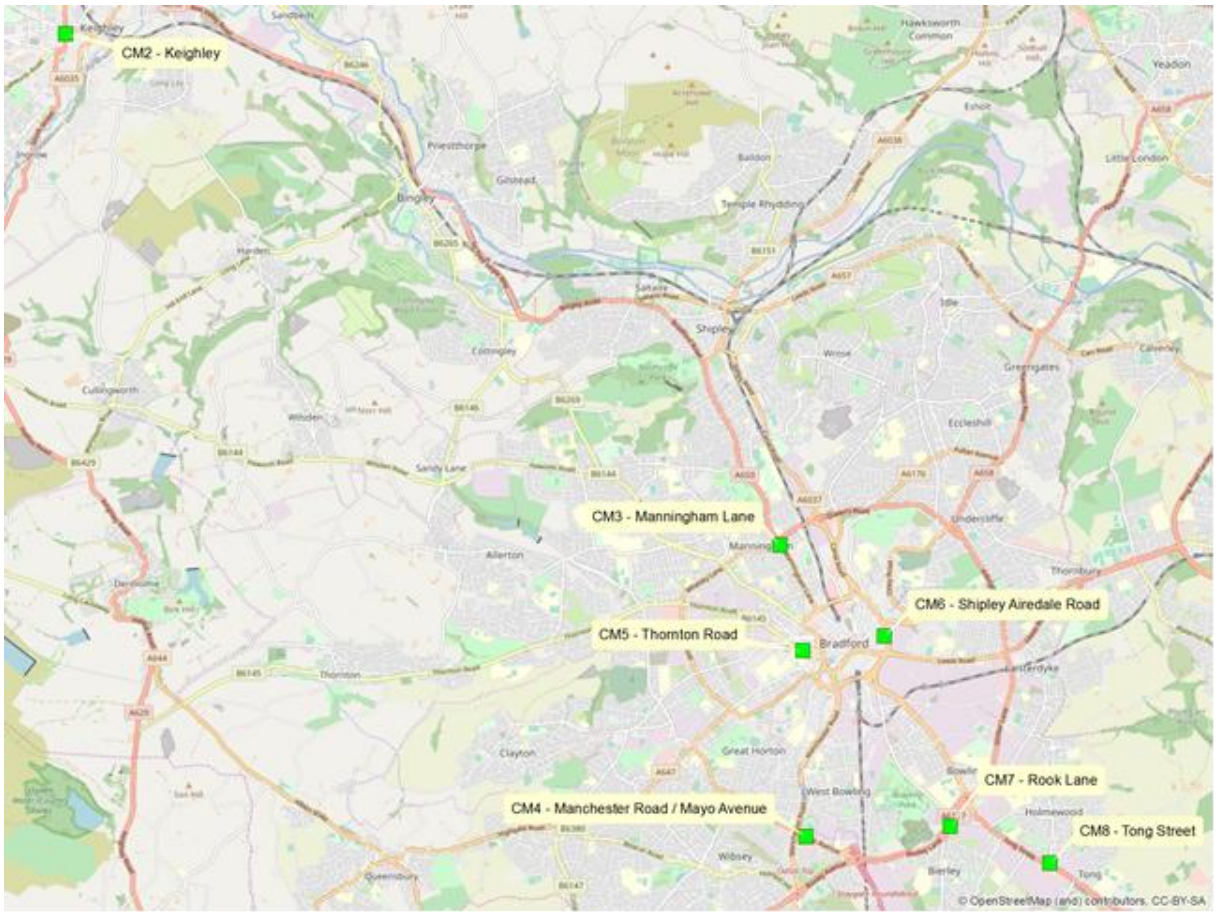
Table C.2 – Diffusion tube distance corrections

Site Name / ID	Distance (m)		NO_2 Annual Mean Concentration ($\mu g/m^3$)			Comment
	Monitoring Site to Kerb	Receptor to Kerb	Background	Monitored at Site	Predicted at Receptor	
CM3	1.5	5.5	17.26995	43	35.7	
CM6	2	4	21.41209	46	**42**	Predicted concentration at receptor above AQS objective
CM4	2	4	18.08745	41.2	37.4	Predicted concentration at receptor within 10% the AQS objective

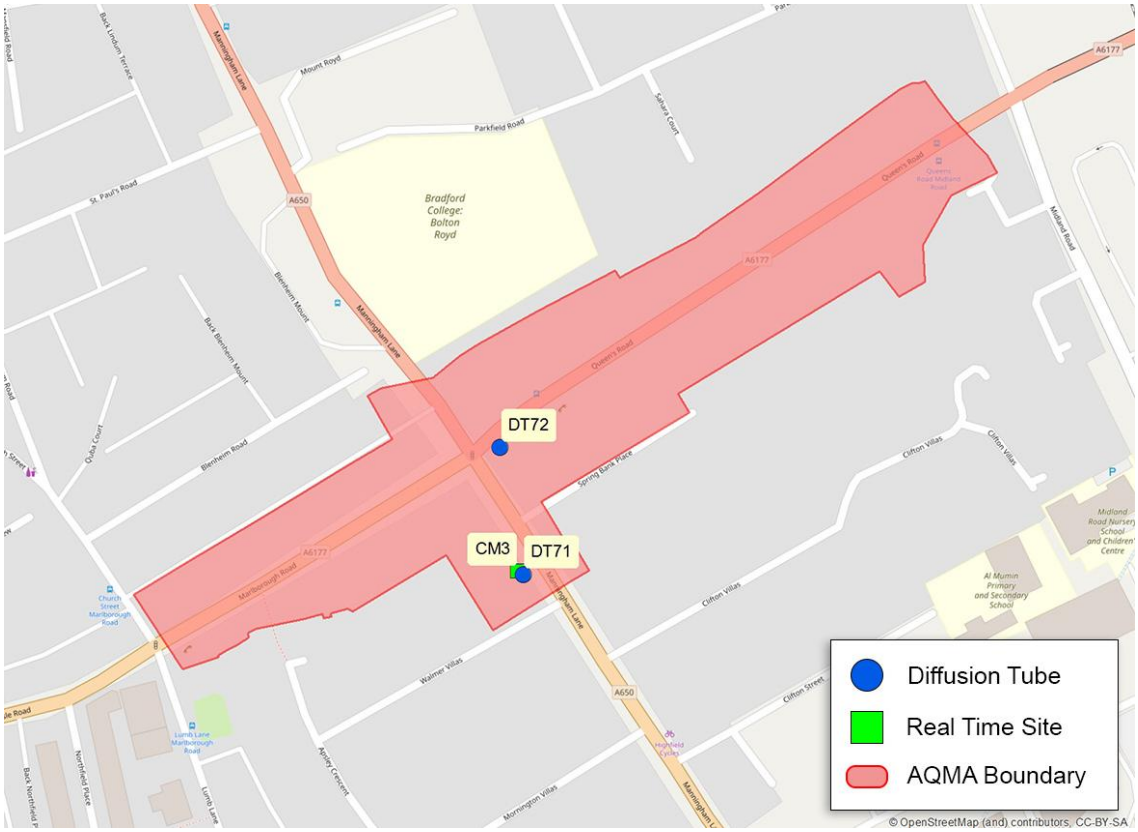
CM7	1.5	2.5	18.67533	38	35.8	
DT12	1.5	2.5		64	**51.5**	Predicted concentration at Receptor above AQS objective
DT31	1.5	5.5	14.10249	41.7	33.8	
DT50	2.0	4.5	14.10249	48.9	42.3	Nearest relevant receptors at first floor above shops. Distance correction doesn't allow for height.
DT71	1.5	5.5	17.26995	36.3	30.9	
DT102	2.4	10.1	14.10249	38.2	29.7	
DT104	4.4	9.3	18.08745	37.6	33.4	

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

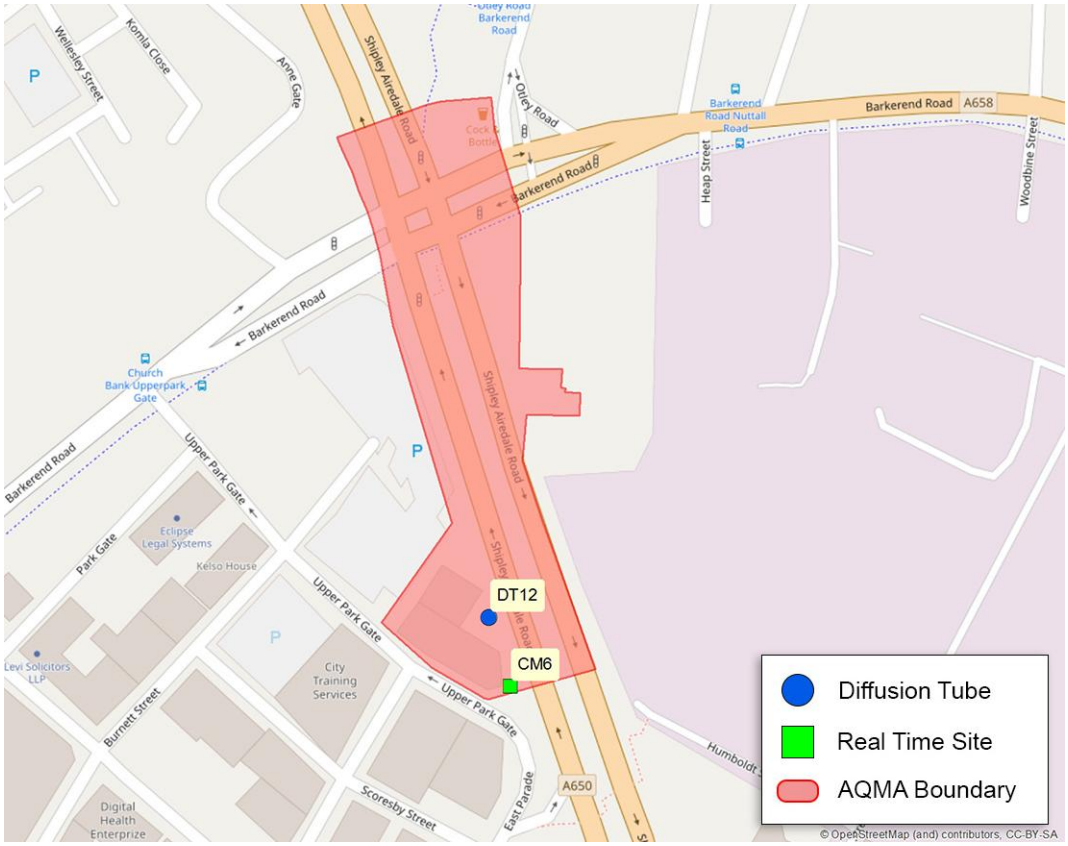
Map 1: Real time monitoring sites in Bradford



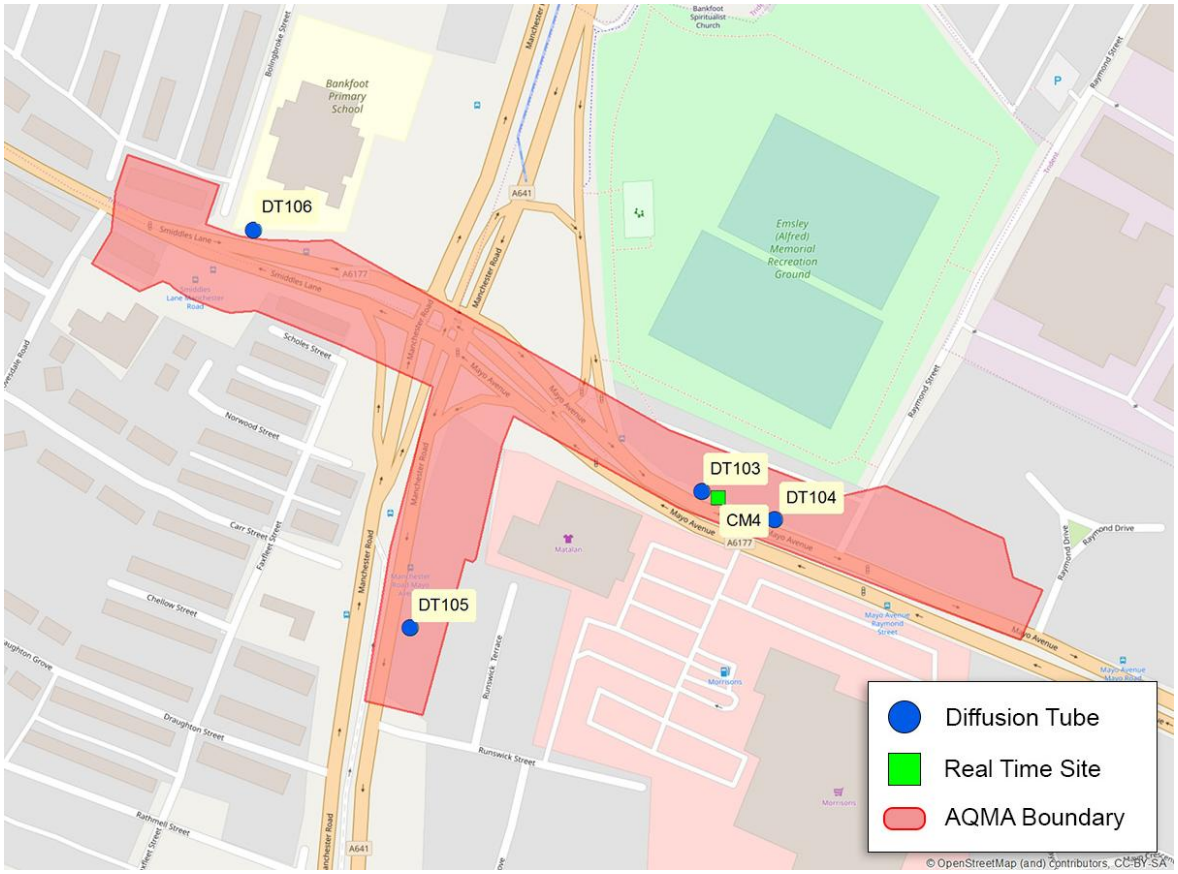
Map 2: Manningham Lane AQMA monitoring sites



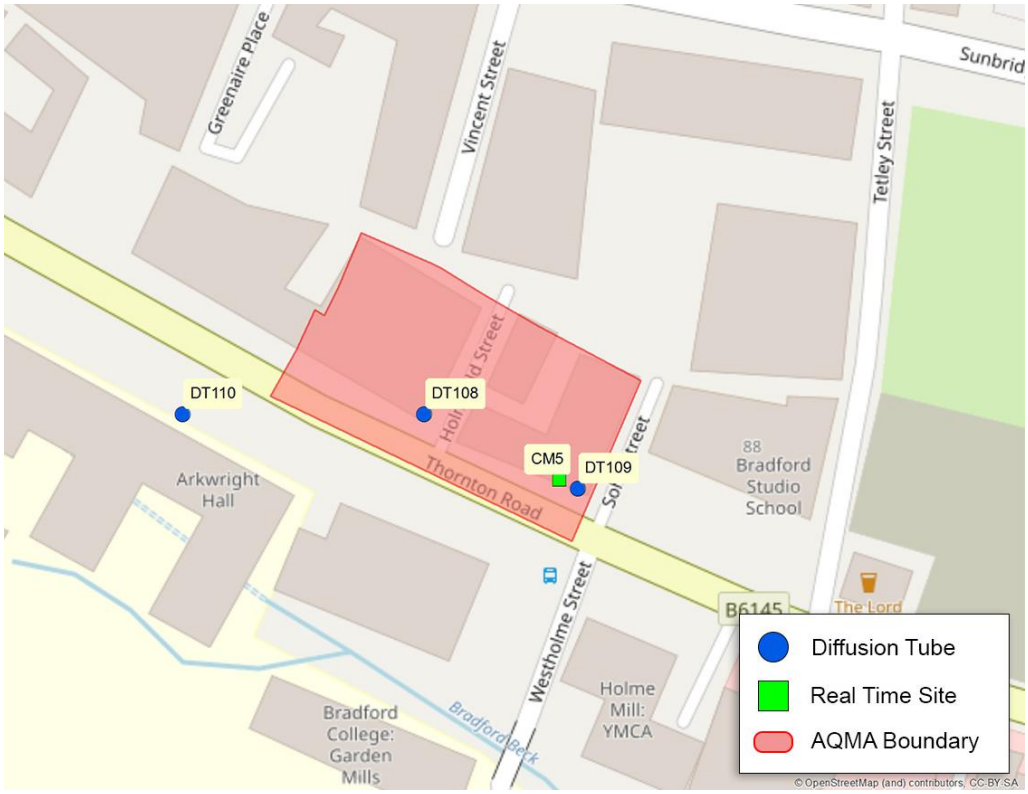
Map 3: Shipley Airedale Road AQMA monitoring sites



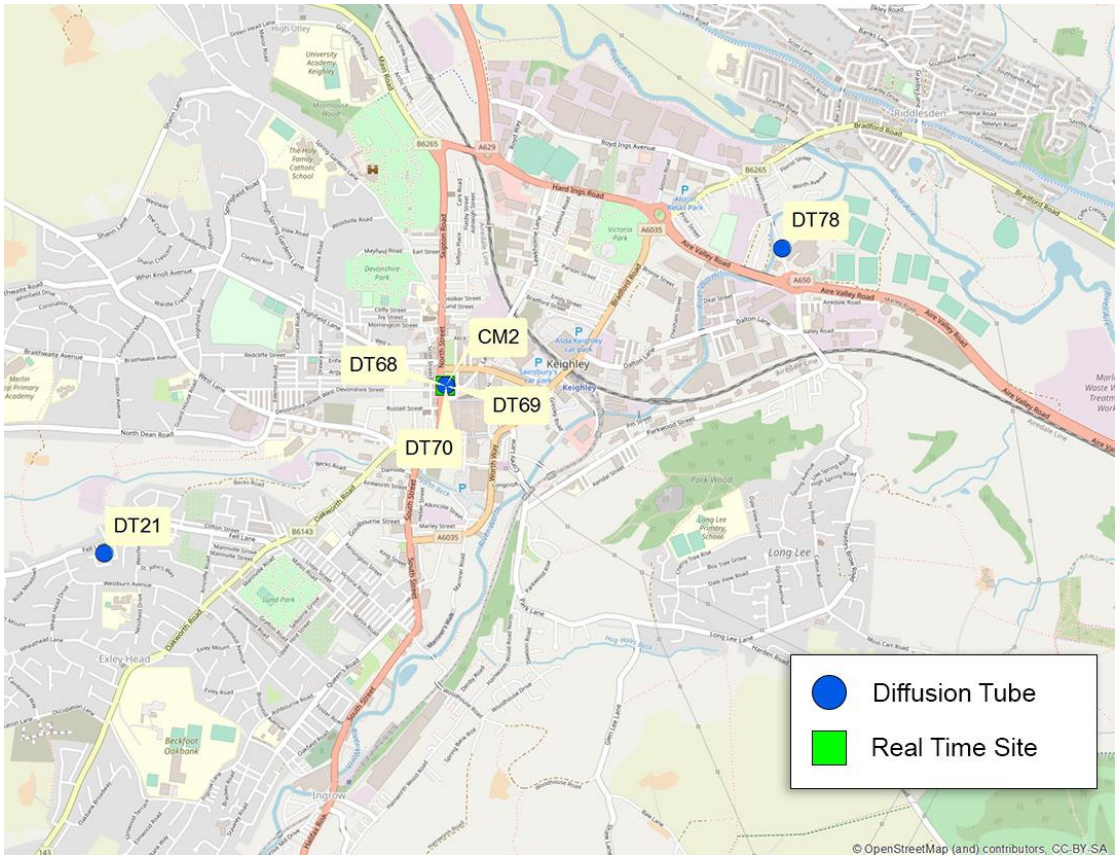
Map 4: Mayo Avenue AQMA monitoring sites



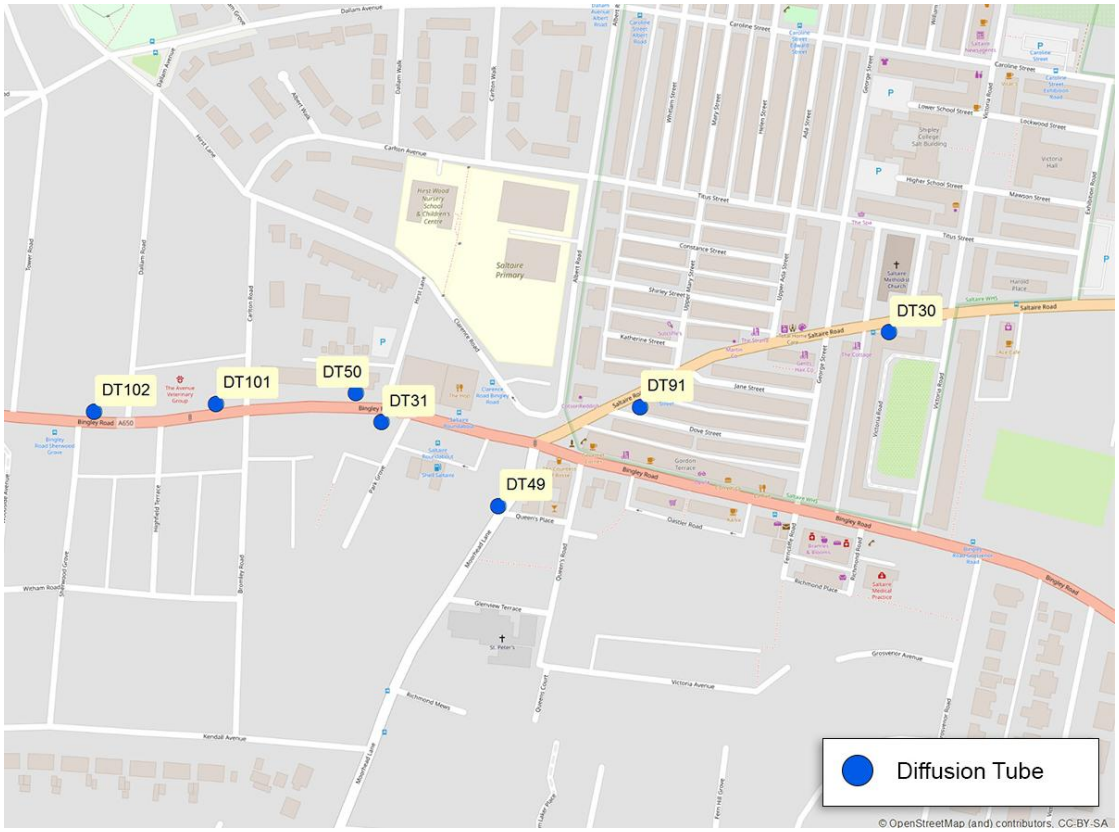
Map 5: Thornton Road AQMA monitoring sites



Map 6: Keighley monitoring sites

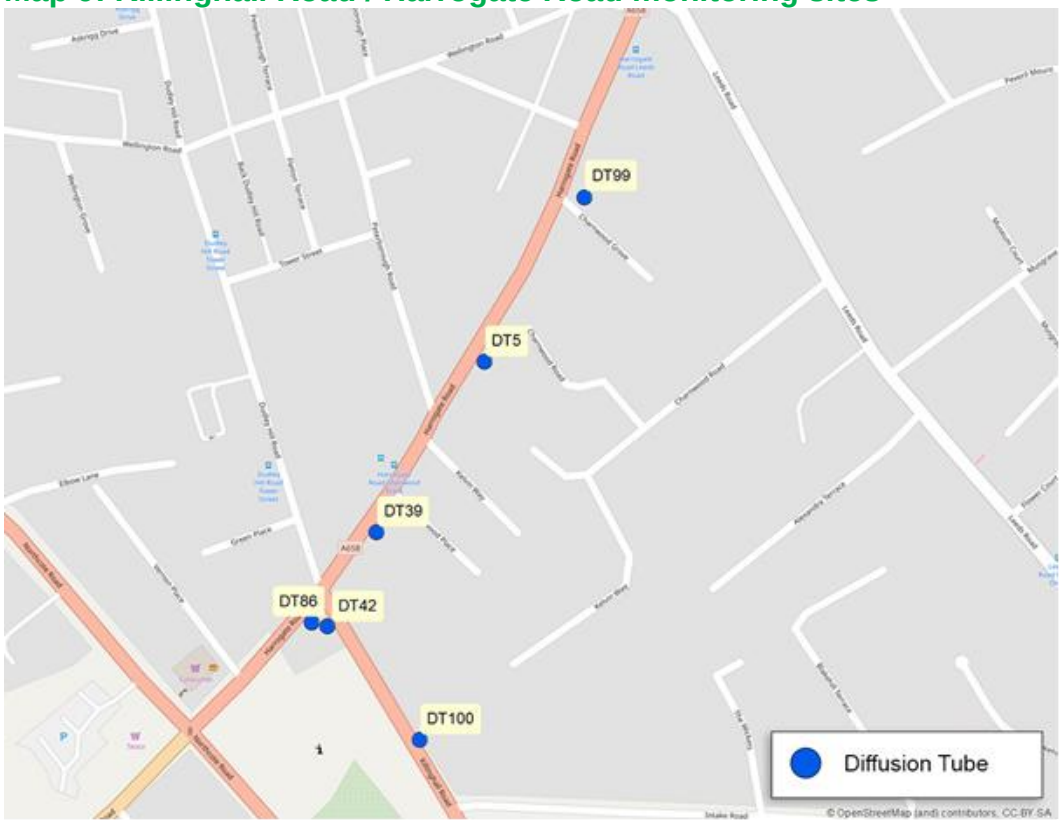


Map 7: Saltaire Road / Bingley Road monitoring sites

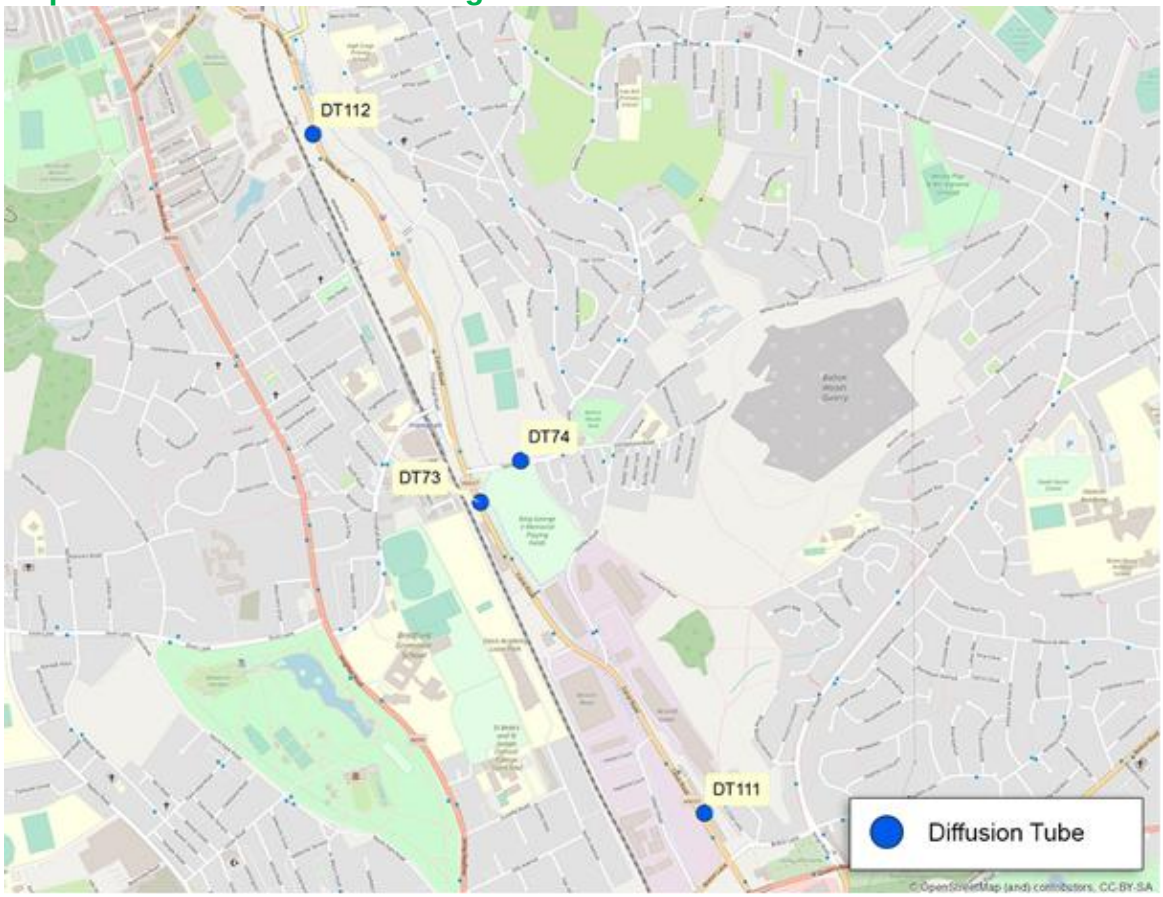


Map 8: Rook Lane / Rooley Lane monitoring sites

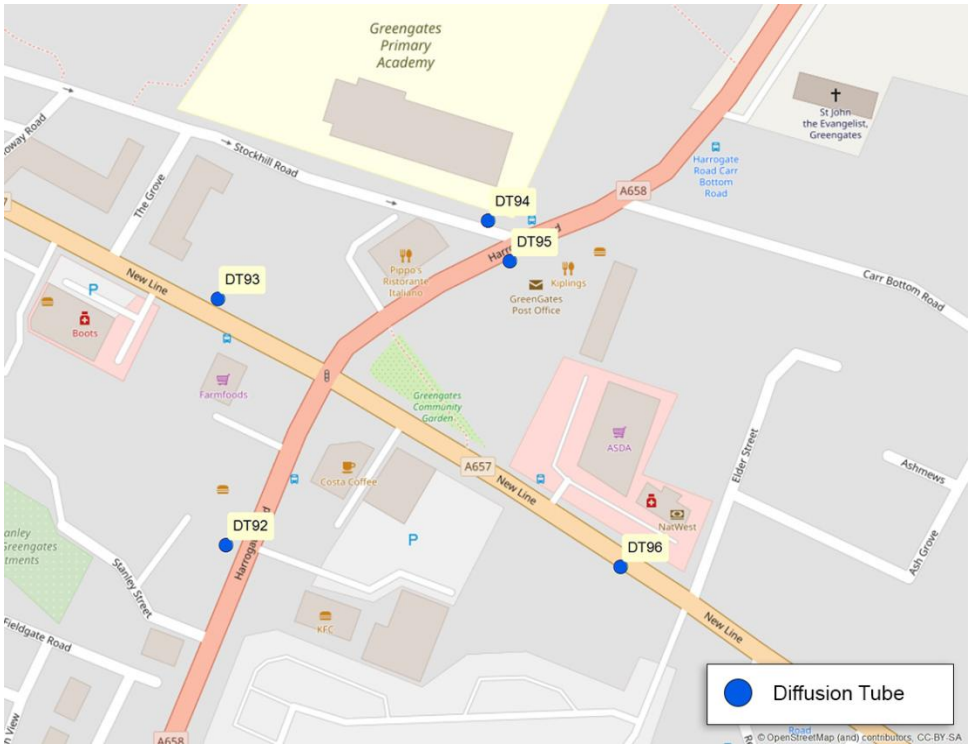
Map 9: Killinghall Road / Harrogate Road monitoring sites



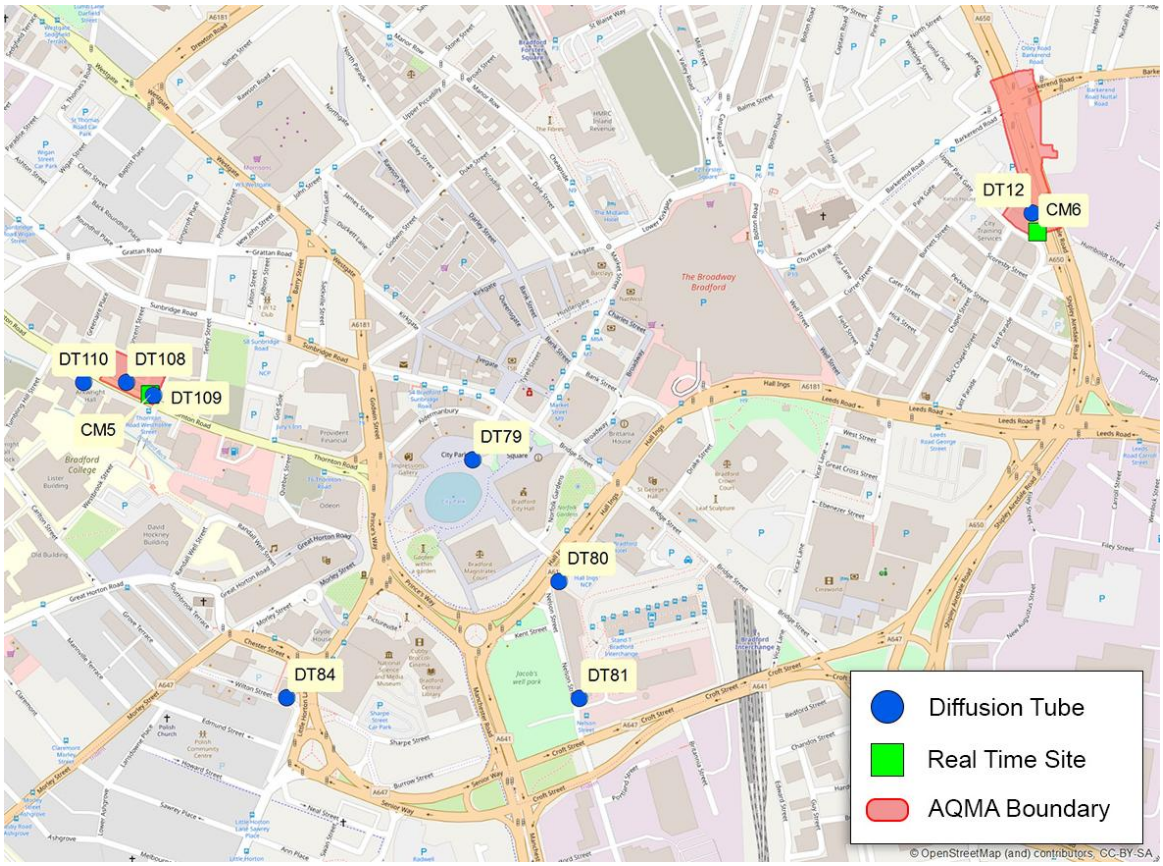
Map 10: Canal Road monitoring sites



Map 11: Greengates crossroads monitoring sites

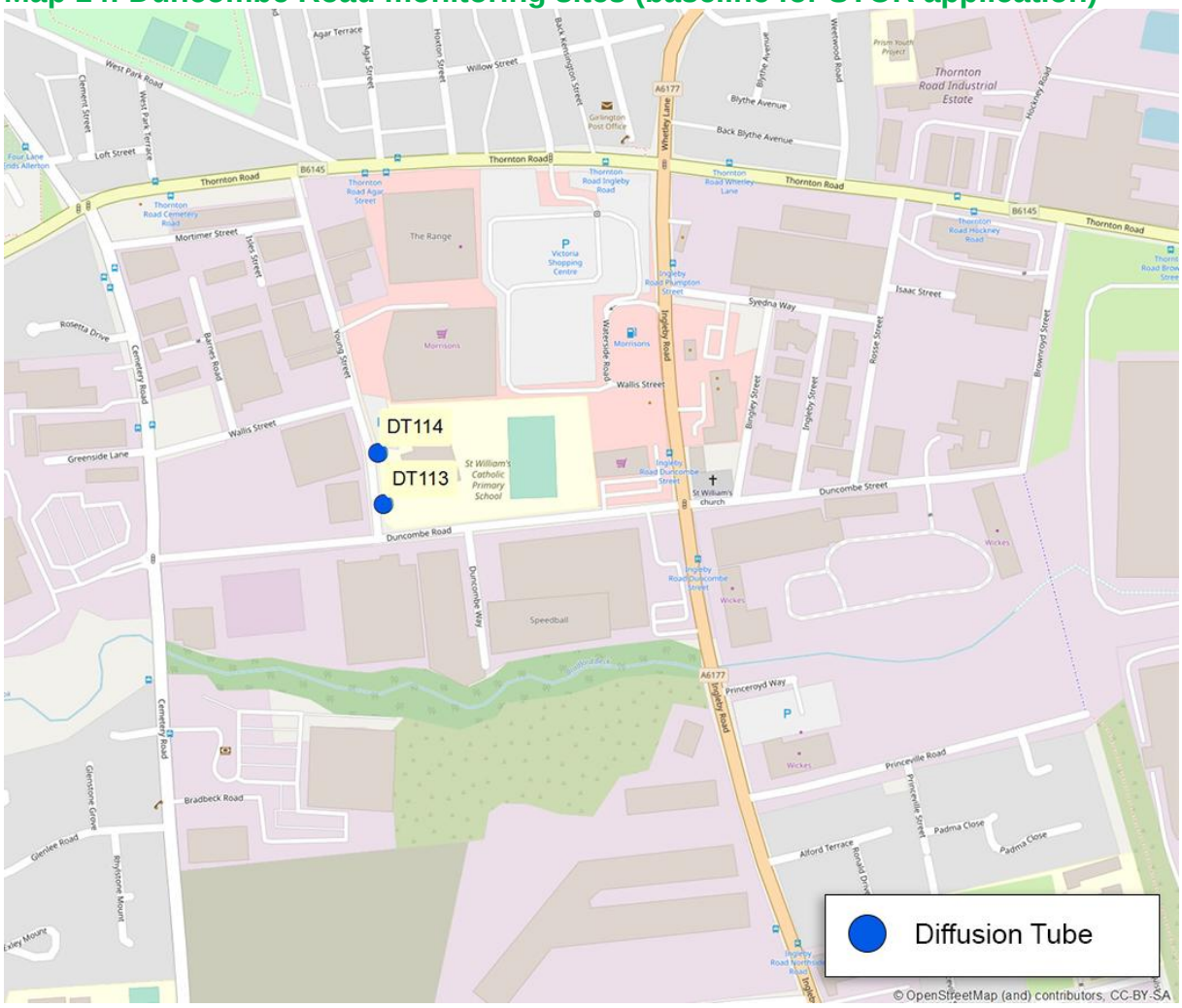


Map 12: City centre monitoring sites

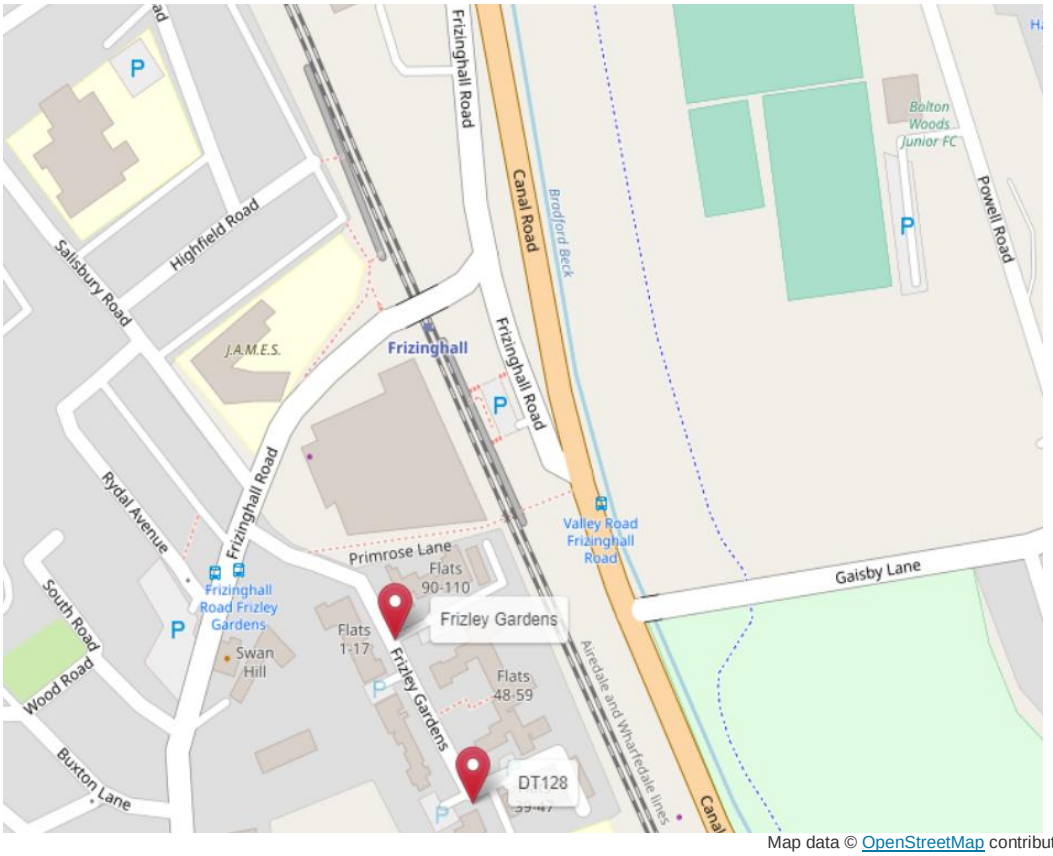


Map 13: Additional monitoring sites to South East of city centre

Map 14: Duncombe Road monitoring sites (baseline for STOR application)



Map 15: Additional background site at Frizley Gardens



Map data © OpenStreetMap contributors

Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[8]	
	Concentration	Measured as
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m^3	Annual mean
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

[8] The units are in microgrammes of pollutant per cubic metre of air (µg/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	Air quality Annual Status Report
B-CAP	Bradford Clean Air Plan
BiB	Born in Bradford (health research programme)
CAZ	Clean Air Zone
CHP	Combined Heat and Power
CVTF	Cleaner Vehicle Technology Fund
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
LES	Low Emission Strategy
NIHR	National Institute for Health Research (NIHR)
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less

$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SCA	Smoke Control Area
SCRT	Selective Catalytic Reduction Technology
SO_2	Sulphur Dioxide
STOR	Short Term Operating Reserve
WHO	World Health Organisation
WYCA	West Yorkshire Combined Authority
WYLES	West Yorkshire Low Emission Strategy

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West Yorkshire Low Emission Strategy

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West Yorkshire Low Emission Planning Guidance

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City of Bradford MDC - Third Wave targeted feasibility study to deliver nitrogen dioxide concentration compliance in the shortest possible time.

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