



# NORWICH City Council

## 2025 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995  
Local Air Quality Management, as amended by the  
Environment Act 2021

This ASR is reporting on figures from the 2024  
Calendar Year

Date: 16<sup>th</sup> June 2025

| Information             | Norwich City Council Details                     |
|-------------------------|--------------------------------------------------|
| Local Authority Officer | Sally Nicholson                                  |
| Department              | Planning & Regulatory Services                   |
| Address                 | City Hall. St Peters Street, Norwich,<br>NR2 1NH |
| Telephone               | 01603 989669                                     |
| E-mail                  | environmentalprotection@norwich.gov.uk           |
| Report Reference Number | Norwich_2025_ASR                                 |
| Date                    | 16 <sup>th</sup> June 2025                       |

## Local Responsibilities and Commitment

This ASR was prepared by the Environmental Protection Team of Norwich City Council with the support and agreement of the following officers and departments:

- Environmental Strategy
- Victoria Berryman RN - Advanced Public Health Officer (Environment) – Norfolk County Council

This ASR has been approved by:

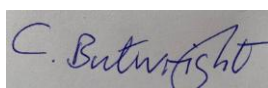
**Cllr Emma Hampton** – Norwich City Council

**Emily Yule** - Executive Director of Resources – Norwich City Council

**Jeremy Wiggin BSc (Hons) MSc MCIHT**, Head of Sustainable Transport – Norfolk County Council

**This ASR has been signed off by Christopher Butwright, Assistant Director of Public Health – Prevention and Policy, Norfolk County Council (in the absence of a current Director of Public Health).**

Signed:



If you have any comments on this ASR please send them to Sally Nicholson at:  
Environmental Protection Team Leader, Norwich City Council, City Hall, Norwich, NR2 1NH 01603 989669 [SallyNicholson@norwich.gov.uk](mailto:SallyNicholson@norwich.gov.uk) or  
[EnvironmentalProtection@norwich.gov.uk](mailto:EnvironmentalProtection@norwich.gov.uk)

## Executive Summary: Air Quality in Our Area

### Air Quality in Norwich City Council

Breathing in polluted air affects our health and costs the NHS and our society billions of pounds each year. Air pollution is recognised as a contributing factor in the onset of heart disease and cancer and can cause a range of health impacts, including effects on lung function, exacerbation of asthma, increases in hospital admissions and mortality.

Air pollution particularly affects the most vulnerable in society, children, the elderly, and those with existing heart and lung conditions. Low-income communities are also disproportionately impacted by poor air quality, exacerbating health and social inequalities.

Table ES 1 provides a brief explanation of the key pollutants relevant to Local Air Quality Management and the kind of activities they might arise from.

**Table ES 1 - Description of Key Pollutants**

| Pollutant                                                    | Description                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nitrogen Dioxide (NO <sub>2</sub> )                          | Nitrogen dioxide is a gas which is generally emitted from high-temperature combustion processes such as road transport or energy generation.                                                                                                                                                                                                                                                           |
| Particulate Matter (PM <sub>10</sub> and PM <sub>2.5</sub> ) | <p>Particulate matter is everything in the air that is not a gas.</p> <p>Particles can come from natural sources such as pollen, as well as human made sources such as smoke from fires, emissions from industry and dust from tyres and brakes.</p> <p>PM<sub>10</sub> refers to particles under 10 micrometres. Fine particulate matter or PM<sub>2.5</sub> are particles under 2.5 micrometres.</p> |

Norwich covers 39 km<sup>2</sup> and has a population of around 143,900 people (Census 2021). The population of the local plan defined Norwich Urban Area which includes parishes close to the city have a strong relationship with Norwich, is around 235,000 (Census 2021) and that of Greater Norwich (Broadland, Norwich and South Norfolk) is approximately 418,000 (Census 2021). Norwich is the fourth most densely populated local authority district in the eastern region with 3,690 people per km<sup>2</sup>.

Norwich City Council permits 29 'Part B' processes, which include a road stone coating plant, a sawmill and timber treatment facility, a cement batching installation, aircraft and vehicle respray operations, and a crematorium.

The Environment Agency regulates larger 'Part A' processes, of which Briar Chemicals—an agrochemical company—is the only one operating within the city.

However, neither Part A nor Part B processes are considered to contribute significantly to air pollution levels in Norwich.

The University of East Anglia (UEA) operates a 20 MW natural gas boiler and three natural gas combined heat and power (CHP) heat engines, which together produce 5.7 MW of electricity and 6 MW of heat. This energy is used on campus and within the neighbouring Eaton School. The CHP stack height has been designed to ensure effective dispersion of emissions; therefore, this source of NO<sub>2</sub> is not considered to significantly impact pollution levels in the city.

Road traffic is a major source of air pollution in Norwich. Completed source apportionment exercises have identified road traffic emissions to be the most significant source of NO<sub>2</sub>. As a result, an Air Quality Management Area (AQMA) covering an area around the centre of Norwich was declared in 2012 due to exceedances of the NO<sub>2</sub> annual mean objective.

In 2024, the annual mean objective was **not** exceeded within the AQMA.

In order to tackle the exceedances within the AQMA Norwich City Council produced an updated Air Quality Action Plan (AQAP) in 2021 (accessible [here](#)). So that any pollution hotspots can be identified (i.e. those areas where action is needed) Norwich City Council proposes to maintain and continue with the passive diffusion tube monitoring network. Diffusion tube locations are reviewed annually, with locations determined by any anticipated pollution hotspots, such as where changes to the road network may have had an impact on NO<sub>2</sub> levels.

In 2024, the highest annual mean nitrogen dioxide (NO<sub>2</sub>) concentration recorded within the Air Quality Management Area (AQMA) was 37.2 µg/m<sup>3</sup> at diffusion tube site DT11. This marks a reduction from 38.4 µg/m<sup>3</sup> in 2023 at the same location. The improvement is particularly notable given that DT11 recorded 52 µg/m<sup>3</sup> in 2012, a level influenced by the canyon effect, which previously hindered pollutant dispersal. The recent decline is believed to be the result of measures such as the introduction of electric buses and an increase in low-emission vehicles.

Outside the AQMA, DT40, which had the highest concentration in 2023 at 21.8  $\mu\text{g}/\text{m}^3$ , showed a significant improvement in 2024, falling to 18.9  $\mu\text{g}/\text{m}^3$ —its lowest recorded level to date.

The highest overall concentration outside the AQMA in 2024 was observed at DT65 on Bracondale, with a raw value of 41.0  $\mu\text{g}/\text{m}^3$ . As this exceeded the national annual mean objective, the reading was distance-corrected in line with point 7.84 of the LAQM TG22 guidance. This adjustment, which accounts for the inherent uncertainty in diffusion tube monitoring, brought the value down to 36.5  $\mu\text{g}/\text{m}^3$ .

Since DT65 is a newly established monitoring site for 2024, it will be closely monitored going forward to assess whether the current AQMA boundary remains appropriate or if it may need to be revised.

All diffusion tube monitoring sites that were operational before 2024 recorded a reduction in  $\text{NO}_2$  concentrations during 2024. This trend is clearly illustrated in the [“Comparison of Diffusion Tubes – Increase/Decrease in 2023 and 2024”](#) chart, which provides strong evidence that air quality within the Air Quality Management Area (AQMA) has improved overall.

There were no exceedances of the national annual mean  $\text{NO}_2$  objective within the AQMA in 2024, which is a very encouraging outcome. However, according to LAQM TG22 guidance, an AQMA should not be considered for revocation until there have been three consecutive years where annual mean  $\text{NO}_2$  concentrations are below 36  $\mu\text{g}/\text{m}^3$ —a level that provides a 10% buffer below the national objective of 40  $\mu\text{g}/\text{m}^3$ .

Although current concentrations are compliant with the national objective, the highest recorded value within the AQMA in 2024 was 37.2  $\mu\text{g}/\text{m}^3$ , which remains above the 36  $\mu\text{g}/\text{m}^3$  threshold. As a result, the AQMA cannot yet be considered for revocation.

It is important to note that last year’s report suggested only two more years of compliance were needed. However, that assessment did not account for the 36  $\mu\text{g}/\text{m}^3$  threshold, which is a key requirement under the current guidance.

This 2025 Annual Status Report (ASR) refers to measures proposed in the new 2021 Air Quality Action Plan.

Norwich City Council proposes to continue with both automatic continuous  $\text{NO}_2$  monitoring in tandem with passive diffusion tube monitoring.

Diffusion tube locations are reviewed annually. Locations are determined where pollution hotspots are anticipated and include sites where road changes may have had an impact on NO<sub>2</sub> levels, such as where higher traffic loading has resulted on alternative routes. In 2020, diffusion tube locations were also chosen in response to the submission of a planning application for a large development at Anglia Square. This was so baseline pollutant levels could be determined prior to any potential development.

We work closely with Norfolk County Council's Highways Department, and in 2022, we installed four diffusion tubes outside schools on Nelson Road and Turner Road, both located outside the Air Quality Management Area (AQMA). These were introduced to support the School Streets initiative, which aims to improve air quality and road safety around schools.

As anticipated, the monitoring results showed consistently low NO<sub>2</sub> levels, reflecting the transient nature of school-related traffic. However, it's important to note that diffusion tubes provide an average concentration over time and do not capture short-term peaks in pollution, such as those that may occur during school drop-off and pick-up times.

Despite this limitation, the overall levels remained low throughout the monitoring period. As the School Streets trial did not progress at these locations and no air quality concerns were identified, the diffusion tubes were removed in 2024.

In response to concerns about increased traffic around Bethel Street and St Giles, following the closure of Exchange Street to general traffic as part of COVID-19 restrictions, Norwich City Council, in collaboration with Norfolk County Council, agreed to implement additional air quality monitoring in the area.

To support this, five diffusion tubes were installed in September 2023 at key locations: DT60, DT61, DT62, DT63, and DT64. However, due to the theft of some tubes during 2023, there was insufficient data to include all of them in that year's diffusion tube reporting.

Despite this setback, tubes remained at these locations, and complete data has been successfully collected in 2024, enabling a more accurate assessment of air quality in this part of the city.

In 2024 a new triplicate diffusion tube location (DT67,DT68 & DT69) was installed at the new air quality station Castle Meadow 2 (CM3) to replace the diffusion tubes at the old Air Quality Station – Castle Meadow (CM1)

DT51 at 70 Bracondale was removed, and two new locations (DT65) Outside 72 Bracondale and (DT66) Opposite 72 Bracondale were installed.

In 2024 DT21 Rotary House was removed – it was situated on a gate and the gate was removed – the decision was made not to replace the tube at this location, as the annual mean for 2023 was 25.4  $\mu\text{g}/\text{m}^3$  and well below the national objective.

As a result, in 2024 we had a total of 46 diffusion tubes:

- 9 diffusion tubes were removed (7 locations)
- 5 diffusion tubes added (3 locations)
- 35 diffusion tube locations in total

The data presented in this report, when assessed against the national annual mean objective for  $\text{NO}_2$ , should be viewed as providing an indicative rather than definitive assessment of pollution levels. This is largely due to the lasting impacts of the COVID-19 pandemic, which significantly altered traffic volumes and patterns across the region.

In addition to reduced travel during lockdown periods, long-term changes in work patterns—such as increased levels of remote and hybrid working—have continued to influence traffic flows and, consequently, air quality. As a result,  $\text{NO}_2$  concentrations have not yet returned to pre-pandemic levels, and current data may not fully reflect typical long-term conditions.

That said, the 2024 results appear to follow a sustained downward trend, suggesting that improvements in air quality may be part of a broader, long-term shift rather than a temporary effect of pandemic-related disruptions.

The requirement for a detailed assessment has not been identified for any pollutants and the council will progress to the 2025 Annual Status Report (ASR).

There has been ongoing progress with the measures to improve Norwich's Air Quality that includes:

- The new Air Quality Station at Castle Meadow 2 was completed in Summer 2023 – photo below and is now fully commissioned. During 2023 the old and new monitoring stations were operating in tandem until end of 2023. The old station was decommissioned in January 2024. The 2024 results are from the new Castle Meadow 2 station only.





- Low NOx Buses - The full fleet of electric buses were operational by May 2024. Making half of the buses operating in Norwich zero emission.



*Source: First Bus*

- Installation of Beryl Bikes and E-Scooters across the Greater Norwich Area - There has been over 1.8m total rides, 3.2million miles and 95,000 users since the launch. There are over 185 bays across Greater Norwich.





Source: Beryl

- **Ring road junction improvements** - Work to the Heartsease Fiveways junction to improved pedestrian and cycle safety, encouraging greater use of active travel in this area was completed in May 2024.
- **Transport hubs at key transport interchanges** - Norwich Bus Station works were completed 2024.
- **Bus rapid transit** - Cromer Road and Aylsham Road bus lanes are now completed.
- **Thorpe Road bus/cycle contraflow** - Provides a substantially improved and more direct route for buses and cyclists travelling into the city centre along a key radial route.

Full details of the improvements are listed in table 2.2.

Norwich City Council is working closely with Norfolk County Council Highways/Sustainable Transport and Public Health. We are also part of the County wide Air Quality Group established between all the Local Authorities, the Environment Agency, Natural England, The University of East Anglia and The Integrated Care Board and various departments of Norfolk County Council including Public Health.

We will be collaborating with Public Health to add public health related air quality targets to our next Action Plan which is due to be revised in 2026.

We shall not be reviewing our AQMA this year.

## Actions to Improve Air Quality

Whilst air quality has improved significantly in recent decades, there are still some areas where local action is needed to protect people and the environment from the effects of air pollution.

The Environmental Improvement Plan<sup>1</sup> sets out actions that will drive continued improvements to air quality and to meet the new national interim and long-term targets for fine particulate matter (PM<sub>2.5</sub>), the pollutant of most harmful to human health. The Air Quality Strategy<sup>2</sup> provides more information on local authorities' responsibilities to work towards these new targets and reduce fine particulate matter in their areas.

The Road to Zero<sup>3</sup> strategy sets out the UK Government's long-term approach to reducing exhaust emissions from road transport through a variety of measures, while ensuring these efforts are balanced with the needs of local communities. This is especially important given that cars remain the most widely used mode of personal travel, and that transport emissions are a major contributor to elevated nitrogen dioxide (NO<sub>2</sub>) levels. In fact, the majority of Air Quality Management Areas (AQMAS) have been designated due to NO<sub>2</sub> concentrations that exceed national objectives—levels that are heavily influenced by road traffic.

The 2021 AQAP focuses on road infrastructure changes that are designed to divert traffic away from the congested city centre and re-allocate more road space for active forms of travel (i.e., walking/wheeling and cycling). The main focus is on removing congestion from the road network as factors such as vehicle emission standards are beyond the control of Norwich City Council. In addition, the plan promotes the use of public transport by prioritising bus routes, improving bus frequency on key routes and providing easy access to Park & Ride facilities. Cycle infrastructure is also a key focus for Norwich City Council by lengthening and linking up cycle routes as well as providing segregated and safer routes (i.e. at major junctions).

---

<sup>1</sup> Defra. Environmental Improvement Plan 2023, January 2023

<sup>2</sup> Defra. Air Quality Strategy – Framework for Local Authority Delivery, August 2023

<sup>3</sup> DfT. The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy, July 2018

Norwich City Council's main priorities are to reduce emissions from transport and promote alternative modes of travel. To achieve this, Norwich City Council are working in conjunction with Norfolk County Council to examine the feasibility of implementing the following measures over the course of the next five years:

- Expansion of the Low Emission Zone (LEZ).
- Restricting the buses and taxis that are allowed to travel through the LEZ to a much tougher Euro emission standard (following discussions with transport operators).
- Extending engine switch off powers to accommodate the extended LEZ.
- Promote low and zero emission public transport through the use of external grant schemes and private investment through the Bus Service Improvement Plan.
- Reviewing traffic light junctions to reduce congestion and improve traffic flow, as well as supporting the provision of traffic light priority for buses.
- Make road junctions safer and easier for those walking, wheeling and cycling to navigate.
- Expand the cycle networks and create safe, connected corridors for those walking, wheeling and cycling.
- Review the support provided to schools in encouraging more active and sustainable travel to and from school, delivering initiatives such as School Streets, and encouraging schools to participate in air quality initiatives such as Clean Air Day.
- Engage the public and businesses through a behaviour change programme, including the use of social media to increase awareness of taking personal responsibility for reducing air pollution, such as engine switch off, walking/cycling, car sharing and using domestic solid fuelled open fire or wood burners responsibly.

Norwich City Council believe that the implementation of these measures along with further measures in subsequent years will contribute to the reduction of NO<sub>2</sub> levels to below the annual mean AQS objective, so that the current AQMA designation can be eventually revoked.

Over the past decade, significant infrastructure improvements have been made across Norwich city centre. These include:

- The creation of pedestrian-only areas
- The removal of traffic lights and kerbside barriers at several junctions
- Restrictions on private motor vehicles on certain streets, allowing access only to buses, coaches, taxis, delivery vehicles, bicycles, and scooters

These changes aim to enhance the vitality of the city centre by reducing conflicts between vehicles, pedestrians, and cyclists.

Norfolk County Council and First Bus secured £14.7 million from the Department for Transport's Zero Emission Bus Regional Area (ZEBRA) fund. This has enabled:

- The introduction of 70 zero-emission battery electric buses starting in October 2023
- Full deployment across Norwich and surrounding areas by May 2024, replacing older diesel buses

This funding has enabled First Bus to electrify their most frequent cross-city routes, accounting for nearly 2/3rds of bus journeys they operate through Castle Meadow. This significant joint investment provides a benefit for passengers, whilst contributing towards improving the overall air quality in the city especially within the AQMA.

The Norwich Park & Ride service has faced challenges regaining patronage post-COVID. However:

- The Postwick site reopened on a trial basis in September 2023 following public and parish requests and remains operational.
- A new contract for the service was tendered in 2024, with operations beginning on 30<sup>th</sup> March 2025.

A new Bus Passenger Charter was launched under the Norfolk Bus Service Improvement Plan (BSIP) in October 2021, committing to:

- Rebuilding passenger confidence
- Offering green, sustainable transport
- Providing simple and affordable fares
- Making buses the primary mode of transport

The goal is for 90% of buses in Norfolk to be Euro 5, Euro 6, or zero-emission by 2027. A new website, [Travel Norfolk](#), offers live bus times, journey planning, and bus stop locations.

Norfolk County Council is looking at options to provide EV charging facilities at Park & Ride sites.

In terms of alternatives to private vehicle use, the cycle network for the greater Norwich area has been significantly upgraded over recent years. It comprises five radial and two orbital pedalway routes and a number of cycle routes connecting those pedalway routes. In addition, the Beryl micromobility scheme was launched in 2020, which now includes 470

standard bikes, 200 electric bikes and 500 electric scooters. The scooters are being operated as part of the government e-scooter trial. There has been over 1.8m total rides, 3.2 million miles and 95,000 users since the launch. There are over 185 bays across Greater Norwich. The future aim is to exceed 100,000 users and more than 2 million cycle and e-scooter journeys in Norwich.

Norwich City Council continues to promote the uptake and use of electric vehicles (EVs). As of 30 April 2025, official electric vehicle public charging infrastructure statistics show that there are 131 publicly accessible 'charging devices' within the Norwich city area.<sup>4</sup> This represents a snapshot of devices reported as operational at midnight on the last day of the quarter. It should be noted that many charging devices have more than one charging connector and therefore may be able to charge more than one vehicle at a time<sup>5</sup>. Whilst official data on this is not yet available to provide a complete picture of public EV charging capacity, the number of individual publicly accessible charging connectors in Norwich is believed to be in excess of 200, and therefore the figure of 131 can be assumed as a minimum simultaneous public charging capacity for electric vehicles across the city at any one time. It should be noted that this does not include privately owned chargers at people's homes and workplaces.

Mapping of publicly accessible electric vehicle charging devices can be found using websites including Zapmap (<https://www.zap-map.com/live/>) and Carwow (<https://www.carwow.co.uk/electric-cars/charging-points>).

Norfolk County Council has been delivering an on-street chargepoint project<sup>6</sup> in Norwich, making EV ownership more accessible to households who don't have off-street parking where a private charger could be installed. To date this has included installation of 46 charging devices across 26 streets in Norwich.

Norwich City Council presently owns two EV charging points at UEA Enterprise Centre car park, and six charging points at Rose Lane Car Park. In partnership with Norfolk County Council, additional public charging points will be rolled out across Norwich City Council

---

<sup>4</sup> <https://www.gov.uk/government/statistics/electric-vehicle-public-charging-infrastructure-statistics-april-2025>

<sup>5</sup> <https://www.gov.uk/government/publications/electric-vehicle-charging-device-statistics-information/electric-vehicle-public-charging-infrastructure-statistics-methodology-note>

<sup>6</sup> <https://www.norfolk.gov.uk/article/55136/Norwich-City-on-street-chargepoint-project>

surface car parks during 2025, delivered under Local Electric Vehicle Infrastructure (LEVI) funding. Details of these chargers will be added to Zapmap as they become operational.

We are working closely with Public Health on the Public Health Outcomes Framework (PHOF) on actions in relation to PM<sub>2.5</sub>. We have had preliminary talks and shall be working with Public Health to identify sources of PM<sub>2.5</sub> and will add this in to our next action plan.

We hope to work again with the Environmental Science Department at the University of East Anglia (UEA), who we have previously collaborated with for various research projects.

Norwich City Council are currently reviewing their taxi policy using the Taxi and private hire vehicle licensing best practice guidance for licensing authorities in England<sup>7</sup>. This considers the local transport plans and strategy. Vehicle emission standards and the location and capacity of electric vehicle charging infrastructure shall be considered in the review to support taxis and private hire vehicles to contribute to air quality objectives.

## Conclusions and Priorities

The 2021 AQAP presents a comprehensive review of Norwich air quality, the problem areas and the additional measures that will be required to combat this.

Norwich City Council intend to continue with automatic and passive NO<sub>2</sub> monitoring within the city area. As completion of road changes are implemented, Norwich City Council will keep the locations of passive monitoring under continuous review so that any resulting impacts from these changes can be determined.

The key findings for 2024 are:

- There are no exceedances of the NO<sub>2</sub> annual mean AQS objective within the AQMA.
- There was one exceedance of the NO<sub>2</sub> annual mean AQS objective at a site outside of the AQMA. This was distance corrected to allow for uncertainty in diffusion tube monitoring concentration data which resulted in the result falling below the annual mean AQS objective.

---

<sup>7</sup> Taxi and private hire vehicle licensing best practice guidance for licensing authorities in England - GOV.UK



- The NO<sub>2</sub> annual mean was 22.0 µg m<sup>-3</sup> at Norwich Castle Meadow 2 which did not exceed the AQS Objective of 40 µg m<sup>-3</sup>.
- The NO<sub>2</sub> 1-hour AQS Objective of 200 µg m<sup>-3</sup> was not exceeded at either AQS.
- The PM<sub>10</sub> annual mean was 14.5 µg m<sup>-3</sup> at Norwich Castle Meadow 2 which did not exceed the AQS Objective of 40 µg m<sup>-3</sup>.
- The PM<sub>10</sub> 24-hour AQS Objective was not exceeded. There is an annual allowance of 35 days.
- The PM<sub>2.5</sub> annual mean was 8.6 µg m<sup>-3</sup> at Norwich Castle Meadow 2 which did not exceed the AQS Objective of 20 µg m<sup>-3</sup>.
- All automatic monitoring stations reported concentrations of NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> to be below the relevant objectives.
- All diffusion tubes installed prior to 2024 showed a decline in NO<sub>2</sub> levels during the year. This includes the site at 52 St Augustine's Street, which exceeded the national limit in 2012 and was instrumental in the declaration of the AQMA. The continued improvement in air quality is believed to be largely due to the introduction of electric buses and the increasing presence of cleaner vehicle technologies on the roads.

The new monitoring station Castle Meadow 2 was fully operational in 2024. The old monitoring station was switched off in January 2024 and decommissioned.

With the replacement of older buses with cleaner technologies and the ongoing development of the Bus Service Improvement Plan (BSIP), continued improvements in air quality along Castle Meadow, within the Low Emission Zone (LEZ), are anticipated. As these changes are expected to lead to a measurable reduction in NO<sub>2</sub> levels, the Castle Meadow monitoring station continues to serve a valuable role in tracking progress and evaluating the effectiveness of these interventions.

As well as maintaining the automatic and passive monitoring network, Norwich City Council will also continue to support initiatives that contribute positively to improving air quality. These cover a range of actions, such as:

- Encouraging car sharing in partnership with companies such as Liftshare.
- Encouraging schools to develop travel plans, including using the Modeshift Stars software.
- Support the Enterprise Car Club (formerly Norfolk Car Club).



- Support walking and cycling schemes such as Beryl Bikes and the LCWIP (Local Cycling & Walking Infrastructure Plan).
- Inform citizens on health concerns when using an open fire/wood burner through a program of social media and website campaigns.

Although there are no exceedances within the AQMA, the maximum levels of NO<sub>2</sub> are still within 10% of the AQS objective. Paragraph 3.57 of the LAQM TG22 states:

*3.57 The revocation of an AQMA should be considered following three consecutive years of compliance with the relevant objective as evidenced through monitoring. Where NO<sub>2</sub> monitoring is completed using diffusion tubes, to account for the inherent uncertainty associated with the monitoring method, it is recommended that revocation of an AQMA should be considered following three consecutive years of annual mean NO<sub>2</sub> concentrations being lower than 36µg/m<sup>3</sup> (i.e. within 10% of the annual mean NO<sub>2</sub> objective).<sup>8</sup>*

Therefore, Norwich City Council is unable to consider revocation of the AQMA until the annual mean NO<sub>2</sub> is within 10% of the annual mean objective for 3 years.

Norwich City Councils Action Plan was last reviewed in 2021, so there shall be a new Action Plan produced for 2026.

## How to get Involved

Norwich City Council are aware that air quality is a subject that has become an increasing area of interest and concern for more and more people year on year. As a result, information about air quality in general and actions that can be taken to improve air quality, can be found at the following:

- [UK-AIR](#) (the government's air information resource).
- [Norwich City Council](#) (air quality reporting website).
- [Enterprise Car Club](#) ('connecting Norfolk').
- [Norfolk Liftshare](#) (car journey sharing).
- [Modeshift Stars](#) (national schools award for schools promoting sustainable travel).

---

<sup>8</sup> [LAQM-TG22-August-22-v1.0.pdf](#)

- Cycle City Ambition Programme (report for Department for Transport).
- Transforming Cities Overview (funding application to Department for Transport)
- <https://www.beryl.cc/> (Beryl Bikes)

*(Please note Norwich City Council does not have control over third party websites and, hence, may not necessarily endorse its content.)*

Norwich City Council promote initiatives such as “Clean Air Day” and “Clean Air Night”, which allow the public to raise any air quality issues or concerns and learn more about how to help themselves with improving the air which they breathe in (both indoors and outdoors). This is done with aid from the Norfolk Countywide Air Quality Group, who have promoted issues such as:

- Encouraging children to walk, wheel or cycle to school and find routes away from busy roads.
- Encouraging citizens to abandon the car and use an alternative mode of transport such as car share, public transport, cycle or walk.
- Raising awareness of the safest way to use a wood-burner/open fire on the Norwich City Council website.
- Encouraging pedestrians to walk on side streets instead of the main road and encouraging drivers to switch off engines when idling.
- Norfolk County Council are working with schools to better understand current travel behaviour and support the delivery of school travel plans.
- Promoting ‘Clean Air Day’ on Norwich City Council social media sites. It is hoped that initiatives such as ‘Clean Air Day’ would be a catalyst for behavioural changes that will continue beyond the day itself.
- Work in partnership with Beryl to exceed 100,000 users and more than 2 million cycle and e-scooter journeys in Norwich. <https://www.beryl.cc/>
- Working with bus operators to deliver additional zero emission buses in Norwich

## Table of Contents

|                                                                                                               |           |
|---------------------------------------------------------------------------------------------------------------|-----------|
| Local Responsibilities and Commitment .....                                                                   | i         |
| <b>Executive Summary: Air Quality in Our Area .....</b>                                                       | <b>ii</b> |
| Air Quality in Norwich City Council .....                                                                     | ii        |
| Actions to Improve Air Quality .....                                                                          | ii        |
| Conclusions and Priorities .....                                                                              | xiii      |
| How to get Involved .....                                                                                     | xv        |
| <b>1 Local Air Quality Management .....</b>                                                                   | <b>1</b>  |
| <b>2 Actions to Improve Air Quality .....</b>                                                                 | <b>2</b>  |
| <b>2.1 Air Quality Management Areas .....</b>                                                                 | <b>2</b>  |
| <b>2.2 Progress and Impact of Measures to address Air Quality in Norwich City Council .....</b>               | <b>4</b>  |
| <b>2.3 PM<sub>2.5</sub> – Local Authority Approach to Reducing Emissions and/or Concentrations .....</b>      | <b>15</b> |
| <b>3 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance .....</b> | <b>19</b> |
| <b>3.1 Summary of Monitoring Undertaken .....</b>                                                             | <b>19</b> |
| 3.1.1 Automatic Monitoring Sites .....                                                                        | 19        |
| 3.1.2 Non-Automatic Monitoring Sites .....                                                                    | 19        |
| <b>3.2 Individual Pollutants .....</b>                                                                        | <b>20</b> |
| 3.2.1 Nitrogen Dioxide (NO <sub>2</sub> ) .....                                                               | 20        |
| 3.2.2 Particulate Matter (PM <sub>10</sub> ) .....                                                            | 24        |
| 3.2.3 Particulate Matter (PM <sub>2.5</sub> ) .....                                                           | 26        |
| <b>Appendix A: Monitoring Results .....</b>                                                                   | <b>28</b> |
| <b>Appendix B: Full Monthly Diffusion Tube Results for 2024 .....</b>                                         | <b>49</b> |
| <b>Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC .....</b>                 | <b>52</b> |
| New or Changed Sources Identified Within Norwich City Council During 2024 .....                               | 52        |
| Additional Air Quality Works Undertaken by Norwich City Council During 2024 .....                             | 52        |
| QA/QC of Diffusion Tube Monitoring .....                                                                      | 52        |
| Diffusion Tube Annualisation .....                                                                            | 53        |
| Diffusion Tube Bias Adjustment Factors .....                                                                  | 54        |
| NO <sub>2</sub> Fall-off with Distance from the Road .....                                                    | 55        |
| QA/QC of Automatic Monitoring .....                                                                           | 56        |
| PM <sub>10</sub> and PM <sub>2.5</sub> Monitoring Adjustment .....                                            | 57        |
| Automatic Monitoring Annualisation .....                                                                      | 57        |
| NO <sub>2</sub> Fall-off with Distance from the Road .....                                                    | 58        |
| <b>Appendix D: Map(s) of Monitoring Locations and AQMAs .....</b>                                             | <b>61</b> |
| <b>Appendix E: Summary of Air Quality Objectives in England .....</b>                                         | <b>65</b> |

|                                |           |
|--------------------------------|-----------|
| <b>Glossary of Terms</b> ..... | <b>66</b> |
| <b>References</b> .....        | <b>67</b> |

## Figures

|                                                                                                    |    |
|----------------------------------------------------------------------------------------------------|----|
| Figure A.1A – Trends in Annual Mean NO <sub>2</sub> Concentrations .....                           | 37 |
| Figure A.3 – Trends in Annual Mean PM <sub>10</sub> Concentrations .....                           | 44 |
| Figure A.4 – Trends in Number of 24-Hour Mean PM <sub>10</sub> Results > 50µg/m <sup>3</sup> ..... | 46 |
| Figure A.5 – Trends in Annual Mean PM <sub>2.5</sub> Concentrations .....                          | 48 |
| Figure D.1 – Map of Non-Automatic Monitoring Site .....                                            | 61 |

## Tables

|                                                                                                                                         |    |
|-----------------------------------------------------------------------------------------------------------------------------------------|----|
| Table 2.1 – Declared Air Quality Management Areas .....                                                                                 | 3  |
| Table 2.2 – Progress on Measures to Improve Air Quality .....                                                                           | 10 |
| Table A.1 – Details of Automatic Monitoring Sites .....                                                                                 | 28 |
| Table A.2 – Details of Non-Automatic Monitoring Sites .....                                                                             | 28 |
| Table A.3 – Annual Mean NO <sub>2</sub> Monitoring Results: Automatic Monitoring (µg/m <sup>3</sup> ) .....                             | 32 |
| Table A.4 – Annual Mean NO <sub>2</sub> Monitoring Results: Non-Automatic Monitoring (µg/m <sup>3</sup> ) ....                          | 33 |
| Table A.5 – 1-Hour Mean NO <sub>2</sub> Monitoring Results, Number of 1-Hour Means > 200µg/m <sup>3</sup><br>.....                      | 42 |
| Table A.6 – Annual Mean PM <sub>10</sub> Monitoring Results (µg/m <sup>3</sup> ) .....                                                  | 43 |
| Table A.7 – 24-Hour Mean PM <sub>10</sub> Monitoring Results, Number of PM <sub>10</sub> 24-Hour Means ><br>50µg/m <sup>3</sup> .....   | 45 |
| Table A.8 – Annual Mean PM <sub>2.5</sub> Monitoring Results (µg/m <sup>3</sup> ) .....                                                 | 47 |
| Table B.1 – NO <sub>2</sub> 2024 Diffusion Tube Results (µg/m <sup>3</sup> ) .....                                                      | 49 |
| Table C.1 – Annualisation Summary (concentrations presented in µg/m <sup>3</sup> ) .....                                                | 53 |
| Table C.2 – Bias Adjustment Factor .....                                                                                                | 54 |
| Table C.3 – Local Bias Adjustment Calculation .....                                                                                     | 55 |
| Table C.4 – Non-Automatic NO <sub>2</sub> Fall off With Distance Calculations (concentrations<br>presented in µg/m <sup>3</sup> ) ..... | 56 |
| Table C.5 – Automatic NO <sub>2</sub> Fall off With Distance Calculations (concentrations presented<br>in µg/m <sup>3</sup> ) .....     | 57 |
| Table E.1 – Air Quality Objectives in England .....                                                                                     | 65 |

# 1 Local Air Quality Management

This report provides an overview of air quality in Norwich City Council during 2024. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995), as amended by the Environment Act (2021), 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 order to achieve and maintain the objectives and the dates by which each measure will be carried out. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by Norwich City Council to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England are presented in Table E.1.

## 2 Actions to Improve Air Quality

### 2.1 Air Quality Management Areas

Air Quality Management Areas (AQMA) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority should prepare an Air Quality Action Plan (AQAP) within 18 months. The AQAP should specify how air quality targets will be achieved and maintained and provide dates by which measures will be carried out.

A summary of AQMA declared by Norwich City Council can be found in Table 2.1. The table presents a description of the 1 AQMA that is currently designated within Norwich City Council. Appendix D: Map(s) of Monitoring Locations and AQMA provides maps of the AQMA and also the air quality monitoring locations in relation to the AQMA. The air quality objectives pertinent to the current AQMA designation are as follows:

- NO<sub>2</sub> annual mean



**Table 2.1 – Declared Air Quality Management Areas**

| AQMA Name    | Date of Declaration | Pollutants and Air Quality Objectives | One Line Description                                                            | Is air quality in the AQMA influenced by roads controlled by Highways England? | Level of Exceedance: Declaration                   | Level of Exceedance: Current Year | Number of Years Compliant with Air Quality Objective | Name and Date of AQAP Publication | Web Link to AQAP               |
|--------------|---------------------|---------------------------------------|---------------------------------------------------------------------------------|--------------------------------------------------------------------------------|----------------------------------------------------|-----------------------------------|------------------------------------------------------|-----------------------------------|--------------------------------|
| Central AQMA | November 2012       | NO <sub>2</sub> Annual Mean           | An area encompassing Norwich City Centre, broadly following the inner link road | NO                                                                             | 52 µg/ m <sup>3</sup> (at 52 St Augustines Street) | 37.2 µg/ m <sup>3</sup>           | 0                                                    | AQAP June 2021                    | <a href="#">AQAP June 2021</a> |

☒ Norwich City Council confirm the information on UK-Air regarding their AQMA(s) is up to date

☒ Norwich City Council confirm that all current AQAPs have been submitted to Defra

## 2.2 Progress and Impact of Measures to address Air Quality in Norwich City Council

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

The report is well structured, detailed, and provides the information specified in the Guidance. The following comments are designed to help inform future reports:

1. The ASR has been signed off by the Director of Public Health. This is welcomed.  
*We are continuing to work with Public Health to work towards joint goals.*
2. The Council have provided a detailed summary of the monitoring results both within and outside of the AQMA, with supporting graphs provided.
3. Details for Valid data capture for 2023 and for relevant monitoring periods align as expected with deviations due to monitoring starting part way through the year clearly stated.
4. Table 2.1 states that the level of exceedance in the current year within the Central AQMA is 35.1µg/m<sup>3</sup>. The maximum recorded concentration at a point of relevant exposure is 38.4µg/m<sup>3</sup> according to Table B.1. This is the value which should be recorded in Table 2.1.  
*Thank you for pointing out this area – We will ensure this figure is correct in the 2025 report.*
5. The annualisation factor for CM3 has been provided. Annualisation factors for both diffusion tubes and automatic monitoring are included in Table C.1. It should be noted that there is an annualisation factor provided for DT44, however it has not been used and should not be annualised due to there being 9 months data capture, which TG(22) states is acceptable for not requiring annualisation. This should be noted for future ASRs and the latest version of the Diffusion Tube Data Processing tool should account for this.  
*Thank you for pointing this out and it is noted.*
6. The Council have included detailed information regarding completed measures and priorities for the upcoming years, highlighting their pro-active approach to addressing air quality.

7. Norwich City Council have reviewed their current monitoring strategy, with the addition of 8 new diffusion tube locations. This is welcomed, as it allows for identification of any potential new hotspot locations.
8. In Table A.4. annualised figures are included in 2023 within brackets. As specified within the ASR template guidance box, concentrations presented should be annualised (where required) and bias adjusted, but **NOT** distance corrected. Only a single value should be provided in this table which aligns with this format as specified. The Council are encouraged to align with this format for future ASRs

Thank you for clarifying this – it is noted for the 2025 report.

9. QA/QC procedures are appropriate, with sufficient evidence provided in the appendix. However, an explanation as to why the local bias adjustment has been used has not been provided. Comparison with the national bias adjustment factor is recommended.

This is noted and it will be clearer in the 2025 report

10. It should be noted that no justification for the choice of the local bias adjustment factor has been provided. Future reports should provide reason behind the choice of national or local bias adjustment

This is noted and it will be clearer in the 2025 report

11. Data capture for both CM2 and CM3 are below 85%. As such details of the 99.8<sup>th</sup> Percentile for NO<sub>2</sub> and 90.4<sup>th</sup> Percentile for PM<sub>10</sub> should be detailed in Table A.5 and Table A.7.

This is noted and has been added to the 2025 report for CM2 in Table A.5 and A.7

12. In Table B.1 annualised and bias adjusted values are correctly provided, however where annualisation was undertaken, these sites have just their annualised value prior to bias adjustment in brackets. Only a single value for should be provided in this table which aligns with this format as specified. The Council are encouraged to align with this format for future ASRs

This has been noted for the 2025 report.

13. Overall, the report is detailed and concise, providing a good overview of the work the Council is undertaking to improve air quality within their area, and satisfies the criteria of the relevant reporting standard. The Council should continue their good work.

Both Norwich City Council and Norfolk County Council have taken forward a number of direct measures during the current reporting year of 2024 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2. 24 measures are included within Table 2.2, with the type of measure and the progress Norwich City Council have made during the reporting year of 2024 presented. Where there have been, or continue to be, barriers restricting the implementation of the measure, these are also presented within Table 2.2.

More detail on these measures can be found in their respective Action Plans [Action Plan being reported in July 2021](#).

**Key completed measures are:**

- **Review of traffic light times & synchronisation to optimise traffic flow for all new road layout schemes** - Traffic signals along Koblenz Avenue in Norwich have been optimized following highway improvement works around Norwich station. Works completed Summer 2023.
- **Ring road junction improvements** - Work to the Heartsease Fiveways junction to improve pedestrian and cycle safety, encouraging greater use of active travel in this area was completed in May 2024.
- **Low NOx Buses** – By May 2024 all 70 zero emission battery electric buses were in operation in Norwich, replacing diesel buses. Around half of the buses operating in Norwich are now zero emission.
- **Revised layout in St Stephens Street / Red Lion Street** - Provides substantially improved conditions for pedestrians and reduces congestion with buses
- **Transport hubs at key transport interchanges** - Norwich Bus Station works were completed 2024.
- **Bus rapid transit** - Cromer Road and Aylsham Road bus lanes are now completed.
- **Installation of new Air Quality Monitoring Station** - The old station was switched off in January 2024 and removed. New Station producing accurate monitoring results.
- **Thorpe Road bus/cycle contraflow** - Provides a substantially improved and more direct route for buses and cyclists travelling into the city centre along a key radial route.

- **Wayfinding. Investment in new and transformative infrastructure to encourage more sustainable modes of transport for commuting and leisure journeys** - Roll out of pedestrian wayfinding across greater Norwich is complete.

**Norwich City Council expects the following measures to be completed over the course of the next reporting year:**

- **Ring road junction improvements** - Works are to take place at the Yarmouth Road / Pound Lane junction in Summer 2025 to reduce delays and congestion for all highway users.
- **Low Nox Buses** - Work with bus operators is ongoing to deliver additional zero emission buses in Norwich
- **Assess opportunity for a zero-emission bus fleet to operate the Norwich Park & Ride service when the contract is renewed in 2023** - A new Park & Ride contract will commence March 2025 – this operates using zero emission and Euro 6 buses, replacing Euro 5 buses.
- **Transport hubs at key transport interchanges** - Bowthorpe interchange works shall be completed in early 2025.
- **Bus rapid transit** - Dereham Road bus lanes will be completed early-2025. Priority for bus movements will be implemented at the Angel Road / Waterloo Road junction Spring 2025. Improvements to bus movements at the Yarmouth Road / Pound Lane junction are to be delivered Summer 2025.
- **Installation of Beryl Bikes and E-Scooters across the Greater Norwich Area** - There has been over 1.8m total rides, 3.2million miles and 95,000 users since the launch. There are over 185 bays across Greater Norwich.
- **Wayfinding. Investment in new and transformative infrastructure to encourage more sustainable modes of transport for commuting and leisure journeys** - Roll out of improved wayfinding for cycle routes remains ongoing.

**Norwich City Council's priorities for the coming year are:**

- **School Travel Plan** - Work with schools to better understand current travel behaviour and support the delivery of school travel plans.

- **Installation of Beryl Bikes and E-Scooters across the Greater Norwich Area** - Work in partnership with Beryl to exceed 100,000 users and more than 2 million cycle and e-scooter journeys across Greater Norwich.
- **Low Nox Buses** - Work with bus operators is ongoing to deliver additional zero emission buses in Norwich
- **Ring road junction improvements** - Reduce congestion and bus journey times along Yarmouth Road in 2025/26 by redesigning the road layout and parking provision
- **Bus rapid transit** - Provide traffic light priority for buses through an additional 10 junctions in Norwich during 2025/26.

Norwich City Council worked to implement these measures in partnership with the following stakeholders during 2024:

- Norfolk County Council Highways
- Public Health Norfolk
- Norfolk Countywide Air Quality Group
- Environmental Strategy Team – Norwich City Council

**The principal challenges and barriers to implementation that Norwich City Council anticipates facing are:**

- **West to East traffic restriction in Norwich City Centre** - This scheme has been put on hold due to local concerns around negative impacts on general traffic and taxis.
- **Rationalising and simplifying of traffic on Prince of Wales Road** - This scheme has been put on hold due to local concerns around negative impacts on general traffic and taxis.
- **Extension to Thickthorn Park & Ride** - Park & Ride patronage remains significantly below pre-COVID levels so the business case to extend this site is weakened. Opportunities to install EV charge points across Park & Ride sites is being examined. Though this scheme is currently on hold.
- **Education & information campaigns to encourage more responsible driving and the use of alternative modes** - Engagement with large employers is challenging in terms of accessing sites and engagement with staff.

**Progress on the following measures has been slower than expected due to:**

**Extension to Postwick Park & Ride site** – Although the new contract shall commence in 2025 the site is still not utilised to pre covid levels, so the extension to this site is not currently being progressed.

**Introduction of School Streets** - A School Streets trial was undertaken across Greater Norwich in 2022 involving 6 schools, this was not progressed with the schools inside Norwich at this time. Support for schools to encourage more active travel to and from school is being reviewed.

**Construction of final link of Northern Distributor Road (NDR) over River Wensum joining up with A47 West** - The planning application for the scheme has been withdrawn and discussions are underway with the Department for Transport on the way forward for the project.

**Removal of private vehicle traffic from Tombland** – This is a longer-term goal. It will be considered as part of the development of the Transport for Norwich Implementation Plan.

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, Norwich City Council anticipates that further additional measures not yet prescribed will be required in subsequent years to achieve compliance and enable the revocation of Central Air Quality Management Area.

Norwich City Council shall be producing a new Action Plan in 2026 and the measures in table shall be reviewed and added to. Consideration will be given to other areas that can be investigated to work towards compliance.

Table 2.2 – Progress on Measures to Improve Air Quality

| Measure No. | Measure Title                                                              | Category                         | Classification                                                            | Year Measure Introduced in AQAP | Estimated / Actual Completion Date | Organisations Involved                      | Funding Source                              | Funding Status | Estimated Cost of Measure | Measure Status | Reduction in Pollutant / Emission from Measure                                                                            | Key Performance Indicator                                                                                                                        | Progress to Date                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Comments / Barriers to Implementation                                                                                                                                                                                                                                                                                                                             |
|-------------|----------------------------------------------------------------------------|----------------------------------|---------------------------------------------------------------------------|---------------------------------|------------------------------------|---------------------------------------------|---------------------------------------------|----------------|---------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.          | Low NOx Buses                                                              | Promoting Low Emission Transport | Public Vehicle Procurement - Prioritising uptake of low emission vehicles | N/A                             | Ongoing                            | Norfolk County Council/Norwich City Council | Norfolk County Council/Norwich City Council | Funded         | £1 million - £10 million  | Implementation | Every electric bus introduced will reduce emissions of NO <sub>2</sub>                                                    | Reduction in NO <sub>2</sub> levels in the city and surrounds                                                                                    | 24 buses retrofitted with exhaust gas treatment equipment by June 2018. Funding was secured from First Bus and government through the Zero Emission Bus Regional Area (ZEBRA) programme for 70 zero emission battery electric buses which were in operation in Norwich from March 2024, replacing diesel buses. Around half of the buses operating in Norwich are now zero emission.                                                                                          | Aim is to continue to work in partnership with bus operators on funding opportunities relating to low and zero NOx emission vehicles.                                                                                                                                                                                                                             |
| 2.          | Ring Road Junction improvements                                            | Traffic Management               | UTC, Congestion management, traffic reduction                             | 2020                            | 2025                               | Norfolk County Council/Norwich City Council | Norfolk County Council/Norwich City Council | Funded         | £1 million - £10 million  | Implementation | Specific value not known but will contribute to overall reduction in NO <sub>2</sub> levels in city centre and surrounds. | Reduced city centre congestion as well as wider network. Increase in numbers of people walking, wheeling and cycling                             | Grapes Hill roundabout was completed in November 2021. Foundry Bridge completed in July 2022 and initial evidence shows reduced congestion/smoothen traffic flows. Work to the Heartsease Fiveways junction to improve pedestrian and cycle safety, encouraging greater use of active travel in this area was completed in May 2024. Works are to take place at the Yarmouth Road / Pound Lane junction in Summer 2025 to reduce delays and congestion for all highway users. | Works at three key junctions on the inner and outer ring roads in Norwich have been completed. All have provided an improved environment for walking, wheeling and cycling and have reduced congestion for all modes, including public transport. Levels of active travel using Beryl bikes and e-scooters have increased by 66% through the Heartsease junction. |
| 3           | Installation of Beryl Bikes and E-Scooters across the Greater Norwich Area | Promoting Travel Alternatives    | Other                                                                     | 2020                            | 2029                               | Norfolk County Council/Norwich City Council | Norfolk County Council/Norwich City Council | Funded         | £100k - £500k             | Implementation | Studies are showing that 30% of all journeys taken by bike or scooter would otherwise have been taken by car              | There has been over 1.8m total rides, 3.2million miles and 95,000 users since the launch.<br><br>There are over 185 bays across Greater Norwich, | The Beryl scheme was expanded in 2023/23 to include Wymondham and Drayton. Additional of more bays continues. There are now nearly 200 e-bikes and nearly 500 e-scooters in the scheme.                                                                                                                                                                                                                                                                                       | Finding suitable space for bays to achieve optimal bay network density to drive up ridership is challenging but new bays are being added every month.                                                                                                                                                                                                             |
| 4.          | Castle Meadow Low Emission Zone                                            | Promoting Low Emission Transport | Low Emission Zone (LEZ)                                                   | 2006/09                         | Ongoing                            | Norfolk County Council                      | Norwich City Council                        | Funded         | <£10k                     | Planning       | Approx. 10-15 µg/m <sup>3</sup> NO <sub>2</sub>                                                                           | Reduction in NO <sub>2</sub> levels in Castle Meadow                                                                                             | Erratic decline in NO <sub>2</sub> but probably would have been worse without LEZ                                                                                                                                                                                                                                                                                                                                                                                             | Ongoing review of LEZ and the requirement to further reduce vehicle emissions. Review once electric buses are fully rolled out in 2024.Further discussions required with operators at enhanced partnership to agree revision.                                                                                                                                     |



| Measure No. | Measure Title                                                                                                                    | Category                      | Classification                                | Year Measure Introduced in AQAP | Estimated / Actual Completion Date                      | Organisations Involved                      | Funding Source                              | Funding Status | Estimated Cost of Measure | Measure Status                                                                      | Reduction in Pollutant / Emission from Measure                                                                            | Key Performance Indicator                                                   | Progress to Date                                                                                                                                                                                                                      | Comments / Barriers to Implementation                                                                                                                                                                                                                                                                                                                                                      |
|-------------|----------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------------------------------------|---------------------------------|---------------------------------------------------------|---------------------------------------------|---------------------------------------------|----------------|---------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|             |                                                                                                                                  |                               |                                               |                                 |                                                         |                                             |                                             |                |                           |                                                                                     |                                                                                                                           |                                                                             |                                                                                                                                                                                                                                       | May need to amend TRO Norfolk CC to lead through enhanced partnership                                                                                                                                                                                                                                                                                                                      |
| 5           | Review of traffic light times & synchronisation to optimise traffic flow for all new road layout schemes                         | Traffic Management            | UTC, Congestion management, traffic reduction | 2016                            | Completed 2023                                          | Norfolk County Council                      | Norfolk County Council                      | Funded         | £10 - £50k                | Completed                                                                           | Specific value not known but will contribute to overall reduction in NO <sub>2</sub> levels in city centre and surrounds. | Reduced city centre congestion as well as wider network.                    | Traffic signals along Koblenz Avenue in Norwich have been optimized following highway improvement works around Norwich station. Works completed Summer 2023                                                                           | This scheme was delivered in two phases; one in January – February 2023 and the other June – July 2023. All works are completed and has led to traffic signals along this corridor being better co-ordinated, reducing delays and congestion.                                                                                                                                              |
| 6           | Engine Switch Off Enforcement                                                                                                    | Public Information            | Other                                         | Complete                        | Complete August 2018                                    | Norwich City Council                        | Norwich City Council                        | Funded         | <£10k                     | Ongoing on Castle Meadow & St Stephens. Reach extended if LEZ extended as proposed. | Complimentary to other measures; Castle Meadow LEZ.                                                                       | Reduction in NO <sub>2</sub> levels in Castle Meadow                        | Engine switch off enforcement in place with issue of Fixed penalty Notices for drivers who fail to comply when requested. To date no non-compliance.                                                                                  | Use of powers to enforce engine switch-off via issue of fixed penalty notices.<br><br>Specifically on Castle Meadow & St Stephens where bus & taxi only traffic. Any extension of the LEZ would mean extension of engine switch off enforcement area.<br><br>No change to this. Though Norwich City Council are planning on writing to coach companies to remind them of the restrictions. |
| 7           | Signage informing engine switch- off enforcement.<br><br>Electronic displays at traffic lights giving waiting times.             | Public Information            | Other                                         | 2017                            | Ongoing<br>October 2018 for switch off on Castle Meadow | Norfolk County Council/Norwich City Council | Norfolk County Council/Norwich City Council | Not Funded     | £100k - £500k             | Planning                                                                            | Specific value not known but will contribute to overall reduction in NO <sub>2</sub> levels in city centre and surrounds. | Reduction of NO <sub>2</sub> levels in AQMA                                 | Ongoing - A review of technology available to display waiting times at traffic lights has been undertaken, which highlighted that this isn't currently an option to deliver in terms of available standards and legislation.          | New signage associated with enforcement of engine switch off educates road users and reinforces AQMA. Review has highlighted that this is not an option at present – shall keep under review                                                                                                                                                                                               |
| 8           | Assess opportunity for a zero-emission bus fleet to operate the Norwich Park & Ride service when the contract is renewed in 2023 | Promoting Travel Alternatives | Other                                         |                                 | March 2025                                              | Norfolk County Council                      | Norfolk County Council                      | Funded         | £1 million - £10 million  | Implementation                                                                      | Specific value not known but will contribute to overall reduction in NO <sub>2</sub> levels in city centre and surrounds. | Reduction in NO <sub>2</sub> levels in city centre and on busy feeder roads | Park & Ride patronage continues to struggle post-COVID operating at 40-50% pre-COVID levels.<br><br>A new Park & Ride contract will commence March 2025 – this operates using zero emission and Euro 6 buses, replacing Euro 5 buses. | Opportunities to operate all Park & Ride journeys using zero emission buses will be explored with the operators during the delivery of the contract.                                                                                                                                                                                                                                       |
| 9           | School Travel Plan                                                                                                               | Promoting Travel Alternatives | School Travel Plans                           | Ongoing                         | Ongoing                                                 | Norfolk County Council                      | Norfolk County Council                      | Funded         | £10 - £50k                | Implementation                                                                      | Specific value not known but will contribute to overall reduction in                                                      | Reduction in NO <sub>2</sub> levels in city centre and surrounds.           | A review is being undertaken to identify whether a comprehensive programme of support                                                                                                                                                 | County Council already promotes Modeshift Stars software with schools so they can                                                                                                                                                                                                                                                                                                          |

| Measure No. | Measure Title                                                    | Category                              | Classification                                                    | Year Measure Introduced in AQAP | Estimated / Actual Completion Date | Organisations Involved                      | Funding Source                              | Funding Status | Estimated Cost of Measure | Measure Status | Reduction in Pollutant / Emission from Measure                                                                | Key Performance Indicator                                     | Progress to Date                                                                                                                                                                                                                                                                                                                            | Comments / Barriers to Implementation                                                                                                                                                                                                                                                                                                                              |
|-------------|------------------------------------------------------------------|---------------------------------------|-------------------------------------------------------------------|---------------------------------|------------------------------------|---------------------------------------------|---------------------------------------------|----------------|---------------------------|----------------|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|             |                                                                  |                                       |                                                                   |                                 |                                    |                                             |                                             |                |                           |                | NO2 levels in city centre and surrounds.                                                                      |                                                               | can be offered to schools to support more pupils travelling to school actively.                                                                                                                                                                                                                                                             | generate and manage their own travel plans. Consideration will be given to whether school bus contracts can be amended on their renewal to utilise lower emission vehicles. Options being explored for all schools in Norfolk to provide information on mode travelled to school throughout the academic year to provide baseline data to measure progress against |
| 10          | West to East traffic restriction in Norwich City Centre          | Traffic Management                    | UTC, Congestion management, traffic reduction                     | 2020                            | Ongoing                            | Norfolk County Council                      | Norfolk County Council (TFC Funding)        | Funded         | £1 million - £10 million  | Planning       | Specific value not known but will contribute to overall reduction in NO2 levels in city centre and surrounds. | Reduction in NO <sub>2</sub> levels in the city and surrounds | The scheme is currently on hold                                                                                                                                                                                                                                                                                                             | This scheme has been put on hold due to local concerns around negative impacts on general traffic and taxis.                                                                                                                                                                                                                                                       |
| 11          | Revised layout in St Stephens Street/Red Lion Street             | Traffic Management                    | UTC, Congestion management, traffic reduction                     | 2020                            | 2023                               | Norfolk County Council                      | Norfolk County Council (TFC Funding)        | Funded         | £1 million - £10 million  | Completed      | Specific value not known but will contribute to overall reduction in NO <sub>2</sub> levels in city centre    | Reduction in NO <sub>2</sub> levels in the city and surrounds | The scheme is now completed                                                                                                                                                                                                                                                                                                                 | Provides substantially improved conditions for pedestrians and reduces congestion with buses                                                                                                                                                                                                                                                                       |
| 12          | Transport hubs at key transport interchanges                     | Transport Planning & Infrastructure   | Public transport improvements - interchange stations and services | 2020                            | 2027                               | Norfolk County Council                      | Norfolk County Council (TFC Funding)        | Funded         | £1 million - £10 million  | Implementation | Specific value not known but will contribute to overall reduction in NO <sub>2</sub> levels in city centre    | Reduction in NO <sub>2</sub> levels in the city and surrounds | Norwich Rail station works were completed July 2022. Norwich Bus Station works were completed 2024. Bowthorpe interchange works will be completed early-2025.                                                                                                                                                                               | Discussions ongoing regarding an improved transport interchange at the Norfolk & Norwich University Hospital.                                                                                                                                                                                                                                                      |
| 13          | Bus rapid transit                                                | Transport Planning and Infrastructure | Bus route improvements                                            | Ongoing                         | Ongoing                            | Norfolk County Council/Norwich City Council | Norfolk County Council/Norwich City Council | Funded         | >£10 million              | Implementation | Specific value not known but will contribute to overall reduction in NO2 levels in city centre and surrounds. | Reduced city centre congestion as well as wider network.      | Cromer Road and Aylsham Road bus lanes are complete. Dereham Road bus lanes will be completed in early-2025. Priority for bus movements was implemented at the Angel Road / Waterloo Road junction will be completed Spring 2025. Improvements to bus movements at the Yarmouth Road / Pound Lane junction are to be delivered Summer 2025. | Reallocation of road space to public transport divide's opinion and some proposals remain on hold due to specific objections at some sites.                                                                                                                                                                                                                        |
| 14          | Rationalising and simplifying of traffic on Prince of Wales Road | Traffic Management                    | UTC, Congestion management, traffic reduction                     | Long term                       |                                    | Norfolk County Council/Norwich City Council | Norfolk County Council/Norwich City Council | Funded         | >£10 million              | Planning       | Specific value not known but will contribute to overall reduction in NO <sub>2</sub> levels in city           | Reduced city centre congestion                                | Proposals to restrict eastbound traffic movement on St Andrews Street have been put on hold due to political concerns                                                                                                                                                                                                                       | This scheme has been put on hold due to local concerns around negative impacts on general traffic and taxis.                                                                                                                                                                                                                                                       |

| Measure No. | Measure Title                                                                                                                                       | Category                            | Classification | Year Measure Introduced in AQAP | Estimated / Actual Completion Date | Organisations Involved                      | Funding Source                              | Funding Status   | Estimated Cost of Measure | Measure Status | Reduction in Pollutant / Emission from Measure                                                                            | Key Performance Indicator                                                                | Progress to Date                                                                                                                                                        | Comments / Barriers to Implementation                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|----------------|---------------------------------|------------------------------------|---------------------------------------------|---------------------------------------------|------------------|---------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|             |                                                                                                                                                     |                                     |                |                                 |                                    |                                             |                                             |                  |                           |                | centre and surrounds.                                                                                                     |                                                                                          | around negative impacts on general traffic and taxis.                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 15          | Extension to Thickthorn Park & Ride                                                                                                                 | Promoting Travel Alternatives       | Other          | 2020                            | Ongoing                            | Norfolk County Council                      | Norfolk County Council (TFC Funding)        | Funded           | £1 million - £10 million  | Planning       | Specific value not known but will contribute to overall reduction in NO <sub>2</sub> levels in city centre                | Reduced city centre congestion as well as wider network.                                 | This scheme is on hold                                                                                                                                                  | Park & Ride patronage remains significantly below pre-COVID levels so the business case to extend this site is weakened. Opportunities to install EV charge points across Park & Ride sites is being examined.                                                                                                                                                                                                                                          |
| 16          | Extension to Postwick Park & Ride site                                                                                                              | Promoting Travel Alternatives       | Other          | TBC                             | TBC                                | Norfolk County Council                      | Norfolk County Council                      | Not Funded       | £1 million - £10 million  | Planning       | Specific value not known but will contribute to overall reduction in NO <sub>2</sub> levels in city centre                | Reduced city centre congestion as well as wider network.                                 | Services from the Postwick Park & Ride site are operating under the new Park & Ride contract from March 2025. Extension to this site is not currently being progressed. | Park & Ride patronage remains significantly below pre-COVID levels so the business case to extend this site is weakened                                                                                                                                                                                                                                                                                                                                 |
| 17          | Introduction of School Streets                                                                                                                      | Transport Planning & Infrastructure | Other          | 2021                            | Ongoing                            | Norfolk County Council/Norwich City Council | Norfolk County Council/Norwich City Council | Funded           | £50k - £100k              | Implementation | Specific value not known but will encourage corridors to be utilised by students/pupils                                   | Reduction in traffic levels, improved air quality and greater numbers of pupils walking. | A School Streets trial was undertaken across Greater Norwich in 2022 involving 6 schools. 1 School Street remains operational in Wymondham.                             | Support for schools to encourage more active travel to and from school is being reviewed.                                                                                                                                                                                                                                                                                                                                                               |
| 18          | Wayfinding. Investment in new and transformative infrastructure to encourage more sustainable modes of transport for commuting and leisure journeys | Transport Planning & Infrastructure | Other          | 2020                            | Ongoing                            | Norfolk County Council                      | Norfolk County Council (TFC Funding)        | Funded           | £100k - £500k             | Implementation | Specific value not known but will contribute to overall reduction in NO <sub>2</sub> levels in city centre and surrounds. | Reduction in NO <sub>2</sub> levels in the city and surrounds                            | Roll out of pedestrian wayfinding across greater Norwich is complete.                                                                                                   | Roll out of improved wayfinding for cycle routes remains ongoing.                                                                                                                                                                                                                                                                                                                                                                                       |
| 19          | Construction of final link of Northern Distributor Road (NDR) over River Wensum joining up with A47 West                                            | Transport Planning & Infrastructure | Other          | 2023                            | Ongoing                            | Norfolk County Council                      | Norfolk County Council                      | Partially Funded | >£10 million              | Planning       | Specific value not known but will contribute to overall reduction in NO <sub>2</sub> levels in city centre and surrounds. | Reduced city centre congestion as well as wider network.                                 | The planning application for the scheme has been withdrawn and discussions are underway with the Department for Transport on the way forward for the project.           | The Norwich Western Link remains a priority infrastructure project for the County Council. Advice from Natural England has changed during the development of the project and this now presents a significant impediment to delivering this scheme. The County Council has written to Ministers to stress that the need to deliver a transport intervention in this area to tackle existing transport issues and support planned growth has not changed. |

| Measure No. | Measure Title                                                                                            | Category                      | Classification                                                                                                                                                               | Year Measure Introduced in AQAP | Estimated / Actual Completion Date | Organisations Involved                      | Funding Source                                  | Funding Status | Estimated Cost of Measure | Measure Status | Reduction in Pollutant / Emission from Measure                                                                            | Key Performance Indicator                                                        | Progress to Date                                                                                 | Comments / Barriers to Implementation                                                                                                    |
|-------------|----------------------------------------------------------------------------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|------------------------------------|---------------------------------------------|-------------------------------------------------|----------------|---------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| 20          | Removal of private vehicle traffic from Tombland                                                         | Traffic Management            | Strategic highway improvements, Re-prioritising Road space away from cars, including Access management Selective vehicle priority, bus priority, high vehicle occupancy lane | Long Term                       | TBC                                | Norfolk County Council/Norwich City Council | Norfolk County Council/Norwich City Council     | Not Funded     | £1 million - £10 million  | Planning       | Specific value not known but will contribute to overall reduction in NO <sub>2</sub> levels in city centre and surrounds. | Reduced city centre congestion                                                   | Not Started                                                                                      | Longer term goal. Will be considered as part of the development of the Transport for Norwich Implementation Plan.                        |
| 21          | Education & information campaigns to encourage more responsible driving and the use of alternative modes | Promoting Travel Alternatives | Other                                                                                                                                                                        | Ongoing                         | Ongoing                            | Norfolk County Council/Norwich City Council | Norfolk County Council/Norwich City Council     | Funded         | £1 million - £10 million  | Implementation | Specific value not known but will contribute to overall reduction in NO <sub>2</sub> levels in city centre and surrounds. | Reduction of NO <sub>2</sub> levels in the city centre and surrounds             | Ongoing through delivery of engagement programmes at key employers in partnership with Sustrans. | Engagement with large employers is challenging in terms of accessing sites and engagement with staff.                                    |
| 22          | Installation of new Air Quality Monitoring Station                                                       | Other                         | Other                                                                                                                                                                        | 2021                            | 2023                               | Norfolk County Council/Norwich City Council | Norfolk County Council                          | Funded         | £10 - £50k                | Completed      | Replaced ageing AQS with more up to date technology. Implementation of measures more reliably quantified                  | Accurate Monitoring of Norwich Air Quality                                       | Completed                                                                                        | The old station was switched off in January 2024 and removed.                                                                            |
| 23          | Thorpe Road bus/cycle contraflow                                                                         | Traffic Management            | Strategic highway improvements, Re-prioritising Road space away from cars, including Access management Selective vehicle priority, bus priority, high vehicle occupancy lane | 2020                            | 2022                               | Norfolk County Council                      | Norfolk County Council (TFC Funding)            | Funded         | £1 million - £10 million  | Completed      | Specific value not known but will contribute to overall reduction in NO <sub>2</sub> levels in city centre                | Reduction of NO <sub>2</sub> levels in the city centre and surrounds             | Completed                                                                                        | Provides a substantially improved and more direct route for buses and cyclists travelling into the city centre along a key radial route. |
| 24          | CCAG Programmes                                                                                          | Promoting Travel Alternatives | Promotion of Cycling                                                                                                                                                         | 2014                            | 2020                               | Norfolk County Council/Norwich City Council | Norfolk County Council/Norwich City Council/DfT | Funded         | £1 million - £10 million  | Completed      | Specific value not known but will contribute to overall reduction in NO <sub>2</sub> levels in city centre and surrounds. | Reduction in vehicle use in the city centre. Increased number of people cycling. | Completed                                                                                        | Cycle routes have been extended and more joined up. All 2 orbital and 5 radial pedal ways now complete                                   |

## 2.3 PM<sub>2.5</sub> – Local Authority Approach to Reducing Emissions and/or Concentrations

As detailed in Policy Guidance LAQM.PG22 (Chapter 8) and the Air Quality Strategy<sup>9</sup>, local authorities are expected to work towards reducing emissions and/or concentrations of fine particulate matter (PM<sub>2.5</sub>). There is clear evidence that PM<sub>2.5</sub> (particulate matter smaller 2.5 micrometres) has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

Long term exposure to anthropogenic particulate air pollution is estimated to have an effect on mortality risks equivalent to a number of attributable deaths. The Public Health Outcome Framework (PHOF) indicator D01<sup>7</sup> gives an estimate for this value, down to local authority area. In fact air pollution is likely to contribute a small amount to the deaths of a larger number of exposed individuals rather than being solely responsible for the number of deaths equivalent to the calculated figure of attributable deaths. However, this attributable deaths value gives a measure of the importance of air pollution for a local authority. This relative risk forms the cause for action through all delivery partners to tackle air pollution in the area.

The fraction of mortality attributable to particulate air pollution for Norwich in 2023 was 5.6% which has declined since 2022's figure of 6.2% which is pleasing to see. Though this is still slightly higher than the average for Norfolk and England.

Primary PM<sub>2.5</sub> sources are from human activities like burning fuels, braking and various industrial processes as well as from natural sources and sea spray and dust. Domestic combustion contributed to 27% of emissions in 2021.<sup>4</sup>

There are also often widespread PM episodes in the spring, which is believed to be from the fertilisers spread on the fields across the near continent. The UK gets a blast of PM (nitrate and sulphate particles) when the wind is blowing off the continent which is beyond Local Authorities control. These episodes can sometimes last for a few days and can affect the daily mean for a few days.

There are also occasional PM peaks on bonfire night and New Year's Eve, local episodes, but these are too short to exceed the daily limit.

---

<sup>9</sup> Defra. Air Quality Strategy – Framework for Local Authority Delivery, August 2023

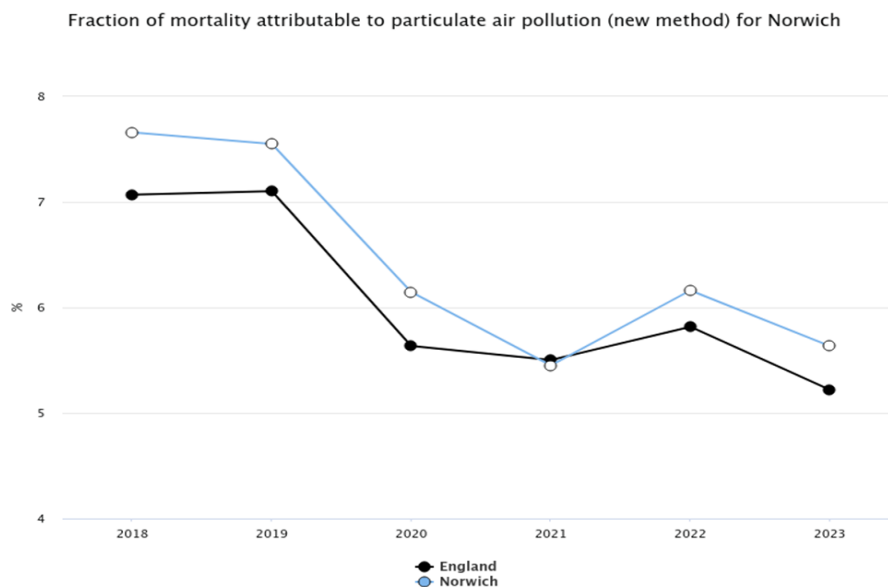
Norwich City Council currently only monitors for PM<sub>2.5</sub> at the Castle Meadow 2 (CM3) Air Quality Station and it also uses results from the Lakenfields (CM2) AURN station. We do not currently have any particulate monitoring in other areas of the city, though this is something that is being reviewed.

**Recent trend:** Could not be calculated

| Period | Norwich |       |       |              |              | Norfolk | England |
|--------|---------|-------|-------|--------------|--------------|---------|---------|
|        |         | Count | Value | 95% Lower CI | 95% Upper CI |         |         |
| 2018   | ○       | -     | 7.7%  | -            | -            | 7.2%    | 7.1%    |
| 2019   | ○       | -     | 7.6%  | -            | -            | 7.2%    | 7.1%    |
| 2020   | ○       | -     | 6.1%  | -            | -            | 5.7%    | 5.6%    |
| 2021   | ○       | -     | 5.5%  | -            | -            | 4.9%    | 5.5%    |
| 2022   | ○       | -     | 6.2%  | -            | -            | 5.4%    | 5.8%    |
| 2023   | ○       | -     | 5.6%  | -            | -            | 5.3%    | 5.2%    |

Source: Department for Environment, Food and Rural Affairs

The table above and graph below is taken from Fingertips<sup>10</sup> a website that provides public health data for the period 2018 to 2023. Note that this data has not been updated to reflect 2024 results.



<sup>10</sup>

<https://fingertips.phe.org.uk/search/particulate#page/4/gid/1/pat/502/par/E10000020/ati/501/are/E07000148/iid/93861/age/230/sex/4/cat/-1/ctp/-1/yr/1/cid/4/tbm/1>



Table A.8 and [Figure A.4](#) show the PM<sub>2.5</sub> monitoring results for the automatic stations Lakenfields (CM2) and Castle Meadow 2 (CM3). The PM<sub>2.5</sub> figures for 2024 have slightly increased at CM2 for 2023 and declined slightly at CM3.

Norwich City Council is taking the following measures to address PM<sub>2.5</sub>:

- **Real-Time Monitoring:** Automatic monitoring of PM<sub>2.5</sub> is carried out at the Automatic Urban and Rural Network (AURN) station (Norwich Lakenfields), which is an urban background site fitted with a FIDAS PM<sub>2.5</sub> analyser. Norwich City Council also has an automatic monitoring station which also has a FIDAS PM<sub>2.5</sub> analyser.
- **Air Quality Partnerships:** Norwich City Council are working with partners within the newly formed Norfolk Countywide Air Quality Group to ensure regular two-way engagement with representatives of Public Health Norfolk and Norfolk County Council Highways. This allows for an exchange of information and data, including that referenced in the Public Health Outcomes Framework. The Air Quality Group is looking for funding options through Defra and other sources with the view of carrying out more particulate monitoring across the County. The Group is also looking at a joint countywide communications programme.
- **Strategy Measures:** The measures listed within Table 2.2 ('Progress on Measures to Improve Air Quality') will have a positive contribution towards reducing PM<sub>2.5</sub> emissions and/or exposure, despite being primary orientated to NO<sub>2</sub>. For example, reducing the volume of road traffic, increasing pedestrian only areas and promoting walk and cycle routes will also reduce vehicle brake and tyre wear – a contributor to PM<sub>2.5</sub> emissions. The switch to electrically powered buses will avoid the particulate matter produced from diesel engines. It is however understood that, at least in Norwich, PM<sub>2.5</sub> can be a transboundary pollutant.
- **Planning Applications:** The minimisation of airborne particulates will continue to be an important factor in all planning application considerations. Developers are encouraged to be part of the Considerate Contractors Scheme and have a fully adhered to onsite Environmental Policy which includes dust suppression. During 2024 Norwich City Council have also been requesting that any large developments consider the 2040 target of 10µg/m<sup>3</sup> in their planning.
- **Smoke Control Areas:** Norwich City Council has currently declared three smoke control areas in King Street, Norwich Airport and Bowthorpe. In these areas they are only allowed to burn in DEFRA exempt appliances using DEFRA authorised fuels

which is enforced by Air Quality (Domestic Solid Fuels Standards) (England) Regulations 2020.

The pollutants emissions from burning wood and coal are harmful to everyone (especially the young, elderly and most vulnerable) and we shall be doing further education to our residents and businesses on how to be compliant. We are also updating the enforcement procedure for these areas as introduced in the Environment Act 2021.

We shall continue to use social media, Norwich City Council's monthly magazine and educational days such as Clean Air Day and Clean Air Night to broadcast the message. We are also working with the Air Quality Group to progress joint education projects.

- **Trading Standards:** Norwich City Council are working with Trading Standards to ensure retailers of wood and coal are complying with the new Air Quality (Domestic Solid Fuels Standards) (England) Regulations 2020.

### 2.3.1 Open Fires and Wood Burning Stoves

The use of open fires and wood-burning stoves has risen in popularity, particularly over recent years, causing emissions from domestic chimneys to increase. As a result, there is the potential for indoor air pollution to also increase. This is significant as pollutants such as PM<sub>2.5</sub> which are associated with wood burners and open fires can cause breathing problems such as asthma attacks and contribute to other health conditions.

Norwich City Council have made it a priority to identify all houses which have open fires as their primary source of heating, and especially those pertaining to their own housing stock. On the last assessment there were 32 wood burners/solid fuel appliances in Council owned properties.

Norwich City Council still owns its housing stock and in 2022 it was decided that:

- We no longer grant permission for wood burners or other solid fuel appliances for safety and environmental reasons.
- If a property containing a solid fuel appliance becomes empty the appliance will be removed and the chimney opening sealed before a new tenant moves in.
- If an existing appliance or chimney is found to be dangerous it will be removed.

Guidance on burning can be found [here](#).



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

This section sets out the monitoring undertaken within 2024 by Norwich City Council and how it compares with the relevant air quality objectives. In addition, monitoring results are presented for a five-year period between 2020 and 2024 to allow monitoring trends to be identified and discussed.

### 3.1 Summary of Monitoring Undertaken

#### 3.1.1 Automatic Monitoring Sites

Norwich City Council undertook automatic (continuous) monitoring at 1 site during 2024. Table A.1 in Appendix A shows the details of the automatic monitoring sites.

In January 2024 old Castle Meadow (CM1) Air Quality Station was switched off and decommissioned and left the new Air Quality Station on Castle Meadow, known as Castle Meadow 2 (CM3) as the sole AQS for Norwich from January 2024. There is also an AURN monitoring station within Norwich; Norwich Lakenfields (CM2).

The [Envista – Air Resources Manager](#) page presents automatic monitoring results for Norwich City Council, with automatic monitoring results also available through the [UK-Air website](#).

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

#### 3.1.2 Non-Automatic Monitoring Sites

Norwich city Council undertook non- automatic (i.e. passive) monitoring of NO<sub>2</sub> at 35 sites during 2024. Table A.2 in Appendix A presents the details of the non-automatic sites.

Maps showing the location of the monitoring sites are provided in [Appendix D](#). Further details on Quality Assurance/Quality Control (QA/QC) for the diffusion tubes, including bias adjustments and any other adjustments applied (e.g. annualisation and/or distance correction), are included in Appendix C.

## 3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias, annualisation (where the annual mean data capture is below 75% and greater than 25%), and distance correction. Further details on adjustments are provided in Appendix C.

### 3.2.1 Nitrogen Dioxide (NO<sub>2</sub>)

Table A.3 and Table A.4 in Appendix A compare the ratified and adjusted monitored NO<sub>2</sub> annual mean concentrations for the past five years with the air quality objective of 40µg/m<sup>3</sup>. Note that the concentration data presented represents the concentration at the location of the monitoring site, following the application of bias adjustment and annualisation, as required (i.e. the values are exclusive of any consideration to fall-off with distance adjustment).

For diffusion tubes, the full 2024 dataset of monthly mean values is provided in Appendix B. Note that the concentration data presented in Table B.1 includes distance corrected values, only where relevant.

Table A.5 in Appendix A compares the ratified continuous monitored NO<sub>2</sub> hourly mean concentrations for the past five years with the air quality objective of 200µg/m<sup>3</sup>, not to be exceeded more than 18 times per year.

During 2024, the maximum NO<sub>2</sub> annual mean concentration recorded at a diffusion tube site within the Central Norwich AQMA was 37.2 µg/ m<sup>3</sup> (DT11). Over the last five years, the NO<sub>2</sub> annual mean AQS objective (40 µg/ m<sup>3</sup>) has been exceeded at this site in 2021 and 2022, it was not exceeded in 2020 which could be attributed to covid restrictions though it was just under the limit at 39.4 µg/ m<sup>3</sup>. The drop below the objective in 2023 and 2024 is very promising, and with the roll out of the zero emission buses it is hoped the air quality in this area shall improve further, especially as it was this site that exceeded the annual mean and the reason the AQMA was created in 2012 with a maximum level of 52 µg/ m<sup>3</sup>.

DT11 was also the only diffusion tube within the AQMA that recorded an NO<sub>2</sub> annual mean concentration within 10% of the AQS objective which was 37.2 µg/ m<sup>3</sup>.

The maximum NO<sub>2</sub> annual mean concentration has fallen within the AQMA, indicating that there has been a reduction in NO<sub>2</sub> concentrations during 2024 in Norwich.

Of the Diffusion tube results for 2024 compared against the 2023 figures, out of the 35 locations, 29 locations saw NO<sub>2</sub> levels reduce, and the other 6 locations were new for 2024 or only had monitoring data for 2024. This is represented in the table below:

### Comparison of Diffusion Tubes – Increase/Decrease in 2023 and 2024

| Diffusion Tube ID   | 2023 | 2024 | Increase ↑ or Decrease ↓ |
|---------------------|------|------|--------------------------|
| DT1A, DT1B          | 26.6 | 23.7 | ↓                        |
| DT4A, DT4B, DT4C    | 8.5  | 7.7  | ↓                        |
| DT6                 | 23.1 | 20.0 | ↓                        |
| DT9                 | 31.1 | 26.9 | ↓                        |
| DT11                | 38.4 | 37.2 | ↓                        |
| DT13                | 36.8 | 26.2 | ↓                        |
| DT16                | 28.5 | 27.1 | ↓                        |
| DT19                | 25.6 | 24.2 | ↓                        |
| DT22                | 22.4 | 20.6 | ↓                        |
| DT25                | 26.2 | 23.4 | ↓                        |
| DT26A, DT26B, DT26C | 33.3 | 29.0 | ↓                        |
| DT29A, DT29B, DT29C | 28.6 | 20.2 | ↓                        |
| DT31A, DT31B, DT31C | 29.7 | 28.5 | ↓                        |
| DT34                | 30.2 | 24.0 | ↓                        |
| DT37                | 23.9 | 19.6 | ↓                        |
| DT39                | 19.1 | 17.7 | ↓                        |
| DT40                | 21.8 | 18.9 | ↓                        |

| Diffusion Tube ID | 2023 | 2024 | Increase ↑ or Decrease ↓ |
|-------------------|------|------|--------------------------|
| DT41              | 28.3 | 24.9 | ↓                        |
| DT42              | 25.6 | 23.1 | ↓                        |
| DT44              | 35.5 | 17.2 | ↓                        |
| DT45              | 21.8 | 19.9 | ↓                        |
| DT46              | 22.9 | 21.3 | ↓                        |
| DT47              | 20.5 | 17.9 | ↓                        |
| DT48              | 27.3 | 25.4 | ↓                        |
| DT49              | 29.2 | 27.3 | ↓                        |
| DT50              | 26.8 | 23.5 | ↓                        |
| DT52              | 16.9 | 14.3 | ↓                        |
| DT60              |      | 14.4 | New                      |
| DT61              | 18.2 | 13.3 | ↓                        |
| DT62              |      | 24.2 | New                      |
| DT63              |      | 13.8 | New                      |
| DT64              | 21.6 | 17.4 | ↓                        |
| DT65              |      | 41.0 | New                      |
| DT66              |      | 30.7 | New                      |
| DT67, DT68, DT69  |      | 22.5 | New                      |

The decrease in the levels is very likely to be due to the introduction of the 70 Zero emission buses to Norwich, it will be interesting to see if next year's figures continue this trend.

The two diffusion tubes showing the most significant reductions in NO<sub>2</sub> levels in 2024 were DT13 (Castle Meadow Middle) and DT44 (Botolph/Edwards Street). DT13 recorded a reduction of 10.6 µg/m<sup>3</sup>, while DT44 showed a substantial drop of 18.3 µg/m<sup>3</sup> compared to 2023. However, it's worth noting that the 2023 figures were annualised, which may have contributed to the apparent increase that year. For context, the 2022 level at DT44 was 20.7 µg/m<sup>3</sup>, just 3.5 µg/m<sup>3</sup> higher than the 17.2 µg/m<sup>3</sup> in 2024, suggesting a more gradual long-term improvement.

The reduction at DT13 (Castle Meadow) is particularly encouraging, as this location is restricted to buses and taxis. The significant drop in NO<sub>2</sub> levels provides a strong indication that the introduction of zero-emission electric buses has had a positive impact on air quality in this area.

Previously, diffusion tubes were located at the old air quality monitoring station on Castle Meadow. However, these were relocated to the new station in 2024, meaning there is no directly comparable data from earlier years to further reinforce these findings.

DT29A, B & C also saw a good reduction of 8.4 µg/m<sup>3</sup> which is at Chapelfield North. Changes to the highway layout at the Grapes Hill junction using Transforming Cities Fund (TCF) funding saw the removal of some traffic signals and changes to priority for traffic entering and leaving Chapelfield North. This has led to a reduction in traffic queuing on Chapelfield North and a smoother flow of traffic. Also, it is important to note that Chapelfield North is the main route out of the city centre for all buses travelling to the west of the city and that the majority of buses using Chapelfield North are now zero emission. Combined, these factors will have contributed significantly to the reduction at this site.

In 2023, we noted that DT49 (Queens Road North) would be kept under review, as it had shown an increase in NO<sub>2</sub> levels since its installation in 2020. At the time, we lacked pre-COVID data, making it difficult to determine whether the rise was part of a longer-term trend or a temporary fluctuation.

Encouragingly, the 2024 results show a decline of 1.9 µg/m<sup>3</sup> compared to 2023. However, the current level still remains above the 2020 baseline of 24.9 µg/m<sup>3</sup>, indicating that while progress has been made, further monitoring is needed to assess whether this downward trend will continue.

For the seven diffusion tube sites that are located outside of the AQMA (DT4A,B & C, DT40, DT52, DT65 & DT66), the maximum NO<sub>2</sub> annual mean concentration was 41 µg/m<sup>3</sup> in 2024. This was at a new location for 2024 and shall be kept under scrutiny in view of this exceedance.

DT40 St Stephens Road outside the AQMA saw a 2.9 µg/m<sup>3</sup> reduction to 18.9 µg/m<sup>3</sup> and DT52 saw a 2.6 µg/m<sup>3</sup> reduction so a good indication air quality is improving in the city outside the AQMA.

For diffusion tubes, the full 2024 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 which is for one location and that is DT65.

Paragraph 7.84 of LAQM TG22 states that “Where it is not possible to measure locations of relevant exposure, for the purposes of LAQM, distance correction can be applied to monitoring locations that record an annual mean concentration above the NO<sub>2</sub> annual objective of 40µg/m<sup>3</sup>. It is also recommended that this process be applied to monitoring locations that record an annual mean concentration that is within 10% of the NO<sub>2</sub> annual objective of 40µg/m<sup>3</sup> (i.e. above 36µg/m<sup>3</sup>), to account for the inherent uncertainty in diffusion tube monitoring concentration data.”

Therefore, DT65 has been distance corrected as the annual mean concentration was 41 µg/m<sup>3</sup> which is above the NO<sub>2</sub> annual objective and the distance corrected value for this location is 36.5 µg/m<sup>3</sup>.

At the triplicate site DT31 (DT31A, DT31B, DT31C), a peak nitrogen dioxide (NO<sub>2</sub>) concentration of 62.3 µg/m<sup>3</sup> was recorded in March. This appears to have been an isolated and abnormal event, as subsequent measurements for the remainder of the year were significantly lower, typically ranging between 20 and 30 µg/m<sup>3</sup>.

Notably, two of the three diffusion tubes at this site recorded elevated values (DT31A - 75.5 µg/m<sup>3</sup> and DT31B - 77.8 µg/m<sup>3</sup>), while the third tube measured a much lower concentration of DT31C - 33.6 µg/m<sup>3</sup>, suggesting a possible anomaly or inconsistency in the data.

The next highest reading across all sites was at DT65, which recorded 54.9 µg/m<sup>3</sup>, remaining below the 60 µg/m<sup>3</sup> threshold.

Given the overall data trends and the isolated nature of the March peak, it is unlikely that the annual mean NO<sub>2</sub> concentration or the hourly mean limit was exceeded at these monitoring sites.

The annual mean NO<sub>2</sub> concentration recorded at the new Castle Meadow 2 Air Quality Station (CM3) was 22.0 µg/m<sup>3</sup> which is recorded in [Table A.3](#). this is lower than that recorded in the previous reporting year. Though the station was only in operation from July 2023 so the previous years results had been annualised. The reduction in NO<sub>2</sub> may also be a clear indication that the electric buses are having a positive impact of the air quality on Castle Meadow. CM3 is sited on the southern end of castle meadow and is plotted on map in Appendix D. This site was chosen due to availability of space along Castle Meadow, and it is at a more central location.

At the Norwich Lakenfields urban background AURN monitoring site (CM2), the annual mean NO<sub>2</sub> concentration (8.5 µg/ m<sup>3</sup>) stayed the same as that in 2023. There is no clear evidence to why this is at this time, though it could be attributed to the increase in electric vehicles in the area.

[Table A.5](#) in Appendix A compares the ratified continuous monitored NO<sub>2</sub> hourly mean concentrations for the past five years with the air quality objective of 200µg/m<sup>3</sup>, not to be exceeded more than 18 times per year.

The AQS objective for the NO<sub>2</sub> hourly mean concentration was not exceeded at any of the two automatic monitoring stations during 2024. A maximum NO<sub>2</sub> hourly mean concentration of 82 µg/m<sup>3</sup> with 99.7% data capture was recorded at CM3. And at CM2 the NO<sub>2</sub> hourly mean concentration was 45 µg/m<sup>3</sup> recorded as a 98<sup>th</sup> percentile as there was only 64.2% data capture. As there was only 64.2% valid data capture for the Lakenfields AQS for NO<sub>2</sub> and as this was below 75% these results were annualised see [Table C5](#).

This is especially relevant for the Castle Meadow 2 (CM3) automatic monitoring analyser as this site is located in a area where pedestrians may stay for one hour or more.

### 3.2.2 Particulate Matter (PM<sub>10</sub>)

[Table A.6](#) in Appendix A: Monitoring Results compares the ratified and adjusted monitored PM<sub>10</sub> annual mean concentrations over the past five years with the air quality objective of 40 µg/m<sup>3</sup>.

At the Castle Meadow 2 (CM3) automatic monitoring site, the 2024 annual mean PM<sub>10</sub> concentration was 14.5 µg/m<sup>3</sup>, slightly higher than the 13.8 µg/m<sup>3</sup> recorded in 2023. However, this remains well below the air quality objective.

At the AURN Norwich Lakenfields (CM2) site, the annual mean PM<sub>10</sub> concentration was 11.1 µg/m<sup>3</sup>, a reduction of 0.7 µg/m<sup>3</sup> from the 2023 level of 11.8 µg/m<sup>3</sup>. This is the lowest value recorded in the past five years, down from 14.0 µg/m<sup>3</sup> in 2022.

Table A.7 in Appendix A compares the ratified daily mean PM<sub>10</sub> concentrations with the air quality objective of 50 µg/m<sup>3</sup>, which must not be exceeded more than 35 times per year.

At Castle Meadow 2 (CM3), there were no exceedances of the 24-hour mean limit. The highest recorded value was 48.9 µg/m<sup>3</sup>.

At the Norwich Lakenfields AURN (CM2) site, the maximum daily mean was 41.1 µg/m<sup>3</sup>, also below the threshold.

No automatic monitoring stations exceeded either the PM<sub>10</sub> 24-hour mean limit of 50 µg/m<sup>3</sup> or the annual exceedance allowance of 35 days. The data confirms compliance with both the annual and daily PM<sub>10</sub> objectives across Norwich in 2024.

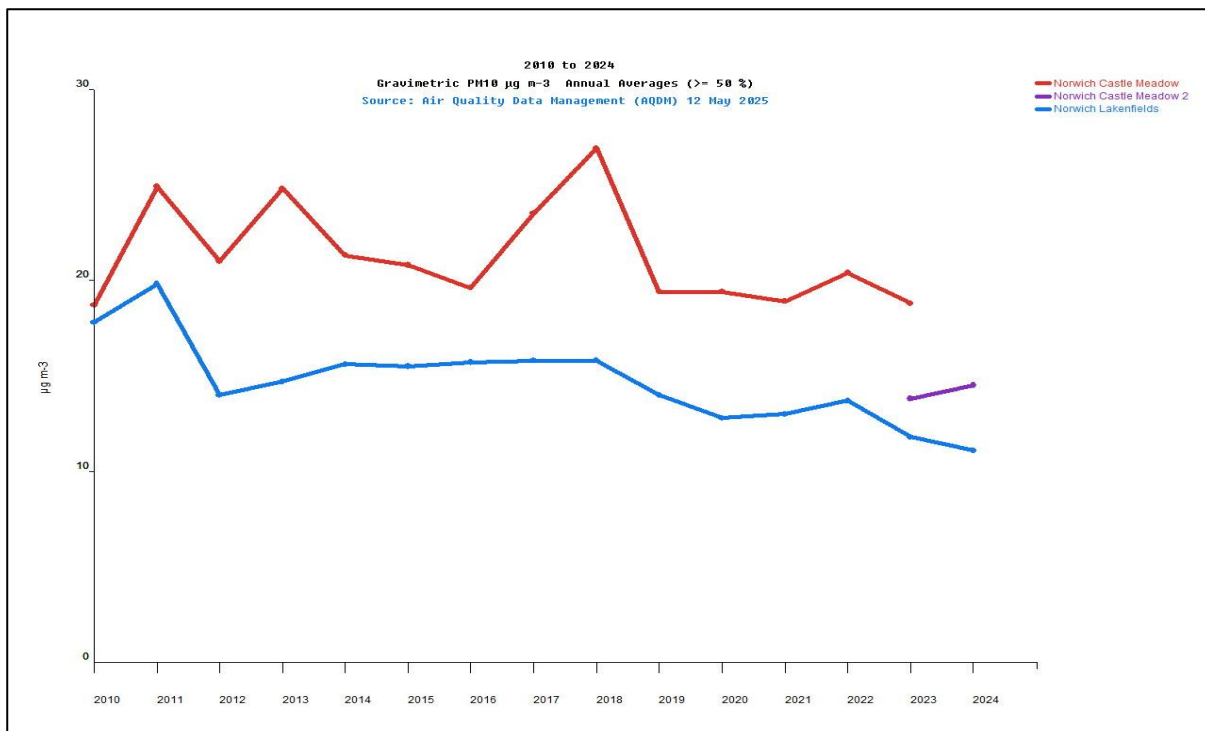
A chart produced by Air Quality Data Management (AQDM) shows Gravimetric PM<sub>10</sub> Annual Averages (µg/m<sup>3</sup>) from 2010 to 2024. The data indicates:

- A reduction in PM<sub>10</sub> levels since 2022
- Significantly lower PM<sub>10</sub> concentrations at Castle Meadow 2 compared to the former Castle Meadow site, likely due to differences in monitoring locations and equipment (the old TEOM monitor vs. the new AQS)

The new AQS for particulates was commissioned in March 2023, so while the long-term trend is still developing, confidence in the accuracy of the results has improved.

Currently, PM<sub>10</sub> is only monitored at automatic stations in Norwich. However, the City Council is actively exploring funding opportunities to expand the monitoring network and include additional locations within the AQMA.





### 3.2.3 Particulate Matter (PM<sub>2.5</sub>)

[Table A.8](#) in Appendix A presents the ratified and adjusted monitored PM<sub>2.5</sub> annual mean concentrations for the past five years.

At the Castle Meadow 2 (CM3) automatic monitoring site, the 2024 annual mean PM<sub>2.5</sub> concentration was 8.6 µg/m<sup>3</sup>, a slight increase of 0.4 µg/m<sup>3</sup> from 8.2 µg/m<sup>3</sup> in 2023.

This may be attributed to the FIDAS monitor, which was installed in March 2023, meaning a full year of data was not available. The long-term trend for PM<sub>2.5</sub> at this site has not yet been established, and next year's results will provide a clearer picture.

At the AURN Norwich Lakenfields (CM2) site, the annual mean PM<sub>2.5</sub> concentration was 7.2 µg/m<sup>3</sup>, a slight decrease of 0.4 µg/m<sup>3</sup> from 7.6 µg/m<sup>3</sup> in 2023.

Both sites remained well below the annual air quality objective of 20 µg/m<sup>3</sup>.

A chart produced by Air Quality Data Management (AQDM) shows Gravimetric PM<sub>2.5</sub> Annual Averages (µg/m<sup>3</sup>) from 2010 to 2024 for:

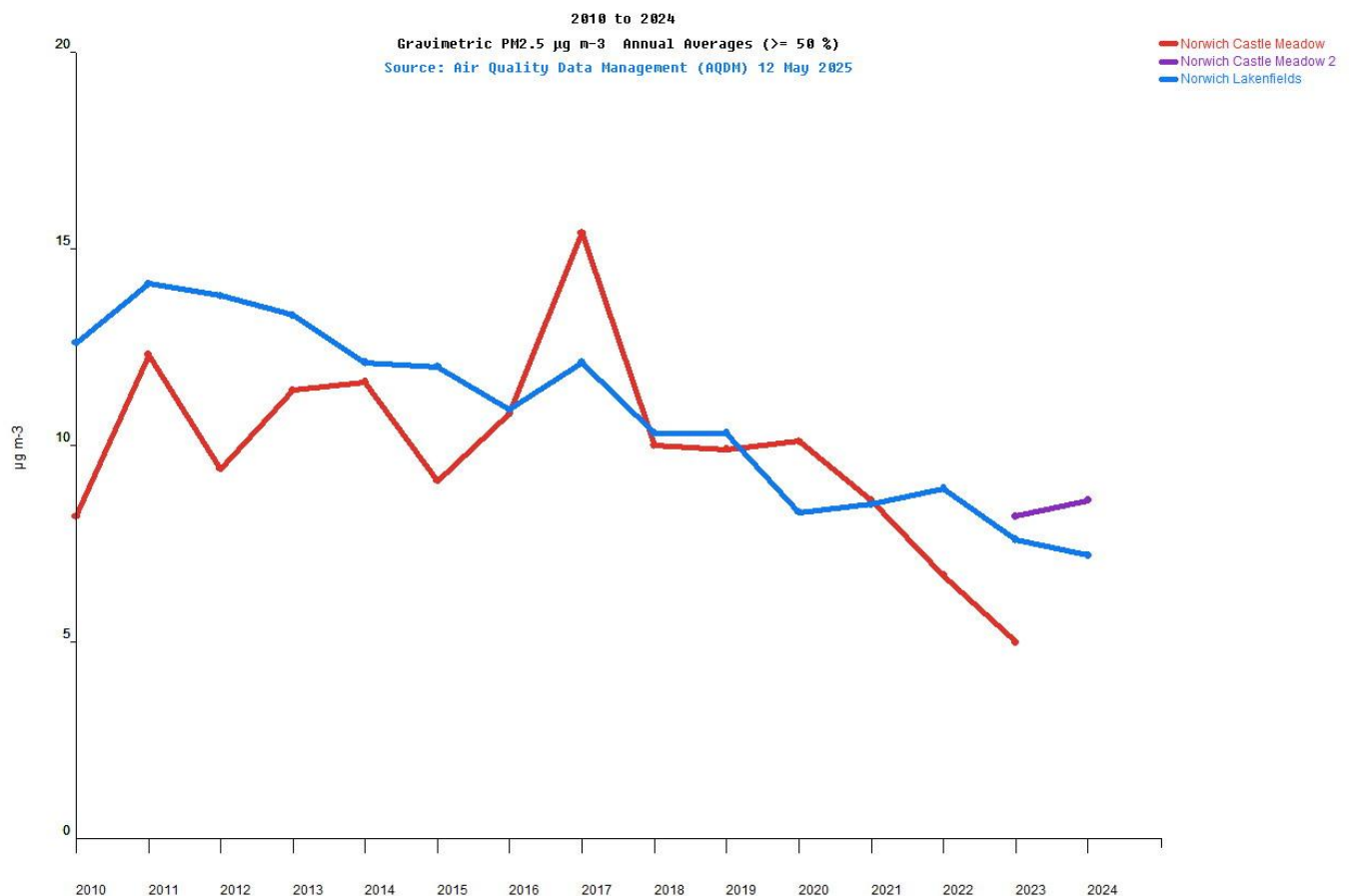
- Castle Meadow (decommissioned in January 2024)
- Norwich Lakenfields (CM2)
- Castle Meadow 2 (CM3)

The data indicates a downward trend since 2022. However, because Castle Meadow 2 was only commissioned for particulate monitoring in March 2023, a full year of data is not yet available.

The previous TEOM monitor at the old Castle Meadow site was not equivalent to the reference measurement method, but due to the long history of data, its results were still useful for tracking PM<sub>2.5</sub> trends. The new FIDAS monitor provides more accurate and robust measurements.

It's also important to note that CM3 is located in a different area than CM1, so variations in PM<sub>2.5</sub> levels may reflect differences in local activity and emissions.

Currently, PM<sub>2.5</sub> is only monitored at automatic stations in Norwich. The City Council is actively exploring funding opportunities to expand the monitoring network and include additional locations within the AQMA, aiming to gain a more comprehensive understanding of PM<sub>2.5</sub> levels across the city.



## Appendix A: Monitoring Results

**Table A.1 – Details of Automatic Monitoring Sites**

| Site ID | Site Name       | Site Type        | X OS Grid Ref (Easting) | Y OS Grid Ref (Northing) | Pollutants Monitored                                   | In AQMA? | Which AQMA? <sup>(1)</sup> | Monitoring Technique             | Distance to Relevant Exposure (m) <sup>(2)</sup> | Distance to kerb of nearest road (m) <sup>(1)</sup> | Inlet Height (m) |
|---------|-----------------|------------------|-------------------------|--------------------------|--------------------------------------------------------|----------|----------------------------|----------------------------------|--------------------------------------------------|-----------------------------------------------------|------------------|
| CM2     | Lakenfields     | Urban Background | 623637                  | 306940                   | NO <sub>2</sub> , PM <sub>10</sub> , PM <sub>2.5</sub> | No       | Central                    | Chemiluminescent (thermo);FDMS   | 10.0                                             | 1.5                                                 | 2.5              |
| CM3     | Castle Meadow 2 | Kerbside         | 623112                  | 308532                   | NO <sub>2</sub> , PM <sub>10</sub> , PM <sub>2.5</sub> | Yes      | Central                    | Chemiluminescent (APNA-370);FDMS | 4.0                                              | 1.0                                                 | 1.8              |

**Notes:**

(1) N/A if not applicable

(2) 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).

**Table A.2 – Details of Non-Automatic Monitoring Sites**

| Diffusion Tube ID | Site Name       | Site Type        | X OS Grid Ref (Easting) | Y OS Grid Ref (Northing) | Pollutants Monitored | In AQMA? Which AQMA? | Distance to Relevant Exposure (m) <sup>(1)</sup> | Distance to kerb of nearest road (m) <sup>(2)</sup> | Tube Co-located with a Continuous Analyser? | Tube Height (m) |
|-------------------|-----------------|------------------|-------------------------|--------------------------|----------------------|----------------------|--------------------------------------------------|-----------------------------------------------------|---------------------------------------------|-----------------|
| DT1A, DT1B        | 256 King St B   | Roadside         | 623863                  | 307679                   | NO <sub>2</sub>      | Yes, Norwich         | 0.0                                              | 3.5                                                 | No                                          | 1.7             |
| DT4A, DT4B, DT4C  | Lakenfields AQS | Urban Background | 623681                  | 307016                   | NO <sub>2</sub>      | No, Urban Background | 20.0                                             | 1.5                                                 | Yes                                         | 2.5             |

| Diffusion Tube ID   | Site Name              | Site Type | X OS Grid Ref (Easting) | Y OS Grid Ref (Northing) | Pollutants Monitored | In AQMA? Which AQMA? | Distance to Relevant Exposure (m) <sup>(1)</sup> | Distance to kerb of nearest road (m) <sup>(2)</sup> | Tube Co-located with a Continuous Analyser? | Tube Height (m) |
|---------------------|------------------------|-----------|-------------------------|--------------------------|----------------------|----------------------|--------------------------------------------------|-----------------------------------------------------|---------------------------------------------|-----------------|
| DT6                 | 130 Magdalen St        | Roadside  | 623160                  | 309550                   | NO <sub>2</sub>      | Yes, Norwich         | 0.0                                              | 4.0                                                 | No                                          | 2.5             |
| DT9                 | 13 St Augustines St    | Kerbside  | 622906                  | 309496                   | NO <sub>2</sub>      | Yes, Norwich         | 1.0                                              | 1.5                                                 | No                                          | 2.5             |
| DT11                | 52 St Augustines St    | Kerbside  | 622826                  | 309573                   | NO <sub>2</sub>      | Yes, Norwich         | 0.0                                              | 1.0                                                 | No                                          | 2.5             |
| DT13                | Castle Meadow (Middle) | Roadside  | 623141                  | 308607                   | NO <sub>2</sub>      | Yes, Norwich         | 0.0                                              | 2.5                                                 | No                                          | 2.5             |
| DT16                | Zipfel House           | Roadside  | 623186                  | 309650                   | NO <sub>2</sub>      | Yes, Norwich         | 0.0                                              | 3.0                                                 | No                                          | 2.3             |
| DT19                | 27 Cattle Market St    | Roadside  | 623321                  | 308431                   | NO <sub>2</sub>      | Yes, Norwich         | 0.0                                              | 2.0                                                 | No                                          | 2.6             |
| DT22                | Carrow Bridge House    | Roadside  | 623901                  | 307710                   | NO <sub>2</sub>      | Yes, Norwich         | 0.0                                              | 5.0                                                 | No                                          | 2.5             |
| DT25                | Bargate Court          | Roadside  | 623422                  | 309388                   | NO <sub>2</sub>      | Yes, Norwich         | 0.0                                              | 4.0                                                 | No                                          | 2.4             |
| DT26A, DT26B, DT26C | 3 Riverside Rd         | Roadside  | 623870                  | 308516                   | NO <sub>2</sub>      | Yes, Norwich         | 0.0                                              | 3.0                                                 | No                                          | 2.5             |
| DT29A, DT29B, DT29C | Chapelfield North      | Kerbside  | 622532                  | 308490                   | NO <sub>2</sub>      | Yes, Norwich         | 1.5                                              | 1.0                                                 | No                                          | 2.5             |
| DT31A, DT31B, DT31C | Quantrell House        | Kerbside  | 623380                  | 307700                   | NO <sub>2</sub>      | Yes, Norwich         | 0.0                                              | 3.0                                                 | No                                          | 2.3             |
| DT34                | 41 St Stephens Street  | Kerbside  | 622898                  | 308114                   | NO <sub>2</sub>      | Yes, Norwich         | 10.0                                             | 0.5                                                 | No                                          | 2.3             |

| Diffusion Tube ID | Site Name                    | Site Type | X OS Grid Ref (Easting) | Y OS Grid Ref (Northing) | Pollutants Monitored | In AQMA? Which AQMA? | Distance to Relevant Exposure (m) <sup>(1)</sup> | Distance to kerb of nearest road (m) <sup>(2)</sup> | Tube Co-located with a Continuous Analyser? | Tube Height (m) |
|-------------------|------------------------------|-----------|-------------------------|--------------------------|----------------------|----------------------|--------------------------------------------------|-----------------------------------------------------|---------------------------------------------|-----------------|
| DT37              | 7a Gunns Court               | Kerbside  | 622492                  | 308520                   | NO <sub>2</sub>      | Yes, Norwich         | 3.0                                              | 2.5                                                 | No                                          | 2.3             |
| DT39              | 49 Duke St                   | Kerbside  | 622884                  | 309082                   | NO <sub>2</sub>      | Yes, Norwich         | 0.0                                              | 1.0                                                 | No                                          | 2.5             |
| DT40              | St Stephens Rd (Kingsley Rd) | Roadside  | 622695                  | 307855                   | NO <sub>2</sub>      | No                   | 1.5                                              | 2.0                                                 | No                                          | 2.2             |
| DT41              | Magdalen St (RSPCA)          | Roadside  | 623148                  | 309277                   | NO <sub>2</sub>      | Yes, Norwich         | 1.5                                              | 3.5                                                 | No                                          | 2.5             |
| DT42              | Magdalen St (Fly Over)       | Roadside  | 623151                  | 309326                   | NO <sub>2</sub>      | Yes, Norwich         | 25.0                                             | 2.5                                                 | No                                          | 2.5             |
| DT44              | Botolph/Edwards St           | Roadside  | 622910                  | 309391                   | NO <sub>2</sub>      | Yes, Norwich         | 20.0                                             | 2.0                                                 | No                                          | 2.2             |
| DT45              | Pitt St W                    | Roadside  | 622904                  | 309418                   | NO <sub>2</sub>      | Yes, Norwich         | 25.0                                             | 2.2                                                 | No                                          | 2.5             |
| DT46              | Pitt St E                    | Roadside  | 622987                  | 309486                   | NO <sub>2</sub>      | Yes, Norwich         | 20.0                                             | 2.1                                                 | No                                          | 2.3             |
| DT47              | Duke St/St Crispins          | Roadside  | 622869                  | 309187                   | NO <sub>2</sub>      | Yes, Norwich         | 27.0                                             | 2.5                                                 | No                                          | 2.4             |
| DT48              | Riverside/Aspland            | Roadside  | 623878                  | 308532                   | NO <sub>2</sub>      | Yes, Norwich         | 0.0                                              | 1.2                                                 | No                                          | 2.2             |
| DT49              | Queens Rd N                  | Roadside  | 623480                  | 307679                   | NO <sub>2</sub>      | Yes, Norwich         | 0.0                                              | 2.0                                                 | No                                          | 2.0             |
| DT50              | Queens Rd S                  | Roadside  | 623474                  | 307692                   | NO <sub>2</sub>      | Yes, Norwich         | 0.0                                              | 1.1                                                 | No                                          | 2.2             |
| DT52              | 73 Heigham Road              | Roadside  | 621958                  | 309000                   | NO <sub>2</sub>      | No                   | 0.0                                              | 5.0                                                 | No                                          | 1.8             |

| Diffusion Tube ID | Site Name                      | Site Type | X OS Grid Ref (Easting) | Y OS Grid Ref (Northing) | Pollutants Monitored | In AQMA? Which AQMA? | Distance to Relevant Exposure (m) <sup>(1)</sup> | Distance to kerb of nearest road (m) <sup>(2)</sup> | Tube Co-located with a Continuous Analyser? | Tube Height (m) |
|-------------------|--------------------------------|-----------|-------------------------|--------------------------|----------------------|----------------------|--------------------------------------------------|-----------------------------------------------------|---------------------------------------------|-----------------|
| DT60              | Forum Car Park, Bethel St      | Roadside  | 622797                  | 308454                   | NO <sub>2</sub>      | Yes, Norwich         | 1.0                                              | 1.0                                                 | No                                          | 2.3             |
| DT61              | Aldwych House, Bethel St       | Roadside  | 622655                  | 308506                   | NO <sub>2</sub>      | Yes, Norwich         | 2.0                                              | 2.0                                                 | No                                          | 2.4             |
| DT62              | Chapelfield North/Cleveland Rd | Roadside  | 622497                  | 308499                   | NO <sub>2</sub>      | Yes, Norwich         | 9.0                                              | 1.0                                                 | No                                          | 2.3             |
| DT63              | 53 St Giles St                 | Roadside  | 622638                  | 308595                   | NO <sub>2</sub>      | Yes, Norwich         | 2.0                                              | 0.5                                                 | No                                          | 2.5             |
| DT64              | 28 St Giles St                 | Roadside  | 622788                  | 308569                   | NO <sub>2</sub>      | Yes, Norwich         | 2.0                                              | 1.5                                                 | No                                          | 2.4             |
| DT65              | Outside 72 Bracondale          | Roadside  | 624050                  | 307313                   | NO <sub>2</sub>      | No                   | 2.2                                              | 3.2                                                 | No                                          | 2.5             |
| DT66              | Opposite 72 Bracondale         | Roadside  | 624068                  | 307319                   | NO <sub>2</sub>      | No                   | 14.9                                             | 2.2                                                 | No                                          | 2.3             |
| DT67, DT68, DT69  | Castle Meadow 2                | Roadside  | 623099                  | 308478                   | NO <sub>2</sub>      | Yes, Norwich         | 5.2                                              | 1.9                                                 | Yes                                         | 1.8             |

**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<sub>2</sub> Monitoring Results: Automatic Monitoring (µg/m<sup>3</sup>)**

| SFite ID | X OS Grid Ref (Easting) | Y OS Grid Ref (Northing) | Site Type        | Valid Data Capture for Monitoring Period (%) <sup>(1)</sup> | Valid Data Capture 2024 (%) <sup>(2)</sup> | 2020 | 2021 | 2022 | 2023  | 2024 |
|----------|-------------------------|--------------------------|------------------|-------------------------------------------------------------|--------------------------------------------|------|------|------|-------|------|
| CM2      | 623637                  | 306940                   | Urban Background | 64.2                                                        | 64.2                                       | 10   | 10   | 10   | 8.5   | 8.5  |
| CM3      | 623112                  | 308532                   | Kerbside         | 99.7                                                        | 99.7                                       |      |      |      | 24.14 | 22.0 |

☒ Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22

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

☒ Where exceedances of the NO<sub>2</sub> annual mean objective occur at locations not representative of relevant exposure, the fall-off with distance concentration has been calculated and reported concentration provided in brackets for 2024.

#### Notes:

The annual mean concentrations are presented as µg/m<sup>3</sup>.

Exceedances of the NO<sub>2</sub> annual mean objective of 40µg/m<sup>3</sup> are shown in **bold**.

All means have been “annualised” as per LAQM.TG22 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

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

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



**Table A.4 – Annual Mean NO<sub>2</sub> Monitoring Results: Non-Automatic Monitoring (µg/m<sup>3</sup>)**

| Diffusion Tube ID   | X OS Grid Ref (Easting) | Y OS Grid Ref (Northing) | Site Type        | Valid Data Capture for Monitoring Period (%) <sup>(1)</sup> | Valid Data Capture 2024 (%) <sup>(2)</sup> | 2020 | 2021        | 2022        | 2023 | 2024 |
|---------------------|-------------------------|--------------------------|------------------|-------------------------------------------------------------|--------------------------------------------|------|-------------|-------------|------|------|
| DT1A, DT1B          | 623863                  | 307679                   | Roadside         | 100.0                                                       | 100.0                                      | 25.6 | 25.7        | 27.1        | 26.6 | 23.7 |
| DT4A, DT4B, DT4C    | 623681                  | 307016                   | Urban Background | 100.0                                                       | 100.0                                      | 10.0 | 9.8         | 8.5         | 8.5  | 7.7  |
| DT6                 | 623160                  | 309550                   | Roadside         | 100.0                                                       | 84.9                                       | 21.7 | 21.8        | 21.9        | 23.1 | 20.0 |
| DT9                 | 622906                  | 309496                   | Kerbside         | 100.0                                                       | 100.0                                      | 33.0 | 32.8        | 34.3        | 31.1 | 26.9 |
| DT11                | 622826                  | 309573                   | Kerbside         | 100.0                                                       | 100.0                                      | 39.4 | <b>40.2</b> | <b>40.3</b> | 38.4 | 37.2 |
| DT13                | 623141                  | 308607                   | Roadside         | 100.0                                                       | 81.2                                       | 35.5 | 36.4        | 34.1        | 36.8 | 26.2 |
| DT16                | 623186                  | 309650                   | Roadside         | 100.0                                                       | 100.0                                      | 30.5 | 28.6        | 28.8        | 28.5 | 27.1 |
| DT19                | 623321                  | 308431                   | Roadside         | 100.0                                                       | 58.6                                       | 22.9 | 23.7        | 25.9        | 25.6 | 24.2 |
| DT22                | 623901                  | 307710                   | Roadside         | 100.0                                                       | 100.0                                      | 21.7 | 21.6        | 20.9        | 22.4 | 20.6 |
| DT25                | 623422                  | 309388                   | Roadside         | 100.0                                                       | 82.8                                       | 25.9 | 25.9        | 24.8        | 26.2 | 23.4 |
| DT26A, DT26B, DT26C | 623870                  | 308516                   | Roadside         | 100.0                                                       | 100.0                                      | 32.6 | 30.6        | 27.2        | 33.3 | 29.0 |

| Diffusion Tube ID   | X OS Grid Ref (Easting) | Y OS Grid Ref (Northing) | Site Type | Valid Data Capture for Monitoring Period (%) <sup>(1)</sup> | Valid Data Capture 2024 (%) <sup>(2)</sup> | 2020 | 2021 | 2022 | 2023 | 2024 |
|---------------------|-------------------------|--------------------------|-----------|-------------------------------------------------------------|--------------------------------------------|------|------|------|------|------|
| DT29A, DT29B, DT29C | 622532                  | 308490                   | Kerbside  | 100.0                                                       | 100.0                                      | 29.8 | 29.4 | 27.7 | 28.6 | 20.2 |
| DT31A, DT31B, DT31C | 623380                  | 307700                   | Kerbside  | 100.0                                                       | 92.5                                       | 29.9 | 28.0 | 28.8 | 29.7 | 28.5 |
| DT34                | 622898                  | 308114                   | Kerbside  | 100.0                                                       | 90.3                                       | 29.2 | 26.4 | 23.9 | 30.2 | 24.0 |
| DT37                | 622492                  | 308520                   | Kerbside  | 100.0                                                       | 100.0                                      | 24.6 | 22.6 | 23.4 | 23.9 | 19.6 |
| DT39                | 622884                  | 309082                   | Kerbside  | 100.0                                                       | 100.0                                      | 24.6 | 22.6 | 23.4 | 19.1 | 17.7 |
| DT40                | 622695                  | 307855                   | Roadside  | 100.0                                                       | 90.6                                       | 21.5 | 21.3 | 19.8 | 21.8 | 18.9 |
| DT41                | 623148                  | 309277                   | Roadside  | 100.0                                                       | 100.0                                      | 27.4 | 29.4 | 28.2 | 28.3 | 24.9 |
| DT42                | 623151                  | 309326                   | Roadside  | 100.0                                                       | 90.6                                       | 21.4 | 27.4 | 26.7 | 25.6 | 23.1 |
| DT44                | 622910                  | 309391                   | Roadside  | 100.0                                                       | 100.0                                      | 22.5 | 21.3 | 20.7 | 35.5 | 17.2 |
| DT45                | 622904                  | 309418                   | Roadside  | 100.0                                                       | 100.0                                      | 25.4 | 22.7 | 22.5 | 21.8 | 19.9 |
| DT46                | 622987                  | 309486                   | Roadside  | 100.0                                                       | 92.5                                       | 25.4 | 23.9 | 24.0 | 22.9 | 21.3 |
| DT47                | 622869                  | 309187                   | Roadside  | 100.0                                                       | 90.6                                       | 19.8 | 22.1 | 20.7 | 20.5 | 17.9 |

| Diffusion Tube ID | X OS Grid Ref (Easting) | Y OS Grid Ref (Northing) | Site Type | Valid Data Capture for Monitoring Period (%) <sup>(1)</sup> | Valid Data Capture 2024 (%) <sup>(2)</sup> | 2020 | 2021 | 2022 | 2023 | 2024        |
|-------------------|-------------------------|--------------------------|-----------|-------------------------------------------------------------|--------------------------------------------|------|------|------|------|-------------|
| DT48              | 623878                  | 308532                   | Roadside  | 100.0                                                       | 75.0                                       | 27.3 | 26.8 | 23.0 | 27.3 | 25.4        |
| DT49              | 623480                  | 307679                   | Roadside  | 100.0                                                       | 100.0                                      | 24.9 | 24.7 | 26.7 | 29.2 | 27.3        |
| DT50              | 623474                  | 307692                   | Roadside  | 100.0                                                       | 80.9                                       | 25.3 | 24.2 | 25.5 | 26.8 | 23.5        |
| DT52              | 621958                  | 309000                   | Roadside  | 100.0                                                       | 100.0                                      |      |      | 16.0 | 16.9 | 14.3        |
| DT60              | 622797                  | 308454                   | Roadside  | 100.0                                                       | 82.5                                       |      |      |      |      | 14.4        |
| DT61              | 622655                  | 308506                   | Roadside  | 100.0                                                       | 100.0                                      |      |      |      | 18.2 | 13.3        |
| DT62              | 622497                  | 308499                   | Roadside  | 100.0                                                       | 92.5                                       |      |      |      |      | 24.2        |
| DT63              | 622638                  | 308595                   | Roadside  | 100.0                                                       | 75.0                                       |      |      |      |      | 13.8        |
| DT64              | 622788                  | 308569                   | Roadside  | 100.0                                                       | 83.1                                       |      |      |      | 21.6 | 17.4        |
| DT65              | 624050                  | 307313                   | Roadside  | 100.0                                                       | 100.0                                      |      |      |      |      | <b>41.0</b> |
| DT66              | 624068                  | 307319                   | Roadside  | 100.0                                                       | 100.0                                      |      |      |      |      | 30.7        |
| DT67, DT68, DT69  | 623099                  | 308478                   | Roadside  | 100.0                                                       | 100.0                                      |      |      |      |      | 22.5        |

☒ Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22

☒ Diffusion tube data has been bias adjusted

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

**Notes:**

The annual mean concentrations are presented as  $\mu\text{g}/\text{m}^3$ .

Exceedances of the  $\text{NO}_2$  annual mean objective of  $40\mu\text{g}/\text{m}^3$  are shown in **bold**.

$\text{NO}_2$  annual means exceeding  $60\mu\text{g}/\text{m}^3$ , indicating a potential exceedance of the  $\text{NO}_2$  1-hour mean objective are shown in **bold and underlined**.

Means for diffusion tubes have been corrected for bias. All means have been “annualised” as per LAQM.TG22 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

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

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

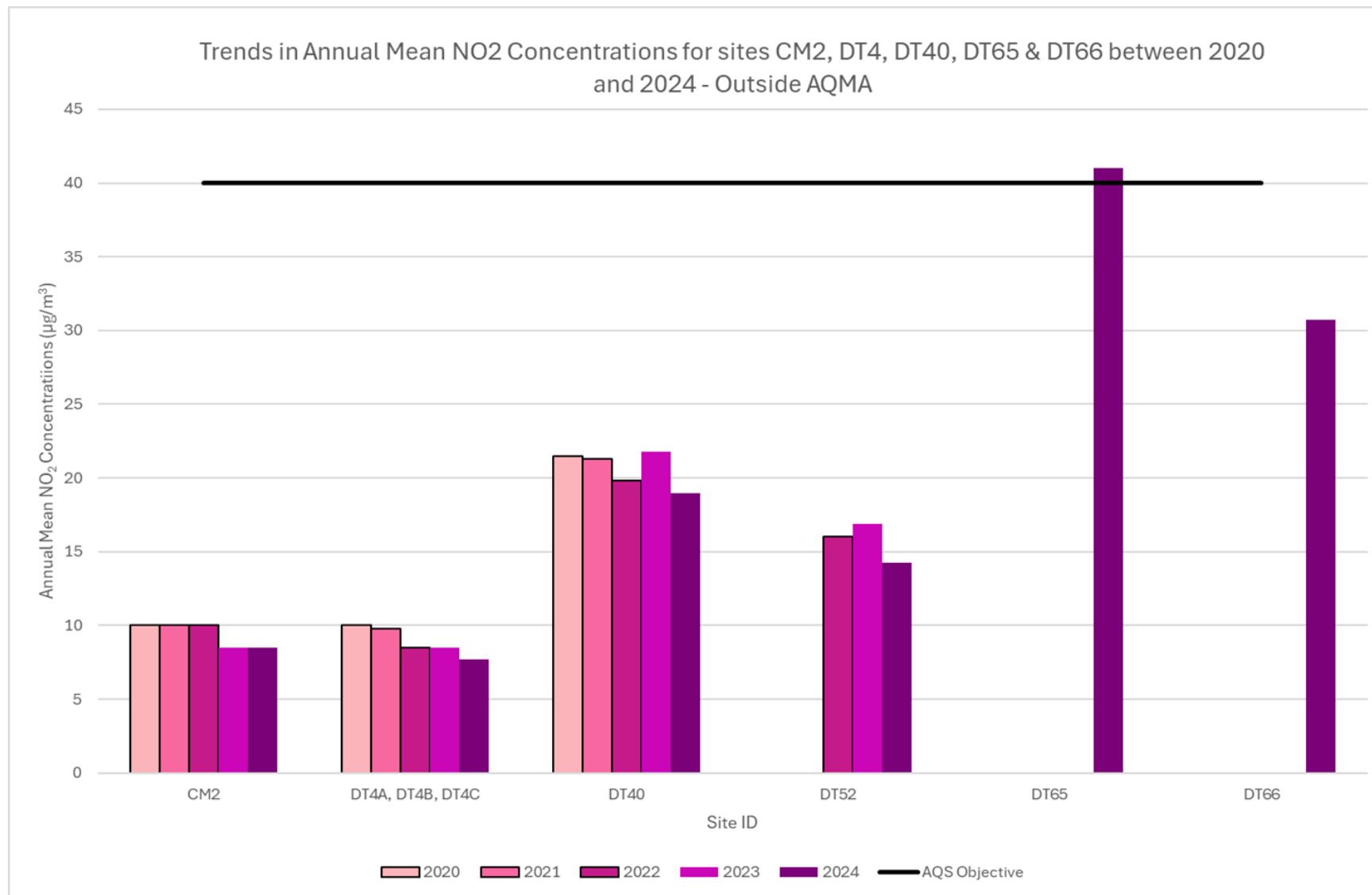
**Figure A.1A – Trends in Annual Mean NO<sub>2</sub> Concentrations**

Figure A.1.B

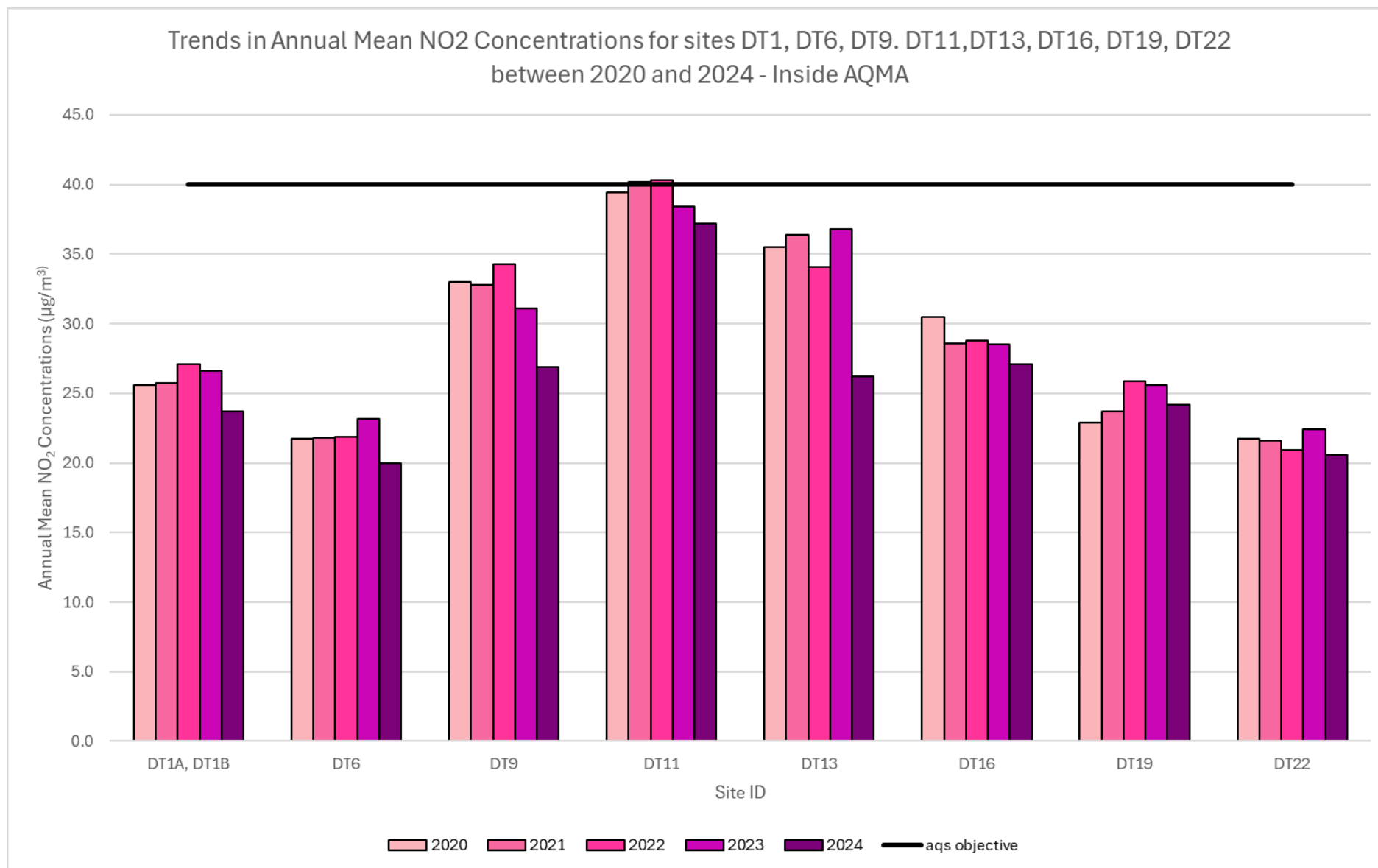


Figure A.1.C

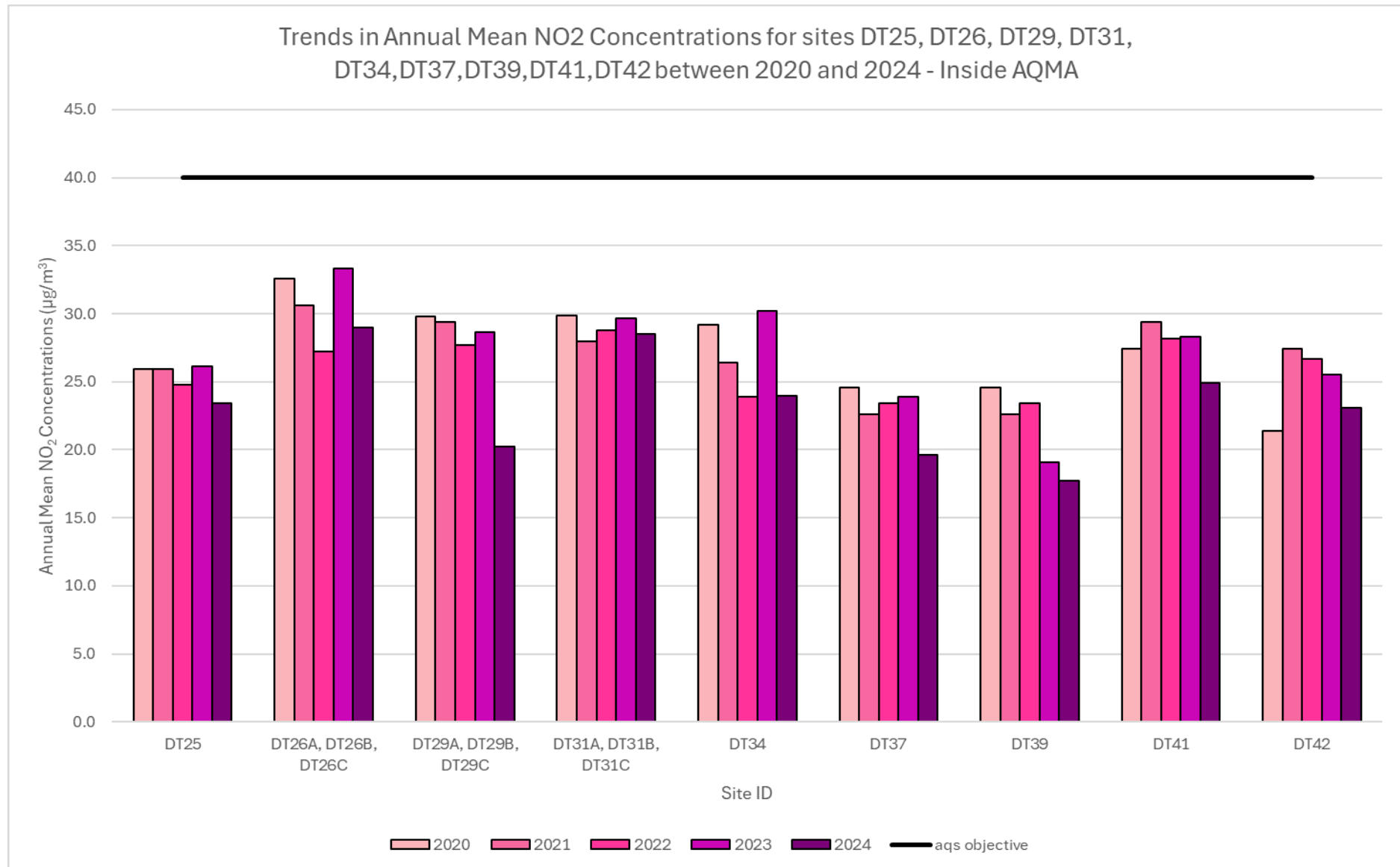


Figure A.1.D

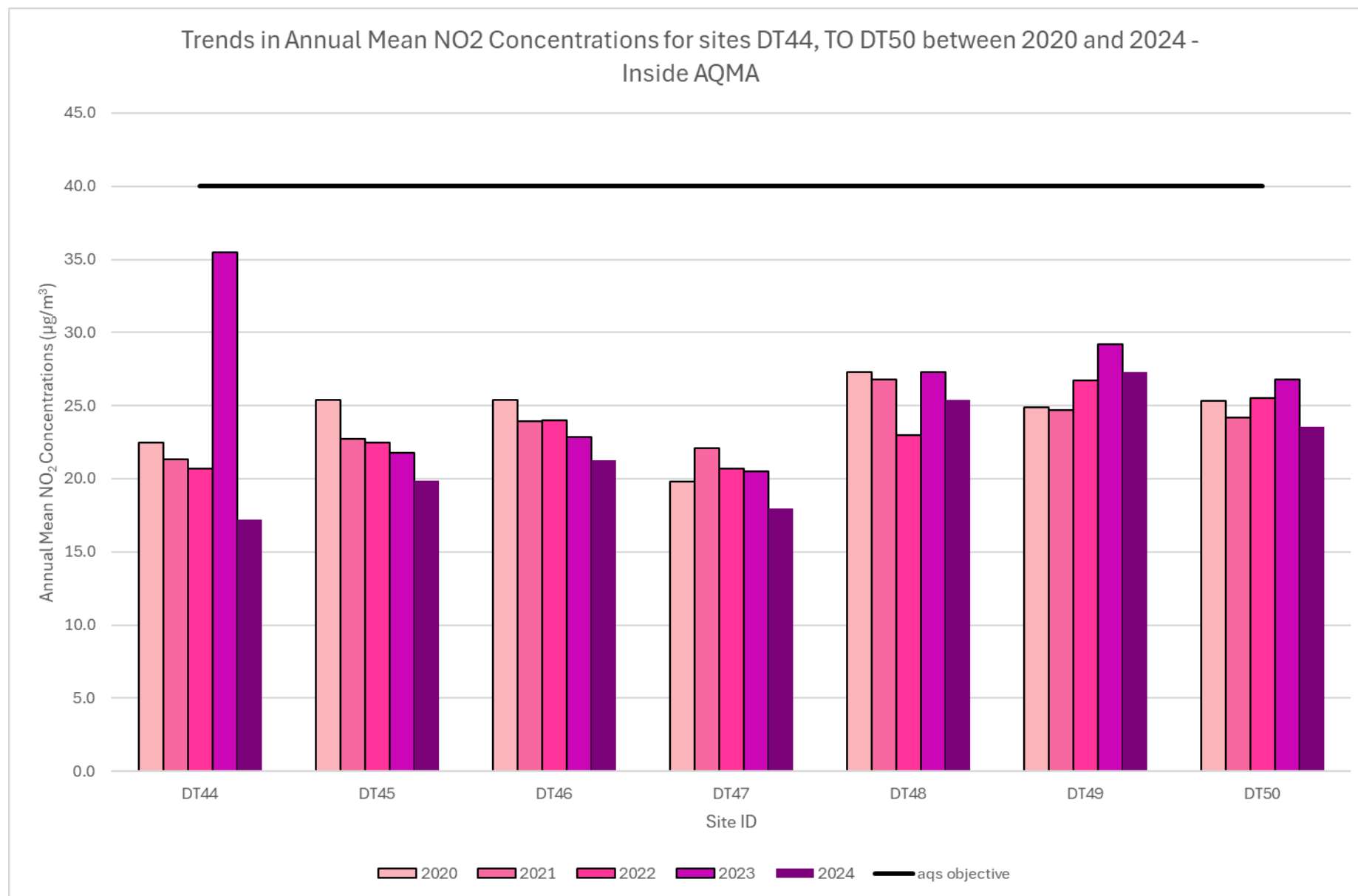
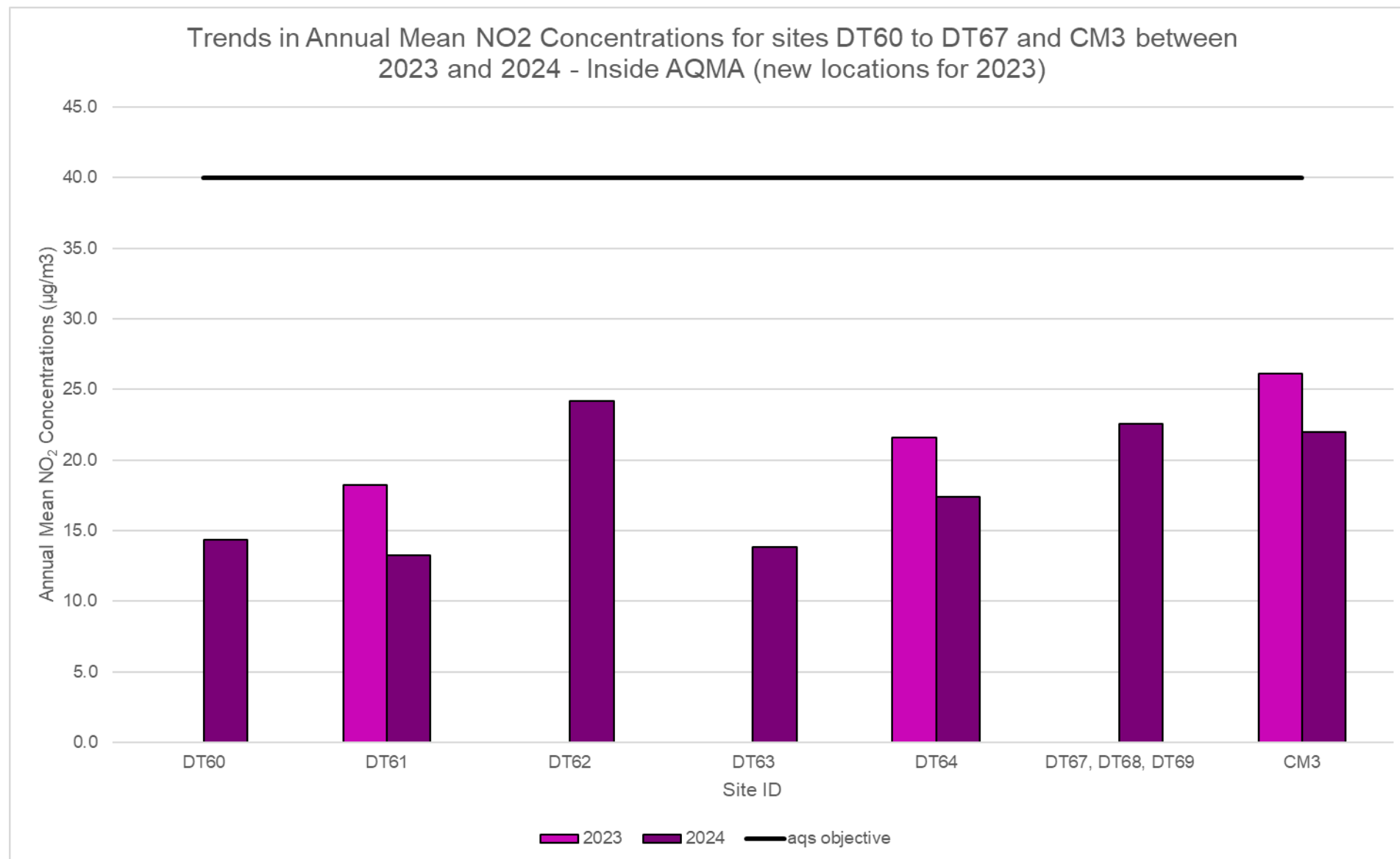




Figure A.1.E



**Table A.5 – 1-Hour Mean NO<sub>2</sub> Monitoring Results, Number of 1-Hour Means > 200µg/m<sup>3</sup>**

| Site ID | X OS Grid Ref (Easting) | Y OS Grid Ref (Northing) | Site Type        | Valid Data Capture for Monitoring Period (%) <sup>(1)</sup> | Valid Data Capture 2024 (%) <sup>(2)</sup> | 2020 | 2021 | 2022 | 2023 | 2024   |
|---------|-------------------------|--------------------------|------------------|-------------------------------------------------------------|--------------------------------------------|------|------|------|------|--------|
| CM2     | 623637                  | 306940                   | Urban Background | 64.2                                                        | 64.2                                       | 0    | 0    | 0    | 0    | 0 (45) |
| CM3     | 623112                  | 308532                   | Kerbside         | 99.7                                                        | 99.7                                       |      |      |      | 0    | 0      |

**Notes:**

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

Exceedances of the NO<sub>2</sub> 1-hour mean objective (200µg/m<sup>3</sup> not to be exceeded more than 18 times/year) are shown in **bold**.

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

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

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

**Table A.6 – Annual Mean PM<sub>10</sub> Monitoring Results (µg/m<sup>3</sup>)**

| Site ID | X OS Grid Ref (Easting) | Y OS Grid Ref (Northing) | Site Type        | Valid Data Capture for Monitoring Period (%) <sup>(1)</sup> | Valid Data Capture 2024 (%) <sup>(2)</sup> | 2020 | 2021 | 2022 | 2023 | 2024 |
|---------|-------------------------|--------------------------|------------------|-------------------------------------------------------------|--------------------------------------------|------|------|------|------|------|
| CM2     | 623637                  | 306940                   | Urban Background | 97.5                                                        | 97.5                                       | 13   | 13   | 14   | 11.8 | 11.1 |
| CM3     | 623112                  | 308532                   | Kerbside         | 81.1                                                        | 81.0                                       |      |      |      | 13.8 | 14.5 |

 **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22**

**Notes:**

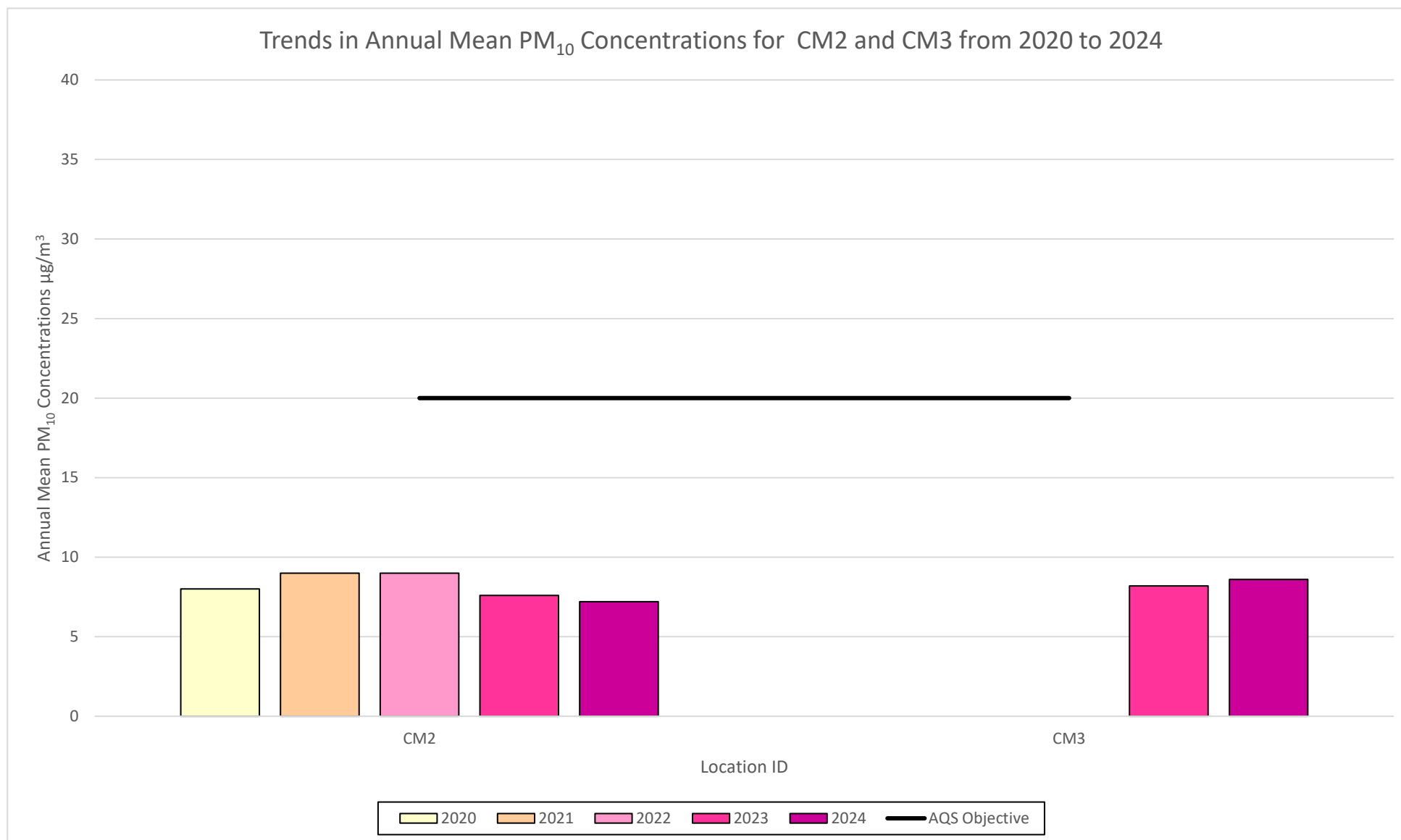
The annual mean concentrations are presented as µg/m<sup>3</sup>.

Exceedances of the PM<sub>10</sub> annual mean objective of 40µg/m<sup>3</sup> are shown in **bold**.

All means have been “annualised” as per LAQM.TG22 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

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

**Figure A.2 – Trends in Annual Mean PM<sub>10</sub> Concentrations**

**Table A.7 – 24-Hour Mean PM<sub>10</sub> Monitoring Results, Number of PM<sub>10</sub> 24-Hour Means > 50µg/m<sup>3</sup>**

| Site ID | X OS Grid Ref (Easting) | Y OS Grid Ref (Northing) | Site Type        | Valid Data Capture for Monitoring Period (%) <sup>(1)</sup> | Valid Data Capture 2024 (%) <sup>(2)</sup> | 2020 | 2021 | 2022 | 2023 | 2024   |
|---------|-------------------------|--------------------------|------------------|-------------------------------------------------------------|--------------------------------------------|------|------|------|------|--------|
| CM2     | 623637                  | 306940                   | Urban Background | 97.5                                                        | 97.5                                       | 0    | 0    | 3    | 0    | 0      |
| CM3     | 623112                  | 308532                   | Kerbside         | 81.1                                                        | 81.0                                       |      |      |      | 0    | 0 (26) |

**Notes:**

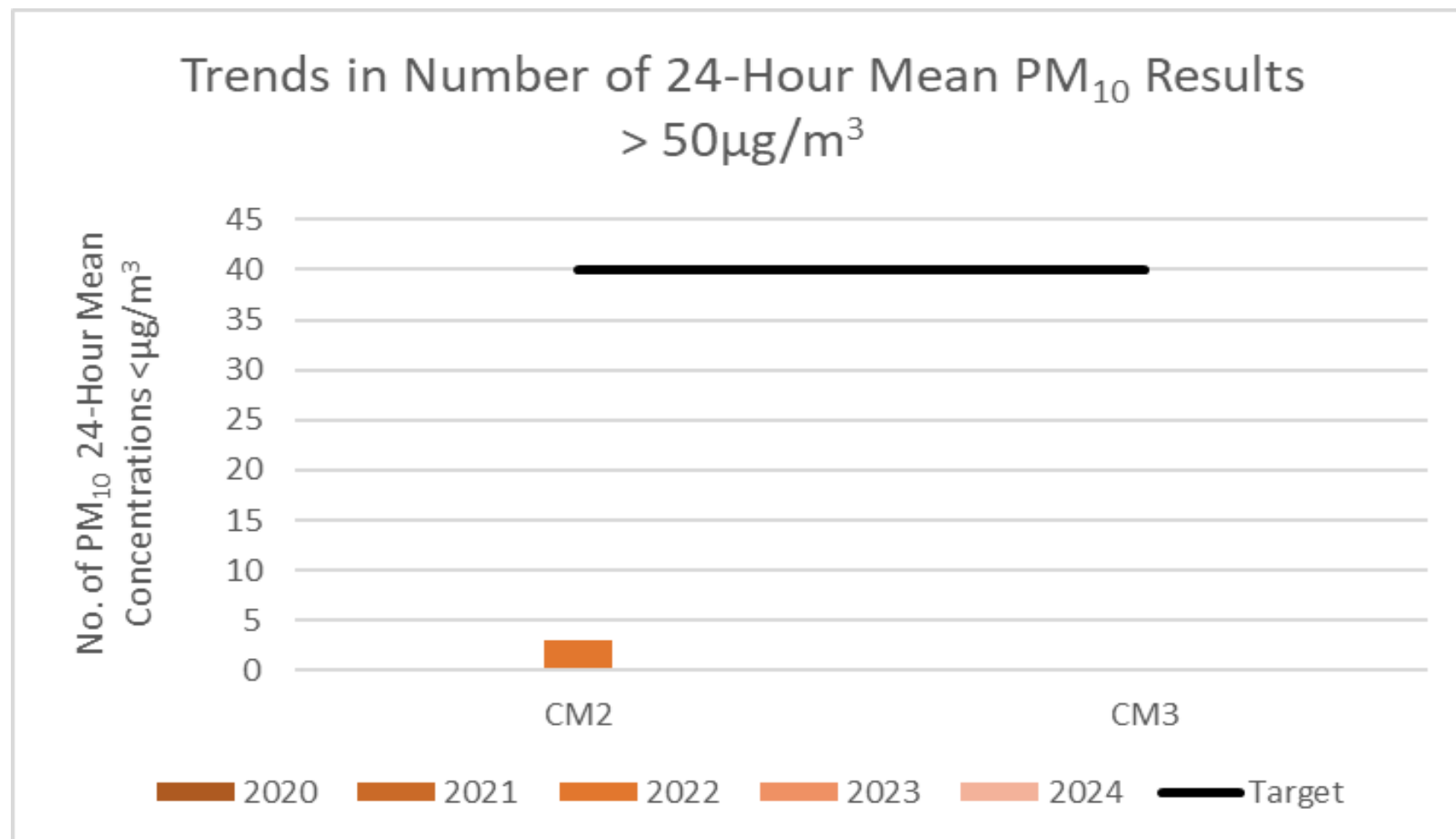
Results are presented as the number of 24-hour periods where daily mean concentrations greater than 50µg/m<sup>3</sup> have been recorded.

Exceedances of the PM<sub>10</sub> 24-hour mean objective (50µg/m<sup>3</sup> not to be exceeded more than 35 times/year) are shown in **bold**.

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

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

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

**Figure A.3 – Trends in Number of 24-Hour Mean PM<sub>10</sub> Results > 50µg/m<sup>3</sup>**

**Table A.8 – Annual Mean PM<sub>2.5</sub> Monitoring Results (µg/m<sup>3</sup>)**

| Site ID | X OS Grid Ref (Easting) | Y OS Grid Ref (Northing) | Site Type        | Valid Data Capture for Monitoring Period (%) <sup>(1)</sup> | Valid Data Capture 2024 (%) <sup>(2)</sup> | 2020 | 2021 | 2022 | 2023 | 2024 |
|---------|-------------------------|--------------------------|------------------|-------------------------------------------------------------|--------------------------------------------|------|------|------|------|------|
| CM2     | 623637                  | 306940                   | Urban Background | 97.9                                                        | 97.9                                       | 8    | 9    | 9    | 7.6  | 7.2  |
| CM3     | 623112                  | 308532                   | Kerbside         | 81.1                                                        | 81.0                                       |      |      |      | 8.2  | 8.6  |

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22**

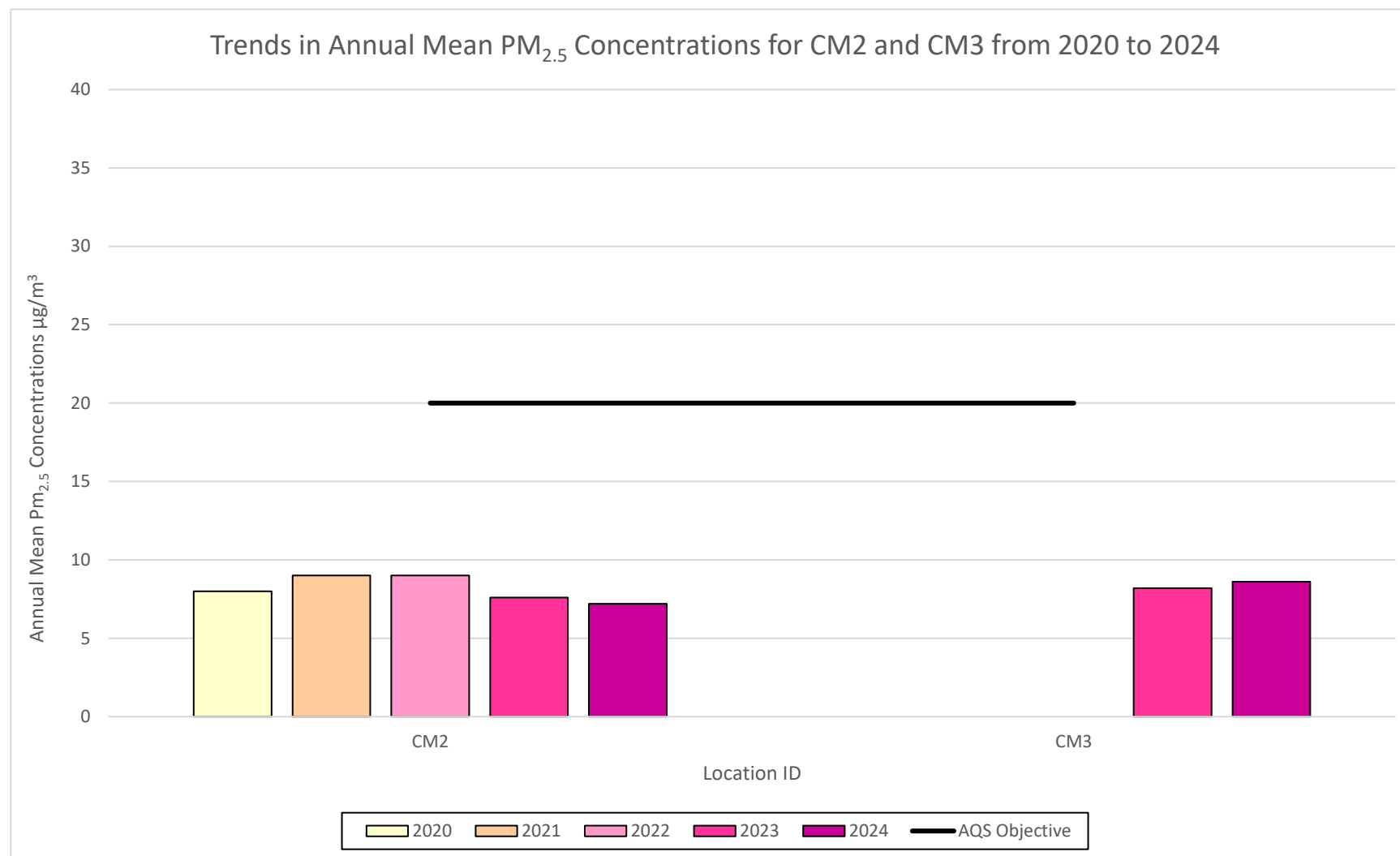
**Notes:**

The annual mean concentrations are presented as µg/m<sup>3</sup>.

All means have been “annualised” as per LAQM.TG22 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

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

**Figure A.4 – Trends in Annual Mean PM<sub>2.5</sub> Concentrations**



Appendix B: Full Monthly Diffusion Tube Results for 2024

Table B.1 – NO<sub>2</sub> 2024 Diffusion Tube Results (µg/m<sup>3</sup>)

| DT ID  | X OS Grid Ref (Easting) | Y OS Grid Ref (Northing ) | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  | Annual Mean: Raw Data | Annual Mean: Annualised and Bias Adjusted 0.88 | Annual Mean: Distance Corrected to Nearest Exposure | Comment                                                                           |
|--------|-------------------------|---------------------------|------|------|------|------|------|------|------|------|------|------|------|------|-----------------------|------------------------------------------------|-----------------------------------------------------|-----------------------------------------------------------------------------------|
| DT1A   | 623863                  | 307679                    | 28.3 | 30.6 | 30.3 | 23.4 | 25.8 | 22.2 | 27.3 | 26.7 | 21.1 | 31.7 | 32.5 | 23.8 | -                     | -                                              | -                                                   | Duplicate Site with DT1A and DT1B - Annual data provided for DT1B only            |
| DT1B   | 623863                  | 307679                    | 26.0 | 30.9 | 27.1 | 23.2 | 23.5 | 25.2 | 27.9 | 24.9 | 25.2 | 30.7 | 30.6 | 26.9 | 26.9                  | 23.7                                           | -                                                   | Duplicate Site with DT1A and DT1B - Annual data provided for DT1B only            |
| DT4A   | 623681                  | 307016                    | 11.9 | 11.7 | 9.4  | 7.4  | 6.5  | 5.6  | 6.6  | 6.6  | 7.3  | 11.1 | 9.1  | 10.6 | -                     | -                                              | -                                                   | Triplicate Site with DT4A, DT4B and DT4C - Annual data provided for DT4C only     |
| DT4B   | 623681                  | 307016                    | 12.0 | 11.5 | 9.4  | 6.3  | 6.7  | 5.9  | 6.6  | 6.7  | 7.9  | 10.9 | 13.3 | 11.4 | -                     | -                                              | -                                                   | Triplicate Site with DT4A, DT4B and DT4C - Annual data provided for DT4C only     |
| DT4C   | 623681                  | 307016                    | 12.3 | 12.5 | 8.6  | 7.3  | 6.2  | 6.1  | 6.0  | 6.9  | 8.3  |      | 9.2  | 8.1  | 8.7                   | 7.7                                            | -                                                   | Triplicate Site with DT4A, DT4B and DT4C - Annual data provided for DT4C only     |
| DT6    | 623160                  | 309550                    | 24.8 | 27.0 |      | 23.7 | 21.1 | 21.8 | 14.2 | 17.3 |      | 27.2 | 28.1 | 21.7 | 22.7                  | 20.0                                           | -                                                   |                                                                                   |
| DT9    | 622906                  | 309496                    | 33.2 | 32.4 | 23.2 | 30.7 | 33.2 | 31.5 | 26.9 | 25.5 | 33.1 | 34.3 | 35.2 | 27.4 | 30.6                  | 26.9                                           | -                                                   |                                                                                   |
| DT11   | 622826                  | 309573                    | 46.5 | 49.6 | 40.7 | 44.1 | 41.2 | 41.7 | 40.9 | 35.8 | 39.9 | 46.3 | 45.9 | 34.4 | 42.3                  | 37.2                                           | -                                                   |                                                                                   |
| DT13   | 623141                  | 308607                    | 34.2 | 33.5 | 30.2 | 29.0 |      | 27.8 | 27.3 | 27.4 | 31.5 |      | 30.5 | 26.5 | 29.8                  | 26.2                                           | -                                                   |                                                                                   |
| DT16   | 623186                  | 309650                    | 33.4 | 38.0 | 35.6 | 29.4 | 25.5 | 28.9 | 27.0 | 27.8 | 23.5 | 34.0 | 38.1 | 28.1 | 30.8                  | 27.1                                           | -                                                   |                                                                                   |
| DT19   | 623321                  | 308431                    |      |      |      |      |      | 23.4 | 24.7 | 23.6 | 25.9 | 31.1 | 31.5 |      | 26.7                  | 24.2                                           | -                                                   |                                                                                   |
| DT22   | 623901                  | 307710                    | 28.4 | 25.1 | 22.4 | 20.9 | 20.8 | 21.4 | 19.8 | 18.0 | 22.8 | 25.7 | 30.5 | 24.4 | 23.4                  | 20.6                                           | -                                                   |                                                                                   |
| DT25   | 623422                  | 309388                    | 30.3 | 26.7 | 22.3 | 30.6 | 22.7 | 28.0 | 24.4 | 25.9 | 29.4 | 26.0 |      |      | 26.6                  | 23.4                                           | -                                                   |                                                                                   |
| DT26 A | 623870                  | 308516                    | 35.4 | 39.4 | 37.0 | 28.2 | 31.7 | 31.1 | 35.6 | 31.2 | 30.1 | 37.7 | 33.0 | 25.1 | -                     | -                                              | -                                                   | Triplicate Site with DT26A, DT26B and DT26C - Annual data provided for DT26C only |
| DT26 B | 623870                  | 308516                    | 36.6 | 39.9 | 38.6 | 28.7 | 31.2 | 30.4 | 34.3 | 30.4 | 30.0 | 37.8 | 27.8 | 25.5 | -                     | -                                              | -                                                   | Triplicate Site with DT26A, DT26B and DT26C - Annual data provided for DT26C only |
| DT26 C | 623870                  | 308516                    | 33.7 | 39.5 | 38.2 | 27.6 | 30.1 | 30.0 | 34.2 | 32.1 | 32.8 | 37.0 | 36.7 | 27.6 | 32.9                  | 29.0                                           | -                                                   | Triplicate Site with DT26A, DT26B and DT26C - Annual data provided for DT26C only |
| DT29 A | 622532                  | 308490                    | 32.0 | 26.5 | 22.6 | 18.5 | 20.4 | 19.9 | 19.8 | 18.8 | 23.6 | 27.0 | 27.1 | 25.4 | -                     | -                                              | -                                                   | Triplicate Site with DT29A, DT29B and DT29C - Annual data provided for DT29C only |

| DT ID  | X OS Grid Ref (Easting) | Y OS Grid Ref (Northing ) | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  | Annual Mean: Raw Data | Annual Mean: Annualised and Bias Adjusted 0.88 | Annual Mean: Distance Corrected to Nearest Exposure | Comment                                                                           |
|--------|-------------------------|---------------------------|------|------|------|------|------|------|------|------|------|------|------|------|-----------------------|------------------------------------------------|-----------------------------------------------------|-----------------------------------------------------------------------------------|
| DT29 B | 622532                  | 308490                    | 26.8 | 26.7 | 22.1 | 20.8 | 20.7 | 20.6 | 19.5 | 18.8 | 21.6 | 27.1 | 27.5 | 20.5 | -                     | -                                              | -                                                   | Triplicate Site with DT29A, DT29B and DT29C - Annual data provided for DT29C only |
| DT29 C | 622532                  | 308490                    | 30.7 | 26.0 | 20.8 | 20.5 | 21.0 | 20.1 | 18.3 | 18.8 | 21.5 | 24.1 | 28.0 |      | 23.0                  | 20.2                                           | -                                                   | Triplicate Site with DT29A, DT29B and DT29C - Annual data provided for DT29C only |
| DT31 A | 623380                  | 307700                    | 30.6 | 0.7  | 75.5 | 30.8 | 29.4 | 30.5 | 34.1 | 28.0 |      | 37.5 | 35.9 | 25.4 | -                     | -                                              | -                                                   | Triplicate Site with DT31A, DT31B and DT31C - Annual data provided for DT31C only |
| DT31 B | 623380                  | 307700                    | 33.5 | 37.1 | 77.8 | 28.4 | 29.4 | 29.6 | 32.5 | 28.1 |      | 35.2 | 37.1 | 26.7 | -                     | -                                              | -                                                   | Triplicate Site with DT31A, DT31B and DT31C - Annual data provided for DT31C only |
| DT31 C | 623380                  | 307700                    | 33.1 | 0.7  | 33.6 | 30.4 | 30.7 | 30.0 | 30.4 | 29.1 |      | 35.3 | 32.6 | 28.7 | 32.4                  | 28.5                                           | -                                                   | Triplicate Site with DT31A, DT31B and DT31C - Annual data provided for DT31C only |
| DT34   | 622898                  | 308114                    | 33.5 | 32.5 | 29.2 | 24.4 | 25.2 | 23.2 | 22.2 |      | 26.0 | 31.3 | 24.4 | 28.0 | 27.3                  | 24.0                                           | -                                                   |                                                                                   |
| DT37   | 622492                  | 308520                    | 21.0 | 26.3 | 23.2 | 21.6 | 16.3 | 18.1 | 19.7 | 20.9 | 20.6 | 25.9 | 28.9 | 24.7 | 22.3                  | 19.6                                           | -                                                   |                                                                                   |
| DT39   | 622884                  | 309082                    | 23.0 | 24.0 | 20.0 | 16.6 | 19.8 | 17.4 | 17.5 | 14.9 | 20.5 | 26.0 | 23.1 | 19.0 | 20.1                  | 17.7                                           | -                                                   |                                                                                   |
| DT40   | 622695                  | 307855                    | 27.2 | 24.8 | 20.2 | 18.4 |      | 16.9 | 19.4 | 16.9 | 21.1 | 22.4 | 28.1 | 21.5 | 21.5                  | 18.9                                           | -                                                   |                                                                                   |
| DT41   | 623148                  | 309277                    | 36.0 | 30.6 | 25.6 | 26.3 | 27.1 | 27.7 | 25.4 | 24.3 | 30.2 | 31.2 | 31.8 | 23.4 | 28.3                  | 24.9                                           | -                                                   |                                                                                   |
| DT42   | 623151                  | 309326                    | 31.4 | 29.8 | 28.3 | 24.7 |      | 23.4 | 23.7 | 21.2 | 24.4 | 29.5 | 28.8 | 23.6 | 26.3                  | 23.1                                           | -                                                   |                                                                                   |
| DT44   | 622910                  | 309391                    | 25.5 | 21.4 | 18.3 | 16.2 | 17.3 | 16.3 | 15.8 | 14.5 | 18.4 | 24.8 | 26.2 | 20.0 | 19.6                  | 17.2                                           | -                                                   |                                                                                   |
| DT45   | 622904                  | 309418                    | 26.2 | 26.7 | 24.0 | 18.2 | 20.9 | 19.9 | 20.9 | 21.9 | 22.5 | 23.8 | 26.2 | 20.0 | 22.6                  | 19.9                                           | -                                                   |                                                                                   |
| DT46   | 622987                  | 309486                    | 26.9 | 26.3 | 24.9 |      | 18.5 | 23.3 | 22.9 | 21.9 | 24.0 | 29.4 | 27.7 | 20.1 | 24.2                  | 21.3                                           | -                                                   |                                                                                   |
| DT47   | 622869                  | 309187                    | 26.9 | 19.8 | 20.1 | 17.6 | 20.0 | 18.3 | 16.9 | 15.6 | 23.9 |      | 24.1 | 21.1 | 20.4                  | 17.9                                           | -                                                   |                                                                                   |
| DT48   | 623878                  | 308532                    | 31.8 | 30.7 |      | 28.1 |      |      | 27.6 | 25.8 | 24.6 | 32.1 | 33.9 | 25.0 | 28.8                  | 25.4                                           | -                                                   |                                                                                   |
| DT49   | 623480                  | 307679                    | 35.9 | 34.3 | 28.5 | 28.5 | 31.6 | 29.8 | 27.7 | 27.4 | 32.9 | 34.5 | 37.1 | 24.1 | 31.0                  | 27.3                                           | -                                                   |                                                                                   |
| DT50   | 623474                  | 307692                    | 27.5 | 30.7 | 27.2 | 22.7 | 23.8 | 25.6 | 25.3 |      | 24.9 | 30.7 | 29.1 |      | 26.7                  | 23.5                                           | -                                                   |                                                                                   |
| DT52   | 621958                  | 309000                    | 22.2 | 17.9 | 17.0 | 18.0 | 10.4 | 12.0 | 11.2 | 11.6 | 17.3 | 20.2 | 20.4 | 16.2 | 16.2                  | 14.3                                           | -                                                   |                                                                                   |
| DT60   | 622797                  | 308454                    | 17.8 | 20.4 | 15.4 | 13.7 | 15.5 | 13.4 | 13.1 |      | 16.7 | 22.3 |      | 15.2 | 16.3                  | 14.4                                           | -                                                   |                                                                                   |

| DT ID | X OS Grid Ref (Easting) | Y OS Grid Ref (Northing ) | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  | Annual Mean: Raw Data | Annual Mean: Annualised and Bias Adjusted 0.88 | Annual Mean: Distance Corrected to Nearest Exposure | Comment                                                                       |
|-------|-------------------------|---------------------------|------|------|------|------|------|------|------|------|------|------|------|------|-----------------------|------------------------------------------------|-----------------------------------------------------|-------------------------------------------------------------------------------|
| DT61  | 622655                  | 308506                    | 17.7 | 18.3 | 15.7 | 10.0 | 11.9 | 10.8 | 13.5 | 12.4 | 14.3 | 20.5 | 18.8 | 17.3 | 15.1                  | 13.3                                           | -                                                   |                                                                               |
| DT62  | 622497                  | 308499                    | 31.5 | 28.2 | 25.4 | 26.3 | 24.9 | 24.8 | 28.4 | 24.9 |      | 32.4 | 29.9 | 25.3 | 27.5                  | 24.2                                           | -                                                   |                                                                               |
| DT63  | 622638                  | 308595                    | 22.5 |      | 16.7 |      | 10.7 | 11.6 | 14.4 | 13.4 | 15.9 | 23.9 |      | 12.2 | 15.7                  | 13.8                                           | -                                                   |                                                                               |
| DT64  | 622788                  | 308569                    |      | 21.0 | 17.4 | 16.1 | 18.9 | 15.2 | 15.3 |      | 21.6 | 25.1 | 23.5 | 23.6 | 19.8                  | 17.4                                           | -                                                   |                                                                               |
| DT65  | 624050                  | 307313                    | 49.4 | 54.9 | 49.3 | 45.5 | 39.8 | 44.7 | 47.0 | 41.6 | 46.0 | 47.6 | 48.8 | 44.8 | 46.6                  | <b>41.0</b>                                    | 36.5                                                |                                                                               |
| DT66  | 624068                  | 307319                    | 37.7 | 38.7 | 32.8 | 33.6 | 32.2 | 34.0 | 35.6 | 28.1 | 33.0 | 39.5 | 39.6 | 34.3 | 34.9                  | 30.7                                           | -                                                   |                                                                               |
| DT67  | 623099                  | 308478                    | 32.2 | 31.8 | 23.1 | 23.7 | 24.2 | 22.5 | 23.5 | 23.2 | 30.3 | 26.5 | 24.0 | 24.0 | -                     | -                                              | -                                                   | Triplicate Site with DT67, DT68 and DT69 - Annual data provided for DT69 only |
| DT68  | 623099                  | 308478                    | 31.3 | 31.1 | 24.5 | 22.8 | 24.7 | 24.2 | 22.3 | 22.4 | 23.7 | 29.0 | 28.3 | 23.9 | -                     | -                                              | -                                                   | Triplicate Site with DT67, DT68 and DT69 - Annual data provided for DT69 only |
| DT69  | 623099                  | 308478                    | 29.6 | 30.9 | 25.7 | 22.6 | 24.3 | 23.8 | 22.0 | 22.6 | 24.4 | 27.4 | 27.9 | 23.9 | 25.6                  | 22.5                                           | -                                                   | Triplicate Site with DT67, DT68 and DT69 - Annual data provided for DT69 only |

- ☒ All erroneous data has been removed from the NO<sub>2</sub> diffusion tube dataset presented in Table B.1
- ☒ Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22
- ☐ Local bias adjustment factor used
- ☒ National bias adjustment factor used
- ☒ Where applicable, data has been distance corrected for relevant exposure in the final column
- ☒ Norwich City Council confirm that all 2024 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System

Notes:

Exceedances of the NO<sub>2</sub> annual mean objective of 40µg/m<sup>3</sup> are shown in **bold**.

NO<sub>2</sub> annual means exceeding 60µg/m<sup>3</sup>, indicating a potential exceedance of the NO<sub>2</sub> 1-hour mean objective are shown in **bold and underlined**.

See Appendix C for details on bias adjustment and annualisation.

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

### **New or Changed Sources Identified Within Norwich City Council During 2024**

Norwich City Council has not identified any new sources relating to air quality within the reporting year of 2024.

### **Additional Air Quality Works Undertaken by Norwich City Council During 2024**

Norwich City Council has not completed any additional works within the reporting year of 2024.

### **QA/QC of Diffusion Tube Monitoring**

The diffusion tubes deployed in 2024 were supplied and analysed by Gradko International using the 50% TEA in acetone preparation method. Gradko International are a UKAS accredited laboratory, partaking in the AIR-PT scheme for NO<sub>2</sub> diffusion tube analysis and Annual Field Intercomparison Exercise. These provide strict criteria relating to the performance that participating laboratories must meet, thereby ensuring that the reported NO<sub>2</sub> concentrations are of a high calibre.

The current version of the AIR-PT scheme shows that January – February AIR PT AR062, April – June AIR PT AR063 2024 Gradko results were awarded a score of 100%. The percentage is an indication of the results deemed satisfactory based upon the z-score of < ±2.

For all 11 observations in 2024, the precision of NO<sub>2</sub> diffusion tubes supplied by Gradko International were classified as 'good'. The precision is an indication of the laboratory's performance and consistency in both the preparation, analysis and handling of the diffusion tubes. Full details of the precision summary results are available [here](#).

During 2024, the diffusion tubes were deployed in line with the monitoring calendar, with February, August and December being 1 day earlier than the calendar. (see figure below)

However, no diffusion tube was left out beyond the recommended four to five weeks of TG(22). As a result, data has not had to be removed for any month, and all data has been used in the annual results.

| Month     | Defra Start Dates 2024 | Actual Start Dates 2024 | Defra End Dates 2024 | Actual End Dates 2024 |
|-----------|------------------------|-------------------------|----------------------|-----------------------|
| January   | 03/01/2024             | 03/01/2024              | 31/01/2024           | 30/01/2024            |
| February  | 31/01/2024             | 30/01/2024              | 06/03/2024           | 06/03/2024            |
| March     | 06/03/2024             | 06/03/2024              | 03/04/2024           | 03/04/2024            |
| April     | 03/04/2024             | 03/04/2024              | 01/05/2024           | 01/05/2024            |
| May       | 01/05/2024             | 01/05/2024              | 05/06/2024           | 05/06/2024            |
| June      | 05/06/2024             | 05/06/2024              | 03/07/2024           | 03/07/2024            |
| July      | 03/07/2024             | 03/07/2024              | 31/07/2024           | 30/07/2024            |
| August    | 31/07/2024             | 30/07/2024              | 04/09/2024           | 04/09/2024            |
| September | 04/09/2024             | 04/09/2024              | 02/10/2024           | 02/10/2024            |
| October   | 02/10/2024             | 02/10/2024              | 06/11/2024           | 06/11/2024            |
| November  | 06/11/2024             | 06/11/2024              | 04/12/2024           | 05/12/2024            |
| December  | 04/12/2024             | 05/12/2024              | 08/01/2025           | 09/01/2025            |

### Diffusion Tube Annualisation

There was only one diffusion tube location that recorded data capture less than 75% but greater than 25% which was DT19. In such instances it is necessary to annualise the data. Results are presented in Table C.1 below:

The data for Lakenfields was below 85% and therefore could not be used for annualisation. Therefore, Castle Meadow 2, Kings Lynn (Gaywood) and Wicken Green sites which had over 85% data capture were used for determining the annualisation factor.

The data capture across the diffusion tube network in 2024 ranged from a minimum of 49.2% to a maximum of 100%, with 19 of the 35 diffusion tube locations meeting the 100% which is 54% of the diffusion tubes, which is a slight improvement on last year. We are keeping the diffusion sites under review and shall amend the heights of the tubes if we find particular areas where the tubes go missing repeatedly.

Table C.1 – Annualisation Summary (concentrations presented in  $\mu\text{g}/\text{m}^3$ )

| Site ID | Annualisati on Factor Lakenfields Norwich | Annualisati on Factor Castle Meadow 2 Norwich | Annualisati on Factor Kingslynn - Gaywood | Annualisati on Factor Wicken Fen | Average Annualisati on Factor | Raw Data Annual Mean | Annualised Annual Mean |
|---------|-------------------------------------------|-----------------------------------------------|-------------------------------------------|----------------------------------|-------------------------------|----------------------|------------------------|
| DT19    |                                           | 1.0122                                        | 0.9957                                    | 1.0545                           | 1.0208                        | 26.7                 | 27.3                   |

## Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2024 ASR have been corrected for bias using an adjustment factor. Bias represents the overall tendency of the diffusion tubes to under or over-read relative to the reference chemiluminescence analyser. LAQM.TG22 provides guidance with regard to the application of a bias adjustment factor to correct diffusion tube monitoring. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data taken from NO<sub>x</sub>/NO<sub>2</sub> continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

Norwich City Council has one automatic monitor (Castle Meadow 2 CM3) and there is a AURN (Lakenfields CM2) in Norwich where diffusion tubes are co-located. A local bias adjustment calculation was carried out and shown in Table C.3 though unfortunately Lakenfields had a data capture of less than 90% and it was decided that this combined Local Bias Adjustment Factor (0.89) could not be trusted.

The national bias adjustment factor (0.88) is slightly lower than the combined local bias adjustment factor (0.89) so leads to very slightly lower measured diffusion tube concentrations once bias adjusted.

Section 7.229 of LAQM.TG22 states that the two derived local factors should only be used if the resulting tube precision and data capture meet the requirements as per para 7.219. If these conditions are not met, then the national factors should be used within the calculation.

Therefore, Norwich City Council have applied a national bias adjustment factor from national spreadsheet version 03/25 of 0.88 to the 2024 monitoring data. A summary of bias adjustment factors used by Norwich City Council over the past five years is presented in Table C.2.

Table C.2 – Bias Adjustment Factor

| Monitoring Year | Local or National | If National, Version of National Spreadsheet | Adjustment Factor |
|-----------------|-------------------|----------------------------------------------|-------------------|
| 2024            | National          | 03/25 (12 studies)                           | 0.88              |
| 2023            | Local             | -                                            | 0.88              |
| 2022            | National          | 06/23 (15 studies)                           | 0.82              |
| 2021            | National          | 03/22 (14 studies)                           | 0.83              |

|      |       |   |      |
|------|-------|---|------|
| 2020 | Local | - | 0.88 |
|------|-------|---|------|

**Table C.3 – Local Bias Adjustment Calculation**

Norwich City Council co-located the diffusion tubes at Lakenfields Automatic Station CM2 and Castle Meadow 2 AQS CM3 for 2024.

|                                                  | Local Bias Adjustment Input 1 | Local Bias Adjustment Input 2 | Local Bias Adjustment Input 3 | Local Bias Adjustment Input 4 | Local Bias Adjustment Input 5 |
|--------------------------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| Periods used to calculate bias                   | 7                             | 12                            |                               |                               |                               |
| Bias Factor A                                    | 0.92 (0.86 - 0.99)            | 0.86 (0.82 - 0.9)             |                               |                               |                               |
| Bias Factor B                                    | 8% (1% - 16%)                 | 16% (11% - 22%)               |                               |                               |                               |
| Diffusion Tube Mean ( $\mu\text{g}/\text{m}^3$ ) | 8.6                           | 25.6                          |                               |                               |                               |
| Mean CV (Precision)                              | 5.5%                          | 4.2%                          |                               |                               |                               |
| Automatic Mean ( $\mu\text{g}/\text{m}^3$ )      | 7.9                           | 22.0                          |                               |                               |                               |
| Data Capture                                     | 65%                           | 100%                          |                               |                               |                               |
| Adjusted Tube Mean ( $\mu\text{g}/\text{m}^3$ )  | 8 (7 - 8)                     | 22 (21 - 23)                  |                               |                               |                               |

**Notes:** A combined local bias adjustment factor of 0.89 – though this has **NOT** been used to bias adjust the 2024 diffusion tube results and the national bias adjustment figure of 0.88 has been used.

### NO<sub>2</sub> Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO<sub>2</sub> concentration at the nearest location relevant for exposure has been estimated using the Diffusion Tube Data Processing Tool/NO<sub>2</sub> fall-off with distance calculator available on the LAQM Support website. Where appropriate, non-automatic annual mean NO<sub>2</sub> concentrations corrected for distance are presented in Table B.1.

One diffusion tube NO<sub>2</sub> monitoring location with Norwich City Council required a distance correction during 2024. This was a new diffusion tube location for 2024 at Bracondale DT65. The results of the calculation are shown in [Table C.4](#). DT65 is just outside of the AQMA.

**Table C.4 – Non-Automatic NO<sub>2</sub> Fall off With Distance Calculations (concentrations presented in µg/m<sup>3</sup>)**

| Site ID | Distance (m): Monitoring Site to Kerb | Distance (m): Receptor to Kerb | Monitored Concentration (Annualised and Bias Adjusted) | Background Concentration | Concentration Predicted at Receptor | Comments                                                                 |
|---------|---------------------------------------|--------------------------------|--------------------------------------------------------|--------------------------|-------------------------------------|--------------------------------------------------------------------------|
| DT65    | 3.2                                   | 5.4                            | 41.0                                                   | 8.5                      | 36.5                                | <i>Predicted concentration at Receptor within 10% the AQS objective.</i> |

## QA/QC of Automatic Monitoring

In order to satisfy the requirements outlined in LAQM TG(22), at the Norwich City Council owned automatic monitoring station Castle Meadow 2 (CM3), the following QA/QC procedures were implemented,

- The analysers are now calibrated every four weeks by a member of the Norwich City Council Environmental Protection Team. This frequency was reduced from every two weeks due to supply issues with nitric oxide (NO) gas, which is essential for the calibration process.
- Annual audits.
- 6-monthly servicing of the monitoring sites.
- Data ratification.

Calibration of the analysers was carried out using certified compressed gas standards (ISO17025). This ensured that the calibration gas was traceable to the national and international standards. In addition to the calibration, sample filters were changed for Horiba APNA-370 – Nox Monitor and any faults were rectified swiftly, thus minimising data loss. Audits of the monitoring sites were carried out by Ricardo-AEA Ltd and consisted of a number of performance checks to identify any faults with the equipment. The calibration cylinders were also checked against other standard gas to confirm the gas concentration. Any identified faults were forwarded on to the service unit for repair.

Both the validation and ratification of data from the Castle Meadow 2 automatic monitoring station is provided by [Air Quality Data Management \(AQDM\)](#) for details to the standards described in LAQM TG(22). Validation is the process that operates on data during the collection stage; all data is continually screened algorithmically and manually for



anomalies. The anomalies may occur due to equipment failure, human error, power failure, interferences or other disturbances. Ratification is the process that finalises the data to produce the measurements suitable for reporting. All available data is critically assessed so that the best data scaling is applied and all anomalies are appropriately edited; generally, this occurs at three, six or twelve month intervals. Public access to live/historic data is available on the [AQDM website](#).

The Norwich Lakenfields automatic monitoring station is part of the AURN operated by Bureau Veritas. The AURN have appointed LSO's and servicing is conducted by Ricardo AEA on a six monthly basis. Audits are conducted by Ricardo-AEA Ltd annually. Live and historic data is available through the [DEFRA website](#).

### PM<sub>10</sub> and PM<sub>2.5</sub> Monitoring Adjustment

The Castle Meadow 2 Station and Norwich Lakenfields AURN sites both have a FIDAS analyser to monitor PM<sub>10</sub> and PM<sub>2.5</sub>.

The Gravimetric PM<sub>2.5</sub> is the FIDAS PM<sub>2.5</sub> divided by 1.06 as detailed in Chapter 7 of the LAQM.TG22.

No adjustment is required for PM<sub>10</sub>.

### Automatic Monitoring Annualisation

**Table C.5 – Automatic NO<sub>2</sub> Annualisation Summary (concentrations presented in µg/m<sup>3</sup>)**

| Background Site                              | Annual Data Capture | Annual Mean (A <sub>m</sub> ) | CM2                           |                                         |
|----------------------------------------------|---------------------|-------------------------------|-------------------------------|-----------------------------------------|
|                                              |                     |                               | Period Mean (P <sub>m</sub> ) | Ratio (A <sub>m</sub> /P <sub>m</sub> ) |
| Lakenfields, Norwich                         | 64.2                |                               |                               |                                         |
| Castle Meadow 2, Norwich                     | 99.7                | 22.0                          | 22.5                          | 0.978                                   |
| Kingslynn - Gaywood                          | 98.6                | 22.6                          | 22.8                          | 0.992                                   |
| Wicken Fen                                   | 95.6                | 4.8                           | 4.9                           | 0.982                                   |
| Average (R <sub>a</sub> )                    |                     |                               | 0.984                         |                                         |
| Raw Data Annual Mean (M)                     |                     |                               | 8.7                           |                                         |
| Annualised Annual Mean (M x R <sub>a</sub> ) |                     |                               | 8.5                           |                                         |

### **NO<sub>2</sub> Fall-off with Distance from the Road**

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO<sub>2</sub> concentration at the nearest location relevant for exposure has been estimated using the NO<sub>2</sub> fall-off with distance calculator available on the LAQM Support website. Where appropriate, automatic annual mean NO<sub>2</sub> concentrations corrected for distance are presented in [Table A.3](#).

No automatic NO<sub>2</sub> monitoring locations within Norwich City Council required distance correction during 2024.



## QA/QC of Automatic Air Quality Instruments

Air quality measurements from the automatic instruments are validated and ratified by Air Quality Data Management (AQDM) <http://www.aqdm.co.uk> to the standards described in the Local Air Quality Management – Technical Guidance LAQM (TG22) <https://laqm.defra.gov.uk/technical-guidance>.

### Validation

This process operates on data during the data collection stage. All data are continually screened algorithmically and manually for anomalies. There are several techniques designed to discover spurious and unusual measurements within a very large dataset. These anomalies may be due to equipment failure, human error, power failures, interference or other disturbances. Automatic screening can only safely identify spurious results that need further manual investigation.

Raw data from the gaseous instruments (e.g. NO<sub>x</sub>, O<sub>3</sub>, SO<sub>2</sub> and CO) are scaled into concentrations using the latest values derived from the manual and automatic calibrations. These instruments are not absolute and suffer drifts. Both the zero baseline (background) and the sensitivity may change over time. Regular calibrations with certified gas standards are used to measure the zero and sensitivity. However, these are only valid for the moment of the calibration since the instrument will continue to drift. Raw measurements from particulate instruments (e.g. PM<sub>10</sub> and PM<sub>2.5</sub>) generally do not require scaling into concentrations. The original raw data are always preserved intact while the processed data are dynamically scaled and edited.

### Ratification

This is the process that finalises the data to produce the measurements suitable for reporting. All available information is critically assessed so that the best data scaling is applied and all anomalies are appropriately edited. Generally this operates at three, six or twelve month intervals. However, unexpected faults can be identified during the instrument routine services or independent audits which are often at 6-monthly intervals. In practice, therefore, the data can only be fully ratified in 12-month or annual periods. The data processing performed during the three and six monthly cycles helps build a reliable dataset that is finalised at the end of the year.

There is a diverse range of additional information that can be essential to the correct understanding and editing of data anomalies. These may include

- the correct scaling of data
- ignoring calibrations that were poor e.g. a spent zero scrubber
- closely tracking rapid drifts or eliminating the data
- comparing the measurements with other pollutants and nearby sites
- corrections due to span cylinder drift
- corrections due to flow drifts for the particulate instruments
- corrections for ozone instrument sensitivity drifts
- eliminating measurements for NO<sub>2</sub> conversion inefficiencies
- eliminating periods where calibration gas is in the ambient dataset
- identifying periods where instruments are warming-up after a powercut
- identification of anomalies due to mains power spikes



- correcting problems with the date and time stamp
- observations made during the sites visits and services

The identification of data anomalies, the proper understanding of the effects and the application of appropriate corrections requires expertise gained over many years of operational experience. Instruments and infrastructure can fail in numerous ways that significantly and visually affect the quality of the measurements. There are rarely simple faults that can be discovered by computer algorithms or can be understood without previous experience.

The PM<sub>10</sub> and PM<sub>2.5</sub> concentrations may require scaling into Gravimetric Equivalent concentration units by use of the Volatile Correction Model (VCM) <http://www.volatile-correction-model.info> or by corrections published by Defra <https://uk-air.defra.gov.uk/networks/monitoring-methods?view=mcerts-scheme> depending on the measurement technique.

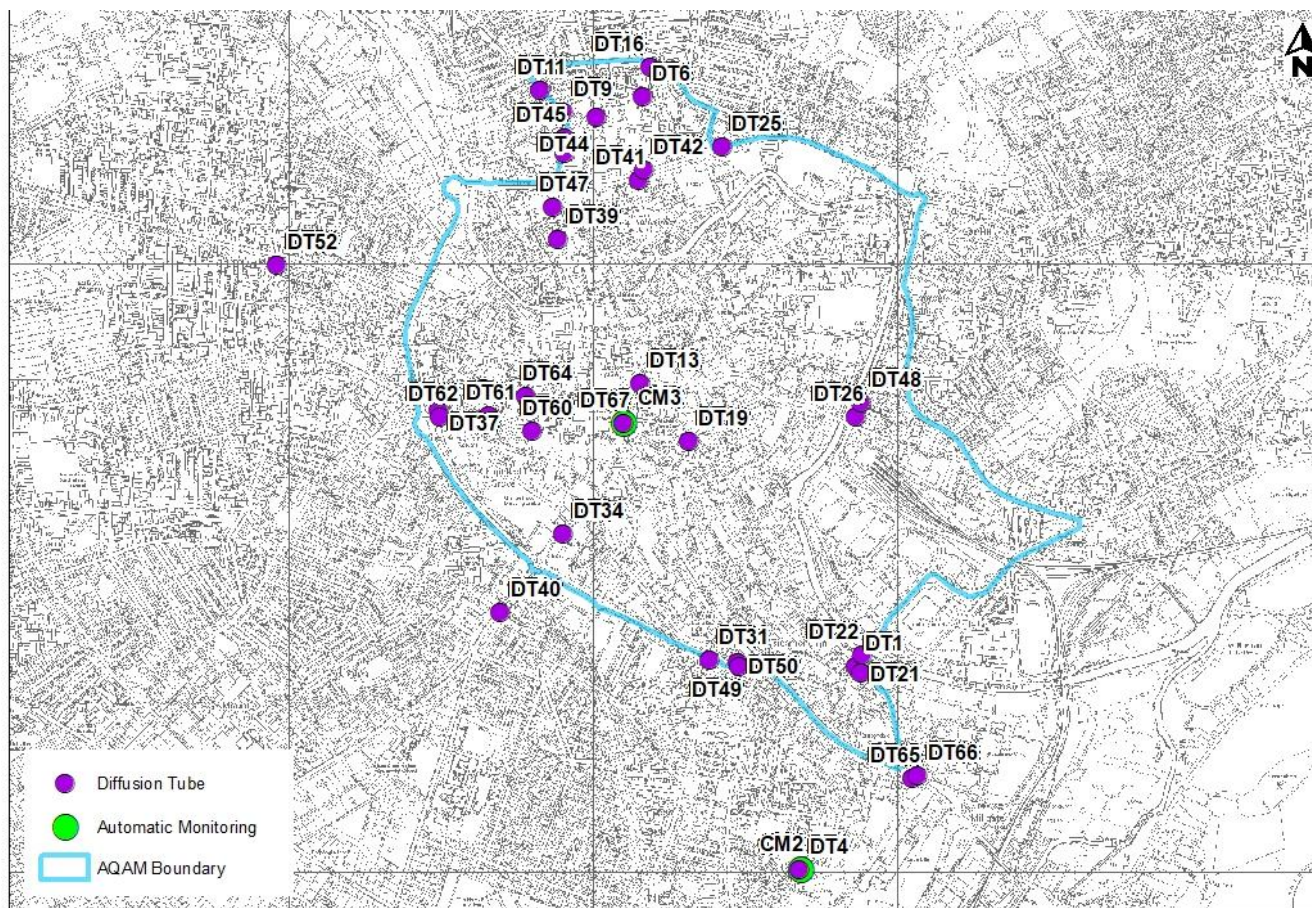
Further information about air quality data management, expert data ratification and examples of bad practices are given on the Air Quality Data Management (AQDM) website <http://www.aqdm.co.uk>.



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

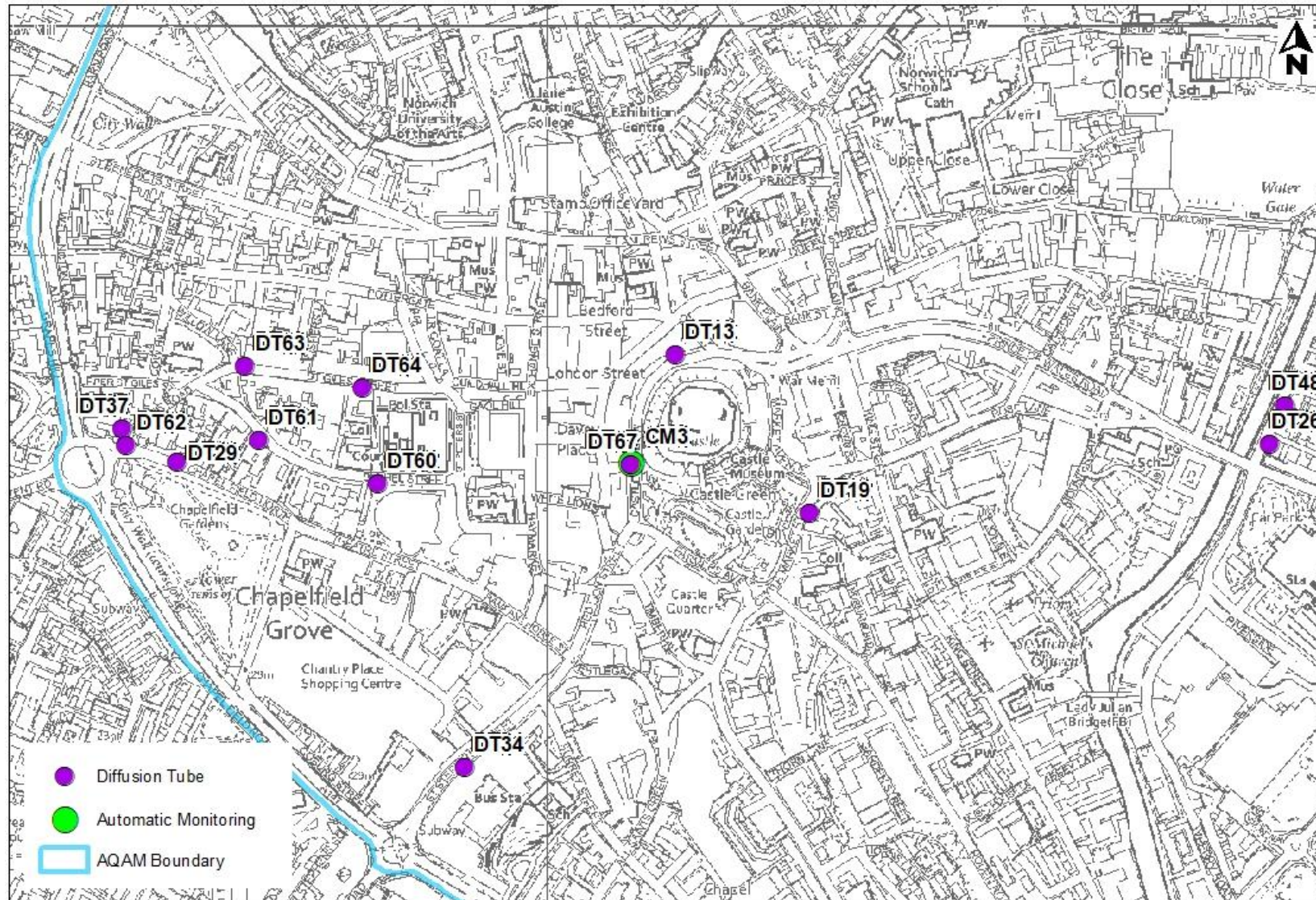
Figure D.1 – Map of Non-Automatic Monitoring Site

Diffusion Tube Location Overview showing AQMA Boundary



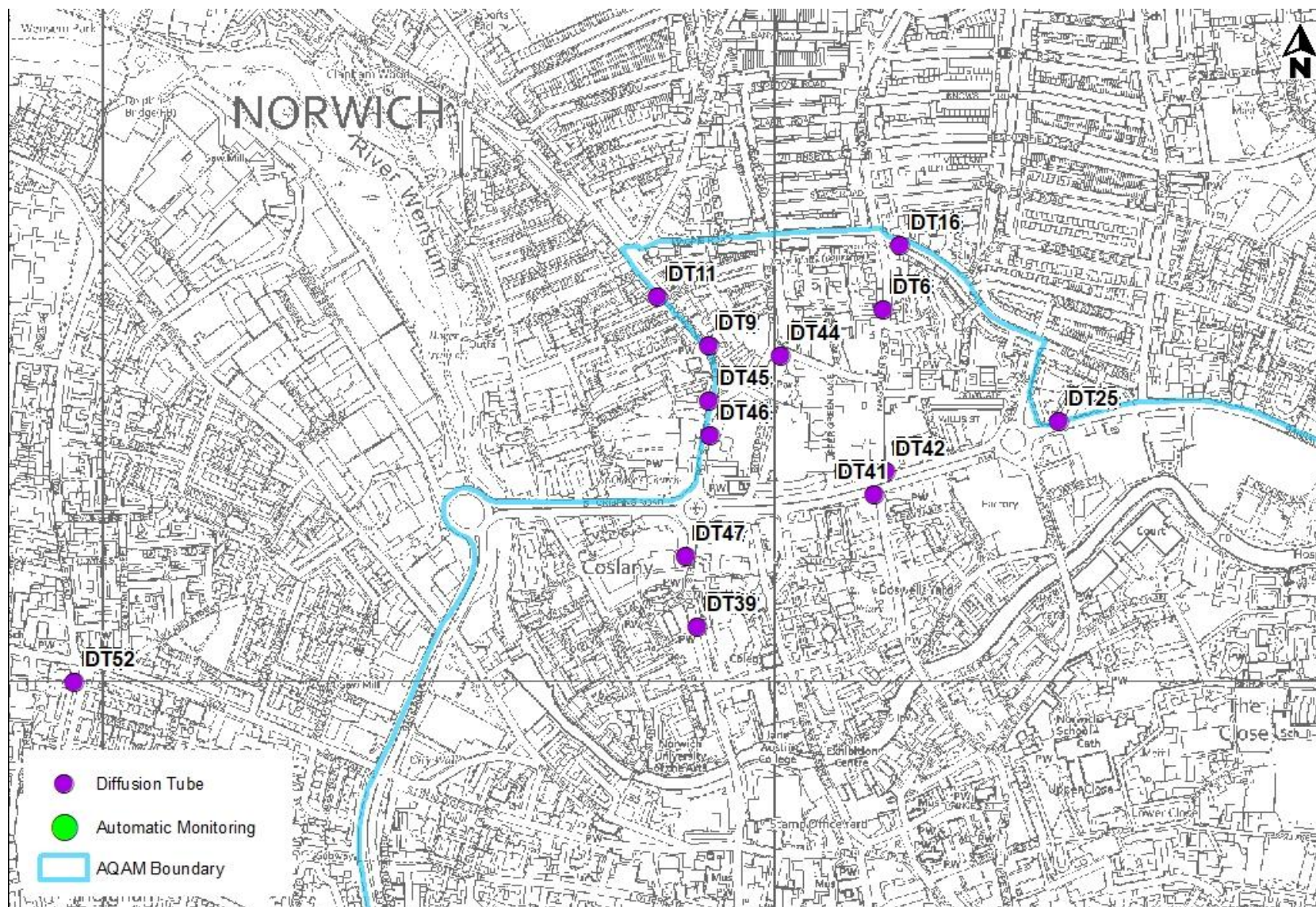


## Diffusion Tubes – Central Norwich





## Diffusion Tubes – North Norwich









## Appendix E: Summary of Air Quality Objectives in England

**Table E.1 – Air Quality Objectives in England<sup>11</sup>**

| Pollutant                              | Air Quality Objective: Concentration                               | Air Quality Objective: Measured as |
|----------------------------------------|--------------------------------------------------------------------|------------------------------------|
| Nitrogen Dioxide (NO <sub>2</sub> )    | 200µg/m <sup>3</sup> not to be exceeded more than 18 times a year  | 1-hour mean                        |
| Nitrogen Dioxide (NO <sub>2</sub> )    | 40µg/m <sup>3</sup>                                                | Annual mean                        |
| Particulate Matter (PM <sub>10</sub> ) | 50µg/m <sup>3</sup> , not to be exceeded more than 35 times a year | 24-hour mean                       |
| Particulate Matter (PM <sub>10</sub> ) | 40µg/m <sup>3</sup>                                                | Annual mean                        |

---

<sup>11</sup> The units are in microgrammes of pollutant per cubic metre of air (µg/m<sup>3</sup>).

## 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 |
| AQS               | Air Quality Standard                                                                                                                                                                                  |
| ASR               | Annual Status Report                                                                                                                                                                                  |
| BSIP              | Bus service improvement plan                                                                                                                                                                          |
| Defra             | Department for Environment, Food and Rural Affairs                                                                                                                                                    |
| DMRB              | Design Manual for Roads and Bridges – Air quality screening tool produced by National Highways                                                                                                        |
| LAQM              | Local Air Quality Management                                                                                                                                                                          |
| NO <sub>2</sub>   | Nitrogen Dioxide                                                                                                                                                                                      |
| NO <sub>x</sub>   | Nitrogen Oxides                                                                                                                                                                                       |
| PM <sub>10</sub>  | Airborne particulate matter with an aerodynamic diameter of 10µm or less                                                                                                                              |
| PM <sub>2.5</sub> | Airborne particulate matter with an aerodynamic diameter of 2.5µm or less                                                                                                                             |
| QA/QC             | Quality Assurance and Quality Control                                                                                                                                                                 |

## References

- Local Air Quality Management Technical Guidance LAQM.TG22. August 2022. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- Local Air Quality Management Policy Guidance LAQM.PG22. August 2022. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- Chemical hazards and poisons report: Issue 28. June 2022. Published by UK Health Security Agency
- Air Quality Strategy – Framework for Local Authority Delivery. August 2023. Published by Defra.