2023 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

June 2023

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Executive Summary: Air Quality in Our Area

The 2023 Annual Status Report is designed to provide the public with information relating to local air quality in Chelmsford, to fulfil Chelmsford City Council's statutory duty to review and assess air quality within its area, and to determine whether or not the air quality objectives are likely to be achieved.

In 2022, Chelmsford City Council measured **no** exceedances of the Air Quality Objectives.

Air Quality in Chelmsford

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

The mortality burden of air pollution within the UK is equivalent to 29,000 to 43,000 deaths at typical ages[3], with a total estimated healthcare cost to the NHS and social care of £157 million in 2017[4].

Chelmsford is located in mid Essex, thirty-one miles from London and has a population of over 181,500 (2021 census), largely living in the main urban areas of Chelmsford and South Woodham Ferrers. The City of Chelmsford comprises of a number of suburban areas surrounding the main urban areas and the larger rural villages of Danbury, East and West Hanningfield, Great Leighs, Little Waltham and Little Baddow.

Chelmsford City Council has declared two Air Quality Management Areas (AQMA) due to emissions from road traffic causing exceedances of the nitrogen dioxide annual mean air quality objective.

These AQMAs are detailed in Table 2.1 and further information online at https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=53.

There is a steady trend of improvement in measured air quality. In 2022, measured air quality was better at all current diffusion tube monitoring sites than prior to the Covid-19 pandemic.

[1] Public Health England. Air Quality: A Briefing for Directors of Public Health, 2017
[2] Defra. Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006
[3] Defra. Air quality appraisal: damage cost guidance, January 2023
[4] Public Health England. Estimation of costs to the NHS and social care due to the health impacts of air pollution: summary report, May 2018

Actions to Improve Air Quality

Chelmsford City Council Air Quality Strategy

The Defra Technical guidance sets out that following revocation of all AQMAs in a local authority area, local authorities in England should put a local air quality strategy in place.

Although there are two AQMAs within Chelmsford, the Council considered that development of an Air Quality Strategy was important to ensure air quality is a high profile issue.

Chelmsford City Council adopted the Air Quality Strategy in June 2022.

The strategy sets out:

- The duties that Chelmsford City Council are required to carry out
- the Councils policies and actions which will contribute to improving air quality
- the air quality monitoring plan for Chelmsford
- a focus on public health
- targets to be achieved across the duration of the strategy

As a large local employer, the Council supports staff in choosing more sustainable ways of commuting to and from work and also during their work activities. The Council's current travel plan holds gold level accreditation from the ModeSHIFT STARS business travel plan scheme.

Recycling and waste vehicles utilise electric powered tail/bin lifts. In addition to directly reducing nitrogen dioxide emissions, these reduce carbon emissions and noise pollution when in use.

The Council has replaced the diesel car used by the Mayor and Deputy Mayor to attend official engagements with a petrol hybrid car

The process of procuring electric pool cars and fleet vehicles is underway and has already installed electric charging points for Council fleet vehicles.

Electric utility vehicles have replaced traditional petrol utility vehicles for use within the Councils parks and green spaces. Petrol handheld tools, such as hedge trimmers, strimmer’s and blowers have been replaced with battery versions. These vehicles and handheld tools not only operate with zero emissions, but also emit less noise and vibration, improving the environment for both residents and workers.

All new residential properties are required to provide electric charging points to encourage the uptake of ultra-low emission vehicles.

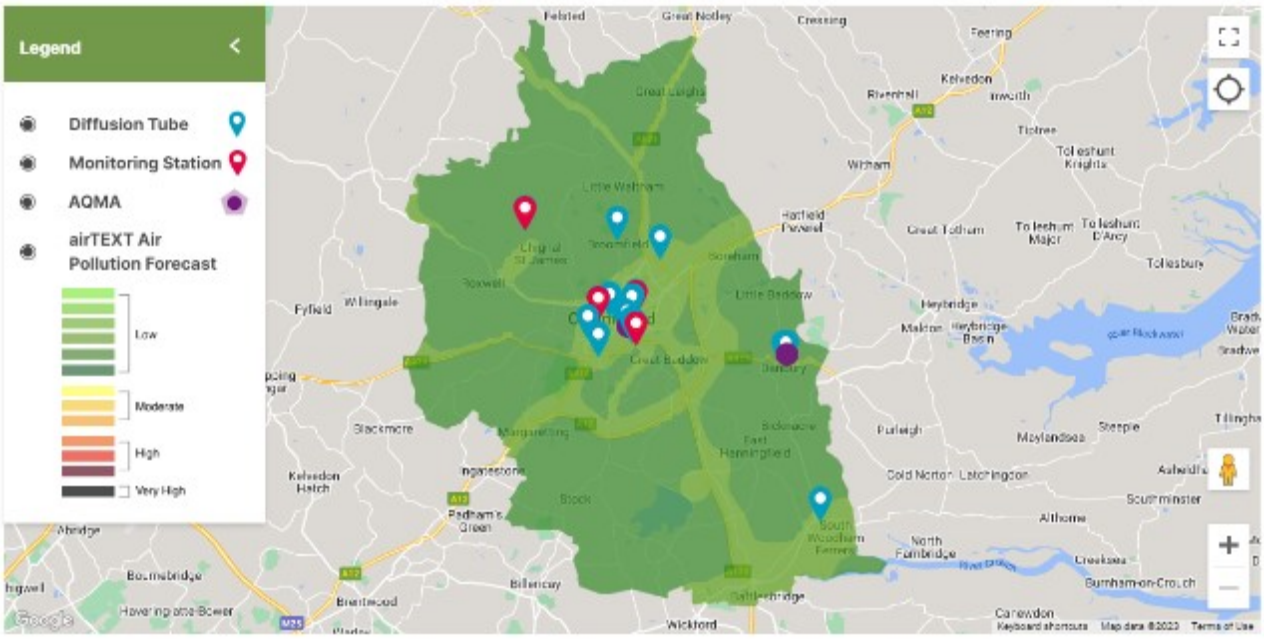
Local Engagement and How to get Involved

Air Quality Dashboard

The Chelmsford City Council air quality dashboard is located online at the Love Your Chelmsford website https://loveyourchelmsford.co.uk/air-quality-dashboard/

The dashboard contains the following information:

- 2022 annual mean measurement at each diffusion tube site
- Rolling annual average diffusion tube concentrations
- Most recent measurement from each automatic monitoring station
- Quarterly summaries of the years automatic monitoring data
- AQMAs
- *air*TEXT air pollution forecast



In addition to the dashboard, there is an webpage summarising air quality in Chelmsford, a webpage providing do's and don'ts for domestic burning and a webpage giving information about sustainable travel.

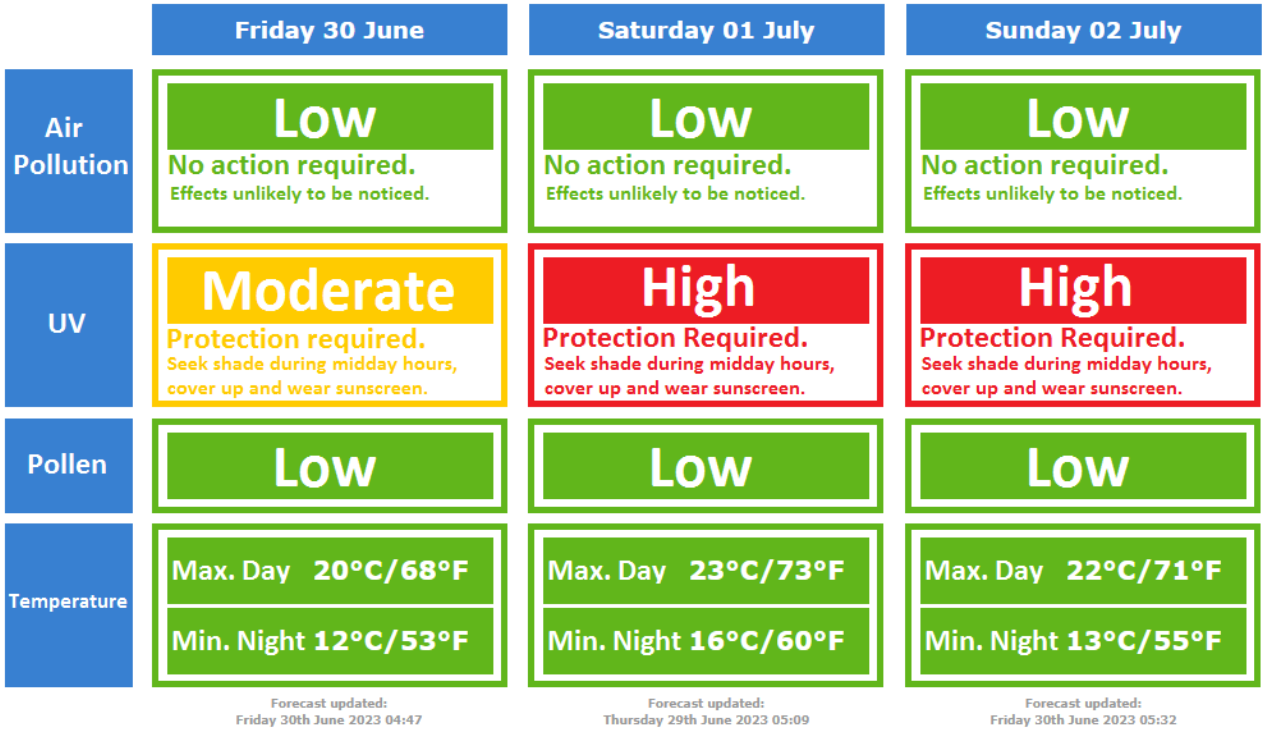
airTEXT

Chelmsford City Council is a member of the *air*TEXT consortium that operates a free service for the public providing air quality alerts by SMS text message, email and voicemail, and 3-day forecasts of air quality, pollen, UV and temperature are available online.

The hourly concentrations of four pollutants are calculated: nitrogen dioxide (NO2), particulates (PM10 and PM2.5) and ozone (O3). From the hourly concentrations the daily air quality index (DAQI) of each pollutant is derived. The overall air quality index is determined by the highest index for any of these pollutants.

Residents and visitors to Chelmsford can sign up at the following link https://www.airtext.info/signupemail to receive the free *air*TEXT alerts and health advice by email, text message or voicemail alerts.

An example of a local bulletin displayed on the *air*TEXT website and @essexair twitter is shown below:



airTEXT issues an alert for a local authority or region if at least 10% of the geographical area is predicted to reach MODERATE or above.

Forecast values of UV, grass pollen and temperature are supplied by DTN.

Conclusions

Chelmsford City Council have concluded that:

- There is a long term downwards trend of monitored NO2 air pollution.
- No exceedances of the air quality objectives have been identified in 2022
- No exceedances of the air quality objectives at relevant exposure have occurred within the last three years
- There are no new developments that will have a significant impact on air quality

Priorities

Chelmsford City Council will prioritise the following air quality measures:

- Extending the PM2.5 monitoring network
- Consider revocation of the Army & Navy Air Quality Management Area (AQMA)
- Consider revocation of the Danbury Air Quality Management Area (AQMA)

As set out in the Chelmsford City Council Air Quality Strategy the following measures will be considered:

- Explore whether the creation of Smoke Controlled Areas in Chelmsford would improve local air quality
- Undertake research into adding air quality sensor nodes to complement the existing monitoring network

Local Responsibilities and Commitment

This ASR was prepared by Public Health and Protection Services of Chelmsford City Council.

This ASR has been approved by:

Paul Brookes – Public Health and Protection Services Manager, Chelmsford City Council

This ASR has been sent to the Director of Public Health at Essex County Council.

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

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Local Air Quality Management

This report provides an overview of air quality in Chelmsford during 2022. 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 Chelmsford 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.

Actions to Improve Air Quality

Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority should prepare an Air Quality Action Plan (AQAP) within 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 AQMAs declared by Chelmsford City Council can be found in Table 0.1. The table presents a description of the AQMA that is currently designated within Chelmsford. Appendix D: Maps of Monitoring Locations and AQMAs provides maps of AQMAs and also the air quality monitoring locations in relation to the AQMAs.

Table 0.1 – 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 (µg/m^3)	Level of Exceedance: Current Year (µg/m^3)	Number of Years Compliant with Air Quality Objective (at relevant exposure)	Name and Date of AQAP Publication	Web Link to AQAP
Army & Navy AQMA	Declared 01/12/2005, Amended 1/10/2012	NO2 Annual Mean	Army & Navy Roundabout and surrounding roads	NO	51	No Exceedance	3	Air Quality Action Plan Army & Navy July 2008	https://uk-air.defra.gov.uk/assets/documents/no2ten/Local_zone29_Chelmsford_AQActionplan_1.pdf
A414 Maldon Road, Danbury	Declared 08/10/2018	NO2 Annual Mean	The stretch of road between Gay Bowers Lane and Danbury Village Green	NO	47.3	No Exceedance	3	No development being actively undertaken due to compliance with AQO	N/A

☒ **Chelmsford City Council confirms the information on UK-Air regarding their AQMA is up to date**

Progress and Impact of Measures to address Air Quality in Chelmsford City Council

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

Chelmsford City Council have a number of ongoing measures to improve air quality in Chelmsford. These are detailed in Table 0.2 below.

Table 0.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
1	Chelmsford Growth Package - Outer Zone	Transport Planning and Infrastructure	2010-2017	2010-2017	2022	Essex County Council / South East Local Enterprise Partnership	Essex County Council / South East Local Enterprise Partnership	NO	Funded	£1 million - £10 million	Implementation			Bus Priority Measures. Focus on removing as much traffic as possible on the outskirts of the City by emphasising existing rail and Park & Ride routes and exploring potential for future services.	
2	Chelmsford Growth Package - Mid Zone	Transport Planning and Infrastructure	2017	2017	2022	Essex County Council / South East Local Enterprise Partnership	Essex County Council / South East Local Enterprise Partnership	NO	Funded	£1 million - £10 million	Completed			Sustainable alternatives to the private car use and encouraging trips using public transport, cycling and on the pedestrian network	
3	Chelmsford Growth Package - Inner Zone	Promoting Travel Alternatives	2017	2017	2022	Essex County Council / South East Local Enterprise Partnership	Essex County Council / South East Local Enterprise Partnership	NO	Funded	£1 million - £10 million	Completed			Public Realm Improvements - Improving the quality of the walking environment	
4	Army & Navy Sustainable Transport Package	Transport Planning and Infrastructure	2019	2019	2025	DfT	DfT	NO	Not Funded	> £10 million	Planning		A new 'hamburger' junction has been formally approved	Funding proposal to be submitted to DfT	
5	Chelmsford Air Quality Strategy	Policy Guidance and Development Control	2018	2018	2022	Chelmsford City Council	Chelmsford City Council	NO	Funded	< £10k	Planning		Strategy is due to be adopted in 2022	Complete	
6	Essex Liftshare	Alternatives to private vehicle use	N/A	N/A	N/A	Essex County Council	Essex County Council	NO	Funded	< £10k	Implementation				
7	Member of Essex Air	Policy Guidance and Development Control	N/A	N/A	N/A	N/A	N/A	NO	Funded	< £10k	Implementation				

8	Environmental Permit Inspection & Enforcement	Environmental Permits	N/A	N/A	N/A	Chelmsford City Council	Chelmsford City Council	NO	Funded	< £10k	Implementation				
9	Replace all Council fleet vehicles that do not currently meet the Euro 6/VI emissions standard	Promoting Low Emission Transport	2020	2020	2024	Chelmsford City Council	Chelmsford City Council	NO	Funded	£1 million - £10 million	Planning		Replacement programme in place [fully funded] to ensure that all vehicles in the Council fleet will meet at least the low-emission standard by 2024		
10	Evaluate ultra-low emission alternatives [electric or hydrogen powered] for selected vehicles where operationally and commercially viable	Promoting Low Emission Transport	2020	2020	2021	Chelmsford City Council	Chelmsford City Council	NO	Funded	£10k - 50k	Complete		Two further electric-powered [ultra-low emission] utility vehicles due for delivery to Parks in January 2020. Two tipper mini-vans used by grounds maintenance team to be replaced with electric-powered alternative in 2020/21		
11	Acquire a selection of low emission or ultra-low emission ‘pool’ vehicles to provide more sustainable options for business travel	Promoting Low Emission Transport	2020	2020	2022	Chelmsford City Council	Chelmsford City Council	NO	Not Funded	£100k - £500k	Planning		Capital programme bid submitted to acquire up to 5 pool vehicles	Delays incurred due to a shortage of appropriate vehicles	

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

As detailed in Policy Guidance LAQM.PG22 (Chapter 8), local authorities are expected to work towards reducing emissions and/or concentrations of PM2.5 (particulate matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that PM2.5 has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

Chelmsford City Council commenced $PM_{2.5}$ monitoring in 2019 at the Springfield Road (Chelmsford Prison) site which routinely measures the highest PM10 in the monitoring network. This location is sited next to a busy road and junction along with an adjacent bus stop. The PM2.5 annual mean measurement for 2022 was 10.5µg/m^3.

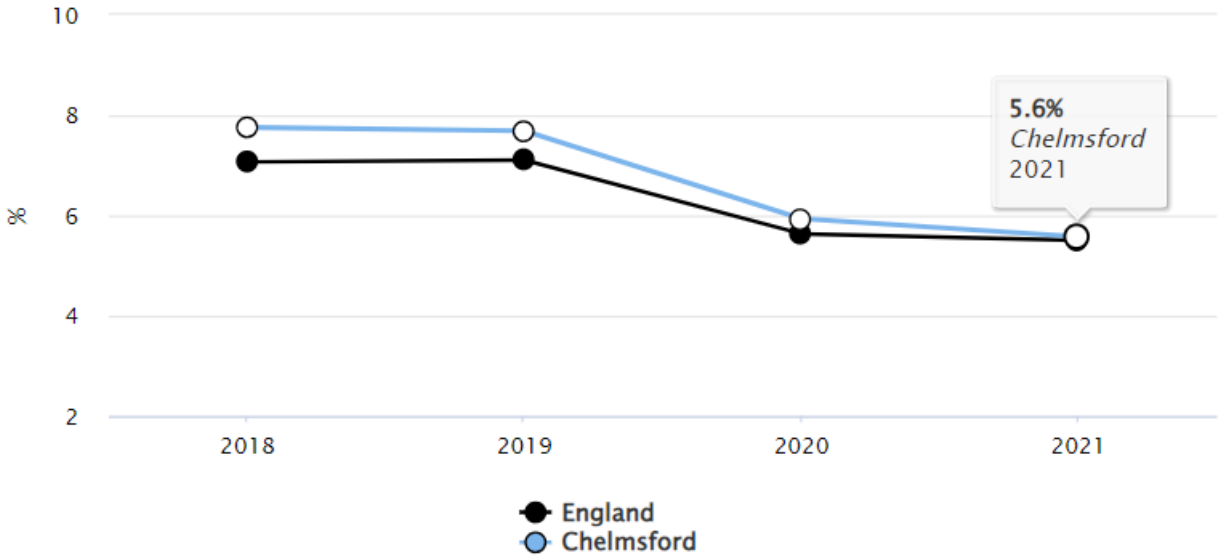
Table 0.3 – Measured $PM_{2.5}$ Concentrations

Monitoring Site	$PM_{2.5}$ Annual Mean Concentration			
	2019	2020	2021	2022
CM2 Springfield Road	11.4µg/m³	10.2µg/m³	10.9µg/m³	10.5µg/m³

The Defra background mapping resource for PM2.5 in Chelmsford models a maximum annual mean concentration of 12.2µg/m^3 in 2022.

The Public Health Outcomes Framework indicator D01 – Fraction of mortality attributable to particulate (PM2.5) air pollution which for 2021 gave a value of 5.6% which has improved from 7.8% in 2018.

Figure 2.1 – Public Health Framework Indicator D01 Fraction of all-cause adult mortality attributable to anthropogenic particulate air pollution



Chelmsford City Council is taking the following measures to address PM2.5:

- Use of Essex Air twitter to encourage the reporting of smoky vehicles through the DVSA reporting service. It is possible to report either heavy goods vehicles or public service vehicles (buses)
- Regular inspections of permitted industry where combustion and non-combustion processes could lead to anthropogenic emissions of PM2.5
- Chelmsford City Council has provided an information webpage regarding domestic burning https://loveyourchelmsford.co.uk/air-quality-dashboard/domestic-burning/
- In 2023, we will explore whether the creation of Smoke Controlled Areas would improve local air quality
- In 2023, the PM2.5 monitoring network in Chelmsford will be extended

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

This section sets out the monitoring undertaken within 2022 by Chelmsford City Council and how it compares with the relevant air quality objectives. In addition, monitoring results are presented for a five-year period between 2018 and 2022 to allow monitoring trends to be identified and discussed.

No exceedances of the NO2 air quality objectives have been identified and the long-term trend for monitored concentrations is downwards.

No exceedances of the PM10 have been identified and the long-term trend is down. However, there has been a slight short-term upwards trend.

Quality assurance and quality control information for the automatic analysers, diffusion tubes bias adjustments and other adjustments applied (e.g. annualisation and/or distance correction) are presented in Appendix C. Maps showing the location of the monitoring sites are presented in Appendix D.

Summary of Monitoring Undertaken

Automatic Monitoring Sites

Chelmsford City Council undertook automatic (continuous) monitoring at four sites during 2022 measuring Nitrogen Dioxide (NO_2). In addition, three of these sites measure Particulate Matter (PM_{10}), one site measures Particulate Matter ($PM_{2.5}$) and one site measures Ozone (O_3). Table A.1 in Appendix A provides detail of these sites.

Details on how the monitors are calibrated and how the data has been adjusted is provided in Appendix C.

Maps showing the location of the monitoring sites are provided in Appendix D.

Non-Automatic Monitoring Sites

Chelmsford City Council undertook non- automatic (i.e. passive) monitoring of NO_2 at 39 sites during 2022. Table A.2 in Appendix A presents the details of the non-automatic sites.

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

Individual Pollutants

Nitrogen Dioxide (NO2)

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.

Table A.1 and Table A.2 presents details of the NO2 monitoring sites.

Table A.3 and Table A.4 in Appendix A compare the ratified and adjusted monitored NO2 annual mean concentrations for the past five years with the air quality objective of 40µg/m3. Note that the concentration data presented represents the concentration at the location of the monitoring site, following the application of bias adjustment and annualisation, as required (i.e. the values are exclusive of any consideration to fall-off with distance adjustment).

Figure A.1 provides NO2 annual mean concentrations for the continuous automatic monitoring sites from 2012 to 2022. All sites have a long term trend of improved air quality.

Figures A.2 & A.3 provides NO2 annual mean concentrations from the Army & Navy and Danbury AQMA monitoring sites from 2017 to 2022. All sites have a long term trend of improved air quality.

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

For diffusion tubes, the full 2022 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.

In 2022, no exceedances of the air quality objectives have been measured. As no measured annual mean concentrations were greater than 60µg/m^3, it is unlikely that there has been an exceedance of the 1-hour mean objective

Particulate Matter (PM10)

In 2022, Chelmsford City Council measured no exceedances of the PM10 annual mean or PM10 daily mean air quality objectives.

Chelmsford City Council has been monitoring PM2.5 since 2019. The analyser is sited at the CM2 Springfield Road air quality monitoring station.

Figure A.4 in Appendix A presents the ratified and adjusted monitored PM10 annual mean concentrations from 2019 to 2022.

Table A.6 presents PM10 automatic monitoring data from 2018 to 2022. The short-term trend for monitored concentrations is downwards identifying improved air quality.

Figure A.6 presents PM10 automatic monitoring data from 2008 to 2022.and compares the ratified and adjusted monitored PM10 annual mean concentrations with the annual mean air quality objective of 40µg/m^3.

For 2023, Chelmsford City Council will not be measuring PM10 at the Chignal St James monitoring site due to plans to upgrade the monitoring equipment to measure PM2.5.

Particulate Matter (PM2.5)

Chelmsford City Council has been monitoring PM2.5 since 2019. The analyser is sited at the CM2 Springfield Road air quality monitoring station.

Table A.8 in Appendix A presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations from 2019 to 2022.

Figure A.5 presents PM2.5 automatic monitoring data from 2019 to 2022. The short-term trend for monitored concentrations is downwards identifying improved air quality.

In 2023, Chelmsford City Council will start measuring PM2.5 at the Chignal St James monitoring site.

Ozone (O3)

It is not a requirement of Local Air Quality Management to monitor Ozone concentrations. However, Chelmsford City Council undertakes measurement at the Chignal St James rural background monitoring site.

Table A.9 in Appendix A provides the results of ozone monitoring from 2011 to 2022.

Figure A.6 presents this data graphically.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
CM1	Chignal St James	Rural	566463	210830	NO, NOx, NO2, PM10, O3	NO	Chemiluminescent / Unheated BAM / UV Photometry	40	43	4
CM2	Springfield Road (Prison)	Roadside	571640	207179	NO, NOx, NO2, PM10, PM2.5	NO	Chemiluminescent / Unheated BAM / Heated BAM	29.2	2.8	2.5
CM3	Rainsford Lane (Fire Station)	Roadside	569912	206881	NO, NOx, NO2, PM10	NO	Chemiluminescent / Unheated BAM	20	2.5	2.5
CM4	Baddow Road	Roadside	571654	205798	NO, NOx, NO2	NO	Chemiluminescent	12	5.1	1.5

Notes:

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

(2) N/A if not applicable

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

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
CB01	12 Van Diemans Road	Roadside	571421	205963	NO2	Yes Army & Navy AQMA	0.0	12.0	No	2.5
CB13	60 Roxwell Road	Roadside	569077	207528	NO2	No	0.0	16.0	No	2.5
CB22, CB22B, CB22C	95 Baddow Road	Roadside	571505	205968	NO2	Yes Army & Navy AQMA	0.0	8.0	No	2.5
CB26	214 Baddow Road	Roadside	571614	205812	NO2	No	0.0	5.0	No	2.5
CB27	Howe Green Interchange	Roadside	574080	203469	NO2	No	0.0	18.0	No	2.5
CB32	2 Abbots Place	Roadside	571581	207144	NO2	No	0.0	5.0	No	2.5
CB36	2 Rainsford Lane	Roadside	570104	207247	NO2	No	2.0	1.0	No	2.5
CB38, CB39, CB40	Prison 3	Roadside	571640	207179	NO2	No	14.0	3.0	Yes	2.5
CB46	32 Rochford Road	Roadside	571062	206281	NO2	Yes Army & Navy AQMA	2.0	3.0	No	2.5

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
CB49	26 Rochford Road	Roadside	571104	206262	NO2	Yes Army & Navy AQMA	0.0	5.0	No	2.5
CB57	Goldlay House, Parkway	Roadside	571359	206124	NO2	No	0.0	16.0	No	2.5
CB58	148 Baddow Road	Roadside	571476	205964	NO2	Yes Army & Navy AQMA	0.0	12.0	No	2.5
CB61	10 Fraser Close	Urban Background	571445	205631	NO2	No	0.0	7.0	No	2.5
CB62, CB63, CB64	Chignal 3	Rural	566463	210830	NO2	No	40.0	43.0	Yes	2.5
CB65, CB66, CB67	Fire Station 3	Roadside	569912	206881	NO2	No	20.0	2.5	Yes	2.5
CB68, CB68B, CB68C	Goldlay Avenue 3	Roadside	571382	206092	NO2	No	0.0	12.0	No	2.5
CB76, CB76b, CB76c	5/7 Maldon Road, Danbury	Roadside	578506	205122	NO2	Yes Danbury AQMA	0.0	1.0	No	2.5
CB79	10 Waterhouse Lane	Roadside	569480.455	206009.327	NO2	No	2.0	1.0	No	2.5

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
CB82	122 Springfield Road	Roadside	571438	206966	NO2	No	0.0	4.0	No	2.5
CB83	134/136 Springfield Road	Roadside	571462	206999	NO2	No	0.0	3.0	No	2.5
CB84, CB85, CB86	Baddow Road AQMS 3	Roadside	571653	205800	NO2	No	12.0	5.1	Yes	2.5
CB87	Bus Station	Urban Centre	570444	207044	NO2	No	4.0	3.0	No	2.5
CB89	135 Springfield Road	Kerbside	571426	206979	NO2	No	2.0	0.5	No	2.5
CB90	144 Springfield Road	Roadside	571480	207019	NO2	No	2.0	2.0	No	2.5
CB91, CB92, CB93	26 Maldon Road, Danbury	Roadside	578539	205113	NO2	Yes Danbury AQMA	0.0	1.0	No	2.5
CB94	Copt Hill, Danbury	Roadside	578571	205108	NO2	Yes Danbury AQMA	-1.4	2.8	No	2.5
CB95	Eves Corner, Danbury	Roadside	578415	205106	NO2	Yes Danbury AQMA	3.0	2.0	No	2.5
CB96	Heathcote School, Main	Kerbside	578359	205120	NO2	No	3.0	0.3	No	2.5

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
	Road, Danbury									
CB98A, CB98B, CB98C	Rear of 66 Baddow Road (Dentists)	Roadside	571148	206324	NO2	Yes	2.0	3.0	No	2.5
CB99A, CB99B, CB99C	Rear of 74 Baddow Road (Aga Shop)	Roadside	571211	206274	NO2	Yes	3.4	1.3	No	2.5
CB102	Maldon Road Junction w/ The Avenue, Danbury	Roadside	578954.31	205131.82	NO2	No	1.0	1.0	No	2.5
CB103A, CB103B, CB103C	Opposite Myra Cottage Maldon Road, Danbury	Roadside	578476.76	205110.58	NO2	Yes Danbury AQMA	8.0	1.0	No	2.5
CB108	Blacksmiths Cottage, Maldon Road, Danbury	Urban Background	578487.544	205139.213	NO2	No	0.0	19.0	No	2.5
CB109	Adjacent to Anytime Fitness, Viaduct Road	Roadside	570456.126	207024.951	NO2	No	0.0	1.0	No	2.5
CB110	Adjacent to 25 Wood Street	Roadside	569982.25	205263.95	NO2	No	0.0	1.0	No	2.5

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
CB111	Wood Street adjacent to Bruce Grove	Roadside	569996.04	205198.82	NO2	No	0.0	1.0	No	2.5
CB112	Burnham Road / Greenwood Surgery	Roadside	580275	198121	NO2	No	10.8	1.0	No	2.5
CB113	Broomfield Road	Roadside	570669	210486	NO2	No	0.0	1.0	No	2.5
CB117	White Hart Lane adjacent to Centenary Way	Kerbside	572642	209674	NO2	No	N/A	1.0	No	2.5

Notes:

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

(2) N/A if not applicable.

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

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2022 (%) (2)	2018	2019	2020	2021	2022
CM1	566463	210830	Rural	97.6	97.6	12.4	11.9	9.3	8.9	12.9
CM2	571640	207179	Roadside	98.0	98.0	29.2	34.5	31.4	28.2	28.4
CM3	569912	206881	Roadside	96.9	96.9	24.2	19.9	18.8	19.7	20.3
CM4	571654	205798	Roadside	99.7	99.7	27.5	27	20.7	20.1	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**

Notes:

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

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

All means have been "annualised" as per LAQM.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.1 – Trends in Automatic Monitoring NO2 Annual Mean Concentrations

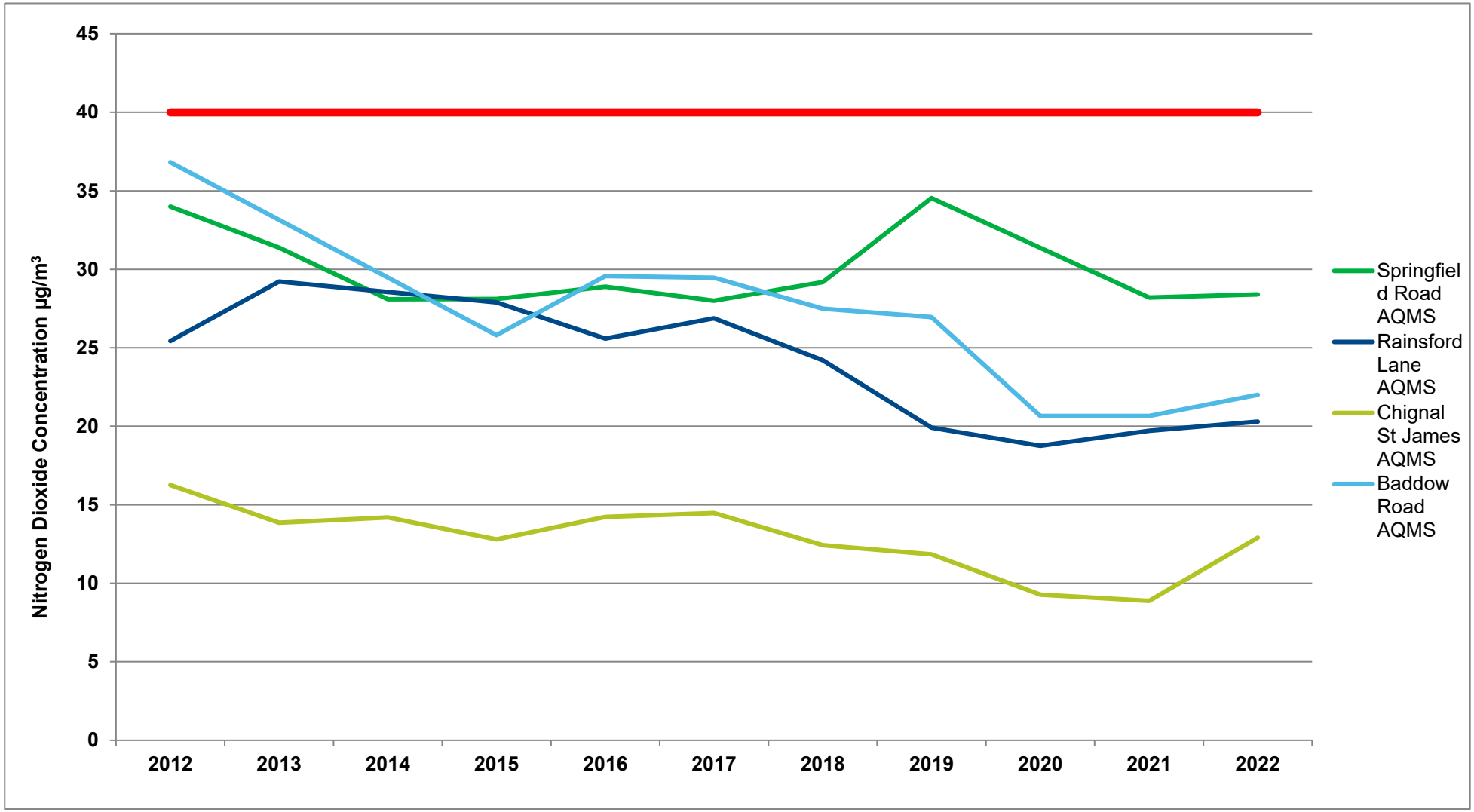


Table A.4 – Annual Mean NO2 Monitoring Results: Non-Automatic Monitoring (µg/m3)

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2022 (%) [2]	2018	2019	2020	2021	2022
CB01	571421	205963	Roadside	100.0	100.0	31.7	30.2	24.4	25.6	26.4
CB13	569077	207528	Roadside	92.3	92.3	18.3	17.7	14.5	14.7	13.7
CB22, CB22B, CB22C	571505	205968	Roadside	90.4	90.4	33.0	29.6	23.6	26.1	24.6
CB26	571614	205812	Roadside	100.0	100.0	29.7	28.0	24.8	24.0	21.8
CB27	574080	203469	Roadside	100.0	100.0	32.4	31.8	26.2	26.3	27.2
CB32	571581	207144	Roadside	100.0	100.0	29.0	29.3	25.9	24.8	23.9
CB36	570104	207247	Roadside	92.3	92.3	28.6	28.4	22.8	21.9	20.4
CB38, CB39, CB40	571640	207179	Roadside	100.0	100.0	29.0	28.0	23.6	22.0	21.5
CB46	571062	206281	Roadside	100.0	100.0	27.7	24.9	19.4	22.0	21.8
CB49	571104	206262	Roadside	100.0	100.0	22.3	24.2	20.1	17.3	16.8
CB57	571359	206124	Roadside	100.0	100.0	28.2	27.6	24.0	23.1	23.1
CB58	571476	205964	Roadside	100.0	100.0	37.2	35.1	31.3	31.7	31.0
CB61	571445	205631	Urban Background	100.0	100.0	15.5	15.2	13.7	12.6	12.3
CB62, CB63, CB64	566463	210830	Rural	100.0	100.0	11.6	11.6	9.2	9.0	9.0
CB65, CB66, CB67	569912	206881	Roadside	100.0	100.0	23.2	21.4	19.2	18.7	18.0
CB68, CB68B, CB68C	571382	206092	Roadside	100.0	100.0	32.3	29.4	24.6	25.0	24.8

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2022 (%) [2]	2018	2019	2020	2021	2022
CB76, CB76b, CB76c	578506	205122	Roadside	100.0	100.0	36.5	36.3	27.6	31.5	31.0
CB79	569480.455	206009.327	Roadside	100.0	100.0	41.8	39.0	32.5	32.4	32.2
CB82	571438	206966	Roadside	92.3	92.3	34.7	31.5	23.9	25.6	25.9
CB83	571462	206999	Roadside	92.3	92.3	36.4	35.8	30.9	31.9	30.4
CB84, CB85, CB86	571653	205800	Roadside	100.0	100.0	26.4	26.4	22.0	21.0	21.0
CB87	570444	207044	Urban Centre	100.0	100.0	35.4	39.6	30.6	30.4	32.8
CB89	571426	206979	Kerbside	80.8	80.8	38.5	37.4	31.8	31.3	33.1
CB90	571480	207019	Roadside	92.3	92.3	26.9	26.1	23.1	21.9	21.1
CB91, CB92, CB93	578539	205113	Roadside	100.0	100.0	44.6	42.8	33.9	34.6	34.8
CB94	578571	205108	Roadside	90.4	90.4	27.8	25.0	19.7	21.6	22.3
CB95	578415	205106	Roadside	100.0	100.0	29.4	27.5	20.3	23.4	23.0
CB96	578359	205120	Kerbside	92.3	92.3	29.2	29.8	23.8	22.7	22.4
CB98A, CB98B, CB98C	571148	206324	Roadside	92.3	92.3	45.9	45.8	38.3	36.8	35.9
CB99A, CB99B, CB99C	571211	206274	Roadside	92.3	92.3	47.1	45.4	40.2	37.5	37.8
CB102	578954.31	205131.82	Roadside	100.0	100.0	N/A	39.4	28.9	31.1	30.8
CB103A, CB103B, CB103C	578476.76	205110.58	Roadside	100.0	100.0	N/A	36.9	29.6	30.7	30.8
CB108	578487.544	205139.213	Urban Background	100.0	100.0	N/A	17.8	14.8	14.4	14.5

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2022 (%) (2)	2018	2019	2020	2021	2022
CB109	570456.126	207024.951	Roadside	84.6	84.6	N/A	33.7	24.8	24.4	25.0
CB110	569982.25	205263.95	Roadside	100.0	100.0	N/A	25.4	24.3	21.6	23.0
CB111	569996.04	205198.82	Roadside	100.0	100.0	N/A	N/A	25.9	29.2	33.1
CB112	580275	198121	Roadside	100.0	100.0	N/A	N/A	N/A	26.3	28.4
CB113	570669	210486	Roadside	100.0	100.0	N/A	N/A	N/A	25.1	23.6
CB117	572642	209674	Kerbside	100.0	100.0	N/A	N/A	N/A	29.9	33.0

☒ **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 µg/m^3.

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined**.

Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per LAQM.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.2 – Trends in Diffusion Tube Monitoring: NO2 Annual Mean Concentrations in Army & Navy AQMA

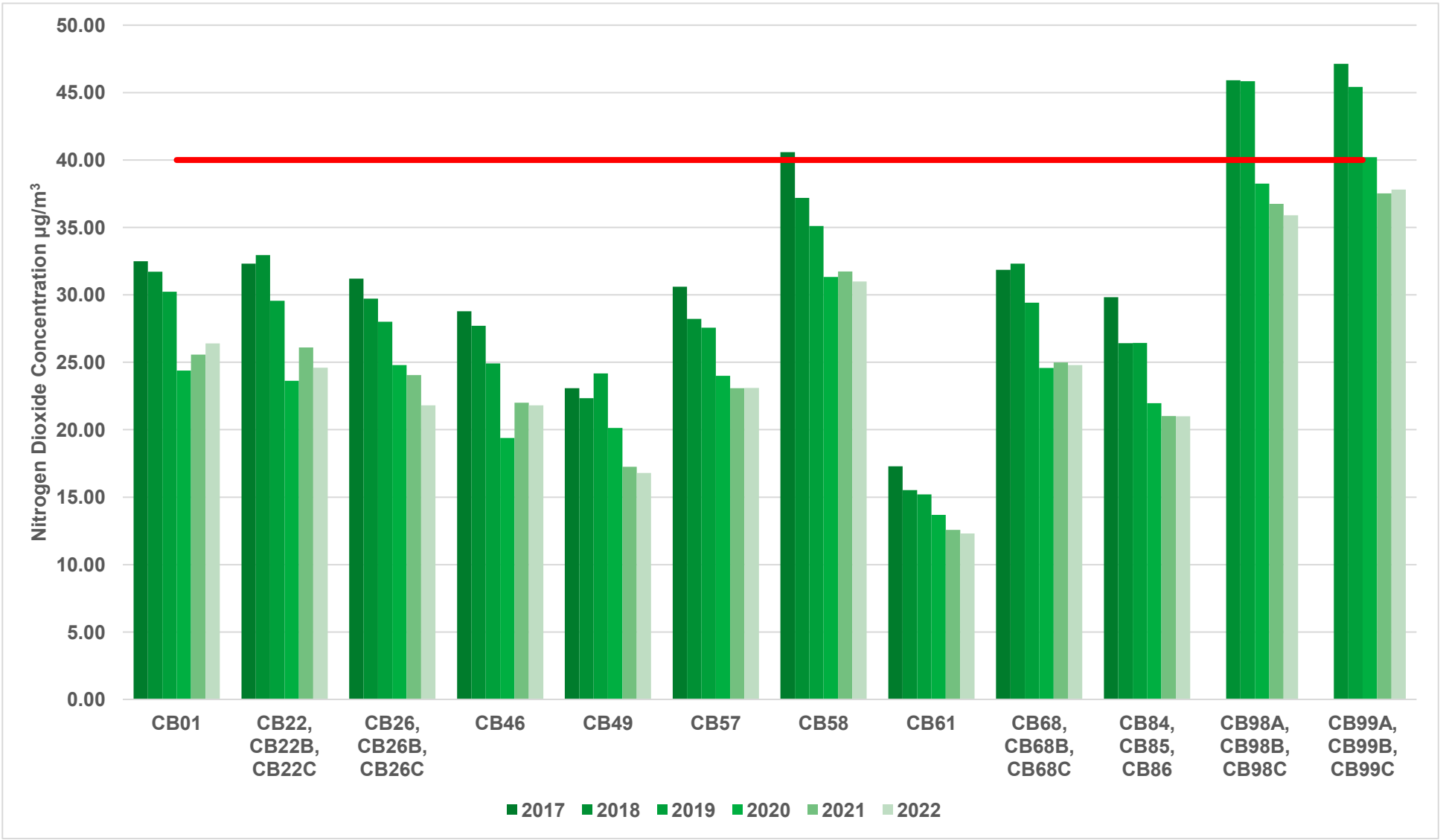


Figure A.3 – Trends in Diffusion Tube Monitoring: NO2 Annual Mean Concentrations in Danbury AQMA

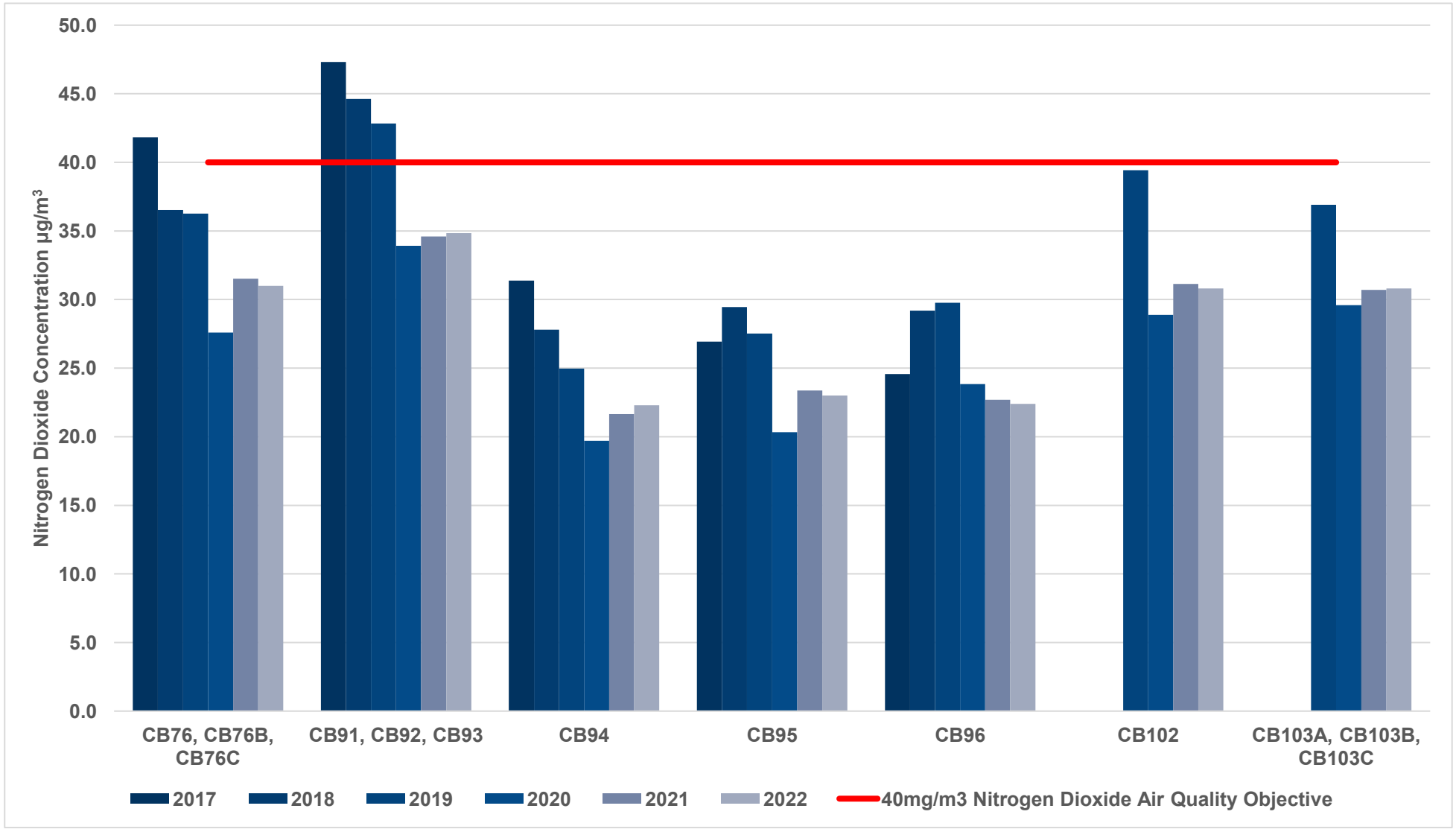


Table A.5 – 1-Hour Mean NO2 Monitoring Results, Number of 1-Hour Means > 200µg/m3

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2022 (%) (2)	2018	2019	2020	2021	2022
CM1	566463	210830	Rural	97.6	97.6	0	0	0 (57.7)	0	0
CM2	571640	207179	Roadside	98	98	0	0	0 (74.6)	0	0
CM3	569912	206881	Roadside	96.9	96.9	0	0	0	0	0
CM4	571654	205798	Roadside	99.7	99.7	0	0	0	0	0

Notes:

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

Exceedances of the NO_2 1-hour mean objective (200µg/m^3 not to be exceeded more than 18 times/year) are shown in **bold**.

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

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

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

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

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2022 (%) (2)	2018	2019	2020	2021	2022
CM1	566463	210830	Rural	96.2	96.2	13.5	15.9	12.4	10.9	16
CM2	571640	207179	Roadside	95.3	95.3	27	25.3	21.9	24.7	19.3
CM3	569912	206881	Roadside	95.3	95.3	17.7	18.7	21.4	24	25

☒ **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^3.

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

All means have been "annualised" as per LAQM.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_{10} Concentrations

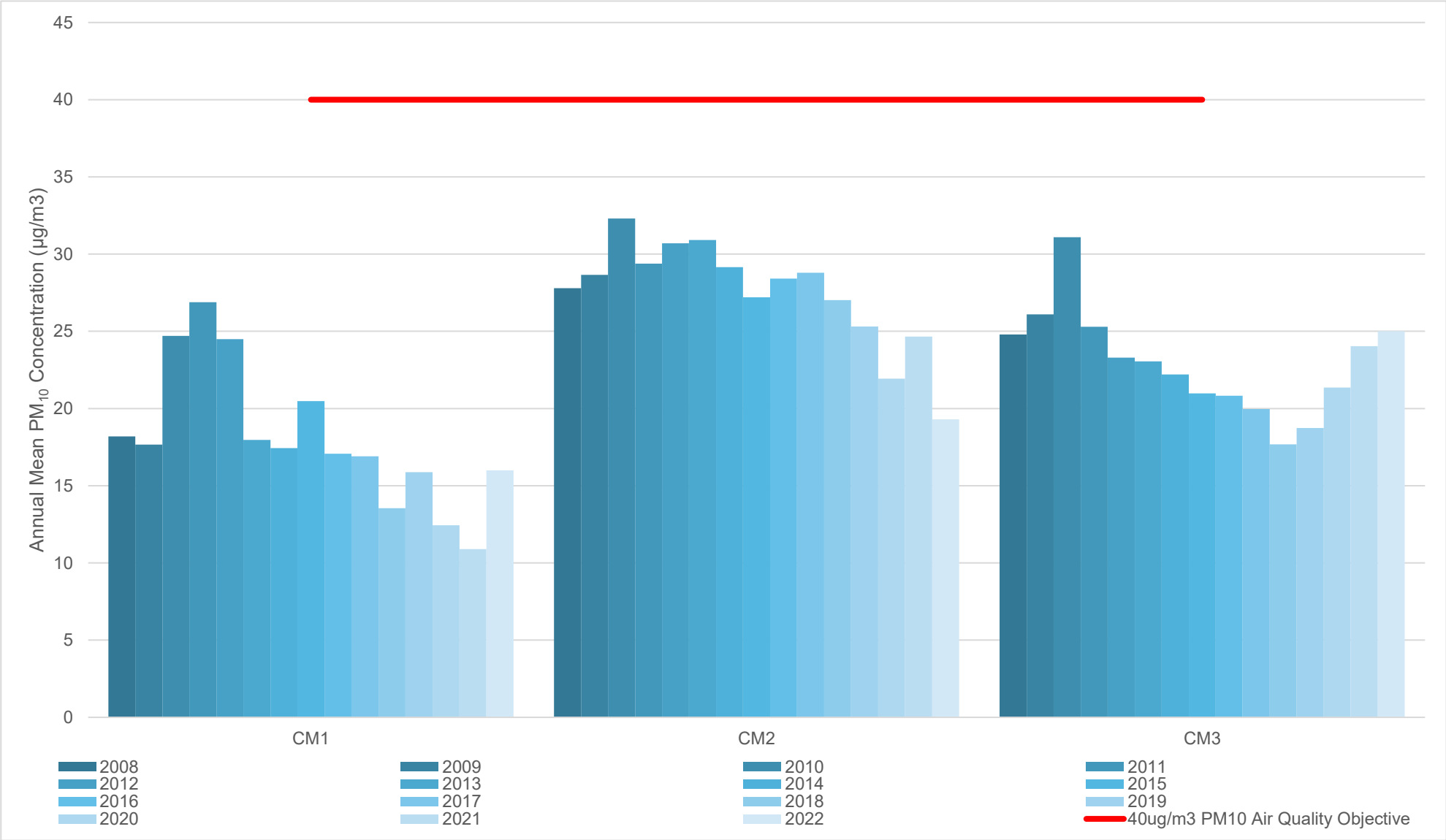


Table A.7 – 24-Hour PM10 Monitoring Results, Number of PM10 24-Hour Means > 50µg/m3

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2022 (%) (2)	2018	2019	2020	2021	2022
CM1	566463	210830	Rural	96.2	96.2	1	3	0	0	0
CM2	571640	207179	Roadside	95.3	95.3	12	13	2	5	3
CM3	569912	206881	Roadside	95.3	95.3	2	2	2	3	3

Notes:

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

Exceedances of the PM_{10} 24-hour mean objective (50µg/m^3 not to be exceeded more than 35 times/year) are shown in **bold**.

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

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

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

Table A.8 – Annual Mean PM2.5 Monitoring Results (µg/m3)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2022 (%) (2)	2018	2019	2020	2021	2022
CM2	571640	207179	Roadside	97.5	97.5	N/A	11.4	10.2	10.9	10.5

☒ **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^3.

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.5 – Measured Annual Mean $PM_{2.5}$ Concentrations at CM2 Springfield Road AQMS

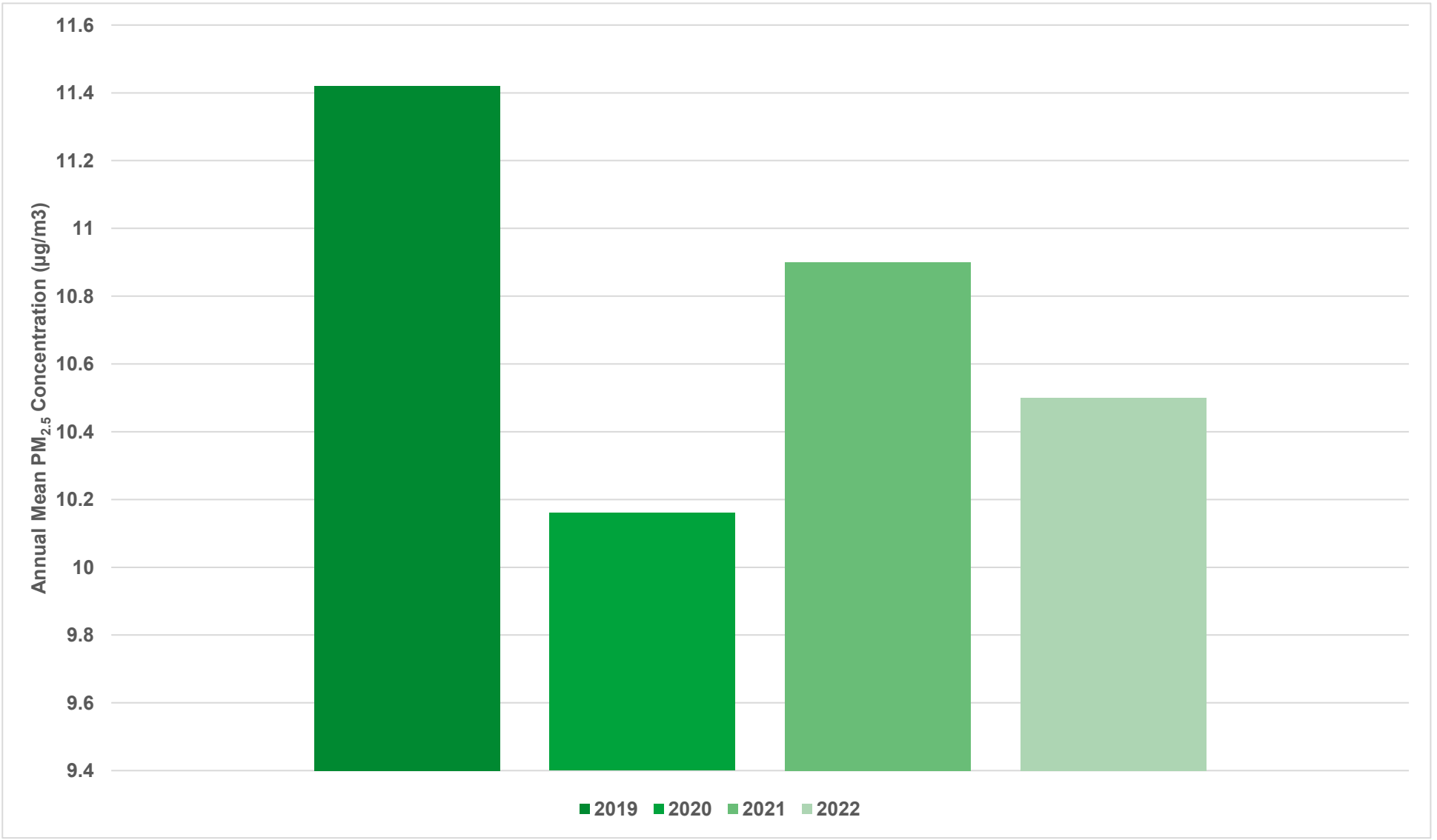
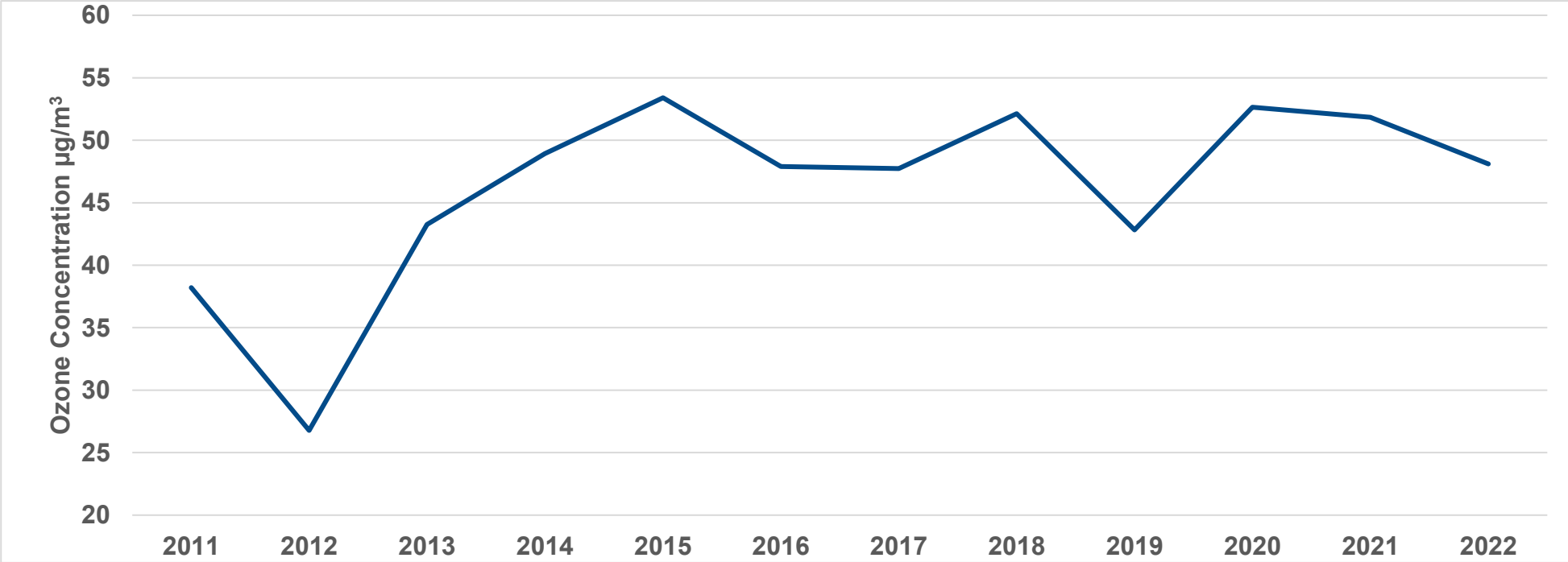


Table A.9 – Ozone (O_3) 2022 Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	O3 Annual Mean											
				2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
CM1	Rural	97.9	97.9	38.2	26.8	43.3	48.9	53.4	47.9	47.7	52.1	42.8	52.7	51.8	48.1

Figure A.6 – Trends in Annual Mean Ozone (O_3) Concentrations



Appendix B: Full Monthly Diffusion Tube Results for 2022

Table B.1 – NO2 2022 Diffusion Tube Results (µg/m3)

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 (0.76)	Annual Mean: Distance Corrected to Nearest Exposure
CB01	571421	205963	46.9	34.0	44.8	32.7	28.5	28.5	33.1	36.0	35.0	31.5	33.0	33.6	34.8	26.4	
CB13	569077	207528	32.6	22.7	Erroneous Data Point Removed	16.8	13.8	11.5	12.3	13.0	14.0	19.8	21.1	20.1	18.0	13.7	
CB22, CB22B, CB22C	571505	205968	47.4	33.7	35.9	Vandalised	26.2	25.3	26.6	31.4	33.8	26.9	31.0	38.1	32.4	24.6	
CB26	571614	205812	21.7	33.9	33.5	29.1	22.3	18.9	24.5	27.8	32.4	32.1	30.8	37.4	28.7	21.8	
CB27	574080	203469	42.5	47.0	31.1	24.8	31.1	33.8	27.0	26.5	33.4	41.9	49.3	41.1	35.8	27.2	
CB32	571581	207144	51.9	38.6	32.9	30.5	27.9	20.4	15.0	24.3	28.6	32.0	35.1	40.6	31.5	23.9	
CB36	570104	207247	40.2	Erroneous Data Point Removed	21.9	24.0	21.5	20.9	13.9	25.1	24.7	31.2	35.7	36.2	26.8	20.4	
CB38, CB39, CB40	571640	207179	45.7	31.5	29.6	26.6	25.2	19.4	18.9	23.6	24.8	28.7	31.9	33.3	28.3	21.5	
CB46	571062	206281	40.1	26.4	37.3	30.5	21.0	17.3	23.3	27.5	29.3	26.2	28.1	37.6	28.7	21.8	
CB49	571104	206262	37.4	22.1	28.1	20.7	12.9	14.5	15.5	17.2	23.4	21.0	23.2	29.9	22.2	16.8	
CB57	571359	206124	43.6	33.8	38.3	25.2	25.8	24.4	26.1	26.1	32.0	29.7	32.2	28.1	30.4	23.1	
CB58	571476	205964	51.0	45.2	42.8	39.2	35.4	36.9	33.8	41.9	39.9	40.1	41.9	41.9	40.8	31.0	
CB61	571445	205631	30.6	18.4	18.5	13.3	11.5	9.6	8.9	11.4	13.7	16.5	17.8	24.2	16.2	12.3	
CB62, CB63, CB64	566463	210830	21.6	13.1	13.6	8.2	9.3	7.3	7.0	7.0	8.4	13.6	16.8	16.9	11.9	9.0	
CB65, CB66, CB67	569912	206881	35.8	26.4	25.2	21.5	18.4	16.5	17.9	21.3	22.4	24.6	27.3	27.4	23.7	18.0	
CB68, CB68B, CB68C	571382	206092	41.6	29.7	42.6	33.0	27.7	25.0	27.4	32.3	32.1	31.4	34.4	34.2	32.6	24.8	
CB76, CB76b, CB76c	578506	205122	65.6	41.4	45.3	36.3	40.9	35.8	33.4	37.8	38.4	39.0	41.2	35.0	40.9	31.0	
CB79	569480	206009	55.9	38.5	50.4	44.2	32.2	34.3	34.3	40.3	40.8	45.8	45.6	45.7	42.3	32.2	
CB82	571438	206966	44.5	Missing	35.2	40.1	29.2	26.4	29.1	33.2	33.7	34.4	36.1	33.6	34.1	25.9	
CB83	571462	206999	44.2	42.9	44.2	36.1	32.2	36.5	28.8	37.1	Missing	46.1	47.6	44.8	40.0	30.4	
CB84, CB85, CB86	571653	205800	44.2	30.2	30.7	25.0	21.9	23.8	21.0	19.8	27.7	25.7	27.2	34.0	27.6	21.0	
CB87	570444	207044	52.0	46.6	35.3	36.9	40.1	41.4	42.9	37.4	43.0	48.3	51.9	42.0	43.2	32.8	
CB89	571426	206979	62.8	48.2	42.7	Missing	Missing	35.0	32.3	36.7	43.5	42.8	44.6	46.8	43.5	33.1	

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 (0.76)	Annual Mean: Distance Corrected to Nearest Exposure
CB90	571480	207019	Missing	32.7	35.5	29.4	21.6	21.7	20.3	25.3	28.2	30.0	29.5	31.7	27.8	21.1	
CB91, CB92, CB93	578539	205113	61.7	47.2	53.8	39.2	41.3	42.7	39.2	41.3	40.3	48.6	51.4	43.4	45.8	34.8	
CB94	578571	205108	44.7	27.1	40.0	29.1	24.2	22.9	22.6	28.7	28.8	Missing	21.5	33.5	29.4	22.3	24.6
CB95	578415	205106	45.5	23.8	45.5	29.0	21.5	25.6	27.3	23.4	28.9	26.9	30.5	34.6	30.2	23.0	
CB96	578359	205120	47.4	32.2	30.3	21.1	28.2	25.2	24.8	22.5	27.9	32.9	Missing	32.4	29.5	22.4	
CB98A, CB98B, CB98C	571148	206324	62.3	49.1	Missing	43.9	44.7	38.4	44.0	51.9	52.4	44.9	47.0	40.7	47.2	35.9	
CB99A, CB99B, CB99C	571211	206274	68.8	52.4	50.3	40.3	41.3	44.5	44.8	Missing	53.0	49.0	51.4	51.0	49.7	37.8	31.5
CB102	578954	205132	48.7	33.0	44.6	38.7	35.4	38.5	39.7	43.6	36.8	41.7	43.6	41.4	40.5	30.8	
CB103A, CB103B, CB103C	578477	205111	60.6	36.8	49.7	38.8	35.8	34.8	36.9	38.3	41.6	38.9	39.3	34.3	40.5	30.8	
CB108	578488	205139	33.2	21.1	26.2	13.0	15.4	15.9	12.0	12.7	13.6	19.0	23.1	23.7	19.1	14.5	
CB109	570456	207025	47.0	34.0	31.6	31.0	24.9	25.4	Missing	Missing	32.3	32.3	37.1	33.2	32.9	25.0	
CB110	569982	205264	45.9	29.3	33.3	26.0	23.7	22.6	40.3	25.4	24.4	29.1	31.4	32.3	30.3	23.0	
CB111	569996	205199	62.9	44.3	45.8	39.3	40.6	41.4	24.2	38.8	46.7	48.9	46.2	44.3	43.6	33.1	
CB112	580275	198121	48.3	37.0	50.7	31.3	33.2	34.2	34.5	34.6	32.4	40.1	42.0	30.0	37.4	28.4	
CB113	570669	210486	41.5	22.5	39.5	29.8	23.1	25.6	23.7	31.3	34.6	31.6	36.0	32.7	31.0	23.6	
CB117	572642	209674	60.7	43.2	47.5	35.2	35.4	38.7	37.2	34.5	40.8	49.5	53.0	45.6	43.4	33.0	

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

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

☒ **National bias adjustment factor used**

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

☒ **Chelmsford City Council confirm that all 2022 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System**

Notes:

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined**.

See Appendix C for details on bias adjustment and annualisation.

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

New or Changed Sources Identified Within Chelmsford City Council During 2022

Chelmsford City Council has not identified any new sources relating to air quality within the reporting year of 2022.

QA/QC of Diffusion Tube Monitoring

- Chelmsford City Council undertook monitoring at 39 sites in 2022.
- Chelmsford City Council adheres with the Diffusion Tube Monitoring Calendar although it is acknowledged that there may be occasional slight deviation due to resources.
- The diffusion tubes were supplied by Socotec (UKAS Testing Laboratory number 1015) with a preparation method of 50% triethanolamine (TEA) in Acetone.
- The AIR NO_2 proficiency testing scheme found that the laboratory achieved the following percentage of results determined as satisfactory for 2022:

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2022 ASR have been corrected for bias using an adjustment factor. Bias represents the overall tendency of the diffusion tubes to under or over-read relative to the reference chemiluminescence analyser. LAQM.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_x/NO_2 continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

Chelmsford City Council undertakes co-location studies at all four automatic air quality monitoring stations. The data collected at these has been used to calculate a local bias adjustment for comparison.

However, rather than using this local bias adjustment, Chelmsford City Council uses the Defra provided national bias adjustment factor which for 2022 is 0.76. This is to maintain consistency with other Councils in Essex and to exclude issues where poor data capture from the automatic analysers may affect the overall bias adjustment figure.

A summary of bias adjustment factors used by Chelmsford City Council over the past five years is presented in Table C.1.

Table C.1 – Bias Adjustment Factor

Monitoring Year	Local or National	Diffusion Tube	If National, Version of National Spreadsheet	Adjustment Factor
2022	National	Socotec 50% TEA in Acetone	03/23	0.76
2021	National	Socotec 50% TEA in Acetone	03/22	0.78
2020	National	Socotec 50% TEA in Acetone	03/21	0.77
2019	National	Socotec 50% TEA in Acetone	03/20	0.75
2018	National	ESG Didcot 50% TEA in Acetone	03/19	0.76

Diffusion Tube Annualisation

All diffusion tube monitoring locations within Chelmsford recorded data capture of 75% therefore it was not required to annualise any monitoring data. In addition, any sites with a data capture below 25% do not require annualisation.

NO2 Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO_2 concentration at the nearest location relevant for exposure has been estimated using the Diffusion Tube Data Processing Tool/NO_2 fall-off with distance calculator available on the LAQM Support website.

Table C.2 – NO2 Fall-off Calculations

Diffusion Tube ID	Distance (m)		NO2 Annual Mean Concentration (µg/m3)		
	Monitoring Site to Kerb	Receptor to Kerb	Bias Adjusted	Background	Predicted at Receptor
CB94	2.8	1.4	22.3	9.5	24.6
CB99A, CB99B, CB99C	1.3	4.7	37.8	15.2	31.5

Two monitoring locations have had NO2 fall-off calculations undertaken. Monitoring location CB94 is set back from the road slightly further than the receptor. After accounting for NO2 fall-off, the NO2 concentration at relevant exposure is well below the air quality objectives.

Monitoring location CB99 measured concentrations borderline with the air quality objectives. After accounting for NO2 fall-off, the NO2 concentration at relevant exposure is well below the air quality objectives.

QA/QC of Automatic Monitoring

Chelmsford City Council operates four automatic monitoring sites measuring NO_2, $PM_{2.5}$ and PM_{10}. Data from these sites is collected by a contractor.

Daily data validation checks are made to ensure the analysers are working correctly and to identify any abnormal readings that may occur. Monitoring data is forwarded to the Council.

The automatic monitoring station equipment is serviced every six months by a contractor who also carries out maintenance callouts when faults are identified.

The nitrogen dioxide analysers are calibrated monthly with a certified reference gas. Particulate monitors have their filter tapes changed every two months. All automatic monitoring sites are colocated with triplicate NO_2 diffusion tubes.

Data ratification for the analyser contains following processes;

- Applying the scaling factors derived from calibrations, maintenance visits and servicing
- Checking for equipment drift with adjustments made where detected
- Comparison with datasets from other appropriate Essex Air monitoring sites
- Checking for and deletion of erroneous data that can be linked to analyser fault or failure
- Live data is available online at Chelmsford City Councils air quality dashboard
- Summaries of continuous automatic monitoring for the year to date are available at the air quality dashboard

Monitoring Adjustment

When undertaking data ratification, there are some calculations necessary for ensuring accurate and precise data:

- The Met One PM_{10} monitors are unheated and require a correction for slope by dividing the raw data by 1.2.
- The Met One PM2.5 monitor has a smart heater and does not require correction for slope and/or intercept.
- The automatic monitoring sites within Chelmsford recorded data capture of greater than 75% therefore it was not required to annualise any monitoring data.
- The automatic monitoring sites within Chelmsford did not require distance correction during 2022.

Appendix D: Maps of Monitoring Locations and AQMAs

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

Figure D.2 – Map of Non-Automatic Monitoring Sites: North Chelmsford

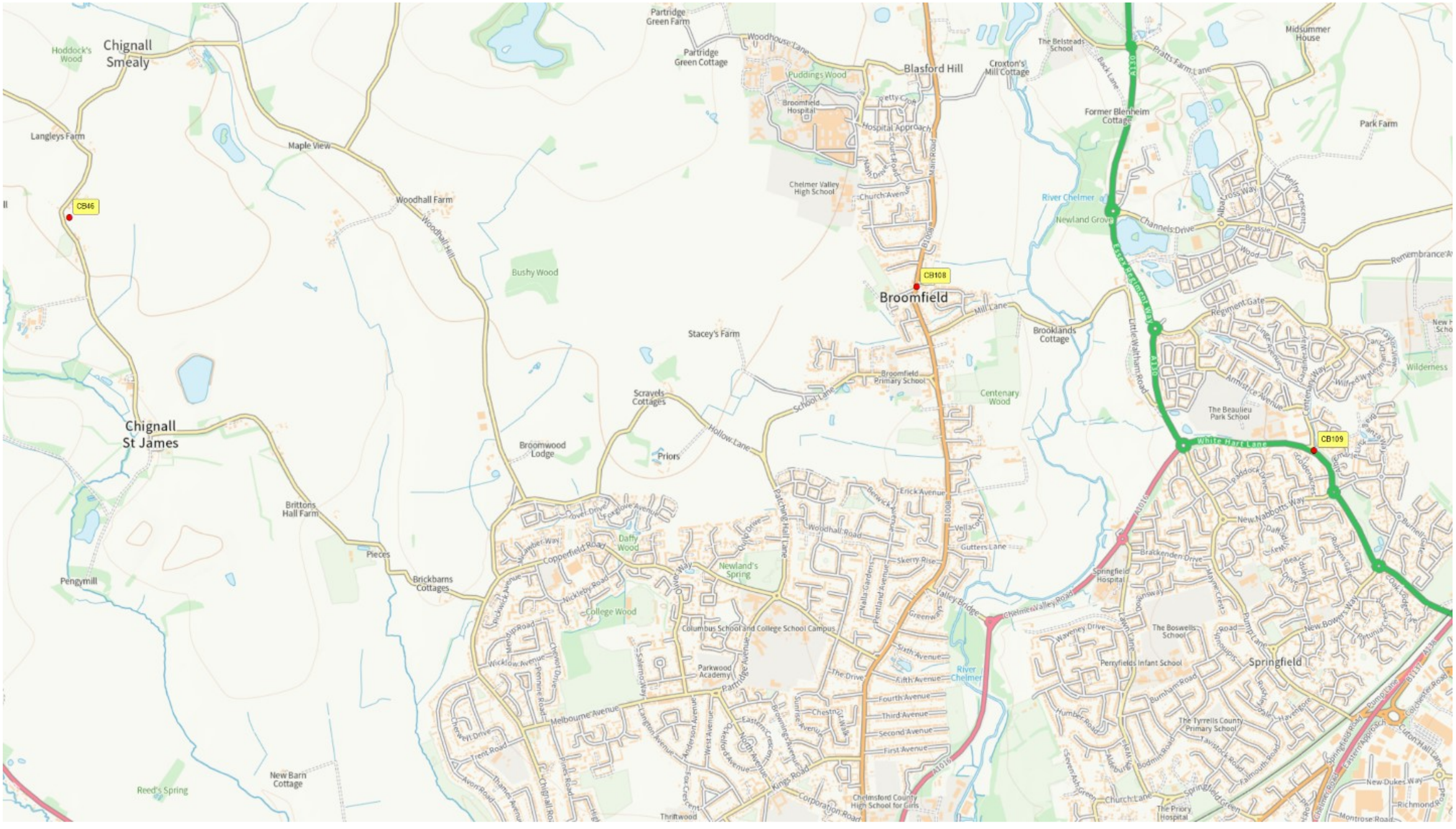


Figure D.3 – Map of Non-Automatic Monitoring Sites: Danbury AQMA

Figure D.4 – Map of Non-Automatic Monitoring Sites: Howe Green

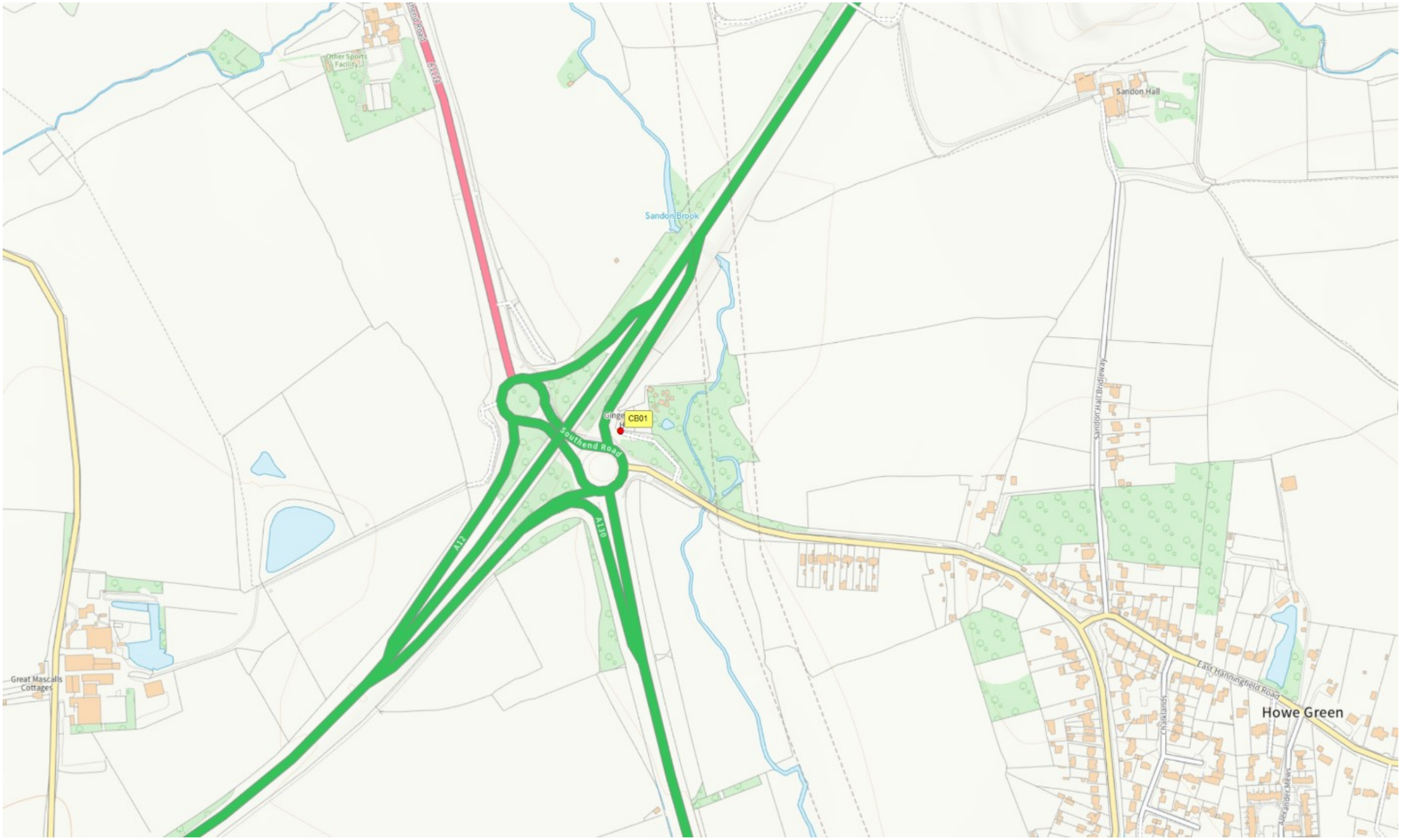
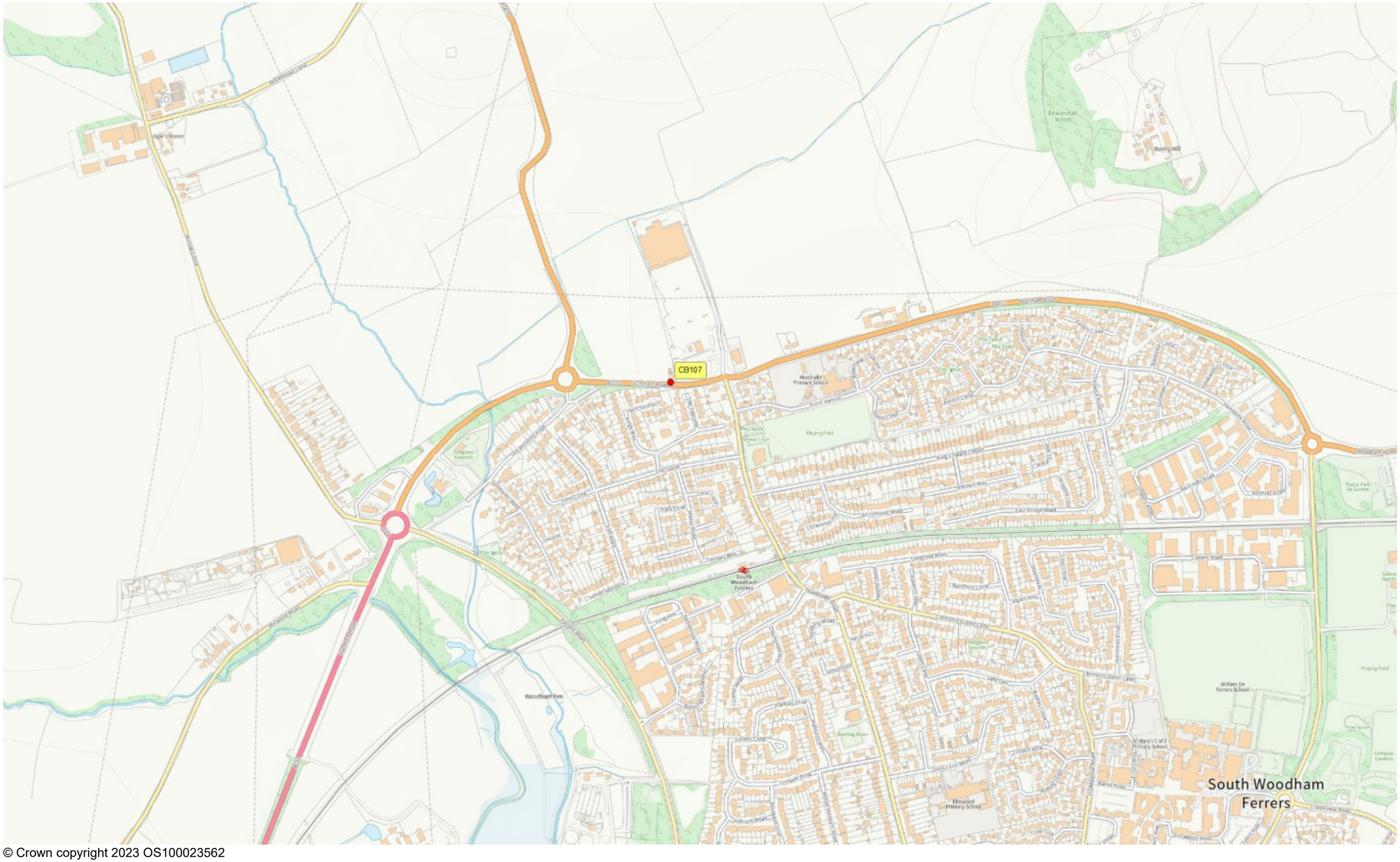


Figure D.5 – Map of Non-Automatic Monitoring Sites: South Woodham Ferrers



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England[5]

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

[5] The units are in microgrammes of pollutant per cubic metre of air (µg/m^3).

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQIA	Air Quality Impact Assessment – Reports provided in support of planning applications.
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Air Quality Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
EU	European Union
Euro Standard	Euro standards define the acceptable limits for exhaust emissions of new vehicles sold in EU and EEA member states.
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
Street Canyon	Road which is flanked by buildings resembling a canyon
TEA	Triethanolamine – substance used in diffusion tubes for absorbing nitrogen dioxide
UK-AIR	An information resource providing in-depth information on air quality and air pollution in the UK. A range of information is available, from the latest pollution levels, pollution forecast information, a data archive, and details of the various monitoring networks.
UKAS	United Kingdom Accreditation Service
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'

References

- *air*TEXT Air Quality Forecasts and Alerts available at; http://www.airtext.info/
- Chelmsford City Council Air Quality Dashboard available at; https://loveyourchelmsford.co.uk/air-quality-dashboard/
- Air Quality in Chelmsford webpage available at; https://loveyourchelmsford.co.uk/air-quality-dashboard/air-quality-in-chelmsford/
- Chelmsford City Council Domestic Burning webpage available at; https://loveyourchelmsford.co.uk/air-quality-dashboard/domestic-burning/
- Chelmsford City Council Sustainable Travel webpage available at; https://loveyourchelmsford.co.uk/green-living/sustainable-travel/
- Defra Diffusion Tube Bias Adjustment Factors Spreadsheet available at; https://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html
- Defra LAQM Summary of Laboratory Performance in AIR NO_2 PT Scheme available at; https://laqm.defra.gov.uk/diffusion-tubes/qa-qc-framework.html
- Essex Air Quality Consortium available at; http://www.essexair.org.uk
- Essex Air Twitter Feed available at; https://twitter.com/essexair
- EssexCarShare.com available at; https://liftshare.com/uk/community/essex
- 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 available at; https://laqm.defra.gov.uk/wp-content/uploads/2022/08/LAQM-TG22-August-22-v1.0.pdf
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