2022 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995

Local Air Quality Management

12th July, 2022

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Executive Summary: Air Quality in Our Area

The 2022 Annual Status Report is designed to provide the public with information relating to local air quality in Colchester, to fulfil Colchester Borough 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 2021, Colchester Borough Council measured **three** exceedances of the Air Quality Objectives at relevant exposure.

These exceedances are located within an existing Air Quality Management Area (AQMA).

Air Quality in Colchester

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

The mortality burden of air pollution within the UK is equivalent to 28,000 to 36,000 deaths at typical ages[3], with a total estimated healthcare cost to the NHS and social care of £157 million in 2017[4].

The main source of air pollution in the Colchester is road traffic emissions from major roads, notably the A12, A120, A133, A134, A1232, Brook Street and Mersea Road. Significant traffic congestion can occur during peak times within Colchester causing high emissions of pollution such as nitrogen dioxide and particulate matter.

As the oldest recorded Roman town in Britain, Colchester has many narrow roads within the town centre and surrounding areas buildings flank to form a canyon like environment. Street canyons act to reduce dispersal of pollutants which can significantly worsen air quality.

Colchester Borough Council has three Air Quality Management Areas (AQMAs) which are detailed in Table 2.1. These air pollution hotspots have been declared due to emissions from road traffic causing exceedances of Nitrogen Dioxide concentrations at relevant exposure. The Air Quality Objectives and examples of where they apply are described in Appendix E.

[1] Public Health England. Air Quality: A Briefing for Directors of Public Health, 2017
[2] Defra. Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006
[3] Defra. Air quality appraisal: damage cost guidance, July 2020
[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

In 2021, Colchester Borough Council have undertaken a number of sustainable transport and awareness measures.

For Clean Air Day in 2021, pupils from St James' Primary School in Colchester have published an open letter to their parents, relatives and other carers setting out why clean air is important for young lungs. They are urging adults to adopt better driving habits by switching off the car engine while stationary outside their school, to stop children having to breath polluted air.

St James' pupils are wanting adults to take action to reduce the risks to children's health in support of the town-wide CAReless Pollution campaign. Air pollution is associated with asthma and other lung diseases, and young developing lungs are especially in danger of being damaged. Breathing bad air can also cause heart problems and stroke and it is linked to 1 in 20 deaths in Colchester. Breathing in air pollution is the equivalent of a child smoking 1.5 cigarettes a day.

A CAReless Pollution Zorb-ball was on display at the school to help highlight the poor quality air that children have to breath when they are sat inside a stationary car with the engine running. The Zorb-ball will then be visiting other events across the summer.

St James' Primary School, along with other schools across Colchester, have received the new CAReless Pollution online toolkit which provides teachers with a range of age-appropriate activities and ideas for inspiring pupils.

A pupil at St James' School said: "We have been learning about air pollution at school and how bad air can come inside the car. I don't want to breathe that in on my way to and from school so I will be asking my mum to switch off the engine when we are not moving."

Figure i.1 – CAReless Pollution Campaign

E-Cargo Bike Delivery Service

Following on from the successful E-Cargo bike trial that took place in 2020, Colchester Borough Council submitted a successful bid for an air quality grant to develop a new and innovative service, building on the E-Cargo delivery service for businesses by tailoring it to reduce vehicle traffic in and out of the Town Centre.

E-Cargo bikes have many advantages over the use of cars and vans.

- Low-cost – low running costs: no fuel or tax bill to pay, and can travel up to 50 miles on a full battery
- Versatile - use routes that cars and vans cannot, including cycle paths and bus lanes
- Convenient - can be parked right on the doorstep for easier loading/unloading
- Green - emission and pollution-free transport
- Active - healthy way to travel

The new service will offer an e-cargo bike delivery service for shoppers and visitors to the Town Centre. Shoppers will be able to request, via a specially designed and bespoke app, an E-Cargo bike to deliver their goods to a smart locker in an outlying car park or to their homes if within a 5-mile radius. This will support modal shift away from the use of polluting transport into the town centre by making walking, cycling or parking outside the town centre an easier and convenient choice.

Figure i.2 – Colchester E-Cargo Bike

This project impacts are set to include a reduction in traffic on AQMA roads, with a focus on Mersea Road, and thereby reduction in air pollution in our AQMA's. By the end of the 2 year project we will aim for an annual E-Cargo bike mileage of 20,020 miles a year equating to a NOx reduction of 192kgs and the replacement of 14,560 car journeys by walking, cycling, park and ride or parking in Napier road car park.

Based on an estimate of the average return car journey being 10 miles, we calculate that 1390kg of NOx could be reduced through a change in travel behaviour to access the town centre.

As well as reducing air pollution and improving the Town Centre environment through a reduction in traffic, the project will support the economic growth and post pandemic recovery through enhancing the town centre retail experience. Our service will allow customers to enjoy shopping as a leisure experience and spend longer in Town unhindered by having to carry bulky shopping.

Sustainable Transport Initiatives

In a bid to reduce traffic into the Town Centre, Colchester Borough Council has been undertaking a number of sustainable transport initiatives:

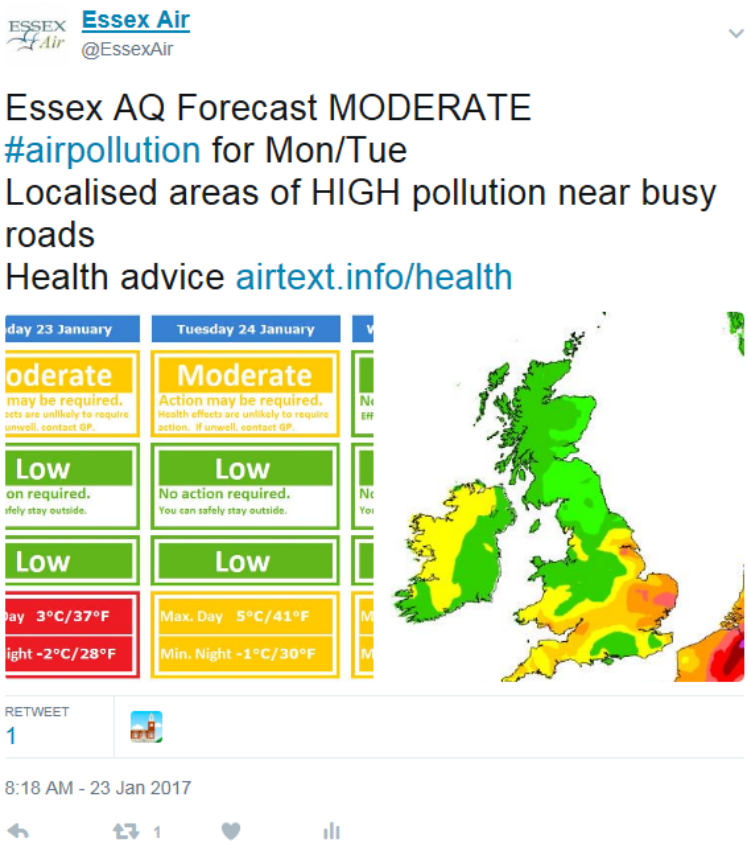
- Investigated providing a secure cycle parking facility in the town centre including location and operational requirements and sub-letting to a community bike maintenance organisation to help people maintain their own bikes and encourage more people to cycle.
- Working with the Colchester Cycle Campaign on review of the Colchester Cycling Delivery Strategy Supplementary Planning Document (SPD), and its alignment with the ECC Colchester Cycling Action Plan.
- Developed Fixing the Link alternative plans to enhance the walking route from Colchester station to the town centre
- Study of provision of secure cycle parking facility in the town centre and in residential areas has been completed.
- Park Active being set up for 'last mile' active travel alternative (repurposing long stay car parks as park & walk).
- Adoption of the Positive Parking Strategy. Traffic congestion and air quality will be a key consideration in setting the quantities of parking available and parking tariff employed to ensure that more sustainable alternative modes of travel remain viable and attractive options.

Local Engagement and How to get Involved

Pollution Forecasts and Alerts

Colchester Borough Council is a member of the Essex Air Quality consortium. The Essex Air web site provides a daily forecast of air pollution which is based off UK-AIR data feeds. Also, the @EssexAir twitter feed provides localised weekly air pollution forecasts.

Figure i.3 - Essex Air Twitter Air Quality Notifications



Links to Defra recommended actions and health advice are provided when air pollution is likely to be moderate or higher. This will enable those with heart or lung conditions, or other breathing problems to make informed judgements about their levels of activity or exposure.

Loveurcar Colchester Car Sharing Scheme

Colchester Borough Council is encouraging everyone to car share. Dedicated car share parking spaces have been provided at several town centre car parks in Colchester and at Colchester North station. These are located in preferential locations near the entrance or exit of each car park, giving you easy access in and out of the car park.

More information can be found at the following link:

https://www.colchester.gov.uk/loveurcarcolchester/carsharingscheme/

Conclusions

Colchester Borough Council have concluded that:

- Despite the reduced traffic movements in 2021, three air quality exceedances have been identified. These were in the existing air pollution hotspots of Brook Street, Mersea Road and Osborne Street.
- There are no new developments that will have a significant impact on air quality.

Priorities

For 2022, Colchester Borough Councils priority is to develop a new Air Quality Action Plan (AQAP) which will focus on direct interventions to improve air quality at air pollution hotspots. This will involve partnership working with Essex County Council and Essex Highways whom are developing The Colchester Future Transport Strategy which has an objective of reducing air pollution.

The Councils ongoing sustainable transport projects will complement these direct measures.

Local Responsibilities and Commitment

This ASR was prepared by Public Health and Protection Services of Chelmsford City Council on behalf of Colchester Borough Council

This ASR has been approved by:

Lucie Breadman – Assistant Director of Communities, Colchester Borough Council

This ASR was sent to the Director of Public Health at Essex County Council on 22/07/22.

If you have any comments on this ASR please send them to Colchester Borough Council

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1 Local Air Quality Management

This report provides an overview of air quality in Colchester during 2021. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

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

In 2021, Colchester Borough Council measured three exceedances of the Air Quality Objectives at relevant exposure. These exceedances are outlined in Table 1.1 below.

Table 1.1 – 2021 Measured Exceedances

Site ID	Site Address	Monitored Annual Mean Concentration (µg/m³)	Annual Mean Concentration at Relevant Exposure (µg/m³)
CBC3A / CBC3B / CBC3C	21 Mersea Road	46.4	44.7
CBC71	6 Osborne Street	40.2	40.2
CBC129	37 Brook Street	41.3	41.3

These exceedances are located within an existing Air Quality Management Area (AQMA).

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

2 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 12 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

A summary of AQMAs declared by Colchester Borough Council can be found in Table 2.1.

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 (µg/m³)	Level of Exceedance: Current Year (µg/m³)	Name and Date of AQAP Publication	Web Link to AQAP
Area 1 - Central Corridors	Declared May 2001, Amended February 2013	NO_2 Annual Mean	High Street, Head Street, North Hill, Queen Street, St Botolph's Street, St Botolph's Circus, Osborne Street, Magdalen Street, Military Road, Mersea Road, Brook Street, East Street and St Johns Street	NO	65.9	44.7	Healthier Air for Colchester – Air Quality Action Plan 2016-2021	http://www.essexair.org.uk/Reports/Colchester_AQ_Action_Plan.pdf
Area 1 - Central Corridors	Declared May 2001, Amended February 2013	NO_2 1 Hour Mean	High Street, Head Street, North Hill, Queen Street, St Botolph's Street, St Botolph's Circus, Osborne Street, Magdalen Street, Military Road, Mersea Road, Brook Street, East Street and St Johns Street	NO	Annual Mean > 60(µg/m³)	No Exceedance	Healthier Air for Colchester – Air Quality Action Plan 2016-2021	
Area 2 - East Street and the adjoining lower end of Ipswich Road	Amended June 2018	NO_2 Annual Mean	East Street and Ipswich Road	NO	45.2	No Exceedance	Healthier Air for Colchester – Air Quality Action Plan 2016-2021	
Area 4 - Lucy Lane North, Stanway	Declared January 2012, Amended February 2013	NO_2 Annual Mean	Lucy Lane North, Stanway	YES	55.3	No Exceedance	Healthier Air for Colchester – Air Quality Action Plan 2016-2021	

Appendix D: Map of Monitoring Locations provide maps of the air quality monitoring locations in relation to the AQMAs.

This Annual Status Report has identified three exceedances that have occurred in AQMA 1 – Central Corridors.

Progress and Impact of Measures to address Air Quality in Colchester

Defra's appraisal of last year's ASR concluded that the report is detailed, concise and satisfies the criteria of relevant standards and that the Council should continue their good work.

Colchester Borough Council and Essex County Council have a number of ongoing measures to improve air quality in Colchester. These are detailed in Table 2.1 below.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
1	Development of a new Air Quality Action Plan	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	2022	2023	Colchester Borough Council	Colchester Borough Council	NO	Funded	< £10k	Planning	Not quantified		Baseline Air Quality & Traffic Data being collected in AQMA	
2	Collection and analysis of Air Quality and transport data to develop traffic management measures	Traffic Management	UTC, Congestion management, traffic reduction	2016	2023	Essex County Council	Essex County Council / March 2021 Defra Air Quality Grant Funding	YES	Funded	£100k - £500k	Implementation	Not quantified	Data Capture	Air quality and vehicle movement sensors have been installed at strategic locations to enable combined traffic flow and pollution monitoring to be undertaken	Installation complete and data capture in progress
3	Clean Air for Colchester Community Engagement	Public Information	Via other mechanisms	2019	2020	Colchester Borough Council	Colchester Borough Council / Defra Air Quality Grant Funding	YES	Funded	< £10k	Completed	Not quantified	N/A	Completed	From October 2019 to January 2020 Colchester Borough Council spoke to over 3,000 residents, schools and businesses about pollution as part of a two-year behaviour change project, Clean Air for Colchester, which aims to reduce pollution levels across the borough.
4	CAReless Pollution Campaign	Public Information	Other	2019	2023	Colchester Borough Council	Colchester Borough Council / Defra Air Quality Grant Funding	YES	Funded	< £10k	Implementation	Not quantified	N/A	Ongoing	CAReless Pollution is a Colchester-wide campaign urging drivers to adopt better driving habits and switch off their engines while they wait at traffic lights, level crossings or outside schools. This is to improve their own health and help reduce air pollution in the town.

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
5	Door to Door Engagement	Public Information	Via other mechanisms	2019	2020	Colchester Borough Council	Colchester Borough Council / Defra Air Quality Grant Funding	YES	Funded	< £10k	Completed	Not quantified	N/A	Completed	Door to door engagement was conducted in Brook Street, East Street, East Hill and the lower end of Ipswich Road (part of our Air Quality Management Area's) and over 200 households were visited. This gave us valuable insight into resident's perceptions of air quality and enabled us to provide households with information about the project and how to get involved.
5	Engine Switch Off Campaign	Public Information	Other	2020	2021	Colchester Borough Council	Colchester Borough Council / Defra Air Quality Grant Funding	YES	Funded	< £10k	Completed	Not quantified	N/A	Completed	We worked with a marketing partner to launch a Switch Off awareness campaign starting in September 2020. The campaign and its resources will be created in partnership with the local community and will aim to raise awareness of the effects of pollution on health and get more people switching off their engine when stationary in a bid to cut pollution.
6	No Idling Roadside Reminders	Public Information	Other	2020	2021	Colchester Borough Council	Colchester Borough Council / Defra Air Quality Grant Funding	YES	Funded	< £10k	Completed	Not quantified	N/A	Completed	The roadsigns could be seen by all road users at the traffic lights on Brook Street, in both directions, and at the East Gates rail crossing. To evaluate the effectiveness of each sign the Council is working in partnership with the University of Essex.

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
7	Traffic Light Feasibility Study	Other	Other	2020	2021	Colchester Borough Council	Colchester Borough Council / Defra Air Quality Grant Funding	YES	Funded	< £10k	Completed	Not quantified	N/A	Completed	A feasibility study was undertaken to explore the economic cost and technicalities of installing the timers to encourage drivers to switch off their engines at red lights in Colchester. This study will not result in the installation of countdown timers, but instead assessed the effectiveness of the use of such technologies.
8	Active Travel Project	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	2021	2023	Colchester Borough Council	Colchester Borough Council	NO	Funded	< £10k	Implementation	Not quantified	N/A	The first phase of this work is an evaluation of Bikeability which is offered in schools. We will be looking at how it currently works and exploring ways to enhance it so we can get more children cycling and cycling more often.	A key objective of the clean air project is to get people walking and cycling short journeys. We know that a quarter of all car journeys in Colchester are under 2 miles and the most common journey people said they make in their cars is to the shops. Through this project we will be working closely with a resident area which has good walking and cycling infrastructure, somewhere in which we know people are driving short distances through the air quality management areas. We will also be working closely with 4 schools to explore ways to encourage an increase in active travel.
9	2021 Clean Air Day Promotion	Public Information	Other	2021	2021	Colchester Borough Council	Colchester Borough Council	NO	Funded	< £10k	Completed	Not quantified	N/A	Completed. The event was featured on regional television news.	On national Clean Air Day, pupils from St James' Primary School in Colchester published an open letter to their parents, relatives and other carers setting out why clean air is important for young lungs. They are urging adults to adopt better driving

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
															habits by switching off the car engine while stationary outside their school, to stop children having to breath polluted air. A CAReless Pollution Zorb-ball is on display at the school to help highlight the poor quality air that children have to breath when they are sat inside a stationary car with the engine running. The Zorb-ball will then be visiting other events this summer.
10	Colchester Future Transport Strategy	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane			Essex County Council	Essex County Council	NO		£500k - £1 million		Not quantified		Public Engagement	Crreating a long-term transport plan for Colchester
11	Implement vehicle emissions requirements within Taxi licensing conditions	Promoting Low Emission Transport	Taxi Licensing conditions	2016	2019	Colchester Borough Council	Colchester Borough Council	NO	Funded	< £10k	Complete	Not quantified	Reduced emissions	Complete	
12	Require taxis to turn off engines when idling in the AQMAs	Promoting Low Emission Transport	Taxi Licensing conditions	2016	2019	Colchester Borough Council	Colchester Borough Council	NO	Funded	< £10k	Complete	Not quantified	Reduced emissions within AQMAs	Complete	
13	No Idling Policy	Traffic Management	Anti-idling enforcement	2018	2019	Colchester Borough Council & Colchester Borough Homes	Colchester Borough Council & Colchester Borough Homes	NO	Funded	< £10k	Completed	Not quantified	N/A	Complete	Drivers of CBC and CBH vehicles (except for recycling and rubbish collection vehicles when collecting refuse and street cleaning

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
															vehicles) and all staff using their own vehicles for business travel, are required to adopt the 'No Idling' policy and switch off their vehicle engines when stationary. This also applies to vehicles on Council office premises. A no idling requirement for AQMAs has been introduced into the Taxi Licensing policy.
14	St Botolphs Circus Roundabout	Transport Planning and Infrastructure	Other	2019		Essex County Council	Essex County Council	NO	Funded	£1 million - £10 million	Autumn 2021	Not quantified	Reduced Congestion	Consultation complete. Further works likely to be included within Colchester Future Transport Strategy	

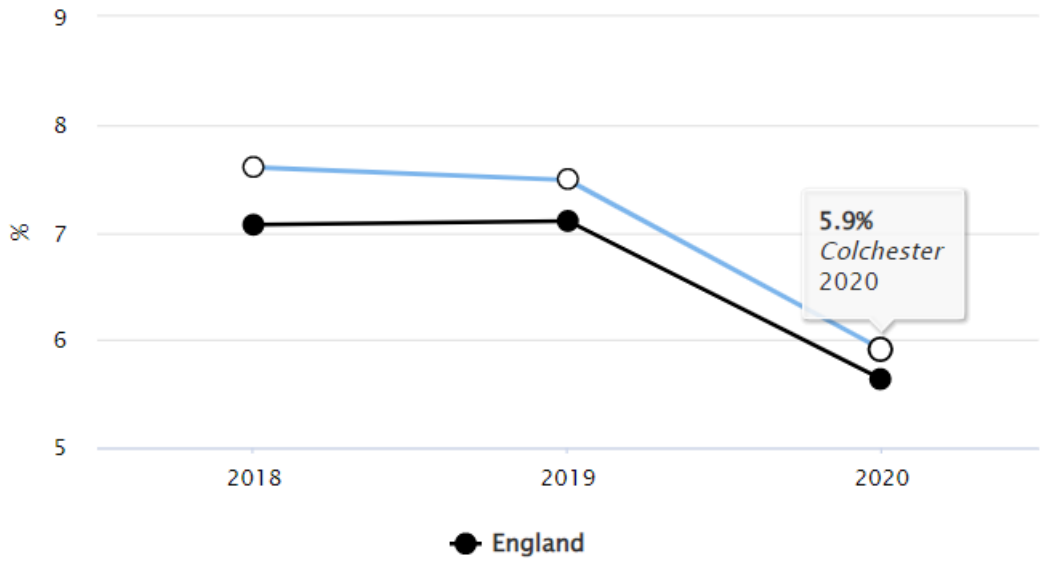
$PM_{2.5}$ – Local Authority Approach to Reducing Emissions and/or Concentrations

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

Colchester Borough Council does not monitor $PM_{2.5}$ concentrations however notes the Defra background mapping resource which for $PM_{2.5}$ in 2021 models a maximum annual mean concentration of 10.8µg/m^3 in the Local Authority area.

The Public Health Outcomes Framework indicator D01 – Fraction of mortality attributable to particulate ($PM_{2.5}$) air pollution which for 2019 gave a value of 5.9%. These values are broadly similar to other authorities within the region.

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



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

- Regular inspections of permitted industry where combustion and non-combustion processes could lead to anthropogenic emissions of $PM_{2.5}$
- Working with Essex County Council (highway authority) to deliver Major Transport improvement schemes to alleviate congestion. In addition to reduced exhaust emissions, these schemes will reduce non-exhaust emissions from brake and tyre wear by making traffic flows smoother.

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

This section sets out the monitoring undertaken within 2021 by Colchester Borough Council and how it compares with the relevant air quality objectives. In addition, monitoring results are presented for a five-year period between 2017 and 2021 to allow monitoring trends to be identified and discussed.

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

3.1.1 Automatic Monitoring Sites

Colchester Borough Council undertook automatic (continuous) monitoring with reference analysers at one site during 2021.

- Site CBC Auto1 in Brook Street, Colchester measuring NO_2

Table A.1 in Appendix A presents detail of this site.

No exceedances of the nitrogen dioxide air quality objectives have been identified at this site and the long-term trend for monitored concentrations is downwards.

3.1.2 Non-Automatic Monitoring Sites

Colchester Borough Council undertook non- automatic (i.e. passive) monitoring of NO_2 at 62 sites during 2021.Table A.1 in Appendix A presents the details of the non-automatic sites.

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

Three exceedances of the nitrogen dioxide air quality objectives have been identified however the long-term trend for monitored concentrations is downwards.

Individual Pollutants

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

3.1.3 Nitrogen Dioxide (NO_2)

Table A.2 in Appendix A compare the ratified and adjusted monitored NO_2 annual mean concentrations for the past five years with the air quality objective of 40µg/m^3. Note that the concentration data presented represents the concentration at the location of the monitoring site, following the application of bias adjustment and annualisation, as required (i.e. the values are exclusive of any consideration to fall-off with distance adjustment).

For diffusion tubes, the full 2021 dataset of monthly mean values is provided in Appendix B. Note that the concentration data presented in Table B.1 includes distance corrected values, only where relevant.

In 2021, Colchester Borough Council measured three exceedances of the annual mean Air Quality Objective at relevant exposure. However, the long-term trend for monitored concentrations is downwards.

The maximum annual mean concentrations that were measured were significantly below 60µg/m^3. As such it is very unlikely that an exceedance of the 1-hour mean objective has occurred at any of the monitoring sites.

Appendix A: Monitoring Results

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 – 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)
CBC Auto1	Brook Street	Roadside	600571	225141	NOx, NO, NO_2	Yes AQMA 1	Chemiluminescent	0	3	1.5

Notes:

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

(2) N/A if not applicable

Table A.2 – Annual Mean NO_2 Monitoring Results: Automatic Monitoring (µg/m^3)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2020 (%) (2)	2017	2018	2019	2020	2021
CBC Auto1	600571	225141	Roadside	99.2	99.2	29.13	25.84	26.44	21.76	23.0

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

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

Notes:

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

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

All means have been "annualised" as per LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

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

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

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

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2020 (%) (2)	2017	2018	2019	2020	2021
CBC Auto1	600571	225141	Roadside	99.2	99.2	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%).

Figure A.1 – Brook Street Analyser Hourly Nitrogen Dioxide Concentrations

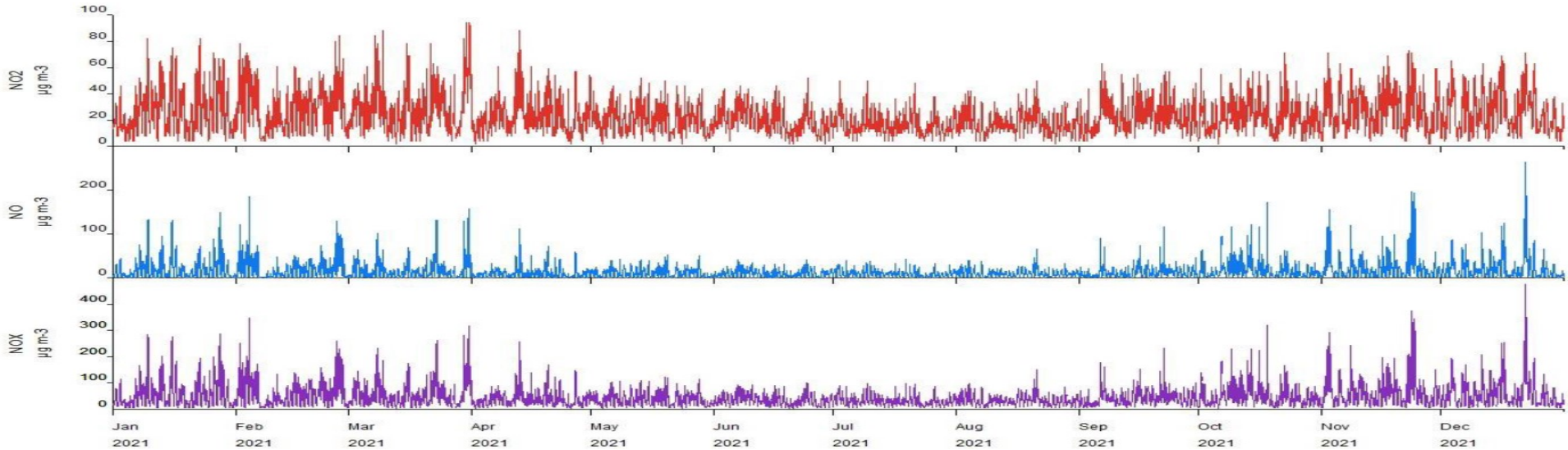


Figure A.2 – Trends in CBC1 Automatic Monitoring Annual Mean NO_2 Concentrations

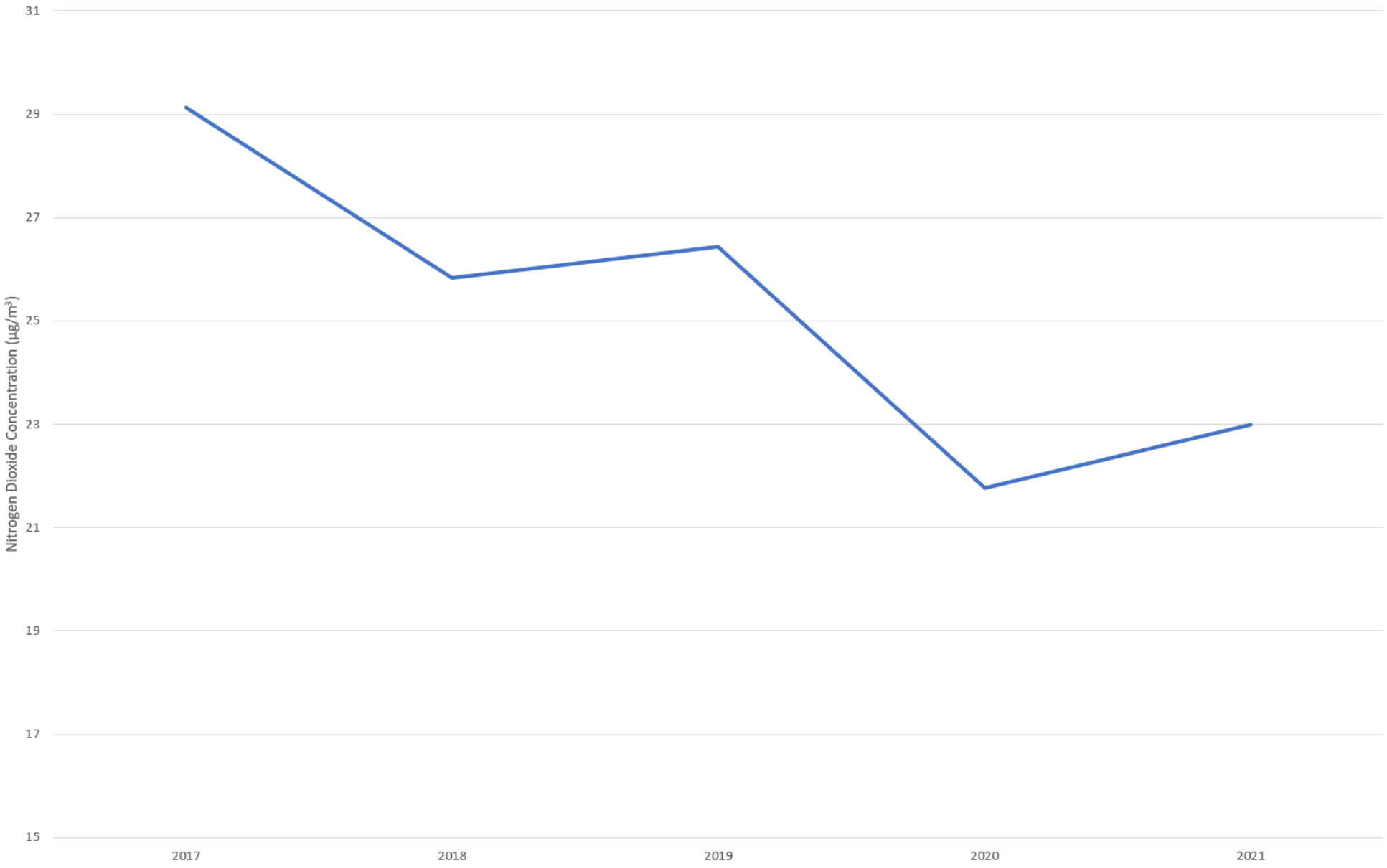


Table A.4 – Details of Non-Automatic Monitoring Sites

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)
CBC2	Fairax Road, 21	Roadside	599981	224633	NO2	NO	2.0	1.1	No	2.5
CBC3A, CBC3B, CBC3C	Mersea Road, 21	Roadside	599914	224643	NO2	YES AQMA1	0.5	1.9	No	2.5
CBC8	Shrub End Road, 105/107	Roadside	597640	223661	NO2	NO	17.0	1.2	No	2.5
CBC20	Papillon Road	Urban Background	599063	225097	NO2	NO	4.0	1.2	No	2.5
CBC43	Magdalen Street	Roadside	600356	224763	NO2	YES AQMA1	9.0	0.4	No	2.5
CBC45A, CBC45B, CBC45C	Brook Street, 28/30	Roadside	600560	225181	NO2	YES AQMA1	0.0	1.0	No	2.5
CBC48	33 St Botolphs Street	Roadside	599908	224942	NO2	YES AQMA1	0.0	1.5	No	2.5
CBC49	High Street - Brighthouse	Kerbside	599720	225217	NO2	YES AQMA1	4.0	3.5	No	2.5
CBC54	Mersea Road, 10	Roadside	599922	224728	NO2	YES AQMA1	1.6	1.8	No	2.5
CBC62, CBC62A, CBC62B	Mersea Road, 9	Roadside	599923	224738	NO2	YES AQMA1	0.0	2.9	No	2.5
CBC63	Mersea Road, 12	Roadside	599921	224711	NO2	YES AQMA1	0.0	1.8	No	2.5
CBC65	Maldon Road, 99	Roadside	598797	224489	NO2	NO	8.0	0.4	No	2.5
CBC66	Brook Street RAB	Roadside	600622	224881	NO2	YES AQMA1	16.0	1.2	No	2.5
CBC68	Brook Street 56	Roadside	600589	225113	NO2	YES AQMA1	0.0	10.4	No	2.5
CBC69, CBC69A, CBC69B	Brook Street 23	Roadside	600545	225205	NO2	YES AQMA1	0.0	1.1	No	2.5
CBC71	Osborne Street, 6	Roadside	599818	224924	NO2	YES AQMA1	0.0	2.1	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)
CBC72	Ipswich Road. Old Coach House.	Roadside	600885	225441	NO2	YES AQMA2	9.0	1.9	No	2.5
CBC76	Harwich Road, 53	Roadside	601162	225471	NO2	NO	2.0	2.0	No	2.5
CBC88, CBC88A, CBC88B	Brook Street 48 (Auto Monitor)	Roadside	600571	225151	NO2	YES AQMA1	0.0	2.6	Yes	2.5
CBC90	London Rd 170 Marks Tey	Roadside	591312	223431	NO2	NO	12.0	2.0	No	2.5
CBC91	Blackberry Rd 2	Roadside	595239	223936	NO2	NO	3.0	2.0	No	2.5
CBC93	Butt Road 129	Roadside	599031	224427	NO2	NO	5.0	1.5	No	2.5
CBC94	Elmstead Rd 6	Roadside	601925	224652	NO2	NO	11.0	2.5	No	2.5
CBC96	Mill Rd 239	Roadside	599909	228288	NO2	NO	7.0	1.2	No	2.5
CBC97	Mill Rd 87	Roadside	599452	227884	NO2	NO	6.0	1.2	No	2.5
CBC98	Cowdray Av 154	Roadside	600086	226157	NO2	NO	4.0	1.0	No	2.5
CBC99	Ipswich Rd 130	Roadside	600891	225957	NO2	NO	0.0	15.5	No	2.5
CBC100	Harwich Road 175	Roadside	601252	225627	NO2	NO	12.0	1.5	No	2.5
CBC101	Ipswich Rd 50	Roadside	600868	225452	NO2	YES AQMA2	2.0	1.3	No	2.5
CBC102	East St 72	Roadside	600752	225313	NO2	YES AQMA2	0.0	1.0	No	2.5
CBC103	Brook St 74	Roadside	600607	225049	NO2	YES AQMA1	6.0	2.0	No	2.5
CBC104	Military Rd 37	Roadside	600193	224653	NO2	YES AQMA1	0.0	4.5	No	2.5
CBC105	East Hill 4A	Roadside	600224	225255	NO2	NO	1.0	1.0	No	2.5
CBC106	Mersea Rd 30	Roadside	599911	224558	NO2	YES AQMA1	1.5	0.1	No	2.5
CBC107	North Hill 49	Roadside	599389	225373	NO2	YES AQMA1	2.3	0.1	No	2.5
CBC108	North Station Rd 39	Roadside	599354	225802	NO2	NO	2.5	0.1	No	2.5
CBC109	North Hill, Strada	Roadside	599398	225432	NO2	YES AQMA1	0.0	1.5	No	2.5
CBC110	1A St Botolphs Street	Roadside	599891	225021	NO2	YES AQMA1	0.0	2.0	No	2.5
CBC111	St John's Street, Lemon Tree	Urban Centre	599473	224982	NO2	YES AQMA1	0.0	1.5	No	2.5

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
CBC112	High St George Hotel	Urban Centre	599730	225232	NO2	YES AQMA1	0.0	2.5	No	2.5
CBC113	Orchard Gardens	Roadside	600845	225671	NO2	NO	15.0	3.0	No	2.5
CBC115	Harwich Road 18	Roadside	601083	225387	NO2	NO	0.0	7.0	No	2.5
CBC116	Harwich Road 19	Roadside	601115	225355	NO2	NO	0.0	12.0	No	2.5
CBC117	High Street 71	Roadside	599984	225238	NO2	NO	0.0	2.0	No	2.5
CBC118	North Station Road 120	Roadside	599269	226122	NO2	NO	0.0	2.0	No	2.5
CBC119	Claremont Heights	Roadside	599230	226272	NO2	NO	0.0	2.0	No	2.5
CBC123	131 Bergholt Road	Roadside	598938	226707	NO2	NO	0.0	3.8	No	2.5
CBC124	58 East Hill	Roadside	600516	225277	NO2	YES AQMA1	0.0	2.0	No	2.5
CBC125	6 Bergholt Road	Roadside	599227	226509	NO2	NO	0.0	1.0	No	2.5
CBC127	West Side Brook Street Junction w/ East Hill	Roadside	600537	225242	NO2	YES AQMA1	0.0	1.0	No	2.5
CBC128	East Side Brook Street Junction w/ East Street	Roadside	600547	225244	NO2	YES AQMA1	0.0	1.0	No	2.5
CBC129	37 Brook Street	Roadside	600550	225183	NO2	YES AQMA1	0.0	1.0	No	2.5
CBC131	Lucy Lane North	Roadside	595025	225166	NO2	YES AQMA4	0.0	12.0	No	2.5
CBC132	Lucy Lane South	Roadside	595106	225123	NO2	NO	0.0	15.0	No	2.5
CBC135	11 Bridge Farm Coggeshall Road	Roadside	591366	223679	NO2	NO	0.0	9.0	No	2.5
CBC136	85 Coggeshall Road	Roadside	590444	223502	NO2	NO	1.0	1.0	No	2.5
CBC137	93B Coggeshall Road	Roadside	590325	223495	NO2	NO	0.0	3.0	No	2.5
CBC21, CBC138, CBC139	Head Street	Roadside	599413	225056	NO2	YES AQMA1	2.0	0.6	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)
CBC140	Colchester Road Wivenhoe	Roadside	603496	224190	NO2	NO	N/A	1.0	No	2.5
CBC141	The Cross Wivenhoe	Roadside	604045	222827	NO2	NO	0.0	1.5	No	2.5
CBC142	Colchester Crematorium	Urban Background	600253	223411	NO2	NO	N/A	N/A	No	2.5
CBC143	The Willows	Urban Background	600056	223156	NO2	NO	5.0	5.0	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.5 – Annual Mean NO_2 Monitoring Results: Non-Automatic Monitoring (µg/m^3)

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
CBC2	599981	224633	Roadside	100.0	100.0	31.2	28.0	30.0	24.3	23.6
CBC3A, CBC3B, CBC3C	599914	224643	Roadside	100.0	100.0	**48.2**	**54.5**	**55.4**	**43.9**	**46.4**
CBC8	597640	223661	Roadside	84.6	84.6	23.5	22.5	22.1	15.5	16.8
CBC20	599063	225097	Urban Background	76.9	76.9	20.6	21.7	19.5	14.1	17.1
CBC43	600356	224763	Roadside	92.3	92.3	31.9	32.8	32.5	25.4	25.0
CBC45A, CBC45B, CBC45C	600560	225181	Roadside	100.0	100.0	**45.7**	**50.5**	**44.0**	35.3	38.4
CBC48	599908	224942	Roadside	100.0	100.0	35.4	**42.5**	39.9	30.3	30.9
CBC49	599720	225217	Kerbside	82.7	82.7	**40.5**	38.8	**40.4**	32.2	28.5
CBC54	599922	224728	Roadside	100.0	100.0	**42.2**	**47.1**	**42.8**	35.1	37.8
CBC62, CBC62A, CBC62B	599923	224738	Roadside	100.0	100.0	39.2	**42.9**	**40.7**	31.8	35.2
CBC63	599921	224711	Roadside	100.0	100.0	**43.9**	**48.6**	**45.0**	37.4	39.7
CBC65	598797	224489	Roadside	76.9	76.9	25.3	24.3	23.4	17.6	18.3
CBC66	600622	224881	Roadside	100.0	100.0	26.5	25.7	25.6	19.5	18.7
CBC68	600589	225113	Roadside	92.3	92.3	22.2	23.2	26.8	19.1	21.8
CBC69, CBC69A, CBC69B	600545	225205	Roadside	92.3	92.3	**48.6**	**46.9**	**45.0**	38.3	34.5
CBC71	599818	224924	Roadside	100.0	100.0	**43.3**	**51.6**	**46.5**	37.8	**40.2**
CBC72	600885	225441	Roadside	73.1	73.1	32.1	34.7	29.2	21.4	24.3
CBC76	601162	225471	Roadside	100.0	100.0	31.1	31.4	30.6	23.8	25.9
CBC88, CBC88A, CBC88B	600571	225151	Roadside	100.0	100.0	27.9	27.7	25.9	22.2	20.7
CBC90	591312	223431	Roadside	100.0	100.0	26.6	27.1	26.7	17.5	17.5
CBC91	595239	223936	Roadside	100.0	100.0	22.4	21.7	21.2	16.6	15.9
CBC93	599031	224427	Roadside	100.0	100.0	20.7	20.4	20.4	14.4	14.5
CBC94	601925	224652	Roadside	100.0	100.0	27.5	25.8	26.8	20.3	21.1

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
CBC96	599909	228288	Roadside	100.0	100.0	20.8	18.4	19.9	14.4	13.8
CBC97	599452	227884	Roadside	73.1	73.1	25.8	26.0	26.8	19.8	19.3
CBC98	600086	226157	Roadside	75.0	75.0	22.1	21.8	21.9	16.7	18.7
CBC99	600891.32	225956.98	Roadside	100.0	100.0	24.3	22.4	22.7	16.5	15.3
CBC100	601252	225627	Roadside	84.6	84.6	29.3	28.4	28.5	22.0	20.3
CBC101	600868	225452	Roadside	100.0	100.0	36.5	34.9	32.7	24.5	28.0
CBC102	600752	225313	Roadside	100.0	100.0	38.4	**41.2**	**40.8**	31.3	36.2
CBC103	600607	225049	Roadside	92.3	92.3	26.8	27.8	26.8	20.3	23.6
CBC104	600193	224653	Roadside	100.0	100.0	27.9	29.0	29.7	22.9	21.9
CBC105	600224	225255	Roadside	100.0	100.0	33.1	34.1	34.0	26.0	26.1
CBC106	599911	224558	Roadside	92.3	92.3	35.6	36.4	35.9	34.2	33.4
CBC107	599389	225373	Roadside	100.0	100.0	30.5	30.9	32.3	28.3	24.1
CBC108	599354	225802	Roadside	100.0	100.0	29.6	32.4	29.9	23.5	25.0
CBC109	599398	225432	Roadside	100.0	100.0	31.2	33.3	34.5	29.9	29.6
CBC110	599891	225021	Roadside	84.6	84.6	31.5	32.2	32.4	24.2	26.7
CBC111	599473	224982	Urban Centre	100.0	100.0	**42.8**	**42.3**	**44.2**	37.3	37.3
CBC112	599730	225232	Urban Centre	65.4	65.4	32.5	32.3	30.4	19.2	19.9
CBC113	600845	225671	Roadside	80.8	80.8	27.4	27.9	26.2	19.2	21.0
CBC115	601083	225387	Roadside	65.4	65.4	28.0	27.2	27.5	20.4	20.1
CBC116	601115	225355	Roadside	92.3	92.3	20.4	21.5	21.1	16.2	14.5
CBC117	599984	225238	Roadside	73.1	73.1	**41.1**	39.8	**41.7**	33.5	31.8
CBC118	599269	226122	Roadside	100.0	100.0	29.6	28.5	30.1	25.2	23.6
CBC119	599230	226272	Roadside	100.0	100.0	20.9	21.9	22.1	15.6	15.7
CBC123	598938	226707	Roadside	92.3	92.3	21.0	24.7	22.0	17.0	16.3
CBC124	600516	225277	Roadside	92.3	92.3	39.8	39.8	39.0	28.4	32.1
CBC125	599226.52	226508.71	Roadside	92.3	92.3	**N/A**	30.2	34.7	26.8	26.6
CBC127	600537.22	225241.99	Roadside	92.3	92.3	**N/A**	**N/A**	**43.2**	35.1	32.9
CBC128	600546.54	225244.33	Roadside	100.0	100.0	**N/A**	**N/A**	31.4	24.4	25.7
CBC129	600550	225183	Roadside	84.6	84.6	**N/A**	**N/A**	**45.3**	**40.0**	**41.3**
CBC131	595025	225166	Roadside	100.0	100.0	**N/A**	**N/A**	**41.0**	34.2	27.6
CBC132	595106.06	225123	Roadside	100.0	100.0	**N/A**	**N/A**	39.8	31.7	26.9
CBC135	591366	223679	Roadside	100.0	100.0	**N/A**	**N/A**	32.5	25.6	23.8
CBC136	590444	223502	Roadside	92.3	92.3	**N/A**	**N/A**	30.6	22.2	24.4
CBC137	590325	223495	Roadside	100.0	100.0	**N/A**	**N/A**	37.9	28.5	33.3

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
CBC21, CBC138, CBC139	599413	225056	Roadside	100.0	100.0	**N/A**	**N/A**	**44.6**	32.4	39.1
CBC140	603496	224190	Roadside	100.0	100.0	**N/A**	**N/A**	**N/A**	**N/A**	24.1
CBC141	604045	222827	Roadside	92.3	92.3	**N/A**	**N/A**	**N/A**	**N/A**	17.9
CBC142	600253	223411	Urban Background	51.9	51.9	**N/A**	**N/A**	**N/A**	**N/A**	10.9
CBC143	600056	223156	Urban Background	51.9	51.9	**N/A**	**N/A**	**N/A**	**N/A**	9.8

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

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

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

Notes:

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

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

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

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

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

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

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

Figure A.3 – Trends in Diffusion Tube Annual Mean NO_2 Concentrations (Mersea Road Air Quality Hotspot)

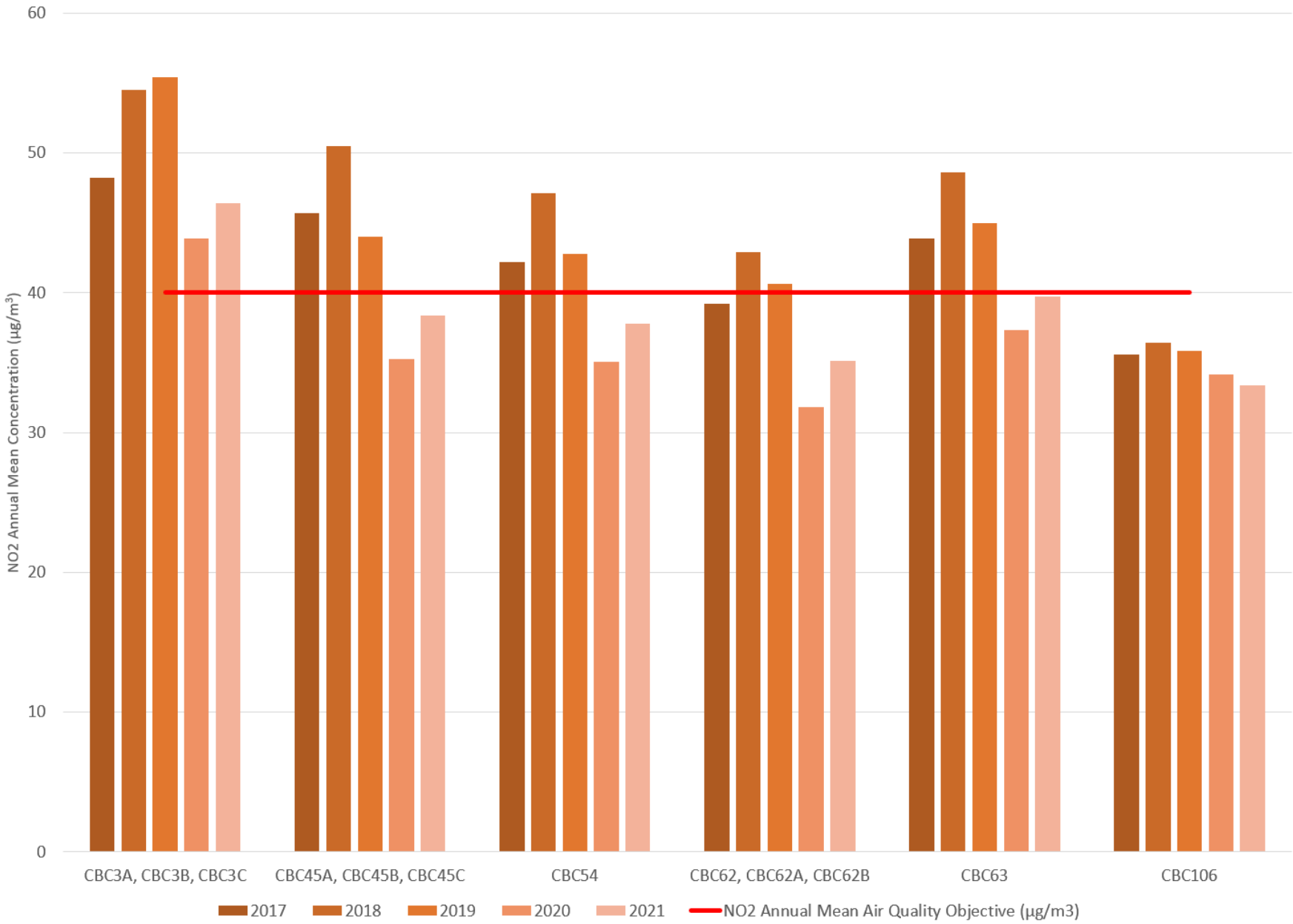
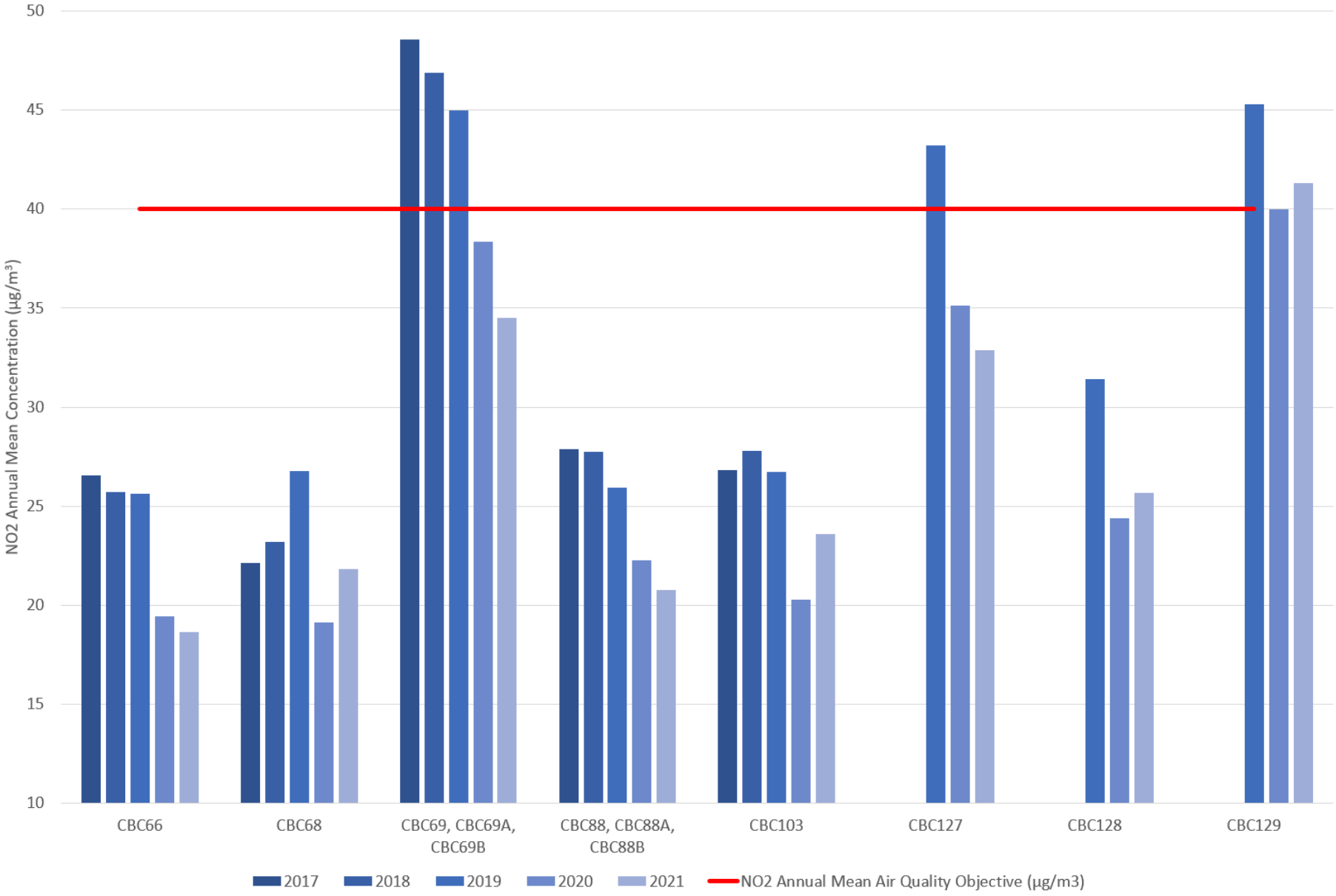


Figure A.4 – Trends in Diffusion Tube Annual Mean NO_2 Concentrations (Brook Street Air Quality Hotspot)



Appendix B: Full Monthly Diffusion Tube Results for 2021

Table B.1 – NO_2 2021 Diffusion Tube Results (µg/m^3)

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.78)	Annual Mean: Distance Corrected to Nearest Exposure
CBC2	599981	224633	40.8	29.9	33.8	26.5	27.2	25.1	26.5	22.5	26.7	33.7	34.0	35.8	30.2	23.6	
CBC3A, CBC3B, CBC3C	599914	224643	56.2	60.2	54.3	58.3	59.1	55.2	58.3	41.3	51.2	82.8	76.5	61.1	59.5	**46.4**	**44.7**
CBC8	597640	223661	28.6	24.3	22.7	16.2	Missing	Missing	16.2	14.4	15.1	25.9	24.3	28.3	21.6	16.8	
CBC20	599063	225097	28.6	24.4	20.1	12.1	Missing	Missing	12.1	Missing	9.9	19.2	20.7	50.5	22.0	17.1	
CBC43	600356	224763	Missing	37.1	34.1	25.7	28.1	28.3	25.7	26.5	27.0	37.0	36.2	46.9	32.1	25.0	
CBC45 A, CBC45 B, CBC45 C	600560	225181	46.2	51.8	44.0	53.4	36.4	54.8	53.4	47.9	43.0	65.0	46.3	48.5	49.2	38.4	
CBC48	599908	224942	49.5	37.4	34.3	41.1	35.7	36.1	41.1	22.4	36.9	45.2	47.7	47.9	39.6	30.9	
CBC49	599720	225217	49.8	36.5	35.1	33.6	27.7	27.1	33.6	33.4	Missing	Missing	49.8	38.8	36.5	28.5	
CBC54	599922	224728	46.1	44.0	43.0	56.3	42.1	48.9	56.3	49.8	44.0	62.7	48.1	39.8	48.4	37.8	34.3
CBC62, CBC62 A, CBC62 B	599923	224738	41.3	48.0	34.6	55.5	33.7	44.2	55.5	46.4	37.0	60.0	43.2	41.7	45.1	35.2	
CBC63	599921	224711	47.4	55.5	44.6	60.4	49.3	54.2	60.4	52.5	40.5	67.7	50.2	28.3	50.9	39.7	
CBC65	598797	224489	25.5	27.3	24.1	20.3	Missing	Missing	20.3	Missing	13.8	26.7	25.5	27.4	23.4	18.3	
CBC66	600622	224881	30.6	27.3	26.7	20.8	18.4	19.1	20.8	18.5	20.1	27.3	30.6	26.9	23.9	18.7	
CBC68	600589	225113	30.5	30.8	23.8	25.2	Missing	27.9	25.2	19.4	14.5	28.7	25.1	56.9	28.0	21.8	
CBC69, CBC69 A, CBC69 B	600545	225205	56.8	43.2	54.6	25.0	Missing	46.1	25.0	36.1	41.5	53.7	53.3	51.2	44.2	34.5	
CBC71	599818	224924	80.1	68.6	48.3	55.3	49.1	38.1	55.3	46.2	37.3	53.0	53.4	34.4	51.6	**40.2**	

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 (0.78)	Annual Mean: Distance Corrected to Nearest Exposure
CBC72	600885	225441	34.1	35.8	28.7	Erroneous Data Point Removed	27.6	26.1	Erroneous Data Point Removed	29.7	26.1	41.7	Missing	31.1	31.2	24.3	
CBC76	601162	225471	38.7	33.3	33.8	29.8	23.6	26.5	29.8	24.1	27.2	72.3	35.9	24.2	33.3	25.9	
CBC88, CBC88A, CBC88B	600571	225151	33.0	28.8	25.1	22.9	26.5	22.0	22.9	21.4	20.3	29.3	38.4	28.5	26.6	20.7	
CBC90	591312	223431	26.7	25.7	22.1	21.4	24.9	21.1	21.4	10.7	14.0	31.2	26.6	24.1	22.5	17.5	
CBC91	595239	223936	27.9	23.9	23.0	16.0	19.5	16.2	16.0	16.8	12.7	25.2	23.9	23.7	20.4	15.9	
CBC93	599031	224427	25.5	22.5	20.2	15.2	13.3	14.7	15.2	13.4	13.7	23.1	21.4	24.8	18.6	14.5	
CBC94	601925	224652	35.5	53.9	27.7	21.1	20.9	22.0	21.1	18.0	17.9	26.2	31.0	28.8	27.0	21.1	
CBC96	599909	228288	20.7	20.8	19.0	14.9	14.0	17.0	14.9	12.6	13.8	21.2	20.5	22.7	17.7	13.8	
CBC97	599452	227884	30.4	26.5	22.8	Erroneous Data Point Removed	Missing	21.4	Erroneous Data Point Removed	20.1	14.0	29.0	29.6	28.8	24.7	19.3	
CBC98	600086	226157	28.3	21.8	20.6	33.6	Missing	15.5	33.6	13.6	Missing	Missing	25.4	23.8	24.0	18.7	
CBC99	600891	225957	23.7	23.4	19.0	15.6	17.3	17.6	15.6	14.6	12.4	25.5	26.5	24.5	19.6	15.3	
CBC100	601252	225627	34.7	28.4	26.9	19.6	Missing	Missing	19.6	16.3	20.2	34.3	31.0	29.4	26.0	20.3	
CBC101	600868	225452	45.2	35.2	40.5	37.6	36.0	34.9	37.6	17.9	37.6	32.1	41.4	34.2	35.9	28.0	
CBC102	600752	225313	50.2	42.0	46.1	52.9	42.7	50.4	52.9	41.4	39.7	53.0	41.7	44.6	46.5	36.2	
CBC103	600607	225049	31.2	31.5	26.9	39.7	25.5	27.2	39.7	23.1	Missing	31.1	28.6	28.2	30.2	23.6	
CBC104	600193	224653	35.7	28.9	28.5	26.6	24.9	23.4	26.6	23.0	22.1	34.3	31.8	30.5	28.0	21.9	
CBC105	600224	225255	40.2	35.0	32.5	30.5	31.7	27.8	30.5	30.4	26.7	41.0	37.7	36.9	33.4	26.1	
CBC106	599911	224558	47.9	42.4	41.5	40.0	Missing	32.0	40.0	38.4	37.5	52.9	52.1	46.4	42.8	33.4	
CBC107	599389	225373	40.9	31.1	32.5	26.1	25.4	24.5	26.1	24.2	27.9	38.0	38.9	35.9	31.0	24.1	

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 (0.78)	Annual Mean: Distance Corrected to Nearest Exposure
CBC108	599354	225802	34.3	33.0	30.2	32.4	25.9	32.6	32.4	27.1	36.4	39.2	30.5	30.5	32.0	25.0	
CBC109	599398	225432	40.7	41.5	31.3	35.4	35.0	35.9	35.4	34.4	28.4	48.7	48.6	39.7	37.9	29.6	
CBC110	599891	225021	33.5	Missing	28.9	40.9	Missing	23.4	40.9	29.4	26.6	36.7	48.2	34.4	34.3	26.7	
CBC111	599473	224982	59.9	21.6	43.9	53.4	42.0	44.0	53.4	41.6	45.7	61.5	54.4	52.4	47.8	37.3	
CBC112	599730	225232	33.6	26.6	23.0	Missing	Missing	18.5	Missing	Missing	29.6	35.2	37.5	35.6	30.0	19.9	
CBC113	600845	225671	29.6	34.4	21.1	Erroneous Data Point Removed	25.0	20.0	Erroneous Data Point Removed	21.7	16.5	39.7	32.9	27.7	26.9	21.0	
CBC115	601083	225387	34.2	30.1	30.5	Missing	Missing	34.9	Missing	Missing	22.4	29.5	30.7	29.0	30.2	20.1	
CBC116	601115	225355	26.0	21.8	19.1	17.6	Missing	17.9	17.6	13.7	12.5	20.4	14.8	22.5	18.5	14.5	
CBC117	599984	225238	47.3	Missing	37.4	Missing	25.4	32.6	Missing	40.9	34.2	52.6	49.9	46.7	40.8	31.8	
CBC118	599269	226122	40.6	32.2	31.8	27.0	24.6	26.2	27.0	21.4	24.5	36.1	37.3	34.6	30.3	23.6	
CBC119	599230	226272	27.8	25.5	18.8	18.3	14.8	17.2	18.3	14.6	14.7	24.5	23.4	23.5	20.1	15.7	
CBC123	598938	226707	Missing	27.4	20.4	21.2	15.0	21.4	21.2	16.5	14.6	26.9	20.8	24.9	20.9	16.3	
CBC124	600516	225277	42.9	41.7	39.1	46.9	33.8	41.9	46.9	Missing	37.4	50.6	32.4	39.4	41.2	32.1	
CBC125	599227	226509	41.2	40.0	29.4	35.8	Missing	27.1	35.8	31.9	27.2	48.4	40.7	18.3	34.2	26.6	
CBC127	600537	225242	48.7	46.9	44.1	24.9	45.0	36.7	24.9	Missing	38.9	54.1	53.2	46.0	42.1	32.9	
CBC128	600547	225244	39.6	39.4	32.9	33.3	22.1	37.4	33.3	37.6	21.4	32.1	30.5	35.4	32.9	25.7	
CBC129	600550	225183	56.1	50.4	55.4	49.4	52.7	46.1	49.4	Missing	48.3	68.3	Missing	53.2	52.9	**41.3**	
CBC131	595025	225166	40.0	36.0	34.9	30.7	30.6	22.9	30.7	37.3	28.0	46.6	46.8	39.4	35.3	27.6	
CBC132	595106	225123	39.8	33.7	39.7	36.1	31.4	37.6	36.1	27.6	31.8	34.7	31.9	32.8	34.4	26.9	
CBC135	591366	223679	31.1	33.8	24.7	24.8	27.1	24.8	24.8	25.5	18.3	71.7	29.6	29.3	30.5	23.8	
CBC136	590444	223502	41.6	Missing	31.8	27.7	33.3	27.9	27.7	32.1	22.0	31.1	34.6	33.6	31.2	24.4	
CBC137	590325	223495	64.2	47.2	43.4	34.9	33.7	46.5	34.9	33.7	30.2	48.6	46.8	48.3	42.7	33.3	

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.78)	Annual Mean: Distance Corrected to Nearest Exposure
CBC21, CBC138, CBC139	599413	225056	48.8	46.0	38.4	61.4	46.1	55.7	61.4	48.2	43.8	57.1	49.7	45.1	50.1	39.1	31.1
CBC140	603496	224190	45.0	29.9	32.2	30.1	32.5	24.7	30.1	14.2	25.3	36.0	39.8	31.7	31.0	24.1	
CBC141	604045	222827	26.1	26.9	21.8	19.3	20.2	17.8	19.3	37.5	14.9	26.2	Missing	23.0	23.0	17.9	
CBC142	600253	223411	N/A	N/A	N/A	N/A	N/A	N/A	11.6	11.4	9.5	17.3	15.4	18.1	13.9	10.9	
CBC143	600056	223156	N/A	N/A	N/A	N/A	N/A	N/A	10.1	9.2	8.1	15.4	15.5	16.7	12.5	9.8	

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

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

☒ **National bias adjustment factor used**

It has not been necessary to distance corrected the data for relevant exposure

☒ **Colchester Borough Council confirms that all 2021 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System**

Notes:

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

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

See Appendix C for details on bias adjustment and annualisation.

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

New or Changed Sources Identified Within Colchester During 2021

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

Additional Air Quality Works Undertaken by Colchester Borough Council During 2021

Colchester Borough Council has not completed any additional air quality works within the reporting year of 2021.

QA/QC of Diffusion Tube Monitoring

- Colchester Borough Council undertook monitoring at 62 sites in 2021.
- Colchester Borough Council adheres with the Diffusion Tube Monitoring Calendar
- 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 2021:

Table C.1 – AIR PT Results 2021

AIR PT Round	AIR PT AR42
Round conducted in the period	January – March 2021
SOCOTEC	100%

Diffusion Tube Annualisation

Diffusion tubes CBC112, CBC115, CBC142 and CBC143 had a valid data capture of less than 75%. Data annualisation was undertaken using the Defra Diffusion Tube Processing Tool with calculations shown in Table C.2.

Table C.2 – Annualisation Summary (concentrations presented in µg/m^3)

Site ID	Annualisation Factor Chignal St James	Annualisation Factor Rochester Stoke	Annualisation Factor St Osyth	Annualisation Factor Wicken Fen	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean
CBC112	0.8944	0.8422	0.8274	0.8495	0.8534	30.0	25.6
CBC115	0.8944	0.8422	0.8274	0.8495	0.8534	30.2	25.7
CBC142	0.9804	1.0013	1.0194	1.0358	1.0092	13.9	14.0
CBC143	0.9804	1.0013	1.0194	1.0358	1.0092	12.5	12.6

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2022 ASR have been corrected for bias using an adjustment factor. Bias represents the overall tendency of the diffusion tubes to under or over-read relative to the reference chemiluminescence analyser. LAQM.TG16 provides guidance with regard to the application of a bias adjustment factor to correct diffusion tube monitoring. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data taken from NO_x/NO_2 continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

Colchester Borough Council have applied a national bias adjustment factor of 0.78 to the 2021 monitoring data. A summary of bias adjustment factors used by Colchester Borough Council over the past five years is presented in Table C.3.

Table C.3 – Bias Adjustment Factor

Monitoring Year	Local or National	Diffusion Tube	Version of National Spreadsheet	Adjustment Factor
2021	National	Socotec 50% TEA in Acetone	03/22	0.78
2020	National	Socotec 50% TEA in Acetone	03/21	0.77
2019	National	Gradko 20% TEA in Water	03/20	0.93
2018	National	Gradko 20% TEA in Water	03/19	0.92
2017	National	Gradko 20% TEA in Water	03/18	0.89

NO_2 Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO_2 concentration at the nearest location relevant for exposure has been estimated using the Diffusion Tube Data Processing Tool/NO2 fall-off with distance calculator available on the LAQM Support website. Non-automatic annual mean NO2 concentrations corrected for distance are presented in Table C.4 below.

Table C.4 – NO_2 Fall-off with Distance from the Road Calculator (concentrations presented in µg/m^3)

Site ID	Distance (m): Monitoring Site to Kerb	Distance (m): Receptor to Kerb	Monitored Concentration (Annualised and Bias Adjusted	Background Concentration	Concentration Predicted at Receptor
CBC3A, CBC3B, CBC3C	1.9	2.4	46.4	14.2	**44.7**
CBC54	1.8	3.4	37.8	14.2	34.3
CBC21, CBC138, CBC139	0.6	2.6	39.1	9.1	31.1

QA/QC of Automatic Monitoring

Colchester Borough Council operates one automatic monitoring site measuring NO_2. Data from this site 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 fortnightly LSO calibrations and biannual servicing are carried out by a contractor who also makes emergency maintenance callouts when faults are identified.

The nitrogen dioxide analysers are calibrated fortnightly with a certified reference gas. The continuous automatic monitoring site is co-located with triplicate NO_2 diffusion tubes.

Data ratification is undertaken by the Councils contractor. The 2021 data ratification for the Brook Street air quality monitoring site has been completed to the LAQM (TG16) April 2021 standards using the AURN methodology. Ratification procedures 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 for ozone instrument sensitivity drifts
- eliminating measurements for NO_2 conversion inefficiencies
- eliminating periods where calibration gas is in the ambient dataset
- identifying periods were 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 CBC1 continuous automatic monitor recorded data capture of greater than 75% therefore it was not required to annualise any monitoring data. In addition, any sites with a data capture below 25% do not require annualisation.

NO_2 Fall-off with Distance from the Road

Results from the CBC1 continuous automatic monitor did not require distance correction.

Appendix D: Map of Monitoring Locations and AQMAs

Figure D.1 – Monitoring Location Map: AQMA1 Central Corridors

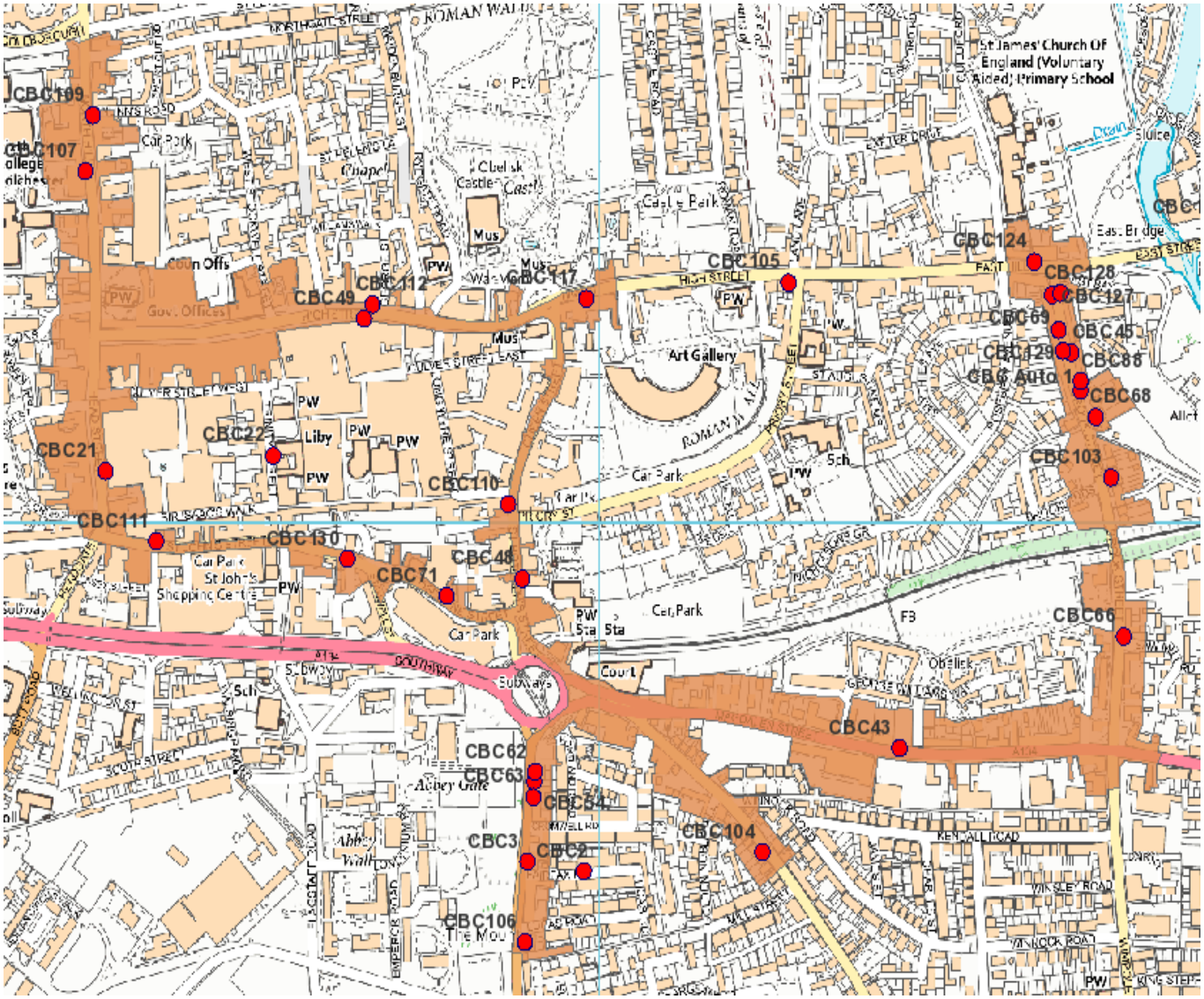


Figure D.2 – Monitoring Location Map: AQMA2 & East Colchester

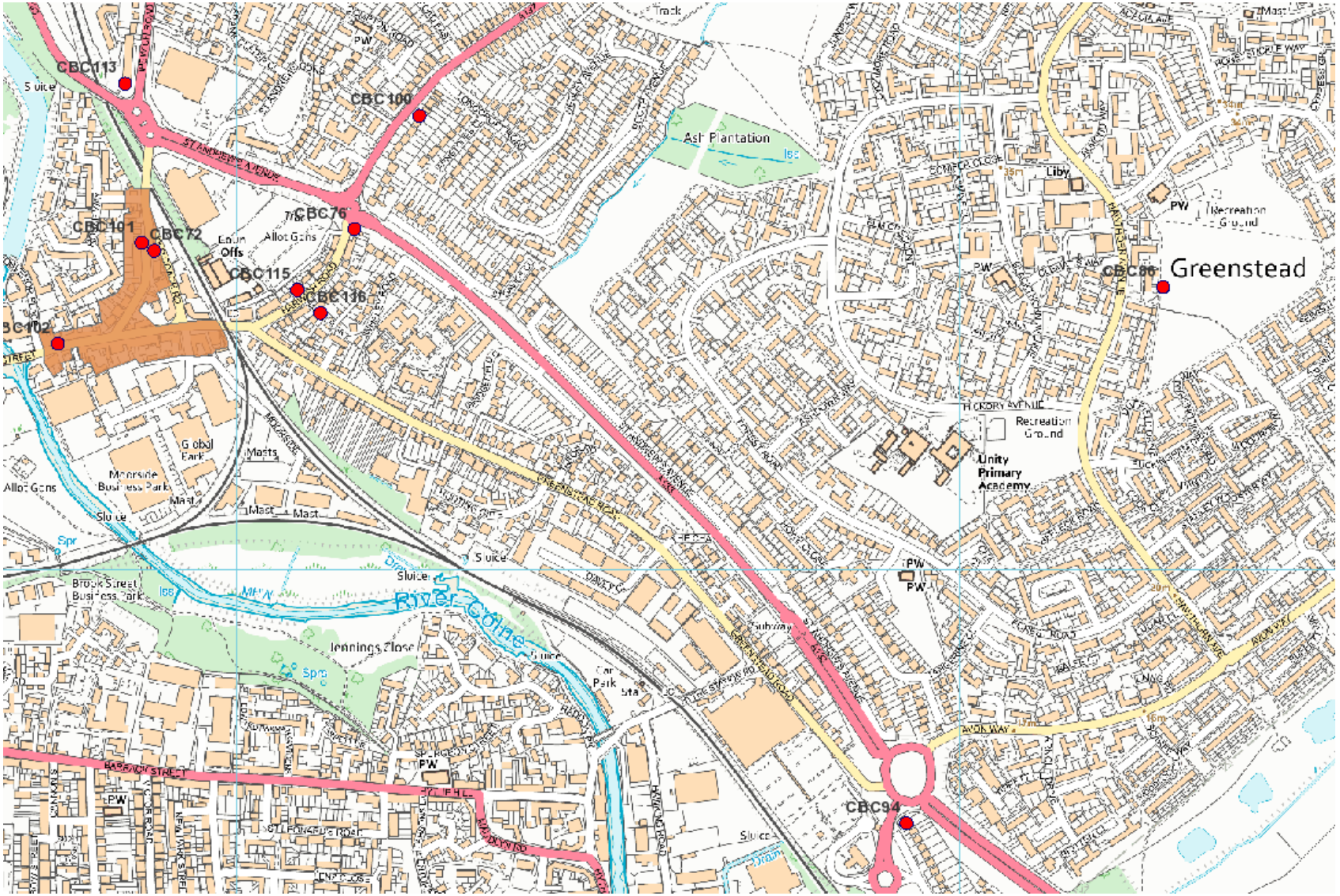


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Figure D.3 – Monitoring Location Map: AQMA4 & Stanway

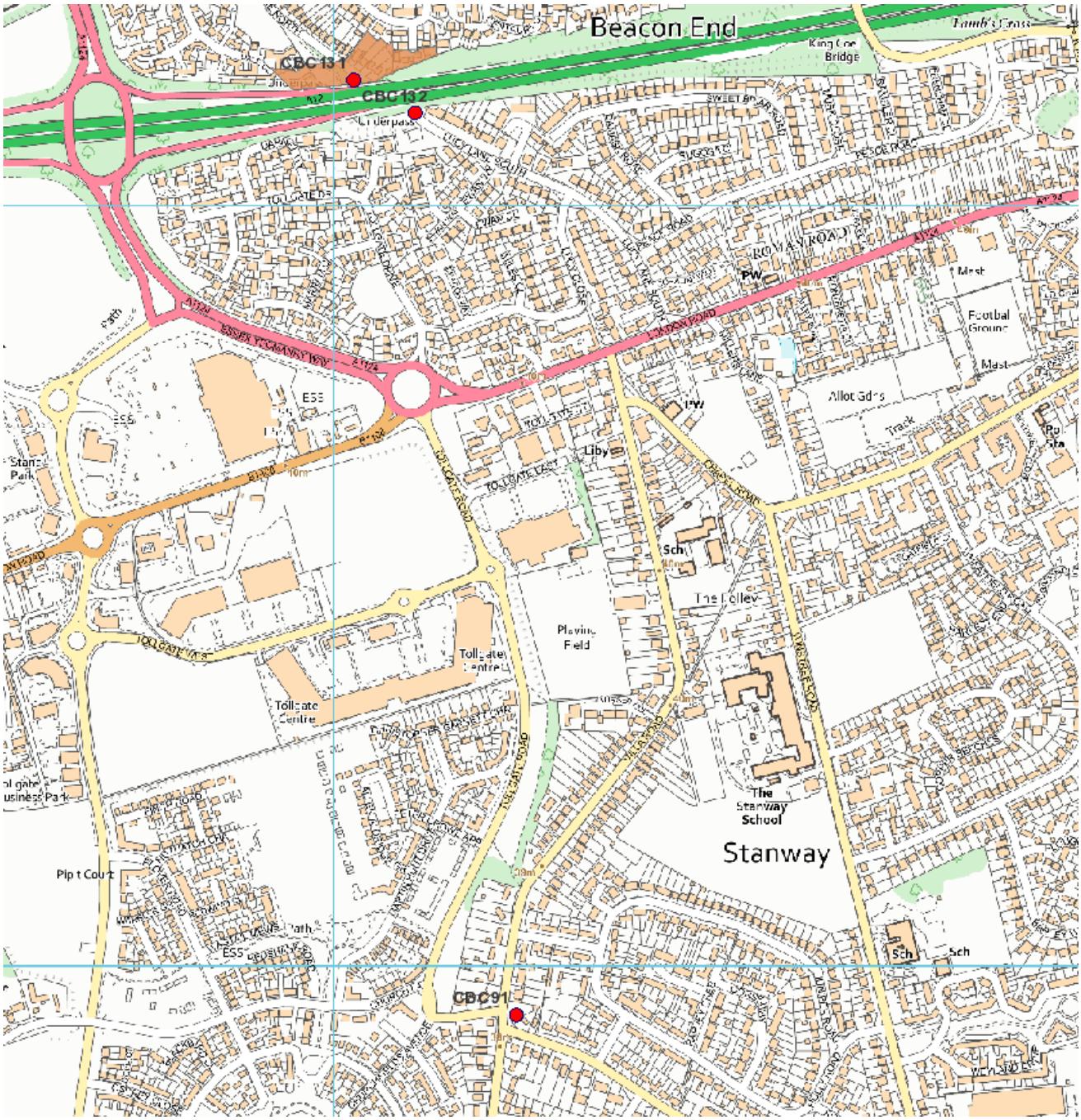

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Figure D.4 – Monitoring Location Map: West Colchester

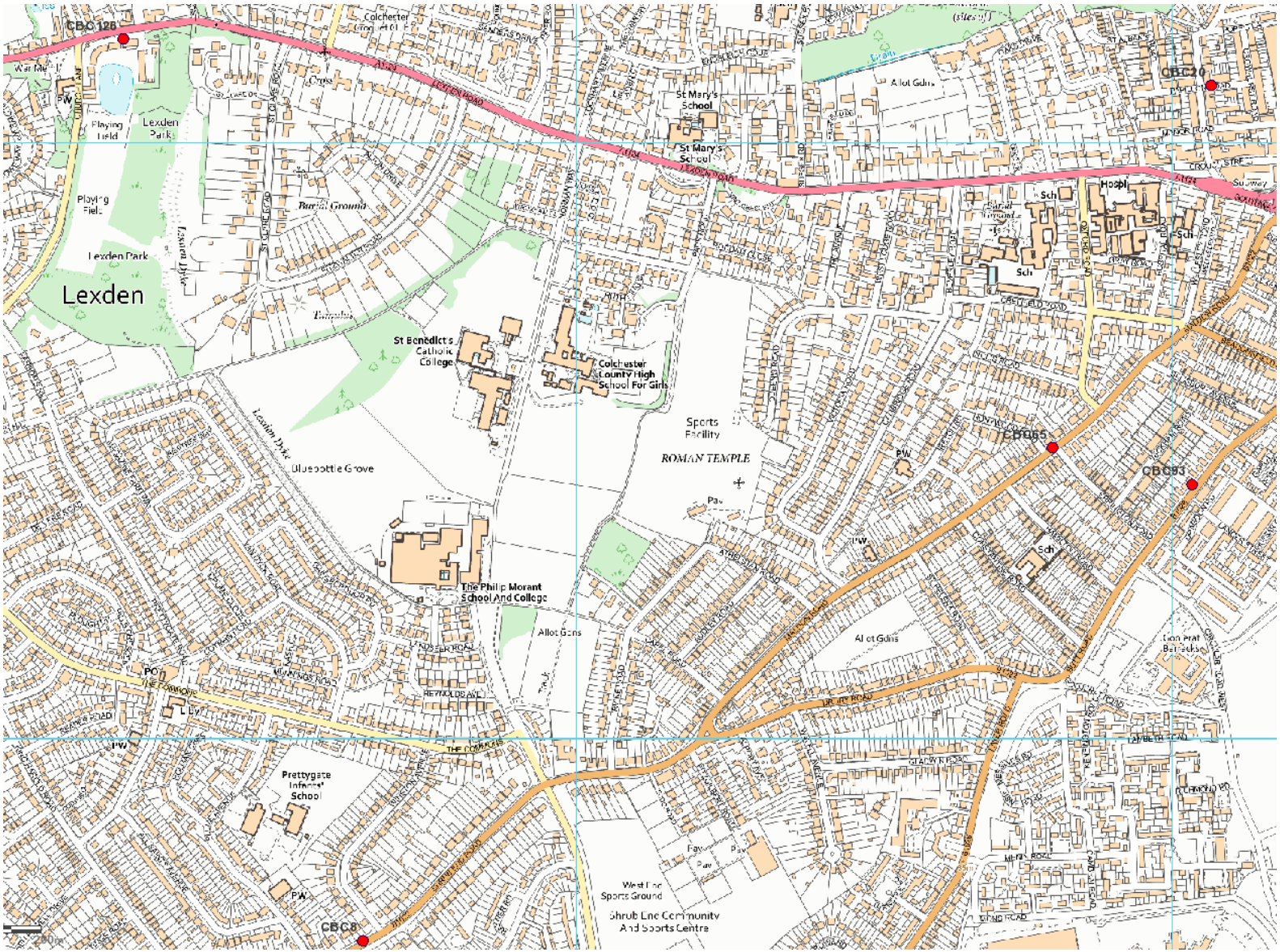

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Figure D.5 – Monitoring Location Map: North Colchester

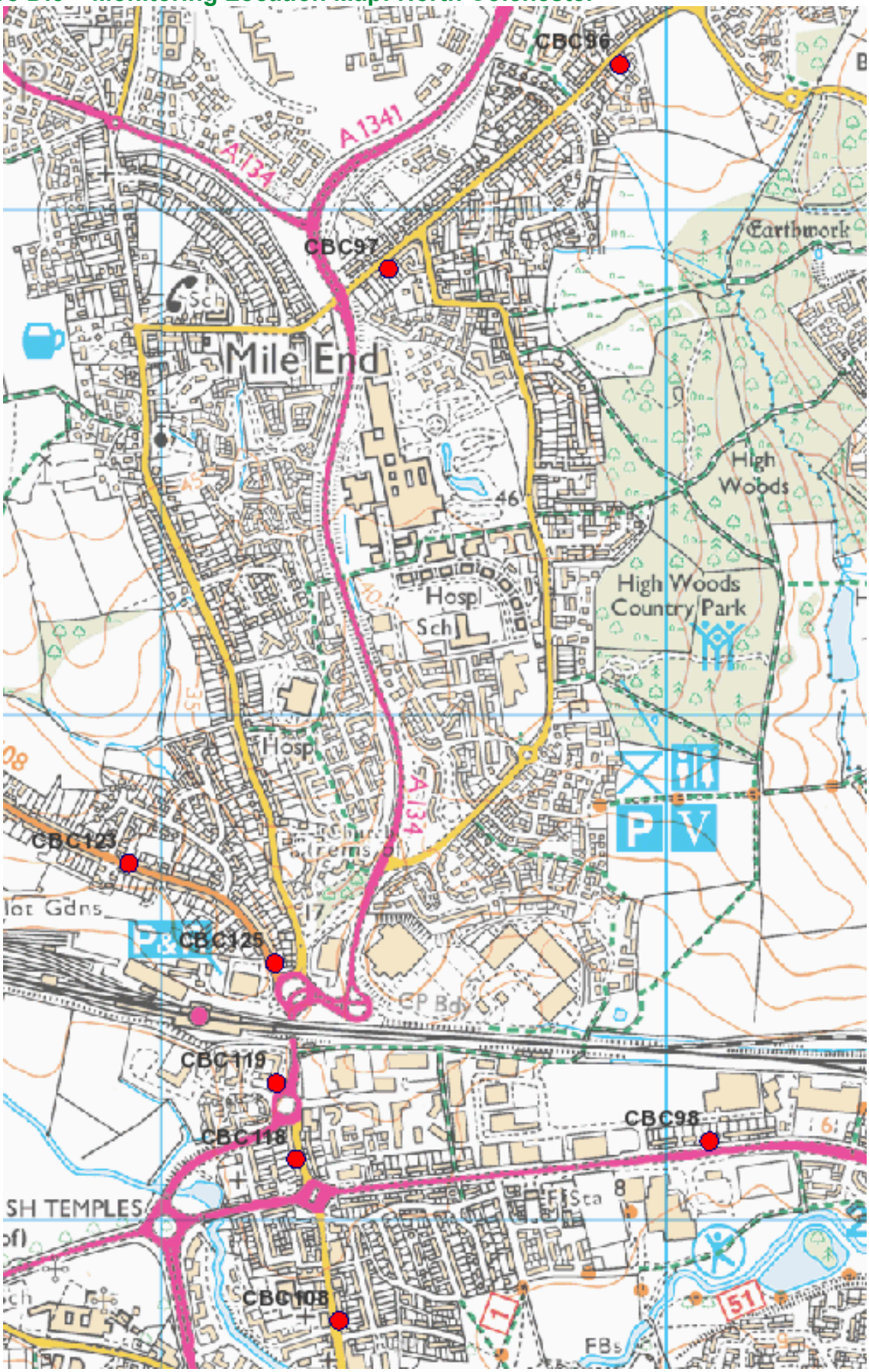

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Figure D.6 – Monitoring Location Map: Marks Tey

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Figure D.7 – Monitoring Location Map: Wivenhoe

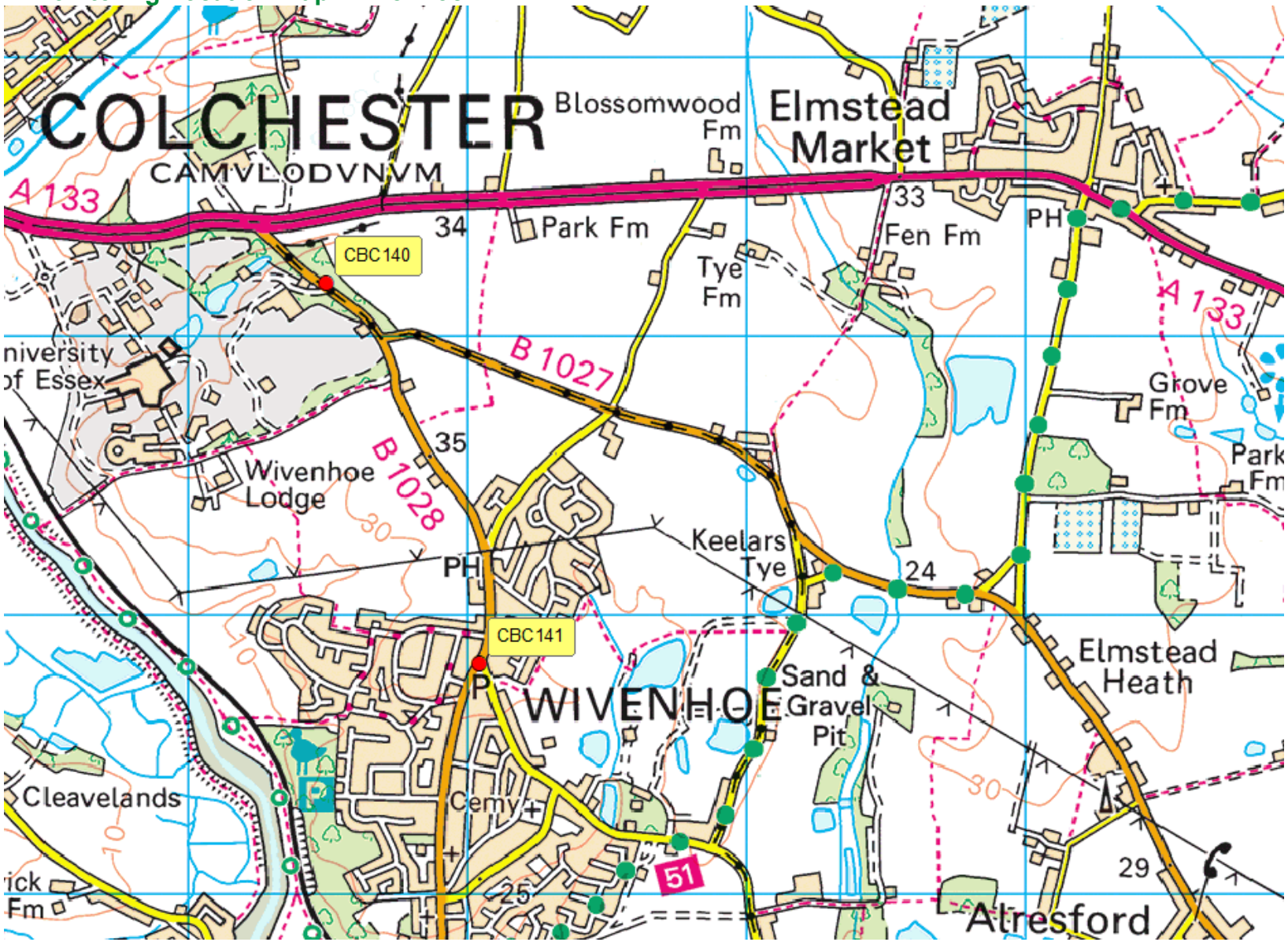

Figure D.8 – Monitoring Location Map: Colchester Crematorium

Appendix E: Summary of Air Quality Objectives in England

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

=	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
airTEXT	airTEXT is 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
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
CVTF	Clean Vehicle Technology Fund – A DfT fund that provides grants for upgrading vehicles to reduce emissions in areas of poor air quality
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
SCRT	Selective Catalytic Reduction Technology – Retrofitted equipment to reduce bus emissions
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

References

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- Essex Air Quality Consortium available at; http://www.essexair.org.uk
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- Public Health Outcomes Framework Indicator D01 available at; https://fingertips.phe.org.uk/profile/public-health-outcomes-framework