

City Council

2017 Air Quality Annual Status Report (ASR)

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

September 2017

Local Authority Officer	Tim Savage
Department	Public Health & Protection
Address	Duke Street Chelmsford Essex CM1 1JE
Telephone	01245 606264
E-mail	tim.savage@chelmsford.gov.uk
Report Reference number	CHE/ASR2017
Date	15 th September 2017
Written by	Tim Savage
Scientific Team Public Health & Protection Services Chelmsford City Council Duke Street Chelmsford Essex CM1 1JE	City Council

Executive Summary: Air Quality in Our Area

This 2017 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 2017, all Air Quality Objectives were achieved in Chelmsford.

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 and older people, and those with heart and lung conditions. There is also often a strong correlation with equality issues, because areas with poor air quality are also often the less affluent areas^{1,2}.

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around $\pounds 16$ billion³.

Chelmsford is located in mid Essex, thirty-one miles from London and has a population of over 168,310 (2011 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.

The main source of air pollution in Chelmsford is road traffic emissions from major roads, notably the A12, A414, A138, A130 and B1016

Chelmsford City Council has declared one Air Quality Management Area (AQMA) at the Army and Navy roundabout and surrounding roads which is detailed in Table 2.1.

In 2016, the Council measured no exceedances of the air quality objectives at relevant exposure.

¹ Environmental equity, air quality, socioeconomic status and respiratory health, 2010

² Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006

³ Defra. Abatement cost guidance for valuing changes in air quality, May 2013

Actions to Improve Air Quality

In 2016, Chelmsford City Council joined the <u>airTEXT</u> air quality forecasting service. This service provides free air quality alerts by SMS text message, email, twitter and voicemail and 3-day forecasts of air quality, pollen, UV and temperature across Greater London, Chelmsford, Colchester and Cambridge. When the air quality forecast is moderate or worse, an alert is sent to subscribers.

The 2017 UK plan for tackling roadside nitrogen dioxide concentrations highlighted <u>raising awareness</u> of air quality and gave the example of *air*TEXT as a service to inform vulnerable people about air pollution levels.



Figure i.1 airTEXT Screenshot

This service will enable those with heart or lung conditions, or other breathing problems to make informed judgements about their levels of activity or exposure.

Conclusions and Priorities

Chelmsford City Council has found that on average, measured concentrations of Nitrogen Dioxide in 2016 increased by 5% from 2015. Monitoring data from four other local authorities in Essex has identified similar increases of between 4 and 10%.

It is important to view air quality over the long term as meteorological variation can influence pollutant concentrations significantly. The increases in 2016 alone do not indicate an upwards trend.

Army and Navy AQMA

In 2016, all monitored locations within the AQMA were found to achieve the Air Quality Objectives for Nitrogen Dioxide (NO₂). It is essential that pollutant concentrations remain below the threshold to ensure that exposure to poor air quality does not occur.

A414 Danbury Pollution Hotspot

Traffic modelling identified that congestion will increase along the A414 corridor as a result of growth and development taking place in the neighbouring borough of Maldon. Chelmsford City Council monitors air quality along the A414 in Danbury and there is a small pollution hotspot where concentrations of Nitrogen Dioxide (NO₂) are borderline with the Air Quality Objectives. A scheme to improve traffic flow on the A414 through the centre of Danbury at peak times has been completed however, it appears that a combination of traffic management work further along the A414 and increased traffic volumes may have contributed to the marked increase in pollution measured in 2016.

Springfield Road Pollution Hotspot

The crossroads junction of Springfield Road and Victoria Road is a congestion hotspot and the Council monitors air quality on all four road-links entering the junction.

A small section of Springfield Road west of the junction up to Trinity Road has buildings flanking the road creating a canyon-like environment. This 'street canyon' reduces the dispersion of pollution generated by traffic. Vehicles queue down to the traffic lights and monitoring has found that air quality in this section of road is borderline with the Air Quality Objectives.

The Council has extended the coverage of air quality monitoring in this area and Essex County Council plans to refurbish the junction in 2017.

Local Engagement and How to get Involved

Residents and visitors to Chelmsford are encouraged to <u>sign up</u> to *air*TEXT for free air quality alerts by SMS text message, email, <u>@airtext_chelm</u> on twitter and voicemail. The service also provides 3-day forecasts of air quality, pollen, UV and temperature. It is possible to sign up by visiting <u>airTEXT.info/signup</u> or by texting airTEXT to 78070.

There is also a free *air*TEXT smart phone app that gives users forecasts for pollution, UV, grass pollen and temperature. This app is available for iPhones and Android smartphones.





Chelmsford City Council is a member of the Essex Air Quality consortium. The purpose of Essex Air is to promote improvements in air quality related issues. The Essex Air <u>web site</u> provides a daily forecast of air pollution. Also, the <u>@EssexAir</u> twitter feed provides localised weekly air pollution forecasts.

Figure i.2 - 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.

The Essex Air twitter also promotes the <u>DVSA service</u> for reporting smoky lorries or buses. Particulate matter is usually not visible but when poorly maintained diesel engines can produce visible particles, appearing as smoke. Fine particles have an adverse effect on human health, particularly among those with respiratory and cardiovascular problem.

Figure i.3 - Essex Air Reporting Smoky Vehicle Tweets



Essex County Council has worked closely with <u>Liftshare</u> to develop the Essex Car Share scheme. This operates across Chelmsford and provides commuters with a car sharing service which could cut congestion and air pollution whilst saving money.

Table of Contents

Executive Summary: Air Quality in Our Area	i
Air Quality in Chelmsford	i
Actions to Improve Air Quality	ii
Conclusions and Priorities	iii
Local Engagement and How to get Involved	iv
Local Air Quality Management	1
2 Actions to Improve Air Quality	2
2.1 Air Quality Management Areas	2
2.2 Progress and Impact of Measures to address Air Quality in Chelmsford	3
2.3 PM _{2.5} – Local Authority Approach to Reducing Emissions and or	
Concentrations	6
3 Air Quality Monitoring Data and Comparison with Air Quality	
Objectives and National Compliance	7
3.1 Summary of Monitoring Undertaken	7
3.1.1.1 Automatic Monitoring Sites	7
3.1.1.2 Non-Automatic Monitoring Sites	7
3.2 Individual Pollutants	7
3.2.1 Nitrogen Dioxide (NO ₂)	7
3.2.2 Particulate Matter (PM ₁₀)	8
3.2.3 Ozone (O ₃)	8
Appendix A: Monitoring Results	9
Appendix B: Full Monthly Diffusion Tube Results for 2016	20
Appendix C: Trend Data	24
Appendix D: Supporting Technical Information / Air Quality Monitoring	
Data QA/QC	27
Appendix E: Map of Monitoring Locations	29
Appendix F: Summary of Air Quality Objectives in England	33
Appendix G: AQMA Order	34
Glossary of Terms	36
References	37

List of Tables

Table 2.1 – Declared Air Quality Management Areas	2
Table 2.2 – Progress on Measures to Improve Air Quality	4
Table A.1 – Details of Automatic Monitoring Sites	9
Table A.2 – Details of Non-Automatic Monitoring Sites	10
Table A.3 – Annual Mean NO ₂ Monitoring Results	14
Table A.4 – 1-Hour Mean NO2 Monitoring Results	18
Table A.5 – Annual Mean PM ₁₀ Monitoring Results	18
Table A.6 – 24-Hour Mean PM10 Monitoring Results	19
Table A.7 – Ozone (O3) Monitoring Results 2010-2016	19
Table B.1 – NO ₂ Monthly Diffusion Tube Results - 2016	20
Table D.1 – AIR PT Results 2016	28
Table F.1 – Air Quality Objectives in England	33

List of Figures

Figure i.1 – <i>air</i> TEXT Screenshot	ii
Figure i.2 - Essex Air Twitter Air Quality Notifications	iv
Figure i.3 - Essex Air Reporting Smoky Vehicle Tweets	v
Figure C.1 – Nitrogen Dioxide (Diffusion Tube) Trend Data 2010-2016	24
Figure C.2 - Nitrogen Dioxide (Automatic Monitor) Trend Data 2009-2016	25
Figure C.3 – PM ₁₀ (Automatic Monitor) Trend Data 2008-2016	26
Figure D.1 – Local Bias Adjustment Calculation	28
Figure E.1 – Overview Map of Monitoring Locations	29
Figure E.2 – Map of 2016 AQMA Monitoring Locations	30
Figure E.3 – Map of 2016 Monitoring at the A414 Danbury Air Pollution Hotspot	31
Figure E.4 – Map of 2016 Monitoring at the Springfield Road Air Pollution Hotspot	32
Figure G.1 – Chelmsford City Council AQMA Order	34

1 Local Air Quality Management

This report provides an overview of air quality in Chelmsford during 2016. 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 Chelmsford City Council to improve air quality and any progress that has been made.

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

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

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

A summary of AQMAs declared by Chelmsford City Council can be found in Table 2.1 with a copy of the AQMA order in Appendix G.

Further information related to declared or revoked AQMAs are available online at: <u>https://uk-</u>

air.defra.gov.uk/aqma/details?aqma_id=900

Table 2.1 – Declared Air Quality Management Areas

AQMA	Date of	Pollutants and Air	City /	One Line	Is air quality in the AQMA influenced by roads	Level of Excee monitored/mode at a location of	edance (maximum elled concentration relevant exposure)	Action Plan (2005)
Name	Declaration	Quality Objectives	Town	Description	controlled by Highways England?	At Declaration	Now	/ tonon / ton ()
Army & Navy AQMA	Declared 01/12/2005, Amended 1/10/2012	NO2 Annual Mean	Chelmsford	Army & Navy Roundabout and surrounding roads	NO	51.3µg/m³	36.59µg/m³	<u>Air Quality Action Plan</u> <u>Army & Navy AQMA (July</u> <u>2008)</u>

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

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

Chelmsford City Council has taken forward a number of measures during the current reporting year of 2016 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2.

Chelmsford City Council's priorities for the coming year are:

- Increased air quality monitoring in the vicinity of the Danbury A414 air pollution hotspot. Additional diffusion tube monitoring locations will be added in and around the air pollution hotspot
- Assessment of a number of forthcoming planning and development proposals that have the potential to affect the Danbury A414 air pollution hotspot
- Monitoring Air Quality in the vicinity of the Springfield Road and Victoria Road junction
- Development and inclusion of air quality policies within the new Local Plan

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
1	Essex Liftshare	Alternatives to private vehicle use	Car & lift sharing schemes	Essex County Council	N/A	2014	Number of Users	Not quantified	Ongoing	Ongoing Measure	
2	Member of Essex Air	Policy Guidance and Development Control	Regional Groups Co- ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	Essex Air	N/A	N/A	N/A	N/A	Ongoing	Ongoing Measure	
3	Environmental Permit Inspection & Enforcement	Environmental Permits	Measures to reduce pollution through IPPC Permits going beyond BAT	Chelmsford City Council	N/A	N/A	Operator compliance with Environmental Permit	N/A	Ongoing	N/A	
4	Parkway Pinch Point Removal	Traffic Management	Strategic Highway Improvements	Essex County Council	2012	2013	Monitored Air Quality	Not quantified	Complete	Complete	
5	Extended left turn slip lane on Parkway / Army & Navy	Traffic Management	Strategic Highway Improvements	Essex County Council	2012	2014	Monitored Air Quality	Not quantified	Complete	Complete	
6	Replacement	Traffic Management	Strategic Highway Improvements	Highways	2012	2015	Monitored Air	Not	Complete	Complete	
0	Viaduct	Transport Planning and Infrastructure	Cycle network	England	2012	2010	Quality	quantified	Joinpiele	Complete	

Table 2.2 – Progress on Measures to Improve Air Quality

7	Danbury Traffic Priority Scheme	Traffic Management	Congestion Management	Essex County Council	2015	2016	Congestion Reduction	Increased measured pollution believed to be due to increased traffic	Complete	Complete	
8	<i>air</i> TEXT Air Quality Forecasting System	Public Information	Via other mechanisms	Chelmsford City Council	2016	2016	Subscribers	N/A	Complete	Complete	
9	Chelmsford Future Transport Network - A Growth Package for the City	Transport Planning and Infrastructure	Other	Essex County Council	2016	2018	Congestion Reduction / Improved Bus & Cycle Infrastructure	Not quantified	Option Development	Long Term Growth Package	Public Consultation / Funding
10	Euro VI Buses for Chelmsford Park & Ride	Vehicle Fleet Efficiency	Other	Essex County Council / Contracted Bus Operator	2016	2017	Reduced Emissions	Not quantified	Planning	2017	
11	Considering Air Quality for the Chelmsford Local Plan	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	Chelmsford City Council	2016	2017	New developments not causing Exceedances of the Air Quality Objectives	N/A	Policy development	2017	Public Consultation Local Plan Examination Process

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

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

Chelmsford City Council does not monitor $PM_{2.5}$ concentrations however does monitor PM_{10} at three locations. A <u>report</u> on the UK-AIR websites suggests that an approximate ratio of $PM_{2.5}$: PM_{10} concentrations to be 0.67.

The Springfield Road (Chelmsford Prison) site routinely measures the highest PM_{10} in the monitoring network. This location is sited next to a busy road and junction along with an adjacent bus stop. Particulate matter is likely to be present at relatively high concentrations due to tyre / brake wear and from dust resuspension as well as diesel vehicle emissions.

In 2016 the Springfield Road (Chelmsford Prison) site measured an annual mean PM_{10} value of 28.42µg/m³. Using the 0.67 ratio would suggest that the concentration of $PM_{2.5}$ at this busy junction would be 19.04µg/m³ well below the National Air Quality objective of 25µg/m³. It should also be noted that all three PM_{10} monitors in Chelmsford are trending downwards suggesting that $PM_{2.5}$ concentrations may also be reducing. This can be seen in Figure C.3 in Appendix C.

Chelmsford City Council notes the Public Health Outcomes Framework indicator 3.01 – Fraction of mortality attributable to particulate ($PM_{2.5}$) air pollution which for 2015 gave a value of 5.5% which is the same as in 2013. These values are broadly similar to other authorities within the region.

Chelmsford City Council is taking the following measures to address PM_{2.5}:

- Regular inspections of permitted industry where combustion and noncombustion processes could lead to anthropogenic emissions of PM_{2.5}
- Working with Essex County Council (highway authority) and Highways England 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

3.1 Summary of Monitoring Undertaken

3.1.1.1 Automatic Monitoring Sites

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

Chelmsford City Council undertook automatic (continuous) monitoring at 4 sites during 2016. Table A.1 in Appendix A shows the details of the sites.

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

3.1.1.2 Non-Automatic Monitoring Sites

Chelmsford City Council undertook non-automatic (passive) monitoring of NO₂ at 52 sites during 2016. Table A.2 in Appendix A provides detail of these sites.

Maps showing the location of the monitoring sites are provided in Appendix E. Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in Appendix D.

3.2 Individual Pollutants

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

3.2.1 Nitrogen Dioxide (NO₂)

Table A.3 in Appendix A compares the ratified and adjusted monitored NO₂ annual mean concentrations for the past 5 years with the air quality objective of $40\mu g/m^3$.

For diffusion tubes, the full 2016 dataset of monthly mean values is provided in Appendix B. Monitoring has identified that no diffusion tube site has breached the Air Quality Objectives.

Table A.4 in Appendix A compares the ratified continuous monitored NO₂ hourly mean concentrations for the past 5 years with the Air Quality Objective of $200\mu g/m^3$, not to be exceeded more than 18 times per year.

Chelmsford City Council has not monitored any exceedances of the 1-hour mean objective. Also, no diffusion tubes have exceeded $60\mu g/m^3$ which indicates that there has been no exceedance of the 1-hour mean objective at these sites either.

3.2.2 Particulate Matter (PM₁₀)

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

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

Chelmsford City Council have measured no exceedances of the Air Quality Objective for PM_{10} .

3.2.3 Ozone (O₃)

Table A.7 in Appendix A identified the results of Ozone monitoring from 2010 to 2016. Since 2010, concentrations can be seen to be gradually increasing.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In 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	NO	Chemiluminescent / Unheated BAM	29.2	2.8	2.5
CM3	Rainsford Lane (Fire Station)	Roadside	569912	206881	NO, NO _x , NO2, PM10	NO	Chemiluminescent / Unheated BAM	20	2.5	2.5
CM4	Baddow Road	Roadside	571654	205798	NO, NO _x , NO2	NO	Chemiluminescent	12	5.1	1.5

(1) Om 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.

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?	Height (m)
CB01	12 Van Diemans Road	Roadside	571421	205963	NO2	Yes	0	12	No	2.5
CB02	3 Moulsham Chase	Roadside	571388	205725	NO2	No	9.3	2.5	No	2.5
CB04	28 Cleves Ct.	Urban Background	575266	210080	NO2	No	0	5	No	2.5
CB08	109 Balmoral Ct.	Roadside	571383	206926	NO2	No	3	3	No	2.5
CB11	20 Brooklands Walk	Urban Background	570065	205468	NO2	No	0	19	No	2.5
CB13	60 Roxwell Road	Roadside	569077	207528	NO2	No	0	16	No	2.5
CB18	180 Maldon Rd	Roadside	573846	205362	NO2	No	0	17	No	2.5
CB19	92 Maldon Road	Roadside	573408	205317	NO2	No	0	16	No	2.5
CB20	Lyster Avenue	Urban Background	573106	205252	NO2	No	0	4	No	2.5
CB22	95 Baddow Road	Roadside	571505	205968	NO2	No	0	8	No	2.5
CB22B	95 Baddow Road	Roadside	571505	205968	NO2	No	0	8	No	2.5
CB22C	95 Baddow Road	Roadside	571505	205968	NO2	No	0	8	No	2.5
CB25	20 Allen Way	Suburban	573992	207985	NO2	No	4	0	No	2.5
CB26	214 Baddow Road	Roadside	571614	205812	NO2	No	0	5	No	2.5
CB26B	214 Baddow Road	Roadside	571614	205812	NO2	No	0	5	No	2.5
CB26C	214 Baddow Road	Roadside	571614	205812	NO2	No	0	5	No	2.5
CB27	Howe Green Interchange	Roadside	574080	203469	NO2	No	0	18	No	2.5

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

CB27A	Howe Green Interchange	Roadside	574080	203469	NO2	No	0	18	No	2.5
CB27B	Howe Green Interchange	Roadside	574080	203469	NO2	No	0	18	No	2.5
CB30	Colchester Road	Roadside	573403	208650	NO2	No	0	5	No	2.5
CB31	Main Road, Boreham	Roadside	575265	209975	NO2	No	0	5	No	2.5
CB32	2 Abbots Place	Roadside	571581	207144	NO2	No	0	5	No	2.5
CB33	Victoria Road	Roadside	570973	207160	NO2	No	3	3	No	2.5
CB35	129 Moulsham Street	Roadside	570491	205979	NO2	No	4	1	No	2.5
CB36	2 Rainsford Lane	Roadside	570104	207247	NO2	No	2	1	No	2.5
CB37	30 Victoria Crescent	Urban Background	570481	207469	NO2	No	0	26	No	2.5
CB38	Prison 1	Roadside	571640	207179	NO2	No	14	3	Yes	2.5
CB39	Prison 2	Roadside	571640	207179	NO2	No	14	3	Yes	2.5
CB40	Prison 3	Roadside	571640	207179	NO2	No	14	3	Yes	2.5
CB41	Hill Road South	Urban Background	571731	206292	NO2	No	17	184	No	2.5
CB42	Wharf Road(Gas Works)	Urban Background	571308	206614	NO2	No	10	1	No	2.5
CB44	Atlantic Business Centres	Roadside	570422	207352	NO2	No	0	11	No	2.5
CB45	32 Van Diemans Road	Roadside	571393	205906	NO2	No	0	11	No	2.5
CB46	32 Rochford Road	Roadside	571062	206281	NO2	Yes	2	3	No	2.5
CB48	1 Weight Road	Roadside	571462	206950	NO2	No	3	1	No	2.5
CB49	26 Rochford Road	Roadside	571109	206256	NO2	Yes	0	5	No	2.5
CB52	Penpol, Victoria Road	Roadside	571377	207007	NO2	No	0	3	No	2.5
CB55	15 Cedar Avenue	Roadside	570278	207309	NO2	No	0	8	No	2.5
CB56	52 Goldlay Road	Roadside	571177	206222	NO2	Yes	5	1	No	2.5

CB57	Goldlay House, Parkway	Roadside	571359	206124	NO2	No	0	16	No	2.5
CB58	148 Baddow Road	Roadside	571476	205964	NO2	Yes	0	12	No	2.5
CB61	10 Fraser Close	Suburban	571445	205631	NO2	No	0	7	No	2.5
CB62	Chignal 1	Rural	566463	210830	NO2	No	40	43	Yes	4
CB63	Chignal 2	Rural	566463	210830	NO2	No	40	43	Yes	4
CB64	Chignal 3	Rural	566463	210830	NO2	No	40	43	Yes	4
CB65	Fire Station 1	Roadside	569912	206881	NO2	No	20	2.5	Yes	2.5
CB66	Fire Station 2	Roadside	569912	206881	NO2	No	20	2.5	Yes	2.5
CB67	Fire Station 3	Roadside	569912	206881	NO2	No	20	2.5	Yes	2.5
CB68	Goldlay Avenue 1	Roadside	571382	206092	NO2	No	0	12	No	2.5
CB68B	Goldlay Avenue 2	Roadside	571382	206092	NO2	No	0	12	No	2.5
CB68C	Goldlay Avenue 3	Roadside	571382	206092	NO2	No	0	12	No	2.5
CB73	Chelmer Road	Roadside	572130	206507	NO2	No	0	18	No	2.5
CB74	South Primrose Hill	Roadside	570074	207167	NO2	No	0	4	No	2.5
CB75	Main Road, Danbury	Roadside	577921	205246	NO2	No	0	2	No	2.5
CB76	Maldon Road, Danbury	Roadside	578506	205122	NO2	No	0	2	No	2.5
CB77	Meadgate Avenue	Suburban	571656	205949	NO2	No	0	1	No	2.5
CB79	10 Waterhouse Lane	Roadside	569485	206012	NO2	No	0	3	No	2.5
CB80	208 Springfield Road	Roadside	571710	207246	NO2	No	0	3	No	2.5
CB81	2/4 Arbour Lane	Roadside	571674	207282	NO2	No	4	1	No	2.5
CB82	122 Springfield Road	Roadside	571438	206966	NO2	No	0	4	No	2.5
CB83	134/136 Springfield Road	Roadside	571462	206999	NO2	No	0	3	No	2.5
CB83b	134/136 Springfield Road	Roadside	571462	206999	NO2	No	0	3	No	2.5

CB83c	134/136 Springfield Road	Roadside	571462	206999	NO2	No	0	3	No	2.5
CB84	Baddow Road AQMS 1	Roadside	571653	205800	NO2	No	12	5.1	Yes	1.5
CB85	Baddow Road AQMS 2	Roadside	571653	205800	NO2	No	12	5.1	Yes	1.5
CB86	Baddow Road AQMS 3	Roadside	571653	205800	NO2	No	12	5.1	Yes	1.5
CB87	Bus Station	Other	570444	207044	NO ₂	No	4	3	No	2.5
CB88	147 Baddow Road	Suburban	571664	205811	NO2	No	0	22	No	2.5
CB89	135 Springfield Road	Roadside	571428	206979	NO ₂	No	2	0.5	No	2.5
CB90	144 Springfield Road	Roadside	571480	207019	NO ₂	No	2	2	No	2.5

(1) Om if the monitoring site is at a location of exposure (e.g. installed on/adjacent to the façade of a residential property).

(2) N/A if not applicable.

Table A.3 – Annual Mean NO2 Monitoring Results

		Monitoring	Valid Data Capture	Valid Data		NO ₂ Annual Mean C	oncentration	(µg/m³) ⁽³⁾	
Site ID	Site Type	Туре	Monitoring Period (%)	Capture 2016 (%) ⁽²⁾	2012	2013	2014	2015	2016
CM1	Rural	Automatic	94.59	94.59	16.26	13.86	14.19	12.79	14.23
CM2	Roadside	Automatic	90.37	90.37	34	31.38	28.09	28.11	28.89
CM3	Roadside	Automatic	94.81	94.81	25.44	29.22	<u>N/A</u>	27.9	25.59
CM4	Roadside	Automatic	96.7	96.7	36.82	<u>43.52</u> (33.8 at receptor)	<u>N/A</u>	25.8	29.57
CB01	Roadside	Diffusion Tube	100.00	100.00	27.71	33.9	30.27	28.44	31.30
CB02	Roadside	Diffusion Tube	91.67	91.67	19.32	25.17	21.5	20.15	20.53
CB04	Urban Background	Diffusion Tube	91.67	91.67	21.03	29.7	22.3	21.65	22.00
CB08	Roadside	Diffusion Tube	100.00	100.00	28.25	31.02	28.02	28.59	28.91
CB11	Urban Background	Diffusion Tube	100.00	100.00	26.71	26.57	23.37	23.39	24.41
CB13	Roadside	Diffusion Tube	100.00	100.00	18.7	20.16	18.59	16.26	18.09
CB18	Roadside	Diffusion Tube	100.00	100.00	16.65	17.65	17.67	17.02	17.02
CB19	Roadside	Diffusion Tube	100.00	100.00	17.09	23.74	19.65	18.56	19.61
CB20	Urban Background	Diffusion Tube	100.00	100.00	16.67	19.9	17.23	15.65	17.87
CB22/CB22B/CB22C (Triplicate Results Averaged)	Roadside	Diffusion Tube	100.00	100.00	26.71	36.07	32.39	30.34	32.37

CB25	Suburban	Diffusion Tube	100.00	100.00	18.59	23.64	20.91	19.81	20.64
CB26/CB26B/CB26C (Triplicate Results Averaged)	Roadside	Diffusion Tube	100.00	100.00	26.81	35.78	30.7	28.07	29.29
CB27/CB27A/CB27B	Roadside	Diffusion Tube	91.67	91.67	32.9	40.3	39.33	36.64	35.04
CB30	Roadside	Diffusion Tube	100.00	100.00	26.02	32.71	31.28	28.2	29.12
CB31	Roadside	Diffusion Tube	91.67	91.67	24.76	29.15	26.49	24.78	26.69
CB32	Roadside	Diffusion Tube	100.00	100.00	30.42	37.83	32.64	31.6	31.88
CB33	Roadside	Diffusion Tube	83.33	83.33	27.09	37.29	31.44	31.08	28.82
CB35	Roadside	Diffusion Tube	100.00	100.00	21.79	27.48	24.33	23.23	25.46
CB36	Roadside	Diffusion Tube	100.00	100.00	31.24	31.21	29.89	25.84	27.95
CB37	Urban Background	Diffusion Tube	100.00	100.00	23.58	27.54	24.82	22.06	24.21
CB38/CB39/CB40 (Triplicate Results Averaged)	Roadside	Diffusion Tube	100.00	100.00	28.69	31.81	28.01	28.29	28.3
CB41	Urban Background	Diffusion Tube	91.67	91.67	16.8	19.64	17.57	16.76	16.10
CB42	Urban Background	Diffusion Tube	75.00	75.00	28.78	25.2	21.3	19.23	21.71
CB44	Roadside	Diffusion Tube	91.67	91.67	29.35	33.16	31.12	29.96	31.09
CB45	Roadside	Diffusion Tube	100.00	100.00	24.19	30.76	29.11	23.99	28.78
CB46	Roadside	Diffusion Tube	100.00	100.00	23.86	30.3	25.52	25.15	25.22
CB48	Roadside	Diffusion Tube	100.00	100.00	24.06	26.93	24.32	23.88	21.58

Chelmsford City Council

CB49	Roadside	Diffusion Tube	100.00	100.00	25.32	25.22	22.27	21.37	22.74
CB52	Roadside	Diffusion Tube	100.00	100.00	26.6	36.54	31.77	30.79	30.35
CB55	Roadside	Diffusion Tube	100.00	100.00	21.99	27.33	25.49	24.85	25.28
CB56	Roadside	Diffusion Tube	100.00	100.00	23.27	27.33	23.65	21.13	24.15
CB57	Roadside	Diffusion Tube	100.00	100.00	25.15	30.78	27.35	26.45	28.25
CB58	Roadside	Diffusion Tube	100.00	100.00	32.08	45.94	36.75	35.77	36.59
CB61	Suburban	Diffusion Tube	100.00	100.00	15.06	18.83	16.31	15.29	15.98
CB62/CB63/CB64 (Triplicate Results Averaged)	Rural	Diffusion Tube	100.00	100.00	13.75	13.78	12.37	11.15	12.22
CB65/CB66/CB67 (Triplicate Results Averaged)	Roadside	Diffusion Tube	100.00	100.00	23.27	26.46	23.37	22.44	23.1
CB68/CB68B/CB68C (Triplicate Results Averaged)	Roadside	Diffusion Tube	100.00	100.00	27.52	33.89	40.78	28.70	29.85
CB73	Roadside	Diffusion Tube	100.00	100.00	32.13	25.1	22.77	23.07	21.89
CB74	Roadside	Diffusion Tube	100.00	100.00	N/A	N/A	N/A	25.52	31.00
CB75	Roadside	Diffusion Tube	83.33	83.33	N/A	N/A	N/A	30.55	34.27
CB76	Roadside	Diffusion Tube	91.67	91.67	N/A	N/A	N/A	33.43	39.36
CB77	Suburban	Diffusion Tube	100.00	100.00	N/A	N/A	N/A	24.34	25.02
CB79	Roadside	Diffusion Tube	83.33	83.33	N/A	N/A	N/A	28.2	35.22
CB80	Roadside	Diffusion Tube	100.00	100.00	N/A	N/A	N/A	25.34	25.29

CB81	Roadside	Diffusion Tube	100.00	100.00	N/A	N/A	N/A	25.96	29.16
CB82	Roadside	Diffusion Tube	91.67	91.67	N/A	N/A	N/A	32.83	31.90
CB83/CB83B/CB83C (Triplicate Results Averaged)	Roadside	Diffusion Tube	100.00	100.00	N/A	N/A	N/A	39.05	38.02
CB84/CB85/CB86	Roadside	Diffusion Tube	100.00	100.00	N/A	N/A	N/A	24.28	27.48
CB87	Other	Diffusion Tube	100.00	100.00	N/A	N/A	N/A	39.92	35.81
CB88	Suburban	Diffusion Tube	100.00	100.00	N/A	N/A	N/A	19.82	21.84
CB89	Roadside	Diffusion Tube	100.00	100.00	N/A	N/A	N/A	N/A	37.37
CB90	Roadside	Diffusion Tube	100.00	100.00	N/A	N/A	N/A	N/A	30.48

☑ Diffusion tube data has been bias corrected

Annualisation has been conducted where data capture is <75%

Historic data has not been distance corrected for relevant exposure. 2016 data has been distance corrected and can be found in Table B.1 in Appendix B.

Notes: Exceedances of the NO₂ annual mean objective of $40\mu g/m^3$ are shown in **bold**.

NO₂ annual means exceeding 60µg/m³, indicating a potential exceedance of the NO₂ 1-hour mean objective are shown in **bold and underlined**.

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

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

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

Site ID	Site Turne	Monitoring	Valid Data Capture for	Valid Data	Ν	O₂ 1-Houi	r Means >	• 200µg/m³	(3)
	Sile Type	Туре		(2)	2012	2013	2014	2015	2016
CM1	Rural	Automatic	94.59	94.59	0	0	0	0(63.08)	0
CM2	Roadside	Automatic	90.37	90.37	0	2	0	0	0
CM3	Roadside	Automatic	94.81	94.81	0	0	N/A	0(98.51)	0
CM4	Roadside	Automatic	96.7	96.7	0	0	N/A	0(82.10)	0

Table A.4 – 1-Hour Mean NO₂ Monitoring Results

Notes: Exceedances of the NO₂ 1-hour mean objective (200µg/m³ not to be exceeded more than 18 times/year) are shown in **bold**.

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

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

(3) If the period of valid data is less than 90%, the 99.8th percentile of 1-hour means is provided in brackets.

Table A.5 – Annual Mean PM₁₀ Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2016 (%) ⁽²⁾	РМ	I₁₀ Annual Me	ean Concenti	ration (µg/m³) (3)
				2012	2013	2014	2015	2016
CM1	Rural	91.53	91.53	24.49	17.97	17.44	20.49	17.07
CM2	Roadside	90.71	90.71	30.7	30.92	29.15	27.21	28.42
CM3	Roadside	93.99	93.99	23.29	23.06	22.2	20.97	20.83

Notes: Exceedances of the PM₁₀ annual mean objective of 40µg/m³ are shown in **bold**.

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

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

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

Table A.6 – 24-Hour Mean PM₁₀ Monitoring Results

	Site Turne	Valid Data Capture for	Valid Data Capture		PM ₁₀ 24-Hour Means > 50µg/m ^{3 (3)}							
Site ID	Sile Type	Monitoring Period (%) ⁽¹⁾	2016 (%) ⁽²⁾	2012	2013	2014	2015	2016				
CM1	Rural	91.53	91.53	5	1	5	3	1				
CM2	Roadside	90.71	90.71	15	20(45.56)	21(43.09)	7	8				
CM3	Roadside	93.99	93.99	7	9(39.74)	9(35.55)	4	5				

Notes: Exceedances of the PM₁₀ 24-hour mean objective (50µg/m³ not to be exceeded more than 35 times/year) are shown in **bold**.

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

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

(3) If the period of valid data is less than 90%, the 90.4th percentile of 24-hour means is provided in brackets.

Table A.7 – Ozone (O₃) Monitoring Results 2010-2016

Sito ID	Site Type	Valid Data Capture for Monitoring Period (%)	Valid Data			O₃ Annu	al Mean		
Site ib	te ID Site Type		(2)	2011	2012	2013	2014	2015	2016
CM1	Rural	89.34	89.34	38.2	26.78	43.26	48.94	53.4	47.89

Appendix B: Full Monthly Diffusion Tube Results for 2016

Table B.1 – NO2 Monthly Diffusion Tube Results - 2016

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

	NO ₂ Mean Concentrations (μg/m³)														
														Annual	Mean
Site ID	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted (0.72) and Annualised (1)	Distance Corrected to Nearest Exposure ⁽²⁾
CB01	36.9	47.9	46.7	40.1	44.3	34.4	37.9	36.8	44.2	48.9	54.3	56.6	44.1	31.30	31.30
CB02	37.7	31.3	29.7	27.1	22.4	Missing	19.3	18.7	24.5	30.7	38.1	38.6	28.9	20.53	18.44
CB04	37.8	Missing	35.2	35.1	28.1	20.7	25	27.6	26.5	30.3	44.4	30.1	31.0	22.00	22.00
CB08	44.9	46.3	38.1	46.2	37.6	34.8	40.6	35.6	37.3	34.2	55.1	38	40.7	28.91	26.59
CB11	36.8	36.5	32.6	33.5	28.7	26.4	29.3	28.2	36.7	26.9	42	55	34.4	24.41	24.41
CB13	32.7	28.1	24.9	24.2	21.5	17.1	19.2	18.3	24.4	20.5	37.4	37.5	25.5	18.09	18.09
CB18	29.2	28.4	22.3	22.9	21.1	16.1	18.1	19	21.1	24.6	33.1	31.8	24.0	17.02	17.02
CB19	34.7	30.2	27.6	27.8	24	16.8	20.1	21.8	25.8	24.8	38.6	39.2	27.6	19.61	19.61
CB20	29	29.8	24.2	23.7	21.9	15.9	16.4	17.2	24.4	25.1	35.9	38.6	25.2	17.87	17.87
CB22	45.1	52	30.3	49	48.5	30	35.1	38.8	43.6	48.8	59.9	53.3	44.5	31.62	31.62
CB22B	42.2	47.1	49.2	47.7	49.4	37.8	36	33.3	43.3	53.4	59	55.3	46.1	32.76	32.76
CB22C	43.6	51	52.5	45	43.4	35.8	35.8	36.4	44.9	52.6	58.4	53.9	46.1	32.74	32.74
CB25	37	30.9	24.3	29.8	27.3	20	18.8	22.5	27.9	27.8	39.4	43.1	29.1	20.64	17.11
CB26	46.6	42.2	41.2	44.2	38.2	32.6	33.3	33.8	40.2	39.7	52.2	56.1	41.7	29.60	29.60

CB26B	48.4	44.9	36.2	41.7	39.6	32.7	34	32	44.1	38.5	49.6	36	39.8	28.26	28.26
CB26C	50.1	46	42.4	40.4	40.7	32.9	33.8	33.2	42.4	41.4	48.3	55.4	42.3	30.00	30.00
CB27	63.1	55.2	37.7	52.2	43.9	40.8	44.7	Missing	53.8	30.2	56.8	58.3	48.8	34.64	34.64
CB27A	70.3	57.4	43.8	49.5	40.5	43.6	46.7	Missing	53.1	31	57.5	58.9	50.2	35.65	35.65
CB27B	67.9	55.1	47	49.7	42	40.6	46.1	Missing	55	35.8	60.2	40.1	49.0	34.82	34.82
CB30	51.1	43.3	37.4	40.2	32.9	32.2	37	32	44.9	39.4	51.1	50.7	41.0	29.12	29.12
CB31	46.6	45.5	40.2	31.3	35.7	24.9	Missing	28.3	28.6	34.3	53.7	44.4	37.6	26.69	26.69
CB32	57.3	49.5	48.5	47.6	37.1	36	36.9	35.7	43.7	41.4	57.8	47.4	44.9	31.88	31.88
CB33	43.7	Missing	37.8	38.2	Missing	35.6	34.3	34.9	41.4	31.1	57.1	51.8	40.6	28.82	26.70
CB35	43.8	39.7	34.7	33.2	30.1	25.4	28.6	26.6	33.1	34.7	49	51.4	35.9	25.46	22.09
CB36	50.5	41.9	34.2	41.8	36	28.4	28.3	29.5	38.4	42.9	52.5	48	39.4	27.95	25.53
CB37	40.4	39.1	31.5	34.2	27.4	23.6	27.9	28.5	34.6	33.8	43.6	44.6	34.1	24.21	24.21
CB38	53.8	41.4	36.9	39.4	35	28.8	33	30.7	34.4	33.2	51.6	52.6	39.2	27.86	22.44
CB39	44.8	48.2	39.1	38.1	*Spurious result (black cap split)	28	32.9	28.2	38.4	38	49.8	55.4	40.1	28.46	22.78
CB39 CB40	44.8 51	48.2 46.4	39.1 41.2	38.1 40.5	*Spurious result (black cap split) 34.7	28 30.3	32.9 29.6	28.2 29.6	38.4 33.3	38 38.3	49.8 52.8	55.4 55.4	40.1 40.3	28.46 28.58	22.78 22.85
CB39 CB40 CB41	44.8 51 Missing	48.2 46.4 32	39.1 41.2 23.8	38.1 40.5 24.1	*Spurious result (black cap split) 34.7 16.8	28 30.3 15.3	32.9 29.6 18	28.2 29.6 19.7	38.4 33.3 24.5	38 38.3 24.1	49.8 52.8 39.9	55.4 55.4 11.3	40.1 40.3 22.7	28.46 28.58 16.10	22.78 22.85 16.15
CB39 CB40 CB41 CB42	44.8 51 Missing 36.6	48.2 46.4 32 Missing	39.1 41.2 23.8 31.1	38.1 40.5 24.1 31.5	*Spurious result (black cap split) 34.7 16.8 Missing	28 30.3 15.3 22.9	32.9 29.6 18 22.2	28.2 29.6 19.7 21.5	38.4 33.3 24.5 Missing	38 38.3 24.1 31.7	49.8 52.8 39.9 41.8	55.4 55.4 11.3 35.9	40.1 40.3 22.7 30.6	28.46 28.58 16.10 21.71	22.78 22.85 16.15 18.94
CB39 CB40 CB41 CB42 CB44	44.8 51 Missing 36.6 50.3	48.2 46.4 32 Missing 43.7	39.1 41.2 23.8 31.1 39.5	38.1 40.5 24.1 31.5 41.9	*Spurious result (black cap split) 34.7 16.8 Missing 40	28 30.3 15.3 22.9 32.2	32.9 29.6 18 22.2 35.4	28.2 29.6 19.7 21.5 Missing	38.4 33.3 24.5 Missing 46.2	38 38.3 24.1 31.7 43.2	49.8 52.8 39.9 41.8 55.1	55.4 55.4 11.3 35.9 54.1	40.1 40.3 22.7 30.6 43.8	28.46 28.58 16.10 21.71 31.09	22.78 22.85 16.15 18.94 31.09
CB39 CB40 CB41 CB42 CB44 CB45	44.8 51 Missing 36.6 50.3 33.8	48.2 46.4 32 Missing 43.7 44.4	39.1 41.2 23.8 31.1 39.5 41.5	38.1 40.5 24.1 31.5 41.9 44.9	*Spurious result (black cap split) 34.7 16.8 Missing 40 38.4	28 30.3 15.3 22.9 32.2 31.3	32.9 29.6 18 22.2 35.4 45.9	28.2 29.6 19.7 21.5 Missing 32.4	38.4 33.3 24.5 Missing 46.2 36.7	38 38.3 24.1 31.7 43.2 36.9	49.8 52.8 39.9 41.8 55.1 47.8	55.4 55.4 11.3 35.9 54.1 52.4	40.1 40.3 22.7 30.6 43.8 40.5	28.46 28.58 16.10 21.71 31.09 28.78	22.78 22.85 16.15 18.94 31.09 28.78
CB39 CB40 CB41 CB42 CB44 CB45 CB46	44.8 51 Missing 36.6 50.3 33.8 34.7	48.2 46.4 32 Missing 43.7 44.4 42.7	39.1 41.2 23.8 31.1 39.5 41.5 35.4	38.1 40.5 24.1 31.5 41.9 44.9 36.9	*Spurious result (black cap split) 34.7 16.8 Missing 40 38.4 34.6	28 30.3 15.3 22.9 32.2 31.3 22.1	32.9 29.6 18 22.2 35.4 45.9 24.2	28.2 29.6 19.7 21.5 Missing 32.4 27.8	38.4 33.3 24.5 Missing 46.2 36.7 26.9	38 38.3 24.1 31.7 43.2 36.9 43	49.8 52.8 39.9 41.8 55.1 47.8 52.6	55.4 55.4 11.3 35.9 54.1 52.4 45.3	40.1 40.3 22.7 30.6 43.8 40.5 35.5	28.46 28.58 16.10 21.71 31.09 28.78 25.22	22.78 22.85 16.15 18.94 31.09 28.78 23.99
CB39 CB40 CB41 CB42 CB44 CB45 CB46 CB48	44.8 51 Missing 36.6 50.3 33.8 34.7 13.2	48.2 46.4 32 Missing 43.7 44.4 42.7 45.4	39.1 41.2 23.8 31.1 39.5 41.5 35.4 17.7	38.1 40.5 24.1 31.5 41.9 44.9 36.9 35.3	*Spurious result (black cap split) 34.7 16.8 Missing 40 38.4 34.6 29.6	28 30.3 15.3 22.9 32.2 31.3 22.1 24.4	32.9 29.6 18 22.2 35.4 45.9 24.2 27	28.2 29.6 19.7 21.5 Missing 32.4 27.8 27.1	38.4 33.3 24.5 Missing 46.2 36.7 26.9 31.8	38 38.3 24.1 31.7 43.2 36.9 43 27.7	49.8 52.8 39.9 41.8 55.1 47.8 52.6 46.6	55.4 55.4 11.3 35.9 54.1 52.4 45.3 38.9	40.1 40.3 22.7 30.6 43.8 40.5 35.5 30.4	28.46 28.58 16.10 21.71 31.09 28.78 25.22 21.58	22.78 22.85 16.15 18.94 31.09 28.78 23.99 20.50
CB39 CB40 CB41 CB42 CB44 CB45 CB46 CB48 CB49	44.8 51 Missing 36.6 50.3 33.8 34.7 13.2 33.5	48.2 46.4 32 Missing 43.7 44.4 42.7 45.4 36.3	39.1 41.2 23.8 31.1 39.5 41.5 35.4 17.7 30.5	38.1 40.5 24.1 31.5 41.9 44.9 36.9 35.3 31.4	*Spurious result (black cap split) 34.7 16.8 Missing 40 38.4 34.6 29.6 30.2	28 30.3 15.3 22.9 32.2 31.3 22.1 24.4 28.8	32.9 29.6 18 22.2 35.4 45.9 24.2 27 20.7	28.2 29.6 19.7 21.5 Missing 32.4 27.8 27.1 21	38.4 33.3 24.5 Missing 46.2 36.7 26.9 31.8 36	38 38.3 24.1 31.7 43.2 36.9 43 27.7 35.3	49.8 52.8 39.9 41.8 55.1 47.8 52.6 46.6 38.7	55.4 55.4 11.3 35.9 54.1 52.4 45.3 38.9 41.9	40.1 40.3 22.7 30.6 43.8 40.5 35.5 30.4 32.0	28.46 28.58 16.10 21.71 31.09 28.78 25.22 21.58 22.74	22.78 22.85 16.15 18.94 31.09 28.78 23.99 20.50 22.74
CB39 CB40 CB41 CB42 CB44 CB45 CB46 CB48 CB49 CB52	44.8 51 Missing 36.6 50.3 33.8 34.7 13.2 33.5 53.3	48.2 46.4 32 Missing 43.7 44.4 42.7 45.4 36.3 42.1	39.1 41.2 23.8 31.1 39.5 41.5 35.4 17.7 30.5 39.1	38.1 40.5 24.1 31.5 41.9 44.9 36.9 35.3 31.4 47.5	*Spurious result (black cap split) 34.7 16.8 Missing 40 38.4 34.6 29.6 30.2 38.5	28 30.3 15.3 22.9 32.2 31.3 22.1 24.4 28.8 35.2	32.9 29.6 18 22.2 35.4 45.9 24.2 27 20.7 39.3	28.2 29.6 19.7 21.5 Missing 32.4 27.8 27.1 21 34.4	38.4 33.3 24.5 Missing 46.2 36.7 26.9 31.8 36 39.5	38 38.3 24.1 31.7 43.2 36.9 43 27.7 35.3 41	49.8 52.8 39.9 41.8 55.1 47.8 52.6 46.6 38.7 59	55.4 55.4 11.3 35.9 54.1 52.4 45.3 38.9 41.9 44.1	40.1 40.3 22.7 30.6 43.8 40.5 35.5 30.4 32.0 42.8	28.46 28.58 16.10 21.71 31.09 28.78 25.22 21.58 22.74 30.35	22.78 22.85 16.15 18.94 31.09 28.78 23.99 20.50 22.74 30.35

CB56	39.5	37.3	36.1	33.3	28.1	24.4	23.1	23.5	29.8	38.9	45.9	48.3	34.0	24.15	21.20
CB57	37.8	56.2	36.5	40.6	37.8	30.1	36.7	35	38.7	32.3	48.6	47.2	39.8	28.25	28.25
CB58	52.6	56.2	46.4	55.2	54	44.7	48.3	43.2	52.7	53.4	59.3	52.4	51.5	36.59	36.59
CB61	26.9	28.1	22.3	20.6	16.9	14.3	14.4	14.9	18.2	23.6	33.4	36.4	22.5	15.98	15.98
CB62	25.8	21	11.9	15.1	11.6	9.2	10.6	11	16.6	11.5	24.8	33	16.8	11.96	11.96
CB63	28.4	18.6	11.8	16.3	12	8.7	15.1	12	17.2	13.3	23.3	31.6	17.4	12.32	12.32
CB64	24.4	19.4	14	15.6	11.9	*Spurious result (black cap split)	10.6	12.5	16.4	12.2	23.8	30.8	17.4	12.37	12.37
CB65	35.4	38.8	32.4	30	28.5	25	25.6	24.8	29	31.9	44.4	43	32.4	23.00	19.45
CB66	34.3	37.5	32	32.9	27.8	25.1	24.4	24.4	28.1	36.4	41.3	44.3	32.4	22.99	19.45
CB67	35.6	37.1	34.8	32.3	26.6	22.8	25.8	25.9	28.3	34.6	46.8	43.6	32.9	23.32	19.60
CB68	37.2	43	38.3	40	47.3	32.1	29.3	31.7	41.5	41.5	52.1	60.4	41.2	29.25	29.25
CB68B	44.8	*Spurious result (black cap split)	42.3	36.2	42.4	Missing	29.4	34.4	44.8	48	49.9	59.4	43.2	30.64	30.64
CB68C	42.3	35.2	40.9	39.5	46.3	Missing	29.2	33.2	41.3	48.9	58.3	44.3	41.8	29.65	29.65
CB73	41.7	37.1	27.7	30.9	22.8	20.4	23.7	22	32.6	25.5	41.9	43.6	30.8	21.89	21.89
CB74	39.9	14.6	40.8	43	113.6	29.9	27.3	29.4	38.1	45.7	50.8	50.9	43.7	31.00	31.00
CB75	50	51.2	44.4	44.6	45.7	37.4	Missing	Missing	48.5	42.6	60.1	58.2	48.3	34.27	34.27
CB76	49.2	53.3	51.1	61.5	44.8	47.8	Missing	50.1	57.8	53.6	69.2	71.4	55.4	39.36	39.36
CB77	38	41.8	40	33.9	35.3	23.6	25.3	26.9	33.4	34.1	47.8	42.8	35.2	25.02	25.02
CB79	42.2	46.1	36.9	40.9	56.8	43.8	Missing	30.3	Missing	60.1	67.7	71.3	49.6	35.22	35.22
CB80	38.2	41	33.1	34.9	35.3	29	32.2	31.9	31	30.9	44.6	45.3	35.6	25.29	25.29
CB81	52	47.6	36.5	40.9	34.5	30.9	29.5	32.1	40	43.6	53.7	51.6	41.1	29.16	24.83

CB82	Missing	34	49.6	49.3	41.1	38.5	39.5	41.3	43.1	43	56.6	58.2	44.9	31.90	31.90
CB83	64.4	55.6	51.3	54.3	53	46.5	58.4	46.1	54.4	42.3	61.7	68.3	54.7	38.83	38.83
CB83b	59.9	60.7	48.8	75.3	50	40.7	44.7	49.2	56.1	46.7	58.9	61.3	54.4	38.59	38.59
CB83c	45.7	46.3	50.2	56.2	49.8	45.8	51	47	56.1	49.9	64.1	57	51.6	36.63	36.63
CB84	41.4	53.9	42.3	35.6	37.7	27.2	27.5	29.5	32.9	27.9	44.7	59.9	38.4	27.25	22.77
CB85	41.5	72.2	36.4	30.7	28.6	26.2	27	32.8	39.4	29.6	59.2	51.4	39.6	28.10	23.32
CB86	45.1	39	33.3	*Spurious result (black cap split)	30.6	24.6	35	28.2	34.3	45.4	54.2	49.9	38.1	27.08	22.67
CB87	60.8	53	46.9	44.4	52.3	44.4	48.2	46.8	54.7	38.2	57.1	58.4	50.4	35.81	31.84
CB88	36.6	34.6	30.7	28.1	32.9	21.6	22.4	22	28.8	29.3	37.1	45.1	30.8	21.84	21.84
CB89	60.2	50.2	46.5	62.5	50.8	29.7	33.5	51.9	56.6	53	69.1	67.6	52.6	37.37	31.78
CB90	46.7	44.3	31	41.2	32.3	49.9	55.4	32.3	37.5	34.7	52.6	57.2	42.9	30.48	28.41

☑ Local bias adjustment factor used

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

Notes:

Exceedances of the NO₂ annual mean objective of $40\mu g/m^3$ are shown in **bold**.

NO₂ annual means exceeding 60µg/m³, indicating a potential exceedance of the NO₂ 1-hour mean objective are shown in **bold and underlined**.

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

(2) Distance corrected to nearest relevant public exposure.

Appendix C: Trend Data

The charts below contain data from a range of diffusion tube monitoring sites. The 148 Baddow Road and Goldlay Avenue sites were negatively affected by road works causing exceedances in 2013 and 2014 however all sites have a similar trend downwards indicating that local Air Quality is gradually improving despite a small increase of concentrations in 2016.





The following chart shows NO₂ concentrations from automatic monitoring stations from 2009 to 2016. The Springfield Road and Chignal St James (Background) sites show a gradual decline but the Rainsford Lane and Baddow Road sites have increased slightly which may identify a change in traffic patterns over this time.





The following chart shows PM₁₀ concentrations from automatic monitoring stations from 2008 to 2016. Linear trendlines identify that all sites are showing a gradual decline in measured PM₁₀.



Figure C.3 – PM₁₀ (Automatic Monitor) Trend Data 2008-2016

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

Automatic Monitoring QA/QC

Chelmsford City Council operates four automatic monitoring sites measuring NO_2 , PM_{10} and O_3 . Data from these sites is collected by a contractor and forwarded to the Councils server.

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

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

The analysers are calibrated fortnightly with a certified reference gas by Council officers. All sites also have triplicate NO₂ diffusion tubes and the Springfield Road (Prison) site is used to calculate a local bias adjustment.

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 of data with other pollutants and other appropriate Essex Air monitoring sites
- Checking for and deletion of erroneous data that can be linked to analyser failure or unrepresentative periods of operation

Diffusion Tubes QA/QC

Chelmsford City Council undertook monitoring using 70 nitrogen dioxide diffusion tubes at 52 sites in 2016.

The diffusion tubes were supplied by Environmental Scientifics Group (ESG Didcot) (UKAS Testing Laboratory number 1015) with a preparation method of 50% triethanolamine (TEA) in Acetone.

The AIR NO2 proficiency testing scheme found that the laboratory achieved the following percentage of results determined as satisfactory for 2016:

AIR PT Round	AIR PT AR006	AIR PT AR007	AIR PT AR009	AIR PT AR010
Round conducted in the period	January – February 2016	April – May 2016	July – August 2016	September – October 2016
ESG Didcot	100%	75%	75%	100%

Table D.1 – AIR PT Results 2016

Diffusion Tube Bias Adjustment Factors

Chelmsford City Council acknowledges the National Bias Adjustment data that is available however chooses to use a Local Bias Adjustment figure.

Figure D.1 - Local Bias Adjustment Calculation

			Diff	usion Tu	bes Mea	surements	5			Automa	tic Method	Data Qual	ity Check
reriou	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm ^{-s}	Tube 2 µgm ⁻³	Tube 3 µgm ^{- s}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automation Monitor Data
1	07/01/2016	03/02/2016	53.8	44.8	51	50	4.6	9	11.4	31.11	97.84	Good	Good
2	03/02/2016	02/03/2016	41.4	48.2	46.4	45	3.5	8	8.8	35.44	95.91	Good	Good
3	02/03/2016	30/03/2016	36.9	39.1	41.2	39	2.2	6	5.3	28.32	96.20	Good	Good
\$	30/03/2016	27/04/2016	39.4	38.1	40.5	39	1.2	3	3.0	28.53	96.09	Good	Good
5	27/04/2016	25/05/2016	35.0		34.7	35	0.2	1	1.9	21.42	81.47	Good	Good
6	25/05/2016	06/07/2016	28.8	28.0	30.3	29	1.2	4	2.9	16.78	76.80	Good	Good
1	06/07/2016	27/07/2016	33.0	32.9	29.6	32	1.9	6	4.8	18.14	79.06	Good	Good
8	27/07/2016	24/08/2016	30.7	28.2	29.6	30	1.3	4	3.1	18.50	67.10	Good	Poor Data Capture
э	24/08/2016	03/10/2016	34.4	38.4	33.3	35	2.7	8	6.7	24.94	97.13	Good	Good
0	03/10/2016	26/10/2016	33.2	38	38.3	37	2.9	8	7.1	29.63	97.42	Good	Good
11	26/10/2016	30/11/2016	51.6	49.8	52.8	51	1.5	3	3.8	39.28	96.36	Good	Good
2	30/11/2016	04/01/2017	52.6	55.4	55.4	54	1.6	3	4.0	44.11	97.29	Good	Good
3													
is	necessary to	have results	for at lea	st two tu	bes in oro	ler to calcul	ate the prec	ision of the me	asurements	Overa	ll survey>	Good precision	Poor Overall
Site	e Name/ ID:	S	pringfiel	d Road			Precision	12 out of 12	periods have	a CV smallei	than 20%	(Check avera from Accuracy	age CV & DC calculation:
	Accuracy	(with	95% con	fidence	interval)		Accuracy	(with	95% confiden	ice interval)	-	5	8
	without pe	riods with C	V larger	than 20	%		WITH ALL	DATA			50%	•	
Bias calculated using 11 periods of data					Bias calcu	lated using 1	1 periods of	data	00 05 9L	1	I		
	В	ias factor A	0.71	(0.65 - 0).78)		1	Bias factor A	0.71 (0.6	5 - 0.78)	in 23 /a		
		Bias B	41%	(28% -	54%)	1		Bias B	41% (28	% - 54%)	g 0%	-	
	Diffusion T	ubes Mean	41	uam-3			Diffusion	Tubes Mean:	41 10	m ⁻³	L	Without CVA-20%	With all data
	Mean CV	(Precision):	5	as ma			Mean CL	(Precision)	5		-25%		
	mean ov	(Freeision).					mean or	(i recision).		-3	10 -50%		
	Autor Data Capti	natic Mean: ure for perior	29 ds used:	µgm * 92%			Data Car	matic Mean: oture for perio	29 µgi ds used: 929	m -			

A bias adjustment factor of 0.71 using data captured from the Springfield Road AQMS which being a roadside site is representative of exposure at the high traffic locations in Chelmsford.

Point Sources

No significant new point sources of emissions have been identified.

Appendix E: Map of Monitoring Locations

Figure E.1 – Overview Map of Monitoring Locations



© Crown copyright and database rights 2017 Ordnance Survey 100023562

Blue Markers – Automatic Monitoring Stations Red Markers – Diffusion Tube Locations



Figure E.2 – Map of 2016 AQMA Monitoring Locations

© Crown copyright and database rights 2017 Ordnance Survey 100023562

Blue Markers – Automatic Monitoring Stations Red Markers – Diffusion Tube Locations Blue Polygon – Air Quality Management Area



Figure E.3 – Map of 2016 Monitoring at the A414 Danbury Air Pollution Hotspot

© Crown copyright and database rights 2017 Ordnance Survey 100023562

Red Markers – Diffusion Tube Locations Red Polygon – Air Pollution Hotspot



Figure E.4 – Map of 2016 Monitoring at the Springfield Road Air Pollution Hotspot

© Crown copyright and database rights 2017 Ordnance Survey 100023562

Red Markers – Diffusion Tube Locations Red Polygon – Air Pollution Hotspot

Appendix F: Summary of Air Quality Objectives in England

Table F.1 – Air Quality Objectives in England

Dollutont	Air Quality Objective ⁴				
Pollutant	Concentration	Measured as			
Nitrogen Dioxide	200 µg/m ³ not to be exceeded more than 18 times a year	1-hour mean			
(NO_2)	40 μg/m ³	Annual mean			
Particulate Matter	50 μg/m ³ , not to be exceeded more than 35 times a year	24-hour mean			
(FIVI10)	40 μg/m ³	Annual mean			
	350 μg/m ³ , not to be exceeded more than 24 times a year	1-hour mean			
Sulphur Dioxide (SO ₂)	125 µg/m ³ , not to be exceeded more than 3 times a year	24-hour mean			
	266 µg/m ³ , not to be exceeded more than 35 times a year	15-minute mean			

 $^{^4}$ The units are in microgrammes of pollutant per cubic metre of air (µg/m³).

Appendix G: AQMA Order

Figure G.1 – Chelmsford City Council AQMA Order

	ENVIRONMENT ACT 1995 PART IV SECTION 83(1)
AIR QU	CHELMSFORD CITY COUNCIL ALITY MANAGEMENT AREA (AMENDMENT) ORDER 2012
	Made and came into force on 1 ST October 2012
helmsford ection 83()rder:-	City Council, in exercise of the powers conferred upon it by 1) of the Environment Act 1995, hereby makes the following
1. This Air Q 1 st Oc	Order may be cited as Chelmsford City Council Army and Navy uality Management Area Order 2012 and shall come into effect on ctober 2012.
2. This (11 th M	Order varies the Air Quality Management Area Order made on the lovember 2005.
3. The a incorp and t outlin	amended area designated as the Air Quality Management Area porates several roads leading into the Army and Navy roundabout he Baddow Road roundabout and is shown in blue with a red e on the map annexed to this Order.
4. This a the a as sp	area is designated in relation to breaches and likely breaches of nnual mean air quality objective of the pollutant Nitrogen Dioxide ecified in the Air Quality Regulations (England) 2000.
5. This subse	Order shall remain in force until it is varied or revoked by a equent Order.
HE COMM HELMSFC ras hereunt the preserver Mayo	ON SEAL of RD CITY COUNCIL o affixed nce of:- J CKugsly r
Ri	Reave

AQMA Order 2012



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 often 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
Highways England	Government-owned company with responsibility for managing the core road network in England
LAQM	Local Air Quality Management
NO ₂	Nitrogen Dioxide
NOx	Nitrogen Oxides
Pinch Point	Bottlenecks on the local highway network
PM ₁₀	Airborne particulate matter with an aerodynamic diameter of $10\mu m$ (micrometres or microns) or less
PM _{2.5}	Airborne particulate matter with an aerodynamic diameter of $2.5\mu m$ 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
UKAS	United Kingdom Accreditation Service

References

*air*TEXT air quality, UV, pollen and temperature forecasts available at; http://www.airtext.info/

AEA Energy & Environment – Checking Precision & Accuracy of Triplicate Tubes available at; <u>http://laqm.defra.gov.uk/documents/AEA_DifTPAB_v04.xls</u>

Chelmsford New Local Plan available at; <u>https://www.chelmsford.gov.uk/planning-and-building-control/planning-policy-and-new-local-plan/new-local-plan/</u>

Chelmsford Statutory Air Quality Reports available at; http://www.essexair.org.uk/AQInEssex/LA/Chelmsford.aspx?View=reports&ReportTy pe=CHELMSFORD

Defra Air Quality web pages available at; <u>http://uk-air.defra.gov.uk</u>.

Defra Diffusion Tube Bias Adjustment Factors Spreadsheet available at; http://laqm.defra.gov.uk/documents/Database Diffusion Tube Bias Factors v06 16 -Final.xls

Defra LAQM Summary of Laboratory Performance in AIR NO₂ PT Scheme available at; <u>http://laqm.defra.gov.uk/documents/LAQM-AIR-PT-Rounds-1-12-(April-2014-</u> February-2016)-NO2-report.pdf

Defra LAQM Policy Guidance LAQM.PG16 available at; http://laqm.defra.gov.uk/documents/LAQM-PG16-April-16-v1.pdf

Defra LAQM Technical Guidance LAQM.TG16 available at; http://laqm.defra.gov.uk/documents/LAQM-TG16-April-16-v1.pdf

Defra Nitrogen Dioxide Fall-Off with Distance Calculator available at; <u>http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html</u>

Essex Air Quality Consortium available at;

http://www.essexair.org.uk/AQInEssex/LA/Chelmsford.aspx

Essex Air Twitter Feed available at; https://twitter.com/essexair

EssexCarShare.com available at; <u>https://essex.liftshare.com/</u>

Essex County Council Major Schemes website available at;

http://www.essexhighways.org/Transport-and-Roads/Highway-Schemes-and-Developments/Major-Schemes.aspx Essex County Council Pinch Point Fund available at;

http://www.essexhighways.org/Transport-and-Roads/Highway-Schemes-and-Developments/Major-Schemes/Pinch-Point-Fund.aspx

Fine (PM2.5) and Coarse (PM2.5-10) Particulate Matter on a heavily trafficked London Highway: Sources and Processes available at; <u>https://uk-</u>

air.defra.gov.uk/assets/documents/reports/cat05/0506061415_Fine_PM25_and_Coa rse4.pdf

Highways England A138 – Replacement of Chelmer Viaduct available at; http://www.highways.gov.uk/roads/road-projects/a138-chelmsford-replacement-ofchelmer-viaduct/

Public Health Outcomes Framework available at; http://www.phoutcomes.info/