MALDON DISTRICT COUNCIL

2019 Air Quality Annual Status Report (ASR)

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

April, 2019

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Executive Summary: Air Quality in Our Area

The 2019 Annual Status Report is designed to provide the public with information relating to local air quality in Maldon, to fulfil Maldon District 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 2018, air quality in the district of Maldon did not comply with the Air Quality Objectives. Maldon District Council has declared an Air Quality Management Area (AQMA) in Market Hill, Maldon where exceedances of the annual mean have been measured. Due to the elevated concentrations, the AQMA has been declared for the 1-hr Air Quality Objective as well.

An Air Quality Action Plan (AQAP) is currently being developed and is discussed in this report.

Air Quality in Maldon

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

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

Traffic emissions are the most significant source of air pollution in Maldon and the A414 is the principle route within the district. Locally, congestion dominates the town centre and bypass during the rush hour periods.

The Council recognises the importance of working with partnering Authorities such as with Essex County Council to make improvements to local transport infrastructure and to fulfil its own regulatory responsibility towards industrial processes.

[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

Air pollution is generally considered to be low across the Maldon district with the exception of along Market Hill in Maldon, where significant exceedances of the nitrogen dioxide (NO_2) air quality objective have been measured.

The trend of results across monitored sites indicates that Air Quality is improving. A graph can be found in Appendix A that shows monitoring results from 2012 to 2018.

There is not enough data to draw conclusions as to whether air quality along Market Hill is improving or declining.

Actions to Improve Air Quality

In the 2018 Annual Status Report, Maldon District Council prioritised the following air quality actions:

- Declare an AQMA in Market Hill, Maldon: This was declared in December 2018.
- Develop an AQAP for Market Hill, Maldon: The AQAP is currently in development.
- Increase air quality monitoring along Market Hill, Maldon: Six new diffusion monitoring sites commenced in 2018.

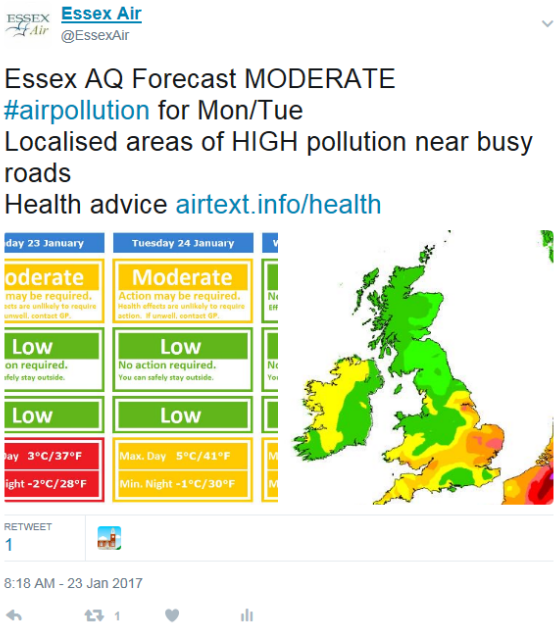
Local Engagement and How to get Involved

As part of development works for the Air Quality Action Plan, Maldon District Council propose to encourage various forms of community engagement events for residents and businesses to have their say and make suggestions on measures that could be used to reduce pollution.

Before the Air Quality Action Plan is finalised, the draft plan will be put out for public consultation to allow public consideration of the proposed options.

Maldon District 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.1 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 DVSA service 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.2 - Essex Air Reporting Smoky Vehicle Tweets

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

Table of Contents

List of Tables

List of Figures

1 Local Air Quality Management

This report provides an overview of air quality in Maldon during 2018. 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 Maldon District 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 E.1 in Appendix E.

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

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

A summary of Maldon District Council's AQMA can be found in Table 2.1. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=33

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

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	City / Town	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance (maximum monitored/modelled concentration at a location of relevant exposure)				Action Plan		
						At Declaration		Now		Name	Date of Publication	Link
MDC Air Quality Management Area Number 1 (Market Hill)	11/12/2018	NO2 Annual & 1 Hour Mean	Maldon	The stretch of road and properties between Anchorage Hill and Bull Lane, Maldon	NO	58.25	µg/m3	61.8	µg/m3	In Development		

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

Table 2.2 – Progress on Measures to Improve Air Quality

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 Quanitified	Ongoing	N/A	
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	Not Quanitified	Ongoing	N/A	
3	Environmental Permit Inspection & Enforcement	Environmental Permits	Measures to reduce pollution through IPPC Permits going beyond BAT	Maldon District Council	N/A	N/A	Operator compliance with Environmental Permit	Not Quanitified	Ongoing	N/A	
4	A414 Route Improvements	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	2015	2016	Monitored Air Quality	Not Quanitified	Complete	2016	
5	Provision of strategic measures to reduce vehicle journeys and therefore	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	Maldon District Council. Funding to be secured through development	2016	Through Implementation of the Local Plan	Reduced Congestion & Emissions	Not Quantified	Policy Development	Thoughout the life of the new Local Plan	New and enhanced public transport links, cycle networks. Installation of EV charging points. Planned Garden Suburb developments are funding a new bus service to Chelmsford and creating a cycle path network linking up

	reduce vehicle exhaust emissions			agreements							to the existing settlement to provide viable alternative to road vehicles. Relief roads have also been secured to reduce congestion in parts of Maldon.
6	Sustainable Procurement Policy	Policy Guidance and Development Control	Sustainable Procurement Guidance	Maldon District Council	2016	2016	N/A	Not Quanitified	Complete	2016	Use the procurement system to ensure that air quality is a consideration within contracts for Maldon District Council
7	Air Quality & Public Health Publicity	Public Information	Other	Maldon District Council	2016	2017	N/A	Not Quanitified	Ongoing	Ongoing	Work with Public Health colleagues to inform the public about health impacts of Air Pollution and how they can change behaviour to reduce emissions and reduce exposure
8	Staff Car Share Scheme	Alternatives to private vehicle use	Car & lift sharing schemes	Maldon District Council	2016	2016	Number of Users	Not Quanitified	Ongoing	Ongoing	Encouragement of staff to car share including the provision of a car sharing space in the staff car park.
9	Explore grant options for the installation of electric charging points in 2 strategic locations within the district.	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	Maldon District Council	2017	Dependant on the availability of funding streams	Number of Users	Not Quanitified	Ongoing	Ongoing	By providing these points it will provide and encourage accessibility to both residents of Maldon and visitors.
10	Assessing Air Quality & Emissions Impacts from Development Technical Document	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	Maldon District Council	2016	2017	Formal Adoption of Guidance	Not Quantified	Complete	2017	

2.3 Air Quality Action Plan Development

Detailed NO_2 Modelling for Market Hill

An air quality modelling study has been undertaken to establish baseline air quality concentrations along Market Hill.

A data inventory was collated:

- monitored air quality data
- vehicle emission factors
- automatic traffic count data
- background pollutant data
- meteorological data
- emissions data from other sources such as from the National Atmospheric Emissions Inventory (NAEI)

This data was input into a model created on the ADMS-Urban (v4.2) dispersion modelling software. The model included street canyon characteristics along sections of the road and to account for the steep gradient of Market Hill, emissions factors were adjusted based on Defra Technical Guidance.

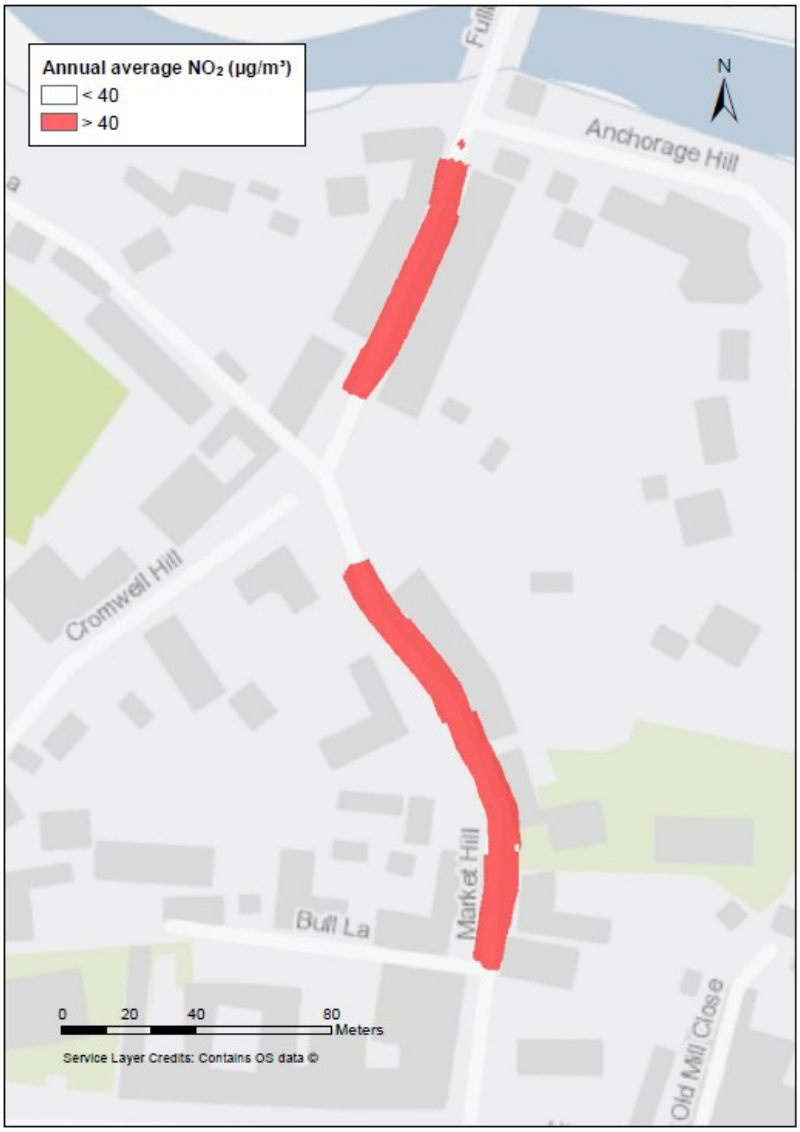
The modelling will identify the reduction in pollutant emissions that is required to attain the objectives. A suite of air quality mitigation measures can then be developed to meet the required level of emission reduction.

Principle measures may come in the form of strategic transport planning and local traffic management.

Secondary measures are likely to include sustainable development and travel policy.

Figure 2.1 identifies the areas where exceedances have been modelled. This covers the same area as the AQMA. A copy of the AQMA order can be found in Appendix F.

Figure 2.1 – Market Hill Modelled Exceedances



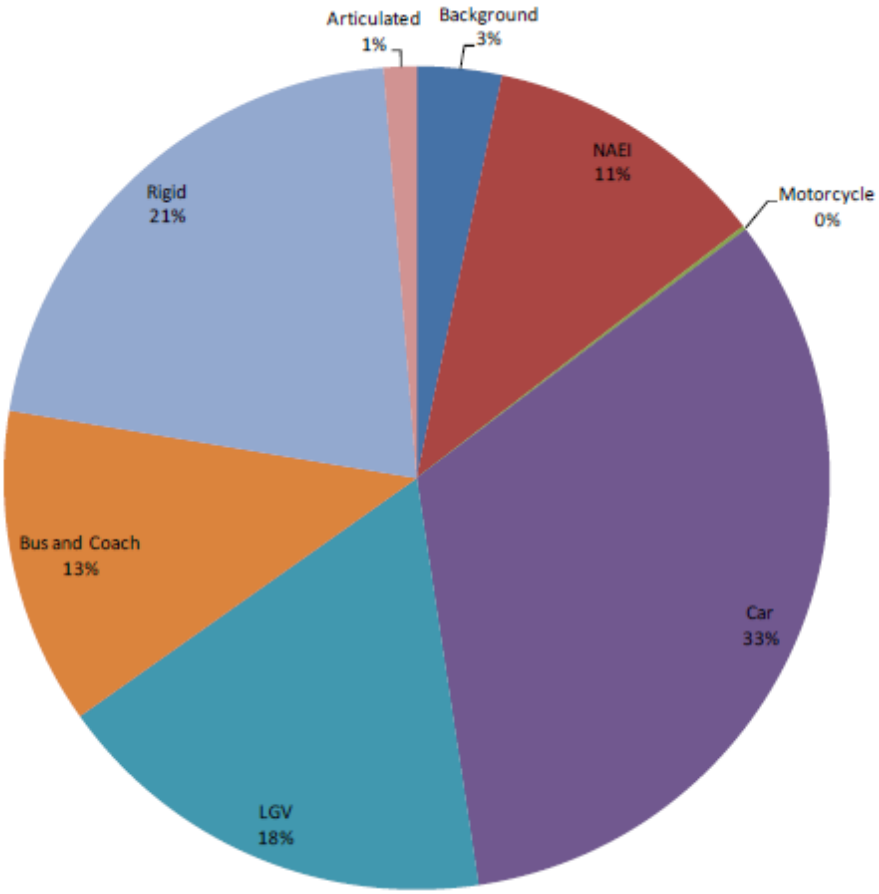
The modelled exceedances occur at locations where the road is steep and have canyon like characteristics.

Source Apportionment

The modelling output also apportions emissions to vehicle type. This enables key sources to be identified and appropriate measures to be selected for further consideration.

Source apportionment seen in Figure 2.2 shows that the major contribution to annual average NOx concentration is from cars with significant contributions from buses, LGVs and rigid HGVs.

Figure 2.2 – Market Hill NOx emissions by source type



Community engagement events will enable residents and businesses to make suggestions on measures that could be used to reduce pollution. The air quality steering group will undertake a feasibility analysis to screen available options.

Principle measures will have traffic and air quality modelling undertaken where required to quantify their effectiveness, determine the limitations of the measure and other assistive actions that may be required for the success of the measure.

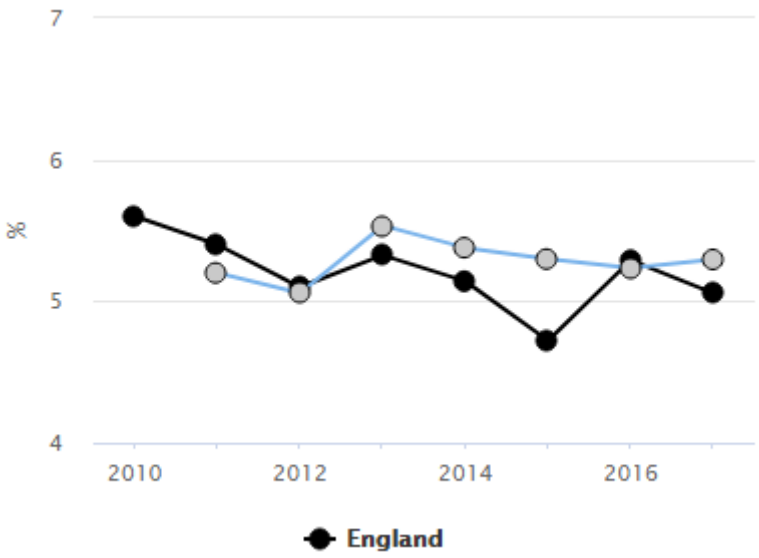
After a final appraisal of measures, the air quality action plan will be drafted, opened for public consultation prior to finalising and subsequent adoption by the Council.

2.4 $PM_{2.5}$ – 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.

Maldon District Council does not monitor $PM_{2.5}$ concentrations however notes the Public Health Outcomes Framework indicator 3.01 – Fraction of mortality attributable to particulate ($PM_{2.5}$) air pollution which for 2017 gave a value of 5.3%. These values are broadly similar to other authorities within the region.

Figure 2.3 - Public Health Framework Indicator 3.01 Fraction of all-cause adult mortality attributable to anthropogenic particulate air pollution



Maldon District Council is taking the following measures to address $PM_{2.5}$:

- The Essex Air twitter account is encouraging the reporting of smoky vehicles through the DVSA reporting service. It is possible to report either heavy goods vehicles or public service vehicles (buses).
- Regular inspections of permitted industry where combustion and non-combustion processes could lead to anthropogenic emissions of $PM_{2.5}$

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

3.1 Summary of Monitoring Undertaken

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

3.1.1 Automatic Monitoring Sites

Maldon District Council does not undertake automatic continuous monitoring.

3.1.2 Non-Automatic Monitoring Sites

Maldon District Council undertook non-automatic (passive) monitoring of NO_2 at 24 sites during 2018. Table A.1 in Appendix A provides details of these sites.

Details of the Quality Assurance/Quality Control (QA/QC) for the diffusion tube monitoring is included in Appendix C.

A plan showing the location of the monitoring sites is provided in Appendix D.

In 2018 three sites (MD18, MD20 and MD21) were discontinued.

MD20 was not compliant with Defra Technical Guidance and has produced erroneous results not consistent with other nearby monitoring sites.

MD18 and MD21 were discontinued part of the way through 2018. Although kerbside sites, these were located in background areas, measuring very low levels of nitrogen dioxide and not contributing to identifying high levels of pollution.

Six new monitoring sites commenced in 2018. These are sited along Market Hill and will allow the local air quality in Market Hill to be understood better and to highlight where exceedances occur.

An audit of the monitoring strategy for 2019 has been undertaken and additional monitoring will commence at new sites where traffic congestion is a notable characteristic.

3.2 Individual Pollutants

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

3.2.1 Nitrogen Dioxide (NO_2)

Table A.2 in Appendix A compares the ratified and bias adjusted monitored NO_2 annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

For diffusion tubes, the full 2018 dataset of monthly mean values is provided in Appendix B along with distance correction for relevant exposure.

Maldon District Council has measured multiple exceedances of the 40µg/m^3.annual mean Air Quality Objective on Market Hill. As one of these measurements was in excess of 60µg/m^3 it is considered that there has been a breach of the 1-hour Air Quality Objective.

Appendix A: Monitoring Results

Table A.1 – Details of Non-Automatic Monitoring Sites

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)
MD1	Opposite Cherry Oak A414	Roadside	580645	204820	NO2	NO	15.9	10.7	NO	2.5
MD2	A414 Spital Road/A414 Bypass	Kerbside	583952	205742	NO2	NO	17	1	NO	2.5
MD2b	A414 Spital Road/A414 Bypass	Kerbside	583952	205742	NO2	NO	17	1	NO	2.5
MD2c	A414 Spital Road/A414 Bypass	Kerbside	583952	205742	NO2	NO	17	1	NO	2.5
MD3	Heybridge Approach	Roadside	584763	208107	NO2	NO	17.9	3.7	NO	2.5
MD4	Heybridge Street/ The Causeway	Kerbside	585465	208071	NO2	NO	20.1	1.3	NO	2.5
MD5	Colchester Rd/Heybridge Street Junction	Roadside	585914	208104	NO2	NO	15.6	3.9	NO	2.5
MD6	High Street (Market Hill Junction)	Urban Centre	585072	207080	NO2	NO	0	2.1	NO	2.5
MD7	Wantz Road/High Street	Urban Centre	585307	206943	NO2	NO	1.9	1.6	NO	2.5

MD8	Latchingdon/Burnham Road Junction	Kerbside	588575	200492	NO2	NO	11.6	0.4	NO	2.5
MD11	Latchingdon Street	Kerbside	588205	200438	NO2	NO	0	1.3	NO	2.5
MD12	A414 Spital Roadl/A414 Bypass	Kerbside	583862	205549	NO2	NO	32.4	1.5	NO	2.5
MD13	Limebrook Way/A414 Bypass	Kerbside	584165	205532	NO2	NO	31.6	1.5	NO	2.5
MD14	The Causeway	Roadside	585221	207682	NO2	NO	0	9	NO	2.5
MD16	8 Narvik Close	Roadside	584309	205776	NO2	NO	3	0.5	NO	2.5
MD17	2 Creasen Butt Close	Suburban	585078	207924	NO2	NO	5	0.5	NO	2.5
MD18	Opp 37 Imperial Avenue, Mayland	Suburban	590466	202313	NO2	NO	0	9	NO	2.5
MD19	Adjacent to 16 Mill Road, Maldon	Kerbside	585565	206723	NO2	NO	3.4	0.2	NO	3
MD21	Adjacent to 61 Station Road, Southminster	Kerbside	596181	199660	NO2	NO	0	0.8	NO	3
MD22A	10 Market Hill, Maldon	Roadside	585062	207160	NO2	YES	0.5	1.5	NO	2.5
MB22B	10 Market Hill, Maldon	Roadside	585062	207160	NO2	YES	0.5	1.5	NO	2.5
MD22C	10 Market Hill, Maldon	Roadside	585062	207160	NO2	YES	0.5	1.5	NO	2.5
MD23	59-63 Market Hill, Maldon	Roadside	585055	207324	NO2	YES	1.5	1.3	NO	2.5
MD24	32 Market Hill	Roadside	585045	207272	NO2	YES	0.65	1.9	NO	2.5
MD25	1 Hillside, Maldon	Roadside	585016	207241	NO2	YES	5	1.4	NO	2.5
MD26	18 Market Hill, Maldon	Roadside	585045	207186	NO2	YES	0	2.6	NO	2.5

MD27	6 Market Hill, Maldon	Roadside	585073	207132	NO2	YES	0	2.3	NO	2.5
MD28	21 Market Hill, Maldon	Roadside	585067	207116	NO2	YES	0	1.6	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.2 – Annual Mean NO2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	NO_2 Annual Mean Concentration (µg/m³) (3)				
					2014	2015	2016	2017	2018
MD1	Roadside	Diffusion Tube	100.0	100.0	33.6	31.9	33.3	31.4	28.8
MD2	Kerbside	Diffusion Tube	100.0	100.0	40.0	28.4	32.7	29.4	29.3
MD2b	Kerbside	Diffusion Tube	100.0	100.0	N/A	N/A	29.7	27.8	28.8
MD2c	Kerbside	Diffusion Tube	100.0	100.0	N/A	N/A	30.3	27.3	28.2
MD3	Roadside	Diffusion Tube	100.0	100.0	32.4	26.5	30.8	30.2	29.2
MD4	Kerbside	Diffusion Tube	100.0	100.0	32.0	28.9	29.0	30.1	27.3
MD5	Roadside	Diffusion Tube	100.0	100.0	36.6	32.6	32.3	32.2	29.2
MD6	Urban Centre	Diffusion Tube	100.0	100.0	29.6	30.2	30.1	29.7	26.9
MD7	Urban Centre	Diffusion Tube	100.0	100.0	31.1	27.0	29.2	31.6	26.4
MD8	Kerbside	Diffusion Tube	100.0	100.0	26.1	28.4	32.1	32.4	29.0
MD11	Kerbside	Diffusion Tube	100.0	100.0	26.2	25.3	23.3	24.7	24.0
MD12	Kerbside	Diffusion Tube	100.0	100.0	33.7	27.0	29.0	27.6	24.5
MD13	Kerbside	Diffusion Tube	91.7	91.7	27.4	26.3	25.9	25.5	23.9
MD14	Roadside	Diffusion Tube	100.0	100.0	39.3	31.3	30.7	29.4	26.6

MD16	Suburban	Diffusion Tube	100.0	100.0	N/A	16.9	15.7	15.3	13.6
MD17	Suburban	Diffusion Tube	100.0	100.0	N/A	17.8	18.5	20.9	15.8
MD18	Suburban	Diffusion Tube	75.0	75.0	N/A	N/A	N/A	14.3	12.2
MD19	Kerbside	Diffusion Tube	91.7	91.7	N/A	N/A	N/A	21.6	20.7
MD21	Kerbside	Diffusion Tube	75.0	75.0	N/A	N/A	N/A	15.5	12.6
MD22A	Roadside	Diffusion Tube	83.3	83.3	N/A	N/A	N/A	**55.2**	**57.1**
MD22B	Roadside	Diffusion Tube	100.0	100.0	N/A	N/A	N/A	**56.7**	**58.3**
MD22C	Roadside	Diffusion Tube	91.7	91.7	N/A	N/A	N/A	**62.8**	**59.9**
MD23	Roadside	Diffusion Tube	0.9	66.7	N/A	N/A	N/A	N/A	37.1
MD24	Roadside	Diffusion Tube	0.9	66.7	N/A	N/A	N/A	N/A	**46.3**
MD25	Roadside	Diffusion Tube	0.9	66.7	N/A	N/A	N/A	N/A	30.9
MD26	Roadside	Diffusion Tube	100.0	75.0	N/A	N/A	N/A	N/A	39.1
MD27	Roadside	Diffusion Tube	100.0	75.0	N/A	N/A	N/A	N/A	**61.8**
MD28	Roadside	Diffusion Tube	100.0	75.0	N/A	N/A	N/A	N/A	28.9

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

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

Notes:

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

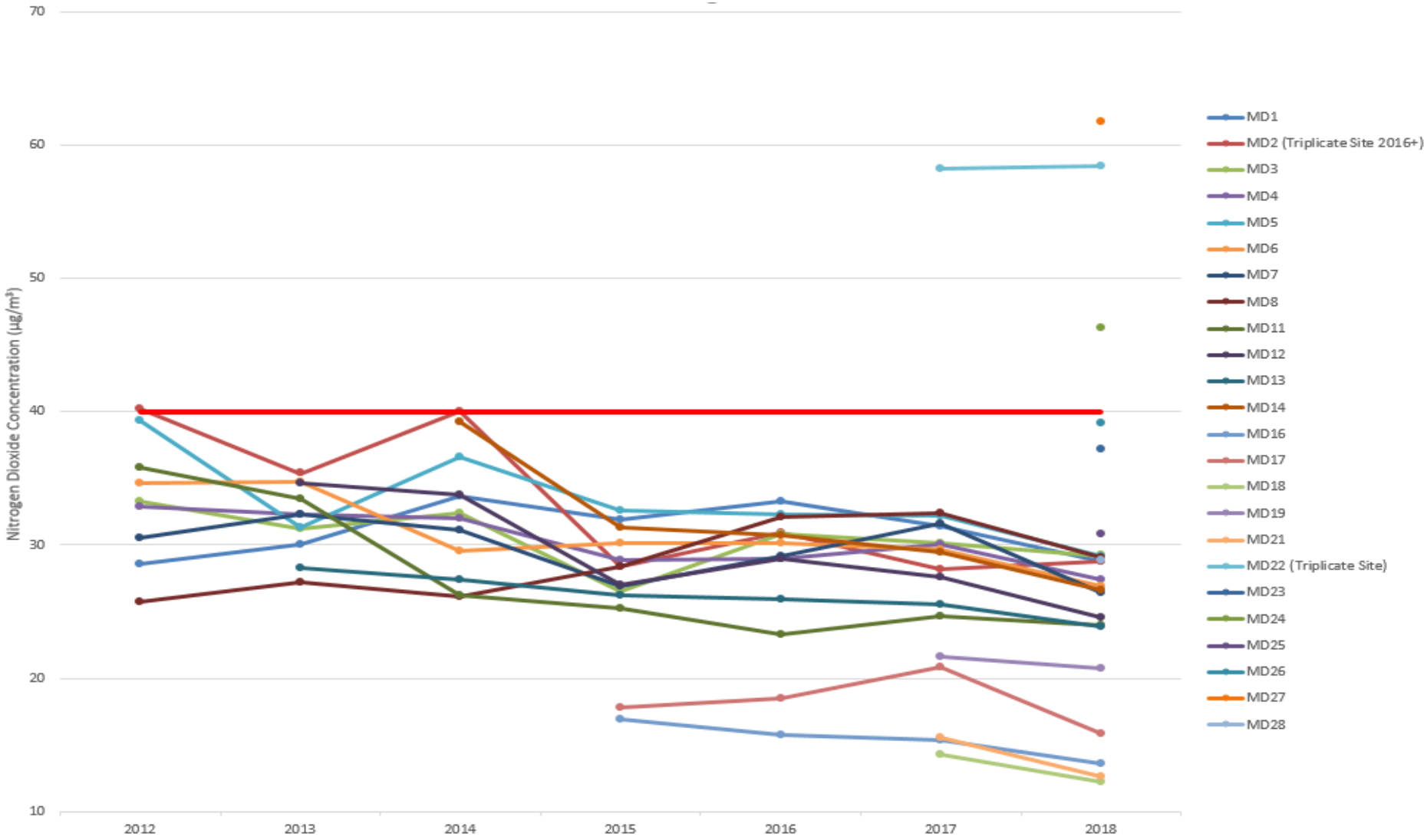
NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined.**

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

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

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

Figure A.1 – Trends in Annual Mean NO2 Concentrations



Appendix B: Full Monthly Diffusion Tube Results for 2018

Table B.1 – NO2 Monthly Diffusion Tube Results - 2018

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (0.76) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
MD1	37.7	33.3	37.3	41.0	36.3	40.6	43.2	37.1	36.7	38.0	36.9	35.9	37.8	28.8	21.8
MD2	33.2	47.3	40.2	35.4	36.5	40.2	44.3	31.8	34.3	41.3	45.6	33.0	38.6	29.3	17.7
MD2b	33.2	46.8	41.8	34.3	39.5	38.4	35.3	28.4	31.6	44.5	50.2	31	37.9	28.8	17.5
MD2c	30	46.2	39.9	36	34.5	49	37.3	27.3	27.1	38.9	46.9	32.1	37.1	28.2	17.3
MD3	36.9	36.4	41.2	40.8	36.9	35.2	38.8	37.9	31.7	40.7	43.7	40.9	38.4	29.2	19.6
MD4	41.7	43.6	37.7	36.8	28.6	33.4	34.2	32.7	31	37.9	32	42.2	36.0	27.3	17.6
MD5	46.1	43	40.8	36.6	32.9	31	39.3	35.7	39.9	39.9	39.7	35.4	38.4	29.2	21.0
MD6	38.4	39	35.9	33.6	28	25.6	28.7	32	38.8	43.2	38.7	42.5	35.4	26.9	26.9
MD7	40.9	39.7	39.3	36.6	30.1	25.8	27.6	29	35	39.3	35.6	38.6	34.8	26.4	23.7
MD8	39.8	38.3	41	40.9	33.9	32.5	33.5	37.3	39.1	44.1	40.7	37	38.2	29.0	16.8
MD11	39.1	32.6	31.2	31.5	26.8	28.6	33.5	27	27.6	33.5	33	33.9	31.5	24.0	24.0
MD12	31	38.6	34.8	30.6	28.9	31.3	33.2	28.3	30.2	34.5	37.6	28.3	32.3	24.5	14.2
MD13	37.2	26.5	35	Missing	23.3	31.3	30.3	29.8	33.5	36.3	28.9	33.3	31.4	23.9	14.0
MD14	39.1	42	40	33.4	25.7	28.4	35.2	28.5	32.8	35.4	43	36.9	35	26.6	26.6
MD16	24.8	22.3	18.6	15.1	9.1	10.4	14.9	15.2	17.3	20.6	22.3	23.5	17.8	13.6	12.1

MD17	30.8	24.2	24.1	18.6	10.3	10.5	17.2	17.2	20.2	26	24.8	25.8	20.8	15.8	14.4
MD18	19.6	18.2	16.9	14.8	11.4	12.4	15.8	16.2	19.5	Discontinued	Discontinued	Discontinued	16.1	12.2	12.2
MD19	31.9	30.7	31.7	24	18	19.3	25.3	24.2	28.5	Missing	33.8	32.5	27.3	20.7	16.2
MD21	21.8	18.9	20	16.6	11.1	11.6	16	14.4	18.8	Discontinued	Discontinued	Discontinued	16.6	12.6	12.6
MD22A	54.7	95.1	82.4	77.5	Missing	84	79.9	65.4	63.6	Missing	81.4	66.7	75.1	**57.1**	**54.2**
MB22B	59	88.7	79.2	83.2	81.3	90.4	82.5	60.9	65	82.5	80	67.9	76.7	**58.3**	**55.4**
MD22C	65.6	93	86.9	90.3	76.6	92.1	88.9	65.9	62.1	87	Missing	58.9	78.8	**59.9**	**56.9**
MD23	N/A	N/A	N/A	44.6	30.7	19.9	35	32.3	47.4	53.4	Missing	79.7	42.9	37.2	33.1
MD24	N/A	N/A	N/A	66.3	Missing	62.6	64.8	47.9	56.5	65.3	62.8	51.3	59.7	46.3	44.0
MD25	N/A	N/A	N/A	41.5	35.3	31.2	Missing	30.4	42.6	47.7	43.4	37.3	38.7	30.9	24.8
MD26	N/A	N/A	N/A	54.8	49.8	60.4	50.2	40.3	45	54.1	36.6	41.7	48.1	39.1	39.1
MD27	N/A	N/A	N/A	72.5	80	87.2	72.3	66.5	66.1	81.6	84.5	73	76.0	**61.8**	**61.8**
MD28	N/A	N/A	N/A	35.9	29.6	33.5	39.3	26.1	37.7	40.9	36.7	39.8	35.5	28.9	28.9

☒ **National bias adjustment factor used**

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

☒ **Where applicable, data has been distance corrected for relevant exposure**

Notes:

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

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

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

(2) Distance corrected to nearest relevant public exposure.

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

Diffusion Tubes QA/QC

Maldon District Council undertook monitoring at 24 sites using 28 nitrogen dioxide diffusion tubes sites in 2018. 2 sites are triplicate monitoring sites.

The diffusion tubes were supplied and analysed by Socotec (formerly ESG, Didcot) 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 2018:

Table C.1 – AIR PT Results 2018

AIR PT Round	AIR PT AR024	AIR PT AR025	AIR PT AR027	AIR PT AR028
Round conducted in the period	January – February 2018	April – May 2018	July – August 2018	September – October 2018
ESG Didcot	100%	100%	100%	100%

Diffusion tube Bias Adjustment Factors

Maldon District Council uses the national bias adjustment figure for calculating diffusion tubes results.

The Diffusion Tube Bias Adjustment Factors Spreadsheet 03/18 identified that for Socotec 50% TEA in acetone diffusion tubes in 2018, a bias adjustment factor of 0.76 should be used. This was derived from orthogonal regression analysis of 21 studies.

NO_2 Fall Off Estimation

Using the equation from the Bureau Veritas NO_2 Fall Off with Distance Calculator (version 4.2), a custom Excel spreadsheet has been developed to derive the NO_2 concentrations for multiple diffusion tubes from measured annual mean concentrations 2018 NO_2 background maps.

Estimated Annual Mean at Relevant Exposure:

=IF(AC>0,(((AB-AC)/(-0.5476*LN(J)+2.7171))*(-0.5476*LN(H)+2.7171)+AC),"")

AB = Bias Adjusted Mean

AC = Annual Mean Background NO_2

J = Distance: diffusion tube to kerb of nearest road (m)

H = Distance: relevant exposure to kerb of nearest road (m)

Annualisation

A process of annualisation is applied to the monitoring data that has less than 75% data collection across the calendar year to consider the seasonal variation of meteorology such as temperature, pressure and ozone level that influences air pollution.

The process of adjustment is undertaken as described in Box 7.10 of the Defra Technical Guidance TG(16) and used ratified data from the background continuous monitoring station of Chignal St James, Chelmsford. No other nearby background monitoring stations has ratified data available at the time of calculation.

The calculated adjustment factors are presented below:

Table C.2 - MD23 Data Annualisation

MD23				
Start Date	End Date	B1	D1	B1 when D1 is available
17/01/2018	16/02/2018	15.8		
16/02/2019	19/03/2018	16.4		
19/03/2018	18/04/2018	11.6		
18/04/2018	18/05/2018	10.2	44.6	10.2
18/05/2018	19/06/2018	6.9	30.7	6.9
19/06/2018	16/07/2018	5.7	19.9	5.7
16/07/2018	13/08/2018	9.7	35.0	9.7
13/08/2018	10/09/2018	9.0	32.3	9.0
10/09/2018	08/10/2018	13.8	47.4	13.8
08/10/2018	07/11/2018	14.5	53.4	14.5
07/11/2018	05/12/2018	17.1		
05/12/2018	09/01/2019	16.6	79.7	16.6
Average		12.3	42.9	10.8
Annualisation Ratio		1.14		

Table C.3 - MD24 Data Annualisation

MD24				
Start Date	End Date	B1	D1	B1 when D1 is available
17/01/2018	16/02/2018	15.8		
16/02/2019	19/03/2018	16.4		
19/03/2018	18/04/2018	11.6		
18/04/2018	18/05/2018	10.2	66.3	10.2
18/05/2018	19/06/2018	6.9		
19/06/2018	16/07/2018	5.7	62.6	5.7
16/07/2018	13/08/2018	9.7	64.8	9.7
13/08/2018	10/09/2018	9.0	47.9	9.0
10/09/2018	08/10/2018	13.8	56.5	13.8
08/10/2018	07/11/2018	14.5	65.3	14.5
07/11/2018	05/12/2018	17.1	62.8	17.1
05/12/2018	09/01/2019	16.6	51.3	16.6
Average		12.3	59.7	12.1
Annualisation Ratio		1.02		

Table C.4 - MD25 Data Annualisation

MD25				
Start Date	End Date	B1	D1	B1 when D1 is available
17/01/2018	16/02/2018	15.8		
16/02/2019	19/03/2018	16.4		
19/03/2018	18/04/2018	11.6		
18/04/2018	18/05/2018	10.2	41.5	10.2
18/05/2018	19/06/2018	6.9	35.3	6.9
19/06/2018	16/07/2018	5.7	31.2	5.7
16/07/2018	13/08/2018	9.7		
13/08/2018	10/09/2018	9.0	30.4	9.0
10/09/2018	08/10/2018	13.8	42.6	13.8
08/10/2018	07/11/2018	14.5	47.7	14.5
07/11/2018	05/12/2018	17.1	43.4	17.1
05/12/2018	09/01/2019	16.6	37.3	16.6
Average		12.3	38.7	11.7
Annualisation Ratio		1.05		

Table C.5 - MD26 Data Annualisation

MD26				
Start Date	End Date	B1	D1	B1 when D1 is available
17/01/2018	16/02/2018	15.8		
16/02/2019	19/03/2018	16.4		
19/03/2018	18/04/2018	11.6		
18/04/2018	18/05/2018	10.2	54.8	10.2
18/05/2018	19/06/2018	6.9	49.8	6.9
19/06/2018	16/07/2018	5.7	60.4	5.7
16/07/2018	13/08/2018	9.7	50.2	9.7
13/08/2018	10/09/2018	9.0	40.3	9.0
10/09/2018	08/10/2018	13.8	45.0	13.8
08/10/2018	07/11/2018	14.5	54.1	14.5
07/11/2018	05/12/2018	17.1	36.6	17.1
05/12/2018	09/01/2019	16.6	41.7	16.6
Average		12.3	48.1	11.5
Annualisation Ratio		1.07		

Table C.6 - MD27 Data Annualisation

MD27				
Start Date	End Date	B1	D1	B1 when D1 is available
17/01/2018	16/02/2018	15.8		
16/02/2019	19/03/2018	16.4		
19/03/2018	18/04/2018	11.6		
18/04/2018	18/05/2018	10.2	72.5	10.2
18/05/2018	19/06/2018	6.9	80.0	6.9
19/06/2018	16/07/2018	5.7	87.2	5.7
16/07/2018	13/08/2018	9.7	72.3	9.7
13/08/2018	10/09/2018	9.0	66.5	9.0
10/09/2018	08/10/2018	13.8	66.1	13.8
08/10/2018	07/11/2018	14.5	81.6	14.5
07/11/2018	05/12/2018	17.1	84.5	17.1
05/12/2018	09/01/2019	16.6	73.0	16.6
Average		12.3	76.0	11.5
Annualisation Ratio		1.07		

Table C.7 - MD28 Data Annualisation

MD28				
Start Date	End Date	B1	D1	B1 when D1 is available
17/01/2018	16/02/2018	15.8		
16/02/2019	19/03/2018	16.4		
19/03/2018	18/04/2018	11.6		
18/04/2018	18/05/2018	10.2	35.9	10.2
18/05/2018	19/06/2018	6.9	29.6	6.9
19/06/2018	16/07/2018	5.7	33.5	5.7
16/07/2018	13/08/2018	9.7	39.3	9.7
13/08/2018	10/09/2018	9.0	26.1	9.0
10/09/2018	08/10/2018	13.8	37.7	13.8
08/10/2018	07/11/2018	14.5	40.9	14.5
07/11/2018	05/12/2018	17.1	36.7	17.1
05/12/2018	09/01/2019	16.6	39.8	16.6
Average		12.3	35.5	11.5
Annualisation Ratio		1.07		

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

Figure D.1 – Diffusion Tube Monitoring Locations on Market Hill and AQMA

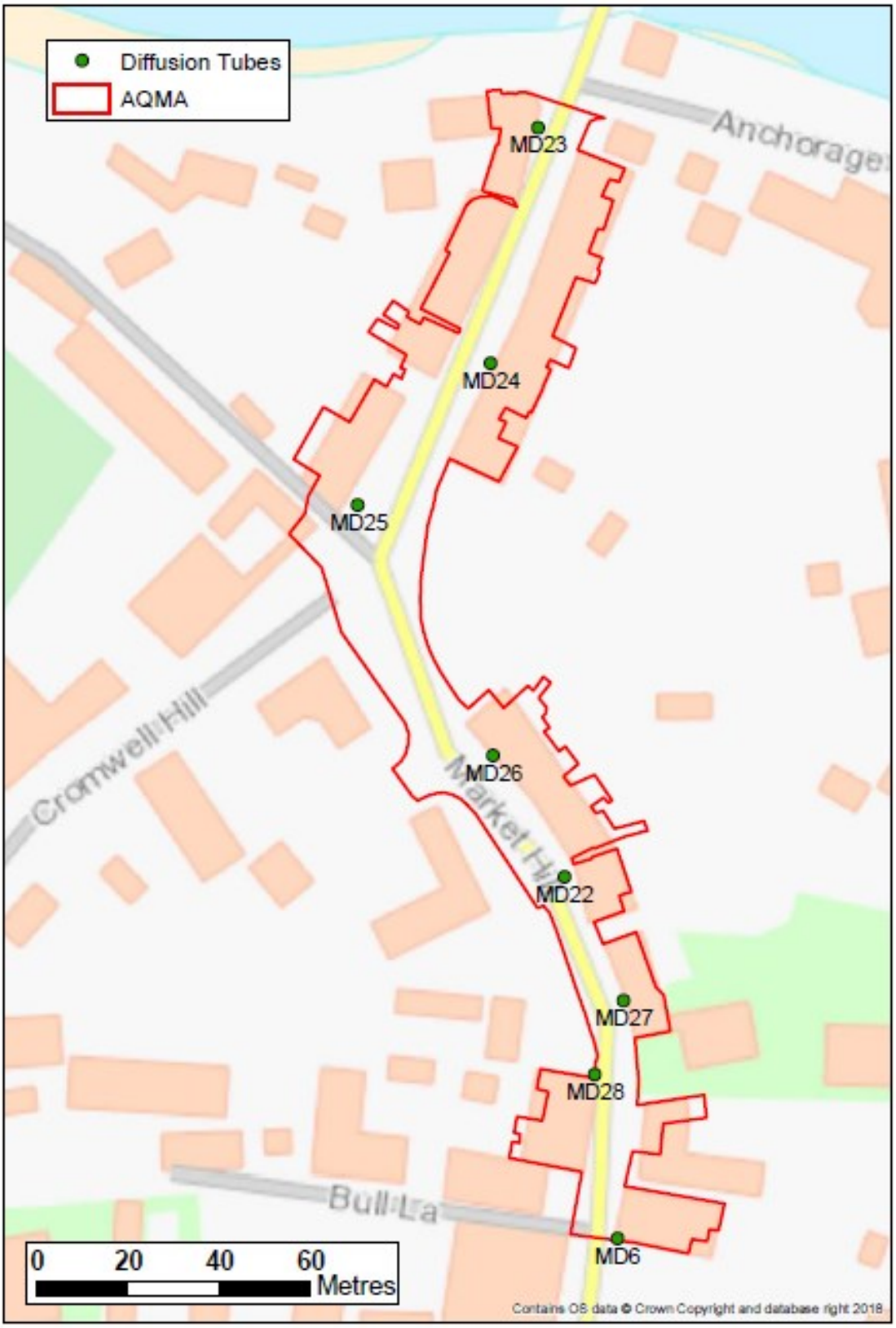


Figure D.2 – Diffusion Tube Monitoring Locations East of Maldon Town Centre

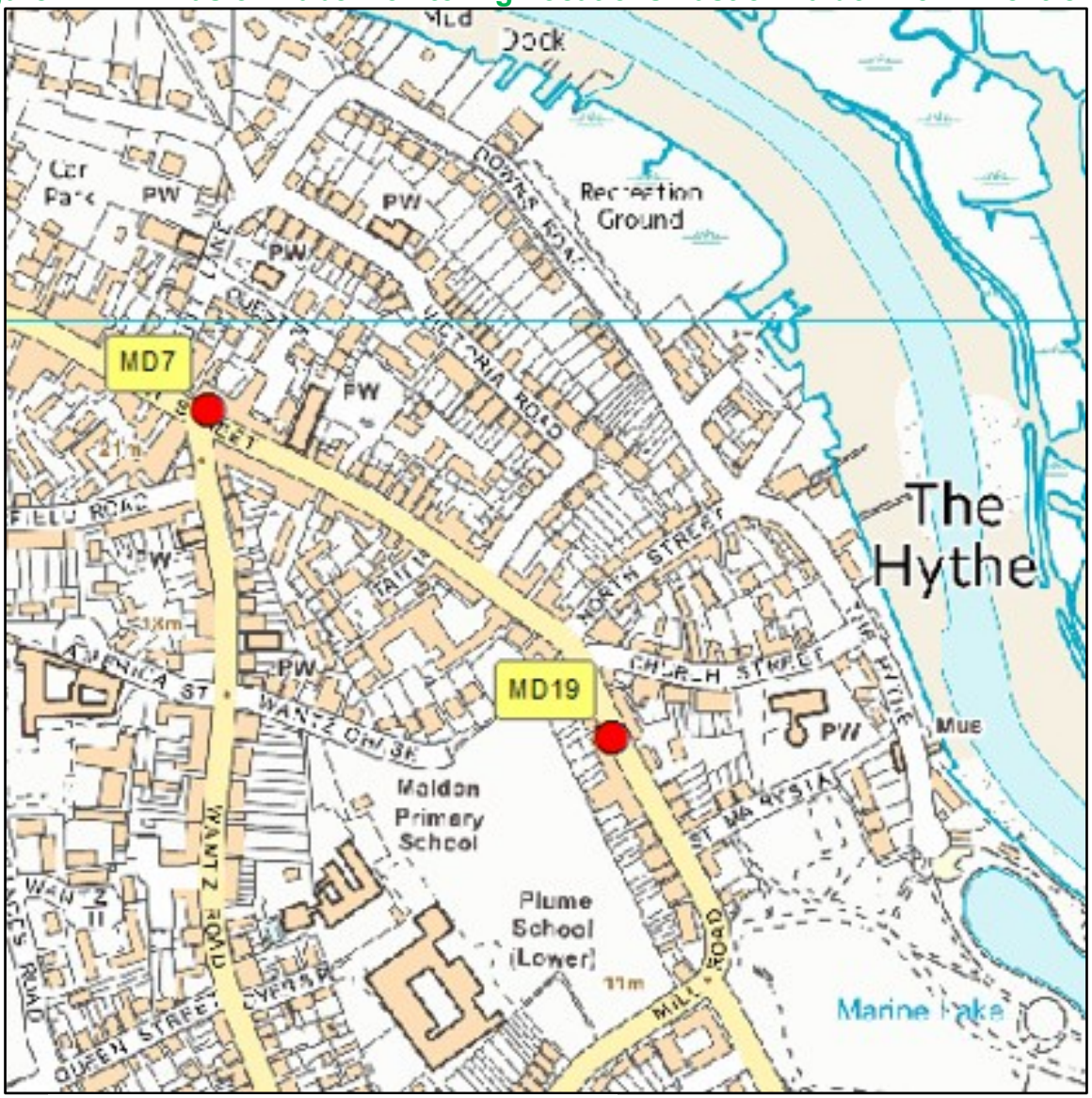


Figure D.3 – Diffusion Tube Monitoring Locations in Heybridge

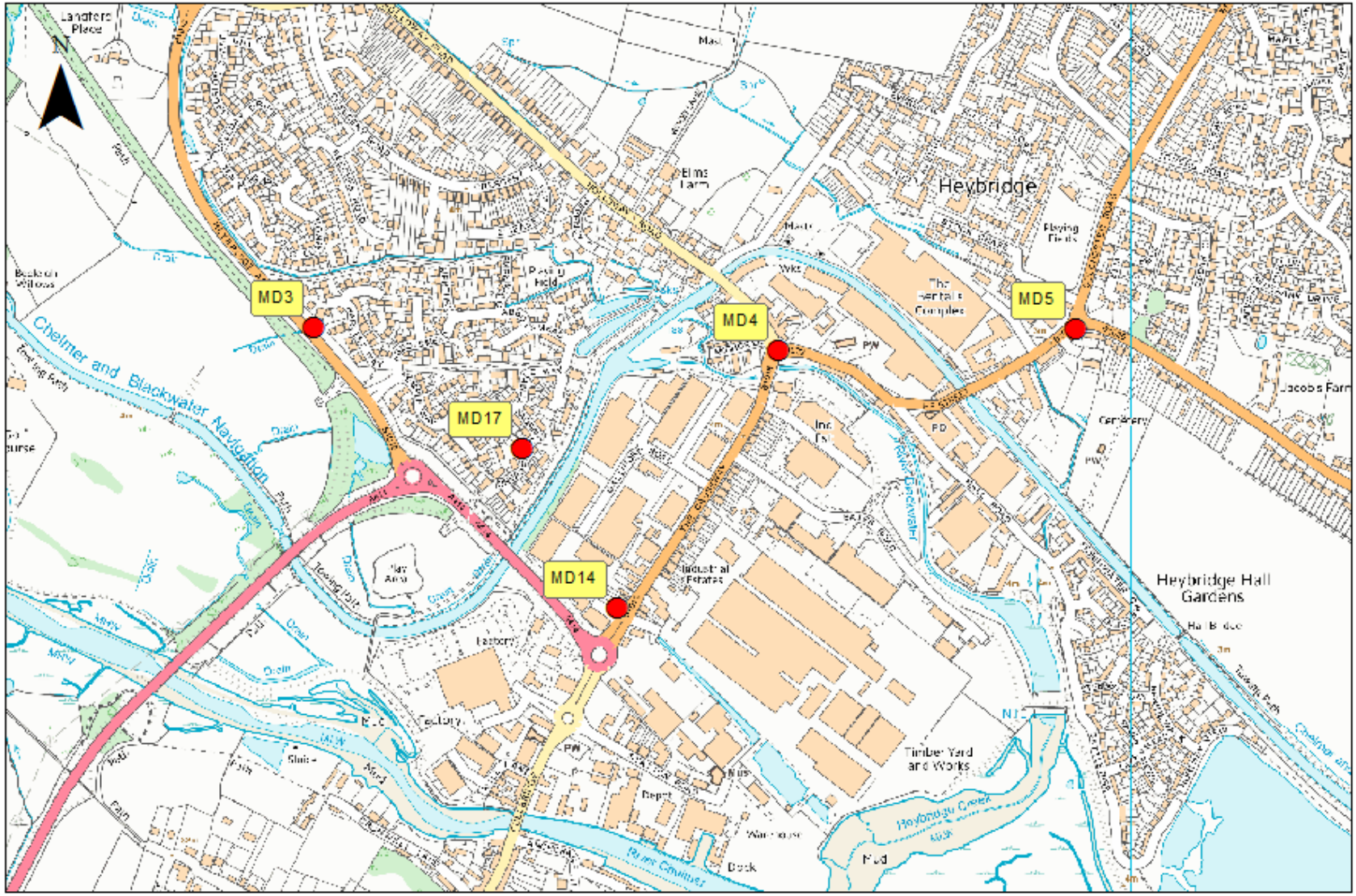


Figure D.4 – Monitoring Locations A414 Wycke Hill / Limebrook Way Roundabout

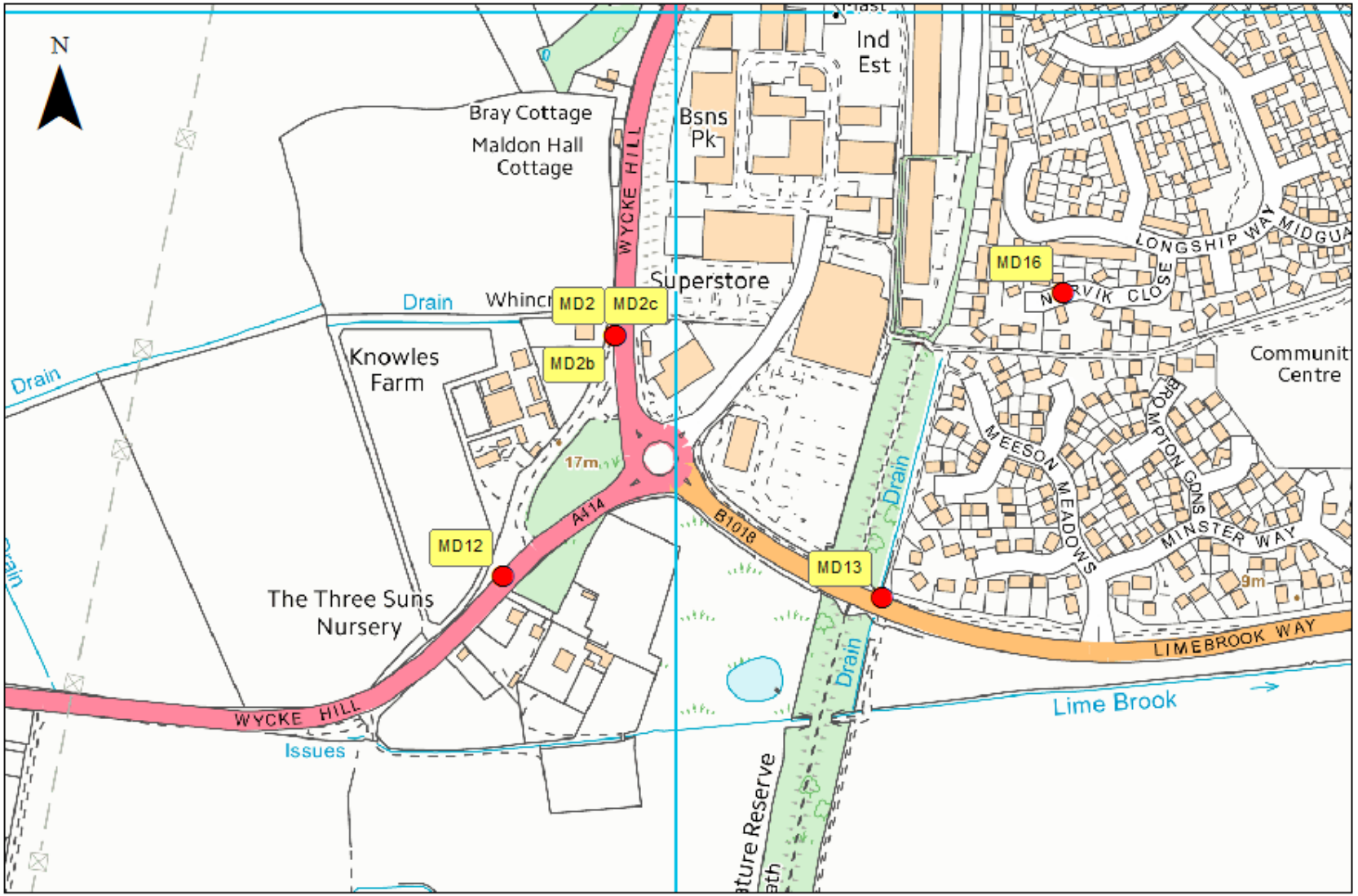


Figure D.5 – Monitoring Locations Latchingdon, Maylandsea & Southminster

Figure D.6 – Monitoring Location A414 Chelmsford Road

Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[4]	
	Concentration	Measured as
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m^3	Annual mean
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

Table E.2 – Examples of Where the Air Quality Objectives Should Apply

Averaging Period	Nitrogen Dioxide (NO_2) Air Quality Objective[5]	
	Objectives should apply at:	Objectives should not generally apply at:
Annual Mean (40 µg/m^3)	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.

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

Averaging Period	Nitrogen Dioxide (NO_2) Air Quality Objective[5]	
	Objectives should apply at:	Objectives should not generally apply at:
1-hour Mean (200 $\mu g/m^3$ not to be exceeded more than 18 times a year) It can be considered that exceedances of the NO_2 1-hour objective may occur at roadside sites if the annual mean is above $60\mu g/m^3$	All locations where the annual mean and: 24 and 8-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably expected to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.

Appendix F: Market Hill AQMA Order

Environment Act 1995 Part IV Section 83(1)
Maldon District Council
Market Hill, Air Quality Management Order 2018

Maldon District Council in exercise of the powers conferred upon it by Section 83(1) of the Environment Act 1995, hereby makes the following Order.

This Order may be cited/referred to as the Maldon District Council Air Quality Management Area number 1.

Area 1 – Market Hill, Maldon.

And shall come into effect on **11th December 2018.**

The areas shown on the attached maps in red are to be designated as air quality management area 1. The designated area incorporates the stretch of road and properties between Anchorage Hill and Bull Lane.

The map may be viewed at the Council Offices.

Area 1 is designated in relation to the likely breach of the nitrogen dioxide annual mean and hourly objectives as specified in the Air Quality Regulations 2000.

This Order shall remain in force until it is varied or revoked by a subsequent order.

The Common Seal of Maldon District Council was hereunto affixed in the presence of:

Authorised signatory

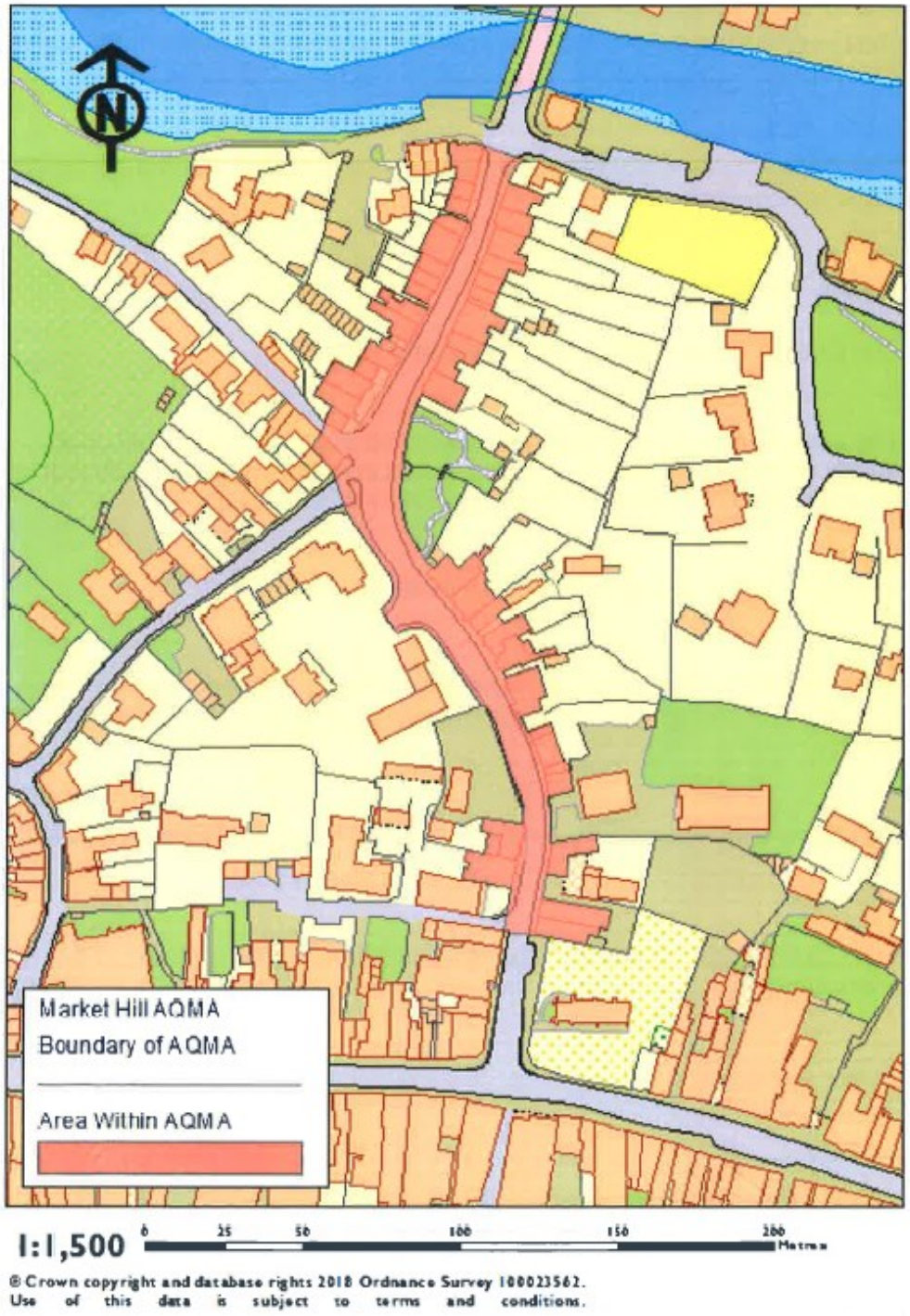
.....

Paul Dodson, Director ~~of Planning & Regulatory Services~~

5842
11/12/18

Authorised Signatory
S.J QUELCH, SOLICITOR

Maldon District Council
Market Hill, Air Quality Management Order 2018



Glossary of Terms

Abbreviation	Description
AIR-PT	An independent analytical proficiency-testing (PT) scheme, operated by LGC Standards and supported by the Health and Safety Laboratory (HSL)
Annualisation	The process of estimating annual means from the extrapolation of short-term monitoring results
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Air Quality Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
Dispersion Modelling	The mathematical computation of the dispersal of emissions as they travel through the ambient atmosphere
EU	European Union
HGV	Heavy Goods Vehicle
LAQM	Local Air Quality Management
LGV	Light Goods Vehicle
NAEI	National Atmospheric Emissions Inventory
NO_2	Nitrogen Dioxide
NOx	Oxides of nitrogen
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
Street Canyon	Generally defined as narrow streets where the height of buildings on both sides of the road is greater than the road width, leading to the formation of vortices and recirculation of air flow that can trap pollutants and restrict dispersion
TEA	Triethanolamine – substance used for absorbing nitrogen dioxide in diffusion tubes
UKAS	United Kingdom Accreditation Service

References

Defra Diffusion Tube Bias Adjustment Factors Spreadsheet available at; https://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html

Defra LAQM Summary of Laboratory Performance in AIR NO_2 PT Scheme available at; https://laqm.defra.gov.uk/assets/tubeprecision2019version0319finalfull.pdf

Defra LAQM Policy Guidance LAQM.PG16 available at; https://laqm.defra.gov.uk/documents/LAQM-TG16-February-18-v1.pdf

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

Defra NO2 Background Maps available at; https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2017

Essex Air Quality Consortium available at; http://www.essexair.org.uk

EssexCarShare.com available at; https://essex.liftshare.com/

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

Maldon District Council Statutory Air Quality Reports available at; http://www.essexair.org.uk/AQInEssex/LA/Maldon.aspx?View=reports&ReportType=MALDON

Public Health Outcomes Framework Indicator 3.01 available at; http://www.phoutcomes.info/