

Subject: AIR QUALITY STATUS REPORT 2017

Report to: EMT, 25th May 2017;
Environment Committee, 12th June 2017

Report by: David Addy, Environmental Health Officer

SUBJECT MATTER/RECOMMENDATIONS

This report details Great Yarmouth's 2017 Air Quality Annual Status Report. This is an annual statutory report to Government on the state of local air quality in the Borough

Recommendation:

That the committee notes the Air Quality Annual Status Report 2017 and its contents.

1. INTRODUCTION/BACKGROUND

- 1.1 Great Yarmouth Borough Council must annually report on the status of the air quality in the Borough, as required by Part IV of the Environment Act 1995. The reporting format follows a standard national template.

2. THE 2017 REPORT

- 2.1 Overall, this Air Quality Annual Status Report has shown that air quality standards are being met, and should continue to be so for next 12 months.
- 2.2 The Council's detailed air quality monitoring programme gives the surety to vital decisions around transport, infrastructure, business, and housing development for the Borough.
- 2.3 A detailed assessment is not required for any pollutants and the Council will progress to the next Annual Status Report in 2018.

3. FINANCIAL IMPLICATIONS

- 3.1 There are no financial implications at present, as the monitoring and reporting work is within existing budget provision, and the Air Quality Objectives in England are being met.

4. RISK IMPLICATIONS

- 4.1 There are no risk implications at present, as the Air Quality Objectives in England are being met.

5. CONCLUSIONS

- 5.1 Overall, this Air Quality Annual Status Report has not revealed any exceedance of air quality standards and has not predicted any likely exceedance over the next 12 months.

6. RECOMMENDATIONS

- 6.1 That the committee notes the Air Quality Annual Status Report and its contents.

7. BACKGROUND PAPERS

APPENDIX 1 – Great Yarmouth Borough Council 2017 Air Quality Annual Status Report (ASR)

Area for consideration	Comment
Monitoring Officer Consultation:	No
Section 151 Officer Consultation:	No
Existing Council Policies:	No
Financial Implications:	No
Legal Implications (including human rights):	No
Risk Implications:	No
Equality Issues/EQIA assessment:	No
Crime & Disorder:	No
Every Child Matters:	No

APPENDIX 1



GREAT YARMOUTH
BOROUGH COUNCIL

2017 Air Quality Annual Status Report (ASR)

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

May 2017

Great Yarmouth Borough Council

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Executive Summary: Air Quality in Our Area

Overall, this Air Quality Annual Status Report has not revealed any exceedance of air quality standards and has not predicted any likely exceedance over the next 12 months.

The Outer Harbour remains in use for general bulk cargo and there are no plans to set up a container terminal. The Port is now owned by Peel Ports, who have been successful in securing contracts related to north sea offshore wind turbine construction and maintenance. The detailed assessment in 2010 recommended a watching brief and that position remains the same.

The Local Enterprise Zone for the South Denes peninsula, plus the Local Development Order covering this area, and small parts of Southtown and Gorleston, may attract in new industry over the coming years and with its relaxation of planning standards. Close liaison between Environmental Services and Planning departments is essential in early identification of new business that may impact on local air quality.

The large residential development and enterprise zone in Bradwell and South Gorleston is progressing, and the associated A12 – A143 link road (assessed as unlikely to have adverse impacts) is in use.

The dualling of the A47 between Acle and Great Yarmouth has no firm timescale for construction yet, though the A47 Alliance is applying for funding for it as a priority project with the 2020-25 period. Elsewhere the Great Yarmouth Third River Crossing (GYTRC) (between Southtown and the South Denes Peninsula) now has an intended scheme delivery of 2021/2023, with the design phase starting in 2018.

Highways England are currently exploring options to improve a number of A47 junctions in Great Yarmouth, including the Harfrey's Roundabout where the proposed GYTRC would join the A47. The Option Development stage is due to be completed later in 2016 with construction planned for 2020/21. Together the GYTRC and A47 junction improvements have the potential to significantly improve connectivity between the LDO / Enterprise Zone including port of Great Yarmouth, and the strategic road network.

These developments make it absolutely critical that the Council maintains it's type-approved real-time air quality monitoring, so that the data is available to support the design and planning stages of the third crossing, plus to monitor the real-world

operational phase. To this end the Council is commissioning a state-of-the-art replacement monitoring station during this 2017-18 financial year.

A detailed assessment is not required for any pollutants and the Council will progress to the next Annual Status Report in 2018.

Air Quality in Great Yarmouth Borough

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 billion³.

Great Yarmouth Borough Council's area is situated in the south east corner of Norfolk. It covers the area from Hopton-on-Sea in the south to Winterton-on-Sea in the north, a coastline of some 24 miles. The southern boundary follows the County boundary with Suffolk. To the west and north, the Borough is bounded by rivers of the Norfolk Broads including the Yare, Waveney, Bure and Thurne.

A mixed urban/rural area, the population of approximately 98,000 is concentrated in the urban centres of Great Yarmouth, Gorleston, Bradwell and Caister-on-Sea, with smaller communities in Hopton-on-Sea, Hemsby, Martham, Ormesby and Winterton on-Sea. In summer, the population doubles. The geology is gently undulating in the east on glacial tills with flat marshland adjacent to the Broadland rivers. The River Yare is the principal river of Broadland and this discharges to the North Sea at Great Yarmouth, forming a long narrow port area. There are a number of Sites of Special Scientific Interest and Breydon Water is considered an important international site with a RAMSAR designation.

Most land use outside the built up urban areas is given over to farming. This is predominantly arable farming although there are grazing marshes on the river flood

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

plains. Large areas adjacent to the coast are used in conjunction with tourism which is one of the main industries. The Port is the principal UK base for the Southern North Sea offshore oil and gas industry, plus it is becoming established as a centre for the construction and maintenance of offshore wind farms in the North Sea.

Actions to Improve Air Quality

The Borough does not have any Air Quality Management Areas, and so there is no action plan to improve air quality. However, the Council has taken a significant number of measures forward (see section 2) to improve air quality, and reduce the exposure of the public to adverse air quality.

Conclusions and Priorities

The aforementioned Great Yarmouth Third River Crossing (GYTRC) development makes it absolutely critical that the Council maintains its type-approved real-time air quality monitoring, so that the data is available to support the (2018) design and planning stages of the third crossing, plus to monitor the real-world operational phase. The challenge here is that the Council's air quality monitoring station is over 20 years old, has equipment and enclosure integrity failures, and the landowner required it to be removed from the site, which caused it to be decommissioned. The Council is therefore commissioning a state-of-the-art replacement monitoring station during this 2017-18 financial year, to continue its detailed air quality monitoring programme, which gives the surety to vital decisions around transport, infrastructure, business, and housing development for the Borough.

Local Engagement and How to get Involved

If people would like to find out more about air quality, and how they can contribute to improving it in their area, these links can provide further information:

- Defra's – UK Government – UK-Air website: <https://uk-air.defra.gov.uk/>
- Great Yarmouth Borough Council's historic (the old monitoring station has been decommissioned, to be replaced this 2017-18 financial year) real-time air quality (and meteorology) monitoring data: <http://www.wecare4air.co.uk/air-quality-data/great-yarmouth-bc-gorleston/>

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- Sustrans' 'CleanSpace' sustainable transport and air quality movement: <http://www.sustrans.org.uk/what-you-can-do/use-your-car-less/join-air-quality-movement> - the Council has bought some of the CleanSpace Tags mentioned on this site, for residents and staff in urban areas to trial. Please contact the report's author or your Neighbourhood Manager for more information. Media enquiries should be directed to the Council's Communications & Press Officer;
- 'Air Pollution' website – college/university level: <http://www.air-quality.org.uk/index.php>
- BBC 'Bitesize' – GCSE air quality: http://www.bbc.co.uk/schools/gcsebitesize/science/21c/air_quality/
- 'Clean Air Kids' – air quality website for children aged 5-11: <http://www.clean-air-kids.org.uk/index.html>
- Evolution of WHO air quality guidelines: past, present and future (2017) – report on the World Health Organisation's evolving advice: <http://www.euro.who.int/en/health-topics/environment-and-health/air-quality/publications/2017/evolution-of-who-air-quality-guidelines-past,-present-and-future-2017>

Please note that Great Yarmouth Borough Council does not have any control over the content of the above websites, and is not responsible for their content, which it does not necessarily endorse.

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1 Local Air Quality Management

This report provides an overview of air quality in Borough of Great Yarmouth during 2016 and 2017. 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 Great Yarmouth Borough 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 the objectives.

Great Yarmouth Borough Council currently does not have any AQMAs.

☒ **Great Yarmouth Borough 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 the Borough of Great Yarmouth

Defra's appraisal of last year's ASR concluded *"The report is well structured, detailed, and provides the information specified in the Guidance. The following comments are made:*

1. *The local authority has identified the need to consider PM2.5 and this is supported. In future reports they could outline how they plan to work together with Public Health to address this health issue.*
2. *It would be very useful to develop KPIs to include in Table 2.1 so that it obvious how the measures being taken to improve air quality are being assessed."*

Great Yarmouth Borough Council has taken forward a number of measures – both new and building on existing ones – during the current reporting year of 2016 which has helped to improve local air quality. Details of all measures completed, in progress or planned are set out in **Error! Reference source not found..** Key completed measures are:

- Formation of a Cycling Hub;
- Review of domestic bin presentation;
- Payment of cycling allowance to Council staff;
- Work bike scheme;
- Energy efficient new build housing;
- Replacement heating system;
- Switch off of streetlights;
- Replacement of streetlights with energy efficient units;
- Establishment of county wide air quality group;
- Promotion of town walks;
- Carbon reduction and fuel poverty;
- Bike & Go scheme at Gt Yarmouth railway station;
- Leisure centre upgrade (to the Marina Centre);

- Leisure centre upgrade (2nd) (to the Phoenix Pool & Gym);
- Establishment of joint working with Director of Public Health, GYBC & county wide air quality group;

Great Yarmouth Borough Council expects the following measure to be completed over the course of the next reporting year:

- 'Introduction and improvement of safe cycle route between train station and town centre', which is expected to reduce motor vehicle use and emissions, by promoting safe walking and cycle active travel.

Great Yarmouth Borough Council's Local Air Quality Management programme ties in with the priorities within the Council's 'The Plan 2015-2020', by:

- Helping businesses with timely, accurate advice on air quality;
- Safeguarding the health of the population, through ensure a suitable and sufficient air quality monitoring network and programme for now and the future, to meet the air quality objectives, and to reduce the exposure of people to potentially harmful air quality
- Consulting and maintaining a dialogue with Norfolk County Council Highways, and Highways England – which is essential as transport related air quality emissions have the greatest impact in health;
- Working with Planning Authorities and Developers, to ensure that air quality is considered in business, transport, industrial, retail, and residential developments.

Table 2.1 – 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	Formation of a Cycling Hub	Promoting Travel Alternatives	Promotion of cycling	GYBC	Completed	Completed	Individual take-up	N/A	Slow growth in take-up	Complete	Not significant take-up to date, scheme continues to be promoted, particularly with tourists
2	Review of domestic bin presentation	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	GYBC	Yes	Late February 2015	Reduction in collection vehicle miles	N/A	Planning phase	Autumn 2016	Initial thoughts are that this may remove one complete refuse vehicle
3	Payment of cycling allowance to Council staff	Alternatives to private vehicle use	Other	GYBC	Completed	Completed	Reduction in car mileage & take-up of scheme	N/A	Implemented	Complete	Small impact
4	Work bike scheme	Alternatives to private vehicle use	Other	GYBC	Completed	Completed	Reduction in car mileage & take-up of scheme	N/A	Implemented	Complete	Bikes regularly used by staff
5	Energy efficient new build housing	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	GYBC	Completed	Completed	Reduction in householder energy bills	N/A	Implemented	2015	Reduced energy bills for householders
6	Replacement heating system	Promoting Low Emission Plant	Public Procurement of stationary combustion sources	GYB Services	Completed	Completed	Reduction in energy bill	N/A	Implemented	2015	Reduced energy bill
7	Switch off of streetlights	Policy Guidance and Development Control	Other policy	GYBC	Completed	Completed	Reduction in energy bill	N/A	Implemented	2014	Reduced energy bills for the Council

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8	Replacement of streetlights with energy efficient units	Policy Guidance and Development Control	Low Emissions Strategy	GYBC	Completed	Completed	Reduction in energy bill	N/A	Planned long term replacement scheme	2018	Reduced energy bills
9	Establishment of county wide air quality group	Policy Guidance and Development Control	Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	Joint partnership	Completed	Completed	Better air quality in Norfolk	N/A	Implemented	Ongoing	Shared ideas & feeding into County Council policies on transportation & air quality
10	Work place parking levy	Promoting Travel Alternatives	Workplace Travel Planning	GYBC	Yes	Autumn 2015	Reduction in car use	N/A	Planning phase	Autumn 2015	Reduced vehicle commuting
11	Promotion of town walks	Promoting Travel Alternatives	Promotion of walking	GYBC	Completed	Completed	Reduction in vehicle use in town	N/A	Implemented	Ongoing	Reduction in vehicle use
12	Carbon reduction and fuel poverty	Policy Guidance and Development Control	Other policy	GYBC	Completed	Completed	Reduction in energy bills	N/A	Implemented	Ongoing	Reduction in energy bills for householders
13	Energy efficiency advice & links on GYBC website	Public Information	via the Internet	GYBC	Completed	Completed	Reduction in energy use for residents and businesses	N/A	Implemented	2010	Advice for residents & businesses
14	Bike & Go scheme at Gt Yarmouth railway station	Promoting Travel Alternatives	Promotion of cycling	Abellio Greater Anglia	Completed	Completed	Reduction in vehicle use in town	N/A	Implemented	2014	Reduction in vehicle emissions

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15	Leisure centre upgrade	Policy Guidance and Development Control	Low Emissions Strategy	GYBC	Yes	Completed	Reduction in energy bill	N/A	Implemented	2015	Reduced energy usage
16	Leisure centre upgrade	Policy Guidance and Development Control	Low Emissions Strategy	GYBC	Yes	Completed	Reduction in energy bill	N/A	Implemented	2016	Reduced energy usage
17	Leisure centre upgrade	Policy Guidance and Development Control	Low Emissions Strategy	GYBC	Preparation	2019	Reduction in energy bill	N/A	Preparation Phase	2019	Reduced energy usage
18	Introduction and improvement of safe cycle route between train station and town centre	Promoting Travel Alternatives	Promotion of cycling	Norfolk County Council	Completed	2017	Reduction in vehicle use in town	N/A	Planning phase	2017	Reduction in vehicle emissions
19	Introduction and improvement of safe cycle route between train station and town centre	Promoting Travel Alternatives	Promotion of walking	Norfolk County Council	Completed	2017	Reduction in vehicle use in town	N/A	Planning phase	2017	Reduction in vehicle emissions
20	Removal of unnecessary streetlights	Policy Guidance and Development Control	Other policy	GYB Services	Completed	Completed	Reduction in energy bill	N/A	Implemented	2020	Reduced energy bills for the Council

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21	Establishment of joint working with Director of Public Health, GYBC & county wide air quality group	Policy Guidance and Development Control	Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	Joint partnership	Completed	Completed	Better air quality in Norfolk	N/A	Implemented	Ongoing	Shared ideas & feeding into County Council policies on transportation, air quality & public health
22	Construction of third road river crossing in Great Yarmouth	Transport Planning and Infrastructure	Other	Norfolk County Council	Preparation	2020	Reduction in vehicle use in town & better air quality	N/A	Preparation Phase	2022	The County and the Borough Councils are working on the business case

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.

Great Yarmouth Borough Council is taking the following measures to address PM_{2.5}:

- Reviewing our air quality monitoring arrangements: we consider that it would be beneficial to accurately measure and monitor the ambient atmospheric concentrations of PM_{2.5} within the Borough of Great Yarmouth, in order to be aware what concentrations our residents and visitors are exposed to, and also to enable us to work effectively to our exposure reduction targets. To this end, the Council is purchasing a new real time monitoring station so that we can start PM_{2.5} monitoring during this 2017-18 financial year;
- The Council is working through the Norfolk Environmental Protection Group's (NEPG) Air Quality Sub-Group, to ensure regular two-way engagement with representatives of Public Health England, and the Director of Public Health at Norfolk County Council;
- The Council has started a programme to encourage active travel, exercise, healthy choices, and avoidance of areas of poor air quality by residents and staff within the urban areas, and to produce some useful air quality data. This has been done by allocating out CleanSpace Tags via the Council's Neighbourhood Managers. The Office of Norfolk's Director of Public Health is interested in working with the Council, and so has applied for funding to get more Tags based upon what we are doing.
- The Council will also be meeting and working with the Director of Public Health's Office to help imbed air quality within their work, their Joint Strategic Needs Assessment, to ensure that it is discussed at the Norfolk Health and Wellbeing Board, and to ideally provide data to improve the Public Health Outcomes Framework indicator 3.01 'Fraction of mortality attributable to particulate air pollution' estimate;

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- The Council is looking to work directly with Public Health England following an active travel and air quality workshop proposed for the 15th of June;
- The Council has direct dialogue with Officers of Norfolk County Council Highways, and also through the NEPG Air Quality Subgroup, on proposed significant changes to highways and traffic flows in the Borough, when possible improvements to PM_{2.5} exposure will also be considered;
- Also the Council's measures from section 2.2 and 'Table 2.2 – Progress on Measures to Improve Air Quality' above, also contribute to reducing PM_{2.5} emissions and/or exposure.

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

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

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

Great Yarmouth Borough Council undertook automatic (continuous) monitoring of nitrogen dioxide, particulate matter, and ozone at one site in Gorleston during 2016. Albeit particulate monitoring finished on the 27th of March 2016, and nitrogen dioxide and ozone monitoring finished on the 27th of October 2016; the former was due to equipment failure, and the latter was due to the landowner requiring removal of the monitoring station. Table A.1 in Appendix A shows the details of the site.

NB. Great Yarmouth Borough Council does not report on sulphur dioxide (SO₂), as previous assessments have shown that concentrations are so low that there is no need to monitor. Local authorities do not have to report annually on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead, unless local circumstances indicate there is a problem. National monitoring results are available at <https://uk-air.defra.gov.uk/interactive-map>

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

3.1.2 Non-Automatic Monitoring Sites

Great Yarmouth Borough Council undertook non-automatic (passive) plastic diffusion tube monitoring of NO₂ at 12 sites during 2016. Table A.2 in Appendix A shows the details of the sites.

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

3.2 Individual Pollutants

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

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 40µg/m³.

For diffusion tubes, the full 2016 dataset of monthly mean values is provided in Appendix B.

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 200µg/m³, not to be exceeded more than 18 times per year. There were no exceedances of either the annual, or hourly air quality objectives here, with an improving trend for the annual mean objective, and the hourly objective unchanged at 0 exceedances.

3.2.2 Particulate Matter (PM₁₀)

Table A.5 in Appendix A compares the ratified and adjusted monitored PM₁₀ annual mean concentrations for the past 5 years with the air quality objective of 40µg/m³.

Table A.6 in Appendix A compares the ratified continuous monitored PM₁₀ daily mean concentrations for the past 5 years with the air quality objective of 50µg/m³, not to be exceeded more than 35 times per year.

There were no exceedances of either the annual, nor 24 hour mean air quality objectives here, with an improving trend for both.

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)	Distance to kerb of nearest road (m)	Inlet Height (m)
CM1	Gorleston	Urban background	652498	305600	PM10	N	BAM	5	25	3
					Ozone	N	UV Photometer			
					Nitrogen Dioxide	N	Chemiluminescence			

Table A.2 – Details of Non-Automatic (diffusion tube) Monitoring Sites (including historic sites 2011-2015)

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)
DT1	12 Bridge Road	Roadside	TG52053	8188	NO2	NO	0	4	NO	3
DT2	44 North Quay	Roadside	TG52079	7828	NO2	NO	0	2	NO	2.5
DT3	60 North Quay (upper)	Roadside	TG52104	7665	NO2	NO	0	1	NO	3
DT5	110 South Quay	Roadside	TG52520	6862	NO2	NO	0	6	NO	3
DT6	9 Southgates Road	Roadside	TG52569	6537	NO2	NO	0	3	NO	3
DT7	41 Southgates Road	Roadside	TG52611	6223	NO2	NO	0	2	NO	3
DT4	Southtown Road Junction	Roadside	TG52092	7419	NO2	NO	0	2	NO	3
DT8	Maltings House, Gorleston	Urban Background	TG 52492	5612	NO2	NO	5	26	YES	2.5
DT8	Maltings House, Gorleston	Urban Background	TG 52492	5612	NO2	NO	5	26	YES	2.5
DT8	Maltings House, Gorleston	Urban Background	TG 52492	5612	NO2	NO	5	26	YES	2.5
DT9	81 North Quay	Roadside	TG52066	7874	NO2	NO	0	3	NO	3
DT3	60 North Quay (lower)	Roadside	TG52104	7665	NO2	NO	0	1	NO	2

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DT10	1 South Quay	Roadside	TG52326	7376	NO2	NO	0	3	NO	1.5
DT11	25 South Quay	Roadside	TG52490	7174	NO2	NO	0	4	NO	2
DT12	Pasteur Road	Roadside	651993	307370	NO2	NO	14.5	9	NO	1.5

Table A.3 – Annual Mean NO₂ Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2016 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2012	2013	2014	2015	2016
CM1	Urban Background	Automatic	99.8	81.9	18.8	18.2	17.1	16.8	14.5
DT1	Roadside	Diffusion Tube	100	100	25.8	22.1	22	21.9	21.1
DT2	Roadside	Diffusion Tube	100	100	24.8	23.95	24.1	22.5	21.2
DT3	Roadside	Diffusion Tube	100	100	25.6	25.4	26.9	25.4	24.4
DT5	Roadside	Diffusion Tube	100	100	25.1	25.31	23.5	23.8	22.9
DT6	Roadside	Diffusion Tube	100	100	26.4	25.81	25.6	24.4	22.2
DT7	Roadside	Diffusion Tube	100	100	23.8	20.84	22.9	20.9	20.3
DT4	Roadside	Diffusion Tube	91.7	91.7	38.8	37.48	37.8	37.4	33.2
DT8	Urban Background	Diffusion Tube	100	100	18.5	18.15	17.8	16	17.7
DT8	Urban Background	Diffusion Tube	100	100	18.3	14.27	16.9	16.3	17.7
DT8	Urban Background	Diffusion Tube	100	100	17.8	17.18	15.4	15.7	17.1
DT9	Roadside	Diffusion Tube	83.3	83.3	20	20.21	18.7	19.9	18.5
DT3	Roadside	Diffusion Tube	N/A	N/A	<u>27.7</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
DT10	Roadside	Diffusion Tube	75	75	<u>33.2</u>	<u>33.97</u>	<u>30.6</u>	<u>32.8</u>	<u>33.7</u>
DT11	Roadside	Diffusion	100	100	<u>28.8</u>	<u>N/A</u>	<u>N/A</u>	<u>31.6</u>	<u>27.4</u>

		Tube							
DT12	Roadside	Diffusion Tube	25	25	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>24.9</u>

☒ Diffusion tube data has been bias corrected

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

☒ If applicable, all data has been distance corrected for relevant exposure

Notes:

Exceedances of the NO₂ annual mean objective of 40µg/m³ 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 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.

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

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2016 (%) ⁽²⁾	NO ₂ 1-Hour Means > 200µg/m ³ ⁽³⁾				
					2012	2013	2014	2015	2016
CM1	Urban Background	Automatic	99.8	81.9	0	0	0	0	0 (80.5)

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 85%, 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⁾	PM ₁₀ Annual Mean Concentration (µg/m ³) ⁽³⁾				
				2012	2013	2014	2015	2016
CM1	Urban Background	94.3	22.4	19.9	20.7	16.6	16.8	15.5

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

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 Boxes 7.9 and 7.10 in 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 ID	Site Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2016 (%) ⁽²⁾	PM ₁₀ 24-Hour Means > 50µg/m ³ ⁽³⁾				
				2012	2013	2014	2015	2016
CM1	Urban Background	94.3	22.4	3 (30.6)	8	4	0	0 (14.9)

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 85%, the 90.4th percentile of 24-hour means is provided in brackets.

Appendix B: Full Monthly Diffusion Tube Results for 2016

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

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 (0.83) and Annualised ⁽¹⁾	Distance Corrected to Nearest Exposure ⁽²⁾
DT1 - 12 BRIDGE ROAD	30.2	27.8	18.0	23.3	27.4	18.6	24.1	22.5	29.1	17.3	27.0	40.2	25.5	21.1	21.1
DT2 - 44 NORTH QUAY	26.3	27.3	22.8	27.4	27.1	23.4	20.9	20.1	30.3	22.8	26.4	32.1	25.6	21.2	21.2
DT3 - 60 NORTH QUAY	29.87	27.99	25.23	30.57	33.68	30.74	23.76	22.75	36.55	25.06	32.53	33.4	29.3	24.4	24.4
DT5 - 110 SOUTH QUAY	26.26	27.86	27.76	30.3	28.62	27.02	23.43	24.34	30.81	24.1	28.22	32.77	27.6	22.9	22.9
DT6 - 9 SOUTHGATES ROAD	28.4	28.22	25.59	26.36	28.6	25.61	22.94	20.09	31.32	23.67	27.75	33.05	26.8	22.2	22.2
DT7 - 41 SOUTHGATES ROAD	27.66	27.27	24.32	24.31	27.88	23.99	20.12	16.55	25.79	19.97	26.53	29.14	24.5	20.3	20.3
DT4 - SOUTHTOWN ROAD	41.12	41.7	33.42	33.3	41.42	44.6	38.93	35.86	-	41.01	41.19	47.54	40.0	33.2	33.2
DT8 - MALTINGS HOUSE	22.7	23.5	18.4	17.5	17.6	15.7	15	12.2	18.9	14.9	22.7	27.9	18.9	15.7	17.7

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DT8 - MALTINGS HOUSE	21.6	21.6	19.1	16.8	18	16.2	14.6	13.1	20.5	15.9	22.4	27.7	19.0	15.7	17.7
DT8 - MALTINGS HOUSE	19	21.1	19.1	16.4	18.1	15.3	14.8	11.5	19.3	15.6	22.6	27.4	18.3	15.2	17.1
DT9 - 81 NORTH QUAY	24.43	23.96	19.83	24.03	22.3	-	17.72	15.2	22.04	-	25.55	28.1	22.3	18.5	18.5
DT10 - 1 SOUTH QUAY		34.78	32.6	47.84	43.24	44.13	40.53	36.23	-	41.91	44.05	-	40.6	33.7	33.7
DT11 - 25 SOUTH QUAY	34.91	35.28	26.67	38.23	34.06	31.37	30.47	27.96	27.72	32.03	38.06	39.22	33.0	27.4	27.4
DT12 - PASTEUR ROAD	-	-	-	-	-	-	-	-	-	29.96	31.27	34.82	32.0	26.6	24.9

☒ Local bias adjustment factor used

☐ National bias adjustment factor used

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

Notes:

Exceedances of the NO₂ annual mean objective of 40µg/m³ 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: Supporting Technical Information / Air Quality Monitoring Data QA/QC

QA/QC of Diffusion Tube Monitoring

The diffusion tubes are supplied by Gradko Environmental, part of Gradko International Ltd. They consist of 20% TEA (Triethanolamine) in deionised water. Once received by post the tubes are stored in a refrigerator until required. Once the tubes have been placed in their holders, the end caps are removed and the tubes exposed for a month. At the end of the period the tubes are recapped and retrieved and stored in the refrigerator until returned by post to the laboratory for analysis. A travel blank is used. This travels everywhere with the exposed tubes but is not itself exposed. It is stored in the refrigerator and sent for analysis with the exposed tubes. Its purpose is to check on contamination of the tubes.

Gradko International is accredited by UKAS for the analysis of NO₂. Gradko also take part in the AIR NO₂ Proficiency Testing Scheme on a quarterly basis. Their AIR results over the last twelve rounds of testing gave 100% laboratory performance in terms of the accuracy and precision of results (Summary of Laboratory Performance in AIR NO₂ Proficiency Testing Scheme (April 2015 – February 2017))

Diffusion Tube Bias Adjustment Factors

The National bias adjustment factor for the period was 0.94 (Spreadsheet Version 2 3/17)

Factor from Local Co-location Studies

The Borough Council has co-located three diffusion tubes with its continuous air quality monitors. The site is set up as an urban background site. From the co-location study the local bias adjustment factor derived is 0.83 for 12 months of data – 10 of which the continuous monitor was running – as detailed in Figure C.1 below.

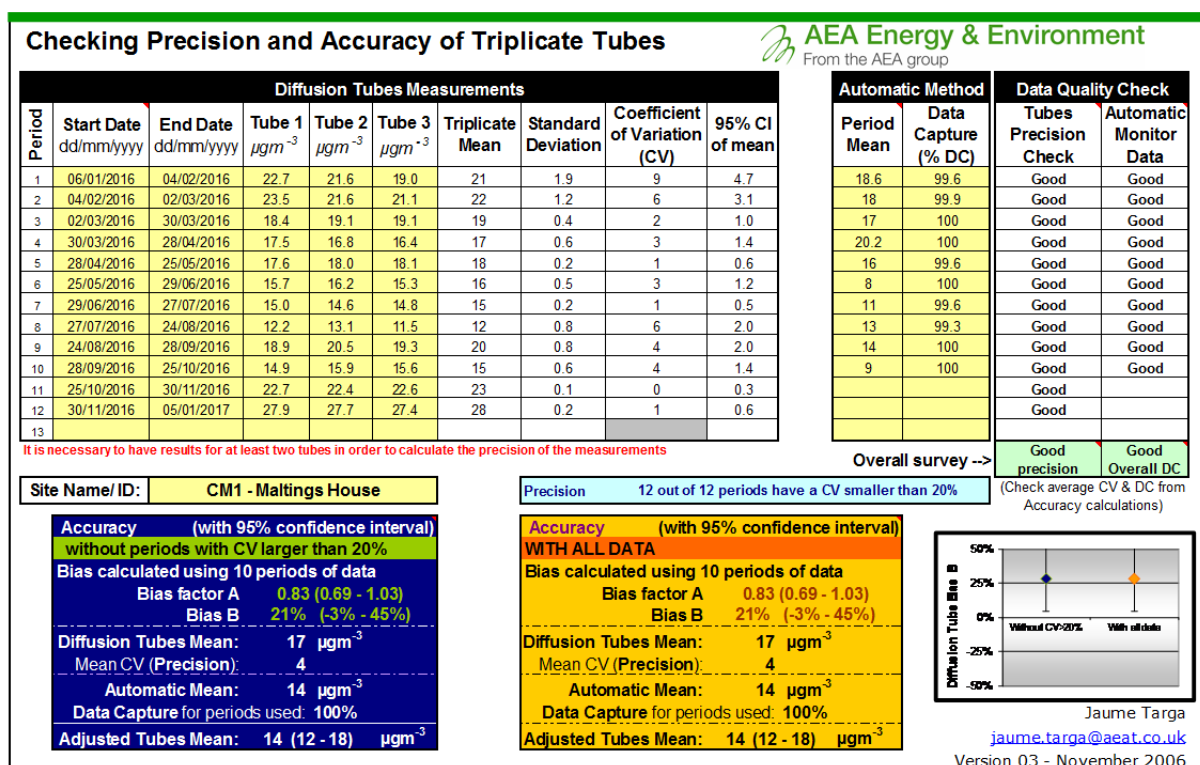


Figure C.1 Derivation of Local Bias Adjustment Figure

Discussion of Choice of Factor to Use

The Borough Council has used the local bias adjustment figure of 0.83 as the bias adjustment factor. The national factor for 2016 is quite similar. There is a preference to use a local factor due to the following:

- The co-location of triplicate tubes alongside the continuous monitoring site;
- There is greater than 9 months of data; and,
- It is considered the local bias adjustment factors will be most representative of the local conditions.

QA/QC of automatic monitoring

The automatic monitors are maintained in accordance with the manufacturer's recommendations. The Council has a maintenance contract with ET who took over the maintenance contract the Council had enjoyed for many years from the original manufacturers of the equipment, Casella. The site was routinely visited by ET every six months for routine maintenance and the contract allows for a 48hour response to emergency call out situations.

Automatic calibrations of the NO₂ analyser are carried out daily. BOC specialist calibration gases are used to obtain span values and instrumental drift is accounted for during the processing of the data. Data processing and handling is provided by

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WeCare4Air who took over the original data handling contract the Council had for many years with Casella, then briefly Supporting U. Regular check calibrations and inlet filter changes are also carried out by local Council personnel.

The BAM unit was also maintained as part of the servicing contract with local Council personnel carrying out tape changes approximately every two months (when operational).

All site visits are recorded in the site log and describe adjustments, repairs, problems encountered etc. Following scheduled service visits reports are issued by the engineers.

PM Monitoring Adjustment

The Met-One BAM PM monitoring unit utilised an unheated inlet and meets the equivalence criteria for PM10 provided the results are corrected for slope.

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

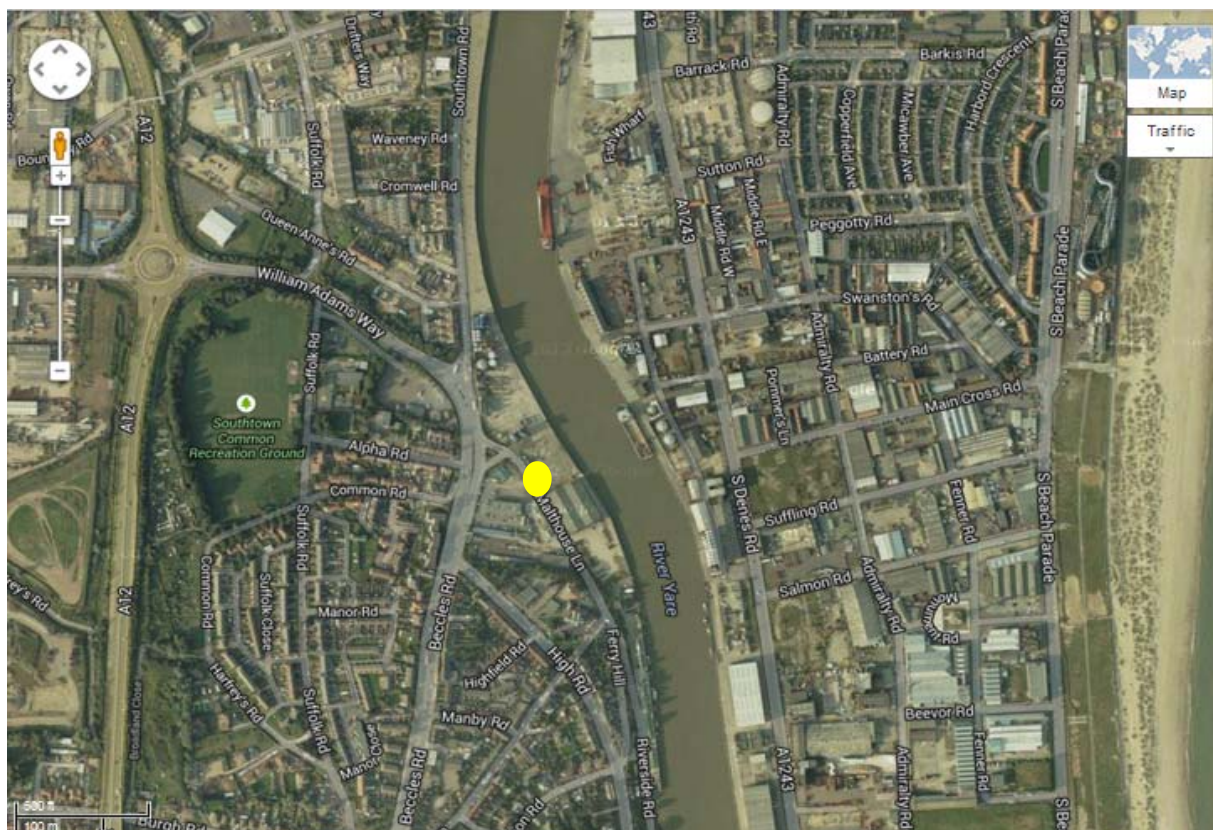


Figure D.1 Location of the Automatic Air Quality Monitoring Station

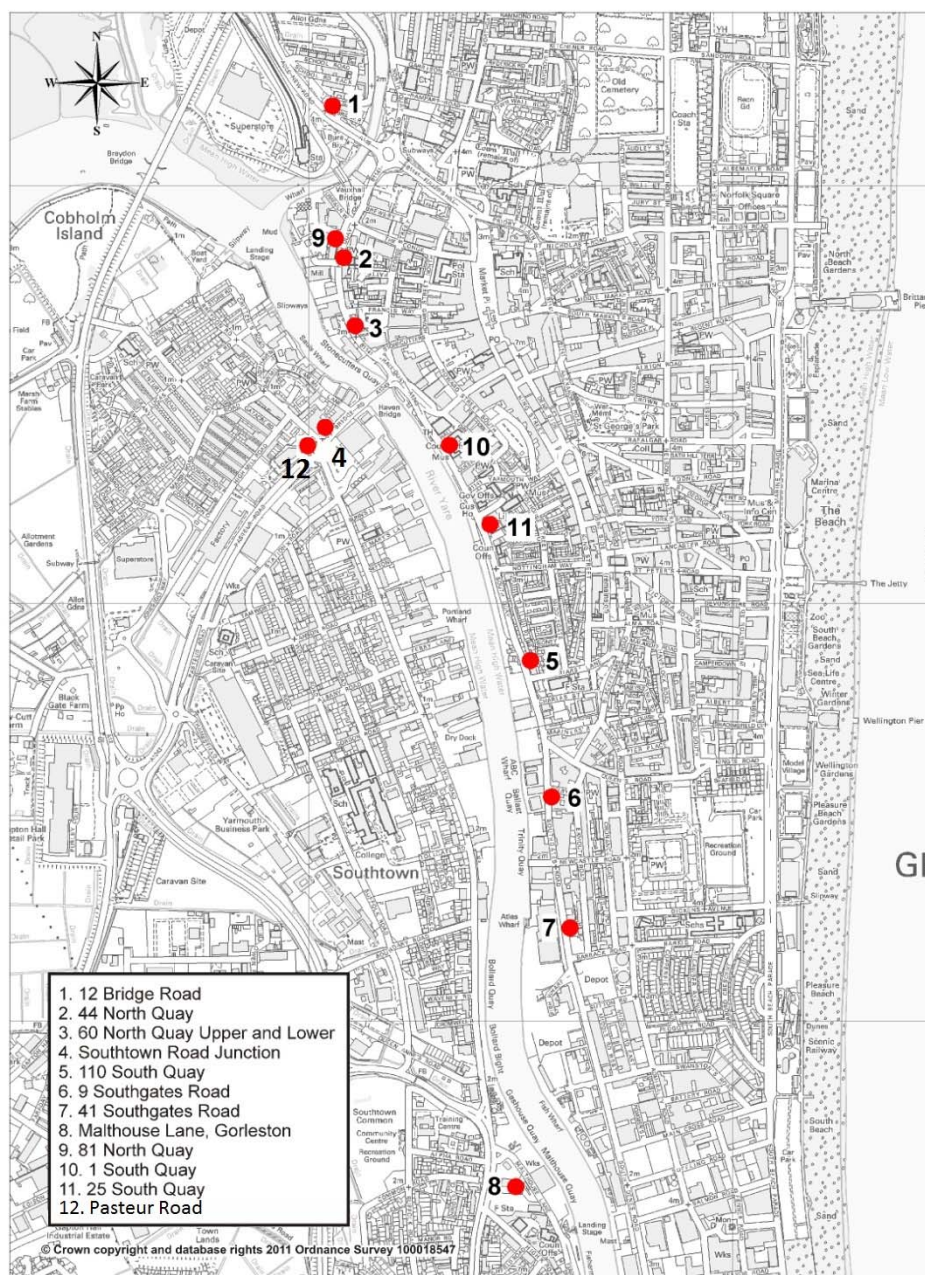


Figure D.2 Map(s) of Non-Automatic Monitoring Sites

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

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

Glossary of Terms

Abbreviation	Description
AIR	Independent analytical proficiency-testing scheme by LGC Ltd. and the Health and Safety Laboratory (HSL)
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
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EU	European Union
FDMS	Filter Dynamics Measurement System
GYTRC	Great Yarmouth Third River Crossing
LAQM	Local Air Quality Management
NEPG	Norfolk Environmental Protection Group
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxides
PM ₁₀	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
PM _{2.5}	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO ₂	Sulphur Dioxide
TEA	Triethanolamine: the reagent used in diffusion tubes as an absorbent for ambient NO ₂

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