IPSWICH
BOROUGH COUNCIL

2017 Air Quality Annual Status Report (ASR)

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

June, 2017

Local Authority Officer	Andrew Loosley
Department	Environmental Protection
Address	Grafton House, 15-17 Russell Road, Ipswich, IP1 2DE
Telephone	01473 433 115
E-mail	andrew.loosley@ipswich.gov.uk
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Executive Summary: Air Quality in Our Area

Air Quality in Ipswich 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 billion[3].

In order to comply with its duty to review the air quality within its area, Ipswich Borough Council monitors nitrogen dioxide (NO_2) levels within the town using a total of 85 diffusion tubes positioned at carefully selected locations across the borough. Changed and analysed on a monthly basis, the data from these tubes provides a measure of how nitrogen dioxide levels vary over time and is used to calculate an annual mean concentration at each monitoring location. Once corrected for experimental bias and adjusted to take into account the location of the tubes relative to any likely human exposure, these annual values should not exceed the national air quality objective level of 40µg/m^3. In the event that this level is, or is likely, to be exceeded on a consistent basis Local Authorities have a legal duty to declare an Air Quality Management Area (AQMA) encompassing the relevant locations. Both nationally and locally the main source of high levels of nitrogen dioxide is road transport.

To date, Ipswich Borough Council has declared four AQMAs:

- *Ipswich AQMA No.1* - The land in or around the junction of Norwich Road, Chevallier Street and Valley Road (declared in 2006);

[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

- *Ipswich AQMA No. 2* - The land in or around the junction of Crown Street, Fonnereau Road, St Margaret's Street and St Margaret's Plain (declared in 2006);
- *Ipswich AQMA No. 3* - The land in or around the junction of Grimwade Street, St Helen's Street, and the Star Lane gyratory system – including Fore Street, Salthouse Street, Key Street, College Street, Bridge Street, Foundation Street and Slade Street (declared in 2006); and
- *Ipswich AQMA No. 4* - Part of the Bramford Road and Chevallier Street junction (declared in 2010).

Further information on the above AQMAs (including maps showing their location and boundaries) is available on Ipswich Borough Council's AQMA webpage on the DEFRA website – https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=133.

Since these AQMAs were declared subsequent monitoring data would appear to indicate that some of the locations within the borough that exceed the air quality objective level for nitrogen dioxide have changed over time. Consequently, consistent with the priority *"to consider the most recent monitoring information and to determine any changes to the existing AQMAs"* identified in last year's *Air Quality Annual Status Report* (ASR), Ipswich Borough Council is currently consulting on making changes to its AQMAs. Recommended in the *2015 Air Quality Detailed Assessment for Ipswich Borough* (http://tinyurl.com/y78nypla), if implemented the proposals being consulted on would slightly amend three of the existing AQMAs (#1, #2 and #3) as well as declare a new fifth AQMA along St. Matthew's Street and Norwich Road between the Civic Drive roundabout and Bramford Road.

Again, as highlighted in last year's ASR, the adoption of these changes will in turn require Ipswich Borough Council to develop a new Air Quality Action Plan in co-operation with Suffolk County Council and other stakeholders.

Although not immediately apparent from looking at the raw data, as discussed in detail in Appendix F, a recent analysis of long term trends in annual average nitrogen dioxide concentrations within Ipswich concluded that in general levels are falling.

Ipswich Borough Council is a member of the Suffolk Air Quality Management Group which includes all of the Suffolk local authorities.

Actions to Improve Air Quality

In December 2016, Ipswich Borough Council re-commenced automatic (continuous) nitrogen dioxide monitoring after a 2 year hiatus.

In addition to this, the past year has also seen the initiation of a review of the boundaries of the Borough's AQMAs and the completion of the final aspects of the *Travel Ipswich* scheme of major traffic improvements.

Conclusions and Priorities

The nitrogen dioxide diffusion tube data for 2016 shows that the national air quality objective for mean annual NO_2 concentrations was exceeded at 11 of Ipswich Borough Council's 74 monitoring locations. 4 of these exceedances were observed at sites within existing AQMAs. However, with a further 6 occuring at locations that would fall within an AQMA should the changes proposed in the 2015 Detailed Assessment be implemented, the monitoring results would appear to vindicate the Council's decision to approve the detailed assessment report and consult on its recommendations.

Over the coming year Ipswich Borough Council's air quality priorities will be to complete the review of its AQMA boundaries and to commence work on a new Air Quality Action Plan.

Local Engagement and How to get Involved

More information on air quality within Ipswich is available on the Ipswich Borough Council *Air Quality Management* website (http://tinyurl.com/mzjsurv).

If you have any specific questions or concerns, or if you would like to make suggestions on possible improvements and/or supply additional air quality information, please contact Environmental Health at Ipswich Borough Council on 01473 433 115 or environmental.health@ipswich.gov.uk.

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1 Local Air Quality Management

This report provides an overview of air quality in Ipswich Borough 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 Ipswich 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 compliance with the objectives.

A summary of AQMAs declared by Ipswich Borough Council can be found in Table 2.1. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at http://uk-air.defra.gov.uk/aqma/local-authorities?la_id=133 – see full list at http://uk-air.defra.gov.uk/aqma/list. 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 AQMA(s).

Ipswich Borough Council is currently consulting on the implementation of the recommendations of the *2015 Air Quality Detailed Assessment for Ipswich Borough* (http://tinyurl.com/y78nypla), which proposed:

- the amendment of three of the four existing AQMAs (#1, #2 and #3); and
- the declaration of a new fifth AQMA along St. Matthew's Street and Norwich Road between the Civic Drive roundabout and Bramford Road.

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 (inc. date of publication)
						At Declaration	Now	
AQMA No.1	Declared 11/04/2006	NO_2 Annual Mean	Ipswich	The land in or around the junction of Norwich Road, Chevallier Street and Valley Road	NO	50 µg/m^3	47 µg/m^3	Ipswich Air Quality Action Plan 2008 http://tinyurl.com/ybu3ys9d
AQMA No.2	Declared 11/04/2006	NO_2 Annual Mean	Ipswich	The land in or around the junction of Crown Street, Fonnereau Road, St Margaret's Street and St Margaret's Plain	NO	45 µg/m^3	47 µg/m^3	Ipswich Air Quality Action Plan 2008 http://tinyurl.com/ybu3ys9d

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 (inc. date of publication)
						At Declaration	Now	
AQMA No.3	Declared 11/04/2006	NO_2 Annual Mean	Ipswich	The land in or around the junction of Grimwade Street, St Helen's Street, and the Star Lane gyratory system - including Fore Street, Salthouse Street, Key Street, College Street, Bridge Street, Foundation Street and Slade Street	NO	50 µg/m^3	46 µg/m^3	Ipswich Air Quality Action Plan 2008 http://tinyurl.com/ybu3ys9d
AQMA No.4	Declared 14/12/2010	NO_2 Annual Mean	Ipswich	The land in or around the junction of Bramford Road, Yarmouth Road, and Chevallier Street, and part of Chevallier Street	NO	55 µg/m^3	37 µg/m^3	Ipswich Air Quality Action Plan 2008 http://tinyurl.com/ybu3ys9d

☒ **Ipswich 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 Ipswich Borough

Defra's appraisal of last year's ASR concluded that:

> *"On the basis of the evidence provided by the local authority the conclusions reached are acceptable for all sources and pollutants.*
>
> *The next step for Ipswich Borough Council is to review the current AQMAs and make any required adjustments or declarations, pending the review of the detailed assessment submitted earlier this year. Following this, the Council should update the AQAP. Details of the reviewed AQMAs and AQAP should be included in the next Annual Status Report, to be submitted in 2017."*

In accordance with these recommendations, following the approval of the *2015 Air Quality Detailed Assessment for Ipswich Borough* (http://tinyurl.com/y78nypla) by the Council Executive on 29 November 2016, it was resolved that the proposed changes to the AQMAs should be subject to public consultation. As this consultation is still ongoing and the recommended changes are not due to return to Executive for further consideration and potential approval until September 2017, it has not been possible to include finalised details of the reviewed AQMAs and AQAP in this year's report as suggested.

Ipswich Borough Council has taken forward a number of direct measures during the current reporting year of 2017 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2.

More detail on these measures can be found in the *Ipswich Air Quality Action Plan* [http://tinyurl.com/ybu3ys9d] or on the *Travel Ipswich* website [http://tinyurl.com/jvw9we6]. Furthermore, details of additional supporting documents can be found in the References section at the end of this report.

The key completed measures during the last 12 months have been the finalisation of outstanding aspects of the *Travel Ipswich* scheme.

Ipswich Borough Council's priorities for the coming year are:

- To complete the review of its AQMA boundaries;
- To undertake source apportionment to better understand the cause of the Borough's mean annual nitrogen dioxide exceedances;
- To establish an Air Quality Steering Group to drive the development and implementation of a new Air Quality Action Plan for Ipswich; and
- To establish a closer working relationship with Public Health colleagues, with a particular focus on achieving a better understanding of the relevance of the potential risks posed by $PM_{2.5}$.

The principal challenges and barriers to implementation that Ipswich Borough Council anticipates facing are related to limitations on the level of dedicated resource available for air quality management activities.

During the course of the last year, progress on the review of the AQMA boundaries has been slower than was expected at the time of the last ASR. This has primarily been due to a lack of available resources delaying consultation on the proposed changes.

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, Ipswich Borough Council anticipates that further additional measures not yet prescribed will be required in subsequent years to achieve compliance and enable the revocation of all of its current and proposed AQMAs.

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
1a	Urban Traffic Management Control (UTMC)	Traffic Management	UTC, Congestion management, traffic reduction	Suffolk County Council	This is a major component of the Travel Ipswich Major Scheme	Construction during 2012 - 2015	Traffic to be controlled to reduce congestion and reduce idling	Not classified	Completed	Apr-17	
1b	Bus Stop Improvements	Transport Planning and Infrastructure	Public transport improvements-interchanges stations and services	Suffolk County Council	2011	Completed	Promotion of sustainable travel.	Not classified	Completed	2017	
2	Clean Bus Technology Fund	Vehicle Fleet Efficiency	Vehicle Retrofitting programmes	Suffolk County Council	Ongoing as funding bids become available	Completed	Reduced vehicle emissions	Not classified	Ongoing		
3	Low Emissions Strategy SPD	Policy Guidance and Development Control	Low Emissions Strategy	Ipswich Borough Council	Commenced June 2017	2017	Mitigation of air quality impacts of new development	Not classified	Planning	2017	
4a	Cycling SPD	Policy Guidance and Development Control	Other policy	Ipswich Borough Council	2015	Completed July 2016			Planning	2017	
4b	Suffolk Cycling Strategy	Promoting Travel Alternatives	Promotion of cycling	Suffolk County Council	N/A	2015	Suffolk Transport Delivery Plan	Not classified	Ongoing	N/A	Subject to periodic review

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
5	Suffolk Walking Strategy	Promoting Travel Alternatives	Promotion of walking	Suffolk County Council	N/A	2015	Reverse the trend of walking less (10% fall in walking between 2003 and 2012)	N/A	77% of the population of Suffolk are walking at least once a week for a minimum duration of 10 minutes (0.4% above the national average - DFT 2012/13)	2020	Review outcomes at the end of the period.
6	Green Travel Planning	Promoting Travel Alternatives	Other	Ipswich Borough Council / Suffolk County Council		For new development, changes of use of buildings or land, and alterations to existing buildings, the transportation and accessibility outcomes of development needs to be set out as part of a planning submission.	Encouraging sustainable travel	Not classified	Ongoing	N/A	This is an ongoing commitment.

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
7	Greener Travel information available on the Suffolk County Council website	Public Information	Via the Internet	Suffolk County Council	N/A	Implemented	Number of hits	N/A	Ongoing	N/A	Sign posting function with links to travel plan and alternative modes of transport support
8	CATCH! - Home to/from School	Transport Planning and Infrastructure	Other	Ipswich Borough Council / Suffolk County Council	Detailed design March 2017	Ongoing until winter 2017		Not classified	Planning	2017	

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.

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

- The Suffolk Air Quality Group, of which Ipswich Borough Council is a member, has engaged Suffolk County Council (SCC) Public Health and Protection in order to move forward together with regard to $PM_{2.5}$. A meeting with the SCC Consultant in Public Health in September 2016 allowed discussions to begin. Following this meeting, SCC committed to pulling together Suffolk-wide information on items that will impact on $PM_{2.5}$ by reducing the use of motor vehicles, such as cycling and walking. This is with a view to identify areas where improvements are needed so that we can focus our efforts for maximum effect. This will not only assist with air quality but also with the more general health agenda – getting people to take more exercise.

  A recent update from SCC confirmed that this work is currently ongoing with the DEFRA *Directors of Public Health Air Quality Toolkit* being used to develop a framework for evaluating the air quality situation within Suffolk. It is envisaged that this work will feed into the Joint Strategic Needs Assessment (JSNA) process. SCC is due to report on progress at the next full meeting of the Suffolk Air Quality Group in September 2017.

- Again, looking to address $PM_{2.5}$ through the promotion of modal shift to more suitable active travel, on 27 July 2016 Ipswich Borough Council adopted a new *Cycling Strategy Supplementary Planning Document* (SPD) [http://tinyurl.com/y7wag62m]. Supporting Ipswich's Core Strategy Policies, the new SPD provides detailed guidance in relation to designing cycle routes and infrastructure as part of new development. The document also identifies potential improvements for cycling throughout Ipswich.

- Looking to achieve further improvements in air quality via the SPD route, Ipswich Borough Council's Planning Policy Team is currently conducting a call for ideas consultation on the preparation of a Low Emissions Strategy SPD. Although at an earlier stage of development, it is envisaged that the finalised document will provide consistency in the approach to dealing with air quality and planning in Ipswich. Specifically, it will provide guidance on measures that can be implemented to mitigate the potentially harmful impacts of new developments (e.g. in terms of increased vehicles and congestion or heating of homes) considering measures such as the use and types of vehicles, the role of walking, cycling and public transport, boiler types, and the role of trees and hedgerows in absorbing pollutants.

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.

In December 2016, Ipswich Borough Council re-commenced automatic (continuous) nitrogen dioxide monitoring on Chevallier Street. Located within AQMA No. 1, the analyser is co-located with diffusion tubes 45, 46 and 47.

Table A.1 in Appendix A shows the details of this site. However, due to the negligible level of data capture achieved during 2016 (only 4%), no new automatic monitoring data has been included in this report.

3.1.2 Non-Automatic Monitoring Sites

Ipswich Borough Council undertook non- automatic (passive) monitoring of NO_2 at 74 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) for the diffusion tubes, including bias adjustments and any other adjustments applied (e.g. “annualisation” and/or distance correction), 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 (NO_2)

Table A.3 in Appendix A compares the ratified and 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 2016 dataset of monthly mean values is provided in Appendix B.

Table A.4 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year.

Exceedances of the annual average air quality objective (shown in bold on the tables) are found at 11 unique monitoring sites, 4 of which are located in existing AQMAs. Of the remaining 7 exceedances:

- 5 are located along St. Matthew's Street and Norwich Road within the boundaries of the proposed fifth AQMA currently being consulted on;
- 1, at Site 68 on Woodbridge Road, will fall within the amended boundaries of AQMA No. 2 should the proposed changes currently being consulted on be implemented; and
- Only 1 exceedance, at Site 79 on Woodbridge Road, falls outside of an area covered by an existing or proposed AQMA. It should be noted that this is the only exceedance to have occured at this location within the last 5 years. Furthermore, this result will have been influenced by an uncharacteristically high concentration recorded for the site in October (at 132.4µg/m^3 this was more than twice the next highest value).

There are no annual averages greater than 60µg/m^3 that would indicate that an exceedance of the 1-hour mean objective.

3.2.2 Particulate Matter (PM_{10})

Ipswich Borough Council does not monitor for particulate matter (PM_{10}) – historical studies / monitoring have not identified any exceedance of the objective levels.

3.2.3 Particulate Matter ($PM_{2.5}$)

Ipswich Borough Council does not monitor for particulate matter ($PM_{2.5}$).

3.2.4 Sulphur Dioxide (SO_2)

Ipswich Borough Council does not monitor for Sulphur Dioxide (SO_2) – previous screening work has not suggested that there will be any exceedance of the objective levels.

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)
IPS(3)	St Margarets Street [CLOSED]	Roadside	616578	224759	NO_2	YES	Chemiluminescent	Sited immediately adjacent to residential property	3	0.27
IPS3	Chevallier Street	Roadside	615257	245349	NO_2	YES	Chemiluminescent	Equal distance from kerb as relevant exposure	2.5	1.5

Notes:

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

(2) N/A if not applicable

(3) Monitoring at site discontinued 31/05/2012 – included for legacy purposes.

Table A.2 – 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)
1	Civic Drive	Roadside	615982	244419	NO_2	NO	30	3.77	NO	2.34
2	Chevallier Street	Roadside	615141	245243	NO_2	YES	1.49	2.44	NO	2.04
3	Coprolite Street/Duke Street	Kerbside	617067	244038	NO_2	YES	9.07	0.71	NO	2.52
4	Berners Street	Roadside	615926	244924	NO_2	NO	5.68	1.77	NO	2.36
5	Fore Street	Roadside	616868	244130	NO_2	YES	1	2.27	NO	2.59
6	Kings Avenue	Urban Background	617282	244417	NO_2	NO	11.9	2.02	NO	2.6
7	Bramford Road	Roadside	615003	245238	NO_2	NO	0	5.36	NO	2.32
8	Bramford Road	Roadside	615128	245204	NO_2	NO	4.02	2.33	NO	2.43
9	Bramford Road	Roadside	615128	245204	NO_2	NO	4.02	2.33	NO	2.43
10	Bramford Road	Roadside	615128	245204	NO_2	NO	4.02	2.33	NO	2.43

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)
11	St Margarets Street	Roadside	616595	244747	NO_2	YES	0	2.42	NO	2.28
12	St Margarets Street	Roadside	616595	244747	NO_2	YES	0	2.42	NO	2.28
13	Bramford Lane	Roadside	615115	245301	NO_2	NO	3.03	1.49	NO	2.52
14	Chevalier Street	Roadside	615283	245391	NO_2	YES	0.52	2.47	NO	2.2
15	Tavern Street	Urban Centre	616272	244642	NO_2	NO	N/A	N/A	NO	2.62
16	Valley Road	Roadside	615368	245442	NO_2	YES	2.4	3.36	NO	2.42
17	Woodbridge Road	Roadside	616983	244657	NO_2	NO	2.48	1.92	NO	2.5
18	Yarmouth Road	Roadside	615093	245172	NO_2	NO	0	7.7	NO	2.28
19	St Margarets Street	Roadside	616595	244747	NO_2	YES	0	2.42	NO	2.28
20	Fonnereau Road	Roadside	616455	244824	NO_2	YES	1.51	2.44	NO	2.6

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)
21	St Margarets Plain	Roadside	616491	244808	NO_2	YES	N/A	2.29	NO	2.36
22	St Margarets Plain / Northgate Street	Roadside	616488	244789	NO_2	YES	N/A	1.81	NO	2.59
23	St Margarets Green	Roadside	616641	244784	NO_2	YES	N/A	3.42	NO	2.5
24	St Margarets Street	Roadside	616661	244689	NO_2	NO	N/A	3.65	NO	2.3
25	St Helens Street	Roadside	616751	244578	NO_2	NO	3.06	2.11	NO	2.52
26	St Helens Street / Grimwade Street	Roadside	616966	244505	NO_2	YES	4.93	3.92	NO	2.46
27	St Helens Street / Argyle Street	Roadside	616962	244544	NO_2	YES	5.69	1.46	NO	2.57
28	Chevallier Street	Roadside	615191	245289	NO_2	YES	2.39	1.98	NO	2.46
29	Fore Hamlet	Roadside	617124	244070	NO_2	YES	0	2.17	NO	2.68

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)
30	Fore Street	Roadside	616911	244118	NO_2	YES	2.2	2.78	NO	2.46
31	Star Lane	Roadside	616325	244134	NO_2	YES	N/A	2.26	NO	1.94
32	Spring Road	Roadside	617391	244567	NO_2	NO	3.02	2.42	NO	2.46
33	Key Street	Roadside	616656	244112	NO_2	YES	2.29	1.88	NO	2.45
34	College Street	Roadside	616468	244071	NO_2	YES	N/A	2.52	NO	1.82
35	Cobden Place	Roadside	616744	244694	NO_2	NO	0	1.27	NO	2.48
36	Franciscan Way	Roadside	616153	244245	NO_2	NO	3.6	1.82	NO	2.44
37	Lower Brook Street	Kerbside	616479	244164	NO_2	YES	N/A	0.83	NO	2.28
38	Civic Drive	Kerbside	615898	244796	NO_2	NO	6.85 (estimated)	0.88	NO	2.48
39	Star Lane / Fore Street	Kerbside	616716	244255	NO_2	YES	N/A	0.61	NO	2.6

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)
40	Norwich Road	Roadside	615458	245144	NO_2	YES	5.77	3	NO	2.36
41	Norwich Road	Roadside	615560	245009	NO_2	NO	N/A	1.27	NO	2.54
42	Norwich Road	Roadside	615741	244898	NO_2	NO	0 (but est. 3 to the nearest flat above)	2.35	NO	2.54
43	Yarmouth Road / Bramford Road	Roadside	615104	245197	NO_2	YES	0.24	3.6	NO	2.4
44	Bramford Road	Roadside	615051	245233	NO_2	NO	4.57	1.44	NO	2.35
45	Chevallier Street	Roadside	615260	245348	NO_2	YES	2.61	3.89	YES	1.81
46	Chevallier Street	Roadside	615260	245348	NO_2	YES	2.61	3.89	YES	1.81
47	Chevallier Street	Roadside	615260	245348	NO_2	YES	2.61	3.89	YES	1.81
48	Valley Road	Roadside	615414	245477	NO_2	YES	6.9	2.49	NO	2.7

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)
49	St Matthews Street	Roadside	615803	244871	NO_2	NO	0 (but est. 3 to the nearest flat above)	1.91	NO	2.57
50	Barrack Lane	Roadside	615768	244885	NO_2	NO	1.42	1.52	NO	2.37
51	St Matthews Street junction with Portman Road	Roadside	615759	244864	NO_2	NO	4.03	1.04	NO	2.55
52	St Matthews Street	Roadside	615821	244868	NO_2	NO	N/A	2.32	NO	2.49
53	St Matthews Street	Roadside	615822	244855	NO_2	NO	0 (but est. 3 to the nearest flat above)	2.53	NO	2.28
54	St Matthews Street	Roadside	615880	244862	NO_2	NO	4 (estimated)	10 (estimated)	NO	2.41
55	Berners Street	Roadside	615914	244894	NO_2	NO	2 (estimated)	2.47	NO	2.38
56	Berners Street	Roadside	615931	244913	NO_2	NO	1 (estimated)	1.61	NO	2.54
57	Berners Street	Roadside	615939	244980	NO_2	NO	1.4	7.87	NO	2.55

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)
58	Berners Street	Kerbside	615974	245032	NO_2	NO	7.55	0.44	NO	2.46
59	St Matthews Street Roundabout	Roadside	615926	244835	NO_2	NO	N/A	2.98	NO	2.5
60	St Matthews Street Roundabout	Roadside	615926	244835	NO_2	NO	N/A	2.98	NO	2.5
61	St Matthews Street Roundabout	Roadside	615926	244835	NO_2	NO	N/A	2.98	NO	2.5
62	St Matthews Street	Roadside	615934	244798	NO_2	NO	4 (estimated)	2.31	NO	2.62
63	St Matthews Street	Roadside	615949	244788	NO_2	NO	2 (estimated)	3.7	NO	2.4
64	Norwich Road	Roadside	615686	244937	NO_2	NO	0.3	1.35	NO	2.56
65	Norwich Road	Roadside	615686	244937	NO_2	NO	0.3	1.35	NO	2.56
66	Woodbridge Road	Roadside	616807	244667	NO_2	NO	0	3.55	NO	2.35

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)
67	Woodbridge Road junction with Blanche Street	Roadside	616887	244672	NO_2	NO	7 (estimated)	1.4	NO	2.62
68	Woodbridge Road	Roadside	616900	244656	NO_2	NO	0 (but est. 1 to flats)	3.48	NO	2.46
69	Argyle Street	Roadside	616974	244591	NO_2	YES	2.5 (estimated)	4.84	NO	2.83
70	Argyle Street	Roadside	616964	244574	NO_2	YES	5.05	1.76	NO	2.56
71	St Helens Street	Roadside	617027	244535	NO_2	YES	0	13.77	NO	2.46
72	St Helens Street	Roadside	617119	244533	NO_2	YES	0.86	2.66	NO	2.56
73	Regent Street	Roadside	617122	244506	NO_2	YES	1.19	1.07	NO	2.51
74	Grimwade Street	Roadside	616949	244440	NO_2	NO	N/A	2.32	NO	2.49
75	Grimwade Street	Roadside	616929	244360	NO_2	NO	1	3.41	NO	2.52

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)
76	St Helens Street	Roadside	616943	244519	NO_2	YES	0	3.14	NO	2.46
77	St Helens Street	Roadside	616900	244538	NO_2	YES	0	4.73	NO	2.4
78	Orchard Street	Roadside	616868	244585	NO_2	NO	1.49	1.59	NO	2.47
79	Woodbridge Road	Roadside	617041	244674	NO_2	NO	7.76	5.45	NO	2.43
80	St Helens Street	Roadside	616837	244541	NO_2	YES	N/A	2.91	NO	2.82
81	St Helens Street	Roadside	616837	244541	NO_2	YES	N/A	2.91	NO	2.82
82	St Helens Street	Roadside	616837	244541	NO_2	YES	N/A	2.91	NO	2.82
83	Bond Street	Roadside	616788	244494	NO_2	NO	1.61	1.88	NO	2.34
84	Carr Street junction with Majors Corner	Roadside	616698	244597	NO_2	NO	N/A	4.41	NO	2.48
85	Old Foundry Road	Roadside	616674	244625	NO_2	NO	2 (estimated)	1.43	NO	2.53

Notes:

(1) 0m 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 NO_2 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 ($\mu g/m^3$) [3]				
					2012	2013	2014	2015	2016[4]
IPS	Roadside	Automatic	N/A	N/A	**49**	**52**	N/A	N/A	N/A
IPS3	Roadside	Automatic	N/A	N/A	34	**45**	29	N/A	N/A
1	Roadside	Diffusion Tube	100	100	27	28	28	26	24
2	Roadside	Diffusion Tube	100	100	38	**40**	**43**	**41**	37
3	Kerbside	Diffusion Tube	83	83	30	31	29	27	21
4	Roadside	Diffusion Tube	92	92	38	35	33	34	27
5	Roadside	Diffusion Tube	92	92	39	**41**	**40**	**42**	**39**
6	Urban Background	Diffusion Tube	100	100	22	17	16	16	17
7	Roadside	Diffusion Tube	100	100	34	33	32	33	30
8	Roadside	Diffusion Tube	100	100	33	35	33	34	30
9	Roadside	Diffusion Tube	92	92	35	36	33	34	30
10	Roadside	Diffusion Tube	100	100	32	34	33	34	29
11	Roadside	Diffusion Tube	92	92	**43**	39	**44**	**47**	**45**
12	Roadside	Diffusion Tube	100	100	**45**	39	**43**	**49**	**47**

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[4]
13	Roadside	Diffusion Tube	92	92	38	34	35	22	22
14	Roadside	Diffusion Tube	100	100	**48**	**49**	**47**	**48**	**46**
15	Urban Centre	Diffusion Tube	100	100	29	26	25	24	23
16	Roadside	Diffusion Tube	100	100	35	36	33	36	32
17	Roadside	Diffusion Tube	100	100	**49**	**51**	**47**	**43**	37
18	Roadside	Diffusion Tube	100	100	32	31	30	29	28
19	Roadside	Diffusion Tube	100	100	**44**	**40**	**41**	**48**	**45**
20	Roadside	Diffusion Tube	92	92	30	33	33	33	28
21	Roadside	Diffusion Tube	100	100	37	37	36	37	36
22	Roadside	Diffusion Tube	100	100	37	38	38	38	36
23	Roadside	Diffusion Tube	100	100	25	23	23	23	21
24	Roadside	Diffusion Tube	92	92	39	**41**	**42**	**40**	38
25	Roadside	Diffusion Tube	92	92	**43**	**40**	**41**	**40**	36
26	Roadside	Diffusion Tube	100	100	32	33	32	31	28

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2016 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3]				
					2012	2013	2014	2015	2016[4]
27	Roadside	Diffusion Tube	100	100	**42**	**44**	37	35	32
28	Roadside	Diffusion Tube	100	100	39	37	35	37	32
29	Roadside	Diffusion Tube	100	100	32	33	30	31	32
30	Roadside	Diffusion Tube	100	100	31	29	29	**47**	**42**
31	Roadside	Diffusion Tube	67	67	33	35	32	34	36
32	Roadside	Diffusion Tube	100	100	36	34	31	32	27
33	Roadside	Diffusion Tube	100	100	33	34	33	33	30
34	Roadside	Diffusion Tube	100	100	**42**	39	**42**	38	37
35	Roadside	Diffusion Tube	100	100	30	27	28	27	24
36	Roadside	Diffusion Tube	58	58	31	30	28	30	27
37	Kerbside	Diffusion Tube	100	100	26	27	24	25	24
38	Kerbside	Diffusion Tube	100	100	34	36	35	33	26
39	Kerbside	Diffusion Tube	100	100	**43**	**41**	39	**42**	**41**
40	Roadside	Diffusion Tube	92	92	29	27	27	27	24

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[4]
41	Roadside	Diffusion Tube	100	100	37	35	37	37	34
42	Roadside	Diffusion Tube	92	92	37	37	34	34	**41**
43	Roadside	Diffusion Tube	100	100	**40**	37	37	**40**	37
44	Roadside	Diffusion Tube	100	100	**40**	37	37	37	31
45	Roadside	Diffusion Tube	100	100	31	29	30	29	26
46	Roadside	Diffusion Tube	100	100	30	30	29	28	26
47	Roadside	Diffusion Tube	100	100	30	30	29	28	26
48	Roadside	Diffusion Tube	100	100	28	28	27	27	23
49	Roadside	Diffusion Tube	100	100	38	**42**	**42**	**42**	**41**
50	Roadside	Diffusion Tube	92	92	31	26	25	28	25
51	Roadside	Diffusion Tube	100	100	34	35	36	38	31
52	Roadside	Diffusion Tube	100	100	**47**	**48**	**45**	**47**	**47**
53	Roadside	Diffusion Tube	83	83	**46**	**44**	**49**	**46**	**45**
54	Roadside	Diffusion Tube	92	92	35	31	31	31	31

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2016 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3]				
					2012	2013	2014	2015	2016[4]
55	Roadside	Diffusion Tube	92	92	33	32	30	31	29
56	Roadside	Diffusion Tube	100	100	32	26	27	28	29
57	Roadside	Diffusion Tube	100	100	30	27	25	26	24
58	Kerbside	Diffusion Tube	92	92	28	27	25	27	19
59	Roadside	Diffusion Tube	100	100	36	34	32	34	32
60	Roadside	Diffusion Tube	58	58	36	35	36	34	36
61	Roadside	Diffusion Tube	58	58	36	33	33	34	36
62	Roadside	Diffusion Tube	100	100	39	39	38	38	33
63	Roadside	Diffusion Tube	100	100	39	38	37	38	35
64	Roadside	Diffusion Tube	92	92	**59**	**52**	**52**	**55**	**49**
65	Roadside	Diffusion Tube	100	100	**57**	**54**	**51**	**51**	**49**
66	Roadside	Diffusion Tube	100	100	**41**	38	38	38	35
67	Roadside	Diffusion Tube	100	100	29	29	30	27	23
68	Roadside	Diffusion Tube	100	100	**47**	**48**	**46**	**43**	**41**
69	Roadside	Diffusion Tube	100	100	27	29	27	26	26

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2016 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3]				
					2012	2013	2014	2015	2016[4]
70	Roadside	Diffusion Tube	100	100	38	36	33	33	28
71	Roadside	Diffusion Tube	100	100	30	27	24	27	24
72	Roadside	Diffusion Tube	100	100	**40**	39	38	36	34
73	Roadside	Diffusion Tube	100	100	27	25	22	23	22
74	Roadside	Diffusion Tube	100	100	29	29	26	27	26
75	Roadside	Diffusion Tube	100	100	27	24	23	25	25
76	Roadside	Diffusion Tube	100	100	38	36	37	37	34
77	Roadside	Diffusion Tube	100	100	30	30	27	28	28
78	Roadside	Diffusion Tube	100	100	26	25	23	24	24
79	Roadside	Diffusion Tube	92	92	28	25	23	30	**43**
80	Roadside	Diffusion Tube	100	100	38	36	34	35	32
81	Roadside	Diffusion Tube	100	100	**40**	36	35	35	33
82	Roadside	Diffusion Tube	100	100	**40**	36	36	35	33
83	Roadside	Diffusion Tube	100	100	32	31	31	30	25
84	Roadside	Diffusion Tube	100	100	31	29	27	26	24

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(4)
85	Roadside	Diffusion Tube	100	100	34	31	32	32	29

☒ **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 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.

(4) Where applicable, all 2016 data has been distance corrected for relevant exposure using *NO_2 Fall-Off with Distance Calculator (Version 4.1)* and 2013-based background NO_2 map for 2016

Table A.4 – 1-Hour Mean NO_2 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
IPS(4)	Roadside	Automatic	N/A	N/A	0	8	N/A	N/A	N/A
IPS3	Roadside	Automatic	N/A	N/A	3	0	0	N/A	N/A

Notes:

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

(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.

(4) Monitoring at site discontinued 31/05/2012 – included for legacy purposes.

Appendix B: Full Monthly Diffusion Tube Results for 2016

Table B.1 – NO_2 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 (0.77) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
1	36.7	35.3	31.5	29.2	23.3	21.7	27.2	27.2	32.5	29.3	36.8	45.6	31.4	24.2	N/A
2	55.2	51.8	50.3	56.6	51.4	42.5	49.9	40.0	60.1	43.7	50.2	62.8	**51.2**	39.4	36.6
3	37.3	38.1	43.8	-	21.4	25.6	26	-	35.9	28.9	42.4	45.9	34.5	26.6	21.4
4	47	49	37.2	40.2	35.1	27.2	41.3	33.6	-	37.2	53.2	61.5	**42.1**	32.4	27.1
5	55.3	59.8	-	58	53.1	44.9	53.7	45.8	61	44.3	49.3	60.6	**53.3**	**41.0**	39.1
6	26.1	28	23.1	19.8	13.9	14.3	17.7	14.3	21	19.9	31.2	31.5	21.7	16.7	N/A
7	46.4	44.6	36.3	39	36.7	30.2	37.4	29.5	44.9	34.9	48.1	46.6	39.6	30.5	30.5
8	36.8	52	48.2	49.1	41.9	37.9	38.2	38.5	47.4	46.2	50.8	50.6	**44.8**	34.5	29.8
9	44.7	50.4	48.6	48.2	43	~~5.5~~(3)	37.2	38.9	44.7	41.8	55.1	52.2	**45.9**	35.3	30.4
10	45.5	46.2	46.7	45.3	41.8	34.6	37	34.6	43.9	43.4	55.8	47.6	**43.5**	33.5	29.0
11	64.1	56.2	52	62.1	53.9	44.7	63.7	46.2	66.9	-	60.1	68.2	**58.0**	**44.7**	**44.7**
12	75.3	67.6	53.2	57.8	53.7	50.8	65.5	45.8	72.9	46.7	66.8	74.4	**60.9**	**46.9**	**46.9**
13	33.1	34.9	28.4	31.3	-	23.5	20.8	21.4	32.2	29	40.1	46.8	31.1	23.9	21.8
14	61.3	71.2	69.9	63.1	56.1	52.1	56.3	46	57.7	57.6	74.7	73.2	**61.6**	**47.4**	**45.9**
15	38.4	37.6	29.2	27.3	19	19.6	21.7	19.4	26	26.6	38	48.7	29.3	22.6	N/A
16	55	55.2	46	42.6	43.5	32.3	46.6	40.9	42.5	39.6	52.7	50	**45.6**	35.1	32.2

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 (0.77) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
17	53.3	67.6	53.4	61.3	45.4	44.4	46.8	42.5	58.2	48	56.7	70	**54.0**	**41.6**	37.2
18	36.5	39.2	42.3	31.4	25.4	34.8	36.7	33.6	36.3	36	47.5	42.7	36.9	28.4	28.4
19	73	63.4	48.1	58.3	56.3	47	58.1	46.6	68.8	44.5	64.8	68.2	**58.1**	**44.7**	**44.7**
20	49.6	46.1	32.2	38.5	33	30.5	37.9	35.5	43.5	27.7	40.5	-	37.7	29.1	27.8
21	53.6	53.6	45.1	51.5	42.6	43.8	43.4	38.2	42.6	39.4	54.1	57	**47.1**	36.3	N/A
22	47.7	52.6	45.2	51.5	46.3	39.9	40.2	39	50.8	41.4	50.3	52.1	**46.4**	35.7	N/A
23	34.3	31	25.2	24.7	21	21.7	24.5	18.9	28.7	23.2	32.5	40.7	27.2	20.9	N/A
24	56.7	56.5	44.1	46.7	42.7	-	46.6	38.5	55.4	42.9	55	57.7	**49.4**	38.0	N/A
25	49.4	70.8	33.3	52.6	38.3	39.1	47.9	32.9	51.2	42.1	54.8	-	**46.6**	35.9	35.9
26	33.7	48	39.2	46.4	38.3	33	34.9	32.2	43.5	39	46.5	38.7	39.5	30.4	27.8
27	56.2	58.9	53.5	51.1	46.6	38.7	44.8	39.3	50.5	48.2	51.9	60.6	**50.0**	38.5	31.7
28	39.8	56.6	44.6	47	42.2	37.7	42.6	38.7	51.3	38.4	56.1	58.6	**46.1**	35.5	31.7
29	38.5	44.8	43.8	46	35.7	43.5	33.6	35	40.3	43.4	44.5	44	**41.1**	31.6	31.6
30	58.3	69.4	58.6	66.1	59.1	46.5	61.8	50.4	71.4	49.3	71	57.4	**59.9**	**46.2**	**42.1**
31	40.3	46.9	38.5	47.8	41.5	33.4	37.2	31.8	-	-	-	-	39.7	35.5	N/A
32	51.5	46.6	31.3	42.1	33	24.9	31.3	30.2	40.1	29	47.4	52.8	38.4	29.5	26.8
33	44.1	42.2	39	50.3	45.1	37	34.5	33.2	44.5	42.3	47.2	55.4	**42.9**	33.0	30.4
34	52.3	56.7	39.8	57.7	42.1	39	44.5	43.9	50	38.8	53.1	58.9	**48.1**	37.0	**N/A**
35	43.1	38.8	31.3	33.6	20.7	21.3	27.8	22.9	34	26.6	33.5	43.4	31.4	24.2	24.2
36	43.6	41.4	34.4	35.1	31.3	27.2	29.3	-	-	-	-	-	34.6	29.7	27.0

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 (0.77) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
37	36.7	36.5	30.2	28.9	24.2	22.5	23.8	24	31.7	30	39.3	42.2	30.8	23.7	N/A
38	48.3	43.9	38	40.2	46.9	36.3	35	32.9	45.8	40.7	48.5	53.2	42.5	32.7	25.7
39	60.4	53.7	58.8	49.9	46.8	46.8	48.6	41.7	54.3	49.8	58.3	64.6	52.8	**40.7**	N/A
40	40.7	42.4	-	38.8	28.1	25.9	27.3	23.2	35.2	33.8	40.9	52.9	35.4	27.2	23.9
41	50.3	51.9	38.7	47.6	37.8	33	46.1	37	53.1	35.9	50.2	49.3	44.2	34.1	N/A
42	149.7	47.4	50.6	49.4	42.6	38.8	31.4	30	49.1	45.9	52.8	-	53.4	**41.1**	**41.1**
43	56.6	52.8	52.5	53.3	45.9	39	44.9	40.9	49.4	44.2	52.5	46.1	48.2	37.1	36.7
44	52.8	57.6	50.1	52.4	39.7	39.7	37.8	39.3	50.1	44.9	59.2	59.4	48.6	37.4	30.5
45	36.4	39.6	34.7	40.5	29.9	29.6	25.2	25.9	39.4	36.6	43.8	45.9	35.6	27.4	25.7
46	40	39.2	37.6	37.6	25	28.5	27	30.3	35.1	34.5	46.7	45.8	35.6	27.4	25.7
47	40.6	42.8	36.6	37.5	28.7	28.5	28.1	29.5	35.9	35.1	41.9	45.1	35.9	27.6	25.8
48	40.6	42.9	38.9	35.2	21.9	22.5	30	28.8	34.8	31.6	46.4	47.9	35.1	27.1	23.1
49	46.8	61	53.1	63.9	62.9	49.8	39.1	36.4	64.3	59.2	60.2	49.7	53.9	**41.5**	**41.5**
50	43.6	36.4	-	37.4	28.1	21.1	27.8	25.8	37.1	28.1	42.5	42.7	33.7	25.9	24.6
51	48.3	51.8	49.5	55	44.4	38.7	36.9	26.6	63	50.3	59.7	63.7	49.0	37.7	30.9
52	59.6	64	65.3	65.4	55.1	56.1	52.1	50.6	55.8	57.5	70.6	73	60.4	**46.5**	N/A
53	68.6	65.7	52.1	54.7	43.8	-	57	47.4	66.6	-	63.1	69.3	58.8	**45.3**	**45.3**
54	44.4	40.8	35.8	39.7	29.1	30.6	31.5	27.8	38	-	57.5	67.1	40.2	31.0	31.0
55	41.5	43.3	43	37.7	32.8	31.9	30.9	25	-	36	46.9	47.4	37.9	29.2	29.2

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 (0.77) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
56	45.4	46.2	37.8	39.1	32.2	21.8	32.3	29.7	40.1	33.3	44.9	53.3	38.0	29.3	29.3
57	38.4	40.3	26.9	32.3	27.3	24.3	28	25.3	31	24.7	40.2	45	32.0	24.6	24.2
58	36.4	38.4	31.4	-	24.7	21.9	25.5	22.5	33.5	11.8	41.5	45.6	30.3	23.3	19.2
59	47.7	49.4	42.5	43.5	33.3	32.4	32.7	33.2	43.2	39.9	50.3	50.3	**41.5**	32.0	N/A
60	50.3	52	45.7	46.8	32.9	31	36.5	-	-	-	-	-	**42.2**	36.2	N/A
61	46.7	50.1	40.7	42.6	42.3	32.9	35	-	-	-	-	-	**41.5**	35.6	N/A
62	53.3	48.6	37.9	48.8	33.3	35.7	42.8	38.7	46.7	35.6	49.3	50.8	**43.5**	33.5	33.5
63	51.6	48.3	39.5	45.1	37.9	35.2	42.2	38.6	51.1	38.2	55.7	59.8	**45.3**	34.9	34.9
64	85.6	-	57.2	72.4	61.8	50.3	59.3	49.1	65.2	52.7	76.6	83.6	**64.9**	**50.0**	**48.5**
65	80.5	72.1	60.9	64.4	56.2	56.2	65.8	55.5	72.1	50.9	74.6	84.3	**66.1**	**50.9**	**49.4**
66	52.5	48.3	44.6	45.4	42.5	33.3	45	39.9	53.6	35.3	51.4	53.4	**45.4**	35.0	35.0
67	41.6	39	33.6	32.8	26.7	22.1	32.1	21.5	38.4	29.6	42.8	41.2	33.5	25.8	23.1
68	55.3	65.3	57.7	55.5	44.6	38.8	44.8	43.6	54.3	48.3	69	67	**53.7**	**41.3**	**41.3**
69	34.2	42	38.2	26.9	30.5	23.1	25.3	24.4	33.1	31.8	44.3	45.3	33.3	25.6	25.6
70	51.4	54.8	4.2	48.2	36.9	35.8	36.9	35	45.9	40.1	60.1	57.3	**42.2**	32.5	28.3
71	36.5	38.3	30.3	34.4	22.7	26.6	18.5	23.5	27.7	36.4	40.3	40.3	31.3	24.1	24.1
72	47.1	57.5	46.2	43.7	47.3	36.8	36.8	33.5	44.9	46.9	60.3	57.1	**46.5**	35.8	34.4
73	34.9	37.2	31.8	32.4	24.5	20.6	21.5	18.7	26.2	27.6	39	38.4	29.4	22.6	21.6
74	37.2	41.1	35.7	35.3	23.9	23.3	26.8	23.7	33.7	31.3	45.2	45.1	33.5	25.8	N/A

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 (0.77) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
75	37.4	40.7	29.6	34.6	27.5	22.6	28.5	23.9	34.4	30.1	44.9	41.3	33.0	25.4	25.4
76	50.7	51.9	44.6	48.5	36.5	35.6	41	35.4	48.1	34.5	49.7	55.9	**44.4**	34.2	34.2
77	41.7	41	33.1	44.8	35.6	32.2	26.9	27.2	34.7	35.5	46.8	40.3	36.7	28.2	28.2
78	36.9	39.3	33.7	37	22.9	20.9	25.4	20.3	29.3	26.9	44.9	44.4	31.8	24.5	23.7
79	37.4	42.3	28.3	34.8	27.9	-	33.1	30.7	34	132.4(4)	63.9	62.7	**48.0**	36.9	**43.4**
80	44.7	49.8	36.7	46.4	39	35	39.7	34.3	42.1	34.1	51.2	52.4	**42.1**	32.4	N/A
81	47.7	46.4	39.1	50	34.5	35.5	40.6	31.4	45.2	35.5	47	56.3	**42.4**	32.7	N/A
82	48.6	50.2	38.8	49	38.4	34.5	40.7	30.4	44.6	32.8	49.5	49	**42.2**	32.5	N/A
83	38.9	41.3	35.2	45.2	32.2	28.6	24.3	23.2	38.3	33	45.7	27.7	34.5	26.5	25.4
84	34.2	38.8	35.7	30.6	20.3	22.6	23.7	23.2	31.5	29.7	40	39.8	30.8	23.8	N/A
85	46.8	43	28.9	42.8	26.8	28.5	38.4	29.6	41.6	35.8	42.6	46.7	37.6	29.0	29.0

☐ **Local bias adjustment factor used**

☒ **National bias adjustment factor used**

☒ **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) See Appendix C for details on bias adjustment and annualisation.

(2) Distance corrected to nearest relevant public exposure.

(3) Measurement discounted from dataset as a low than expected outlier.

(4) Measurement likely to be an artefact as significantly higher than expected, however adopting the precautionary approach recommended by LAQM.TG16 Paragraph 7.187 it has not been discounted from the dataset.

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

Diffusion tube analysis

Nitrogen dioxide diffusion tubes are supplied by Environmental Scientifics Group, Didcot. The exposed tubes are analysed in accordance with Environmental Scientifics Group standard operating procedure which complies with the guidelines set out in DEFRA's *'Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance'*. The analysis of diffusion tube samples to determine the amount of nitrogen dioxide present on the tubes is within the scope of their UKAS schedule. Environmental Scientifics Group participates in the AIR NO_2 PT scheme, the results of which indicate that during 2016 approximately 88% of QC samples were analysed satisfactorily. During the same period, reported nitrogen dioxide diffusion tube collocation studies indicated that the laboratory achieved good precision in 26 out of 27 studies.

Using the *AEA_DifTPAB_v04.xls* spreadsheet published on the DEFRA LAQM Support website to check the precision of collocated tubes, the results for all collocated monitoring sites within Ipswich were shown to demonstrate "*Good precision".*

A control tube (travel blank) is sent with each month's tubes.

Diffusion tube bias adjustment

Where possible a local bias adjustment factor is used – but this is reliant on obtaining good data capture from local continuous monitors and on the placement of the tubes being at locations comparable to the analyser sites. Where a local factor is not available, national data, which is available on the air quality review website, is used to bias adjust diffusion tube results.

With automatic air quality monitoring at the Chevallier Street site (IPS3) only resuming in December 2016, insufficient data was available to calculate a local bias adjustment factor. Consequently, a national factor was obtained from the *National*

Diffusion Tube Bias Adjustment Factor Spreadsheet Version 03/17 V2 published on the DEFRA LAQM Support website.

For the Environmental Scientific Group, Didcot laboratory; preparation method 50% TEA in acetone; for the year 2016, a bias adjustment figure of 0.77 was obtained based on 30 studies.

Diffusion tube annualisation

During the course of 2016, four diffusion tubes were moved to new locations:

- tubes 36, 60 and 61 being relocated from August onwards; and
- tube 31 being relocated from September onwards.

To account for these changes, the mean nitrogen dioxide concentration obtained using the partial dataset for each tube was annualised in accordance with the procedure detailed in LAQM.TG16 Box 7.9.

This adjustment was undertaken using whole year datasets from the following AURN monitoring sites (all within a 50 mile radius of Ipswich and with data capture rates of in excess of 85%):

- Southend-on-Sea (UKA 00409) – Type: Urban Background;
- St Osyth (UKA 00445) – Type: Rural Background; and
- Norwich Lakenfields (UKA 00549) – Type: Urban Background

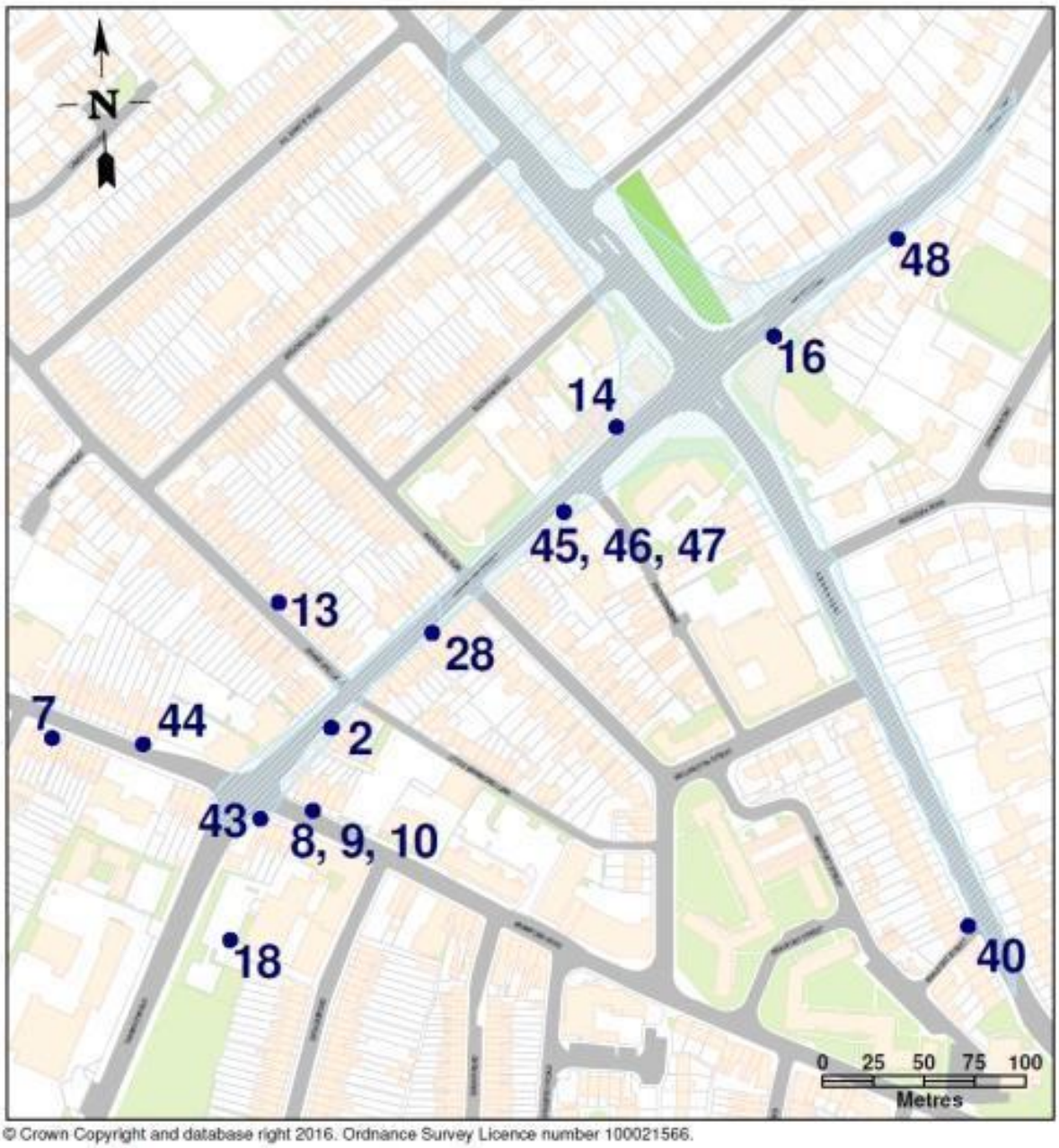
Diffusion tube distance correction

Wherever possible diffusion tube monitoring locations are selected to be representative of exposure. However, where this is not practicable measurements should be adjusted to estimate the nitrogen dioxide concentration at the nearest location relevant for exposure.

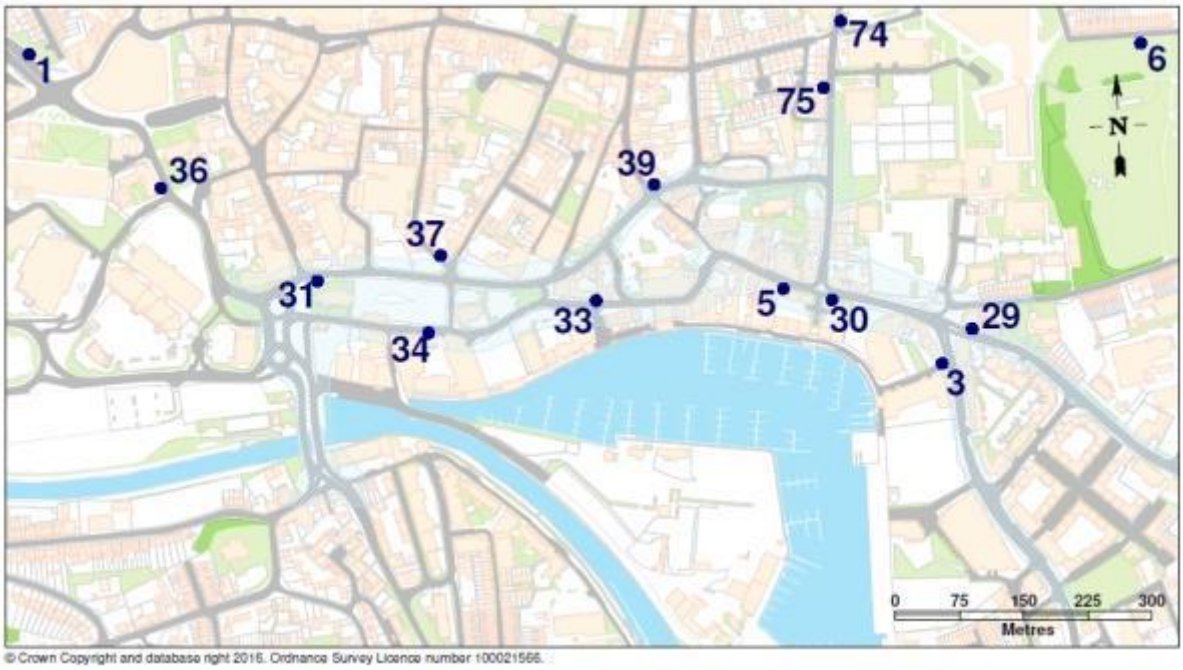
Where necessary, this correction has been undertaken using the *NO_2 Fall-off with Distance Calculator Version 4.1* available on the DEFRA LAQM Support website along with mean background NO_2 concentrations obtained from the *2013-based background NO_2 map for 2016*.

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

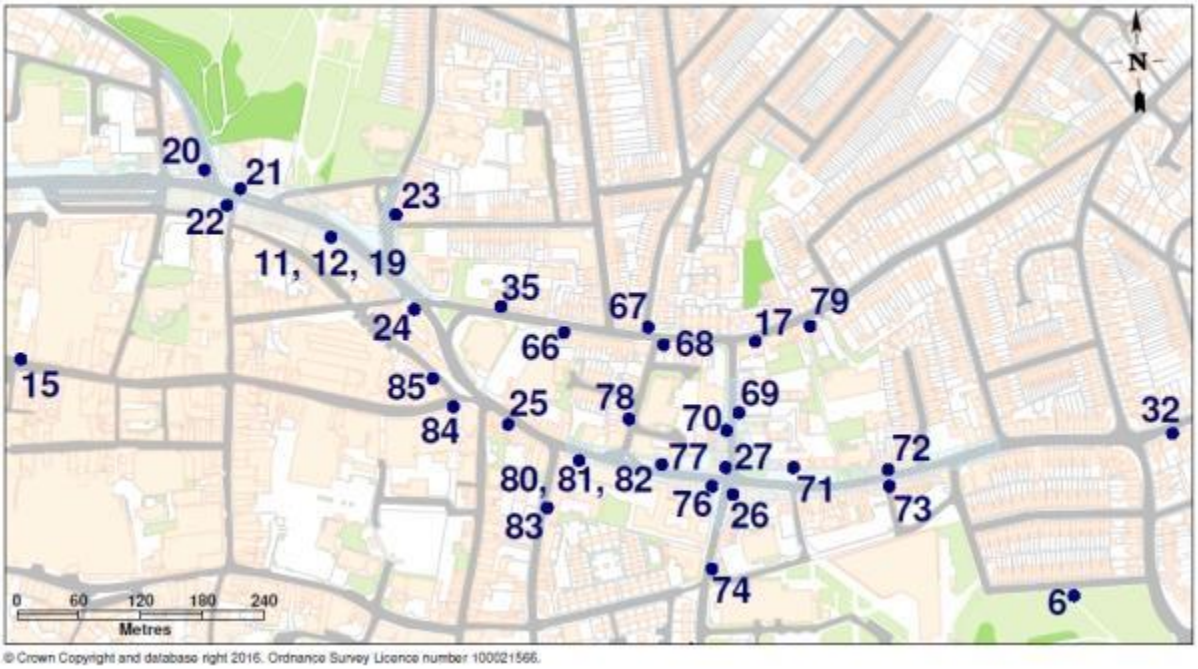
Tube Locations 2016
Norwich Road Area



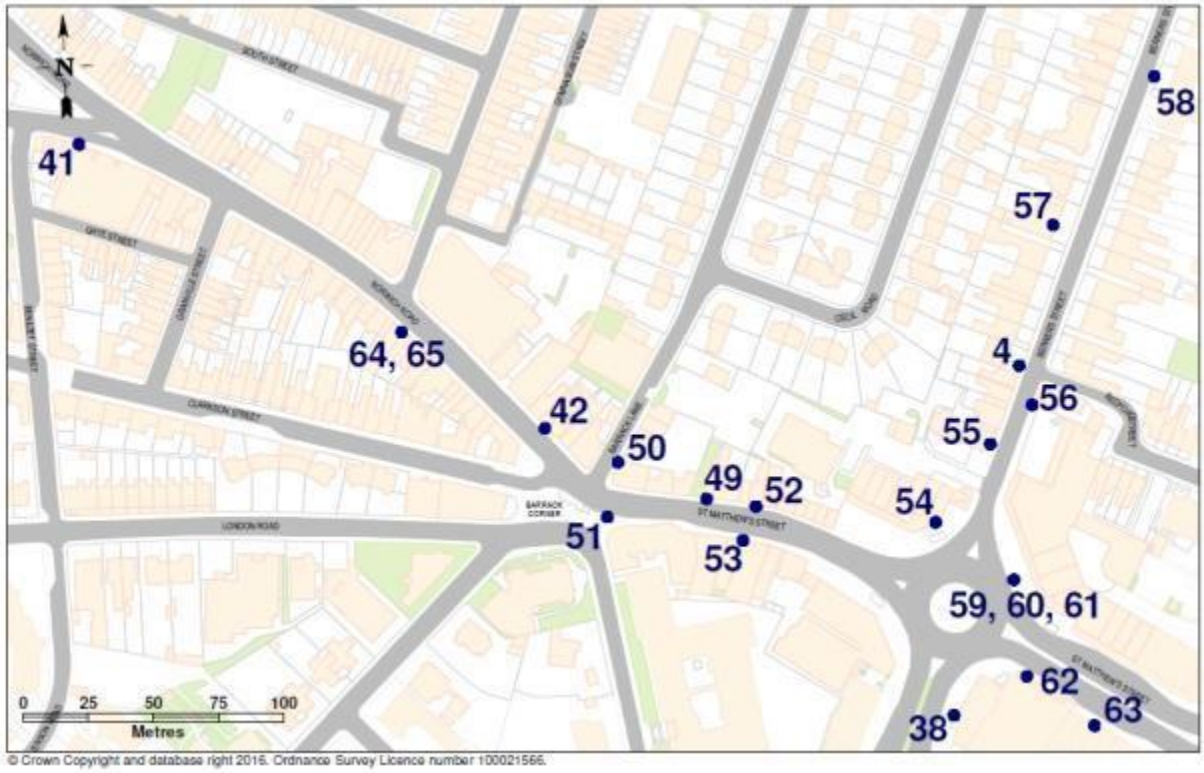
Tube Locations 2016
Star Lane, College Street



Tube Locations 2016
St. Margaret's Street, St. Helen's Street



Tube Locations 2016
St. Matthew's Street



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/m^3).

Appendix F: Long Term Trends Nitrogen Dioxide (NO_2)

WSP| Parsons Brinckerhoff was commissioned by Ipswich Borough Council to undertake an air quality modelling study for the Ipswich Urban area[5]. The objective of the study was to indicate locations on the highway network where there is high, medium or low risk of non-compliance with current standards for air quality in relation to locations identified for future development under the Ipswich Core strategy and Policies Development Plan Document (the Ipswich Local Plan). Locations indicated to have medium to high risk can then be prioritised for further investigation and/or mitigation as appropriate.[5]

NO_2 annual average monitoring data was provided by Ipswich Borough Council for the period 2005 to 2015 inclusive. WSP| Parsons Brinckerhoff analysed the long term trends using the Mann-Kendall test to indicate whether or not the trend is statistically significant, and the Sens's method for determining the slope of the linear trend line. The data was screened to remove annual average concentrations that were based on inadequate data capture and were bias adjusted to national figures for the appropriate lab to ensure consistency between years. Sixty two sites had sufficient data capture and were in operation for 5 years. The annual average NO_2 concentration data for the 62 sites were then analysed using the 'MAKESENS' spreadsheet application.

At 59 of the 62 monitoring sites considered, long term trends in annual average NO_2 concentrations appear to have been falling, as indicated by negative Sens's slope values. Considering monitoring from 2005, in 22 cases there are statistically significant falling trends. There is some evidence for concentrations peaking around 2010. Taking data from 2009 onwards there are statistically significant falling trends at 28 sites. At three of the 62 sites there are contrary increasing trends for measurements between 2006 and 2013 at two and 2011 and 2015 at one. These trends are not statistically significant with a greater than 10% chance of the pattern in the data being random.[5]

[5] WSP| Parsons Brinckerhoff; Ipswich Core Strategy Air Quality Report; Report No 70007052-OF7; May 2016

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'
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
AURN	Automatic Urban and Rural Network
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
LAQM	Local Air Quality Management
LAQM.TG16	Local Air Quality Management Technical Guidance (TG16) [April 2016]
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
SCC	Suffolk County Council
SO_2	Sulphur Dioxide
SPD	Supplementary Planning Document

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