



***West Lindsey District Council
Annual Status Report 2017***

Bureau Veritas

August, 2017

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2017 Air Quality Annual Status Report (ASR)

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

August, 2017

West Lindsey District Council

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Executive Summary: Air Quality in Our Area

Air Quality in West Lindsey

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.

The concentrations of nitrogen dioxide (NO₂) recorded within the District in 2016 were well below the Air Quality Standard (AQS) objectives. There has not been a recorded exceedance of any AQS objectives within the District in the past five years. West Lindsey is mostly rural in nature and the main source of pollution is vehicle emissions from the existing road network, most notably the A15, A46 and the A631.

There are three power stations operated by EDF Energy within the neighbouring District of Bassetlaw to the west of West Lindsey; Cottam and West Burton A are both coal fired power stations, and West Burton B is a gas fired combined cycle gas turbine (CCGT) power station. Due to the close proximity of the three power stations to each other an automatic air quality monitoring station is located in Gainsborough, north to north east of the location of the power stations to continuously monitor both NO₂ and sulphur dioxide (SO₂).

There are currently no Air Quality Management Areas (AQMAs) within the District. This is due to the low concentrations that are currently, and have historically been monitored. The monitoring network is to remain in place to continually assess a number of identified areas against the AQS objectives, these locations will be reviewed in the event of a hotspot area of pollution being identified.

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

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

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

Actions to Improve Air Quality

Due to being a rural district, the concentrations of air pollutants within West Lindsey have historically been low and in compliance with the AQS objectives. With the construction of the Lincoln Eastern bypass, which is due to open in 2018, the traffic routing in and out of Lincoln will change, with less traffic passing directly through Lincoln.

Due to this development and further developments being proposed across the District and the country as a whole, a continual emphasis on local air quality will be maintained. The newly adopted Central Lincolnshire Local Plan contains objectives and policies designed to minimise the impact upon local air quality from new developments.

Air quality will continue to be assessed across the District by way of the monitoring network, and any areas of poor air quality that are identified will be investigated.

Conclusions and Priorities

There continues to be no AQMAs designated within the West Lindsey District, and as in previous years, all monitored pollutant concentrations in 2016 remain below the AQS objectives. Being a rural district without any substantial urbanised areas, the pollution concentrations continue to be relatively low and monitoring will continue to ensure that any concentration trends can be identified.

West Lindsey will continue to assess new developments submitted through the planning department ensuring that any proposed developments are not detrimental to local air quality. In addition, any new industry will be permitted in line with The Environmental Permitting (England and Wales) Regulations 2010.

Local Engagement and How to get Involved

A number of initiatives can be completed by everyone to help reduce air pollution concentrations on a local scale, these include:

- Using alternative modes of transport rather than the car, walking, cycling or using public transport;
- Changes in transport modes can bring added health benefits through walking and cycling exercise; and

West Lindsey District Council

- Asking your employer, school or college about the possibility of developing a green travel plan.

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1 Local Air Quality Management

This report provides an overview of air quality in West Lindsey 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 West Lindsey 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 within Appendix E.

2 Actions to Improve Air Quality

2.1 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 AQAP within 12-18 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

Currently there are no AQMAs designated within West Lindsey.

The monitoring completed within the District presented in Appendix A continues to comply with the air quality objectives, therefore no AQMA designations are proposed.

For reference, maps of the monitoring sites within West Lindsey are presented in Appendix D.

2.2 Progress and Impact of Measures to address Air Quality in West Lindsey

There are currently no designated AQMAs within the District and therefore an AQAP is not required. The air quality across West Lindsey is considered to be good, and as such there are no specific measures related to the control and mitigation of sources of local air pollution currently in place.

West Lindsey will continue to monitor for the coming year within the NO₂ diffusion tube network and to assess the results along with the results from the automatic monitoring station operated by EDF Energy at Gainsborough.

The Central Lincolnshire Local Plan was adopted in April 2017 and contains planning policies and allocations for the growth and regeneration of Central Lincolnshire over the next twenty years. This is relevant to West Lindsey District Council, North Kesteven District Council and the City of Lincoln. Air quality is one of the overarching objectives (objective k) within the Plan:

- k. *‘...**Pollution**: To minimise pollution (air, noise and light) and improve air quality...’*

In addition Policy LP26 puts constraints on all development within Central Lincolnshire, ensuring that development proposals are assessed against relevant design and amenity criteria:

Policy LP26: Design and Amenity

'All development, including extensions and alterations to existing buildings, must achieve high quality sustainable design that contributes positively to local character, landscape and townscape, and supports diversity, equality and access for all.

Development proposals will be assessed against the following relevant design and amenity criteria.

Amenity Considerations

- s. *Adverse impact upon air quality from odour, fumes, smoke, dust and other sources...*

All development proposed within the District will be assessed in relation to these considerations and be expected to adhere to them.

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.

Currently there is no monitoring of PM_{2.5} or PM₁₀ completed within West Lindsey, therefore no concentration values can be reported or estimated using the method as described in Box 7.7 of LAQM.TG(16).

The current Defra background maps for West Lindsey (2013 based⁴) show that all background concentrations of PM_{2.5} are far below the 2020 annual mean AQS objective for PM_{2.5}. The highest concentration is predicted to be 12.3µg/m³ within the 1 x 1km grid square with the centroid grid reference of 497500, 374500. This is an area to the north of Lincoln that contains the A15 and the A46.

There is currently one designated smoke control zone within West Lindsey, the Lincoln Fringe (the area between the boundary of the City of Lincoln and Lincoln

⁴ Defra Background Mapping data for local authorities (2013-based), available online at <https://uk-air.defra.gov.uk/data/lagm-background-maps?year=2013>

bypass). Details on the smoke control area and the order governing the zone are available within the air quality section of the website for West Lindsey⁵.

The Public Health Outcomes Framework data tool⁶ compiled by Public Health England quantifies the mortality burden of PM_{2.5} within England on a county and local authority scale. The 2015 fraction of mortality attributable to PM_{2.5} pollution across England is 4.7%, and in contrast the fraction within West Lindsey is slightly higher than the National average at 5.2%.

LAQM.TG(16) Table A.1 Action toolbox presents a list of measures that can be implemented to help reduce concentrations of PM_{2.5}.

Where required West Lindsey will review any proposed actions to be implemented with the County Council Public Health team to consider the potential impact of the actions and whether any further action is required.

⁵ West Lindsey District Council, Air Quality, available online at <https://www.west-lindsey.gov.uk/my-services/my-community/environment/air-quality-and-smoke-control/air-quality/>

⁶ Public Health Outcomes Framework, Public Health England. data tool available online at <http://www.phoutcomes.info/public-health-outcomes-framework#page/0/gid/1000043/pat/6/par/E12000004/ati/101/are/E07000142>

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

3.1 Summary of Monitoring Undertaken

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

3.1.1 Automatic Monitoring Sites

West Lindsey undertook automatic (continuous) monitoring at one site during 2016. Table A.1 in Appendix A shows the details of the sites. The Gainsborough Cemetery site is operated by EDF Energy as part of a monitoring network to monitor emissions from the 'North Trent' group of power stations.

The results from the Gainsborough Cemetery monitoring site are not currently available online however national monitoring results are available at <https://uk-air.defra.gov.uk/networks/>.

Maps showing the location of the monitoring sites are 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

West Lindsey undertook non- automatic (passive) monitoring of NO₂ at twelve locations during 2016. This is an increase of one location compared to 2015, Site WL14 (Sykes Lane) was added to the monitoring network in November 2016 to complete a short term study. 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.

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. All monitoring locations continue to be well below the annual mean AQS objective for NO₂. The highest concentration in 2016 was 26.6µg/m³, this was recorded at the diffusion tube monitoring location WL7 which is located on Lea Road in Gainsborough.

Annual mean concentration graphs for NO₂ are presented in Figure A.1 and Figure A.2. The annual mean concentration recorded at the Gainsborough Cemetery automatic monitor has remained at a relatively constant concentration since 2014, this follows a period of decline between 2012 and 2014. For the diffusion tube concentrations, when compared to 2015, nine sites experienced a decrease in concentration, one site experienced an increase (WL11), and one site remained at the same concentration (WL12). All of the monitoring results were far below the AQS objective of 40µg/m³.

The diffusion tube location WL14 was a temporary monitoring location that was installed due to complaints from neighbouring properties in regards to a biomass boiler that was located nearby. For the two months when monitoring was completed at this location the NO₂ concentrations were 21.4µg/m³ and 25.3µg/m³.

The full diffusion tube 2016 dataset of monthly mean values is provided in Table B.1 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. The highest 1-hour NO₂ concentration recorded in 2016 was 59.2µg/m³. Data capture was below 85% during 2016 therefore the 99.8% percentile of the 1-hour means has been provided, this percentile was calculated to be 55.4.

3.2.2 Sulphur Dioxide (SO₂)

Table A.5 in Appendix A compares the ratified continuous monitored SO₂ concentrations for year 2016 with the air quality objectives for SO₂.

The results presented in Table A.5 show that all AQS objectives for SO₂ continue to be met at the Gainsborough Cemetery monitoring location.

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)
GC	Gainsborough Cemetery	Industrial	482021	289974	NO ₂ ; SO ₂	NO	Chemiluminescent; UVF	N/A	N/A	3

Notes:

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

(2) N/A if not applicable.

Table A.2 – 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)
WL1	19 Spring Gardens, Gainsborough	Roadside	481721	389935	NO ₂	NO	7.8	2.9	NO	2.75
WL2	58 Etherington Street, Gainsborough	Roadside	481688	389770	NO ₂	NO	20.1	1.6	NO	2.75
WL3/4/5	Gainsborough Cemetery, Gainsborough	Industrial	482021	389974	NO ₂	NO	N/A	13.8	YES	3
WL6	Cherry Tree, Gainsborough	Kerbside	481500	390400	NO ₂	NO	1.7	0.2	NO	2.75
WL7	3 Lea Road, Gainsborough	Roadside	481526	389077	NO ₂	NO	0	8.6	NO	2.75
WL8	Marshall Way, Gainsborough	Roadside	483062	389224	NO ₂	NO	11.2	15.9	NO	2.75
WL9	Lamas Leas Lane, Market Rasen	Roadside	510840	388610	NO ₂	NO	32.4	10.2	NO	2.75
WL10	Beeches Way, Market Rasen	Roadside	510851	388475	NO ₂	NO	1.2	6.9	NO	2.75
WL11	53 Caistor Rd/ Gallimore Lane, Market Rasen	Roadside	510681	389675	NO ₂	NO	15.1	1.7	NO	2.75
WL12	Walkerith	Rural	479811	392738	NO ₂	NO	51	2	NO	2.75
WL13	Heaton Street	Roadside	481555	389891	NO ₂	NO	5.9	2.22	NO	2.75

WL14 ⁽³⁾	Sykes Lane	Rural	487742	376707	NO ₂	NO	0	50	NO	2.5
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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.
- (3) Monitoring only completed in November and December due to a resident complaint.

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
GC	Industrial	Automatic	73.1	73.1	16.0	15.2	13.8	13.6	13.7
WL1	Roadside	Diffusion Tube	91.7	91.7	23.4	21.7	19.5	24.7	20.8
WL2	Roadside	Diffusion Tube	100	100	16.1	15.1	14.1	19.9	18.2
WL3/4/5	Industrial	Diffusion Tube	88.9	88.9	20.2	18.8	17.7	13.4	12.3
WL6	Roadside	Diffusion Tube	100	100	31.8	29.4	26.9	16.8	15.2
WL7	Roadside	Diffusion Tube	100	100	22.3	19.4	19.0	26.8	26.6
WL8	Roadside	Diffusion Tube	100	100	19.7	18.6	17.4	18.1	14.9
WL9	Roadside	Diffusion Tube	91.7	91.7	15.7	15.8	12.8	18.1	17.2
WL10	Roadside	Diffusion Tube	91.7	91.7	19.8	19.1	18.2	13.7	12.6
WL11	Roadside	Diffusion Tube	91.7	91.7	17.0	15.1	13.7	18.8	19.8
WL12	Rural	Diffusion Tube	83.3	83.3	27.1	25.4	23.7	12.7	12.7
WL13	Roadside	Diffusion Tube	100	100	27.7	28.9	24.6	24.7	21.0

Diffusion tube data has been bias corrected using the national factor of 1.01

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.

Figure A.1 – Trends in Annual Mean NO₂ Concentrations: Gainsborough Cemetery

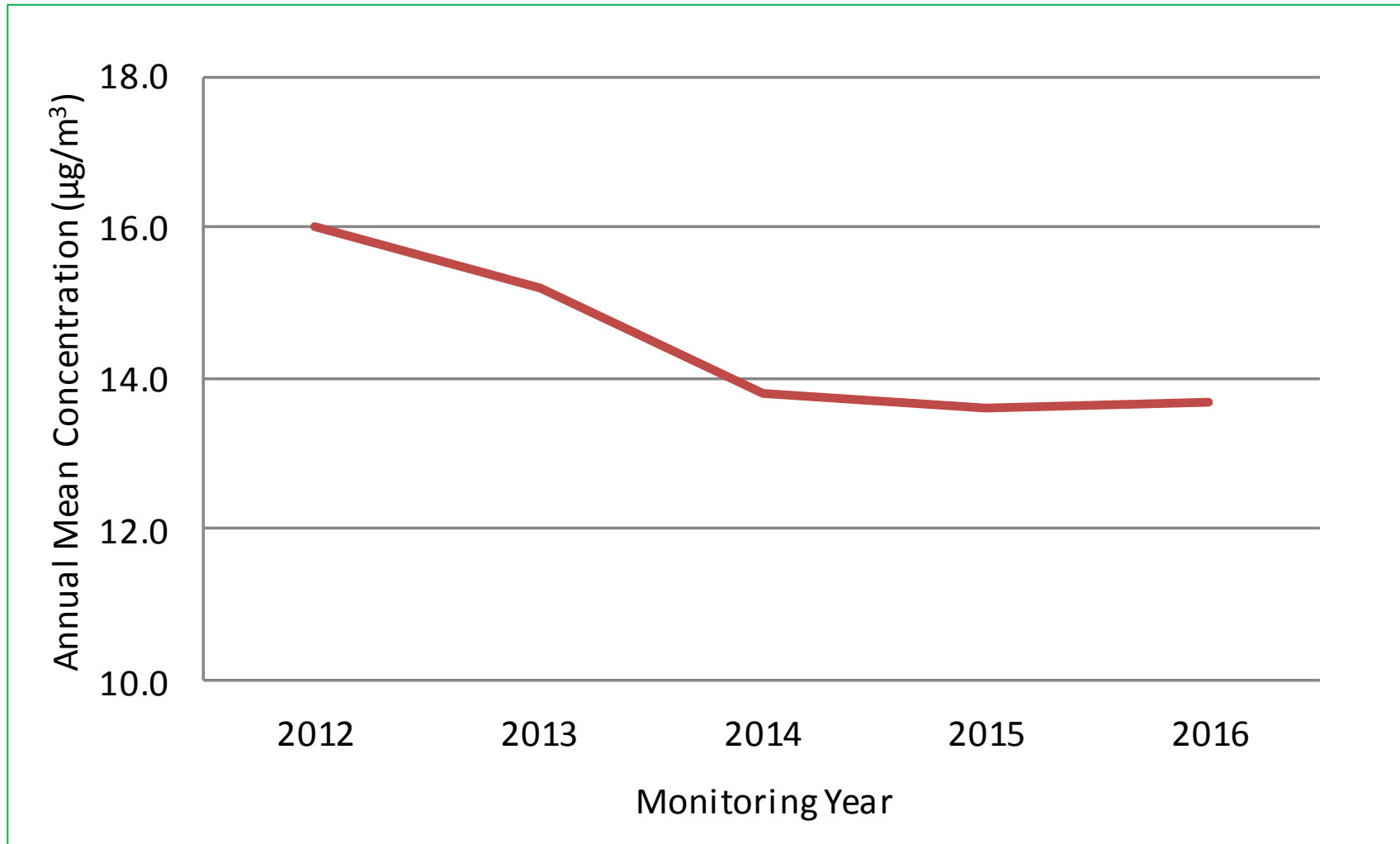


Figure A.2 – Trends in Annual Mean NO₂ Concentrations: Diffusion Tubes

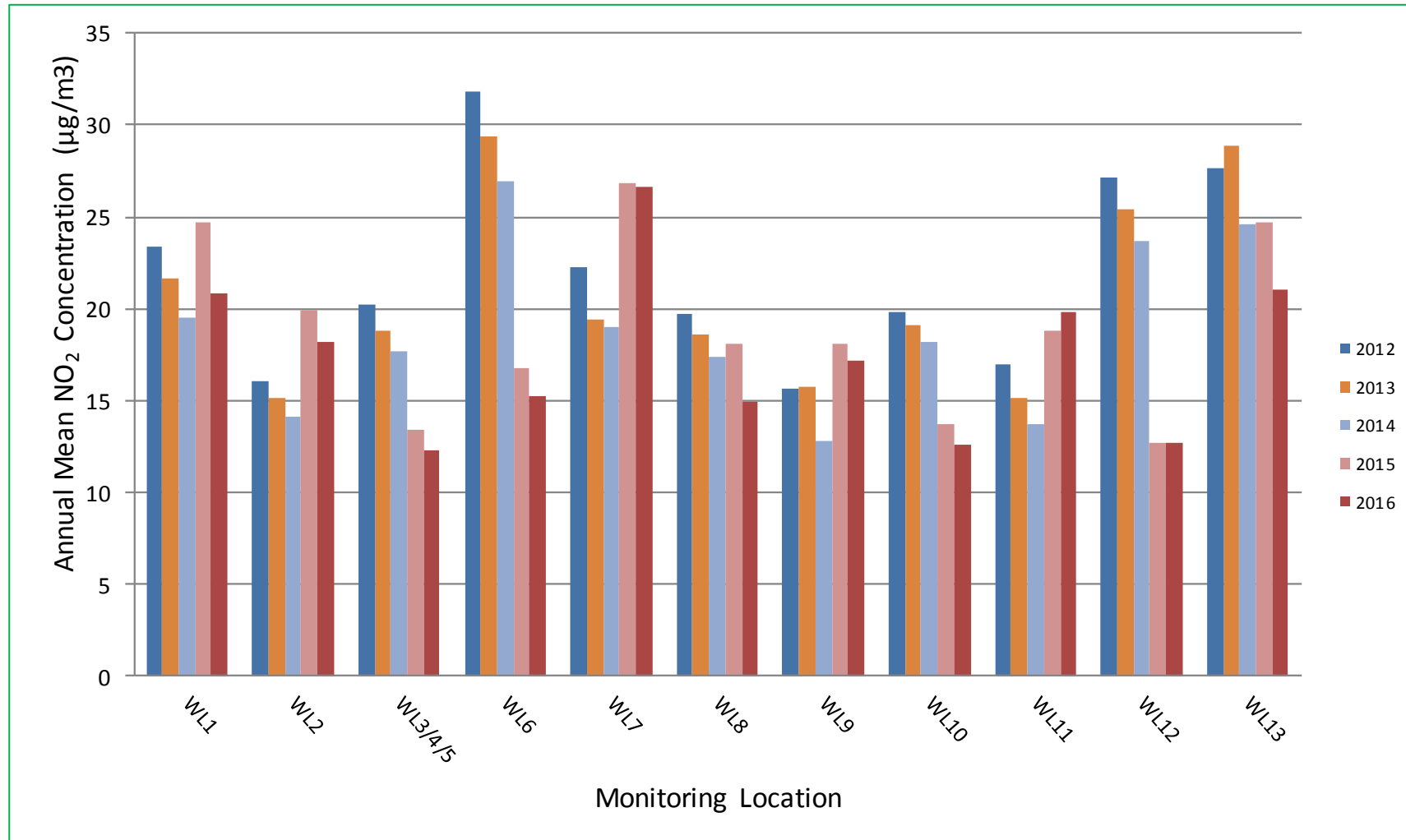


Table A.4 – 1-Hour Mean NO₂ Monitoring Results

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
GC	Industrial	Automatic	73.1	73.1	0	0	0	0	0 (55.4)

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 – SO₂ Monitoring Results

Site ID	Site Type	Valid Data Capture for monitoring Period (%) ⁽¹⁾	Valid Data Capture 2016 (%) ⁽²⁾	Number of Exceedances 2016 (percentile in bracket) ⁽³⁾		
				15-minute Objective (266 µg/m ³)	1-hour Objective (350 µg/m ³)	24-hour Objective (125 µg/m ³)
GC	Industrial	99.3	99.3	0	0	0

Notes:

Exceedances of the SO₂ objectives are shown in **bold** (15-min mean = 35 allowed a year, 1-hour mean = 24 allowed a year, 24-hour mean = 3 allowed a year)

(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 relevant percentiles are 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)												Annual Mean		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted (1.01) and Annualised ⁽¹⁾	Distance Corrected to Nearest Exposure ⁽²⁾
WL1	27.0	20.6	19.1	20.7	17.0	15.9	7.0	16.0	20.5	19.4	29.4	29.5	20.6	20.8	-
WL2	23.1	20.0	16.8	13.9	15.2	14.1	8.0	11.9	17.1	18.6	29.2	27.9	18.0	18.2	-
WL3	15.8	14.7	10.2	9.0	9.1	-	8.7	6.3	10.8	12.5	18.4	17.2	12.1	12.2	-
WL4	17.1	13.3	10.7	6.8	8.4	-	11.8	7.3	9.7	10.9	17.8	22.8	12.4	12.5	-
WL5	18.0	13.9	8.7	9.2	8.0	-	16.5	6.0	9.8	11.3	18.5	17.9	12.1	12.3	-
WL6	22.8	16.6	14.2	12.5	10.9	10.1	10.1	7.7	13.3	13.5	23.6	25.2	15.1	15.2	-
WL7	28.3	26.7	24.3	26.0	23.7	24.7	21.1	19.2	24.5	29.6	36.2	31.7	26.3	26.6	-
WL8	21.9	17.6	15.7	15.1	11.7	9.3	10.6	9.7	13.7	14.0	14.7	23.6	14.8	14.9	-
WL9	19.4	19.1	18.0	13.4	13.3	13.3	-	10.6	14.4	17.5	23.5	25.3	17.1	17.2	-
WL10	15.5	13.4	11.1	10.9	10.5	8.5	8.4	7.5	10.3	11.5	17.9	20.3	12.5	12.6	-
WL11	18.8	19.4	20.2	20.0	18.9	18.3	27.6	15.4	15.6	18.2	12.9	23.7	19.7	19.8	-
WL12	15.4	11.9	9.6	10.3	16.2	6.4	6.5	2.4	9.8	8.7	17.2	20.5	12.6	12.7	-
WL13	26.9	23.3	19.3	21.4	8.6	15.8	13.2	15.1	18.2	20.9	32.3	34.3	20.8	21.0	-
WL14 ⁽³⁾	-	-	-	-	-	-	-	-	-	-	21.4	25.3	-	-	-

Local bias adjustment factor used

National bias adjustment factor used

Annualisation has been conducted where data capture is <75%, no tubes required annualisation in 2016

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, distance correction not completed due to all concentrations being far below the 40µg/m³ annual mean objective.

(3) Monitoring only completed in November and December due to a resident complaint, results have not been annualised or bias adjusted.

Concentrations shown in **RED** have been removed from the data set due to the diffusion tubes containing spiders.

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

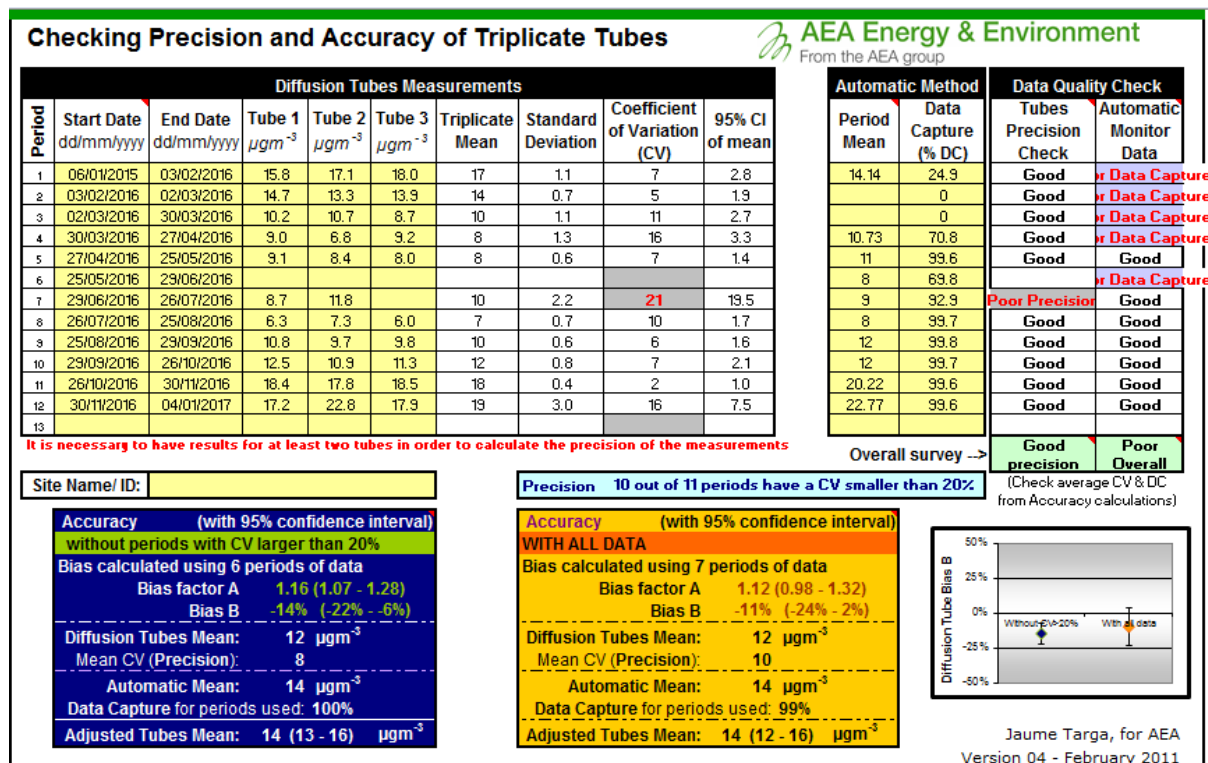
Sources of Pollution

West Lindsey have not identified any potential **new sources** within the District as described in Chapter 7, Section 1 of Defra LAQM.TG(16).

Diffusion Tube Local Bias Adjustment Factor

There is a triplicate co-located diffusion tube monitoring site within the District located at the Gainsborough Cemetery automatic monitoring station. A local bias adjustment factor has been calculated using the Precision and Bias adjustment spreadsheet (v04)⁷, the output is shown below in Figure C.1.

Figure C.1 – Local Bias Correction Output: Gainsborough Cemetery



Diffusion Tube National Bias Adjustment Factors

Diffusion tube data for West Lindsey District Council is supplied and analysed by Gradko International Ltd. The tubes were prepared using the 50% TEA in acetone preparation method. The national bias adjustment factor for Gradko 50% TEA in

⁷ AEA_DifTPAB_v04.xls, available at <http://laqm.defra.gov.uk/bias-adjustment-factors/local-bias.html>

acetone is 1.01, based on 18 studies for the year 2016, as derived from the national bias adjustment factor spreadsheet⁸.

Discussion of Choice of Factor to Use

The diffusion tube data has been corrected using a bias adjustment factor, which is an estimate of the difference between diffusion tube concentration and continuous monitoring, the latter assumed to be a more accurate method of monitoring. The Defra LAQM.TG(16) provides guidance with regard to the application of a bias adjustment factor to correct diffusion tube monitoring. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data taken from NO_x/NO₂ continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

With regard to the application of a bias adjustment factor for diffusion tubes, Defra LAQM.TG(16) and the LAQM Helpdesk⁹ recommend the use of a local bias adjustment factor where available and relevant to the diffusion tube sites.

The local bias adjustment factor calculated for 2016 is 1.16. Data capture for the co-location monitoring site was 73.1% for the automatic monitor, and 88.9% for the diffusion tubes. There were five out of the twelve monitoring periods that had poor data capture, and good precision was recorded for ten or the twelve monthly monitoring periods. It was decided to use the national bias adjustment factor of 1.01 for the 2016 diffusion tube data set. This was due to the poor data capture experienced at the Gainsborough Cemetery monitoring stations during 2016.

For previous years data (2012 to 2015) presented in Table A.3, the bias adjustment factors have been taken from previous LAQM reports completed by West Lindsey District Council.

QA/QC of Diffusion Tube Monitoring

The diffusion tubes for the year 2016 were supplied and analysed by Gradko International Ltd, the tubes were prepared using the 50% TEA in acetone preparation

⁸ National Diffusion Tube Bias Adjustment Factor Spreadsheet version 06/17 available at <https://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html>

⁹ Laqm.defra.gov.uk

method. All results have been bias adjusted and annualised where required before being presented in Table A.3.

Gradko is a UKAS accredited laboratory and participates in the AIR-PT Scheme (a continuation of the Workplace Analysis Scheme for Proficiency (WASP)) for NO₂ tube analysis and the Annual Field Inter-Comparison Exercise. These provide strict performance criteria for participating laboratories to meet, thereby ensuring NO₂ concentrations reported are of a high calibre. The lab follows the procedures set out in the Harmonisation Practical Guidance In the latest available AIR-PT results, AIR-PT AR 0012 (January to February 2016), AIR-PT AR013 (April to May 2016), AIR-PT AR015 (July to August 2016), AIR-PT AR016 (September to October 2016) and AIR-PT AR01 (October to November 2016). Gradko has scored 100% on all results. The percentage score reflects the results deemed to be satisfactory based upon the z-score of $< \pm 2$. Seventeen out of the eighteen local Authority co-location studies in 2016 were rated as 'good' (tubes are considered to have "good" precision where the coefficient of variation of duplicate or triplicate diffusion tubes for eight or more periods during the year is less than 20%).

Appendix D: Maps of Monitoring Locations and AQMAs

Figure D.1 – Map of Automatic Monitoring Location



Figure D.2 – Map of Non-Automatic Monitoring Sites: Gainsborough



Figure D.3 – Map of Non-Automatic Monitoring Sites: Market Rasen

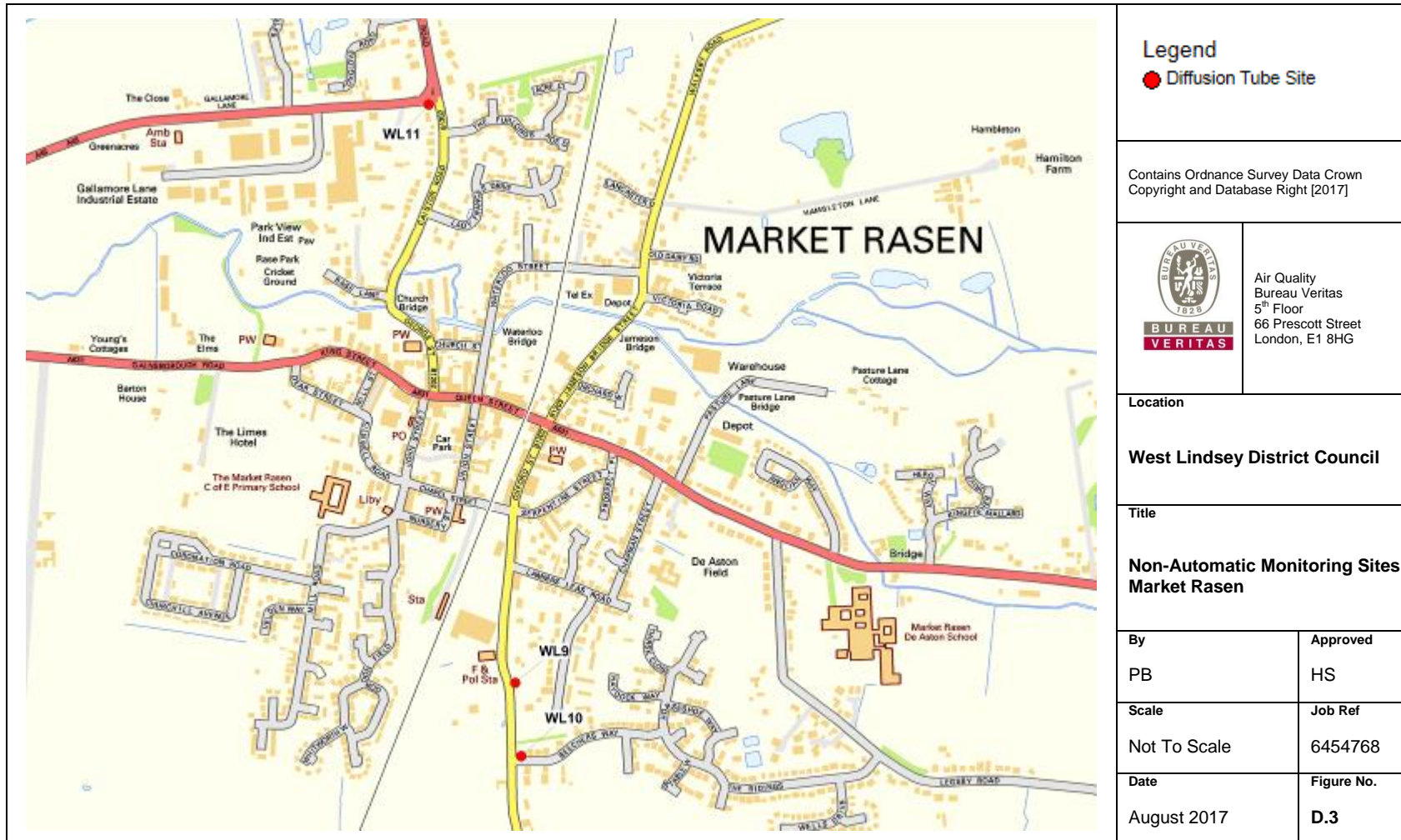


Figure D.4 – Map of Non-Automatic Monitoring Sites: Sykes Lane



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective ¹⁰	
	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

¹⁰ The units are in microgrammes of pollutant per cubic metre of air (µg/m³).

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
Defra	Department for Environment, Food and Rural Affairs
EU	European Union
LAQM	Local Air Quality Management
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxides
PM ₁₀	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
PM _{2.5}	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO ₂	Sulphur Dioxide

References

- Local Air Quality Management Technical Guidance LAQM.TG(16). May 2016. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- Local Air Quality Management Policy Guidance LAQM.PG(16). May 2016. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- West Lindsey District Council, 2016 Annual Status Report.
- West Lindsey District Council, 2015 Updating and Screening Assessment.
- Central Lincolnshire Local Plan, Adopted April 2017.
- Lincolnshire County Council, Lincoln Eastern Bypass, Environmental Statement, December 2012.
- National Diffusion Tube Bias Adjustment Factor Spreadsheet, version 06/17 published in June 2017.