West Lindsey District Council
Annual Status Report 2021

Bureau Veritas

June 2021

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Identification	
Client	West Lindsey District Council
Document Title	West Lindsey 2021 Annual Status Report
Bureau Veritas Ref No.	[redacted]

Contact Details		
Company Name	Bureau Veritas UK Limited	West Lindsey District Council
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Configuration				
Version	**Date**	**Author**	**Reason for Issue/Summary of Changes**	**Status**
[redacted]				
[redacted]				

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2021 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995

Local Air Quality Management

Date: June 2021

Information	West Lindsey District Council Details
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Department	Senior Environmental Health Practitioner
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Report Reference Number	[redacted]
Date	June 2021

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, the elderly, and those with existing heart and lung conditions. There is also often a strong correlation with equalities issues because areas with poor air quality are also often less affluent areas[1,2].

The mortality burden of air pollution within the UK is equivalent to 28,000 to 36,000 deaths at typical ages[3], with a total estimated healthcare cost to the NHS and social care of £157 million in 2017[4].

In 2020, the annual mean nitrogen dioxide (NO_2) concentrations reported in West Lindsey continue to remain well below the Air Quality Strategy (AQS) objectives. No new monitoring sites were deployed in 2020. There has been no reported exceedance of any AQS objective within West Lindsey for the past 5 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.

Three power stations, operated by EDF Energy, are located nearby and in close proximity to one-another. Two of these, Cottam and West Burton A, are coal fired, whereas West Burton B is a gas fired combined cycle gas turbine power station. A continuous air quality monitoring station is located in Gainsborough Cemetery, north to north-east of the power stations. This has been put in place to continuously monitor both NO_2 and sulphur dioxide (SO_2) concentrations which are produced by such industrial activities.

For three years, the automatic monitor at Gainsborough Cemetery has reported much lower NO_2 concentrations than previously, and these concentrations are also lower than

[1] Public Health England. Air Quality: A Briefing for Directors of Public Health, 2017

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

[3] Defra. Air quality appraisal: damage cost guidance, July 2020

[4] Public Health England. Estimation of costs to the NHS and social care due to the health impacts of air pollution: summary report, May 2018

the co-located NO_2 diffusion tubes. As a result, the relevant national bias adjustment factors have been applied to the 2020 monitoring data.

Other than impacts on the laboratories which supply and analyse the diffusion tubes, there has been very little impact on the Council's LAQM duties, or air quality within the District, as a result of the COVID-19 pandemic.

There are currently no Air Quality Management Areas (AQMAs) within the Council's designation. This is due to the continuously low concentrations that are currently, and also have been historically, 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. The results show that all AQS objectives for SO_2 continue to be met at the Gainsborough Cemetery monitoring location.

Actions to Improve Air Quality

Whilst air quality has improved significantly in recent decades, and will continue to improve due to national policy decisions, there are some areas where local action is needed to improve air quality further.

The 2019 Clean Air Strategy[5] sets out the case for action, with goals even more ambitious than EU requirements to reduce exposure to harmful pollutants. The Road to Zero[6] sets out the approach to reduce exhaust emissions from road transport through a number of mechanisms; this is extremely important given that the majority of Air Quality Management Areas (AQMAs) are designated due to elevated concentrations heavily influenced by transport emissions.

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.

[5] Defra. Clean Air Strategy, 2019

[6] DfT. The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy, July 2018

West Lindsey will continue to monitor for the coming year within the NO_2 diffusion tube network and to assess the results along with those from the automatic monitoring station operated by EDF Energy at Gainsborough.

The adopted Central Lincolnshire Local Plan contains objectives and policies designed to minimise the impact upon local air quality from new developments.

Conclusions and Priorities

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 so as to ensure that any proposed developments are not detrimental to local air quality. In addition, any new industrial processes will be regulated in line with The Environmental Permitting (England and Wales) Regulations 2016 (as amended).

Additionally, as an investigation in order to determine the decrease in concentrations detected at the Gainsborough Cemetery continuous monitor was not possible in 2020 due to a shift in priorities, there is the intention to undertake this in 2021.

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

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 2020. 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 are presented in Table E.1.

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 should prepare an Air Quality Action Plan (AQAP) within 12 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

West Lindsey currently does not have any declared AQMAs. For reference, a map of West Lindsey's monitoring locations is available in Appendix D.

The monitoring completed within the District presented in Appendix A continues to comply with the Air Quality Strategy (AQS) objectives, therefore no AQMA designations are proposed.

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

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

- *"There were no exceedances of the NO_2 hourly air quality objective. There were also no reported exceedances of the 15-minute, 1-hour or 24-hour SO_2 air quality objectives;*
- *Concentrations at all sites have remained consistent or seen a small reduction.*
- *Data capture for 2019 was good at all locations so no annualisation of monitoring data was necessary either;*
- *Trends are clearly presented and discussed and a robust comparison with air quality objectives is provided;*
- *The diffusion tube mapping is comprehensive and clearly demonstrates the monitoring network;*
- *Comments from the previous appraisal are included and responded to.*
- *The report refers to the Public Health Outcomes Framework, this is welcomed and encouraged to continue;*
- *The investigation with EDF to determine the cause for the notable drop in NO_2 concentrations at the Gainsborough monitoring site is encouraged; and*
- *The conservative approach to use the national bias adjustment factor instead of the local factor derived from the Gainsborough monitoring site is also supported. The extremely low local bias adjustment factor is not likely to be representative of the other roadside diffusion tube locations throughout West Lindsey."*

Due to West Lindsey being a rural district without any substantial urbanised areas, the pollution concentrations continue to be relatively low and few measures are required to control this. Several industries remain in the district with the potential to pollute and are controlled by Environmental Permits. These industries have their emissions controlled by a range of legally enforceable conditions. Whilst Part A1 processes are subject to regulation by the Environment Agency, Part A2 and Part B processes are subject to regular routine inspection by the Council. The Environmental Protection team also responds to complaints regarding other air pollution issues, such as smoke nuisance from bonfires, emissions of dark smoke and offensive odours.

Monitoring of pollutants continues to ensure that any increase in concentration trends can be identified, as well as facilitating the review of areas believed to be at most risk of exceeding the AQS objectives. West Lindsey continues 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 industrial processes will be regulated in line with the Environmental Permitting (England and Wales) Regulations 2016 (as amended). The Lincoln Eastern Bypass has been completed, which is on the edge of the district boundary, alongside some large residential developments being in early stages of development. The Council will continue to monitor pollutant levels to determine the impact in coming years.

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 PM_{10} 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), which provides a method for estimating $PM_{2.5}$ concentrations from PM_{10} measurements.

The current Defra background maps for West Lindsey (2018 reference year) show that all 2020 background concentrations of $PM_{2.5}$ are far below the recommended 2020 annual mean AQS objective for $PM_{2.5}$ of 25µg/m^3. The highest concentration is predicted to be 9.5µg/m^3 within the 1km x 1km grid square with the centroid grid reference of 497500, 374500. This is an area to the north of Lincoln close to the A46 and A15.

There is currently one designated smoke control zone within West Lindsey, the Lincoln Fringe (the area between the boundary of the West Lindsey District and Lincoln bypass). Smoke control zones are a defined geographical region within which smoke cannot be legally emitted from a chimney, unless using authorised fuels or using exempt appliances.

The Public Health Outcomes Framework data tool compiled by Public Heath England quantifies the mortality burden of $PM_{2.5}$ within England on a county and local authority scale. The 2019 fraction of mortality attributable to $PM_{2.5}$ pollution within West Lindsey is 5.0%. This remains lower than average for England as a whole and the East Midlands region, which are 5.1% and 5.3% respectively.

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

This section sets out the monitoring undertaken within 2020 by West Lindsey District Council and how it compares with the relevant air quality objectives. In addition, monitoring results are presented for a five-year period between 2016 and 2020 to allow monitoring trends to be identified and discussed.

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

West Lindsey District Council undertook automatic (continuous) monitoring at 1 site during 2020. Table A.1 in Appendix A shows the details of the automatic monitoring site, Gainsborough Cemetery. This site is operated by EDF Energy as part of a monitoring network to assess emissions from the 'North Trent' group of power stations. Table A.3 in Appendix A presents the automatic monitoring results for West Lindsey.

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 District Council undertook non- automatic (i.e. passive) monitoring of NO_2 at 12 sites during 2020. Table A.2 in Appendix A presents the details of the non-automatic 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 (where the annual mean data capture is below 75% and greater than 25%), and distance correction. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO_2)

Table A.3 and Table A.4 in Appendix A compare the ratified and adjusted monitored NO_2 annual mean concentrations for the past five years with the air quality objective of 40µg/m^3. Note that the concentration data presented represents the concentration at the location of the monitoring site, following the application of bias adjustment and annualisation, as required (i.e. the values are exclusive of any consideration to fall-off with distance adjustment).

For diffusion tubes, the full 2020 dataset of monthly mean values is provided in Appendix B. Note that the concentration data presented in Table B.1 includes distance corrected values, only where relevant.

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

All monitoring locations, both continuous and passive, within West Lindsey continue to report annual mean NO_2 concentrations well below the AQS objective. Following bias adjustment and annualisation where required, the maximum reported concentration in 2020 is 24.4µg/m^3 at diffusion tube monitoring location WL14, located on Queen Street in Market Rasen. This monitoring location was added in 2019 and also reported the maximum concentration in the 2020 report.

Graphs showing the annual mean NO_2 cocnetrations are presented in Figure A.1. All monitoring locations have reported a continued, but larger decrease in annual mean NO_2 concentrations during 2020 compared to previous years. This is largely expected to be a result of the COVID-19 pandemic, whereby the UK Government issued advice to stay at home where possible, alongside strict lockdowns. This resulted in decreased levels of traffic observed across the UK, and therefore was significantly reduced NO_x and NO_2 emissions. Additionally, the natural improvement of the UK's vehicle fleet has aided in decreasing NO_2 concentrations.

All monitoring results are well below the annual mean NO_2 AQS objective of 40µg/m^3. Fall-off with distance correction is not required due to the low monitored concentrations.

Table A.5 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 the be exceeded more than 18 times per year. The highest 1-hour mean NO_2 concentration observed at the Gainsborough Cemetary monitoring location during 2020 was 37.8µg/m^3. Futhermore, there have been no recorded exceedances of the 1-hour mean NO_2 AQS objective in the last 5 years.

Alongside this, it is possible to infer the risk of exceedances of the 1-hour mean NO_2 AQS objective at diffusion tube monitoring sites. LAQM.TG(16) provides an empirical relationship that states exceedances of the 1 hour objective are unlikely when the annual mean concentration is below 60µg/m^3. Given that the highest recorded annual mean concentration at any of the diffusion tube monitoring sites is 24.4µg/m^3, it is possible to conclude that there have been no exceedances of the hourly mean NO_2 objective in the last five years at these locations.

3.2.2 Sulphur Dioxide (SO_2)

Table A.6 in Appendix A compares the ratified continuous monitored SO_2 concentrations for 2020 with the air quality objectives for SO_2.

The SO_2 AQS objectives are as follows:

- 15-minute mean of 266µg/m^3 not to be exceeded more than 35 times a year;
- 1-hour mean of 350µg/m^3 not to be exceeded more than 24 times a year; and
- 24-hour mean of 125µg/m^3 not to be exceeded more than 3 times a year.

There were no reported exceedances of any of these AQS objectives at the Gainsborough Cemetery monitoring location during 2020.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which 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	389974	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

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
WL1	3 Lea Road, Gainsborough	Roadside	481526	389077	NO_2	No	0.0	8.6	No	2.8
WL2	58 Etherington Street, Gainsborough	Roadside	481688	389770	NO_2	No	20.1	1.6	No	2.8
WL3	19 Spring Gardens, Gainsborough	Roadside	481721	389935	NO_2	No	7.8	2.9	No	2.8
WL4	Heaton Street	Roadside	481555	389891	NO_2	No	5.9	2.2	No	2.8
WL5, WL6, WL7	Gainsborough Cemetery, Gainsborough	Industrial	482021	389974	NO_2	No	N/A	13.8	Yes	3.0
WL8	Cherry Tree, Gainsborough	Kerbside	481500	390400	NO_2	No	1.7	0.2	No	2.8
WL9	Walkerith	Rural	479811	392738	NO_2	No	51.0	2.0	No	2.8
WL10	Marshall Way, Gainsborough	Roadside	483062	389224	NO_2	No	11.2	15.9	No	2.8
WL11	53 Caistor Rd/ Galamore Lane, Market Rasen	Roadside	510681	389675	NO_2	No	15.1	1.7	No	2.8
WL12	Lammas Leas Lane, Market Rasen	Roadside	510840	388610	NO_2	No	32.4	10.2	No	2.8
WL13	Beechers Way, Market Rasen	Roadside	510851	388475	NO_2	No	1.2	6.9	No	2.8
WL14	Queen Street	Roadside	510866	389106	NO_2	No	2.0	2.0	No	2.8

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.3 – Annual Mean NO_2 Monitoring Results: Automatic Monitoring (µg/m^3)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2020 (%) (2)	2016	2017	2018	2019	2020
GC	482021	389974	Industrial	98.0	98.0	13.7	14.8	6.9	7.5	5.5

☐ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16.**

☒ **Reported concentrations are those at the location of the monitoring site (annualised, as required), i.e. prior to any fall-off with distance correction.**

Notes:

The annual mean concentrations are presented as µg/m^3.

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

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

Concentrations are those at the location of monitoring and not those following any fall-off with distance adjustment.

(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%).

Table A.4 – Annual Mean NO_2 Monitoring Results: Non-Automatic Monitoring (µg/m^3)

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2020 (%) (2)	2016	2017	2018	2019	2020
WL1	481526	389077	Roadside	50.0	50.0	26.6	32.7	24.6	22.8	16.3
WL2	481688	389770	Roadside	92.3	92.3	18.2	20.9	18.6	19.0	14.4
WL3	481721	389935	Roadside	76.9	76.9	20.8	25.3	20.6	17.3	14.2
WL4	481555	389891	Roadside	92.3	92.3	21.0	26.5	21.4	20.7	15.2
WL5, WL6, WL7	482021	389974	Industrial	92.3	92.3	12.3	14.6	11.5	11.3	9.1
WL8	481500	390400	Kerbside	84.6	84.6	15.2	17.6	15.0	14.7	11.9
WL9	479811	392738	Rural	76.9	76.9	12.7	13.2	11.7	11.5	9.5
WL10	483062	389224	Roadside	92.3	92.3	14.9	19.5	16.8	15.0	12.0
WL11	510681	389675	Roadside	82.7	82.7	19.8	23.0	17.1	16.3	11.2
WL12	510840	388610	Roadside	92.3	92.3	17.2	20.0	17.2	14.8	12.0
WL13	510851	388475	Roadside	67.3	67.3	12.6	15.5	12.8	12.3	9.9
WL14	510866	389106	Roadside	82.7	82.7	-	-	-	28.8	24.4

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16.**

☒ **Diffusion tube data has been bias adjusted.**

☒ **Reported concentrations are those at the location of the monitoring site (bias adjusted and annualised, as required), i.e. prior to any fall-off with distance correction.**

Notes:

The annual mean concentrations are presented as µg/m^3.

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**.

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

Concentrations are those at the location of monitoring and not those following any fall-off with distance adjustment.

(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%).

Figure A.1 – Trends in Annual Mean NO_2 Concentrations

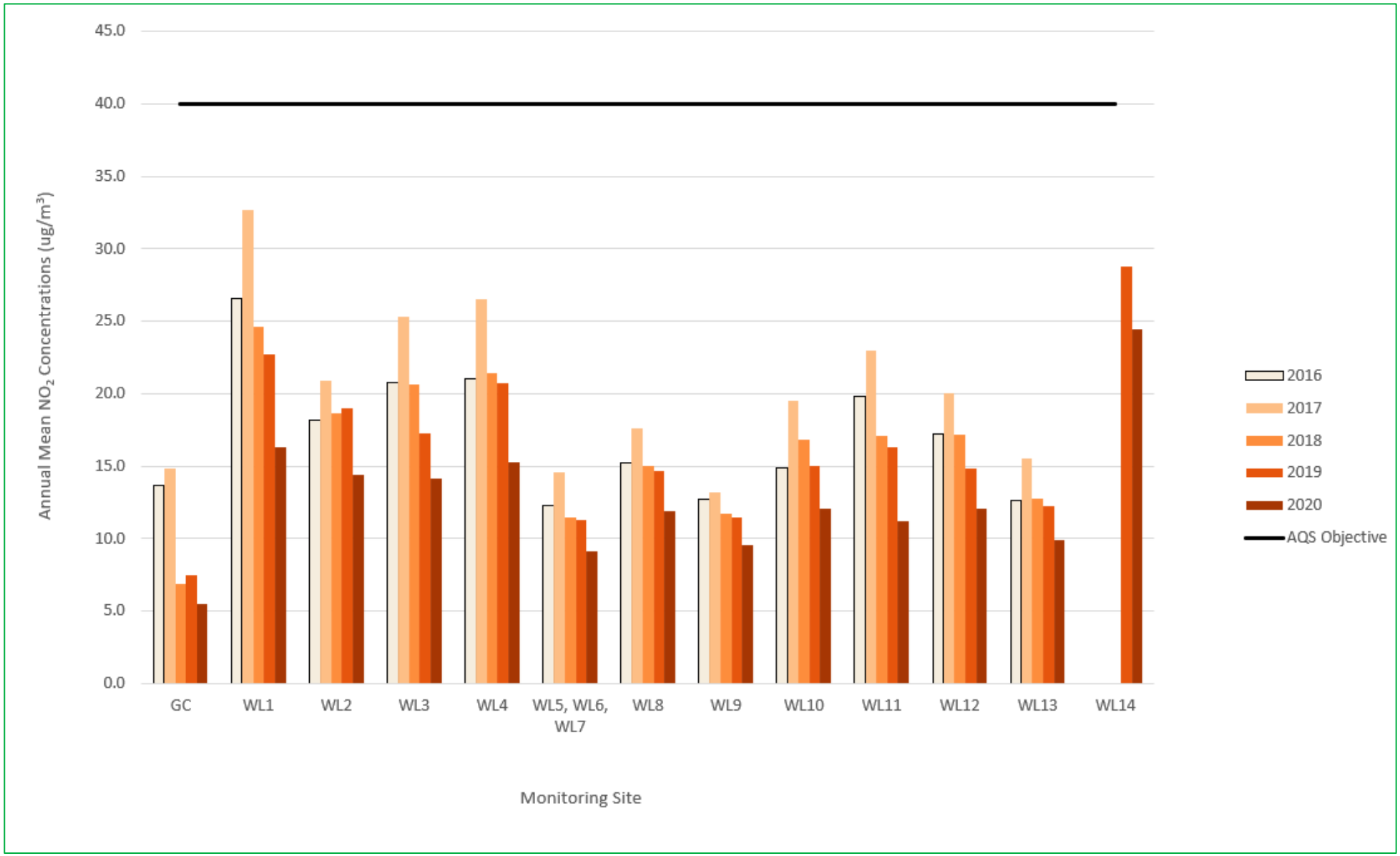


Table A.5 – 1-Hour Mean NO_2 Monitoring Results, Number of 1-Hour Means > 200µg/m^3

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2020 (%) (2)	2016	2017	2018	2019	2020
GC	482021	389974	Industrial	Automatic	99.0	98.3	0	0	0	0

Notes:

Results are presented as the number of 1-hour periods where concentrations greater than 200µg/m^3 have been recorded.

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**.

If the period of valid data is less than 85%, the 99.8th percentile of 1-hour means is provided in brackets.

(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%).

Table A.6 – SO_2 2020 Monitoring Results, Number of Relevant Instances

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2020 (%) (2)	Number of 15-minute Means > 266µg/m³	Number of 1-hour Means > 350µg/m³	Number of 24-hour Means > 125µg/m³
GC	482021	389974	Industrial	87.6	87.6	0	0	0

Notes:

Results are presented as the number of instances where monitored concentrations are greater than the objective concentration.

Exceedances of the SO_2 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).

If the period of valid data is less than 85%, the relevant percentiles are provided in brackets.

(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%).

Appendix B: Full Monthly Diffusion Tube Results for 2020

Table B.1 – NO_2 2020 Diffusion Tube Results (µg/m^3)

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Easting)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (Gradko – 0.82, SOCOTEC Didcot – 0.77)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
WL1	481526	389077	30.0		19.8	8.1					23.9	24.8	27.9	27.8	23.2	16.3		
WL2	481688	389770	28.2	19.7	15.1	12.6	10.7	13.0	10.9	14.6	16.6	18.3	26.9	24.8	17.6	14.4		
WL3	481721	389935	28.7		17.9	12.5	12.1	10.6		12.0	14.9	18.0	23.1	24.0	17.4	14.2		
WL4	481555	389891	31.1	22.5	16.7	11.8	12.3	14.0	14.5	16.4	16.2	15.7	27.9	24.6	18.7	15.2		
WL5	482021	389974	21.4	15.1	10.6	8.3	6.9	6.9	6.6	6.7	9.1	10.2	18.3	16.7	-	-		Triplicate Site with WL5, WL6 and WL7 - Annual data provided for WL7 only
WL6	482021	389974	15.4	13.8	10.1	8.4	7.6	7.9	8.0	8.4	9.1	10.7	19.7	15.8	-	-		Triplicate Site with WL5, WL6 and WL7 - Annual data provided for WL7 only
WL7	482021	389974	15.7	13.6	10.6	8.2	7.2	7.6	6.7	7.3	9.7	10.4	18.8	13.7	11.4	9.1		Triplicate Site with WL5, WL6 and WL7 - Annual data provided for WL7 only
WL8	481500	390400	20.7	17.6	14.7	10.6	9.2		9.7	10.7	12.7	16.2	19.4	18.8	14.6	11.9		
WL9	479811	392738	17.2	12.0	9.5	7.4	9.9			7.8	9.0	9.1	17.4	17.6	11.7	9.5		
WL10	483062	389224	23.8	20.4	15.3	10.9	7.5	10.7	12.2	11.0	11.8	13.4	22.8	16.8	14.7	12.0		
WL11	510681	389675	22.3	13.5	12.8	12.5	13.1	10.5	13.7	10.7	13.5		17.1	10.9	13.7	11.2		
WL12	510840	388610	21.5	16.2	16.8	11.4	11.3	11.5	10.4	11.7	13.3	13.5	20.0	19.3	14.7	12.0		
WL13	510851	388475	17.7	14.9	12.0	8.1	8.8	7.4		8.3			18.0	14.1	12.1	9.9		
WL14	510866	389106	32.2	27.9	30.9	23.5		29.0	30.2	27.8	30.5	30.6	31.4	33.9	29.8	24.4		

☒ **All erroneous data has been removed from the NO_2 diffusion tube dataset presented in Table B.1.**

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16.**

☐ **Local bias adjustment factor used.**

☒ **National bias adjustment factor used.**

☒ **Where applicable, data has been distance corrected for relevant exposure in the final column.**

☒ **West Lindsey District Council confirm that all 2020 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System.**

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**.

See Appendix C for details on bias adjustment and annualisation.

May tubes were supplied and analysed by SOCOTEC Didcot and have therefore had a different bias adjustment factor applied. See Appendix C for further details.

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

New or Changed Sources Identified Within West Lindsey During 2020

The Lincoln Eastern Bypass has been completed during 2020. This only covers a small area within the southern part of the District, near to the local authority boundary, however may bring with it additional traffic the nearby junctions. Additionally, there are two larger residential developments which are in early stages:

- A development just on the southern edge of Gainsborough, planning ref #140081 phase 1 of original ref #125020; and
- 300 residential units to the immediate north of Market Rasen, planning ref #135013.

Additional Air Quality Works Undertaken by West Lindsey District Council During 2020

West Lindsey District Council has not completed any additional works within the reporting year of 2020.

QA/QC of Diffusion Tube Monitoring

The diffusion tubes for the year 2020 were supplied and analysed by Gradko International Ltd for the majority of the year, with SOCOTEC Didcot providing the tubes in May whilst Gradko's labs were closed as a result of the COVID-19 pandemic. All tubes were prepared using the 50% TEA in acetone preparation method. All results have been bias adjusted before being presented in Table B.1.

Both Gradko International Ltd and SOCOTEC Didcot are UKAS accredited laboratories and participate in the AIR-PT Scheme (a continuation of the former Workplace Analysis Scheme for Proficiency (WASP)) for NO_2 tube analysis and the Annual Field Inter-Comparison Exercise. These provide strict performance criteria for participating laboratories to meet, thereby ensuring NO_2 concentrations reported are of a high calibre.

The labs follow the procedures set out in the Harmonisation Practical Guidance. In the 2020 AIR-PT results, AIR-PT AR036 (January – February 2020) and AR040 (September – October 2020) Gradko scored 75%, and SOCOTEC scored 100%. The AIR-PT rounds AR037 (May – June 2020), AR039 (July – August 2020) were cancelled due to the COVID-19 pandemic. The percentage score reflects the results deemed to be satisfactory based upon the z-score of < ±2.

Additionally, the precision of the NO_2 diffusion tubes supplied by Gradko International Ltd has been classified as 'good' for all but one observation during 2020, whereas SOCOTEC Didcot have been classified as 'good' for all observations in 2020. This precision reflects the laboratory's performance and consistency in preparing and analysing the tubes, as well as the subsequent handling of the tubes in the field. Further information on the precision summary results can be found on the LAQM website.

Diffusion Tube Annualisation

As per LAQM.TG(16), annualisation is required for any site which has a data capture of less than 75%, but greater than 25%. Annualisation was therefore required to be completed for one site, WL1, due to there being a 57.7% data capture for 2020. This was completed by using version 1 of the Diffusion Tube Data Processing Tool. The three closest continuous monitoring background locations which were selected to annualise the data are:

- Hull Freetown;
- Immingham Woodlands Avenue; and
- Sheffield Tinsley

All of these sites have a data capture of >85% and therefore could be used for annualisation. Table C.2 presents the annualisation summary and is taken directly from the Diffusion Tube Data Processing Tool.

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2021 ASR have been corrected for bias using an adjustment factor. Bias represents the overall tendency of the diffusion tubes to under or over-read relative to the reference chemiluminescence analyser. LAQM.TG16 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/NO_2

continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

West Lindsey District Council have applied a national bias adjustment factor of 0.82 (based on 14 studies) to the 2020 monitoring data, with the exception of May 2020 where a factor of 0.77 (based on 22 studies) has been applied. This is because SOCOTEC Didcot was used to supply and analyse the May tubes whilst the Gradko labs were closed as a result of the COVID-19 pandemic. The application of two bias adjustment factors is followed in accordance with Box 7.14 of the LAQM.TG(16) and the LAQM COVID-19 Supplementary Guidance. Both labs supplied tubes prepared using the 50% Triethanolamine (TEA) in water preparation method. A summary of bias adjustment factors used by West Lindsey District Council over the past five years is presented in Table C.1.

Both national bias adjustment factors were taken from the National Diffusion Tube Bias Adjustment Factor Spreadsheet (v03_21), and are shown in Figure C.1.

Figure C.1 – National Diffusion Tube Bias Adjustment Factor Spreadsheet version 03_21

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 03/21

Follow the steps below in the correct order to show the results of relevant co-location studies
Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods
Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet
This spreadhseet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.

This spreadsheet will be updated at the end of June 2021
LAQM Helpdesk Website

The LAQM Helpdesk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.

Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.

Step 1: Select the Laboratory that Analyses Your Tubes from the Drop-Down List
If a laboratory is not shown, we have no data for this laboratory.

Step 2: Select a Preparation Method from the Drop-Down List
If a preparation method is not shown, we have no data for this method at this laboratory.

Step 3: Select a Year from the Drop-Down List
If a year is not shown, we have no data[2]

Step 4: Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] shown in blue at the foot of the final column.
If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@bureauveritas.com or 0800 0327953

Analysed By[1]	Method	Year[2]	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[4]	Bias Adjustment Factor (A) (Cm/Dm)
Aberdeen Scientific Services	20% TEA in water	2020		Overall Factor[3] (7 studies)				Use		0.77
Edinburgh Scientific Services	50% TEA in acetone	2020		Overall Factor[3] (2 studies)				Use		0.88
Glasgow Scientific Services	20% TEA in water	2020		Overall Factor[3] (10 studies)				Use		0.96
Gradko	20% TEA in water	2020		Overall Factor[3] (18 studies)				Use		0.81
Gradko	50% TEA in acetone	2020		Overall Factor[3] (14 studies)				Use		0.82
Lambeth Scientific Services	50% TEA in acetone	2020		Overall Factor[3] (5 studies)				Use		0.96
Milton Keynes Council	20% TEA in water	2020		Overall Factor[3] (4 studies)				Use		0.83
SOCOTEC Didcot	20% TEA in water	2020		Overall Factor[3] (6 studies)				Use		0.74
SOCOTEC Didcot	50% TEA in acetone	2020		Overall Factor[3] (22 studies)				Use		0.77
SOCOTEC Glasgow	20% TEA in water	2020		Overall Factor[3] (1 study)				Use		0.79
SOCOTEC Glasgow	50% TEA in acetone	2020		Overall Factor[3] (1 study)				Use		0.79
Somerset County Council	20% TEA in water	2020		Overall Factor[3] (2 studies)				Use		0.76
South Yorkshire Air Quality Samplers	50% TEA in acetone	2020		Overall Factor[3] (1 study)				Use		0.77
Staffordshire Scientific Services	20% TEA in water	2020		Overall Factor[3] (15 studies)				Use		0.85
Tayside Scientific Services	20% TEA in water	2020		Overall Factor[3] (1 study)				Use		0.75

Although a co-location site is present at the Gainsborough Cemetery location, for the past 3 years this site has been reporting much lower concentrations that what would be expected, and lower than the co-located diffusion tubes, and there is some uncertainty in the accuracy of the continuous monitoring results. Additionally, the Gainsborough Cemetery site is located in an industrial setting, whereas many of the diffusion tubes deployed are at roadside settings. This means that a local bias adjustment factor derived

from this co-location study would not be representative of roadside locations, and therefore the diffusion tubes, hence why the national factor has been applied.

Table C.1 – Bias Adjustment Factor

Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2020	National	03/21	Gradko – 0.82 SOCOTEC Didcot – 0.77 (applied to May only)
2019	National	03/20	0.87
2018	National	03/19	0.92
2017	Local	N/A	1.22
2016	National	06/17	1.01

NO_2 Fall-off with Distance from the Road

No diffusion tube NO_2 monitoring locations within West Lindsey required distance correction during 2020.

QA/QC of Automatic Monitoring

The Gainsborough Cemetery monitoring station is operated by EDF Energy. All LSO duties, servicing, ratification and data checks are therefore carried out by EDF Energy.

Automatic Monitoring Annualisation

All automatic monitoring locations within West Lindsey recorded data capture of greater than 75% therefore it was not required to annualise any monitoring data. In addition, any sites with a data capture below 25% do not require annualisation.

NO_2 Fall-off with Distance from the Road

Wherever possible, local authorities should ensure that monitoring locations are representative of exposure. However, where this is not possible, the NO_2 concentration at the nearest location relevant for exposure should be estimated using the NO_2 fall-off with distance calculator available on the LAQM Support website. Where appropriate, non-

automatic annual mean NO_2 concentrations corrected for distance are presented in Table B.1.

No automatic NO_2 monitoring locations within West Lindsey required distance correction during 2020.

Table C.2 – Annualisation Summary (concentrations presented in µg/m^3)

Site ID	Annualisation Factor Hull Freetown	Annualisation Factor Immingham Woodlands Avenue	Annualisation Factor Sheffield Tinsley	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean	Comments
WL1	0.8544	0.8609	0.8622	0.8592	23.2	19.9	

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

Figure D.1 – Monitoring Locations: Gainsborough

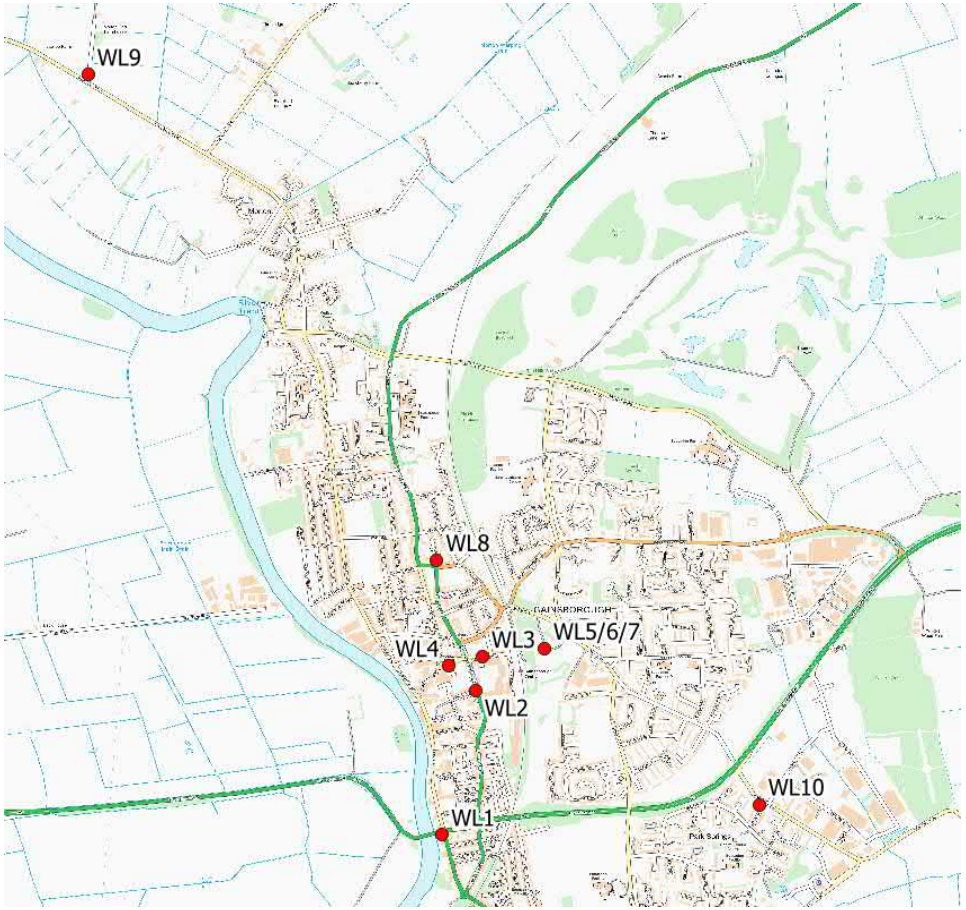
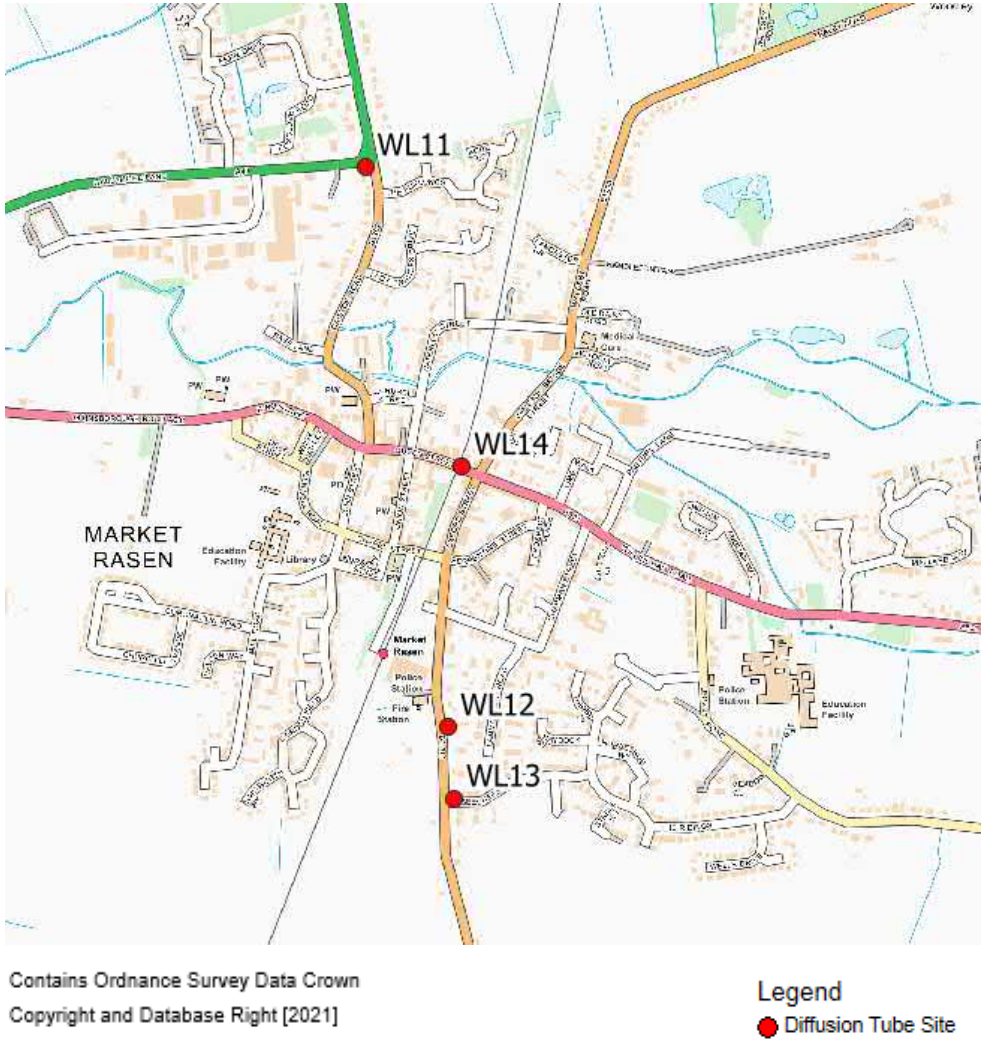


Figure D.2 – Monitoring Locations: Market Rasen



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England[7]

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

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

Appendix F: Impact of COVID-19 upon LAQM

COVID-19 has had a significant impact on society. Inevitably, COVID-19 has also had an impact on the environment, with implications to air quality at local, regional and national scales.

COVID-19 has presented various challenges for Local Authorities with respect to undertaking their statutory LAQM duties in the 2021 reporting year. Recognising this, Defra provided various advice updates throughout 2020 to English authorities, particularly concerning the potential disruption to air quality monitoring programmes, implementation of Air Quality Action Plans (AQAPs) and LAQM statutory reporting requirements. Defra has also issued supplementary guidance for LAQM reporting in 2021 to assist local authorities in preparing their 2021 ASR. Where applicable, this advice has been followed.

Despite the challenges that the pandemic has given rise to, the events of 2020 have also provided Local Authorities with an opportunity to quantify the air quality impacts associated with wide-scale and extreme intervention, most notably in relation to emissions of air pollutants arising from road traffic. The vast majority (>95%) of AQMAs declared within the UK are related to road traffic emissions, where attainment of the annual mean objective for nitrogen dioxide (NO_2) is considered unlikely. On 23rd March 2020, the UK Government released official guidance advising all members of public to stay at home, with work-related travel only permitted when absolutely necessary. During this initial national lockdown (and to a lesser extent other national and regional lockdowns that followed), marked reductions in vehicle traffic were observed; Department for Transport (DfT) data[8] suggests reductions in vehicle traffic of up to 70% were experienced across the UK by mid-April, relative to pre COVID-19 levels.

This reduction in travel in turn gave rise to a change of air pollutant emissions associated with road traffic, i.e. nitrous oxides (NO_x), and exhaust and non-exhaust particulates (PM). The Air Quality Expert Group (AQEG)[9] has estimated that during the initial lockdown period in 2020, within urbanised areas of the UK reductions in NO_2 annual mean concentrations were between 20 and 30% relative to pre-pandemic levels, which

[8] Prime Minister's Office, COVID-19 briefing on the 31st of May 2020

[9] Air Quality Expert Group, Estimation of changes in air pollution emissions, concentrations and exposure during the COVID-19 outbreak in the UK, June 2020

represents an absolute reduction of between 10 to 20µg/m^3 if expressed relative to annual mean averages. During this period, changes in $PM_{2.5}$ concentrations were less marked than those of NO_2. $PM_{2.5}$ concentrations are affected by both local sources and the transport of pollution from wider regions, often from well beyond the UK. Through analysis of AURN monitoring data for 2018-2020, AQEG have detailed that $PM_{2.5}$ concentrations during the initial lockdown period are of the order 2 to 5µg/m^3 lower relative to those that would be expected under business-as-usual conditions.

As restrictions are gradually lifted, the challenge is to understand how these air quality improvements can benefit the long-term health of the population.

Impacts of COVID-19 on Air Quality within West Lindsey

There were no identifiable impacts as a consequence of COVID-19 upon air quality within West Lindsey.

Opportunities Presented by COVID-19 upon LAQM within West Lindsey

No LAQM related opportunities have arisen as a consequence of COVID-19 within West Lindsey.

Challenges and Constraints Imposed by COVID-19 upon LAQM within West Lindsey

The challenges and constraints imposed by COVID-19 upon LAQM duties within West Lindsey are as follows:

- No further study or analysis of the continuous monitoring equipment at Gainsborough Cemetery was undertaken due to officers having to prioritise COVID-19 related workload. **No Impact**
- Environmental Health Officers (EHOs) were required to carry out COVID-19 related work, as Covid Wardens had limited powers. Any formal action had to be carried out by the EHOs. There is limited work carried out on LAQM in general as West Lindsey experiences good air quality, so did not cause much disruption to LAQM duties. **No Impact**

- Gradko International Ltd. closed their labs in May due to the COVID-19 pandemic. This meant that an alternative lab and tube supplier had to be sourced. SOCOTEC Didcot was chosen as this alternative. As a result of this, the April tubes were returned to the Gradko labs with non-standard caps but were sealed tightly with tape to ensure there are no air gaps. Despite this, there was no deviation from the LAQM Diffusion Tube Calendar, and all tubes were returned to the labs and analysed within their shelf-life of 4 months from preparation. Additionally, two separate bias adjustment factors have had to be utilised when adjusting the diffusion tube data. **No Impact**

The impacts as presented above are aligned with the criteria as defined in Table F.1, with professional judgement considered as part of their application.

Table F.1 – Impact Matrix

Category	Impact Rating: None	Impact Rating: Small	Impact Rating: Medium	Impact Rating: High
Automatic Monitoring – Data Capture (%)	More than 75% data capture	50 to 75% data capture	25 to 50% data capture	Less than 25% data capture
Automatic Monitoring – QA/QC Regime	Adherence to requirements as defined in LAQM.TG16	Routine calibrations taken place frequently but not to normal regime. Audits undertaken alongside service and maintenance programmes	Routine calibrations taken place infrequently and service and maintenance regimes adhered to. No audit achieved	Routine calibrations not undertaken within extended period (e.g. 3 to 4 months). Interruption to service and maintenance regime and no audit achieved
Passive Monitoring – Data Capture (%)	More than 75% data capture	50 to 75% data capture	25 to 50% data capture	Less than 25% data capture
Passive Monitoring – Bias Adjustment Factor	Bias adjustment undertaken as normal	<25% impact on normal number of available bias adjustment colocation studies (2020 vs 2019)	25-50% impact on normal number of available bias adjustment studies (2020 vs 2019)	>50% impact on normal number of available bias adjustment studies (2020 vs 2019) and/or applied bias adjustment factor studies not considered representative of local regime
Passive Monitoring – Adherence to Changeover Dates	Defra diffusion tube exposure calendar adhered to	Tubes left out for two exposure periods	Tubes left out for three exposure periods	Tubes left out for more than three exposure periods
Passive Monitoring – Storage of Tubes	Tubes stored in accordance with laboratory guidance and analysed promptly.	Tubes stored for longer than normal but adhering to laboratory guidance	Tubes unable to be stored according to be laboratory guidance but analysed prior to expiry date	Tubes stored for so long that they were unable to be analysed prior to expiry date. Data unable to be used
AQAP – Measure Implementation	Unaffected	Short delay (<6 months) in development of a new AQAP, but is on-going	Long delay (>6 months) in development of a new AQAP, but is on-going	No progression in development of a new AQAP
AQAP – New AQAP Development	Unaffected	Short delay (<6 months) in development of a new AQAP, but is on-going	Long delay (>6 months) in development of a new AQAP, but is on-going	No progression in development of a new AQAP

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	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
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm 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.TG16. April 2021. 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.PG16. 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, 2020 Annual Status Report.
- West Lindsey District Council, 2019 Annual Status Report.
- West Lindsey District Council, 2018 Annual Status Report.
- Central Lincolnshire Local Plan, Adopted April 2017.
- National Diffusion Tube Bias Adjustment Factor Spreadsheet, version 03/21 published in March 2021.