North Kesteven District Council

Air Quality Annual Status Report 2024

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June 2024

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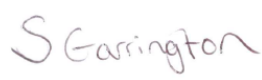
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Company Name	Bureau Veritas UK Limited	North Kesteven District Council
Contact Name	Viral Patel	Peter Rogers
Position	Senior Consultant	Environmental Health
Address	Bureau Veritas Atlantic House, Atlas Business Park Manchester M22 5PR	1 Kesteven Street Sleaford Lincolnshire NG34 7EF
Telephone	07790771444	01529 414155
e-mail	Viral.patel@bureauveritas.com	Peter_Rogers@n-kesteven.gov.uk
Websites	www.bureauveritas.co.uk	www.n-kesteven.gov.uk

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	Name	Job Title	Signature
Prepared By	S Garrington	Air Quality Consultant	*S Garrington*
Approved By	Viral Patel	Senior Consultant	

2024 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995 Local Air Quality Management, as amended by the Environment Act 2021

Date: June 2024

Information	North Kesteven District Council Details
Local Authority Officer	Peter Rogers
Department	Environmental Health
Address	1 Kesteven Street Sleaford Lincolnshire NG34 7EF
Telephone	01529 414155
E-mail	Peter_rogers@n-kesteven.gov.uk
Report Reference Number	NK_ASR_2024
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Executive Summary: Air Quality in Our Area

Air Quality in North Kesteven District Council

Breathing in polluted air affects our health and costs the NHS and our society billions of pounds each year. Air pollution is recognised as a contributing factor in the onset of heart disease and cancer and can cause a range of health impacts, including effects on lung function, exacerbation of asthma, increases in hospital admissions and mortality. In the UK, it is estimated that the reduction in healthy life expectancy caused by air pollution is equivalent to 29,000 to 43,000 deaths a year[1].

Air pollution particularly affects the most vulnerable in society, children, the elderly, and those with existing heart and lung conditions. Additionally, people living in less affluent areas are most exposed to dangerous levels of air pollution[2].

Table 1 provides a brief explanation of the key pollutants relevant to Local Air Quality Management and the kind of activities they might arise from.

Table 1 - Description of Key Pollutants

Pollutant	Description
Nitrogen Dioxide (NO_2)	Nitrogen dioxide is a gas which is generally emitted from high-temperature combustion processes such as road transport or energy generation.
Sulphur Dioxide (SO_2)	Sulphur dioxide (SO_2) is a corrosive gas which is predominantly produced from the combustion of coal or crude oil.
Particulate Matter (PM_{10} and $PM_{2.5}$)	Particulate matter is everything in the air that is not a gas. Particles can come from natural sources such as pollen, as well as human made sources such as smoke from fires, emissions from industry and dust from tyres and brakes. PM_{10} refers to particles under 10 micrometres. Fine particulate matter or $PM_{2.5}$ are particles under 2.5 micrometres.

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[1] UK Health Security Agency. Chemical Hazards and Poisons Report, Issue 28, 2022.

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

Actions to Improve Air Quality

Whilst air quality has improved significantly in recent decades, there are some areas where local action is needed to protect people and the environment from the effects of air pollution.

The Environmental Improvement Plan[3] sets out actions that will drive continued improvements to air quality and to meet the new national interim and long-term targets for fine particulate matter ($PM_{2.5}$), the pollutant of most harmful to human health. The Air Quality Strategy[4] provides more information on local authorities' responsibilities to work towards these new targets and reduce fine particulate matter in their areas.

The Road to Zero[5] details the Government's approach to reduce exhaust emissions from road transport through a number of mechanisms, in balance with the needs of the local community. This is extremely important given that cars are the most popular mode of personal travel, and the majority of Air Quality Management Areas (AQMAs) are designated due to elevated concentrations heavily influenced by transport emissions.

In the past, the air quality within North Kesteven has met the AQS (Air Quality Strategy) objectives, with no reported exceedances of the annual mean NO_2 objective in the last five years. As a result of this consistent compliance, no AQMAs have been declared, and no AQAP (Air Quality Action Plan) has been published.

However, North Kesteven District Council is committed to taking actions that will further improve air quality and reduce pollutant concentrations. This is an important step to ensure that no exceedances occur at any monitoring locations in the future.

To reduce the impact of vehicle emissions within North Kesteven District Council, electric vehicle charging points (EVCP) are promoted via the planning process in new residential developments, as well as encouraging active modes of travel. Lincolnshire County Council (LCC) are currently working with the preferred bidder to establish sites for on-street EVCPs

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[3] Defra. Environmental Improvement Plan 2023, January 2023

[4] Defra. Air Quality Strategy – Framework for Local Authority Delivery, August 2023

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

across the region/district. More information on electric vehicle (EV) charging can be found on their website[6].

The Council's waste and street scene fleet is predominantly made up of diesel vehicles, all of which are Euro 6 compliant. The Council closely monitors the performance and efficiency of all vehicles in the fleet and ensures compliance with all manufacturers' recommended service schedules. Maintenance is provided on-site at the Council's own workshop.

As part of the fleet replacement program, the Council has replaced three diesel vehicles with electric vans. This commitment aligns with the Council's pledge to reduce its carbon footprint.

The Stop Start Idling project aims to promote the understanding of the causes of air pollution and deter the idling cars outside schools. Through the use of work sheets and real time air quality data collected outside a school, the project encouraged school children to understand the causes and impacts of air pollution and help deter cars idling outside their school. The project received national coverage and was deemed a success.

More detail on the project can be found on the NKDC website[7]

Conclusions and Priorities

During 2023, the maximum NO_2 annual mean concentration recorded at a single diffusion tube site was 23.4 μg/m^3 (Site ID – A)– a decrease from the maximum NO_2 concentration in the previous reporting year (27.0 μg/m^3). Monitoring within North Kesteven District Council continues to be compliant with the NO_2 annual mean AQS objective. North Kesteven District Council continues to seek opportunities to further reduce the recorded pollutant levels and, more importantly, ensure there are not likely to be any areas of exceedance in the future. The focus continues to be on NO_2, with no planned monitoring of PM_{10} or $PM_{2.5}$ within the district.

A continued key priority for North Kesteven District Council during 2024 is to continue to expand the Schools Air Quality project, an educational campaign with younger people, to discourage idling and use of private vehicles. This priority has continued as a result of the Stop Start Idling project in 2023.

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6 https://www.n-kesteven.gov.uk/climate-change-environment/evs-charging

7 https://www.n-kesteven.gov.uk/council-news/2023/03/bid-boost-air-quality-school-home-time

Local Engagement and How to get Involved

North Kesteven District Council have 'Our Environment' as a corporate policy, with a climate emergency being declared in 2019. The Climate Emergency Strategy to 2030 and Action Plan[8] which was subsequently formed in 2022, reviewed annually, and is currently being delivered for the period 2024-2025. North Kesteven District Council's approach to environmental damage follows the doughnut economics model, recognising that air pollution is one of the earth's boundaries that must not be breached.

The public can get involved with improving air quality in North Kesteven through numerous educational projects. For example, the Schools Air Quality Project encouraged an educational understanding of air pollution amongst primary school students. Continuous air quality monitoring has been undertaken outside of a school in Sleaford. The project aims were:

- Encourage an educational understanding for air pollution amongst primary school students
- Engage pupils in the topic area of air quality and encourage them to become positive influencers
- Promote good air quality governance as a District Council
- Promote the concept of Active Travel as alternatives to car use and link to wider wellbeing factors, climate change and sustainable energy use
- Promote 'no idling' to those who have to use private transport for school drop off/pick up

The aims of the Stop Start Idling project were achieved by engaging pupils with the topic area through the provision of learning materials, learning activities, and access to real-time air quality monitoring data collected outside the school.

As part of the project, 'No Idling' car air fresheners and information leaflets were distributed to parents and guardians who use private vehicles to transport their children to and from school. The project was also promoted on the school's and North Kesteven District Council's (NKDC) social media pages and websites.

Furthermore, the project received coverage in the local newspaper, on the local BBC news, and on national BBC news (BBC Breakfast), helping to raise awareness and promote the

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[8] https://www.n-kesteven.gov.uk/climate-change-environment/climate-emergency-strategy-action-plan

initiative. The project has been approved to be rolled out in 2024 to another school in the district.

The real-time air quality data collected outside the school was used to demonstrate the impact of vehicle emissions during the morning drop-off and evening pick-up periods. The aim was to actively motivate individuals to reduce their personal impact on air quality through strategies such as using public transport, active travel (walking/cycling), car sharing, and reducing idling of stationary vehicles.

As a result of North Kesteven District Council's dedication to ensuring continued compliance with the Air Quality Strategy (AQS) objectives, the council has implemented several actions. These include:

1. Purchasing 100% renewable energy for council-controlled buildings.

2. Equipping diesel-powered waste and recycling vehicles with telemetric systems to monitor fuel efficiency and idling.

3. Installing an air pollution monitor to provide detailed, real-time air quality measurements and identify pollution hotspots.

These measures demonstrate the council's commitment to improving air quality and reducing the environmental impact of its operations.

In order to reduce the impact of vehicle emissions, electrical vehicle charging points are promoted via the planning process in new residential and commercial developments, as well as encouraging active modes of travel.

North Kesteven District Council's Climate Emergency Action Plan has resulted in a net-zero carbon housing standard being approved for inclusion in the new building programme. Following the formal adoption of the Cycling Strategy, officers have consulted with Town and Parish Council's to identify any potential infrastructure project that could potentially encourage residents to cycle more.

Two environmentally friendly building projects from North Kesteven District Council have been shortlisted for the Unlock Net Zero awards in recognition of their positive climate impact. The Unlock Net Zero awards are designed to champion progress in housing and the built environment on the journey to decarbonisation, in which environmental impacts from buildings are reduced or eliminated. In the 'Building or development of the year – Commercial' category, the Council's Sleaford Moor Enterprise Park has been shortlisted,

while in the 'Green homes upgrade of the year – Central and East of England' category the Council has been recognised alongside partners Equans for retrofitting of council homes.

Both of these projects were conceived and undertaken with a view to support tenants by making it easier and cheaper to heat and run their homes and business premises. Overall, the range of actions being taken by North Kesteven District Council aim to reduce air pollution from its key sources, helping to achieve the target to be a net-zero carbon emission district by 2030.

Local Responsibilities and Commitment

This ASR was prepared by North Kesteven District Council with the support and agreement of the following officers and departments:

- Environmental Health
- Planning

This ASR has been approved by:

David Steels – Assistant Director of Environment and Public Protection

If you have any comments on this ASR please send them to Peter Rogers at:

Environmental Health, North Kesteven District Council, Kesteven Street, Sleaford NG34 7EF

Telephone: 01529 308287

Email: ehteam@n-kesteven.gov.uk

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Tables

1. Local Air Quality Management

This report provides an overview of air quality in North Kesteven District Council (NKDC) during 2023. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995), as amended by the Environment Act (2021), 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 order to achieve and maintain the objectives and the dates by which each measure will be carried out. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by NKDC 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 18 months. The AQAP should specify how air quality targets will be achieved and maintained and provide dates by which measures will be carried out.

NKDC currently does not have any declared AQMAs. A local Air Quality Strategy is under development to prevent and reduce polluting activities.

Based on the latest monitoring data continuing the trend seen in the last five years (not including COVID-19 years) of NO_2 concentrations being below the AQS objective, NKDS do not intend to declare an AQMAs during the current reporting year

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

Defra's appraisal of last year's ASR concluded the 'report is well structured, detailed, and provides the information specified in the Guidance. The following comments are designed to help inform future reports:

1.   Evidence of local engagement is detailed and robust, and this practice should continue going forward.

2.   Trends presented clearly and follow the correct template with consistency throughout the document.

3.   Reference to the Public Health Outcomes Framework has been made and this practice should continue going forward.

4.   Minor grammatical inconsistencies throughout document, were capitalising names of objective and legal framework. For example, on pages 1-2 'Air Quality Objectives' was not capitalised on page 3 is capitalised.

5.   Defra recommends that Directors of Public Health approve draft ASRs. Sign off is not a requirement, however collaboration and consultation with those who have responsibility for Public Health is expected to increase support for measures to improve air quality, with co-benefits for all. Please bear this in mind for the next annual reporting process too

6.   As there is no AQMA's in NKD, the council should prepare an air quality strategy within the next reporting year.'

NKDC has taken forward a number of direct measures during the current reporting year of 2023 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.1. Three measures are included within Table 2.1, with the type of measure and the progress NKDC have made during the reporting year of 2023 presented. Where there have been, or continue to be, barriers restricting the implementation of the measure, these are also presented within Table 2.1.

Due to there being no declared AQMA's, NKDC do not currently have an AQAP. For this reason, these measures have been formed in light of the anticipated Air Quality Strategy. Table 2.1 will form the basis for the AQS that is currently being developed by NKDC.

NKDC worked to implement these measures in partnership with the following stakeholders during 2023:

- Lincolnshire County Council

The principal challenges and barriers to implementation that North Kesteven District Council anticipates facing are funding criteria for new and ongoing measures to improve air quality as well as site suitability for the implementation of EV charging.

NKDC anticipates that the measures stated above and in Table 2.1 will continue to help NKDC achieve air quality compliance into 2024.

Table 2.1 – Progress on Measures to Improve Air Quality

Measure No.	Measure Title	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
1	Stop Start Idling Project	Traffic Management	Anti-idling enforcement	N/A	N/A	North Kesteven DC	North Kesteven DC	No	Funded	£5K	Planning	Reduction in emissions at localised points around schools	Number of schools participating in the project	Design of a help yourself web site to download materials in progress	None
2	Promotion of EV charging points	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	N/A	N/A	North Kesteven DC	LCC and private investment	No	Partially funded	6.6M (£1m for the pilot and £5.6m for tranche 1).	Implementation	Estimated to be less than 1µg/m µg/m^3 based on a low to medium uptake	Number of applications including EV charging	LCC are working with the preferred bidder to establish sites for EVCPs across the region/district.	Funding criteria and site suitability vs demand. Plus, grid capacity.
3	Enforcement of smoke control area	Policy Guidance and Development Control	Other policy	N/A	N/A	North Kesteven DC	DEFRA	No	Funded	£8K	Implementation	Reduced emissions from outdoor burning	Solid fuel appliance properties adhering to SCA	Continued monitoring of properties with solid fuel appliances	None

2.3 PM$_{2.5}$ – Local Authority Approach to Reducing Emissions and/or Concentrations

As detailed in Policy Guidance LAQM.PG22 (Chapter 8) and the Air Quality Strategy[9], local authorities are expected to work towards reducing emissions and/or concentrations of fine particulate matter (PM$_{2.5}$)). There is clear evidence that PM$_{2.5}$ (particulate matter smaller 2.5 micrometres) has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

Whilst there are no permanent fixed monitoring stations for particulate matter (PM$_{10}$ and PM$_{2.5}$), the use of DEFRA background concentrations identifies that the levels of particulate matter within the district are also low. The highest dataset within the district was recorded as 10.0 µg/m^3 (PM$_{2.5}$) at the A46 near Doddington, however this is well below the annual mean objective of 20 µg/m^3.

The Public Health Outcomes Framework data tool[10] compiled by Public Health England quantifies the mortality burden of PM$_{2.5}$ within England on a country and local authority scale. The fraction of mortality attributable to PM$_{2.5}$ in North Kesteven (4.8%) is lower than that seen across the region (6.1%) and England (5.8%). As is the case for NO$_2$ emissions, traffic emissions are also the primary source of anthropogenic particulates (both PM$_{10}$ and PM$_{2.5}$) emissions within North Kesteven. As such, the implementation of the transport measures associated to the Climate Emergency and Strategy Action Plan should help reduce the concentration of PM$_{2.5}$.

There are currently two Smoke Control Areas designated by North Kesteven District Council, both located in North Hykeham, one off Newark Road and the other Lincoln Road. Further information, alongside maps of these designations, is accessible on North Kesteven District Council's website[11]. It is an offence to burn unauthorised fuels within these areas, with failure to comply resulting in a fine. Recently, NKDC initiated a Smoke Control project, sending reminders to all properties within the smoke control area about their responsibilities. As part of this project, a drone survey was conducted over the entire area to identify properties with

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[9] Defra. Air Quality Strategy – Framework for Local Authority Delivery, August 2023

[10] https://www.gov.uk/government/statistics/public-health-outcomes-framework-march-2023-data-update

[11] https://www.n-kesteven.gov.uk/environment-climate/environmental-protection/pollution-nuisance/air-quality-enforcement

solid fuel appliances (such as flues and chimneys). This allows the council to monitor these properties and provide targeted education.

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

This section sets out the monitoring undertaken within 2023 by NKDC and how it compares with the relevant air quality objectives. In addition, monitoring results are presented for a five-year period between 2019 and 2023 to allow monitoring trends to be identified and discussed.

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

North Kesteven District Council did not carry out any automatic (continuous) monitoring for any pollutants during 2023.

3.1.2 Non-Automatic Monitoring Sites

NKDC undertook non- automatic (i.e. passive) monitoring of NO_2 at 22 sites (site BH being a triplicate) during 2023. Table A.1 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 (NO2)

Table A.2 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 2023 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.

During 2022, the average NO_2 annual mean concentration across the entire diffusion tube network was 12.3 µg/m^3, with concentrations ranging from 8.1 µg/m^3 at Site ID 'Witham St Hughs' to 23.4 µg/m^3 at Site ID 'A (Newark Road/Station Road, North Hykeham)'. Therefore, all sites reported NO_2 annual mean concentrations well below the AQS objective of 40 µg/m^3. The average NO_2 annual mean across the diffusion tube network has decreased by 2 µg/m^3 from that recorded in 2022 (14.3 µg/m^3) and a reduction was seen at all sites from 2022 to 2023. This indicates that there has been a reduction in NO_2 emitting activities within North Kesteven during the reporting year of 2023. As a result of the continued compliance with the AQS objective, North Kesteven District Council are not intending to declare an AQMA for NO_2 annual mean. In addition, no single diffusion tube site recorded an annual mean NO_2 concentration above 60 µg/m^3 therefore, in accordance with LAQM TG(22), there is not likely to be any exceedances of the 1-hour mean objective.

Appendix A: Monitoring Results

Table A.1 – 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)
A	Newark Road / Station Road, North Hykeham	Roadside	493845	366567	NO_2	No	7.5	4.0	No	2.5
B	Asda / Newark Road, North Hykeham	Roadside	493485	366402	NO_2	No	14.9	0.6	No	2.1
C	9 Dore Avenue, North Hykeham	Roadside	494829	366698	NO_2	No	7.8	2.7	No	2.2
D	St Hughs Drive, North Hykeham	Urabn Background	494159	367115	NO_2	No	6.3	22.6	No	2.3
Ruskington	Winchelsea Road	Roadside	508316	350447	NO_2	No	0.0	1.0	No	2.5
Canwick	Heighington Road	Roadside	498561	369494	NO_2	No	39.0	0.0	No	2.5
BH1, BH2, BH3	Bracebridge Heath, Sleaford Road	Roadside	498000	367544	NO_2	No	7.0	1.0	No	2.5
Waddington	A607 Grantham Road	Roadside	497718	363898	NO_2	No	7.0	1.0	No	2.5
Sleaford	Southgate, Sleaford	Roadside	506835	345684	NO_2	No	1.4	1.4	No	2.3
Holdingham 1	Walnut Cottage	Roadside	505704	347269	NO_2	No	64.4	1.5	No	1.9
Holdingham 2	A15 (South) Junction	Urban Background	505985	347343	NO_2	No	1.8	6.1	No	1.8
Westbanks	Westbanks, Sleaford	Roadside	506507	345744	NO_2	No	0.0	1.0	No	2.5
Grantham Road	12 - 14 Grantham Road, Sleaford	Roadside	506601	345300	NO_2	No	0.0	1.0	No	2.2

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)
Sleaford 1	Pedestrian Area of Town	Urban Background	506648	345757	NO_2	No	0.0	46.2	No	2.0
Waddington 1	A607 Grantham Road	Roadside	496425	365685	NO_2	No	7.5	1.0	No	2.5
Branston	1 Sleaford Road, Branston	Rural	502358	367322	NO_2	No	0.0	2.9	No	2.6
Auborn	Auborn	Kerbside	492360	362640	NO_2	No	4.2	1.8	No	1.8
Witham St Hughs	Witham St Hughs	Kerbside	489199	361790	NO_2	No	0.9	1.8	No	1.8
Harmston	Harmston	Kerbside	497006	362368	NO_2	No	6.2	1.2	No	1.8
Metheringham	Metheringham	Urban Background	506126	361636	NO_2	No	66.5	1.2	No	1.8
Navenby	Navenby	Kerbside	498841	357758	NO_2	No	7.0	1.6	No	1.8
Heckington	Heckington	Kerbside	514514	343906	NO_2	No	2.9	1.5	No	1.8

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.2 – 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 2023 (%) [2]	2019	2020	2021	2022	2023
A	493845	366567	Roadside	100	100.0	32.2	25.8	24.9	27.0	23.4
B	493485	366402	Roadside	100	100.0	14.1	18.2	19.6	17.0	16.7
C	494829	366698	Roadside	100	100.0	15.4	11.7	11.3	11.6	9.9
D	494159	367115	Urban Background	100	100.0	16.1	9.3	10.5	10.5	9.1
Ruskington	508316	350447	Roadside	100	100.0	13.3	10.7	11.5	10.4	8.9
Canwick	498561	369494	Roadside	100	100.0	19.8	28.5	21.2	22.4	19.0
BH1, BH2, BH3	498000	367544	Roadside	100	100.0	27.9	21.5	20.5	20.1	17.1
Waddington	497718	363898	Roadside	92.3	92.3	11.9	10.7	10.8	10.4	8.2
Sleaford	506835	345684	Roadside	67.3	67.3	24.2	17.9	19.7	23.6	21.1
Holdingham 1	505704	347269	Roadside	100	100.0	19.0	14.1	14.0	13.9	12.4
Holdingham 2	505985	347343	Urban Background	100	100.0	18.0	12.5	15.0	14.0	11.2
West Banks	506507	345744	Roadside	100	100.0	17.0	13.1	13.1	13.2	10.9
Grantham Rd	506601	345300	Roadside	90.4	90.4	17.5	13.6	13.2	11.0	10.6

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 2023 (%) [2]	2019	2020	2021	2022	2023
Sleaford 1	506648	345757	Urban Background	82.7	82.7	13.9	10.6	11.3	10.4	9.3
Waddington 1	496425	365685	Roadside	57.7	57.7	11.9	9.8	9.5	9.8	7.6
Branston	502358	367322	Rural	100	100.0	20.6	17.2	19.5	19.6	16.3
Aubourn	492360	362640	Kerbside	100	100.0	13.9	10.9	11.8	11.3	9.4
Witham St Hughs	489199	361790	Kerbside	100	100.0	11.2	9.2	9.2	9.3	8.1
Harmston	497006	362368	Kerbside	100	100.0	15.0	12.5	12.1	11.4	8.6
Metheringham	506126	361636	Urban Background	100	100.0	11.3	9.8	10.2	10.2	9.1
Navenby	498841	357758	Kerbside	100	100.0	22.0	13.1	14.0	13.0	10.6
Heckington	514514	343906	Kerbside	92.3	92.3	17.3	14.6	15.8	15.6	13.0

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22**

☒ **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 $\mu g/m^3$.

Exceedances of the NO_2 annual mean objective of $40 \mu g/m^3$ 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 **<u>bold and underlined</u>**.

Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per LAQM.TG22 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 NO₂ Concentrations
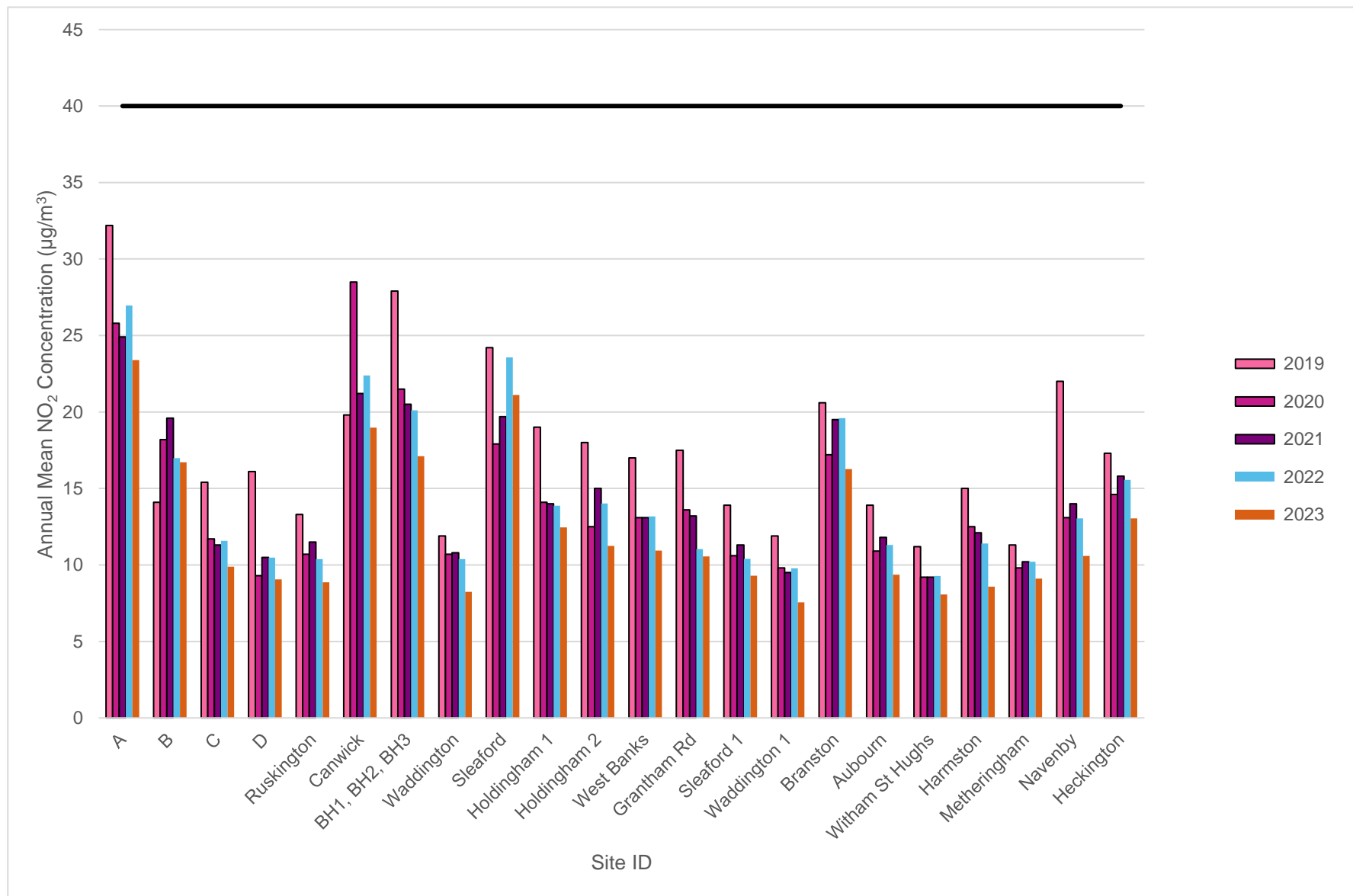
Appendix B: Full Monthly Diffusion Tube Results for 2023

Table B.1 – NO$_2$ 2023 Diffusion Tube Results (µg/m^3)

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.77)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
A	493845	366567	38.2	25.1	34.6	32.5	26.2	27.4	26.2	25.1	29.8	31.7	36.8	31.0	30.4	23.4		
B	493485	366402	27.3	26.5	22.0	20.2	17.3	21.3	15.6	19.5	22.9	25.3	23.5	19.0	21.7	16.7		
C	494829	366698	20.0	13.5	13.2	9.5	9.0	7.8	9.1	8.9	11.5	13.5	21.3	16.9	12.9	9.9		
D	494159	367115	18.4	8.6	11.9	9.2	8.6		6.5	7.7	10.8	15.3	19.2	13.3	11.8	9.1		
Ruskington	508316	350447	17.5	10.5	13.4	13.2	9.1	9.1	7.8	7.6	11.3	14.0	14.0	10.8	11.5	8.9		
Canwick	498561	369494	29.6	29.9	24.6	23.9	24.5	19.0	21.3	17.4	28.9	29.6	20.0	27.1	24.7	19.0		
BH1	498000	367544	29.7	25.2	19.9	24.1		24.0		18.2	20.2	22.8	26.4	20.6	-	-		Triplicate Site with BVL_NK_BH1, BVL_NK_BH2 and BVL_NK_BH3 - Annual data provided for BVL_NK_BH3 only
BH2	498000	367544	25.5	18.0	22.4	24.2	25.3	24.4	18.5	18.5	24.3	20.0	28.0	21.6	-	-		Triplicate Site with BVL_NK_BH1, BVL_NK_BH2 and BVL_NK_BH3 - Annual data provided for BVL_NK_BH3 only
BH3	498000	367544	28.6	24.9	22.0	24.6	25.9	23.3		20.4	23.6			21.2	22.2	17.1		Triplicate Site with BVL_NK_

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.77)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
																		BH1, BVL_NK_BH2 and BVL_NK_BH3 - Annual data provided for BVL_NK_BH3 only
Waddington	497718	363898	11.0		11.8	12.3	10.2	8.0	8.0	7.6	11.7	13.3	13.8	10.1	10.7	8.2	
Sleaford	506835	345684	31.5	26.2	30.9					25.0	31.1	31.2	35.5	26.0	29.7	21.1	
Holdingham 1	505704	347269	18.2	16.2	15.1	18.5	18.8	17.8	10.9	14.1	15.4	15.1	22.2	11.7	16.2	12.4	
Holdingham 2	505985	347343	22.0	5.3	15.9	18.8	13.7	11.9	10.4	12.1	13.2	18.1	21.1	12.6	14.6	11.2	
West Banks	506507	345744		10.7	15.3	12.8	9.9	10.3		10.4	14.2	20.6	20.2	17.7	14.2	10.9	
Grantham Rd	506601	345300	15.7	18.2		12.3	11.5		9.1	9.7	12.2	17.0	18.0	13.5	13.7	10.6	
Sleaford 1	506648	345757	16.1	19.9		10.1	8.8	8.4	11.7	7.8	10.1		16.1	11.8	12.1	9.3	
Waddington 1	496425	365685	13.0	14.2				6.6	7.4			12.4	10.3	8.3	10.3	7.6	
Branston	502358	367322	22.5	20.6	17.4	24.1	16.8	16.1	23.1	17.7	21.6	22.7	28.4	22.5	21.1	16.3	
Aubourn	492360	362640	16.5	14.9	11.7	8.6	10.3	9.3	8.5	10.0	11.6	14.3	16.3	13.8	12.2	9.4	
Witham St Hughs	489199	361790	15.9	10.8	10.0	8.2	8.9	7.3	7.1	7.7	9.2	12.4	17.5	10.8	10.5	8.1	
Harmston	497006	362368	6.7	11.7	9.5	9.0	12.8	12.0	5.7	12.8	14.6	11.6	16.5	10.8	11.1	8.6	
Metheringham	506126	361636	17.3	17.4	11.1	8.6	7.1	7.6	8.6	7.4	10.4	11.8	21.0	13.5	11.8	9.1	
Navenby	498841	357758	20.7	10.8	16.0	15.9	12.0	11.6	9.0	11.2	13.8	16.9	14.4	12.6	13.7	10.6	
Heckington	514514	343906	22.9	23.6	17.2	18.0	14.3	12.8	7.2	13.1		17.6	23.8	15.8	16.9	13.0	

☒ **All erroneous data has been removed from the NO₂ diffusion tube dataset presented in Table B.1**

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22**

☐ **Local bias adjustment factor used**

☒ **National bias adjustment factor used**

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

☒ **NKDC confirm that all 2023 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 **<u>bold and underlined</u>**.

See Appendix C for details on bias adjustment and annualisation.

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

New or Changed Sources Identified Within NKDC During 2023

North Kesteven District Council has not identified any new major sources relating to air quality within the reporting year of 2023. However, the following planning applications were granted, which may impact air quality through the design of new road layouts/access routes:

Permissions that granted over 100 dwellings from 01/01/2023 – 32/12/2023

- **20/0057/OUT** - 1,082
- **16/0498/OUT**- 1,400
- **22/1478/RESM** – 182

Developments >1000m^2 of commercial floor space between 01/01/2023 and 31/12/2023

- **22/1502/FUL** - 2115 m2 decision date 10 Jan 2023
- **22/1753/FUL** - 2143 m2 decision date 06 Feb 2023
- **22/0362/FUL** - 1652 m2 decision date 15 Mar 2023
- **22/1534/FUL** - 1084 m2 decision date 11 Apr 2023
- **22/0508/FUL** - 1524 m2 decision date 12 Apr 2023
- **23/0390/FUL** - 1800 m2 decision date 15 Jun 2023
- **23/0800/FUL** - 1295 m2 decision date 15 Jun 2023

There were no applications for large new biomass boilers in 2023.

Additional Air Quality Works Undertaken by NKDC During 2023

North Kesteven District Council has not completed any additional works within the reporting year of 2023.

QA/QC of Diffusion Tube Monitoring

The diffusion tubes for the year 2023 were supplied and analysed by SOCOTEC Didcot. All tubes were prepared using the 50% TEA in acetone preparation method. SOCOTEC Didcot is a UKAS accredited laboratories and participate in the AIR-PT scheme for NO_2 tube analysis and the Annual Field-Intercomparison Exercise. These provide strict performance criteria for participating laboratories to meet, thereby ensuring NO_2 concentrations reported are of a high calibre. The percentage score reflects the results deemed to be satisfactory

based upon the z-score of ±2. Additionally, the precision of NO$_2$ diffusion tubes supplied by SOCOTEC Didcot were classified as 'satisfactory for all observations. The precision reflects the laboratories performance and consistency in preparing and analysing the diffusion tubes.

During 2023, all diffusion tubes were exposed and changed in adherence (±2 days) with the 2023 Defra diffusion tube monitoring calendar. Therefore, no single diffusion tube was exposed for longer than the 4–5-week recommendation.

Diffusion Tube Annualisation

All but two diffusion tube monitoring locations within NKDC recorded data capture of less than 75%, Sleaford and Waddington 1. Annualisation was therefore carried out for these sites using the annualisation tool, the details are contained in Table C.1 below. Since NKDC does not conduct its own automatic monitoring, data from the Automatic Urban and Rural Network (AURN) were used to annualise the two diffusion tube monitoring sites. The three automatic sites selected for annualisation were chosen because they are within 50 kilometres of both Sleaford and Waddington 1 and are Urban Background monitoring site.

Table C.1 – Annualisation Summary (concentrations presented in µg/m^3)

Site ID	Annualisation Factor Sheffield Tinsley	Annualisation Factor Immingham	Annualisation Factor Sheffield Devonshire Green	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean
Sleaford	0.8993	0.9524	0.9211	0.9243	29.7	27.4
Waddington 1	0.9456	0.9563	0.9563	0.9527	10.3	9.8

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2024 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.TG22 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.

NKDC have applied a national bias adjustment factor of 0.77 to the 2023 monitoring data. A summary of bias adjustment factors used by 0.77 over the past five years is presented in Table C.2.

Table C.2 – Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2023	National	03/24	0.77
2022	National	03/23	0.76
2021	National	03/22	0.83 (Gradko, applied to January – March) & 0.78 (SOCOTEC Didcot, applied to April – December)
2020	National	03/21	0.82 (Gradko) & 0.77 (SOCOTEC Didcot, applied to May only)
2019	National	03/20	0.87

National Diffusion Tube Bias Adjustment Factor Spreadsheet

Spreadsheet Version Number: 03/24

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 spreadsheet 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 2024
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.

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 shown in blue at the foot of the final column.

If you have your own co-location study then see footnote. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@bureauveritas.com or 0800 0327953

Analysed By	Method	Year	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	Bias Adjustment Factor (A) (Cm/Dm)
SOCOTEC Didcot	50% TEA in acetone	2023	UB	City Of York Council	11	15	12	27.9%	G	0.78
SOCOTEC Didcot	50% TEA in acetone	2023	R	City Of York Council	11	22	17	26.8%	G	0.79
SOCOTEC Didcot	50% TEA in acetone	2023	R	City Of York Council	9	22	17	33.7%	G	0.75
SOCOTEC Didcot	50% TEA in acetone	2023	R	City Of York Council	10	31	25	26.1%	G	0.79
SOCOTEC Didcot	50% TEA in acetone	2023	UB	Gravesham Borough Council	12	19	15	25.6%	G	0.80
SOCOTEC Didcot	50% TEA in acetone	2023	UB	Gravesham Borough Council	12	23	19	18.4%	G	0.84
SOCOTEC Didcot	50% TEA in acetone	2023	R	Ipswich Borough Council	9	26	20	33.0%	G	0.75
SOCOTEC Didcot	50% TEA in acetone	2023	R	Ipswich Borough Council	12	36	27	34.3%	G	0.74
SOCOTEC Didcot	50% TEA in acetone	2023	R	North East Lincolnshire Council	12	43	26	61.9%	G	0.62
SOCOTEC Didcot	50% TEA in acetone	2023	UB	North East Lincolnshire Council	10	13	10	29.1%	G	0.77
SOCOTEC Didcot	50% TEA in acetone	2023	R	North East Lincolnshire Council	11	24	21	18.0%	G	0.85
SOCOTEC Didcot	50% TEA in acetone	2023	R	Cardiff Council / Shared Regulatory Services	11	41	34	22.2%	G	0.82
SOCOTEC Didcot	50% TEA in acetone	2023	UB	Torfaen County Borough Council	11	12	9	43.9%	G	0.70
SOCOTEC Didcot	50% TEA in Acetone	2023	R	East Suffolk Council	12	29	21	38.9%	G	0.72
SOCOTEC Didcot	50% TEA in Acetone	2023	R	Wrexham County Borough Council	11	17	14	25.2%	G	0.80
SOCOTEC Didcot	50% TEA in Acetone	2023	R	Horsham District Council	12	21	17	23.5%	G	0.81
SOCOTEC Didcot	50% TEA in Acetone	2023	R	Horsham District Council	10	25	17	43.5%	G	0.70
SOCOTEC Didcot	50% TEA in Acetone	2023	R	Horsham District Council	10	23	24	-5.4%	G	1.06
SOCOTEC Didcot	50% TEA in acetone	2023	UI	North Lincolnshire Council	10	14	11	26.2%	G	0.79
SOCOTEC Didcot	50% TEA in acetone	2023	R	Bridgend Council	11	32	27	20.8%	G	0.83
SOCOTEC Didcot	50% TEA in acetone	2023	R	Cambridge City Council	12	22	18	24.8%	G	0.80
SOCOTEC Didcot	50% TEA in acetone	2023	R	Leeds City Council	10	39	29	32.3%	G	0.76
SOCOTEC Didcot	50% TEA in acetone	2023	KS	Leeds City Council	10	30	20	48.9%	G	0.67
SOCOTEC Didcot	50% TEA in acetone	2023	R	Leeds City Council	12	25	19	30.0%	G	0.77
SOCOTEC Didcot	50% TEA in acetone	2023	UC	Leeds City Council	11	26	19	40.0%	G	0.71
SOCOTEC Didcot	50% TEA in acetone	2023	KS	Marylebone Road intercomparison	11	53	38	41.4%	G	0.71
SOCOTEC Didcot	50% TEA in acetone	2023	R	Vale Of White Horse District Council	10	22	18	21.2%	G	0.83
SOCOTEC Didcot	50% TEA in acetone	2023	UB	Wirral Council	11	15	13	16.7%	G	0.86
SOCOTEC Didcot	50% TEA in acetone	2023		**Overall Factor (28 studies)**					Use	0.77

NO$_2$ Fall-off with Distance from the Road

No diffusion tube NO$_2$ monitoring locations within North Kesteven required distance correction during 2023.

4. Appendix D: Map(s) of Monitoring Locations

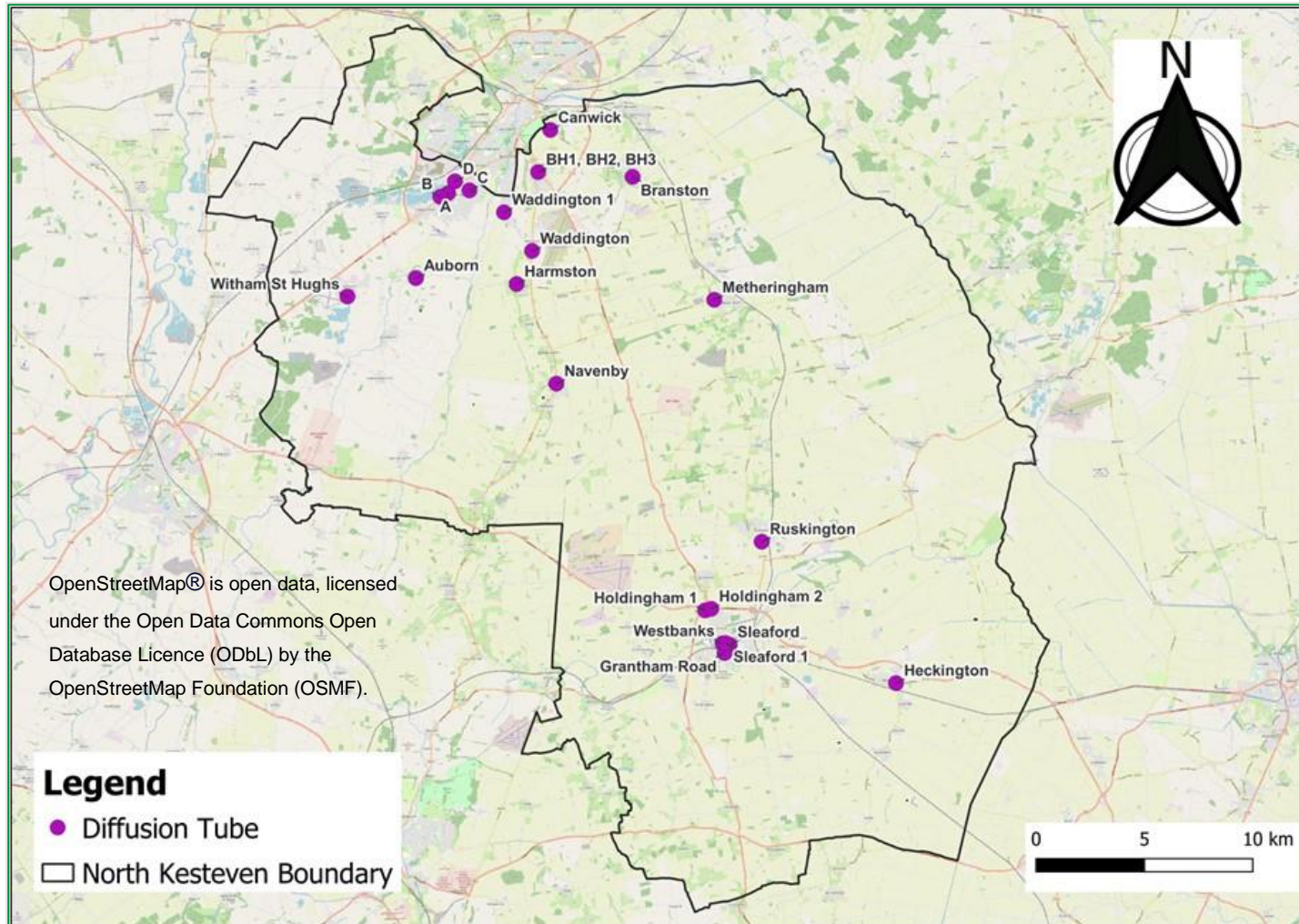**Figure D.1 – Map of Non-Automatic Monitoring Sites in North Kesteven (Overview)**

Figure D.2 – Map of Non-Automatic Monitoring Sites in Sleaford & Holdingham

OpenStreetMap® is open data, licensed under the Open Data Commons Open Database Licence (ODbL) by the OpenStreetMap Foundation (OSMF).

Legend
● Diffusion Tube

Figure D.3 – Map of Non-Automatic Monitoring Sites in Heckington

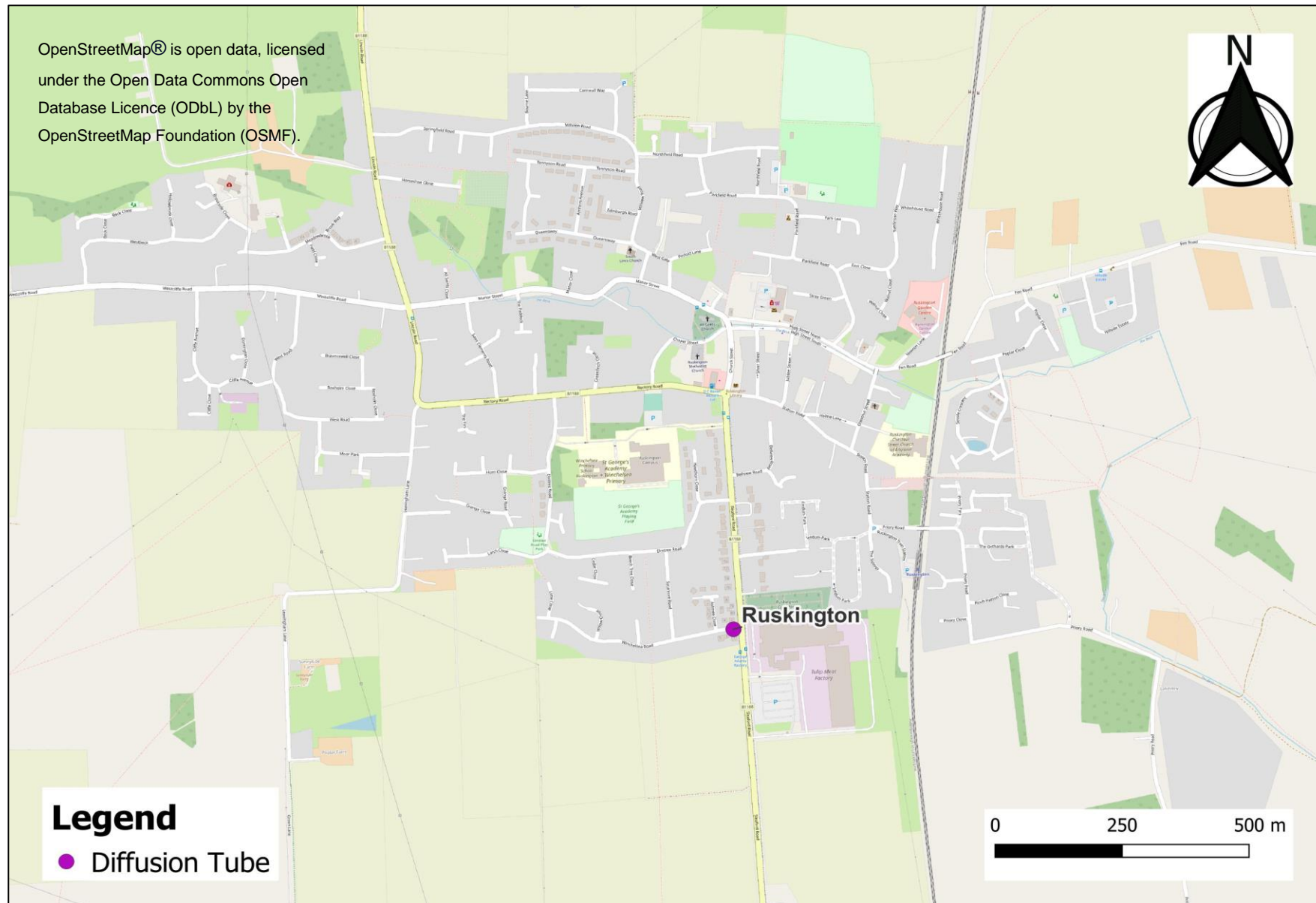**Figure D.4 – Map of Non-Automatic Monitoring Sites in Ruskington**

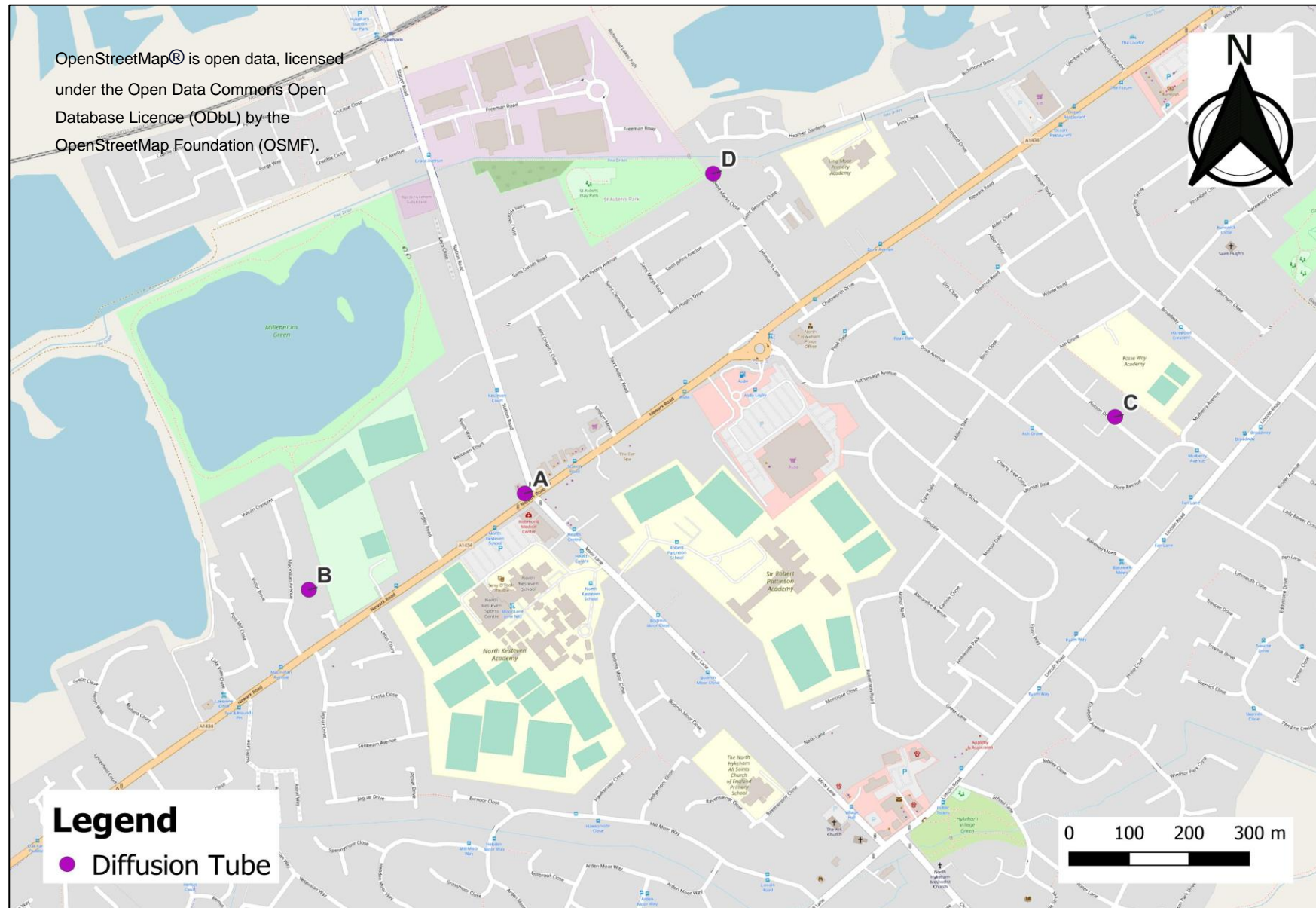**Figure D.5 – Map of Non-Automatic Monitoring Sites in North Hykeham**

Figure D.6 – Map of Non-Automatic Monitoring Sites in Witham St Hughs & Auborn

Figure D.7 – Map of Non-Automatic Monitoring Sites in Canwick, Bracebridge Heath & Branston

Figure D.8 – Map of Non-Automatic Monitoring Sites in Waddington & Harmston

Figure D.9 – Map of Non-Automatic Monitoring Sites in Metheringham

Figure D.10 – Map of Non-Automatic Monitoring Sites in Navenby

5. Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England12

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

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

6. 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 National Highways
EU	European Union
EVCP	Electric Vehicle Charging Point
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
LCC	Lincolnshire County Council
NKDC	North Kesteven District Council
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

7. References

- Local Air Quality Management Technical Guidance LAQM.TG22. August 2022. 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.PG22. August 2022. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
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- Air Quality Strategy – Framework for Local Authority Delivery. August 2023. Published by Defra.
- Background Mapping Data for Local Authorities – 2018-Based Background Maps for NOx, NO_2, PM_{10} and $PM_{2.5}$. Defra. 2022.
- Climate Emergency Strategy Action Plan. 2020. North Kesteven District Council.
- North Kesteven Annual Status Report for the 2022 Reporting Year, 2023.
- National Diffusion Tube Bias Adjustment Factor Spreadsheet published March 2024.
- Diffusion Tube Data Processing Tool version 3.0 published March 2024, Defra.
- Public Health Outcomes Framework, Office for Health Improvement & Disparities, 2023 - https://fingertips.phe.org.uk/profile/public-health-outcomes-framework
- EVs and charging, NKDC Website: https://www.n-kesteven.gov.uk/climate-change-environment/evs-charging
- Bid to boost air quality at school home-time, NKDC Website, published March 2023: https://www.n-kesteven.gov.uk/council-news/2023/03/bid-boost-air-quality-school-home-time
- The Climate Emergency Strategy to 2030 and Action Plan v3 published November 2022.