



North Kesteven District Council

Annual Status Report 2023

Bureau Veritas

June 2023



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Document Control Sheet

Identification	
Client	North Kesteven District Council
Document Title	North Kesteven District Council – 2023 Annual Status Report
Bureau Veritas Ref No.	AIR19287723

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Configuration				
Version	Date	Author	Reason for Issue/Summary of Changes	Status
v1.0	23/06/23	S Garrington	Draft for comment	Draft
V2.0	29/06/23	S Garrington	Client comments	Final

	Name	Job Title	Signature
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North Kesteven

DISTRICT COUNCIL

2023 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 2023

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Date	June 2023

Executive Summary: Air Quality in Our Area

Air Quality in North Kesteven

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 29,000 to 43,000 deaths at typical ages³, with a total estimated healthcare cost to the NHS and social care of £157 million in 2017⁴.

In North Kesteven, the air quality is generally good, owing to the large amount of rural land. Across the entire diffusion tube network, the average NO₂ annual mean concentration in 2022 was 14.3 µg/m³, with the maximum concentration recorded at a single diffusion tube site being 27 µg/m³. The average NO₂ annual mean concentration is 0.2 µg/m³ lower than that recorded in 2021 (14.5 µg/m³), indicating that there has been a marginal decrease in the NO₂ concentration within North Kesteven during 2022. The main source of pollution is from road traffic emissions from the expansive road network that spans across the district – in particular the A15, A17 and the A46. In addition, there are over 30 industrial processes located within North Kesteven that are permitted under the Environmental Permitting (England and Wales) Regulations 2010⁵. These processes are subject to regular routine inspection.

Historically, air quality within North Kesteven has complied with the Air Quality Standard (AQS) objectives, with no exceedances of the NO₂ annual mean objective being recorded in the last five years. Therefore, no Air Quality Management Areas have been declared

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, January 2023

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

⁵ <https://www.gov.uk/government/publications/environmental-permitting-guidance-core-guidance--2>

within North Kesteven, and an Air Quality Action Plan has not needed to be published. However, North Kesteven District Council (NKDC) continues to review the annual NK-Plan, including introducing the 'Our Environment' corporate policy in 2018, declaring a climate emergency in 2019, and formally adopting the Climate Emergency Strategy and Action Plan in 2020 so that greenhouse gas emission reductions remain a key priority within the district. Therefore, North Kesteven District Council are committed to ensuring the measured concentrations of NO₂ continue to comply with the AQS objective, to maintain the trend of the last five years.

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 Plan⁶ sets out actions that will drive continued improvements to air quality and to meet the new national interim and long-term PM_{2.5} targets. The National Air Quality Strategy, due to be published in 2023, will provide more information on local authorities' responsibilities to work towards these new targets and reduce PM_{2.5} in their areas. The Road to Zero⁷ details 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.

Historically, air quality within North Kesteven has complied with the AQS objectives, with no exceedances of the NO₂ annual mean reported in the last five years. Therefore, due to this consistent compliance, no AQMAs have been declared and no AQAP has been published. However, North Kesteven District Council are committed to taking actions that improve air quality to further reduce pollutant concentrations and, importantly, ensure that no exceedances arise at locations in the future. The impact of vehicle emissions is reduced by North Kesteven District Council's hybrid working, with members of staff encouraged to work from home at least three days a week. This strategy aims to limit the number of unnecessary commutes to the workplace and the overall emissions from staff vehicles. In order to reduce

⁶ Defra. Environmental Improvement Plan 2023, January 2023

⁷ DfT. The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy, July 2018

the impact of vehicle emissions beyond the staff of North Kesteven District Council, electrical vehicle charging points are promoted via the planning process in new residential developments, as well as encouraging active modes of travel.

The Council's waste and street scene fleet is predominantly made up of diesel vehicles all of which are Euro 6. The Council monitor the performance and efficiency of all vehicles on the fleet and comply with all manufacturers recommended service schedules, with maintenance provided on site at our own workshop. As part of the fleet replacement programme, three electric vans have replaced their diesel predecessors which commits to the Council's pledge of reducing its carbon footprint.

Conclusions and Priorities

During 2022, the maximum NO₂ annual mean concentration recorded at a single diffusion tube site was 27.0 µg/m³ – a marginal increase from the maximum NO₂ concentration in the previous reporting year (24.9 µg/m³). Monitoring continues to report compliance with the NO₂ annual mean AQS objective. North Kesteven District Council continue 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 NO₂, with no planned monitoring of PM₁₀ or PM_{2.5} within the district.

A key priority for North Kesteven District Council during the current year 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 arisen from the success of last year's campaign delivered at William Alvey School in Sleaford, which involved a Zephyr air quality monitoring station being installed, as well as providing the school with lesson plans and promotional air fresheners for parents' cars, alongside information leaflets explaining the need to cut idling.

Local Engagement and How to get Involved

North Kesteven District Council have 'Our Environment' as a corporate policy, with a climate emergency being declared. The Climate Emergency Strategy and Action Plan which was subsequently formed in 2020 is being delivered. 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.

To support the NKDC priority area of 'Our Environment' NKDC currently have a student undertaking their MSc dissertation on the impacts of domestic fuel combustion on ambient

air quality. This research study will reinforce the governments recently introduced additional controls within smoke control areas regarding wood burning stoves and as part of this research, the following recommendations have been identified that could be incorporated into actions for improving air quality through local engagement . These include:

- Pilot area of study for how many domestic appliances exist in a location.
- Educational leaflet for the public advising on the pros and cons of fuel types.
- Information on social media/council websites.
- Resident drop-in sessions in communities to provide information.
- List of properties with woodburning appliances provided to Environmental Health Department from installers.

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 for air pollution amongst primary school students. Continuous air quality monitoring has been conducted 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

These aims were achieved by engaging pupils with the topic area by providing learning materials, learning activities and access to real time air quality monitoring data outside the school. 'No idling' car air freshers and information leaflets were distributed to parents and guardians who use private vehicular transport. This project was promoted on the school's and NKDC's social media page/websites. Furthermore, the project was promoted in the local newspaper, the local BBC news and national BBC news (BBC Breakfast). The project has been approved to be rolled out in 23/24 to another school in the district.

The data is used to demonstrate the impact of vehicle emissions during the morning drop-off and evening pick-up; and it is hoped that individuals will be actively motivated to reducing their individual impact. This includes strategies such as using public transport, active travel (i.e. walking/cycling), car sharing, and less idling of stationary vehicles.

As a result of North Kesteven District Council's dedication to ensure continued compliance with the AQS objectives, multiple actions have been taken. For example, 100% renewable energy has been purchased for all council-controlled buildings, diesel waste/recycling vehicles have telemetric systems to monitor fuel efficiency and idling, and an air pollution monitor is active to provide detailed air quality measurements in real time to identify pollution hot spots. 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. 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 Bohdan Dawyd at:

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1 Local Air Quality Management

This report provides an overview of air quality in North Kesteven during 2022. 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 North Kesteven 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.

North Kesteven District Council currently does not have any declared AQMAs.

Based on the latest monitoring data continuing the trend seen in the last five years (not including COVID-19 years) of NO₂ concentrations being below the AQS objective, North Kesteven District Council do not intend to declare an AQMA during the current reporting year.

2.2 Progress and Impact of Measures to address Air Quality in North Kesteven

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. Reference to the Public Health Outcomes Framework has been made and this practice should continue going forward.
2. Trends have been presented with a robust comparison to the Air Quality Objectives.
3. QA/QC procedures are robust, with sufficient supporting evidence provided.

Air quality measures are inextricably linked to measures contained within North Kesteven District Council's Climate Emergency Strategy and Action Plan, which was approved and adopted in 2020. Although the primary focus is on reducing CO₂ emissions, many of the measures within the plan are also expected to have a positive impact on improving air quality within the district by reducing emissions from the combustion of fossil fuels.

Over the course of the next reporting year, North Kesteven District Council expects the following measures to be completed:

- Expansion of the Schools Air Quality Project.
- Fleet Replacement Programme to continue the councils commitment to reduce its carbon footprint.

2.3 PM_{2.5} – Local Authority Approach to Reducing Emissions and/or Concentrations

As detailed in Policy Guidance LAQM.PG22 (Chapter 8), 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.

There is currently no ongoing monitoring of PM₁₀ or PM_{2.5} within North Kesteven, and no specific measures in place to address PM_{2.5} concentrations. However, with the use of the Defra background maps (2018 reference year), the background concentration of PM_{2.5} is shown to be low. For example, the highest concentration of PM_{2.5} within the 2022 dataset was recorded as 10.0 µg/m³, which is well below the annual mean objective of 20 µg/m³. This PM_{2.5} concentration is reported to be within the 1km grid square which encompasses Doddington and the A46 (X: 491500, Y: 370500).

The Public Health Outcomes Framework data tool 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 (5.1%) is lower than that seen across the Region (5.6%) and England (5.5%). As is the case for NO₂ emissions, traffic emissions are also the primary source of anthropogenic particulates (both PM₁₀ 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 off Newark Road and Lincoln Road. Further information, alongside maps of these designations, is accessible on North Kesteven District Council's website. It is an offence to burn unauthorised fuels within these areas, with failure to comply resulting in a fine. North Kesteven District Council continues to respond to any odour or smoke complaints.

For new developments, dust and bonfires are managed through appropriate conditions and where necessary enforcement action. North Kesteven District Council currently authorises 34 installations where conditions control air pollution through the Environmental Permitting Regulations 2016.

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

This section sets out the monitoring undertaken within 2022 by North Kesteven District Council and how it compares with the relevant air quality objectives. In addition, monitoring results are presented for a five-year period between 2018 and 2022 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 2022.

3.1.2 Non-Automatic Monitoring Sites

North Kesteven District Council undertook non-automatic (i.e. passive) monitoring of NO₂ at 22 sites during 2022. 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 NO₂ annual mean concentrations for the past five years with the air quality objective of 40µg/m³. 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). The diffusion tube network remained at 22 sites in 2022, providing an accurate comparison to 2021.

For diffusion tubes, the full 2022 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 NO₂ annual mean concentration across the entire diffusion tube network was 14.3 µg/m³, with recordings ranging from a minimum of 9.3 µg/m³ at Site ID 'Witham St Hughs' to a maximum of 27 µg/m³ at Site ID 'A (Newark Road/Station Road, North Hykeham)'. Therefore, all sites reported NO₂ annual mean concentrations well below the AQS objective of 40 µg/m³. The average NO₂ annual mean across the diffusion tube network is comparable to that recorded in 2021 (14.5 µg/m³), indicating that there has been no major increase in the concentration of NO₂ within North Kesteven during the reporting year of 2022. As a result of the continued compliance with the AQS objective, North Kesteven District Council are not intending to declare an AQMA for NO₂ annual mean. In addition, no single diffusion tube site recorded an annual mean NO₂ concentration above 60 µg/m³ therefore, in accordance with LAQM TG(22), there is not likely to be any exceedances of the 1-hour mean objective.

For diffusion tubes, the full 2022 dataset of monthly mean values is provided in Appendix B.

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	Roadside	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	Urban Background	505704	347269	NO ₂	No	64.4	1.5	No	1.9

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)
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
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 NO₂ Monitoring Results: Non-Automatic Monitoring (µg/m³)

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 2022 (%) ⁽²⁾	2018	2019	2020	2021	2022
A	493845	366567	Roadside	100.0	100.0	33.0	32.2	25.8	24.9	27.0
B	493485	366402	Roadside	90.4	90.4	25.0	14.1	18.2	19.6	17.0
C	494829	366698	Roadside	100.0	100.0	15.3	15.4	11.7	11.3	11.6
D	494159	367115	Roadside	100.0	100.0	11.9	16.1	9.3	10.5	10.5
Ruskington	508316	350447	Roadside	82.7	82.7	14.7	13.3	10.7	11.5	10.4
Canwick	498561	369494	Roadside	100.0	100.0	34.0	19.8	28.5	21.2	22.4
BH1, BH2, BH3	498000	367544	Roadside	100.0	100.0	32.0	27.9	21.5	20.5	20.1
Waddington	497718	363898	Roadside	100.0	100.0	15.2	11.9	10.7	10.8	10.4
Sleaford	506835	345684	Roadside	92.3	92.3	27.3	24.2	17.9	19.7	23.6
Holdingham 1	505704	347269	Urban Background	100.0	100.0	22.0	19.0	14.1	14.0	13.9
Holdingham 2	505985	347343	Urban Background	100.0	100.0	19.0	18.0	12.5	15.0	14.0
Westbanks	506507	345744	Roadside	90.4	90.4	18.6	17.0	13.1	13.1	13.2
Grantham Road	506601	345300	Roadside	92.3	92.3	17.5	17.5	13.6	13.2	11.0

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 2022 (%) ⁽²⁾	2018	2019	2020	2021	2022
Sleaford 1	506648	345757	Urban Background	90.4	90.4	16.1	13.9	10.6	11.3	10.4
Waddington 1	496425	365685	Roadside	90.4	90.4	15.2	11.9	9.8	9.5	9.8
Branston	502358	367322	Rural	100.0	100.0	18.8	20.6	17.2	19.5	19.6
Auborn	492360	362640	Kerbside	100.0	100.0	-	13.9	10.9	11.8	11.3
Witham St Hughs	489199	361790	Kerbside	100.0	100.0	-	11.2	9.2	9.2	9.3
Harmston	497006	362368	Kerbside	100.0	100.0	-	15.0	12.5	12.1	11.4
Metheringham	506126	361636	Urban Background	100.0	100.0	-	11.3	9.8	10.2	10.2
Navenby	498841	357758	Kerbside	100.0	100.0	-	22.0	13.1	14.0	13.0
Heckington	514514	343906	Kerbside	100.0	100.0	-	17.3	14.6	15.8	15.6

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 $\mu\text{g}/\text{m}^3$.

Exceedances of the NO₂ annual mean objective of $40\mu\text{g}/\text{m}^3$ are shown in **bold**.

NO₂ annual means exceeding 60µg/m³, indicating a potential exceedance of the NO₂ 1-hour mean objective are shown in **bold and underlined**.

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 (1)

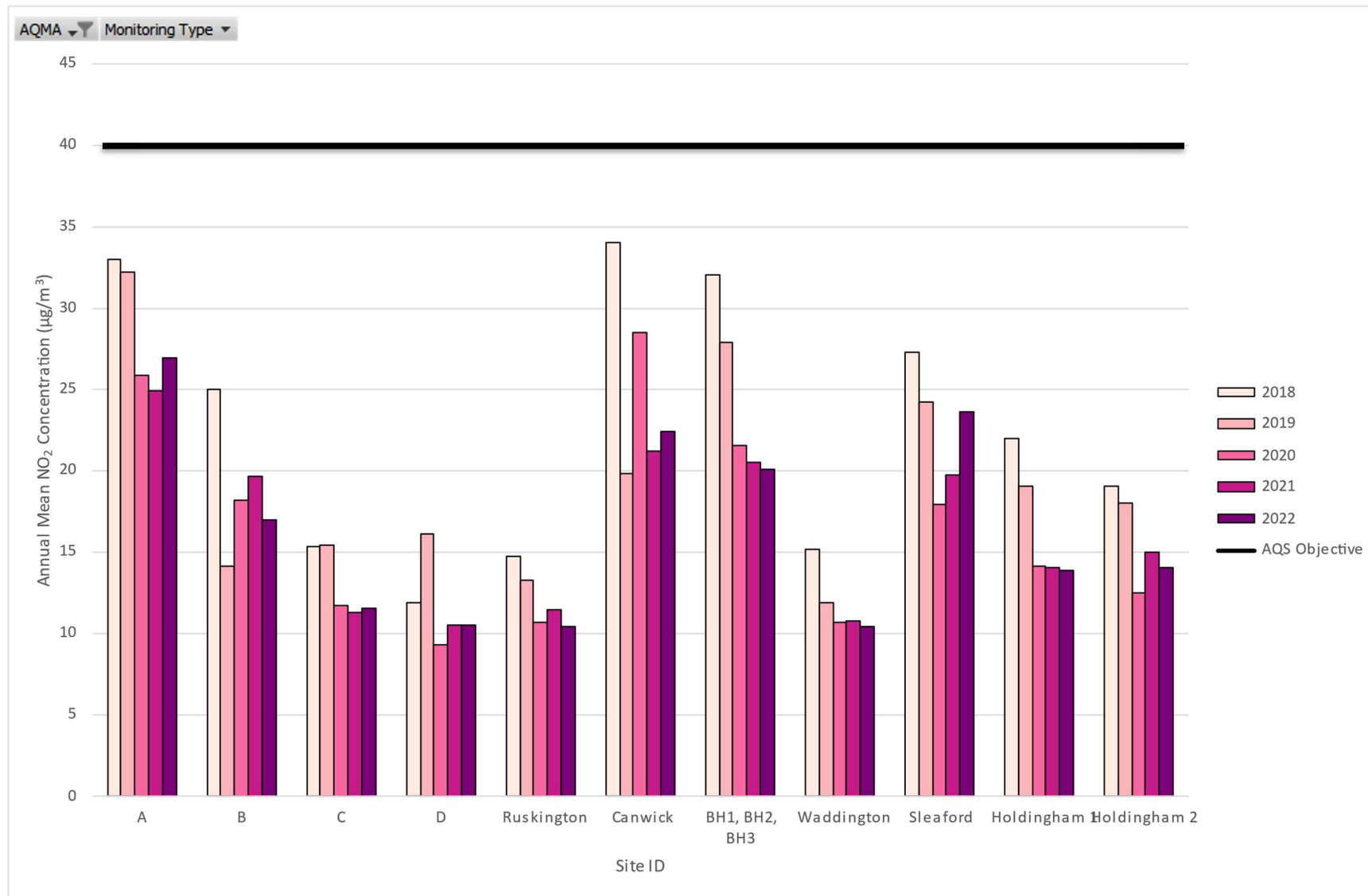
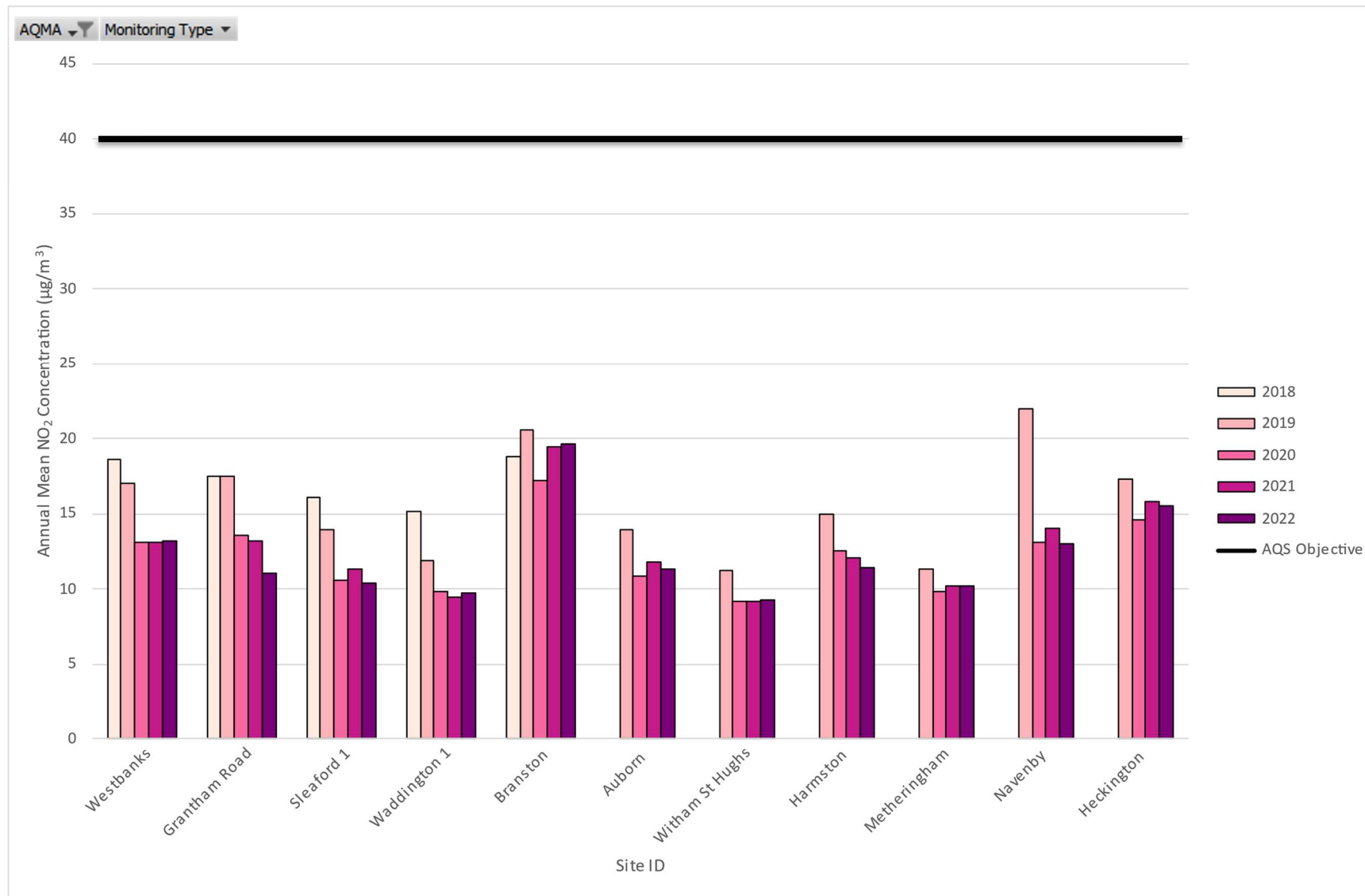


Figure A.2 – Trends in Annual Mean NO₂ Concentrations (2)



Appendix B: Full Monthly Diffusion Tube Results for 2022

Table B.1 – NO₂ 2022 Diffusion Tube Results (µg/m³)

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 (0.76)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
A	493845	366567	55.3	38.4	45.2	28.8	29.9	27.3	29.9	31.7	29.6	32.6	42.5	34.5	35.5	27.0	-	
B	493485	366402	40.3	30.6	24.7	-	0.5	17.3	19.9	22.9	19.5	19.5	23.0	27.5	22.3	17.0	-	
C	494829	366698	29.0	15.8	20.1	9.5	11.0	8.6	9.5	11.4	13.4	14.4	19.5	20.7	15.2	11.6	-	
D	494159	367115	28.7	16.3	15.0	10.0	10.2	7.9	8.4	9.7	13.8	13.6	16.8	15.1	13.8	10.5	-	
Ruskington	508316	350447	23.2	12.6	17.2	12.0	9.6	8.0	10.0	11.2	-	-	14.9	17.9	13.7	10.4	-	
Canwick	498561	369494	50.1	26.6	32.4	23.7	10.6	28.2	25.4	26.5	30.9	32.1	36.8	30.2	29.5	22.4	-	
BH1	498000	367544	38.6	19.0	29.8	-	23.6	20.3	24.4	24.7	27.6	21.5	28.6	28.6	-	-	-	Triplicate Site with BH1, BH2 and BH3 - Annual data provided for BH3 only
BH2	498000	367544	37.3	22.6	24.0	25.1	-	21.3	25.7	27.3	27.2	21.7	29.6	26.0	-	-	-	Triplicate Site with BH1, BH2 and BH3 - Annual data provided for BH3 only
BH3	498000	367544	38.8	23.1	35.1	26.7	23.7	21.6	26.2	26.8	-	22.4	-	-	26.5	20.1	-	Triplicate Site with BH1, BH2 and BH3 - Annual data provided for BH3 only
Waddington	497718	363898	27.1	11.2	19.6	11.3	9.8	7.5	8.5	10.4	11.7	12.7	18.2	16.0	13.7	10.4	-	
Sleaford	506835	345684	33.6	21.7	-	29.1	26.8	28.9	29.4	28.5	31.8	34.5	40.9	35.8	31.0	23.6	-	
Holdingham 1	505704	347269	26.2	15.8	24.7	21.8	15.8	12.2	13.5	20.2	18.8	13.5	17.7	18.8	18.3	13.9	-	
Holdingham 2	505985	347343	30.0	17.6	23.4	18.6	15.2	12.1	12.8	17.4	18.3	14.6	19.2	22.2	18.5	14.0	-	
Westbanks	506507	345744	31.8	18.9	21.3	14.6	13.8	11.5	12.4	12.6	13.7	16.6	23.4	-	17.3	13.2	-	
Grantham Road	506601	345300	0.7	18.9	21.0	13.9	12.8	11.2	-	13.3	12.6	14.5	20.4	20.5	14.5	11.0	-	
Sleaford 1	506648	345757	26.6	14.5	19.7	12.3	-	7.8	8.6	10.3	13.2	11.8	17.1	8.7	13.7	10.4	-	
Waddington 1	496425	365685	25.7	12.8	16.5	9.6	-	8.7	7.5	8.9	9.6	10.8	15.6	15.9	12.9	9.8	-	

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 (0.76)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
Branston	502358	367322	44.3	24.7	28.0	19.4	23.1	20.6	22.6	20.1	25.0	25.5	26.9	29.3	25.8	19.6	-	
Auborn	492360	362640	28.3	16.1	18.9	12.1	11.5	8.1	10.5	11.8	12.4	12.8	17.4	18.7	14.9	11.3	-	
Witham St Hughs	489199	361790	24.9	11.7	14.6	9.6	8.9	7.8	8.2	9.9	10.1	10.0	14.3	16.6	12.2	9.3	-	
Harmston	497006	362368	24.6	11.7	22.2	15.2	11.6	10.2	11.9	14.2	16.0	12.7	14.9	14.9	15.0	11.4	-	
Metheringham	506126	361636	27.7	15.4	16.6	9.7	13.6	8.4	8.0	8.2	11.4	10.8	16.9	14.4	13.4	10.2	-	
Navenby	498841	357758	29.8	16.0	24.9	16.0	13.8	10.5	13.0	13.8	15.5	16.7	21.8	14.2	17.2	13.0	-	
Heckington	514514	343906	33.0	20.1	23.7	15.6	17.2	16.0	16.7	16.0	18.2	18.5	26.3	24.4	20.5	15.6	-	

- 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.
- North Kesteven confirm that all 2022 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System.

Notes:

Exceedances of the NO₂ annual mean objective of 40µg/m³ are shown in **bold**.

NO₂ annual means exceeding 60µg/m³, indicating a potential exceedance of the NO₂ 1-hour mean objective are shown in **bold and underlined**.

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 North Kesteven During 2022

North Kesteven District Council has not identified any new major sources relating to air quality within the reporting year of 2022. However, the following planning applications were granted, which may impact air quality through the design of new road layouts/access routes:

- **21/1975/RESM** - Reserved matters application for the erection of 25 dwellings with design, scale, appearance, layout and landscaping.
- **20/0391/FUL** - Residential development of 190 no. dwellings (comprising 152 no. open market dwellings and 38 no. affordable housing dwellings) with associated open space, landscaping and sustainable drainage infrastructure (Central Lincolnshire Local Plan residential site allocations CL957 and CL4710).
- **22/0174/RESM** - Erection of up to 1,100 dwellings and 150 care/retirement units (C2/C3), the formation of a roundabout to Camp Road, A46 junction improvement works, public open spaces and associated service infrastructure (outline with means of access).
- **21/0049/RESM** - Application for reserved matters approval (details of access, layout, appearance, scale, and landscaping) for the erection of 315 no. dwellings with access, public open space and associated works and infrastructure.

Additional Air Quality Works Undertaken by North Kesteven During 2022

North Kesteven District Council has not completed any additional works within the reporting year of 2022.

QA/QC of Diffusion Tube Monitoring

The diffusion tubes for the year 2022 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 NO₂ tube analysis and the Annual Field-Intercomparison Exercise. These provide strict performance criteria for participating laboratories to meet, thereby ensuring NO₂ 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 NO₂ diffusion tubes supplied by SOCOTEC Didcot were classified as 'good' for all by three observations. The precision reflects the laboratories performance and consistency in preparing and analysing the diffusion tubes.

During 2022, all diffusion tubes were exposed and changed in adherence (± 2 days) with the 2022 diffusion tube monitoring calendar. Therefore, no single diffusion tube was exposed for longer than the 4–5-week recommendation.

Diffusion Tube Annualisation

All diffusion tube monitoring locations within North Kesteven recorded data capture of 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.

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2022 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/NO₂ continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

North Kesteven have applied a national bias adjustment factor of 0.76 to the 2022 monitoring data. A summary of bias adjustment factors used by North Kesteven over the past five years is presented in Table C.1.

Table C.1 – Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
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
2018	National	03/19	0.92

NO₂ Fall-off with Distance from the Road

No diffusion tube NO₂ monitoring locations within North Kesteven required distance correction during 2022.

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

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

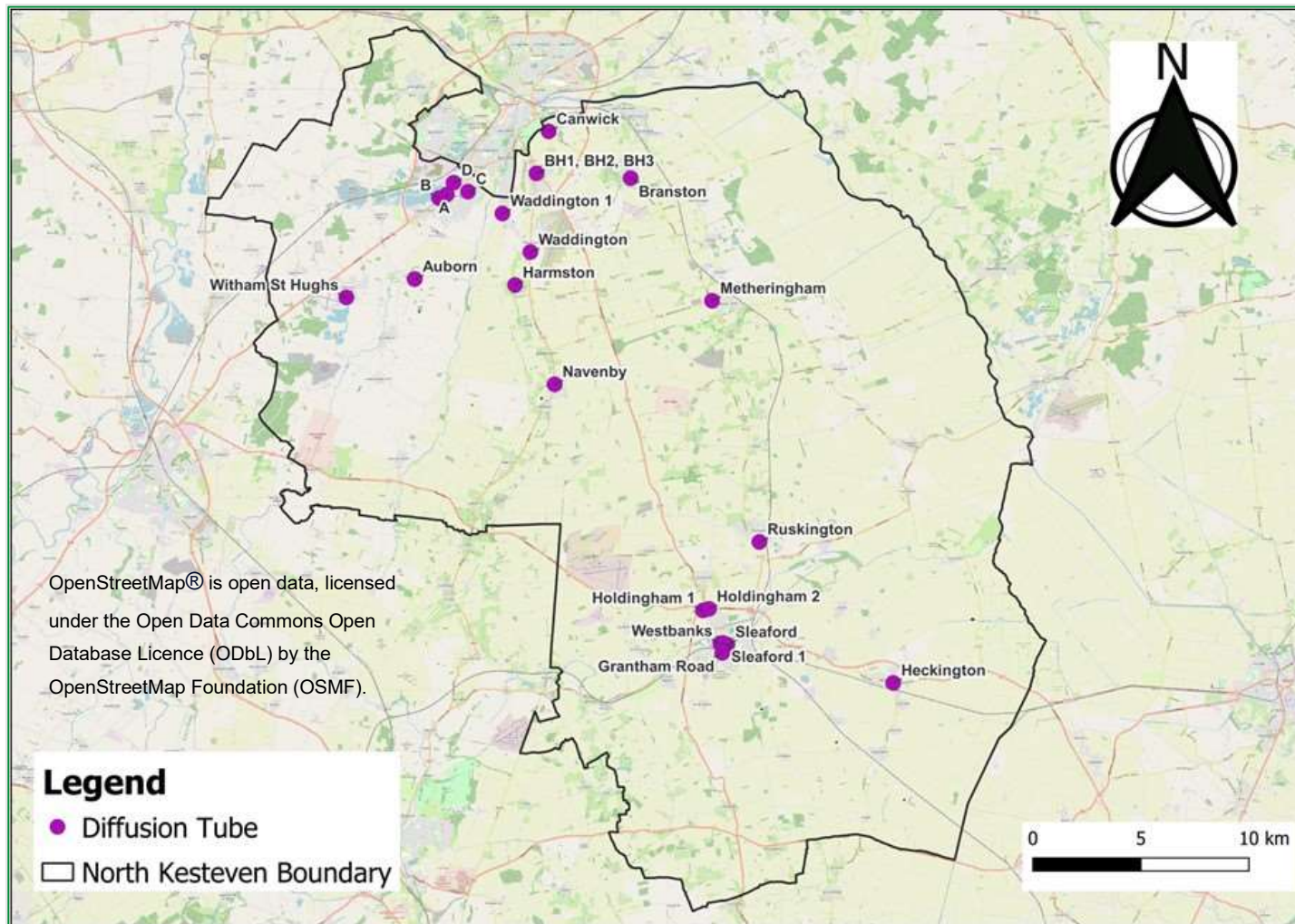


Figure D.2 – Map of Non-Automatic Monitoring Sites in Sleaford & Holdingham

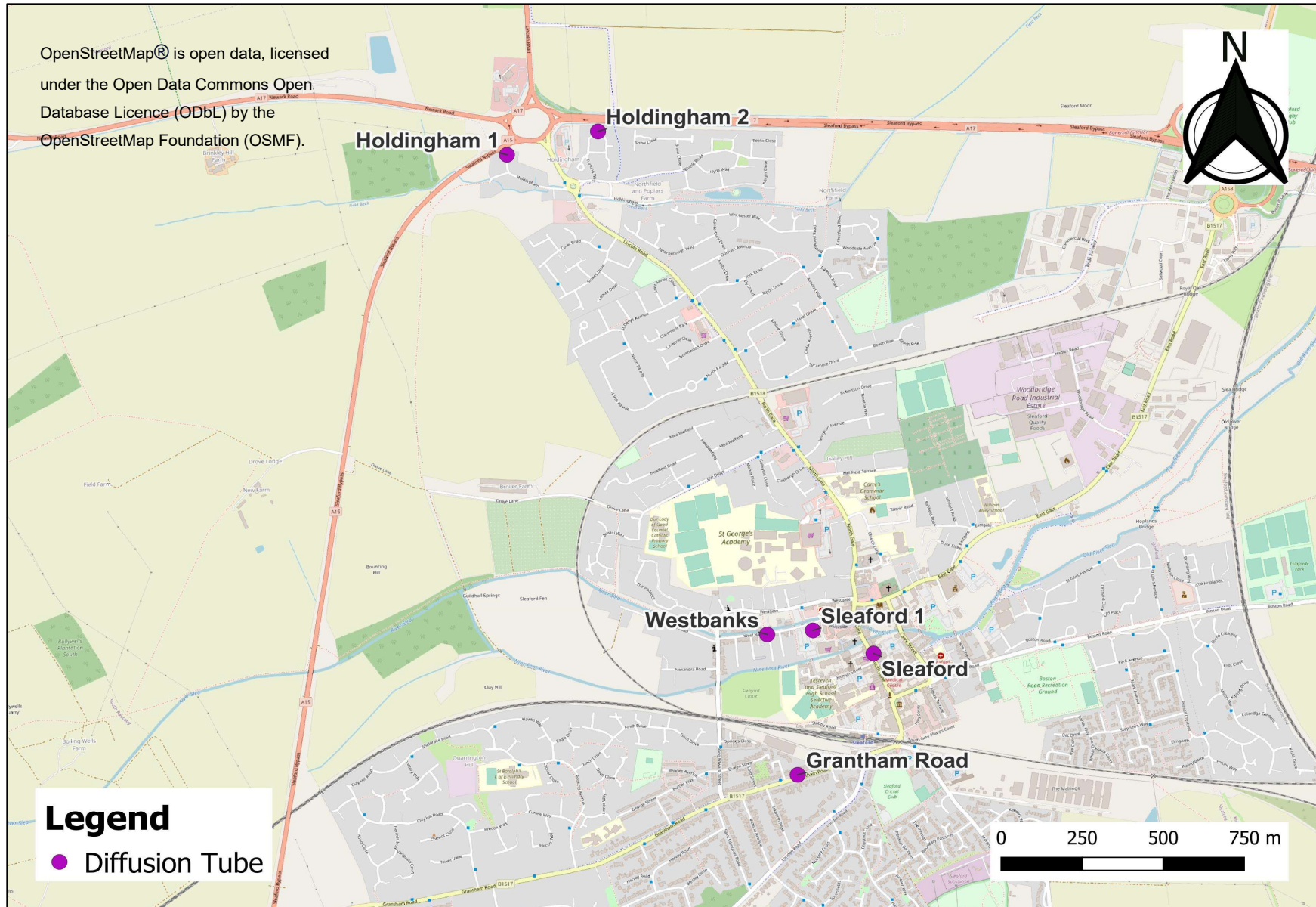


Figure D.3 – Map of Non-Automatic Monitoring Sites in Heckington



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

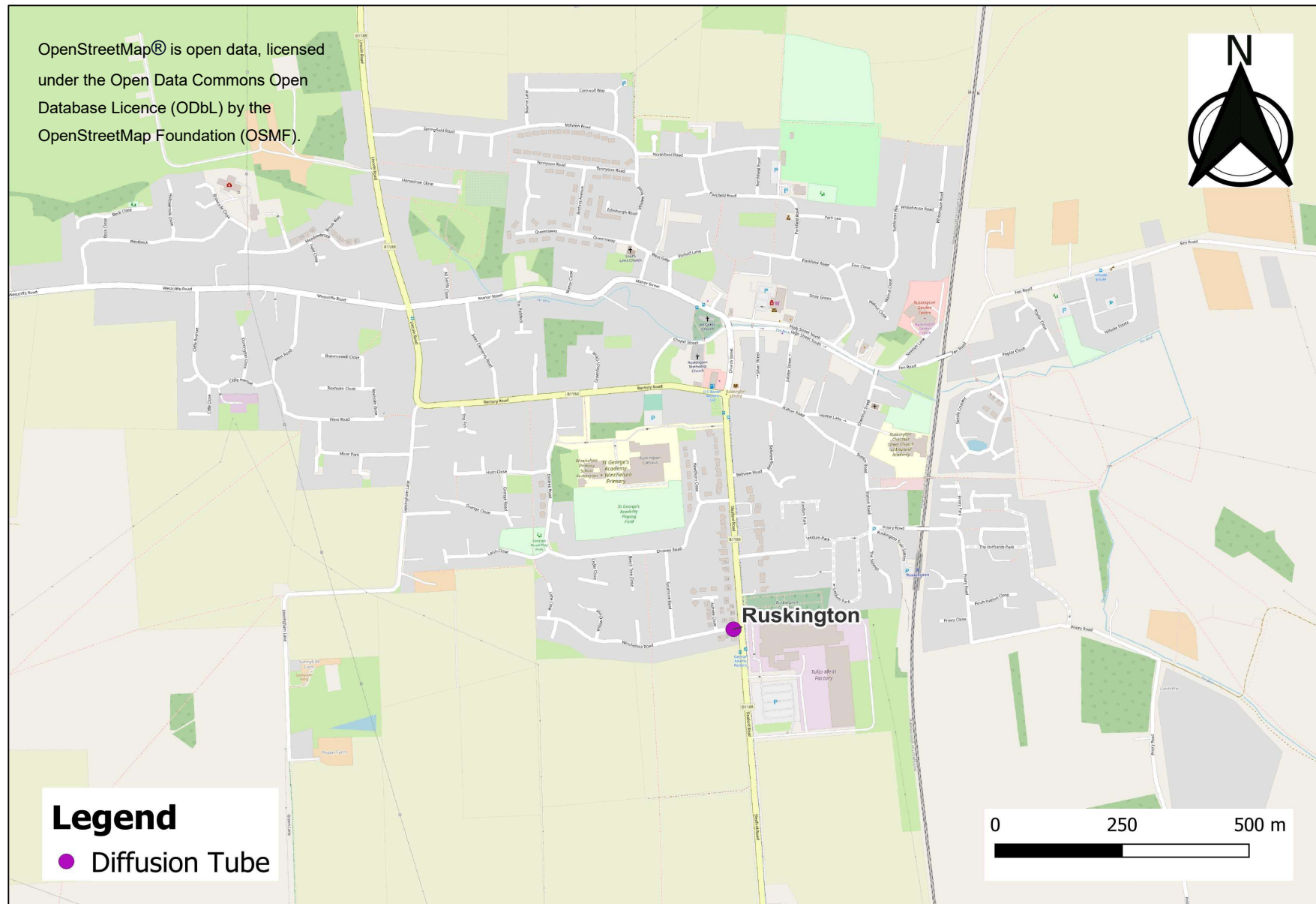


Figure D.5 – Map of Non-Automatic Monitoring Sites in North Hykeham

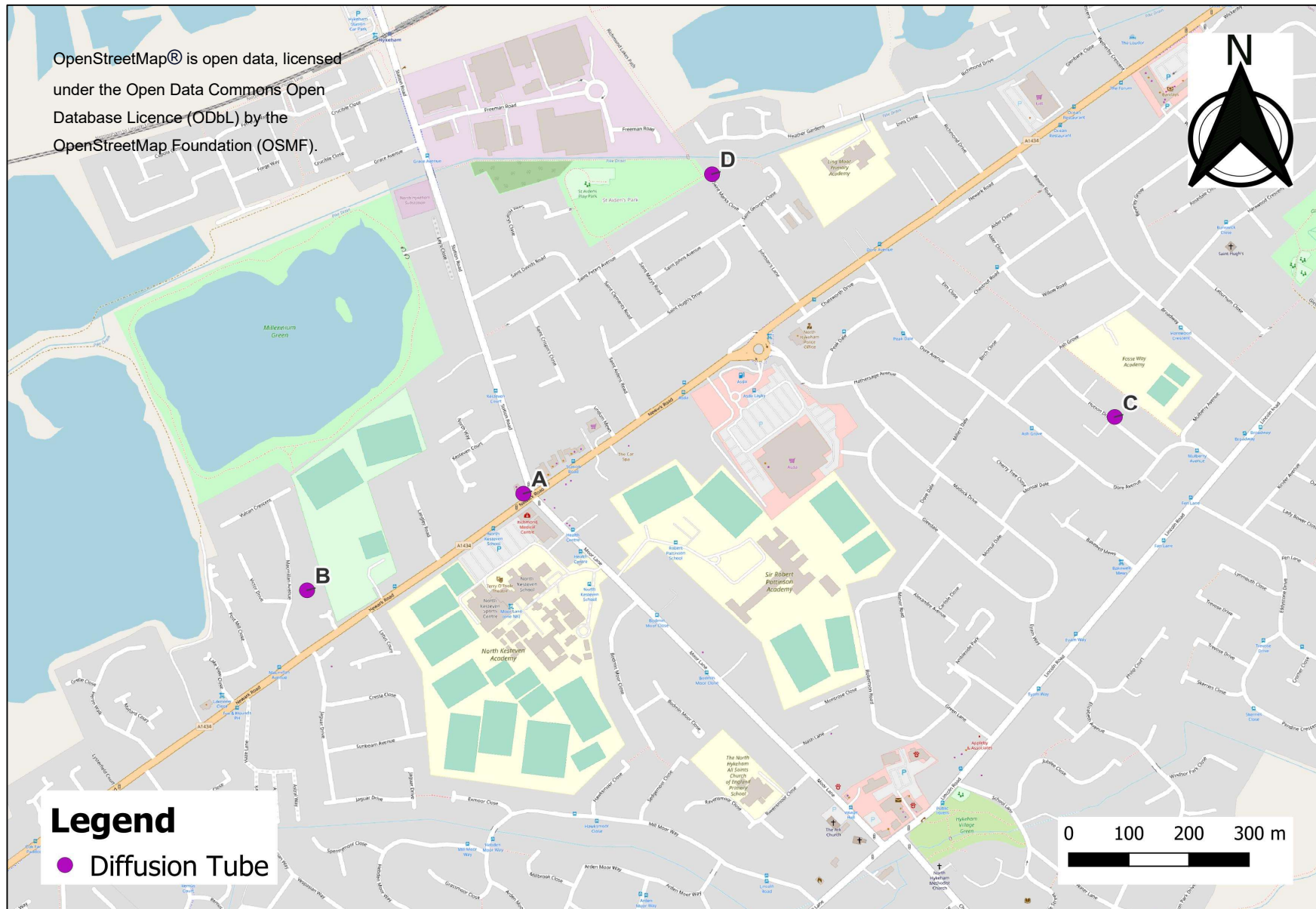


Figure D.6 – Map of Non-Automatic Monitoring Sites in Witham St Hughs & Auborn



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

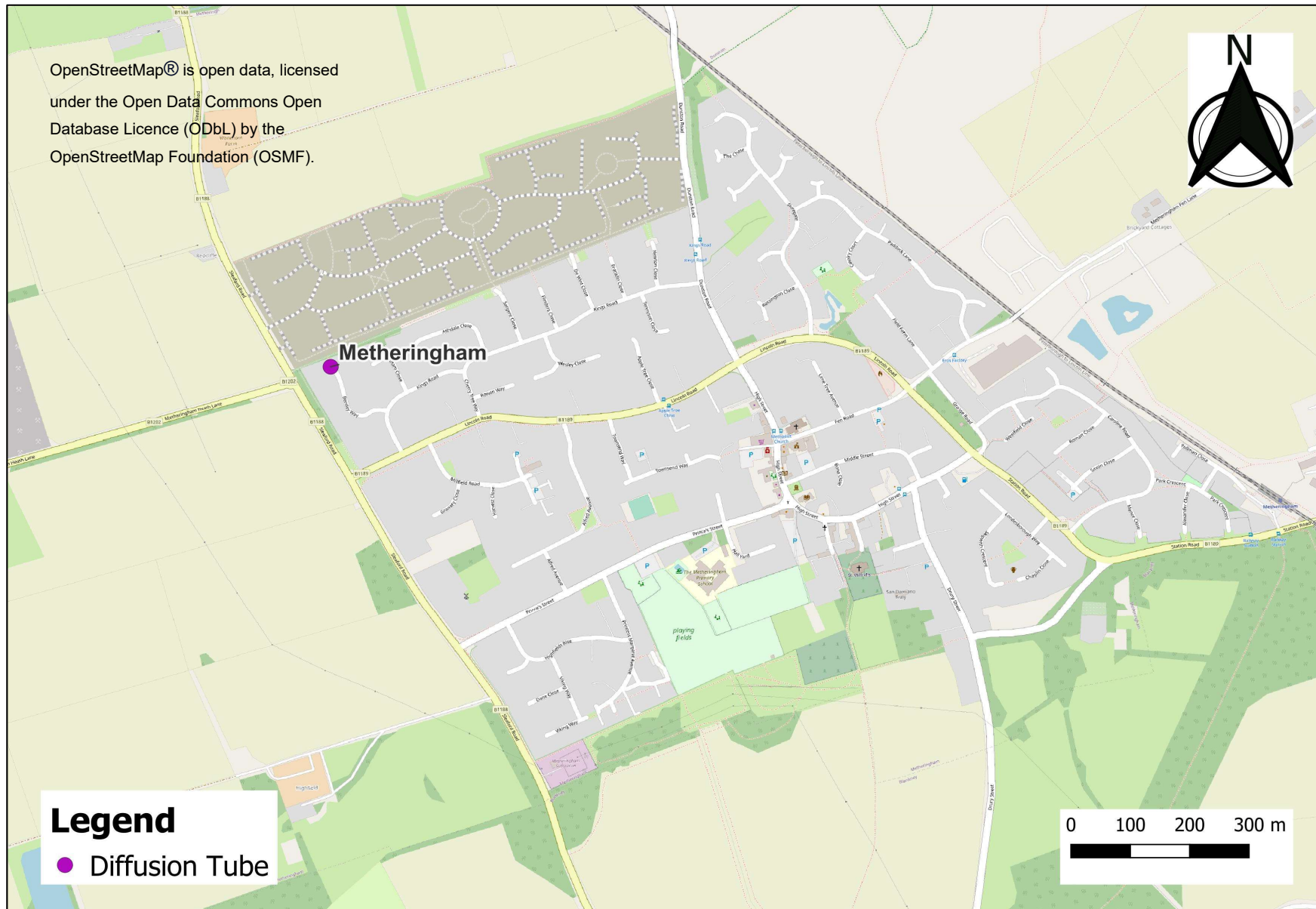


Figure D.10 – Map of Non-Automatic Monitoring Sites in Navenby



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England⁸

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

⁸ The units are in microgrammes of pollutant per cubic metre of air (µg/m³).

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
AQS	Air Quality Standard
ASR	Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
EU	European Union
LAQM	Local Air Quality Management
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

References

- Background Mapping Data for Local Authorities – 2018-Based Background Maps for NO_x, NO₂, PM₁₀ and PM_{2.5}. Defra. 2022.
- Climate Emergency Strategy Action Plan. 2020. North Kesteven District Council.
- 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.
- North Kesteven Annual Status Report for the 2021 Reporting Year, 2022.
- National Diffusion Tube Bias Adjustment Factor Spreadsheet published March 2023.
- Diffusion Tube Data Processing Tool version 3.0 published March 2023, Defra.
- Public Health Outcomes Framework, Office for Health Improvement & Disparities, 2023 - <https://fingertips.phe.org.uk/profile/public-health-outcomes-framework>