

2022 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995

Local Air Quality Management

June 2022

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Executive Summary: Air Quality in Our Area

Air Quality in Nottingham City Council's administrative area

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].

Air pollution is defined as a mixture of gases and particles that have been emitted into the atmosphere by natural and human-made processes.

The combustion of fossil and other carbon based fuels such as coal, gas, petrol, diesel and wood are the most significant sources of the key pollutants of concern: nitrogen oxides, particles and sulphur dioxide; and also carbon dioxide, a key greenhouse gas.

In Nottingham the main sources of urban nitrogen dioxide (NO_2) are natural gas fired heating/hot water systems and boilers (industrial, commercial and domestic sources) and motor vehicles. Furthermore, in some locations in Nottingham, particularly near busy roads, diffusion tube monitoring indicates concentrations of NO_2 might exceed the annual mean Air Quality Objective (AQO) of 40 ug/m3.

The largest local contributors to ambient concentrations of particulate matter (PM_{10}, $PM_{2.5}$, $PM_{0.1}$) are road transport; diesel engine vehicles, tyre, brake, and road surface wear, and the burning of solid fuels such as coal-based 'smokeless fuels' and wood.

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[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 2021

[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

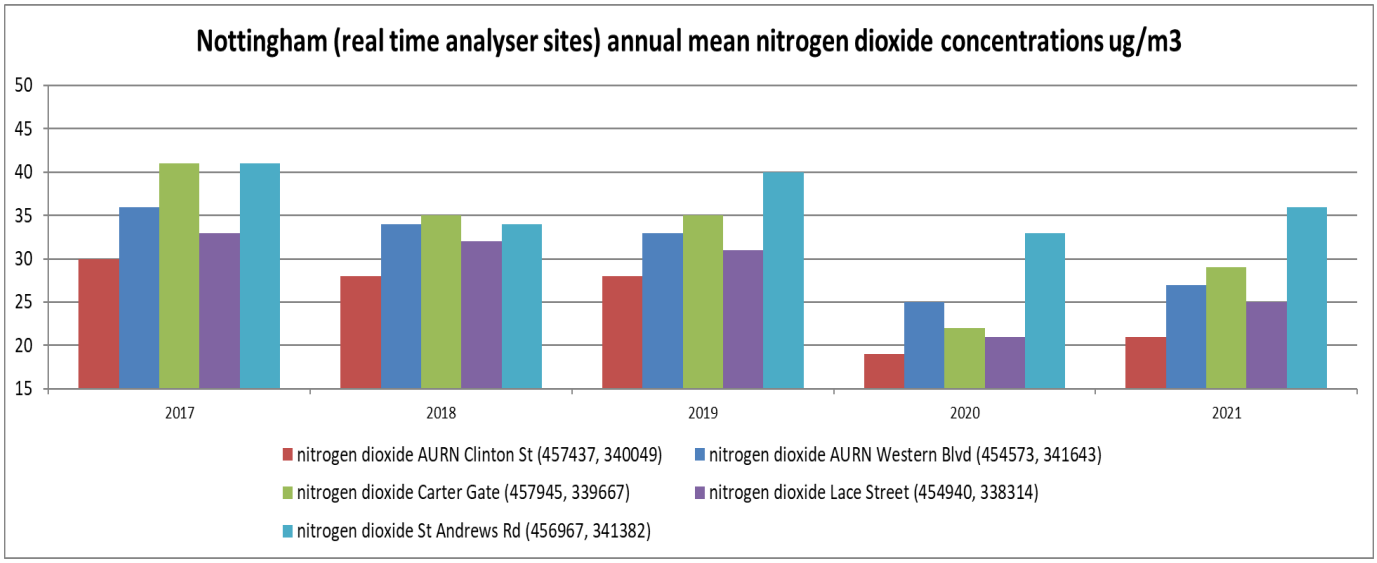
Air quality modelling indicates that the majority of Nottingham's fine particulate air pollution ($PM_{2.5}$ and smaller) comes from sources outside the City, and contains a proportion of secondary particles formed by chemical reactions between air pollutants such as ammonia, sulphur dioxide and nitrogen dioxide.

Air Quality Monitoring data 2021

Nottingham has an AQMA for NO_2 and is required to carry out NO_2 monitoring. It uses real time analysers and nitrogen dioxide diffusion tubes to do this.

DEFRA operates two AURN stations (for the Nottingham 'Agglomeration'), monitoring a range of pollutants of concern. Monitoring data from Nottingham City Council's 3 RTAs and the Clinton Street East and Western Boulevard AURN stations show NO_2 concentrations were below the annual mean air quality objective of 40 *u*g/m^3 (Figure 1.)

During 2020 and part of 2021 action to prevent/minimise transmission of Covid-19 (including 'lockdowns') reduced emissions from road transport and other commercial activity, particularly the office, retail, leisure and hospitality sector, a significant proportion of the commercial activity in Nottingham's city centre.



In 2021 Nottingham's network of 50 diffusion tubes (38 individual locations), although only indicative of NO_2 concentrations, recorded annual mean (bias adjusted and annualised) concentrations of over 40 ug/m3 at 8 sites, compared to just 4 sites in 2020.

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 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.

To raise the profile of air quality issues and its impact on health a Joint Strategic Needs Assessment was undertaken in 2015 resulting in the Air Quality and Health chapter of the JSNA. The chapter identified the key health issues, links to the Public Health Outcome Framework indicators (originally 3.01, now D01) and opportunities and synergies from links to a range of activities with improved health outcomes that reduce emissions of air pollution. The chapter was updated in 2019

https://nottinghaminsight.org.uk/search?q=JSNA%20air%20quality

Nottingham City Council pledge to reduce air pollution

Nottingham City Council is committed to improving air quality by cutting Nitrogen Dioxide and particulate pollution by 20% compared to 2018 (average concentrations of DEFRAs City Centre and Western Boulevard AURN sites).

https://www.nottinghamcity.gov.uk/media/3372996/full-strategic-council-plan-2021-23.pdf

Nottingham City Council aims to achieve this by the range of strategies, plans and activity outlined below.

Nottingham Local Plan Part 1 and 2

Nottingham City Council has been working to improve air quality by reducing emissions of CO_2, NO_x/NO_2 and particles (PM_{10}, $PM_{2.5}$) by increasing energy efficiency across

[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

Nottingham City Council and Nottingham City Homes building stock and investing in alternative energy generation.

Nottingham City Council's Land and Planning Policies Development Plan Document (Local Plan Part 2) was adopted in January 2020.

It supports the wider Broxtowe Borough, Gedling Borough and Nottingham City Aligned Core Strategy. The Core Strategy details policies and objectives) of which the majority directly address or contribute towards improving air quality e.g.

i) Environmentally responsible development addressing climate change

ii) High quality new housing

v) Regeneration

viii) Health and wellbeing

x) Excellent transport systems and reducing the need to travel

xi) Protecting and improving natural assets

xii) Timely and viable infrastructure

https://www.nottinghamcity.gov.uk/information-for-business/planning-and-building-control/planning-policy/the-local-plan-and-planning-policy/the-adopted-local-plan/

Local Plan to Improve Air Quality in Nottingham (Action plan to reduce NO2 concentrations in locations at risk of infraction of EU limit values).

The main element of this air quality action plan, which was the retrofit of approximately 185 Euro V emission standard Nottingham City Transport buses with NO2 abatement technology to bring them up to Euro VI emission standard and the accelerated introduction of lower NO_2 emissions Bio-gas buses, was substantially completed by February 2020.

https://www.nottinghaminsight.org.uk/d/aBFPtBx

A significant proportion of the buses operating on the roads where infraction of the EU limit NO2 annual mean was predicted were upgraded by August 2019. The reduction in NOx/NO2 emissions and ambient NO2 concentrations were calculated, submitted to and, provisionally accepted by, DEFRA in August 2019.

The second element of the plan, Nottingham City Council's revised Hackney Carriage and Private Hire Vehicle Strategy 2017-2020 designed to transition the fleet to Euro VI compliant taxi's from January 2020, and for a minimum of 40% of the HC and 25% of the Private Hire fleet to be Ultra Low Emission Vehicles has been implemented.

Nottinghamshire Air Quality Strategy

In November 2019 Nottingham and Nottinghamshire completed the review of their joint Air Quality Strategy and each Council's respective Health and Wellbeing Boards subsequently approved the drafts. The two versions of the Strategy, an interactive webpage and the more detailed strategy document, are available to download from each Council's website (search on-line for Nottingham and Nottinghamshire Air Quality Strategy).

The strategy draws together work by local authorities, police, fire and rescue services, NHS trusts, Environment Agency and Highway's England to develop, promote and support activity within their own organisations and complement each other to reduce harmful emissions from their activity, estate, staff and customers/service users.

https://www.nottinghaminsight.org.uk/f/5ab131c6-d61b-4cea-b407-de704be9ac17

and search for 'Air Quality Strategy for Nottingham and Nottinghamshire 2020-2030'

Air Quality and Emissions Mitigation – Guidance for Developers 2019 (draft)

Nottingham City Council is working to transpose the draft supplementary planning document, developed in partnership with East Midlands Air Quality Network, into an easy to follow guide and menu for developers in Nottingham to use. The guidance will enable developers to develop sites whilst minimising air pollution and carbon emissions from the development over its lifetime.

https://www.nottinghaminsight.org.uk/f/5ab131c6-d61b-4cea-b407-de704be9ac17

and search for 'Draft East Midlands Air Quality Network Air Quality and Emissions Mitigation Guidance for Developers'

Carbon Neutral Action Plan

This plan builds on Nottingham 2028 Carbon Neutral Charter by setting out high-level objectives in order to achieve a resilient and carbon neutral Nottingham by 2028.

Nottingham's approach to sustainable carbon neutrality will integrate carbon reduction with sustainability and an ambition to identify and realise multiple benefits, termed co-benefits.

Co-benefits are deliberate or incidental positive outcomes across a range of other areas in addition to the central aim of an intervention. An example of a co-benefit is moving towards more active travel to tackle air-quality also has benefits for health from exercise and mental wellbeing and reducing carbon emissions.

The approach encompasses all current and foreseeable emission sources and will reduce or negate entirely the combustion of carbon-based fuels and, in turn, will reduce or negate emissions of NOx/NO2 and particles and other combustion by products.

https://www.nottinghamcity.gov.uk/cn2028

Carbon Neutral Supplementary Planning Document (draft)

In accordance with the Council's agreed Action Plan to achieve Carbon Neutrality by 2028, Planning Policy is currently preparing a supplementary planning document to provide detailed guidance on the range of measures possible to reduce Carbon in new residential and commercial development proposals. It will supplement existing Planning Policies as contained in the Nottingham City Aligned Core Strategy (2014) and the Local Plan Part 2 and highlight the Councils agreed targets.

Taking into consideration the policy context and best practice examples, it is anticipated that this SPD will firstly; provide guidance in relation to energy efficiency, renewable energy and sustainable design and construction and secondly; present a Carbon Neutrality checklist for applicants to demonstrate compliance with the policy approach.

Clear Zone (in development)

Although Nottingham City was not required to introduce a Clean Air Zone it has continued to review practicable options and measures to encourage and facilitate the switch to ultra-low emission vehicles travelling through and operating in the City Centre. This project is still in development with plans to introduce it late 2020. The City Centre Clear Zone will be modified to ensure only the cleanest vehicles will be able to access the city centre by introducing a permit scheme with emissions-based criteria.

Benefits include:

- Encourage the uptake of cleaner vehicles that service the heart of the city centre
- Support the Council's Plan to reduce the level of NO2 in the City and moving towards Carbon Neutral City 2028
- Improve the pedestrian environment, more people wanting to come to the city centre for shopping and leisure
- Reducing illegal trading practices by private hire vehicles; increasing bus punctuality and reducing congestion

- Improve bus journey times and reliability by reducing unnecessary traffic in the City Centre

Go Ultra Low Nottingham programme

Through our Go Ultra Low Nottingham project we are helping to support uptake for electric cars and other low emission vehicles across the city. Our vision is for Nottingham to become an exemplar for low emission vehicles, spanning private cars, vans, buses, taxis and commercial fleets as a core part of our sustainable transport system.

Nottingham has been named one of the UK's first Go Ultra Low Cities. £6.1m funding awarded by the Office for Low Emission Vehicles has introduced a range of innovative projects to support the uptake in Ultra Low Emission Vehicles (ULEVs).

Electric Vehicle Projects - Nottingham's way of improving electric car usage (transportnottingham.com)

Nottingham - Derby Access Fund

A comprehensive package of sustainable travel behaviour change measures to support capital infrastructure investment in Nottingham and Derby building on local good practice.

Objectives:

Improve air quality to support the introduction of Clean Air Zones or similar restricted vehicular access areas.

Embed sustainable and active travel cultures in our businesses and communities

Improve access to work and jobs

https://www.nottinghamshire.gov.uk/media/117257/nottinghamderbyaccessfundbid.pdf

https://www.nottinghaminsight.org.uk/search?q=Nottingham+Derby+Access+fund

Conclusions and Priorities

Air pollution remains a concern to Nottingham City Council, it's citizens and businesses.

2021's monitoring shows an increase in NO2 concentrations and PM10 at all automatic real-time monitoring locations. However, all monitored 'pollutants of concern' remained below the relevant air quality objective for their relevant pollutant.

Priorities to improve air quality

The local (and conurbation wide) priority to improve air quality continues to be how to reduce levels of nitrogen dioxide and identify and implement practicable measures to reduce particle emissions and concentrations in the City area.

The local priorities and challenges to improve air quality in Nottingham and reduce emissions are:

i. Raising local awareness of air pollution and its health impacts and sustained interest and action to reduce emissions and exposure,

ii. Maintain activity to deliver Nottingham City Council's ambition to be Carbon Neutral by 2028, thereby reducing emission of NO2 and particles,

iii. Continue to roll-out/improve energy efficiency in Nottingham City Council's housing stock, as and when funding permits,

iv. Promote energy efficiency and the transition to/installation of alternative technologies that significantly reduce/negate NO2/NOx emissions in the commercial/industrial sector,

v. Go Ultra Low Nottingham – continues to secure funding to promote and support a range of initiatives and projects to facilitate the take-up of Ultra Low Emission Vehicles (ULEV) in Nottingham,

vi. Complete the feasibility study into a low emission/ clear zone for the City Centre and identify/secure funding for implementation,

vii. Encourage all bus operators to implement a retrofit or replacement programme for older polluting buses,

viii. Continue work with Nottingham's taxi companies to introduce low and zero emission vehicles.

ix. Integrate East Midlands Air Quality Network Air Quality and Emission Mitigation guidance as Supplementary Planning Guidance in the Local Plan.

x. Further develop plans and secure funding for extension of Nottingham's Tram network (lines 4 and 5),

xi. Continue to work with major private and public sector employers to review vehicle use to reduce emissions,

xii. Identify opportunities and secure further funding to transition Nottingham City Council commercial vehicle fleet to ULEV,

xiii. Identify and implement practicable local solutions to reduce particle emissions and concentrations.

xiv. Enforce the Road Traffic (Vehicle Emissions) (Fixed Penalty) (England) Regulations 2002, and issue Fixed Penalty Notices to drivers unnecessarily idling a stationary vehicles' engine,

Nottingham City Council's Air Quality Action Plan

The Plan is currently in draft form although many elements of the plan have been implemented or are in the process of being implemented. However, a number of diffusion tubes indicate locations where the nitrogen dioxide annual mean air quality objective of 40 ug/m3 is not being achieved (even when taking into account the uncertainty inherent with the use of Palmes-type NO_2 diffusion tubes). Therefore it is proposed to review the Plan will once DEFRA's ongoing review of the overall LAQM process is completed and any revised air quality objectives have been published (expected late 2022, early 2023).

Local Engagement and How to get Involved

What is the Council doing to reduce emissions?

Nottingham City Council is concerned about air pollution, climate change, and air quality and recognises that these issues are complex and interlinked.

The Council's strategies and action on climate change and public transport have reduced CO_2 emissions and air pollution in the City, but the Council recognises it is necessary to go much further to reduce emissions from the range of sources that generate particles and nitrogen dioxide and impact on health.

Portfolio Holders Air Quality Steering Group

This group comprises Nottingham City Council's Portfolio Holder for Energy and Environment (including Air Quality), Corporate Director of Development, Director of Transport, Director of Public Health, Head of Environmental Health and Safer Housing, and officers from their teams. It develops strategies, policies and implementation plans to deliver improved air quality in Nottingham.

Health and Wellbeing Board

This group comprises Nottingham City Council and a large number of organisations, including Primary Health Care commissioners and providers, Registered Social Landlords, and third sector organisations.

http://www.healthynottingham.co.uk/

In September 2020 the Board approved the revised Nottingham and Nottinghamshire Air Quality Strategy. https://www.nottinghaminsight.org.uk/d/aaJK0SBf

Public health Steering Group (currently suspended)

This group comprises officers from Public Health England, Nottingham City Council and Nottinghamshire County Council Public Health teams, the NHS, Nottingham City Council's Environmental Health service, and a representative of Nottinghamshire's district Environmental Health services.

The group identifies current and emerging public/environmental health issues that require joint and concerted action to resolve, and prepares reports and chapters for the Joint Strategic Needs Assessment, used to inform the Health and Wellbeing Board and its formulation of Strategy.

Nottingham Green Partnership

Nottingham Green Partnership is a wide range of organisations in the public, private and voluntary sectors that are working together to reduce the city's environmental impact. It recognises the environmental issues that affect Nottingham and its citizens, and aims to deliver actions that will reduce our reliance on fossil fuels, increase resilience and improve quality of life.

The partnership celebrated 30 years of co-operation in June 2022.

What can I do to improve air quality?

When burned in air, carbon containing fuels e.g. wood and fossil fuels, emit carbon dioxide, nitrogen oxides (NOx) – nitrogen oxide (NO) and nitrogen dioxide (NO_2), and particles (including PM_{10} and $PM_{2.5}$). Although it does not affect local air quality, carbon dioxide is a greenhouse gas and contributes to climate change. Nitrogen dioxide and particles adversely affect local air quality therefore reducing emissions of these pollutants will improve air quality.

Measures that help to reduce emissions of air pollution and thereby improve air quality:-

Travel choices: walking, cycling, public transport, and journey/travel planning

Walking and cycling, also known as 'active travel', have mental and physical health benefits in addition to reducing air pollution. Follow the links below for more information:

Walking in Nottingham: https://www.nottinghamcity.gov.uk/information-for-residents/transport-parking-and-streets/rights-of-way-walking-and-cycling/walking-in-nottingham/ and http://walkit.com/

Cycling in Nottingham: http://www.transportnottingham.com/cycling/

Nottingham has a high quality public transport network located within the City, including the NET tram network as well as an established bus network.

Nottingham NET: http://www.thetram.net/

Nottingham City Transport: https://www.nctx.co.uk/

Trent Barton: https://www.trentbarton.co.uk/

Stagecoach: https://stagecoachbus.com

Nottingham Car club: https://www.transportnottingham.com/driving/car-club/

A car club is a membership scheme that offers pay-as-you-go basis car rental, At the end of the journey you return your car to its dedicated on-street car club parking space. Nottingham currently has a network for 14 car club vehicles in 11 locations.

Energy efficiency:

We use energy in the form of electricity or natural gas to heat our homes, cook and power electrical equipment. Insulating our homes and using energy efficient appliances reduces energy consumption and emissions, both at power stations and locally from domestic gas boilers and gas cookers.

Visit http://www.energysavingtrust.org.uk/ for ideas on home to save energy and money.

Clean Air Day

On the 16th June 2022 Nottingham, together with other Cities and organisations across the UK, participated in the sixth (National) Clean Air Day. The aim of the day was to raise awareness about air pollution, what people can do, and publicise via social media what people did, to reduce emissions and their exposure to air pollution.

Please visit https://www.cleanairday.org.uk/ for more information.

Although promoted as a single 'Clean Air Day', the event is to highlight the year round issue of air pollution and its effects on health, enable Citizens identify what they can do on Clean Air Day and in the future to reduce personal exposure to air pollution, reduce emissions, and improve air quality.

World Car Free Day

Nottingham City Council continues to promote this world-wide annual event. This year WCFD is on or around Thursday 22nd September 2021 and when confirmed, and if resources allow, Nottingham City Council intends to promote the day.

For more information, comment, or raise your concerns about air pollution and air quality please visit

https://www.nottinghamcity.gov.uk/information-for-business/environmental-health-and-safer-housing/environmental-health-and-safer-places/

Local Responsibilities and Commitment

This ASR was prepared by the Residents Service Department of Nottingham City Council. with the support and agreement of the following officers and departments:

Chris Carter (Head of Transport Strategy, Growth and City Development)

This ASR has been approved by: Cllr Sally Longford,

Portfolio Holder for Energy, Environment and Waste Services

This ASR has not been signed off by a Director of Public Health.

If you have any comments on this Annual Status Report please send them to

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1 Local Air Quality Management

This report provides an overview of air quality in the City of Nottingham during 2021. 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 City of Nottingham 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.

A summary of AQMAs declared by Nottingham City Council for NO_2 can be found in **Error! Reference source not found.**. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=188

Further information detailing declared or revoked AQMAs, including maps of AQMA boundaries are available online at https://uk-air.defra.gov.uk/aqma/maps/

The air quality objectives pertinent to the current AQMA designation are as follows:

- NO_2 annual mean; 40 *u*g/m^3

Figure 2 – Nottingham City Council AQMA No. 2.

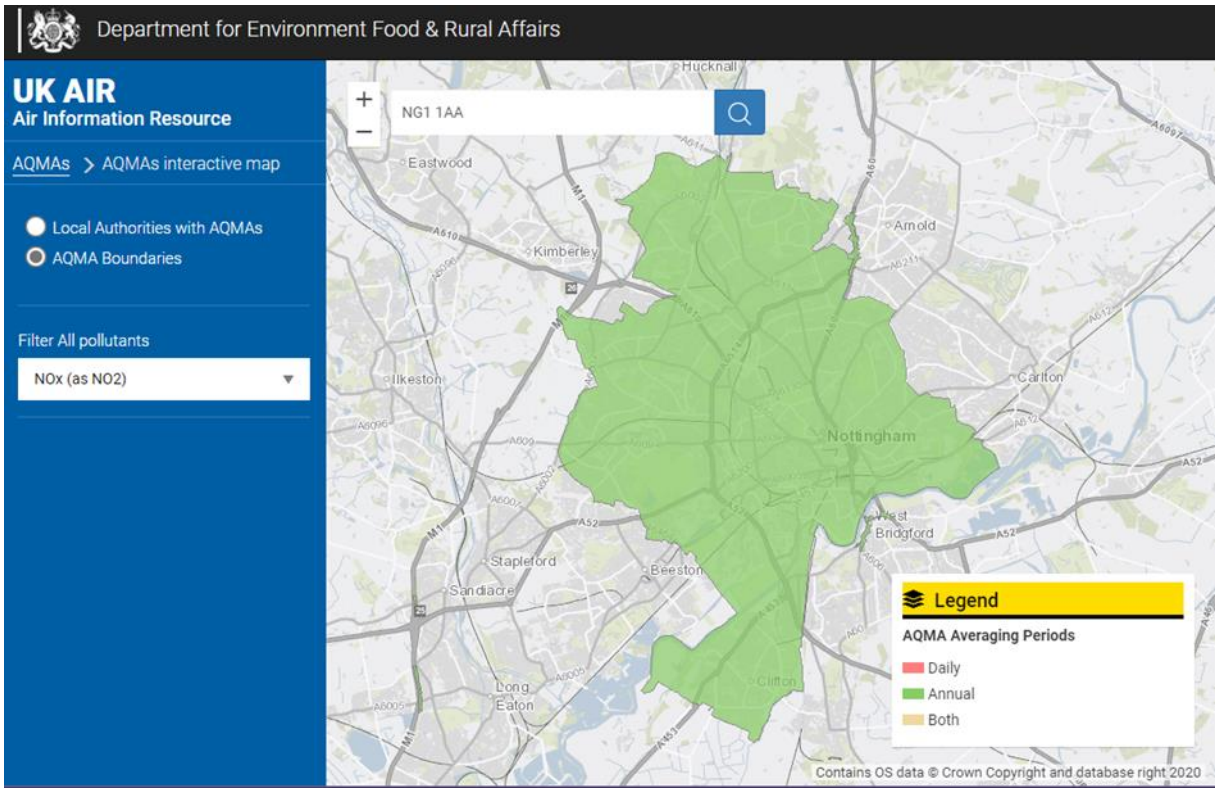


Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance: Declaration	Level of Exceedance: Current Year	Name and Date of AQAP Publication	Web Link to AQAP
AQMA No.2	Declared 2002, Amended 2010 and 2019	NO2 Annual Mean (40 ug/m3)	The AQMA covers the entire administrative area of Nottingham City Council.	NO	41µg/m^3 (St Andrew's Road)	36 µg/m^3	LTP Implementation Plans 2010, 2015-18, 2016-19, 2017-20, 2018-21 and 2019-22 Nottingham City AQAP 2018 draft	http://aqma.defra.gov.uk/action-plans/NottCC%20AQAP%202010.pdf https://www.nottinghaminsight.org.uk/Document-Library/Document-Library/aBFyzqe and https://www.nottinghaminsight.org.uk/search?q=transport+plan and https://www.nottinghaminsight.org.uk/search?q=air+quality+action+plan
AQMA No.2	As above	NO2 Annual Mean (40 ug/m3)	As above	No	44 µg/m^3 (Carter Gate)	29 µg/m^3	As above	As above
AQMA No.2	Declared 2002, Amended 2010 and 2019	NO2 Annual Mean (40 ug/m3)	As above	No	42 µg/m^3 (Lace Street)	25 µg/m^3	As above	As above

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance: Declaration	Level of Exceedance: Current Year	Name and Date of AQAP Publication	Web Link to AQAP
AQMA No.2	As above	NO2 Annual Mean (40 ug/m3)	As above	No	33 µg/m^3 (AURN Clinton Street East)	21 µg/m^3	As above	As above
AQMA No.2	As above	NO2 Annual Mean (40 ug/m3)	As above	No	42µg/m^3 (AURN Western Boulevard)	27 µg/m^3	As above	As above

☒ **Nottingham City Council confirm the information on UK-Air regarding their AQMA(s) is up to date.**

☒ **Nottingham City Council confirm that all current AQAPs have been submitted to Defra.**

2.2 Progress and Impact of Measures to address Air Quality in Nottingham City Council

Defra's appraisal of last year's ASR may be downloaded and viewed via:

https://www.nottinghaminsight.org.uk/f/aAXJ0MT and searching for 'Nottingham City Council Annual Status Report Appraisal July 2021'

In summary it concluded 'On the basis of the evidence provided by the local authority the conclusions reached are acceptable for all sources and pollutants.'

Specific issues raised in the appraisal have been addressed where resources have allowed or where the issue was of material significance to the findings of the report and its influence on existing action or those proposed in the Air Quality Action Plan.

Although Nottingham City Council has taken forward a number of direct measures during the current reporting year of 2021 in pursuit of improving local air quality it has not been possible to update Table 2.2. with 2021 information.

More detail on these measures can be found in their respective Action Plans:-

https://www.nottinghaminsight.org.uk/search?q=transport

https://www.nottinghaminsight.org.uk/f/aAXNRad

The Nottingham Local Transport Plan now encompasses 2011 to 2026:

https://www.nottinghaminsight.org.uk/d/aapQXtBh

Local Transport Plan Implementation Plan 2019-2022

https://www.nottinghaminsight.org.uk/d/aYivUAT

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, Nottingham City Council anticipates that further additional measures not yet identified or prescribed will be required in subsequent years to achieve compliance and enable the revocation of Nottingham City AQMA No. 2.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	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
NCC021	Nottingham City Electric Scooter rental trial	Alternatives to private vehicle use	Other Alternative transport mode low congestion	2020	2024	Nottingham City Council, WIND scooters	DfT				https://www.transportnottingham.com/projects/escooters/			Trials ongoing	Misuse, pavement clutter affecting sight impaired.
NCC024	Nottingham City Centre Clear Zone	Promoting Low Emission Transport	Low Emission Zone (LEZ)			Nottingham City Council	DfT				Linked to securing Moving Traffic Offence powers			Feasibility studies being conducted	
NCC025	Broadmarsh Car park dedicated EV charging spaces/floor	Promoting Low Emission Transport	Priority parking for LEVs	2020	2021	Nottingham City Council	DfT				85 new EV charging sockets installed in new car park			Facility installed	
NCC026	Fleet Strategy	Promoting Low Emission Transport	Public Vehicle Procurement -Prioritising uptake of low emission vehicles	2018		Led by Nottingham City Council	NCC, DEFRA				https://www.nottinghamevservices.co.uk/fleet/			Ongoing	
NCC016	Electric Van Experience	Promoting Low Emission Transport	Other Increase the number of businesses using Electric vehicles	2020	2023	Nottingham City Council, local businesses	Highways England				www.transportnottingham.com/projects/workplace-travel-service-electric-van-experience/			Project underway	
NCC001	DEFRA Air Quality funding	Promoting Low Emission Transport	Other		2020/2021	Led by Nottingham City Council. Joint Air Quality Unit /	DEFRA						Project specific outputs	Initial works underway	-
NCC027	NCC Active travel Fund Measures	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	2020	2024		DEFRA DfT				https://www.transportnottingham.com/projects/emergency-active-travel-fund-covid-19-measures/			ongoing	
NCC09a	Smarter Travel Hubs / Continuity Fund	Promoting Travel Alternatives	Personalised Travel Planning	2021	2022	Nottingham City Council. DfT grant funding (Capability Fund)									
NCC028a	Transport Interchange and Integration BUS2	Promoting Travel Alternatives	Promote use of rail and inland waterways	2018	2023	Led by Nottingham City Council	Midlands Connect, Developer contributions/ partnership working, Local Growth Fund,								

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	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
							Transforming Cities Fund/Other								
NCC09b	Smarter Travel Hubs / Continuity Fund	Promoting Travel Alternatives	Promotion of cycling	2021	2022	Nottingham City Council.	DfT grant funding (Capability Fund)								
NCC09c	Smarter Travel Hubs / Continuity Fund	Promoting Travel Alternatives	Promotion of walking	2021	2022	Nottingham City Council.	DfT grant funding (Capability Fund)								
NCC09d	Smarter Travel Hubs / Continuity Fund	Promoting Travel Alternatives	School Travel Plans	2021	2022	Nottingham City Council.	DfT grant funding (Capability Fund)								
NCC09e	Smarter Travel Hubs / Continuity Fund	Promoting Travel Alternatives	Workplace Travel Planning	2021	2022	Nottingham City Council.	DfT grant funding (Capability Fund)								
NCC013	DfT Active Travel Measures	Promoting Travel Alternatives	Other Monitoring Cameras, Cycle Lanes, School Street Closures and Pop up Cycle Parking	2020	2021	NCC, DfT	DfT				Increase in Active travel			Project underway	
NCC029	Aq data sharing	Public Information	Via the Internet	2018		NCC, AQMS	None				AQ information available on websites				
NCC030	Air Quality news	Public Information	Other	2018		NCC	None				Regular AQ updates and alerts on EH Twitter feed.				
NCC031	Anti-idling signs and campaigns	Traffic Management	Anti-idling enforcement	2019		NCC	None				Signage to discourage idling in identified problem areas				
NCC032	NCC Active Travel Fund Measures	Traffic Management	Reduction of speed limits, 20mph zones		2023	NCC	DfT				Service user survey completed https://www.transportnottingham.com/projects/emergency-active-travel-fund-covid-19-measures/				
NCC007	Southside Transport Strategy (Broadmarsh)	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	2014/15 - 2015/16	2016 - 2023	NCC	Nottingham City Council. Funding from Local Growth Fund, LTP and prudential borrowing							In progress 2021-22.	Large-scale regeneration project. High number of dependencies for the works

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	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
NCC004	Midland Mainline Enhancements	Transport Planning and Infrastructure	Public transport improvements- interchanges stations and services	2016-17	2016-2023	Network Rail								Awaiting introduction of new rolling stock	Electrification cancelled. Uncertainty relating to enhancements on Midland Mainline. New rolling stock may contribute to improving air quality.
NCC012	CAZ additional measures	Transport Planning and Infrastructure	Other Bus retrofit project	2018	October 2021	Nottingham City Transport	DEFRA					1-6 ug/m3 City wide effect. Most pronounced in City Centre due to concentration of routes.		NCT Retrofit Project now complete, council now working other operators	NCT Retrofit now complete, Council now working with other operators to ensure their fleets meet the highest emission standards.
NCC014	Future Transport Zones	Transport and Planning Infrastructure	Other Mobility as a service Mobility hubs better use of data and electric vehicles	2020	2023		DfT							Project underway	Increase active travel and public transport use
NCC015	Transforming Cities Fund	Transport and Planning Infrastructure	Other Active Travel and Bus Priority Measures	2020	2023		DfT							Project underway	Increase active travel and public transport use
-	ECOstars	Vehicle Fleet Efficiency	Driver training and ECO driving aids	-	-	Gedling Borough Council on behalf of Nottinghamshire Local Authorities-	-	-	-	-	https://www.ecostars-uk.com/about-eco-stars/eco-stars-for-buses-vans-freight/public-sector/	Reduction in emission from improved driver behaviour in conurbation	-	Operational	Ecostars
-	ECoStars	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	-		Gedling Borough Council on behalf of Nottinghamshire Local Authorities-					https://www.ecostars-uk.com/about-eco-stars/eco-stars-for-buses-vans-freight/public-sector/	Reduction in emission from improved driver behaviour in conurbation		Operational	Ecostars
NCC026	NCC CAZ additional measures	Vehicle Fleet Efficiency	Promoting Low Emission												

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	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
			Public Transport												
NCC027		Vehicle Fleet Efficiency	Testing Vehicle Emissions												

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.

Nottingham City Council is implementing and considering the following measures to address PM2.5:

Existing measures are focused on:-

i. reducing emissions from transport by constraining traffic growth and encouraging/facilitating walking, cycling and use of public transport and

ii. on-going regulatory activity re Permitted Processes, ensuring compliance with the City's existing Smoke Control Orders, discouraging bonfires and uncontrolled burning, and ensuring construction/demolition activity implement dust minimisation measures.

Additional measures being considered include:-

i. Reducing emissions from non-vehicle fixed and mobile sources and

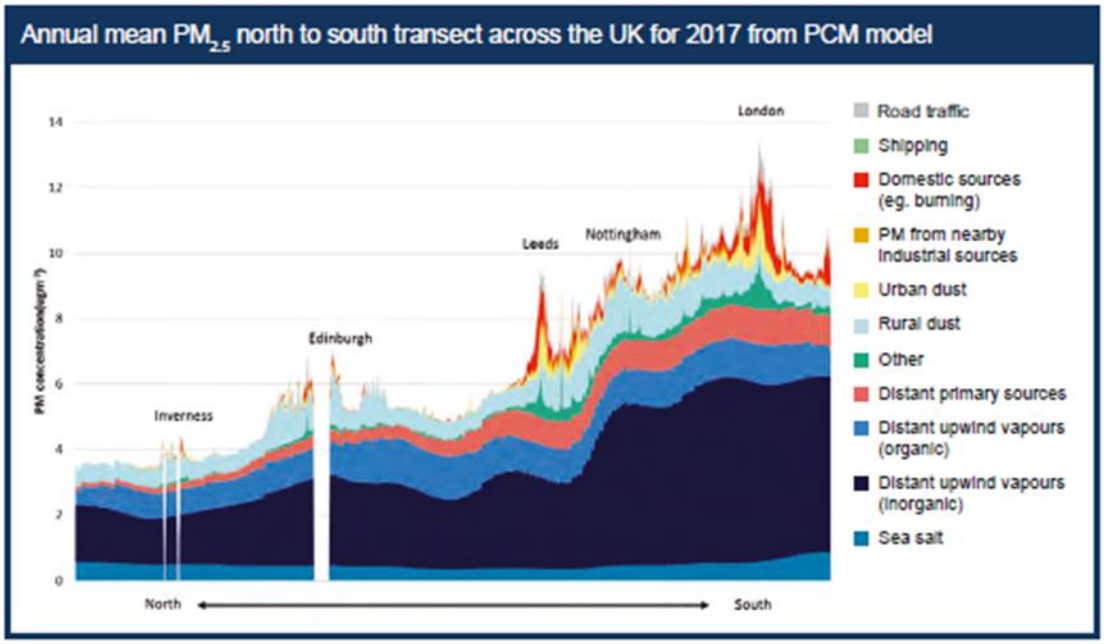
ii. Planting to reduce weathering/entrainment of soil/surface particles and increasing green surface area for adsorption/impingement/entrapment of particles by foliage.

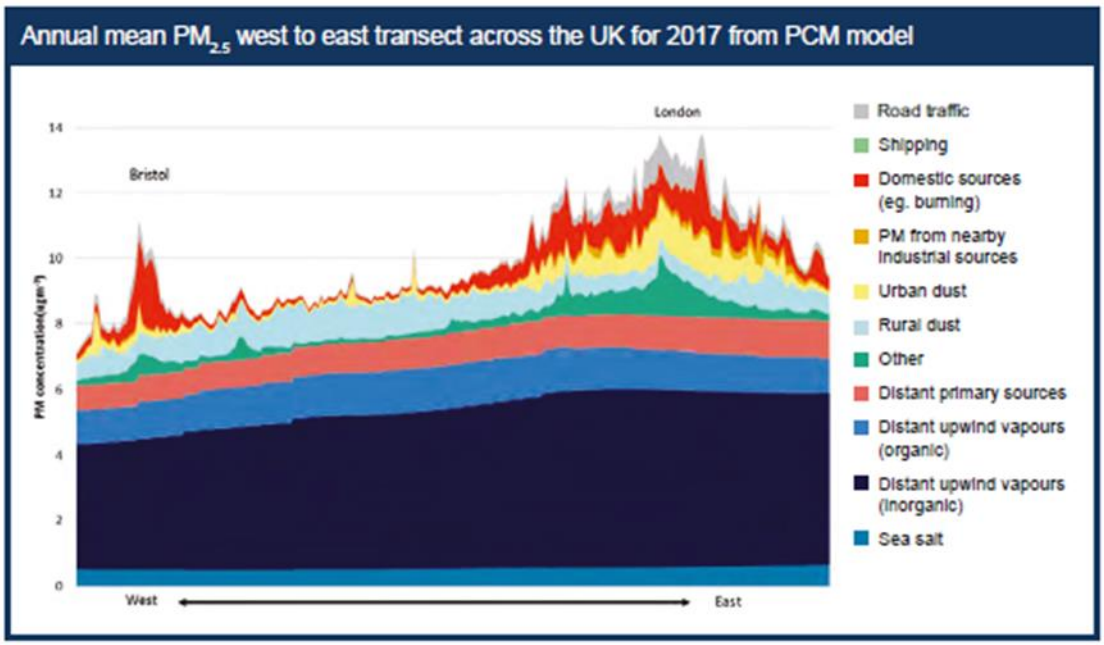
It should be noted that the UK Governments Air Quality Strategy (May 2019) details PM2.5 source contribution to annual mean concentrations across the UK, highlighting a number of cities that fall on the chosen transect line, including Nottingham. (Fig 4).

The PCM model indicates that as much as 80% of Nottingham's PM2.5 levels come from distant primary sources and distant upwind vapours e.g. industrial, commercial and agricultural sources outside the City's boundary and therefore any action by Nottingham City Council will only have a small impact on PM2.5 levels.

Figure 4: $PM_{2.5}$ distribution and source apportionment from Clean Air Strategy May 2019.

These images show how particulate matter from across the country can build up in the atmosphere as 'background pollution' and the role that this can play in combination with local sources in areas with a pollution challenge.







29

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

This section sets out the monitoring undertaken within 2021 by Nottingham City Council and how it compares with the relevant air quality objectives. In addition, monitoring results are presented for a five-year period between 2017 and 2021 to allow monitoring trends to be identified and discussed.

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

Nottingham City Council undertook automatic (continuous) monitoring at three sites during 2021.

Table A.1 in Appendix A shows the details of the sites. National monitoring results are available at https://uk-air.defra.gov.uk/data/data_selector

The https://nottinghamaqm.net/ page presents automatic monitoring results for Nottingham City Council, with automatic monitoring results also available through the UK-Air website https://uk-air.defra.gov.uk/interactive-map?network=nondefraaqmon

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

Nottingham City Council undertook non- automatic (i.e. passive) monitoring of NO_2 at 38 sites during 2021. 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 2021 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.

2020's monitoring generally shows a larger reduction in the number of diffusion tube monitoring sites exceeding the annual mean air quality objective (when applying the local bias adjustment factor) down to 4 (from 18 in 2019), and a reduction in monitored NO2 concentrations at the 3 real time analyser sites. All RTA sites remained below the NO2 annual mean air quality objective of 40 ug/m3.

No changes are proposed to the diffusion tube network for 2022.

3.2.2 Particulate Matter (PM_{10})

Table A.6 in Appendix A: Monitoring Results compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past five years with the air quality objective of 40µg/m^3.

Table A.7 in Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations for the past five years with the air quality objective of 50µg/m^3, not to be exceeded more than 35 times per year.

No exceedances of the Air Quality Objectives were recorded at either of the two AURN sites.

3.2.3 Particulate Matter ($PM_{2.5}$)

Table A.8 in Appendix A presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for the past five years.

Computer dispersion modelling undertaken for DEFRA apportions approximately 80% of PM2.5 pollution to sources outside Nottingham City.

3.2.4 Sulphur Dioxide (SO_2)

Table A.9 in Appendix A compares the ratified continuous monitored SO_2 concentrations for 2021 with the air quality objectives for SO_2.

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)
CG NOx	Carter Gate	Roadside	457945	339667	NO2 NO NOx	Y	Chemiluminescent	12	4	2.5
LS NOx	Lace Street	Roadside	454940	338314	NO2 NO NOx	Y	Chemiluminescent	3	9	1.5
SA NOx	St. Andrews Road	Roadside	456967	341382	NO2 NO NOx	Y	Chemiluminescent	12	13	1.7
CC AURN	Clinton St East.	Urban background	457437	340049	PM2.5,PM10 NO2, NO, NOx O3 SO2	N	FDMS, FDMS Chemiluminescent Ultra Violet Absorption (UVA) Ultra Violet Fluorescence (UVF)	N/A	35	3
WB AURN	Western Boulevard	Kerbside	454573	341643	PM10 NO2	NO	FDMS Chemiluminescent	15	1	2.5

Notes:

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

(2) N/A if not applicable

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)
2	564 Derby Road	Roadside	454520	338931	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	0.0	23.0	No	2.5
4	121 Beeston Rd	Roadside	454784	338146	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	0.0	10.0	No	2.5
5	87 Abbey Street	Roadside	455146	338511	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	0.0	5.0	No	2.5
6	4 Western Blvd	Roadside	454466	340111	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	0.0	17.0	No	2.5
12	Alfreton Road LP (Bentinck Rd - Sch)	Roadside	455774	340812	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	0.0	6.0	No	2.5
13	238 Ilkeston Road	Roadside	455439	340131	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	0.0	3.0	No	2.5
14	Ilkeston Road LP	Kerbside	455622	340142	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	0.0	4.0	No	2.5
16	1-6 Castle Gardens	Roadside	455870	339133	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	0.0	3.0	No	2.5

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)
17	215 Castle Boulevard	Roadside	455955	339129	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	0.0	5.0	No	2.5
19	87 Castle Blvd	Roadside	456853	339303	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	0.0	4.0	No	2.5
21	Salutation Inn Maid Marian Way	Roadside	457083	339637	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	0.0	3.0	No	2.5
24, 25, 26	St Andrew's Rd T	Roadside	456967	341382	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	12.0	16.0	Yes	1.5
27	21 Cartergate	Roadside	457963	339681	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	0.0	8.0	No	2.5
28	Riverbank PH Trent Bridge	Roadside	458060	338276	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	0.0	2.0	No	2.5
30	LP 53890 Manvers Street	Roadside	458079	339887	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	0.0	3.0	No	2.5
31	134 Middleton Boulevard	Roadside	454367	339946	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	0.0	17.0	No	2.5
33	Lace Street NOx RTA	Roadside	454941	338314	NO2	AQMA No.2 (Nottingham	0.0	9.0	Yes	1.5

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)
						City Council) 09/01/2019				
35	Lampost 70 Wollaton Road	Roadside	454587	340088	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	10.0	3.0	No	2.5
40	Lampost Middleton Boulevard/Crown Island	Roadside	454321	339931	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	15.0	5.0	No	2.5
43	328 Derby Road	Roadside	455453	339595	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	6.0	3.0	No	2.5
44	Parking Post Cliff Road	Roadside	457775	339530	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	4.0	17.0	No	2.5
46	Hicking Building Queens Road	Roadside	457781	339123	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	0.0	3.0	No	2.5
47	Carrington Road/Railway Station (Sheriffs Way)	Roadside	457406	339153	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	23.0	1.0	No	2.5
49	2 Castle Boulevard	Roadside	457150	339384	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	0.0	4.0	No	2.5
50	A52 Clifton Boulevard	Roadside	455713	337838	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	0.0	3.0	No	2.5

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)
51	Trent Street	Roadside	457528	339339	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	0.0	2.0	No	2.5
52	Lamppost Crown Public House	Roadside	454386	340087	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	0.0	3.0	No	2.5
53	3 Bayard Court	Roadside	454243	340057	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	0.0	3.0	No	2.5
55	40 Horwood Drive	Roadside	456441	336131	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	4.0	2.0	No	2.5
56	Mountford House Nursery (Lampost outside)	Kerbside	457064	342128	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	10.0	1.0	No	2.5
57	Stepping Stones Retirement Park	Roadside	456265	336414	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	0.0	35.0	No	2.5
10, 58, 59	565 Valley Road	Roadside	455528	342828	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	0.0	7.0	No	2.5
20, 60, 61	13 Canning Terrace	Roadside	456399	340191	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	0.0	5.0	No	2.5
22, 62, 63	Alfreton Road LP 80A01 in front of Beyts Takeaway	Roadside	456156	340383	NO2	AQMA No.2 (Nottingham	0.0	3.0	No	2.5

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)
						City Council) 09/01/2019				
29, 64, 65	346 Meadow Lane	Roadside	458459	339011	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	0.0	3.0	No	2.5
54, 66, 67	Trafford gardens play area	Roadside	454493	341505	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	0.0	3.0	No	2.5
68	Clifton Lane KL409	Roadside	455538	335731	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	0.0	4.0	No	2.5
69	Sturgeon Avenue 14S309	Roadside	455529	335701	NO2	AQMA No.2 (Nottingham City Council) 09/01/2019	5.0	10.0	No	2.5

Notes:

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

(2) N/A if not applicable.

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 2021 (%) (2)	**2017**	**2018**	**2019**	**2020**	**2021**
CG NOx	457945	339667	Roadside		88	**41**	35	35	23	29
LS NOx	454940	338314	Roadside		96	33	32	31	23	25
SA NOx	456967	341382	Roadside		97	**41**	34	**40**	34	36
AURN CC	457437	340049	Urban Background		95	30	28	28	19	21
AURN WB	454573	341643	Roadside		99	36	34	33	25	27

☒ **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 2021 (%) (2)	**2017**	**2018**	**2019**	**2020**	**2021**
2	454520	338931	Roadside		100.0	31.6	26.7	29.5	27.2	25.9
4	454784	338146	Roadside		100.0	35.5	32.4	35.0	28.2	29.6
5	455146	338511	Roadside		100.0	35.6	30.1	31.5	32.9	33.2
6	454466	340111	Roadside		100.0	35.7	29.1	33.1	30.3	29.8
12	455774	340812	Roadside		90.4	**40.2**	32.7	34.9	37.9	31.9
13	455439	340131	Roadside		65.4	34.6	33.2	35.4	35.7	37.1
14	455622	340142	Kerbside		100.0	**49.8**	**45.9**	**46.4**	**43.0**	**43.9**
16	455870	339133	Roadside		100.0	**41.4**	36.3	**40.3**	34.9	33.7
17	455955	339129	Roadside		100.0	38.4	37.7	38.5	37.2	32.9
19	456853	339303	Roadside		100.0	34.3	32.0	33.2	28.2	25.4
21	457083	339637	Roadside		92.3	**46.4**	**42.9**	**43.5**	29.6	38.5
24, 25, 26	456967	341382	Roadside		100.0	**41.1**	35.5	38.0	35.2	35.5
27	457963	339681	Roadside		100.0	**47.5**	**40.0**	**42.3**	36.8	35.5

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 2021 (%) (2)	**2017**	**2018**	**2019**	**2020**	**2021**
28	458060	338276	Roadside		100.0	**40.6**	35.5	35.8	31.8	32.2
30	458079	339887	Roadside		100.0	**45.7**	**43.5**	**42.3**	**40.7**	**41.4**
31	454367	339946	Roadside		100.0	36.6	27.4	29.5	27.2	27.7
33	454941	338314	Roadside		100.0	37.8	33.7	36.3	32.3	31.6
35	454587	340088	Roadside		100.0	**42.2**	**42.2**	39.8	35.2	36.3
40	454321	339931	Roadside		100.0	35.7	36.9	35.8	29.3	32.1
43	455453	339595	Roadside		100.0	35.2	28.3	28.9	27.1	30.4
44	457775	339530	Roadside		100.0	**41.1**	38.6	39.5	32.6	30.2
46	457781	339123	Roadside		90.4	**52.7**	**48.3**	**52.9**	**47.8**	**58.5**
47	457406	339153	Roadside		100.0	**47.4**	38.9	**48.9**	39.3	**42.6**
49	457150	339384	Roadside		92.3	**52.7**	**45.9**	38.0	37.7	39.2
50	455713	337838	Roadside		100.0	**59.0**	**50.9**	**54.9**	**42.1**	**46.8**
51	457528	339339	Roadside		90.4	**49.1**	37.6	37.0	30.9	29.3
52	454386	340087	Roadside		100.0			**40.8**	34.5	37.7

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 2021 (%) [2]	**2017**	**2018**	**2019**	**2020**	**2021**
53	454243	340057	Roadside		92.3			34.3	27.2	26.1
55	456441	336131	Roadside		100.0			31.3	22.6	27.8
56	457064	342128	Kerbside		92.3			**52.3**	**41.4**	**45.1**
57	456265	336414	Roadside		100.0			27.5	22.7	24.6
10, 58, 59	455528	342828	Roadside		100.0	**41.2**	39.4	**40.1**	38.2	**41.8**
20, 60, 61	456399	340191	Roadside		100.0	**48.8**	**49.6**	**49.0**	39.6	**43.1**
22, 62, 63	456156	340383	Roadside		100.0	**47.8**	**43.7**	**40.5**	31.3	33.5
29, 64, 65	458459	339011	Roadside		100.0	**46.1**	**44.6**	**45.2**	**41.9**	**46.4**
54, 66, 67	454493	341505	Roadside		100.0			**42.7**	36.1	37.1
68	455538	335731	Roadside		100.0				33.7	35.8
69	455529	335701	Roadside		90.4				29.4	31.0

☒ **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

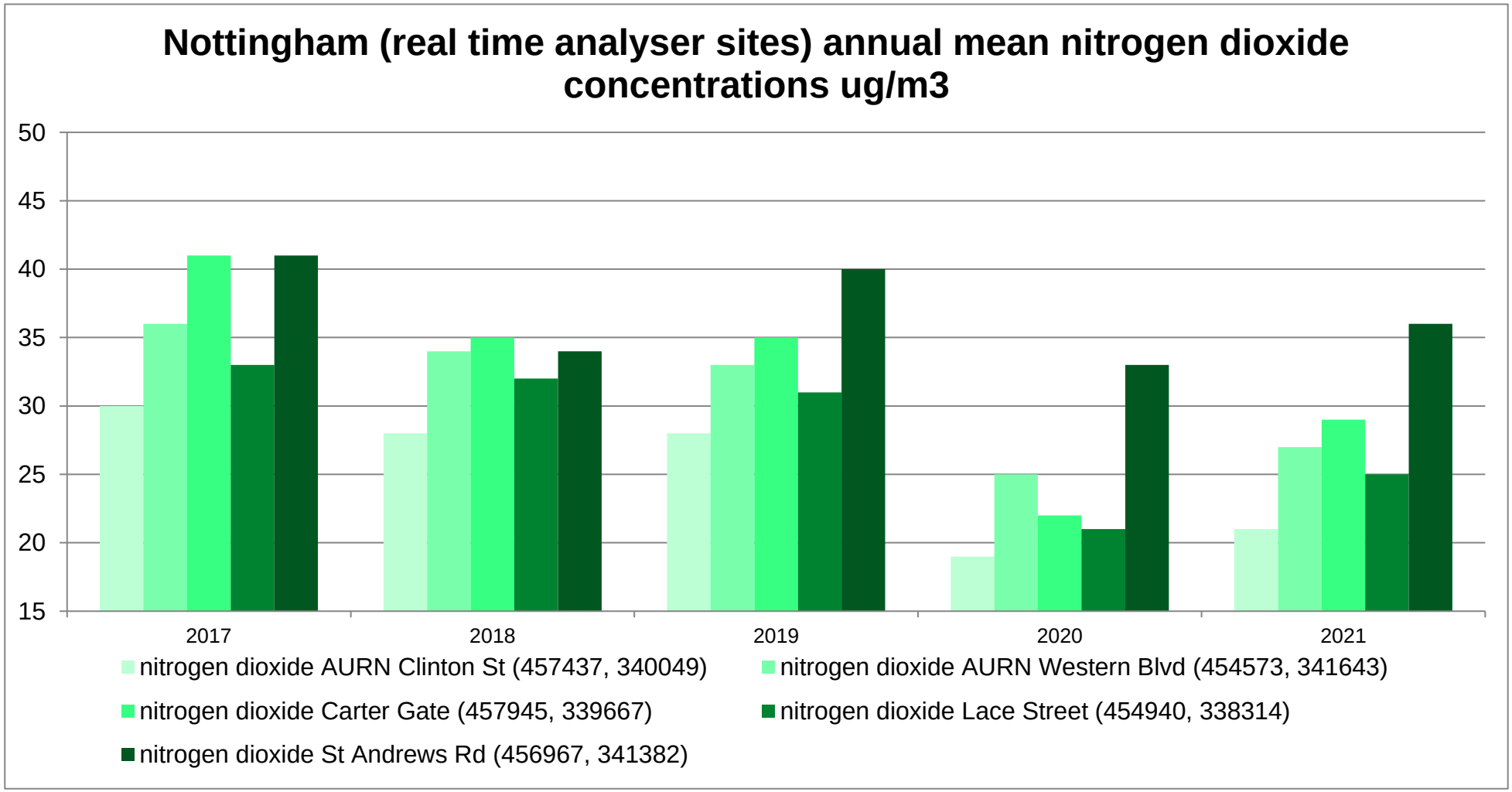


Table A.5 – 1-Hour Mean NO_2 Monitoring Results, Number of 1-Hour Means > 200µg/m^3

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	**2017**	**2018**	**2019**	**2020**	**2021**
CG NOx	457945	339667	Roadside		88	0	0	0	0	0
LS NOx	454940	338314	Roadside		96	0	0	0	0	0
SA NOx	456967	341382	Roadside		97	2	0	0	0	0
AURN CC	457437	340049	Urban Background		95	0	0	0	0	0
AURN WB	454573	341643	Roadside		99	0	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 – Annual Mean PM_{10} Monitoring Results ($\mu g/m^3$)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	**2017**	**2018**	**2019**	**2020**	**2021**
CC AURN	457437	340049	Urban Background		99	18	16	18	15	14
WB AURN	454573	341643	Roadside		97	18	18	20	16	16

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

Notes:

The annual mean concentrations are presented as $\mu g/m^3$.

Exceedances of the PM_{10} annual mean objective of $40\mu g/m^3$ 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.

(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.2 – Trends in Annual Mean PM_{10} Concentrations

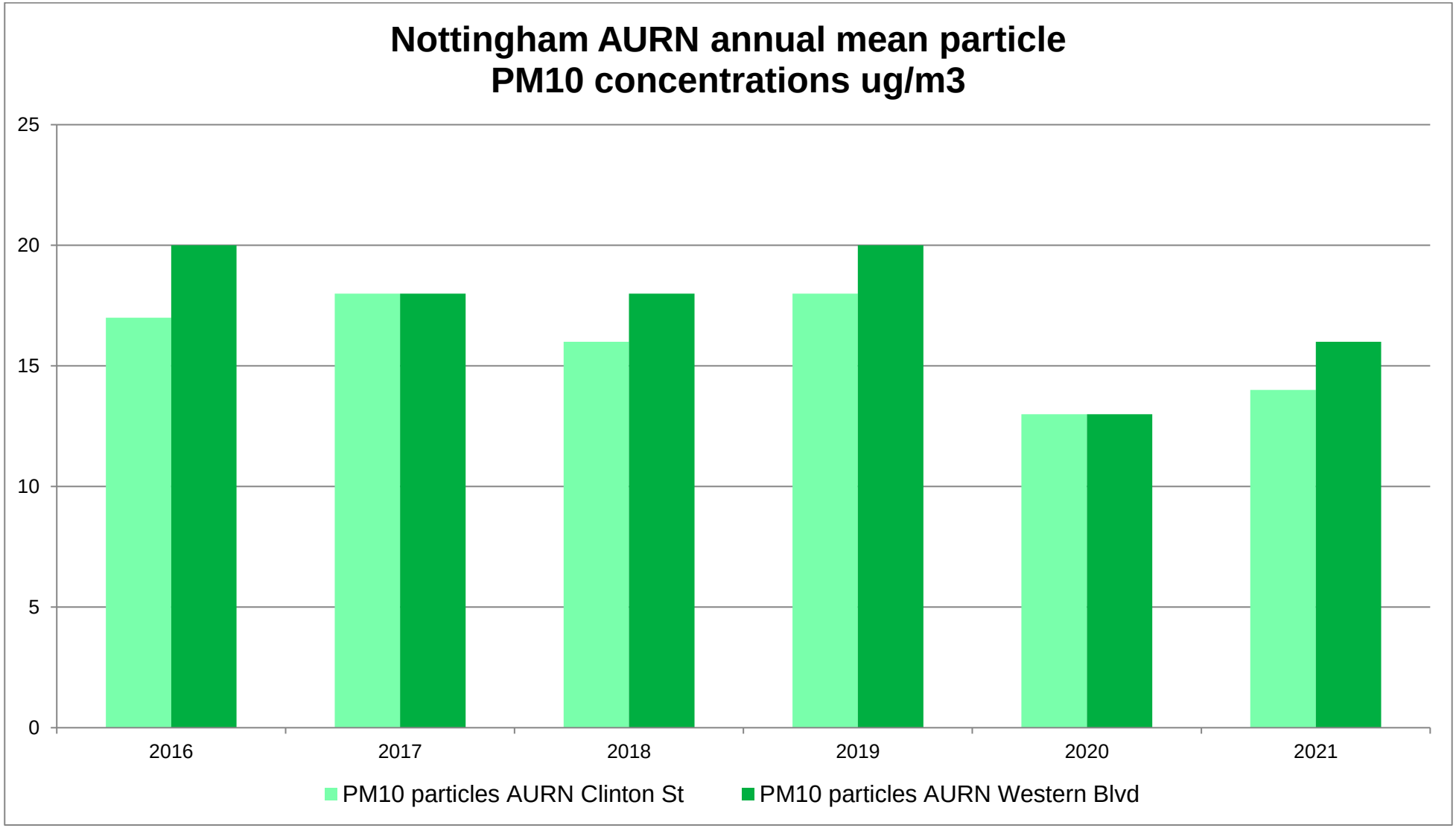


Table A.7 – 24-Hour Mean PM_{10} Monitoring Results, Number of PM_{10} 24-Hour Means > 50µg/m^3

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	**2017**	**2018**	**2019**	**2020**	**2021**
CC AURN	457437	340049	Urban Background		99	5	2	9	0	1
WB AURN	454573	341643	Roadside		97	8	2	12	3	1

Notes:

Results are presented as the number of 24-hour periods where daily mean concentrations greater than 50µg/m^3 have been recorded.

Exceedances of the PM_{10} 24-hour mean objective (50µg/m^3 not to be exceeded more than 35 times/year) are shown in **bold**.

If the period of valid data is less than 85%, the 90.4th percentile of 24-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.8 – Annual Mean $PM_{2.5}$ Monitoring Results (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 2021 (%) (2)	**2017**	**2018**	**2019**	**2020**	**2021**
CC AURN	457437	340049	Urban Background		99	12	10	11	9	8

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

Notes:

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

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.

(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.3 – Trends in Annual Mean $PM_{2.5}$ Concentrations

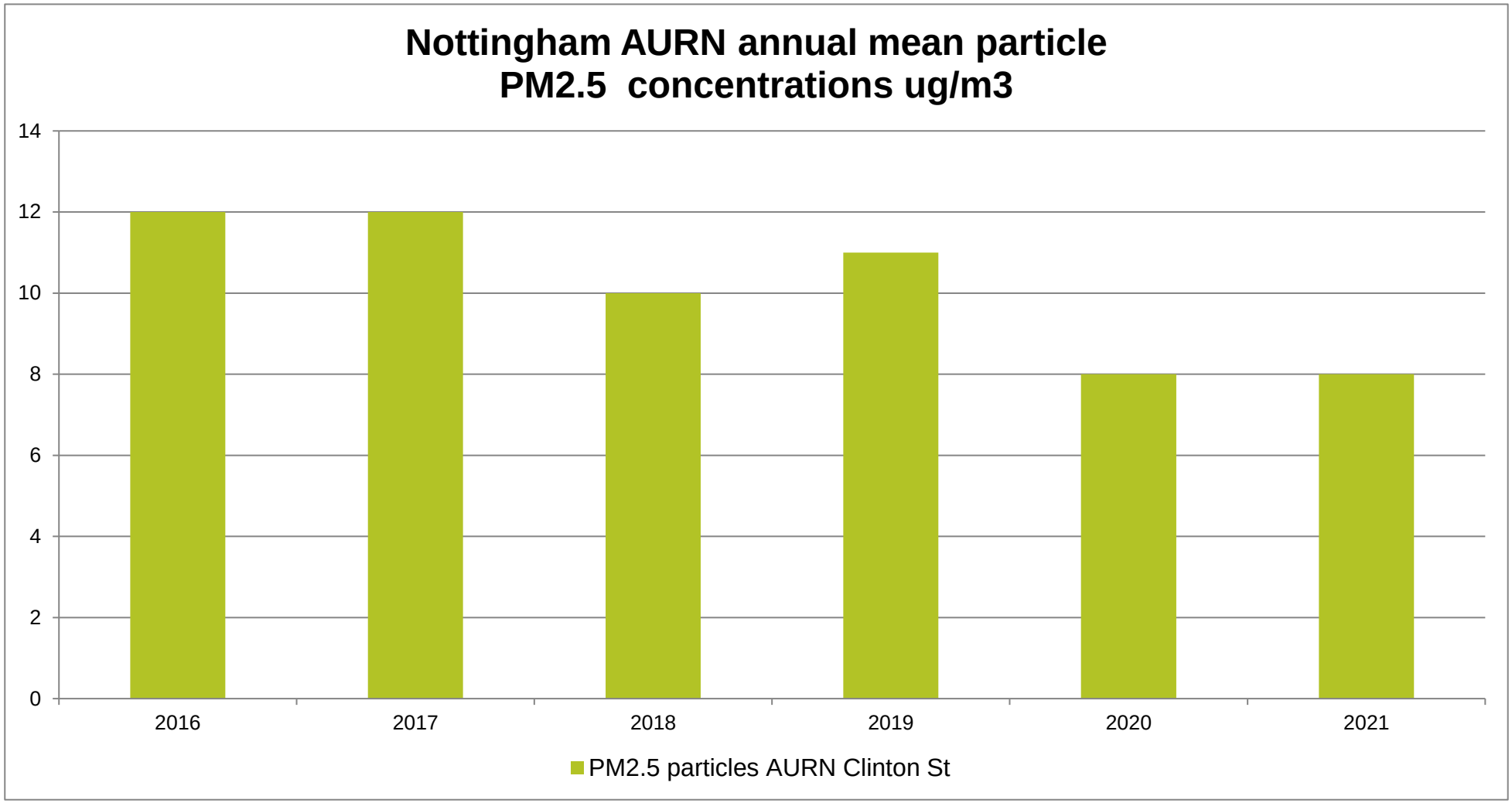


Table A.9 – SO_2 2021 Monitoring Results, Number of Relevant Instances

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	**Number of 15-minute Means > 266µg/m^3**	**Number of 1-hour Means > 350µg/m^3**	**Number of 24-hour Means > 125µg/m^3**
CC AURN	457437	340049	Urban Background		82	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 2021

Table B.1 – NO_2 2021 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 (1.11)**	**Annual Mean: Distance Corrected to Nearest Exposure**	Comment
2	454520	338931	34.6	12.6	26.8	19.6	21.6	18.4	18.5	17.9	25.1	29.1	28.1	27.2	23.3	25.9	-	
4	454784	338146	36.2	31.3	26.4	24.7	22.0	25.1	20.7	19.1	27.6	25.5	32.5	28.4	26.6	29.6	-	
5	455146	338511	40.0	24.0	32.2	27.3	26.7	25.1	24.9	22.6	32.6	33.6	36.6	33.6	29.9	33.2	-	
6	454466	340111	36.9	11.2	29.3	23.5	23.7	22.5	22.3	21.7	28.9	33.8	37.1	31.0	26.8	29.8	-	
10	455528	342828	46.7	28.8	39.3	40.1	41.0	35.0	33.6	33.0	39.1		40.5	38.2	-	**-**	-	Triplicate Site with 10, 58 and 59 - Annual data provided for 59 only
12	455774	340812	35.7	14.1	31.2	26.2	27.5	26.2	26.5	24.9	32.8		40.2	31.0	28.8	31.9	-	
13	455439	340131	47.6	33.9	39.2					32.0	41.0	29.1	32.2	31.8	35.8	37.1	-	
14	455622	340142	47.4	24.7	39.3	41.2	36.1	37.5	39.7	33.0	45.9	39.3	46.2	43.4	39.5	**43.9**	-	
16	455870	339133	38.4	18.4	34.7	24.4	33.2	24.6	27.3	25.7	34.9	34.3	38.7	29.5	30.3	33.7	-	
17	455955	339129	37.6	18.4	36.3	27.7	31.8	24.6	25.7	22.3	31.2	29.0	37.4	33.8	29.6	32.9	-	
19	456853	339303	32.8	18.3	24.7	22.1	20.8	18.0	17.8	16.7	23.8	21.9	29.6	27.3	22.8	25.4	-	
20	456399	340191	43.9	21.6	38.8	38.3	41.0	41.0	39.7	32.9	45.5	39.9	46.2	39.4	-	**-**	-	Triplicate Site with 20, 60 and 61 - Annual data provided for 61 only
21	457083	339637	38.5	20.0	34.3	31.6	34.4		49.6	28.6	38.0	33.1	38.9	34.2	34.6	38.5	-	
22	456156	340383	39.0	18.0	31.1	29.2	29.0	31.5	29.4	29.0	34.3	27.6	38.4	31.3	-	**-**	-	Triplicate Site with 22, 62 and 63 - Annual data provided for 63 only
24	456967	341382	41.9	19.2	37.2	24.0	31.0	27.3	25.7	28.3	34.5	42.2	45.8	34.1	-	**-**	-	Triplicate Site with 24, 25 and 26 - Annual data provided for 26 only
25	456967	341382	39.6	19.3	36.0	25.3	33.1	25.9	26.9	27.5	32.6	40.3	34.4	34.2	-	**-**	-	Triplicate Site with 24, 25 and 26 - Annual data provided for 26 only
26	456967	341382	39.8	15.7	37.7	23.8	33.9	27.8	25.8	29.1	32.6	38.6	43.2	35.7	31.9	35.5	-	Triplicate Site with 24, 25 and 26 - Annual data provided for 26 only
27	457963	339681	39.5	23.0	30.9	30.6	30.5	28.6	26.9	28.6	34.1	35.8	40.9	34.2	32.0	35.5	-	

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 (1.11)**	**Annual Mean: Distance Corrected to Nearest Exposure**	Comment
28	458060	338276	36.3	21.5	27.2	27.3	26.3	24.9	26.4	24.8	33.9	30.7	36.9	31.9	29.0	32.2	-	This tube is located within Nottingham City Council's area but near its boundary with Rushcliffe Borough Council.
29	458459	339011	51.6	29.2	43.0	43.5	35.4	42.0	40.4	32.0	47.6	40.5	41.5	39.1	-	-	-	Triplicate Site with 29, 64 and 65 - Annual data provided for 65 only
30	458079	339887	47.7	28.3	41.9	37.0	35.4	25.2	31.6	33.2	43.4	40.7	44.1	39.2	37.3	**41.4**	-	
31	454367	339946	33.1	17.1	27.0	23.0	22.9	22.8	21.0	20.9	25.8	26.5	31.4	27.2	24.9	27.7	-	
33	454941	338314	41.3	16.0	32.4	28.5	26.9	23.4	22.7	21.7	30.6	30.5	35.9	31.7	28.5	31.6	-	
35	454587	340088	46.2	18.0	35.1	28.5	27.8	31.4	28.5	27.5	34.6	36.4	42.8	35.1	32.7	36.3	29.2	
40	454321	339931	37.5	21.3	30.0	34.7	29.0	27.9	25.4	25.0	32.9	21.3	30.8	30.7	28.9	32.1	-	
43	455453	339595	38.3	15.1	30.0	27.0	24.9	20.8	21.6	19.6	26.4	28.2	45.3	31.6	27.4	30.4	-	
44	457775	339530	34.4	19.1	27.9	27.1	25.5	21.9	23.2	22.6	30.6	29.5	31.6	33.1	27.2	30.2	-	
46	457781	339123	55.7	40.8	50.0	46.5	56.7	49.2		45.7	58.4	63.1	58.2	54.8	52.6	**58.5**	-	
47	457406	339153	55.6	29.2	36.5	38.5	39.2	36.5	33.5	33.3	43.1	38.9	37.7	37.6	38.3	**42.6**	31.8	
49	457150	339384	45.3	29.8	36.9	32.7	33.7	33.3	33.0	31.0		36.2	34.9	41.2	35.3	39.2	-	
50	455713	337838	48.0	30.8	44.1	39.8	37.0	40.5	37.2	37.0	46.2	46.2	53.2	45.9	42.2	**46.8**	-	
51	457528	339339	35.1	17.9	26.5		25.4	19.5	20.5	22.0	27.3	32.8	31.0	32.2	26.4	29.3	-	
52	454386	340087	40.9	22.6	30.0	30.1	32.8	33.2	32.7	30.6	39.1	38.2	38.7	38.0	33.9	37.7	-	
53	454243	340057	31.7	17.6		24.7	21.4	18.1	20.0	16.8	24.7	26.2	27.1	29.7	23.5	26.1	-	
54	454493	341505	40.9	21.9	37.3	29.9	28.5	34.8	32.8	28.6	33.6	34.9	40.5	31.0	-	-	-	Triplicate Site with 54, 66 and 67 - Annual data provided for 67 only
55	456441	336131	35.0	13.6	28.6	21.4	20.5	18.6	18.7	19.3	24.1	34.9	36.7	29.3	25.1	27.8	-	
56	457064	342128	47.6	28.4	40.3	31.8	36.7	32.5	34.6		45.1	49.2	51.7	48.7	40.6	**45.1**	30.8	
57	456265	336414	31.2	14.0	23.0	22.8	22.4	19.5	19.0	18.6	24.6	18.9	26.2	25.1	22.1	24.6	-	
58	455528	342828	47.2	31.4	40.2	43.4	38.5	34.5	35.8	29.5	41.2	33.2	42.0	37.7	-	-	-	Triplicate Site with 10, 58 and 59 - Annual data provided for 59 only

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 (1.11)**	**Annual Mean: Distance Corrected to Nearest Exposure**	Comment
59	455528	342828	44.4	22.3	40.9	41.8	39.7	37.7	37.9	32.8	40.4	31.7	43.6	39.3	37.6	**41.8**	-	Triplicate Site with 10, 58 and 59 - Annual data provided for 59 only
60	456399	340191	43.4	23.2	38.1	43.7	40.6	40.6	42.6	35.0	44.5	36.6	44.8	42.4	-	**-**	-	Triplicate Site with 20, 60 and 61 - Annual data provided for 61 only
61	456399	340191	43.5	25.5	34.1	45.7	37.7	39.2	38.5	33.3	45.6	25.3	42.5	40.8	38.8	**43.1**	-	Triplicate Site with 20, 60 and 61 - Annual data provided for 61 only
62	456156	340383	18.8	20.3	30.0	34.9	28.0	26.5	30.4	25.5	36.2	27.7	32.2	33.4	-	**-**	-	Triplicate Site with 22, 62 and 63 - Annual data provided for 63 only
63	456156	340383	35.5	21.4	30.5	36.3	29.7	29.2	31.2	27.3	26.5	26.3	35.3	46.2	30.2	33.5	-	Triplicate Site with 22, 62 and 63 - Annual data provided for 63 only
64	458459	339011	51.8	30.9	41.5	43.0	37.8	34.9	40.7	34.0	46.5	37.2	43.7	40.1	-	**-**	-	Triplicate Site with 29, 64 and 65 - Annual data provided for 65 only
65	458459	339011	49.6		81.4	43.7	39.5	37.2	41.9	35.5	49.4	41.8	42.8	43.1	41.8	**46.4**	-	Triplicate Site with 29, 64 and 65 - Annual data provided for 65 only
66	454493	341505	44.2	29.7	40.0	33.2	27.9	33.7	32.5	31.1	35.6	32.3	35.0	36.7	-	**-**	-	Triplicate Site with 54, 66 and 67 - Annual data provided for 67 only
67	454493	341505	44.3	20.1	36.1	29.1	31.0	29.9	30.3	28.9	33.2	34.2	41.5	37.0	33.4	37.1	-	Triplicate Site with 54, 66 and 67 - Annual data provided for 67 only
68	455538	335731	43.6	17.5	39.1	30.7	26.9	31.2	28.8	32.1	33.0	31.4	38.2	34.8	32.3	35.8	-	
69	455529	335701	36.5	17.1	31.3		21.1	25.8	24.4	27.2	28.0	26.2	39.0	30.1	27.9	31.0	-	

☒ **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.**

☒ **Nottingham City Council confirm that all 2021 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.

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

New or Changed Sources Identified Within Nottingham City Council During 2021

Nottingham City Council has not identified any new major or significant sources likely to significantly impact on air quality within the reporting year of 2021.

Changes continue to be made the City Centre road layout and prioritisation under the Southside Transport (Broadmarsh) project (Table 2.2 NCC07).

Additional Air Quality Works Undertaken by Nottingham City Council During 2021

Nottingham City Council has not completed any additional works within the reporting year of 2021.

QA/QC of Diffusion Tube Monitoring

Gradko International supply and analyse Nottingham City Council's diffusion tubes. The organisation is UKAS accredited and is assessed annually for compliance to ISO 17025 and participates in other proficiency schemes.

Gradko have confirmed that their procedures follow the guidance issued on behalf of Defra (AEA Energy & Environment, Feb 2008) relating to the preparation, extraction, analysis and calculation procedures for passive NO_2 diffusion tubes

Gradko participate in a number of QA/QC monitoring systems to demonstrate satisfactory performance including the Workplace Analysis Scheme for Proficiency (WASP) programme to ensure uniformity in data throughout the year.

Precision vs Accuracy (Bias)

A further aspect of QA/QC for a laboratory is the reproducibility of results i.e. precision. Precision should not be confused with accuracy. Diffusion tube precision can be described

as the ability of a measurement to be consistently reproduced, i.e. how similar the results of duplicate or triplicate tubes are to each other.

Accuracy represents the ability of the measurement to represent the 'true' value, which for the monitoring results, is defined as the results from the automatic analysers. When averaged over a number of sets of results bias can be evident. This represents the overall tendency of the diffusion tubes to depart from the 'true' value, i.e. to systematically over-or under-read when compared against the reference method.

Once identified, bias can be adjusted for to improve the accuracy of diffusion tube results. This is done using bias adjustment factors which have been found to be specific to a laboratory and tube preparation method. See Appendix A subsection A-1 above.

Unlike bias, poor precision cannot be adjusted for. It can only be improved by careful handling of the tubes in both the laboratory and the field.

The LAQM website provides a link to the summary of precision results for individual laboratories https://laqm.defra.gov.uk/air-quality/air-quality-assessment/precision-and-accuracy/

The 2021 precision rating for Gradko supplied/analyzed diffusion tubes was 'good'. This precision reflects the laboratory's performance/consistency in preparing and analyzing the tubes, as well as the subsequent handling of the tubes in the field.

Diffusion Tube Annualisation

Annualisation was required for one site and calculated within the DTDP tool.

Annualisation Summary - Information Only

Diffusion Tube ID	Annualisation Factor Nottingham Centre AURN	Annualisation Factor Nottingham RTA Lace St	Annualisation Factor Site 3 Name	Annualisation Factor Site 4 Name	Average Annualisation Factor	Raw Data Simple Annual Mean (µg/m3)	Annualised Data Simple Annual Mean (µg/m3)
13	0.9281	0.9358			0.9319	35.8	33.4

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.

Nottingham City Council have applied a local bias adjustment factor of 1.11 (taken from the DTPT) to the 2021 monitoring data. A summary of bias adjustment factors used by Nottingham City Council over the past five years is presented in **Error! Not a valid bookmark self-reference.**.

A local bias adjustment factor has been used because 3 tubes are collocated with a real time analyser that is: serviced, calibrated twice monthly, independently data-scaled/validated, and has a high data collection rate.

Table C.1 – Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	**Adjustment Factor**
2021	Local	-	1.11
2020	Local	-	1.10
2019	Local	-	1.08
2018	Local	-	1.00
2017	Local	-	1.07

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 Diffusion Tube Data Processing Tool/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.

Fall off with distance calculations were performed by the DTDP tool for three sites and reported below:-

Fall off with Distance Inputs

Enter data into the pink cells

Diffusion Tube ID	Distance (m)		NO_2 Annual Mean Concentration (µg/m^3)		
	Monitoring Site to Kerb	Receptor to Kerb	Bias Adjusted and Annualised	Background	Predicted at Receptor
35	3.0	13.0	36.3	17.6	29.2
47	1.0	24.0	42.6	25.7	31.8
56	1.0	11.0	45.1	15.5	30.8

QA/QC of Automatic Monitoring

AURN Sites

The analysers at the AURN sites are subject to a four weekly calibration regime. The calibrations are undertaken by an Environment Agency trained local site operator (LSO) and conducted in accordance with the Local Site Operators' Manual.

CG NOx, LS NOx and SA NOx Sites

At Nottingham City Council's CG NOx, LS NOx and SA NOx sites calibrations are carried out fortnightly. The calibrations, using zero air and span gases, are undertaken by the LSOs that prior to 2016 were also the LSOs for the City Centre AURN site. Calibrations are conducted using the same principles and procedures as given in the AURN LSO Manual.

The equipment is fully serviced every six months by Matts Monitors Ltd, Stroud.

Calibration Gas Traceability

AURN Site

Please visit the DEFRA site https://uk-air.defra.gov.uk/networks/ for more information.

CG NOx, LS NOx and SA NOx Sites

Calibration gases used in the CG NOx, LS NOx and SA NOx monitoring sites are supplied by Matts Monitors Ltd. The gases are supplied with a certificate of analysis.

Data Collection and Processing

AURN Site

Please visit https://uk-air.defra.gov.uk/data/ for more information.

CG NOx, LS NOx and SA NOx Sites

During 2021 data collection, validation and ratification was carried out by Air Quality Data Management Ltd http://www.aqdm.co.uk/

Automatic Monitoring Annualisation

All automatic monitoring locations within Nottingham City Council 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, monitoring locations are representative of exposure. However, where this is not possible, the NO_2 concentration at the nearest location relevant for exposure has been 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 Nottingham City Council required distance correction during 2021.

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

Annualisation Summary - Information Only

Diffusion Tube ID	Annualisation Factor Nottingham Centre AURN	Annualisation Factor Nottingham RTA Lace St	Annualisation Factor Site 3 Name	Annualisation Factor Site 4 Name	Average Annualisation Factor	Raw Data Simple Annual Mean (µg/m3)	Annualised Data Simple Annual Mean (µg/m3)
13	0.9281	0.9358			0.9319	35.8	33.4

Table C.3 – Local Bias Adjustment Calculation

Local Bias Adjustment Outputs - Information Only

	STEP 3a Local Bias Adjustment Input 1	STEP 3b Local Bias Adjustment Input 2
Periods used to calculate bias	12	0
Bias Adjustment Factor A	1.11 (1 - 1.24)	
Diffusion Tube Bias B	-10% (-20% - 0%)	
Diffusion Tube Mean (µg/m^3)	31.9	
Mean CV (Precision)	4.9%	
Automatic Mean (µg/m^3)	35.5	
Data Capture	97%	
Adjusted Tube Mean (µg/m^3)	35 (32 - 40)	

Overall Diffusion Tube Precision	Good Overall Precision	
Overall Continuous Monitor Data Capture	Good Overall Data Capture	

Combined Local Bias Adjustment Factor	**1.11**	

Notes:

A single local bias adjustment factor has been used to bias adjust the 2021 diffusion tube results.

Table C.4 – NO_2 Fall off With Distance Calculations (concentrations presented in µg/m^3)

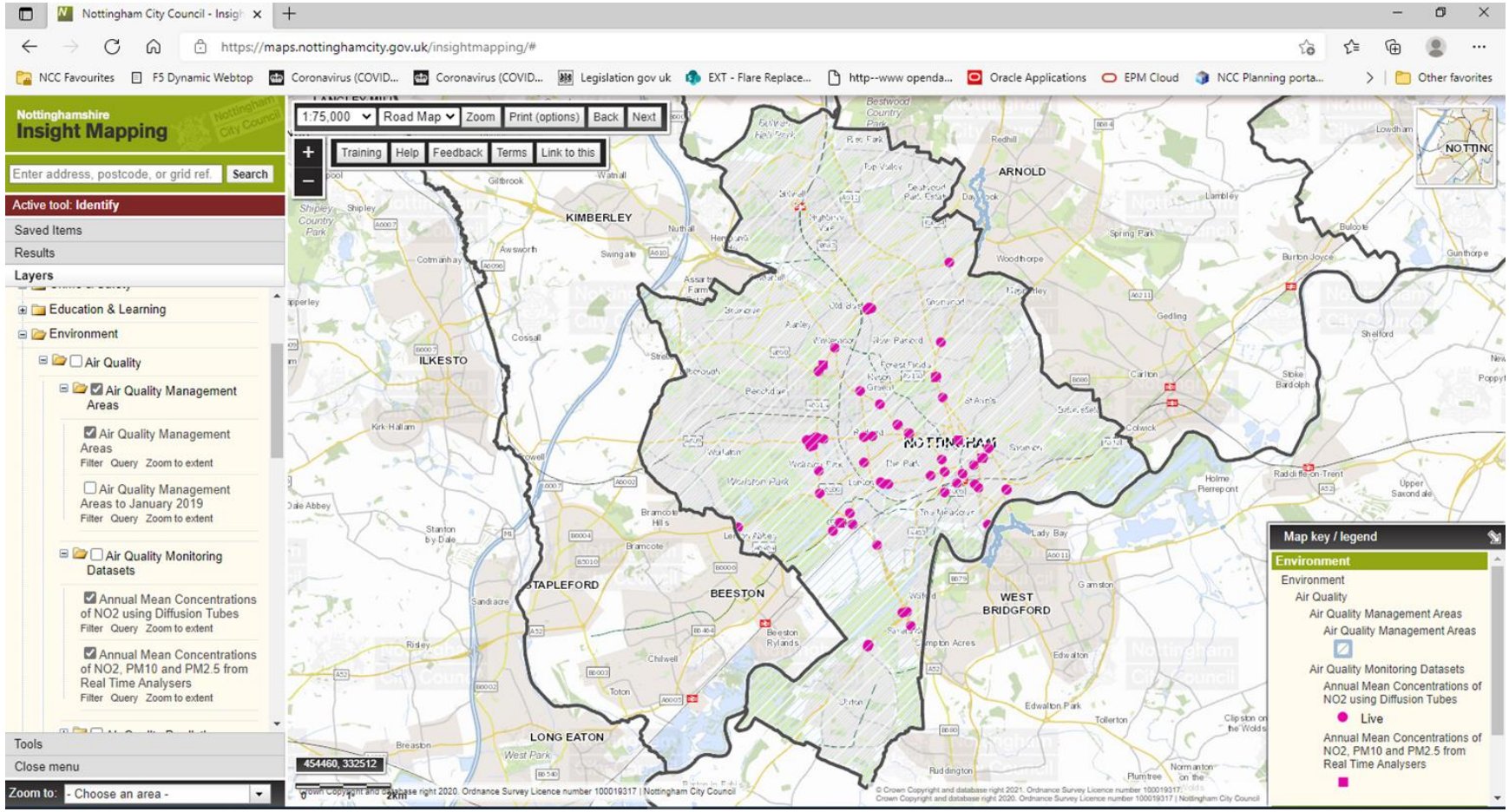
Fall off with Distance Inputs

Enter data into the pink cells

Diffusion Tube ID	Distance (m)		NO_2 Annual Mean Concentration (µg/m^3)		
	Monitoring Site to Kerb	Receptor to Kerb	Bias Adjusted and Annualised	Background	Predicted at Receptor
35	3.0	13.0	36.3	17.6	29.2
47	1.0	24.0	42.6	25.7	31.8
56	1.0	11.0	45.1	15.5	30.8

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

Figure D.1 – Map of Non-Automatic Monitoring Site



To view Nottingham City Council's monitoring site locations:-

1. Using Google Chrome or Microsoft Edge web browser navigate to:- https://maps.nottinghamcity.gov.uk/insightmapping/#
2. On the left hand menu column select 'Layers',
3. Select the '+' of the 'Environment' folder
4. Select the '+' of the Air Quality Management Areas
    a. Tick the box to show the location information of interest on the map
5. Select the '+' of the Air Quality Monitoring Datasets
    a. Tick the box to show the location information of interest on the map
6. Use the + button the map to zoom in (- to zoom out) if sites cannot be distinguished
7. Hover the mouse over the monitoring location of interest and press left mouse button to open the 'Results' table of information and monitoring data for the location.

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).

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
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.
- AEA Energy & Environment (Feb 2008) **Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance for Laboratories and Users Issue 1a**
- AEA Technology (2005) **Local Site Operators' Manual**
- **Air Quality (England) Regulations 2000 (SI 2000 No. 928),**
- **Air Quality Standards Regulations 2010 (SI 2010 No. 1001)**
- Department for the Environment, Food and Rural Affairs **Clean Air Strategy 2019**
- Department for the Environment, Food and Rural Affairs (February 2018) **Local Air Quality Management Technical Guidance LAQM.TG (18))**
- Department for the Environment, Food and Rural Affairs (2007) **The Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007**
- **The Air Quality (England) (Amendment) Regulations 2002 (SI 3043)**
- **The Pollution Prevention and Control Act 1999**
- **Nottingham City Council (2000 - 2019) LAQM Review and Assessment Reports:**

http://www.nottinghaminsight.org.uk/f/63682/Library/Environment/Air-Quality/

- **Nottingham City Council**
  Health and Wellbeing Joint Strategic Needs Assessment:-

  Air Quality and Health 2015 and 2019
- **DEFRA Clean Air Strategy 2019**

Nottingham City Council Website **http://www.nottinghamcity.gov.uk**

Nottingham's geography and weather.

A location's air quality is affected by both local and distant emissions, from a wide range of sources, seasonal and day-to-day weather conditions, and the prevailing wind direction.

Nottingham's location in England means it does not experience daily coastal sea-breeze effects and is therefore subject to the wind direction of the air masses moving across the UK. The wind rose (Figure 9) is typical of data measured at Watnall meteorological station on the western edge of the Nottingham conurbation) shows the wind direction with the greatest frequency as the large lobe at 220^0. This 'prevailing wind' direction is roughly from the southwest. Thus, Nottingham's air quality is significantly influenced by sources ranged in an arc from the west-south-west to the south-south-west.

Fig 9: Nottingham City Council's geographic location in England and example Windrose (Watnall)

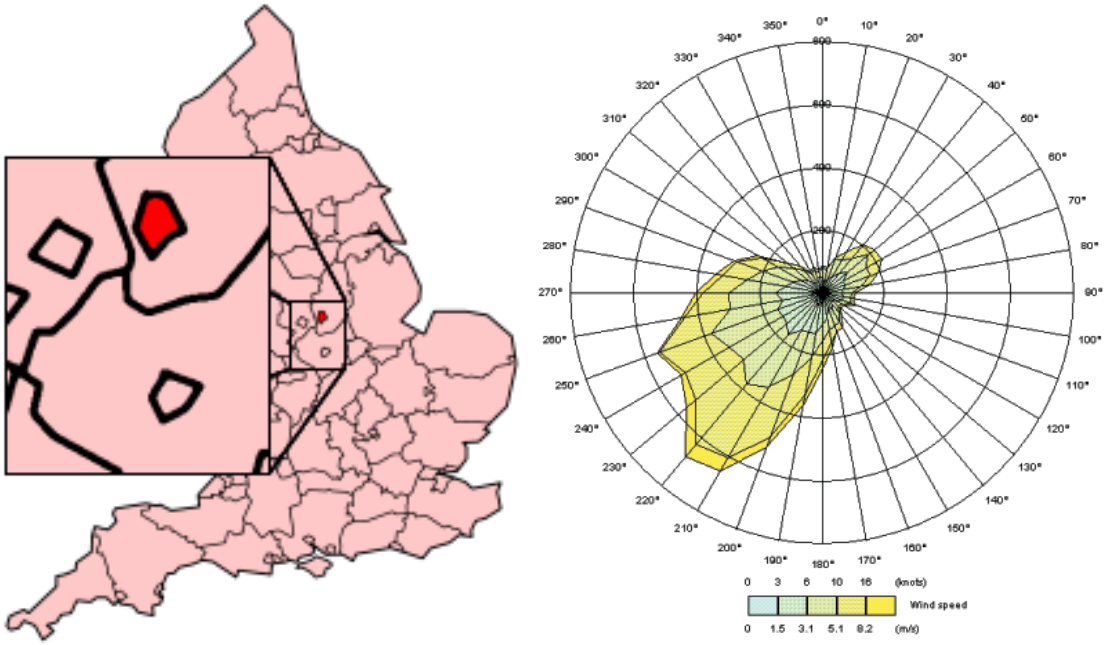
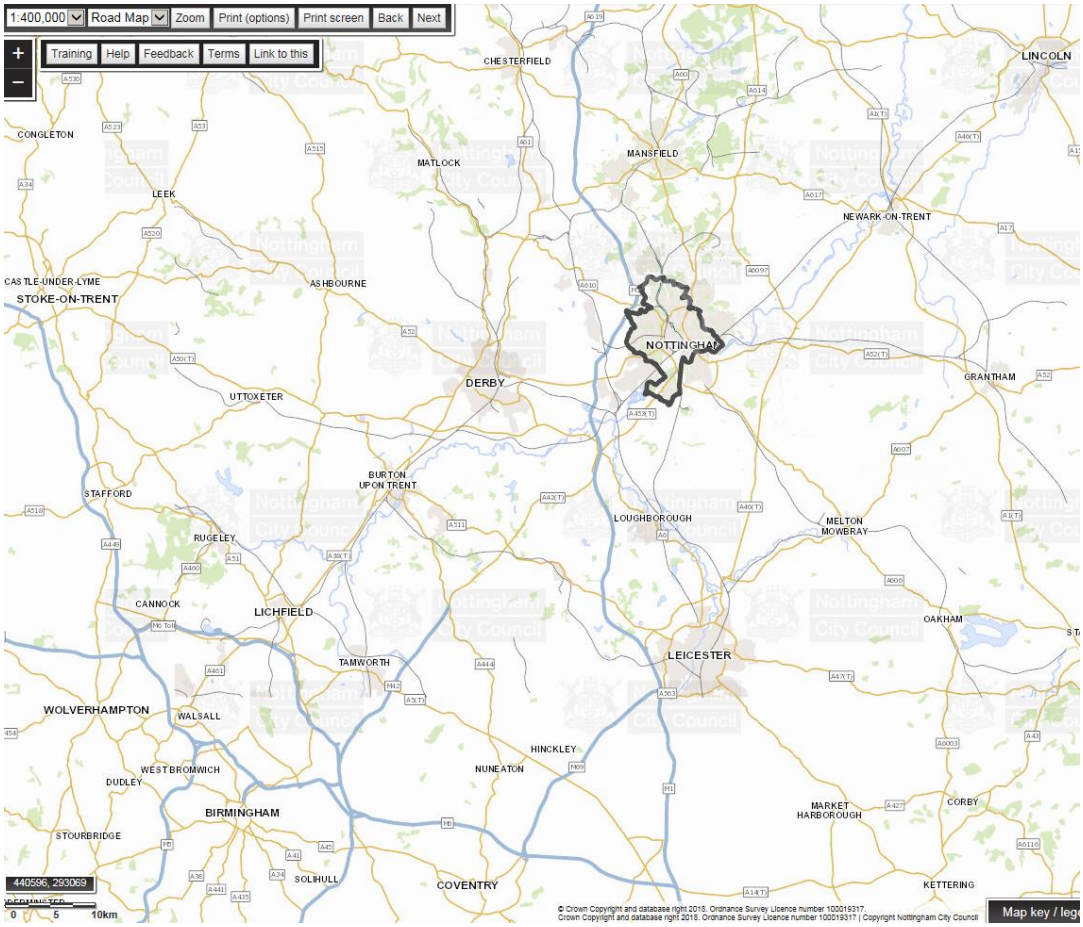


Fig 10: Nottingham City Council's geographic location (detailed)



Nottingham is surrounded by agricultural land, the M1 motorway bounds Nottingham to the west, and the very large urban industrial conurbation of the West Midlands is approximately 40 miles to its southwest (Fig. 10). Emissions from agricultural activity outside the conurbation as well as those from closer and more distant domestic, commercial, industrial and transport sources outside Nottingham contribute to the levels of NO2 and particles measured in Nottingham.