



Department of
**Agriculture, Environment
and Rural Affairs**
www.daera-ni.gov.uk

Air Pollution in Northern Ireland 2023

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1. Report Highlights

This is the twenty-second in a series of annual reports on air quality in Northern Ireland. It has been written and produced by Ricardo, on behalf of the Department of Agriculture, Environment and Rural Affairs (DAERA).

The key purpose of this report is to summarise air quality monitoring results for Northern Ireland in 2023, in order to inform the public, government and wider air quality community in Northern Ireland. This report also contains useful information on air quality policy and legislation as well as on sources of pollution. Figure 1.1 shows the locations of all air quality monitoring sites in Northern Ireland that were in operation during part or all of 2023.

Figure 1.1: Monitoring sites in Northern Ireland in operation during part or all of 2023

- | | |
|------------------------------------------------|------------------------------------------------------|
| 1 Derry/Londonderry Rosemount | 14 Castlereagh Dundonald |
| 2 Derry/Londonderry Dale's Corner | 15 Belfast Westlink Roden Street |
| 3 Strathfoyle Bawnmore Place | 16 Belfast Ormeau Road |
| 4 Derry/Londonderry Brandywell | 17 Belfast Stockman's Lane |
| 5 Limavady Dungiven | 18 Lisburn Dunmurry Seymour Hill ² |
| 6 Ballymena Ballykeel | 19 Lough Navar |
| 7 Ballymena Antrim Road | 20 Armagh Lonsdale Road |
| 8 Strabane Springhill Park ¹ | 21 Downpatrick Roadside |
| 9 Newtownstewart | 22 Newry Canal Street |
| 10 Newtownabbey Antrim Road | |
| 11 North Down Holywood A2 | |
| 12 Belfast Centre | |
| 13 Belfast Newtownards Road | |

22 sites in operation in 2023. This map also shows the location of sites in the UK Black Carbon and PAH Networks

¹ Black Carbon is measured at Strabane 2 which is at the same location as Strabane Springhill Park

² Black Carbon and PAHs are measured at Kilmakee Leisure Centre which is at the same location as Lisburn Dunmurry Seymour Hill





Lagan River, Belfast

This report has been compiled from data supplied by Northern Ireland's network of air quality monitoring stations (Figure 1.1). Some of these are operated on behalf of DAERA, while others are managed by district councils, via the Local Air Quality Management framework, for which DAERA provides funding support. An interactive map of the automatic monitoring stations shown in Figure 1.1 can be found on the Northern Ireland Air Quality website at www.airqualityni.co.uk . Information on the sites in Northern Ireland within the Black Carbon, Polycyclic Aromatic Hydrocarbons (PAH), Hydrocarbon, Toxic Organic Micro Pollutants (TOMPs) and Heavy Metals Networks, can be found on the UK-AIR website at <https://uk-air.defra.gov.uk/interactive-map> .

This report reviews the pollutants monitored, and highlights compliance as well as exceedances of air quality objectives.

Whilst concentrations of sulphur dioxide (SO₂), a pollutant associated with coal and oil combustion, have declined significantly since the 1990s, and a decreasing trend in nitrogen dioxide (NO₂)

There is also growing concern regarding ultra-fine particulate matter in the UK and the impact of this on health.

concentrations has been observed at some monitoring sites in Northern Ireland, a number of pollutants in some parts of Northern Ireland continue to exceed air quality objectives. There is also growing concern regarding ultra-fine particulate matter (particles with one dimension smaller than 100 nanometres (nm) across) in the UK and the impact of this on health. A continued effort to reduce air pollution from all known sources is therefore important, together with monitoring to assess progress and to provide sound, science-based input into policy development.

2. Sources of Air Pollution in Northern Ireland

Table 2.1 below illustrates the most significant air pollutants for our region and provides information on their sources.



Dark Hedges, Northern Ireland

Table 2.1: Key pollutants, their sources and effects

Pollutant	Major Sources	Effects
Nitrogen oxides (NO _x includes NO, NO ₂)	<ul style="list-style-type: none"> Domestic and industrial combustion Energy production Transport 	<ul style="list-style-type: none"> Respiratory irritant (i.e. irritates airways and lungs)
Sulphur Dioxide (SO ₂)	<ul style="list-style-type: none"> Combustion of fuels containing sulphur Power generation Industry Household heating 	<ul style="list-style-type: none"> Respiratory irritant Contributes to formation of acid rain
Particulate Matter (PM ₁₀ and PM _{2.5})	<ul style="list-style-type: none"> Industrial combustion Domestic combustion Road transport 	<ul style="list-style-type: none"> Inflammation (PM₁₀) Respiratory irritant Irritates eyes Travels into the airways (PM₁₀) or deep into lungs and bloodstream (PM_{2.5})
Ground-level ozone (O ₃)	<ul style="list-style-type: none"> Secondary pollutant formed by chemical reactions in presence of sunlight 	<ul style="list-style-type: none"> Respiratory irritant Irritates eyes
Ammonia (NH ₃)	<ul style="list-style-type: none"> Agricultural activities Waste 	<ul style="list-style-type: none"> Forms fine particles of ammonium sulphate and nitrate
Polycyclic Aromatic Hydrocarbons (PAHs)	<ul style="list-style-type: none"> Domestic combustion 	<ul style="list-style-type: none"> Toxic Carcinogenic

3. Legislation and Policy

During 2023 the management of air quality in Northern Ireland was based on the requirements of the Air Quality Standards Regulations (Northern Ireland) 2010, the 2007 UK Air Quality Strategy, the Environment Order (NI) 2002, and the Air Quality Regulations (Northern Ireland) 2003.

The Environment (Northern Ireland) Order 2002

DAERA has a duty under this legislation to prepare and publish a statement or Air Quality Strategy, containing policies with respect to the assessment or management of the quality of air. DAERA is finalising Northern Ireland's first Clean Air Strategy, driven by the need to protect public health. In autumn 2020, a Discussion Document was issued to public consultation. It invited views on a range of matters relating to air quality and was an opportunity for stakeholders to put ideas to the Department. The consultation closed in spring 2021 and responses were analysed in detail. A synopsis of the responses, along with the Discussion Document, can be viewed at: https://www.daera-ni.gov.uk/clean_air_strategy_discussion_document . Now that the Executive has returned, DAERA is working with the other departments to finalise this important cross-cutting Strategy.

District councils have a duty to review and assess air quality within their districts, under Part III of The Environment Order (NI) 2002. These Regulations

also make provision for DAERA to provide financial support to the district councils in carrying out an air quality assessment, review, prepare and implement an action plan, or management of the quality of air. DAERA supports the district councils financially through the Local Air Quality Management Grant.

The Air Quality Regulations (Northern Ireland) 2003

These Regulations set out the air quality objectives to be achieved. The Regulations require district councils to review the quality of air within their area. The reviews have to consider the current and likely future air quality and assess whether the air quality objectives are being met or are likely to be achieved within the relevant period. These Regulations also list a number of other Relevant Authorities in Northern Ireland, with important air quality responsibilities.

The Air Quality Standards Regulations (Northern Ireland) 2010

Ambient air quality in Northern Ireland is regulated by the Air Quality Standards Regulations (Northern Ireland) 2010 and their subsequent 2016 amendment¹.

As well as limit values and non-mandatory target values for ambient concentrations of pollutants, the Regulations set out requirements for ambient air quality monitoring, including the number of monitoring sites required, siting criteria and acceptable methodology. They also identify the duties of Northern Ireland's Government Departments in relation to achieving limit and target values. It is the responsibility of DAERA to inform the public about air quality in the region, particularly with regard to warning the public when air quality is poor.

¹ Available at: <https://www.legislation.gov.uk/nisr/2010/188/contents/made>

The Air Quality Provisional Common Framework

In February 2022, the UK Government published the Air Quality Common Framework (UK Government, 2022). This policy paper, which is available online at <https://www.gov.uk/government/publications/air-quality-provisional-common-framework>, explains how the UK Government and the Devolved Administrations propose to work together to develop air quality policy, following the UK's exit from the European Union.

World Health Organization (WHO) Guidelines

The World Health Organization (WHO) publishes guidelines for key pollutants based on the scientific evidence on the health effects of the pollutants available at the time. The latest update was issued in 2021², with revised guidelines published for these pollutants. The WHO also provides interim targets to guide reduction efforts towards the



Belfast City Hall

ultimate and timely achievement of its Air Quality Guideline levels. Table 3.1 shows the 2021 WHO Air Quality Guideline levels and interim targets for NO₂, PM₁₀ and PM_{2.5}. The WHO guidelines are not legally binding but are valuable for providing guidance for future Northern Ireland legislation.

Table 3.1: WHO 2021 air quality guidelines for NO₂, PM₁₀ and PM_{2.5}

Pollutant	Averaging Period	2021 WHO Interim Targets				2021 WHO Air Quality Guideline Level
		1	2	3	4	
NO ₂ (µg m ⁻³)	Annual	40	30	20	-	10
	24 hour*	120	50	-	-	25
PM ₁₀ (µg m ⁻³)	Annual	70	50	30	20	15
	24 hour*	150	100	75	50	45
PM _{2.5} (µg m ⁻³)	Annual	35	25	15	10	5
	24 hour*	75	50	37.5	25	15

* measured as the 99th percentile of 24 hour means in a year (equivalent to 3 - 4 exceedances)

² World Health Organization. (2021). WHO global air quality guidelines: particulate matter (PM_{2.5} and PM₁₀), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide. World Health Organization. <https://apps.who.int/iris/handle/10665/345329>. License: CC BY-NC-SA 3.0 IGO

Local Air Quality Management

Local Air Quality Management (LAQM) provides the framework under the Environment Order (NI) 2002, within which air quality is managed by the 11 district councils in Northern Ireland. LAQM requires district councils to review and assess a range of air pollutants against the objectives set by the Air Quality Regulations (Northern Ireland) 2003, using a range of monitoring, modelling, observations and corresponding analyses. For locations where objectives are not expected to be met by the relevant target date, district councils are required to declare an Air Quality

Management Area (AQMA), and (along with relevant authorities), to develop an Action Plan to address the problem. In 2023 there were 19 AQMAs in Northern Ireland, as shown in Table 3.2. Nine councils have AQMAs: of these, seven councils have AQMAs for NO₂ only, and two councils have AQMAs for PM₁₀ and NO₂. There are no AQMAs in place for any other pollutants, in Northern Ireland.

District Council reports on air quality can be accessed through the following webpage: <https://www.airqualityni.co.uk/laqm/district-council-reports> .

Table 3.2: Air Quality Management Areas in Northern Ireland

District Council	Number of AQMAs	Pollutant which triggered designation	Sources
Antrim and Newtownabbey Borough Council	1	Nitrogen Dioxide	Road traffic
Ards and North Down Borough Council	0	-	-
Armagh City, Banbridge and Craigavon Borough Council	1	Nitrogen Dioxide	Road traffic
Belfast City Council	4	Nitrogen Dioxide	Road traffic
Causeway Coast and Glens Borough Council	1	Nitrogen Dioxide	Road traffic
Derry City and Strabane District Council	4	Nitrogen Dioxide	Road traffic
Fermanagh and Omagh District Council	0	-	-
Lisburn City and Castlereagh District Council	1	Nitrogen Dioxide	Road traffic
Mid and East Antrim Borough Council	2	Nitrogen Dioxide (1) and PM ₁₀ (1)	NO ₂ : Road traffic PM ₁₀ : Domestic Heating
Mid Ulster District Council	3	Nitrogen Dioxide	Road traffic
Newry, Mourne and Down District Council	2	Nitrogen Dioxide (1) and PM ₁₀ (1)	Road traffic

4. Air Quality Monitoring Results for 2023




Monitoring in Northern Ireland

A wide range of air quality monitoring is carried out in Northern Ireland. Some monitoring sites are run as part of UK-wide monitoring networks; others are operated by district councils in order to meet local objectives.

The Air Quality Standards Regulations (Northern Ireland) divide the region into two 'zones' for reporting purposes – the 'Belfast Metropolitan Urban Area' agglomeration (the conurbation of Greater Belfast), and the 'Northern Ireland' zone (the rest of the region). The Regulations then specify how many monitoring sites (or 'stations') are needed in each zone (based on its size and population). Only sites which meet the stringent siting criteria of the Regulations may be used for reporting compliance. The Regulations' siting criteria are different from those used for LAQM: for example, sites located close to major road junctions are used in LAQM but must not be used for compliance monitoring purposes. There are also different criteria regarding relevant public exposure.

The following pollutants were monitored in Northern Ireland during 2023:

- Carbon monoxide (CO);
- Oxides of nitrogen (NO_x), comprising nitric oxide (NO) and nitrogen dioxide (NO₂);
- Sulphur dioxide (SO₂);
- Particles (as PM₁₀, PM_{2.5}, and black carbon);
- Ozone (O₃);
- Benzene;
- Polluting elements – including lead, arsenic, cadmium and nickel;
- Polycyclic Aromatic Hydrocarbons (PAH); and
- Toxic Organic Micro Pollutants (TOMPs)

There were 22 air quality monitoring stations that operated for all or part of 2023 in Northern Ireland. Each was equipped with continuous monitoring equipment for one or more of the pollutants for which automatic methods are used: CO, NO_x, SO₂, PM₁₀, PM_{2.5}, O₃, and black carbon, and/or a non-automatic sampler for PAH. These sites (shown previously in Figure 1.1) provide information on a wide range of pollutants. Data from the continuous monitoring sites are communicated rapidly to the public via the website www.airqualityni.co.uk  and the Northern Ireland Air app, which can be downloaded free of charge from <https://www.airqualityni.co.uk/stay-informed> . Public health warnings are issued when levels are forecast to, or reach 'High' levels as defined by the Daily Air Quality Index (see <https://www.airqualityni.co.uk/air-quality/daily-air-quality-index>  for an explanation of this Index).

Seven of the automatic monitoring sites (Armagh Lonsdale Road, Ballymena Antrim Road, Ballymena Ballykeel, Belfast Centre, Belfast Stockman's Lane, Derry/Londonderry Rosemount and Lough Navar) were part of the UK's national monitoring network and were used to assess compliance with the Air Quality Standards Regulations. Non-automatic monitoring techniques are used for benzene, metallic pollutants, and PAHs. Some of these measurements are used to assess compliance with the Air Quality Standards Regulations and the UK Air Quality Strategy.

There are no limit or target values for NO but it is measured along with NO₂ and total NO_x. Measurements of black carbon and TOMPs are carried out for research purposes, to increase our scientific understanding of these pollutants.

Key Results for 2023

This section summarises key monitoring results from 2023, including compliance with Air Quality Standards Regulations limit values and the corresponding Air Quality Strategy (AQS) objectives. Further information is provided on the Northern Ireland Air website.

Carbon Monoxide was monitored using an automatic instrument at one site – Belfast Centre. The results were well within the Regulations limit value and AQS objective for this pollutant and have been for many years.

Benzene was monitored at one site, Belfast Centre, which met the annual mean limit value and AQS objective (for the running annual mean) in 2023, as it has for many years.

Metallic and Other Polluting Elements including lead, arsenic, cadmium and nickel – were monitored using non-automatic techniques at Belfast Centre, as part of the Heavy Metals Network. The results for 2023 were within the annual mean limit value and AQS objective for lead, and within the Regulations annual mean target values for arsenic, cadmium and nickel.

Sulphur Dioxide was monitored at five automatic sites during 2023 (Belfast Centre, Derry/Londonderry Rosemount, Lisburn Dunmurry, Ballymena Ballykeel and Strabane Springhill Park). All sites met the limit values for SO₂ (1-hour and 24-hour mean), and the AQS objective for the 15-minute mean. Three sites (Derry/Londonderry Rosemount, Lisburn Dunmurry Seymour Hill and Strabane Springhill Park) had less than 85% data capture for 2023. In these cases:

- Compliance with the 15-minute mean objective is judged on whether the 99.9th percentile of 15-minute mean SO₂ concentrations has exceeded the objective of 266 µg m⁻³, rather than the number of exceedances.

- Compliance with the 1-hour mean objective is judged on whether the 99.7th percentile of 1-hour mean SO₂ concentrations has exceeded the limit value of 350 µg m⁻³, rather than the number of exceedances.
- Compliance with the 24-hour mean objective is judged on whether the 99.2nd percentile of 24-hour mean SO₂ concentrations has exceeded the limit value of 125 µg m⁻³, rather than the number of exceedances.

On this basis, the three sites with data capture less than 85% were compliant with the limit values and objectives for SO₂.

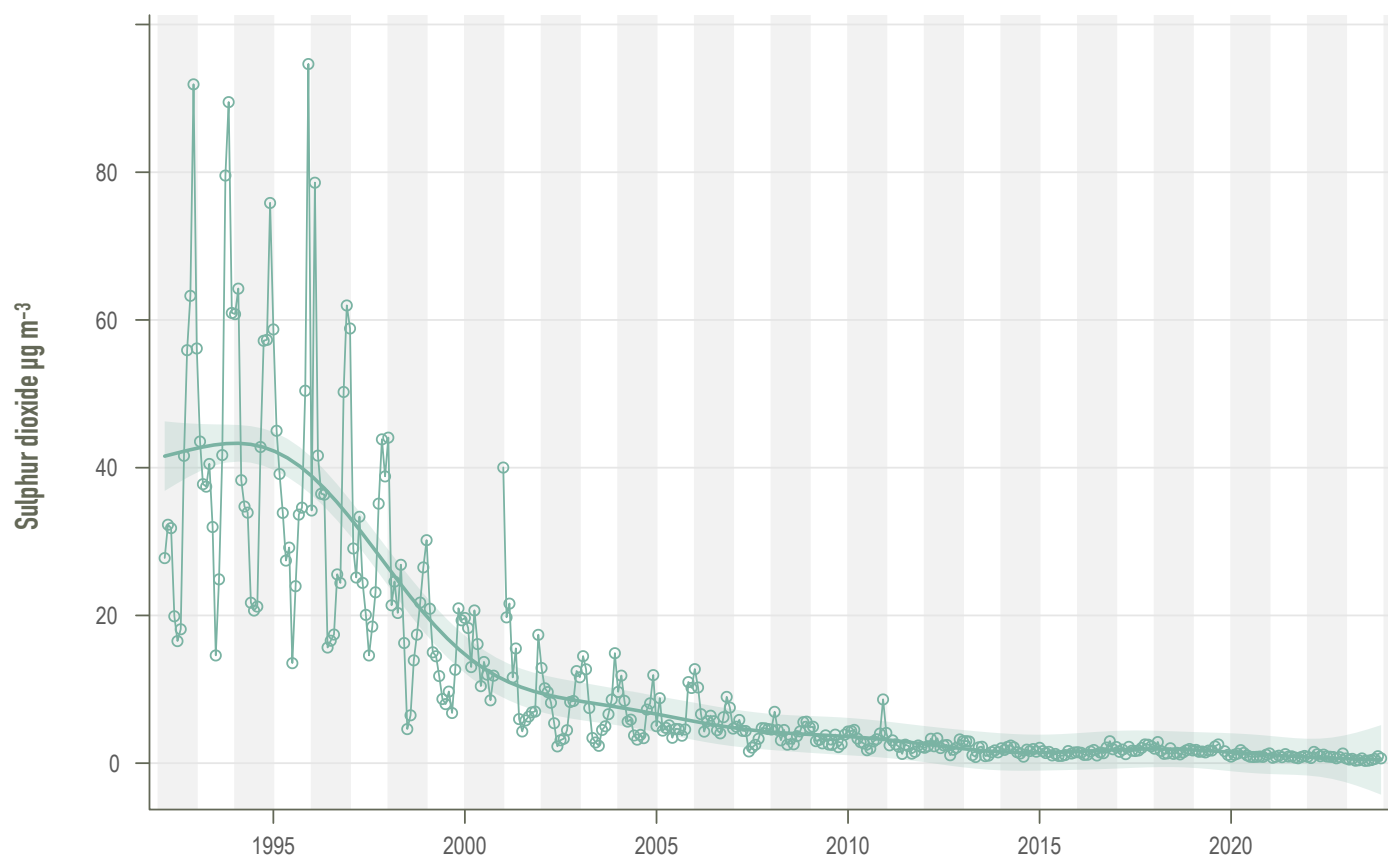


Northern Ireland

Concentrations of sulphur dioxide in Northern Ireland have decreased substantially in recent decades, due to a decrease in reliance on oil and solid fuels for domestic heating.

Figure 4.1 shows a trend plot for the long-running Belfast Centre monitoring site, which has been in operation since 1992.

Figure 4.1: Smoothed Trend Plot for Sulphur Dioxide at Belfast Centre, 1992 - 2023



Newry City Bypass, Co. Down

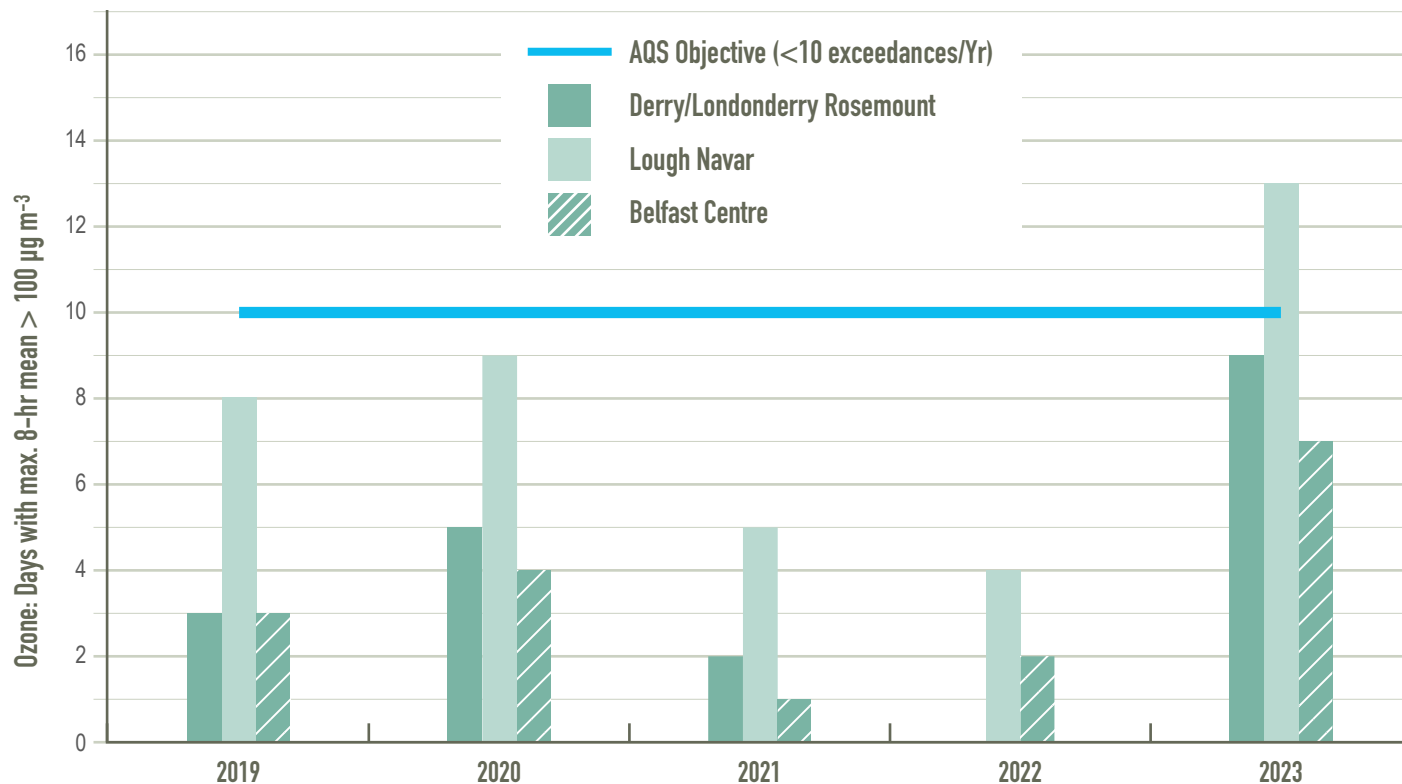
Ozone was monitored at Belfast Centre, Derry/Londonderry Rosemount, and the rural Lough Navar site (Figure 4.2). A maximum daily 8-hour mean above $100 \mu\text{g m}^{-3}$ was measured on 13 days at Lough Navar in 2023: this site therefore exceeded the AQS objective of $100 \mu\text{g m}^{-3}$ on more than the permitted 10 days in 2023. Belfast Centre had a maximum daily 8-hour mean above $100 \mu\text{g m}^{-3}$ on 7 days and Derry/Londonderry Rosemount on 9 days. Therefore, neither of these two sites exceeded the AQS limit of 10 permitted days of ozone concentrations above $100 \mu\text{g m}^{-3}$, in 2023.

Belfast Centre, Derry/Londonderry Rosemount and Lough Navar did not exceed the less stringent Air Quality Standards Regulations

target value, which requires the daily maximum 8-hour running mean not to be more than $120 \mu\text{g m}^{-3}$ on more than 25 days.

Unlike some other pollutants, levels of ozone (O_3) in Northern Ireland do not appear to be decreasing but remain variable from year to year. Ozone exceedances happen in some years but not others. The reasons for this relate to how ozone is formed: it is a 'secondary' pollutant – that is, it is formed by reactions involving other pollutants, in the presence of sunlight, and over several hours. This means that the number of ozone exceedances in any given year depends substantially on weather conditions.

Figure 4.2: Days with Maximum 8-hour mean Ozone Concentrations $> 100 \mu\text{g m}^{-3}$ for Five Years from 2019-2023



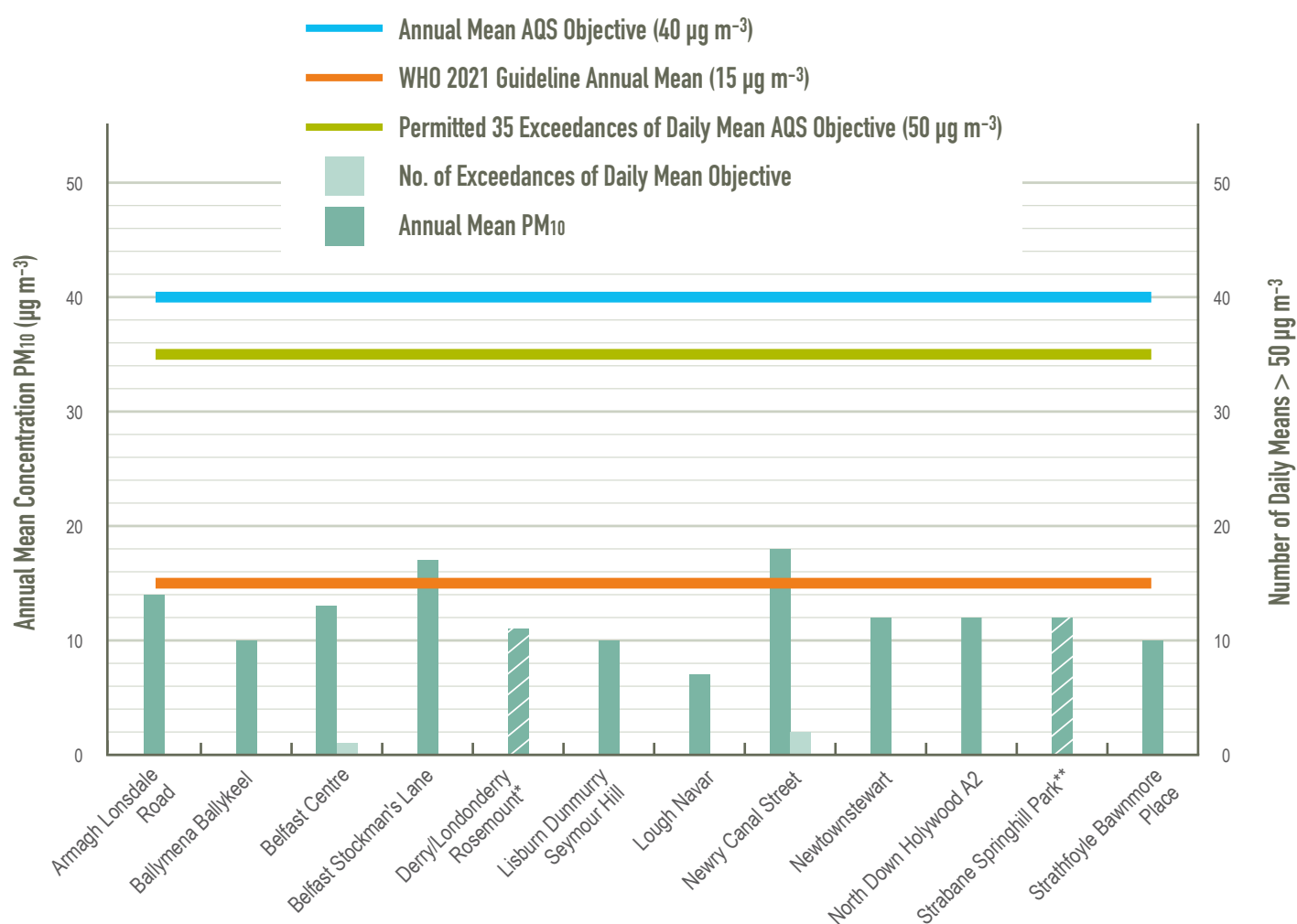
Particulate Matter PM₁₀. Particulate matter as PM₁₀ was monitored at 12 locations in 2023. Figure 4.3 shows the annual mean PM₁₀ concentrations (shown by the darker coloured bars), and the number of exceedances of the daily mean limit value and objective (shown by the lighter coloured bars).

For sites with less than 75% data capture, annualisation has been undertaken to estimate the annual mean, as per the procedure laid out in LAQM.TG(22) (Box 7.9)³. For PM₁₀, Derry/Londonderry

Rosemount and Strabane Springhill Park had data capture below 75% in 2023. The annual means shown for these sites have therefore been calculated using this annualisation procedure.

To perform annualisation, data from two to four nearby continuous background monitors with capture rates greater than 85% should be used to calculate an annualisation factor. Data from Strathfoyle Bawnmore Place and Newtownstewart were used to calculate an annualisation factor for PM₁₀ at these two sites.

Figure 4.3: Annual Mean PM₁₀ Concentrations and Exceedances of Daily Mean Objective, 2023



* Asterisk indicates sites with < 85% data capture, ** Two asterisks indicate sites with less than 50% data capture. Where the valid data capture is less than 75%, the means have been "annualised" and shown as a striped bar

³ Local Air Quality Management - Technical Guidance TG(22): Available at <https://laqm.defra.gov.uk/wp-content/uploads/2022/08/LAQM-TG22-August-22-v1.0.pdf>

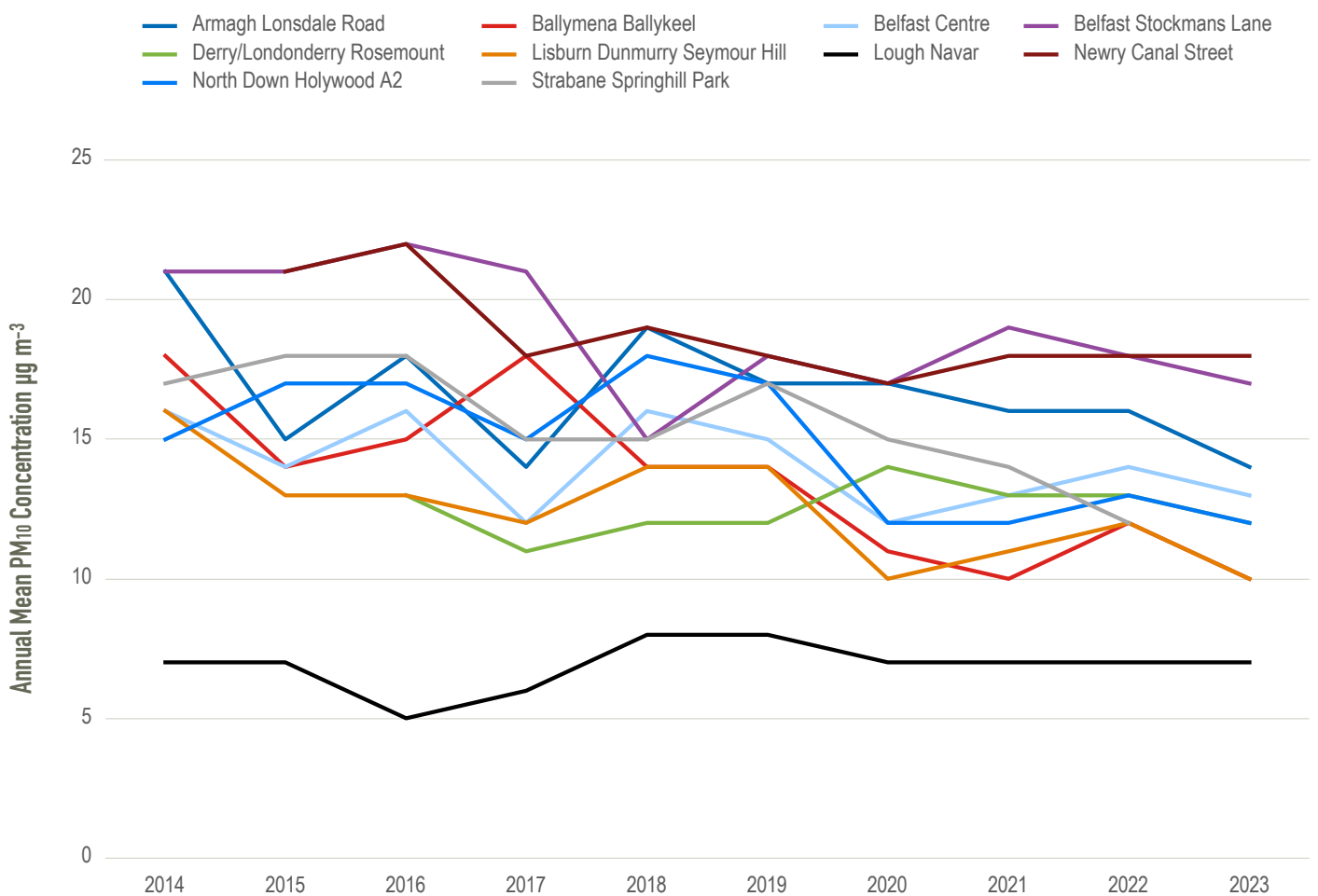
All sites met the limit value and objective of $40 \mu\text{g m}^{-3}$ for annual mean PM_{10} , although two of the twelve sites (Belfast Stockman's Lane and Newry Canal Street) exceeded the more stringent WHO 2021 guideline of $15 \mu\text{g m}^{-3}$ for annual mean PM_{10} concentrations, in 2023.

No sites exceeded the Air Quality Standards Regulations daily mean limit value and AQS objective of $50 \mu\text{g m}^{-3}$ on more than the maximum permitted 35 occasions during the year. Where data capture is less than 85%, the daily mean objective is judged on whether the 90.4th percentile of 24 hour mean PM_{10} concentrations has exceeded

$50 \mu\text{g m}^{-3}$, rather than the number of 24-hour mean exceedances. For the two sites where data capture was below this threshold (Derry/Londonderry Rosemount and Strabane Springhill Park), the daily mean limit value was not exceeded on this basis.

Annual mean PM_{10} concentrations have generally decreased over the past ten years at most sites, as shown in Figure 4.4. However, not all sites have shown a consistent decrease, for example Derry/Londonderry Rosemount, Newry Canal Street and the rural Lough Navar site where levels have remained fairly stable.

Figure 4.4: Annual Mean PM_{10} Concentrations at Northern Ireland Monitoring Sites, 2014 onwards. (Minimum data capture for inclusion: 50%, at least five years of monitoring)



Particulate matter PM_{2.5}. Fine particulate matter as PM_{2.5} was continuously monitored at nine sites in 2023. Figure 4.5 shows the annual mean PM_{2.5} concentrations for 2023 at all nine sites.

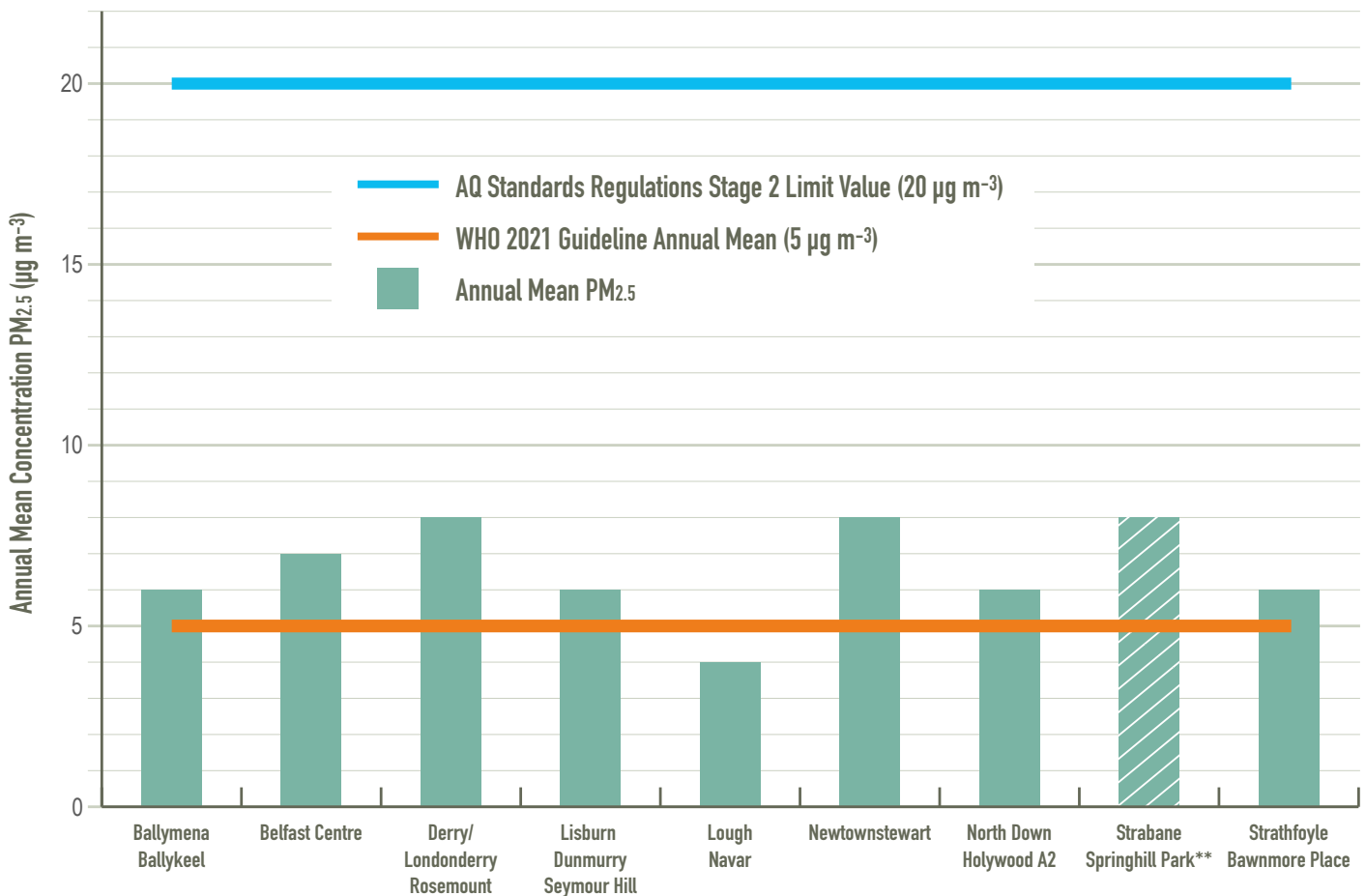
All sites reported annual mean PM_{2.5} concentrations well below the Air Quality Regulations Stage 2 limit value of 20 $\mu\text{g m}^{-3}$ (which had to be achieved by 1 January 2020). All sites, with the exception of the rural site at Lough Navar, exceeded the new WHO guideline for annual mean PM_{2.5} concentrations (5 $\mu\text{g m}^{-3}$), in 2023.

For sites with less than 75% data capture, annualisation has been undertaken to estimate the annual mean, following the same procedure

as described above for PM₁₀. For PM_{2.5}, Strabane Springhill Park had data capture below 75% in 2023. Data from Derry/Londonderry Rosemount and Lough Navar were used to calculate an annualisation factor for PM_{2.5} at this site.

Only three sites in Northern Ireland have been measuring PM_{2.5} concentrations for at least five years (this being considered the minimum for estimation of trends). Annual mean concentrations at these sites showed a decrease between 2019 and 2020, likely due to the COVID-19 restrictions, but since then have remained fairly stable: 7-9 $\mu\text{g m}^{-3}$ at urban sites, 4 $\mu\text{g m}^{-3}$ at the rural Lough Navar.

Figure 4.5: Annual Mean PM_{2.5} Concentrations for 2023

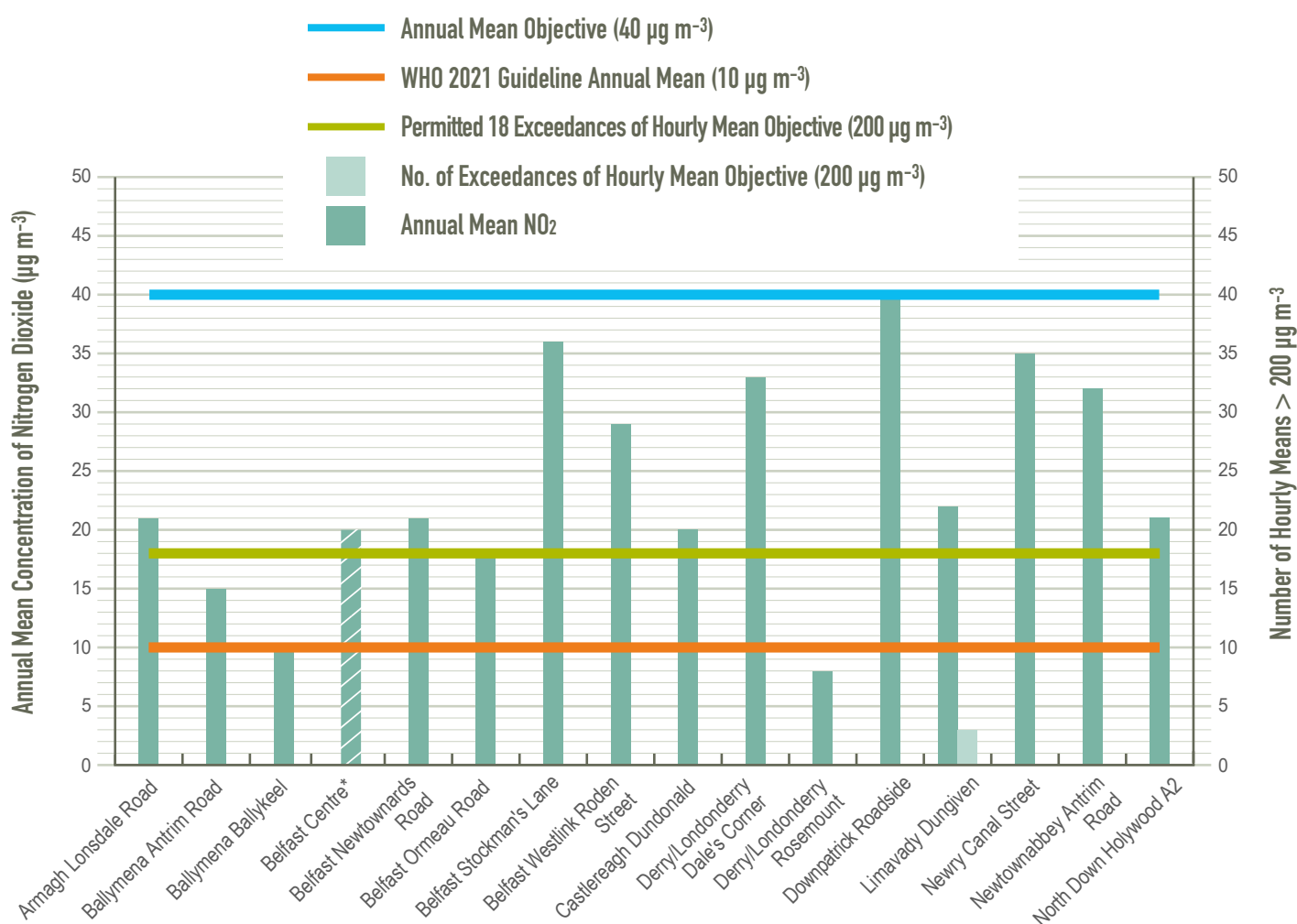


* Asterisk indicates sites with < 85% data capture. ** Two asterisks indicate sites with less than 50% data capture. Where the valid data capture is less than 75%, the means have been "annualised" and shown as a striped bar

Nitrogen Dioxide was monitored using automatic analysers at 16 sites during 2023. Figure 4.6 shows the annual mean NO₂ concentrations for all sites. No sites exceeded the AQS objective for annual mean NO₂ concentration (40 µg m⁻³). One site, Downpatrick Roadside, had an annual mean of 40 µg m⁻³, which equalled but did not exceed the objective. However, annual mean NO₂ concentrations were above the WHO 2021 guideline (10 µg m⁻³) at 14 out of 16 sites in 2023. Sites that did not exceed the WHO annual mean NO₂ guidelines were Ballymena Ballykeel and Derry/Londonderry Rosemount.

Belfast Centre had a data capture of less than 75%, therefore annualisation was undertaken to estimate the annual mean, as per the procedure laid out in LAQM.TG(22) (Box 7.9)⁴. The annual means shown for these sites have therefore been calculated using this annualisation procedure. To perform annualisation, data from two to four nearby continuous background monitors with capture rates greater than 85% should be used to calculate an annualisation factor. Data from Ballymena Ballykeel and Newtownabbey Antrim Road were used to calculate an annualisation factor for NO₂.

Figure 4.6: Annual Mean NO₂ Concentrations and Exceedances of Hourly Objective, 2023



* Asterisk indicates sites with < 85% data capture

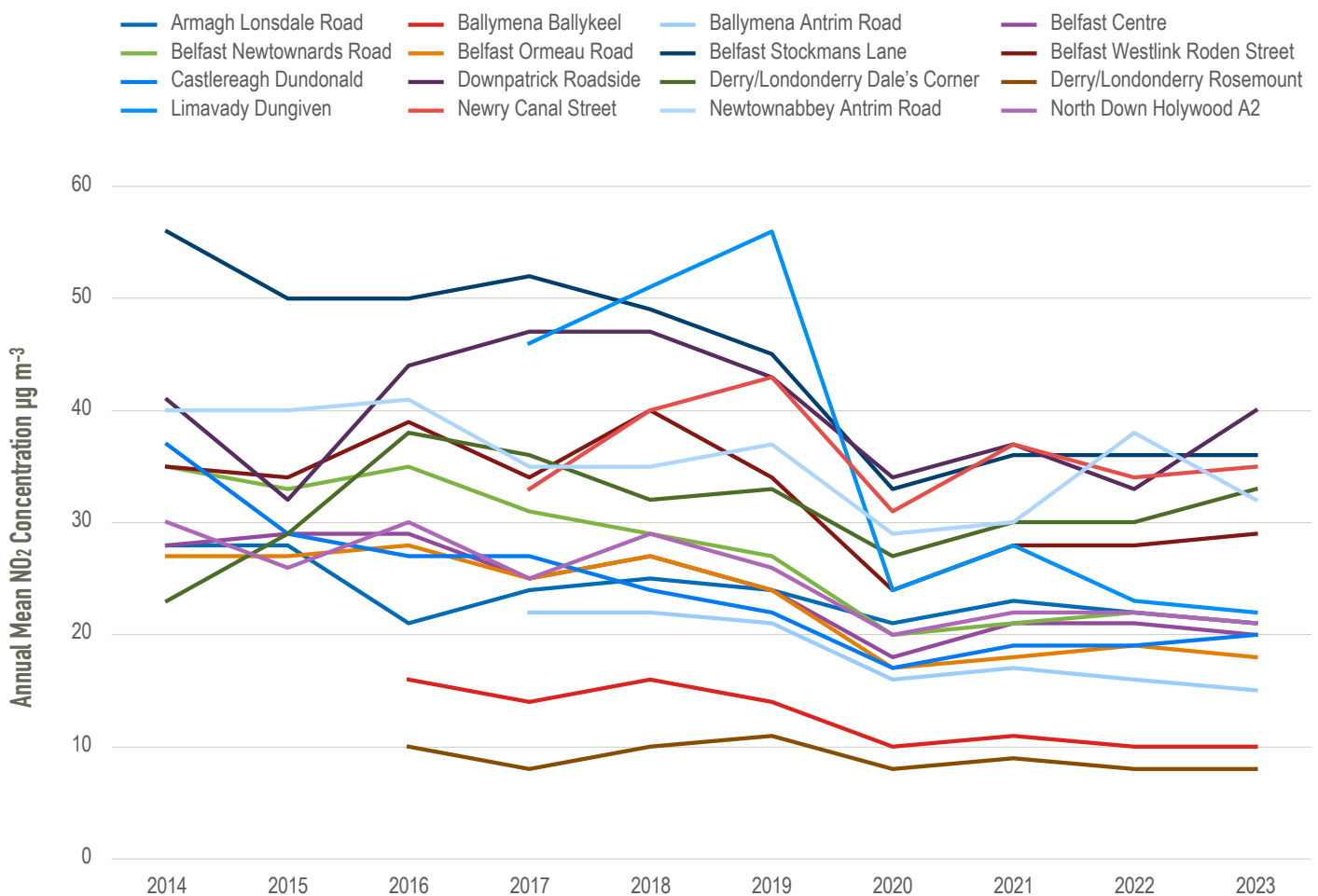
Where the valid data capture is less than 75%, the means have been "annualised" and shown as a striped bar

⁴ Local Air Quality Management - Technical Guidance TG(22): Available at <https://laqm.defra.gov.uk/wp-content/uploads/2022/08/LAQM-TG22-August-22-v1.0.pdf>

For the hourly mean limit, a concentration of $200 \mu\text{g m}^{-3}$ must not be exceeded on more than the permitted 18 occasions in a year. For Belfast Centre, the data capture was less than 85%, therefore the exceedance of the hourly mean objective is judged on whether the 99.8th percentile of hourly values has exceeded $200 \mu\text{g m}^{-3}$ rather than the number of hourly means above the objective. Limavady Dungiven exceeded the hourly limit value of $200 \mu\text{g m}^{-3}$ on three occasions. Despite this, no sites exceeded the AQS objective for hourly mean limit value of $200 \mu\text{g m}^{-3}$ on more than the maximum permitted 18 occasions during the year.

Annual mean NO_2 concentrations have generally decreased at most sites over the last five years, though it has not been a steady year-on-year downward trend: there was a decrease in 2020 attributed to the COVID-19 pandemic restrictions, and in most cases NO_2 concentrations have not returned to their pre-pandemic levels. Also, the amount of variation between individual sites appears to have reduced since 2019. (Figure 4.7 illustrates this pattern).

Figure 4.7: Annual Mean NO_2 Concentrations at Northern Ireland Monitoring Sites, 2014 onwards. (Minimum data capture for inclusion: 50%)

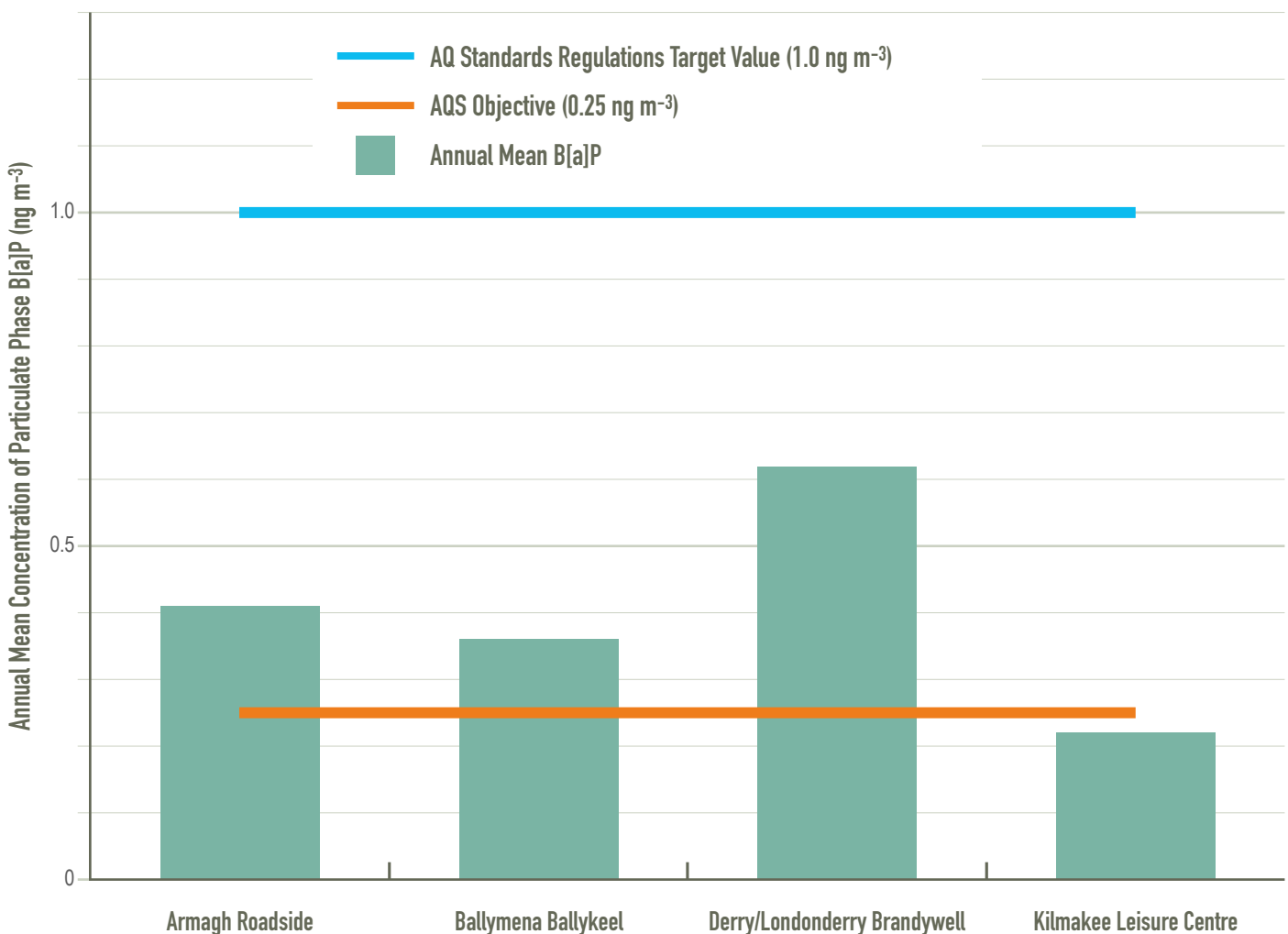


Polycyclic Aromatic Hydrocarbons (PAHs) were monitored at four sites in 2023: Ballymena Ballykeel, Derry/Londonderry Brandywell, Kilmakee Leisure Centre in Dunmurry, and Armagh Roadside. All are part of the UK PAH Monitoring Network. The network measures a range of PAH compounds, but one species in particular, benzo[a]pyrene (B[a]P), is used as a 'marker' for PAH compounds and is the subject of an AQS objective and Air Quality Standards Regulations target value. Figure 4.8 shows the annual mean concentrations for 2023. No site exceeded the target value of 1 ng m^{-3} for annual mean B[a]P concentration during 2023 (which was to be met by 31 December 2012). Three sites exceeded the

more stringent AQS annual mean objective of 0.25 ng m^{-3} for this PAH species, which was to have been achieved by 31 December 2010.

B[a]P concentrations over the last five years have not shown a consistent trend across sites. However, 2023 annual B[a]P concentrations at Ballymena Ballykeel and Kilmakee Leisure Centre were consistently lower than previous years. Armagh Roadside is a relatively new site, and 2023 is its first full year of monitoring PAHs. Derry/Londonderry Brandywell's 2023 annual mean B[a]P concentration was similar to those in 2020 – 2022.

Figure 4.8: Annual Mean Concentrations of Benzo[a]pyrene for 2023





Rathlin Island, County Antrim

Pollution Events

In this section some 'Moderate' pollution events, i.e. when pollution levels reached the 'Moderate' band as defined by the Daily Air Quality Index (DAQI)⁵, are investigated. There were no 'High' or 'Very High' pollution events in Northern Ireland during 2023.

On 7 March and 15 March 2023 there were Moderate NO₂ events observed at Limavady Dungiven. These were likely to be localised pollution events as both were short-term and the DAQI were low on these days elsewhere in Northern Ireland.

At Belfast Centre there was a Moderate PM₁₀ event on 13 February 2023. Concentrations of PM₁₀ at all other sites in Northern Ireland were elevated on this day but none reached the Moderate band. It is likely that the event at Belfast Centre was a mixture of regional and localised pollution.

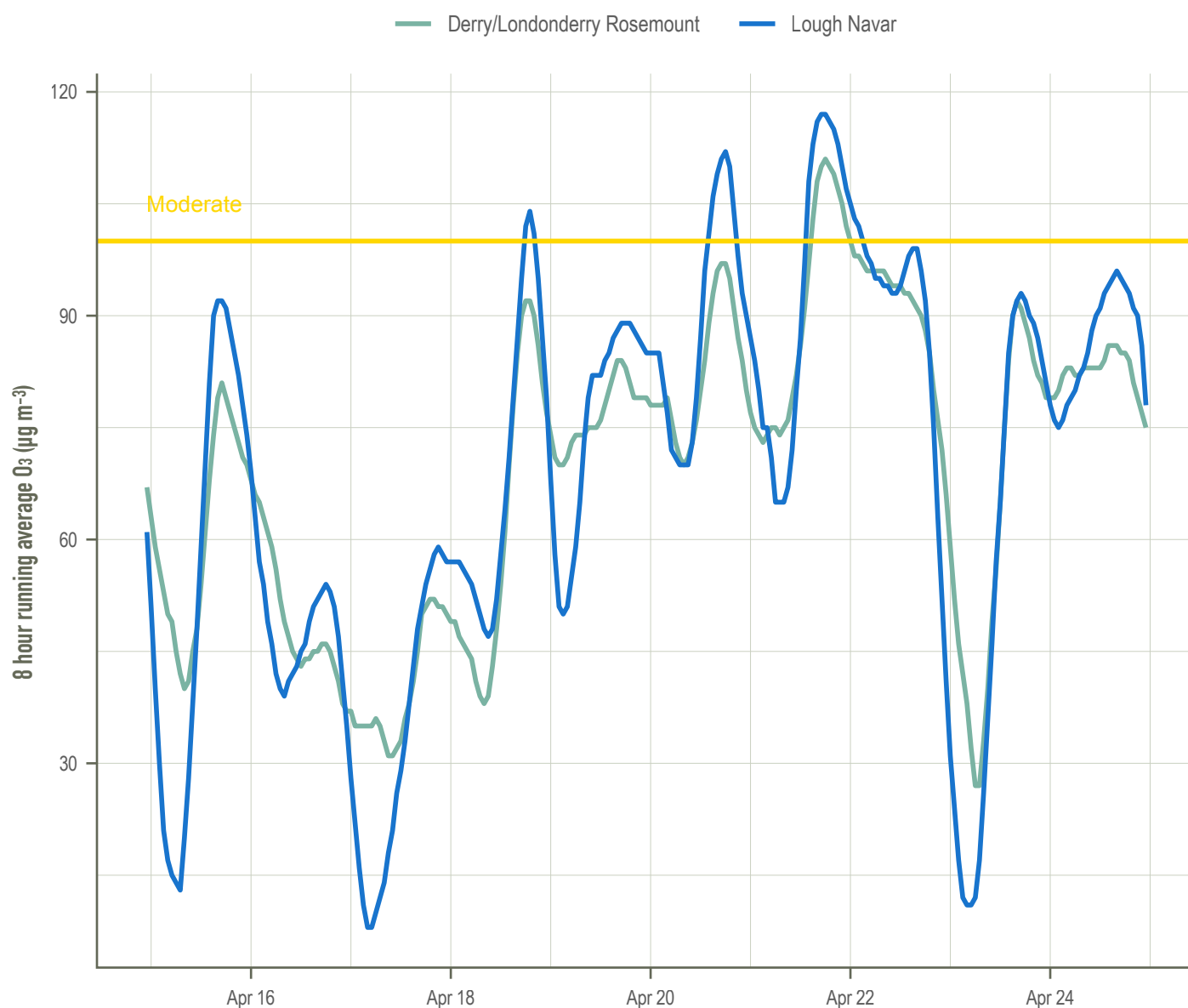
Moderate PM₁₀ was observed at Newry Canal Street on 8 September 2023 and 2 November 2023. During the Moderate pollution event on 8 September PM₁₀ and PM_{2.5} concentrations at all sites monitoring in Northern Ireland increased, therefore a regional event as a result of long-range transported pollution is the likely cause. However, the Moderate pollution observed on 2 November 2023 at Newry Canal Street appears to be a localised event. This site is in a corner formed by two buildings: in the past it has, on occasions, recorded high concentrations of particulate matter not seen at other sites in Northern Ireland. This is suspected to be due to vortices forming in this corner and stirring up dust from the ground. A localised Moderate PM_{2.5} event also occurred on 3 December 2023 at Derry/Londonderry Rosemount.

⁵ <https://www.airqualityni.co.uk/air-quality/daily-air-quality-index>

Two Moderate ozone pollution events occurred in 2023. From 18 to 22 April 2023 Moderate ozone concentrations were observed at Derry/Londonderry Rosemount and Lough Navar (Figure 4.9).

In the UK ozone typically exhibits a springtime peak with highest concentrations observed during April and May⁶, and the above Moderate events are consistent with this.

Figure 4.9: 'Moderate' Ozone Events April 2023

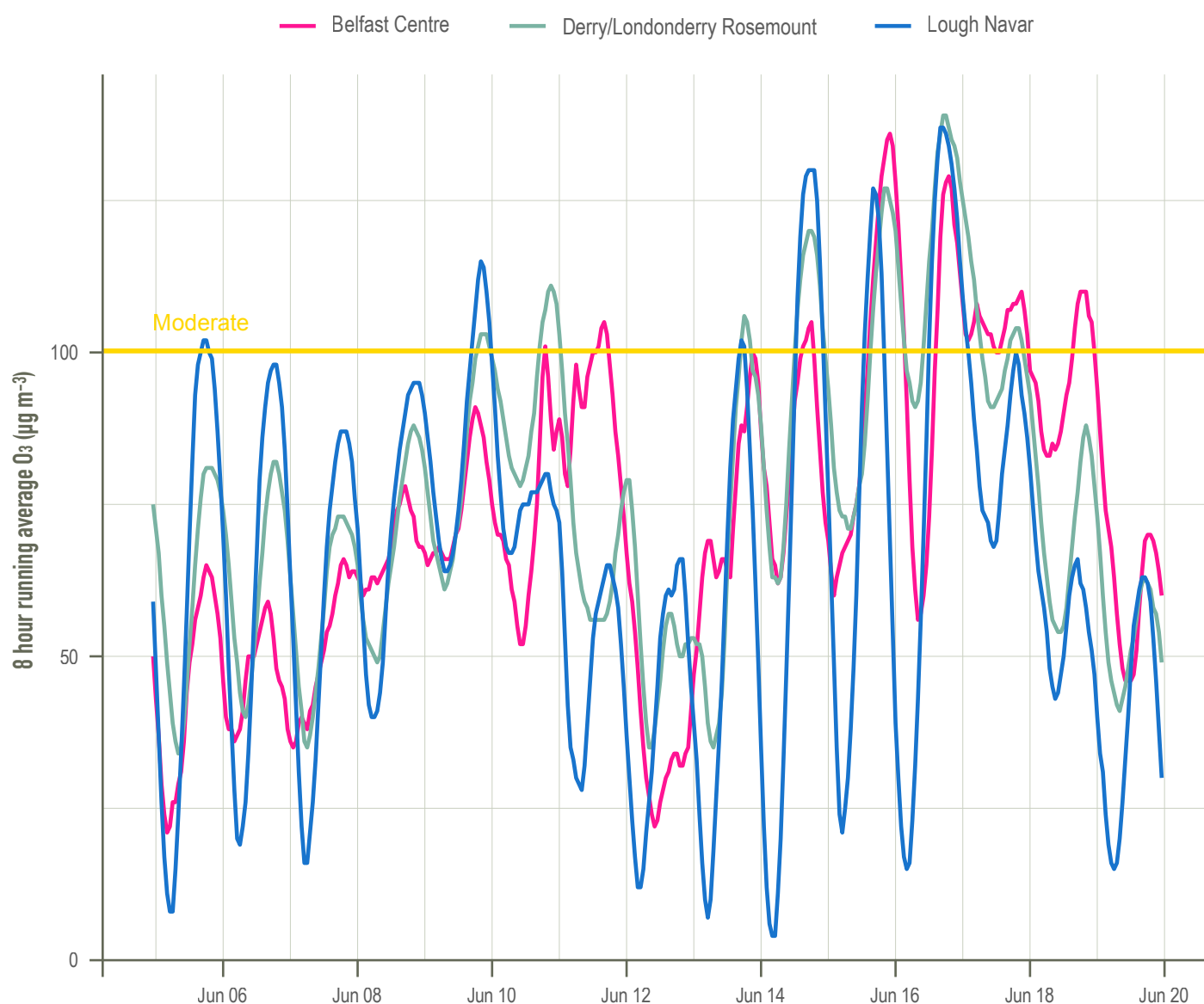


⁶ https://uk-air.defra.gov.uk/assets/documents/reports/cat09/2112200932_Ozone_in_the_UK_Recent_Trends_and_Future_Projections.pdf

A second Moderate ozone event occurred from 5 to 19 June 2023 (Figure 4.10). During the June episode, elevated ozone was observed across most

of the UK. This episode coincided with a period of warm and sunny weather, which can help to form ozone through photochemical reactions.

Figure 4.10: 'Moderate' Ozone Events June 2023





Dunluce Castle, Antrim

Summary

Air Quality Standards Regulations limit values, target values and corresponding AQS objectives have been met for the following pollutants in Northern Ireland:

- Particulate matter as PM₁₀
- Particulate matter as PM_{2.5}
- Nitrogen dioxide
- Carbon monoxide
- Benzene
- Sulphur dioxide
- The elements lead, arsenic, cadmium and nickel

Three of the four sites where benzo[a]pyrene was monitored in 2023 exceeded the AQS objective of 0.25 ng m⁻³.

One site, Lough Navar exceeded the AQS objective for ozone of 100 µg m⁻³ 13 times, more than the permitted 10 days in 2023.

A summary of compliances for the pollutants measured in Northern Ireland with the Air Quality Standards Regulations Limits/Targets, the UK Air Quality Strategy Objectives and the WHO Air Quality Guidelines 2021, is shown in Table 4.1.

Table 4.1: Summary of compliances for pollutants measured in Northern Ireland in 2023

Pollutant	Monitoring sites	Averaging time	Air Quality Standards Regulations (Northern Ireland) Limits/ Targets	Compliance	UK Air Quality Strategy Objective	Compliance	WHO Air Quality Guidelines 2021	Compliance
PM _{2.5} µg m ⁻³	Ballymena Ballykeel Belfast Centre Derry/Londonderry Rosemount Lisburn Dunmurry Seymour Hill Lough Navar Newtownstewart North Down Holywood A2 Strabane Springhill Park Strathfoyle Bawnmore Place	Annual Mean	25	Compliant	20	Compliant	5	Non-compliant at all sites except Lough Navar
		24 hour	–	–	–	–	15 (not to be exceeded more than 3 – 4 times a year)	Non-compliant at all sites except Lough Navar
PM ₁₀ µg m ⁻³	Armagh Lonsdale Road Ballymena Ballykeel Belfast Centre Belfast Stockman's Lane Derry/Londonderry Rosemount Lisburn Dunmurry Seymour Hill Lough Navar Newry Canal Street Newtownstewart North Down Holywood A2 Strabane Springhill Park Strathfoyle Bawnmore Place	Annual Mean	40	Compliant	40	Compliant	15	Non-compliant at the following sites: Belfast Stockman's Lane Newry Canal Street
		24 hour	50 (not to be exceeded more than 35 times a year)	Compliant	50 (not to be exceeded more than 35 times a year)	Compliant	45	Non-compliant at Newry Canal Street
O ₃ µg m ⁻³	Derry/Londonderry Rosemount Lough Navar Belfast Centre	Daily maximum 8 hour running mean	120 (not to be exceeded more than 25 times a year, averaged over 3 years)	Compliant	100 (not to be exceeded more than 10 times a year)	Non-Compliant at Lough Navar (13 exceedances)	100	Non-compliant at all sites
NO ₂ µg m ⁻³	Armagh Lonsdale Road Ballymena Antrim Road Ballymena Ballykeel Belfast Centre Belfast Newtownards Road Belfast Ormeau Road Belfast Stockman's Lane Belfast Westlink Roden Street Castlereagh Dundonald Derry/Londonderry Dale's Corner Derry/Londonderry Rosemount Downpatrick Roadside Limavady Dungiven Newry Canal Street Newtownabbey Antrim Road North Down Holywood A2	Annual Mean	40	Compliant	40	Compliant	10	Non-compliant at all sites except Ballymena Ballykeel and Derry/Londonderry Rosemount
		24 hour	–	–	–	–	25	Non-compliant at all sites
		1 hour	200 (not to be exceeded more than 18 times a calendar year)	Compliant	200 (not to be exceeded more than 18 times a calendar year)	Compliant	200	Non-compliant at Limavady Dungiven (3 exceedances)
SO ₂ µg m ⁻³	Ballymena Ballykeel Belfast Centre Derry/Londonderry Rosemount Strabane Springhill Park	24 hour	125 (not to be exceeded more than 3 times a year)	Compliant	125 (not to be exceeded more than 3 times a year)	Compliant	40	Compliant
CO mg m ⁻³	Belfast Centre	24 hour	–	–	–	–	4	Compliant
		Daily maximum 8 hour running mean	10	Compliant	10	Compliant	10	Compliant
		1 hour	–	–	–	–	35	Compliant
		15 minute	–	–	–	–	100	Compliant

Where to Find Out More About Air Quality

The Northern Ireland Air Quality website at www.airqualityni.co.uk provides information covering all aspects of air pollution in Northern Ireland.

DAERA's website at <https://www.daera-ni.gov.uk> provides links to information on a range of environmental issues including biodiversity, waste and pollution. DAERA's 'Protect the Environment' web page at <https://www.daera-ni.gov.uk/topics/protect-environment> covers air quality, climate change and local environmental issues including noise.

National and local air quality forecasts are available from:

- The Defra UK Air Information Resource (UK-AIR) - <http://uk-air.defra.gov.uk>
- The Northern Ireland Air Quality website - <https://www.airqualityni.co.uk>
- The Environmental Protection Agency (Ireland) Air Quality website - <https://www.airquality.ie>

Download the Northern Ireland Air app for iPhone and Android, keeping you updated about air pollution in Northern Ireland - <https://www.airqualityni.co.uk/stay-informed>

The app provides:

- Easy access to the latest pollution levels from the monitoring sites
- Colour-coded map showing the pollution forecasts
- Approved health advice based on the pollution levels
- Subscribe to free alerts when moderate, high and very high pollution is forecast.

DAERA, in conjunction with Department of Health, provide the "Air Aware" SMS subscription service. This service allows members of the public to receive SMS text alerts when periods of high air pollution are forecast or being experienced in Northern Ireland. The service is targeted at those with chronic health conditions such as heart disease and lung disease, who may be affected by air quality. The service can be initiated by texting 'AIR' to **07984405722**.

For information on air quality issues in your local area please contact the Environmental Health Department of your district council: <https://www.nidirect.gov.uk/contacts/local-councils-in-northern-ireland>



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This report has been produced by Ricardo on behalf of the Department of Agriculture, Environment and Rural Affairs

Air Aware

Do you suffer from a chronic illness that affects your breathing?

You can receive alerts FREE to your mobile phone to let you know when air pollution levels are high.

Just text **Air** to **079 8440 5722** or download the **Northern Ireland Air App**

If you use regular treatment for respiratory problems and think your breathing may be affected by air pollution levels, consider adjusting your treatment as you would do for a normal increase in symptoms. If this is not effective, consult your doctor.

You may wish to consider avoiding busy, congested streets and not participating in strenuous outdoor activity on days when air pollution levels are high.

If you suffer from a heart condition and notice a change in your symptoms, you should seek medical advice as you normally would.



For more information visit: www.airqualityni.co.uk

Text messages to the service will be charged at your normal standard rate. Alerts are received free of charge. To opt out, text STOPAIR to 079 8440 5722



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