Dublin Airport Air Quality Monitoring
Annual Report 2022

Sustainability Department

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Glossary

Abbreviation	Definition
EPA	Environmental Protection Agency
NO	Nitrogen Oxide
NO_2	Nitrogen Dioxide
NOx	Oxides of Nitrogen
PM_{10}	Airborne Particulate Matter, particle size less than 10 micron.
AQIH	Air Quality Index for Health
The Regulations	Ambient Air Quality Standards Regulations 2011

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Executive Summary

daa undertakes a programme of air quality monitoring at Dublin Airport (DAP) and in surrounding communities. Monitoring is undertaken using a stationary continuous air monitoring station located within the DAP boundary. Air quality is also monitored at 11 locations within and outside the airport boundary using passive diffusion tube sampling.

This report provides an overview of the results of air quality monitoring undertaken by daa at DAP in 2022. Air monitoring locations are listed in Table 1 and presented as Figure 1 of this report.

The Ambient Air Quality Standards Regulations 2011 (the Regulations), S.I. No. 180 of 2011, implement EU Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe. The Regulations are referred to in this report for comparison purposes only. It should be noted that there is no requirement under the Regulations for individual companies or operators to carry out air monitoring. In Ireland, compliance with the Regulations is the responsibility of the Environmental Protection Agency (EPA), which is deemed to be the competent authority for the purpose of EU Directive 2008/50/EC. The EPA is required to submit an annual Air Quality report to the Minister of Communications, Climate Action and the Environment and to the European Commission. The latest EPA Report entitled “Air Quality in Ireland 2021” was published in September 2022 and is available on the EPA website. The 2022 report will likely be published later in 2023.

Data collected from all of the daa monitoring locations presented in this report were within the limit values mandated in the 2011 Regulations. The results of the NO_2 and PM_{10} concentrations using the online analyser indicate concentrations are below the relevant annual limit value of 40µg/m³ and within the allowed criteria of short-term limit values. The average annual emissions for NO_2 was 19 µg/m^3. Passive sampling NO_2 results have been largely consistent with 2021 concentrations. The highest NO_2 concentrations were recorded at the Dublin Airport bus depot which experiences significant vehicular activity. daa will continue to closely monitor trends in air quality monitoring results at this location.

In collaboration with the EPA, Dublin Airport’s continuous air monitoring station can be viewed live on the EPA website: https://airquality.ie/. This further demonstrates daa’s commitment to work with regulators and communities to ensure that there is transparency about air quality information at the airport.

1.0 Introduction

1.1 Background

Dublin Airport (DAP) is located approximately 10km north of Dublin city. The areas to the west of the airport are predominantly rural in nature. The airport is surrounded by Swords Village to the north and Santry to the south. The airport is bounded on two sides by the busiest motorways in the country: the M1 and the M50. The M1 motorway is approximately 1km east of the current location of the airport's onsite air quality monitoring station and the M50 motorway is approximately 2.5km south of the monitoring location.

1.2 Purpose

The purpose of this report is to present an overview of the results of air quality monitoring conducted onsite at DAP and at external monitoring locations in the vicinity of the airport in 2022. The Ambient Air Quality Standards Regulations 2011 (the Regulations), S.I. No. 180 of 2011, implement EU Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe. This report compares the data collected during daa's monitoring programme with limit values contained in The Ambient Air Quality Standards Regulations 2011 (the Regulations) to assess air quality at each monitoring location.

The Regulations are referred to in this report for comparison and reference purposes only. There is no requirement under the Regulations that companies or operators shall carry out air quality monitoring. In Ireland, compliance with the Regulations is the responsibility of the Environmental Protection Agency (EPA), which is deemed to be the competent authority.

A range of parameters are recorded at DAP's continuous on-site monitoring station as follows:

- Sulphur dioxide (SO_2);
- Oxides of nitrogen NO_x (NO and NO_2);
- Carbon monoxide (CO);
- Ozone (O_3);
- Particulate Matter (PM_{10}).

Diffusion tube samplers located in communities surrounding the airport monitor the following parameters:

- Sulphur dioxide
- Nitrogen Dioxide (NO_2);
- Benzene;
- Ethylbenzene;
- m- and p-Xylene;
- o-Xylene;
- Toluene;
- Ozone.

The results of air quality monitoring for all of the above parameters are reviewed by daa on a continuous basis.

To date and in line with air quality reporting at many airports, daa has focussed reporting on the most important parameters:

- Nitrogen Dioxide (NO_2) and Particulate Matter (PM_{10}) at the DAP automatic station; and
- Nitrogen Dioxide (NO_2) and Benzene using diffusion tubes at 11 offsite locations.

2.0 Monitoring Locations

A list of the ambient air quality sampling locations is presented in Table 1. Sampling locations are presented in Figure 1.

Ref	Location	Method	Parameters
On-site	Dublin Airport	Continuous analyser	**NO_2** **PM_{10}**
A1	Forrest Little Golf Club	Passive Tubes	**NO_2** **Benzene**
A2	Kilreesk Lane, St. Margaret's	Passive Tubes	
A3	Ridgewood Estate West, Swords	Passive Tubes	
A4	St. Margaret's School and Parish House	Passive Tubes	
A5	Fire Station, Huntstown, Dublin Airport	Passive Tubes	
A6	Southern Boundary Fence, Dublin Airport	Passive Tubes	
A7	Western Boundary Fence, Dublin Airport	Passive Tubes	
A8	St. Nicholas of Myra School, Malahide Road	Passive Tubes	
A9	Naomh Mearnóg GAA Club, Portmarnock.	Passive Tubes	
A10	Oscar Papa Site, Portmarnock.	Passive Tubes	
A11	Airport Bus Depot	Passive Tubes	

Table 1 Community Ambient Air Quality Monitoring Locations

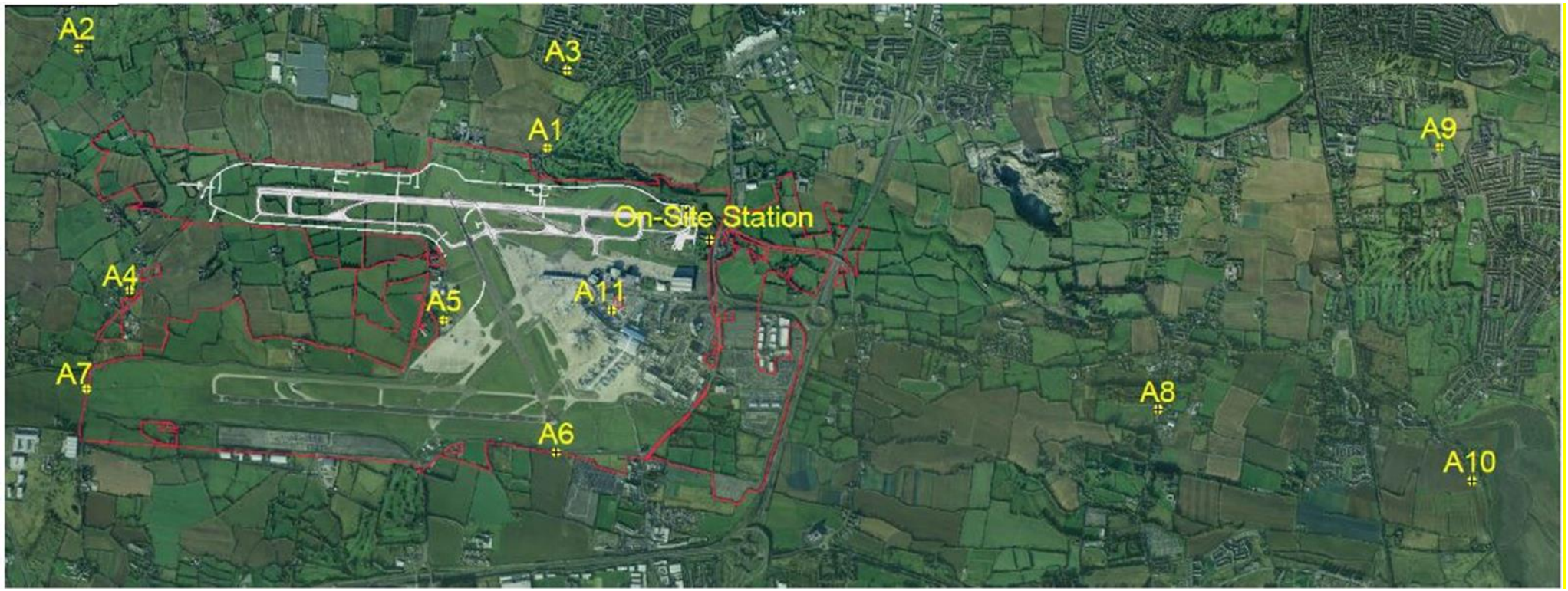


Figure 1 Air Quality Monitoring Locations

3.0 Parameters and Sampling Methodology

3.1 Offsite Passive Sampling

3.1.1 Nitrogen Dioxide (NO_2) and Benzene (C_6H_6)

daa has installed a network of passive diffusion tube samplers in areas surrounding the airport. Monitoring locations are shown on Figure 1 and listed in Table 1. The diffusion tubes are exposed for approximately 4-week intervals and record monthly mean concentrations. The tubes are analysed using UV Spectrophotometry at a UKAS (United Kingdom Accreditation Service) accredited laboratory. Results are expressed in µg/m³ (micrograms per cubic metre). Monthly mean concentrations have been averaged to give an annual mean, presented in Figure 2, which can be compared with limit values.

3.2 Onsite Sampling

3.2.1 Equipment Calibration

An external expert service provider undertakes routine servicing of the DAP air quality monitoring equipment. Additionally, the monitoring station undergoes a full service twice yearly. During routine visits, air filters are replaced, and the instruments are calibrated to EPA gas standards. The technician also inspects the functionality of the station and sampling system. An emergency call-out service is also offered by the service provider as and when required. The calibration process takes approximately 24 hours and data collection resumes after this 24-hour period. The dates of calibration and maintenance of the air monitoring equipment in 2022 were as follows:

- 10th March
- 26th April
- 16th May
- 1st June
- 7th July
- 8th August

Calibration visits were not completed at the DAP continuous air quality monitor in Q4 2022 due to delays in engineer availability from the service provider arising as a result of Brexit. The service provider has advised that attendance delays for customers in Ireland will be reduced from Q1 2023.

In 2022, due to down times of the monitoring equipment during calibration and equipment malfunction approximately 94% of NO_2 data and 98% of PM_{10} was captured.

3.2.2 Nitrogen Dioxide (NO_2)

Onsite monitoring of NO_2 is carried out on a continuous basis at the continuous airport monitoring station. Measurement of NO_2 is carried out using a Horiba APNA-370 ambient NOx monitor which employs a crossflow modulated chemiluminescence method. The results are expressed in µg/m³.

3.2.3 Particulate Matter (PM_{10})

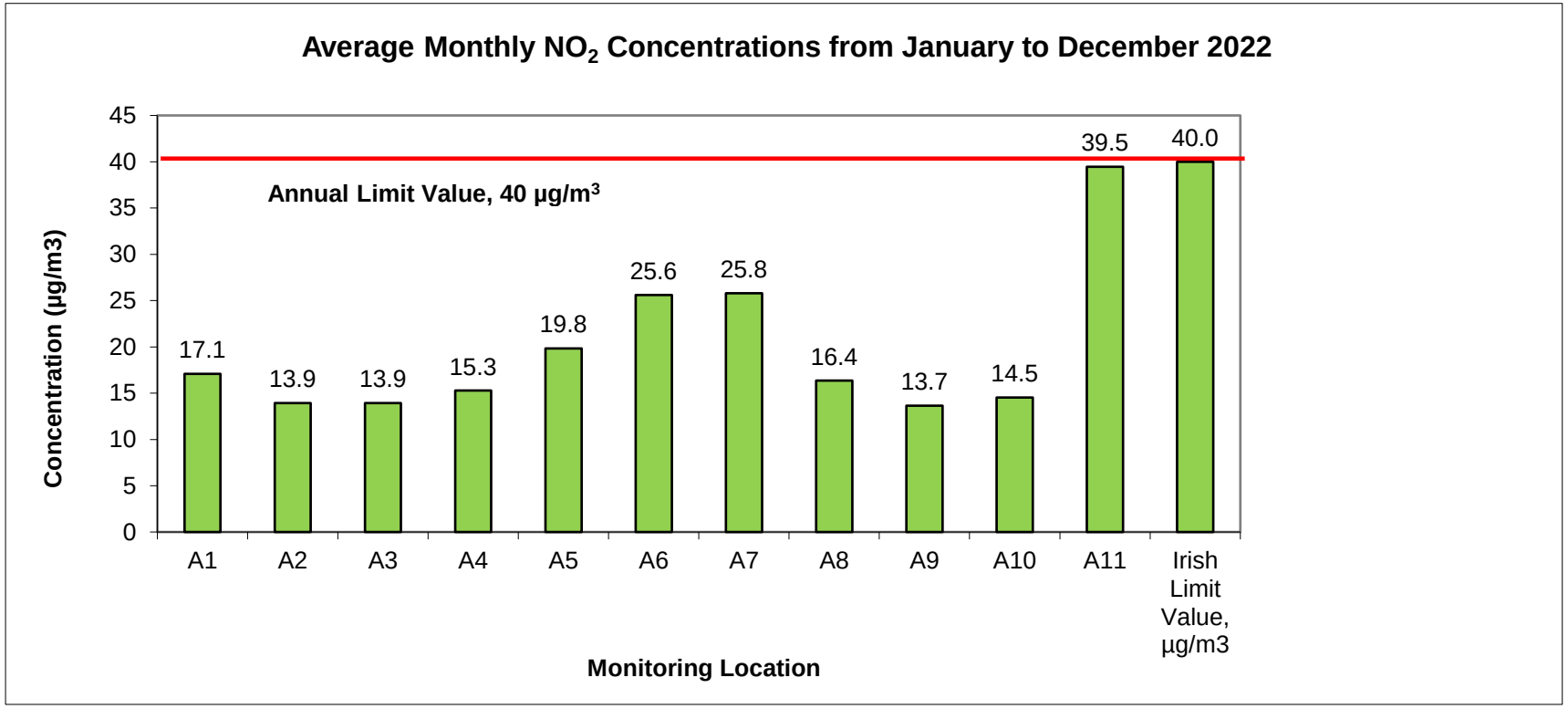
PM_{10} is defined as airborne particulate matter with an aerodynamic diameter equal to or less than 10µm. PM_{10} is monitored on a continuous basis at the airport monitoring station.

The PM_{10} instrument automatically measures and records airborne particulate concentration levels using the principle of beta ray attenuation. The sampler monitors the PM_{10} content of air by drawing a measured volume of air through a chamber containing a pre-conditioned and pre-weighed filter in accordance with the internationally accepted US EPA protocol for PM_{10} sampling. The results are expressed in µg/m³.

4.0 Monitoring Results

4.1 Offsite NO_2 Monitoring Results

Figure 2 presents the annual mean NO_2 concentration for each location based on the monthly passive tube sampling. The Regulations mandate that the annual mean limit value must be below 40 µg/m³ for NO_2. As can be seen from Figure 2, the annual mean values were below the limit at all locations. It is noted that the Terminal 1 staff shuttle bus stop was suspended from 2nd June 2022 to accommodate the temporary installation of covered areas for passengers outside Terminal 1.This bus stop reopened in Q4 on 10th October 2022.



**A11 is the bus depot*

Figure 2: 2022 Average NO_2 Concentrations by location

4.2 Offsite Benzene (C_6H_6) Monitoring Results

Figure 3 presents the mean Benzene concentration for each location, based on the monthly passive tube sampling in 2022. The Regulations mandate an annual mean limit value of 5 µg/m³ for Benzene. As can be seen from Figure 3, the annual mean values were well below the limit value of 5 µg/m³ and less than 1 µg/m³ at all monitoring locations.

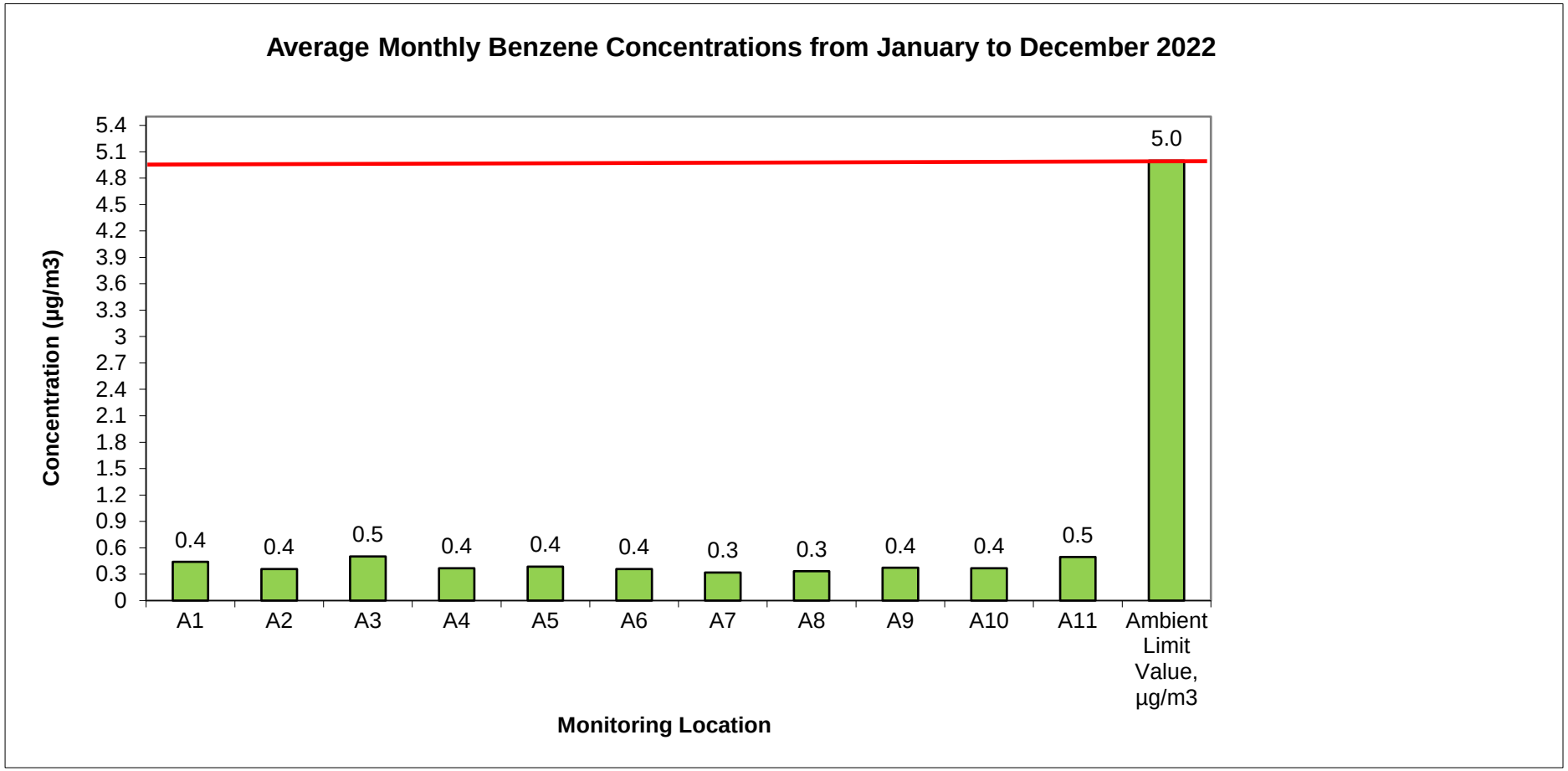


Figure 3: 2022 Average Monthly Benzene (C_6H_6) Concentrations by location

4.3 Odours

Fuel odours may arise from many sources including road traffic, ground handling equipment as well as aircraft on the ground. Depending on weather conditions, odours from fuel (hydrocarbons) may be detected at locations close to the airport. As discussed in section 4.2 of this report, diffusion tubes' results for benzene indicate that the average concentrations are well below the national limit value at all locations.

The human nose is extremely sensitive and can detect very low concentrations of hydrocarbons in the air. Weather also impacts the dispersion of odour and affects the strength of odour and locations affected.

4.4 On-site Airport Monitoring Station Results: Daily Average NO_2

NO_2 concentrations are measured at the automatic station at DAP. Figure 4 presents the daily average NO_2 concentrations measured during 2022. The equivalent daily average was calculated as 19 µg/m^3.

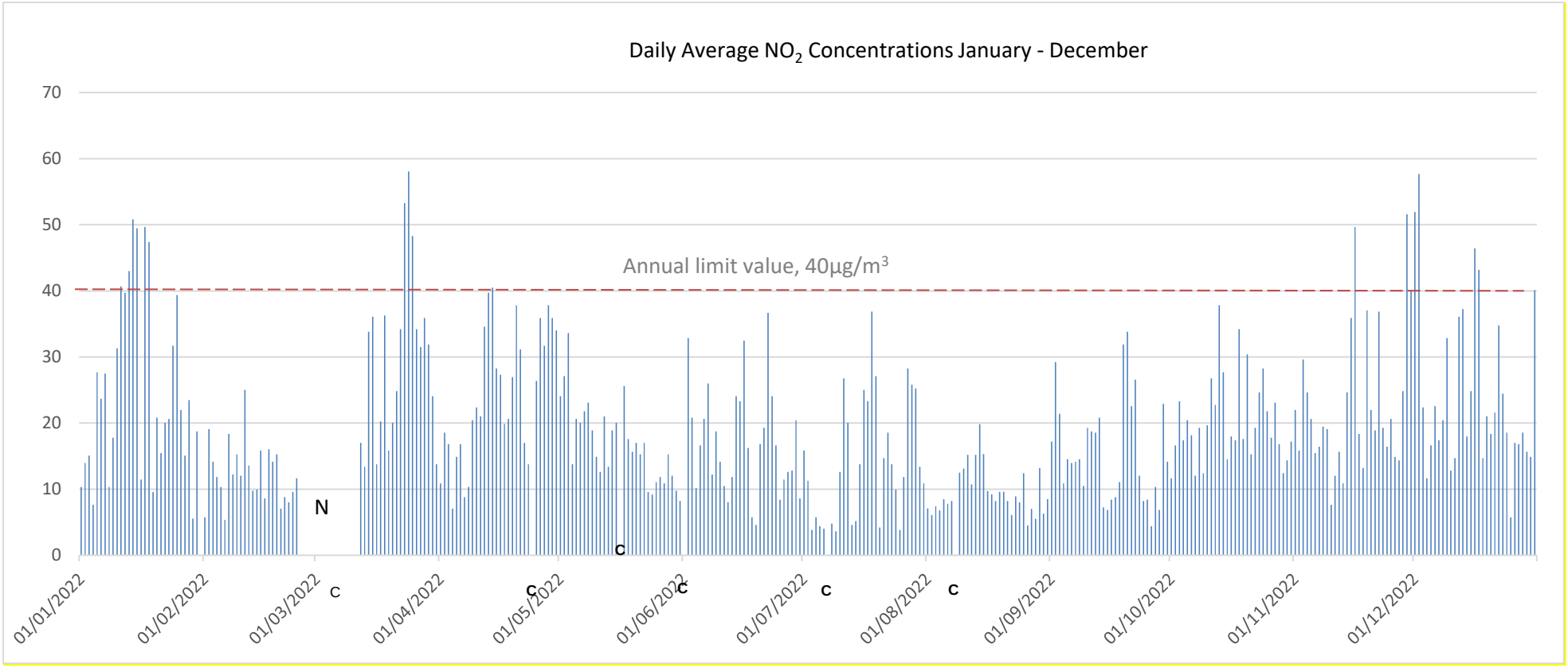


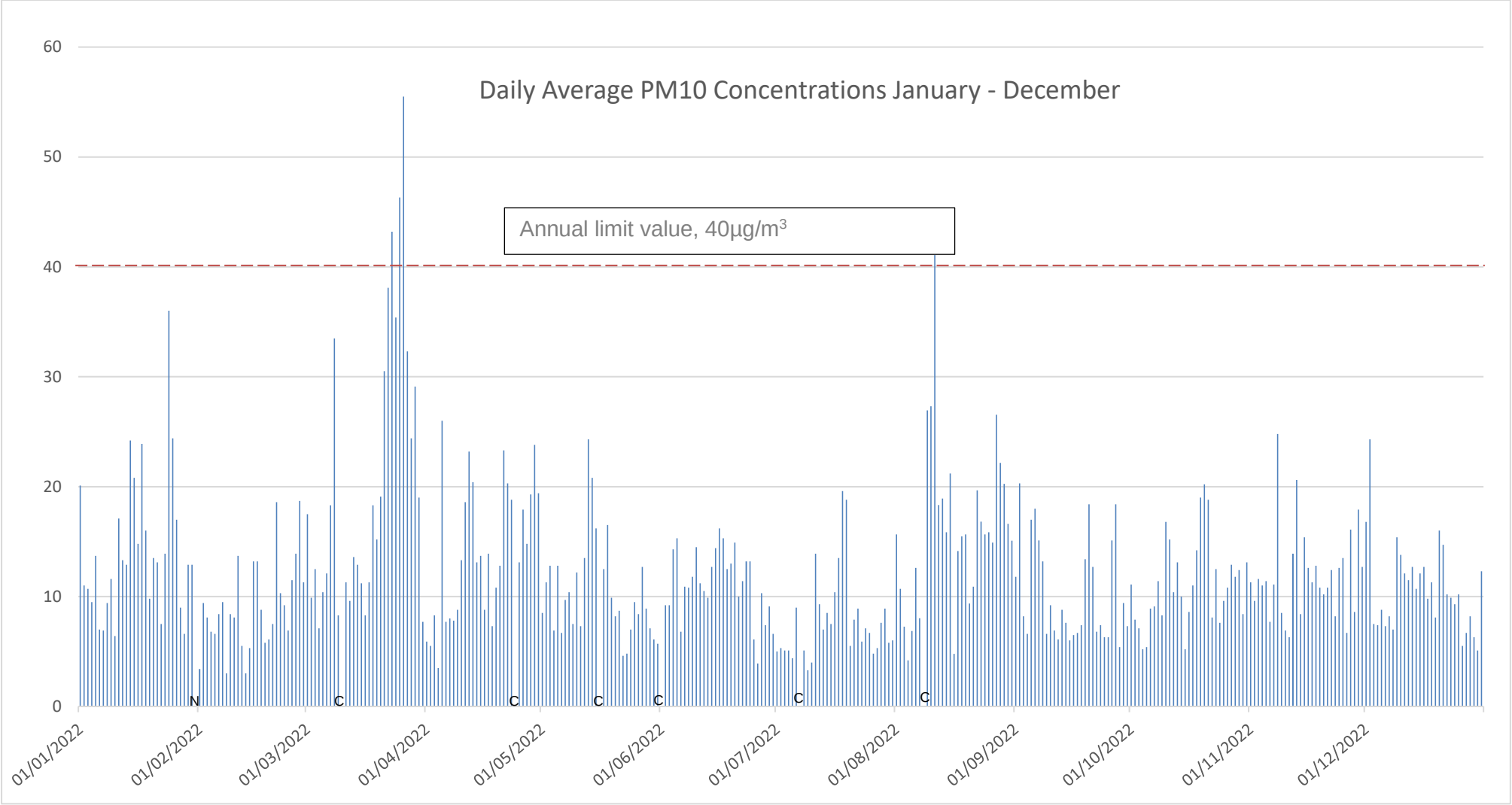
Figure 4: Daily Average NO_2 2022

4.5 On-site Airport Monitoring Station Results: PM_{10}

Daily average PM_{10} concentrations recorded at the automatic station in DAP in 2022 are presented in Figure 5. The mean PM_{10} was calculated as 12 µg/m^3. The Regulations set a 24-hour PM_{10} limit value of 50 µg/m^3, and an annual mean limit value of 40 µg/m³ as shown in Table 2.

Objective	Averaging Period	Limit or Threshold Value (µg/m^3)	No. of Allowed Exceedances (Regulations 2011)	No. of Exceedances
PM_{10} Limit Value	24 hour	50	Not to be exceeded on more than 35 days per year	1
PM_{10} Limit Value	Calendar Year	40	NA	NA

Table 2 PM_{10} Limit Values



N – No Data

C – Calibration

Figure 5: Daily Average PM_{10} 2022

5.0 Onsite: Annual Average NO_2 and PM_{10} (2012- 2022)

Annual mean NO_2 and PM_{10} are presented in Table 3 for the automatic station onsite at DAP. The trends over ten years are shown in Figure 6. For both parameters, annual limits are below the threshold limits outlined in the Regulations.

Location	Year	NO_2 (µg/m³)	PM_{10} (µg/m³)
Dublin Airport Station	2022	19	12
	2021	19	11
	2020	22	16
	2019	28	18
	2018	28	20
	2017	20	21
	2016	23	23
	2015	22	20
	2014	22	21
	2013	19	23
	2012	19	20
Annual Limit Value	**Regulations**	**40**	**40**

Table 3 Annual Mean NO_2 and PM_{10} Concentrations at Dublin Airport

Notes
1. Values rounded to the nearest number.

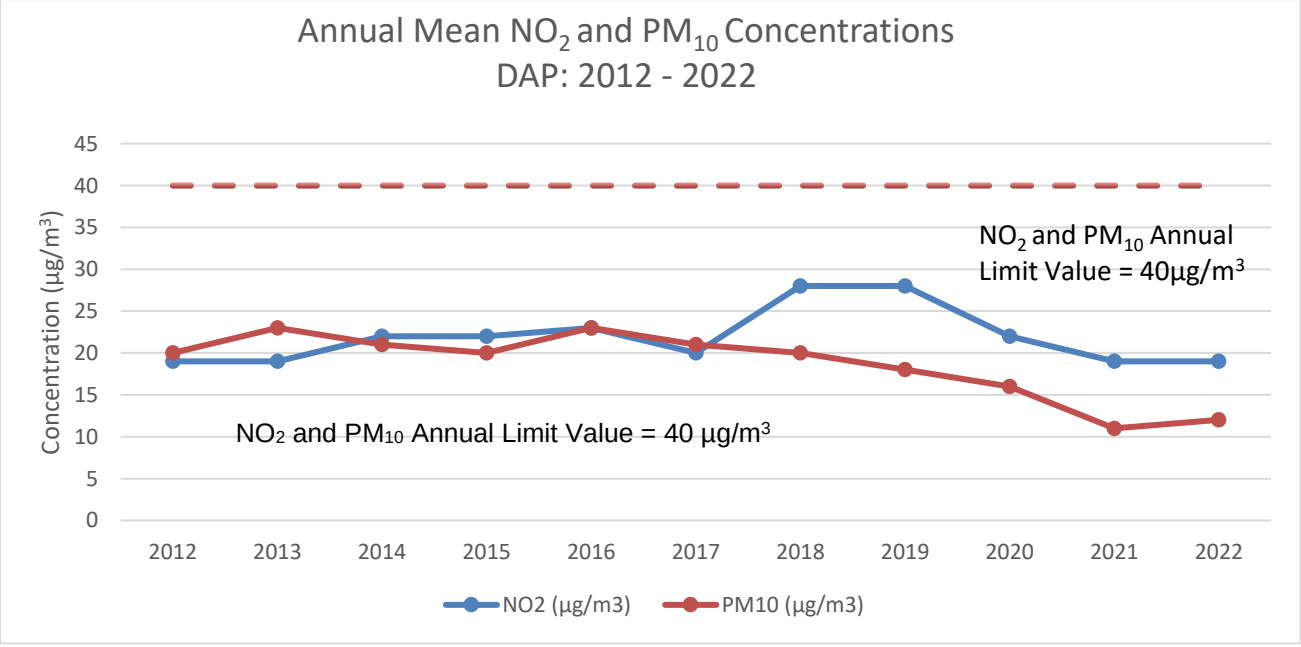


Figure 6 Annual Mean NO_2 and PM_{10} Concentrations at Dublin Airport

PM_{10} and NO_2 results monitored at DAP are well below limits contained in the Regulations. Elevated readings of PM_{10} and NO_2 can occur for a variety of reasons, from both natural and manmade sources including international volcanic eruptions, vehicle traffic, agriculture, industrial emissions, de-icing of roads, etc.

6.0 Results Summary

The EPA is the designated Competent Authority in Ireland for the coordination of ambient air quality monitoring in accordance with the Regulations and undertakes monitoring throughout the country. The tables below compare DAP's annual NO_2 and PM_{10} average concentrations with the EPA national network stations records for years 2012 - 2021.

Location	**NO_2 (µg/m^3)**									
	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022[1]**
Winetavern St.	31	31	31	37	27	29	28	15	24	
Rathmines	19	17	18	20	17	20	22	13	22	
Swords	15	14	15	16	14	16	15	11	13	
Blanchardstown	29	31	25	30	26	25	31	12	34	
Dublin Airport Station[2]	19	22	22	23	20	28*	28*	22	23	19
Annual Limit Value	**40**									

*elevated readings linked to construction activity.

Table 4 NO_2 comparisons with EPA national network stations (2013 – 2021)

Location	**PM_{10} (µg/m^3)**									
	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022[1]**
Winetavern St	14	14	14	14	13	14	15	13	12	
Rathmines	17	14	15	15	13	15	14	11	12	
Phoenix Park	14	12	12	11	9	11	11	10	10	
Blanchardstown	20	18	17	18	15	17	19	15	14	
Ennis	20	21	18	17	16	16	18	20	19	
Dublin Airport Station[2]	23	21	20	23	21	20	18	16	11	12
Annual Limit Value	**40**									

Table 5 PM_{10} comparisons with EPA national network stations (2013 – 2021)

Notes

1. 2022 EPA monitoring data has not yet been published.
2. Values rounded to the nearest whole number.

7.0 Conclusion

7.1 Onsite Monitoring

The results of the NO_2 and PM_{10} concentrations using the online analyser indicate concentrations are below the relevant annual limit value of 40µg/m³ and within the allowed criteria of short-term limit values. The annual average annual emissions for PM_{10} was 12 µg/m^3 while NO_2 was 19 µg/m^3.

In collaboration with the EPA, Dublin Airport's continuous air monitoring can be viewed on the EPA website at: https://airquality.ie/. daa is committed to working with regulators and the local community to ensure that there is transparency about air quality information at the airport.

7.2 Offsite Monitoring

NO_2 readings at Dublin Airport remained largely consistent between 2021 and 2022. While monitoring results at all locations were within the annual limit of 40µg/m³ the highest NO2 concentrations were identified at the Dublin Airport bus depot location (A11) with an average of 39.5 µg/m^3 recorded. A high volume of vehicular activity occurs in this area. In previous years preceding the COVID-19 pandemic, the annual average of NO_2 at this location has exceeded the ambient limit value. It is noted that the Terminal 1 staff shuttle bus stop was suspended from 2nd June until 10th October 2022 to accommodate the temporary installation of covered areas for passengers outside Terminal 1. daa will continue to closely monitor emission levels at this location.