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Dublin Airport Air Quality Monitoring  
Annual Report 2021

Sustainability Department

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**Dublin Airport Air Quality Monitoring**  
**Annual Report 2021**



## Contents

<b>1.0</b>	<b>Introduction .....</b>	<b>5</b>
1.1	Background.....	5
1.2	Purpose .....	5
<b>2.0</b>	<b>Monitoring Locations .....</b>	<b>7</b>
<b>3.0</b>	<b>Parameters and Sampling Methodology.....</b>	<b>9</b>
3.1	Offsite Passive Sampling .....	9
3.1.1	Nitrogen Dioxide (NO <sub>2</sub> ) and Benzene (C <sub>6</sub> H <sub>6</sub> ) .....	9
3.2	Onsite Sampling .....	9
3.2.1	Equipment Calibration .....	9
3.2.2	Nitrogen Dioxide (NO <sub>2</sub> ).....	10
3.2.3	Particulate Matter (PM <sub>10</sub> ) .....	10
<b>4.0</b>	<b>Monitoring Results.....</b>	<b>11</b>
4.1	Offsite NO <sub>2</sub> Monitoring Results .....	11
4.2	Offsite Benzene (C <sub>6</sub> H <sub>6</sub> ) Monitoring Results.....	12
4.3	Odours.....	13
4.4	On-site Airport Monitoring Station Results: Daily Average NO <sub>2</sub> .....	14
4.5	On-site Airport Monitoring Station Results: PM <sub>10</sub> .....	15
<b>5.0</b>	<b>Onsite: Annual Average NO<sub>2</sub> and PM<sub>10</sub> (2012- 2021).....</b>	<b>17</b>
<b>6.0</b>	<b>Results Summary .....</b>	<b>19</b>
<b>7.0</b>	<b>Conclusion.....</b>	<b>20</b>
7.1	Onsite Monitoring.....	20
7.2	Offsite Monitoring.....	20

## Figures

Figure 1 Air Quality Monitoring Locations.....	8
Figure 2: Average NO <sub>2</sub> Concentrations by location, 2021.....	11
Figure 3: Average Monthly Benzene (C <sub>6</sub> H <sub>6</sub> ) Concentrations by location 2021 .....	12
Figure 4: Daily Average NO <sub>2</sub> 2021 .....	14
Figure 5: Daily Average PM <sub>10</sub> 2021 .....	16
Figure 6 Annual Mean NO <sub>2</sub> and PM <sub>10</sub> Concentrations at Dublin Airport.....	17

## Tables

Table 1 Community Ambient Air Quality Monitoring Locations .....	7
Table 2 PM <sub>10</sub> Limit Values.....	15
Table 3 Annual Mean NO <sub>2</sub> and PM <sub>10</sub> Concentrations at Dublin Airport.....	17
Table 4 NO <sub>2</sub> comparisons with EPA national network stations (2013 – 2020) .....	19
Table 5 PM <sub>10</sub> comparisons with EPA national network stations (2013 – 2020).....	19

## Glossary

### Abbreviation Definition

EPA	Environmental Protection Agency
NO	Nitrogen Oxide
NO <sub>2</sub>	Nitrogen Dioxide
NO <sub>x</sub>	Oxides of Nitrogen
PM <sub>10</sub>	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 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 2021. 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 2020” was published in November 2021 and is available on the [EPA website](#). The 2021 report is expected to be published by the EPA later in 2022.

Data collected from the majority of daa monitoring locations presented in this report were within the limit values mandated in the 2011 Regulations. The results of the NO<sub>2</sub> and PM<sub>10</sub> concentrations using the online analyser indicate concentrations are below the relevant annual limit value of 40µg/m<sup>3</sup> and within the allowed criteria of short-term limit values. The average annual emissions for NO<sub>2</sub> was 19 µg/m<sup>3</sup>. A continued decrease in overall levels of NO<sub>2</sub> since 2019, can be linked to decrease in vehicle traffic around the airport due to ongoing COVID-19 restrictions. Passive sampling results of NO<sub>2</sub> have been largely consistent with 2020 results at all locations. The most notable change from pre-pandemic reporting remains the significant reduction in NO<sub>2</sub> readings at the airport bus depot (sample location A11) which can be linked to reduced passenger numbers and the resultant reduction in buses servicing the airport in 2021. As we come out of the COVID-19 restrictions we will continue to monitor emissions levels.

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 11 external monitoring locations in the vicinity of the airport in 2021. 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<sub>2</sub>);
- Oxides of nitrogen NO<sub>x</sub> (NO and NO<sub>2</sub>);
- Carbon monoxide (CO);
- Ozone (O<sub>3</sub>);
- Particulate Matter (PM<sub>10</sub>).

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

- Benzene;
- Nitrogen Dioxide (NO<sub>2</sub>);
- 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. Results are consistently below limit values (where limits exist).

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

- Nitrogen Dioxide (NO<sub>2</sub>) and Particulate Matter (PM<sub>10</sub>) at the DAP automatic station;  
and
- Nitrogen Dioxide (NO<sub>2</sub>) 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
<b>On-site</b>	Dublin Airport	Continuous analyser	<b>NO<sub>2</sub></b> <b>PM<sub>10</sub></b>
<b>A1</b>	Forrest Little Golf Club	Passive Tubes	<b>NO<sub>2</sub></b> <b>Benzene</b>
<b>A2</b>	Kilreesk Lane, St. Margaret's	Passive Tubes	
<b>A3</b>	Ridgewood Estate West, Swords	Passive Tubes	
<b>A4</b>	St. Margaret's School and Parish House	Passive Tubes	
<b>A5</b>	Fire Station, Huntstown, Dublin Airport	Passive Tubes	
<b>A6</b>	Southern Boundary Fence, Dublin Airport	Passive Tubes	
<b>A7</b>	Western Boundary Fence, Dublin Airport	Passive Tubes	
<b>A8</b>	St. Nicholas of Myra School, Malahide Road	Passive Tubes	
<b>A9</b>	Naomh Mearnóg GAA Club, Portmarnock.	Passive Tubes	
<b>A10</b>	Oscar Papa Site, Portmarnock.	Passive Tubes	
<b>A11</b>	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<sub>2</sub>) and Benzene (C<sub>6</sub>H<sub>6</sub>)

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/m<sup>3</sup> (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 monthly 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 monthly 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 2021 were as follows:

- 28<sup>th</sup> January
- 22<sup>nd</sup> February
- 30<sup>th</sup> March
- 19<sup>th</sup> April
- 31<sup>st</sup> May
- 25<sup>th</sup> June
- 26<sup>th</sup> July
- 08<sup>th</sup> September
- 30<sup>th</sup> September
- 01<sup>st</sup> November
- 22<sup>nd</sup> December

In 2021, due to down times of the monitoring equipment during calibration, equipment malfunction and a minor power outage due to construction works near the monitoring station, approximately 87% of NO<sub>2</sub> data and 93% of PM<sub>10</sub> was captured.

### **3.2.2 Nitrogen Dioxide (NO<sub>2</sub>)**

Onsite monitoring of NO<sub>2</sub> is carried out on a continuous basis at the continuous airport monitoring station. Measurement of NO<sub>2</sub> is carried out using a Horiba APNA-370 ambient NO<sub>x</sub> monitor which employs a crossflow modulated chemiluminescence method. The results are expressed in µg/m<sup>3</sup>.

### **3.2.3 Particulate Matter (PM<sub>10</sub>)**

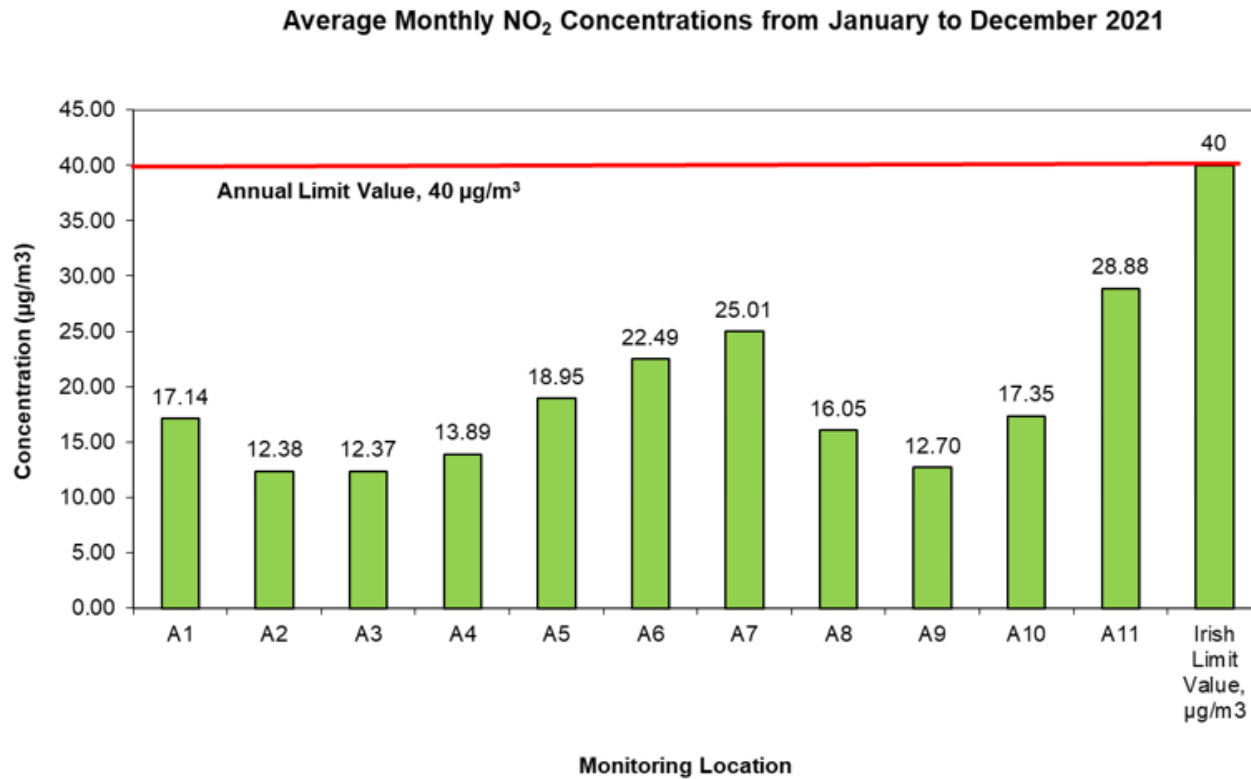
PM<sub>10</sub> is defined as airborne particulate matter with an aerodynamic diameter equal to or less than 10µm. PM<sub>10</sub> is monitored on a continuous basis at the airport monitoring station.

The PM<sub>10</sub> instrument automatically measures and records airborne particulate concentration levels using the principle of beta ray attenuation. The sampler monitors the PM<sub>10</sub> 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<sub>10</sub> sampling. The results are expressed in µg/m<sup>3</sup>.

## 4.0 Monitoring Results

### 4.1 Offsite NO<sub>2</sub> Monitoring Results

Figure 2 presents the annual mean NO<sub>2</sub> 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/m<sup>3</sup> for NO<sub>2</sub>. As can be seen from Figure 2, the annual mean values were well below the limit.



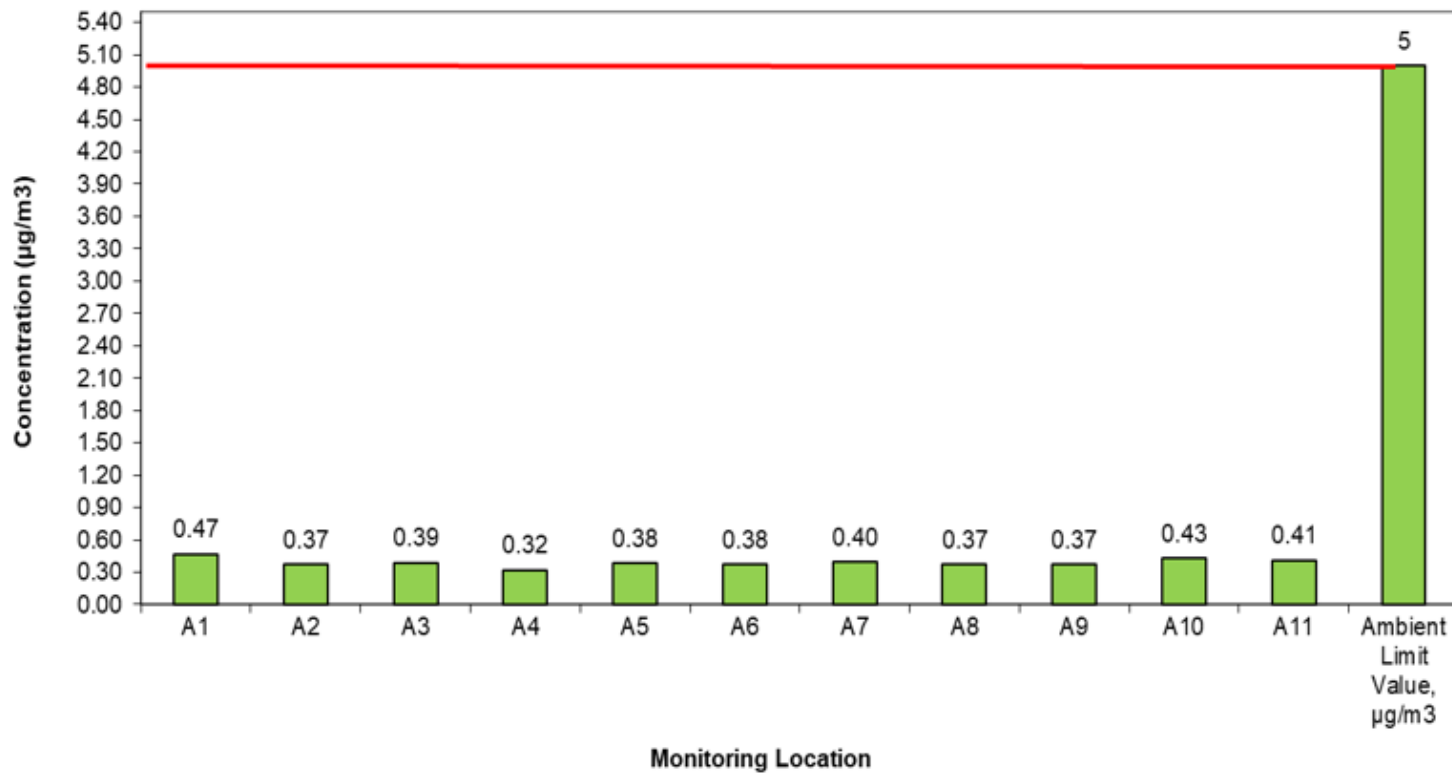
\*A11 is the bus depot

**Figure 2:** Average NO<sub>2</sub> Concentrations by location, 2021

### 4.2 Offsite Benzene (C<sub>6</sub>H<sub>6</sub>) Monitoring Results

Figure 3 presents the mean Benzene concentration for each location, based on the monthly passive tube sampling in 2021. The Regulations mandate an annual mean limit value of 5 µg/m<sup>3</sup> for Benzene. As can be seen from Figure 3, the annual mean values were well below the limit value of 5 µg/m<sup>3</sup> and less than 1 µg/m<sup>3</sup> at all monitoring locations.

**Average Monthly Benzene Concentrations from January to December 2021**



**Figure 3:** Average Monthly Benzene (C<sub>6</sub>H<sub>6</sub>) Concentrations by location 2021

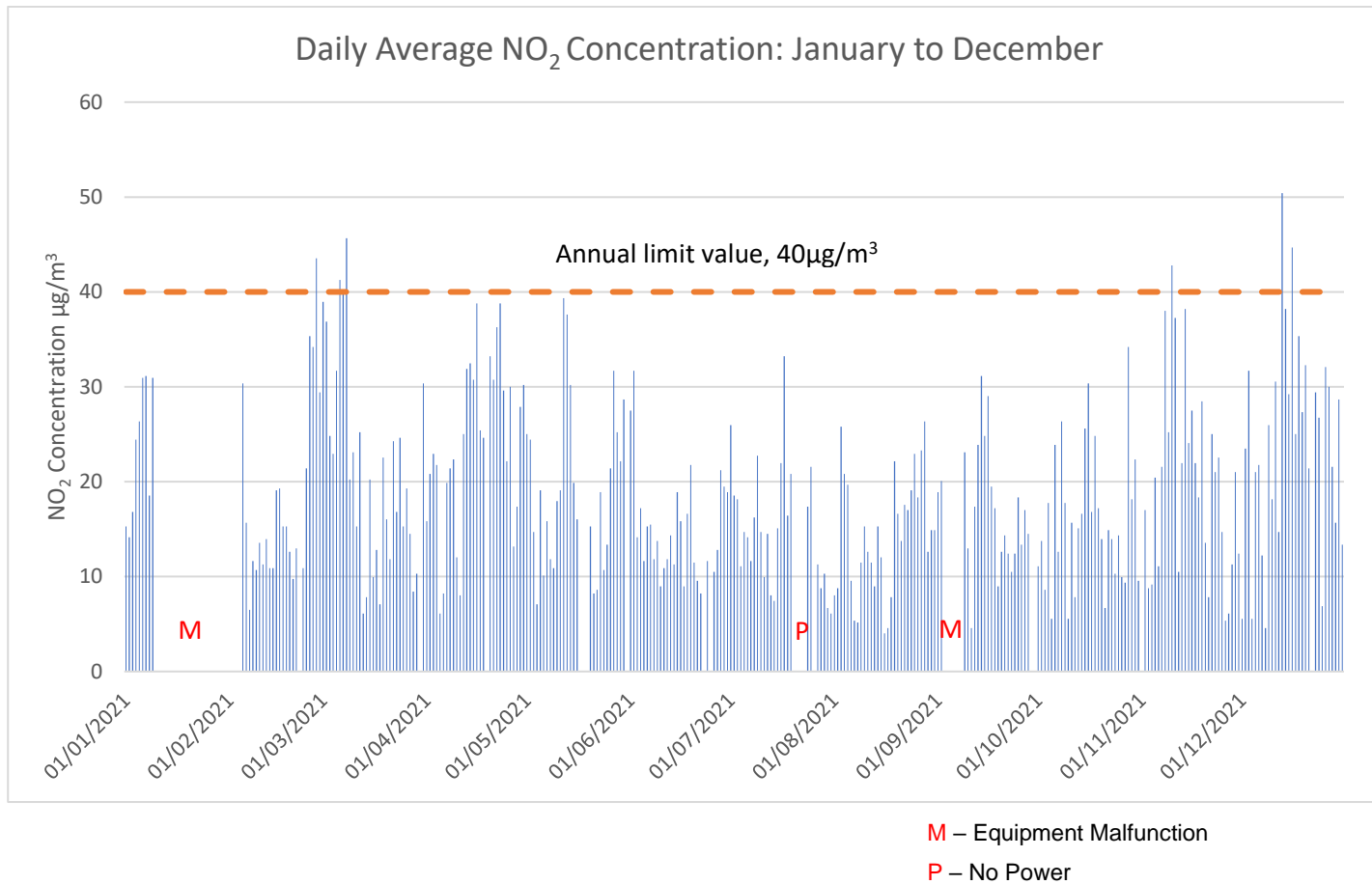
### **4.3 Odours**

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<sub>2</sub>

NO<sub>2</sub> concentrations are measured at the automatic station at DAP. Figure 4 presents the daily average NO<sub>2</sub> concentrations measured during 2021. The equivalent daily average was calculated as 19 µg/m<sup>3</sup>.



**Figure 4:** Daily Average NO<sub>2</sub> 2021

#### 4.5 On-site Airport Monitoring Station Results: PM<sub>10</sub>

Daily average PM<sub>10</sub> concentrations recorded at the automatic station in DAP in 2021 are presented in Figure 5. The mean PM<sub>10</sub> was calculated as 11 µg/m<sup>3</sup>. The Regulations set a 24-hour PM<sub>10</sub> limit value of 50 µg/m<sup>3</sup>, and an annual mean limit value of 40 µg/m<sup>3</sup> as shown in Table 2.

Objective	Averaging Period	Limit or Threshold Value (µg/m <sup>3</sup> )	No. of Allowed Exceedances (Regulations 2011)	No. of Exceedances
PM <sub>10</sub> Limit Value	24 hour	50	Not to be exceeded on more than 35 days per year	0
PM <sub>10</sub> Limit Value	Calendar Year	40	NA	NA

**Table 2** PM<sub>10</sub> Limit Values



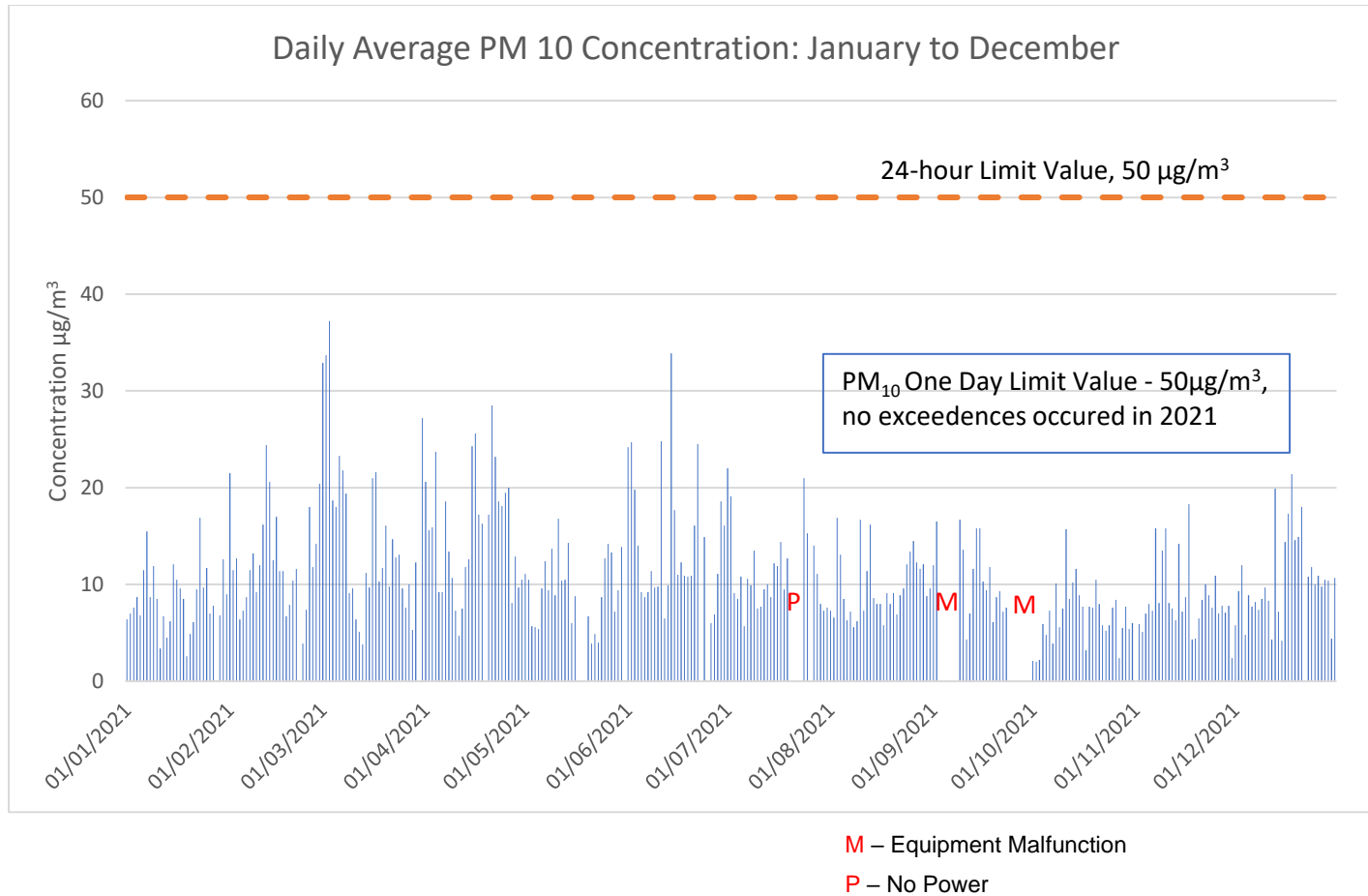


Figure 5: Daily Average PM<sub>10</sub> 2021

## 5.0 Onsite: Annual Average NO<sub>2</sub> and PM<sub>10</sub> (2012- 2021)

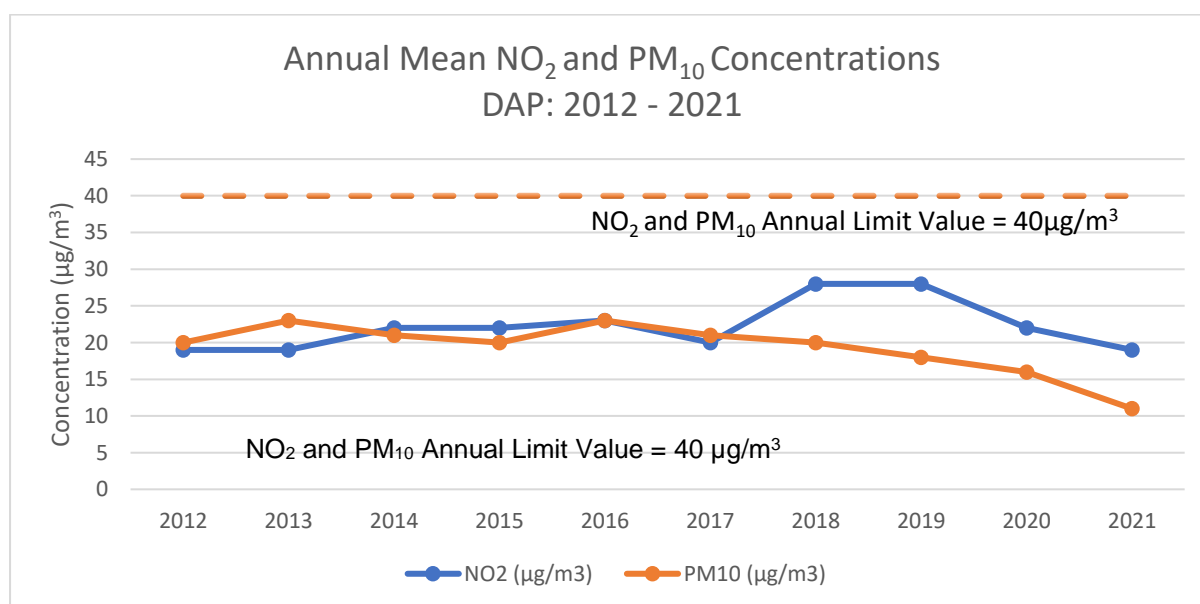
Annual mean NO<sub>2</sub> and PM<sub>10</sub> are presented in Table 3 for the automatic station onsite at DAP. The trends over ten years are shown in Figure 6. For both parameters, annual limits are below the threshold limits contained within the Regulations.

Location	Year	NO <sub>2</sub> (µg/m <sup>3</sup> )	PM <sub>10</sub> (µg/m <sup>3</sup> )
Dublin Airport Station	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
<b>Annual Limit Value</b>	<b>Regulations</b>	<b>40</b>	<b>40</b>

**Table 3** Annual Mean NO<sub>2</sub> and PM<sub>10</sub> Concentrations at Dublin Airport

### Notes

1. Values rounded to the nearest number.



**Figure 6** Annual Mean NO<sub>2</sub> and PM<sub>10</sub> Concentrations at Dublin Airport

PM<sub>10</sub> and NO<sub>2</sub> results monitored at DAP are well below limits contained in the Regulations and have decreased compared to previous years. Elevated readings of PM<sub>10</sub> and NO<sub>2</sub> can occur for a variety of reasons, from both natural and manmade sources including

international volcanic eruptions, vehicle traffic, sandstorms, agriculture, industrial emissions, de-icing of roads, etc.  $PM_{10}$  and  $NO_2$  results monitored at DAP are well below average annual limit values outlined in the Regulations and have continued to decrease in recent years. The lack of activity at and in the environs of the airport due to COVID-19 continued to have an impact on our air quality around Dublin Airport during 2021. The restriction of movement in Ireland had an impact in air quality nationally, with large scale reduction in vehicular traffic. The decrease in our  $NO_2$  and  $PM_{10}$  levels are in direct correlation to the restriction of movements due to COVID-19.

## 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<sub>2</sub> and PM<sub>10</sub> average concentrations with the EPA national network stations records for years 2012 - 2020.

Location	NO <sub>2</sub> (µg/m <sup>3</sup> )								
	2013	2014	2015	2016	2017	2018	2019	2020	2021 <sup>1</sup>
Winetavern St.	31	31	31	36.6	27.2	28.7	28.0	15	
Rathmines	19	17	18	20	17.1	20.3	21.6	13	
Swords	15	14	15	15.7	14.2	15.5	14.6	11	
Blanchardstown	29	31	25	30.2	26.2	25.3	31.0	12	
Dublin Airport Station <sup>2</sup>	19	22	22	23	20	27.6*	28*	22	19
<b>Annual Limit Value</b>	<b>40</b>								

\*elevated readings linked to construction activity.

**Table 4** NO<sub>2</sub> comparisons with EPA national network stations (2013 – 2020)

Location	PM <sub>10</sub> (µg/m <sup>3</sup> )								
	2013	2014	2015	2016	2017	2018	2019	2020	2021 <sup>1</sup>
Winetavern St	14	14	14	14	12.9	14	15.4	13	
Rathmines	17	14	15	15	13.4	15	13.5	11	
Phoenix Park	14	12	12	11	9.1	11	11.3	10	
Blanchardstown	20	18	17	18	15	17	18.9	15	
Ennis	20	21	18	17	15.8	16	18.0	20	
Dublin Airport Station <sup>2</sup>	23	21	20	23	21	20	18	16	11
<b>Annual Limit Value</b>	<b>40</b>								

**Table 5** PM<sub>10</sub> comparisons with EPA national network stations (2013 – 2020)

### Notes

1. 2021 EPA monitoring data has not yet been published.
2. Values rounded to the nearest number.

## **7.0 Conclusion**

### **7.1 Onsite Monitoring**

The results of the NO<sub>2</sub> and PM<sub>10</sub> concentrations using the online analyser indicate concentrations are below the relevant annual limit value of 40µg/m<sup>3</sup> and within the allowed criteria of short-term limit values. The annual average annual emissions for PM<sub>10</sub> was 11 µg/m<sup>3</sup> while NO<sub>2</sub> was 19 µg/m<sup>3</sup>. The decrease levels of NO<sub>2</sub> compared to 2019 and 2020 can be linked to decrease in vehicle traffic and construction works around the airport due to COVID-19 restrictions. As we come out of the COVID-19 restrictions we will continue to monitor emissions levels.

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<sub>2</sub> readings at Dublin Airport remained largely consistent between 2021 and 2020. While the annual average of NO<sub>2</sub> at the Dublin Airport bus depot (sample location A11) has exceeded the ambient limit value in the years preceding the COVID 19 pandemic, in 2021 this annual value was within EPA compliance limits with an NO<sub>2</sub> average of 28.88 µg/m<sup>3</sup>. This reduction correlates to reduced passenger numbers accessing Dublin Airport during the COVID 19 pandemic,