Dublin Airport Air Quality Monitoring
Annual Report 2019

HSSE Environment

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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

Version Control

HSSE Ref No:	Prepared by:	Reviewed by:	Date:
HSSE-ENV-REP-20001	HSSE – Environmental Manager	Head of HSSE	March 2020

Executive Summary

daa undertakes a programme of air quality monitoring at Dublin Airport (DAP) and in surrounding communities. A continuous air monitoring station is located within the DAP boundary. Passive diffusion tube sampling is undertaken at 12 locations within local communities. This report provides an overview of the results of air quality monitoring undertaken by daa at DAP in 2019. 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 2018, Indicators of Ambient Air Quality” was published in 2019 and is available on the EPA website.

Data collected from the majority of daa monitoring location presented in this report were within the limit values mandated in the Regulations in 2011. 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 28 µg/m^3. The increase in levels of NO_2 since 2017 can be linked to increased construction activity located directly beside the monitoring station. Diffusion tube sampling point A11, Dublin Airport Bus Depot also recorded an NO_2 annual average exceedance of 43.59 µg/m^3. As part of daa’s mobility strategy, a large emphasis is on getting employees and passengers out of their cars and into public transport. This has led to Dublin Airport becoming Ireland’s busiest bus depot in Ireland. A consequence of increasing bus routes and times is an increase in NO_2 emissions at Dublin Airport bus depot. daa has engaged with local bus and coach operators in an effort to increase awareness about air quality impacts associated with current public transport vehicles and has increased signage in the area. Efforts in this regard will continue in 2020.

Initiative for 2020:

In recent years, daa has shared monitoring results with the local community and with the EPA. However, from 2020, daa has agreed to permit the information derived from the continuous air monitoring station to be incorporated into the online National Ambient Air Quality Network. 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. The results of National Air Monitoring Programmes carried out by the EPA and local authorities, and further information relating to air quality such as the Air Quality Index for Health, can be found at www.epa.ie.

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 12 external monitoring locations in the vicinity of the airport in 2019. 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 gases:

- Benzene;
- Nitrogen Dioxide (NO_2);
- 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_2) and Particulate Matter (PM_{10}) at the DAP automatic station; and
- Nitrogen Dioxide (NO_2) and Benzene using diffusion tubes at 12 offsite locations.

2.0 Monitoring Locations

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

Ref	Location	Method	Parameters
On-site	Dublin Airport	Continuous analyser[1]	**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	
A12	Portmellick House, Dunbro Lane	Passive Tubes	

Table 1 Community Ambient Air Quality Monitoring Locations

Note

1. A review of the Air Quality Monitoring Station location was undertaken in 2019. The continuous monitoring station was relocated to a more representative location due to construction works being undertaken on the northern section of the airfield.

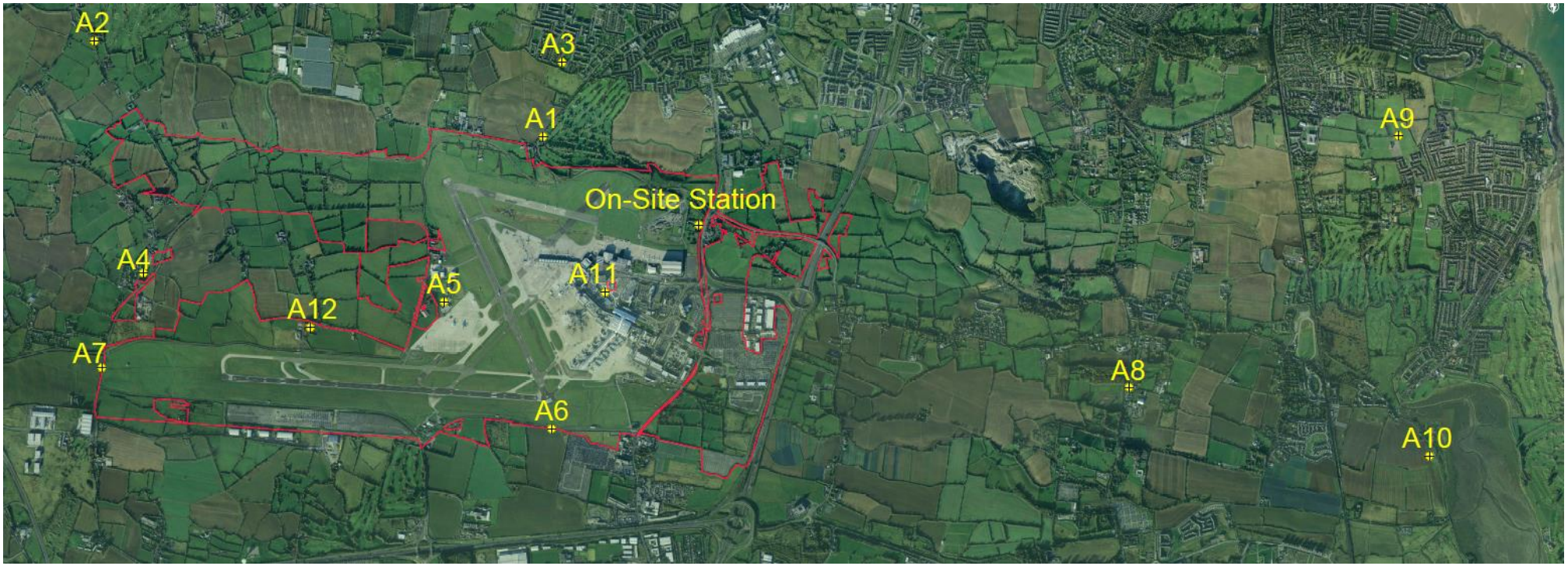


Figure 1 Air Quality Monitoring Locations

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 which can be compared with limit values as presented in this report.

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 monthly 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 2019 were as follows:

- 28th January
- 21st February
- 22nd March
- 19th April
- 5th June
- 26th June
- 19th July
- 26th August
- 23rd September
- 21st October
- 23rd December

In 2019, due to down times of the monitoring equipment during calibration, equipment malfunction and equipment relocation, approximately 88% of NO_2 data 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})

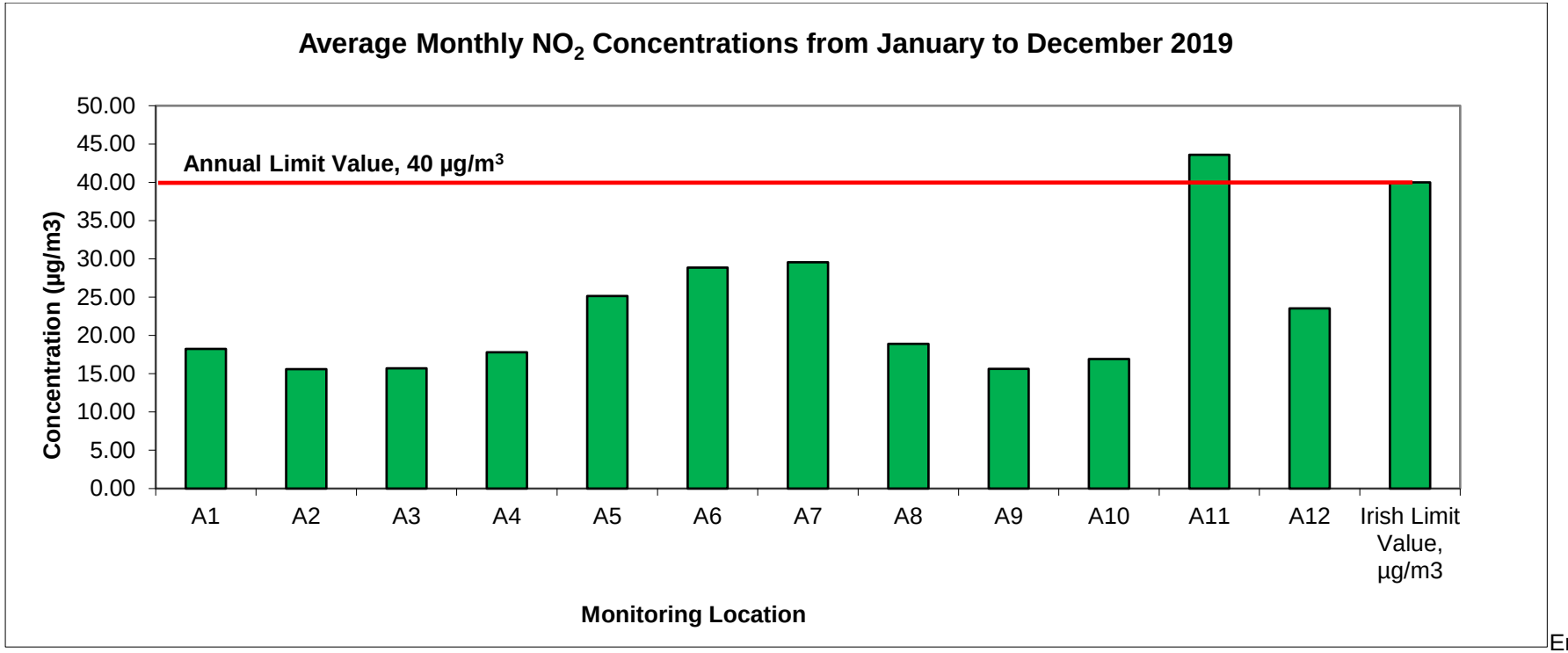
PM_{10} is defined as airborne particulate matter with an aerodynamic diameter equal to or less than 10µm. PM_{10} is monitored on a continuous basis at the airport monitoring station.

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 average for A11 was above the average annual limit. The bus depot recorded an annual average of 43.59 µg/m³.



Error! Reference source not found.**A11 is the bus depot*

Figure 2: Average NO_2 Concentrations by location, 2019

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 2019. 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.

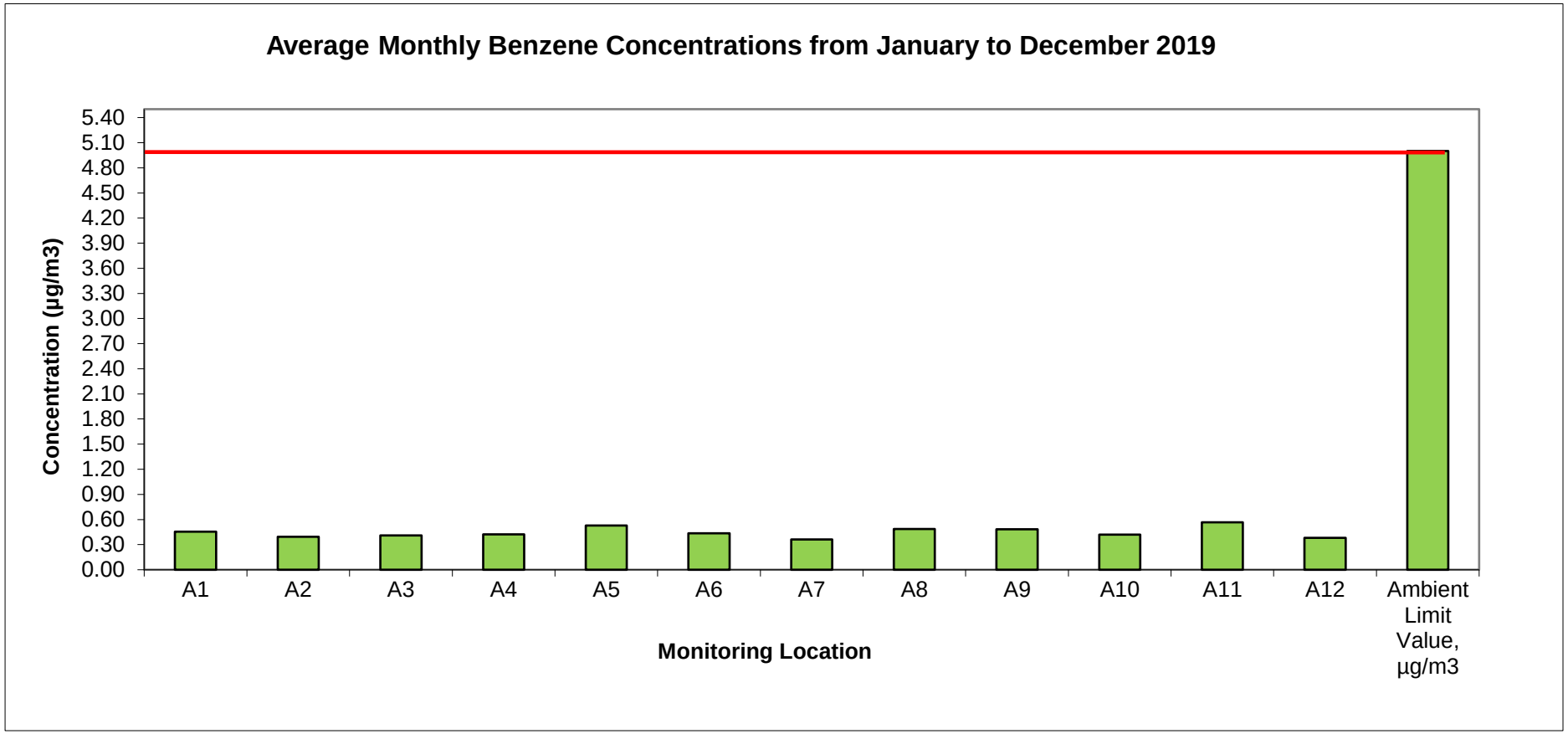


Figure 3: Average Monthly Benzene (C_6H_6) Concentrations by location 2019

4.3 Odours

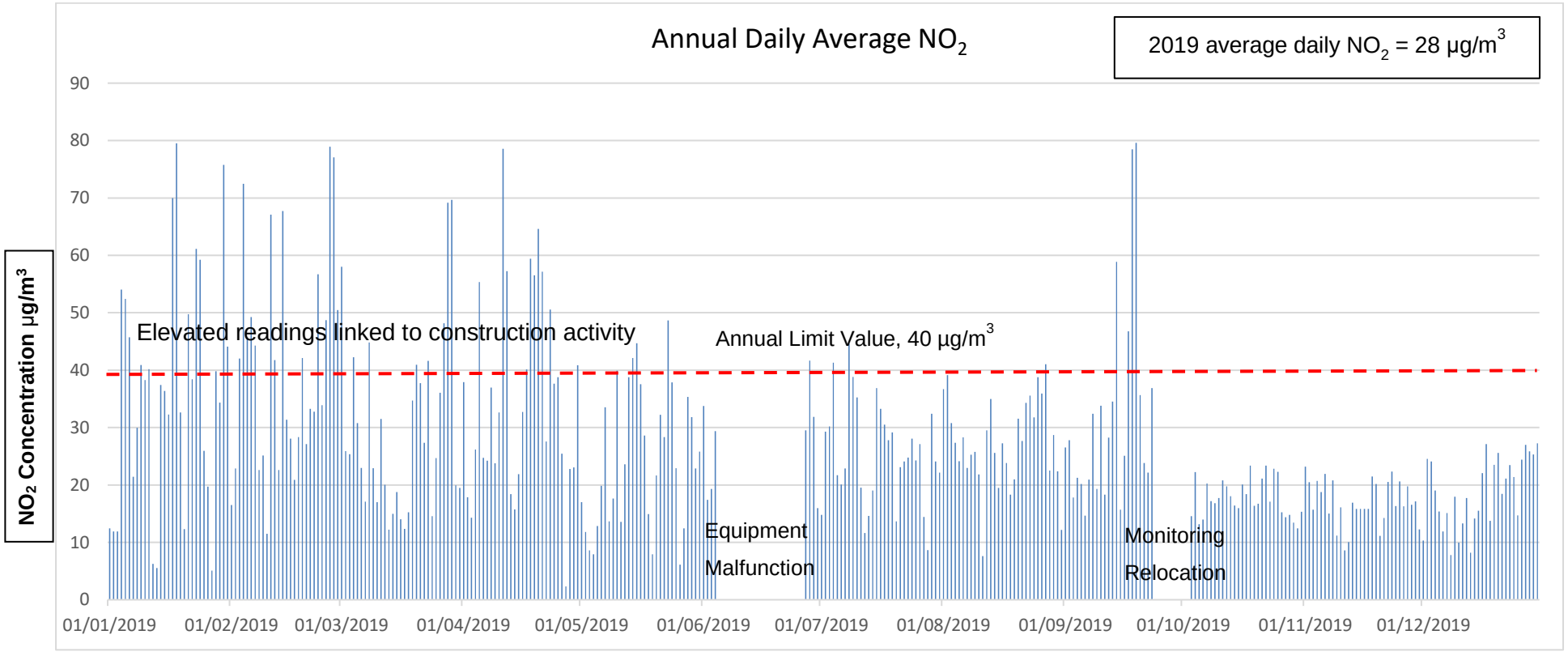
Fuel odours may arise from many sources including road traffic, ground handling equipment as well as aircraft on the ground. Depending on weather conditions odours from fuel (hydrocarbons) may be detected at locations close to the airport. As discussed in section 4.2 of this report, diffusion tubes' 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 2019. The equivalent daily average was calculated as 28 µg/m^3. The elevated NO_2 emissions in 2019 is attributable to the earth works construction activity close to the monitoring station.

Figure 4: Daily Average NO_2 2019



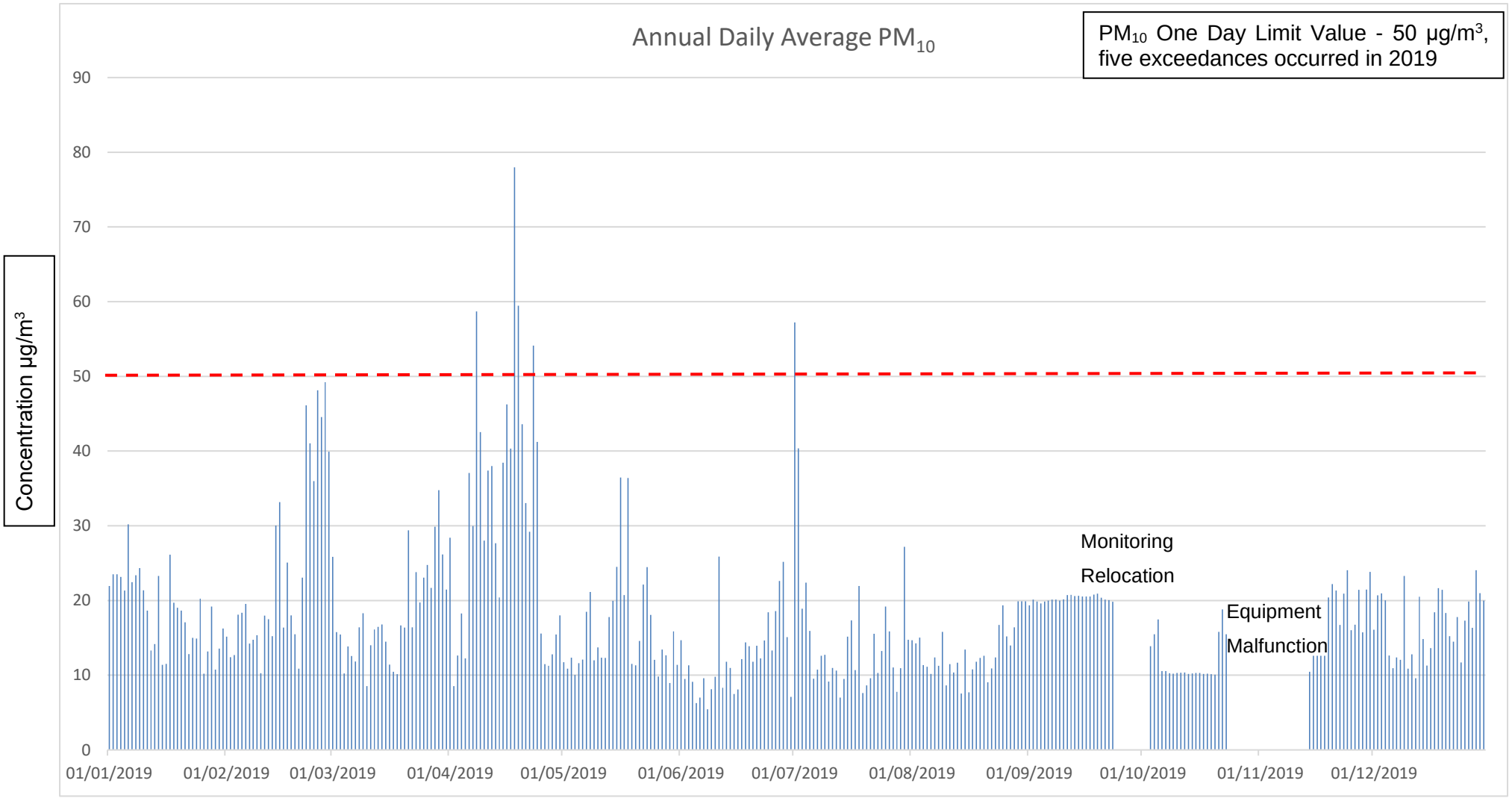
4.5 On-site Airport Monitoring Station Results: PM_{10}

Daily average PM_{10} concentrations recorded at the automatic station in DAP in 2019 are presented in Figure 5. The mean PM_{10} was calculated as 18.12 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	5
PM_{10} Limit Value	Calendar Year	40	NA	NA

Table 2 PM_{10} Limit Values

Figure 5: Daily Average PM_{10} 2019



5.0 Onsite: Annual Average NO_2 and PM_{10} (2012- 2019)

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

Location	Year	NO_2 (µg/m³)	PM_{10} (µg/m³)
Dublin Airport Station	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.

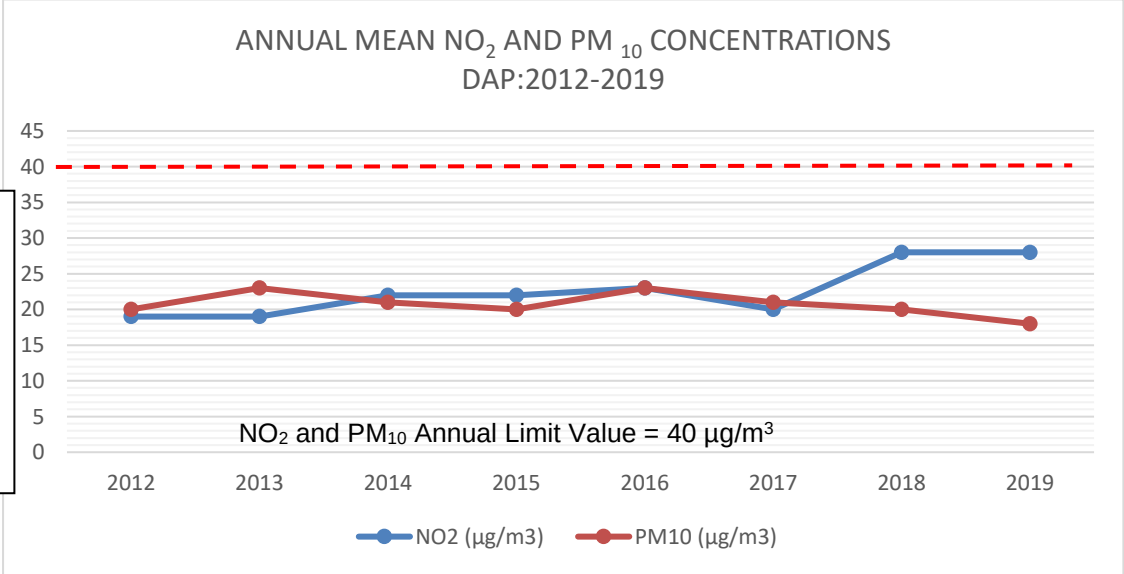


Figure 6 Annual Mean NO_2 and PM_{10} Concentrations at Dublin Airport

PM_{10} results monitored at DAP are well below limits contained in the Regulations and have decreased marginally compared to previous years. It is widely recognised that elevated readings of PM_{10} can occur for a variety of reasons, from both natural and manmade sources including international volcanic eruptions, sand storms, agriculture, industrial emissions, de-icing of roads, etc. These factors can be further exacerbated by a change in prevailing wind conditions. The compound effect is that air quality monitoring stations may intermittently record elevated readings of PM_{10} due to an event unrelated to local activities. Emissions from traffic are the main source of Nitrogen Oxides in Ireland, along with

electricity generating stations and industry. The increase in levels of NO_2 at Dublin Airport since 2017 can be linked to increased construction activity located directly beside the monitoring station.

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 - 2018.

Location	**NO_2 ($\mu g/m^3$)**							
	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019[1]**
Winetavern St	29	31	31	31	36.6	27.2	28.7	
Rathmines	21	19	17	18	20	17.1	20.3	
Swords	15	15	14	15	15.7	14.2	15.5	
Blanchardstown	30	29	31	25	30.2	26.2	25.3	
Dublin Airport Station[2]	19	19	22	22	23	20	27.6*	28*
Annual Limit Value	40							

*elevated readings linked to construction activity.

Table 4 NO_2 comparisons with EPA national network stations (2012 – 2018)

Location	**PM_{10} ($\mu g/m^3$)**							
	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019[1]**
Winetavern St	13	14	14	14	14	12.9	14	
Rathmines	14	17	14	15	15	13.4	15	
Phoenix Park	11	14	12	12	11	9.1	11	
Blanchardstown	-	20	18	17	18	15	17	
Ennis	19	20	21	18	17	15.8	16	
Dublin Airport Station[2]	20	23	21	20	23	21	20	18
Annual Limit Value	40							

Table 5 PM_{10} comparisons with EPA national network stations (2012 – 2018)

Notes

1. 2019 EPA monitoring data has not yet been published.
2. Values rounded to the nearest number.

7.0 Conclusion

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 NO_2 was 28 µg/m^3. The elevated levels of NO_2 compared to 2017 can be linked to the increased construction activity located directly beside the monitoring station.

An investigation was undertaken to identify what measures could be put in place to ensure that the monitoring station was, as far as possible, monitoring emissions from aviation related activity and was not being skewed due to temporary localised construction activities. The continuous monitoring station was accordingly relocated at the end of September to a new location at Castlemoate House to reduce the impact of construction traffic. The new location was viewed by the EPA as part of an agreement with daa to provide monitoring data to the EPA to form part of the National Ambient Air Quality Network.

Offsite Monitoring: The diffusion tube results for NO_2 indicate that the highest concentrations were recorded at the Dublin Airport bus terminal. The Airport bus terminal is the busiest bus terminal in Ireland. The annual average of NO_2 at the Dublin Airport bus depot was in exceedance of the EPA annual average with NO_2 annual average of 43.59µg/m^3 recorded. As part of daa's mobility strategy, a large emphasis is on getting employees and passengers out of their cars and into public transport. This has led to Dublin Airport becoming Ireland's busiest bus depot in Ireland. An offset of increasing bus routes and times is an increase in NO2 emissions at Dublin Airport bus depot. daa has engaged with local bus and coach operators in an effort to increase awareness about air quality impacts associated with current public transport vehicles and has increased signage in the area. Efforts in this regard will continue in 2020.

8.0 Initiative for 2020

In recent years, daa has shared monitoring results with the local community and with the EPA. However, from 2020, daa has also agreed to permit the information derived from the continuous air monitoring station to be incorporated into the online National Ambient Air Quality Network. This is a significant step by daa which indicates its commitment to work with regulators and community to ensure that there is transparency about air quality information at the airport. The results of National Air Monitoring Programmes carried out by the EPA and local authorities and further information relating to air quality such as the Air Quality Index for Health can be found at www.epa.ie.