
Dublin Airport Air Quality Monitoring
Annual Report 2016

HSSE Environment

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Glossary

Abbreviation	Definition
EPA	Environmental Protection Agency
NO	Nitrogen Oxide
NO ₂	Nitrogen Dioxide
NO _x	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 10 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 and environs in 2016. 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. 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 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 2015, Key Indicators of Ambient Air Quality was published in 2016 and is available on the EPA website.

Data collected from each monitoring location presented in this report was well within the limit values mandated in the Regulations in 2016. Similarly, data collected since implementation of the air quality monitoring programme has been found to be well within the limit values mandated in the Regulations.

Section 7.0 of this report compares the annual average NO₂ and PM₁₀ concentrations monitored at DAP's monitoring station with the EPA national network stations records for years 2010 - 2015. Whilst NO₂ concentrations monitored at the DAP monitoring station are 30% lower than in city centre areas, PM₁₀ concentrations are slightly higher. The current location of the DAP air quality monitoring station adjacent to an increasingly active construction compound may have contributed to elevated readings of PM₁₀. daa is considering moving the monitoring station to an alternative location in 2017 and will liaise with Fingal County Council and the EPA in

determining the new location for the continuous monitoring station within the DAP boundary. 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 10 km 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 two 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 10 external monitoring locations in the vicinity of the airport in 2016. 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 the daa 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 (SO₂)
- Oxides of nitrogen NO_x (NO and NO₂)
- Carbon monoxide (CO)
- Ozone (O₃)
- Particulate Matter (PM₁₀)

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

- 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. 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 i.e. PM₁₀ and NO₂. This report also includes the results of Benzene monitoring.

This report presents data on the following parameters:

- Nitrogen Dioxide (NO₂) and Particulate Matter (PM₁₀) at the DAP automatic station; and
- Nitrogen Dioxide (NO₂) and Benzene using diffusion tubes at 10 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	Parameter
On-site	Dublin Airport.	Continuous analyser ¹	NO₂ PM₁₀
A1	Forrest Little Golf Club.	Passive Tubes	NO₂ 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,	Passive Tubes	
A10	Oscar Papa Site, Portmarnock.	Passive Tubes	

Table 1 Community Ambient Air Quality Monitoring Locations

Note

1. A review of the Air Quality Monitoring Station location will be undertaken in 2017.



Figure 1 Air Quality Monitoring Locations

3.0 Parameters and Sampling Methodology

3.1 Offsite Passive Sampling:

3.1.1 Nitrogen Dioxide (NO₂) and Benzene (C₆H₆)

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. Monthly mean concentrations are averaged to give an annual mean, presented in Figure 2. 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).

3.2 Onsite Sampling

3.2.1 Equipment Calibration

An external expert service provider undertakes routine servicing of the DAP air quality monitoring equipment on a monthly basis. 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 provided by the service provider. The monthly calibration process takes approximately 24 hours, Data collection resumes after this 24 hour period. The dates of calibration and maintenance of the air monitoring equipment in 2016 were as follows:

- 8th January
- 5th February
- 7th March
- 7th April
- 5th May
- 12th August
- 8th September
- 5th October
- 9th November
- 15th December

During 2016, both maintenance and power source issues resulted in some of the air quality monitoring equipment being out of service for periods of time, In 2016, approximately 83% of NO₂ data was captured, the capture of PM₁₀ data was approximately 83% due to outages affecting both the PM₁₀ and NO₂ monitoring equipment in early April and mid-August.

DAP is considering moving the monitoring station to an alternative location in 2017 and will liaise with Fingal County Council and the EPA in determining the new location for the continuous monitoring station within the DAP boundary to facilitate the collection of data which is of most use to the local communities, Fingal County Council and DAP.

3.2.2 Nitrogen Dioxide (NO₂)

Onsite monitoring of NO₂ is carried out on a continuous basis at the stationary airport monitoring station. Measurement of NO₂ is carried out using a Horiba APNA-370 ambient NO_x monitor which employs a cross-flow modulated chemiluminescence method.

3.2.3 Particulate Matter (PM₁₀)

PM₁₀ is defined as airborne particulate matter with an aerodynamic diameter equal to or less than 10µm. PM₁₀ is monitored on a continuous basis at the airport monitoring station. This PM₁₀ instrument automatically measures and records airborne particulate concentration levels using the principle of beta ray attenuation. The sampler monitors the PM₁₀ 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 PM₁₀ sampling. The results are expressed in µg/m³.

4.0 Monitoring Results

4.1 Offsite NO₂ Monitoring Results

Figure 2 presents the annual mean NO₂ concentration for each location based on the monthly passive tube sampling. The Regulations mandate an annual mean limit value of 40 µg/m³ for NO₂. As can be seen from Figure 2, the annual mean values were below the limit value at all monitoring locations in 2016 and were less than half the mean limit value at A1, A2, A4, A8, A9 and A10.

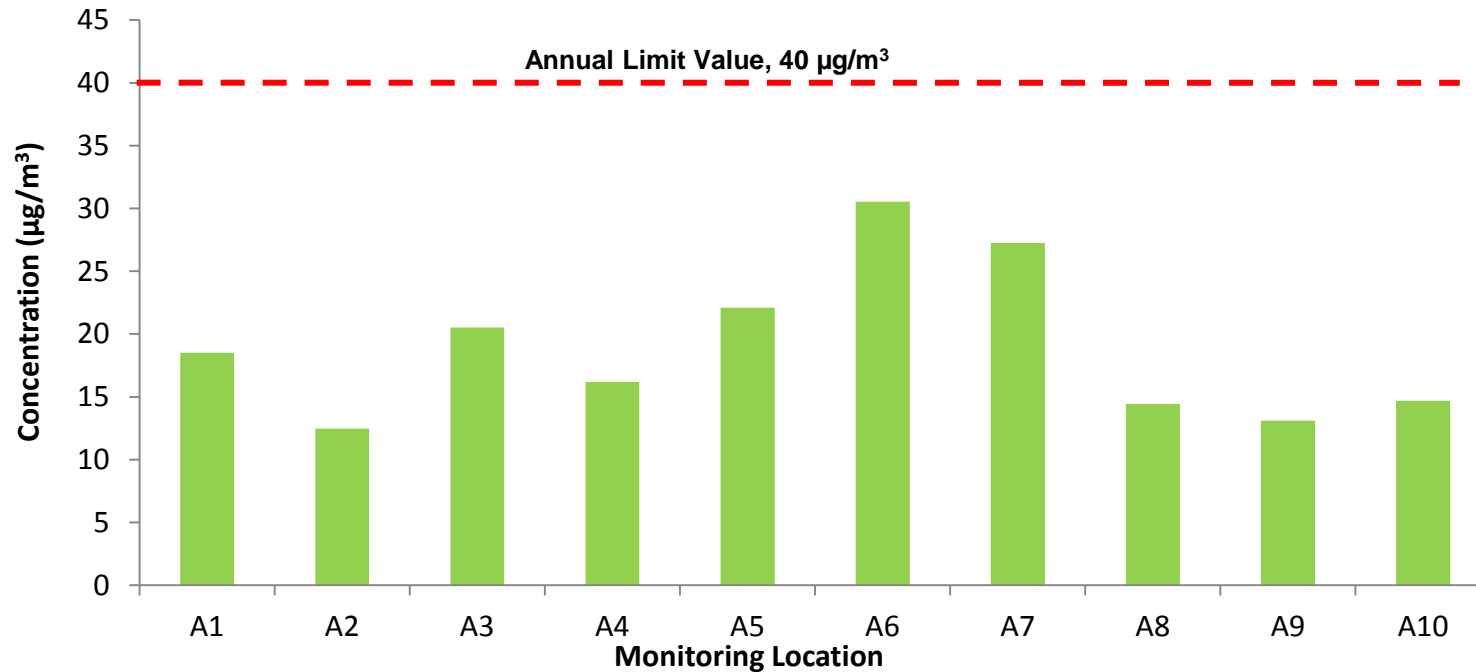


Figure 2 Average Monthly NO₂ Concentrations 2016

**A6 and A7 locations closest to motorway.*

4.2 Offsite Benzene Monitoring Results

Figure 3 presents the annual mean Benzene concentration for each location based on the monthly passive tube sampling. 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 below the limit value of 5 µg/m³ and less than 1 µg/m³ at all monitoring locations.

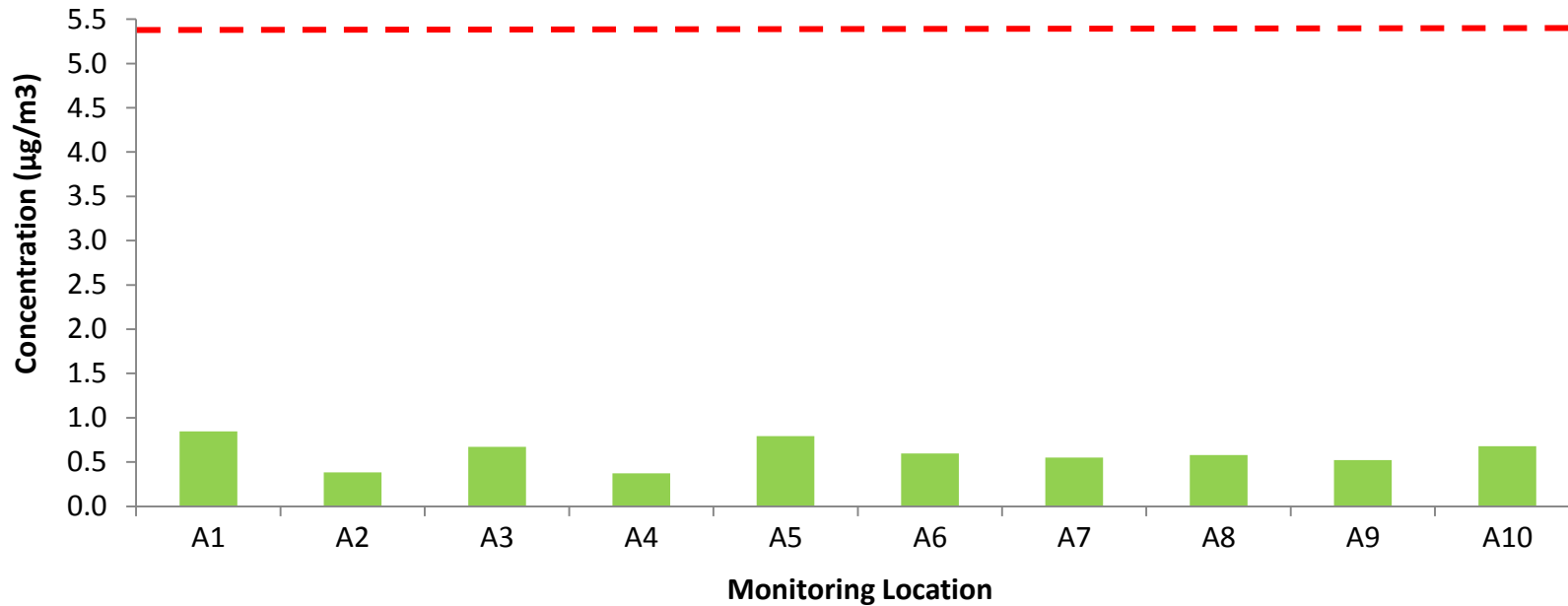


Figure 3 Average Monthly Benzene (C₆H₆) Concentrations 2016

5.0 On-site Airport Monitoring Station Results

5.1 On-site Airport Monitoring Station Results: Daily Average NO₂

NO₂ concentrations are measured at the automatic station at DAP. Error! Reference source not found. presents the daily average NO₂ concentrations measured during 2016. The equivalent daily average was calculated as 22.6 µg/m³. Maintenance activities were carried out on the monitoring equipment between 22/03/2016 and 1/04/2016 and data is unavailable for these dates. Data capture achieved by the on-site station was 83% in 2016.

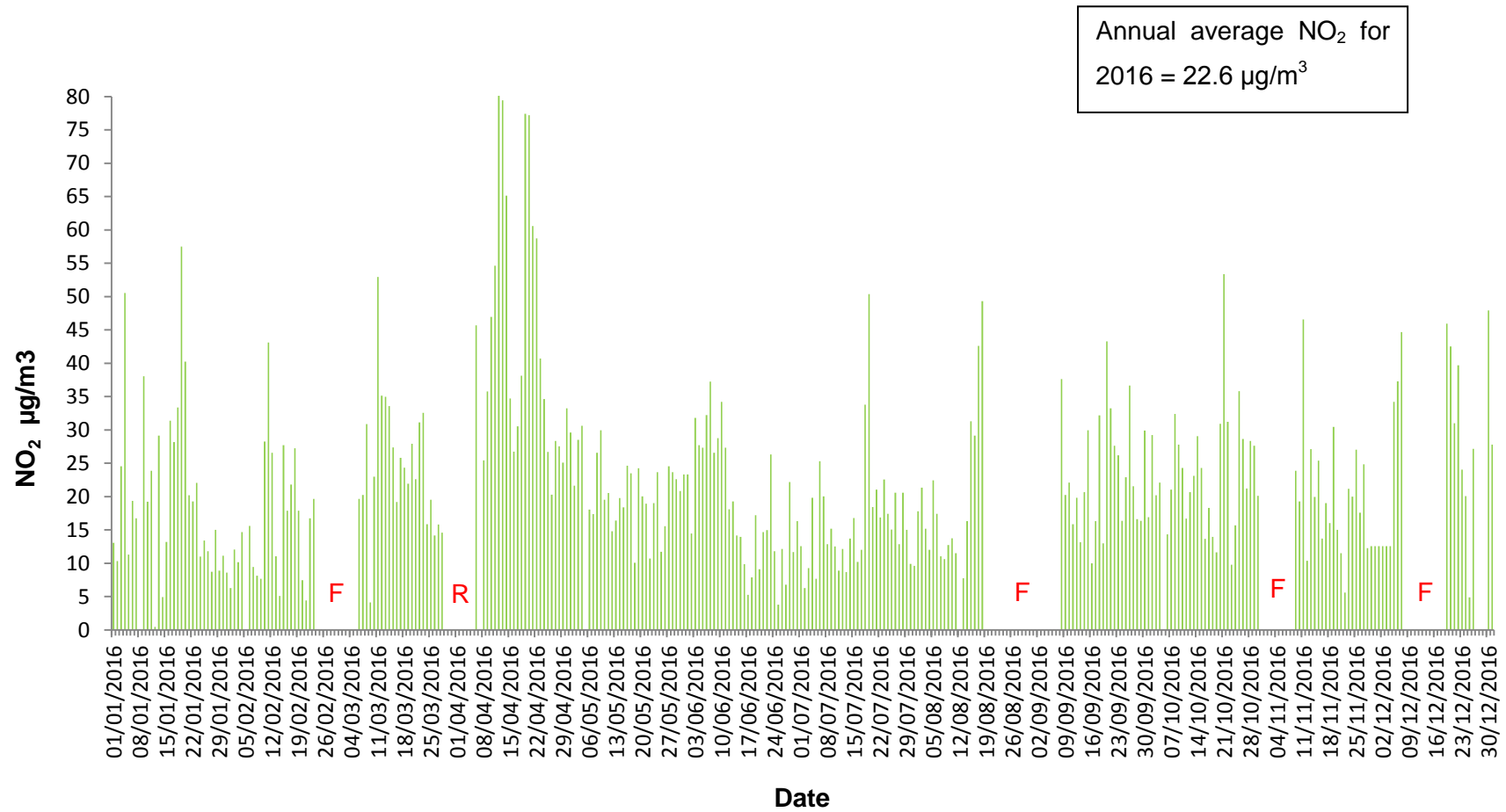


Figure 4 Daily Average NO₂ 2016

5.2 On-site Airport Monitoring Station Results: PM₁₀

Daily average PM₁₀ concentrations recorded at the automatic station in DAP in 2016 are presented in Figure 5. The 2016 mean PM₁₀ was calculated as 23.1 µg/m³. The Regulations set a 24 hour PM₁₀ limit value of 50 µg/m³, and an annual mean limit value of 40 µg/m³ as shown in Table 3. PM₁₀ data capture achieved by the on-site station was 83% in 2016.

Objective	Averaging Period	Limit or Threshold Value (µg/m ³)	No. of Allowed Exceedances	No. of Exceedances (Year to date)
PM ₁₀ Limit Value	24 hour	50	Not to be exceeded on more than 35 days per year	8
PM ₁₀ Limit Value	Calendar Year	40	NA	NA

Table 2 PM₁₀ Limit Values

As shown in Figure 1, the number of daily exceedances of PM₁₀ did not surpass that allowed in the Regulations, with 8 exceedances in total monitored throughout the year. Maintenance activities were carried out between 22/03/2016 and 1/04/2016, and data is not available for these dates.

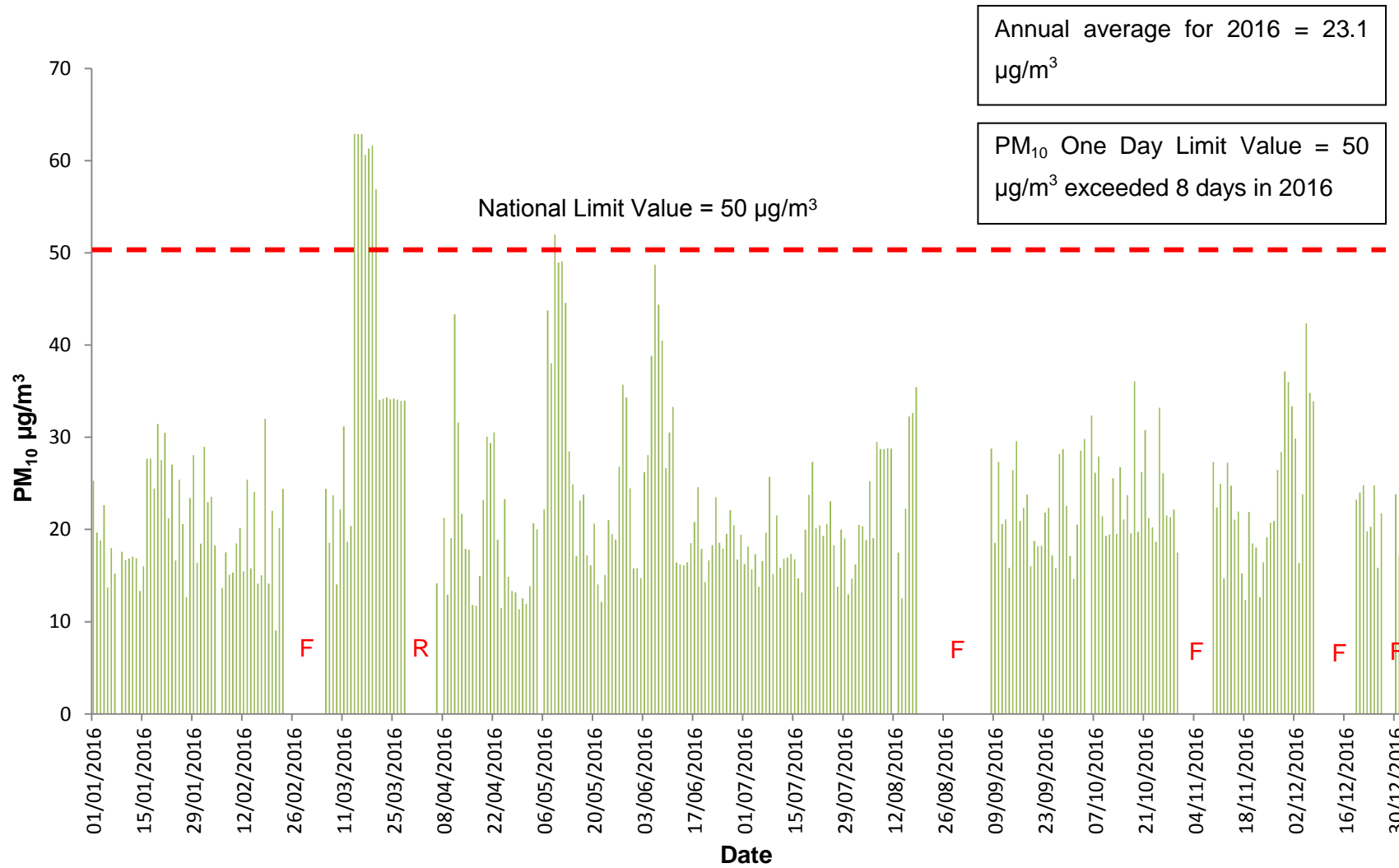


Figure 5 Daily Average PM₁₀ 2016

R - Air Monitoring Station repairs
 F - Air Monitoring Station registering fault

6.0 Onsite: Annual Average NO₂ and PM₁₀ (2011-2016)

Annual mean NO₂ and PM₁₀ are presented in Table 3 for the automatic station onsite at DAP. The trends over five years are shown in Table 3. For both parameters, annual limits are well below the threshold limits contained within the Regulations.

Location	Year	NO ₂ (µg/m ³)	PM ₁₀ (µg/m ³)
Dublin Airport Station	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 NO₂ and PM₁₀ Concentrations at Dublin Airport

Notes

1. Values rounded to the nearest number.

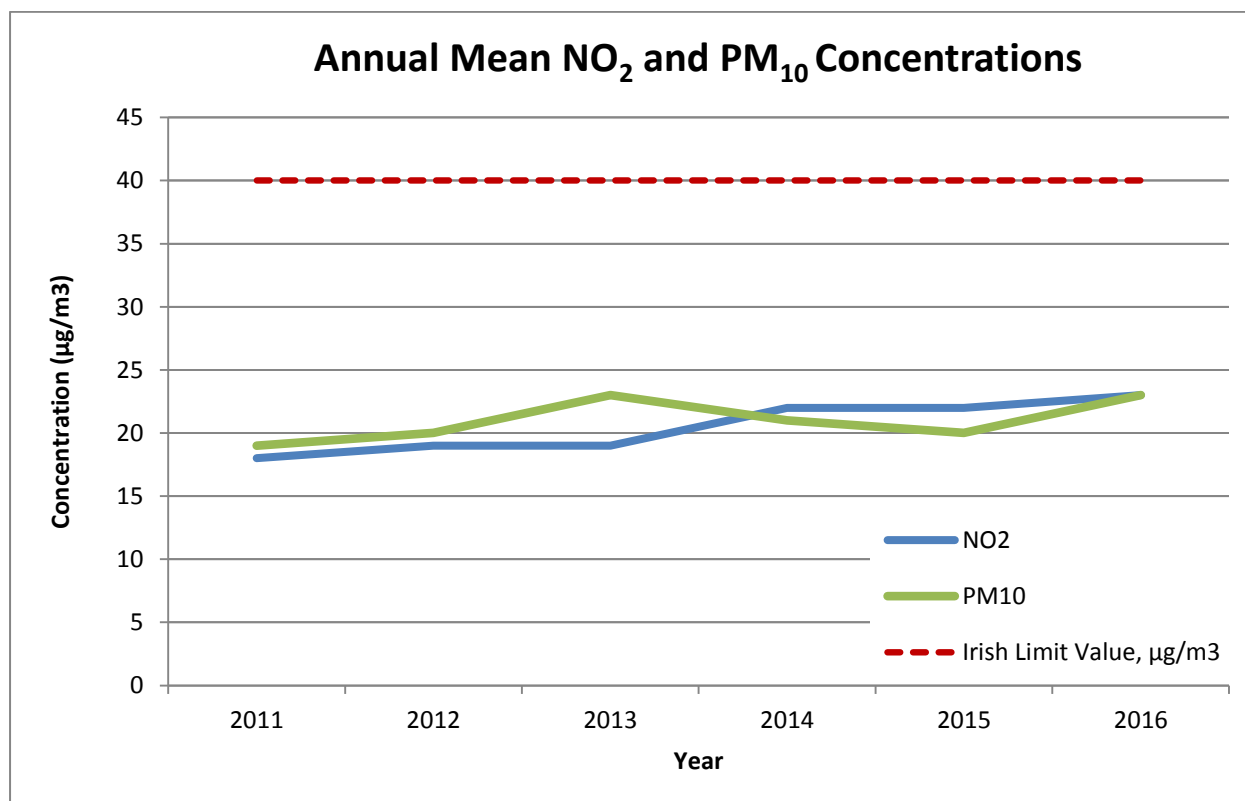


Figure 6 Annual Mean NO₂ and PM₁₀ Concentrations at Dublin Airport

PM₁₀ results monitored at DAP are well below limits contained in the Regulations but have increased marginally compared to previous years. It is widely recognised that elevated readings of PM₁₀, 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 PM₁₀ due to an event unrelated to local activities.

The air quality monitoring station is currently located adjacent to an increasingly active construction compound which may have resulted in elevated readings of PM₁₀ on some occasions. DAP is considering moving the monitoring station to an alternative location in 2017 and will liaise with Fingal County Council and the EPA in determining the new location for the continuous monitoring station within the DAP boundary to facilitate the collection of data which is of most use to the local communities, Fingal County Council and DAP.

7.0 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 NO₂ and PM₁₀ average concentrations with the EPA national network stations records for years 2010 - 2015. The most recent EPA report on ambient air monitoring in Ireland is the "Air Quality in Ireland 2015 – Key Indicators of Ambient Air Quality" (EPA 2016).

Location	NO ₂ (µg/m ³)						
	2010	2011	2012	2013	2014	2015	2016 ¹
Winetavern St	35	34	29	31	31	31	
Rathmines	25	20	21	19	17	18	
Ringsend ²	29	32	25				
Swords	16	14	15	15	14	15	
Blanchardstown		31	30	29	31	25	
Dublin Airport Station ³	18	19	19	19	22	22	23
Annual Limit Value	40						

Table 4 NO₂ comparisons with EPA national network stations (2010 – 2016)

Location	PM ₁₀ (µg/m ³)						
	2010	2011	2012	2013	2014	2015	2016 ¹
Winetavern St	19	14	13	14	14	14	
Rathmines	18	16	14	17	14	15	
Phoenix Park	11	12	11	14	12	12	
Ringsend ²	23	20	20				
Blanchardstown		16	-	20	18	17	
Ennis	27	22	19	20	21	18	
Dublin Airport Station ³	19	20	20	23	21	20	23
Annual Limit Value	40						

Table 5 PM₁₀ comparisons with EPA national network stations (2010 – 2016)

Notes

1. 2016 EPA monitoring data has not yet been published.
2. Ringsend monitoring ceased in 2012.
3. Values rounded to the nearest number.

As can be seen from Table 4, the average annual concentrations of NO₂ monitored at DAP in 2016 (22.6 µg/m³) were 30% lower than those recorded by the EPA's air quality monitoring station at Winetavern Street in Dublin City Centre in 2015 (31 µg/m³). 2016 EPA monitoring data has not yet been published.

As previously mentioned in Section 11 of this report, the air quality monitoring station is currently located adjacent to an increasingly active construction compound and this may have contributed to elevated readings of PM₁₀ and NO₂. daa is considering moving the monitoring station to an alternative location in 2017 and will liaise with Fingal County Council and the EPA in determining the new location for the continuous monitoring station within the DAP boundary to facilitate the collection of data which is of most use to the local communities, Fingal County Council and DAP.

7.1 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.

8.0 Conclusion

Onsite Monitoring: The results of the NO₂ and PM₁₀ concentrations using the online analyser indicate concentrations are well below the relevant annual limit value of 40µg/m³ and well within the allowed criteria of short term limit values.

Offsite Monitoring: The diffusion tube results for NO₂ indicate that the highest concentrations are recorded adjacent to the main roads around the airport. The monitoring locations A6 and A7 are only a few metres from the road and are therefore influenced by roadside concentrations which are close to the vehicular emission source. Concentrations further away from the roadways are much lower and similar to the concentrations recorded at the on-site station. All concentrations are below the annual average limit value for NO₂. Diffusion tube results for benzene indicate that concentrations at all locations are well below the annual average limit value.