Air Quality Monitoring at Dublin Airport: Annual Report 2015

HSSE 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

This report presents the results of air quality monitoring at Dublin Airport and surrounding areas for 2015, based on data collected at onsite monitoring stations and diffusion tube monitoring stations in surrounding areas. Data collected includes nitrogen dioxide (NO_2) and particulate matter (PM_{10}).

daa carries out ambient air monitoring, operating an air monitoring station onsite at the airport. In addition, diffusion tube monitoring is undertaken in surrounding areas, a list of monitoring locations is presented in Table 1 and Figure 1of this report.

The Ambient Air Quality Standards Regulations 2011 (the Regulations), S.I. No. 180 of 2011, implemented 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. It is the responsibility of local authorities to undertake monitoring to assess compliance with the Regulations. In Ireland, compliance is the responsibility of the Environmental Protection Agency (EPA), which the Regulations deem to be the competent authority for the purpose of Directive 2008/50/EC. The Agency is required to send an annual report to the Minister for the Environment, Heritage and Local Government and to the European Commission.

In 2015, data collected from each monitoring location was within the limit values contained in The Regulations. The data which was collected can be considered typical of urban and inter-urban areas.

National monitoring results carried out by the EPA and local authorities and further information relating to air quality can be found at www.epa.ie. The Air Quality Index for Health is available at www.airquality.epa.ie.

1.0 Introduction

1.1 Background

Dublin Airport is located approximately 10 km north of Dublin city. The Airport occupies approximately two and a half thousand acres and is bounded on two sides by the busiest highways in the country – the M1 and the M50. Dublin Airport had its busiest ever year in 2015, with a record 25 million passengers travelling through the airport during the 12 months of 2015.

1.2 Purpose

The purpose of this report is to present the results of air monitoring conducted onsite at Dublin airport and at specific locations surrounding the airport in 2015. The 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 assessment purposes only. There is no requirement under the Regulations that companies or operators carry out air monitoring. It is the responsibility of local authorities to undertake monitoring to assess compliance with the Regulations. In Ireland, compliance is the responsibility of the Environmental Protection Agency (EPA), which the Regulations deem to be the competent authority.

The following parameters were monitored during the 2015 air monitoring programme:

- Nitrogen Dioxide (NO_2) and Particulate Matter (PM_{10}) at the Dublin Airport automatic station; and
- Nitrogen Dioxide (NO_2) using diffusion tubes at 9 offsite locations.

Monitoring locations are presented in Table 1 and Figure 1 of this report.

2.0 Monitoring Locations

A list of the ambient air quality sampling locations is presented in Table 1 below.

Sampling locations are also presented on **Figure 1**.

Ref	Location	Measurement Method	Parameters Reported
On-site[1]	West of Castlemoate Road, Dublin Airport	Continuous analysers	NO_2 PM_{10}
A1	Forrest Little Golf Club	Passive Tubes	NO_2
A2	Kilreesk Lane, St. Margaret's	Passive Tubes	
A3[2]	~~Ridgewood Estate West, Swords~~	NA	
A4	St. Margaret's School & 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	Passive Tubes	
A9	Naomh Mearnóg GAA Club, Portmarnock	Passive Tubes	
A10	Oscar Papa Site, Portmarnock	Passive Tubes	

Table 1 Air Quality Monitoring Locations

Notes

1.The onsite air monitoring station is located in the vicinity of ongoing construction works.

2.This location is no longer sampled due to unauthorised removal.

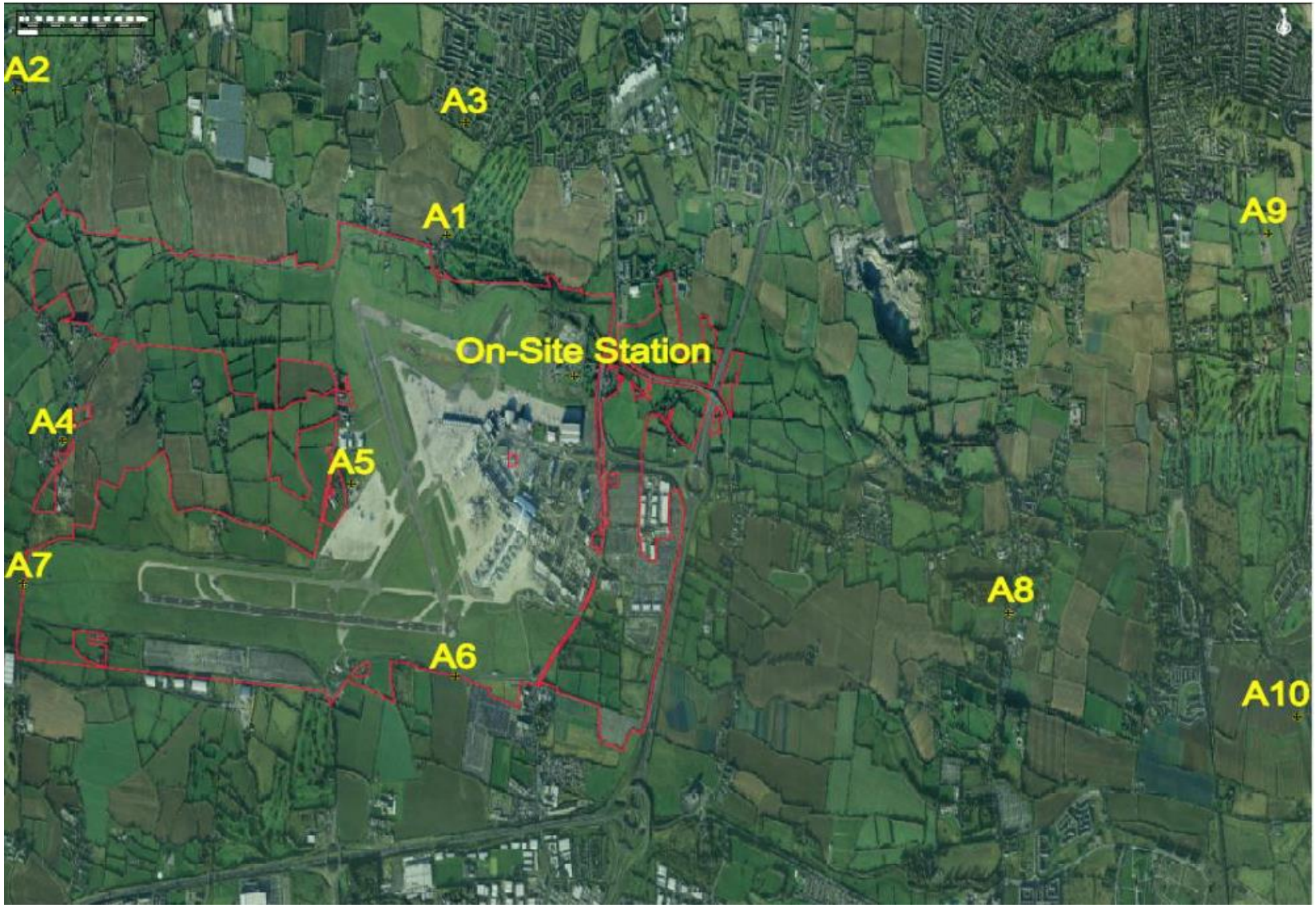

Figure 1 Air Quality Monitoring Locations

3.0 Description of Parameters and Sampling Methodology

Offsite Monitoring: Nitrogen Dioxide (NO_2)

daa operates a network of passive diffusion tube samplers for monitoring of NO2 in areas surrounding Dublin Airport. The purpose of this network is to establish NO2 concentrations in the air at locations surrounding the Airport. The diffusion tubes are exposed for approximately 4-week intervals. The diffusion tubes record monthly mean concentrations, which are averaged to give the annual mean. Results are expressed in µg/m³(micrograms per cubic metre).The tubes then analysed using UV Spectrophotometry at a UKAS (United Kingdom Accreditation Service) accredited laboratory.

Onsite Continuous Monitoring: Nitrogen Dioxide (NO_2)

Monitoring of NO_2 was carried out on a continuous basis onsite at the airport monitoring station between January and December 2015. Measurement of NO_2 was carried out using a Horiba APNA-370 ambient NOx monitor which employs a cross-flow modulated chemiluminescence method.

Onsite Continuous Monitoring: Particulate Matter (PM_{10})

PM_{10}, defined as airborne particulate matter with an aerodynamic diameter equal to or less than 10µm was monitored using an onsite analyser on a continuous basis at the airport monitoring location between January and December 2015. This 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 USEPA protocol for PM_{10} sampling. The results are expressed in µg/m³.

4.0 Offsite NO_2 Monitoring Results

Each of the 9 diffusion tube locations (A1 – A10) record monthly mean concentrations of NO_2. The results have been averaged to give the annual mean for each location, presented in Figure 2 below. The Regulations set an annual mean limit value of 40 µg/m³ for NO_2. As can be seen from Figure 2, annual mean values were significantly below the limit value at all monitoring locations.

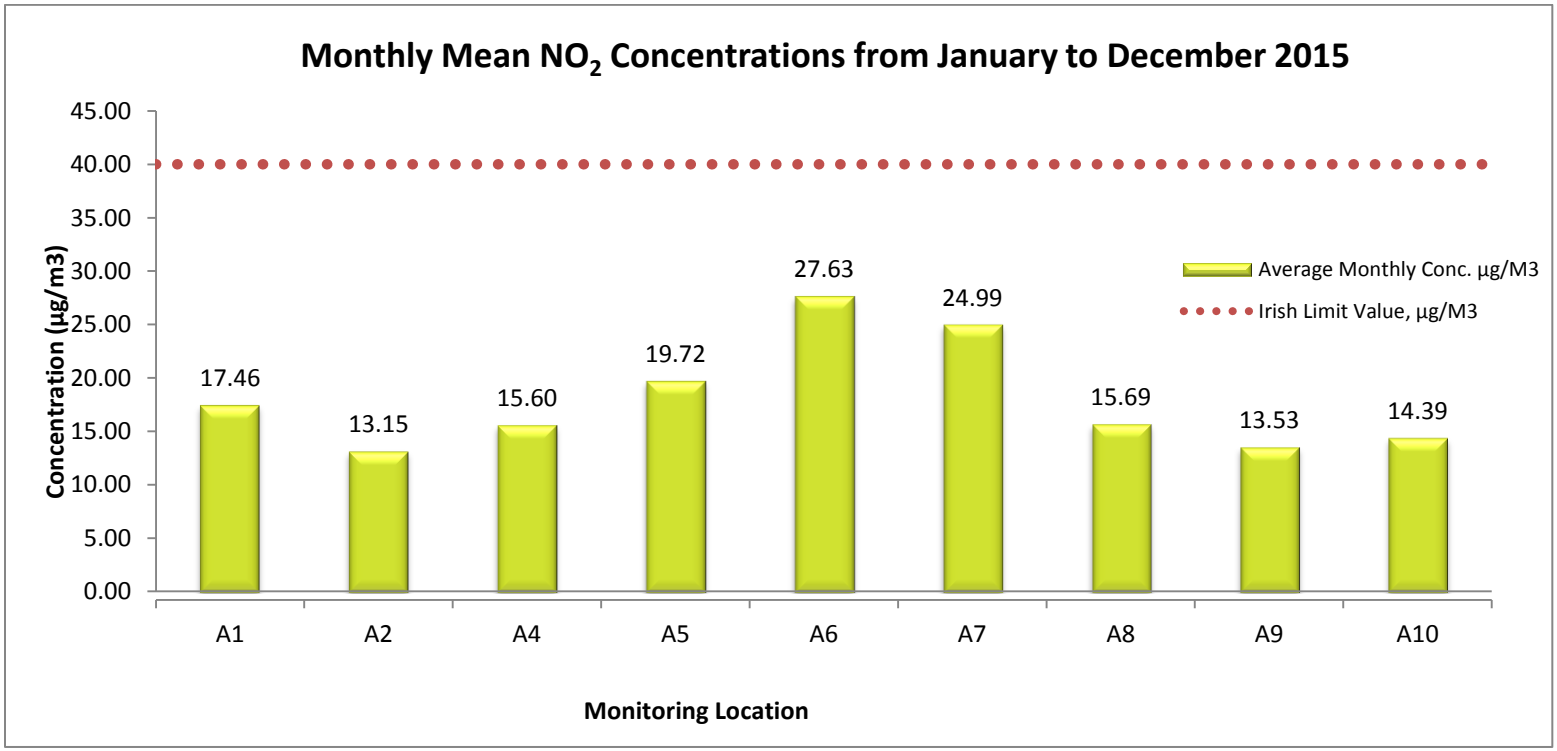

Figure 2 Monthly Mean NO_2 Concentrations

5.0 On-site Airport Monitoring Station Results

Onsite Continuous Monitoring: NO_2

NO_2 concentrations were measured at an hourly rate at the automatic station in Dublin Airport. The data is presented as Figure 3 below. The equivalent daily average was calculated as 22.2 µg/m^3. The annual mean limit value (40 µg/m^3) was not exceeded in 2015.

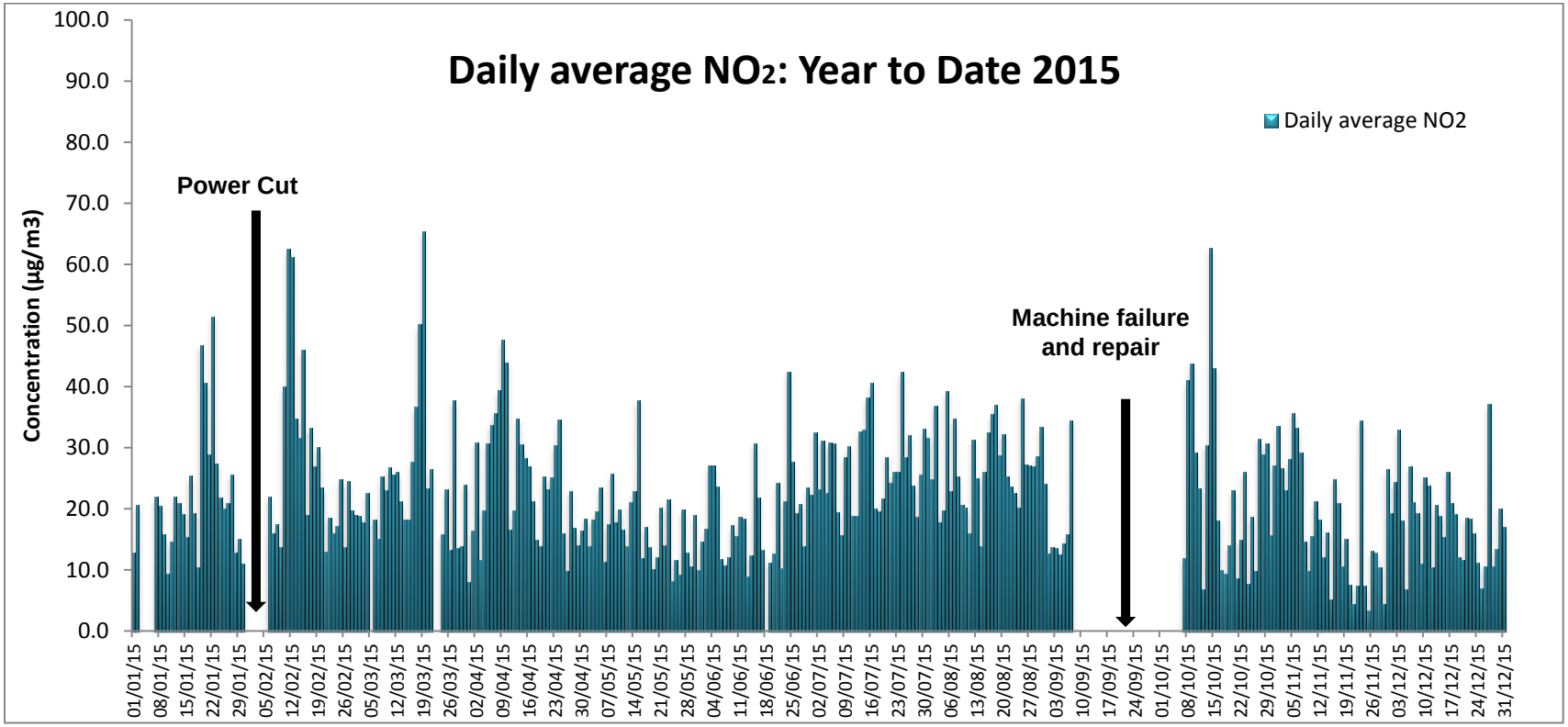

Figure 3 Daily Average NO_2 Concentrations

Onsite Continuous Monitoring: PM_{10}

Daily Average PM_{10} concentrations measured at the automatic station in Dublin Airport for 2015 are presented in **Error! Reference source not found.**. The 2015 annual mean PM_{10} was calculated as 20.3 µg/m^3. The Regulations set a one day PM_{10} limit value of 50 µg/m^3, and an annual mean limit value of 40 µg/m³ as shown in Table 2.The annual limit value (40 µg/m^3) was not exceeded in 2015. The 2015 daily values did not surpass the number of allowed exceedances.

Objective	Averaging Period	Limit or Threshold Value (µg/m^3)	No. of Allowed Exceedances as per the Regulations	Actual No. of Exceedances
PM_{10} Limit Value	One day	50	Not to be exceeded on more than 35 days per year	6
PM_{10} Limit Value	Calendar Year	40	Not Applicable	NA

Table 2 PM_{10} Limit Values

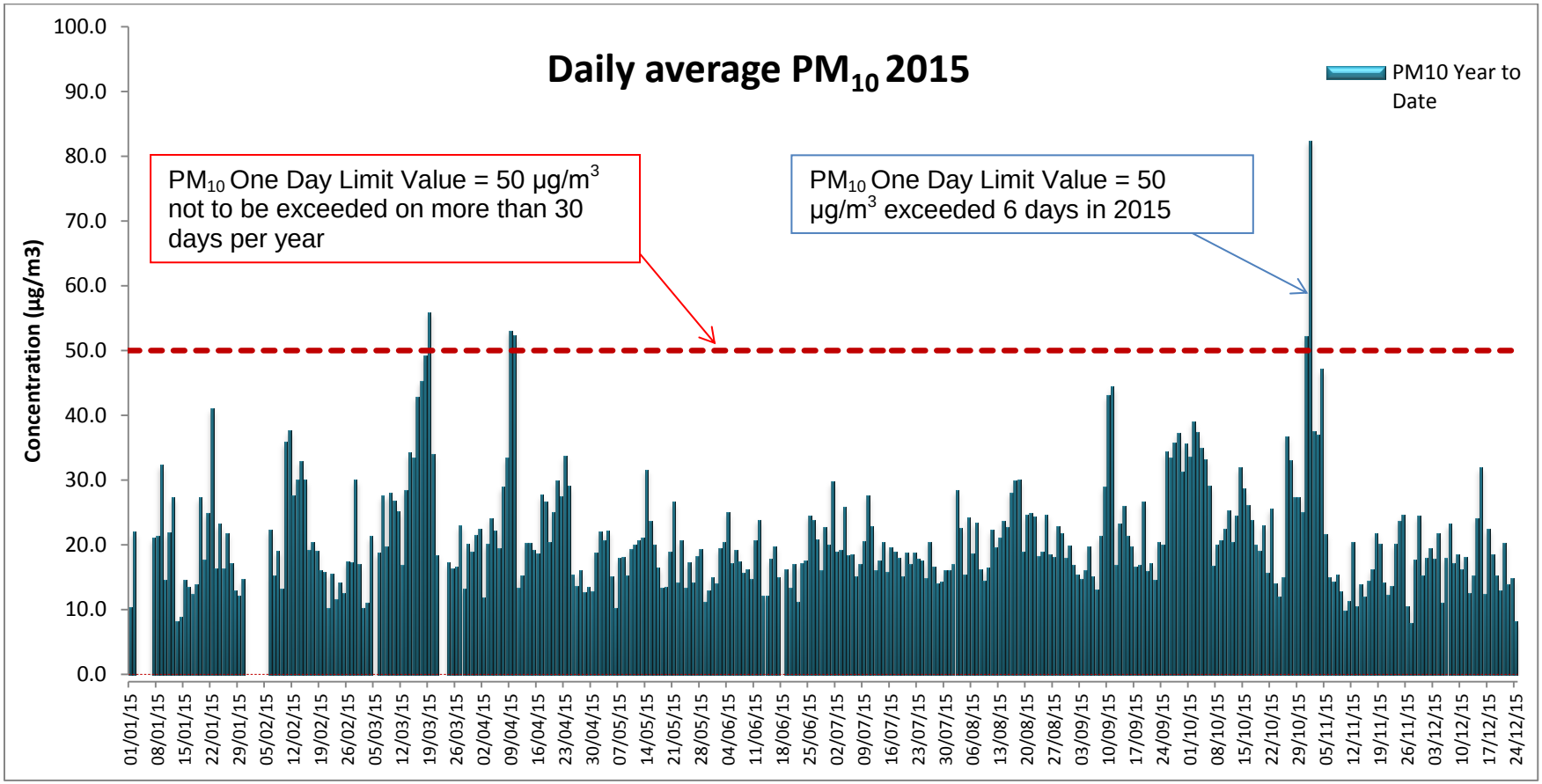

Figure 4 Daily Average PM_{10} Concentrations

6.0 Onsite: Annual Average NO_2 and PM_{10} (2011-2015)

Annual mean NO_2 and PM_{10} are presented in Table 3 for the automatic station onsite at Dublin Airport. The trends over the last four years are shown in Figure 5. There are no exceedances when compared with the limit values contained within the Regulations. The onsite air monitoring station is located in the vicinity of ongoing construction works.

Location	Year	NO_2 ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)
Dublin Airport Station	2015	22	**20**
	2014	22	**21**
	2013	19	**23**
	2012	19	**20**
	2011	18	**19**
Annual Limit Value	**2011 Regulations**	**40**	**40**

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

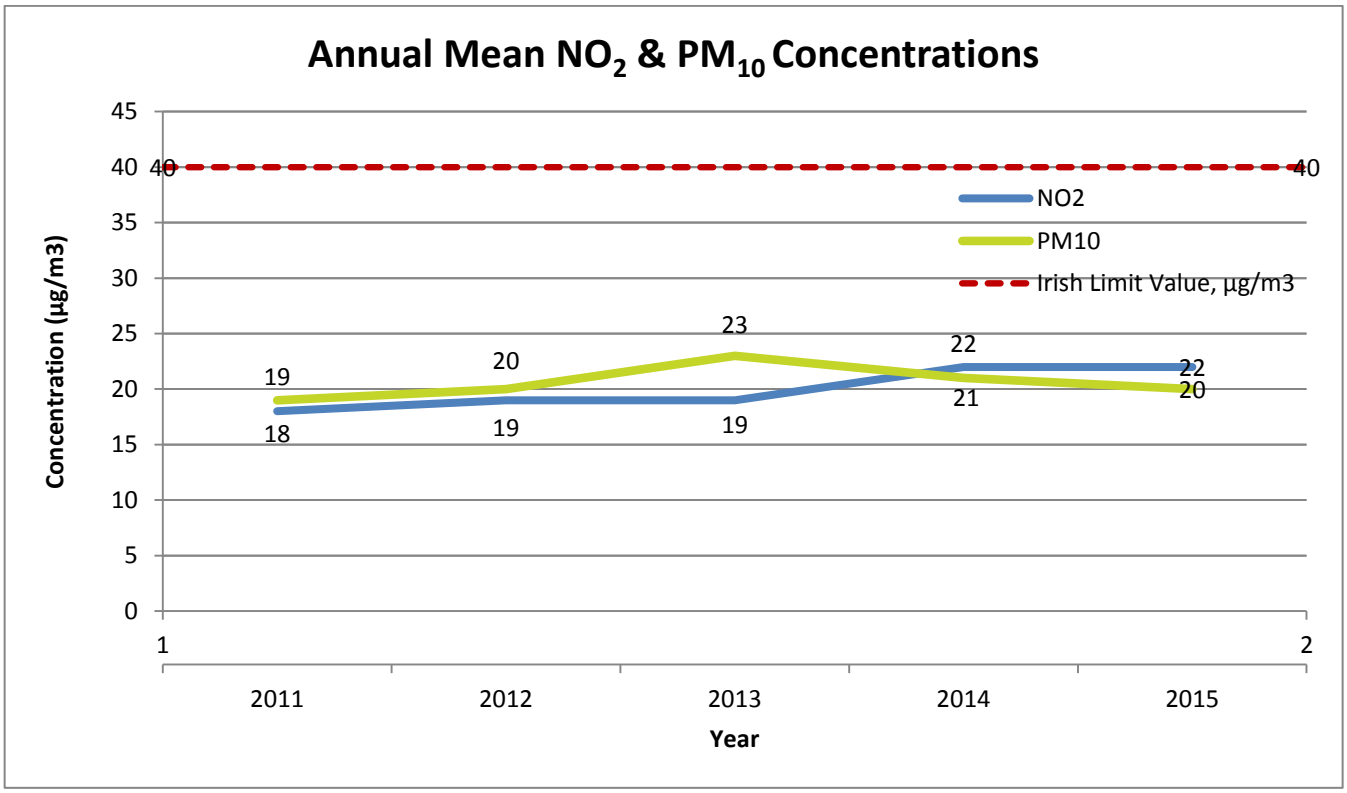

Figure 5 Annual Mean NO_2 & PM_{10} Concentrations at Dublin Airport

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. The Tables below compare Dublin Airport's annual NO_2 and PM_{10} average concentrations with the EPA national network stations records for years 2010-2014. The most recent EPA report on ambient air monitoring in Ireland is the "Air Quality in Ireland 2014 – Key Indicators of Ambient Air Quality" (EPA 2015).

Location	**NO_2 (µg/m^3)**					
	2010	2011	2012	2013	2014	2015[1]
Winetavern St (City Centre)	35	34	29	31	31	
Rathmines	25	20	21	19	17	
Ringsend[2]	29	32	25			
Swords	16	14	15	15	14	
Blanchardstown		31	30	29	31	
Dublin Airport Station[3]	18	19	19	19	22	22
Annual Limit Value	40					

Table 4 NO_2 comparisons with EPA national network stations (2010 – 2014)

Location	**PM_{10} (µg/m3)**					
	2010	2011	2012	2013	2014	2015[1]
Winetavern St (City Centre)	19	14	13	14	14	
Rathmines	18	16	14	17	14	
Phoenix Park	11	12	11	14	12	
Ringsend[2]	23	20	20			
Blanchardstown		16	-	20	18	
Ennis	27	22	19	20	21	
Dublin Airport Station[3]	19	20	20	23	21	20
Annual Limit Value	40					

Table 5 PM_{10} comparisons with EPA national network stations (2010 – 2014)

Notes

1. 2015 EPA monitoring data has not yet been published.
2. Ringsend monitoring ceased in 2012.
3. Dublin Airport values rounded to the nearest number, the onsite monitoring station is located in close proximity to ongoing construction works.

8.0 Environmental Protection Agency: Air Quality Index for Health

The Environmental Protection Agency's Air Quality Index for Health (AQIH) comprises a scale from one to ten which provides air quality information. A reading of 10 indicates that the air quality is very poor and a reading of one to three inclusive indicates that the air quality is good. For a complete AQIH assessment five parameters, including PM_{10} and NO_2 are measured. The AQIH is calculated every hour. The current readings are available on the EPA's AQIH map.

Whilst not directly applicable to Dublin Airport's air quality results, daa assessed the AQIH measurement of two air parameters; NO_2 and PM_{10}.

Station	Parameter	Number of Fair Days	Number of Poor Days	Number of Very Poor Days	Band
Dublin Airport	PM_{10}	6	0	0	Good
	NO_2	0	0	0	Good

Table 6 AQIH for NO_2 and PM_{10} concentrations at Dublin Airport

Using the EPA Air Quality Indices framework as a guide to characterise PM_{10} and NO_2 results, ambient air quality at Dublin Airport is defined as "Good". Further information on the AQIH is presented in Appendix 1.

9.0 Conclusion

Onsite Monitoring: The results of the NO_2 and PM_{10} concentration monitoring using the onsite online analyser indicate concentrations are below the relevant long-term (annual) limit value of 40µg/m³.

Offsite Monitoring: The offsite diffusion tube results for NO_2 indicate that the highest concentrations are recorded adjacent to the main roads around the airport. The monitoring locations are only a few metres from the road and therefore pick up on 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 NO_2.

The EPA is the designated Competent Authority in Ireland for the co-ordination of ambient air quality monitoring in accordance with EU Directives. Using the EPA Air Quality Indices framework as a guide to characterise PM_{10} and NO_2 results, ambient air quality at Dublin Airport is defined as “Good”.

Appendix 1: AQIH (Air Quality Index for Health)

The AQIH health advice messages provide advice to the public on air quality. The table below gives health messages for individuals who are sensitive to air pollution (at risk) and for the general population.

Band	Index	Accompanying health messages for at-risk groups and the general population	
		At-risk individuals *	General population
Good	1	Enjoy your usual outdoor activities.	Enjoy your usual outdoor activities.
	2		
	3		
Fair	4	Adults and children with lung problems, and adults with heart problems, who experience symptoms, should consider reducing strenuous physical activity, particularly outdoors.	Enjoy your usual outdoor activities.
	5		
	6		
Poor	7	Adults and children with lung problems, and adults with heart problems, should reduce strenuous physical activity, particularly outdoors, and particularly if they experience symptoms. People with asthma may find they need to use their reliever inhaler more often. Older people should also reduce physical exertion.	Anyone experiencing discomfort such as sore eyes, cough or sore throat should consider reducing activity, particularly outdoors.
	8		
	9		
Very Poor	10	Adults and children with lung problems, adults with heart problems, and older people, should avoid strenuous physical activity. People with asthma may find they need to use their reliever inhaler more often.	Reduce physical exertion, particularly outdoors, especially if you experience symptoms such as cough or sore throat.

Reference: EPA (2014) "*What is the Air Quality Index for Health?*" Available at http://www.epa.ie/air/quality/index/#d.en.51484