Air Quality Monitoring at Dublin Airport: Annual Report for 2014

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 of particle size less than 10 microns in diameter.
C_6H_6	Benzene
AQIH	Air Quality Index for Health

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Executive Summary

This report provides an overview of air quality at Dublin Airport and surrounding environs for 2014, based on data obtained from the onsite monitoring stations and diffusion tube monitoring in the surrounding areas. This includes the following parameters: nitrogen dioxide (NO_2) and particulate matter (PM_{10}).

daa carries out ambient air monitoring at Dublin Airport and the surrounding area. daa operate an air monitoring station on site at the airport and carry out diffusion tube monitoring in the surrounding areas. A list of these locations is presented in table 1.1 and Figure 1 enclosed within this report.

For comparison purposes the Ambient Air Quality Standards Regulations 2011 (SI 180 of 2011) are referenced. The Air Quality Standards Regulations do not require individual companies or operators to carry out air monitoring or compare the results with limit values specified in the Air Quality Standards Regulations. Monitoring for compliance with the Regulations is the responsibility of local authorities and is supervised by the competent authority under the Regulations, the EPA.

The results from each monitoring location are well below the ambient standards and are typical of urban and inter-urban areas. For national monitoring results carried out by the EPA and local authorities and information relating to air quality please visit www.epa.ie. Up-to-date information including the Air Quality Index for Health is available at www.airquality.epa.ie

1. Introduction

1.1. Background

Dublin Airport is Ireland's busiest international airport, handling approximately 21.7 million passengers in 2014. Dublin Airport covers a significant area of land in North Dublin, approximately two and a half thousand acres and is bounded on two sides by two of the busiest highways in the country – the M1 and the M50.

A list of the current ambient air quality sampling locations is given in Table 1.1. The spatial relationships of the sampling locations to the airport are indicated on a local area map in Figure 1.

1.2. Aims and Objectives

The aim is to monitor concentrations of air parameters around the airport. The results of the daa monitoring programme are compared with the limit values contained within the Regulations as a means of illustrating the general air quality at each location and not as a measure of compliance.

The parameters monitored were as follows:

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

2. Monitoring Locations

A list of the ambient air quality sampling locations for 2014 is given in Table 1.1. The spatial relationships of the sampling locations to the airport are indicated on a local area map in Section 2.

Table 1.1 Community ambient air monitoring locations			
Reference	**Location**	**Measurement Method**	**Parameters Reported**
On-site[1]	West of Castlemoate Road, Dublin Airport	Continuous anlaysers	Nitrogen dioxide (NO_2) Particulate Matter (PM_{10})
A1	Forrest Little Golf Club	Passive Tubes	Nitrogen dioxide (NO_2),
A2	Kilreesk Lane, St. Margaret's	Passive Tubes	
A3[2]	Ridgewood Estate West, Swords	Passive Tubes	
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 Road	Passive Tubes	
A9	Naomh Mearnóg GAA Club, Portmarnock	Passive Tubes	
A10	Oscar Papa Site, Portmarnock	Passive Tubes	

[1] Air Monitoring Station located in the vicinity of a construction compound.
[2] Ceased sampling due to unauthorised removal

2.1. Locations of Monitoring Sites

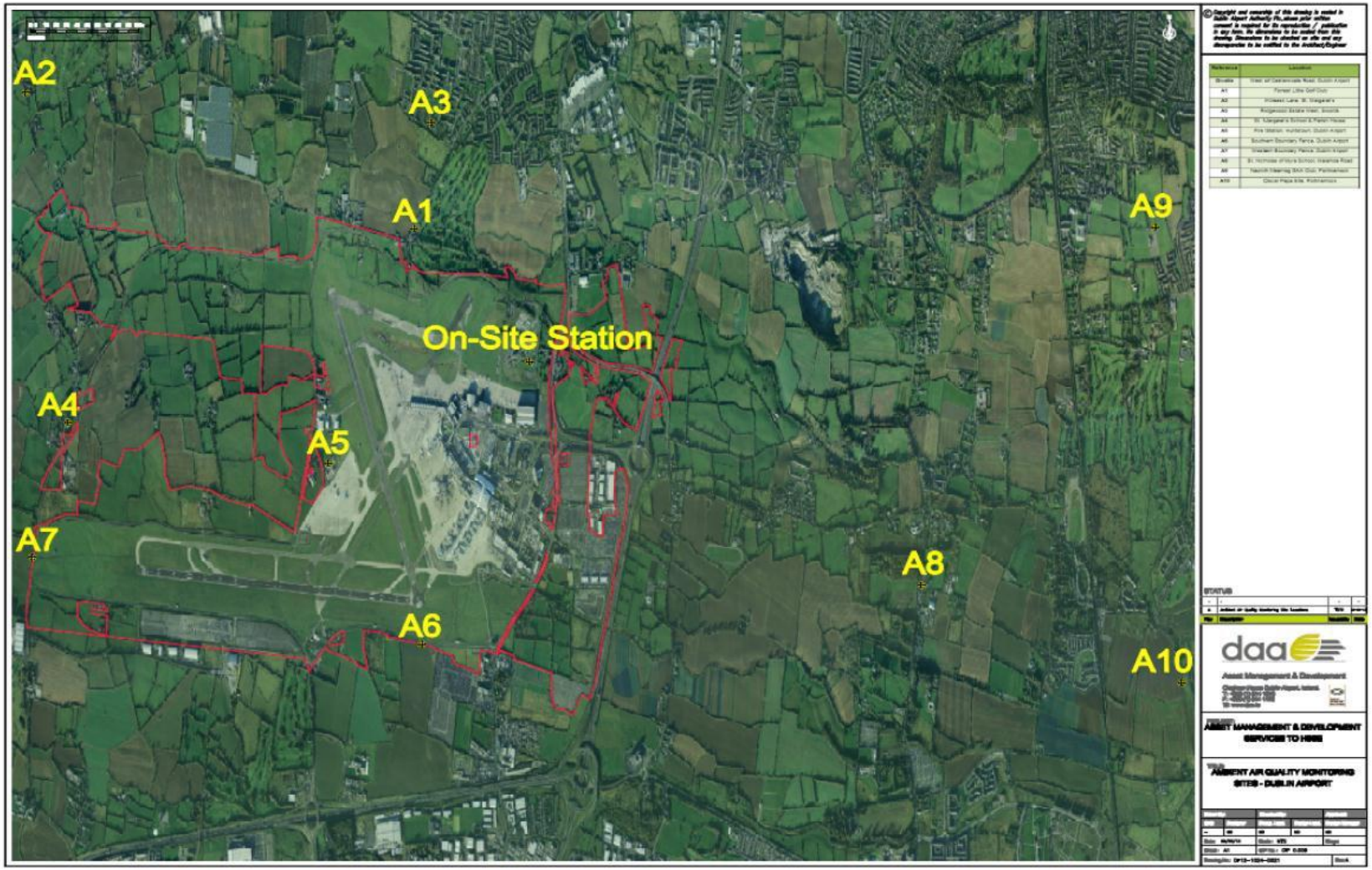

Figure 1: Map of Ambient Air Quality Monitoring Locations for Dublin Airport

3. Description of Parameters and Sampling Methodology

3.1. Passive Sampling: Nitrogen Dioxide (NO_2)

daa operates a network of passive diffusion tube samplers for nitrogen dioxide. The intent of this network is to establish the wider spatial pattern of NO_2 concentrations in the area surrounding the Airport. The locations of the monitoring sites are shown in Figure 1 and are described in Table 1.1. The diffusion tubes are exposed for approximately 4-week intervals. The tubes are then analysed using UV Spectrophotometry at a UKAS accredited laboratory. The diffusion tubes record monthly mean concentrations, which have been averaged to give the annual mean. The results are expressed in µg/m³.

3.2. Onsite Sampling: Nitrogen Dioxide (NO_2)

Monitoring of NO_2 was carried out on a continuous basis at the airport monitoring location between January and December 2014. Measurement of NO_2 was carried out, using a Horiba APNA-370 ambient NOx monitor which employs a cross-flow modulated chemiluminescence method.

3.3. Onsite Sampling: Particulate Matter (PM_{10})

Airborne particulate matter with an aerodynamic diameter equal to or less than 10µm was monitored using the onsite continuous analyser on a continuous basis at the airport monitoring location between January and December 2014. The Met One Instruments automatically measures and records airborne particulate concentration levels using the principle of beta ray attenuation. The sampler draws a measured volume of air through a chamber containing a pre-conditioned and pre-weighed filter according to USEPA protocol for PM_{10} sampling. The results are expressed in µg/m³.

4. Community Monitoring Results

The diffusion tubes record monthly mean concentrations, which have been averaged to give the annual mean**.**

4.1 Average Monthly NO_2 Concentrations

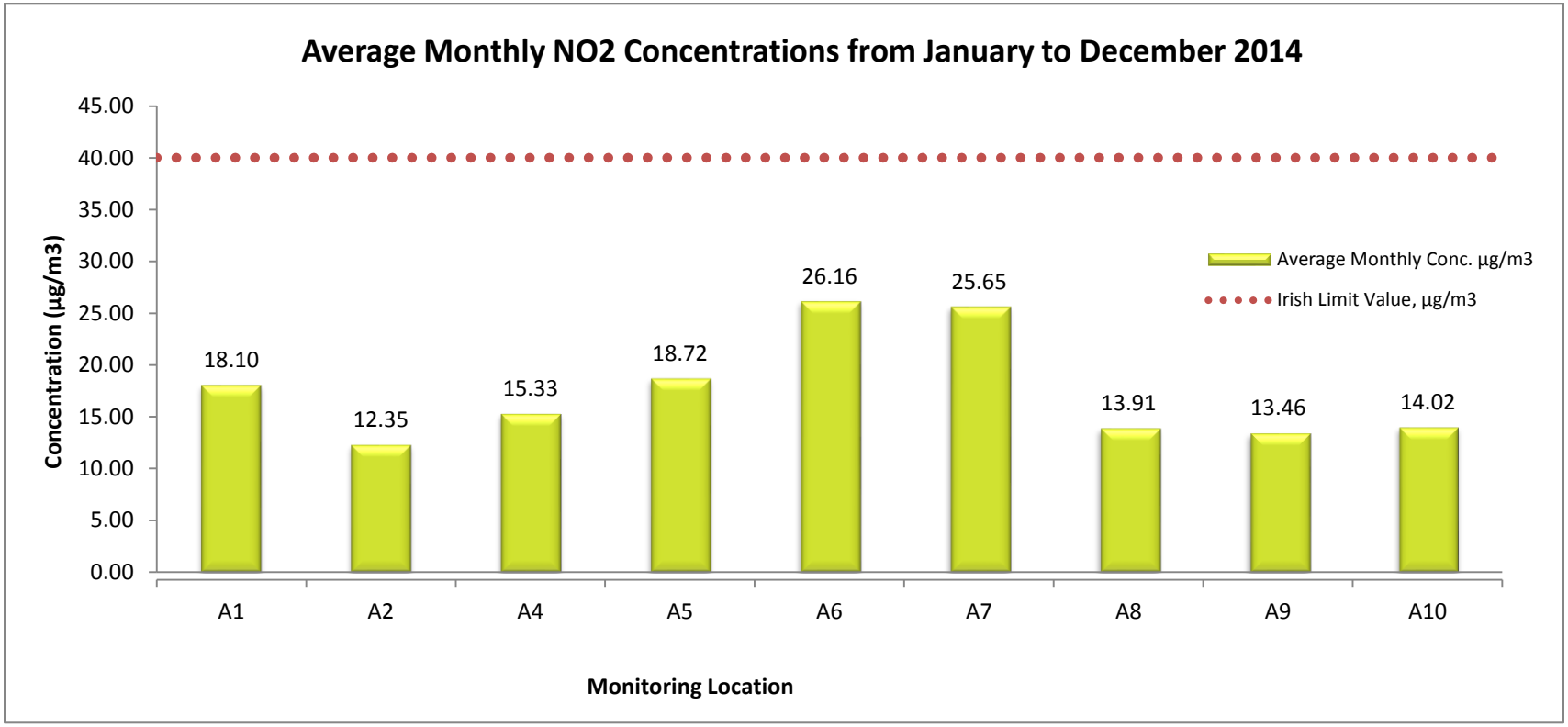

Figure 2: Average Monthly NO_2 Concentrations 2014

5. On-site Airport Monitoring Station Results

5.1 Daily Average NO_2

The 2014 annual mean nitrogen dioxide concentration measured at the automatic station in Dublin Airport was 22.1 µg/m^3 (microgrammes per cubic metre). The annual mean Irish limit value (40 µg/m^3) was not exceeded in 2014.

Table 5-1: Air Quality Limit and Target Values as set out by CAFÉ Directive and S.I. No. 180 of 2011

Objective	Averaging Period	Limit or Threshold Value
NO_2 Limit Value	Calendar Year	40

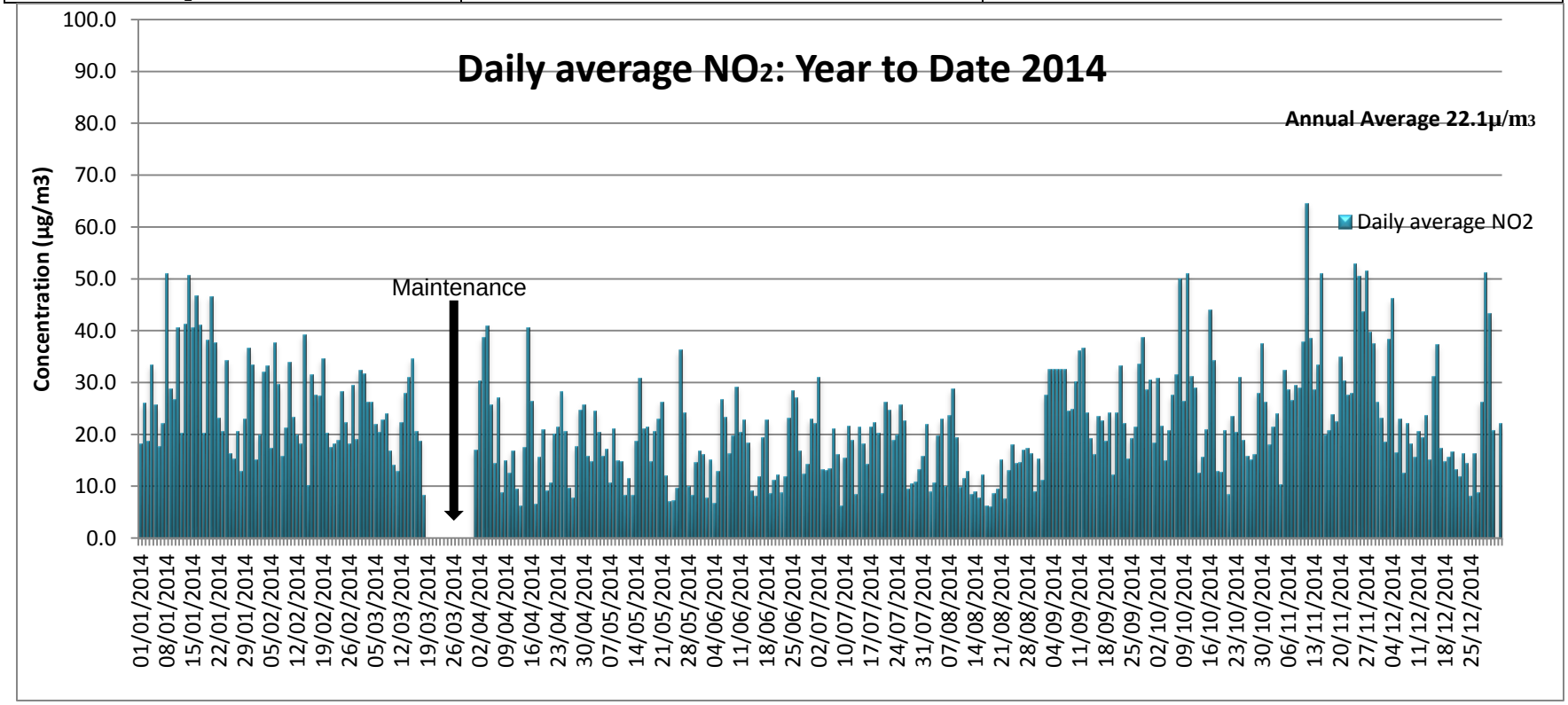

Figure 4: Daily Average NO_2 2014

4.1. Daily average PM_{10}

The 2014 annual mean particulate matter concentration measured at the automatic station in Dublin Airport was 20.5 µg/m^3 (microgrammes per cubic metre). The annual limit value (40 µg/m^3) was not exceeded in 2014. The 2014 daily value did not surpass the number of allowed exceedances as per the Ambient Air Quality Regulations.

Table 5-2: Air Quality Limit and Target Values as set out by CAFÉ Directive and S.I. No. 180 of 2011

Objective	Averaging Period	Limit or Threshold Value	No. of Allowed Exceedances	No. of Exceedances
PM_{10} Limit Value	One day	50	Not to be exceeded on more than 35 days per year	4
PM_{10} Limit Value	Calendar Year	40		0

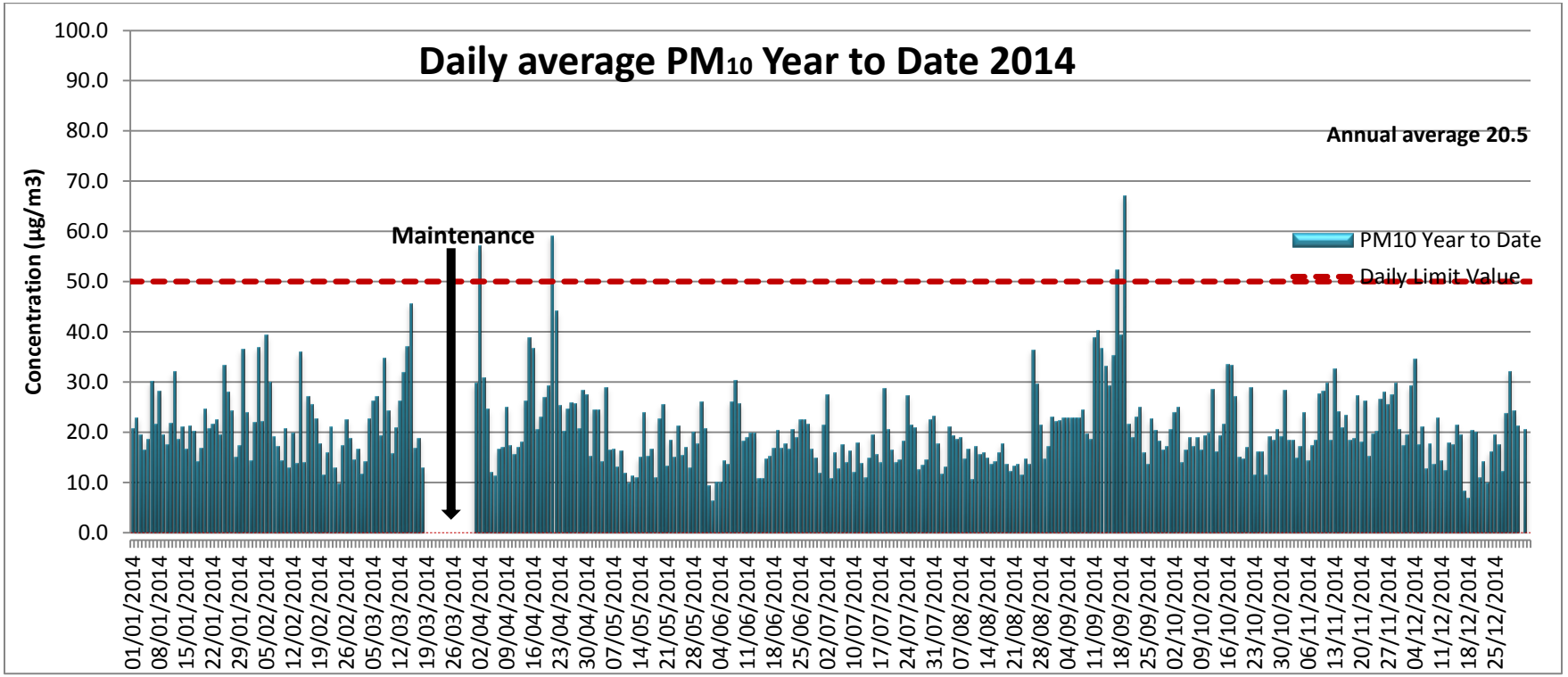

Figure 5: Daily Average PM_{10} 2014

4.2. Annual Average NO_2 & PM_{10} (2012-2014)

Annual mean NO_2 and PM_{10} are presented in Table 5-3 for the automatic station at Dublin Airport. The trends over the last three years are shown in Figure 6. There are no exceedances when compared with the limit values contained within the Ambient Air Quality Regulations. There is a fluctuation in results over the past 3 years with a slight increase in NO_2 and PM_{10} concentrations.

Table 5-3: Annual Mean NO_2 and PM_{10} concentrations at Dublin Airport

Location	Year	NO_2	PM_{10}
Dublin Airport Station	2014	22	21
	2013	19	23
	2012	19	20
Annual Limit Value (µg/m^3)		**40**	**40**

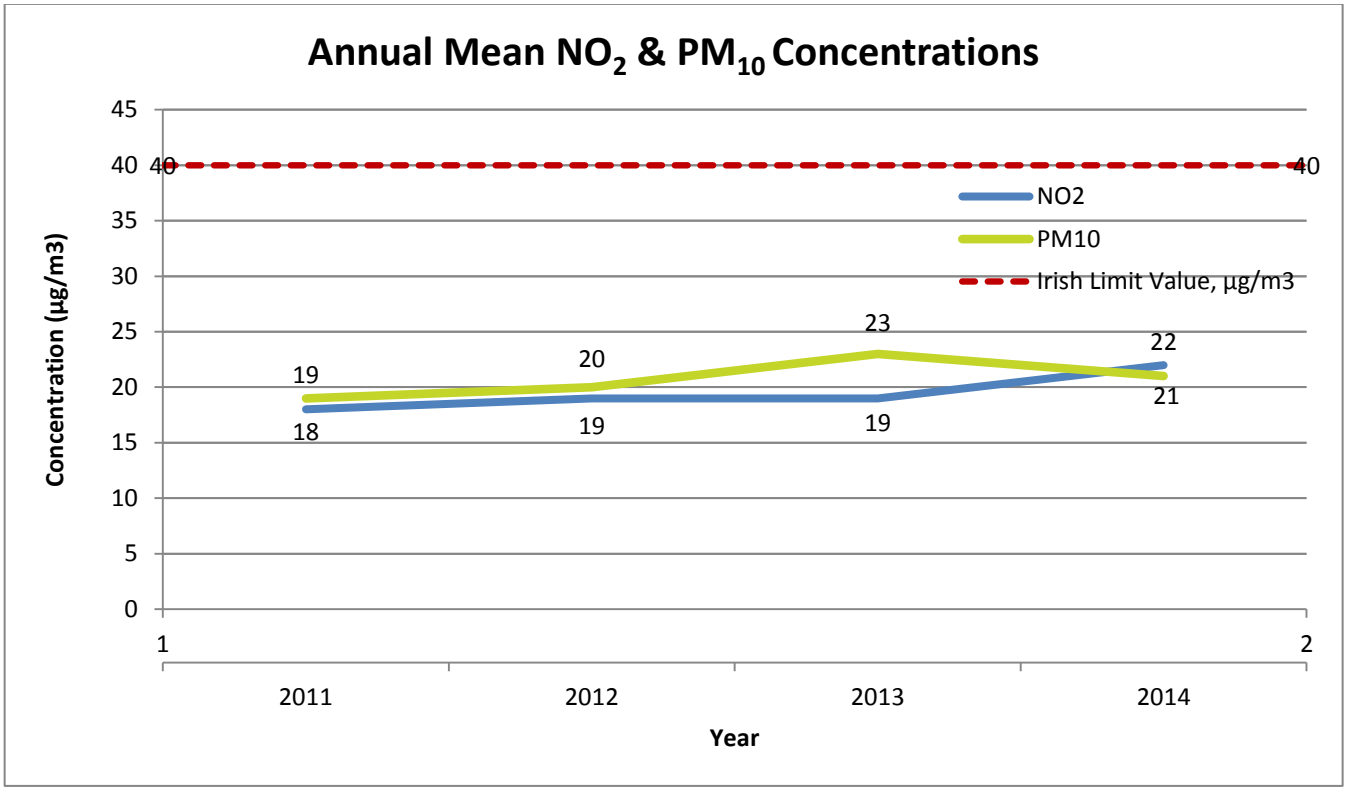

Figure 6: Annual Mean NO_2 and PM_{10} Concentrations at Dublin Airport

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6. Results Summary

6.1 EPA Air Quality Monitoring Program

The Environmental Protection Agency (EPA) has undertaken a significant number of air quality monitoring programs over the last few years. The EPA is the designated Competent Authority in Ireland for the co-ordination of ambient air quality monitoring in accordance with EU Directives. The tables below compares Dublin Airport's annual NO_2 and PM_{10} average with the EPA national network stations for years 2010-2013. The most recent report relating to the monitoring of ambient air at various locations around Ireland is the "Air Quality in Ireland 2013 – Key Indicators of Ambient Air Quality" (EPA 2014).

Table 6-1.1: NO_2 comparisons with EPA national network stations for years 2010 - 2013 (EPA Annual Report 2010-2013)

Location	**NO_2**				
	2010	**2011**	**2012**	**2013**	**2014**[3]
Winetavern St (City Centre)	35	34	29	31	
Rathmines	25	20	21	19	
Ringsend[4]	29	32	25		
Swords	16	14	15	15	
Blanchardstown		31	30	29	
Dublin Airport Station[5]	**18**	**19**	**19**	**19**	**22**
Annual Limit Value	**40**				

Table 6-1.2: PM_{10} comparisons with EPA national network stations for years 2010 - 2013 (EPA Air Quality in Ireland Annual Report 2010-2013)

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

[3] EPA 2014 results not yet published.
[4] Ringsend monitoring ceased in 2012.
[5] DAP values rounded off the nearest number.

6.2 AQIH Index

The Environmental Protection Agency's Air Quality Index for Health (AQIH) is a number from one to 10 that tells you what the air quality currently is in your region. A reading of 10 means the air quality is very poor and a reading of one to three inclusive means that the air quality is good. For a complete AQIH assessment five parameters should be 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 on measurement of two air parameters; NO_2 (Nitrogen Dioxide) and PM_{10} (particles with a diameter <10 µm). The index for each parameter is calculated separately. The table below shows the concentration ranges for each parameter.

Table 6-2: AQIH for NO_2 and PM_{10} concentrations at Dublin Airport

Station	Parameter	Number of Fair Days	Number of Poor Days	Number of Very Poor Days	Band
DAP	PM_{10}	4	0	0	Good
	NO_2	0	0	0	Good

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

6.3 Conclusion

The results of the NO_2 and PM_{10} concentrations using the online analyser indicate concentrations are below the relevant long-term (annual) limit value of 40µg/m³ and within the allowed criteria of short term limit values.

The 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.

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

Appendix 1- AQIH

The AQIH health advice messages are messages to help you and your family better manage your health. 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 [Accessed on 20/02/2014]