Bickerdike Allen Partners
Architecture
Acoustics
Technology

DUBLIN AIRPORT

2021 NOISE CONTOURS

Prepared for:

daa plc
Old Central Terminal Building
Dublin Airport
Co Dublin
Ireland

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Architects: Design and project management services which cover all stages of design, from feasibility and planning through to construction on site and completion.

Acoustic Consultants: Expertise in planning and noise, the control of noise and vibration and the sound insulation and acoustic treatment of buildings.

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1.0 INTRODUCTION

Bickerdike Allen Partners (BAP) have been retained by Dublin Airport Authority (daa) to produce noise contours for 2021. Noise contours have been produced based on the annual movements using the L_{den} and L_{night} metric. Noise contours have also been produced based on the movements in the 92 day summer period (16th June to 15th September) for two metrics, the $L_{Aeq,16h}$ average daytime metric and $L_{Aeq,8h}$ average night-time metric.

This report presents the areas of the noise contours and a summary of the movements used to produce them. Also attached are figures showing the 2021 noise contours, figures comparing the 2020 and 2021 noise contours, and a figure comparing the 2021 summer day 63 dB noise contour with the airports SIGS boundaries.

2.0 METHODOLOGY

The noise contours have been produced based on the actual aircraft movements in 2021, details of which were provided by daa. The noise contours have been produced using a similar methodology to that used to produce the 2019 and 2020 contours, which is detailed in BAP report A11267_08_RP023_2.0. The changes to the methodology are as follows:

- Update from version 2d to 3e of the Federal Aviation Administration software Aviation Environmental Design Tool (AEDT).
- Update to the validation exercise to utilise the noise levels measured by the Dublin Airport Noise and Flight Track Monitoring System (NFTMS) in 2021.
- Update of modelled flight tracks utilising the radar data recorded by the Dublin Airport NFTMS in 2021.
- Use of a standardised 10-year modal split rather than the actual runway used by each aircraft.

2.1 Validation

Results from the Dublin Airport Noise and Track Keeping (NTK) system have been used for noise validation purposes. Specifically, the results from Noise Monitoring Terminals (NMTs) 1, 2 and 20 between January and December 2021 have been used.

The noise levels from the monitors are automatically correlated with aircraft movements using the NFTMS. A number of parameters are measured by the system, for this validation the Sound Exposure Level (SEL) of the individual aircraft movements has been used.

To take into account the measured levels, firstly the logarithmic average of the measured results at each NMT location has been determined for each aircraft type, separately arriving and

departing (specifically considering the most common stage length). The AEDT software was then used to predict the noise level at the NMT locations using the recommended AEDT aircraft type.

The predicted noise levels have been compared to the measured averages for the aircraft types when separately arriving and departing. Where differences between the measured and predicted results were found then adjustments were made to the modelling to minimise these differences. This was done by adjusting the AEDT NPD data for the modelled aircraft types so that the movement-weighted average modelled noise levels at the NMTs matched the measured level noise level. One adjustment is applied for all arrivals by a particular aircraft type, and a separate adjustment is applied to all departures, regardless of runway end or stage length. The actual modelling utilises the stage lengths of the individual departures based on the distance to the destination airport.

Seventeen aircraft have had modifications made to their arrival and departure noise assumptions. The modifications are detailed in Table 1 below. These modifications achieve a better correlation between predicted and measured noise at the airport.

For the most common aircraft, the Airbus A320 and Boeing 737-800, based on confidential information provided by airlines, custom “USER” profiles have been created that more closely replicate the procedures used by aircraft departing from Dublin Airport. These profiles broadly replicate NADP2 procedures with a lower initial thrust than maximum on take-off.

The AEDT departure profiles for many of the aircraft in the AEDT database finish at 10,000 ft. To allow predictions over the whole of the study area these profiles have been extended to 30,000 ft or for certain aircraft the maximum altitude AEDT calculates to be achievable for the particular aircraft type. These user-defined profiles have been denoted “30KFT”.

Aircraft Type	Arrivals		Departures		
	AEDT Type	Adjustment (dB)	AEDT Type	Profile	Adjustment (dB)
A20N	A320-271N	-0.5	A320-271N	30KFT	+0.7
A21N	A320-271N	-0.4	A320-271N	30KFT	-0.2
A306	A300-622R	-3.5	A300-622R	30KFT	+0.1
A319	A319-131	-0.9	A319-131	30KFT	+0.9
A320	A320-211	-1.0	A320-211	USER	-2.0
A333	A330-301	-1.3	A330-301	30KFT	-0.9
ATR72	ATR72-212A	+3.4	ATR72-212A	30KFT [1]	-2.0 [2]
B38M	7378MAX	-0.4	7378MAX	30KFT	-0.2
B734	737400	+0.3	737400	30KFT	-1.3
B737	737700	-1.7	737700	30KFT	-0.3
B738	737800	-1.4	737800	USER	-1.4
B763	767300	-2.0	767300	30KFT	-5.0
B764	767400	+0.3	767400	30KFT	+0.9
B772	777200	0.0	777200	30KFT	+1.4
B773	777300	-1.0	777300	30KFT	-2.9
B787	7878R	-0.2	7878R	30KFT	+0.4
E190	EMB190	-1.1	EMB190	30KFT	-0.4

[1] Maximum altitude limited to AEDT calculated max for the AEDT type.

[2] This aircraft does not routinely depart over NMT20 as it turns before reaching it, validation has therefore been based solely on measured results from NMTs 1 & 2.

Table 1: Modifications to AEDT Default Assumptions

2.2 Aircraft Movements

Table 2 below presents a summary of the 2021 movements.

Aircraft Type	2021 Actual Movements				
	Annual			92-Day Summer	
	Day 07h-19h	Evening 19h-23h	Night 23h-07h	Day 07h-23h	Night 23h-07h
Airbus A306	90	628	642	205	204
Airbus A319	1,277	265	232	431	80
Airbus A320	10,894	2,139	1,887	4,112	704
Airbus A320neo	1,061	154	119	286	52
Airbus A321	249	63	71	91	21
Airbus A321neo	2,521	144	555	806	164
Airbus A330	2,288	295	875	703	214
Airbus A330neo	8	0	0	0	0
Airbus A350	87	11	26	26	2
ATR 42	566	6	291	0	132
ATR 72	1,270	36	531	74	130
BAe 146/Avro RJ	7	1	0	2	0
Boeing 737-400	109	702	1,029	218	282
Boeing 737-700	310	161	140	88	33
Boeing 737-800	25,173	8,071	5,752	10,963	2,103
Boeing 737 MAX	532	175	31	197	10
Boeing 757	82	14	23	21	5
Boeing 767	675	595	890	323	229
Boeing 777	828	17	713	222	229
Boeing 777X	0	0	0	0	0
Boeing 787	2,110	28	1,088	720	211
Bombardier CS300	570	44	4	238	0
Bombardier Dash 8	117	21	0	62	0
Embraer E190/195	2,440	431	218	628	64
Other	6,783	888	994	2,396	251
Total	**60,047**	**14,889**	**16,111**	**22,792**	**5,120**

Table 2: 2021 Actual Movements

3.0 NOISE CONTOURS

The 2021 annual L_{den} contours are shown in Figure 01. Figure 05 shows a comparison of the 2020 and 2021 annual L_{den} contours at 45 and 65 dB(A). The areas of the 2021 annual L_{den} contours are shown below in Table 3, where they are compared with the 2020 contour areas.

Metric Value, dB L_{den}	Contour Area, km^2	
	2021	2020
≥ 45	290.6	237.2
≥ 50	111.0	90.3
≥ 55	45.8	36.5
≥ 60	16.0	12.5
≥ 65	5.6	4.4
≥ 70	2.0	1.6
≥ 75	0.8	0.7

Table 3: Contour Areas, L_{den} Metric

The 2021 annual L_{night} contours are shown in Figure 02. Figure 06 shows a comparison of the 2020 and 2021 annual L_{night} contours at 40 and 55 dB(A). The areas of the 2021 annual L_{night} contours are shown below in Table 4, where they are compared with the 2020 contour areas.

Metric Value, dB L_{night}	Contour Area, km^2	
	2021	2020
≥ 40	172.3	138.7
≥ 45	75.3	59.8
≥ 50	28.3	21.7
≥ 55	9.8	7.5
≥ 60	3.5	2.7
≥ 65	1.3	1.0
≥ 70	0.6	0.4

Table 4: Contour Areas, L_{night} Metric

The 2021 summer day contours are shown in Figure 03. Figure 07 shows a comparison of the 2021 summer day 63 dB contour with the airport's SIGS boundaries. The areas of the 2021 summer day contours are shown below in Table 5, where they are compared with the 2020 contour areas.

Metric Value, dB $L_{Aeq,16h}$	Contour Area, km^2	
	2021	2020
≥ 51	55.2	34.2
≥ 54	30.1	18.0
≥ 57	15.8	9.6
≥ 60	8.5	5.1
≥ 63	4.5	2.8
≥ 66	2.5	1.5
≥ 69	1.4	0.9

Table 5: Contour Areas, $L_{Aeq,16h}$ Metric

The 2021 summer night contours are shown in Figure 04. The areas of the 2021 summer night contours are shown below in Table 6, where they are compared with the 2020 contour areas.

Metric Value, dB $L_{Aeq,8h}$	Contour Area, km^2	
	2021	2020
≥ 45	89.8	66.1
≥ 48	52.4	37.3
≥ 51	28.4	19.7
≥ 54	14.9	10.4
≥ 57	8.0	5.5
≥ 60	4.2	3.0
≥ 63	2.3	1.6

Table 6: Contour Areas, $L_{Aeq,8h}$ Metric

All of the 2021 contours are larger than their 2020 equivalents, due to the increase in movements in 2021, as the airport recovers from the effects of the COVID-19 pandemic.

As can be seen in Figure 07, the 2021 summer day 63 dB $L_{Aeq,16h}$ contour (orange) is fully contained within all three SIGS eligibility boundaries.

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