Bickerdike Allen Partners
Architecture Acoustics Technology

DUBLIN AIRPORT

2020 NOISE CONTOURS

Prepared for:

daa plc
Old Central Terminal Building
Dublin Airport
Co Dublin
Ireland

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Bickerdike Allen Partners LLP is an integrated practice of Architects, Acousticians, and Construction Technologists, celebrating over 50 years of continuous practice.

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.

Construction Technology Consultants: Expertise in building cladding, technical appraisals and defect investigation and provision of construction expert witness services.

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1.0 INTRODUCTION

Bickerdike Allen Partners (BAP) have been retained by Dublin Airport Authority (daa) to produce noise contours for 2020. Noise contours have been produce 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 2020 noise contours, figures comparing the 2019 and 2020 noise contours.

2.0 METHODOLOGY

The noise contours have been produced based on the actual aircraft movements in 2020, details of which were provided by daa. The noise contours have been produced using a similar methodology to that used to produce the 2019 contours, which is detailed in BAP report A11267_08_RP023_2.0. The only change to the methodology, which utilises the Federal Aviation Administration software Aviation Environmental Design Tool (AEDT) version 2d, is an update to the validation exercise to utilise the noise levels measured at the Dublin Airport NMTs in 2020.

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 2020 have been used.

The noise levels from the monitors are automatically correlated with aircraft movements using the radar track keeping system and the average determined by aircraft type and operation. 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 the AEDT software has been used to predict the level at the NMT locations using the recommended AEDT aircraft type. This has been compared to the measured averages for the aircraft types when separately arriving and departing. Where the differences between the measured and predicted results were found to be significant then adjustments were made to the modelling to minimise 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. Small changes to other types such as the Boeing B787 were also made.

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, 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)
A306	A300-622R	-2.7	A300-622R	30KFT	+2.0
A319	A319-131	-0.5	A319-131	30KFT	+0.7
A320	A320-211	-0.4	A320-211	USER	-2.5
A320neo	A320-211	-2.1	A320-211	USER	-4.7
A321	A321-232	+0.7	A321-232	USER	-1.0
A321neo	A321-232	-1.7	A321-232	USER	-5.9
A332	A330-301	-0.1	A330-301	30KFT	-1.8
A333	A330-301	-1.1	A330-301	30KFT	-1.7
ATR72	SD330	+2.4	SD330	30KFT [2]	-0.9[3]
B734	737400	+0.6	737400	30KFT	-0.7
B738	737800	-2.8	737800	USER	-1.9
B763	767300	-2.1	767300	30KFT	-3.5
B772	777200	+0.7	777200	30KFT	+1.0
B773	777300	-0.3	777300	30KFT	-3.1
B787	7878R	0	7878R	30KFT	+0.3
E190	EMB190	-0.6	EMB190	30KFT	-0.3
RJ85	BAE146	-2.4	BAE146	30KFT [2]	-1.7
DH4[1]	SD330	0	DHC6	30KFT [2]	0

[1] The DH4 type was not validated due to insufficient results. The modelled AEDT types are based on BAP's experience of this aircraft at other airports where it operates more frequently, as the default AEDT suggested type of DHC830 typically leads to significant under-prediction of noise levels.

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

[3] 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 2020 movements.

Aircraft Type	2020 Actual Movements				
	Annual			92-Day Summer	
	Day 07h-19h	Evening 19h-23h	Night 23h-07h	Day 07h-23h	Night 23h-07h
Airbus A306	20	255	252	68	59
Airbus A319	965	147	60	248	16
Airbus A320	12,775	2,652	1,071	2,733	61
Airbus A320neo	578	46	33	74	26
Airbus A321	1,229	224	313	140	46
Airbus A321neo	1,172	83	233	315	50
Airbus A330	2,765	229	979	352	209
Airbus A330neo	0	0	0	0	0
Airbus A350	144	5	119	73	5
ATR 42	44	29	5	10	0
ATR 72	6,087	529	642	1,030	133
BAe 146/Avro RJ	730	82	44	4	0
Boeing 737-400	53	542	560	145	139
Boeing 737-700	509	149	99	166	25
Boeing 737-800	23,763	7,223	4,994	8,168	1,834
Boeing 737 MAX	0	0	0	0	0
Boeing 757	318	5	20	6	4
Boeing 767	568	545	1,038	270	273
Boeing 777	809	100	330	153	8
Boeing 777X	0	0	0	0	0
Boeing 787	1,292	49	1,252	354	354
Bombardier CS300	492	9	3	180	2
Bombardier Dash 8	638	230	1	0	0
Embraer E190/195	1,699	167	60	386	31
Other	4,315	842	392	1,318	93
Total	**60,965**	**14,142**	**12,500**	**16,193**	**3,368**

Table 2: 2020 Actual Movements

3.0 NOISE CONTOURS

The 2020 annual L_{den} contours are shown in Figure 01. Figure 05 shows a comparison of the 2019 and 2020 annual L_{den} contours at 45 and 65 dB(A). The areas of the 2020 annual L_{den} contours are shown below in Table 3, where they are compared with the 2019 contour areas.

Metric Value, dB L_{den}	Contour Area, km^2	
	2020	2019
≥ 45	237.2	745.7
≥ 50	90.3	218.7
≥ 55	36.5	88.3
≥ 60	12.5	35.6
≥ 65	4.4	12.2
≥ 70	1.6	4.4
≥ 75	0.7	1.7

Table 3: Contour Areas, L_{den} Metric

The 2020 annual L_{night} contours are shown in Figure 02. Figure 06 shows a comparison of the 2019 and 2020 annual L_{night} contours at 40 and 55 dB(A). The areas of the 2020 annual L_{night} contours are shown below , where they are compared with the 2019 contour areas.

Metric Value, dB L_{night}	Contour Area, km^2	
	2020	2019
≥ 40	138.7	328.4
≥ 45	59.8	122.2
≥ 50	21.7	52.3
≥ 55	7.5	18.6
≥ 60	2.7	6.4
≥ 65	1.0	2.5
≥ 70	0.4	1.0

Table 4: Contour Areas, L_{night} Metric

Metric Value, dB L_{night}	Contour Area, km^2	
	2020	2019
≥ 40	138.7	328.4
≥ 45	59.8	122.2
≥ 50	21.7	52.3
≥ 55	7.5	18.6
≥ 60	2.7	6.4
≥ 65	1.0	2.5
≥ 70	0.4	1.0

Table 4: Contour Areas, L_{night} Metric

The 2020 summer day contours are shown in Figure 03. Figure 07 shows a comparison of the 2020 summer day 63 dB contour with the airport's SIGS boundaries. The areas of the 2020 summer day contours are shown below in Table 5, where they are compared with the 2019 contour areas.

Metric Value, dB $L_{Aeq,16h}$	Contour Area, km^2	
	2020	2019
≥ 51	34.2	114.3
≥ 54	18.0	69.9
≥ 57	9.6	39.8
≥ 60	5.1	21.3
≥ 63	2.8	11.4
≥ 66	1.5	6.1
≥ 69	0.9	3.3

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

The 2020 summer night contours are shown in Figure 04. The areas of the 2020 summer night contours are shown below in Table 6, where they are compared with the 2019 contour areas.

Metric Value, dB $L_{Aeq,8h}$	Contour Area, km^2	
	2020	2019
≥ 45	66.1	140.1
≥ 48	37.3	84.8
≥ 51	19.7	50.8
≥ 54	10.4	27.8
≥ 57	5.5	14.4
≥ 60	3.0	7.6
≥ 63	1.6	4.1

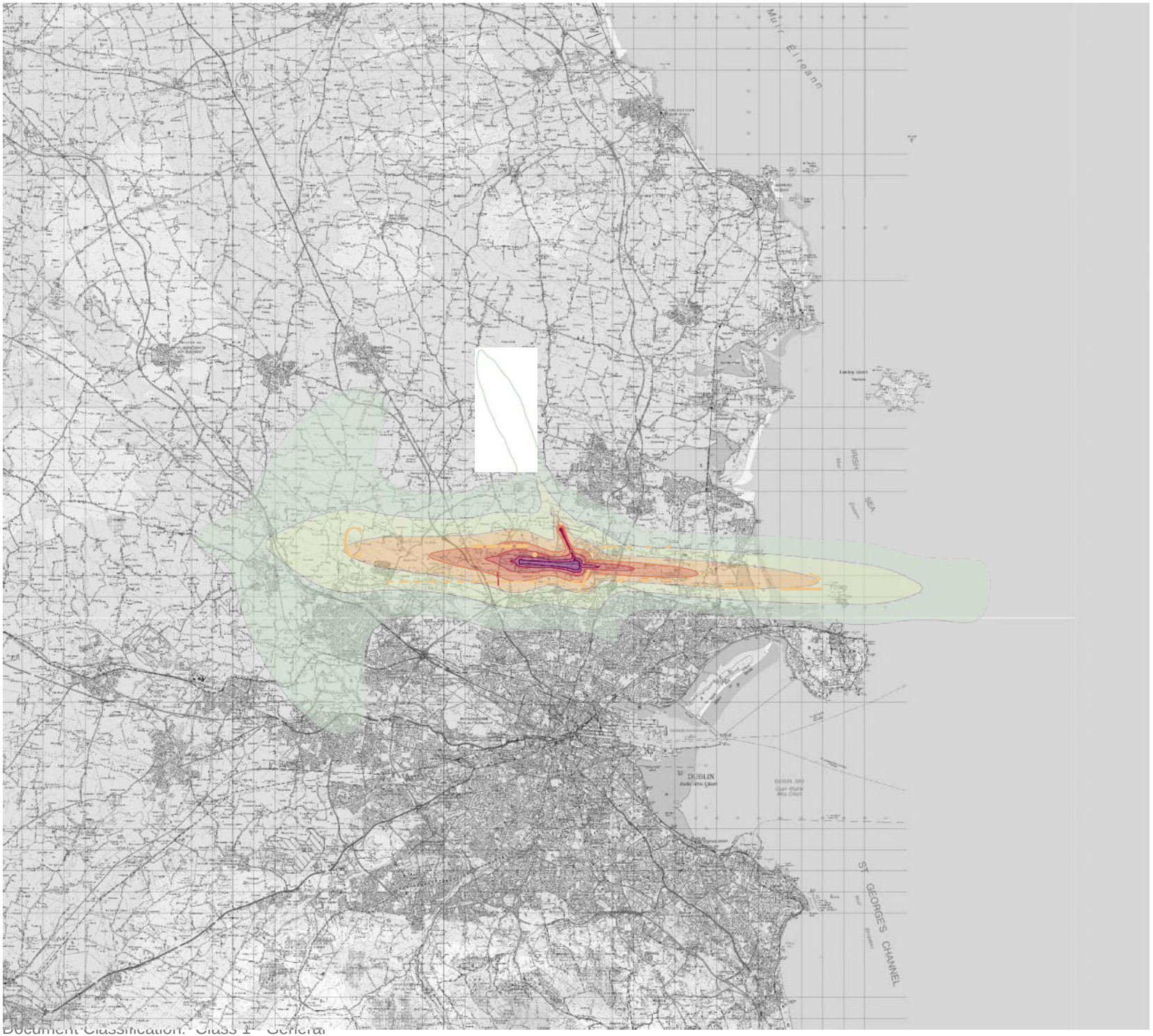
Table 6: Contour Areas, $L_{Aeq,8h}$ Metric

All of the 2020 contours are smaller than their 2019 equivalents, due to the large reduction in movements in 2020, as a result of the COVID-19 pandemic.

Duncan Rogers
for Bickerdike Allen Partners LLP

Nick Williams
Associate

David Charles
Partner



LEGEND:

- 45 - 49 dB(A) ½Jen
- 50 - 54 dB(A) Lden
- 55 - 59 dB(A) ½Jen
- 60 - 64 dB(A) ½Jen
- 65 - 69 dB(A) ½Jen
- 70 - 74 dB(A) ½Jen
- 75+ dB(A) Lden

Rev	Date	Description	Initials

REVISIONS

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Dublin Airport
Annual Noise Contours

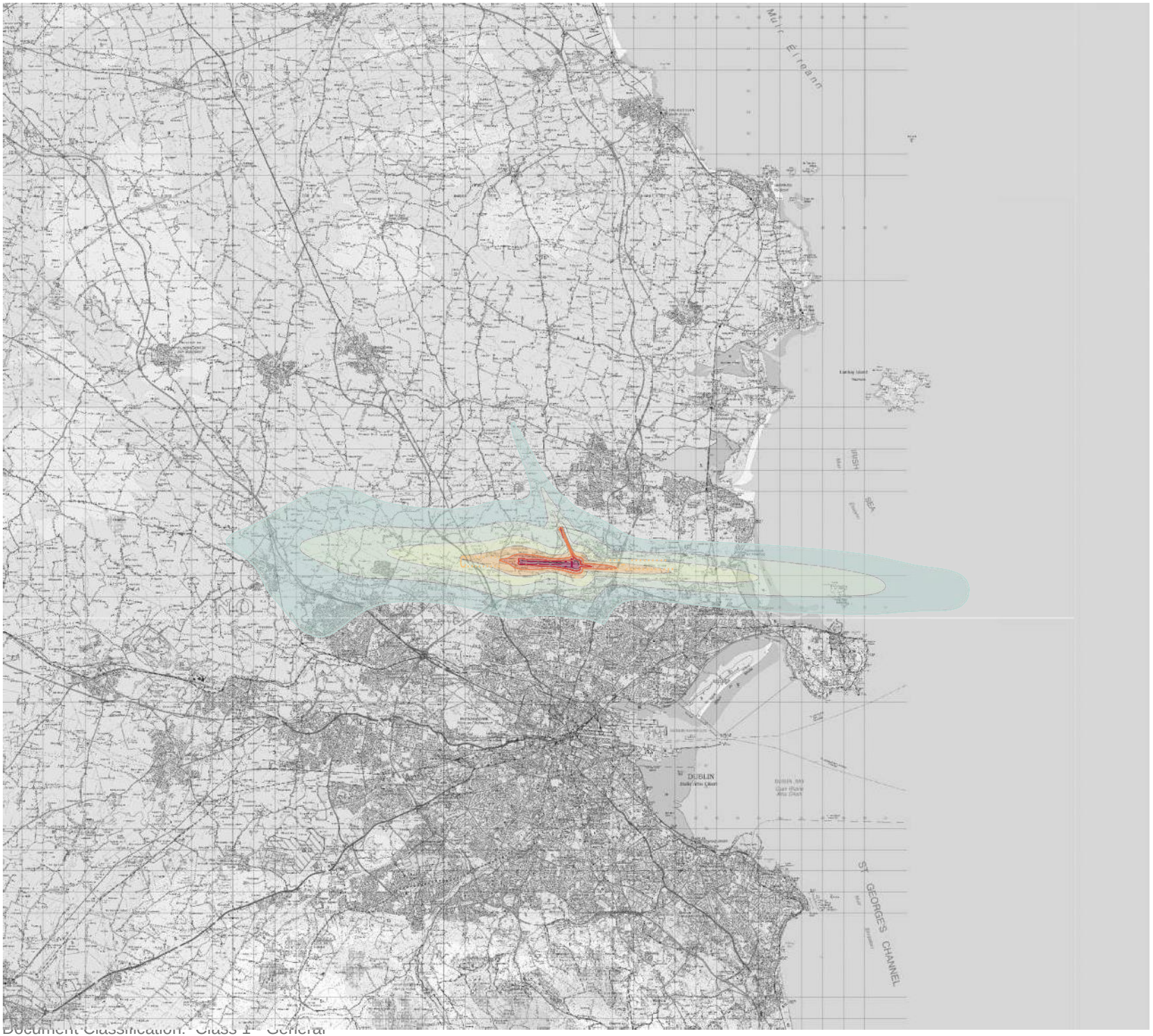
Figure 01
2020 Annual Lden Noise Contours

DRAWN: DR CHECKED: NW

DATE: December 2021 SCALE: 1:25,000@A4

Drawing No:

A11429_01_DR001_1.0



LEGEND:

- 40 - 44 dB(A) Lnight
- 45 - 49 dB(A) Lnight
- 50 - 54 dB(A) Lnight
- 55 - 59 dB(A) Lnight
- 60 - 64 dB(A) Lnight
- 65 - 69 dB(A) Lnight
- 70+ dB(A) Lnight

Rev	Date	Description	Initials

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Dublin Airport
Annual Noise Contours

Figure 02
2020 Annual Lnight Noise Contours

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DATE: December 2021 SCALE: 1:250,000@A4

Drawing No:

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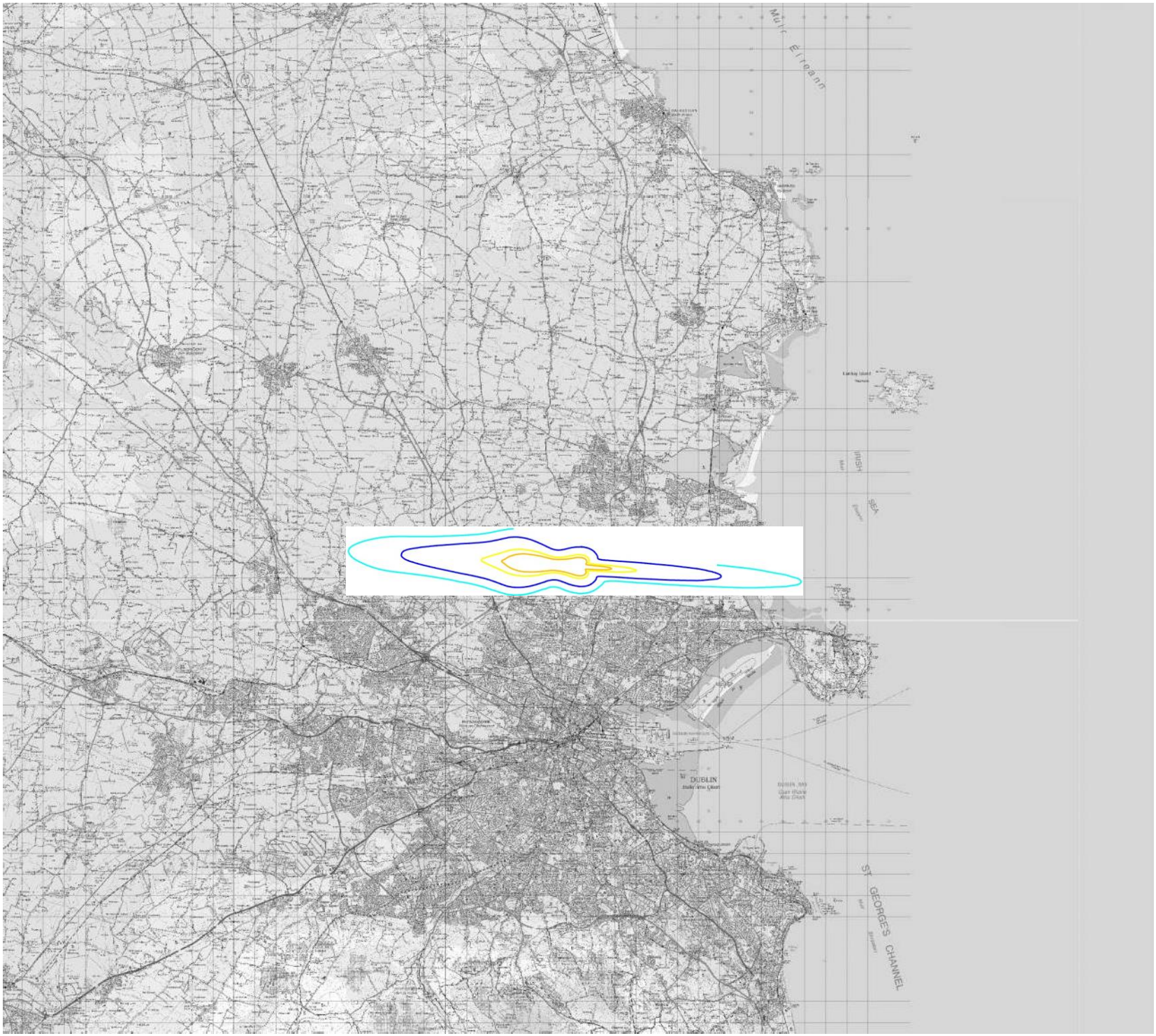

LEGEND:

- 51- 53 dB(A) LAeq,!Gh
- 54 - 56 dB(A) LAeq,!Gh
- 57 - 59 dB(A) LAeq,!Gh
- 60 - 62 dB(A) LAeq,!Gh
- 63 - 65 dB(A) LAeq,16h
- 66 - 68 dB(A) LAeq !Gh
- 69+ dB(A) LAeq,16h

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Dublin Airport
Annual Noise Contours

Figure 03
2020 Summer Day Noise Contours

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DATE: December 2021 SCALE: 1 25 000 @A4

Drawing No:

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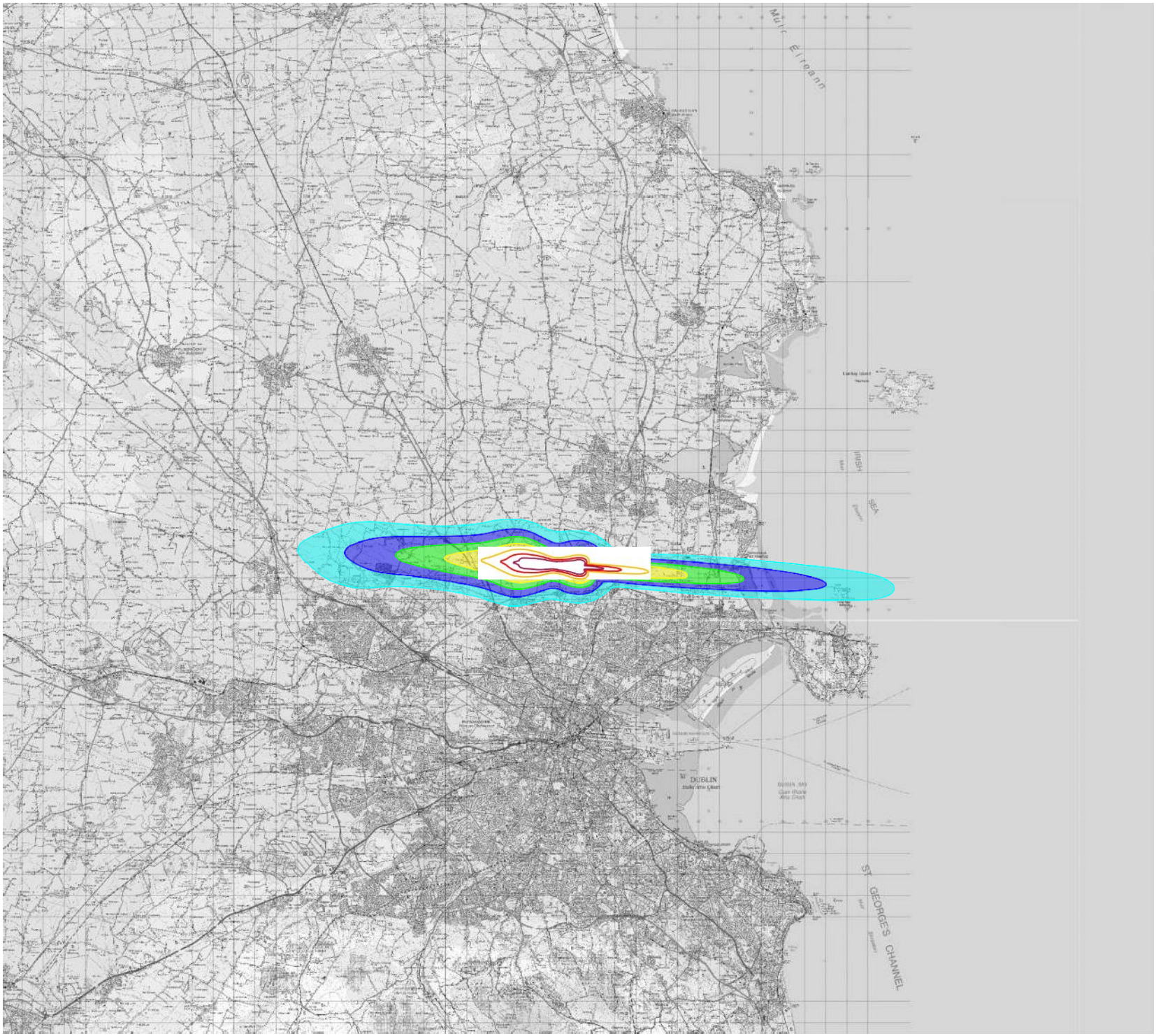

LEGEND:

- 45 - 47 dB(A) $L_{Aeq,8h}$
- 48 - 50 dB(A) $L_{Aeq,8h}$
- 51 - 53 dB(A) $L_{Aeq,8h}$
- 54 - 56 dB(A) $L_{Aeq,8h}$
- 57 - 59 dB(A) $L_{Aeq,8h}$
- 60 - 62 dB(A) $L_{Aeq,8h}$
- 63+ dB(A) $L_{Aeq,8h}$

Rev	Date	Description	Initials

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Dublin Airport
Annual Noise Contours

Figure 04
2020 Summer Night Noise Contours

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DATE: December 2021 SCALE: 1:25,000@A4

Drawing No:

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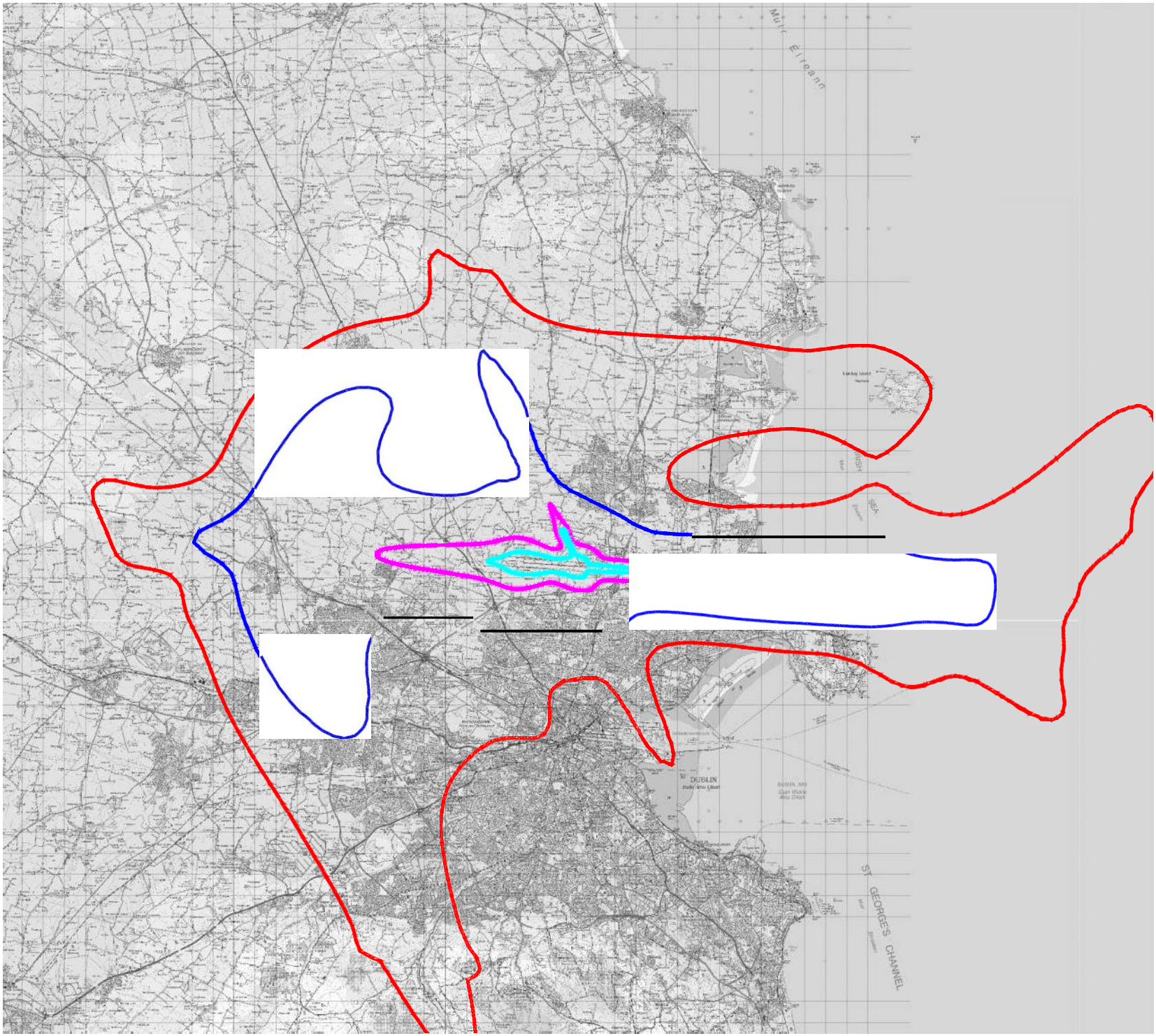

LEGEND:

Noise contours,

- 2019 45 dB(A) L_{den}
- 2019 65 dB(A) L_{den}
- 2020 45 dB(A) L_{den}
- 2020 65 dB(A) L_{den}

Rev	Date	Description	Initials

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Dublin Airport
Annual Noise Contours

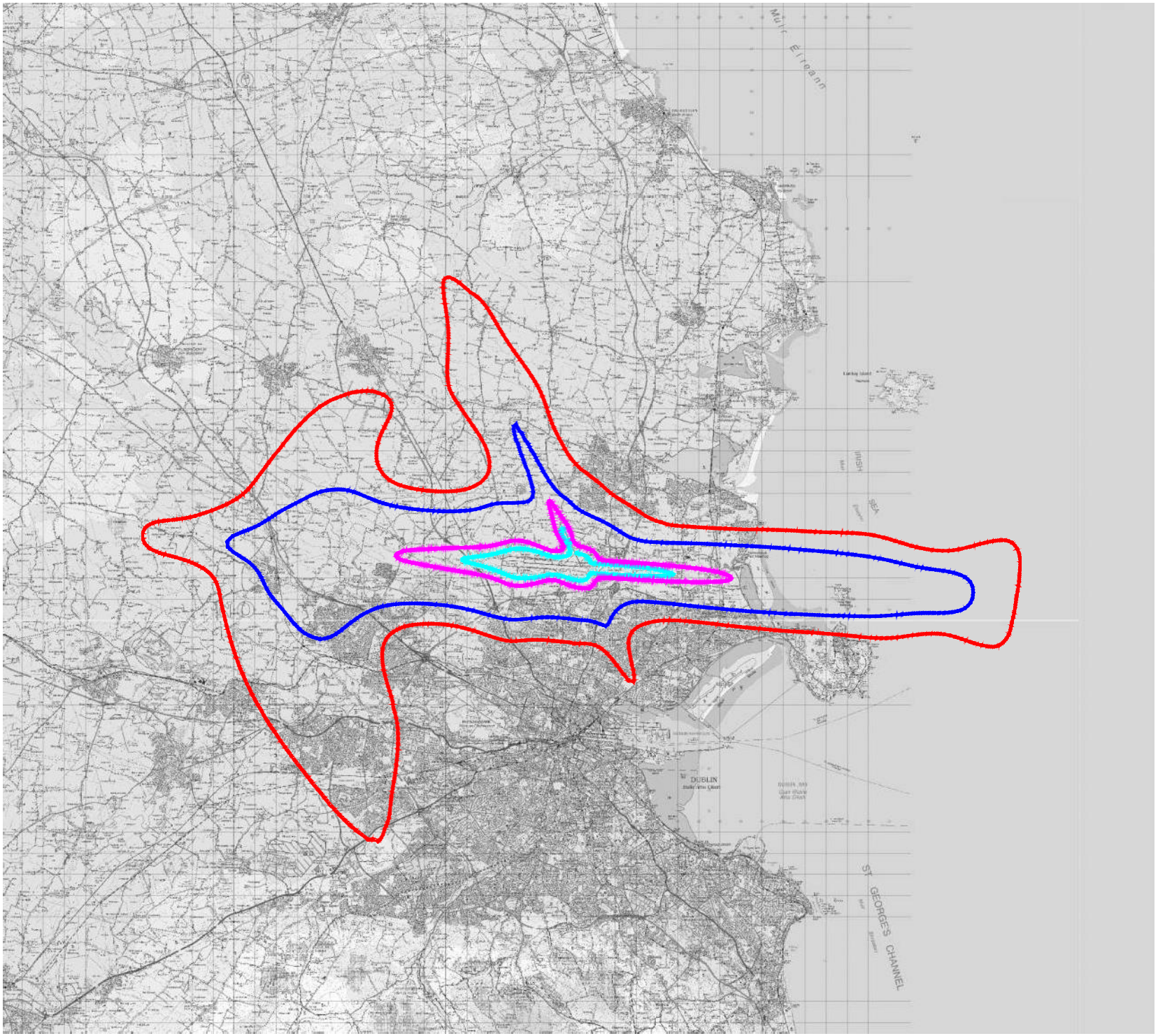
Figure 05
Comparison of 2019 and 2020
Annual L_{den} Noise Contours

DRAWN: DR CHECKED: NW

DATE: December 2021 SCALE: 1:50 000@A4

Drawing No:

A11429_01_DROOS_1.0



LEGEND:

Noise Contours,

- 2019 40 dB(A) L_{night}
- 2019 55 dB(A) L_{night}
- 2020 40 dB(A) L_{night}
- 2020 55 dB(A) L_{night}

Rev	Date	Description	Initials

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Dublin Airport
Annual Noise Contours

Figure 06
Comparison of 2019 and 2020
Annual L_{night} Noise Contours

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DATE: December 2021 SCALE: 1:50 000@A4

Drawing No:

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