Appendix 9-3: Ground Noise Modelling Methodology

9-3. Ground noise modelling methodology

9-3.1 Introduction

9-3.1.1 This appendix of the Environmental Impact Assessment Report (EIAR), prepared by Bickerdike Allen Partners LLP (BAP), describes the methodology for the ground noise modelling.

- Section 9-3.2 lists the scenarios that have been modelled.
- Section 9-3.3 sets out the methodology and assumptions used in the modelling of ground noise levels and the production of noise contours.
- Section 9-3.4 sets out the methodology used to calculate the number of people and dwellings within the contours, as well as noise sensitive community buildings such as schools and hospitals.

9-3.2 Assessment scenarios

9-3.2.1 Three scenarios have been included in the ground noise assessment, these are:

9-3.2.2 Current Receiving Environment (2025)

- 2029 Permitted Operation
- 2029 Proposed Operation

9-3.2.3 As the primary metrics (L_{den} and L_{night}) relate to a calendar year of activity, it is common practice when considering aircraft noise to use the most recently completed calendar year to represent the Current Receiving Environment. Therefore the calendar year of 2025 has been taken to be the Current Receiving Environment.

9-3.2.4 The future assessments are based on air traffic movement forecasts for 2029 which have been supplied by Mott Macdonald. These comprised a forecast “busy day” schedule and scaling factors to convert from the “busy day” to the annual or summer periods required. Separate scaling factors were supplied for the day and night periods based on historical trends. Analysis of the historical data did not show any clear difference between the day and evening periods, so the same scaling factors have been used for both.

9-3.2.5 The modelled movements are the same as those for air noise presented in Appendix 9-2.

9-3.3 Noise modelling methodology

Software

9-3.3.1 Ground noise levels and contours have been calculated using the CadnaA environmental noise modelling software (Datakustik, version 2026 MR1). This software uses the methodology set out in ISO 9613-2:1996, with downwind noise propagation assumed as a worst case for each receptor or grid location.

9-3.3.2 For Dublin Airport the input data has comprised:

- physical details of the airport (assumed the same in 2029 as 2025)
- the topography of the surrounding area,
- the current and future aircraft movements,
- the routes and procedures used by aircraft on the ground, and
- dwelling, population and community building data.

Study area

9-3.3.3 The study area is based on the largest extent of likely impacts due to ground noise, i.e. encompassing an envelope formed by the lowest value noise contours assessed for each metric. This is consistent with industry best practice. The extents of the study area for ground noise are contained within a rectangle that extends 3 km to the west, 4 km to the east, 4 km to the north and 2 km to the south of the centre of the South Runway (10R/28L) at Dublin Airport.

CadnaA model

9-3.3.4 As a basis for the model, drawings of the current airport site have been provided by daa. The locations of taxiways and stands [1]as shown on the AIP Ireland Aerodrome Chart. It has been assumed that this is unchanged by the Proposed Order.

9-3.3.5 Buildings have been included in the model based on these drawings for those on the airport site, and based on building outlines derived from satellite imagery for buildings outside the airport site. Heights have been assigned to the airport buildings, such as the terminals and hangars, based on the drawings supplied by daa. In practice, some of the airport buildings are complex shapes and have been simplified in the model, but this is not considered to have any significant effect on the accuracy of the model. A standard height of 7 m has been assumed for residential buildings.

9-3.3.6 A Digital Terrain Model (DTM) dataset, supplied by emapsite, has been acquired for the study area and incorporated into the noise model.

9-3.3.7 Aircraft ground operations are represented in the CadnaA model by noise point sources at locations across the airport site. The source locations represent stand locations or segments of aircraft taxi routes. Each operation, such as taxiing after an arrival or running an Auxiliary Power Unit (APU) on the stand, is modelled by assigning a noise level and duration to one or more locations. These are then combined for all operations to give a total noise level for each location. This information is then used by the software to compute the total noise level at each receiver location from all noise sources, for each metric considered.

Ground noise sources

9-3.3.8 There are a number of potential sources of ground noise, however this assessment has focussed on only the sources that make significant contributions to the overall ground noise produced at Dublin Airport, when assessed as a long-term average. This is in accordance with EU Commission Directive 2015/996 which states:

"Where noise generating activities associated with airport operations do not contribute materially to the overall population exposure to aircraft noise and associated noise contours, they may be excluded."

9-3.3.9 The directive states that such excluded activities could include helicopters and engine testing, both of which have been excluded from this assessment.

9-3.3.10 The sources considered are aircraft taxiing between the stands and the runways, and the running of Auxiliary Power Units (APUs) on stands.

9-3.3.11 The potential sources of noise from aircraft on the ground that have not been considered as part of this assessment are discussed below:

- Start of roll. This refers to the noise produced by aircraft on the runway while stationary, immediately before departing. Although the aircraft is physically on the ground, this noise source is considered as part of the air noise assessment.
- Reverse thrust. This refers to the noise produced by aircraft immediately after landing, when the engines are sometimes used in order to assist slowing the aircraft down. Although the

[1] The Aeronautical Information Publication (AIP), https://www.airnav.ie/air-traffic-management/aeronautical-information-management/aip-package

aircraft is physically on the ground, this noise source is considered as part of the air noise assessment.

- Engine testing. This refers to the noise produced by aircraft running engines for testing and maintenance purposes. When engines are run at high power, this can cause very high noise levels near the test location. However, this only occurs 1-2 times per day on average, and only during daytime hours. This is considered negligible in the context of the overall airport ground noise. Engine testing at lower power levels also occurs on stands. This occurs more frequently than high power testing, but still relatively rarely compared to the number of aircraft movements, and the noise levels are typically not higher than other activities such as taxiing.
- Aircraft parking on remote stands. The modelling work assumes that all aircraft taxi to one of the main stands and then use their APU for a time on the stand. In practice, a small number of aircraft park in other areas, such as Aircraft Park C to the north of the airfield. For Aircraft Park C in particular, aircraft are towed rather than taxiing when travelling to this area. Details of the exact usage of various non-stand locations were not available, although it is known to be a small percentage of the total aircraft and therefore would have a minimal effect on the overall noise environment.
- Other ground based activities that occur rarely and/or produce low noise levels relative to aircraft taxiing or APUs, such as ground support vehicles or de-icing.

Aircraft types

9-3.3.12 For the purpose of this assessment, aircraft were split into two categories, ‘typical’ and ‘large’. The large aircraft, consisting of twin-aisle jet aircraft such as the Airbus A330 or Boeing 767, were considered separately as they generally have higher noise levels and also typically use different taxi routes for certain operations. The typical aircraft, while primarily representing the Airbus A320 and Boeing 737-800 families, also includes smaller jet aircraft and propeller aircraft. Although these aircraft are significantly quieter once airborne, they are often of a similar noise level when carrying out ground operations. The full list of aircraft operational codes and modelled aircraft categories are given in Table 9-3-1.

Table 9-3-1: Aircraft classification for ground noise modelling

Aircraft Type	Modelled aircraft category
Airbus A300	LARGE
Airbus A306	LARGE
Airbus A319	TYPICAL
Airbus A320	TYPICAL
Airbus A320neo	TYPICAL
Airbus A321	TYPICAL
Airbus A321neo	TYPICAL
Airbus A330	LARGE
Airbus A330neo	LARGE
Airbus A350	LARGE
ATR 42	TYPICAL
ATR 72	TYPICAL
BAe 146/Avro RJ	TYPICAL
Boeing 737-400	TYPICAL
Boeing 737-500	TYPICAL
Boeing 737-700	TYPICAL
Boeing 737-800	TYPICAL
Boeing 737 MAX	TYPICAL

Aircraft Type	Modelled aircraft category
Boeing 757	TYPICAL
Boeing 767	LARGE
Boeing 777	LARGE
Boeing 777X	LARGE
Boeing 787	LARGE
Bombardier CS300	TYPICAL
Bombardier Dash 8	TYPICAL
Convair 580	TYPICAL
Embraer E190/195	TYPICAL
Embraer E190-E2	TYPICAL
Airbus A320neo+ (G3)	TYPICAL
Airbus A321neo+ (G3)	TYPICAL
Airbus A350neo (G3)	LARGE
Boeing 787 NG (G3)	LARGE
Boeing 797 NMA (G3)	TYPICAL
Other	TYPICAL

Number of aircraft movements

9-3.3.13 The number of modelled aircraft movements in each scenario is given in Table 9-3-2 for each relevant time period.

9-3.3.14 Helicopters and military aircraft have been excluded from this assessment. This is the standard approach used for the modelling of airport noise and reflects that operations by helicopter and military aircraft often make up a very small proportion (<1%) of the total and are not able to be assessed to the same level of accuracy. As a result, their inclusion would have a negligible effect on the findings of any assessment.

Table 9-3-2: Modelled aircraft movements by period

Scenario	Modelled aircraft category	Modelled aircraft movements[1]				
		Annual			Summer	
		Day (07:00–18:59)	Evening (19:00–22:59)	Night (23:00–06:59)	Day (07:00–22:59)	Night (23:00–06:59)
Current Receiving Environment	Typical	164,855	39,870	28,552	58,045	8,522
	Large	17,069	1,529	3,307	5,694	886
2029 Permitted Operation	Typical	138,045	47,217	29,348	51,496	9,280
	Large	18,690	2,951	3,542	6,015	1,120
2029 Proposed Operation	Typical	168,033	48,900	33,396	60,216	10,560
	Large	18,707	5,907	4,048	6,832	1,280

[1] Future scenario movements derived from busy day forecast and rounded to nearest whole number.

Runway usage

9-3.3.15 The same assumptions regarding runway usage have been made as for the air noise assessment described in Appendix 9-2.

The total number of modelled flights using each runway is given for each scenario and the relevant assessment period in Table 9-3-3 to Table 9-3-7.

Table 9-3-3: Modelled aircraft movements by runway, annual day

	Modelled aircraft movements (07:00–18:59)					
Scenario	10L (North)	28R (North)	10R (South)	28L (South)	16	34
Current Receiving Environment	30,929	61,179	35,291	54,244	281	0
2029 Permitted Operation	16,413	61,867	19,009	57,879	1,113	455
2029 Proposed Operation	19,553	73,716	22,650	68,952	1,326	542

Table 9-3-4: Modelled aircraft movements by runway, annual evening

	Modelled aircraft movements (19:00–22:59)					
Scenario	10L (North)	28R (North)	10R (South)	28L (South)	16	34
Current Receiving Environment	7,704	11,121	6,591	15,981	2	0
2029 Permitted Operation	5,592	18,658	5,746	19,670	356	145
2029 Proposed Operation	6,106	20,395	6,281	21,478	389	159

Table 9-3-5: Modelled aircraft movements by runway, annual night

	Modelled aircraft movements (23:00–06:59)					
Scenario	10L (North)	28R (North)	10R (South)	28L (South)	16	34
Current Receiving Environment	222	901	9,489	21,204	43	0
2029 Permitted Operation	1,598	8,525	5,835	16,603	234	95
2029 Proposed Operation	1,991	9,897	6,472	18,710	266	109

Table 9-3-6: Modelled aircraft movements by runway, summer day

	Modelled aircraft movements (07:00–22:59)					
Scenario	10L (North)	28R (North)	10R (South)	28L (South)	16	34
Current Receiving Environment	7,951	24,106	8,637	22,977	68	0
2029 Permitted Operation	6,117	22,383	6,881	21,556	408	167
2029 Proposed Operation	7,122	26,123	8,031	25,102	476	194

Table 9-3-7: Modelled aircraft movements by runway, summer night

	Modelled aircraft movements (23:00–06:59)					
Scenario	10L (North)	28R (North)	10R (South)	28L (South)	16	34
Current Receiving Environment	77	477	1,761	7,093	0	0
2029 Permitted Operation	505	2,696	1,845	5,250	74	30

	Modelled aircraft movements (23:00–06:59)					
Scenario	10L (North)	28R (North)	10R (South)	28L (South)	16	34
2029 Proposed Operation	630	3,130	2,046	5,916	84	34

Taxi routes

9-3.3.16 When using the North Runway, most aircraft will not use the full length on departure, and instead join the runway from an intermediate taxiway. The exceptions aircraft which are Code E or larger, which will typically use the full runway length.

9-3.3.17 When using the South Runway, there is more variation. On runway 28L, all aircraft typically use the full runway length. On runway 10R, the intersection with Taxiway S6 is commonly used, but there are a number of exceptions. The conservative assumption has been made for the ground noise assessment to assume that all aircraft use the full runway length when using the South Runway.

9-3.3.18 When using the Crosswind Runway, all aircraft use the full runway length.

9-3.3.19 To develop the modelled taxi routes it was necessary to rationalise the stands into groups, with the same taxi route being followed for all stands in the same group. This grouping is described in Table 9-3-8 where the stand numbers are taken from the Aeronautical Information Package (AIP) Ireland Aircraft Parking/Docking Chart (dated 19 February 2026). There are a small number of stands which have been reconfigured since the beginning of 2025; for the Current Receiving Environment assessment these have been mapped to the stands and groups described below in Table 9-3-8.

Table 9-3-8: Aircraft stand groups

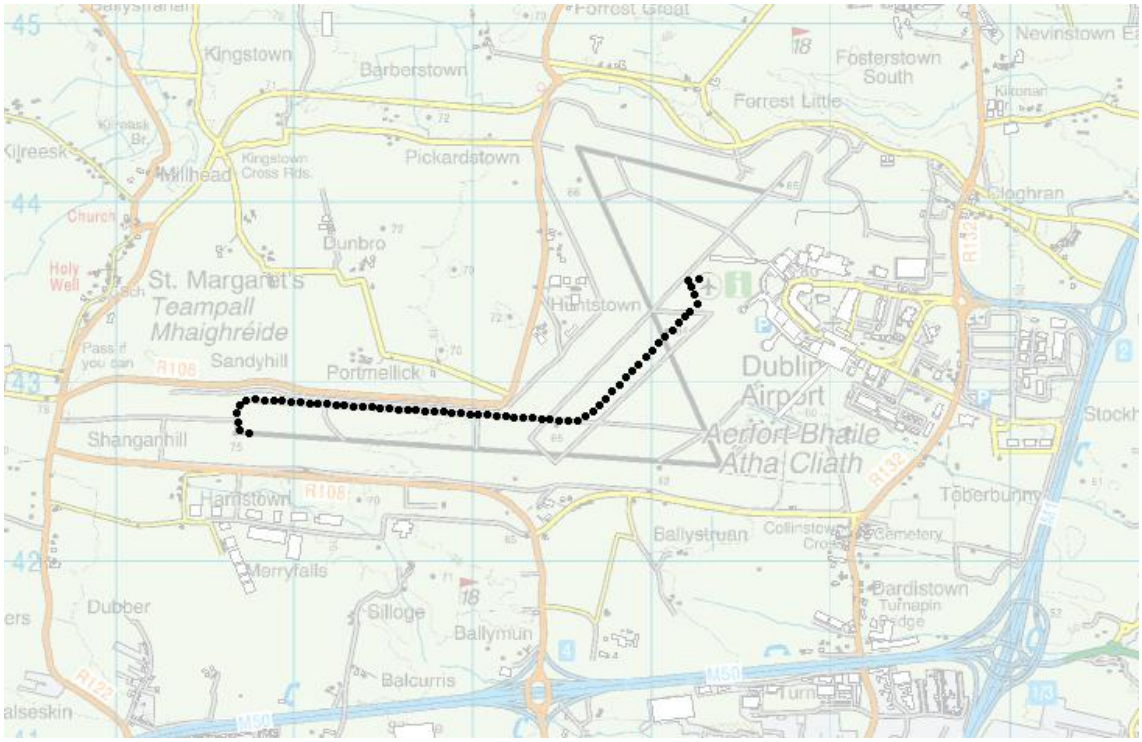
Stand number	Modelled stand group	Stand number	Modelled stand group
137	North	312	Pier 3
138	North	313	Pier 3
139	North	314	Pier 3
140	North	315	Pier 3
141	North	316	Pier 3
142	North	317	Pier 3
144	North	318	Pier 3
145	North	400	Pier 4
50	Northeast	401	Pier 4
51	Northeast	402	Pier 4
52	Northeast	403	Pier 4
53	Northeast	404	Pier 4
105	Northeast	405	Pier 4
106	Northeast	406	Pier 4
131	Northeast	407	Pier 4
132	Northeast	408	Pier 4
133	Northeast	409	Pier 4
134	Northeast	411	South
135	Northeast	412	South
136	Northeast	413	South
107	Pier 1	414	South
108	Pier 1	415	South
109	Pier 1	416	South

Stand number	Modelled stand group	Stand number	Modelled stand group
110	Pier 1	417	South
111	Pier 1	418	South
112	Pier 1	221	Triangle
113	Pier 1	222	Triangle
121	Pier 1	223	Triangle
122	Pier 1	600	West
123	Pier 1	601	West
124	Pier 1	602	West
125	Pier 1	603	West
126	Pier 1	604	West
127	Pier 1	606	West
200	Pier 2	607	West
201	Pier 2	614	West
202	Pier 2	615	West
203	Pier 2	616	West
205	Pier 2	617	West
206	Pier 2	618	West
207	Pier 2	619	West
220	Pier 2	620	West
311	Pier 3	621	West

9-3.3.20 With the stands rationalised, typical taxi routes for the different aircraft categories from each runway end to each stand group were developed through discussion with daa. There are 216 routes allowing for the different runway ends, stand groups, aircraft categories and arrivals and departures.

9-3.3.21 An example taxi route is illustrated in Plate 9-3-1.

Plate 9-3-1: Example modelled taxi route: typical aircraft, runway 10R departure from Pier 1



Stand usage

9-3.3.22 The actual distribution of stand usage in 2025 has been used as the basis of the Current Receiving Environment . This has been supplied by daa. For the 2029 Permitted Operation and the 2029 Proposed Operation, daa has provided information on which stand group would be likely to be used for each flight in the busy day schedule. This has been utilised to determine the overall distribution between stand groups. The distribution within stand groups has been assumed to remain the same as for 2025 operations.

9-3.3.23 The modelled distribution of aircraft using each group of stands is given in Table 9-3-9.

Table 9-3-9: Modelled distribution of aircraft movements by stand group (Current Receiving Environment)

Modelled stand group	Proportion of aircraft movements
North	1.68%
Northeast	7.37%
Pier 1	38.84%
Pier 2	9.28%
Pier 3	12.75%
Pier 4	17.09%
South	7.76%
Triangle	1.13%
West	4.10%

Table 9-3-9: Modelled distribution of aircraft movements by stand group (2029 Permitted Operation)

Modelled stand group	Proportion of aircraft movements
North	0.14%
Northeast	6.52%
Pier 1	32.09%
Pier 2	19.03%
Pier 3	14.31%
Pier 4	13.64%
South	8.88%
Triangle	0%
West	5.39%

Table 9-3-9: Modelled distribution of aircraft movements by stand group (2029 Proposed Operation)

Modelled stand group	Proportion of aircraft movements
North	0.12%
Northeast	6.42%
Pier 1	28.38%
Pier 2	22.27%
Pier 3	14.02%
Pier 4	14.06%
South	9.86%
Triangle	0%
West	4.87%

Aircraft activity locations and noise levels

9-3.3.24 APUs are assumed to only run on aircraft stands. These are modelled at the locations given in the AIP Ireland Aircraft Parking/Docking Chart.

9-3.3.25 For the modelled taxi routes, source locations were defined at 50 m intervals along each route.

9-3.3.26 Reference noise levels for each aircraft category and for each activity were derived from reviewing available data from other studies, as well as on-site measurements of taxiing noise. Specifically, results from the following other studies were used to inform this assessment:

9-3.3.27 Heathrow Airport, North-West Runway Air and Ground Noise Assessment, prepared by AMEC Environment & Infrastructure UK Limited, 2014

- London City Airport, Environmental Statement supporting planning application 13/01228/FUL, prepared by Bickerdike Allen Partners LLP, 2015.

9-3.3.28 The relevant results from these studies have been converted to sound power level, where necessary, and are summarised in Table 9-3-10.

Table 9-3-10: Summary of noise level data from other assessments

Activity	Aircraft	Sound Power Level, dB(A)	Source
APU	Propeller aircraft (typically Dash-8)	122	London City Airport
APU	A319/A320	118	Heathrow Airport
APU	Boeing 777	118	Heathrow Airport
APU	Airbus A380	123	Heathrow Airport
Taxi	Propeller aircraft (typically Dash-8)	129	London City Airport
Taxi	A319/A320	128	Heathrow Airport
Taxi	Boeing 777	132	Heathrow Airport
Taxi	Airbus A380	132	Heathrow Airport

9-3.3.29 Measurements were also taken of aircraft taxiing at Dublin Airport by BAP in 2019. The results from this survey were sound power levels of 128 – 129 dB(A) for Airbus A320 and Boeing 737-800 aircraft taxiing. This was consistent with the assumptions from the Heathrow Airport and London City Airport assessments.

9-3.3.30 The sources have been assumed to be omnidirectional with the levels and durations given in Table 9-3-11. The durations are based on advice from daa regarding typical activity. It is noted that at a number of stands, Fixed Electrical Ground Power (FEGP) is used, and therefore the assumed durations of APU usage are likely to be conservative from a noise perspective. Taxi duration is based on the 50 m source spacing along each route with an assumed aircraft speed of 10 m/s.

Table 9-3-11: Reference noise levels for ground noise modelling

Activity	Modelled aircraft category	Sound Power Level, dB(A)	Duration, s
APU (Arrivals)	Typical	119	300
	Large	123	300
APU (Departures)	Typical	119	600
	Large	123	600
Taxi	Typical	128	5
	Large	132	5

9-3.4 Demographic assessment methodology

Dwelling and population data

9-3.4.1 Dwelling data has been acquired from GeoDirectory, who produce an updated dataset every quarter. The 2026 Q1 dataset has been used for this assessment.

9-3.4.2 An assessment of not yet built dwellings, which have already been granted planning permission, has been carried out. This has utilised information on permitted developments provided by Tom Phillips and Associates (TPA) in 2023, which has been supplemented by the list of developments in Appendix 20-1 of Chapter 20: In-Combination and Cumulative Effects. This has been compared to the data from GeoDirectory, to ensure that developments are not counted twice if they have already been partly or fully completed. This resulted in a separate consented dwellings database.

9-3.4.3 Population data has been estimated using the average dwelling occupancy by small area. This has been based on Census data from the Central Statistics Office, by dividing the number of people by the number of dwellings for each small area. It has then been determined into which of the small areas each of the dwellings falls, based upon which they have been assigned the average dwelling occupancy for the relevant area. The 2022 Census data has been used for the 2023 Q3 and 2026 Q1 datasets.

9-3.4.4 Dwellings marked as vacant in the GeoDirectory data have been included in the dwelling totals, but excluded from the population totals.

9-3.4.5 An assessment of zoned land has also been undertaken. This identified a number of areas which are designated for residential use, however these are outside the area impacted by ground noise.

Community buildings

9-3.4.6 Noise sensitive community buildings have been identified through a review of the GeoDirectory data. For the purposes of this assessment noise sensitive education buildings include nurseries, schools, colleges and universities, but not day-care or creches. Noise sensitive healthcare buildings include healthcare facilities where people may have an overnight stay such as hospitals or nursing homes, but not GP surgeries or dentists.

Noise prediction

9-3.4.7 Each existing dwelling and community building has been included in the noise model as a receptor. Noise levels have been predicted at each of these receptor locations.