13. Aircraft Noise and Vibration

13.1 Introduction

13.1.1 This chapter is a replacement to that in the revised EIAR submitted in September 2021 (2021 EIAR). The update is in response to a number of changes that have taken place in the interim that could affect the findings of the earlier assessment. These changes comprise:

- using updated air traffic forecast data which reflects earlier fleet modernisation and recent levels of activity at the airport;
- assuming that segregated mode is in use from 06:00 to 08:00. This reverts a change made in 2021 EIAR;
- reflecting the actual flight paths from North Runway by using radar data to determine the future modelled tracks;
- reflecting changes to the distribution of the aircraft from the runways;
- the North Runway becoming operational in August 2022 which has allowed actual noise and track information to be gathered and utilised when determining departure profiles and validating the noise predictions;
- allowing for consented developments approved since the original application was made.

13.1.2 This chapter of the EIAR Supplement reports the findings of an appraisal of effects on the noise environment from air noise and vibration. It sets out the relevant aspects of the Current State of the Environment and the Future Receiving Environment and goes on to consider the impact of the proposed Relevant Action, which will be an operational change, to remove the numerical cap on the number of flights permitted between the hours of 23:00 and 07:00 daily in the Permitted Scenario, replacing it with an annual night-time noise quota, and to allow flights to take off from and/or land on the North Runway (Runway 10L 28R) for an additional two hours i.e. 23:00 to 00:00 and 6:00 to 07:00.

13.1.3 Overall, the Proposed Scenario would allow for an increase in the number of flights taking off and/or landing at Dublin Airport between 23:00 and 07:00 in accordance with the annual night-time noise quota. In 2024 and 2025 there would be more passengers using the airport in the Proposed Scenario, which reaches the 32 million passengers per annum (mppa) Cap in 2024. However, by 2026 the 32mppa Cap will also have been reached in the Permitted Scenario, meaning that the return to the pre-Covid-19 passenger throughput will take approximately two years longer than in the Proposed Scenario.

13.1.4 The effect on the forecast numbers of passengers and movements in each of the Assessment Years based on the latest forecasts is summarised in Table 1-1 of *Chapter 1: Introduction* which is repeated below as Table 13-1.

Table 13-1: Assessment Years, Scenarios, PAX and ATMs

Assessment Years and Scenarios	Predicted Annual Passengers (PAX) (millions per annum)	Permitted vs Proposed Difference in PAX (millions)	Air Traffic Movements (ATMs) ('000s per annum)	Typical 'Busy Day' Night-Time ATMs (23:00-07:00)
2025 Permitted	31.8	n/a	227	60
2025 Proposed	32.0	0.2	240	114
2035 Permitted	32.0	n/a	228	60
2035 Proposed	32.0	0.0	240	114

13.1.5 The overall effect on Air Traffic Movements is an increase of around 6% in 2025 and an increase of around 5% in 2035. Considering the typical 'Busy Day' activity at night, the increase in movements is around 90%. This is mainly due to movements under the Permitted scenarios having to reduce from recent levels to comply with the requirement of Condition 5.

13.1.6 This assessment and EIAR Supplement chapter have been produced by Bickerdike Allen Partners LLP. The company and the key individuals involved are described in *Chapter 1: Introduction* of the 2021 EIAR.

13.1.7 Air noise and vibration specifically encompasses noise and vibration associated with flights into and out of Dublin Airport while airborne or using the runway system, including any start of roll or reverse thrust activities but excluding noise and vibration related to any other aircraft ground operations such as taxiing and when aircraft are on stands, which are covered in replacement Chapter 14 of this EIAR Supplement.

13.1.8 Replacement Chapter 14 also includes an assessment of the road traffic noise effects and a cumulative assessment of all noise sources.

13.1.9 This chapter presents information to represent the Current State of the Environment. This includes noise levels for 2018 as it is the most recent year with a throughput of close to but less than 32 mppa at the airport. It is therefore considered to represent the situation with the airport operating without the North Runway or the effects of the Covid-19 pandemic. The chapter considers two Assessment Years of 2025, the first year when 32 mppa was expected to be reached, and 2035, which has been included for an assessment over a longer term period.

13.1.10 For each of the two Assessment Years, this chapter has compared the Permitted Scenario with the Proposed Scenario in the corresponding year. These scenarios are described in the 'Key Concepts and Terminology Used in the EIAR' at the front of this EIAR Supplement.

13.2 Legislation and Planning Policy Context

13.2.1 The Environmental Impact Assessment (EIA) process is described in *Chapter 1: Introduction* of the 2021 EIAR.

13.2.2 *Chapter 6: Planning and Development Context* of the 2021 EIAR sets out the legislative and planning policy context for the proposed Relevant Action. It includes reference to relevant national and local planning policies, including those that have been considered when determining the EIAR scope, method and mitigation. Those considered relevant to this chapter are summarised below with additional material also considered relevant. More detail on this additional material, and selected policies included in Chapter 6, are given in Appendix 13A of the 2021 EIAR.

Strategic Planning Context

13.2.3 The Applicant has a number of obligations to fulfil with regard to the management of Dublin Airport which are described in Chapter 6 of the 2021 EIAR. The following regulations are relevant to noise:

- S.I. No. 549/2018– Environmental Noise Regulations 2018[1]
- Aircraft Noise (Dublin Airport) Regulation Act 2019 (the Aircraft Noise Act)[2]

13.2.4 The last of these implements European Union (EU) Regulation 598/2014[3] on the establishment of rules and procedures with regard to the introduction of noise related operating restrictions at EU Airports within the ICAO Balanced Approach[4]. Further details of this regulation, and the two listed above are contained in Appendix 13A of the 2021 EIAR.

National Planning Policy

13.2.5 National planning policy which is relevant to the proposed Relevant Action is described in Chapter 6 of the 2021 EIAR.

[1] Government of Ireland (2018). S.I. No. 549/2018 - European Communities (Environmental Noise) Regulations 2018, [Online]. Available at: http://www.irishstatutebook.ie/eli/2018/si/549/made/en/ [Checked 17/08/2023]
[2] Government of Ireland (2019). Aircraft Noise (Dublin Airport) Regulation Act 2019, [Online]. Available at: http://www.irishstatutebook.ie/eli/2019/act/12/enacted/en/html [Checked 17/08/2023]
[3] European Commission (2014). Regulation (EU) No 598/2014 of the European Parliament and of the Council of 16 April 2014 on the establishment of rules and procedures with regard to the introduction of noise-related operating restrictions at Union airports within a Balanced Approach and repealing Directive 2002/30/EC, [Online]. Available at: https://eur-lex.europa.eu/eli/reg/2014/598/oj [Checked 17/08/2023]
[4] ICAO (2010). Doc 9829 Guidance on the Balanced Approach to Aircraft Noise Management, ICAO

Local Planning Policy

13.2.6 Local planning policy which is relevant to the proposed Relevant Action was described in Chapter 6 of the 2021 EIAR. The following policy documents are relevant to noise and are discussed further in Section 13.6.

- Fingal Development Plan 2023-2029[5]
- Dublin Airport Local Area Plan (2020)[6]
- Noise Action Plan for Dublin Airport (2019-2023)[7]

International Policy, Standards and Guidance

13.2.7 The following international policies, standards and guidance documents are considered relevant to this assessment. More detail is given in Appendix 13A of the 2021 EIAR.

- ICAO Balanced Approach[8]
- ICAO Convention on International Civil Aviation, Annex 16, Volume 1[9]
- Environmental Noise Directive 2002/49/EC[10]
- EU Commission Directive 2020/367[11]
- WHO Guidelines for Community Noise (1999)[12]
- WHO Night Noise Guidelines for Europe (2009)[13]
- WHO Environmental Noise Guidelines for the European Region (2018)[14]

Relevant UK Policy, Standards and Guidance

13.2.8 The National and International Policy, Standards and Guidance described above set out the overall approach, and much of the subsequent detail required to implement it. There are however some areas where additional information is considered beneficial, such as in relation to the significance of particular noise levels and criteria for particular types of buildings.

13.2.9 To provide this, information has been taken from the following UK policies, standards and guidance documents. More detail is given in Appendix 13A of the 2021 EIAR.

- Noise Policy Statement for England (2010)[15]

[5] Fingal County Council (2023). Fingal Development Plan 2023-2029, [Online]. Available at: https://www.fingal.ie/development-plan [Checked 17/08/2023]
[6] Fingal County Council (2020). Dublin Airport Local Plan, [Online]. Available at: https://www.fingal.ie/sites/default/files/2020-01/dublin-airport-lap-2020.pdf [Checked 17/08/2023]
[7] Fingal County Council (2019). Noise Action Plan for Dublin Airport 2019-2023, [Online]. Available at: https://www.fingal.ie/sites/default/files/2019-04/NAP%20Final.pdf [Checked 17/08/2023]
[8] ICAO (2010). Doc 9829 Guidance on the Balanced Approach to Aircraft Noise Management, ICAO
[9] ICAO (2020). Annex 16 to the Convention on International Civil Aviation, Environmental Protection, Volume 1 Aircraft Noise, 8th Edition, ICAO
[10] European Commission (2002). Directive 2002/49/EC Directive of the European Parliament and of the Council of 25th June 2002 relating to the assessment and management of environmental noise, [Online]. Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32002L0049&from=EN [Checked 17/08/2023]
[11] European Commission (2020). Commission Directive (EU) 2020/367 of 4 March 2020 amending Annex III to Directive 2002/49/EC of the European Parliament and of the Council as regards the establishment of assessment methods for harmful effects of environmental noise (Text with EEA relevance), [Online]. Available at: https://eur-lex.europa.eu/eli/dir/2020/367/oj [Checked 21/08/2023]
[12] Berglund, B. et al (1999). Guidelines for community noise, [Online]. Available at: http://apps.who.int/iris/bitstream/handle/10665/66217/a68672.pdf?sequence=1&isAllowed=y [Checked 21/08/2023]
[13] World Health Organisation Europe (2009). Night Noise Guidelines for Europe, [Online]. Available at: https://apps.who.int/iris/bitstream/handle/10665/326486/9789289041737-eng.pdf?sequence=1&isAllowed=y [Checked 21/08/2023]
[14] World Health Organization Regional Office for Europe (2018). Environmental Noise Guidelines for the European Region, [Online]. Available at: https://www.who.int/europe/publications [Checked 21/08/2023]
[15] Defra (2010). Noise Policy Statement for England, [Online]. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69533/pb13750-noise-policy.pdf [Checked 21/08/2023]

- UK Aviation Policy Framework (2013)[16]
- Survey of Noise Attitudes 2014 (2021)[17]
- UK Airspace Policy: A framework for balanced decisions on the design and use of airspace 2017 consultation[18]
- BS 8233:2014 Sound insulation and noise reduction in buildings – code of practice[19]
- Department of Education - Acoustic design of schools: performance standards BB93 (2015)[20]
- Department of Health - Specialist Services, Health Technical Memorandum 08-01: Acoustics (2013)[21]
- CAP1616a Airspace Change: Environmental requirements technical annex[22]
- BS7445 Description and measurement of environmental noise[23]

13.3 Assessment Methodology

13.3.1 This section of this EIAR Supplement chapter describes the approach to the assessment of the air noise effects, covering the following:

- The key sources of information that have been consulted throughout the preparation of this chapter, see paragraph 13.3.2;
- The methodology behind the assessment of air noise and vibration effects, including the criteria for the determination of sensitivity of receptor and magnitude of change due to the proposed Relevant Action;
- An explanation as to how the identification and assessment of potential air noise and vibration effects has been reached; and
- The significance criteria and terminology for the assessment of air noise and vibration residual effects.

13.3.2 Key sources of information that have been utilised for this assessment are as follows:

- The physical location of the runway system.
- Flight paths, in particular for departures. This information for past routes was taken from a combination of the Aeronautical Information Publication (AIP) for Ireland and an inspection of actual aircraft flight paths using the airport's Noise and Flight Track Monitoring System (NFTMS). Representative future routes for noise modelling purposes, including those for the North Runway, have been developed from radar data recorded by the NFTMS and are updated from those in the 2021 EIAR.
- The number of flights in each relevant assessment period, including their aircraft type, operation, and destination. The actual flights in 2018 have been supplied by the Applicant. For future years air traffic movement forecasts have been supplied by Mott Macdonald in their report *Dublin Airport*

[16] UK Department for Transport (2013). Aviation Policy Framework, [Online]. Available at: https://www.gov.uk/government/publications/aviation-policy-framework [Checked 21/08/2023]
[17] UK Civil Aviation Authority (2017). Survey of noise attitudes 2014: Aircraft, CAP 1506, [Online]. Available at: https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=7744 [Checked 21/08/2023]
[18] Department for Transport (2017). Consultation Response on UK Airspace Policy: A framework for balanced decisions on the design and use of airspace, [Online]. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/653801/consultation-response-on-uk-airspace-policy-web-version.pdf [Checked 21/08/2023]
[19] British Standards Institution (2014). BS 8233:2014 Sound insulation and noise reduction for buildings – Code of practice, [Online]. Available at: https://shop.bsigroup.com/ProductDetail/?pid=000000000030241579 [Checked 21/08/2023]
[20] UK Department of Education (2015). BB93: acoustic design of schools – performance standards, [Online]. Available at: https://www.gov.uk/government/publications/bb93-acoustic-design-of-schools-performance-standards [Checked 21/08/2023]
[21] UK Department of Health (2013). Specialist Services, Health Technical Memorandum 08-01: Acoustics, [Online]. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/144248/HTM_08-01.pdf [Checked 21/08/2023]
[22] Civil Aviation Authority (2020). CAP1616a: Airspace Change: Environmental requirements technical annex, [Online]. Available at: https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=8128 [Checked 21/08/2023]
[23] British Standards Institution (2003). BS 7445:2003 Description and measurement of environmental noise [Online]. Available at: https://shop.bsigroup.com/ProductDetail?pid=000000000030098820 [Checked 21/08/2023]

Operating Restrictions Quantification of Impacts on Future Growth Addendum to the Analysis of June 2021 (Report version 1.3.1).

Air Noise Modelling Methodology

13.3.3 The assessment of air noise relies heavily on the modelling of noise levels. This has been carried out using the noise modelling software produced by the Federal Aviation Administration (FAA), the Aviation Environmental Design Tool (AEDT). This industry standard software evaluates aircraft noise in the vicinity of airports based on aircraft type, operation, route, and flight profile, as well as taking into account local terrain and meteorological information. This software is used to produce noise contours and to predict noise levels at specific locations. The model has been validated by taking into account the measurements recorded by Dublin Airport's Noise and Flight Track Monitoring System (NFTMS). Details of the modelling methodology are given in replacement Appendix 13B.

13.3.4 The aircraft movements assessed as part of the air noise assessment include all aircraft taking off from or landing at Dublin Airport, with the exception of helicopter and military aircraft. Operations by helicopter and military aircraft make up a very small proportion of the total and are not able to be assessed to the same level of accuracy. For example, in 2018 there were 820 operations by helicopters and 2 operations by military aircraft, making up 0.4% of the total. The military aircraft operated during the day, and at night there were only 28 helicopter movements in the year. As a result, their inclusion would have a negligible effect on the findings of this assessment.

Primary Assessment Metrics

13.3.5 There are various noise metrics available for the assessment of the impacts of air noise. These are described in detail in Appendix 13A of the 2021 EIAR. The metrics used here include those that have been used previously to rate air noise around Dublin Airport, as used currently in the UK and also those used around Europe for strategic noise mapping purposes and in noise action plans. Whilst other metrics have been considered in this assessment, emphasis has been placed on the European noise metrics, i.e.:

- L_{den}, which takes into account the annual activity throughout the 24-hour period, with a 5 dB penalty applied to noise in the evening (19:00-23:00) period and a 10 dB penalty applied to noise in the night (23:00-07:00) period. The key effect linked with this metric is annoyance.
- L_{night}, which takes into account the annual activity during the night (23:00-07:00) period. The key effect linked with this metric is sleep disturbance.

13.3.6 These two metrics are required to be used in order to comply with the requirements of EU Regulation 598/2014, and are the metrics used for strategic noise mapping as required under the Environmental Noise Regulations (S.I. No. 549/2018) in Ireland.

13.3.7 The Relevant Action specifically relates to controls at activity at night, however the effect on movements is not confined to the night period, as for example an aircraft that becomes able to arrive at night may then depart during the following day. The L_{den} metric also takes into account activity at night so both it and the L_{night} metric respond to changes in activity at night and so are considered directly relevant.

13.3.8 The number of people 'highly sleep disturbed' and 'highly annoyed' has also been predicted in accordance with the method set out in the World Health Organisation's Environmental Noise Guidelines 2018 as endorsed by the European Commission through Directive 2020/367. These metrics aim to give an overall picture of the noise exposure by assessing a percentage chance of people being highly annoyed or highly sleep disturbed at different noise levels. For example, the association in the WHO Guidelines has around 10% of people assessed as being highly annoyed at a noise level of 45 dB L_{den}, increasing to around 55% of people at a noise level of 70 dB L_{den}.

13.3.9 This chapter does not assign significance to these results as there is not published guidance regarding significance thresholds for a collective community-level assessment. On an individual level however, high annoyance and high sleep disturbance is considered harmful to health, as outlined in EU Directive 2020/367.

Supplementary Noise Metrics

13.3.10 The primary air noise assessment metrics generally rely on extensive surveying of attitudes to aircraft noise resulting in a dose-response relationship linking levels of community annoyance to the metric. In addition, as used previously in the assessment of air noise around Dublin Airport, noise contours have been prepared in terms of the established UK noise metrics for air noise, the $L_{Aeq,16h}$ metric for the daytime (07:00-23:00) period and the $L_{Aeq,8h}$ metric for the night-time (23:00-07:00) period. These periods relate to an average summer day. Summer in this instance is defined as the 92-day period between 16 June and 15 September inclusive.

13.3.11 Some other supplementary air noise metrics, while having limited research into correlation with community annoyance, can be useful in reflecting how aircraft noise is experienced in the locality around an airport and these are also presented here.

13.3.12 The following supplementary noise metrics have been presented to contextualise the noise around Dublin Airport associated with the proposed Relevant Action:

- The summer $L_{Aeq,16h}$ and $L_{Aeq,8h}$ metrics. These describe the average noise level during a summer day (07:00-23:00) and summer night (23:00-07:00) respectively. They were used for the application that led to the North Runway Planning Permission and the former is used for the eligibility of the current Residential Sound Insulation Schemes.
- The annual L_{day} and $L_{evening}$ metrics which are optional under EU Regulation 598/2014. These describe the average noise level during an annual day (07:00-19:00) and evening (19:00-23:00) respectively. They provide information on the variation in noise across the day and evening.
- N65 and N60 indices. N65 for example indicates the number of times a threshold level of 65 dB L_{Amax} is exceeded within the time period of interest and has been determined for the summer daytime period. The N60 has been determined for the summer night-time period. These metrics are included as they are considered to aid public understanding by providing distributions of noise events.
- Single mode contours for the L_{night} and N60 indices. These are used to illustrate the noise on a night when aircraft operate all in the same direction. This differs from the standard contours which reflect the average use of the runways over the long-term, typically a year.
- L_{Amax}, which can be used to rate the impacts of noise from individual aircraft operations at night.
- Hourly noise levels during the night at representative residential receptors shown in Figure 13-4 and listed in Table 13-10, to give an indication of how these will change due to the proposed Relevant Action.

Methodology for Determining Study Area and Sensitive Receptors

13.3.13 The study area is based on the largest extent of likely impacts due to air noise, i.e. encompassing an envelope formed by the lowest value noise contours assessed for each metric detailed above. The extents of the study area are contained within a rectangle that extends 30 km to the west, 35 km to the east, 20 km to the north and 15 km to the south of the centre of the South Runway (10R/28L) at Dublin Airport.

13.3.14 The following have been considered as potential receptors of high sensitivity for this assessment:

- Dwellings;
- Schools;
- Residential healthcare facilities; and
- Places of worship.

13.3.15 Receptors with a lower sensitivity to noise, such as offices and hotels, have not been considered as part of this assessment.

13.3.16 The assessment of dwellings includes an allowance for those which are consented but not yet constructed, including land zoned for residential development. These have been presented separately to the totals for existing dwellings.

Methodology for Determining Construction Effects

13.3.17 As the proposed Relevant Action proposes no changes to the new North Runway, or any other part of Dublin Airport, there will be no physical changes in any part of the airport or its surroundings. As a result, the proposed Relevant Action will not result in any effects on the noise environment arising from construction, and further assessment is therefore not required.

Methodology for Determining Operational Effects

13.3.18 The proposed Relevant Action will seek to amend condition no. 3(d) and replace condition no. 5 of the North Runway Planning Permission. An assessment of the International Civil Aviation Organisation (ICAO) Balanced Approach is therefore required under the Aircraft Noise Act. The principle of the "balanced approach" to aircraft noise management was adopted by the ICAO Assembly in 2011. The Balanced Approach recognises the importance of achieving a careful balance between the interests of developing airport growth as well as managing noise levels; operating restrictions are only considered when all other elements of the Balanced Approach have been assessed.

13.3.19 The Aircraft Noise Act implements European Union (EU) Regulation 598/2014 on the establishment of rules and procedures with regard to the introduction of noise related operating restrictions at EU Airports within the Balanced Approach.

13.3.20 A Regulation 598 assessment for Dublin Airport was undertaken by ANCA and informed their subsequent decision on this application.

13.3.21 The effects of the proposed Relevant Action are determined by comparing the Proposed Scenario with the Permitted Scenario for the relevant Assessment Year. The Permitted Scenario represents the situation if the proposed Relevant Action is not consented and is also described in the 'Key Concepts and Terminology Used in the EIAR' at the front of this EIAR Supplement.

13.3.22 The Permitted and Proposed Scenarios are examined in the Assessment Years of 2025 and 2035.

13.3.23 The general assessment methodology involves the following:

- Derivation of assessment criteria;
- Computation of future noise levels under the various scenarios;
- Assessment of magnitude of impacts (absolute) on sensitive receptors, for each scenario;
- Determination of the change in noise levels, and associated impacts (relative) as a result of the proposed Relevant Action;
- Consideration of the likely significant effects of the proposed Relevant Action, based on both the absolute and relative noise levels;
- Description of the potential effects (beneficial and adverse) associated with the proposed Relevant Action; and
- Description of any mitigation measures, where appropriate, in relation to the proposed Relevant Action and a description of any residual effects.

Significance Criteria – Air Noise

13.3.24 The air noise effects are considered in terms of both the absolute noise level and the change in noise level due to the proposed Relevant Action in order to determine the significance of the effects due to the proposed Relevant Action. Both need to be considered to determine whether a significant effect arises from the proposed Relevant Action in an EIA context; for example if a receptor experiences a high absolute noise level but no change due to the proposed Relevant Action then this is not a significant

effect. Equally if a receptor experiences a large change in noise level but the resulting level is still very low then this receptor is not considered to be significantly affected.

Residential Receptors

13.3.25 Absolute noise impacts for residential receptors have been developed against an effect scale and are given in Table 13-2. The derivation of these is discussed in Appendix 13A of the 2021 EIAR.

Table 13-2: Air Noise Impact Criteria (absolute) – residential

Scale Description	Annual dB Lden	Annual dB Lnight
Negligible	<45	<40
Very Low	45 – 49.9	40 – 44.9
Low	50 – 54.9	45 – 49.9
Medium	55 – 64.9	50 – 54.9
High	65 – 69.9	55 – 59.9
Very High	≥70	≥60

13.3.26 The effect scale used to assess the change in noise level is given in Table 13-3. A semantic scale of this type, following the format of examples given in the Institute of Environmental Management and Assessment (IEMA[24]) guidelines, has been applied in previous air noise assessments and accepted in Public Inquiries for airport developments in the UK and Ireland, for example the application for the North Runway at Dublin Airport. The thresholds are derived from the difference contour bands recommended in CAP1616a[25].

Table 13-3: Air Noise Impact Criteria (relative)

Scale Description	Change in noise level, dB(A)
Negligible	0 – 0.9
Very Low	1 – 1-9
Low	2 – 2.9
Medium	3 – 5.9
High	6 – 8.9
Very High	≥9

13.3.27 The effect of a change in noise level tends to increase with the absolute level of noise experienced at a receptor. If, for example, the night-time noise level at a dwelling were to change from 45 dB to 50 dB L_{night}, the overall effect for the occupants would be less than if the night-time noise level were to increase by the same amount from 55 dB to 60 dB L_{night}.

13.3.28 There is no clearly accepted method of how to rate the magnitude of the effect of a change in the absolute air noise level and the associated change in noise level. Some guidance however has been provided in the UK's Planning Practice Guidance (PPG[26]) which states:

"In cases where existing noise sensitive locations already experience high noise levels, a development that is expected to cause even a small increase in the overall noise may result in a significant adverse effect occurring even though little or no change in behaviour would be likely to occur."

[24] Institute of Environmental Management and Assessment (2014). Guidelines for Environmental Noise Impact Assessment. London: IEMA. https://www.iema.net/download-document/236678 [Checked 21/08/2023]
[25] Civil Aviation Authority (2020). CAP 1616a Airspace Change: Environmental requirements technical annex https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=8128 [Checked 21/08/2023]
[26] Ministry of Housing, Communities & Local Government, Planning practice guidance Noise (2019) https://www.gov.uk/guidance/noise--2 [Checked 21/08/2023]

13.3.29 The magnitude of an effect from changing between one scenario and another (i.e. Permitted Scenario to Proposed Scenario) has been established by considering both the absolute noise level in the higher of the two scenarios and the relative change in noise level that occurs at a given receptor.

13.3.30 Table 13-4 shows how the absolute and relative impacts are interpreted into magnitude of effect. This takes into account the criteria presented above, other guidance and professional judgement. The effect rating scale is taken from the Environmental Protection Agency (EPA) EIAR Guidelines[27].

Table 13-4: Summary of magnitude of effect – air noise

Absolute Noise Level Rating	*Change in Noise Level Rating*					
	Negligible	*Very Low*	*Low*	*Medium*	*High*	*Very High*
Negligible	Imperceptible	Imperceptible	Imperceptible	Not Significant	Slight	Moderate
Very Low	Imperceptible	Imperceptible	Not Significant	Slight	Moderate	Significant
Low	Imperceptible	Not Significant	Slight	Moderate	Significant	Significant
Medium	Not Significant	Slight	Moderate	Significant	Significant	Very Significant
High	Slight	Moderate	Significant	Significant	Very Significant	Profound
Very High	Moderate	Significant	Significant	Very Significant	Profound	Profound

13.3.31 A potential significant effect (adverse or beneficial) would be considered to arise if in Table 13-4 the magnitude of the effect was rated as significant or higher.

Non-Residential Receptors

13.3.32 For receptors other than dwellings, absolute levels rated as medium have been derived from the relevant guidance documents, as described in Appendix 13A of the 2021 EIAR. These are given in Table 13-5. The impact on each non-residential receptor has been rated as significant if the absolute noise level is above this threshold and the change in noise level is at least 3 dB(A), i.e. it is rated medium or higher.

Table 13-5: Air Noise Impact Criteria (absolute) – non-residential

Receptor Type	*Threshold for Medium Absolute Effect*
Schools (08:00-16:00)	55 dB $L_{Aeq,30m}$ (approx. 55 dB L_{den})
Residential Healthcare Facilities – Day (07:00-23:00)	55 dB $L_{Aeq,1h}$ (approx. 55 dB L_{den})
Residential Healthcare Facilities – Night (23:00-07:00)	50 dB $L_{Aeq,1h}$ (approx. 45 dB L_{night})
Places of Worship	55 dB L_{den}

Significance Criteria – Vibration

13.3.33 Low frequency noise from airborne aircraft has the potential to cause perceptible vibration levels within dwellings. For this reason, the most appropriate noise metric to assess the likelihood of these effects is the maximum C-weighted noise level, denoted L_{Cmax}. C-weighting gives more weight to low frequency noise rather than the more commonly used A-weighting, which approximates the average human hearing response to different frequencies of noise.

13.3.34 This vibration effect is most obviously characterised by effects such as windows rattling. As discussed in the Historic England report[28], aircraft passbys that produce a maximum noise level above 97 dB L_{Cmax} are likely to produce an audible rattle of windows. While it is appreciated that low frequency noise from

[27] Environmental Protection Agency (2022). Guidelines on the Information to be Contained in Environmental Impact Assessment Reports

[28] Historic England (2014). Aviation Noise Metric – Research on the Potential Noise Impacts on the Historic Environment by Proposals for Airport Expansion in England, [Online]. Available at: https://research.historicengland.org.uk/Report.aspx?i=15740 [Checked 21/08/2023]

aircraft can induce perceptible vibration levels in lightweight structures and loose-fitting components, the vibration levels are below those at which even minor cosmetic damage would be likely to occur.

13.3.35 Vibration effects due to airborne aircraft can vary depending on the specific details of the building, for example, the room dimensions which can cause resonance effects at certain frequencies. Resonances increase the sound level in parts of the room and decrease it in others which can influence any consequential vibration.

13.3.36 The other potential effect from airborne aircraft vibration is vortex damage to buildings.

13.3.37 Aircraft in flight creates vortices, circulating currents of air that are shed from the aircraft wings. For the most part, these vortices are dissipated by the effects of the wind and atmospheric turbulence before they reach the ground and, whilst they may more often be heard after an aircraft has passed, they seldom have any physical impact at ground level. Occasionally, however, vortices may persist long enough to make contact with buildings underneath the flight path. In extreme cases, the variation in pressure within these vortices can cause some damage to roofs if tiles or slates are not sufficiently firmly secured. In practice, such events may be encountered due to the passage of larger wide-bodied jets which create the largest vortices and during landing when aircraft are relatively close to the ground.

13.3.38 The issue of wake vortex damage was considered in some detail in the 2004 EIS[29] that supported the application for the permitted North Runway. The previous EIS was based on an assumption of 348,358 movements per annum, significantly higher than the number now envisaged in 2025 for the proposed Relevant Action which is 240,000 movements per annum. In granting permission for North Runway under those assumptions, the wake vortex impacts of that number of operations was evidently considered acceptable by the planning authorities. Additionally, the proposed Relevant Action does not affect which aircraft are able to use Dublin Airport or the routes flown. On that basis, the wake vortex impacts associated with the proposed Relevant Action can be expected similarly to be considered acceptable. There have been no reported cases of wake vortex damage at Dublin.

13.3.39 The noise level of 97 dB L_{Cmax} occurring on average at least once per 24-hour day over the year has been taken as a threshold for potential significance of vibration effects due to airborne aircraft events. Whether a significant effect occurs between the Permitted Scenario and the Proposed Scenario depends on the number of dwellings affected and the frequency of the events.

Consultation

13.3.40 Chapter 5 of the 2021 EIAR details the consultation on this application.

Limitations and Assumptions

13.3.41 Planned background noise surveys have been hampered by the Covid-19 pandemic and subsequent recovery which means that even if measurements were taken in recent years, the ambient conditions may not currently be representative. However, a detailed survey was carried out in 2016, and this is supplemented by the continuous measurements taken by Dublin Airport's fixed Noise Monitoring Terminals (NMTs). In any event, the assessment criteria for air noise are dependent on the absolute levels from the aircraft and not the background noise.

13.3.42 There is always some uncertainty associated with forecasting future aircraft traffic, and this has been increased by the recent Covid-19 pandemic, particularly in the short term. The worst-case year in terms of air noise effects is likely to be the year that a passenger throughput of 32 mppa is first reached, as the ongoing fleet renewal means that over time aircraft are getting quieter. It was previously expected that this would occur in 2025 under the Proposed Scenario. The latest forecasts suggest this may now occur in 2024 but that activity will be similar in 2025. For this reason the initial assessment year of 2025 has been retained.

13.3.43 Some aircraft in the forecasts are either not currently in service or have limited noise data available. Assumptions over the future performance of these types have been made using the data available. This

[29] Dublin Airport Northern Parallel Runway Environmental Impact Statement, Part 2 - Text. Mouchel Parkman, December 2004

is not expected to significantly affect the assessment as aircraft in this category, such as the Airbus A330neo and Boeing 777X, are a minority of the total aircraft movements.

13.3.44 In addition to 'high annoyance' and 'high sleep disturbance' EU Directive 2020/367 lists ischaemic heart disease (IHD) as a harmful effect that should be considered. However, it also states that in the case of aircraft noise:

"the population exposed above adequate L_{den} levels is estimated as subject to an increased risk of IHD, while the exact number N of cases of IHD cannot be calculated."

13.3.45 It has therefore not been possible to assess the effects of the proposed Relevant Action on the number of cases of IHD.

13.4 Current State of the Environment

13.4.1 This section describes the current state of the environment in the vicinity of Dublin Airport. In view of the location of the airport, the surrounding community is affected primarily by noise from the local road network and airport operations.

13.4.2 The assessment of the Current State of the Environment includes noise levels for 2018 at it is the most recent year with a throughput of close to but less than 32 million passengers per annum (mppa) at the airport. It is therefore considered to represent the situation with the airport operating without the North Runway.

13.4.3 Noise surveys have been carried in 2016 out at key receptor positions around Dublin Airport to establish the prevailing ambient and background noise conditions during both the daytime and night-time. Use has also been made of the extensive database of noise monitoring data for 2016 and 2018 obtained from Dublin Airport's continuous noise monitoring system, which records in real time noise from both aircraft and non-aircraft related noise sources continuously throughout 24 hours of each day. This database of measurements has been processed to extract both the total noise levels and just those which correlate with aircraft noise events.

13.4.4 Airborne aircraft noise has been modelled for 2018 based on the actual aircraft activity. The primary assessment metrics are presented in this section, and the supplementary metrics are presented in replacement Appendix 13C.

13.4.5 In order to inform the vibration assessment, airborne aircraft noise has been modelled in terms of the L_{Cmax} metric based on the actual aircraft activity in 2018.

Noise Surveys

13.4.6 The noise surveys comprised a combination of attended and unattended noise monitoring. Attended noise monitoring was undertaken at various locations during periods in August, September and October 2016. Appendix 13D of the 2021 EIAR contains details of the noise monitoring procedures, survey dates, observations and results and, identifies the nature of the key contributors to the noise environment for each position.

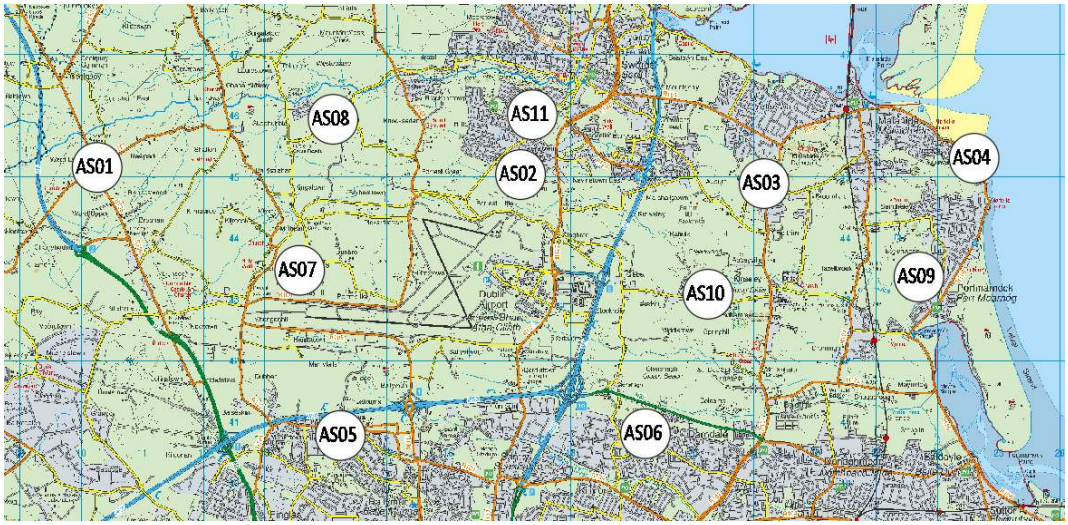
13.4.7 Unattended monitoring was carried out during similar periods to the attended monitoring.

13.4.8 In addition, the long-term monitoring data measured by Dublin Airport's Noise Monitoring Terminals (NMTs) has been utilised for the calendar year of 2018. A comparison of the NMT data for 2016 and 2018 has also been carried out in order to check if the conditions in 2016 were significantly different to those in 2018.

Measurement Locations

13.4.9 The locations of the attended and unattended monitoring are shown in Figure 13-1.

Figure 13-1: Noise Measurement Locations



Attended Survey Measurements

13.4.10 All attended noise monitoring measurements were undertaken in general accordance with the British Standard BS 7445[30]. This comprised positions with free field conditions and a series of 5-minute measurement samples taken at a specified position for typically at least 30 minutes. Repeat measurements were made at each position on a given day or night. The microphone of the noise monitor was positioned approximately 1.5 m above ground level with the monitor mounted on a tripod and away from any reflective surfaces. Observations were made of the noise climate prevailing at the time. These attended measurements include the noise contribution of aircraft activity as well as non-aircraft related activities. This procedure is commonly used to obtain attended environmental noise information, supplemented where possible with unattended noise measurement data.

Unattended Survey Measurements

13.4.11 During the unattended surveys noise measurements were obtained over a period of around three weeks at each position. At three of the locations, AS07, AS08 and AS09, noise measurements were obtained under free field conditions. At two of the positions, locations AS10 and AS11, measurements were made approximately 1 m from a reflective surface and therefore a reflection effect was included in the measurements. Unattended measurements comprised a series of continuous 15-minute measurement samples over the full survey period. The noise monitors were located in environmental cases with the microphones connected via extension cables. The microphones were fitted with windshields and attached to tripods positioned approximately 1.5 m above local ground level with the exception of Portmarnock Community School where the tripod was on a first floor flat roof.

Measurement Parameters and Results

13.4.12 The results of the noise monitoring at survey locations are summarised in Table 13-6 and Table 13-7, which show the attended and unattended results respectively. The survey results are presented in terms of the following parameters:

- $L_{Aeq,T}$ which is commonly used to denote the ambient noise level, signifies the single steady average noise exposure level which is equivalent in energy terms to that produced by the various fluctuating noise levels that occur in the given measurement period.
- $L_{A90,T}$ which represents the prevailing background noise level in the absence of any noise from aircraft in flight or other individual noise sources, such as passing cars. This index denotes the level of noise which is exceeded for 90% of the time.

[30] British Standards Institution BS 7445 - Description and measurement of environmental noise

Table 13-6: Noise Survey Results – Attended – Dublin Airport

Reference	Location	Daytime (07:00-23:00)		Night-time (23:00-07:00)		Location Description and Observations	Survey dates
		$L_{Aeq,T}$ dB	$L_{A90,T}$ dB	$L_{Aeq,T}$ dB	$L_{A90,T}$ dB		
AS01	The Ward Cross	61	52	59	44	Measurement position located approximately 60 metres from R135	9th and 11th August 2016
AS02	Ridgewood	61	47	57	39	Residential area with infrequent local road traffic	9th and 11th August 2016
AS03	South Malahide	50	40	47	32	Residential area, measurement position located approximately 90 metres from Swords Road	16th 17th and 18th August 2016
AS04	Malahide	69	54	55	40	Coastal area, adjacent to the sea and R106	17th and 18th August 2016
AS05	Belcamp Park	57	53	52	46	Residential area with infrequent local road traffic	9th 10th and 11th August 2016
AS06	Hampton Wood	59	56	48	44	Residential area with infrequent local road traffic	10th and 11th August 2016

Table 13-7: Noise Survey Results – Unattended – Dublin Airport

Reference	Location	Daytime (07:00-23:00)		Night-time (23:00-07:00)		Location Description and Observations	Survey dates
		$L_{Aeq,T}$ dB	$L_{A90,T}$ dB	$L_{Aeq,T}$ dB	$L_{A90,T}$ dB		
AS07	St Margaret's Dunsoghly	64	45	59	39	Small village in rural area. Aircraft activity the dominant noise source	11th to 29th August 2016
		64	47	57	42		15th to 26th September 2016
AS08	Kilbrook	50	40	44	33	Quiet residential area. No obvious dominant noise source	11th to 29th August 2016
AS09	Portmarnock Community School	51	40	44	33	Measurement position located within the school grounds. No obvious dominant noise source	19th August to 5th September 2016
AS10	The Baskins	58	43	52	37	Residential area Aircraft activity occasionally the dominant noise source	11th to 29th August 2016
AS11	River Valley	56	45	45	39	Measurement position located within the school grounds	10th to 30th October 2016

13.4.13 As illustrated in the tables above, noise levels vary considerably depending on the proximity to noise sources such as roads and aircraft flight paths in the surrounding environment. Consideration is therefore given below to the areas in the vicinity of the airport in turn.

Noise Environment Description

13.4.14 This section describes the general noise environment in the vicinity of the attended and unattended monitoring locations based on observations made on site and the results presented in Table 13-6 and

13.4.15 Table 13-7. Reference is made below to ambient noise levels, depicted by the $L_{Aeq,T}$ index, and background noise levels, depicted by the L_{A90} index.

North (Locations AS02, AS08 & AS11)

13.4.16 River Valley is a residential area located just under 2 km north of the airport. The R132 and M1 are located approximately 1km and 2.5km from measurement positions D and M. Daytime ambient and background noise levels ranged between 56 dB – 61 dB $L_{Aeq,T}$ and 45 dB – 47 dB L_{A90} respectively. Night-time ambient noise levels ranged between 45 – 57 dB and background noise levels were around 39 dB at both locations. Local road traffic dominated noise sources, however, at location AS02 between 06:30 and 07:00 frequent plane activity was the dominant noise source.

13.4.17 Approximately 2.5km to the west of River Valley is Kilbrook, a quieter residential area located away from busy main roads. At location AS08 the daytime ambient and background noise levels were 50 dB and 40 dB respectively. The night-time levels were 44 dB $L_{Aeq,T}$ and 33 dB L_{A90}. Aircraft noise at this location was considered negligible.

North east (Locations AS03 & AS04)

13.4.18 Malahide is located near the coast, north east of the airport. The R106 was a dominant noise source in the area during the daytime. Position F was located next to the R106 approximately 7km away from Dublin Airport with ambient and background noise levels of around 69 dB $L_{Aeq,T}$ and 54 dB L_{A90}. At night-time ambient and background noise levels at this position were around 55 dB and 40 dB respectively. Position E was located approximately 4km away from Dublin Airport in a quieter residential area located away from busy main roads. The daytime ambient and background noise levels were 50 dB and 40 dB respectively. The night-time levels were 47 dB $L_{Aeq,T}$ and 32 dB L_{A90}. Aircraft noise at these locations was considered negligible.

East (Locations AS09 & AS10)

13.4.19 The area east of the Dublin Airport, at a distance of approximately 2.5 km contains rural areas with smaller residential neighbourhoods located away from busy roads. The area is generally quieter than other locations around the airport with the daytime ambient and background noise levels, measured at Position H, of around 58 dB $L_{Aeq,T}$ and 43 dB L_{A90}. The night-time ambient and background noise levels were around 52 dB $L_{Aeq,T}$ and 37 dB L_{A90}. Aircraft noise was occasionally dominant. For Portmarnock School, approximately 6.5km away from Dublin Airport, which was closed for the summer holidays during the survey, a similar result was evident with daytime ambient and background noise levels of around 51 dB $L_{Aeq,T}$ and 40 dB $L_{Aeq,T}$. At night, the ambient and background levels were around 44 dB $L_{Aeq,T}$ and 33 dB $L_{Aeq,T}$. Aircraft noise at this location was not considered dominant.

South east (Location AS06)

13.4.20 Clonshaugh's business and technology park and Belcamp Park are located approximately 3 km to the south east of the airport. The M1, M50 and R139 are dominant noise sources in the area. The daytime ambient and background noise levels measured were 57 dB and 53 dB respectively. The night-time ambient and background noise levels measured were 52 dB and 46 dB respectively. Aircraft noise was occasionally dominant.

South (Location AS05)

13.4.21 The M50 and the Hampton Wood residential area are located south of the airport. The measurement position was located approximately 500 metres from the M50 and 2km from Dublin Airport. The daytime ambient and background noise levels were 59 dB and 56 dB respectively. The night-time ambient and background noise levels measured were 48 dB and 44 dB respectively.

West (Location AS07)

13.4.22 The area west of the airport contains further rural areas with smaller residential neighbourhoods. Aircraft noise dominated St Margaret's with daytime ambient noise levels of 64 dB and background noise levels ranging from 45 dB – 47 dB. The night-time ambient noise levels ranged between 57 dB – 59 dB and background noise levels ranged between 39 dB – 42 dB. The surrounding road network consisting of N2 and R135 were also audible. Aircraft noise was measured under both easterly and westerly modes of operation at the airport.

North west (Location AS01)

13.4.23 North west of the airport approximately 4km away contains further rural areas. The R135 and R121 roads are dominant noise sources. Ambient and background noise levels of 61 dB and 52 dB respectively were measured. The night-time ambient and background noise levels measured were 59 dB and 44 dB respectively. Aircraft noise was not considered dominant.

Permanent Noise Monitoring Terminal Results

13.4.24 This section describes the locations of the permanent noise monitors in place and operating in the vicinity of Dublin Airport. Results are presented for each noise monitor over the period commencing January 2016 to the end of December 2016, describing the noise environment with and without aircraft activity. The corresponding information for the period commencing January 2018 to the end of December 2018 is also presented to highlight any trends.

13.4.25 The location of each noise monitoring terminal (NMT) is shown in Figure 13-2. There are currently eight permanent NMTs in the vicinity of Dublin Airport. These are located as follows:

- Bay Lane (NMT1), monitoring Runway 28 Departures & Runway 10 Arrivals
- St. Doolaghs (NMT2), monitoring Runway 10 Departures & Runway 28 Arrivals
- Bishopswood (NMT3), monitoring the local area
- Feltrim (NMT4), monitoring the local area
- Balcultry (NMT5), monitoring Runway 34 Departures & Runway 16 Arrivals
- Artane (NMT6), monitoring Runway 16 Departures & Runway 34 Arrivals
- Coast Road (NMT20), monitoring Runway 10 Departures & Runway 28 Arrivals
- North-east of the airport off the Naul Road (NMT21), monitoring noise produced by aircraft on the ground at a location close to the airport.

13.4.26 NMT22 is a mobile NMT, currently located within the airport site, located close to the West Apron in the vicinity of the mid-western boundary of the airport. NMTs 3 and 4 have been installed for permitted operations. The Applicant publishes half yearly reports on the outputs of these NMTs, providing a summary of the aircraft noise measurements from the system. The most recent of these reports are available from the Dublin Airport website[31].

[31] https://www.dublinairport.com/corporate/community-and-sustainability/noise/airport-noise-noise-reports

Figure 13-2: Permanent Noise Monitoring Terminals at Dublin Airport (2018)

13.4.27

13.4.28 Table 13-8 presents the average measured noise level over the six-month period from January to July 2016 inclusive at each monitor, split into daytime (07:00-23:00) and night time (23:00-07:00) periods. Also presented is the noise level produced by aircraft, i.e. the correlated aircraft noise events. Where the "total" noise level at a given monitor is close in value to the "aircraft" noise level, this indicates that the total noise is dominated by aircraft noise. Where there is a 3 dB or more difference, this indicates that some other noise source(s) dominates the noise environment at the NMT. It can be seen that only at NMTs 1 and 2 does aircraft noise dominate the total noise environment. This is to be expected given the locations of these two monitors within 4 km directly to the east and west respectively of the airport's existing main runway.

13.4.29 These averages are not directly comparable to noise contours produced by computer modelling as noise contours are typically based on an average summer or annual day, and also include all aircraft movements rather than just those which produce a correlated noise event. Noise contours also include no noise other than that produced by aircraft.

Table 13-8: Average Measured Noise Levels (2016)

NMT	Daytime Noise Level, dB $L_{Aeq,16hr}$				Night Time Noise Level, dB $L_{Aeq,8hr}$			
	Jan-Jun 2016		Jul-Dec 2016		Jan-Jun 2016		Jul-Dec 2016	
	Total	Aircraft	Total	Aircraft	Total	Aircraft	Total	Aircraft
1	63.8	62.5	63.7	62.4	58.4	57.1	58.1	57.0
2	62.4	60.7	61.8	60.3	56.8	55.4	56.8	55.6
3	62.9	49.6	-	-	54.9	47.0	-	-
4	56.6	41.5	56.8	41.2	52.1	38.3	49.7	39.4
5	54.9	49.2	55.3	48.6	57.3	48.1	51.3	49.7
6	61.6	46.7	58.1	44.2	56.5	45.5	51.6	43.4
20	63.7	57.2	62.4	54.9	57.6	52.2	56.3	50.2

Table 13-9: Average Measured Noise Levels (2018)

NMT	Daytime Noise Level, dB $L_{Aeq,16hr}$				Night Time Noise Level, dB $L_{Aeq,8hr}$			
	Jan-Jun 2018		Jul-Dec 2018		Jan-Jun 2018		Jul-Dec 2018	
	Total	Aircraft	Total	Aircraft	Total	Aircraft	Total	Aircraft
1	63.9	62.8	64.0	62.9	58.9	57.2	58.1	56.6
2	61.1	60.5	61.9	61.1	56.5	54.9	57.5	56.5
4	57.2	46.9	55.3	43.8	54.2	36.7	51.0	33.7
5	58.3	49.5	54.8	48.5	55.1	50.2	54.3	50.4
6	57.7	45.8	60.9	48.9	58.0	45.1	59.2	47.0
20	64.3	58.7	63.4	59.6	58.6	47.7	58.9	54.8

13.4.30 Taking the NMTs where the highest noise levels were measured, these are generally consistent between the two years, especially so for NMT1 where the differences are not more than 0.5 dB, At some of the other locations the variations are greater, for example at NMT6 where the aircraft activity is due to use of the Crosswind Runway, the amount of which is weather dependent. Despite this, the overall picture presented by the results is similar in regard to where the highest noise levels occur, generally at NMT 1 and 20, and where aircraft noise contributes the most, at NMT 1 and 2.

Noise Modelling L_{den} Metric

13.4.31 Aircraft activity in 2018 was primarily on the South Runway with the majority of arrivals from the east along a straight track to the runway. The majority of the departures headed initially to the west on a straight track before commencing turns to the North and South depending on their destination. Some activity took place on the cross runway, mainly arrivals from the North or departures to the North so the number of flights over Dublin were relatively low. The distribution of the aircraft noise reflects this, particularly for locations closer to the airport. Further from the airport the proximity of locations to the departure routes also influences the noise levels.

13.4.32 Taking the representative locations, some such as St Doolaghs and Kilshane Cross were exposed to aircraft noise levels associated with a high impact, with others such as Portmarnock South and St Margret's exposed to aircraft noise levels associated with a medium impact, and others such as Ridgewood and Dunboyne exposed to aircraft noise levels associated with a low impact.

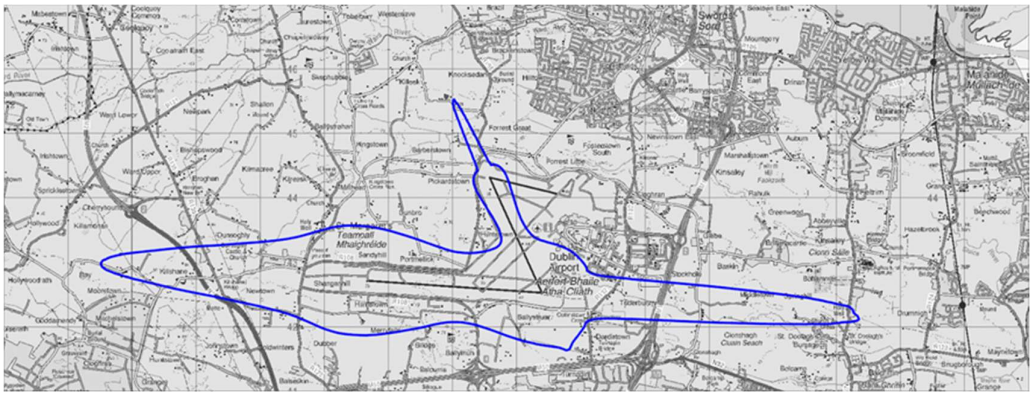
Modelled Results

13.4.33 Noise contours have been produced for the primary assessment metric of L_{den} using the methodology described in Section 13.3. The contours are based on the actual aircraft movements in 2018.

13.4.34 The results for the L_{den} metric are detailed below. These results are also presented in replacement Appendix 13C along with the results for the supplementary noise metrics.

13.4.35 Replacement Appendix 13C presents the full set of noise contours for each scenario. Figure 13-3 shows the noise contours representing a high impact, 65 dB L_{den}, for 2018.

Figure 13-3: 65 dB L_{den} Noise Contours, 2018



13.4.36 The 2018 65 dB L_{den} contour (blue) extends to the west from the South Runway to Mooretown and to the east to St Doolaghs. From the Crosswind Runway, the contour extends to Knocksedan to the north and does not reach the M50 to the south.

13.4.37 To provide further information on changes in the noise environment for specific communities, predictions have also been undertaken of the noise levels at a number of representative locations which are shown on Figure 13-4. The results of these predictions for 2018 in terms of the L_{den} metric are given in Table 13-10.

Figure 13-4: Representative Location Points

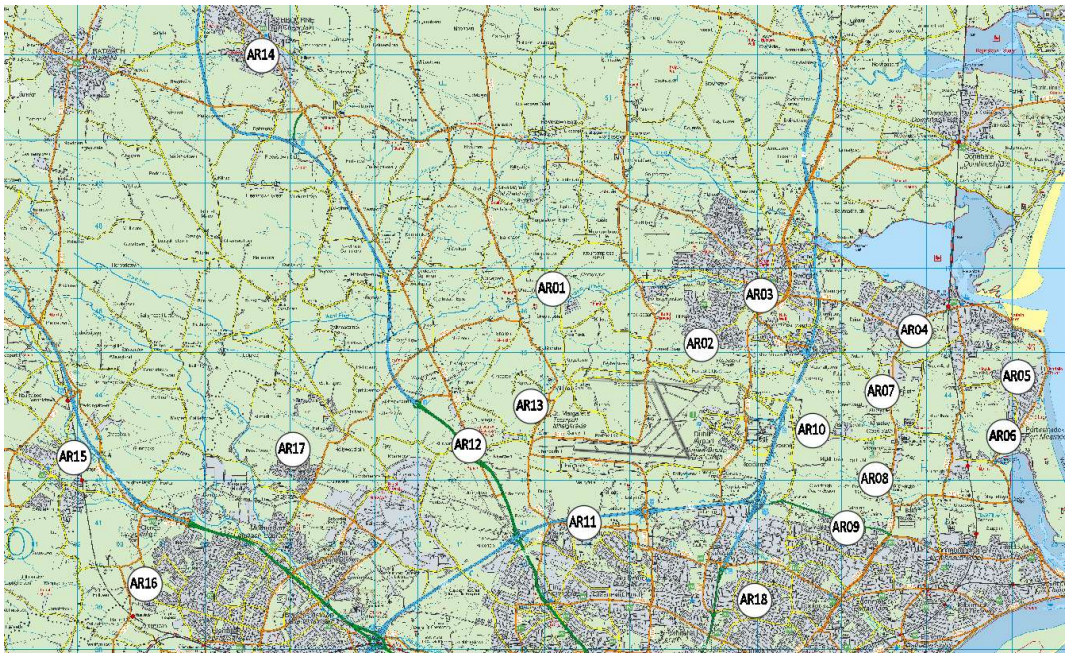


Table 13-10: Noise levels at Representative Locations (L_{den}) – 2018

Representative Location	Reference No.	Noise Level, dB (L_{den})
		2018
Tyrellstown, Toberburr	AR01	50
Ridgewood	AR02	53
Swords	AR03	47
Malahide Castle	AR04	45

Portmarnock N	AR05	48
Portmarnock S	AR06	56
Malahide S	AR07	50
St Doolaghs	AR08	65
Darndale Park	AR09	53
The Baskins	AR10	58
Mayeston Hall	AR11	57
Kilshane Cross	AR12	68
St Margret's	AR13	62
Ashbourne	AR14	48
Dunboyne	AR15	53
Ongar	AR16	51
Mount Garrett	AR17	61
Beaumont	AR18	54

Note – noise levels rounded to nearest whole number.

13.4.38 For the 2018 contours the number of dwellings and the estimated population that they contain have been determined as detailed in replacement Appendix 13B Air Noise Methodology section 13B.4. This has been done based on the existing dwellings and population excluding consented developments, and also based on the existing dwellings and population including consented developments and land zoned for residential development. The consented developments comprise not yet built dwellings, which have already been granted planning permission, and these have been combined with the estimated number of dwellings that areas that have been zoned for residential use are assumed to contain.

13.4.39 The contour results presented in this chapter are all cumulative, e.g. any dwellings inside a 55 dB contour are also included in the totals for any lower value contour.

13.4.40 The dwelling and population results for 2018 are given by contour in Table 13-11 along with the areas of the contours.

Table 13-11: Areas, number of dwellings and population in 2018 Annual L_{den} contours

Scenario	2018				
Contour L_{den} (dB)	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population.	Dwellings	Population
45	703.2	245,808	716,725	260,126	762,641
50	209.3	61,728	184,777	73,098	221,174
55	85.9	11,889	35,482	18,222	55,091
60	33.5	1,641	4,717	5,034	15,612
65	11.6	94	257	94	257
70	4.1	10	31	10	31

13.4.41 The number of people assessed to be highly annoyed in 2018 is given in Table 13-12.

Table 13-12: Number of people highly annoyed – 2018

Scenario	No. People Highly Annoyed	
	Excluding Consented Developments	Including Consented Developments
2018	110,238	121,942

13.4.42 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of

worship. The numbers of each of these above the thresholds given in Table 13-5 for 2018 are given in Table 13-13.

Table 13-13: Schools, residential healthcare facilities and places of worship in L_{den} contours – 2018

Scenario	No. Receptors Above Threshold for Medium Absolute Effect		
	Schools	Residential Healthcare Facilities	Places of Worship
2018	10	3	6

Noise Modelling L_{night} Metric

13.4.43 Aircraft activity at night in 2018 was primarily on the South Runway with the majority of arrivals from the east along a straight track to the runway. The majority of the departures headed initially to the west on a straight track before commencing turns to the north and south depending on their destination. Some activity took place on the cross runway, mainly arrivals from the north or departures to the north so the number of flights over Dublin were relatively low. The distribution of the aircraft noise reflects this, particularly for locations closer to the airport. Further from the airport the proximity of locations to the departure routes also influences the noise levels.

13.4.44 Taking the representative locations, some such as St Doolaghs and Kilshane Cross were exposed to aircraft noise levels associated with a high impact, with others such as Mount Garrett and St Margret's exposed to aircraft noise levels associated with a medium impact, and others such as Ridgewood and Dunboyne exposed to aircraft noise levels associated with a low impact.

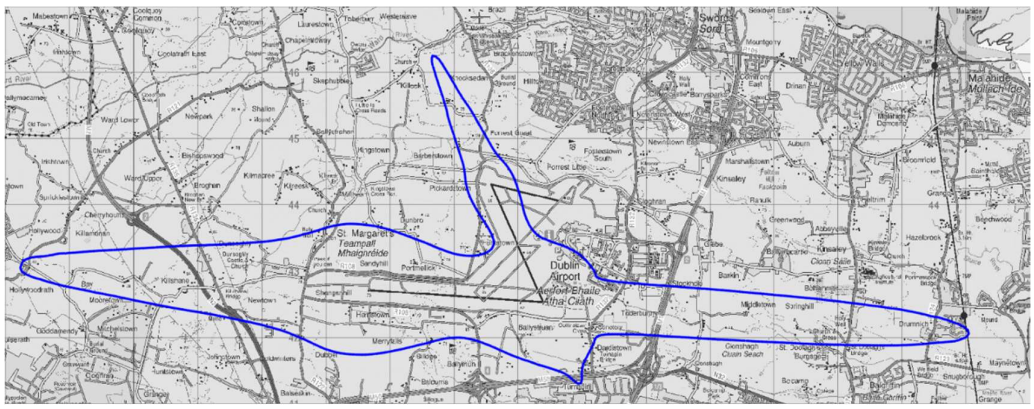
Modelled Results

13.4.45 Noise contours have been produced for the primary assessment metric of L_{night} using the methodology described in Section 13.3. The contours are based on the actual aircraft movements in 2018.

13.4.46 The results for the L_{night} metric are detailed below. These results are also presented in replacement Appendix 13C along with the results for the supplementary noise metrics.

13.4.47 Figure 13-5 shows the noise contours representing a high impact, 55 dB L_{night}, for 2018.

Figure 13-5: 55 dB L_{night} Noise Contours, 2018



13.4.48 The 2018 55 dB L_{night} contour (blue) extends to the west from the South Runway to Hollystown and to the east to Drumnigh. From the Crosswind Runway, the contour extends to Killeek to the north and just crosses the M50 to the south.

13.4.49 To provide further information on changes in the noise environment for specific communities, predictions have also been undertaken of the noise levels at a number of representative locations which are shown on Figure 13-4. The results of these predictions for 2018 in terms of the L_{night} metric are given in Table 13-14.

Table 13-14: Noise levels at Representative Locations (L_{night}) – 2018

Representative Location	Reference No.	Noise Level, dB (L_{night})
		2018
Tyrellstown, Toberburr	AR01	43
Ridgewood	AR02	45
Swords	AR03	39
Malahide Castle	AR04	36
Portmarnock N	AR05	39
Portmarnock S	AR06	48
Malahide S	AR07	42
St Doolaghs	AR08	57
Darndale Park	AR09	44
The Baskins	AR10	49
Mayeston Hall	AR11	48
Kilshane Cross	AR12	59
St Margret's	AR13	54
Ashbourne	AR14	38
Dunboyne	AR15	45
Ongar	AR16	43
Mount Garrett	AR17	52
Beaumont	AR18	47

Note – noise levels rounded to nearest whole number.

13.4.50 For each of the 2018 contours the number of dwellings and the estimated population that they contain have been determined as detailed in The replacement Appendix 13B Air Noise Methodology section 13B.4. This has been done based on the existing dwellings and population, excluding consented developments, and allowing for consented developments and land zoned for residential development.

13.4.51 The contour results presented in this chapter are all cumulative, e.g. any dwellings inside a 55 dB contour are also included in the totals for any lower value contour.

13.4.52 The dwelling and population results for 2018 are given by contour in Table 13-15 along with the areas of the contours.

Table 13-15: Areas, number of dwellings and population in 2018 Annual L_{night} contours

Scenario		2018			
Contour L_{night} (dB)	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population.	Dwellings	Population
40	304.4	102,538	307,457	114,244	344,820
45	118.2	18,815	55,492	26,444	78,989
50	48.4	4,131	12,316	7,946	24,467
55	16.8	276	753	328	950
60	5.8	19	56	19	56
65	2.3	3	10	3	10

13.4.53 The number of people assessed to be highly sleep disturbed in 2018 is given in Table 13-16.

Table 13-16: Number of people highly sleep disturbed – 2018

Scenario	No. People Highly Sleep Disturbed	
	Excluding Consented Developments	Including Consented Developments
2018	42,260	48,950

13.4.54 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. Of these, only residential healthcare facilities are highly sensitive to noise at night. The number of these above the threshold given in Table 13-5 for 2018 is given in Table 13-17.

Table 13-17: Residential healthcare facilities in L_{night} contours – 2018

Scenario	No. Residential Healthcare Facilities Above Threshold for Medium Absolute Effect
2018	5

Noise Modelling to Inform Vibration Effects

13.4.55 The number of dwellings exceeding the threshold for potential vibration effects due to airborne aircraft, based on experiencing noise levels of at least 97 dB L_{Cmax} at least once per 24 hour day, has been predicted for 2018. The results are given in Table 13-18.

Table 13-18: Number of dwellings exceeding threshold for potential vibration effects due to airborne aircraft – 2018

Scenario	No. dwellings exceeding threshold for potential vibration effects due to airborne aircraft
2018	4

13.5 Future Receiving Environment

13.5.1 This section describes the future receiving environment in the Assessment Years of 2025 and 2035. This is the environment in the absence of the proposed Relevant Action and is represented by the Permitted Scenario in each Assessment Year.

13.5.2 Airborne aircraft noise predictions have been made for the Permitted Scenario in the Assessment Years of 2025 and 2035. The primary assessment metrics are presented in this section, and the supplementary metrics are presented in replacement Appendix 13C.

13.5.3 In order to inform the vibration assessment, airborne aircraft noise predictions using the L_{Cmax} metric have also been made for the Permitted Scenario in the Assessment Years of 2025 and 2035.

Noise Modelling L_{den} Metric

13.5.4 Aircraft activity in the Permitted Scenarios during the day is primarily split between the South Runway and the North Runway. Arrivals from the east and departures to the east primarily use the South Runway with arrivals from the west and departures to the west primarily using the North Runway. There is very limited used of the cross runway, and at night activity there is no use of the North Runway other than for the limited periods when the South Runway is closed for maintenance. The distribution of the aircraft noise reflects this, particularly for locations closer to the airport. Further from the airport the proximity of locations to the departure routes also influences the noise levels.

13.5.5 Taking the representative locations, in 2025 only Kilshane Cross is forecast to be exposed to aircraft noise levels associated with a high impact, with others such as St Doolaghs, Portmarnock S and St Margret's exposed to aircraft noise levels associated with a medium impact, and others such as Malahide S and Dunboyne exposed to aircraft noise levels associated with a low impact.

13.5.6 The noise levels in 2035 are generally lower than those in 2025 by 1 to 3 dB, changes of these magnitudes are associated with a very low to medium impact. The reduced noise levels in 2035 are the result of the activity being the same but the aircraft fleet modernising.

13.5.7 Compared to 2018 the noise levels in 2025 do not show a consistent difference. This is primarily due to the opening of North Runway which introduces a new location for some of the flights. For some locations such as Portmarnock N and The Baskins the noise levels are the same, with others such as Ridgewood and Tyrellstown, Toberburr having increased noise levels in 2025. The magnitude of these increases is associated with a low to medium impact. For other locations such as Mount Garrett, Beaumont and Mayeston Hall the noise levels are lower in 2025. The magnitude of these decreases is associated with a medium impact.

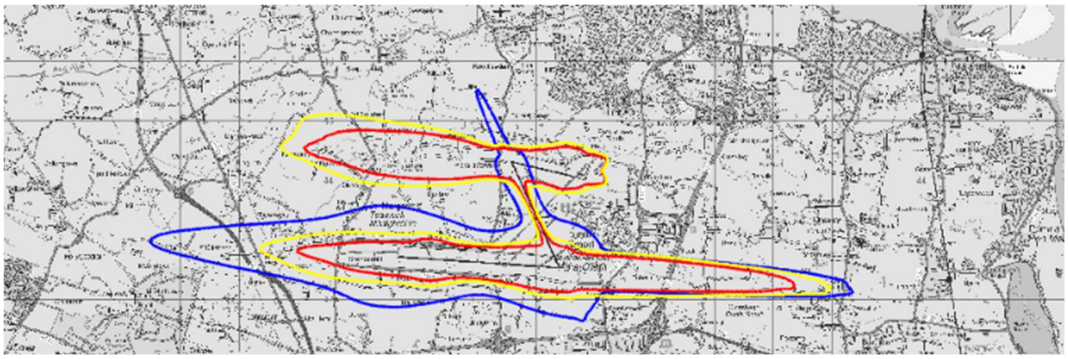
Modelled Results

13.5.8 Noise contours have been produced for the primary assessment metric of L_{den} using the methodology described in Section 13.3. The contours are based on forecast aircraft movements for the Permitted Scenario in the Assessment Years of 2025 and 2035.

13.5.9 The results for the L_{den} metric are detailed below. These are also presented in replacement Appendix 13C along with the results for the supplementary noise metrics.

13.5.10 Replacement Appendix 13C presents the full set of noise contours for each scenario assessed. Figure 13-6 shows the noise contours representing a high impact, 65 dB L_{den}, for the 2025 and 2035 Permitted Scenarios. The equivalent contour for 2018 is also included for comparison.

Figure 13-6: 65 dB L_{den} Noise Contours, 2018 (blue), 2025 Permitted (yellow) and 2035 Permitted (red)



13.5.11 The 2018 65 dB L_{den} contour (blue) extends to the west from the South Runway to Mooretown and to the east to St Doolaghs. From the Crosswind Runway, the contour extends to Knocksedan to the north and does not reach the M50 to the south.

13.5.12 The 2025 Permitted Scenario 65 dB L_{den} contour (yellow) does not reach as far west as 2018 in line with the South Runway, reaching Killshane Bridge, and is also smaller to the east, reaching St Doolaghs. In line with the North Runway, the contour extends just beyond Kilmacree to the west and barely leaves the airport site to the east. The exposure from the Crosswind Runway does not leave the airport site. The aircraft movements are slightly less than 2018, however they are spread between two runways so the number on the South Runway is lower. Fleet renewal also has some effect to reduce the contour size.

13.5.13 The 2035 Permitted Scenario 65 dB L_{den} contour (red) is a very similar shape to that in 2025, albeit slightly smaller. The number of aircraft movements is slightly more than 2025, however fleet renewal causes the contour to be smaller.

13.5.14 To provide further information on changes in the noise environment for specific communities, predictions have also been undertaken of the noise levels at a number of representative locations which are shown on Figure 13-4. The results of these predictions for the 2025 and 2035 Permitted Scenarios in terms of the L_{den} metric are given in Table 13-19. The 2018 results are also included for comparison.

Table 13-19: Noise levels at Representative Locations (L_{den}) – 2018 and Permitted Scenarios

Representative Location	Reference No.	Noise Level, dB (L_{den})		
		2018	2025 Permitted	2035 Permitted
Tyrellstown, Toberburr	AR01	50	55	53
Ridgewood	AR02	53	55	53
Swords	AR03	47	47	44
Malahide Castle	AR04	45	45	43
Portmarnock N	AR05	48	48	46
Portmarnock S	AR06	56	56	54
Malahide S	AR07	50	51	50
St Doolaghs	AR08	65	64	63
Darndale Park	AR09	53	54	52
The Baskins	AR10	58	58	56
Mayeston Hall	AR11	57	51	48
Kilshane Cross	AR12	68	65	63
St Margret's	AR13	62	63	60
Ashbourne	AR14	48	49	46
Dunboyne	AR15	53	50	48
Ongar	AR16	51	47	44
Mount Garrett	AR17	61	58	55
Beaumont	AR18	54	49	47

Note – noise levels rounded to nearest whole number.

13.5.15 Noise levels at receptors close to flight paths from the existing South Runway or Crosswind Runway, for example St Doolaghs (AR08), Kilshane Cross (AR12) or Beaumont (AR18), are forecast to reduce between 2018 and the 2025 Permitted Scenario, whereas the opposite is true for receptors closer to flight paths from the North Runway, for example Tyrellstown, Toberburr (AR01) and Ridgewood (AR02). Going from the 2025 Permitted Scenario to the 2035 Permitted Scenario, there are small decreases of 1-3 dB at all locations.

13.5.16 For each of the sets of contours the number of dwellings and the estimated population that they contain have been determined as detailed in replacement Appendix 13B Air Noise Methodology section 13B.4. This has been done based on the existing dwellings and population excluding consented developments, and also based on the existing dwellings and population including consented developments and land zoned for residential development. The consented developments have been updated to include those approved in recent years.

13.5.17 The contour results presented in this chapter are all cumulative, e.g. any dwellings inside a 55 dB contour are also included in the totals for any lower value contour.

13.5.18 The dwelling and population results for the 2025 Permitted Scenario are given by contour in Table 13-20 along with the areas of the contours.

Table 13-20: Areas, number of dwellings and population in 2025 Permitted Annual L_{den} contours

Scenario		*2025 Permitted*			
Contour L_{den} (dB)	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population.	Dwellings	Population
45	552.7	116,064	345,385	129,278	387,330
50	220.3	31,644	94,752	39,931	120,311

55	90.9	7,167	22,162	13,375	41,382
60	33.5	915	2,411	2,712	7,990
65	10.8	68	191	68	191
70	3.5	2	6	2	6

13.5.19 The dwelling and population results for the 2035 Permitted Scenario are given by contour in Table 13-21 along with the areas of the contours.

Table 13-21: Areas, number of dwellings and population in 2035 Permitted Annual L_{den} contours

Scenario		2035 Permitted			
Contour L_{den} (dB)	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population.	Dwellings	Population
45	358.9	63,100	188,630	72,628	217,940
50	152.9	16,653	49,812	23,721	71,422
55	64.5	3,645	10,507	9,308	28,140
60	22.9	485	1,512	1,952	6,123
65	7.3	25	77	25	77
70	2.5	0	0	0	0

13.5.20 The number of people assessed to be highly annoyed in the Permitted Scenarios for the Assessment Years of 2025 and 2035 is given in Table 13-22. The 2018 results are also included for comparison.

Table 13-22: Number of people highly annoyed – 2018 and Permitted Scenarios

Scenario	No. People Highly Annoyed	
	Excluding Consented Developments	Including Consented Developments
2018	110,238	121,942
2025 Permitted	55,041	64,967
2035 Permitted	29,232	36,826

13.5.21 The number of people exposed to aircraft noise in terms of the L_{den} metric is forecast to reduce from 2018 to the 2025 Permitted Scenario, for all contour levels. Consequently, the number of people assessed as highly annoyed by aircraft noise also decreases, specifically by 50% from 110,238 to 55,041 (excluding consented developments). The number of people exposed to at least a high level of noise (i.e. 65 dB L_{den} or above) decreases from 257 to 191.

13.5.22 Looking further into the future at the 2035 Permitted Scenario, the number of people assessed as highly annoyed decreases to 29,232 (excluding consented developments), lower than in the 2025 Permitted Scenario. 77 people are forecast to be exposed to at least a high noise level.

13.5.23 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. The numbers of each of these above the thresholds given in Table 13-5 for the Permitted Scenarios are given in Table 13-23. The 2018 results are also presented for comparison.

Table 13-23: Schools, residential healthcare facilities and places of worship in L_{den} contours – 2018 and Permitted Scenarios

Scenario	No. Receptors Above Threshold for Medium Absolute Effect		
	Schools	Residential Healthcare Facilities	Places of Worship
2018	10	3	6
2025 Permitted	9	4	5

Scenario	No. Receptors Above Threshold for Medium Absolute Effect		
	Schools	Residential Healthcare Facilities	Places of Worship
2035 Permitted	6	3	4

13.5.24 The overall number of non-residential receptors exposed to the thresholds given in Table 13-5 is forecast to reduce from 2018 to the 2025 Permitted Scenario, before reducing again in the 2035 Permitted Scenario.

Noise Modelling L_{night} Metric

13.5.25 Aircraft activity at night in the Permitted Scenarios comprises very limited used of the cross runway and no use of the North Runway other than for the limited periods when the South Runway is closed for maintenance. The distribution of the aircraft noise reflects this, particularly for locations closer to the airport. Further from the airport the proximity of locations to the departure routes also influences the noise levels.

13.5.26 Taking the representative locations, in 2025 some such as St Doolaghs and Kilshane Cross are forecast to be exposed to aircraft noise levels associated with a high impact, with others such as Mount Garrett and St Margret's exposed to aircraft noise levels associated with a medium impact, and others such as Portmarnock S and Mayeston Hall exposed to aircraft noise levels associated with a low impact.

13.5.27 The noise levels in 2035 are generally lower than those in 2025 by 1 to 4 dB, changes of these magnitudes are associated with a very low to medium impact. The reduced noise levels in 2035 are the result of the activity being the same but the aircraft fleet modernising.

13.5.28 Compared to 2018 the noise levels in 2025 do not show a consistent difference. This is primarily due to the reduction in use of the cross runway. For most locations the noise levels are the same or have changes of 1 to 2 dB(A). The magnitude of these decreases is associated with a very low to low impact. For other locations such as Swords, Ridgewood and Tyrellstown, Toberburr there is a reduction from 2018 associated with a medium impact. The largest reduction from 2018 to 2025 is for Beaumont at 7 dB(A) which is high impact, in this case a beneficial one.

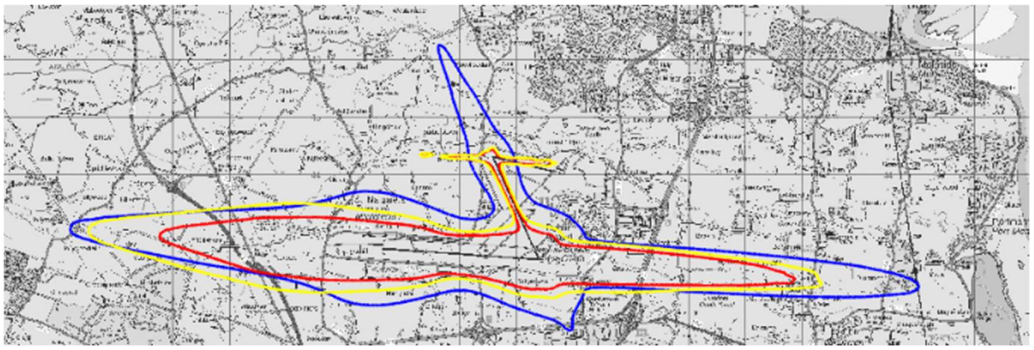
Modelled Results

13.5.29 Noise contours have been produced for the primary assessment metric of L_{night} using the methodology described in Section 13.3. The contours are based on forecast aircraft movements for the Permitted Scenario in the Assessment Years of 2025 and 2035.

13.5.30 The results for the L_{night} metric are detailed below. These are also presented in replacement Appendix 13C along with the results for the supplementary noise metrics.

13.5.31 Replacement Appendix 13C presents the full set of noise contours for each scenario assessed. Figure 13-7 shows the noise contours representing a high impact, 65 dB L_{den}, for the 2025 and 2035 Permitted Scenarios. The equivalent contour for 2018 is also included for comparison.

Figure 13-7: 55 dB L_{night} Noise Contours, 2018 (blue), 2025 Permitted (yellow) and 2035 Permitted (red)



13.5.32 The 2018 55 dB L_{night} contour (blue) extends to the west from the South Runway to Hollystown and to the east to Drumnigh. From the Crosswind Runway, the contour extends to Killeek to the north and just crosses the M50 to the south.

13.5.33 The 2025 Permitted 55 dB L_{night} contour (yellow) does not extend as far as the 2018 contour in line with the South Runway, almost reaching Hollystown to the west and reaching St Doolaghs to the east, although it is wider than the 2018 contour in some places. This reduction is due to the reduction in aircraft movements compared to 2018. The exposure from the Crosswind Runway or the North Runway does not leave the airport site.

13.5.34 The 2035 Permitted 55 dB L_{night} contour (red) is a very similar shape to that in 2025, albeit slightly smaller. The number of aircraft movements is slightly more than 2025, however fleet renewal causes the contour to be smaller.

13.5.35 To provide further information on changes in the noise environment for specific communities, predictions have also been undertaken of the noise levels at a number of representative locations which are shown on Figure 13-4. The results of these predictions for the 2025 and 2035 Permitted Scenarios in terms of the L_{night} metric are given in Table 13-24. The 2018 results are also included for comparison.

Table 13-24: Noise levels at Representative Locations (L_{night}) – 2018 and Permitted Scenarios

Representative Location	Reference No.	Noise Level, dB (L_{night})		
		2018	2025 Permitted	2035 Permitted
Tyrellstown, Toberburr	AR01	43	38	35
Ridgewood	AR02	45	40	36
Swords	AR03	39	36	33
Malahide Castle	AR04	36	36	34
Portmarnock N	AR05	39	40	37
Portmarnock S	AR06	48	47	45
Malahide S	AR07	42	43	42
St Doolaghs	AR08	57	55	54
Darndale Park	AR09	44	45	43
The Baskins	AR10	49	49	47
Mayeston Hall	AR11	48	45	41
Kilshane Cross	AR12	59	59	58
St Margret's	AR13	54	53	50
Ashbourne	AR14	38	39	36
Dunboyne	AR15	45	45	42
Ongar	AR16	43	41	38
Mount Garrett	AR17	52	52	50
Beaumont	AR18	47	40	37

Note – noise levels rounded to nearest whole number.

13.5.36 Noise levels are forecast to reduce between 2018 and the 2025 Permitted Scenario, in particular for receptors close to flight paths from the Crosswind Runway such as Beaumont (AR18). For areas closer to flight paths from the existing South Runway such as St Doolaghs (ASR8) the forecast reduction is more modest. Noise levels in the 2035 Permitted Scenario are generally lower than those for the 2025 Permitted Scenario by 1-4 dB.

13.5.37 For each of the sets of contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also based on the existing dwellings and population including consented developments and land zoned for residential development.

13.5.38 The contour results presented in this chapter are all cumulative, e.g. any dwellings inside a 55 dB contour are also included in the totals for any lower value contour.

13.5.39 The dwelling and population results for the 2025 Permitted Scenario are given by contour in Table 13-25 along with the areas of the contours.

Table 13-25: Areas, number of dwellings and population in 2025 Permitted Annual L_{night} contours

Scenario		2025 Permitted			
Contour L_{night} (dB)	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population.	Dwellings	Population
40	236.0	52,493	160,430	61,530	188,377
45	95.8	10,424	31,419	17,104	51,927
50	37.3	3,138	9,972	6,960	22,132
55	12.5	115	315	115	315
60	4.0	17	48	17	48
65	1.3	0	0	0	0

13.5.40 The dwelling and population results for the 2035 Permitted Scenario are given by contour in Table 13-26 along with the areas of the contours.

Table 13-26: Areas, number of dwellings and population in 2035 Permitted Annual L_{night} contours

Scenario		2035 Permitted			
Contour L_{night} (dB)	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population.	Dwellings	Population
40	143.3	22,110	66,841	29,497	89,470
45	63.9	6,270	19,626	12,231	38,149
50	24.7	973	2,852	4,336	13,679
55	8.2	79	212	79	212
60	2.6	4	13	4	13
65	0.9	0	0	0	0

13.5.41 The number of people assessed to be highly sleep disturbed in the Permitted Scenarios for the Assessment Years of 2025 and 2035 is given in Table 13-27. The 2018 results are also included for comparison.

Table 13-27: Number of people sleep disturbed – 2018 and Permitted Scenarios

Scenario	No. People Highly Sleep Disturbed	
	Excluding Consented Developments	Including Consented Developments
2018	42,260	48,950
2025 Permitted	22,281	27,474
2035 Permitted	9,430	13,592

13.5.42 The number of people exposed to aircraft noise in terms of the L_{night} metric is forecast to reduce from 2018 to the 2025 Permitted Scenario, for all contour levels. Consequently, the number of people assessed as highly sleep disturbed by aircraft noise also decreases, specifically by 47% from 42,260 to 22,281 (excluding consented developments). The number of people exposed to at least a high level of noise (i.e. 55 dB L_{night} or above) decreases from 753 to 315.

13.5.43 Looking further into the future at the 2035 Permitted Scenario, the number of people assessed as highly sleep disturbed decreases to 9,430 (excluding consented developments), lower than in the 2025 Permitted Scenario. 212 people are forecast to be exposed to at least a high noise level.

13.5.44 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. Of these, only residential healthcare facilities are highly sensitive to noise at night. The number of these above the threshold given in Table 13-5 for the Permitted Scenarios is given in Table 13-28. The 2018 result is also presented for comparison.

Table 13-28: Residential healthcare facilities in L_{night} contours – 2018 and Permitted Scenarios

Scenario	No. Residential Healthcare Facilities Above Threshold for Medium Absolute Effect
2018	5
2025 Permitted	2
2035 Permitted	1

13.5.45 The number of residential healthcare facilities exposed to the threshold given in Table 13-5 is forecast to reduce from 5 in 2018 to 2 in the 2025 Permitted Scenarios and to reduce further to 1 in the 2035 Permitted Scenario.

Noise Modelling to Inform Vibration Effects

13.5.46 The number of dwellings exceeding the threshold for potential vibration effects due to airborne aircraft, based on experiencing noise levels of at least 97 dB L_{Cmax} at least once per 24 hour day, has been predicted for the Permitted Scenario in the Assessment Years of 2025 and 2035. The results are given in Table 13-29. The 2018 result is also presented for comparison.

Table 13-29: Number of dwellings exceeding threshold for potential vibration effects due to airborne aircraft – 2018 and Permitted Scenarios

Scenario	No. dwellings exceeding threshold for potential vibration effects due to airborne aircraft
2018	4
2025 Permitted	0
2035 Permitted	0

13.5.47 In 2018, there were 4 dwellings which experienced noise levels in excess of 97 dB L_{Cmax} at least once per day. These are located to the south of Old Airport Road, near to the eastern end of the South Runway. No dwellings exceed this threshold in the in the 2025 Permitted Scenario or the 2035 Permitted Scenario,

13.6 Environmental Design and Management

13.6.1 There are a number of measures already in place at Dublin Airport that reduce or mitigate the noise effects of aircraft operations. These are described in this section.

Reduction of Noise at Source

13.6.2 Over the past 20 years, the models and types of aircraft using Dublin Airport have evolved, and improvements in technology have meant that the typical aircraft using the airport are quieter than they used to be. This is illustrated in Figure 7 of the approved Dublin Airport Noise Action Plan 2019-2023[32].

13.6.3 The ICAO Noise 'Chapter'[33] defines specific noise performance criteria to which aircraft must be certificated. Since 2002, Chapter 2 aircraft have been banned from use in Europe and the vast majority of aircraft operating in the skies above the EU are now Chapter 4 compliant, with an increasing number of quieter Chapter 14 aircraft entering the fleet as airlines take delivery of newer aircraft.

[32] Fngal County Council Noise Action Plan for Dublin Airport 2019 – 2023 December 2018 https://www.fingal.ie/sites/default/files/2019-04/NAP%20Final.pdf [Checked 21/08/2023]
[33] https://www.icao.int/environmental-protection/pages/reduction-of-noise-at-source.aspx Checked 21/08/2023]

13.6.4 This trend is expected to continue in the future as airlines renew their fleets, and increase the use of new aircraft such as the Airbus A320neo and Boeing 737 MAX 8, which both meet the ICAO Chapter 14 requirements and are quieter than the equivalent types they will be replacing.

13.6.5 Fleet renewal plans for airlines at Dublin Airport were considered when preparing the future forecast scenarios and details of the expected fleet evolution are presented in the Mott McDonald report *Dublin Airport Operating Restrictions Quantification of Impacts on Future Growth Addendum to the Analysis of June 2021 (Report version 1.3.1)*.

13.6.6 The Applicant has begun to incentivise quieter aircraft particularly at night in accordance with Action 1 of the Dublin Airport Noise Action Plan 2019-2023. An initial noise charging consultation was circulated to airlines at the end of November 2020. This consultation outlined a range of questions relating to the implementation of noise charging and the potential methodology. Airline responses were received in mid-February 2021. Discussions continued throughout 2022 on the promotion of quieter aircraft and the appropriate use of metrics and methodology to track performance improvement. Live charging for noise was introduced on 1st July 2022 and applied a rate for night time use only (23:00 – 06:59).

Land use Planning and Management

Noise Zones

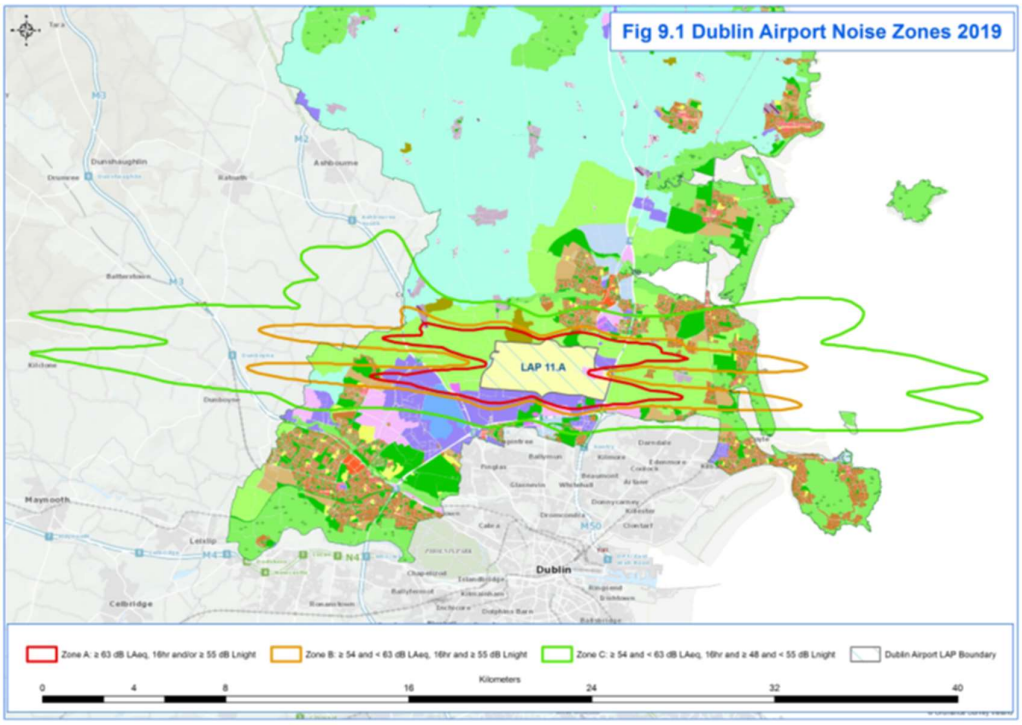
13.6.7 Noise Zones have been in use for a number of years in the Fingal Development Plan. Most recently they were updated in the 2020 Dublin Airport Local Area Plan (LAP). The LAP dedicates an entire Section (section 9.1) to noise. In that section it notes the following:

"The Dublin Airport LAP is a land use plan for the purposes of effective land-use planning and safeguarding the use of the Airport. Noise zones relating to Dublin Airport have been in place for many years to aid land use planning. Since the publication of previous noise zones in 2005, and over the last decade, further evidence has emerged that has updated understanding of how aircraft noise can affect health and quality of life. With the north runway set to become operational in 2022, updated information is available relating to aircraft noise performance and flight paths. For these reasons, it was considered appropriate to update the noise zones for Dublin Airport to allow for more effective land use planning for development within airport noise zones.

13.6.8 *The updated noise zones are set out in Fig. 9.1. Dublin Airport Noise Zones and policies relating to development in Noise Zones are set out in Variation No. 1 to the Fingal Development Plan 2017 - 2023."*

13.6.9 This figure is reproduced as Figure 13-8 below.

Figure 13-8: Extract of Figure 9.1 from Dublin Airport Local Area Plan



13.6.10 The actions to restrict inappropriate development in the noise zones are described in the Fingal Development Plan 2017-2023 Variation No. 1, which states:

13.6.11 *"Three noise zones are shown in the Development Plan maps, Zones B and C within which the Council will continue to restrict inappropriate development, and Zone A within which new provisions for residential development and other noise sensitive uses will be actively resisted. An additional assessment zone, Zone D is also proposed to identify any larger residential developments in the vicinity of the flight paths serving the Airport in order to promote appropriate land use and to identify encroachment."*

13.6.12 Table 7.2 of the Fingal Development Plan 2017-2023 Variation No. 1 is reproduced below for reference as Table 13-30. The table considers two noise metrics, L_{night} which is one of the primary metrics used in this chapter, and $L_{Aeq,16hr}$ which is one of the supplementary noise metrics. Due to the distribution of flights across the day, evening and night periods at larger airports, the noise exposure expressed using the $L_{Aeq,16hr}$ metric is typically 2 dB lower than if it is expressed using the L_{den} metric, the other primary metric used in this chapter.

Table 13-30: Extract from Fingal Development Plan 2017-2023 (Table 7.2)

Zone	Indication of Potential Noise Exposure during Airport Operations	Objective
D	≥ 50 and < 54 dB $L_{Aeq,16hr}$ and ≥ 40 and < 48 dB L_{night}	To identify noise sensitive developments which could potentially be affected by aircraft noise and to identify any larger residential developments in the vicinity of the flight paths serving the Airport in order to promote appropriate land use and to identify encroachment. All noise sensitive development within this zone is likely to be acceptable from a noise perspective. An associated application would not normally be refused on noise grounds, however where the development is residential-led and comprises non-residential noise sensitive uses, or comprises 50 residential units or more, it may be necessary for the applicant to demonstrate that a good acoustic design has been followed. Applicants are advised to seek expert advice.

Zone	Indication of Potential Noise Exposure during Airport Operations	Objective
C		To manage noise sensitive development in areas where aircraft noise may give rise to annoyance and sleep disturbance, and to ensure, where appropriate, noise insulation is incorporated within the development
	≥ 54 and < 63 dB $L_{Aeq,16hr}$	Noise sensitive development in this zone is less suitable from a noise perspective than in Zone D. A noise assessment must be undertaken in order to demonstrate good acoustic design has been followed.
	and	The noise assessment must demonstrate that relevant internal noise guidelines will be met. This may require noise insulation measures.
	≥ 48 and < 55 dB L_{night}	An external amenity area noise assessment must be undertaken where external amenity space is intrinsic to the development's design. This assessment should make specific consideration of the acoustic environment within those spaces as required so that they can be enjoyed as intended. Ideally, noise levels in external amenity spaces should be designed to achieve the lowest practicable noise levels.
		Applicants are strongly advised to seek expert advice.
B		To manage noise sensitive development in areas where aircraft noise may give rise to annoyance and sleep disturbance, and to ensure noise insulation is incorporated within the development.
	≥ 54 and < 63 dB $L_{Aeq,16hr}$	Noise sensitive development in this zone is less suitable from a noise perspective than in Zone C. A noise assessment must be undertaken in order to demonstrate good acoustic design has been followed.
	and	Appropriate well-designed noise insulation measures must be incorporated into the development in order to meet relevant internal noise guidelines.
	≥ 55 dB L_{night}	An external amenity area noise assessment must be undertaken where external amenity space is intrinsic to the development's design. This assessment should make specific consideration of the acoustic environment within those spaces as required so that they can be enjoyed as intended. Ideally, noise levels in external amenity spaces should be designed to achieve the lowest practicable noise levels.
		Applicants must seek expert advice.
A	≥ 63 dB $L_{Aeq,16hr}$	To resist new provision for residential development and other noise sensitive uses.
	and/or	All noise sensitive developments within this zone may potentially be exposed to high levels of aircraft noise, which may be harmful to health or otherwise unacceptable. The provision of new noise sensitive developments will be resisted.
	≥ 55 dB L_{night}	

Notes:

'Good Acoustic Design' means following the principles of assessment and design as described in ProPG: Planning & Noise – New Residential Development, May 2017;

Internal and External Amenity and the design of noise insulation measures should follow the guidance provided in British Standard BS8233:2014 'Guidance on sound insulation and noise reduction for buildings'

Residential Sound Insulation Schemes

13.6.13 Dublin Airport operates an insulation scheme for dwellings exposed to 63 dB $L_{Aeq,16h}$ or greater. There are two separate schemes; a one-off voluntary scheme based on 2016 exposure, and a scheme required by the North Runway Planning Permission based on the forecast traffic in 2022. The 63 dB $L_{Aeq,16h}$ contour eligibility as part of the North Runway scheme will be reviewed every two years following the opening of the North Runway as required by the planning conditions. Over 200 local residences are currently eligible for insulation under the two schemes.

13.6.14 64% of eligible households are currently participating in the voluntary Residential Noise Insulation Scheme, with a further 17% opting to defer works until the biennial reviews (for various reasons such as having recently undertaken insulation works themselves, the timing of works being unsuitable, wishing to undertake other structural works before new insulation, the purchase/sale of the property being incomplete, the legal title of house being in dispute). 17% of households did not participate because of ongoing legal action at the time they were contacted, and their later request to extend the opt-in deadline could not be accommodated; 2% of households have been purchased by daa and did not require works. If it is assumed that the 17% who sought the opt-in extension will seek to have works done as part of the biennial reviews, this indicates that participation in the overall scheme will be 98%.

13.6.15 Dublin Airport takes responsibility for the full implementation of the insulation programmes, from initial survey through to quality assessment after installation works. As part of the voluntary Residential Noise

Insulation Scheme (RNIS), which was assessed and approved in 2016 by Fingal County Council under Condition 7 of the North Runway Planning Permission, daa commissioned an assessment in 2020 to understand the internal acoustic reduction offered by the prescribed scheme's works of:

- Replacement of existing windows with acoustic windows;
- Installation of acoustic vents to allow adequate background ventilation;
- Acoustic insulation laid in roof/attic space; and
- Chimney dampers, where necessary.

13.6.16 Prescribed representative sample properties were acoustically surveyed before insulation works commenced, and those which were completed in time were assessed to establish the sound insulation improvement achieved.

13.6.17 Two recognised methods set out in BS EN ISO 16283-3:2016 Acoustics – Field measurements of sound insulation in buildings and of building elements. Part 3 – Façade sound insulation were followed to measure façade sound insulation performance.

13.6.18 The results showed that all dwellings surveyed in the RNIS benefited from an improvement in airborne sound insulation. Across the 20 examples the average improvements was 7.7 dB as a result of mitigation works conducted under the scheme. In six of the samples, a more significant improvement of ≥10 dB was achieved.

13.6.19 When considering the residual effects of the Relevant Action an improvement in internal noise levels of 5 dB has been assumed for the treated properties. This improvement was achieved in all but two of the 20 examples, and is lower than the average improvement achieved.

Schools Sound Insulation Scheme

13.6.20 A voluntary insulation scheme is on offer for all schools and registered pre-schools which fall within the predicted 60 dB $L_{Aeq,16h}$ contour. The scheme is designed to ensure that noise levels within classrooms and school buildings do not exceed 45 dB L_{Aeq} over 8 hours (a typical school day) after insulation measures are undertaken.

13.6.21 The following schools and pre-schools were specified in the North Runway planning permission and were contacted in relation to the insulation scheme:

- Mary Queen of Ireland National School, Rivermeade
- Little Moo Moo's Pre-School, Skephubble
- St. Margaret's National School, St. Margaret's
- Nzone Creche & Pre-School, Kinsealy
- St Nicholas of Myra National School, Kinsealy
- Portmarnock Community School, Portmarnock

13.6.22 Following acoustic testing it was determined that 2 of these schools (Portmarnock Community School & Mary Queen of Ireland National School) did not exceed the 45 dB threshold and thus no works were required at these schools.

13.6.23 Of the four remaining eligible schools, three (Little Moo Moo's Pre-School, St. Margaret's National School and St Nicholas of Myra National School) opted to have the recommended insulation measures installed and these works were undertaken in 2020 and 2021. Nzone Creche & Pre-School did not wish to have any of the proposed noise insulation installed but they will be considered again as part of the biannual reviews now the North Runway is operational.

Dwelling Purchase Scheme

13.6.24 Following extensive engagement with eligible dwelling owners, their representatives, and the Planning Authority and its advisors, several significant enhancements were made to the draft Voluntary Dwelling Purchase Scheme, and it received approval in 2016. Eligibility for the Scheme is based on the predicted 69 dB $L_{Aeq,16h}$ contour.

13.6.25 Although just five dwellings are located in this contour, the Applicant has voluntarily extended participation in the Scheme to a further 33 dwellings, thus honouring earlier commitments and having regard to the contours used in the original planning application.

13.6.26 The Scheme is completely voluntary and places no obligation on any resident to participate. Offers to purchase will include a 30% premium on the current market value of the residence. Property valuations will be based on operations at Dublin Airport and prior to the North Runway being in place.

13.6.27 Eligible homeowners can have their property independently valued at the Applicant's cost, and the Applicant will also provide allowances in relation to conveyancing fees, stamp duty, tax advice and moving costs.

13.6.28 The Scheme will remain available for three years after the North Runway became operational, and homeowners are also eligible to participate in the Voluntary Residential Noise Insulation Scheme.

13.6.29 This Voluntary Dwelling Purchase Scheme compares very favourably to those at other airports such as Heathrow and Gatwick in the UK. At Heathrow, as detailed in Table 5.3 of the airports current Noise Action Plan[34], their Home relocation assistance scheme is capped at £12,500 per home. At Gatwick, as detailed in Section 15 of the airport's Noise Action Plan[35], the proposed schemes for a potential new runway either buy properties at an unblighted price, without any premium, or offer a contribution to sale costs of up to 5% of their property's sale price to property owners.

Operational Procedures

13.6.30 Along with airport stakeholders, Dublin Airport have implemented a range of operational procedures to minimise noise. These include:

- Noise Preferential Runway usage: aircraft must use the preferred runway under specific conditions and time of day/night. These are selected for noise abatement purposes, the intent being to utilise whenever possible the runways which enable aircraft to avoid noise-sensitive areas during the initial departure and final approach phases of flight.
- Environmental Noise Corridors: aircraft must stay within designated noise corridors on arrival and departure to minimise noise impact.
- Noise Abatement Procedures: these are specific rules on how aircraft should perform take-off climbs to ensure that noise is minimised.
- Continuous Descent Approach: this reduces the noise experienced on the ground by reducing the overall thrust required during the initial descent and keeping aircraft at higher altitudes for longer.
- Reverse thrust is not permitted at night, unless required for safety reasons.
- There are limitations on the use of the Crosswind Runway.
- Now the North Runway is operational, Dublin Airport is being operated using "Option 7b" during the daytime (07:00-23:00), as described in *Chapter 2: Characteristics of the Project* of the 2021 EIAR. Option 7b is a preferred runway concept, which was agreed as part of the 2007 North Runway Planning Permission to lessen the impact of aircraft noise on local communities.

  Mode of operation 7B provides that:

  - The parallel runways - 10R-28L (existing main runway) and 10L-28R (North Runway) - shall be used in preference to the cross runway, 16-34;
  - In westerly operations, when winds are westerly, approximately 70% of the time, Runway 28L shall be preferred for arriving aircraft; either Runway 28L or 28R shall be used for departing aircraft as determined by air traffic control.

[34] NOISE ACTION PLAN 2019-2023
https://www.heathrow.com/content/dam/heathrow/web/common/documents/company/local-community/noise/making-heathrow-quiter/noise-action-plan/Noise_Action_Plan_2019-2023.pdf [Checked 21/08/2023]
[35] GATWICK AIRPORT LIMITED Environmental Noise Directive Noise Action Plan 2019–2024
https://www.gatwickairport.com/globalassets/business--community/new-sub-category-landing-pages/aircraft-noise--airspace/fpt-reports/gal-end-noise-action-plan-2019-2024-lr.pdf [Checked 21/08/2023]

- In easterly operations, when winds are easterly, approximately 30% of the time, either Runway 10L or 10R as determined by air traffic control shall be preferred for arriving aircraft. Runway 10R shall be preferred for departing aircraft.

Measures Forming Part of the Proposed Relevant Action

13.6.31 In addition to the mitigation measures already in place at Dublin Airport, as part of this application the Applicant is proposing to adopt the mitigation measures and controls as follows:

- An Annual Noise Quota (ANQ) system to replace the limit of 65 flights per night
- A preferential runway use system at night with activity on the North Runway limited to a total of two hours.

13.7 Assessment of Effects and Significance

13.7.1 This section assesses the effects of the proposed Relevant Action in each Assessment Year by presenting the effects arising under the Proposed Scenario comparing them with the Permitted Scenario.

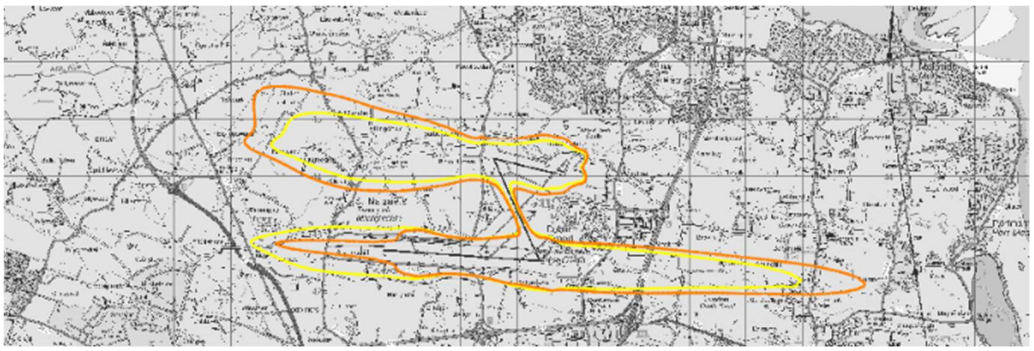
Effects During Operation with Proposed Relevant Action

2025 L_{den} Metric

13.7.2 Noise contours for the 2025 Proposed Scenario have been produced for the primary assessment metric of L_{den} using the methodology described in Section 13.3. They assume that during the peak early morning period of 06:00-08:00, one runway is used for arrivals and another is used for departures.

13.7.3 Replacement Appendix 13C presents the full set of noise contours for each scenario assessed. Figure 13-9 shows the noise contours representing a high impact, 65 dB L_{den}, for the 2025 Proposed Scenario. The 2025 Permitted Scenario is also presented for comparison.

Figure 13-9: 65 dB L_{den} Noise Contours, 2025 Proposed (orange) and 2025 Permitted (yellow).



13.7.4 In line with the South Runway, the 2025 Proposed Scenario 65 dB L_{den} contour (orange) is smaller than the 2025 Permitted Scenario contour to the west of the airport, not reaching Killshane Bridge, and is larger than the 2025 Permitted Scenario contour to the east, nearly reaching Drumnigh. In line with the North Runway, the 2025 Proposed Scenario contour extends further than the 2025 Permitted Scenario, nearly reaching Bishopshwood and Newpark to the west and barely leaves the airport site to the east. The exposure from the Crosswind Runway does not leave the airport site. These changes occur because there are around 6% more flights overall in the Proposed Scenario with a 90% increase at night which results in the contour being larger overall, although the number of departures to the west which use the South Runway is around three times higher in the Permitted Scenario which results in the Proposed Scenario contour being smaller to the west of the South Runway.

13.7.5 To provide further information on changes in the noise environment for specific communities predictions have also been undertaken of the noise levels at a number of representative locations which are shown on Figure 13-4. The results of these predictions for the 2025 Proposed Scenario in terms of the L_{den} metric are given in Table 13-31, where they are compared with the 2025 Permitted Scenario.

Table 13-31: 2025 Noise levels at Representative Locations (L_{den})

Representative Location	Reference No.	Noise Level, dB (L_{den})	
		2025 Proposed	Difference to 2025 Permitted
Tyrellstown, Toberburr	AR01	57	+2
Ridgewood	AR02	57	+2
Swords	AR03	48	+1
Malahide Castle	AR04	45	+1
Portmarnock N	AR05	49	+1
Portmarnock S	AR06	57	+1
Malahide S	AR07	53	+1
St Doolaghs	AR08	66	+2
Darndale Park	AR09	55	+1
The Baskins	AR10	59	+1
Mayeston Hall	AR11	51	-1
Kilshane Cross	AR12	63	-2
St Margret's	AR13	64	+1
Ashbourne	AR14	50	+1
Dunboyne	AR15	49	-2
Ongar	AR16	45	-2
Mount Garrett	AR17	55	-3
Beaumont	AR18	49	+1

Note – values rounded to nearest whole number. Differences based on unrounded values.

13.7.6 Comparing the 2025 Proposed Scenario to the 2025 Permitted Scenario, most receptors see an increase in noise level of around 1 dB(A) associated with a very low impact. However, receptors such as Ongar (AR16) and Mount Garrett (AR17) see decreases of up to 3 dB(A) associated with low to medium impacts.

13.7.7 For the 2025 Proposed Scenario L_{den} contours, the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also based on the existing dwellings and population allowing for consented developments and land zoned for residential development. The results are given by contour in Table 13-32 along with the areas of the contours.

13.7.8 The contour results presented in this chapter are all cumulative, e.g. any dwellings inside a 55 dB contour are also included in the totals for any lower value contour.

Table 13-32: Areas, number of dwellings and population in 2025 Proposed L_{den} contours

Scenario		2025 Proposed			
Contour L_{den}	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population.	Dwellings	Population
45	658.7	111,718	326,176	122,178	358,169
50	246.7	36,789	110,778	45,133	136,449
55	101.4	7,424	21,618	14,110	42,075
60	39.8	1,586	4,329	3,671	10,757
65	13.0	85	254	85	254

70	4.5	6	19	6	19

13.7.9 The number of people assessed to be highly annoyed in the 2025 Proposed Scenario is given in Table 13-33, where it is compared with the 2025 Permitted Scenario.

Table 13-33: Number of people highly annoyed – 2025

Scenario	No. People Highly Annoyed	
	Excluding Consented Developments	Including Consented Developments
2025 Proposed	53,854	62,872
2025 Permitted	55,041	64,967

13.7.10 Comparing the 2025 Proposed Scenario with the 2025 Permitted Scenario, the number of people exposed to aircraft noise is forecast to increase at some contour levels and decrease at others. The number of people assessed as highly annoyed by aircraft noise decreases by 2% from 55,041 to 53,854 (excluding consented developments). The number of people exposed to at least a high level of noise (i.e. 65 dB L_{den} or above) increases from 191 to 254.

13.7.11 The number of people highly annoyed and in the lowest contour band (i.e. 45 to 50 dB L_{den}) decreases slightly in the 2025 Proposed Scenario compared to the 2025 Permitted Scenario, despite an increase in the area of the contour. This is because the Permitted Scenario has more departures to the west using the South Runway, which causes the Permitted Scenario contour to include more of Blanchardstown and the surrounding communities, which are more densely populated than most areas to the north of the airport, where the Proposed Contour is larger.

13.7.12 When comparing scenarios, it is also important to consider the change in noise level in order to determine significant changes between the scenarios. Section 13.3, and specifically Table 13-4, set out the method for interpreting the absolute noise level and change in noise level into a magnitude of effect. The 2025 Proposed Scenario is compared with the 2025 Permitted Scenario in Table 13-34. The table includes all people in existing residential receptors who are exposed to at least 45 dB L_{den} in at least one of the scenarios. People who are exposed to negligible absolute noise levels in both scenarios are assessed as not being subject to significant effects and so have not been included.

Table 13-34: Air Noise (L_{den}) People by Magnitude of effect – 2025 Proposed vs 2025 Permitted

Magnitude of effect	No. people with Beneficial Effect	No. people with Adverse Effect
Imperceptible	42,571	204,769
Not Significant	63,800	34,422
Slight	6,165	11,820
Moderate	4,804	3,410
Significant	7,060	119
Very Significant	0	0
Profound	0	0

13.7.13 Going from the 2025 Permitted Scenario to the 2025 Proposed Scenario, 7,060 people are assessed as having a significant beneficial effect, and 119 people are assessed as having a significant adverse effect using the criteria detailed in Table 13-4. No people are assessed as having the highest effect levels, i.e. very significant and profound.

13.7.14 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of

worship. The numbers of each of these above the thresholds given in Table 13-5 for the 2025 Proposed Scenario are given in Table 13-35, where they are compared with the 2025 Permitted Scenario.

Table 13-35: Schools, residential healthcare facilities and places of worship in 2025 Proposed L_{den} contours

Scenario	No. Receptors Above Threshold for Medium Absolute Effect		
	Schools	Residential Healthcare Facilities	Places of Worship
2025 Proposed	8	4	4
2025 Permitted	9	4	5

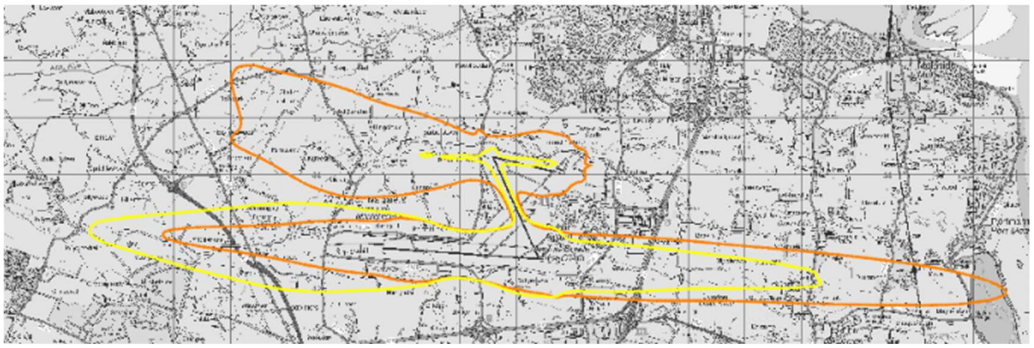
13.7.15 The number of non-residential receptors exposed to the thresholds given in Table 13-5 is forecast to increase between the 2025 Permitted Scenario and 2025 Proposed Scenario. The increases for the individual receptors are all less than 3 dB(A) and so are not rated as significant.

2025 L_{night} Metric

13.7.16 Noise contours for the 2025 Proposed Scenario have been produced for the primary assessment metric of L_{night} using the methodology described in Section 13.3. They assume that during the peak early morning period of 06:00-08:00, one runway is used for arrivals and one runway is used for departures.

13.7.17 Replacement Appendix 13C presents the full set of noise contours for each scenario assessed. Figure 13-10 shows the noise contours representing a high impact, 55 dB L_{night}, for the 2025 Proposed Scenario. The 2025 Permitted Scenario is also presented for comparison.

Figure 13-10: 55 dB L_{night} Noise Contours, 2025 Proposed (orange) and 2025 Permitted (yellow).



13.7.18 In line with the South Runway, the 2025 Proposed Scenario 55 dB L_{night} contour (orange) is smaller than the 2025 Permitted Scenario contour to the west of the airport, extending just past Killshane, and is larger than the 2025 Permitted Scenario contour to the east, extending just past Portmarnock Bridge. In line with the North Runway, the 2025 Proposed Scenario contour extends further than the 2025 Permitted Scenario, reaching Bishopshwood and Newpark to the west and barely leaves the airport site to the east. The exposure from the Crosswind Runway does not leave the airport site. These changes occur because there are around 90% more night flights in the Proposed Scenario which results in the contour being larger overall, although the number of departures to the west which use the South Runway is around three times higher in the Permitted Scenario which results in the Proposed Scenario contour being smaller to the west of the South Runway.

13.7.19 To provide further information on changes in the noise environment for specific communities predictions have also been undertaken of the noise levels at a number of representative locations which are shown on Figure 13-4. The results of these predictions for the 2025 Proposed Scenario in terms of the L_{night} metric are given in Table 13-36, where they are compared with the 2025 Permitted Scenario.

Table 13-36: 2025 Noise levels at Representative Locations (L_{night})

Representative Location	Reference No.	Noise Level, dB (L_{night})	
		2025 Proposed	Difference to 2025 Permitted

Tyrellstown, Toberburr	AR01	48	+10
Ridgewood	AR02	48	+9
Swords	AR03	39	+3
Malahide Castle	AR04	38	+1
Portmarnock N	AR05	42	+2
Portmarnock S	AR06	49	+3
Malahide S	AR07	46	+2
St Doolaghs	AR08	58	+3
Darndale Park	AR09	47	+2
The Baskins	AR10	51	+2
Mayeston Hall	AR11	44	-1
Kilshane Cross	AR12	58	-2
St Margret's	AR13	55	+3
Ashbourne	AR14	41	+1
Dunboyne	AR15	43	-2
Ongar	AR16	38	-3
Mount Garrett	AR17	49	-3
Beaumont	AR18	41	+2

Note – values rounded to nearest whole number. Differences based on unrounded values.

13.7.20 Comparing the 2025 Proposed Scenario to the 2025 Permitted Scenario, the majority of the receptors see increases of up to 3 dB(A) associated with a very low to medium impact. Some see decreases of up to 3 dB(A) associated with a very low to medium impact. However, receptors closer to flight paths from the North Runway, for example Tyrellstown, Toberburr (AR01) and Ridgewood (AR02), see larger increases of up to 10 dB(A), associated with very high impacts. The significance of these is dependent on the resulting noise levels and is considered below.

13.7.21 For the 2025 Proposed Scenario L_{night} contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also based on the existing dwellings and population allowing for consented developments and land zoned for residential development. The results are given by contour in Table 13-37 along with the areas of the contours.

13.7.22 The contour results presented in this chapter are all cumulative, e.g. any dwellings inside a 55 dB contour are also included in the totals for any lower value contour.

Table 13-37: Areas, number of dwellings and population in 2025 Proposed L_{night} contours

Scenario		2025 Proposed			
Contour L_{night} (dB)	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population.	Dwellings	Population
40	334.1	56,532	168,472	66,131	198,008
45	144.3	15,630	46,331	22,662	67,851
50	59.3	3,113	8,766	8,040	24,012
55	20.7	466	1,463	1,933	6,074
60	6.9	26	80	26	80
65	2.4	0	0	0	0

13.7.23 The number of people assessed to be highly sleep disturbed in the 2025 Proposed Scenario is given in Table 13-38, where it is compared with the 2025 Permitted Scenario.

Table 13-38: Number of people highly sleep disturbed – 2025

Scenario	No. People Highly Sleep Disturbed	
	Excluding Consented Developments	Including Consented Developments
2025 Proposed	23,884	29,589
2025 Permitted	22,281	27,474

13.7.24 Comparing the 2025 Proposed Scenario with the 2025 Permitted Scenario, the number of people exposed to aircraft noise is forecast to increase, for most contour levels. Consequently, the number of people assessed as highly sleep disturbed by aircraft noise increases by 7% from 22,281 to 23,884 (excluding consented developments). The number of people exposed to at least a high level of noise (i.e. 55 dB L_{night} or above) increases from 315 to 1,463.

13.7.25 The number of people highly sleep disturbed increases only slightly in the 2025 Proposed Scenario compared to the 2025 Permitted Scenario, despite an increase in the area of the contours. This is because the Permitted Scenario has more departures to the west using the South Runway, which causes the contour to include more of Blanchardstown and the surrounding communities, which are more densely populated than most areas to the north of the airport, where the Proposed Contour is larger.

13.7.26 When comparing scenarios, it is also important to consider the change in noise level in order to determine significant changes between the scenarios. Section 13.3, and specifically Table 13-4, set out the method for interpreting the absolute noise level and change in noise level into a magnitude of effect. The 2025 Proposed Scenario is compared with the 2025 Permitted Scenario in Table 13-39. The table includes all people in existing residential receptors who are exposed to at least 40 dB L_{night} in at least one of the scenarios. People who are exposed to negligible absolute noise levels in both scenarios are assessed as not being subject to significant effects and so have not been included.

Table 13-39: Air Noise (L_{night}) People by Magnitude of effect – 2025 Proposed vs 2025 Permitted

Magnitude of effect	No. people with Beneficial Effect	No. people with Adverse Effect
Imperceptible	26,207	61,236
Not Significant	9,017	21,046
Slight	47,327	27,977
Moderate	4,561	8,124
Significant	6,404	9,380
Very Significant	20	553
Profound	0	176

13.7.27 Going from the 2025 Permitted Scenario to the 2025 Proposed Scenario, 6,423 people are assessed as having a significant beneficial effect, and 10,109 people are assessed as having at least a significant adverse effect.

13.7.28 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. Of these, only residential healthcare facilities are highly sensitive to noise at night. The number of these above the threshold given in Table 13-5 for the 2025 Proposed Scenario is given in Table 13-40, where it is compared with the 2025 Permitted Scenario.

Table 13-40: Residential healthcare facilities in 2025 Proposed L_{night} contours

Scenario	No. Residential Healthcare Facilities Above Threshold for Medium Absolute Effect
2025 Proposed	4
2025 Permitted	2

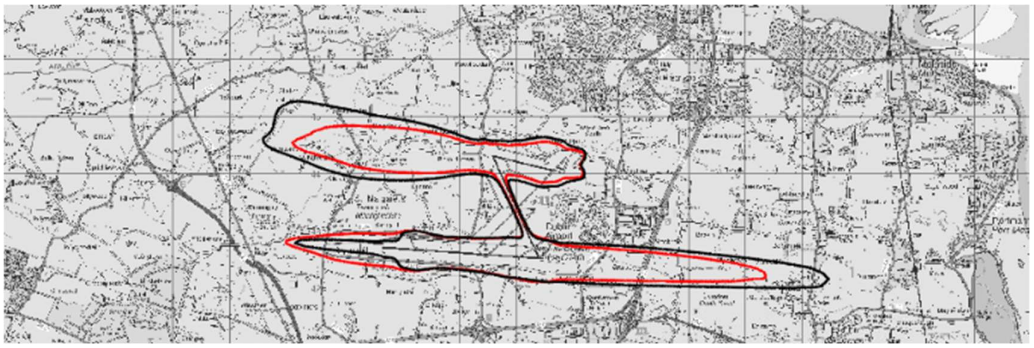
13.7.29 The number of residential healthcare facilities exposed to the threshold given in Table 13-5 in the 2025 Proposed Scenario is 4 whereas it is 2 in the 2025 Permitted Scenario. For 3 of these residential healthcare facilities, the increases for the individual receptors are greater than 3 dB(A) and so are rated as significant.

2035 L_{den} Metric

13.7.30 Noise contours for the 2035 Proposed Scenario have been produced for the primary assessment metric of L_{den} using the methodology described in Section 13.3.They also assume that during the peak early morning period of 06:00-08:00, one runway is used for arrivals and another is used for departures.

13.7.31 Replacement Appendix 13C presents the full set of noise contours for each scenario assessed. Figure 13-11 shows the noise contours representing a high impact, 65 dB L_{den}, for the 2035 Proposed Scenario. The 2035 Permitted Scenario is also presented for comparison.

Figure 13-11: 65 dB L_{den} Noise Contours, 2035 Proposed (black) and 2035 Permitted (red).



13.7.32 In line with the South Runway, the 2035 Proposed Scenario 65 dB L_{den} contour (black) is smaller than the 2025 Permitted Scenario contour to the west of the airport, reaching Newtown, and is larger than the 2025 Permitted Scenario contour to the east, reaching St Doolaghs. In line with the North Runway, the 2025 Proposed Scenario contour extends further than the 2025 Permitted Scenario, reaching Kilmacree and Shallon to the west and barely leaves the airport site to the east. The exposure from the Crosswind Runway does not leave the airport site. These changes occur because there are around 5% more flights overall in the Proposed Scenario with a 90% increase at night which results in the contour being larger overall, although the number of departures to the west which use the South Runway is around three times higher in the Permitted Scenario which results in the Proposed Scenario contour being smaller to the west of the South Runway.

13.7.33 To provide further information on changes in the noise environment for specific communities predictions have also been undertaken of the noise levels at a number of representative locations which are shown on Figure 13-4. The results of these predictions for the 2035 Proposed Scenario in terms of the L_{den} metric are given in Table 13-41, where they are compared with the 2035 Permitted Scenario.

Table 13-41: 2035 Noise levels at Representative Locations (L_{den})

Representative Location	Reference No.	Noise Level, dB (L_{den})	
		2035 Proposed	Difference to 2035 Permitted
Tyrellstown, Toberburr	AR01	55	+2
Ridgewood	AR02	55	+2
Swords	AR03	46	+2
Malahide Castle	AR04	44	+1

Representative Location	Reference No.	Noise Level, dB (L_{den})	
		2035 Proposed	Difference to 2035 Permitted
Portmarnock N	AR05	48	+2
Portmarnock S	AR06	56	+2
Malahide S	AR07	52	+2
St Doolaghs	AR08	65	+2
Darndale Park	AR09	53	+1
The Baskins	AR10	58	+2
Mayeston Hall	AR11	49	+1
Kilshane Cross	AR12	62	-1
St Margret's	AR13	62	+2
Ashbourne	AR14	47	+1
Dunboyne	AR15	48	0
Ongar	AR16	43	-1
Mount Garrett	AR17	54	-1
Beaumont	AR18	48	+1

Note – values rounded to nearest whole number. Differences based on unrounded values.

13.7.34 Comparing the 2035 Proposed Scenario to the 2035 Permitted Scenario, the majority of the receptors see increases of 1-2 dB(A) associated with a low impact. However, receptors to the west or southwest of the South Runway, for example Mount Garrett (AR17), see decreases of 0-1 dB(A) associated with a very low impact. The significance of these is dependent on the resulting noise levels and is considered below.

13.7.35 For the 2035 Proposed Scenario L_{den} contours, the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also based on the existing dwellings and population allowing for consented developments and land zoned for residential development. The results are given by contour in Table 13-42 along with the areas of the contours.

13.7.36 The contour results presented in this chapter are all cumulative, e.g. any dwellings inside a 55 dB contour are also included in the totals for any lower value contour.

Table 13-42: Areas, number of dwellings and population in 2035 Proposed L_{den} contours

Scenario		2035 Proposed			
Contour L_{den}	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population.	Dwellings	Population
45	461.3	74,570	219,839	84,701	250,999
50	187.3	22,098	65,770	29,593	88,831
55	77.7	4,684	13,512	10,519	31,409
60	29.6	1,072	2,938	2,898	8,582
65	9.8	63	188	63	188
70	3.3	2	6	2	6

13.7.37 The number of people assessed to be highly annoyed in the 2035 Proposed Scenario is given in Table 13-43, where it is compared with the 2035 Permitted Scenario.

Table 13-43: Number of people highly annoyed – 2035

Scenario	No. People Highly Annoyed	
	Excluding Consented Developments	Including Consented Developments
2035 Proposed	35,445	43,669
2035 Permitted	29,232	36,826

13.7.38 Comparing the 2035 Proposed Scenario with the 2035 Permitted Scenario, the number of people exposed to aircraft noise is forecast to increase for all contour levels. The number of people assessed as highly annoyed by aircraft noise increases by 21% from 29,232 to 35,445 (excluding consented developments). The number of people exposed to at least a high level of noise (i.e. 65 dB L_{den} or above) increases from 77 to 188.

13.7.39 The relative increase in the number of people highly annoyed is greater than in 2035 as the contours are smaller overall. This means that the higher South Runway activity in the Permitted Scenario does not affect as many people and so the changes in the number of people affected are more in line with the magnitude of the changes in the number of aircraft operations at night.

13.7.40 When comparing scenarios, it is also important to consider the change in noise level in order to determine significant changes between the scenarios. Section 13.3, and specifically Table 13-4, set out the method for interpreting the absolute noise level and change in noise level into a magnitude of effect. The 2035 Proposed Scenario is compared with the 2035 Permitted Scenario in Table 13-44. The table includes all people in existing residential receptors who are exposed to at least 45 dB L_{den} in at least one of the scenarios. People who are exposed to negligible absolute noise levels in both scenarios are assessed as not being subject to significant effects and so have not been included.

Table 13-44: Air Noise (L_{den}) People by Magnitude of effect – 2035 Proposed vs 2035 Permitted

Magnitude of effect	No. people with Beneficial Effect	No. people with Adverse Effect
Imperceptible	12,329	138,539
Not Significant	11,376	42,663
Slight	5,995	20,983
Moderate	3,247	1,707
Significant	104	104
Very Significant	0	0
Profound	0	0

13.7.41 Going from the 2035 Permitted Scenario to the 2035 Proposed Scenario, 104 people are assessed as having a significant beneficial effect, and 104 people are assessed as having a significant adverse effect. No people are assessed as having the highest effect levels, i.e. very significant and profound.

13.7.42 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. The numbers of each of these above the thresholds given in Table 13-5 for the 2035 Proposed Scenario are given in Table 13-45, where they are compared with the 2035 Permitted Scenario.

Table 13-45: Schools, residential healthcare facilities and places of worship in 2035 Proposed L_{den} contours

Scenario	No. Receptors Above Threshold for Medium Absolute Effect		
	Schools	Residential Healthcare Facilities	Places of Worship
2035 Proposed	8	4	4
2035 Permitted	6	3	4

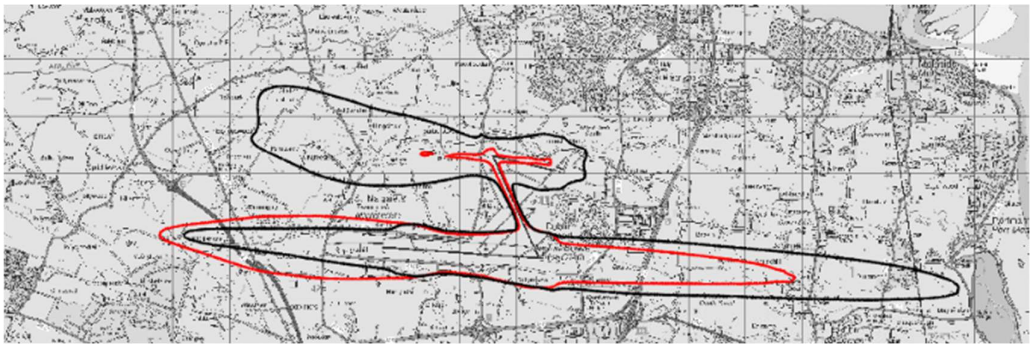
13.7.43 The number of non-residential receptors exposed to the thresholds given in Table 13-5 is forecast to increase between the 2035 Permitted Scenario and 2035 Proposed Scenario. The increases for the individual receptors are all less than 3 dB(A) and so are not rated as significant.

2035 L_{night} Metric

13.7.44 Noise contours for the 2035 Proposed Scenario have been produced for the primary assessment metric of L_{night} using the methodology described in Section 13.3. They also assume, that during the peak early morning period of 06:00-08:00, one runway is used for arrivals and one runway is used for departures.

13.7.45 Replacement Appendix 13C presents the full set of noise contours for each scenario assessed. Figure 13-12 shows the noise contours representing a high impact, 55 dB L_{night}, for the 2035 Proposed Scenario. The 2035 Permitted Scenario is presented for comparison.

Figure 13-12: 55 dB L_{night} Noise Contours, 2035 Proposed (black), 2035 Permitted (red).



13.7.46 In line with the South Runway, the 2035 Proposed Scenario 55 dB L_{night} contour (black) is smaller than the 2035 Permitted Scenario contour to the west of the airport, extending just past Killshane, and is larger than the 2035 Permitted Scenario contour to the east, reaching Portmarnock Bridge. In line with the North Runway, the 2035 Proposed Scenario contour extends further than the 2035 Permitted Scenario, reaching Bishopshwood and Newpark to the west and barely leaves the airport site to the east. The exposure from the Crosswind Runway does not leave the airport site. These changes occur because there are around 90% more night flights in the Proposed Scenario which results in the contour being larger overall, although the number of departures to the west which use the South Runway is around three times higher in the Permitted Scenario which results in the Proposed Scenario contour being smaller to the west of the South Runway.

13.7.47 To provide further information on changes in the noise environment for specific communities predictions have also been undertaken of the noise levels at a number of representative locations which are shown on Figure 13-4. The results of these predictions for the 2035 Proposed Scenario in terms of the L_{night} metric are given in Table 13-46, where they are compared with the 2035 Permitted Scenario.

Table 13-46: 2035 Noise levels at Representative Locations (L_{night})

Representative Location	Reference No.	Noise Level, dB (L_{night})	
		2035 Proposed	Difference to 2035 Permitted
Tyrellstown, Toberburr	AR01	47	+12
Ridgewood	AR02	47	+11
Swords	AR03	38	+5

Malahide Castle	AR04	36	+2
Portmarnock N	AR05	40	+3
Portmarnock S	AR06	48	+3
Malahide S	AR07	45	+3
St Doolaghs	AR08	58	+4
Darndale Park	AR09	45	+2
The Baskins	AR10	50	+3
Mayeston Hall	AR11	42	+1
Kilshane Cross	AR12	57	-1
St Margret's	AR13	53	+3
Ashbourne	AR14	39	+3
Dunboyne	AR15	42	0
Ongar	AR16	36	-2
Mount Garrett	AR17	48	-2
Beaumont	AR18	40	+3

Note – values rounded to nearest whole number. Differences based on unrounded values.

13.7.48 Comparing the 2035 Proposed Scenario to the 2035 Permitted Scenario, the majority of the receptors see increases of up to 5 dB(A) associated with a low to medium impact. Some see decreases of up to 2 dB(A) associated with a very low to low impact. However, receptors closer to flight paths from the North Runway, for example Tyrellstown, Toberburr (AR01) and Ridgewood (AR02), see larger increases of up to 12 dB(A), which are associated with very high impacts. The significance of these is dependent on the resulting noise levels and is considered below.

13.7.49 For the 2035 Proposed Scenario L_{night} contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also based on the existing dwellings and population allowing for consented developments and land zoned for residential development. The results are given by contour in Table 13-47 along with the areas of the contours.

13.7.50 The contour results presented in this chapter are all cumulative, e.g. any dwellings inside a 55 dB contour are also included in the totals for any lower value contour.

Table 13-47: Areas, number of dwellings and population in 2035 Proposed L_{night} contours

Scenario		2035 Proposed			
Contour L_{night} (dB)	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population.	Dwellings	Population
40	268.8	37,765	112,987	46,565	140,174
45	117.4	10,104	29,900	17,088	51,283
50	47.4	2,318	6,390	6,275	18,499
55	15.9	372	1,197	1,328	4,188
60	5.2	13	41	13	41
65	1.8	0	0	0	0

13.7.51 The number of people assessed to be highly sleep disturbed in the 2035 Proposed Scenario is given in Table 13-48, where it is compared with the 2035 Permitted Scenario.

Table 13-48: Number of people highly sleep disturbed – 2035

Scenario	No. People Highly Sleep Disturbed	
	Excluding Consented Developments	Including Consented Developments
2035 Proposed	16,026	21,189
2035 Permitted	9,430	13,592

13.7.52 Comparing the 2035 Proposed Scenario with the 2035 Permitted Scenario, the number of people exposed to aircraft noise is forecast to increase, for all contour levels. Consequently, the number of people assessed as highly sleep disturbed by aircraft noise increases by 70% from 9,430 to 16,026 (excluding consented developments). The number of people exposed to at least a high level of noise (i.e. 55 dB L_{night} or above) increases from 212 to 1,197.

13.7.53 The relative increase in the number of people highly sleep disturbed is greater than in 2035 as the contours are smaller overall. This means that the higher South Runway activity in the Permitted Scenario does not affect as many people and so the changes in the number of people affected are more in line with the magnitude of the changes in the number of aircraft operations at night.

13.7.54 When comparing scenarios, it is also important to consider the change in noise level in order to determine significant changes between the scenarios. Section 13.3, and specifically Table 13-4, set out the method for interpreting the absolute noise level and change in noise level into a magnitude of effect. The 2035 Proposed Scenario is compared with the 2035 Permitted Scenario in Table 13-49. The table includes all people in existing residential receptors who are exposed to at least 40 dB L_{night} in at least one of the scenarios. People who are exposed to negligible absolute noise levels in both scenarios are assessed as not being subject to significant effects and so have not been included.

Table 13-49: Air Noise (L_{night}) People by Magnitude of effect – 2035 Proposed vs 2035 Permitted

Magnitude of effect	No. people with Beneficial Effect	No. people with Adverse Effect
Imperceptible	4,193	13,723
Not Significant	4,356	38,916
Slight	6,330	21,495
Moderate	4,690	16,235
Significant	185	8,948
Very Significant	0	395
Profound	0	113

13.7.1 Going from the 2035 Permitted Scenario to the 2035 Proposed Scenario, 185 people are assessed as having a significant beneficial effect, and 9,456 people are assessed as having at least a significant adverse effect.

13.7.2 In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. Of these, only residential healthcare facilities are highly sensitive to noise at night. The number of these above the threshold given in Table 13-5 for the 2035 Proposed Scenario is given in Table 13-50, where it is compared with the 2035 Permitted Scenario.

Table 13-50: Residential healthcare facilities in 2035 Proposed L_{night} contours

Scenario	No. Residential Healthcare Facilities Above Threshold for Medium Absolute Effect

2035 Proposed	4
2035 Permitted	1

13.7.3 The number of residential healthcare facilities exposed to the threshold given in Table 13-5 in the 2035 Proposed Scenario is 4 whereas it is 1 in the 2035 Permitted Scenario. For 3 of these residential healthcare facilities, the increases for the individual receptors are greater than 3 dB(A) and so are rated as significant.

Noise Modelling to Inform Vibration Effects

13.7.4 The number of dwellings exceeding the threshold for potential vibration effects due to airborne aircraft, based on experiencing noise levels of at least 97 dB L_{Cmax} at least once per 24 hour day, has been predicted for the Proposed Scenarios in the Assessment Years of 2025 and 2035. The results are given in Table 13-51 where they are compared with the results for the Permitted Scenarios.

Table 13-51: Number of dwellings exceeding threshold for potential vibration effects due to airborne aircraft

Scenario	No. dwellings exceeding threshold for potential vibration effects due to airborne aircraft
2025 Permitted	0
2035 Permitted	0
2025 Proposed	0
2035 Proposed	0

13.7.5 No dwellings exceed this threshold in any of the Proposed Scenarios. Therefore, there are no significant vibration effects predicted.

13.8 Mitigation and Monitoring

Mitigation and Controls Proposed

13.8.1 In addition to the mitigation measures already in place at Dublin Airport which are detailed in Section 13-6, as part of this application the Applicant is proposing the following mitigation measures and controls which will help to ensure that the noise effects assessed in the EIAR are not exceeded:

- A night noise insulation scheme.
- A detailed framework for monitoring the noise performance of Dublin Airport.

Night Noise Insulation Scheme

13.8.2 The proposed scheme will provide a grant of €20,000 to fund sound insulation improvement works, for dwellings meeting either of the following criteria:

- Exposed to night-time noise levels of at least 55 dB L_{night} once the North Runway is operational, or
- Exposed to a “very significant” rating arising from forecast noise levels of at least 50 dB L_{night} in the first full year when the Relevant Action comes into operation, with a change of at least +9 dB when compared with the current permitted operation in the same equivalent year. For the purpose of this assessment a comparison of the 2025 Permitted and Proposed Scenarios has been used to estimate which dwellings would be eligible.

13.8.3 Eligibility within the 55 dB L_{night} contour will be reviewed every 2 years.

13.8.4 The proposed night insulation scheme is additional to the existing daytime noise insulation scheme currently provided in accordance with Condition 7 of North Runway planning permission.

13.8.5 The basis for 55 dB L_{night} as a criterion is that it is the level at which a high impact arises. This follows from the 2009 WHO Night Noise Guidelines[13] which describe it as the threshold at which *“Adverse health effects occur frequently”* and *“a sizeable proportion of the population is highly annoyed and sleep-*

disturbed". The noise level is also comparable with the level of 55 dB $L_{Aeq,8h}$ commonly used at airports in the UK for eligibility for sound insulation schemes.

13.8.6 The basis for the 50 dB L_{night} with a change of at least 9 dB criterion is that these are the people who are not exposed to a level of 55 dB L_{night} but who will, without mitigation, experience a very significant effect in the year that the North Runway opens at night, using the rating scale presented in Table 13-4.

Noise Monitoring Framework

13.8.7 A noise monitoring framework has been implemented for monitoring the noise performance with respect to the Noise Abatement Objective (NAO) set by the Aircraft Noise Competent Authority (ANCA). Performance is reported annually to ANCA, in compliance with the relevant sections of the Aircraft Noise (Dublin Airport) Regulation Act 2019. A framework has been provided via 2 Directions for Fixed and Mobile NMT's that was predicated by ANCAs issue of "Benchmarking Noise Measuring Systems and Community Engagement Tools" report. The overall "framework" to date will be largely completed by end Oct 2023 but will require review with ANCA to ensure full coverage for compliance and community monitoring.

13.8.8 Performance is reported for the previous calendar year and includes, but is not be limited to, the following items:

- Effects of aircraft noise:
  - The number of people highly annoyed and highly sleep disturbed by aircraft noise to be calculated using the method set out in EU Directive 2020/367 and reported for the previous calendar year.
- Exposure to aircraft noise:
  - Aircraft noise contours and associated area, population and dwelling totals in 5 dB bands, from 45 dB to 75 dB L_{den} and 40 dB to 70 dB L_{night}.
- Aircraft Source Noise Measures:
  - As part of the reporting for performance of the proposed Night Quota System, the number of movements and QC is to be reported for the previous year. Annual totals of Air Transport Movements (ATMs) and Quota Count (QC) are to be reported, with a breakdown for each of the QC bands (QC0, 0.125, 0.25, 0.5, 1, 2, 4, 8, 16). Data will be provided for the Night Quota Period (NQP, 23:30-06:00) and the Night Period (23:00-07:00).
- Operational Measures:
  - For the previous year calendar year, the number of arriving and departing aircraft and their associated QC totals using each runway during the periods 23:00-00:00, 00:00-06:00 and 06:00-06:59. This will be averaged to indicate "per night" equivalent values. This will also be provided for a monthly breakdown.
- Noise Insulation Scheme Reporting:
  - The number of dwellings eligible and the total grants administered under the proposed night noise insulation scheme to be reported each year.
- Community Noise Reporting:
  - In addition to the requirements for noise reporting specified in Condition 10 of the parent permission. Noise reports will be developed working with ANCA and the local communities to present an overall picture of the airport's operation and its effects which could include the information above.
  - In consultation with ANCA and local communities, the Applicant will continue to develop a community noise monitoring programme to report specific noise related outcomes from the airport operation.
  - the Applicant will make available noise and flight track information to the local community.
  - The number and nature of noise complaints will be reported monthly and annually.

13.8.9 The Aircraft Noise Act sets out a process of aircraft noise regulation whereby the Aircraft Noise Competent Authority (ANCA) shall ensure that the Balanced Approach is adopted where a noise problem at the airport has been identified and requires the identification of a Noise Abatement Objective (NAO) as appropriate.

13.8.10 Prior to the submission of the Relevant Action application Dublin Airport did not have an established defined noise problem and related NAO. Both of these have now been set by ANCA.

13.9 Residual Effects and Summary

13.9.1 The commonly accepted metrics for assessing air noise all relate to external noise levels. Therefore, the assessment of effects presented in Section 13.7 do not allow for any benefit of the residential sound insulation schemes, as this reduces the internal noise level. However, the internal noise level is more representative of the effects, in particular for night noise which is the main focus of this application as most people would be expected to be indoors.

13.9.2 Therefore, in order to assess the residual effects, the benefit of the residential sound insulation schemes has been allowed for by considering a residual effective noise level for properties with sound insulation, being 5 dB(A) lower than the modelled noise level.

13.9.3 Dwellings eligible for the existing schemes in a given scenario have been considered here as having a reduction of 5 dB for both their L_{den} and the L_{night} exposure, on the basis that the existing schemes offer to insulate the whole property.

13.9.4 Dwellings not eligible for the existing schemes, but eligible for the new scheme proposed as part of this application, have been considered here as having a reduction of 5 dB for their L_{night} exposure, and a reduction of 5 dB for the night component of their L_{den} exposure, on the basis that the new scheme is intended to cover insulation of bedrooms.

13.9.5 The assumed 5 dB(A) reduction is based on testing carried out in a sample of the properties treated under the existing scheme.

13.9.6 This residual effective noise level has then been used to determine residual effects, following the same methodology as the assessment of effects in Section 13.7.

13.9.7 Allowing for the benefit of the residential sound insulation schemes in general reduces the number of people assessed with residual significant adverse effects and in some cases increases the number of people assessed with residual significant beneficial effects. This analysis does result in an anomaly for some people who have already benefitted from the existing insulation scheme, where allowing for the insulation scheme reduces an assessed significant beneficial effect in Section 13.7 to a residual not significant beneficial effect in the table below. This is because at lower noise levels a larger change is required to be considered significant, although in practice the people still experience the same reduction in noise but from a lower initial level. This anomaly is estimated to affect fewer than 100 people which is a very small proportion of those being assessed.

Residual Effects

13.9.8 The residual effects, after the benefit of the residential sound insulation schemes has been allowed for, are summarised in Table 13-52. The table includes all people in existing residential receptors who are exposed to at least 45 dB L_{den} or 40 dB L_{night} in at least one of the scenarios.

Table 13-52: Summary of Residual Air Noise Effects, Proposed vs Permitted

Year	L_{den} Residual Effects			L_{night} Residual Effects		
	Significant Beneficial	Significant Adverse	Not Significant	Significant Beneficial	Significant Adverse	Not Significant
2025	7,047	10	371,883	6,414	8,970	206,643
2035	102	0	236,946	94	8,301	111,182

13.9.9 Considering the Assessment Year of 2025, the residual effects of the Proposed Scenario when compared to the Permitted Scenario are a net significant beneficial effect for 7,037 people in terms of the L_{den} metric and a net significant adverse effect for 2,556 people in terms of the L_{night} metric.

13.9.10 Considering the Assessment Year of 2035, the residual effects of the Proposed Scenario when compared to the Permitted Scenario are a significant beneficial effect for 102 people in terms of the L_{den} metric and a net significant adverse effect for 8,207 people in terms of the L_{night} metric.

13.9.11 Using a similar method to calculate the residual effects, the number of people exposed to residual noise levels assessed as high or very high can be calculated. These are presented in Table 13-53.

Table 13-53: Summary of People Exposed to High Residual Noise Levels

Scenario	No. People Exposed to High or Very High Residual L_{den} Noise Level	No. People Exposed to High or Very High Residual L_{night} Noise Level
2025 Permitted	6	105
2025 Proposed	19	80
2035 Permitted	0	13
2035 Proposed	6	41

13.9.12 Considering the L_{den} results, the number of people exposed to a high residual noise level is under 30 for the Permitted Scenario and the Proposed Scenario in all Assessment Years. The number of people so exposed in the Proposed Scenarios is the same or higher than the Permitted Scenarios for the same Assessment Year.

13.9.13 Considering the L_{night} results, the number of people exposed to a high residual noise level is under 110 for the Permitted Scenario and the Proposed Scenario in all Assessment Years. The number of people so exposed in the Proposed Scenario is higher than the Permitted Scenario for the same Assessment Year in 2035, but in 2025 is lower than in the Permitted Scenario. This is due to the proposed new sound insulation scheme.

Summary

13.9.14 The assessment in this chapter presents the likely significant effects from air noise and vibration from aircraft as a result of the proposed Relevant Action.

13.9.15 Taking first the vibration assessment, no significant effects were found as a result of the proposed Relevant Action.

13.9.16 Considering the air noise, this chapter has considered Assessment Years of 2025 and 2035 and has compared the Proposed Scenarios with the Permitted Scenarios for each Assessment Year.

13.9.17 Two primary assessment metrics have been considered, one relating to the overall situation (L_{den}) and the other just to the situation at night (L_{night}). For each of these metrics the number of people exposed to various noise levels have been determined for each assessment scenario. From these the number of people predicted to be highly annoyed and highly sleep disturbed have been computed.

13.9.18 An assessment of significant effects has also been carried out based on the comparison between the Permitted Scenario and the Proposed Scenario for each Assessment Year. This takes into account the change in noise level for individual receptors and their resulting noise exposure.

13.9.19 Looking at the predicted number of people highly annoyed, in the 2025 Proposed Scenario this is 2% lower than the 2025 Permitted Scenario. In the 2035 Proposed Scenario it is predicted to be 23% higher than the 2035 Permitted Scenario. For context the 2025 Permitted Scenario, which has the greatest number of people predicted to be highly annoyed of all the future scenarios, still represents a reduction of 50% compared to the number of people assessed as highly annoyed in 2018.

13.9.20 Looking at the predicted number of people highly sleep disturbed, in the 2025 Proposed Scenario this is 8% higher than the 2025 Permitted Scenario. In the 2035 Proposed Scenario it is predicted to be 76% higher than the 2035 Permitted Scenario. For context the 2025 Proposed Scenario, which has the greatest number of people predicted to be highly sleep disturbed of all the future scenarios, still represents a reduction of 43% compared to the number of people assessed as highly sleep disturbed in 2018.

13.9.21 Looking at the number of people with significant residual effects after the proposed mitigation measures, firstly considering the overall situation (L_{den} metric), there is a forecast net significant beneficial effect for around 7,000 people when comparing the 2025 Proposed Scenario with the 2025 Permitted Scenario, and a net significant beneficial effect for around 100 people when doing a similar comparison for 2035..

13.9.22 Considering the night situation (L_{night} metric), in the Proposed Scenarios there is a forecast net residual significant adverse effect when compared with the corresponding Permitted Scenarios for both Assessment Years. In 2025 this net significant adverse effect is for around 2,600 people, and in 2035 around 8,200 people. These totals are based on people living in existing dwellings, i.e. they do not include consented developments that have not yet been built.

13.9.23 Finally looking at non-residential receptors, significant adverse effects were found as a result of the proposed Relevant Action for 3 residential healthcare facilities based on the increase in night noise (L_{night} metric).

13.9.24 The different result for the two Assessment Years is due to the Permitted Scenario having more night-time departures to the west using the South Runway, which causes the noise contours to include more of Blanchardstown and the surrounding communities, which are more densely populated than most areas to the north of the airport, where the Proposed Contour is larger. This effect is much less noticeable in 2035 as the contours for both the Permitted and Proposed Scenarios are smaller due to fleet renewal, meaning that the contours cover a much smaller part of Blanchardstown and the surrounding communities.

What has changed since the revised EIAR was submitted in September 2021?

Since the revised EIAR chapter was submitted in September 2021 there have been several changes as described in Section 13.1. These include updated forecasts of future activity and changes to allow for actual activity at the airport since the North Runway has become operational.

This replacement EIAR chapter has been updated to account for these changes and all modelling and assessments have been revised accordingly. The above does not change the description of the Relevant Action.

In terms of the assessment conclusions the update has no effect in relation to vibration where no significant effects continue to be found.

In relation to the numbers highly annoyed, the update finds an improved situation in 2025 and a similar situation in 2035.

In relation to the numbers highly sleep disturbed, the update finds an improved situation in 2025 and a similar situation in 2035.

After allowing for mitigation the numbers experiencing significant residual effects remain limited when considering the overall situation. When considering the situation at night there is a reduction in 2025 but an increase in 2035.

Finally looking at non-residential receptors, some significant effects are now found at night.