VANGUARDIA

A BURO HAPPOLD COMPANY

Dublin Airport North Runway

Addendum Report - Noise

0000-BHE-EN-NS-DF-0-EIAR

059490-0000-0

19 April 2024

Revision P01

Issue

Revision	Description	Issued by	Date	Checked
P01	Addendum Report - Noise	DF	19/04/2024	DF

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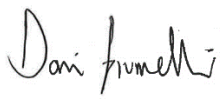
signature	
date	**19th April 2024**

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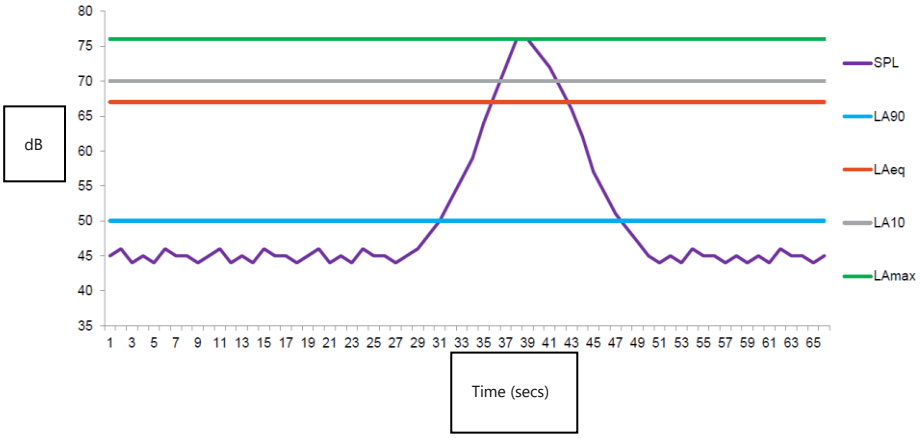
Glossary

Term	Definition
'A' Weighting	'A' Weighting is a standard weighting of the audible frequencies designed to reflect the response of the human ear to noise. The 'A' Frequency Weighting network is the most widely used and is used to represent the response of the human ear to loudness. Measurements made with this frequency weighting will be displayed as dB(A) or dBA. For example, as $L_{Aeq,T}$ $L_{AFmax,T}$ etc. where the A shows the use of 'A' Weighting.
ATM	An Air Traffic Movement is a landing (arrival) or take-off (departure) of an aircraft at a specific airport
Decibel (dB)	The decibel is a relative unit of measurement equal to one tenth of a bel (B). Decibels are used to measure sound pressure levels because the lowest sound pressure which can be heard by humans is called the hearing threshold, the highest which can be endured is known as the pain threshold. Sound pressure at the pain threshold is a million times greater than that at the hearing threshold e.g. hearing threshold sound pressure is 0.000002 Pascals and the auditory pain threshold is 20 Pascals. To avoid having to consider such a massive range of pressure values sound is measured using decibels with the threshold of hearing at 0 decibels and the threshold of pain at 120 decibels. One decibel (0.1 bel) equals 10 times the common logarithm of the power ratio of a sound pressure level under investigation and a reference sound pressure of 20 micropascals (20 µPa), or 0.02 mPa. Because decibel values are added together on a logarithmic scale, the result differs from that on a linear scale. If two equally strong sound sources are added together, the combined sound pressure level does not double but increases by three decibels.
Fast and Slow Time Weightings	The Time Weightings of Fast and Slow are defined by the standards to which the instrument are designed, such as IEC 61672, and they determine the "speed" at which the instrument responds to changing noise levels. For example, an instrument set to Fast will respond quickly to changes in the noise level, whereas an instrument set to Slow will respond less quickly. If the noise level is constant, both instruments will display the same level. Measurement parameters that use these time weightings will show this, for example, as L_{AFmax} which shows that the values are the maximum A-Weighted Fast Time Weighted sound levels.
Equivalent Continuous Sound Level (L_{eq})	$L_{eq,T}$ is the equivalent continuous sound level and represents the hypothetical level of constant sound which would have the same equivalent total energy to the real varying level of sound during a defined period T. $L_{eq,T}$ is often described as the "average" noise level during a noise measurement which although not technically correct, is often the easiest way to think of $L_{eq,T}$, albeit it's an average that tends to be biased towards the highest noise level that occurs during the period T. $L_{eq,T}$ values should be written with a Frequency Weighting, such as dB(A) and also the measurement duration T. For example, $L_{Aeq,8\,hr}$ = 55 dB
$L_{AFmax,T}$	The maximum Sound Level with 'A' Frequency weighting and Fast Time weighting (125 millisecs) during the measurement period T. It can be used to assess the probability of sleep disturbance due to individual noise events.
$L_{ASmax,T}$	The maximum Sound Level with 'A' Frequency weighting and Slow Time weighting (1 sec) during the measurement period T.
L_{den}	Day-evening-night level. It is a descriptor of noise level based on energy equivalent noise level (L_{eq}) over a whole 24 hour day with a penalty of 10 dB(A) for night time noise (23.00-7.00) and an additional penalty of 5 dB(A) for evening noise (i.e. 19.00-23.00).

L_{night}	L_{night}, the A-weighted, L_{eq} (equivalent noise level) over the 8 hour night period of 23:00 to 07:00 hours, also known as the night noise indicator. There is no penalty as it focusses on the 8 hour period of night time.
Sound Exposure level (SEL)	This is an $L_{eq,T}$ normalised to a period of 1 second. It can be used to compare the energy of noise events which have different durations. For example, if a noise level of 90 dB lasts for 1 second then the SEL = 90 dB. If the same noise event lasted 10 seconds the SEL would be 100 dBA. If it lasted 20 seconds the SEL would be 103 dBA and so on. SEL can be used to assess the probability of sleep disturbance due to individual noise events and calculate the overall L_{eq} for a period T of a number of events e.g. ATMs, each of different duration shorter than T.
Sound Pressure Level (dB)	Sound pressure level (SPL) is the pressure level of a sound, measured in decibels (dB). It is equal to 20 x the Log_{10} of the ratio of the Root Mean Square (RMS) of sound pressure to the reference of sound pressure (the reference sound pressure in air is 2 x 10-5 N/m2, or 0,00002 Pa). SPL is the base unit used in the measurement of noise metrics by a sound level meter. The microphone measures instantaneous fluctuations in sound pressure level (SPL) every 125 milliseconds (Fast time weighting) or 1 second (Slow time weighting), converts these to a varying electrical signal, and the meter's electronics apply a range of filters and weightings to calculate, display and record the desired range of noise metrics. The figure below shows how measurements of the varying sound pressure level (SPL) of a noise event e.g. an aircraft approaching the microphone to its closest approach and then moving away, can be processed to derive a range of noise metrics. 

1 Introduction

Vanguardia Ltd have been commissioned to provide acoustic support to An Bord Pleanála (ABP) in relation to the appeal reference An Bord Pleanála: PL06F.314485 of the Fingal County Council (FCC) Decision F20A/0668 to grant permission to amend and replace two planning conditions, namely conditions no. 3(d) and 5 of the North Runway Planning Permission (FCC: Reg. Ref. No. F04A/1755; ABP Ref. No.: PL06F.217429, 'the North Runway Permission').

The proposed Relevant Action (RA) relates to the night-time use of the runway system at Dublin Airport. It involves the amendment of the operating restriction set out in condition no. 3(d) and the replacement of the operating restriction in condition no. 5 of the North Runway Permission, as well as proposing new noise mitigation measures. Conditions no. 3(d) and 5 came into effect when the operation of the North Runway commenced on 24th August 2022.

The proposed RA, would result in the following changes to how the airport operates:

1. Remove the numerical cap on the number of flights permitted between the hours of 11pm and 7am daily that is due to come into effect in accordance with the North Runway Permission
2. Replace the cap on number of flights at night with an annual night-time noise quota between the hours of 11.30pm and 6am (amended by the FCC decision to apply from 2300 to 0700 hrs).
3. Allow flights to take off from and/or land on the North Runway (Runway 10L 28R) for an additional 2 hours between 2300 hrs to 2400hrs and 0600 hrs to 0700 hrs.

Overall, these changes would allow for an increase in the number of Air Traffic Movements (ATMs) taking off and/or landing at Dublin Airport between 2300 hrs and 0700 hrs over and above the number stipulated in condition no. 5 of the existing North Runway Permission i.e. no more than 65, in accordance with the proposed annual night-time noise quota (The Table 1 of the introduction of the revised EIAR indicates that the study assumes that with the scheme operating the number of ATMs at night would be around 98 and the information regarding the QC system implies around 87 ATMs at night).

The proposed RA does not seek any amendment of conditions of the North Runway Permission governing the general operation of the runway system (i.e., conditions which are not specific to night-time use, namely conditions no. 3 (a), 3(b), 3(c) and 4 of the North Runway Planning Permission) or any amendment of permitted annual passenger capacity of the Terminals at Dublin Airport. Condition no. 3 of the Terminal 2 Planning Permission (Fingal County Council Reg. Ref. No. F04A/1755; ABP Ref. No. PL06F.220670) and condition no. 2 of the Terminal 1 Extension Planning Permission (Fingal County Council Reg. Ref. No. F06A/1843; ABP Ref. No. PL06F.223469) provide that the combined capacity of Terminal 1 and Terminal 2 together shall not exceed 32 million passengers per annum (MPPA).

1.1 Aim of this report

Vanguardia provided an initial noise report to ABP which considered the revised and supplementary EIARs for the RA and the applicant's response to the Board's request for further information. In addition, Vanguardia's initial report reviewed and commented on several appeals submitted against the grant of planning permission by FCC. Where this report is referred to in this addendum it will be called the "initial report". This "addendum report" provides further comments to complement the initial report to ABP.

2 Executive Summary

This report complements the initial review by Vanguardia of the revised and supplementary EIARs and associated information regarding the proposal to vary the planning conditions restricting use of the Dublin Airport northern runway at night, submitted in response to the Board's request for further information. This report and the initial review focused on the effect of noise at night on sleep. As this is the most likely significant adverse effect which occurs much more widely and at lower or similar noise levels than other much less common health effects such as noise induced cardio-vascular disease, hypertension and stroke.

The revised and supplementary EIARs focussed on assessment of noise impacts at night based on the L_{night} noise metric. This method averages and accumulates the noise energy from each Air Traffic Movement (ATM) over the whole of the period from 2300 to 0700 hrs (although should the RA be approved; the northern runway will only operate at night between 2300 to 0000 and again from 0600 to 0700 hrs). Consequently, the Board requested submission of an Additional Awakening assessment which evaluates the probability of persons awakening in response to the maximum noise level of each individual ATM i.e. how loud each ATM is.

The long-term trend reported in the revised and supplementary EIARs, and the additional awakenings assessment provided in response to the Board's request for information is that in 2035 fewer people are likely to be highly sleep disturbed or experience an additional awakening over and above normal non-noise induced awakenings at night compared to in 2018 without the RA. But substantially more people will be highly sleep disturbed and/or experience an additional awakening with the proposed RA in place in 2035 compared to the same year under the permitted scenario without the RA. This comes about because although in future a greater proportion of aircraft using the airport will be more modern less noisy types compared to the fleet in 2018, the resulting reduction in noise will be offset by more ATMs in 2025 and 2035 with the proposed RA in operation compared to the permitted scenario with the RA not in use. However, the trends in the shorter term are different. For example, whilst the number of persons highly sleep disturbed falls in 2025 and reduces further by 2035 compared to a baseline of 2018, with the number of persons highly sleep disturbed greater with the RA in either future year, compared to without the scheme. The same is not reported in 2025 for the additional awakenings assessment. Instead, there are marginally fewer additional awakenings reported in 2025 with the proposed RA compared to the permitted scenario without the scheme for the annual and summer averages of the airport's operations and under single mode westerly operations. But for single mode easterly operations in 2025 there are substantially more persons experiencing additional awakening with the RA compared to without. In general terms, if implemented, the RA will mean some people currently affected by noise from night-time ATMs via the southern runway will experience noise from fewer ATMs using this runway at night; whilst some people currently unaffected or less exposed to noise from night-time ATMs will experience noise from aircraft using the northern runway which is currently prohibited from use at night.

The revised and supplementary EIARs propose that the significant adverse noise effects identified will be mitigated by offering noise insulation to those affected and replacing the current cap on the number of ATMs at night with a Quota Count (QC) system based on how noisy each aircraft is. Quota Count systems are based on aircraft noise certification data measured using a standardised internationally agreed methodology. Each aircraft type is classified and awarded a QC value depending on the amount of noise it generates under controlled certification conditions. The less noisy an aircraft is the lower its QC value. Aircraft are classified separately for landing and take-off. An overall QC annual budget is developed which allows trading of numbers of aircraft within different QC values e.g. aircraft in a higher QC category can be replaced by a greater number of aircraft in a lower, less noisy category, and *vice versa,* as long as the overall QC fixed annual budget is not breached.

The proposed noise insulation scheme is one of the more generous programmes in Europe in terms of spatial scope and degree of funding offered. However, the qualifying criteria are based on noise metrics averaging intermittent aircraft noise across the whole 8-hour night period, and it is recommended the qualifying criteria are expanded to include an additional clause that reflects how loud an individual ATM by the noisiest aircraft using the airport at night will be.

Furthermore, reliance on the QC system alone to manage noise effects at night is regarded as inadequate as it would permit substantial increases in ATMs for only marginal reductions in how noisy each aircraft is. Although this might not lead to any change in the percentage of persons Highly Sleep Disturbed assessed using the L_{night} metric which aggregates and then averages the noise from each ATM over the whole 8-hour night period. It could lead to increases in the number of persons experiencing Additional Awakenings and individuals experiencing more Additional Awakenings[1] evaluated with the L_{Amax} metric of each ATM i.e. how loud each ATM is. Consequently, it is recommended that if the RA is to go ahead that a cap on ATMs at night is retained. Such caps are in place at Heathrow, Stansted and Gatwick airports where the QC system was developed in the early 1990s and have been updated regularly and recently, with the caps on ATMs at night maintained.

Finally, this report suggests amendments to the planning conditions attached to the planning permission granted by Fingal County Council to address the points made above.

[1] An Additional Awakening is a noise induced awakening in addition to the approximately 23 awakenings most people typically experience at night as part of normal sleep.

3 Mode of Operation.

3.1 Issues that arise from third party submissions.

Significant numbers of appellants state they are now affected by new flight paths for departures from the northern runway to the west going north, rather than directly west as was assumed In the EIAR supporting the successful application for planning permission for the northern runway in 2007.

The appellants consider these flight paths, and associated noise modelling, contradict the permitted flight paths in condition No 3 of the original permission for the northern runway which refers to Option 7b. and Noise Abatement & Flight Procedures in the EIAR supporting the northern runway Planning Permission (ABP Ref. No.: PL06F.217429) documentation. As shown in the extract reproduced below:

"6.2.4 Aircraft of Categories C/D (medium to heavy jets) departing to the west (Runway 28) are required to maintain straight ahead after take-off to 5NM before commencing turn, unless otherwise cleared by ATC above 3000 feet.

6.2.5 Aircraft of Categories C/D (medium to heavy jets) departing to the east (Runway 10) are required to maintain straight ahead after take-off to 5NM before commencing turn (if turning left), and 6NM (if turning right), unless otherwise cleared by ATC above 3000 feet. The disparity here is to ensure that southbound aircraft do not over-fly Howth Head. Northbound aircraft will turn over the sea thereby avoiding the communities of Portmarnock and Malahide."

At first sight and based on the interpretation that the term "*mode of operation*" includes how aircraft fly to and from the airport, the relevant part of condition 3 is not being complied with as aircraft are currently, as assumed in the revised (2021) and supplementary (2023) EIARs diverging to the northwest immediately on take-off when departing from the northern runway to the west. Such divergence is required by the International Civil Aviation Organisations (ICAO) rules for safe operation of airports with parallel runways.

However, the matter is complicated by the meaning of the term "*mode of operation*" which typically means the manner in which the runways are used e.g. mixed or segregated mode for departures and arrivals, and easterly or westerly modes of the heading for arrivals and departures as dictated by the wind direction. This is seeming to be specifically referred to in the condition where it says "***the runways*** *at the airport shall be operated in accordance with the mode of operation……*" (author's emphasis). This indicates that the condition primarily controls use of runways which is a land use consideration under Planning law, not the flight paths and flight profile of aircraft approaching or departing from the airport which falls under control of air space via the Air Traffic Control regime as dictated by the Irish Aviation Authority in line with international treaty agreements and the priority to promote public safety.

4 Baseline Years

4.1 2018 vs 2019

The revised EIAR used the year 2019 as a baseline for comparison of noise conditions with future scenarios with and without the proposed RA scenarios. The subsequent supplementary EIAR used a baseline year of 2018.

The EIARs using 2018 and 2019 respectively as baseline come to the same conclusions i.e.

- The broad outcome of the revised and supplementary EIARs is that fewer people are likely to be highly sleep disturbed night in 2025 and 2035 with the RA in operation, compared to 2018 or 2019 without the RA.
- However, substantially more people will be highly sleep disturbed and/or experience an additional awakening with the scheme in place in 2035 compared to without the RA in operation. This comes about because although going forward a greater proportion of aircraft using the airport will be more modern less noisy types compared to the fleet in 2018 or 2019, and the resulting reduction in noise will be offset by more ATMs in 2035 with the RA in operation compared to if the scheme was not in use.
- In general terms, if implemented, the RA will mean some people affected in 2018 or 2019 by noise from night-time ATMs via the southern runway will experience noise from fewer ATMs using this runway at night.
- However, some people in either 2018 or 2019 who were unaffected or less exposed to noise from night-time ATMs will experience noise from aircraft using the northern runway which is currently prohibited from use at night as the RA seeks permission for the norther runway to operate during night hours.

4.2 Appropriate use of 2018

It makes no meaningful difference to the outcome of either EIAR whether 2018 or 2019 is used as the baseline. This is because although there was a marginally greater passenger throughput in 2019 compared to 2018 the difference in noise terms is a fraction of a decibel.

4.3 Issues that arise from third party submissions.

The key consideration regarding comparison of a noise baseline with future proposals is to use a baseline that represents the airport operating at or near its maximum permitted capacity. This happened in 2018 when the passenger throughput was close to 32 Million Passengers Per Annum (MPPA) i.e. the maximum permitted under the extant planning permission. The shortfall between the actual passenger throughput in 2018 and the permitted maximum MPPA is of negligible importance in noise terms.

Even if the maximum permitted MPPA had not nearly occurred in 2018 it would have been necessary to model a theoretical baseline based on the airport operating at or near maximum permitted capacity for comparison with the future scenarios. As this would represent the maximum authorised scale and scope of noise distribution and effects under the current planning permission, notwithstanding that if the airport had not nearly reached its maximum capacity the actual scale and scope of noise effects would have been less.

5 Noise Modelling

5.1 Changes to air noise modelling from the revised EIAR to the supplementary EIAR

A summary of the changes in the modelling used for the supplementary EIAR from the methodology used in the revised EIAR are as follows:

- Updated to latest modelling software version.
- Updated set of forecast aircraft movements.
- Departure routes based on recent radar data.
- Departure profiles based on recent radar data.
- Validation exercise updated to utilise more recent noise measurement data.
- Updated assumptions regarding when mixed mode operations would be used. Specifically, the revised EIAR Addendum assumed that between 06:00 and 07:59, both runways would be used for departures. In the EIAR Supplement it is assumed that only one runway will be used for departures during this period.

The consequences of these changes are differences between the revised and supplementary EIARs that are negligible to minor in terms of the predicted noise levels, the general distribution of noise and the overall significance of the effect of air noise.

Although small, the biggest difference between the noise modelling for the revised and supplementary EIARs is in the distribution of noise from aircraft using the northern runway for departures to the west. The revised EIAR assumed theoretical flight paths that included a deviation to the northwest soon after take-off[2], whereas because it was written after the northern runway opened in 2022 the supplementary EIAR uses flight paths based on radar tracks of aircraft departing runway 28R (the northern runway to the west) which although they still divert to the northwest are slightly different to those assumed for the revised EIAR.

5.2 Use of fleet mix for the new modelling

The fleet mix for the revised EIAR noise modelling is slightly different to that used for supplementary EIAR. This reflects updates to the predicted future fleet mix.

Details of the fleet mix are in the Mott McDonald report Quantification of Impacts on Future Growth Addendum to the Analysis of June 2021 (Report version 1.3.1) September 2023 Addendum v1.0.

This Mott McDonald report summarises the fleet mix information as follows:

[2] The original EIAR for the northern runway assumed that aircraft would depart in a westerly direction from the northern runway (28R) in a straight line i.e. on axis with the runway, for 5 nautical miles before diverting from this course. Whereas the flight paths in both the revised and supplementary EIARs follow the ICAO requirement that when parallel runways are in use there must be a 15 degree divergence of aircraft from the runway axes immediately on take-off. This has been modelled as a 15 degree divergence of aircraft using the northern runway (28R) towards the north-west. This represents the reality of how the northern runway has operated since it opened in Augst 2022.

The report "*updates previous Mott MacDonald analysis to reflect the latest information on schedules and traffic forecasts at Dublin Airport. The key differences from the June 2021 study are:*

- *New annual air traffic forecast inputs the June 2021 study was based on DAA's demand forecasts from May 2021, developed in the middle of the COVID 19 pandemic when travel restrictions were still in place and the trajectory for recovery was uncertain. This September 2023 Addendum is based on updated (May 2023) daa forecasts which take account of actual traffic recovery and known schedules for the Summer 2023 season.*
- *Updated airline fleet renewal information and forecasts the COVID 19 pandemic resulted in many airlines grounding aircraft temporarily as well as retiring older types, while the aircraft manufacturers (e.g. Airbus and Boeing) reduced aircraft deliveries. At the time of the June 2021 study, the Boeing 737MAX had just re entered service after a 2 year grounding following fatal accidents in 2018/19. Ryanair had yet to take delivery of any B737MAX aircraft and there was uncertainty around how quickly the new aircraft would be rolled out. This Addendum updates the airline fleet modernisation assumptions in light of up to date information. In general, newer, quieter aircraft are entering service at Dublin Airport (DUB) more quickly than was assumed in 2021.*
- *Changes in the Baseline schedule the June 2021 study was based on a busy day schedule from Summer 2019, before the COVID 19 pandemic. This Addendum is based on a Summer 2023 busy day schedule, reflecting changes that occurred during the pandemic and its recovery. In particular, there was growth in the number of night period freighter services during the pandemic, which are reflected in this latest analysis.".*

The changes described above result in small differences in the noise contours presented in the supplementary EIAR compared to those for the revised EIAR. These changes do not affect the overall conclusions that fewer people are predicted to be likely to be significantly adversely affected by the RA in 2025 and 2035 compared to a baseline of 2018 (or 2019), although more people will be significantly adversely effected by the RA in 2025 and 2035 with the RA in operation compared to if the scheme were not authorised.

Modelling means calculating noise exposure rather than measuring it. Calculating some aircraft noise characteristics from purely theoretical scientific principles is feasible, but it would be far too complex and computationally intensive for application in the production of noise contours. Instead, relatively simple mathematical tools combined with data about the generation and propagation of aircraft noise from a large body of measured data is used. The first step is to gather a large body of representative measured noise data for a range of aircraft types under different flight conditions. The next step is to create robust mathematical tools to estimate how noise will propagate from these noise sources.

Modelling aircraft noise involves combining the noise from many individual aircraft movements. All the different types of aircraft and operations must be taken fully into account, including their specific noise and performance characteristics following different flight paths during both arrivals and departures. It is essential to have reliable ways of estimating how sound attenuates with distance along the propagation path.

Models must sum the diverse sound energy inputs from the individual events over a defined time period. Most models calculate noise exposure levels over an array of grid points around the airports. Contours are then fitted to these point levels by mathematical interpolation between grid points.

These models need input information on aircraft performance and noise characteristics. Direct measurements of noise and flight paths are made. An important source of information is that collected by manufacturers as part of the ICAO noise certification process which is contained within the database associated with the modelling software package. This does not necessarily reflect how much noise an aircraft may make when using a specific airport, and the EIARs for this RA are clear in stating what aircraft noise data has been used and if there are any deviations from the generic data

in the modelling database and how this deviation has been derived from evaluation of radar linked noise monitoring of aircraft using the airport.

5.3 Aircraft and ground noise issues

No new issues.

5.4 ATM increases.

The opening sentence to paragraph 13.1.3 of the supplementary EIAR states that:

"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."

Paragraph 13.1.5 of the supplementary EIAR goes on to state the following.

"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."

Table 13.1 of the revised EIAR illustrates these increases and is reproduced below:

Table 1: Table 13.1 from the supplementary EIAR

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

The consequences of the above will mean some people who currently experience overflight and noise from aircraft using the southern runway will be exposed to fewer ATMs and therefore less noise as the total number of ATMs at the airport will be shared across two runways in future rather than concentrated on one runway as currently. However, authorising the use of the northern runway at night under this RA will mean that some people who currently experience no overflight or relatively little aircraft noise at night will be newly exposed to noise and/or have a substantial increase in noise at night resulting in significant adverse effects.

Because technology is improving, going forward aircraft are becoming less noisy, but this benefit is reversed to a degree by this RA due to more ATMs at the airport at night, if the proposal to use the northern runway at night is approved. Therefore, if the RA is approved there will be fewer people significantly adversely effected by noise at night in 2025 and 2035 compared to a baseline of 2018, but there will be more people significantly adversely effected by noise at night in 2025 and 2035 with the RA in operation compared to if it were not.

The revised and supplementary EIARs propose that the significant adverse noise effects identified will be mitigated by offering noise insulation to those affected and replacing the current cap on the number of ATMs at night with a Quota

Count (QC) system based on how noisy the aircraft are. Quota Count systems are based on aircraft noise certification data measured using a standardised internationally agreed methodology. Each aircraft type is classified and awarded a QC value depending on the amount of noise it generates under controlled certification conditions. The less noisy an aircraft is the lower the QC value. Aircraft are classified separately for landing and take-off. An overall QC annual budget is developed which allows trading of numbers of aircraft within different QC values e.g. aircraft in a higher QC category can be replaced by a greater number of aircraft in a lower, less noisy category, and vice versa, as long as the overall QC annual budget is not breached.

However, reliance on the QC system alone to manage noise effects at night is not sufficient as it would permit substantial increases in ATMs for only marginal reductions in how noisy each aircraft is. Although this might not lead to any change in the percentage of persons Highly Sleep Disturbed assessed using the L_{night} metric which averages the noise from each ATM over the whole 8 hour night period (including the periods in between ATMs when there is no aircraft noise). It could lead to increases in the number of persons experiencing Additional Awakenings and individuals experiencing more Additional Awakenings evaluated with the L_{max} metric of each ATM i.e. how loud each ATM is. Consequently, initial Vanguardia report recommended that if the RA is to go ahead that a cap on ATMs at night is retained. Such caps are in place at Heathrow, Stansted and Gatwick airports where the QC system was developed in the early 1990s and have been updated regularly and recently, with the caps on ATMs at night maintained.

The proposed noise insulation scheme is one of the more generous programmes in Europe in terms of spatial scope and degree of funding offered. However, the two are qualifying criteria are based on noise metrics averaging intermittent aircraft noise across the whole 8-hour night period with a higher threshold for criteria 1 and a lower threshold with a substantial increase in averaged noise for the other. Consequently, it is recommended the qualifying criteria are expanded to include an additional clause that reflects how loud an individual ATM by the noisiest aircraft using the airport at night will be.

5.5 Use of Additional Awakening and the importance of this assessment for the recommendations in the initial Vanguardia report

The revised and supplementary EIARs focussed on assessment of noise impacts at night in terms of the percentage Highly Sleep Disturbed (%HSD) assessed using the L_{night} averaging noise metric. This method aggregates the noise energy from all the ATMs at night and averages it over the whole of the period from 2300 to 0700, including most of this time when there are no ATMs. This method is not particularly sensitive to changes in the number of ATMs. For example, an increase in averaged noise level of 3 decibels would require a doubling of the number of ATMs, with a corresponding small increase in %HSD; or the number of ATMs could be doubled with no change in the averaged noise level if each aircraft was 3 decibels less noisy than previously with no change in %HSD.

However, aircraft noise is not experienced as an average over the whole of the night and there is a risk of awakening depending on how noisy each ATMs is. Consequently, the Board requested submission of an Additional Awakening assessment which evaluates the probability of persons awakening in response to the L_{Amax} maximum noise level of each ATM i.e. how loud each ATM is without any averaging over the night period.

The assessment of adverse effects using Additional Awakenings follows the same broad trend as the evaluation of the %HSD when comparing a 2018 baseline to 2035 with or without the RA in operation but is different to the trend for HSD in 2025. However, because the likelihood of Additional Awakening is more sensitive to the number of ATMs at night this highlights that mitigation needs to consider the likelihood of additional awakening as well as %HSD.

As a result, our initial report included a recommendation that the conditions be amended to add a further qualifying criterion for noise insulation that would include all residential properties predicted to be exposed to peak noise levels

of 80 dB L_{Amax} by the loudest aircraft using the airport between 2300 and 0700 hrs and that the proposed Quota Count (QC) system should be accompanied by a cap on the number of ATMs during the night (as is in place at Heathrow, Gatwick and Stansted airports where the QC system originated).

5.6 Number of persons now HA/HSD. Comparisons between Revised EIAR (2021) and Supplementary EIAR (2023)

The differences between the revised EIAR and the supplementary EIAR in the number of persons Highly Annoyed (HA) and Highly Sleep Disturbed (HSD) are small and do not materially alter the conclusions regarding the significance of these effects between the two assessments, as discussed below.

5.6.1 Comparison of Revised EIAR (2021) and Supplementary EIAR (2023) Permitted Scenarios

The supplementary EIAR (2023) describes differences with the revised EIAR (2021) as follows:

- 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.

The above mean that the predicted noise levels and number of persons affected etc. will be different between the two EIARs.

The broad trend going forward if the RA is not implemented, and the airport operates as permitted, is there will be a reduction in persons Highly Annoyed and/or Highly Sleep Disturbed compared to a baseline of 2018. Similar trends as shown in the revised EIAR from 2021 and the supplementary EIAR of 2023, although the reduction in noise and persons significantly adversely affected is less with the RA in place compared to if it was not. This is due to the fleet mix using the airport changing over time to include a greater proportion of less noisy modern aircraft compared to the baseline in 2018.

The revised EIA (2021) at table 13.22 showed the following comparison of the number of persons Highly Annoyed (HA) by aircraft noise for a 2018 baseline compared to future permitted scenarios i.e. no RA in operation.

Table 2: Table 13-22 from the revised EIAR

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

The reduction in persons Highly Annoyed is due to the mix of aircraft using the airport progressively changing over time to include a greater proportion of less noisy more modern aircraft as airlines update their fleets.

The supplementary EIA (2023) at table 13.23 shows the following comparison of the number of persons Highly Annoyed (HA) by aircraft noise for a 2018 baseline compared to future permitted scenarios i.e. no RA in operation.

Table 3: Table 13-23 from the supplementary EIAR

Table 13-23: Number of people highly annoyed – 2018 and Permitted Scenarios

Scenario	No. People Highly Annoyed	
	Excluding Consented Developments	Including Consented Developments
2018	110,238	120,205
2022 Permitted	50,603	58,880
2025 Permitted	64,241	73,209
2035 Permitted	33,437	41,234

The supplementary EIAR shows a slowing of the reduction in persons Highly Annoyed in future permitted scenarios. This is due to differences in the assumptions regarding the fleet mix and a revised less rapid rate of introduction of less noisy aircraft into the fleet mix in the 2023 EIAR compared to the 2021 EIAR.

The revised and supplementary EIARs show a similar picture for the assessment of persons sleep disturbed, as shown in the tables reproduced below.

Table 4: Table 13-29 from the revised EIAR

Table 13-29: Number of people sleep disturbed – 2018 and Permitted Scenarios

Scenario	No. People Highly Sleep Disturbed	
	Excluding Consented Developments	Including Consented Developments
2018	42,260	48,062
2022 Permitted	18,789	23,729
2025 Permitted	22,500	27,806
2035 Permitted	11,374	15,551

Table 5: Table 13-27 from the supplementary EIAR

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

5.6.2 Comparison of Revised EIAR and Supplementary EIAR Permitted and Proposed Scenarios

Number of persons Highly Annoyed (HA)

The tables below regarding the number of persons highly annoyed are reproduced from the revised EIAR (2021) and supplementary EIAR (2023) for the permitted (no RA) and proposed scenarios (with RA) in 2025 and 2035.

2025

Table 6: Number of people highly annoyed for the proposed and permitted scenarios in 2025 from the revised EIAR

Table 13-45: Number of people highly annoyed – 2025

Scenario	No. People Highly Annoyed	
	Excluding Consented Developments	Including Consented Developments
2025 Proposed	79,405	88,950
2025 Permitted	64,241	73,209

Table 7: Number of people highly annoyed for the proposed and permitted scenarios in 2025 from the supplementary EIAR

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

The difference in 2025 between the revised EIAR and the supplementary EIAR is that when "*Comparing the 2025 Proposed Scenario with the 2025 Permitted Scenario, the number of people exposed to aircraft noise is forecast to increase for all contour levels.*" Whilst the 2023 document says "*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.*".

2035

Table 8: Number of people highly annoyed for the proposed and permitted scenarios in 2035 from the revised EIAR

Table 13-55: Number of people highly annoyed – 2035

Scenario	No. People Highly Annoyed	
	Excluding Consented Developments	Including Consented Developments
2035 Proposed	39,693	47,963
2035 Permitted	33,437	41,234

Table 9: Number of people highly annoyed for the proposed and permitted scenarios in 2035 from the supplementary EIAR

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

Both EIARs comment that in 2035 when "*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*.". However, the supplementarry EIAR goes on to say "*The relative increase in the number of people highly annoyed is greater than in 2035*[3] *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*.".

Number of Persons Highly Sleep Disturbed

The tables below regarding the number of persons highly sleep disturbed are reproduced from the revised EIAR (2021) and supplementary EIAR (2023) for the permitted (no RA) and proposed scenarios (with RA) in 2025 and 2035.

2025

Table 10: Number of persons highly sleep disturbed for the permitted and proposed scenarios in 2025 from the revised EIAR (2021)

Table 13-50: Number of people highly sleep disturbed – 2025

Scenario	No. People Highly Sleep Disturbed	
	Excluding Consented Developments	Including Consented Developments
2025 Proposed	37,080	43,179
2025 Permitted	22,500	27,806

[3] This is presumed to be a typographical error and that it should instead read 2025.

Table 11: Number of persons highly sleep disturbed for the permitted and proposed scenarios in 2025 from the supplementary EIAR (2023)

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

Both EIARs report that when comparing the 2025 Proposed Scenario with the 2025 Permitted Scenario, the number of people exposed to aircraft noise is forecast to increase for all (revised EIAR) or most (supplementary EIAR) contour levels. However, the supplementarry EIAR goes on to say "*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*."

2035

Table 12: Number of persons highly sleep disturbed for the permitted and proposed scenarios in 2035 from the revised EIAR (2021)

Table 13-60: Number of people highly sleep disturbed – 2035

Scenario	No. People Highly Sleep Disturbed	
	Excluding Consented Developments	Including Consented Developments
2035 Proposed	18,711	23,567
2035 Permitted	11,374	15,551

Table 13: Number of persons highly sleep disturbed for the permitted and proposed scenarios in 2035 from the supplementary EIAR (2023)

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

Both EIARs comment that "*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 supplementary EIAR goes on to say "*The relative increase in the number of people highly sleep disturbed is greater than in 2035*[4] *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*

[4] Assumed to be a typo and instead should read 2025.

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."

5.7 Issues that arise from third party submissions.

With reference to the inputs to the noise modelling, section 13.3.43 of the EIAR explains how some aircraft types currently have limited, or no noise data that can be used and assumptions have been made about substituting proxy data from other aircraft types and how this data might have been corrected to better reflect the noise emitted by an aircraft type where data is missing.

It is not unusual that early in the life of recently introduced aircraft or aircraft that have not yet reached the market, but are in the pipeline, that they do not have fully validated noise data derived as per the internationally agreed standard method of assessment. Consequently, the use of data from proxy aircraft that have been noise certified, and correction of this data to reflect monitoring of noise at a specific airport is necessary. To this end, the EIAR makes a comparison of the Boeing 777-200 with the Boeing 777X. The Boeing 777X is similar to the Airbus A330neo. The Suono report on behalf of an appellant considers that the assumed decrease in noise from the chosen proxy Boeing 777-200 is too generous and a more conservative estimation should be used. The implication is that a smaller reduction would increase the intensity and size and of the predicted noise contours and therefore the number of people adversely affected and the degree of such adverse impact.

However, as the EIAR notes in the limitations section at paragraph 13.3.43, both the Boeing 777-200 and Boeing 77X, and the Airbus A330neo aircraft are a small minority of the predicted fleet mix in 2025 and 2030 (see Tables 13B-1 and 13B-2 for Permitted Scenario Forecast Movements in Appendix 13B. Air noise modelling methodology). Consequently, these aircraft contribute a fraction to the total predicted noise which is dominated by the most common aircraft in the fleet mix which in 2025 are predicted to be the Boeing 737-800, the A320 and the Boeing 737max; and in 2030 the A320neo and the Boeing 737max. Between them these aircraft make up around 66 percent of the fleet mix in 2025 and 2030. The remaining approximately 33% of the fleet mix is split to varying proportions between 23 different aircraft types in 2025 and 24 aircraft types in 2030. Consequently, individually none of these 23 aircraft that in total make up a minority of aircraft types expected to be using the airport, has a meaningful impact on the resulting predicted noise contours. This means if the correction from a Boeing 777-200 is reduced to even zero there would be at worst a negligible effect on the predicted noise contours. Such a change would go against the trend for new aircraft types to be less noisy than older equivalent aircraft. Consequently, any uncertainty in the allocated noise for the aircraft where such data is currently not available is likely to be of negligible consequence to the outcome of the EIAR.

In addition, it should first be noted that as part of the first RFI the board required sensitivity testing of the noise predictions and contours to plus or minus 1 dBA. This enables a better understanding of the potential noise impacts if the corrections for proxy aircraft (or any other input data for the calculations) turns out to be different to what occurs in future. Secondly, whilst the conditions attached to the planning permission require that the properties which will qualify for the offer of noise insulation are initially established based solely on modelling of noise contours, which inevitably is subject to a degree of uncertainty. The conditions also require that the noise contours are periodically verified[5], and if necessary, appropriately adjusted, by regular comparison to the data recorded by the airport's noise monitoring network. Thereby, ensuring that the uncertainties regarding the boundaries of contours used for the offer of noise insulation are minimised.

[5] "*By 31 March 2027 and every two years thereafter, the Applicant shall update and publish a revised Eligibility Contour Area map identifying all authorised habitable dwellings within the 55 dB L_{night} contour in the calendar year immediately preceding the review*."

6 Noise Insulation Scheme

6.1 Third Condition of the Regulatory Decision.

Regarding noise insulation the third condition of the Regulatory Decision[6] requires that:

"*A voluntary residential sound insulation grant scheme (RSIGS) for residential dwellings shall be provided. Initial eligibility to the scheme shall apply to all residential dwellings situated within the Initial Eligibility Contour Area as shown in Figure 3.1 - regulatory decision, Third Condition. Residential Sound Insulation Grant Scheme (RSIGS) - Initial Eligibility Contour Area – June 2022.*

Eligibility to the scheme shall be reviewed every 2 years commencing in 2027 with residential dwellings situated in the 55 dB Lnight contour being eligible under the scheme as detailed below."

However, the Regulatory Decision Report[7] comments further as reproduced below:

"Additionally, the scheme will help to mitigate the effects on those who become newly exposed to potentially harmful levels of aircraft noise. The Application proposed a second criterion for eligibility to the proposed scheme. This criterion would have the effect of limiting the availability of noise insulation grants to those who experience a 'very significant' effect as a result of the Application. This occurs where a dwelling is forecast to experience noise exposure of at least 50 dB Lnight and an increase in noise exposure of at least 9 dB when compared to the current permitted operation. The Application has proposed that subsequent eligibility will be on forecasts for the first year of the Relevant Action and would be a 'one-off' in terms of the area of eligibility and would therefore not be subject to any annual review. ANCA recognises that a scheme of this nature would help mitigate the effect of those who become newly exposed to night time aircraft noise below the priority value."

The initial Vanguardia report, and this report, supports the proposal to offer noise insulation to those who are not only exposed to a level of 55 dB L_{night}, but also those who experience a substantial change in noise at night of 9 decibels resulting in a minimum level of 50 dB L_{night}. It should be remembered that there are impacts on sleep at noise levels below the priority level of 55 L_{night}, albeit this level is a reasonable threshold of likely significant effect, and that relatively rapid increases in noise at night e.g. when a new runway comes into use or an existing runway starts to be used at night, can increase the numbers of persons experiencing sleep disturbance compared to a similar population exposed to the same noise levels for a relatively long time.

The scope and scale of the effect of the proposed second noise insulation criterion was illustrated by figure14.1 of the RD report, as reproduced below.

[6] Regulatory Decision of The Aircraft Noise Competent Authority (ANCA) Pursuant to Section 34C(14) Planning and Development Act 2000 EU Regulation No 598/ 2014 Aircraft Noise (Dublin Airport) Regulation Act 2019 Planning Register Reference Number: F20A/0668 20th June 2022

[7]

Table 14: Figure 14.1 from the RD report showing the initial (2022) noise insulation contour at L_{night} 55 dB and the amended initial contour to include areas exposed to L_{night} 50 dB and experiencing a 9 decibel increase in noise at night due to the RA

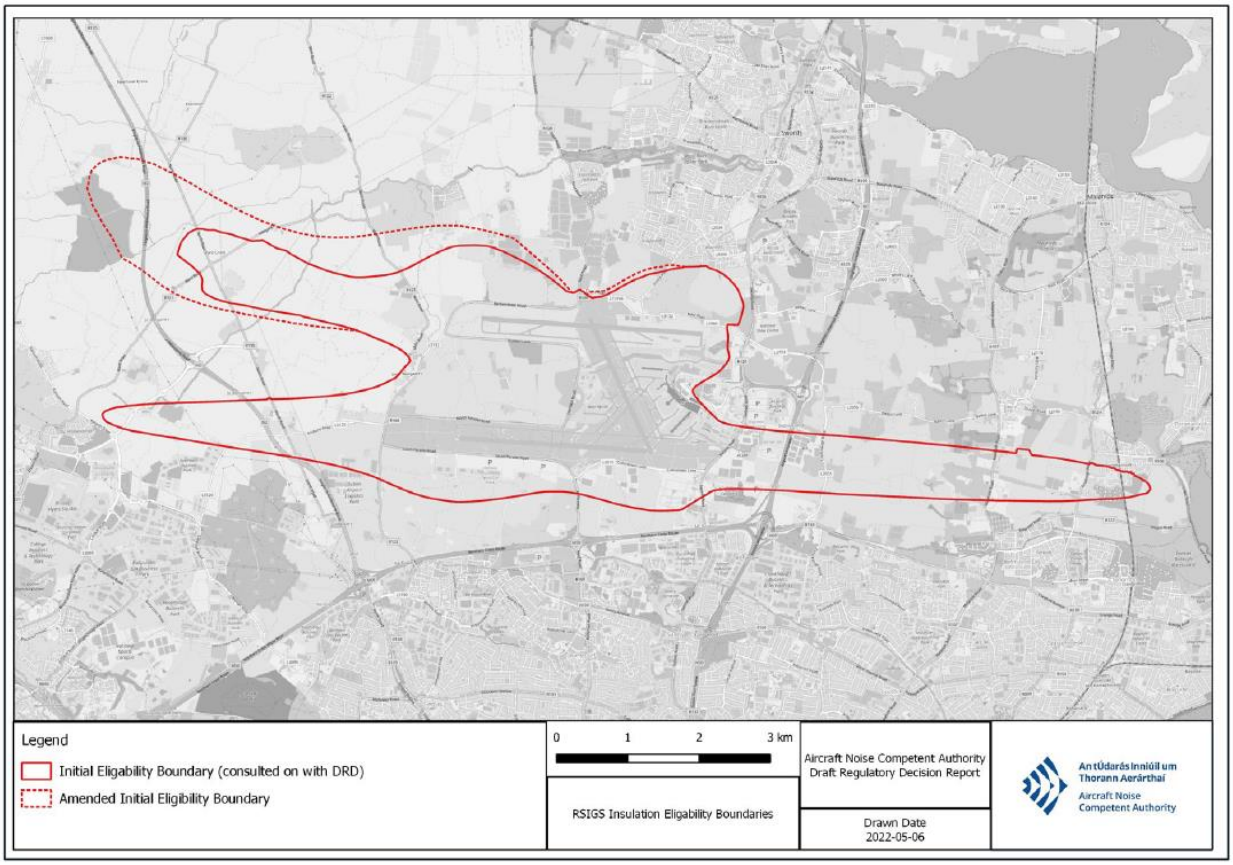


Figure 14.1 – RSIGS Initial Eligibility Boundaries

6.2 Alterations to the RSIGS scheme based on the new modelling submitted (2023)

The second RFI by the board produced revised noise contours. These noise contours are different in size and shape to those presented previously. The letter accompanying the response to the second RFI discusses the differences as follows:

"ANCA's Regulatory Decision acknowledges the variability of the Eligibility Contour Area. As set out in Part 1 (Definitions) of the Third Condition, the 'Eligibility Contour Area' is defined as 'the 55 dB Lnight contour area as varied from time to time….'. The initial eligibility was established by ANCA around the predicted contour area for the priority value of the 55 dB Lnight which was then extended to reflect the 'very significant' effect determined from the 2022 forecast as set out within the initial application documents in December 2021, almost two and half years ago. As such, the variation to the Eligibility Contour Area within the submission dated 14th September 2023, and further demonstrated within this submission, is not surprising.

Since then, as described in the Applicant's submission on 14th September 2023, the North runway has become operational which has allowed actual noise and track information from aircraft using it to be gathered and utilised when determining departure tracks, departure profiles and validating noise predictions. As such, given the previously predicted noise information has been revised, so too should the eligibility contour.

Addressing the variation in the Eligibility Contour Area now set out in the Residential Sound Insulation Grant Scheme (RSIGS)_Initial_Eligibility-Sep_23 contour compared to the Residential Sound Insulation Grant Scheme (RSIGS) - Initial Eligibility Contour Area – June 2022, it is noted that there has been:

- an increase in the contour area off the north runway to the north-west,

- a slight increase off the south runway to the east; and

- a slight increase off the north runway to the south-west.

Other areas have demonstrated a reduction in the contour area, particularly to the west of both the north and south runways and the east of the north runway. The overall area of the eligibility contour increases from 28.5 km2 for the contour based on the December 2021 submission, to 29.9 km2 for the contour based on the September 2023 submission (an increase of approximately 5%). This is primarily due to the change in assumption regarding mixed mode operations, which had the effect of increasing the number of night flights assumed to use the North runway and therefore increasing the area assessed as having 'very significant' effects. The area of the 55 dB Lnight contour, which includes flights using both runways, remains almost identical, reducing from 20.8 km2 in the December 2021 submission to 20.7 km2 in the September 2023 submission.

On the South runway both the flight tracks on approach (from at least 11km) and the flight tracks on departure (up to an aircraft altitude of 3,000ft) are straight. This means that the contour shape is generally long and relatively narrow extending along the centreline of the South runway in both directions."

And.

"On the North runway the flight tracks on approach (from at least 11km) are straight. The small bulges in the noise contours due west of the North runway are the result of arrival noise. On 80% of daytime hours, the wind blows from the west and departures head westward from the North runway (due to Condition 3b). Due to the wind and the planning conditions, nearly 80% of all daytime departures at Dublin Airport are on the North runway, and head west.

Due to airspace safety requirements set down by the International Civil Aviation Authority (ICAO) and enforced by the Irish Aviation Authority (IAA), departures off the North runway must turn slightly (at least 15 degrees) to the north once airborne and clear of the runway end. This means that some 80% aircraft departures head in a north-westerly (NW) direction and about half of these eventually turn further eastward towards UK and European destinations. The result is the evident bulge in the noise contours to the north-west of the airport.

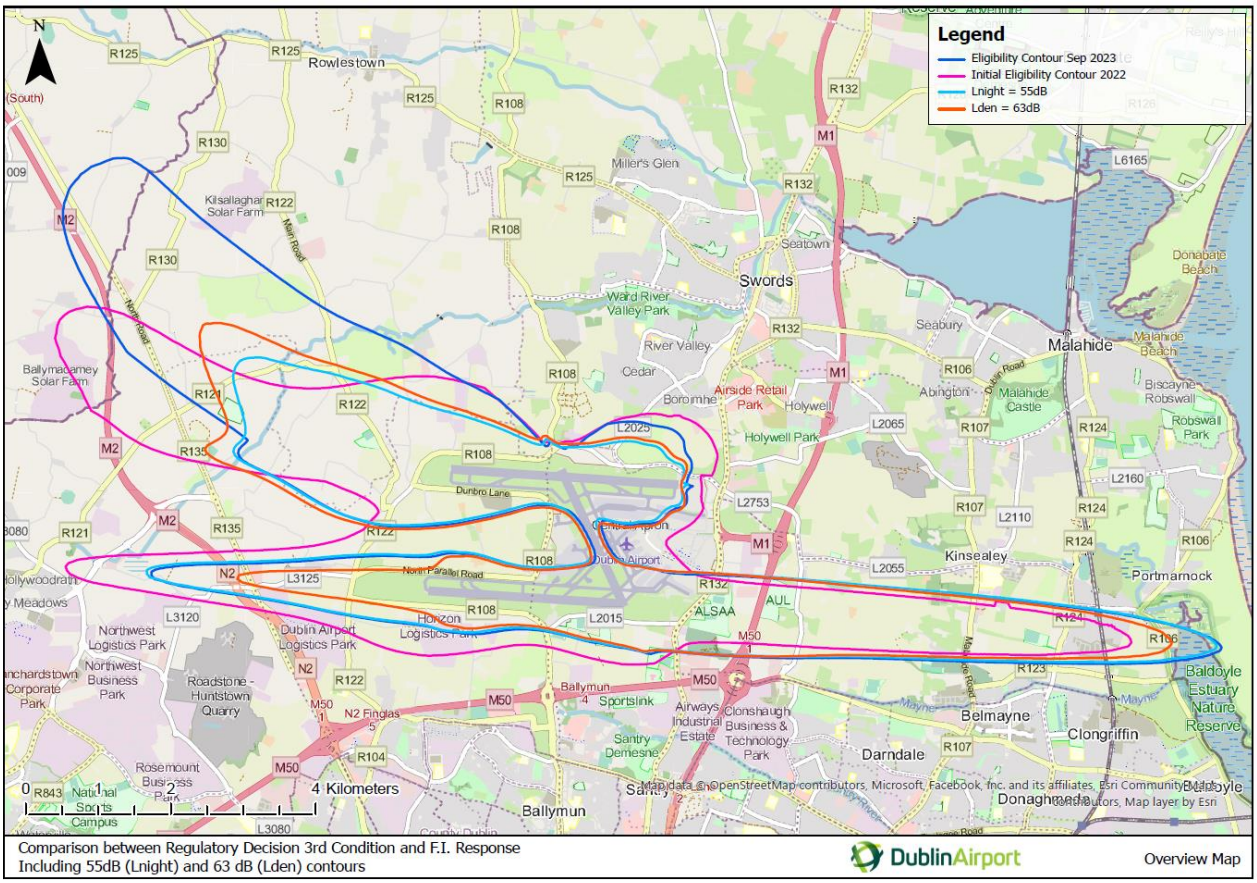
The large and broad contour bulge is because of the proposed RSIGS eligibility that includes a combination of two criteria;

- simple noise threshold of 55 dB Lnight; and

- change in noise level (compared to noise levels without the North runway used at night and the airport limited to 65 nightly movements) of at least 9 dB combined with a lower noise threshold of 50 dB Lnight."

The figure below is reproduced from the response to the Board's second RFI and illustrates how the Initial Eligibility September 2023 contour for noise insulation has changed from the Initial Eligibility Contour June 2022.

Table 15: Overview map from the response to the 2ND RFI showing the initial noise insulation eligibility noise contour 2022 (pink) and the revised noise insulation eligibility noise contour 2023 (dark blue).



7 Noise Abatement Objective

7.1 New noise modelling (2023) and compliance with the NAO

A Noise Abatement Objective (NAO) has been set for Dublin Airport which seeks to "*Limit and reduce the long term adverse effects of aircraft noise on health and quality of life, particularly at night, as part of the sustainable development of Dublin Airport.*".

The NAO objective described above would be achieved if the RA is not implemented. This is because the airport is operating at nearly the full capacity possible within the current planning permission and there is limited scope for increasing ATMs, and going forward airlines will renew and update their fleets with modern aircraft that are progressively becoming less noisy. Consequently, compared to nowadays the area covered by the airport's noise contours will shrink. Consequently, noise levels will reduce, and the number of persons significantly adversely effected by aircraft noise would be fewer in future if the airport continues to operate as currently permitted.

Both the revised and supplementary EIARs show that the NAO objective to "*Limit and reduce the long term adverse effects of aircraft noise on health and quality of life, particularly at night, as part of the sustainable development of Dublin Airport*" is predicted to be achieved if the RA is permitted.

However, the RA was screened by ANCA, and they have determined that a noise problem would arise from the application due to three aspects:

"1. The Application proposes an increase in aircraft activity at night, when referenced against the situation that would otherwise pertain, which may result in higher levels of human exposure to aircraft noise.

2. The Application proposes a situation where some people will experience elevated levels of night time noise exposure for the first time which may be considered harmful to human health.

3. The EIAR accompanying the Application indicates that the proposed relevant action will give rise to significant adverse nighttime noise effects."

The issues identified above arise because although future aircraft will be less noisy than currently, the resulting reduction in noise for those already significantly adversely effected by aircraft noise, would be offset by the increase in the number of ATMs at night and the exposure of persons currently not exposed to, or currently exposed to low levels of aircraft noise at night, this RA would cause if permitted.

In short, although in future with or without the changes this RA would facilitate, the NAO to "*Limit and reduce the long term adverse effects of aircraft noise on health and quality of life, particularly at night, as part of the sustainable development of Dublin Airport.*" would be achieved. However, if this RA comes into effect, it would hinder the health and quality of life benefits of individual aircraft becoming less noisy as technology improves, so that although fewer persons would be affected in future, substantially more people would be significantly adversely effected by aircraft noise at night compared to if the airport continued as it currently operates.

The supplementary EIAR shows a reduction in persons highly sleep disturbed in 2025 and 2035 compared to 2018 (the revised EIAR showed the same for a 2019 baseline compared the future scenarios with or without the RA). This complies with the NAO.

The prediction of a reduction in persons highly sleep disturbed in 2025 and 2035 compared to 2018 relies on achieving a certain minimum rate of introduction of less noisy aircraft into the fleet mix.

The ANCA August 2023 report shows that the NAO objective of fewer persons highly sleep disturbed in 2022 compared to 2018 was not achieved. This is probably because although the overall number of aircraft movements was lower in 2022 than 2019, the night-time movements increased by 1,964 (7%). In addition, the rate of introduction of less noisy aircraft into the fleet mix may have been slower than anticipated when the NAOs were published.

7.2 Aircraft are becoming less noisy.

Both the EIARs rely in part on improvements in aircraft technology reducing the noise emitted by individual aircraft offsetting the increase in noise from having more ATMs at night and the exposure of persons currently not significantly affected or only marginally affected by aircraft noise at night to more noise, because of the RA. This will mean a greater proportion of the aircraft fleet using the airport in future will be newer less noisy aircraft types than use the airport currently[8]. This fleet renewal with the latest generation of less noisy aircraft is expected to lead to a reduction in average noise exposure as measured with the L_{den} and L_{night} indicators over the next two decades. This is primarily due to the fleet penetration of new single-aisle aircraft types e.g. A320neo and Boeing 737MAX which tend to account for the majority of landing and take-off noise energy at European airports[9].

[8] For example the European Aviation Environmental Report 2022 reports that under the base traffic forecast, new aircraft represent 42% of total operations in 2030, 77% in 2040 and 95% in 2050.
[9] European Aviation Environmental Report 2022.

8 Cost Effectiveness Analysis

ANCA undertook a Cost Effectiveness Analysis (CEA) of the proposed runway uses and noise insulation scheme for the RA. This is considered below.

8.1 DAA Preferred scenarios runway and noise insulation scheme

The ANCA Draft Regulatory Decision, Appendix J, Cost Effectiveness Methodology and Results reports that the applicant's preferred long-term noise measures are:

- Runway scenario 2 - During 00:00-06:00, only South runway is used. Otherwise, same usage pattern as day.
- Noise insulation variant B - A €20,000 grant for noise insulation given to dwellings exposed to noise levels exceeding 55dB L_{night} in 2025 or 50dB L_{night} after a change in noise level of 9 dBA or more and are not eligible under existing noise insulation schemes.

ANCA Concluded that runway pattern 10 (alternating between using the North Runway and South Runway over the period 00:00 and 06:00) with noise insulation variant B (insulating homes exposed to noise greater than 55 dB Lnight) is the most cost-effective under both metrics. However, as discussed in the initial noise report, it does not perform as well against the significantly adversely affected metric which is an aspect of the noise problem identified by ANCA.

8.2 The ANCA recommendations

In the Draft Regulatory Decision, Appendix J, Cost Effectiveness Methodology and Results, ANCA concluded overall that the most effective measure assessed against the %Highly Sleep Disturbed (%HSD) metric were:

- Runway scenario 9 - During 00:00-06:00, only North runway is used. Otherwise, same usage pattern as day.
- Noise insulation variant C6 – €20,000 grant for dwellings exposed to noise levels that, in 2025, either a) exceed 55 dB, or b) exceed 50 dB and are 9 dB higher than in a scenario with the operating restrictions, provided they are not eligible under existing noise insulation schemes.

ANCA concluded that the most cost-effective measures were:

- Runway scenario 10 - Alternate between using North and South runway during 00:00-06:00. Otherwise, same usage pattern as day.
- Noise insulation variant B – A €20,000 grant for noise insulation given to dwellings exposed to noise levels exceeding 55dB L_{night} in 2025 and not eligible under existing noise insulation schemes.

This addendum report supports the following measures:

- Runway scenario 9 - During 00:00-06:00, only North runway is used. Otherwise, same usage pattern as day.
- Noise insulation variant C6 – €20,000 grant for dwellings exposed to noise levels that, in 2025, either a) exceed 55 dB, or b) exceed 50 dB and are 9 dB higher than in a scenario with the operating restrictions, provided they are not eligible under existing noise insulation schemes.

8.3 RICONDO 2023 Report - North Runway, Regulation 598/2014 (Aircraft Noise Regulation) Cost-Effectiveness Analysis Updates

The RICONDO 2023 Report provides an updated CEA update for the 2023 supplementary EIAR and concludes that *"updated cost-effectiveness analysis results in the same recommended measures as those in the 2021 CEA Report*".

The 2021 CEA recommendations are regarded as appropriate. However, in relation to the recommendations in section 8 of the report and noise insulation, the report says "*Residential Sound Insulation Grant Programme: Provide sound insulation grant assistance to sound insulate dwelling units with exterior levels at 55 dB Lnight or higher based on forecast 2025 levels.".* This makes no mention of the second noise insulation criterion of a threshold of 50 dB L_{night} where the RA has caused a 9 decibel increase in noise.

It is therefore recommended that the Board specifically require that the noise insulation condition explicitly includes the second criterion so that it includes dwellings exposed to aircraft noise levels that, in 2025, either 1) exceed 55 dB, or 2) exceed 50 dB and are 9 dB higher than in a scenario without the RA in operation.

8.4 Overall opinion with the CEA for the Regulatory Decision

The CEA for the Regulatory Decision provides sufficient information on which to make an informed judgment regarding the RA.

9 Issues arising from third party submissions.

The SUONO report

The following issues are raised in the SUONO technical report included in the submission by The St. Margaret's The Ward Resident Group

9.1.2 The Heathrow Airport Third Runway Preliminary Environmental Impact Report (PEIR) identifies a key assessment standard: Significant Observed Adverse Effect Level (SOAEL) those experiencing additional awakening due to aircraft noise as a yearly average. The developer should have referred to this threshold. Alternatively, they should incorporate the threshold.

Response - SOAEL Significant Observed Adverse Effect Level is a concept unique to noise policy in England and Wales (it doesn't apply in Scotland and NI). It has parallels with the concept of "Likely Significant Adverse Effect" from the EIA directive and adopted in the EIARs for the RA. The Heathrow PEIR used a SOAEL level of 63 dB $L_{Aeq,16\ hr}$ during the day and 55 dB L_{night} at night. The revised and supplementary EIARs use a different noise metric i.e. L_{den} for the whole 24 hours and the same noise metric at night. The approach in the revised EIAR is different to that for the Heathrow PEIR, but the significance categorisation in table 13-2: Air Noise Impact Criteria (absolute) – residential on page 13.8 of the revised EIAR are similar to those used for the Heathrow 3rd Runway PIER.

9.1.3 Section 2.12 of the Suono report criticises use in the applicant's submission of a reduction of 21 dB for conversion of external to internal noise levels.

Response - The applicant's use of the 21 dB reduction for conversion of external to internal noise levels matches what the WHO assumed in their Night Noise Guidelines for Europe 2007 as the annual average, considering typical patterns of windows being open and closed over a year. This is because the L_{night} metric is an annual average. A 21 dB reduction for conversion of external to internal noise levels is a conservative estimate for existing windows when closed as it represents the bottom of the range of noise reduction of a single glazed window which are typically around 20 to 25 dB noise reduction, with ordinary thermal double glazing giving around 25 to 30 dB noise reduction. The noise reduction provided by a façade with a window partially open for ventilation is usually taken to be from 10 to 15 decibels. The annual average of 21 dB noise reduction from the WHO guidelines is derived from statistical analysis of the proportion of the year windows a typically open or closed due to weather conditions across Europe.

9.1.4 Suono state that the additional awakening assessment would benefit from the inclusion of SEL and LAmax contours for key aircraft using the NR.

Response - Contours for additional awakenings would be a helpful addition to aid communication of effects but are not critical to assessment of the likely significant effects of additional awakenings. Figures for N65, N60 and LAmax metrics are provided as noise contours showing how often maximum noise levels of 65 dBA and 60 dBA will be exceeded during the day and night respectively, along with contours showing the area covered by the maximum noise level of individual noise footprint of the most numerous aircraft in the fleet mix expected to use the airport at night. These are useful in communicating impacts of the RA at night.

9.1.5 Suono consider that the Significance Criteria magnitudes in the EIARs underestimate the effects of the air noise in a few places (Highlighted in Table 2 of Suono report) i.e. a A 3 -5.9 dB change should be classified as significant rather than moderate.

Response - A 3 to 5.9 decibel change has been typically classed as a moderate impact in many EIARs for transport infrastructure projects for decades. Moderate impacts are usually rated as likely significant effects where the change exceeds a benchmark value as well.

9.2 Other Issues Raised

QC/ shoulder movement period

Claimed benefits of reverting back to the QC for the 6.5hrs and then introducing an ATM cap for the Shoulder hours?

Response - Any benefits would be outweighed by dis-benefits as the shoulder periods from 2300 to 2330 and 0600 to 0700 would be unregulated and the noisiest aircraft that would be banned by the QC period being the full 8 hours from 2300 to 0700 would be able to use the NR as well as the SR during these shoulder periods.

9.2.1 Noise Modelling

The scenarios presented in the noise modelling have been queried, e.g., noise model contours for the "permitted scenario" e.g., Figure 13C-23. It is stated that these contours follow the flight paths for which the supplementary EIAR models the noise contours rather than the permitted scenario as per the NR application (2007).

Response - Yes, this is correct. The permitted scenarios in the supplementary EIAR are modelled based on the flight paths that have been in use for the NR since it opened in August 2022 i.e. they diverge to the north-west for westerly departure on the NR. These flight paths are different from those used to assess the NR in the original application for the runway (2007). Which assumed departures to the west would fly on a straight line on axis with the runway for around 5 NM before turning to go off on route to destination. The divergence to the north of flights to the west on the northern runway is a requirement from the Irish Aviation Authority enforcing an International Civil Aviation Authority rule that at airports with parallel runaways departing aircraft must diverge by at least 15 degrees from the axis of each other's runway immediately on take-off, on the grounds of public safety i.e. avoid mid-air collision

9.2.2 Year used for comparison.

3rd parties state that in section 3.3 of the applicant's response to RFI it states that for 2018, the existing noise modelling has been used and already includes contours giving the number of times a specific noise is exceeded at night. For 2025 and 2035 they use the updated model with new routes and radar. This raises the question whether a comparison can be adequately made between the 2018 modelling data and the new 2025 and 2035 modelling data having regard to the use of different flight paths in 2018 and now for 2025 and 2035?

Response - Yes.

There were no flight paths for the NR in 2018 as it did not come into use until August 2022.

The 2018 models are based on the flight paths only from the SR and cross runway that are straight lines on axis with each runway. This reflects how the airport was used in 2018.

The flight paths used in the supplementary EIAR are based on those in place when the NR opened in August 2022 i.e. aircraft depart to the west from the SR in a straight line on axis with the runway, whereas aircraft depart the NR to the west using north to north westerly flight paths so they diverge from aircraft departing the SR by at least 15 degrees. The figure 13B-2 and 13B-3 in the Supplementary EIAR Appendix 2 figures 23B show the flight paths modelled for both the SR and NR in 2025 and 2035.

9.2.3 Flight Paths/Standard Instrument Departure (SID)

Several third-party submissions state they are now affected by the new flight paths from the north runway with departures now going north soon after take-off, rather than directly west as was envisaged by the 2007 EIAR for the north runway. They consider these flight paths, and associated noise modelling, contradict the permitted flight paths in condition No 3 of the original permission for NR (PL 06F.217429) (detailed below)

> *Option 7b. and Noise Abatement & Flight Procedures in the North Runway Planning Permission (ABP Ref. No.: PL06F.217429) documentation. See extract below:*
>
> *"6.2.4 Aircraft of Categories C/D (medium to heavy jets) departing to the west (Runway 28) are required to maintain straight ahead after take-off to 5NM before commencing turn, unless otherwise cleared by ATC above 3000 feet.*
>
> *6.2.5 Aircraft of Categories C/D (medium to heavy jets) departing to the east (Runway 10) are required to maintain straight ahead after take-off to 5NM before commencing turn (if turning left), and 6NM (if turning right), unless otherwise cleared by ATC above 3000 feet. The disparity here is to ensure that southbound aircraft do not over-fly Howth Head. Northbound aircraft will turn over the sea thereby avoiding the communities of Portmarnock and Malahide."*

It is considered the RA should also have included alterations to Condition No 3 in totality rather than only 3d, as applied. Condition No 3 of the NR required that Option b of the EIAR be implemented. The above reference is included in Option b.

Response - Based on the interpretation that the term mode of operation of the airport includes how aircraft fly to and from it. The new Standard Instrument Departure (SID) describes flight paths that are different to those described in condition 3.

However, in relation to airports, normally the term "mode of operation" typically means the manner in which the runways are used e.g. mixed or segregated mode, and easterly or westerly arrivals and departures as dictated by the wind direction. This is specifically referred to in the condition where it says "**the runways** at the airport shall be operated in accordance with the mode of operation……." (author's emphasis). This indicates that the condition controls use of runways which is a land use consideration subject to Planning law, not how aircraft approach or depart from the airport which falls under control of air space via the Air Traffic Control regime as regulated by the Irish Aviation Authority.

The flight paths now in use for the northern runway after it opened in August 2022 were used in the noise modelling for the supplementary 2023 EIAR. These latest flight paths are based on radar data and are only slightly different from the theoretical flight paths used for the revised 2021 EIAR. However, both these sets of flight paths are considerably different to those assumed in the noise modelling for the original EIAR for the northern runway (2007). Although the noise contour area covered by the different flight paths is probably similar i.e. the noise is approximately the moves the location where impacts. Similarly, the impact is broadly the same i.e. fewer people are significantly adversely affected in 2025 and 2035 compared to 2019 (or 2018), although in terms of %HSD more people are significantly adversely effected in 2025 and 2035 if the RA is permitted compared to if it is not. But those who suffer these effects are in different areas to those who were identified in the 2007 EIAR.

9.2.4 Mode of Operation

Several 3rd parties have highlighted that the proposed mode of use of the runways has changed from segregated (2021) to semi-mixed mode (both parallel runways used for departures) in the revised EIAR, and now back to segregated mode in the supplementary EIAR (2023).

Whilst there will be some difference in the size of the noise contours due to these changes in mode, any change in size is likely to be negligible to minor. This is because the noise metric the contours are based on is relatively insensitive to changes in the numbers of aircraft and the noisiest aircraft make a disproportionately greater contribution to the contours even though they may be outnumbered substantially by less noisy aircraft.

Even with the change in mode from semi-mixed to segregated, the general trend in noise impacts will remain the same i.e. fewer people significantly adversely affected in 2025 and 2035 compared to 2018 (or 2019), although more people will be significantly adversely affected in 2025 and 2035 if the RA is permitted compared to if it is not.

9.2.5 Baseline Year

Third parties have expressed concerns that the applicant's response on the baseline year has had not adequately addressed the RFI, and the rationale given for not using 2019 does not sufficiently address the issue. (For example, see Page 7 of the SMTW DAC submission).

However, the purpose of item 3 of the RFI was to explore how the assessment might change if the input parameters were different e.g. number of ATMs and the makeup of the fleet mix etc. This is because any assessment must be based on assumptions regarding these critical inputs. For baseline years in the near past the uncertainties regarding these inputs are nil to negligible, but for future scenarios with and without the RA the uncertainty will be greater. Consequently, expanding the assessment by sensitivity testing based on varying the input data provides a better understanding of the potential consequences of uncertainty.

In practice use of 2018 instead of 2019 as the baseline year makes no meaningful difference to the outcome of the assessment i.e. fewer people will be significantly adversely affected in 2025 and 2035 compared to 2018, although more people will be significantly adversely affected in 2025 and 2035 if the RA is permitted compared to if it is not.

Although the difference between 2018 to 2019 in terms of MPPA throughput at the airport was around 2 million, the limit was around 30 million MPPA. This divergence in noise terms is equivalent to a difference of around 0.3 dB. This is of nil to negligible significance.

9.2.6 Independent Noise Assessments

Several independent noise surveys and assessments have been commissioned by residents to the north and northwest of the airport. Many of these assessments highlight differences between the surveyed data and examples of DAA produced noise contours and information, and based on this comparison consider the DAA assessments underestimate the scale of impact.

Noise measurements at the same location by different surveyors will normally vary due to differences in measurement uncertainty, sampling variation, instrumentation tolerances, the measurement location characteristics that influence noise e.g. ground absorption, acoustic reflections, and the influence of ambient non-aircraft noise, wind speeds, direction vertical and lateral shear, temperature, humidity and other factors affecting noise propagation.

The maximum measurements made during the day will not reflect the levels at night if the RA goes ahead as the QC scheme would prevent the noisiest aircraft flying during the day using the NR at night.

The noise contours are models with fixed inputs and parameters designed to produce data for average typical conditions. Whereas day to day surveying will produce results that diverge from these inputs and parameters as they will be different from day to day. It is inevitable that the modelling will initially not match all the noise levels at all the receptors all the time. This is partly why if the RA goes ahead the noise conditions require that the noise contours are revised regularly with reference to measured levels and amendment of the contours as appropriate.

Furthermore, the calculation of the noise levels at the residents' properties in the reports does not appear to reflect the 92 day summer average of the modes of operation of the airport used to develop the DAA contours with approximately 75% westerly operations and 25% easterly. The calculations appear to assume that airport operates on worst case westerly operations every day, whereas there are significant number of days when the airport is on easterly operations and noise levels will be different

The SEL data the 3rd parties use for comparison with the noise surveys is from 2019 noise reports or the now superseded revised EIAR i.e. it isn't directly comparable with the data in the supplementary EIAR which is based on different assumptions about critical inputs to the calculation of noise levels.

Overall, much of the alleged disparity between what has been measured and information provided by the airport is probably due to the comparison not being like for like. A significant reason for this is that the DAA noise data on which the comparisons are based was calculated using assumptions regarding aircraft flight paths and profiles that did not reflect how aircraft now flight to and from the northern runway since it opened in August 2022.

None of the issues raised by 3rd parties relating to surveyed noise data change the outcome of the supplementary EIAR that fewer people will be significantly adversely affected in 2025 and 2030 compared to 2018 (or 2019), although more people will be significantly adversely affected in 2025 and 2035 if the RA is permitted compared to if it is not.

9.3 Fingal County Council (FCC)

FCC has raised issues including the following:

- The same 1 dB adjustment (+ or -) has been applied to both permitted and proposed scenarios.
- For FI request item 2 (c) situations have not been considered where the adjustment is applied to only one scenario (i.e., permitted or proposed being compared).
- The sensitivity test has not been used to inform the appraisal of significant effects in Chapter 13.
- For FI request item 3 in regard to 2014 when the number of ATMs in the 92 day annual summer period were last 25% below those in 2018.

Response – The applicant has described why they haven't included all the scenarios requested in the NOISE MODELLING REPORT ABP RFI 27 APR 2023 submitted in response to the RFI which describes the approach taken in paragraph 4.1 as follows:

"Also given the other controls on the airport such as the limit on passenger numbers, for which no change is sought as part of this application, there being significantly more movements in the Proposed scenario than the Permitted scenario does not seem realistic."

The above explanation why not all of the conceivable scenarios have been tested is considered reasonable and the RFI relating to sensitivity testing is deemed to be discharged adequately.

The conclusion of the sensitivity testing is the same as for the core assessment i.e. that fewer people will be significantly adversely effected in 2025 and 2035 compared to 2018 (or 2019), although more people will be significantly adversely effected in 2025 and 2035 if the RA is permitted compared to if it is not. As expected, the test with smaller contours shows the impact is for fewer persons and the test with larger contours shows a greater number of persons are affected compared to the core assessment. This is helpful as it indicates that the modelling and assessment methodologies are working as intended and provides useful information on the potential consequences if the inputs to the model prove to be different to what occurs.

9.4 Air Traffic Forecast Data

Chapter 13 states that for the proposed scenario the 32 MPPA cap will be reached in 2024 and in 2026 the 32 MPPA cap will be reached in the permitted scenario. There is confusion, given that the TPA letter states that the original forecast show 32 MMPA being reached by 2025 without the RA.

Response - Whilst it is conceivable that either 2024 or 2026 could in theory have different MPPAs sufficiently different to influence the resulting noise predictions, in practice this is almost certainly not going to happen. As the airport is already very close to the 32 MPPA cap so any change will be proportionately small and the resulting noise impacts of event smaller magnitude.

9.5 Fleet Renewal

FCC highlight that:

- Updated air traffic forecasts and assumptions surrounding fleet modernisation have an input and material influence on the noise assessments.
- It is unclear what influence DAA specific incentives/ restrictions may have on fleet renewal assumptions and if they are different from the permitted and proposed scenarios.
- Is there any associated influence of the fleet renewal and different noise assessment on the permitted and proposed scenarios?

Response – The makeup of the fleet using an airport and the rate of fleet renewal is one of the primary influences on the modelling of airport noise. It is also subject to moderate to significant uncertainty when looking in the near to medium future i.e. 5 year to 10 years ahead. This is one of the reasons why sensitivity testing was asked for in the RFI.

However, whilst potential variation of the future fleet mix from that assumed in the supplementary EIAR can influence the future noise predictions. It is unlikely that the trend identified in the revised EIAR will change i.e. that fewer people will be significantly adversely affected in 2025 and 2035 compared to 2018 (or 2019), although more people will be significantly adversely affected in 2025 and 2030 if the RA is permitted compared to if it is not.

If the rate at which less noisy aircraft enter the fleet mix is slower than assumed in the EIAR it may mean fewer people are exposed to less noise in 2025 and 2035 compared to 2018 (or 2019); or more people suffer a significant effect in 2025 and 2035 with the RA compared to without the scheme; and vice versa if the rate at which less noisy aircraft enter the fleet mix is faster than assumed in the EIAR.

9.6 Mode of Operation

FCC highlight that:

- Chapter 13 and 14 assumes segregated mode? (between 06:00 and 08:00) will revert to the change made in 2021. This will influence the noise model outputs and associated assessments.
- Preferential runway uses with activity on the NR limited to 2 hrs is presented as a mitigation/control.

Response - The change in mode from mixed in the revised EIAR (2021) to the supplementary EIAR (2023) has been included in the noise modelling and assessment presented by the applicant. There will be a minor noise benefit in the switch from segregated to semi-mixed mode. Potentially this benefit could be incorporated as a requirement of planning conditions.

Restriction of the use of the NR to only 2 hours a night has only a modest noise benefit in terms of the % Highly Sleep Disturbed assessed by aggregating the noise from each ATM and then averaging over the whole 8 hours of the night period. But a much greater effect in limiting the numbers of person likely to experience additional awakenings assessed using the maximum noise level of each ATM as this is more sensitive to numbers of ATMs rather than the magnitude of the maximum noise level.

The supplementary EIAR (as did the revised EIAR) is based on the NR only being used between 2300 and midnight and 0600 and 0700. All ATMs outside of these times will be on the SR, which will also be used between 2300 and midnight and 0600 and 0700 as well.

The Mott McDonald report shows that the maximum hourly numbers of ATMs will be between 2300 and midnight and 0600 and 0700 on both runways, although a substantial proportion of ATMs will occur between these times on the SR at a reduced hourly rate.

9.7 ANCA

9.7.1 Fleet modernisations and forecasts

ANCA point out that:

- The forecast provided with the application for 2025 did not include any 737 max aircraft type. These are in operation in Dublin. The updated forecast shows a large deployment in 2025 and future years.
- There are increase proportions of Generation Zero (GO) aircraft (oldest and nosiest) in updated forecast which will increase in 2025 and 2035. There is no narrative why this is the case or implications for the noise assessments.
- The significant further information notes a greater number of nighttime flights than forecast with the application.

Response - The absence of the 737 max from previous assessments doesn't have any implications for the noise assessment now submitted with the revised information as they are included now. Furthermore, Tables 13B-1 and 13B-2 in Appendix 13B. Air noise modelling methodology show 737Max aircraft in the fleet mix for 2025 and 2035 as the 3rd most common aircraft. Notwithstanding this there are significantly more A320 and Boeing 737-800 aircraft in each future year so that these aircraft will dominate the total noise with the 737 max contributing significantly less.

The increased proportion of GO aircraft indicates a slowing of the introduction of newer less noisy aircraft. This is expected as the pandemic was a major factor in airlines delaying or even cancelling new acquisitions. For example, some airlines will have shed aircraft to generate cash and cut costs; and other airlines will have seen this as an

opportunity to acquire aircraft with useful residual working life at lower cost than buying newer less noisy aircraft thereby delaying future plans to acquire next generation even less noisy aircraft.

9.8 Uncertainty

ANCA note the EIAR has factored in a certain amount of uncertainty in the Regulatory Decision (RD) as the NR had not commenced operations (Appendix F of the ANCA RD decision Report).

Response - Uncertainty undermines confidence that the predicted impact will occur as stated. It is best understood in relation to a defined assessment i.e. the noise level could be +/-X dB and be taken into account when decision making. The sensitivity tests contribute to this process.

However, uncertainty will not fundamentally change the assessment i.e. i.e. that fewer people will be significantly adversely affected in 2025 and 2035 compared to 2018 (or 2019), although more people will be significantly adversely affected in 2025 and 2035 if the RA is permitted compared to if it is not. So, on a qualitative basis the decision should not be affected.

However, uncertainty can influence how many people are affected and where they are on a quantitative basis. This is to a degree countered by the requirement to review the noise insulation scheme and adjust the qualifying noise contours once the NR is in use at night.

10 Conclusions

The conclusions to this report are similar to those for the initial Vanguardia report, which are reproduced below.

The approach in the revised and supplementary EIARs to assessment of noise effects at night focusses on L_{night} noise metric. This method combines and averages the noise energy from all the ATMs over the whole of the period from 2300 to 0700 hrs (although the northern runway will only operate between 2300 to mid-night and from 0600 to 0700 hrs). Consequently, the Board requested submission of an Additional Awakening assessment which evaluates the probability of persons awakening in response to the maximum noise level of each ATM.

The long-term trend reported in the revised and supplementary EIARs, and the additional awakenings assessment provided in response to the Board's request for information is that in 2035 fewer people are likely to be highly sleep disturbed or experience an additional awakening over and above normal non-noise induced awakenings at night compared to in 2018 without the RA. But substantially more people will be highly sleep disturbed and/or experience an additional awakening with the proposed RA in place in 2035 compared to the same year under the permitted scenario without the RA. This comes about because although in future a greater proportion of aircraft using the airport will be more modern less noisy types compared to the fleet in 2018, the resulting reduction in noise will be offset by more ATMs in 2025 and 2035 with the proposed RA in operation compared to the permitted scenario with the RA not in use. However, the trends in the shorter term are different. For example, whilst the number of persons highly sleep disturbed falls in 2025 and reduces further by 2035 compared to a baseline of 2018, with the number of persons highly sleep disturbed greater with the RA in either future year, compared to without the scheme. The same is not reported in 2025 for the additional awakenings assessment. Instead, there are marginally fewer additional awakenings reported in 2025 with the proposed RA compared to the permitted scenario without the scheme for the annual and summer averages of the airport's operations and under single mode westerly operations[10]. But for single mode easterly operations in 2025 there are substantially more persons experiencing additional awakening with the RA compared to without.

In general terms, if implemented the RA will mean some people currently affected by noise from night-time ATMs via the southern runway will experience noise from fewer ATMs using this runway at night; whilst some people currently unaffected or less exposed to noise from night-time ATMs will experience noise from aircraft using the northern runway which is currently prohibited from use at night.

The revised and supplementary EIARs propose that the significant adverse noise effects identified will be mitigated by offering noise insulation to those affected and replacing the current cap on the number of ATMs at night with a Quota Count (QC) system based on how noisy the aircraft are.

The proposed noise insulation scheme is one of the more generous programmes in Europe in terms of spatial scope and degree of funding offered. However, the qualifying criteria are based on a noise metric which averages intermittent aircraft noise across the whole 8-hour night period, and it is recommended the qualifying criteria are expanded to include a clause that reflects how loud the noisiest ATM using the airport at night will be.

Furthermore, reliance on the QC system alone to manage noise effects at night is regarded as inadequate as it would permit substantial increases in ATMs for only marginal reductions in how noisy each aircraft is, which could lead to increases in the number of persons experiencing Additional Awakenings and some individuals experiencing more

[10] Single mode refers to the direction that aircraft approach or depart the airport into the wind e.g. in westerly single mode aircraft depart the airport to the west and approach from the east, and under easterly mode aircraft approach depart the airport to the east and approach from the west.

Additional Awakenings. Consequently, it is recommended that if the RA is to go ahead that a cap on ATMs at night, based on how the QC scheme is calculated, is retained. Such caps on ATMs are in place at Heathrow, Stansted and Gatwick airports for which the QC system was developed in the early 1990s and which has been updated regularly and recently, with the caps on ATMs maintained.

Notwithstanding broad agreement of the existing conditions, it is recommended that the Board considers supplementing the conditions attached to the FCC permission as follows:

A. Introduce an additional third stand-alone qualifying criterion for noise insulation for all residential properties subject to aircraft noise between 2300 and 0700 hrs of L_{Amax} 80 dB[11] based on the noise footprint of the airport's westerly and easterly single modes of approach and departure (not averaging the modes of operation of the airport over the 92 days of summer) of the noisiest aircraft using the airport at night between 2300 hrs and 0700hrs. (NB this may fall within the proposed noise insulation envelope criteria of >55 dB L_{night} or >50 dB L_{night} and at least a 9 dBA change in L_{night}.)

   Reason – To account for the impact of noise from individual ATMs assessed in terms of the maximum noise level at a receptor during the fly-by.

And

B. Setting a cap on the total number of ATMs at night based on the number of ATMs derived from the calculation of the proposed QC budget of 16260, with a QC to ATM ratio of 0.51 i.e. 87 ATMs.

   Reason – To avoid substantial increases in ATMs being traded against marginal reductions in how noisy aircraft are, leading to increases in Additional Awakenings although the QC budget may not be exceeded.

The above conditions are intended to address the potential impact on sleep of the maximum noise level of individual ATMs, as a parallel measure to the DAA proposal to solely use energy averaging metrics that aggregate the noise from all ATMs, each of which is only for brief periods of seconds, and average it over the whole 8 hour period from 2300 to 0700 hrs

[11] The Ollerhead et al 1992 field study in the UK found that below outdoor ATM levels of about 80 dB L_{Amax}, (approximately 90 dBA SEL) ATMs are not likely to cause any increase in sleep disturbance measured by monitoring people's movements (actimetry) whilst exposed to aircraft noise, from that which occurs naturally during normal sleep. For those ATMs above this level, the average arousal rate was about 1 in 30 aircraft noise events. Based on this research Heathrow has a supplementary night noise insulation criterion whereby properties predicted to experience 80 dB L_{Amax} or more at night from the noisiest ATM qualify for noise insulation. See previous section 4.2 "Average" Noise Levels (L_{night}) & Maximum Noise Levels (L_{Amax}) of the initial Vanguardia report for more detail.

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