



Belcamp SHD

FCC Lands / Conroy Crowe Kelly Architects

Proposed Residential Development

6070

Aircraft & Traffic Noise Impact Analysis Report

DUBLIN AIRPORT & TRAFFIC NOISE ASSESSMENT

**Belcamp,
Malahide Road,
Dublin 17**

Gerard Gannon Properties

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ING Gerard (Craig) van Deventer CEng., BE(mech.), HDip CIOB, MCIBSE

M : [00] 353 (0)87 260 8080
 E : gerard@dkpartnership.com

DKPartnership
 70 Main Street, Applewood , Swords, Co. Dublin, Ireland
 Reen Kenmare Co. Kerry

post@dkpartnership.com
 www.dkpartnership.com

T : [00] 353 (0) 1813 1930
 T : [00] 353 (0)64664 1686



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1 Introduction

1.1 Report purpose

This report assesses any likely impacts of aircraft noise and traffic noise upon the new proposed development and compares any potential impacts with current to be achieved noise level standards and if deemed required mitigates against any noise levels in excess of such standards.

1.2 Instruction

DKPartnership (DKP) have been commissioned by Gerard Gannon Properties, to carry out the analysis and report for the proposed development at Belcamp, Malahide Road, Dublin 17.

1.3 Development description

The following is a brief summary of the proposed development; "A 10-year planning permission is sought by Gerard Gannon Properties for a proposed Strategic Housing Development on lands at Belcamp Hall (protected structure), Malahide Road, the R139 road and Carr's Lane, Belcamp, Dublin 17. The proposed development will consist of the construction of 2,527 no. residential units comprising houses, apartments and duplex units, 2 no. childcare facilities; 1 no. sports changing facilities building; 3 no. cafés/restaurants; 18 no. retail/commercial units; and all associated engineering and site works necessary to facilitate the development."



2 Executive summary

2.1 Analysis conducted

This report details the potential for noise impacts on the proposed development relating to aircraft noise from Dublin Airport and traffic noise mainly from the R139. Both aircraft and traffic noise impacts were assessed and evaluated against current standards to be achieved using live data and monitoring results obtained from EPA aircraft and traffic noise maps, Dublin Airport monitoring sites and a manual background noise level survey.

2.2 Standards and regulations overview

The following guideline / standards have been applied:

- Fingal development plan 2017-2023
- Dublin Agglomeration Noise Action Plan 2019 – 2023
- ProPG: Planning & Noise Professional Practice Guidance on Planning & Noise
- World health Organisation(WHO). Published External Environmental Noise Guidelines for the European Region
- British Standard BS 8233 Sound insulation and noise reduction for buildings.
- European Environmental Noise Regulations 2018 (S.I. No. 549).
- EPA guide NG4

2.3 Methodology

For compliance against the current guidelines and standards we need to establish the achieved noise levels at the facades of the buildings, the internal ambient noise levels in rooms within those buildings and the external noise levels in proposed amenity spaces. This is achieved by establishing the possible noise sources and then assessing whether the effects of these noise sources on the noise levels at facades, internal rooms and amenity spaces of the new proposed development are within the recommended parameters as set out in the various tables by the WHO /CIBSE / BS8233 and EPA. For this development both aircraft and traffic noise was assumed to be of possible influence and noise data was sourced from 4 no. different sources; Source A was gathered from DAA St Doolaghs noise monitoring station approximately 2km from the proposed site, source B is from the EPA aircraft day time and night time noise mapping, Source C is from the EPA day time and night time traffic noise mapping and source D is from a manual DKP 24 hour background noise survey undertaken December 1st / 2nd 2021.

2.4 Technical analysis

When we assess the noise levels from all data sources A, B, C, D as per sections 5.3, 5.4, 5.5 and 5.6 we note the noise to come from aircraft and traffic. Aircraft noise is coming from the North as a result of the DAA flight path and traffic noise is generated by the M50, R139, East-West link road, and to a lesser degree to North-South link road.

To establish the noise levels at facades and amenity spaces we need to take the average day time and night noise levels from the traffic noise data sets and calculate the resultant noise levels at the relevant facades by subtracting the noise reduction from the source data by applying the inverse square noise reduction law or reduction formula " $L_r = L_w - 20\log_{10}(R2/R1)$ " where L_r is the resultant noise level, L_w is the source noise level, $R1$ is the distance between the survey point and the noise source and $R2$ is the distance between the noise source and receptor (façade or amenity space).

Achieved façade noise levels; The noise levels effecting this particular proposed development are from aircraft noise and traffic noise with the development zoned for this report as zone A (above the East-West link road) exposed to mainly aircraft noise and zone B (below the East-West link road) exposed to mainly traffic noise. The final calculated predicted day time façade noise levels for zone A is 59dB and for zone B between 34.6dB and 48.5dB and predicted night time noise levels for zone A is 54dB and for zone B between 23.6 dB and 43.5dB at the relevant facades as per table 5.3. When we compare these with the noise impact assessment criterion table 4.5 and note that zone A fall in the category B where the noise impact requires to be considered and zone B falls into category "A" where no consideration to noise levels is required.

To mitigate against possible noise nuisance issues noise reduction measures for zone A are applied in the form of a façade and roof noise reduction capability of ≥ 30.5 dB and any permanent or closable ventilation openings or other openings to be fitted with attenuation ≥ 30.5 dB.

Achieved internal ambient room noise levels; The noise levels achieved in internal rooms using a relative low façade noise reduction capability of 30.5 dB to be conservative are for zone A a maximum predicted ambient day time noise level of 28.5dB and maximum night time noise level of 23.5.8dB and for zone B a maximum internal day time ambient



room noise level of 18dB and maximum ambient internal room night time noise level of 13dB. Both zone A and B by using the criterion table 4.2 have resultant ambient internal room noise levels categorised to be “very good”.

Achieved amenity space noise levels; When we assess the final predicted noise levels in the blocks amenity spaces we note the predicted calculated day time noise levels in zone A of between 56dB and 59dB and night time noise levels of between 51dB and 54dB and day time noise levels in zone B of between 48.5dB and 37.7dB and night time noise levels of between 32.7dB and 43.5dB.. Comparing these noise levels for the relevant day time & night time EPA recommended maximum external ambient amenity space noise levels shown in table 4.4 below we note the zone A amenity space day time noise levels to be in excess of the EPA guidelines in the order of 1dB to 4dB and zone B to be below the recommended maximum values. Like wise the same applied for the zone A and B night time levels. We note that the guidelines also take in account lenience to areas of noisier environment like zone A. It is worth considering however to keep the main amenity areas close or South of the East-West link road.

2.5 Conclusion

Based on the above achieved façade, internal ambient and amenity space noise levels we, DKP, are of the opinion that the proposed development is in substantial compliance to the relevant standards and guidelines.

2.6 Recommendations and / or mitigation measures

Zone A mitigation : To ensure the relative high internal ambient noise level standards all permanent and closable openings (ventilation etc) in the façades are to be fitted with sound attenuation in excess of 30.5dB and that all facades & roofs achieve a sound reduction of ≥ 30.5 dB.

Zone B recommendation; Whereas no mitigation measures are required to achieve compliance to the relevant standards we would suggest to give consideration to the following measures to ensure the relative high internal ambient noise level standards all permanent and closable openings (ventilation etc) in the façade directly facing the East-West link road in duplex 2.6, block F, block D, block C, duplex 2.1 , block B and A to be avoided or where they can not be avoided for any reason to be fitted with sound attenuation in excess of 30.5dB.



3 Geographical overview

3.1 Project overview

Image 3.1 the (google arial) site map below indicates the location of the site, approximately outlined.



Image 3.1 Google maps arial view – with approximate proposed development outline and location of FCC section..



4 Approach and methodology

4.1 Guidelines / standards

The following guideline / standards have been applied:

- Fingal development plan 2017-2023
- Dublin Agglomeration Noise Action Plan 2019 – 2023
- ProPG: Planning & Noise Professional Practice Guidance on Planning & Noise
- World health Organisation(WHO). Published External Environmental Noise Guidelines for the European Region
- British Standard BS 8233 Sound insulation and noise reduction for buildings.
- European Environmental Noise Regulations 2018 (S.I. No. 549).
- EPA NG4 guide and noise mapping

We note that despite the Brexit changes to standards or European standards the British Standards continue to be functional and applied for referenced under the Association of Acoustic Consultants of Ireland (AACI). Indeed the current building regulations TGD Part E still refer to BS8233 and BRE documents.

Fingal Development Plan Policy on Aircraft Noise

Fingal County Council's County Development Plan 2017 - 2023 has defined noise zones A-D representing potential site exposure to aircraft exposure, with zone A having the most potential for noise exposure during airport operations. The proposed development site is located in zone C, where the zone is identified as *"Noise sensitive development in this zone is less suitable from a noise perspective than in Zone D. A noise assessment must be undertaken in order to demonstrate good acoustic design has been followed. The noise assessment must demonstrate that relevant internal noise guidelines will be met. This may require noise insulation measures. An external amenity area noise assessment must be undertaken where external amenity space is intrinsic to the development's design. This assessment should make specific consideration of the acoustic environment within those spaces as required so that they can be enjoyed as intended. Ideally, noise levels in external amenity spaces should be designed to achieve the lowest practicable noise level"*.

Dublin Agglomeration Noise Action Plan 2019 – 2023

The Dublin Agglomeration noise action plan (NAP) states the following with respect to assessing the noise impact on new residential development: *"In the scenario where new residential development or other noise sensitive development is proposed in an area with an existing climate of environmental noise, there is currently no clear national guidance on appropriate noise exposure levels. The EPA has suggested in the interim, that Action Planning Authorities should examine planning policy guidance notes, such as ProPG (2017). Such guidance notes have been produced with a view to providing practitioners with guidance on a recommended approach to the management of noise within the planning system."*

ProPG: Planning & Noise Professional Practice Guidance on Planning & Noise

The Professional Practice Guidance on Planning & Noise (ProPG) document was published in May 2017. since its publication it has been generally considered as a best practice guidance and has been widely adopted in the absence of equivalent Irish guidance. The ProPG recommends a risk-based 2-stage approach for evaluating noise exposure on sites for residential development. The two stages of the approach can be summarised as follows:

Stage 1: Comprises a high-level initial noise risk assessment of the proposed site considering either measured and or predicted noise levels

Stage 2: Involves a full detailed appraisal of the proposed development covering four "key elements" that include: Element 1 - Good Acoustic Design Process; Element 2 - Noise Level Guidelines; Element 3 - External Amenity Area Noise Assessment, and; Element 4 - Other Relevant Issues.

World health Organisation(WHO)

The World Health Organisation (WHO) have published in October 2018 Environmental Noise Guidelines for the European Region. These guidelines provide recommendations for protecting human health from exposure to environmental noise from different sources of noise. The guidelines present recommendations for each noise source type in terms of Lden and Lnight levels above which there is risk of adverse health risks.



British Standard BS 8233 Sound insulation and noise reduction for buildings

Internal noise level: BS 8233 sets out recommended internal noise levels for several different building types from external noise sources. The recommended indoor ambient noise levels for residential dwellings are reproduced in Table 4.1

Activity	Location	Day (07:00 to 23:00hrs) dB LAeq,16hr	Night (23:00 to 07:00hrs) dB LAeq,8hr
Resting	Living room	35	-
Dining	Dining room/area	40	-
Sleeping (daytime resting)	Bedroom	35	30

Table 4.1 : Indoor Ambient Noise Levels for Dwellings (BS8233: 2014)

4.2 Maximum recommended room noise level guidelines

The table below shows the maximum recommended noise levels for residential dwellings as published by CIBSE and the world Health Organisation for habitable rooms in different environments as illustrated below;

Room type	Very good / Country	Good / Suburban	Reasonable / Urban	City centre
Bed room	25	30	35	40
Living room	30	35	40	45

Table 4.2: recommended room noise level (dB) in different environments (CIBSE/WHO)

4.3 External noise level

BS 8233 and EPA guide NG4 also provides desirable noise levels for external amenity areas such as gardens, patios and balconies. It states: *“For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB LAeq,T, with an upper guideline value of 55 dB LAeq,T which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.”*

Amenity spaces	Desirable condition	Acceptable conditional in noisier environments
Outdoor gardens, patios, balconies	< 50 dB LAeq,T,	> 50-55 dB LAeq,T

Table 4.3 : External Ambient Noise Levels interpreted from BS 8233

EPA NG4. Noise limits in external dedicated amenity space in NG4 are based on the principle that an NSL *“for its proper enjoyment requires the absence of noise at nuisance levels”*. The EPA sets a daytime limit of 55 dB(A), reducing to 50 dB(A) in the evening and 45 dB(A) at night. See table below.

External space	Day time	Evening time	Night time
Amenity space	55	50	45

Table 4.4 : External Ambient Noise Levels recommended under EPA NG4 guise.

4.4 EPA Ireland noise mapping

The EPA has made available the strategic noise mapping of agglomeration, major airports, major roads and major rail networks, in the form of noise contours for the L_{den} (day, evening, night) and L_{night} (night) periods. A noise map is a graphical representation of the predicted situation with regards to noise in a particular area with different colours representing different noise levels in decibels dB(A). All noise maps are presented in terms of two noise indicators: L_{den} and L_{night} .



4.5 Aircraft Noise metrics

There are a range of noise metrics that can be used to describe and manage aircraft noise. Some of these noise metrics are used to help develop policies and describe overall exposure to noise, namely Leq noise metrics. These noise metrics describe the 'equivalent continuous sound level' and are a measure of the average sound energy over time. Whilst these are often described as 'an average' it is important to note that these allow comparison of the total amount of noise exposure in one location as opposed to another, the key noise metrics used in policy are the Lden and Lnight which are equivalent sound level (Leq) noise metrics.

- L_{den} is the day-evening-night noise indicator and it represents the noise indicator for overall annoyance. It is 'weighted' to account for extra annoyance in the evening and night periods. The Environmental Noise Directive defines an L_{den} threshold of 55 dB for reporting on the numbers of people exposed.
- L_{night} is the night time noise indicator and is used in the assessment of sleep disturbance. An L_{night} threshold of 50 dB is defined for reporting on the numbers of people exposed. These indicators are based on year long averages of the day (07:00-19:00), evening (19:00-23:00) and night (23:00-07:00) time periods.

4.6 Background noise criterion at facades of residential receptors

The table below shows the different noise categories as published by BS8233-“Guidance on sound insulation and noise reduction for buildings” in residential area's for the day time and night time periods with the relevant assessment criterion.

Background noise	7.00-23.00 L_{den} / L_{AEQ16}	23.00-7.00 L_{night} / L_{AEQ8}	Assessment / Action.
Cat “A”	≤ 55 dB	≤ 45 dB	Noise need not to be considered
Cat “B”	55 – 66 dB	45 – 59 dB	Noise impact need to be considered
Cat “C”	66 – 72 dB	59 – 66 dB	Noise impact mitigation need to be considered
Cat “D”	> 72 dB	> 66 dB	Unless quieter sites are not available residential use is not recommended

Table 4.5: Background noise criterion at facades of buildings

4.7 Predicted noise nuisance complaints

The table below shows the predicted level of compliant for residential dwellings as a result of exceeding the particular sound level. This table is an appraisal in term of both the margin of excess above the measured back ground noise and existing sound environment which may already have a high ambient or residual sound level. It should also be noted that not all differences or impacts lead to complaints and that not every complaint is proof of an adverse impact.

Level over the back ground noise	Compliant indication
10 dB or more	Likely to cause noise nuisance complaints
5 dB	May give rise to some extend of noise nuisance complaints
0 dB	Unlikely to give rise to noise nuisance complaints

Table 4.6: predicted level of compliant for residential dwellings



5 Development site current noise environment assessment

5.1 Site location

The proposed development site at Belcamp is located off the Malahide Road in Balgriffin in the northern suburbs of Dublin. Balgriffin lies within southern Fingal in the traditional County Dublin and it is partly in the jurisdiction of Dublin City Council and partly that of Fingal County Council, situated approximately 8km from Dublin city centre. The site is approximately 7km from Dublin Airport. Fingal County Council's County Development Plan 2017 - 2023 has defined noise zones A-D, with zone A having the most potential for noise exposure during airport operations. The proposed development site is located in zone C, where the zone is identified as 'A noise assessment must be undertaken in order to demonstrate good acoustic design has been followed. The noise assessment must demonstrate that relevant internal noise guidelines will be met. An external amenity area noise assessment must be undertaken where external amenity space is intrinsic to the development's design'.

5.2 Noise monitoring data

Noise data for the development site was obtained from a number of sources. Source A was gathered from DAA noise monitoring data, source B is from the EPA aircraft noise mapping, Source C is from the EPA traffic noise mapping and source D is from a manual DKP background noise survey undertaken December 1st / 2nd 2021.

5.3 Source A) St. Doolaghs results

Dublin Airport have recently installed a noise monitoring system to ensure minimum disruption to the local community and to challenge deviations when they occur through an investigation process with the IAA and the airlines in question. This system is comprised of a number of fixed monitoring locations. In relation to Belcamp development site, St. Doolaghs Monitoring station is located the nearest, approximately 2km from the proposed development site. Results have been examined in the next section.

DAA publish half yearly reports on monitoring stations, the years 2017-2021 are available for public information. Summary of St. Doolaghs noise monitoring data is presented in table 5.1 showing the different noise events types, namely the percentage of noise in either, weather, human activity of aircraft related events. The impact of the national lockdown can be seen in the data for the year 2020/1 with a drop in aircraft noise recordings. Depending on the season, weather events have a significant input also.

Month / Year	Daytime noise level $L_{Aeq,16h}$ (dB)		Night-time noise level $L_{Aeq,8h}$ (dB)	
	Total	Aircraft	Total	Aircraft
07/12/2017	59.9	59	53.4	52.3
01/06/2018	61.1	60.5	56.5	54.9
07/12/2018	61.9	61.1	54.5	56.5
01/06/2019	62.2	61.2	57.9	56.3
07/12/2019	62.2	61.4	57.8	57
01/06/2020	59.9	58.1	55.5	53.1
07/12/2020	56.9	55	54.2	52.6
01/03/2021	56.7	52.6	55.3	52.2
04/06/2021	55.1	52.8	53.7	51.8

Table 5.1 summarizes the average measured noise levels at St. Doolaghs (Daytime noise level $L_{Aeq,16h}$ and Night-time noise level $L_{Aeq,8h}$).

St. Doolaghs Noise Measurement Overview:

During daytime periods average daytime noise levels were in the range 55.1 to 62.2dB L_{den} and average night-time background noise levels were in the range 54.3 to 57.9dB L_{night} .

5.4 Source B) EPA aircraft noise map:

EPA noise contour maps: EPA noise contour maps available show L_{den} and L_{night} contours. L_{night} is the A-weighted long-term average sound level for the night time period (23.00 to 07.00). L_{den} – is the A-weighted long-term average sound level for the day-evening-night noise indicator in decibels (24 hours). All data has been taken from the EPA Mapping website.



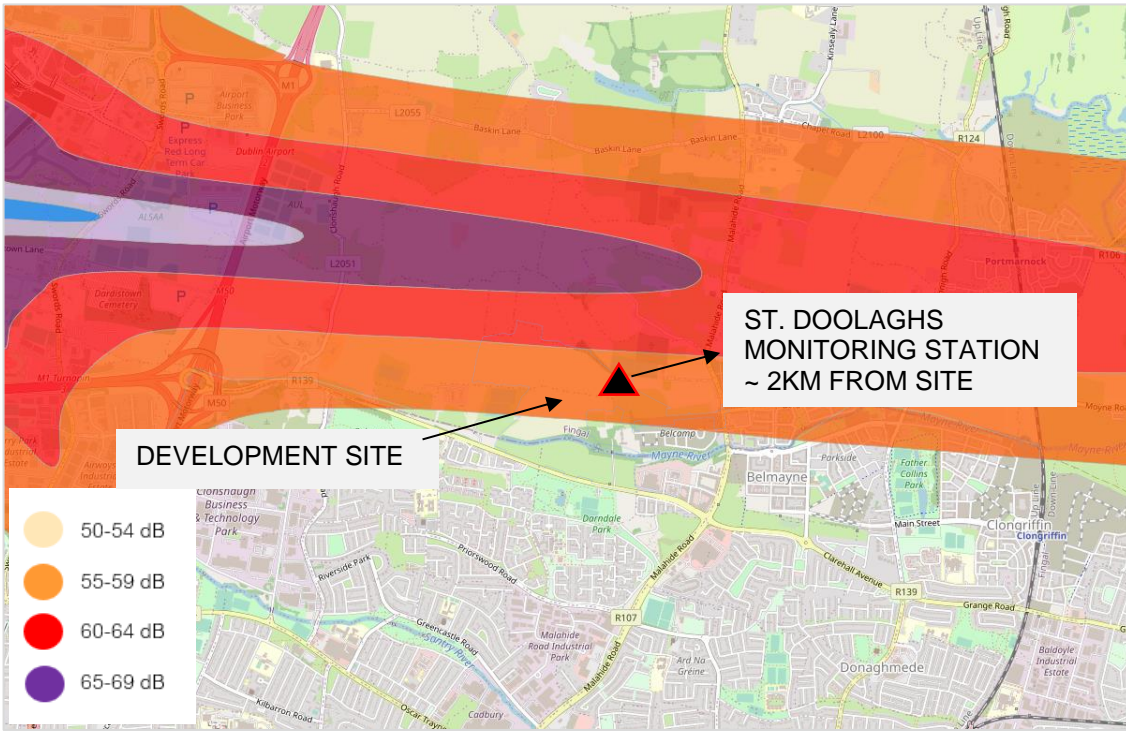


Image 5.1 EPA airport noise map – Lden Day time 07.00 – 23.00 noise map

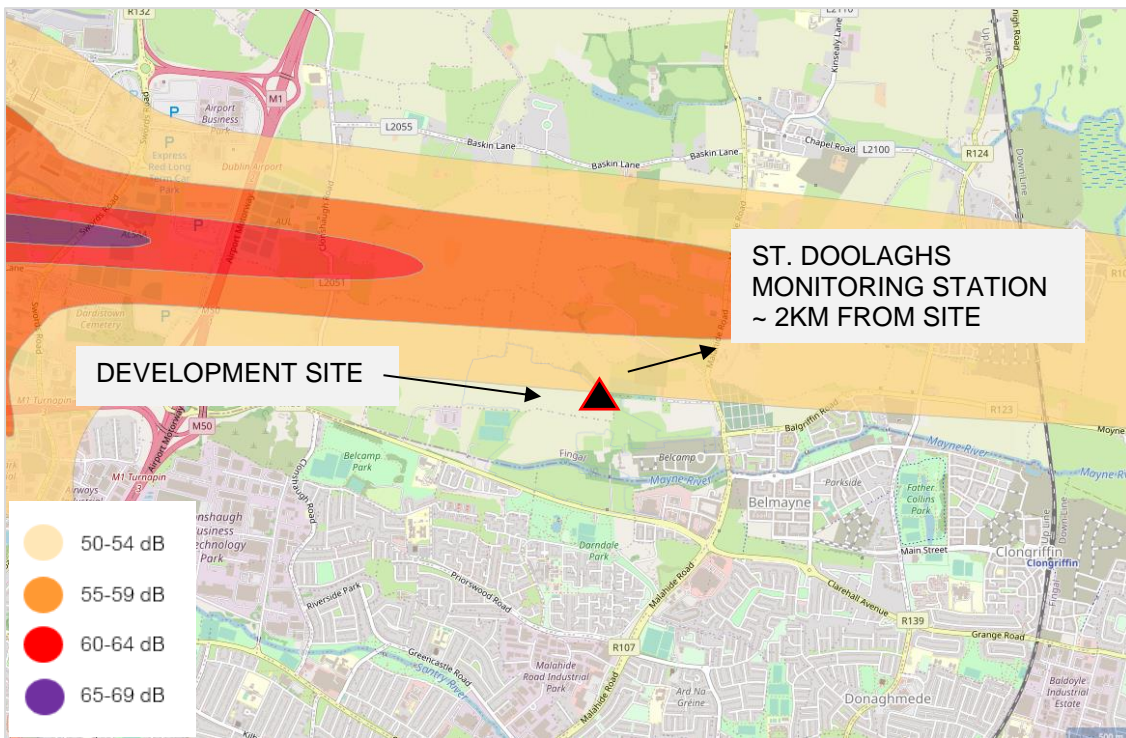


Image 5.2 EPA airport noise map – Lnight Night time 23.00 – 07.00 noise map

From the aircraft noise maps we note the daytime periods average daytime noise levels for the development site to be in the range of 55-59dB Lden. The average night-time background noise levels for most of the site will be in range of 45-54dB Lnight.



5.5 Source C) EPA traffic noise map

EPA noise contour maps: EPA noise contour maps available show Lden and Lnight contours. Lnight is the A-weighted long-term average sound level for the night time period (23.00 to 07.00). Lden – is the A-weighted long-term average sound level for the day-evening-night noise indicator in decibels (24 hours). All data has been taken from the EPA Mapping website.

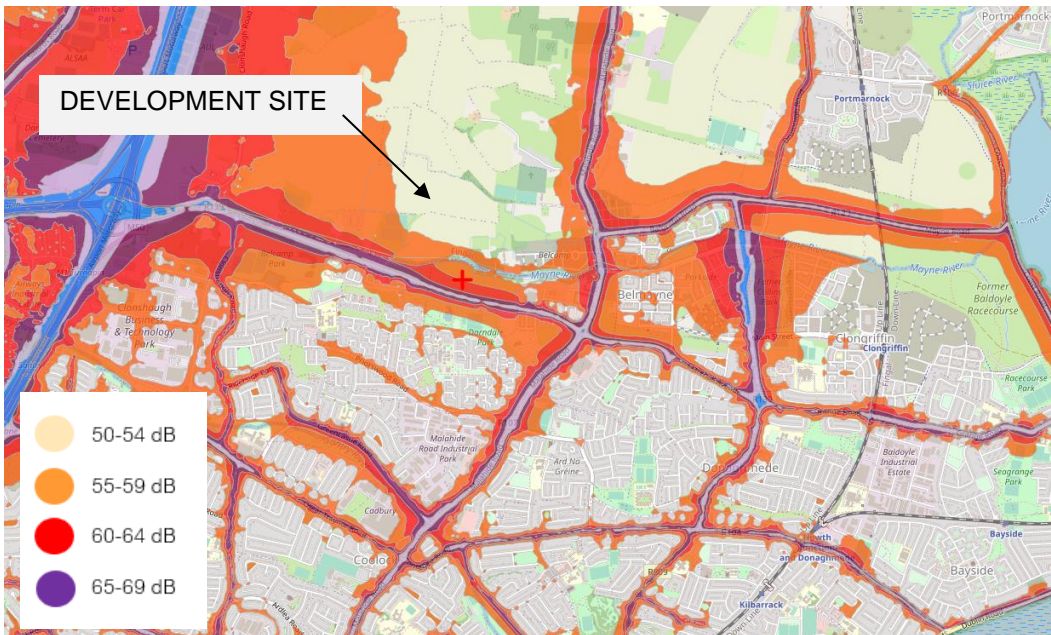


Image 5.3 EPA road noise map – Lden Day time 07.00 – 23.00 noise map

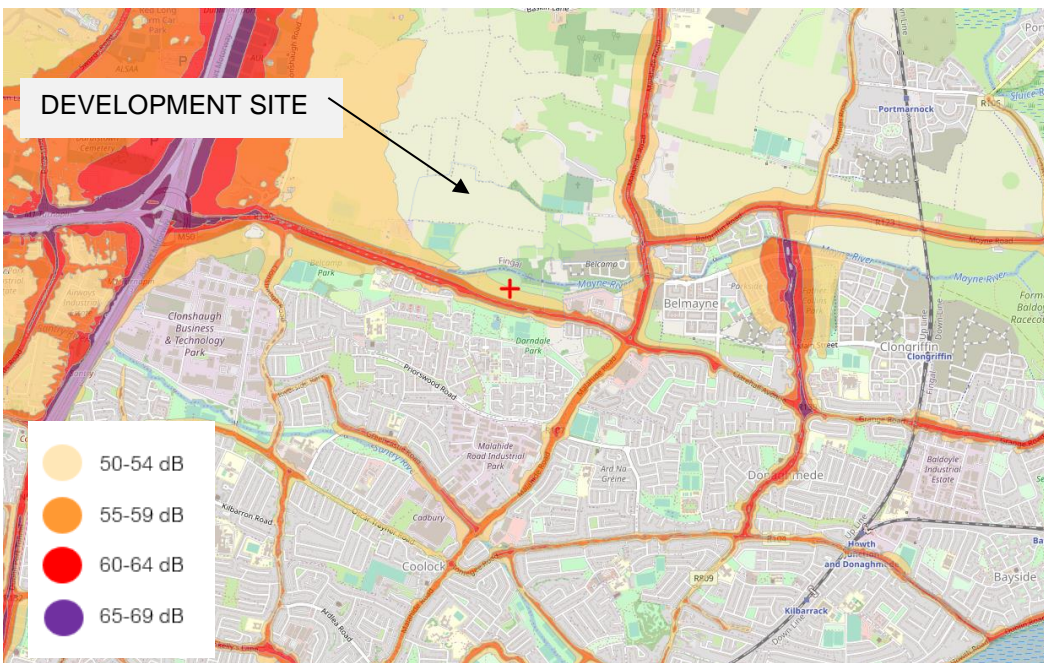


Image 5.4 EPA road noise map – Lnight Night time 23.00 – 07.00 noise map

From the traffic noise maps we note the daytime periods average daytime noise levels for the greater part of the development site to be in the range of 50-54dB Lden. Average night-time background noise levels are in the range of 40-45dB Lnight.



5.6 Source D) Background noise survey data

To assess the surrounding back ground noise levels, a daytime back ground noise survey was carried out on December 1st and 2nd 2021 outside the covid lockdown period. During the survey the station was monitored and consecutive 15-minute measurements were recorded during the period from 07:00 to 7:00. See image 5.3 for receptor locations (arial view). The station was approximately 3.0m from the road edge.



Image 5.5 : Google arial view of receptor location of background noise study. ● Approximate survey point location.

The measurements taken are deemed to be representative of typical noise levels on the relevant roads. The measurements have been performed using a Bruel & Kjaer Type 2260 sound level meter and Bruel & Kjaer 4231 sound level calibrator. All measurements were carried out in accordance with ISO 1996: 'Acoustics-Description and measurement of environmental noise'. Weather conditions during the survey were in line with the conditions described within ISO 1996, Acoustics 'Description and Measurements of Environmental Noise'. Weather conditions were rainy and cool with a moderate wind. The following environmental noise parameters were measured which are defined below.

- LAeq is the A-weighted equivalent continuous steady sound level during the measurement period and effectively represents an average ambient noise value.
- LAmax is the maximum A-weighted sound level measured during the measurement period.
- LAmin is the minimum A-weighted sound level measured during the measurement period.
- LA10 is the A-weighted sound level that is exceeded for 10% of the sample period; this parameter is typically used to quantify traffic noise.
- LA90 is the A-weighted sound level that is exceeded for 90% of the sample period; this parameter is typically used to quantify background noise.

Background Noise Measurement Overview:

During daytime periods average background noise levels were in the range 60.1 and 72.0dB LAeq and average night time background noise levels were in the range 54.5 to 56.3dB LAeq. The back ground survey measurements are indicating that most of the measured noise levels would have arisen from traffic noise. See table below.

The following table is the measured and calculated (average) background noise levels from the monitoring location.

Station 2						R139
Time	LAeq	LAmx	LAmn	LA10	LA90	Comments
3	54.5	50.4	55.3	56.1	53.5	Main artery road Mainly general traffic noise with occasional lorry for construction site Laeq Avg 23.00 hr : 7.00 hr = 55.5 dB Laeq Avg 7.00 hr : 23.00 hr = 66.5 dB Laeq Avg = 65.3 dB
5	55.7	54.0	58.2	59.6	57.1	
7	62.6	72.0	58.2	70.1	59.5	
9	69.5	82.8	66.4	79.9	65.4	
11	66.4	76.3	64.0	73.6	58.3	
13	72.0	79.9	65.2	74.3	66.6	
17	71.4	81.3	65.8	73.6	66.0	
21	63.9	64.8	59.4	68.0	60.7	
23	60.1	62.6	57.1	65.2	57.1	
1	56.3	56.2	55.9	61.7	53.5	
Avg	65.3	72.0	61.5	70.8	60.9	

Table 5.2: R139 Site monitoring results

5.7 Noise source prediction at / in the development site

When we assess the noise levels from all data sources A, B, C, D as per sections 5.3, 5.4, 5.5 and 5.6 we note the aircraft noise to be the most prominent noise source for this development and in particular the most northern element of the FCC lands. Traffic noise will also be a factor as a result of the new proposed new main artery road the East-West link road which is an extension of the Balgriffin road from the Malahide road cross.

5.8 Noise levels at the facades

The noise levels of the facades of the new proposed development are subject to noise exposure at different levels pending the location of a receptor in relation to either aircraft noise or traffic noise. We have, for this report, zoned the particular areas into 2 zones reflecting there respective exposure. Zone A is the area north of the East-West link road and zone B is the area South of the East link road. Zone A has predominant exposure from aircraft noise as a result of its distance to the DAA flight path and Zone B is predominantly subject to traffic noise from the R139, The East-West link road and the local circulation.

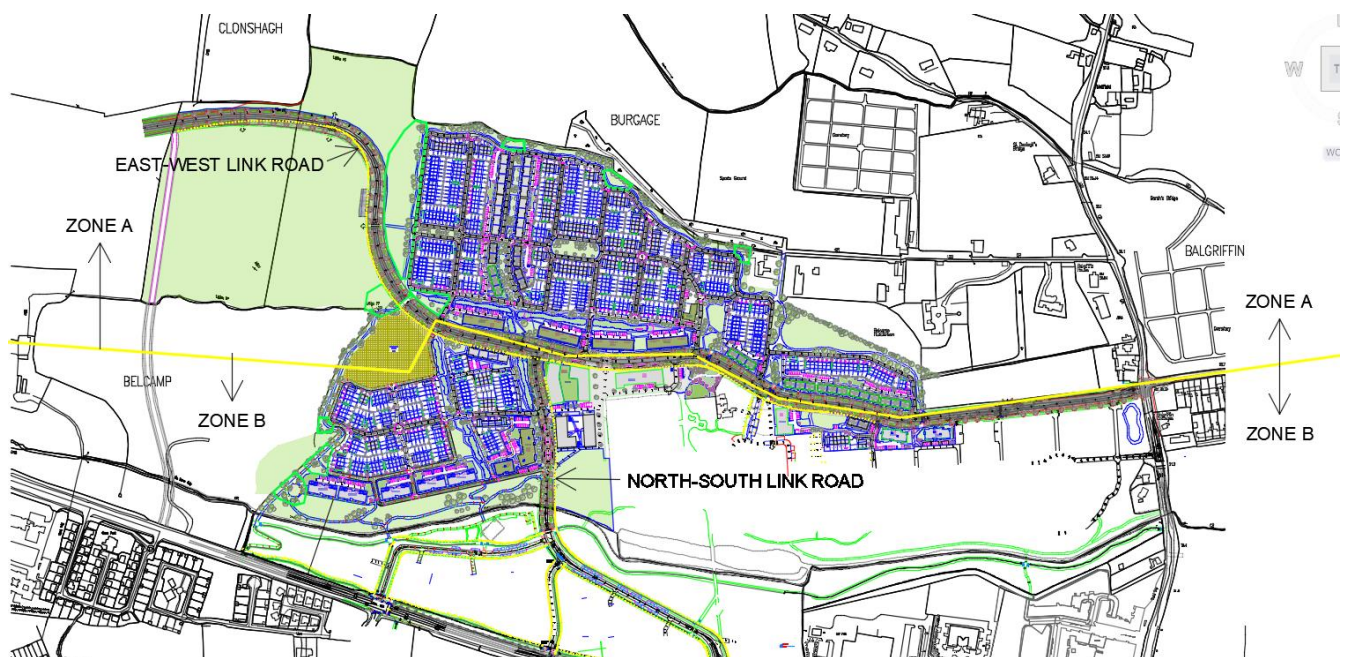


Image 5.6 : Architects site layout with noise zones A and B and East-West link road and North-South link road



Zone A has day time exposure from aircraft noise in the range of 55-59dB L_{den} and average night-time background noise levels ranging from 45-54dB L_{night} .

Zone B has day time exposure from traffic noise from the West from the M50 in the range of 50-54dB L_{den} , from the South from the R139 in the range of 60 to 72dB and from the North and East from the East-West link road / North-South link road in the estimated range of 55 to 59 range. Zone B has night time exposure from traffic noise from the M50 in the range of 40-45dB L_{den} , from the R139 in the range of 54 to 56dB and from the East-West link road / North-South link road of an estimated range of 50 to 54 range.

Each noise source is a certain distance from the relevant receptor resulting in a reduction in noise level calculated using the inverse square reduction law formula " $L_r = L_w - 20\log_{10}(R2/R1)$ " where L_r is the resultant noise level, L_w is the source noise level, $R1$ is the distance between the survey point and the noise source and $R2$ is the distance between the noise source and receptor (façade or amenity space).

The table below details the final predicted & calculated noise levels at the relevant facades.

The table below details the day time L_{den} & night time L_{night} noise source levels, the relevant distances from the source to the receptors and the final calculated day time and night time noise levels at the relevant facades.

Final noise levels at facades.

Location	Source	Source L_{den} dB	Source L_{night} dB	Distance m min max	Reduction	Exposure	Exposure
					L_{den} / LAEQ16 dB	L_{den} / LAEQ16 dB	L_{night} / LAEQ8 dB
Zone A	Aircraft	59	54	0	0.0	59.0	54.0
Zone B South (139)	R139	72	56	125	32.4	39.6	23.6
Zone B West (M50)	M50	59	54	50	24.4	34.6	29.6
Zone B house East	North-South link rd	59	54	35	21.3	37.7	32.7
Zone B Duplex 1.1	East-West link rd	59	54	10	10.5	48.5	43.5
Zone B houses North	East-West link rd	59	54	22	17.3	41.7	36.7

Table 5.3 Predicted noise levels at facades of proposed development.

Note that all façade exposure noise levels are calculated using "free range" noise reduction only meaning that any obstacles (trees, vegetation, fencing, screening, other buildings/blocks, etc or direction of sound have not been taken in account and would lower the actual façade exposure to some degree.

5.9 New development façade noise impact assessment criterion

To determine any possible actions from the predicted day time façade noise levels for zone A of 59dB and for zone B between 34.6dB and 48.5dB and predicted night time noise levels for zone A at 54dB and for zone B between 23.6 dB and 43.5dB at the relevant facades as per table 5.3 we compare these with the noise impact assessment criterion table 4.5 and note that zone A fall in the category B where the noise impact requires to be considered and zone B falls into category "A" where no consideration to noise levels is required.

Background noise	7.00-23.00 L_{den} / L_{AEQ16}	23.00-7.00 L_{night} / L_{AEQ8}	Assessment / Action.
Cat "A"	<= 55 dB	<= 45 dB	Noise need not to be considered
Cat "B"	55 – 66 dB	45 – 59 dB	Noise impact need to be considered
Cat "C"	66 – 72 dB	59 – 66 dB	Noise impact mitigation need to be considered
Cat "D"	> 72 dB	> 66 dB	Unless quieter sites are not available residential use is not recommended

Table 4.5: Background noise criterion at facades of buildings

To mitigate against possible noise nuisance issues noise reduction measures for zone A are applied in the form of a façade and roof noise reduction capability of ≥ 30.5 dB and any permanent or closable ventilation openings or other openings to be fitted with attenuation ≥ 30.5 dB.



5.10 Façade noise reduction capability

To predict the internal habitable room ambient noise levels we have to ascertain the noise reduction capability of the façade. The new proposed development will be of modern construction and as part of the new building regulations and in particular Part L requirements will need to have a high level airtightness standard giving the construction a relative high noise reduction capability. For this report we have applied a “low” 30.5dB noise reduction capability for zone A and B in order to be conservative.

Type	Solid external walls	Glazing	Façade average	Comments
Noise reduction capability good	> 55 dB	40 dB	40.5 dB	
Noise reduction capability standard	> 50 dB	35 dB	35.5 dB	
Noise reduction capability low	> 45 dB	30 dB	30.5 dB	Applied for zone A and B

Table 5.4: Noise reduction capability of a modern façade.

5.11 Predicted ambient noise levels in habitable rooms

The resultant internal ambient room noise levels shown in the table below are the results of the façade exposure noise levels from table 5.3 minus the noise reduction of the façade taken at 30.5 dB to be conservative.

Location	Source	Source Lden dB	Source Lnight dB	Façade reduction db	Internal day time noise level dB	Internal night time noise level dB
Zone A	Aircraft	59.0	54.0	30.5	28.5	23.5
Zone B South (139)	R139	39.6	23.6	30.5	9.1	0.0
Zone B West (M50)	M50	34.6	29.6	30.5	4.1	0.0
Zone B house East	North-South link Rd	37.7	32.7	30.5	7.2	2.2
Zone B Duplex 1.1 North	East-West link rd	48.5	43.5	30.5	18.0	13.0
Zone B houses North	East-West link rd	41.7	36.7	30.5	11.2	6.2

Table 5.5 Final predicted internal ambient room noise levels.

From the table above we note the Zone A internal day time ambient room noise levels to be maximum 28.5dB and predicted ambient internal room night time noise level to be maximum 23.5.8dB and Zone B internal day time ambient room noise levels to be maximum 18dB and predicted ambient internal room night time noise level to be maximum 13dB.

5.12 New development ambient internal room noise level criterion

When we assess the final predicted ambient noise levels we note the internal day time ambient room noise levels to be maximum 23.5dB and predicted ambient internal room night time noise level to be maximum 23.5dB as per table 5.5. Using the criterion table 4.2 below we note the final resultant ambient internal room noise levels to be “very good”.

Room type	Very good / Country	Good / Suburban	Reasonable / Urban	City centre
Bed room	25	30	35	40
Living room	30	35	40	45

Table 4.2: recommended room noise level (dB) in different environments (CIBSE/WHO)



5.13 Predicted noise levels in the main amenity spaces

For this assessment we selected 6 no amenity spaces, 3 no. in zone A and 2 no. in zone B. Zone A for the greater part is subject to aircraft noise coming from the North and zone B is subject to mainly traffic noise from surrounding road ways.

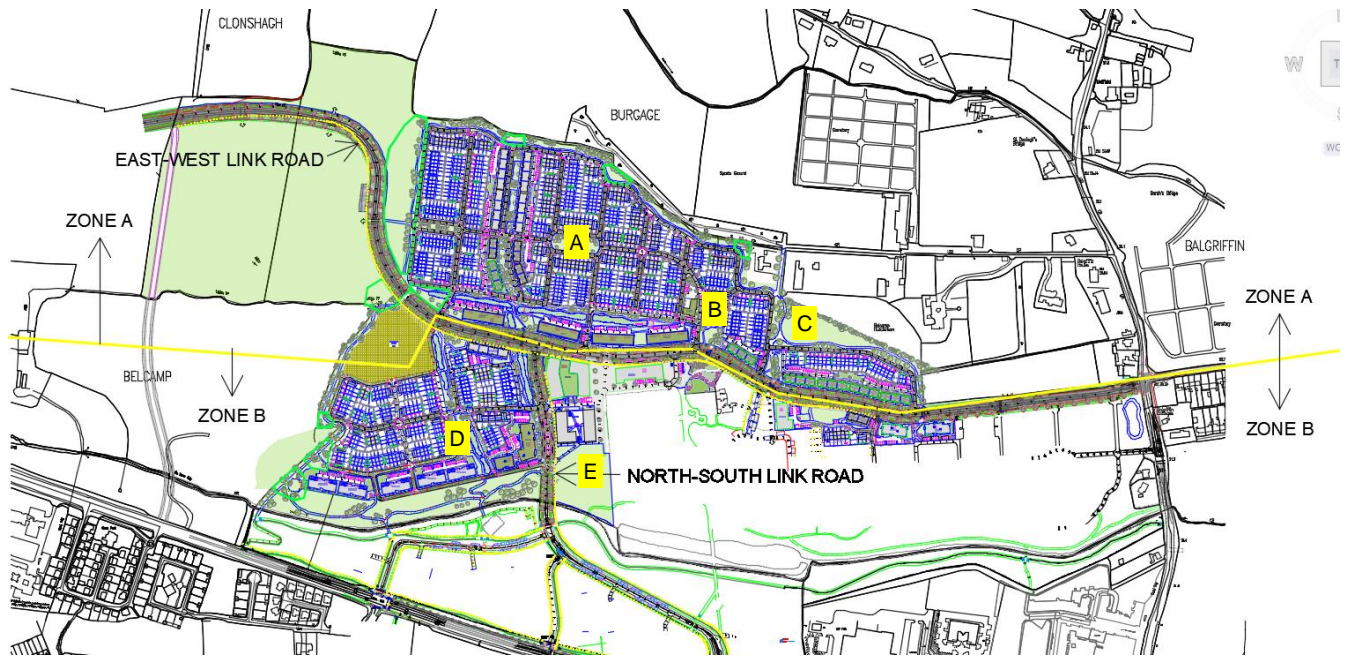


Image 5.7 : Architects site layout with amenity spaces A,B,C,D and E locations.

Location	Source	Source Lden dB	Source Lnight dB	Distance m min max	Reduction Lden / LAEQ16 dB	Exposure Lden / LAEQ16 dB	Exposure Lnight / LAEQ8 dB
Amenity space A	Aircraft	59.0	54.0	0	0.0	59.0	54.0
Amenity space B	Aircraft	57.0	52.0	0	0.0	57.0	52.0
Amenity space C	Aircraft/traffic	56.0	51.0	0	0.0	56.0	51.0
Amenity space D	Traffic	59.0	54.0	35	21.3	37.7	32.7
Amenity space E	Traffic	59.0	54.0	10	10.5	48.5	43.5

Table 5.6 Final predicted external amenity space noise levels.

5.14 Predicted noise levels in the main amenity spaces assessment

When we assess the final predicted noise levels in the blocks amenity spaces we note the predicted calculated day time noise levels in zone A of between 56dB and 59dB and night time noise levels of between 51dB and 54dB and day time noise levels in zone B of between 48.5dB and 37.7dB and night time noise levels of between 32.7dB and 43.5dB.. Comparing these noise levels for the relevant day time & night time EPA recommended maximum external ambient amenity space noise levels shown in table 4.4 below we note the zone A amenity space day time noise levels to be in excess of the EPA guidelines in the order of 1dB to 4dB and zone B to be below the recommended maximum values. Like wise the same applied for the zone A and B night time levels.

We note that these are guidelines and not standards and that some lenience is given to areas of noisier environment like zone A. It is worth considering however to keep the main amenity areas close or South of the East-West link road.



External space	Day time	Evening time	Night time
Amenity space	55	50	45

Table 4.4 : External Ambient Noise Levels recommended under EPA NG4 guise.

We note that all amenity space noise levels are calculated using “free range” noise reduction only meaning that any obstacles (trees, vegetation, fencing, screening, other buildings/blocks, etc or direction of sound have not been taken in account and would lower the final predicted noise levels.

5.15 Conclusion

Noise source data : For this development we used noise data sets source from various aircraft and traffic sources. Source A was gathered from DAA St Doolaghs noise monitoring station approximately 2km from the proposed site, data, source B is from the EPA aircraft day tome and night time noise mapping, Source C is from the EPA day time and night time traffic noise mapping and source D is from a manual DKP 24 hour background noise survey undertaken December 1st / 2nd 2021.

Noise level criterion to achieve; For this report we targeted the final predicted noise levels at the relevant building facades with maximum recommended noise levels given by the WHO/CIBSE/EPA and also by using the façade noise level exposure to establish the final internal ambient room noise levels. Secondly a separate analysis was conducted on the external noise levels in provided amenity space with maximum recommended noise levels given by the EPA.

Achieved façade noise levels; The noise levels effecting this particular proposed development are from aircraft noise and traffic noise with the development zoned for this report as zone A (above the East-West link road) exposed to mainly aircraft noise and zone B (below the East-West link road) exposed to mainly traffic noise. The final calculated predicted day time façade noise levels for zone A is 59dB and for zone B between 34.6dB and 48.5dB and predicted night time noise levels for zone A is 54dB and for zone B between 23.6 dB and 43.5dB at the relevant facades as per table 5.3. When we compare these with the noise impact assessment criterion table 4.5 and note that zone A fall in the category B where the noise impact requires to be considered and zone B falls into category “A” where no consideration to noise levels is required.

To mitigate against possible noise nuisance issues noise reduction measures for zone A are applied in the form of a façade and roof noise reduction capability of ≥ 30.5 dB and any permanent or closable ventilation openings or other openings to be fitted with attenuation ≥ 30.5 dB.

Achieved internal ambient room noise levels; The noise levels achieved in internal rooms using a relative low façade noise reduction capability of 30.5 dB to be conservative are for zone A a maximum predicted ambient day time noise level of 28.5dB and maximum night time noise level of 23.5.8dB and for zone B a maximum internal day time ambient room noise level of 18dB and maximum ambient internal room night time noise level of 13dB. Both zone A and B by using the criterion table 4.2 have resultant ambient internal room noise levels categorised to be “very good”.

Achieved amenity space noise levels; When we assess the final predicted noise levels in the blocks amenity spaces we note the predicted calculated day time noise levels in zone A of between 56dB and 59dB and night time noise levels of between 51dB and 54dB and day time noise levels in zone B of between 48.5dB and 37.7dB and night time noise levels of between 32.7dB and 43.5dB.. Comparing these noise levels for the relevant day time & night time EPA recommended maximum external ambient amenity space noise levels shown in table 4.4 below we note the zone A amenity space day time noise levels to be in excess of the EPA guidelines in the order of 1dB to 4dB and zone B to be below the recommended maximum values. Like wise the same applied for the zone A and B night time levels. We note that the guidelines also take in account lenience to areas of noisier environment like zone A. It is worth considering however to keep the main amenity areas close or South of the East-West link road.

Based on the above achieved façade, internal ambient and amenity space noise levels we, DKP, are of the opinion that the proposed development is in substantial compliance to the relevant standards and guidelines.



5.16 Recommendations and / or mitigation measures

Zone A mitigation : To ensure the relative high internal ambient noise level standards all permanent and closable openings (ventilation etc) in the façades are to be fitted with sound attenuation in excess of 30.5dB and that all facades & roofs achieve a sound reduction of ≥ 30.5 dB.

Zone B recommendation; Whereas no mitigation measures are required to achieve compliance to the relevant standards we would suggest to give consideration to the following measures to ensure the relative high internal ambient noise level standards all permanent and closable openings (ventilation etc) in the façade directly facing the East-West link road in duplex 2.6, block F, block D, block C, duplex 2.1 , block B and A to be avoided or where they can not be avoided for any reason to be fitted with sound attenuation in excess of 30.5dB.

