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Noise Impact Assessment

LRD at Tyrells Road, Ardan / Puttaghan, Tullamore, Offaly

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16/12/2022	Draft	Draft report for review and comments
01/02/2023	Final	For planning

1 Introduction

This Noise Impact Assessment has been prepared for a proposed Large Scale Residential Development at Tyrell's road, Ardan/Phuttagan, Tullamore, Co Offaly.

The subject site is situated south of the N52; this is the primary noise source under consideration in this report. iAcoustics have undertaken a baseline noise survey at the development location to quantify the existing impact of road traffic noise. Using predictive modelling, the noise levels across the development have been calculated. Best practice guidance has been followed in developing an Acoustic Design Statement (ADS) to ensure that future residents are protected from adverse noise impacts indoors and in outdoor amenity areas.

1.1 Development Description

Application for planning permission for the demolition of existing buildings and the construction of Large scale Residential Development comprising 148 dwellings which will consist of: 90no. houses (comprising 08 no. 2 bedroom houses, 58 no. 3 bedroom houses and 24 no. 4 bedroom houses. 89 no. of the houses are 2 storey with 1 no. 3 bed bungalow); 20 dwelling apartments (comprising 4 no. 1 bed units and 16 no. 2 bed units over 4 storeys); 38 no. age friendly assisted living units (comprising of 28 no. 1 bed units and 10 no. 2 bed units with associated communal and administrative facilities); a Creche; and all ancillary site development works including access, roads and footpaths, landscaping and boundary treatments, public and private open space areas, car parking, bicycle parking, ESB substations, bin and bicycle stores, replacement waste water pumping station and drainage connections; and all ancillary site development works on land at Wellwood Housing site.

Figure 1-1 Site Layout Plan, refer to PL003

2 Relevant Standards & Guidance

2.1 Environmental Noise Regulations in Ireland

The European Union's (EU) Environmental Noise Directive (END; 2002/49/EC) deals with environmental noise from major transport infrastructure, including roads, railways and airports (EC, 2002). The END requires EU Member States, including Ireland to:

I. Establish the scale of the noise problem by preparing 'strategic noise maps' for major roads, railways, airports, agglomerations and industry, and;
II. Develop action plans to reduce the level of noise where necessary and to maintain environmental noise quality where it is good.

END is transposed into Irish law as S.I. No. 549/2018 - European Communities (Environmental Noise) Regulations 2018.

2.2 Offaly County Council Noise Action Plan 2018 - 2023

Under the Environmental Noise Regulations 2018, Offaly County Council is a designated body for preparing a Noise Action Plan. The key objective of the Offaly Noise Action Plan 2018-2023 is to avoid, prevent and reduce, where necessary, on a prioritised basis, the harmful effects, including annoyance, arising from long-term exposure to environmental noise. There are no noise limits or target criteria proposed for new residential development. Hence, the criteria provided by the WHO shall be assumed. This report shall consider the aims and objectives of the Noise Action Plan; specifically, we will:

- Identify areas of desirable low sound levels & undesirable high sound levels throughout the scheme;
- Assess measures to protect areas of desirable low sound levels and advise on their implementation;
- Identify mitigation measures to reduce the noise impact in areas of undesirable high sound levels.

2.3 World Health Organisation (WHO) *Guidelines for Community Noise* 1999

The WHO drafted the Guidelines for Community Noise (1999) as a response to the need for action on community noise. The document is widely referenced throughout the industry for assessing acoustics for residential developments.

- For 'outdoor living areas', a daytime limit of $L_{Aeq,16hr}$ 55dB to safeguard against the likelihood of 'serious annoyance'. A second daytime limit of $L_{Aeq,16hr}$ 50dB is also given as a 'moderate annoyance' threshold.
- For 'internal living areas', a level of $\leq L_{Aeq,16hr}$ 35dB is desirable to maintain reasonable speech intelligibility indoors and prevent moderate annoyance during day and evening times.
- A night-time threshold value of $L_{Aeq,8hr}$ 30dB should not be exceeded *indoors* in the interest of preventing adverse effects of sleep. It follows that an internal level of $L_{Aeq,T}$ 30dB is equivalent to a façade level of $L_{Aeq,T}$ 45dB for continuous, steady noise (assuming a partially open window provides 15 dB's of reduction).

- When the background noise is low, single noise events exceeding 45dB L_{AFmax} inside bedrooms at night-time should be limited.

It should be noted that the WHO guideline values are not intended as noise limits. The WHO guideline values are evidence-based public health oriented recommendations to serve as the basis for policy-making processes.

2.4 BS 8233:2014' *Guidance on sound insulation and noise reduction for buildings'*

This British Standard provides guidance for the control of noise in buildings. The Standard defines upper limits for internal ambient noise levels in habitable areas of a home; these values are outlined in Table 2-1. Note, these are the same values set out by the WHO.

Activity	Location	07:00 – 23:00	23:00 – 07:00
Resting	Living Room	$L_{Aeq,16hr}$ 35dB	-
Dining	Dining Room	$L_{Aeq,16hr}$ 40dB	-
Sleeping	Bedroom	$L_{Aeq,16hr}$ 35dB	$L_{Aeq,8hr}$ 30dB

Table 2-1 BS 8233:2014 guidance on internal ambient noise levels in dwellings

BS 8233:2014 adds that where a development is considered necessary or desirable, "*the internal target levels may be relaxed by up to 5dB and reasonable internal conditions be achieved*". This relaxation is also noted in the World Health Organisations' *Guidelines for Community Noise* (1999).

2.5 Environmental Noise in the Planning Process

The National Planning Framework (2018) lists noise management as one of its Environment and Sustainability Goals for creating a clean environment for a healthy society. The Framework lists National Policy Objective 65 as follows,

> *"Promote the pro-active management of noise where it is likely to have significant adverse impacts on health and quality of life and support the aims of the Environmental Noise Regulations through national planning guidance and Noise Action Plans."*

The National Planning Framework will support:

- Noise Management and Action Planning

Measures to avoid, mitigate, and minimise or promote the pro-active management of noise, where it is likely to have significant adverse impacts on health and quality of life, through strategic noise mapping, noise action plans and suitable planning conditions.

- Noise, Amenity and Privacy

This includes but is not limited to, good acoustic design in new developments, in particular residential development, through a variety of measures such as setbacks and separation between noise sources and receptors, good acoustic design of buildings, building orientation, layout, building materials and noise barriers and buffer zones between various uses and thoroughfares.

- Quiet Areas

The further enjoyment of natural resources, such as our green spaces, through the preservation of low sound levels or a reduction in undesirably high sound levels, is particularly important for providing respite from high levels of urban noise. As part of noise action plans, an extra value placed on these areas, in terms of environmental quality and the consequential positive impact on quality of life and health, due to low sound levels and the absence of noise, can assist in achieving this.

2.6 ProPG Planning & Noise (2017)

The Professional Guidance on Planning & Noise (ProPG) was developed to provide acoustic practitioners with guidance on a recommended approach to the management of noise within the planning system in the UK. ProPG has been widely adopted in Ireland in the absence of an Irish equivalent.

This ProPG encourages a systematic, proportionate, risk-based, 2-stage, approach. The approach encourages early consideration of noise issues, facilitates straightforward accelerated decision making for lower-risk sites and assists proper consideration of noise issues where the acoustic environment is challenging. The two sequential stages of the overall approach are:

I. Stage 1 – an initial noise risk assessment of the proposed development site; and
II. Stage 2 – a systematic consideration of four key elements.

The four key elements to be undertaken in parallel during Stage 2 of the recommended approach are:

I. Element 1 – demonstrating a "Good Acoustic Design Process";
II. Element 2 – observing internal "Noise Level Guidelines";
III. Element 3 – undertaking an "External Amenity Area Noise Assessment";
IV. Element 4 – consideration of "Other Relevant Issues".

The approach is underpinned by preparing and delivering an "Acoustic Design Statement" (ADS). An ADS for a site assessed as high risk should be more detailed than for a site assessed as low risk. An ADS should not be necessary for a site assessed as negligible risk. Following the ProPG approach will lead to the choice of one of four possible recommendations from the noise practitioner to the decision maker:

A. Planning consent may be granted without any need for noise conditions;
B. Planning consent may be granted subject to the inclusion of suitable noise conditions;

C. Planning consent should be refused on noise grounds in order to avoid significant adverse effects ("avoid"); or
D. Planning consent should be refused on noise grounds in order to prevent unacceptable adverse effects ("prevent").

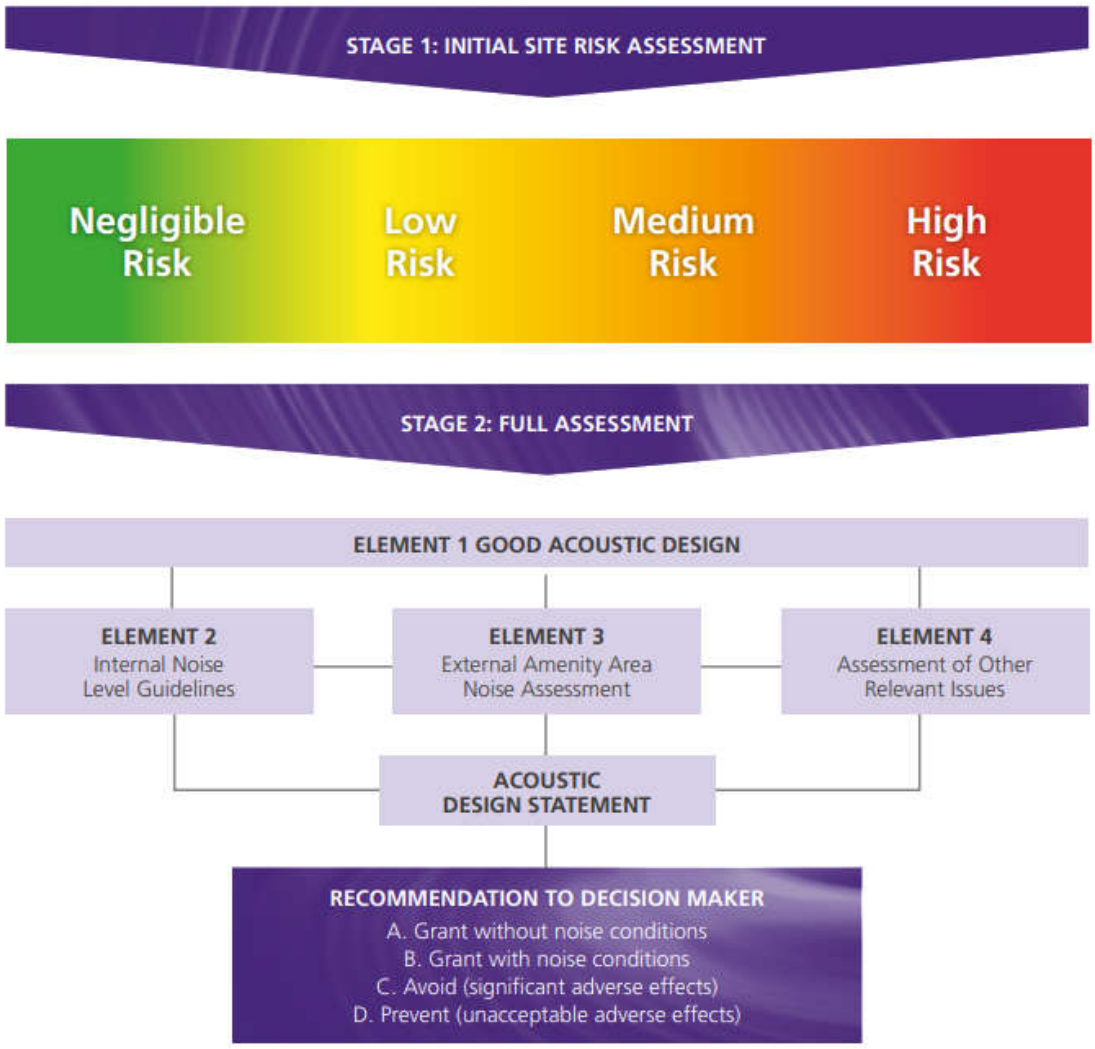


Figure 2-1 – Summary of ProPG procedure

2.7 Building Regulations Part E (2014)

Part-E of the Building Regulations aims to ensure that dwellings achieve reasonable levels of sound insulation from sound transmission emanating from adjoining buildings or differently occupied parts of the same building. Part-E does not address environmental noise through the building facade from external sources such as aircraft, trains, road traffic or industry. Therefore, Part-E falls outside the scope of this Noise Impact Assessment.

3 Baseline Noise Survey

iAcoustics carried out an attended baseline noise survey on the 18th of November 2022. Noise monitoring was carried out at the location indicated in Figure 3-1 below. This monitoring location represents the approximate location of the nearest dwelling to the primary noise source (N52).

Figure 3-1 Ariel view of the development site showing the location of noise monitoring

The following measurement standards were referenced:

- ISO 1996-1:2016 Acoustics — Description, measurement, and assessment of environmental noise — Part 1: Basic quantities and assessment procedures.
- ISO 1996-2:2017 Acoustics — Description, measurement, and assessment of environmental noise — Part 2: Determination of sound pressure levels.

Measurement Equipment & Weather Conditions

The complete sound measuring system deployed conforms to BS EN 61672-1, Class 1. Sound calibrators deployed for use conform to BS EN 60942, Class 1. The microphone was fitted with an all-weather protection kit (NTI WP30) to minimise interference.

Type	Make & Model	Serial No.	Next Calibration
Sound Level Meter	*NTI XL2-TA*	*a2a-06306-EO*	*Mar-2023*
Microphone	*NTI MA220*	*8285*	*Mar-2023*
Calibrator	*Castle GA607*	*044447*	*Oct-2023*

Table 3-1Noise Monitoring equipment. Calibration certificates are available on request.

Weather conditions were calm and dry throughout the survey. Temparatures remained constanst at 7°C. Windspeeds ranged from 3-5m/s in a southerly direction.

The survey results are presented below in Table 3-1. There is little variation between the statistical values (L_{A10} & L_{A90}) and the equivalent continuous level (L_{Aeq}) which suggests that the noise climate is dominated by noise from one source emitting a more or less constant level, which in this case is the N52. Variations in the L_{AFMax} level are generally expected; these values ranged from 61-69dB. Auditioning of the audio revealed that the L_{AFMax} 69dB measurement was a light aircraft passing overhead. The highest L_{AFMax} level associated with road traffic was found to be L_{AFMax} 62dB.

Date	Start	Stop	L_{Aeq}	L_{AFmax}	L_{A10}	L_{A90}
18/11/2022	14:57:44	15:02:44	54	61	57	51
18/11/2022	15:02:44	15:07:44	56	63	58	52
18/11/2022	15:07:44	15:12:44	56	67	58	53
18/11/2022	15:12:44	15:17:44	56	61	57	53
18/11/2022	15:17:44	15:22:44	55	63	57	52
18/11/2022	15:22:44	15:27:44	56	69	57	52
18/11/2022	15:27:44	15:32:44	55	61	57	53
18/11/2022	15:32:44	15:37:44	55	65	57	52
18/11/2022	15:37:44	15:42:44	55	62	57	53
18/11/2022	15:42:44	15:47:44	55	59	56	52
18/11/2022	15:47:44	15:52:44	55	61	57	53
18/11/2022	15:52:44	15:57:44	55	61	56	52
18/11/2022	15:57:44	16:02:44	54	60	56	52
18/11/2022	16:02:44	16:04:19	55	62	58	52

Table 3-2 Noise Monitoring Results

4 Predicted Noise Levels

4.1 Strategic Noise Maps

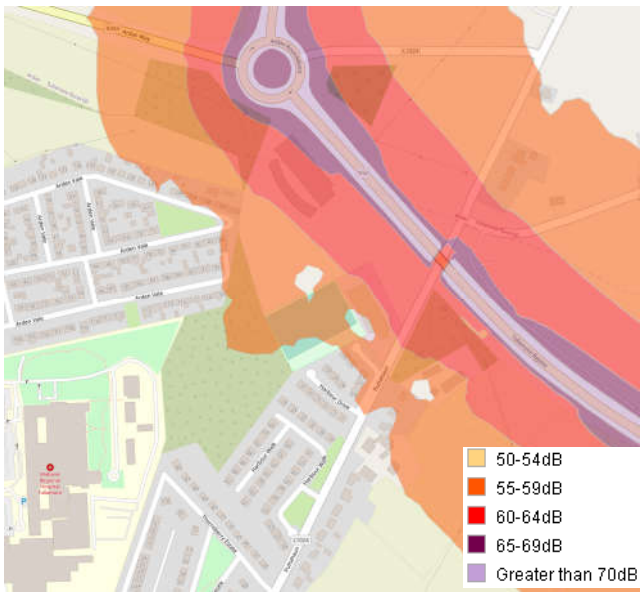
Transport Infrastructure Ireland (TII) is responsible for the development of strategic noise maps for all national roads carrying in excess of 3 million vehicles a year and for light rail lines. A strategic noise map is a graphical representation of the predicted situation with regard to noise in a particular area with different colours representing different noise levels in decibels.

The noise maps are presented in terms of two noise indicators: L_{den} and L_{night},

- 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.
- L_{night} is the night-time noise indicator and is used in the assessment of sleep disturbance.

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.

Figures 3-1 & 3-2 below are extracts from TII's strategic noise maps 2017-2023 showing the predicted L_{den} and L_{night} at the subject site from road traffic sources.



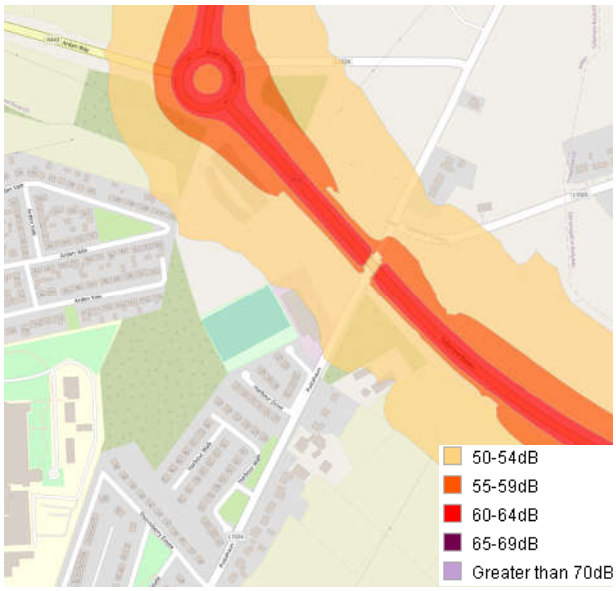


Figure 4-1 (left) This is a polygon dataset of the strategic noise mapping of roads, which were identified as those roads exceeding the flow threshold of 3 million passages per year, in the form of noise contours for the Lden (day-evening-night) period. The dB value represents the average decibel value during the Lden time.

Figure 4-2 (right) This is a polygon dataset of the strategic noise mapping of roads, which were identified as those roads exceeding the flow threshold of 3 million passages per year, in the form of noise contours for the Lnight (night) period. The dB value represents the average decibel value during the Lnight time.

4.2 Desktop Noise Modelling

iAcoustics have prepared site-specific noise maps of the proposed site using the CadnaA software suite. The purpose of preparing manual noise maps is to supplement the information shown in the strategic noise

maps by illustrating a project-specific context. The dominant noise source impacting the development site is road traffic noise from the N52; a secondary source is road traffic noise from the L1024. Noise from local estate roads (i.e. Harbour Dr., Arden Vale) is not considered in predictive modelling.

Figure 4-3 L_{day} noise map, grid height of 1.5m.

Figure 4-4 L_{night} noise map, grid height of 1.5m.

5 Assessment

5.1 Proposed Ventilation Strategy

It is proposed that all dwellings (including apartments) will be naturally ventilated. Air inlets will be provided for rooms.

5.2 Assessment of Indoor Noise Levels with Closed Windows

BS 8233:2014' Guidance on sound insulation and noise reduction for buildings' provides a standardised method of calculating the level of noise break-in from free-field noise levels at the façade. The calculation takes into account the dimensions of the façade and the receiving room, as well as the amount of absorption present. The sound reduction of the façade will depend on the:

- Solid masonry element;
- Glazed element;
- Ventilation element (i.e. humidity-sensitive air inlet).

The solid masonry elements will provide adequate sound insulation against external noise; the sound insulation performance of the façade is dictated by the weaker elements, i.e. glazing and the air inlets. Facades facing the roads will be exposed to higher noise levels than facades shielded from road traffic sources. It follows that the *minimum* acoustic requirements for facades differ depending on the location and orientation of the facades relative to noise sources.

Table 5-1 below has established two categories of façade noise exposure levels. Each category contains a range of predicted façade noise exposure levels. An outdoor-to-indoor noise prediction has been carried out as per the procedure in BS 8233:2014 based on a bedroom with dimensions of 3m x 3m x 2.4m and a reverberation time of 0.5 seconds. The façade area and the area of the windows are in accordance with the architects' drawings.

The objective of this desktop exercise is to determine The acoustic ratings of the glazing been adjusted until *both* the daytime and night-time noise criteria have been met.

The values used for glazing are based on generic products taken from IS EN 12758:2019. They are conservative values that can be used in the absence of measured data. Values for glazing are summarised using the *weighted sound reduction index, R_w dB*. The weighted sound reduction index is used to characterise the insulation of a material or product that has been measured in a laboratory. The values used for air inlets are based on *Aereco EHT Humidity-sensitive air inlets* for which laboratory test data is available.

		Category 1	Category
Daytime	Anticipated daytime levels at the façade:	55-60 dB $L_{Aeq,16hr}$	< 55dB $L_{Aeq,16hr}$
	Glazing	R_w (C_{tr}) 29dB (-4)	R_w (C_{tr}) 29dB (-4)
	Air Inlet	$D_{n,e,w}$ 40 dB(A)	$D_{n,e,w}$ 40 dB(A)
	Daytime Criterion	≤ 35 dB $L_{Aeq,16hr}$	≤ 35 dB $L_{Aeq,16hr}$
	*Calculated Indoor level	33 dB $L_{Aeq,16hr}$	28 dB $L_{Aeq,16hr}$
Night-time	Anticipated night-time levels at the façade	45-50 dB $L_{Aeq,16hr}$	< 45 dB $L_{Aeq,8hr}$
	Air Inlet	$D_{n,e,w}$ 40 dB(A)	$D_{n,e,w}$ 40 dB(A)
	Glazing	R_w (Ctr) 29dB (-4)	R_w (Ctr) 29dB (-4)
	Night-time Criterion	≤ 30 dB $L_{Aeq,8hr}$	≤ 30 dB $L_{Aeq,8hr}$
	*Calculated Indoor level	23 dB $L_{Aeq,8hr}$	18 dB $L_{Aeq,8hr}$

Table 5-1

According to Table 5-1:

Where free-field façade levels are predicted to be between below 60 dB $L_{Aeq,16hr}$ during the day and 50 dB $L_{Aeq,8hr}$ during the night, the minimum acoustic requirement for glazing shall be R_w (C_{tr}) 29dB (-3) and $D_{n,e,w}$ 40 dB(A) for the air inlet.

5.3 Assessment of Indoor Noise Levels with Open Windows

When a window is partially opened, the outside-to-inside level difference is typically 13 - 15dB[1]; this level difference is considered representative of typical domestic rooms with simple façade openings of around 2% of the floor area. Opening a window for purge ventilation may be relied on to improve thermal comfort or for the rapid dilution of outdoors and pollutants; however, opening a window will invariably allow noise ingress into dwellings. *General ventilation* will be provided by the air inlet vents and *extract ventilation* will be provided by the DCV system; *purge ventilation* will only be required from time to time. It is widely accepted that the acoustic guide values (WHO & BS 8233:2014) would not apply when windows are opened for *purge ventilation*.

[1] *Association of Noise Consultants. Acoustics, Ventilation & Overheating Guide (2020)*

In respect of mitigation against overheating, The *Acoustics Ventilation & Overheating Residential Design Guide (2020)* states the following:

> *"It is considered reasonable to allow higher levels of internal ambient noise from transport sources when higher rates of ventilation are required in relation to the overheating condition. The basis for this is that the overheating condition occurs for only part of the time. During this period, occupants may accept a trade-off between acoustic and thermal conditions, given that they have some control over their environment. In other words, occupants may, at their own discretion, be more willing to accept higher short-term noise levels in order to achieve better thermal comfort. The importance of control is relevant to daytime exposure, but not to night-time exposure where the consideration is sleep disturbance. It is important to note that there is no specific research available to support this view regarding human response to combined exposure to heat and noise. However, the notion that control over one's environment moderates the response to exposure is well established in the field of thermal comfort, and underpins the adaptive thermal comfort model."*

5.4 Assessment of Outdoor Noise Levels

For external areas that are used for amenity space, such as gardens and patios, the external noise level should not exceed 50 dB $L_{Aeq,16hr}$ with an upper guideline value of 55 dB $L_{Aeq,16hr}$. The guide values are taken from the W.H.O document *Guidelines for Community Noise (1999)*; these guide values are also cited in BS 8233:2014 and ProPG (2017). Based on a review of the site-specific noise maps, the vast majority of gardens will achieve noise levels below 50 dB $L_{Aeq,16hr}$. It is relevant to note the following passage from BS 8233:2014' *guidance on sound insulation and noise reduction for buildings'* concerning the guide values for outdoor amenity spaces:

> *"it is also recognised 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."*

5.5 Operational-Phase Impacts

During the operational phase of the development, there is a very low potential for adverse noise impacts on the surrounding environment. Typical noise sources for the residential aspect of this development will include vehicular movements, children playing etc. These noise sources would not be above and beyond those noises which form part of the existing environment at nearby noise-sensitive locations.

The development's commercial aspect may require noise-generating mechanical equipment. Since these details are unknown, it is appropriate to apply noise criteria. The mechanical plant shall not exceed the following noise levels during operation:

Period	Noise Emission Limit Value
Daytime (07:00 to 19:00hrs)	55 dB $L_{Ar,T}$
Evening (19:00 to 23:00hrs)	50 dB $L_{Ar,T}$
Night-time (23:00 to 07:00hrs)	45 dB $L_{Aeq,T}$ & no tonality
Note: $L_{Ar,T}$ is the rating level as defined in BS 4142:2014.	

Table 4-3

The plant noise criteria are based on the limit values provided in the Environmental Protection Agency document - *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4), 2016*. These limits values are widely used in the imposition of planning conditions by local authorities.

6 Conclusion

I. This Noise Impact Assessment (NIA) has been prepared for a LRD at Ardan/Phuttagan , Tullamore, Co Offaly. iAcoustics have evaluated the predicted noise levels against the relevant standards and guidance to ensure an appropriate quality of life and residential amenity both indoors and outdoors for residential development.

II. **Indoor noise levels:** all dwellings are predicted to achieve indoor ambient noise levels below 35 dB $L_{Aeq,16hr}$ during the day and 30 dB $L_{Aeq,16hr}$ at night. The performance of the glazing and air inlets will determine noise ingress through the façade. The indoor noise criteria will be satisfied by providing the following performance ratings throughout the development:
R_w (C_{tr}) 29dB (-4) for windows (including the window frame).
$D_{n,e,w}$ 40 dB(A) for the air inlet.

III. **Outdoor noise levels:** The noise levels within all private gardens (dwellings) at the subject site are predicted to comply with the 50 & 55 dB $L_{Aeq,16hr}$ guide values proposed by the W.H.O.

IV. **Outward noise impacts:** The development is not expected to impact surrounding noise-sensitive locations adversely. Residential development, by its nature, does not produce significant amounts of noise. Noise from the commercial aspect of the development will be controlled through the imposition of noise limits at nearby noise-sensitive locations, and all mechanical plants shall be selected and designed to meet this criterion.

Appendix A - Further Details

Appendix A.1.

IS EN 12758:2019 generic values for glazing. They are conservative values that can be used in the absence of measured data.

Insulating glass units	Octave band centre frequency, Hz						R_w (C_{tr}) dB
	125	250	500	1000	2000	4000	
4 mm / (6 - 16 mm) / 4 mm	21	17	25	35	37	31	29 (-4)
6 mm / (6 - 16 mm) / 4 mm	21	20	26	38	37	39	32 (-4)
6 mm / (6 - 16 mm) / 6 mm	20	18	28	38	34	38	31 (-4)
8 mm / (6 - 16 mm) / 4 mm	22	21	28	38	40	47	33 (-4)
8 mm / (6 - 16 mm) / 6 mm	20	21	33	40	36	48	35 (-6)
10 mm / (6 - 16 mm) / 4 mm	24	21	32	37	42	43	35 (-5)
10 mm / (6 - 16 mm) / 6 mm	24	24	32	37	37	44	35 (-3)
6 mm / (6 - 16 mm) / 6 mm Laminated	20	19	30	39	37	46	33 (-5)
6 mm / (6 - 16 mm) / 10 mm Laminated	24	25	33	39	40	49	37 (-5)
6 mm / 16 mm argon cavity / 6.8 mm Pilkington Optiphon	21	28	37	48	48	54	40 (-6)