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PROPOSED TRAVELLER-SPECIFIC GROUP HOUSING, STOCKHOLE LANE, CO. DUBLIN

ACOUSTIC DESIGN STATEMENT

Technical Report Prepared For

Fingal County Council

Technical Report Prepared By

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EXECUTIVE SUMMARY

AWN Consulting has been commissioned to carry out a study in relation to the potential noise impacts incident to the proposed traveller-specific group accommodation development at Stockhole Lane, Co. Dublin. The proposed development is located close to Dublin Airport and is within the airport noise zones.

The baseline noise environment at the development site has been described using noise maps available for the site. Based on this review and an assessment of the likely changes to the noise environment in the future as a result of the development of the North Runway at Dublin Airport, the assessment has classified the development site as having a 'medium' risk to environmental noise.

It will be necessary to provide enhanced acoustic glazing and vents to ensure that when windows are closed that the internal noise environment is good. The noise level internally with the windows open will be higher than ideal, however, inhabitants will have the option to close the window to reduce the noise level internally.

External noise levels are above the recommended noise level recommended in ProPg, however, efforts have been made to provide private external amenity space for each dwelling to the rear of the houses away from Stockhole Lane.

CONTENTS

1.0 INTRODUCTION

AWN Consulting has been commissioned to carry out a study in relation to the potential noise impacts incident to the proposed traveller-specific group accommodation development at Stockhole Lane, Co. Dublin. The focus of this report is to provide input into the acoustic design of the proposed development, identify any potential noise impacts and provide measures to minimise or mitigate those impacts.

Figure 1 presents the approximate outline of the proposed development site.

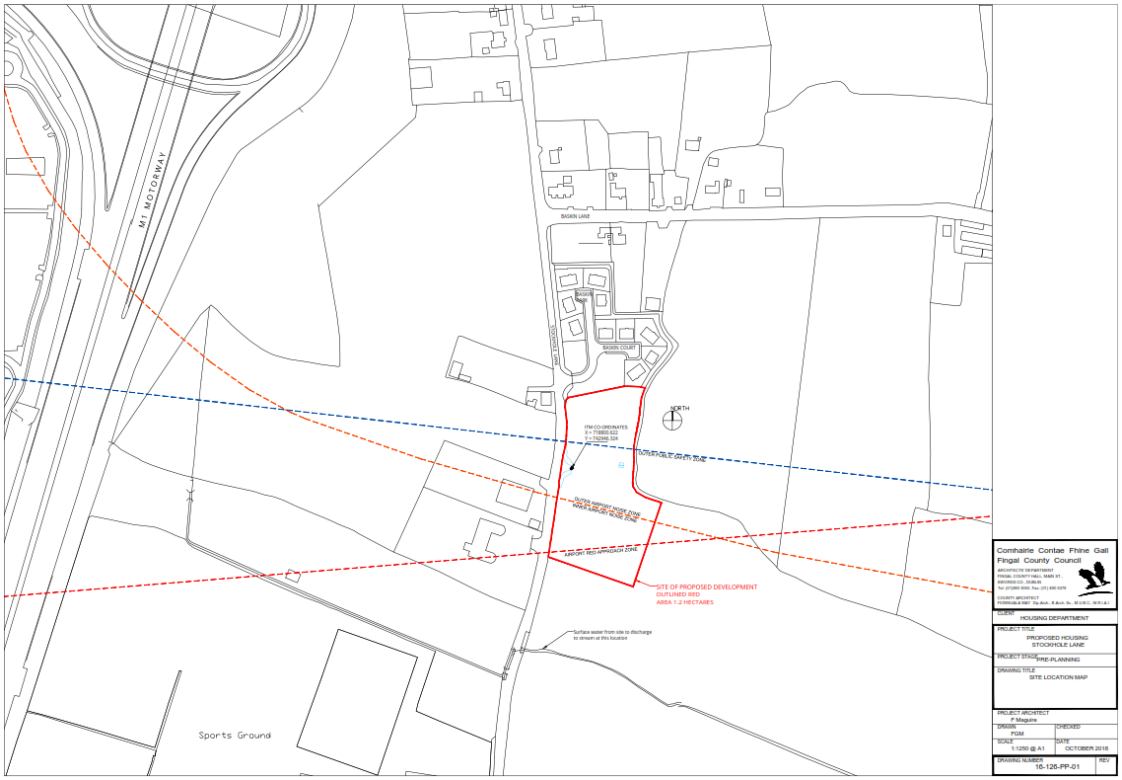

Figure 1 Location of proposed development

Appendix A presents a glossary of acoustic terminology that is used throughout this report.

2.0 DESIGN GUIDANCE

2.1 Draft Fingal Noise Action Plan (NAP)

The Draft Fingal Noise Action Plan (NAP) was published for review in September 2018. The 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."*

In addition, the following is provided

> *"In advance of any national guidance relating to noise in the planning process, the following actions relating to planning and development will be considered for implementation:*
>
> *a. To integrate Noise Action Plans into the County Development Plans.*
> *b. To develop guidelines relating to Noise and Planning for FCC. These guidelines should outline the considerations to be taken into account when determining planning applications for both noise-sensitive developments and for those activities which will generate noise. They should introduce the concept of a risk based approach to assessment of noise exposure, and for Good Acoustic Design to be encouraged as part of all new residential developments in FCC.*
> *c. To require developers to produce a noise impact assessment and mitigation plans, where necessary, for any new development where the Planning Authority considers that any new development will impact negatively on pre-existing environmental noise levels within their Council area.*
> *d. To ensure that future developments are designed and constructed in such a way as to minimise noise disturbances in accordance with Department of the Environment, Community and Local Government planning guidelines such as the Urban Design Manual. e.g. the position, direction and height of new buildings, along with their function, their distance from roads, and the position of noise barriers and buffer zones with low sensitivity to noise,*
> *e. To ensure that new housing areas and in particular brown field developments will be planned from the outset in a way that ensures that at least the central area is quiet. This could mean designating the centre of new areas as pedestrian and cycling zones with future developments to provide road design layouts to achieve low speed areas where appropriate.*
> *f. To incorporate street design in new developments, which recognise that residential streets have multi-function uses (e.g. movement, recreation) for pedestrians, cyclists and vehicles, in that priority order. The noise maps will be used to identify and classify the priority areas and streets. In the design of streets, cognisance should be given to the Irish Manual for Roads and Streets 2013.*

g. *To require sound proofing for all windows, in all new residential developments, where noise maps have indicated undesirable high noise levels. This may also lead to a requirement to install ducted ventilation.*
h. *To advise during pre-planning meetings regarding site specific design, the orientation of sensitive rooms and balconies away from noise, designing the layout and internal arrangement in apartments to ensure that similar rooms in individual units are located above each other or adjoin each other and that halls are used as buffer zones between sensitive rooms and staircases."*

In accordance with this NAP policy, the following Acoustic Design Statement (ADS) has been prepared to comply with the requirements of this policy.

2.2 ProPG: Planning & Noise

The *Professional Guidance on Planning & Noise* (ProPG) document was published in May 2017. The document was prepared by a working group comprising members of the Association of Noise Consultants (ANC), the Institute of Acoustics (IOA) and the Chartered Institute of Environmental Health (CIEH). Although not a UK or Irish government document, since it's 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 outlines a systematic risk based 2 stage approach for evaluating noise exposure on prospective sites for residential development. The two primary 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; and,
- 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.

A key component of the evaluation process is the preparation and delivery of an Acoustic Design Statement (ADS) which is intended for submission to the planning authority. This document is intended to clearly outline the methodology and findings of the Stage 1 and Stage 2 assessments, so as the planning authority can make an informed decision on the permission. ProPG outlines the following possible recommendations in relation to the findings of the ADS:

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").

Section 3.0 of the ProPG provides a more detailed guide on decision making to aid local authority planners on how to interpret the findings of an accompanying Acoustic Design Statement (ADS).

A summary of the ProPG approach is illustrated in Figure 2.

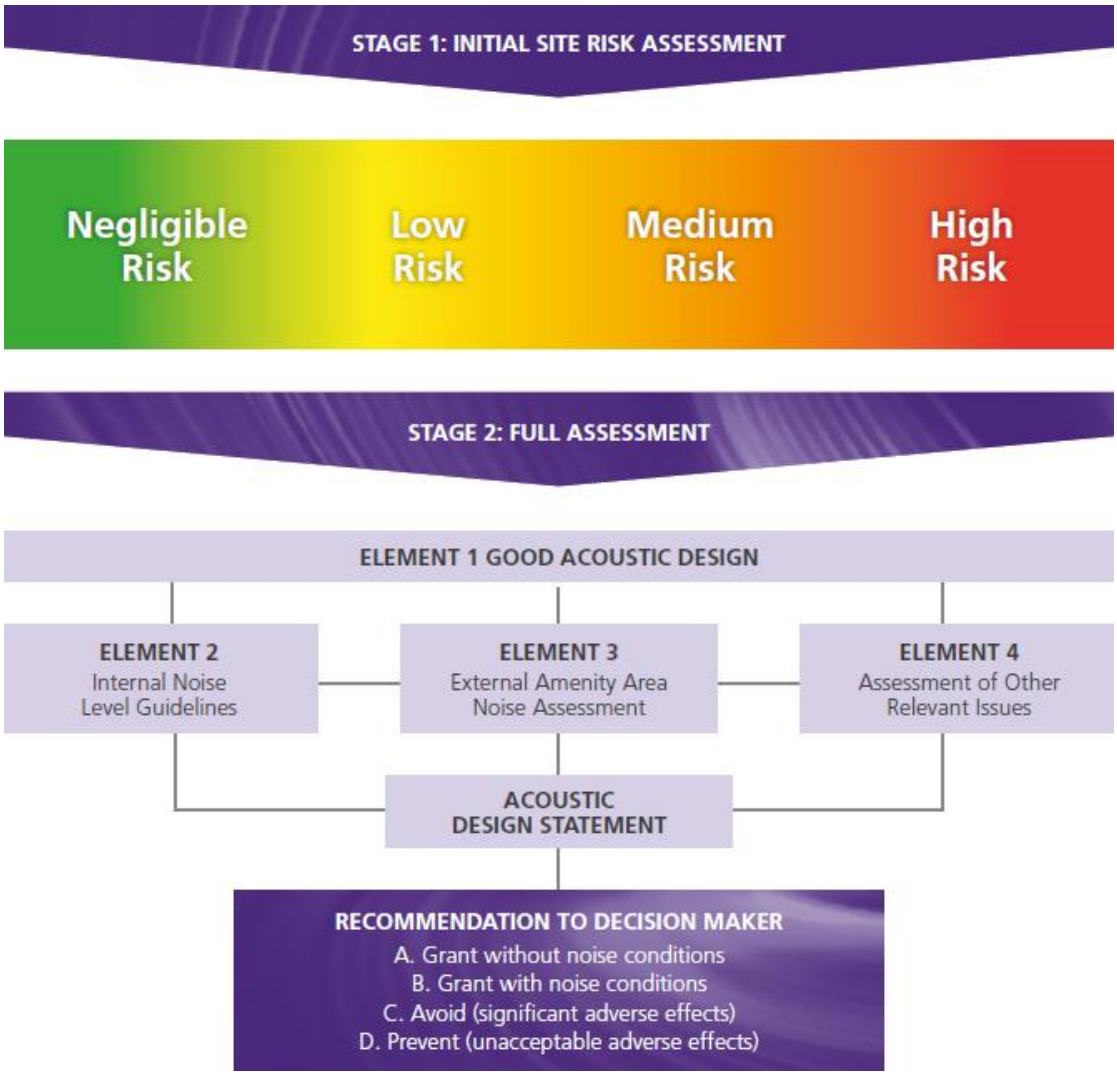

Figure 2 ProPG Approach (Source: ProPG)

2.3 WHO Environmental Noise Guidelines for Europe

The World Health Organisation (WHO) have published in October 2018 *Environmental Noise Guidelines for the European Region*. The objective of these guidelines is to provide recommendations for protecting human health from exposure to environmental noise from transportation, wind farm and leisure sources of noise. The guidelines present recommendations for each noise source type in terms of L_{den} and L_{night} levels above which there is risk of adverse health risks.

However, It should be noted that the WHO guideline values referred to here are recommended to serve as the basis for a policy-making process to allow evidence based public health orientated recommendations. They are not intended to be noise limits and the WHO document states the following regarding the implementation of the guidelines,

> *"The WHO guideline values are evidence-based public health-oriented recommendations. As such, they are recommended to serve as the basis for a policy-making process in which policy options are considered. In the policy decisions on reference values, such as noise limits for a possible standard or legislation, additional considerations – such as feasibility, costs, preferences and so on – feature in and can influence the ultimate value chosen as a noise limit. WHO acknowledges that implementing the guideline recommendations will require coordinated effort from ministries, public and private sectors and nongovernmental organizations, as well as possible input from international development and finance organizations. WHO will work with Member States and support the implementation process through its regional and country offices."*

It is therefore not intended to refer to the WHO guidelines in an absolute sense as part of this assessment and it will be a decision for national and local policy makers to adopt the WHO guidelines and propose noise limits for use.

3.0 STAGE 1 – NOISE RISK ASSESSMENT

3.1 Methodology

The initial noise risk assessment is intended to provide an early indication of any acoustic issues that may be encountered. It calls for the categorisation of the site as a negligible, low, medium or high risk based on the pre-existing noise environment. Figure 3 presents the basis of the initial noise risk assessment, it provides appropriate risk categories for a range of continuous noise levels either measured and/or predicted on site.

It should be noted that a site should not be considered a negligible risk if more than 10 L_{AFmax} events exceed 60 dB during the night period and the site should be considered a high risk if the L_{AFmax} events exceed 80 dB more than 20 times a night.

Paragraph 2.9 of ProPG states that,

> *"The noise risk assessment may be based on measurements or prediction (or a combination of both) as appropriate and should aim to describe noise levels over a "typical worst case" 24 hour day either now or in the foreseeable future."*

In this instance it is proposed to use the noise maps produced by Fingal County Council and daa as part of the noise mapping requirements under the European Noise Directive (END). These maps present the noise levels incident across the site over the course of an annual average, in addition the noise contour produced by daa for the future operation of Dublin Airport including the North Runway will be used to characterise the future noise environment.

ProPG states the following with respect to the initial risk assessment,

> *"The risk assessment should not include the impact of any new or additional mitigation measures that may subsequently be included in development proposals for the site and proposed as part of a subsequent planning application. In other words, the risk assessment should include the acoustic effect of any existing site features that will remain (e.g. retained buildings, changes in ground level) and exclude the acoustic effect of any site features that will not remain (e.g. buildings to be demolished, fences and barriers to be removed) if development proceeds."*

In this instance there are no buildings to be demolished and the site topography is not expected to change significantly during construction.

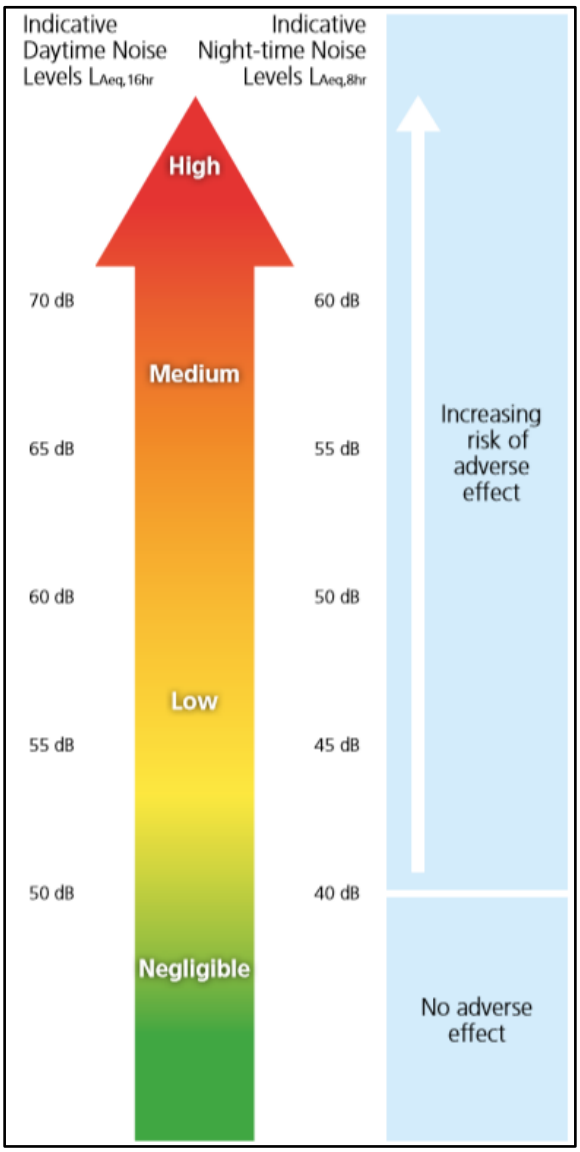

Figure 3 ProPG Stage 1 - Initial Noise Risk Assessment

3.2 Baseline Noise Environment

The following noise maps have been referred to when assessing the baseline noise environment,

- Round 3 Noise Maps for Roads – Dublin Agglomeration, and;
- Round 3 Noise Maps for Airports – Dublin Airport.

The above noise maps are provided for the overall day evening night period in terms of L_{den} and for the night-time period in terms of L_{night}.

All data has been taken from the EPA Mapping website http://gis.epa.ie.

Figures 4 to 7 present the predicted noise levels across the development site for road and air traffic in terms of L_{den} and L_{night}.

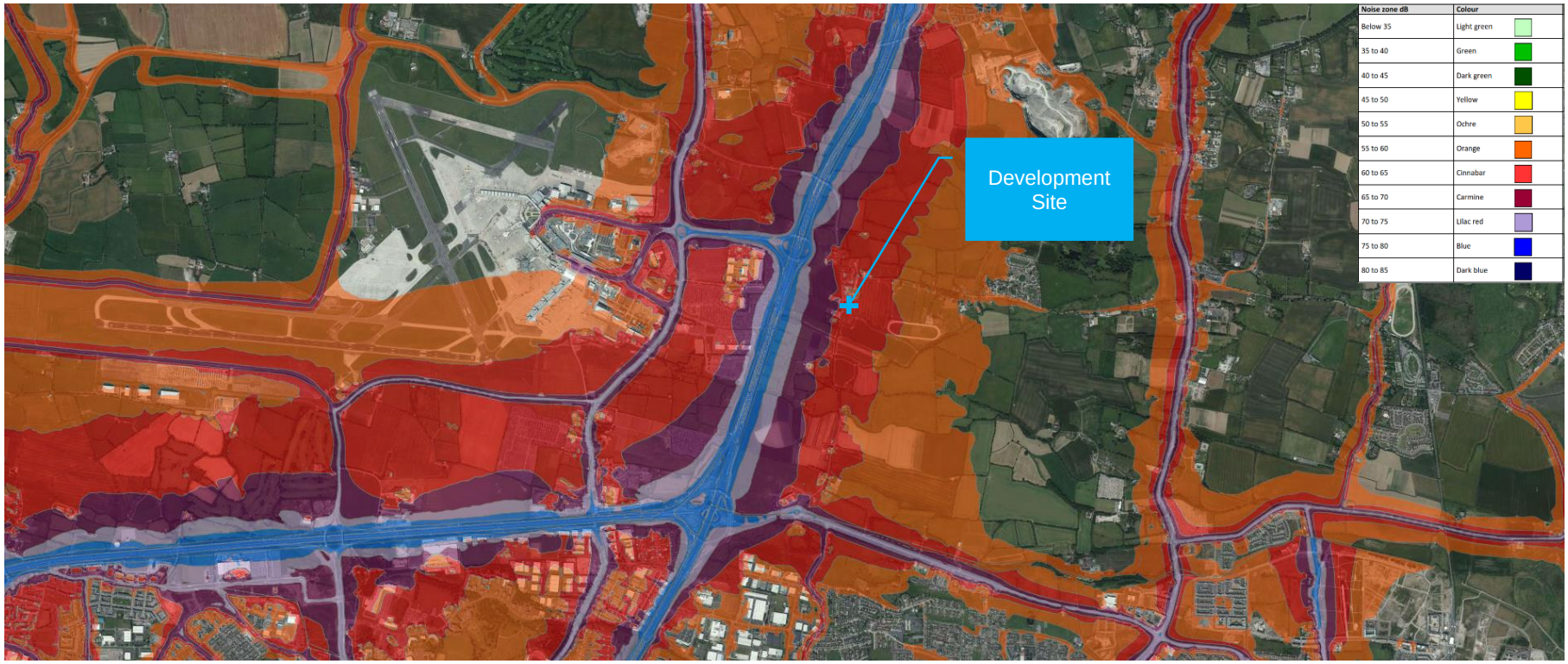

Figure 4 L_{den} Road Traffic Noise Levels

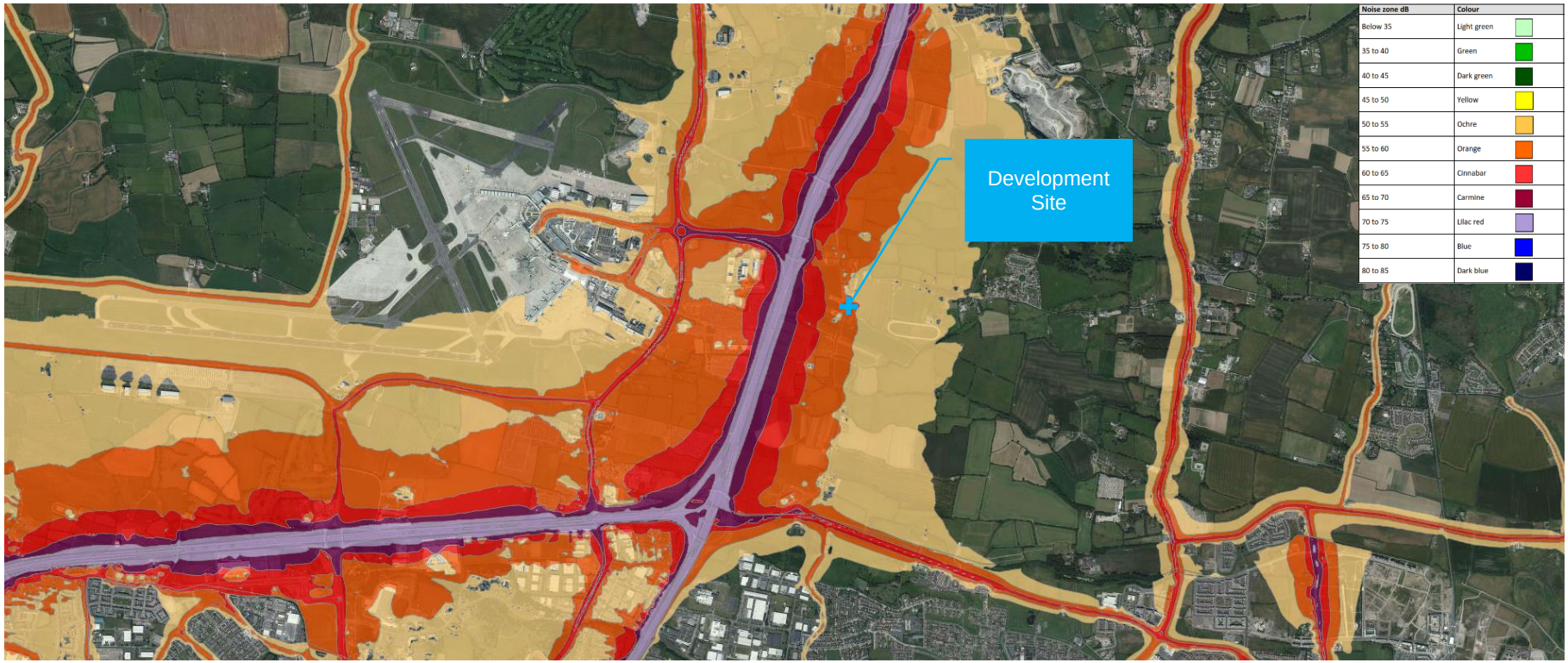

Figure 5 L_{night} Road Traffic Noise Levels

Figure 6 L_{den} Aircraft Noise Levels

Figure 7 L_{night} Aircraft Noise Levels

Table 1 summarises the current noise levels across the site for each source type.

Noise Source	L_{den}, dB	L_{night}, dB	L_{day}, dB Note A
Road Traffic	60 – 64	55 – 59	55 – 61
Air Traffic	55 – 59	50 – 54	55 – 57
Total	61 – 65	56 – 60	58 – 62

Table 1 Noise Levels at Development Site

Note A L_{day} has been estimated by assuming day and evening noise levels are equal

3.3 Future Noise Environment

The major change to the local infrastructure that is likely to alter the noise environment is the development of the North Runway at Dublin Airport. Under the permitted operation of the North Runway there will be no night-time use of the new runway and night-time use of the existing runway will be severely constrained. However, daa are currently in the process of applying for a change to the permitted operations of the airport once the North Runway is constructed. While the Environmental Impact Statement for this change of use application has not been published there has been some documents published as part of the public consultation process for that development.

In particular making reference to the information booklet published by daa in October 2016, several noise contour maps are presented for a variety of airport proposed Operational scenarios based on an indicative future proposal. Referring to these maps it can be seen that the worst-case daytime noise level from aircraft movements at the site location is unchanged at 60dB $L_{Aeq,16hr}$ i.e. Scenario A: 2022 Average (L_{Aeq}) Day Noise Contours. Night-time noise levels are predicted to be slightly higher than current levels to be of the order of 55dB $L_{Aeq,8hr}$ i.e. Scenario A: 2022 Average (L_{Aeq}) Night Noise Contours. Figures 8 and 9 reproduce the noise contours for these scenarios. It is noted that the public consultation information is indicative and does not form part of any approved scenario at present, however, it is representative of the worst-case noise impact when night flights may be permitted.

Note that road traffic noise is not expected to change significantly into the future.

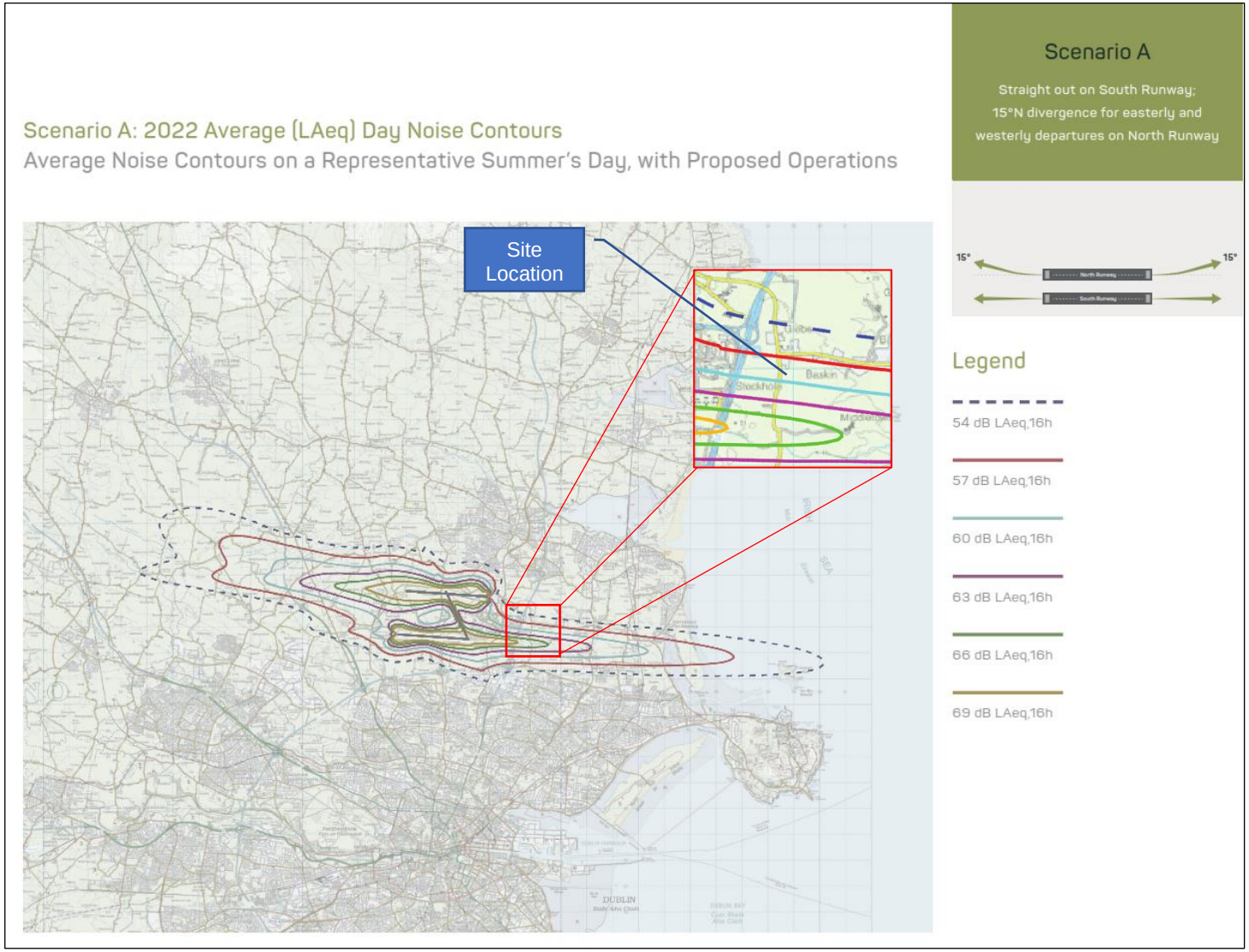

Figure 8 Future Daytime Aircraft Noise Level (Source: daa)

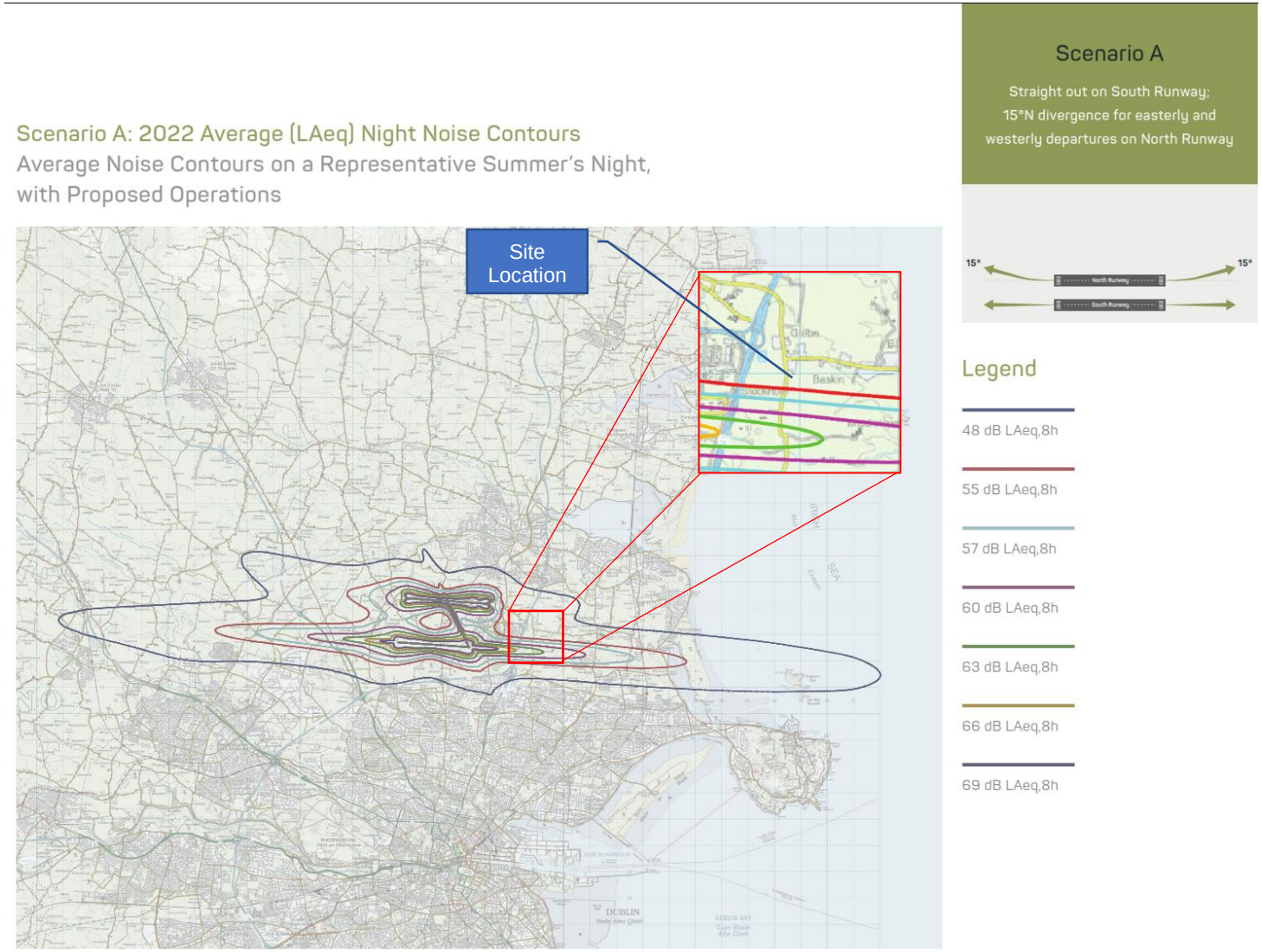

Figure 9 Future Night-time Aircraft Noise Level (Source: daa)

Table 2 summarises the future noise levels across the site for each source type.

Noise Source	L_{night}, dB	L_{day}, dB
Road Traffic	55 – 59	55 – 61
Air Traffic	55	60
Total	58 – 60	61 – 64

Table 2 Noise Levels at Development Site

This demonstrates that the future noise level across the site is expected to be slightly higher with the development of the North Runway and inclusive of indicative proposed changes to the existing permitted operations.

3.4 Noise Risk Assessment Conclusion

Giving consideration to the noise levels presented in the previous sections, the initial site noise risk assessment has concluded that the level of risk across the site is medium noise risk. No areas of the site where buildings are proposed are categorised as being high risk.

ProPG states the following with respect to negligible, low and medium risks:

Negligible Risk — *These noise levels indicate that the development site is likely to be acceptable from a noise perspective, and the application need not normally be delayed on noise grounds.*

Low Risk — *At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.*

Medium Risk — *As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development.*

Given the above it can be concluded that the development site may be categorised as *Medium Risk* and as such an Acoustic Design Strategy will be required to demonstrate that suitable care and attention has been applied in mitigating and minimising noise impact to such an extent that an adverse noise impact will be avoided in the final development.

It should be noted that ProPG states the following with regard to how the initial site noise risk is to be used,

> *"2.12 It is important that **the assessment of noise risk at a proposed residential development site is not the basis for the eventual recommendation to the decision maker**. The recommended approach is intended to give the developer, the noise practitioner, and the decision maker an early indication of the likely initial suitability of the site for new residential development from a noise perspective and the extent of the acoustic issues that would be faced. Thus, a site*

considered to be high risk will be recognised as presenting more acoustic challenges than a site considered as low risk. A site considered as negligible risk is likely to be acceptable from a noise perspective and need not normally be delayed on noise grounds. A potentially problematical site will be flagged at the earliest possible stage, with an increasing risk indicating the increasing importance of good acoustic design."

Therefore, following the guidance contained in ProPG does not preclude residential development on sites that are identified as having medium or high-risk noise levels. It merely identifies the fact that a more considered approach will be required to ensure the developments on the higher risk sites are suitable designed to mitigate the noise levels. The primary goal of the approach outlined in ProPG is to ensure that the best possible acoustic outcome is achieved for a particular site.

4.0 STAGE 2 – FULL ACOUSTIC ASSESSMENT

4.1 Element 1 – Good Acoustic Design Process

4.1.1 ProPG Guidance

In practice, good acoustic design should deliver the optimum acoustic design for a particular site without adversely affecting residential amenity or the quality of life of occupants or compromising other sustainable design objectives. It is important to note that ProPG specifically states that good acoustic design is not equivalent to overdesign or "*gold plating"* of all new development but that it seeks to deliver the optimum acoustic environment for a given site.

Section 2.23 of the ProPG outlines the following checklist for Good Acoustic Design:

- Check the feasibility of relocating, or reducing noise levels from relevant sources;
- Consider options for planning the site or building layout;
- Consider the orientation of proposed building(s);
- Select construction types and methods for meeting building performance requirements;
- Examine the effects of noise control measures on ventilation, fire regulation, health and safety, cost, CDM (construction, design and management) etc;
- Assess the viability of alternative solutions; and,
- Assess external amenity area noise.

In the context of the proposed development, each of the considerations listed above have been addressed in the following subsections.

4.1.2 Application of GAD Process to Proposed Application

Relocation or Reduction of Noise from Source

The main noise sources are located outside the redline boundary of the site and therefore it is beyond the scope of this development to introduce any noise mitigation at source.

Planning, Layout and Orientation

In the first instance, a primary consideration was to ensure that buildings are located outside the inner noise zone of Dublin Airport. Another consideration would be that the buildings are set back from the road network. As such, the houses on the site have been positioned as close as possible to the eastern boundary and away from Stockhole Lane.

Furthermore, the internal layout of the buildings has been designed such that rooms facing Stockhole Lane have been provided with dual aspect windows. This allows the window facing away from the road to be used to ventilate the space which will reduce the noise from road traffic that enters the building.

Select Construction Types for meeting Building Regulations

Masonry constructions will be used in constructing the external walls of the development. This construction type offers high levels of sound insulation performance. However, as is typically the case the glazed elements and any required ventilation paths to achieve compliance with Part F of the Building Regulations will be the weakest elements in the façade in terms of sound insulation performance.

Consideration will therefore be given to the provision of upgraded glazing and acoustic ventilators. Note that it will not be possible to achieve the desirable internal acoustic environments with windows open. Instead the proposal here will be to provide dwelling units with glazed elements and ventilators that have good acoustic insulation properties so that when the windows are closed the noise levels internally are good. Inhabitants will be able to open the windows if they wish, however, doing so will increase the internal noise level. This approach to mitigation is supported in ProPG where it states the following (note my emphasis has been added in bold),

> "2.22 *Using fixed unopenable glazing for sound insulation purposes is generally unsatisfactory and should be avoided;* ***occupants generally prefer the ability to have control over the internal environment using openable windows, even if the acoustic conditions would be considered unsatisfactory when open****. Solely relying on sound insulation of the building envelope to achieve acceptable acoustic conditions in new residential development, when other methods could reduce the need for this approach, is not regarded as good acoustic design. Any reliance upon building envelope insulation with closed windows should be justified in supporting documents* "
>
> *Note 5 Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded*
>
> 2.34 *Where the LPA accepts that there is a justification that the internal target noise levels can only be practically achieved with windows closed,* ***which may be the case in urban areas and at sites adjacent to transportation noise sources****, special care must be taken to design the accommodation so that it provides good standards of acoustics,*

> *ventilation and thermal comfort without unduly compromising other aspects of the living environment. In such circumstances, internal noise levels can be assessed with windows closed but with any façade openings used to provide "whole dwelling ventilation" in accordance with Building Regulations Approved Document F (e.g. trickle ventilators) in the open position (see Supplementary Document 2). Furthermore, in this scenario the internal L_{Aeq} target noise levels should not generally be exceeded*."

It is very important to note that it is impractical to achieve the good internal noise levels with windows open across the vast majority of development sites in close proximity to major infrastructure such as roads or airports. Such sites would need to be classified as having a negligible risk in accordance with the ProPG noise risk assessment approach. For this reason, there are no guidance documents either at a local level or an international level that AWN is aware of which would support the approach of achieving the ideal internal noise levels only in the open window scenario. It is therefore considered entirely correct and justifiable to provide building facades with a moderate degree of sound insulation such that with windows closed but vents opened a good internal acoustic environment is achieved.

Impact of noise control measures on fire, health and safety etc

The good acoustic design measures that have been implemented on site, e.g. locating properties away from the road are considered to be cost neutral and do not have any significant impact on other issues.

Assess Viability of Alternative Solutions

The major noise sources incident on the site are road and air traffic. Road traffic from Stockhole Lane will be mitigated by the distance from the road edge to the building. However, aircraft noise and road traffic noise from the M1 to the west cannot be mitigated using a boundary noise barrier. For these reasons it was not considered practicable to provide a noise screen to the boundary of the site with Stockhole Lane.

Assess External Amenity Area Noise

ProPG provides the following advice with regards to external noise levels for amenity areas in the development:

> *"The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq,16hr}$."*

External noise levels across the site during the daytime, with the North Runway in operation, are expected to be up to 60dB $L_{Aeq,16hr}$. While this is above the desirable level of 55dB $L_{Aeq,16hr}$ it is not possible to reduce the noise level across external spaces due to aircraft noise being the dominant noise source. Notwithstanding this, efforts have been made to provide private external space to each dwelling to the rear of the houses away from traffic noise on Stockhole Lane.

Summary

Considering the constraints of the site, in so far as possible and without limiting the extent of the development area, the principles of Good Acoustic Design have been applied to the development.

In terms of viable alternatives to acoustic treatment of façade elements, currently it is not considered likely that there will be further options for mitigation outside of proprietary acoustic glazing and ventilation.

4.2 Element 2 – Internal Noise Guidelines

4.2.1 Internal Noise Criteria

Element 2 of the ProPG document sets out recommended internal noise targets derived from BS 8233 (2014). The recommended indoor ambient noise levels are set out in Table 3 and are based on annual average data, that is to say they omit occasional events where higher intermittent noisy events may occur, such as New Year's Eve.

Activity	Location	(07:00 to 23:00hrs)	(23:00 to 07:00hrs)
Resting	Living room	35 dB $L_{Aeq,16hr}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$ 45 dB $L_{Amax,T}$*

Table 3 ProPG Internal Noise Levels

*Note The document comments that the internal $L_{AFmax,T}$ noise level may be exceeded no more than 10 times per night without a significant impact occurring.

In addition to these absolute internal noise levels ProPG provides guidance on flexibility of these internal noise level targets. For instance, in cases where the development is considered necessary or desirable, and noise levels exceed the external noise guidelines, then a relaxation of the internal L_{Aeq} values by up to 5 dB can still provide reasonable internal conditions.

4.2.2 Discussion on Open/Closed Windows

In the first instance, it is important to note the typical level of sound reduction offered by a partially open window falls in the region of 10 to 15 dB[1].

Considering the design goals outlined in Table 3 and a sound reduction across an open window of 15 dB, the free-field noise levels that would be required to ensure that internal noise levels do not exceed good (i.e. at or below the internal noise levels) or reasonable internal noise levels (i.e. 5 dB above the internal noise levels) have been summarised in Table 4.

Level Desired	Day 07:00 to 23:00hrs	Night 23:00 to 07:00hrs
Good (i.e. at or below the internal noise levels)	50 – 55dB $L_{Aeq,16hour}$	45dB $L_{Aeq,8hour}$
Reasonable (i.e. 5 dB above the internal noise levels)	55 – 60dB $L_{Aeq,16hour}$	50dB $L_{Aeq,8hour}$

Table 4 External Noise Levels Required to Achieve Internal Noise Levels

In this instance the external noise levels are such that it will not be possible to achieve the desired internal noise levels with windows open and therefore appropriate acoustic specifications to windows and passive vents will be provided to ensure the rooms are adequately ventilated and achieve the good internal noise levels detailed here.

[1] Section 2.33 of ProPG, additional information can be found in the DEFRA NANR116: *'Open/Closed Window Research' Sound Insulation Through Ventilated Domestic Windows'*

4.2.3 Proposed Façade Treatment

The British Standard BS EN 12354-3: 2000: *Building acoustics – Estimation of acoustic performance of buildings from the performance of elements – Part 3: Airborne sound insulation against outdoor sound* provides a calculation methodology for determining the sound insulation performance of the external envelope of a building. The method is based on an elemental analysis of the building envelope and can take into account both the direct and flanking transmission paths.

The Standard allows the acoustic performance of the building to be assessed taking into account the following:

- Construction type of each element (i.e. windows, walls, etc.);
- Area of each element;
- Shape of the façade, and;
- Characteristics of the receiving room.

The principals outlined in BS EN 12354-3 are also referred to in BS8233 and Annex G[2] of BS8233 provides a calculation method to determine the internal noise level within a building using the composite sound insulation performance calculated using the methods outlined in BS EN 12354-3. The methodology outlined in Annex G of BS8233 has been adopted here to determine the required performance of the building facades. This approach corrects the noise levels to account for the frequency content of aircraft noise which has been determined by AWN from numerous noise surveys in the vicinity of Dublin Airport.

Glazing

As is the case in most buildings, the glazed elements of the building envelope are typically the weakest element from a sound insulation perspective. In this instance the facades will be provided with glazing that, when closed, achieve the minimum sound insulation performance as set out in Table 5.

Glazing Specification	Octave Band Centre Frequency (Hz)						R_w
	125	250	500	1k	2k	4k	
Acoustic Glazing	26	28	38	46	44	56	41

Table 5 Sound Insulation Performance Requirements for Glazing, SRI (dB)

The acoustic specification listed in Table 6 can be achieved using a double-glazed unit with slightly thicker than standard glass. An example configuration is 6mm glass – 12mm cavity – 13mm laminated glass.

It is important to note that the acoustic performance specifications detailed herein are minimum requirements which apply to the overall glazing system. In the context of the acoustic performance specification the 'glazing system' is understood to include any and all of the component parts that form part of the glazing element of the façade, i.e. glass, frames, seals, openable elements etc.

[2] The methodology contained within Annex G of BS8233 is based on the assumption that the source is a line source (such as a road) and that the building facades are simple, i.e. do not have balconies. These assumptions are considered valid for the purposes of this assessment and have been adopted.

Wall Construction

In general, all wall constructions (i.e. block work or concrete) offer a high degree of sound insulation, much greater than that offered by the glazing systems. Therefore, noise intrusion via the wall construction will be minimal. The calculated internal noise levels across the building façade have assumed a minimum sound reduction index of 50 dB R_w for this construction.

Ventilation

The ventilation strategy for the development will be in accordance with Part F of the Building Regulations and will be finalised at the detail design stage. Options which will be considered to achieve compliance with background ventilation requirements will be adjustable hit and miss acoustic ventilators or trickle vents built into the façade or window frames respectively. It is recommend that the wall vents are specified to achieve a sound insulation performance of 45dB $D_{n,e,w}$. This specification and can be achieved by a range of proprietary vents in either through frame trickle vent or through wall vents.

Roof

There is the potential for the roof structure to allow the passage of sound into the rooms. In order to control potential sound transmission via this route the ceiling / roof construction will need to provide a sound reduction in excess of that required for the windows. In order to provide such a sound reduction performance it would normally be necessary for the ceilings in these spaces to be built of boards with a surface mass of 18kg/m^2 or greater. These boards will need to be fixed to the support joists by means of a "resilient" bar system (not a direct fix), and there must by a layer of mineral / glassfibre quilt / slab in the void between the joists of at least 100mm thickness (which will normally be greater than this for thermal reasons) and a density of 15 to 30kg/m^3. Any penetrations through the ceiling boards must be as small as possible and made good by fully filling with plaster or with an acoustic sealant.

4.2.5 Internal Noise Levels

Taking into account the external façade levels and the specified building envelope the internal noise levels have been calculated. In all instances the good internal noise criteria are achieved for daytime and night-time periods.

4.2.6 Overheating

Another issue arising is the impact of intrusive noise when the windows are temporarily opened during periods of overheating. Section 2.36 of ProPG provides the following guidance in respect of overheating:

> *"In addition to providing purge ventilation, open windows can also be used to mitigate overheating. Therefore, should the LPA accept a scheme is to be assessed with windows closed, but this scheme is reliant on open windows to mitigate overheating, it is also necessary to consider the potential noise impact during the overheating condition. In this case a more detailed assessment of the potential impact on occupants should be provided in the ADS. It should be noted that overheating issues will vary across the country and any specific design solutions will need to be developed alongside advice from energy consultants."*

As is the case in the vast majority of residential dwellings overheating will be controlled by opening windows as required. ProPG does not specify any internal noise targets to be achieved during the overheating scenario and neither do other guidance documents. In the absence of guidance the Association of Noise Consultants (ANC) in the UK have produced a draft document entitled *Acoustics Ventilation and Overheating Residential Design Guide – February 2018.* While this is a draft document it is considered appropriate for use in the absence of other guidance.

A two-level assessment procedure is recommended by the ANC guide depending on the risk of potential impact. Table 6 presents the Risk Categories presented within the ANC guide for the overheating conditions.

External Free-field noise level Note 1		Risk Category Note 4
Daytime, dB $L_{Aeq,T}$ Note 2	Night-time, dB $L_{Aeq,8hr}$ Note 3	
≤52dB	≤47dB	Low
>52dB and ≤62dB	>47dB and ≤55dB	Medium
>62dB	>55dB	High

Table 6 Façade Noise Levels on Worst-Effected Facades

Note 1 The values presented in this table should not be regarded as fixed thresholds and reference can also be made to relevant dose-response relationships, such as those described in a DEFRA 2014 study.

Note 2 - A decision must be made regarding the appropriate averaging period to use. The averaging period should reflect the nature of the noise source, the occupancy profile and times at which overheating might be likely to occur. Further guidance can be found within the 2014 IEMA Guidelines.

Note 3 - Regular individual noise events should also be considered. Refer to Appendix A of ProPG for further guidance.

Note 4 - The risk of an adverse effect occurring will also depend on how frequently and for what duration the mitigation of overheating is likely to result in increased internal noise levels.

Figure 10 presents a flow chart of the process to assess the adverse effect of noise during the overheating condition.

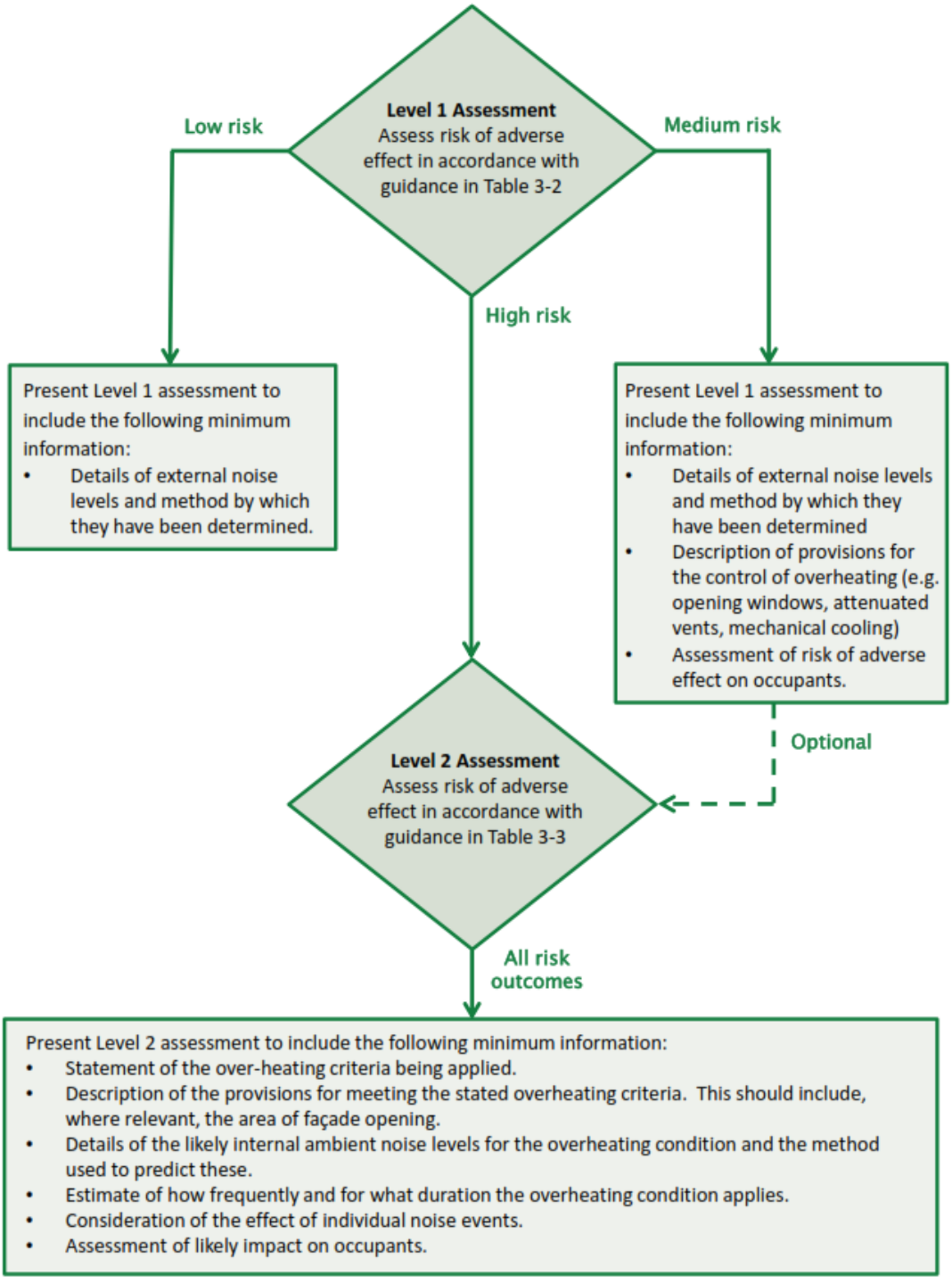

Figure 10 2-stage Assessment of Overheating Condition

In this instance the façade levels previously presented in Table 2, which include the future operation of the North Runway, have been used to categorise the risk level across the facades of the development.

Given the external noise levels, all facades are categorised as medium risk and high risk facades. In all instances the overheating condition will be controlled by opening windows. This is the only practical option and will be required during the hottest days of the year. Given that the façade levels on the high risk facades range from 60dB $L_{Aeq,8hr}$ at night to 64dB $L_{Aeq,16hr}$ during the day and an open window offers a noise reduction of up to 15dB the expected internal noise level at the worst-affected facades

during the overheating condition is in the range of 45dB $L_{Aeq,8hr}$ at night and 49dB $L_{Aeq,16hr}$ during the day.

Following the ANC guide these internal noise levels would be considered to represent a medium risk of an adverse impact due to an adverse impact on speech communication during the daytime or sleep disturbance at night. Noise levels of this level are likely to be considered suitable if they occur for limited periods.

4.3 Element 3 – External Amenity Area Noise Assessment

As previously discussed, while external amenity areas are not expected to achieve the recommended 55dB $L_{Aeq,16hr}$ noise level recommended in ProPg efforts have been made to provide private external amenity space for each dwelling to the rear of the houses away from Stockhole Lane. Figure 11 illustrates this approach.

Figure 11 Private External Space to Rear of Dwellings

4.4 Element 4 – Assessment of Other Relevant Issues

Element 4 gives consideration to other factors that *may* prove pertinent to the assessment, these are defined in the document as:

- 4(i) compliance with relevant national and local policy
- 4(ii) magnitude and extent of compliance with ProPG
- 4(iii) likely occupants of the development
- 4(iv) acoustic design v unintended adverse consequences
- 4(v) acoustic design v wider planning objectives

Each is discussed in turn below.

4.4.1 Compliance with Relevant National and Local Policy

There are no National policy documents relating to the acoustic design of residential dwellings. Locally the Fingal Development Plan 2017 – 2023 contains Objective DA07 relating to development within the Outer Noise Zone. This objective states:

"Objective DA07

Strictly control inappropriate development and require noise insulation where appropriate within the Outer Noise Zone, and actively resist new provision for residential development and other noise sensitive uses within the Inner Noise Zone, as shown on the Development Plan maps, while recognising the housing needs of established families farming in the zone. To accept that time based operational restrictions on usage of a second runway are not unreasonable to minimize the adverse impact of noise on existing housing within the inner and outer noise zone".

Furthermore, the Draft Fingal Noise Action Plan recommends that the guidance contained within ProPG should be used in assessing the noise impact on new residential developments being introduced to existing noise sources.

This Acoustic Design Statement has been prepared in compliance with the requirements of ProPG and therefore complies with the requirements of local policy.

4.4.2 Magnitude and Extent of Compliance with ProPG

As discussed within this report the following conclusions have been drawn with regards to the extent of compliance with ProPG:

- All dwellings as part of the development have been designed to achieve the good level of internal noise levels specified within ProPG. The units require closed windows and open vents to achieve this level;
- External amenity areas have been assessed and while the noise levels externally will not comply with the recommended criterion set out in ProPG, Good Acoustic Design has been adopted to place the private external space away from the Stockhole Lane side of the development, and;
- An assessment of the potential for adverse noise impacts during the overheating condition has also been included and it has concluded that there is a medium risk of an adverse impact which is considered acceptable if the overheating condition occurs for a limited period.

Based on the preceding it is concluded that the proposed development is in full compliance with the requirements of ProPG.

4.4.3 Likely Occupants of the Development

The development will be permanently occupied by families and there is no proposal for the units to be offered as short-term dwellings. The criteria adopted as part of this assessment are based on those recommended for permanent dwellings and are therefore considered robust and appropriate for the likely occupants.

4.4.4 Acoustic Design v Unintended Adverse Consequences

Unintended adverse consequences did not occur on this project.

4.4.5 Acoustic Design v Wider Planning Objectives

The Fingal Development Plan 2017 – 2023 sets the following objective with regard to the control of development within the airport noise zones,

Objective DA07 *Strictly control inappropriate development and require noise insulation where appropriate within the Outer Noise Zone, and actively resist new provision for residential development and*

other noise sensitive uses within the Inner Noise Zone, as shown on the Development Plan maps, while recognising the housing needs of established families farming in the zone. To accept that time based operational restrictions on usage of a second runway are not unreasonable to minimize the adverse impact of noise on existing housing within the inner and outer noise zone.

In this instance the majority of the proposed development site is within the Outer Noise Zone and outside the Inner Noise Zone. In particular, the acoustic design of the site has taken cognisance of Objective DA07 and ensured that all dwelling units are located on the area of the site that is within the Outer Noise Zone. Figure 12 illustrates the relative positions of the proposed dwellings and the airport noise zones.

Furthermore, this report has demonstrated the noise insualtion measures required to ensure that the proposed dwelling units achieve a good internal noise environment.

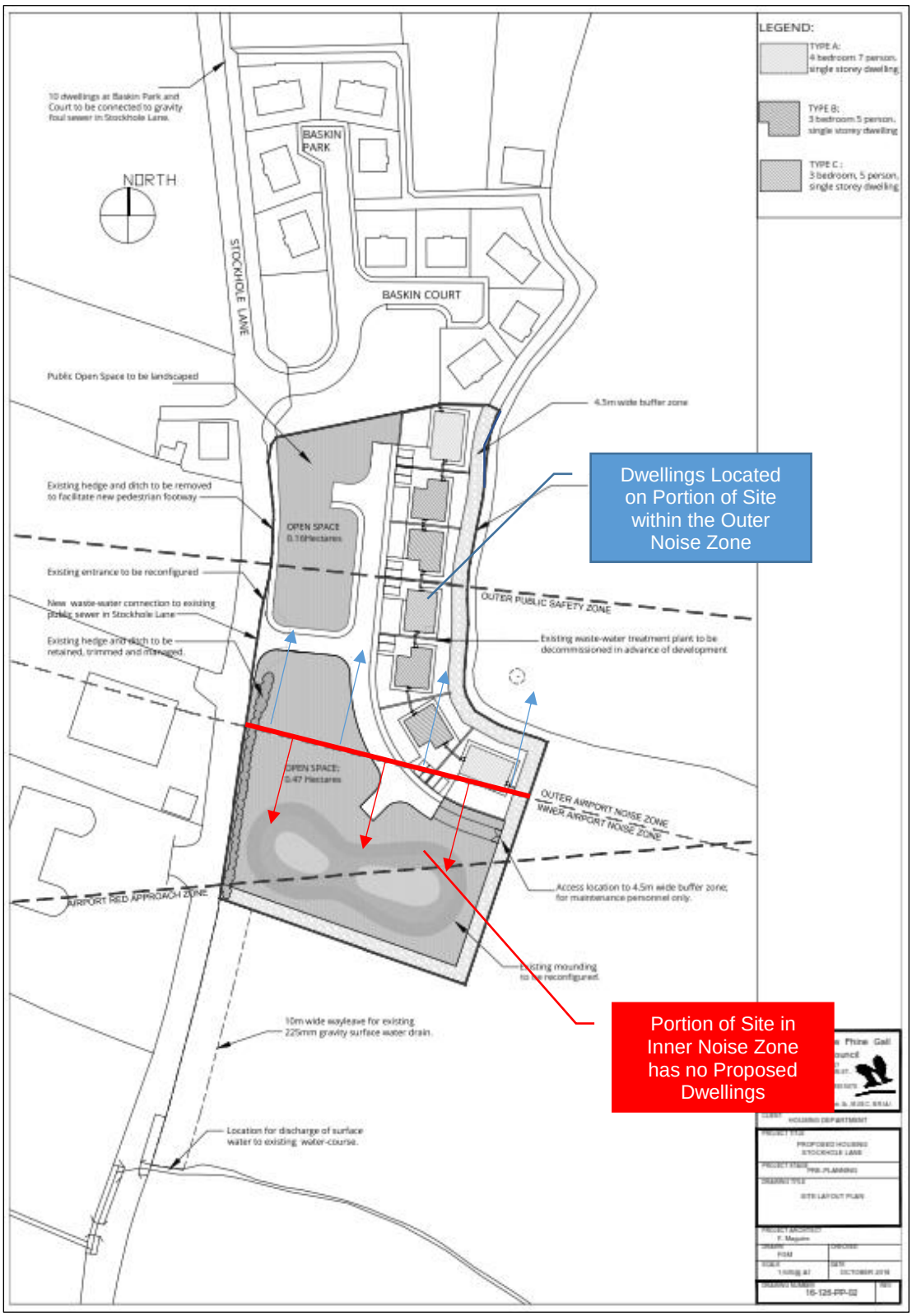

Figure 12 Proposed Dwelling Locations vs Airport Noise Zones

5.0 CONCLUSION

An initial site noise risk assessment has been carried out on the proposed traveller-specific group accommodation at Stockhole Lane, Co. Dublin. The assessment has classified the development site as having a medium noise risk. This was determined through a review of noise maps available for the proposed development site.

Further discussion is presented in terms of the likely noise impact of both the external and internal areas of the proposed development. It will be necessary to provide enhanced acoustic glazing and vents to ensure that when windows are closed that the internal noise environment is good. The noise level internally with the windows open will be higher than ideal, however, inhabitants will have the option to close the window to reduce the noise level internally with acoustic attenuated passive ventilation.

External noise levels are above the recommended noise level recommended in ProPg, however, efforts have been made to provide private external amenity space for each dwelling on the side of the buildings away from Stockhole Lane.

APPENDIX A
GLOSSARY OF ACOUSTIC TERMINOLOGY

Ambient noise — The totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, near and far.

Background noise — The steady existing noise level present without contribution from any intermittent sources. The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 per cent of a given time interval, T ($L_{AF90,T}$).

dB — Decibel - The scale in which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the RMS pressure of the sound field and the reference pressure of 20 micro-pascals (20 µPa).

dB(A) — An 'A-weighted decibel' - a measure of the overall noise level of sound across the audible frequency range (20 Hz – 20 kHz) with A-frequency weighting (i.e. 'A'–weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.

$D_{n,e,w}$ — Weighted element-normalized level difference. This is the value of sound insulation performance of a ventilator measured under laboratory conditions. It is a weighted single figure index that is derived from values of sound insulation across a defined frequency spectrum. Technical literature for acoustic ventilators typically presents sound insulation data in terms of the $D_{n,e,w}$ parameter.

Hertz (Hz) — The unit of sound frequency in cycles per second.

$L_{Aeq,T}$ — This is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period (T).The closer the L_{Aeq} value is to either the L_{AF10} or L_{AF90} value indicates the relative impact of the intermittent sources and their contribution. The relative spread between the values determines the impact of intermittent sources such as traffic on the background.

L_{AFN} — The A-weighted noise level exceeded for N% of the sampling interval. Measured using the "Fast" time weighting.

L_{AF90} — Refers to those A-weighted noise levels in the lower 90 percentile of the sampling interval; it is the level which is exceeded for 90% of the measurement period. It will therefore exclude the intermittent features of traffic and is used to estimate a background level. Measured using the "Fast" time weighting.

L_{AF10} — Refers to those A-weighted noise levels in the upper 10 percentile of the sampling interval; it is the level which is exceeded for 10% of the measurement period. It is typically representative of traffic noise levels. Measured using the "Fast" time weighting.

L_{AFmax}	is the instantaneous fast time weighted maximum sound level measured during the sample period.
Octave band	A frequency interval, the upper limit of which is twice that of the lower limit. For example, the 1,000Hz octave band contains acoustical energy between 707Hz and 1,414Hz. The centre frequencies used for the designation of octave bands are defined in ISO and ANSI standards.
R_w	Weighted Sound Reduction Index – This is the value of the sound insulation performance of a partition or element measured under laboratory conditions. It is a weighted single figure index that is derived from values of sound insulation across a defined frequency spectrum. Technical literature typically presents sound insulation data in terms of the R_w parameter.