

11 AIR (NOISE & VIBRATION)

11.1 Introduction

This document prepared by AWN Consulting Ltd. (AWN) to assess the potential noise and vibration impacts of the Proposed Development in the context of current relevant standards and guidance.

This assessment has been prepared by Mike Simms BE MEngSc MIOA MIET, Senior Acoustic Consultant at AWN, who has worked in the field of acoustics for 20 years and has been a consultant since 1998. He has extensive experience in all aspects of environmental surveying, noise modelling and impact assessment for various sectors including, energy, industrial, commercial and residential.

This chapter includes a description of the receiving ambient noise climate in the vicinity of the subject site and an assessment of the potential noise and vibration impact associated with the proposed development, during both the short-term construction phase and the permanent operational phase, on its surrounding environment. The assessment of direct, indirect and cumulative noise and vibration impacts on the surrounding environment have been considered as part of the assessment.

Mitigation measures are included, where relevant, to ensure the proposed development is constructed and operated in an environmentally sustainable manner in order to ensure minimal impact on the receiving environment.

11.2 Assessment Methodology

The assessment of impacts has been undertaken with reference to the most appropriate guidance documents relating to environmental noise and vibration which are set out within the relevant sections of this chapter. In addition to specific guidance documents for the assessment of noise and vibration impacts which are discussed further in the relevant sections, the following guidelines were considered and consulted for the purposes of this chapter: -

- EPA Guidelines on the Information to be contained in Environmental Impact Assessment Reports Draft August 2017.
- EPA Advice Notes for Preparing Environmental Impact Statements, (Draft, September 2015).

The study has been undertaken using the following methodology: -

- An environmental noise survey has been undertaken in the vicinity of the subject site in order to characterise the existing baseline noise environment.
- A review of the most applicable standards and guidelines has been conducted in order to set a range of acceptable noise and vibration criteria for the construction and operational phases of the proposed development.
- Predictive calculations have been performed during the construction phase of the project at the nearest sensitive locations to the development site.
- Predictive calculations have been performed to assess the potential impacts associated with the operational of the development at the most sensitive locations surrounding the development site.
- A schedule of mitigation measures has been proposed to reduce, where necessary, the identified potential outward impacts relating to noise and vibration from the proposed development.

11.2.1 Construction Phase Criteria

There is no published statutory Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. Local Authorities typically control construction activities by imposing limits on the hours of operation and consider noise limits at their discretion.

In the absence of specific noise limits, appropriate criteria relating to permissible construction noise levels for a development of this scale may be found in the British Standard BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Noise*.

The approach adopted here calls for the designation of an NSL into a specific category (A, B or C) based on existing ambient noise levels in the absence of construction noise. A threshold noise value is applied to each category. Exceedances (construction noise only) of the threshold value, at the facade of a sensitive receptor during construction, indicates a potential significant noise impact associated with the construction activities. The threshold values recommended by BS5228-1 are set out in Table 11.1.

Assessment category and threshold value period (L_{Aeq})	Threshold value, in decibels (dB)		
	Category A ^{Note A}	Category B ^{Note B}	Category C ^{Note C}
Night-time (23:00 to 07:00hrs)	45	50	55
Evenings and weekends ^{Note D}	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75

Table 11.1: Example Threshold of Significant Effect at Dwellings.

Note A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.

Note B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.

Note C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.

Note D) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.

It should be noted that this assessment method is only valid for residential properties.

For the appropriate period (e.g. daytime) the ambient noise level is determined and rounded to the nearest 5dB. Based on review of existing noise levels obtained from the noise survey, relevant BS5228-1 threshold values at the various assessment locations are presented in the Table 11.2.

Period	Construction Noise Threshold Value $L_{Aeq,1hr}$ (dB)	Baseline Noise Category
Daytime (07:00 – 19:00) and Saturdays(07:00 – 13:00)	65	A
Evening(19:00 to 23:00hrs)	55	A
Night time (23:00 to 07:00hrs)	45	A

Table 11.2: Rounded Baseline Noise Levels and Associated Categories.

See Section 7.4 for the assessment in relation to this development. If the construction noise level exceeds the appropriate category value, then a potential significant effect is deemed to occur.

Guidance on the degree of significance is presented the UK document Design Manual for Roads and Bridges (2020) LA 111 Sustainability & Environmental Appraisal. Noise and Vibration Rev 2. The approach is as follows: -

- To determine the threshold value for construction noise according to the method from BS5228 described above.
- To compare the predicted construction noise level with the existing noise levels and the threshold value according to the criteria in the table below.

Potentially this procedure is to be followed separately for each noise-sensitive location, however in this instance as the existing noise levels at all survey locations correspond to Category A according to table above, all noise-sensitive locations are considered together.

Similarly, for this proposed development the vast majority of construction works will take place within the 'Daytime' period, i.e. 07:00 – 19:00 on Mondays to Fridays and 07:00 – 13:00 on Saturdays.

The magnitude of the construction noise impact according the DMRB is mapped to the EPA significance terms as detailed in Table 11.3: -

Construction Noise Level	Magnitude of Impact (DMRB)	EPA Significance of Effect
Below or equal Baseline Noise Level	Negligible	Not Significant
Above Baseline and below or equal to threshold	Minor	Slight – Moderate
Above threshold and below or equal to threshold + 5dB	Moderate	Moderate – Significant
Above threshold + 5dB	Major	Significant – Very Significant

Table 11.3: Description of Construction Noise Impacts based on DMRB.

It should be noted that this assessment method is only valid for residential properties.

This assessment process determines whether a significant construction noise impact is likely. Notwithstanding the outcome of this assessment, the overall acceptable levels of construction noise set out in the Transport Infrastructure Ireland (TII) publication Guidelines for the Treatment of Noise and Vibration in National Road Schemes, which should not be exceeded at noise sensitive locations during the construction phase of the development. Table 11.4 sets out these levels.

Days and Times	Noise Levels (dB re. 2x10 ⁻⁵ Pa)	
	L _{Aeq} (1hr)	L _{Amax}
Monday to Friday 07:00 to 19:00hrs	70	80
Monday to Friday 19:00 to 22:00hrs	60*	65*
Saturdays 08:00 to 16:30hrs	65	75
Sundays & Bank Holidays 08:00 to 16:30hrs	60*	65*

Table 11.4: Maximum Permissible Noise Levels at the Facade of Dwellings during Construction.

Note * Construction activity at these times, other than that required for emergency works, will normally require the explicit permission of the relevant local authority.

In exceptional circumstances there may be a requirement that certain construction works are carried out during night-time periods. Therefore, based on the above the following construction noise criteria are proposed for the site.

70 dB L_{Aeq,1hr} at any residential noise sensitive location.

11.2.1.1 Construction Vibration

Vibration standards come in two varieties: those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. In both instances, it is appropriate to consider the magnitude of vibration in terms of Peak Particle Velocity (PPV).

It is acknowledged that humans are particularly sensitive to vibration stimuli and that any perception of vibration may lead to concern. In the case of road traffic, vibration is perceptible at around 0.5 mm/s and may become disturbing or annoying at higher magnitudes. However, higher levels of vibration are typically tolerated for single events or events of short duration. For example, rock breaking and piling, two of the primary sources of vibration during construction, are typically tolerated at vibration levels up to 12 mm/s and 5 mm/s respectively. This guidance is applicable to the daytime only; it is unreasonable to expect people to be tolerant of such activities during the night.

Guidance relevant to acceptable vibration within buildings is contained in the following documents: -

- British Standard BS 7385: 1993: Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration.
- British Standard BS 5228-2: 2009+A1:2014: Code of practice for noise and vibration control on construction and open sites – Vibration.

BS 7385 states that there should typically be no cosmetic damage if transient vibration does not exceed 15 mm/s at low frequencies rising to 20 mm/s at 15 Hz and 50 mm/s at 40 Hz and above. These guidelines relate to relatively modern buildings and should be reduced to 50% or less for more critical buildings.

BS 5228 recommends that, for soundly constructed residential property and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak component particle velocity (in frequency range of predominant pulse) of 15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz and 50 mm/s at 40 Hz and above. Below these values minor damage is unlikely. Where continuous vibration is such as to give rise to dynamic magnification due to resonance, the guide values may need to be reduced by up to 50%. BS 5288-2 also comments that important buildings which are difficult to repair might require special consideration on a case by case basis.

The TII document Guidelines for the Treatment of Noise and Vibration in National Road Schemes also contains information on the permissible construction vibration levels as follows: -

Allowable Vibration (in Terms of Peak Particle) at the Velocity Closest Part of Sensitive Property to the Source of Vibration, at a Frequency of		
Less than 10 Hz	10 to 50 Hz	50 to 100 Hz (and above)
8 mm/s	12.5 mm/s	20 mm/s

Table 11.5: Allowable Vibration during Construction Phase.

11.2.2 Operational Phase Criteria

11.2.2.1 Additional Traffic on Surrounding Roads

There are no specific guidelines or limits relating to traffic related sources along the local or surrounding roads. Given that traffic from the development will make use of existing roads already carrying traffic volumes, it is appropriate to assess the calculated increase in traffic noise levels that will arise because of vehicular movements associated with the development. In order to assist with the interpretation of the noise associated with additional vehicular traffic on public roads, Table 11.6, taken from Design Manual for Roads and Bridges (DMRB), LA 111 Noise and vibration Revision 2 (UK Highways Agency et al, 2020) offers guidance as to the likely degree of impact associated with any long-term change in traffic noise level.

Change in Sound Level (dB)	Subjective Reaction	DMRB Magnitude of Impact	EPA Significance of Effect
0	Inaudible	No impact	Imperceptible
0.1 – 2.9	Barely Perceptible	Negligible	Not significant
3 – 4.9	Perceptible	Minor	Slight, Moderate
5 – 9.9	Up to a doubling of loudness	Moderate	Significant
10+	Doubling of loudness and above	Major	Very significant

Table 11.6: Significance in Change of Noise Level.

The guidance outlined in Table 11.6 will be used to assess the predicted increases in traffic levels on public roads associated with the proposed development and comment on the likely long-term impacts during the operational phase.

11.2.2.2 Building Services Plant Noise

The most appropriate standard used to assess the impact of a new continuous source (i.e. plant items) to a residential environment and that often applied by Dublin City Council is BS 4142 *Methods for Rating and Assessing Industrial and Commercial Sound* (2014). This standard describes a method for assessing the impact of a specific noise source at a specific location with respect to the increase in “background” noise level that the specific noise source generates. The standard provides the following definitions that are pertinent to this application:

Specific sound level, $L_{Aeq, Tr}$	Is equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T. This level has been determined with reference to manufacturers information for specific plant items.
Rating level $L_{Ar, T}$	Is the specific noise level plus adjustments for the character features of the sound (if any).
Background noise level	Is the sound A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T. This level is expressed using the LA90 parameter. These levels were measured as part of the baseline survey.

The assessment procedure in BS4142: 2014 is outlined as follows: -

1. Determine the specific noise level.
2. Determine the rating level as appropriate.
3. Determine the background noise level.
4. Subtract the background noise level from the specific noise level in order to calculate the assessment level.

The lower the rating level is relative to the measured background sound level, the less likely it is that the specific source will have an adverse impact or a significant adverse impact. A difference of +10dB or more is a likely to be an indication of a significant adverse impact. A difference of around +5dB is likely to be an indication of an adverse impact, dependent on the context. Where the rated plant noise level is equivalent to the background noise level, noise impacts are typically considered to be neutral.

11.2.2.3 Inward Noise Impact

Fingal Development Plan Policy on Aircraft Noise

The members of Fingal County Council resolved to adopt Variation No. 1 of the Fingal Development Plan 2017-2023 at a Council meeting on 9 December 2019. Variation No. 1 outlines revised Noise Zones and policy objectives in relation to aircraft noise from Dublin Airport.

Four noise zones (Zone A to D) are now indicated representing potential site exposure to aircraft exposure. The council will actively resist residential development within Zone A, and resist in Zone B and C pending independent acoustic advise and mitigation measures. Certain specific residential developments located in Zone D may be required to demonstrate that aircraft noise intrusion has been considered in the design.

Table 11.7 outlines the objectives to be adhered to by applicants for developments in each zone.

Zone	Indication of Potential Noise Exposure during Airport Operations	Objective
D	<p>≥ 50 dB and < 54 dB LAeq, 16hr</p> <p>and</p> <p>≥ 40 dB and < 48 dB Lnight</p>	<p>To identify noise sensitive developments which could potentially be affected by aircraft noise and to identify any larger residential developments in the vicinity of the flight paths serving the Airport in order to promote appropriate land use and to identify encroachment.</p> <p><i>All noise sensitive development within this zone is likely to be acceptable from a noise perspective. An associated application would not normally be refused on noise grounds, however where the development is residential-led and comprises non-residential noise sensitive uses, or comprises 50 residential units or more, it may be necessary for the applicant to demonstrate that a good acoustic design has been followed.</i></p> <p><i>Applicants are advised to seek expert advice.</i></p>
C	<p>≥ 54 dB and < 63 dB LAeq, 16hr</p> <p>and</p> <p>≥ 48 dB and < 55 dB Lnight</p>	<p>To manage noise sensitive development in areas where aircraft noise may give rise to annoyance and sleep disturbance, and to ensure, where appropriate, noise insulation is incorporated within the development</p> <p><i>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.</i></p> <p><i>The noise assessment must demonstrate that relevant internal noise guidelines will be met. This may require noise insulation measures.</i></p> <p><i>An external amenity area noise assessment must be undertaken where external amenity space is intrinsic to the development's design. This assessment should make specific consideration of the acoustic environment within those spaces as required so that they can be enjoyed as intended. Ideally, noise levels in external amenity spaces should be designed to achieve the lowest practicable noise levels.</i></p> <p><i>Applicants are strongly advised to seek expert advice.</i></p>

B	<p>≥ 54 dB and < 63 dB $L_{Aeq, 16hr}$</p> <p>and</p> <p>≥ 55 dB L_{night}</p>	<p>To manage noise sensitive development in areas where aircraft noise may give rise to annoyance and sleep disturbance, and to ensure noise insulation is incorporated within the development.</p> <p><i>Noise sensitive development in this zone is less suitable from a noise perspective than in Zone C. A noise assessment must be undertaken in order to demonstrate good acoustic design has been followed.</i></p> <p><i>Appropriate well-designed noise insulation measures must be incorporated into the development in order to meet relevant internal noise guidelines.</i></p> <p><i>An external amenity area noise assessment must be undertaken where external amenity space is intrinsic to the development's design. This assessment should make specific consideration of the acoustic environment within those spaces as required so that they can be enjoyed as intended. Ideally, noise levels in external amenity spaces should be designed to achieve the lowest practicable noise levels.</i></p> <p>Applicants must seek expert advice.</p>
A	<p>≥ 63 dB $L_{Aeq, 16hr}$</p> <p>and/or</p> <p>≥ 55 dB L_{night}</p>	<p>To resist new provision for residential development and other noise sensitive uses.</p> <p>All noise sensitive developments within this zone may potentially be exposed to high levels of aircraft noise, which may be harmful to health or otherwise unacceptable. The provision of new noise sensitive developments will be resisted.</p>
<p>Notes: -</p> <ul style="list-style-type: none"> • 'Good Acoustic Design' means following the principles of assessment and design as described in ProPG: Planning & Noise – New Residential Development, May 2017. • Internal and External Amenity and the design of noise insulation measures should follow the guidance provided in British Standard BS8233:2014 'Guidance on sound insulation and noise reduction for buildings'. 		

Table 11.7: Aircraft Noise Zones.

Dublin Agglomeration Noise Action Plan 2019 – 2023

The Dublin Agglomeration 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.

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 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 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.
 - **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”).
- 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 11.1.

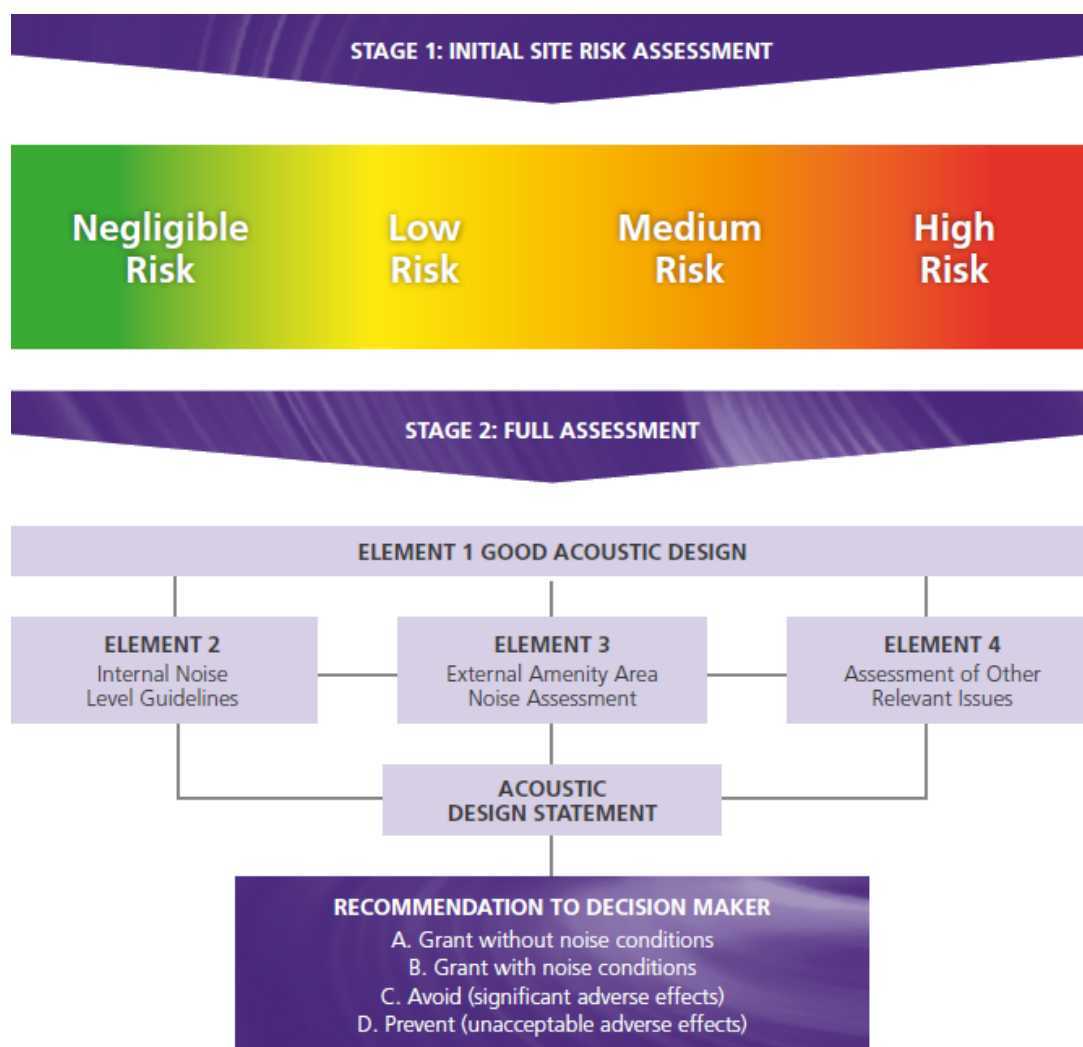


Figure 11.1: ProPG Approach (Source: ProPG).

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.

ProPG: Stage 1 – Noise Risk Assessment

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 11.1 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 day or night, in addition the noise zone contour produced by Fingal County Council 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.

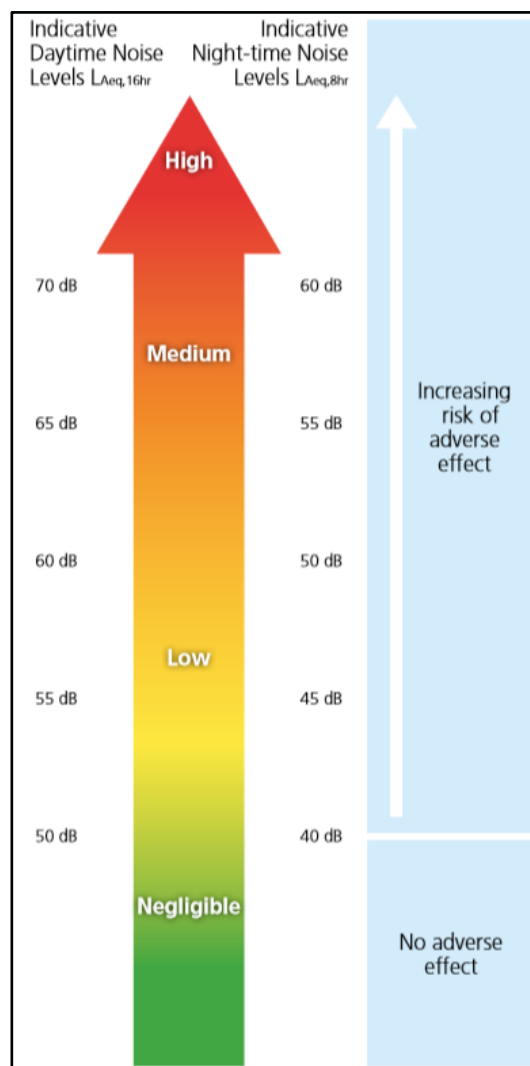


Figure 11.2: ProPG Stage 1 – Initial Noise Risk Assessment.

11.3 Receiving Environment

11.3.1 Proposed Development

An environmental noise survey has been conducted at the site in order to quantify the existing noise environment. The survey was conducted in general accordance with ISO 1996: 2017: *Acoustics – Description, measurement and assessment of environmental noise*.

11.3.1.1 Noise Survey Locations

A set of three attended locations were chosen to inform the outward impact of the proposed development: -

- **AT1:** At the corner of The Lawn / The View within the existing St Marnock's Phase 1C, to by the northern boundary with the proposed development
- **AT2:** At the south-eastern corner of Drumnigh Wood to the west of the proposed development
- **AT3:** Mid-way along the southern boundary of the proposed development. This location considered to represent the acoustic environment at Moyne Lodge.

These locations are shown in Figure 11.3 below.

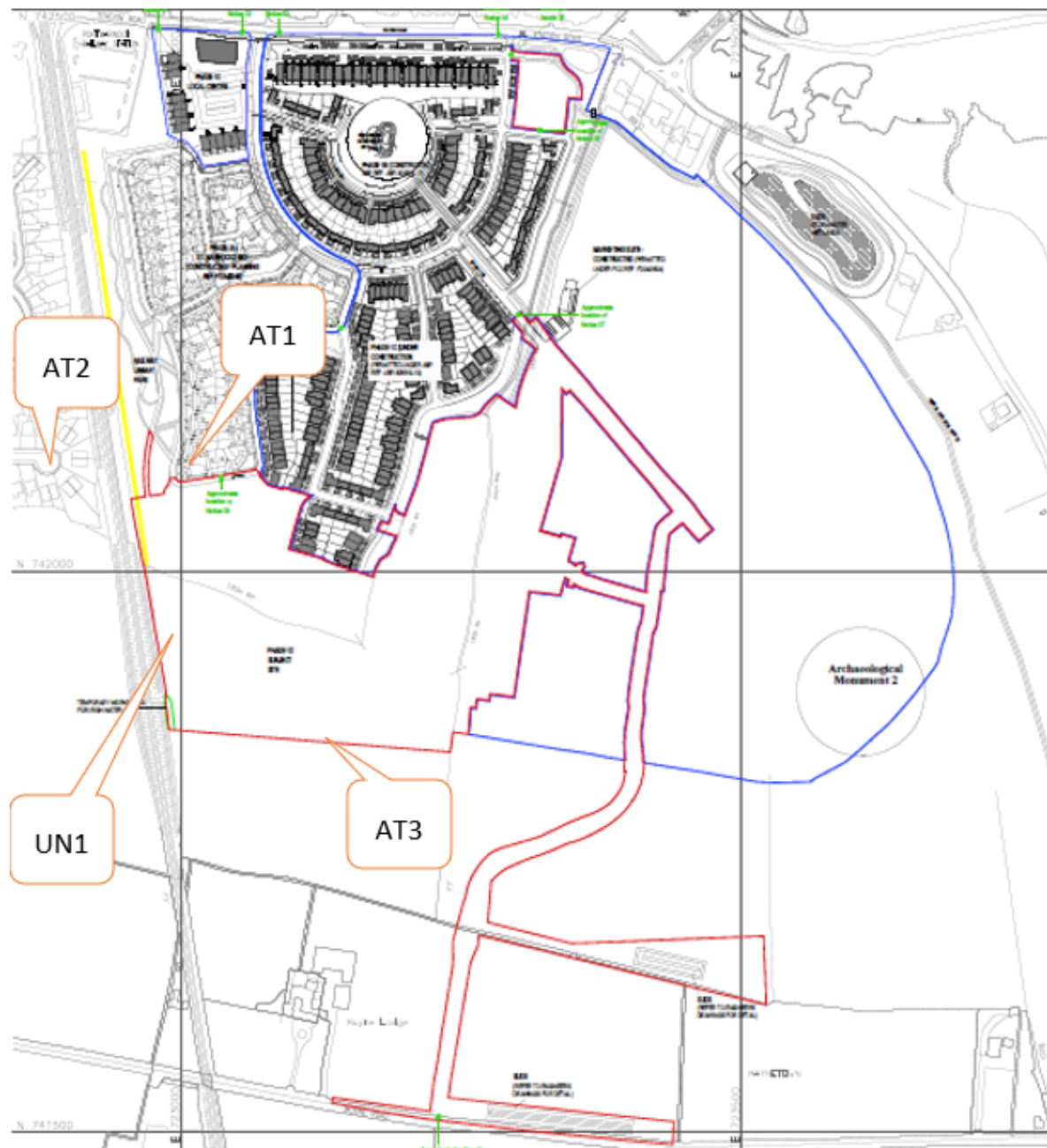


Figure 11.3: Noise Survey Locations.

11.3.1.2 Survey Periods

The attended noise survey was carried out on Friday 18 June 2021. Noise levels were measured over 15-minute periods on a cyclic basis at each measurement location.

The weather during the survey period was dry with varying cloud cover. Wind speeds were moderate; however they were not considered to have had a detrimental effect on the noise measurements.

Unattended noise measurements were carried out between 14:55 on Thursday 19 August and 06:55hrs on Tuesday 24 August 2021.

11.3.1.3 Personnel and Instrumentation

AWN installed and collected the noise monitoring equipment. The following instrumentation was used in conducting the noise and surveys: -

Equipment	Type	Serial Number	Calibration Date
Sound Level Meter	Rion NL-52	575802	July 2020
Sound Level Meter	Rion NL-52	186672	May 2020

Table 11.8: Instrumentation Details.

11.3.1.4 Noise Measurement Parameters

The noise survey results are presented in terms of the following parameters: -

L_{Aeq} 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.

L_{AFmax} is the instantaneous maximum sound level measured during the sample period using the 'F' time weighting.

L_{A10} is the sound level that is exceeded for 10% of the sample period. It is typically used as a descriptor for traffic noise.

L_{A90} is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise.

The "A" suffix denotes the fact that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing. All sound levels in this chapter are expressed in terms of decibels (dB) relative to 2×10^{-5} Pa.

11.3.1.5 Survey Results

Attended Noise Measurements

The survey results for the attended monitoring are given in Table 11.9.

Location	Start Time	Measured Noise Levels (dB re. 2×10^{-5} Pa)			
		L_{Aeq}	L_{AFmax}	L_{A10}	L_{A90}
AT1	11:50	56	83	59	48
	13:20	45	60	49	37
	14:45	59	77	58	41
AT2	12:20	50	73	48	37
	13:45	52	79	45	37
	15:15	45	72	43	35
AT3	12:55	51	72	49	39
	14:20	50	71	47	38
	15:45	56	76	55	37

Table 11.9: Attended Noise Survey Results.

At AT1, the noise environment was dominated by construction activity at the neighbouring construction site, with a reduction in activity during the second measurement period. Other audible sources were traffic on station road, birdsong, and train and aircraft movements.

At AT2, the main contributors to noise build-up were construction activity, intermittently audible, along with train movements, wind noise in foliage and birdsong.

Similarly, at AT3, the main contributors to noise build-up were construction activity, along with train and aircraft movements, wind noise in foliage and birdsong.

Unattended Noise Measurements

The results of the unattended monitoring survey at Location UN1 are summarised for daytime periods in Table 11.10 and for night-time periods in Table 11.11.

Monitoring Period / Range		Measured Noise Levels (dB re. 2x10 ⁻⁵ Pa)	
		L _{Aeq}	L _{A90}
Thursday 19 August	Highest	66	41
	Lowest	33	27
	Average	58	34
Friday 20 August	Highest	66	47
	Lowest	37	34
	Average	59	42
Saturday 21 August	Highest	66	47
	Lowest	37	35
	Average	58	39
Sunday 22 August	Highest	67	41
	Lowest	34	31
	Average	58	36
Monday 23 August	Highest	66	43
	Lowest	31	23
	Average	58	35

Table 11.10: Summary of Daytime Unattended noise measurements at UN1.

Monitoring Period / Range		Measured Noise Levels (dB re. 2x10 ⁻⁵ Pa)	
		L _{Aeq}	L _{A90}
Thursday 19 August to Friday 20 August	Highest	62	36
	Lowest	22	21
	Average	52	28
Friday 20 August to Saturday 21 August	Highest	61	45
	Lowest	30	28
	Average	52	33

Monitoring Period / Range		Measured Noise Levels (dB re. 2x10 ⁻⁵ Pa)	
		L _{Aeq}	L _{A90}
Saturday 21 August to Sunday 22 August	Highest	64	41
	Lowest	30	28
	Average	54	33
Sunday 22 August to Monday 23 August	Highest	64	42
	Lowest	26	22
	Average	53	30
Monday 23 August to Tuesday 24 August	Highest	62	33
	Lowest	20	18
	Average	53	24

Table 11.11: Summary of Night-time Unattended noise measurements at UN1.

During daytime periods, average noise levels were in the range 58 to 59 dB L_{Aeq} and 35 to 43 dB L_{A90}. During night-time periods, average noise levels were in the range 52 to 53 dB L_{Aeq} and 28 to 33 dB L_{A90}.

L_{Aeq} and L_{AFMax} values were measured at 15-minute intervals over the duration of the survey. Figure 11.4 and Figure 11.5 present the number of measured L_{Aeq} and L_{AFMax} events for each decibel level during the day and night periods. It is noted from Figure 11.5 the noise level of 75 dB L_{Amax} is not normally exceeded.

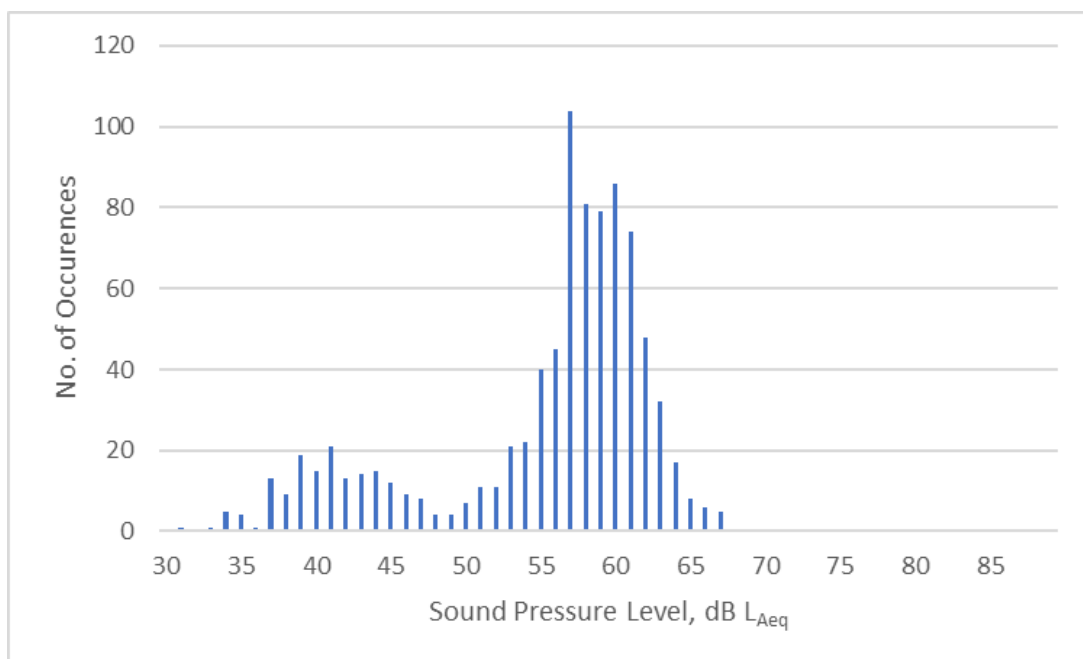


Figure 11.4: Number of Events at Each Decibel Level – Day

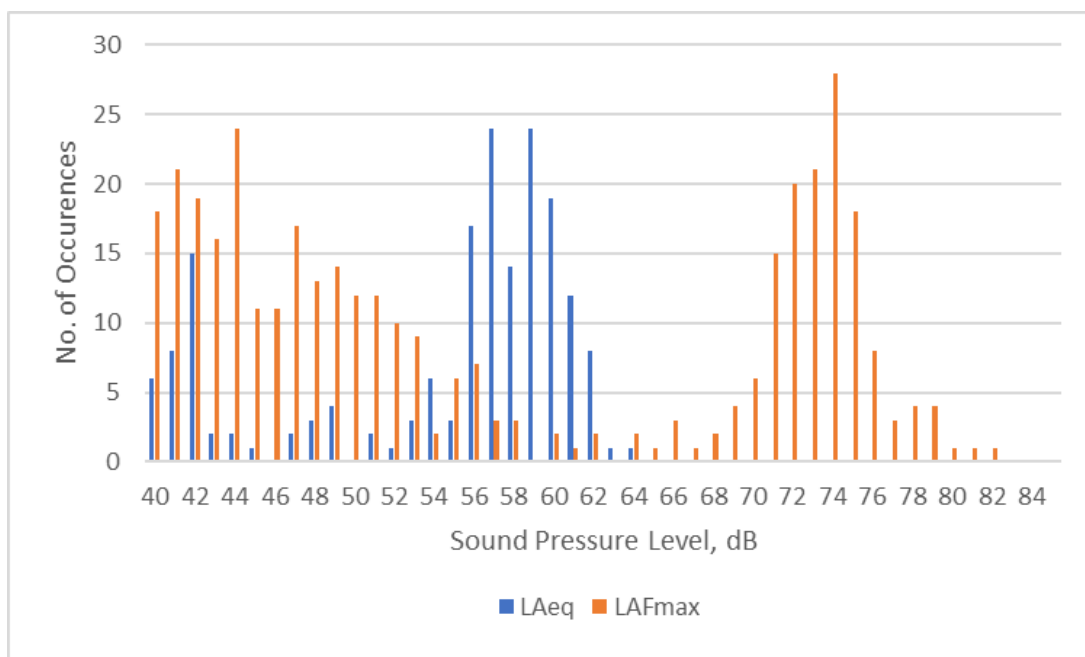


Figure 11.5: Number of Events at Each Decibel Level – Night.

11.3.1.6 Comparison with EPA Noise Maps

It is important to note that due to Covid19 travel restrictions, activity at the airport was reduced. It is considered appropriate to examine suitable published data to establish typical noise levels incident on the site for comparison to the measured levels.

To assist in establishing a representative baseline noise environment in the vicinity of the site, reference has been made to the Environmental Protection Agency strategic noise mapping for Dublin Airport. The 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>.

Figure 11.6 and Figure 11.7 present the predicted noise levels across the development site for road and air traffic in terms of L_{den} and L_{night} for roads and similarly for rail, in Figure 11.8 and Figure 11.9.

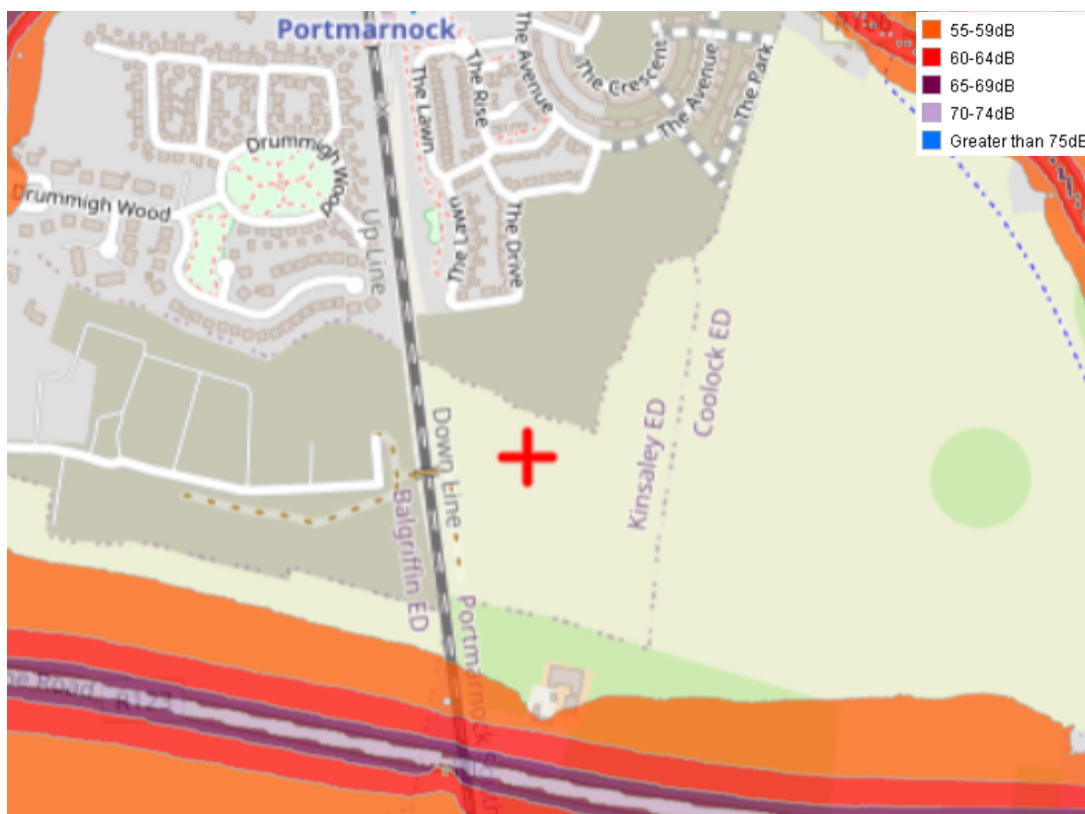


Figure 11.6: EPA Round 3 Noise Map for Roads, L_{den} .



Figure 11.7: EPA Round 3 Noise Map for Roads, L_{night} .

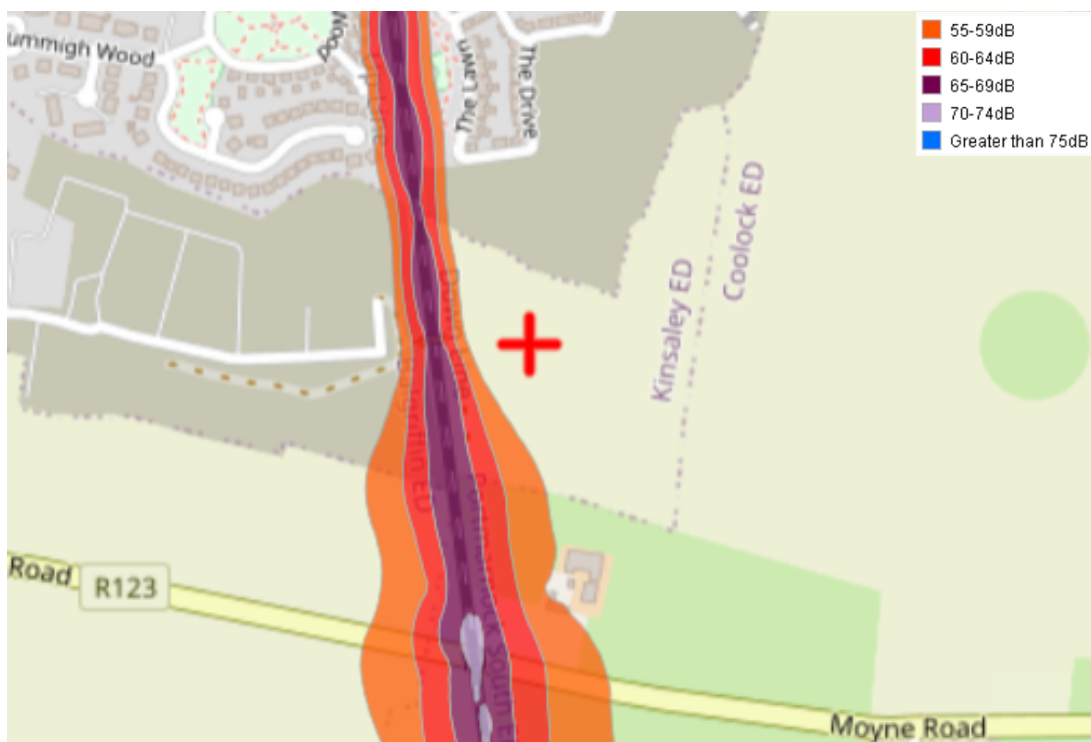


Figure 11.8: EPA Round 3 Noise Map for Rail, L_{den}.

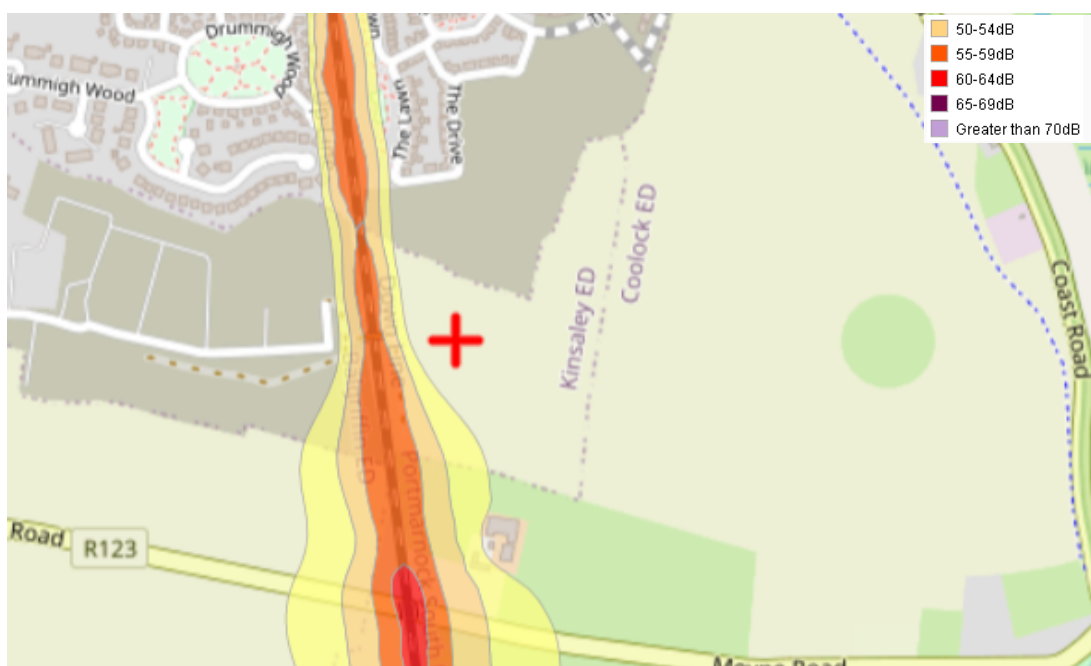


Figure 11.9: EPA Round 3 Noise Map for Rail, L_{night}.

11.3.1.7 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. To address this Fingal have produced noise zone maps for the area surrounding the airport. These maps present noise contours as follows: -

- Zone A – ≥ 63 dB L_{Aeq,16hr} and/or ≥ 55 dB L_{night}.
- Zone B – ≥ 54 dB L_{Aeq,16hr} and < 63 dB L_{Aeq,16hr} and ≥ 55 dB L_{night}.

- Zone C – ≥ 54 dB $L_{Aeq,16hr}$ and < 63 dB $L_{Aeq,16hr}$ and ≥ 48 dB L_{night} and < 55 dB L_{night} .
- Zone D – ≥ 50 dB $L_{Aeq,16hr}$ and < 54 dB $L_{Aeq,16hr}$ and ≥ 40 dB L_{night} and < 48 dB L_{night} .

Figure 11.10 presents the current development site in the context of these zones. Note that road traffic noise is not expected to change significantly into the future.



Figure 11.10: Dublin Airport Noise Zones.

It is noted that the development site is located within Zone B. Based on the noise Zones, the worst case noise levels incident to dwellings and external amenity areas falling within these zone can be summarised as: -

- **Daytime:** 63 dB $L_{Aeq,16hr}$.
- **Night-time:** 55 dB L_{night} .

11.3.1.8 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 Low to Medium Noise Risk. ProPG states the following with respect to various levels of risk: -

Negligible Risk	<i>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.</i>
Low Risk	<i>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.</i>
Medium Risk	<i>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.</i>

Given the above it can be concluded that the development site may be categorised as ‘low to 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. Appropriate mitigation measures are set out in section 11.6 of this chapter.

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 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.

11.4 Characteristics of the Proposed Development

The Proposed Development comprises 172no. residential dwellings, a public park (‘Skylark Park’), 2no. townland boundary linear parks, extension south of the railway linear park, upgrade of existing temporary foul pumping station and storage tank, provision of permanent vehicular roads to connect with Mayne Road to the south including 2no. associated linear wetlands for stormwater management and a new junction with Moyne Road, provision of pedestrian / cycle tracks through the linear parks and along the southern extent of the site and all associated and ancillary site development, landscaping and boundary treatment works.

A full project description is provided in Chapter 3: Description of Proposed Development.

11.5 Potential Impact of the Proposed Development

The potential impacts of the proposed development are considered for the short-term construction phase and long-term operational phase. These are set out in the following sections.

11.5.1 Proposed Development

11.5.1.1 Construction Phase

It is predicted that the construction programme will create typical construction activity related noise on site. During the construction phase of the proposed development, a variety of items of plant will be in use, such as excavators, lifting equipment, dumper trucks, compressors and generators.

The proposed general construction hours are 07:00 to 18:00hrs, Monday to Friday and 08:00 to 14:00hrs on Saturdays. Occasional weekday evening works may also be required; however evening activities will be significantly reduced in order to manage any associated noise impacts in an appropriate manner and more stringent construction noise criteria will be applicable during any evening works that may be required. As a result, noise emissions from evening activities are expected to be significantly lower than for other general daytime activities.

Due to the nature of daytime activities undertaken on a construction site there is potential for generation of significant levels of noise. The flow of vehicular traffic to and from a construction site is also a potential source of relatively high noise levels. The potential for vibration at neighbouring sensitive locations during construction is typically limited to excavation works and lorry movements on uneven road surfaces. Due to the proximity of sensitive locations to site works however, there is little likelihood of structural or even cosmetic damage to existing neighbouring dwellings as a result of vibration.

As the construction programme has been established in outline form only, it is difficult to calculate the actual magnitude of noise emissions to the local environment. However, it is possible to predict typical noise levels using guidance set out in BS 5228-1. Table 11.12 outlines typical plant items and associated noise levels that are anticipated for various phases of the construction programme.

For the purposes of the assessment, we have assumed that standard good practice measures for the control of noise from construction sites will be implemented. These issues are commented upon in further detail in the mitigation section of this chapter.

Phase	Item of Plant (BS 5228-1 Ref.)	Construction Noise Level at 10m Distance, (dB LAeq,1hr)
1 – Site Preparation	Wheeled Loader Lorry (C2 28)	74
	Track Excavator (C2 22)	72
	Dozer (C2.13)	78
	Dump Truck (C4.2)	78
2 – Foundations	Tracked Excavator (C3.24)	74
	Concrete Pump (C3.25)	78
	Compressor (C3 19)	75
	Poker Vibrator (C4 33)	78
3 – General Construction	Mobile Telescopic Crane C4.39	77
	Hand tools	81
	Pneumatic Circular Saw (D7.79)	75
	Internal fit – out	70
4 – Landscaping	Dozer (C2.13)	78
	Dump Truck (C4.2)	78
	Surfacing (D8.25)	68

Table 11.12: Typical Noise Levels associated with Construction Plant Items (BS5228-1)

A number of representative noise sensitive locations have been considered in relation to the Proposed Development as illustrated in Figure 11.11 and described in Table 11.13.

Ref	Description
N1	St Marnock's Phase 1C
N2	The Green
N3	Drumnigh Wood
N4	Moyne Lodge, to the south of the site

Table 11.13: Noise Assessment Locations.

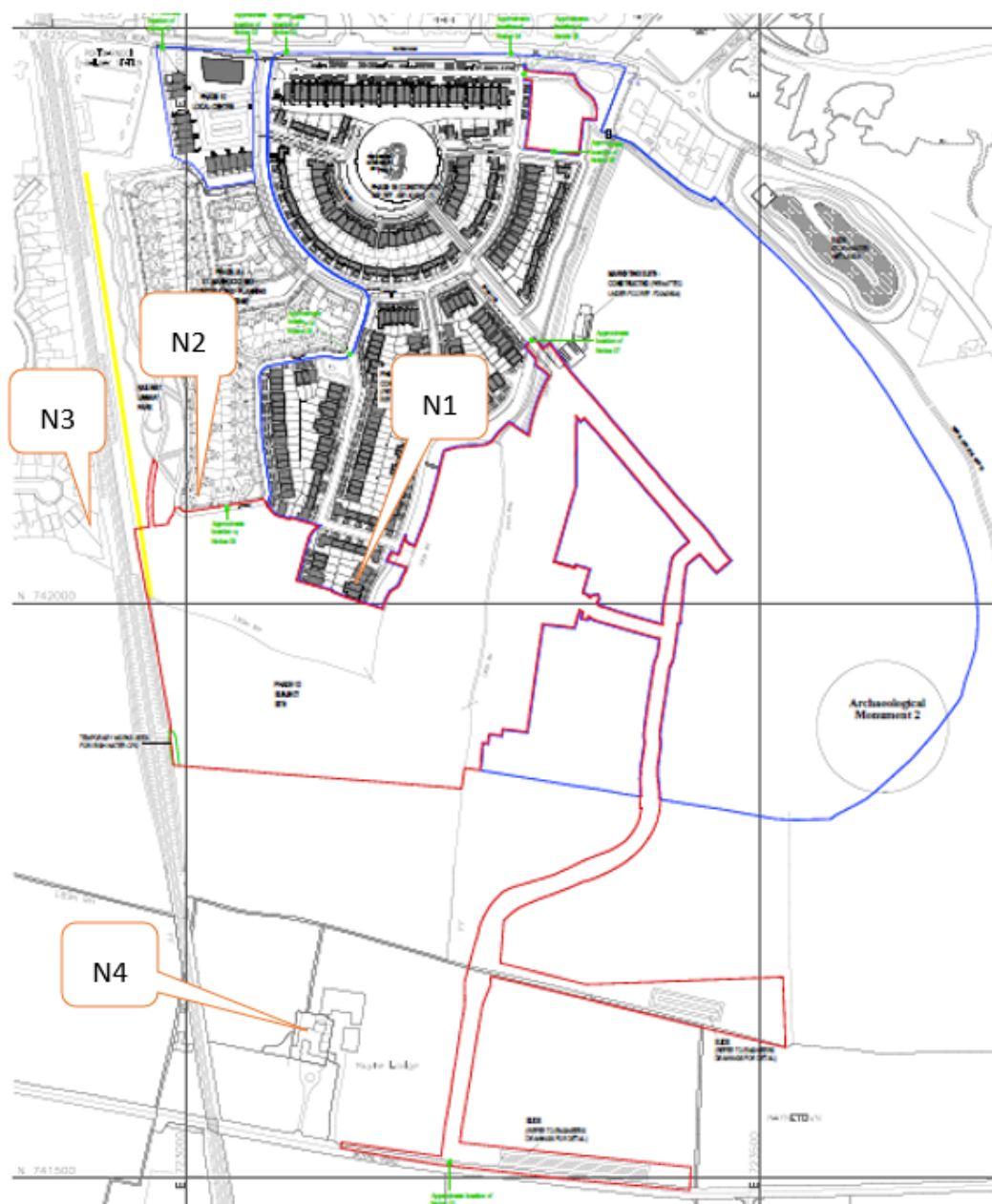


Figure 11.11: Noise Assessment Locations.

Table 11.14 sets out a range of construction noise levels relating to different construction activity at the various noise assessment location. It is assumed that the construction site is to be surrounded by a 2.4m high solid hoarding and that an 'on-time' of 66% applies to construction plant.

Ref.	Predicted Construction Noise Level for Various Phases dB L _{Aeq,1hr}			
	Site Preparation	Foundations	General Construction	Landscaping
N1	71	71	72	69
N2	64	64	65	63
N3	59	59	60	58
N4	59	59	60	58

Table 11.14: Review of Potential Daytime Construction Noise Levels.

The indicative construction noise prediction values are within the criterion of 70 dB L_{Aeq,1hr} for weekdays but in excess of the criterion for the closest location, N1. Because of this, management of construction noise will need to be applied on a proactive day to day basis. A complete Construction Noise Management Plan has been prepared for the proposed development. There are no construction activities that would be expected to give rise to noise construction levels that would be considered out of the ordinary or in exceedance of the levels outlined in Table 11.14 on an on-going basis

Based on the above description of impacts presented in Table 11.3, and the predicted noise levels presented the assigned impacts are summarised in Table 11.15 as follows:

Ref.	Predicted Construction Noise Impacts for Various Phases dB L _{Aeq,1hr}			
	Site Preparation	Foundations	General Construction	Landscaping
N1	Significant	Significant	Significant	Moderate-Significant
N2	Slight-Moderate	Slight-Moderate	Slight-Moderate	Slight-Moderate
N3	Slight-Moderate	Slight-Moderate	Slight-Moderate	Slight-Moderate
N4	Slight-Moderate	Slight-Moderate	Slight-Moderate	Slight-Moderate

Table 11.15: Review of Potential Daytime Construction Noise Impacts.

In terms of the numbers of noise-sensitive location in the proposed development surroundings, in the majority of cases, the construction noise impact is Slight-Moderate. At a smaller number of locations, where in particular the proposed development adjoins the existing The Lawn / The Green and also the St. Marnock's Phase 1C, the impact has the potential to be significant, though the duration of these predicted worst-case impacts will be temporary.

It is anticipated that the construction of the proposed development will be completed during normal construction hours i.e. 07:00 to 19:00hrs Monday to Friday and 08:00 to 14:00hrs on Saturdays. However, it is possible that the contractor may wish to carry out certain operations outside these hours i.e. evening hours during long summer days etc. Such occurrences will be kept to a minimum and take place over a short timeframe and as such are unlikely to cause excessive disturbance. A more stringent construction noise criteria (as per Table 11.4) will be applicable during any evening works that may be required.

11.5.1.2 Operational Phase – Outward Impact

The main potential noise outward noise impact to the surrounding will be from additional vehicles on the surrounding road network and building services and mechanical plant serving the development.

Potential impacts from each of these sources are discussed below.

Additional Vehicular Traffic on Surrounding Roads

During the operational phase of the proposed development, there will be an increase in vehicular traffic associated with the site and other planned developments on surrounding roads.

The predicted change in noise levels due to an increase in road traffic has been calculated for each of these roads. Projected traffic data used for the purpose of this assessment includes committed and planned developments in the vicinity of the project site as listed in Chapter 14: Material Assets (Transportation) of this EIAR.

In terms of the additional traffic on local roads that will be generated as a result of this development the following comment is presented: Considering that in order to increase traffic noise levels by 1dB traffic volumes would need to increase by the order of 25% it is considered that additional traffic introduced onto the local road network due to this development will not result in a significant noise impact. The resultant noise impact is neutral, imperceptible and long-term.

For the purposes of assessing potential noise impact, it is appropriate to consider the relative increase in noise level associated with traffic movements on existing roads surrounding the subject site with and without development using the Annual Average Daily Traffic (AADT) data.

The impact from the increase in traffic from the proposed development has been assessed for the design year of 2038 relative to the Do Nothing scenario along the sections of road detailed in Table 11.16.

Road Link	Noise level (dB L _{A10}) Increase between Do Nothing and Do Something based on AADT Traffic Data, Year 2038
Moyne Road West	0.6
Moyne Road West	0.5

Table 11.16: Predicted Change In Noise Level associated with Vehicular Traffic

The predicted increase in traffic flows associated with the development in the design year of 2038 will result in an increase less than 1dB along all roads receiving traffic from the proposed development will have a negligible effect. The effect is therefore neutral, imperceptible and permanent.

Comment on Moyne Road

The potential noise impact of the proposed link road from the main part of the site to the Moyne Road to the south is assessed in this subsection.

The nearest noise-sensitive location is Moyne Lodge at a distance of 120 m from the proposed link road. The traffic consultants have confirmed an estimated traffic flow of the order of 224 vehicles in the AM peak hour and 229 in the PM peak hour.

The potential noise impact of vehicles accessing the Proposed Development is assessed through consideration of the cumulative noise level associated with a series of individual events. The noise level associated with an event of short duration, such as a vehicle drive-by, may be expressed in terms of its Sound Exposure Level (L_{Ax}). The SEL can be used to calculate the contribution of an event or series of events to the overall noise level in a given period. The appropriate formula is as follows: -

$$L_{Aeq,T} = L_{Ax} + 10\log_{10}(N) - 10\log_{10}(T) - 20\log_{10}(r_2/r_1) - S \text{ dB}$$

Where: -

$L_{Aeq,T}$ is the equivalent continuous sound level over the time period T (s).

L_{Ax} is the “A-weighted” Sound Exposure Level of the event under consideration (dB).

N is the number of events over the course of time period T.

r_2 is the distance from the edge of the entrance road to the facade of nearest property.

r_1 is the distance from vehicle to the point of original measurement.

S is the attenuation due to screening.

The mean value of Sound Exposure Level for a car at low speeds is of the order of 72 dB L_{Ax} at a distance of 5m from the edge of the road. This figure is based on a series of measurements conducted under controlled conditions.

Predicted noise levels at the Moyne Lodge due to the link road are of the order of 49 dB. Measured noise levels at noise survey location AT3 are in the range 50 to 53 dB L_{Aeq} . It is therefore considered that vehicle noise from Moyne Road at this location is not significant.

Building Services Plant

It is expected that the principal items of building and mechanical services plant will be for heating and ventilation of the buildings. These items and their location will be selected at the detailed design stage to ensure that noise emissions to sensitive receivers both external and within the development itself will be within the relevant criteria set out in Section 11.2.2.1. The effects are considered neutral, not significant and permanent.

11.5.1.3 Operational Phase – Inward Impact

Element 1 – Good Acoustic Design Process

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.

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*

The site lies completely within the Noise Zone B for Dublin Airport and as such it would not have been possible to reduce the noise due to aircraft overhead by designing the layout in a different way. The assessment in this chapter is appropriate for sites of this nature in Noise Zone B.

- *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 where required. For units where it will not be possible to achieve the desirable internal acoustic environments with windows open, 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 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 LAeq 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 LAeq 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. using suitable glazing and vents to be cost neutral and do not have any significant impact on other issues.

- *Assess Viability of Alternative Solutions*

The site lies within Dublin Airport Noise Zone B. Due to the height at which aircraft noise would be incident to the dwellings and external amenity areas, an acoustic barrier or similar would be ineffective and is not proposed anywhere on the site.

- *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 LAeq,16hr.”

External noise levels across the site during the daytime, with the North Runway in operation, are expected fall in the region of 63 dB LAeq,16hr.

It is noted that whilst external amenity areas located in Zone B would be above the desirable level of 55 dB LAeq,16hr it is not possible to reduce the noise level across external spaces due to aircraft noise being the dominant noise source.

- *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.

Element 2 – Internal Noise Guidelines

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 **Error! Reference source not found.** 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.

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 LAeq values by up to 5 dB can still provide reasonable internal conditions.

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	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$ 45 dB $L_{Amax,T}^*$

Table 11.17: 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.

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 .

Considering the design goals outlined in **Error! Reference source not found.** 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 11.18.

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 11.18: 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 good internal noise levels with windows open for properties located within Zone C 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.

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.
- Characteristics of the receiving room.

The principles outlined in BS EN 12354-3 are also referred to in BS8233 and Annex G 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 11.19.

Octave Band Centre Frequency (Hz)						R _w
125	250	500	1k	2k	4k	
20	19	29	38	36	45	32

Table 11.19: Sound Insulation Performance Requirements for Glazing, SRI (dB)

The acoustic specification listed in **Error! Reference source not found.** can be achieved using a double-glazed unit with slightly thicker than standard glass. This performance could also be achieved using a suitably specified triple glazing window.

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.

- *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.

Table 11.20 presents the acoustic specification for the vents: -

Octave Band Centre Frequency (Hz)						R _w
125	250	500	1k	2k	4k	
29	30	37	39	36	42	39

Table 11.20: Sound Insulation Performance Requirements for Ventilation, SRI (dB)

- **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. A suitable sound reduction performance would be provided by a standard tiled or slated roof with a single 12.5mm layer plasterboard ceiling and heat insulation layer above the ceiling.

Any penetrations through the ceiling constructions must be as small as possible and made good by fully filling with plaster or with an acoustic sealant.
- **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.

Element 3 – External Amenity Area Noise Assessment

As previously discussed, external amenity areas are not expected to achieve the recommended 55dB $L_{Aeq,16hr}$ noise level recommended in ProPG. However, it is not possible to reduce the noise level across external spaces due to aircraft noise being the dominant noise source.

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.

Compliance with Relevant National and Local Policy

There are no National policy documents relating to the acoustic design of residential dwellings. Locally, the Adopted Variation No 1 to Fingal Development Plan 2017 – 2023 contains Objective DA07 relating to development within the Airport Noise Zones. This objective states: -

“Objective DA07

Strictly control inappropriate development and require noise insulation where appropriate in accordance with table 1 above within Noise Zone B and Noise Zone C and where necessary in Assessment Zone D, and actively resist new provision for residential development and other noise sensitive uses within Noise Zone A, 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 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.

Magnitude and Extent of Compliance with ProPG

As discussed within this chapter 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. However as the development is considered desirable – the land is zoned for residential development – then the criteria can be relaxed to a value of the order of the current daytime noise levels; 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.

Likely Occupants of the Development

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.

Acoustic Design v Unintended Adverse Consequences

Unintended adverse consequences did not occur on this project.

Acoustic Design v Wider Planning Objectives

With reference to the Proposed Variation No 1 to Fingal Development Plan 2017 – 2023, the proposed development site is within Zone B. This assessment has demonstrated the noise insulation measures required to ensure that the proposed dwelling units achieve a good internal noise environment.

11.5.1.4 Do-Nothing Impact

In the absence of the Proposed Development being constructed, the noise environment at the nearest noise sensitive locations and within the development site will remain largely unchanged resulting in a neutral impact in the long-term.

11.5.2 Cumulative

11.5.2.1 Construction Phase

If construction of the proposed development were to concur with that of other phases, there is potential for cumulative construction noise impacts. As noted in Section 11.5.1.1, significant construction noise levels are only expected when works are being carried out at short distances from a given noise-sensitive location. However, it is not likely that there will be simultaneous construction activity from other proposed developments at such distances from noise-sensitive locations.

11.5.2.2 Operational Phase

In respect of cumulative impact, assessment of the impact of additional vehicular traffic on surrounding roads presented in above takes into account both traffic flows due to the Proposed Development and flows generated by other phases of the Portmarnock Framework Plan, namely the 'entire development' as it is described in Chapter 14: Material Assets Traffic and Transport.

11.6 Mitigation Measures (Ameliorative, Remedial or Reductive Measures)

In order to ameliorate the likely noise impacts, a schedule of noise control measures has been formulated for both construction and operational phases.

11.6.1.1 Construction Phase

With regard to construction activities, best practice operational and control measures for noise and vibration from construction sites are found within BS 5228 (2009 +A1 2014) Code of Practice for Noise and Vibration Control on Construction and Open Sites Parts 1 and 2.

BS5228 includes guidance on several aspects of construction site practices, including, but not limited to: -

- Selection of quiet plant.
- Control of noise sources.
- Screening (boundary, and or localised plant screening).
- Hours of work.
- Liaison with the public.
- Monitoring.

Detailed comment is offered on these items in the following paragraphs. Noise control measures that will be considered include the selection of quiet plant, enclosures and screens around noise sources, limiting the hours of work and noise monitoring.

Selection of Quiet Plant

This practice is recommended in relation to sites with static plant such as compressors and generators. It is recommended that these units be supplied with manufacturers' proprietary acoustic enclosures where possible. The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item should be selected wherever possible.

Noise Control at Source

If replacing a noisy item of plant is not a viable or practical option, consideration should be given to noise control "at source". This refers to the modification of an item of plant or the application of improved sound reduction methods in consultation with the supplier. For example, resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can often be controlled by fixing resilient materials in between the surfaces in contact.

BS5228 states that "as far as reasonably practicable sources of significant noise should be enclosed". In applying this guidance, constraints such as mobility, ventilation, access and safety must be taken into account. Items suitable for enclosure include pumps and generators.

BS5228 makes a number of recommendations in relation to "*use and siting of equipment*". These are all directly relevant and hence are reproduced below. These recommendations will be adopted on site.

"Plant should always be used in accordance with manufacturers' instructions. Care should be taken to site equipment away from noise-sensitive areas. Where possible, loading and unloading should also be carried out away from such areas.

Machines such as cranes that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum. Machines should not be left running unnecessarily, as this can be noisy and waste energy.

Plant known to emit noise strongly in one direction should, when possible, be orientated so that the noise is directed away from noise-sensitive areas. Attendant operators of the plant can also benefit from this acoustical phenomenon by sheltering, when possible, in the area with reduced noise levels.

*Acoustic covers to engines should be kept closed when the engines are in use and idling. The use of compressors that have effective acoustic enclosures and are designed to operate when their access panels are closed is recommended.**

Materials should be lowered whenever practicable and should not be dropped. The surfaces on to which the materials are being moved could be covered by resilient material."

Other forms of noise control at source relevant to the development works are set out below: -

- For mobile plant items such as cranes, dump trucks, excavators and loaders, the installation of an acoustic exhaust and or maintaining enclosure panels closed during operation can reduce noise levels by up to 10dB. Mobile plant should be switched off when not in use and not left idling.
- For percussive tools such as pneumatic concrete breakers and tools a number of noise control measures include fitting muffler or sound reducing equipment to the breaker 'tool' and ensure any leaks in the air lines are sealed. Erect localised screens around breaker or drill bit when in operation in close proximity to noise sensitive boundaries.
- For concrete mixers, control measures should be employed during cleaning to ensure no impulsive hammering is undertaken at the mixer drum.
- For all materials handling ensure that materials are not dropped from excessive heights, lining drops chutes and dump trucks with resilient materials.
- Demountable enclosures can also be used to screen operatives using hand tools/ breakers and will be moved around site as necessary.
- All items of plant should be subject to regular maintenance. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures.

Screening

Typically screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to all other forms of noise control. The effectiveness of a noise screen will depend on the height and length of the screen and its position relative to both the source and receiver.

Screening may be a useful form of noise control when works are taking place at basement and ground level to screen noise levels at ground floor adjacent buildings.

In addition, careful planning of the site layout should also be considered. The placement of site buildings such as offices and stores and in some instances materials such as aggregate can provide a degree of noise screening if placed between the source and the receiver. The use of localised mobile (mobile hoarding screens and / or acoustic quilts) to items of plant with the potential to generate high levels of noise are an effective noise control measure. These options should be considered when percussive works are taking place in close proximity to the nearest sensitive perimeter buildings.

Liaison with the Public

A designated noise liaison should be appointed to site during construction works. All noise complaints should be logged and followed up in a prompt fashion by the liaison officer. In addition, prior to particularly noisy construction activity, e.g. demolition, breaking, piling, etc., the liaison officer should inform the nearest noise sensitive locations of the time and expected duration of the noisy works.

Hours of Work

Construction works will be undertaken within the times below, taken from the Section 6 of the Draft Construction Management Plan: -

- Monday to Friday 07:00 to 19:00hrs
- Saturday 07:00 to 14:00hrs
- Sunday and Public Holidays No noisy work on site.

11.6.1.2 Operational Phase

Building Services Plant

During the detailed design of the development, the selection and location of mechanical and electrical plant will be undertaken in order to ensure the noise emission limits set out above are not exceeded. Plant items in the proposed development are limited to domestic heating and ventilation equipment and therefore no specific mitigation measures are required.

Additional Traffic on Surrounding Roads

During the operational phase of the Proposed Development, noise mitigation measures with respect to the (outward) impact of traffic from the development are not deemed necessary.

Inward Impact

At detailed design stage, glazing and vent specifications fulfilling the requirements in Section 11.5.1.3 will ensure suitable internal noise levels.

11.7 Residual Impact of the Proposed Development

This section summarises the likely noise impact associated with the Proposed Development, taking into account the mitigation measures.

11.7.1 Proposed Development

11.7.1.1 Construction Phase

During the Construction Phase of the project there will be a short-term noise impact on nearby noise sensitive properties from site activities and the close proximity of adjacent buildings. The application of binding noise limits, hours of operation, along with implementation of appropriate noise and vibration control measures, will ensure that noise and vibration are kept to minimised. For the nearest noise sensitive locations within 50m of the Proposed Development, negative, significant and temporary effects are likely.

For the majority of noise sensitive locations at greater distances from the Proposed Development, negative, moderate and short-term effects are likely.

11.7.1.2 Operational Phase

Additional Traffic on Surrounding Roads

The predicted change noise levels associated with additional traffic is predicted to be of imperceptible impact along the existing road network. In the context of the existing noise environment, the overall effects from noise contribution of increased traffic is considered to be of neutral, imperceptible and permanent effect to nearby noise sensitive locations.

Building Services Plant

With the application of mitigation measures for building services noise as described in Section 6.2.1, the range of potential noise levels is not expected to add significantly to the existing noise environment. The resultant noise effect from this source will be of neutral, not significant, permanent impact.

11.7.1.3 Worst Case Impact

Impact on nearby noise sensitive properties from site activities and the close proximity of adjacent buildings if all items of plant assessed will be in operational simultaneously. However, this would only be during the worst case and would be temporary in nature.

11.7.2 Cumulative

11.7.2.1 Construction Phase

As per Section 11.7.1.1.

11.7.2.2 Operational Phase

As per Section 11.7.1.2.

11.7.2.3 Worst Case Impact

As per Section 11.7.1.3.

11.8 Monitoring

11.8.1.1 Construction Phase

During the construction phase consideration may be given to noise and vibration monitoring at the nearest sensitive locations, where high level of noise and or vibration are expected.

Noise monitoring should be conducted in accordance with the International Standard ISO 1996: 2017: "Acoustics – Description, Measurement and Assessment of Environmental Noise" and be located a distance of greater than 3.5m away from any reflective surfaces, e.g. walls, in order to ensure a free-field measurement without any influence from reflected noise sources.

Vibration monitoring should be conducted in accordance with BS 7385-1 (1990) *Evaluation and measurement for vibration in buildings — Part 1: Guide for measurement of vibrations and evaluation of their effects on buildings* or BS 6841 (1987) *Guide to Measurement and Evaluation of Human Exposure to Whole-Body Mechanical Vibration and Repeated Shock*. With regard to construction activities, best practice operational and control measures for noise and vibration from construction sites are found within BS 5228 (2009 +A1 2014) *Code of Practice for Noise and Vibration Control on Construction and Open Sites Parts 1 and 2*.

11.8.2 Cumulative**11.8.2.1 Construction Phase**

Each construction site in the cumulative scenario shall implement the mitigation measures presented in Section 11.6.1.1, thus the cumulative impact on noise-sensitive receptors can be controlled.

11.8.2.2 Operational Phase

Not applicable.

11.9 Reinstatement

Not Applicable.

11.10 Difficulties Encountered

There were no difficulties encountered in the preparation of this EIAR chapter.