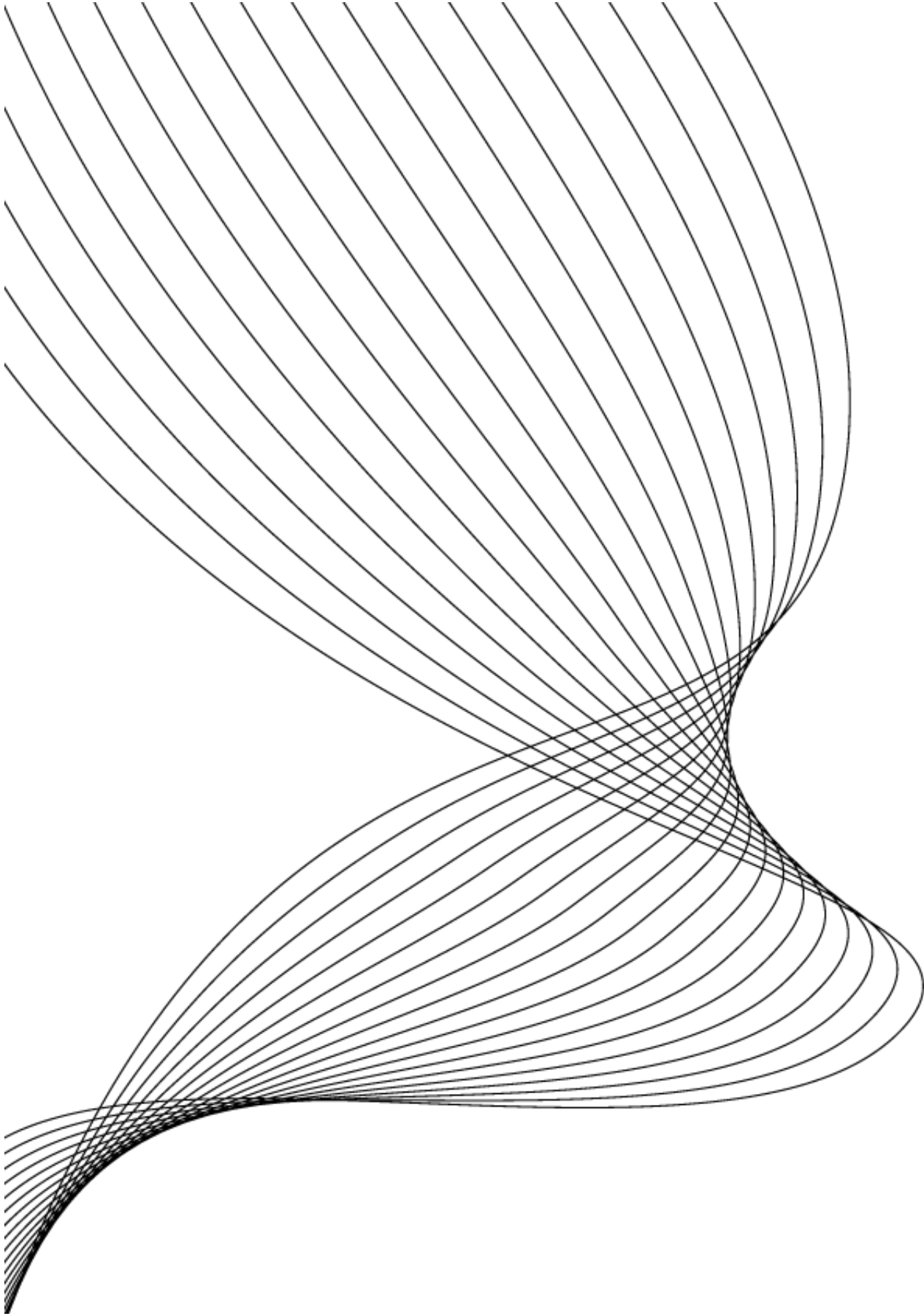


Zolbury Ltd

PM21005 SHD Blackglen Road – Noise Impact Assessment

Issued





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Executive Summary

This noise and vibration impact assessment report includes consideration of both the Construction and Operational phases of the development and quantifies the noise impact on the amenity of adjoining residents and also the acoustic well-being of future residences of the scheme.

Specifically, the following are considered:

- Compliance with the Dublin Agglomeration (including Dún Laoghaire-Rathdown County Council) Noise Action Plan¹
- Construction noise and vibration limits.
- Operational noise impact assessment.
- Building envelope design.

The findings of the report demonstrate that:

- a) The development shall not be exposed to levels in excess of target values for undesirable high sound levels as set out in the Dublin Agglomeration Noise Action Plan.
- b) The temporary noise and vibration impact on the local residents during the construction phase will be mitigated to ensure that it falls within appropriate criteria.
- c) The design of the associated mechanical and electrical plant will ensure no adverse impact at the local residences once the scheme is operational.
- d) There is no adverse impact as a result of the traffic associated with the scheme.
- e) A Good Acoustic Design methodology has been applied to ensure that the internal noise criteria set out in BS8233:2014 will be satisfied with appropriate glazing specification.

1.0 Introduction

The subject site is a Strategic Housing Development on a site of c.3.7ha at Blackglen Road and Woodside Road, Sandyford, Dublin 18.

The proposed development consists of a new residential scheme comprising 360no. residential units, associated resident amenity facilities and a childcare facility, in the form of 9no. new apartment buildings.

This report assesses several elements with regard to the potential noise impact and the acoustic design including:

1. The noise and vibration impact during both the construction and operational phases of the development will be identified and assessed. The construction phase will likely result in increased levels for a relatively short period whereas a small increase in traffic volumes associated with the development is likely to be the main impact source once operational.

¹ Dublin Agglomeration Environmental Noise Action Plan (2018-2023) – Volume 2 Dun Laoghaire – Rathdown County Council

2. The Acoustic Design Statement (ADS) methodology considers the external noise levels for day and night periods and the effectiveness of the building's design to meet the required noise criteria.

2.0 Methodology

The study has been undertaken using the following methodology:

- Baseline Noise monitoring and an Environmental Noise Survey has been undertaken across the development area to quantify the range of noise levels at varying locations.
- A review of the most applicable standards and guidelines has been conducted to set a range of acceptable noise and vibration criteria for the construction and operational phases of the proposed development, this is summarised in the following sections.
- Predictive calculations have been performed to estimate the likely noise and vibration emissions during the construction phase of the project at the nearest sensitive locations (NSLs) to the site.
- Predictive calculations have been performed to assess the potential impacts associated with the operation of the development at the most sensitive locations surrounding the development site; and,
- A schedule of mitigation measures has been proposed, where relevant, to control the noise and vibration emissions associated with both the construction and operational phases of the proposed development.
- An Acoustic Design Statement has been prepared setting out the required acoustic performance of the glazing units.

3.0 Guidance

Following a review of relevant standards and guidance, this section sets out those applicable to this assessment as follows:

- BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites - Part 1 – Noise.
- BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites - Part 2 -Vibration.
- BS 6472-1 (2008) Guide to evaluation of Human Exposure to Vibration in Buildings - Vibration sources other than Blasting.
- BS 7385-2:1993 Evaluation and Measurement for Vibration in Buildings - Guide to damage levels from Ground borne Vibration.
- South Dublin Agglomeration Noise Action Plan (2018-2023)
- BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings.
- ProPG: Professional Practice Guidance on Planning & Noise. New Residential Development. May 2017.
- BS 4142: 2014: Methods for Rating and Assessing Industrial and Commercial Sound.

- Institute of Environmental Management and Assessment's (IEMA) 'Guidelines for Noise Impact Assessment'.
- World Health Organisation (WHO) Environmental noise guidelines for the European Region (2018).
- ISO 1996: 2017: Acoustics - Description, Measurement and Assessment of Environmental Noise.
- EPA Guidelines on the information to be contained in Environmental Impact Assessment Reports (May 2022)
- EPA Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)

3.1 Construction Phase – Assessment Criteria (Noise)

3.1.1 Noise: BS 5228-1

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. Therefore, to set appropriate construction noise limits for the development site, reference has been made to *BS 5228 - 1:2009 +A1 2014 Code of practice for noise and vibration control on construction and open sites – Noise*.

This standard provides basic information on the prediction and measurement of noise from construction sites and operations such as mines and quarries. It also includes a large database of source noise levels for commonly used equipment and activities on construction sites.

The standard provides guidance on the 'threshold of significant effect' in respect of noise impact at dwellings. One suggested method for determining threshold noise levels is known as the 'ABC method'. This involves measuring existing ambient noise levels at noise sensitive locations and categorising them A, B or C accordingly, with the relevant threshold level derived from the category as set out in Table 1.

Table 1. BS 5228 - Example of significant effect at dwellings

Assessment category and threshold value period (L_{Aeq})	Threshold value, in decibels (dB)		
	Category A ^{A)}	Category B ^{B)}	Category C ^{C)}
Night-time (23.00–07.00)	45	50	55
Evenings and weekends ^{D)}	55	60	65
Daytime (07.00–19.00) and Saturdays (07.00–13.00)	65	70	75
NOTE 1 A significant effect has been deemed to occur if the total L_{Aeq} noise level, including construction, exceeds the threshold level for the Category appropriate to the ambient noise level.			
NOTE 2 If the ambient noise level exceeds the threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a significant effect is deemed to occur if the total L_{Aeq} noise level for the period increases by more than 3 dB due to construction activity.			
NOTE 3 Applied to residential receptors only.			
^{A)}	Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.		
^{B)}	Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.		
^{C)}	Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.		
^{D)}	19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00–23.00 Sundays.		

In general, the noise impact due to the construction phase will be from the specific items of plant used, the duration and phasing of the construction methods, the time of day that each plant will be used and their location.

3.1.2 Vibration: BS 5228-2

BS 5228-2:2009+A1:2014 - Code of practice for noise and vibration control on construction and open sites: - Part 2: Vibration, outlines several calculation methods for predicting vibration from construction works on open sites.

The standard references other guidance to set acceptable levels for:

- **Disturbance:**
BS 6472-1 (2008) Guide to evaluation of Human Exposure to Vibration in Buildings, and;
- **Damage**
BS 7385-2 (1993) Evaluation and Measurement for Vibration in Buildings.

3.1.3 Disturbance

BS 6472 requires that the estimated Vibration Dose Value (eVDV) parameter be determined for the 16-hour daytime and 8-hour night-time periods. For vibration associated with construction sites however it is considered more appropriate to provide guidance in terms of the Peak Particle Velocity (PPV), since this parameter is likely to be more routinely measured based upon the more usual concern over potential building damage. Furthermore, since many of the empirical vibration predictors yield a result in terms of PPV, it is necessary to understand what the consequences might be of any predicted levels in terms of human perception and disturbance. Some guidance is given in Table 2.

Table 2. Guidance on effects of vibration levels

Vibration Level	Effect
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 mm/s	Vibration might be just perceptible in residential environments.
1.0 mm/s	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.
10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

3.1.4 Building Damage

The response of a building to ground-borne vibration is affected by the type of foundation, underlying ground conditions, the building construction, and the state of repair of the building.

BS 7385 provides guidance on vibration measurement, data analysis and reporting as well as building classification and guide values for building damage.

Limits for transient vibration, above which cosmetic damage could occur, are given in Table 3.

Table 3. Transient vibration guide values for cosmetic damage.

Type of Building	Peak component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures.	50 mm/s at 4Hz and above	50 mm/s at 4Hz and above
Industrial and heavy commercial buildings		
Unreinforced or light framed Structures	15 mm/s at 4Hz ¹ increasing to 20 mm/s at 15Hz	20 mm/s at 15Hz increasing to 50 mm/s at 40Hz and above
Residential or light commercial buildings		
NOTE 1 Values referred to are at the base of the building. ¹ At frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded		

Minor structural damage may occur at levels around twice the above limits and major damage can occur at levels around four times the above limits.

Both standards note that important buildings that are difficult to repair might require special consideration on a case-by-case basis but building of historical importance should not (unless it is structurally unsound) be assumed to be more sensitive. If a building is in a very unstable state, then it will tend to be more vulnerable to the possibility of damage arising from vibration or any other ground borne disturbance.

It should be noted that there is a major difference between the sensitivity of people in feeling vibration and the onset of vibration which caused building damage. Vibration in relation to construction sites therefore may result in short-term disturbance but rarely cause even cosmetic damage. For some construction sites e.g., during piling or rock-braking and with dwellings nearby, vibration monitoring at these locations may be prudent.

3.2 Operational Phase – Noise Assessment

3.2.1 Dublin Agglomeration Environmental Noise Action Plan (2018-2023)

The *Noise Pollution of the Dublin Agglomeration Noise Action Plan Volume 2 Dun Laoghaire-Rathdown County Council, Section 8.2.9.2.* states the following:

“The Planning Authority will have regard to the Dublin Agglomeration Environmental Noise Action Plan 2013 – 2018 when assessing planning applications along major road and rail transport corridors – the objective being to reduce noise from new sources and to identify and protect and create areas of low sound levels. Mitigation measures should be undertaken, where appropriate...”

It goes on to state:

“Good design should minimise noise intrusion and nuisance to all nearby buildings that are occupied. Residential development should be set back from roads/rail lines such that amenities of residents are not unduly impacted upon by reason of noise.”

Section 6.2.1 sets out proposed targets for desirable low and undesirable high sound levels as follows:

Desirable Low Sound levels:

$< 50 \text{ dB(A)} L_{\text{night}}$

$< 55 \text{ dB(A)} L_{\text{day}}$

Undesirable High Sound levels:

$> 55 \text{ dB(A)} L_{\text{night}}$

$> 70 \text{ dB(A)} L_{\text{day}}$

It should be noted that appropriate mitigation measures ought to be undertaken if the above criteria are exceeded.

3.2.2 Building Envelope Design – BS 8233:2014

To assess the building envelope design, it is appropriate to follow the guidance set out in BS 8233:2014 Guidance on sound insulation and noise reduction for buildings which is concerned with noise ingress into dwellings.

The recommended levels for indoor ambient noise in residential dwellings is summarised in Table 4.

Table 4. BS 8233:2014 Recommended internal noise limits.

Activity	Location	07:00 – 23:00 hours	23:00 – 07:00 hours
Resting	Living room	$L_{\text{Aeq},16\text{hr}}$ 35dB	-
Dining	Dining room/area	$L_{\text{Aeq},16\text{hr}}$ 40dB	-
Sleeping (daytime resting)	Bedroom	$L_{\text{Aeq},16\text{hr}}$ 35dB	$L_{\text{Aeq},8\text{hr}}$ 30dB $L_{\text{AFMax},8\text{hr}}$ 45dB

3.2.3 Acoustic Design Statement – ProPG

An Acoustic Design Statement methodology is set out in the Professional Practice Guidance on Planning and Noise (ProPG) which focuses on the adoption of Good Acoustic Design for dwellings when required as a result of high external noise levels.

ProPG also provides guidance on flexibility of the internal noise level targets set out in BS8233:2014. For instance, in cases where the development is considered necessary or desirable, then a relaxation of the internal L_{Aeq} values by up to 5dB can still provide reasonable internal conditions.

It also provides the following guidance regarding external noise levels for amenity areas in the development:

“noise levels should ideally not be above the range 50-55dB $L_{\text{Aeq},16\text{hr}}$.”

In addition, it offers flexibility on the amenity noise targets in cases where residents have access to a quiet recreational environment or where other development factors warrant the scheme.

3.2.4 Operational Noise – Impact Assessment

The likely significant sources of noise associated with the operational phase of the proposed development are items of Electrical and Mechanical (M&E) plant and an associated increase to vehicular traffic on the local road network.

The noise impact associated with the M&E plant and services should be assessed following the procedures in BS4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*.

The standard describes a method for assessing the impact of a proposed or existing industrial or commercial sound source. Its principal uses are to assess noise from new or changed industrial or commercial premises, to accompany a planning application, or to assess noise which may be giving rise to complaints.

The standard is basic in principle, but the details can be complex. In the simplest terms, the procedure rates the noise levels from an operation (the 'Specific' noise) and compares it with the 'Background' noise levels in the absence of the noise source(s) under investigation. The level difference is an indication of the impact that the operation might have.

If for example, the 'Rated' noise level (the Specific noise + any penalties for particular noise characteristics) exceeds the Background noise by 10dB or more, it is likely to be an indication of a significant adverse impact. A difference of around 5dB indicates an adverse impact. If the level does not exceed the background, it is likely to have a low impact.

This however is dependent on the 'context' of the site and its environs e.g. time of day, nature of the neighbourhood, local attitudes to the development etc. There is also a degree of uncertainty applicable to the results e.g. for weather, instrumentation, measurement duration, calculation errors etc which ought to be considered.

3.2.5 Traffic – Impact Assessment

The increase in traffic numbers associated with the scheme's residences is a likely source of noise during the operational phase of the scheme.

The most appropriate criteria for assessing disturbance or annoyance from noise arising from the site would be related to the significance of perceived changes in noise levels.

The Institute of Environmental Management and Assessment's (IEMA) 'Guidelines for Noise Impact Assessment' gives appropriate impacts which have been summarised with relevant guidance in Table 5.

Table 5. Summary of appropriate impact for changes in traffic noise levels.

Change in Noise Level	Subjective Reaction	Magnitude of Impact	EPA Glossary of Effects ²
0	No change	None	Imperceptible
0.1 to 2.9	Barely perceptible	Minor	Slight
3.0 to 4.9	Noticeable	Moderate	Moderate
5.0 to 9.9	Up to a doubling of loudness	Substantial	Significant
10+	More than a doubling of loudness	Major	Profound

A change in traffic noise of less than 2dBA is generally not noticeable to the human ear whilst a change of 3dBA is generally considered to be just perceptible. Changes in noise levels of 3 to 5 dBA would however be noticeable and, depending on the final noise level, there may be a slight or moderate noise impact. Changes in noise level in excess of 6dBA would be clearly noticeable,

² EPA Guidelines on the Information to be contained in Environmental Impact Assessment Reports, (May 2022)

and depending on the final noise level, the impact may be moderate or significant.

However, a significant change in traffic volumes or traffic category i.e., increase in the use of a road by HGVs, would be required to result in such increases.

The UK Design Manual for Roads and Bridges (DMRB, Volume 11, Section 3, Part 7) states that a change in noise level of 1dB $L_{A10,18h}$ is equivalent to a 25% increase or a 20% decrease in traffic flow, assuming other factors remain unchanged and a change in noise level of 3dB $L_{A10,18h}$ is equivalent to a 100% increase or a 50% decrease in traffic flow.

3.2.6 Health Effects

The World Health Organisation (WHO) in their 2018 publication entitled Environmental Noise Guidelines for the European Region has proposed new guidelines for community noise. In this guidance, a L_{den} threshold daytime noise limit of 53dB is suggested to protect against adverse health effects. L_{night} Levels of 45dB or less are proposed at night-time to protect against adverse effects on sleep.

The operational phase of the development shall be assessed with regard to the 2018 WHO guidelines and appropriate acoustic design applied.

4.0 Receiving Environment

This section set out the methodology undertaken to quantify the existing acoustic receiving environment, the basis of which is used to assess the likely impact of the proposed scheme.

4.1.1 Noise Sensitive Locations

The assessment criteria will apply to Noise Sensitive Locations (NSLs), the definition of which is given in the EPA NG4 document as:

“any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or other area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels.”

4.2 Development Description

The subject site is a Strategic Housing Development on a site of c.3.7ha between Blackglan Road and Woodside Road, Sandyford, Dublin 18.

The development shall consist of a new residential scheme comprising 360 no. residential units, associated resident amenity facilities and a childcare facility in the form of 9 no. new apartment buildings (A1 – C3) as follows:

- Block A1 (4 storeys) comprising 18 no. apartments (3 no. 1 bed units and 15 no. 2 bed units); a crèche facility of approx. 401 sq. m with associated outdoor play space of approx. 20 sq. m; and resident amenity facilities of approx. 30 sq. m.
- Block A2 (3-4 storeys) comprising 24 no. apartments (2 no. 1 bed units and 22 no. 2 bed units) and resident amenity facilities of approx. 390m².
- Blocks B1 and B2 (2-6 storeys) comprising 69 no. apartments (30 no. 1 bed units, 34 no. 2 bed units, 5 no. 3 bed units).

- Blocks B3 and B4 (2-6 storeys) comprising 62 no. apartments (30 no. 1 bed units, 27 no. 2 bed units and 5 no. 3 bed units).
- Blocks C1, C2 and C3 (3-6 storeys) comprising 187 no. apartments (58 no. 1 bed units, 126 no. 2 bed units and 3 no. 3 bed units); and resident amenity facilities of approx. 187.5 sq. m.

Each residential unit is afforded with associated private open space in the form of a terrace / balcony.

Total Open space (approx. 22,033 sq. m) is proposed in the form of public open space (approx. 17,025 sq. m), and residential communal open space (approx. 5,008 sq. m).

Podium level / basement level areas are proposed adjacent to / below Blocks A2, B1, B2, B3, B4, C1, C2 and C3 (approx. 12,733 sq. m GFA). A total of 419 no. car parking spaces (319 no. at podium/basement level and 100 no. at surface level); to include 80 no. electric power points and 26 no. accessible parking spaces); and 970 no. bicycle spaces (740 no. long term and 230 no. short term), and 19 no. Motorcycle spaces are proposed. 10 no. car spaces for creche use are proposed at surface level.

Vehicular/pedestrian and cyclist access to the development will be provided via Blackglen Road to tie in with the Blackglen Road Improvement Scheme. A second access is also proposed via Woodside Road for emergency vehicles, pedestrian and cyclist access only.

The proposal also provides for Bin Storage areas and 4 No. ESBN substations to supply the development. 3 no. sub-stations shall be integrated within the building structures of Blocks B and Blocks C. In addition, one Sub-station shall be classed as a unit sub-station mounted externally on a dedicated plinth.

The associated site and infrastructural works include provision for water services; foul and surface water drainage and connections; attenuation proposals; permeable paving; all landscaping works; green roofs; boundary treatment; internal roads and footpaths; electrical services; and all associated site development works.

The site is boarded by Blackglen Road to the north and Woodside Road to the south. The M50 motorway is approximately 700m to the north.

There are a number of existing residences surrounding the site. These residential dwellings are considered as the nearest Noise Sensitive Locations (NSLs) for the purposes of this assessment.

The site layout and Noise Sensitive Locations are presented in Figure 1.

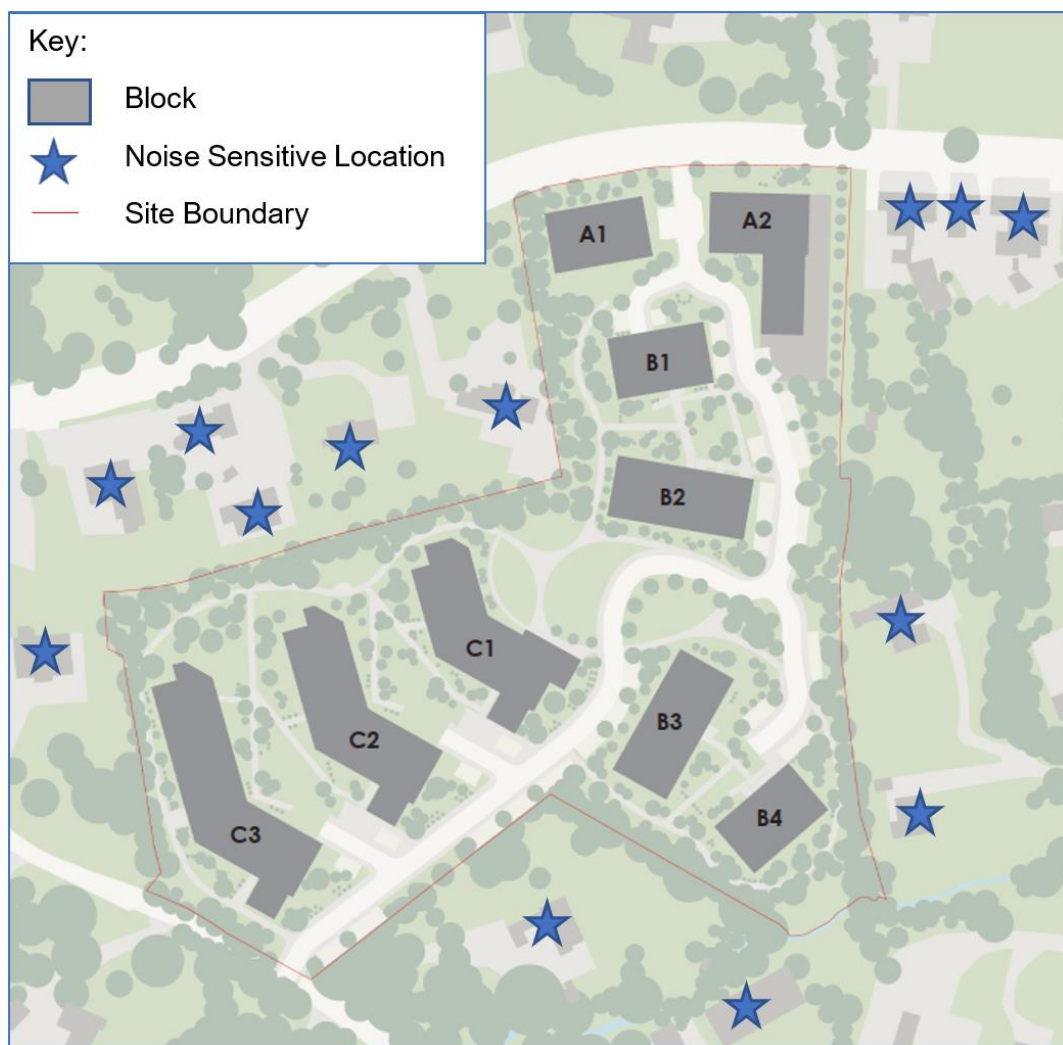


Figure 1. Layout for the proposed development.

4.3 Background Noise Survey

To quantify the existing baseline noise levels, a noise survey was conducted at the site. This consisted of noise monitoring over a 24hr period. The survey was conducted in general accordance with *ISO 1996: 2017: Acoustics - Description, Measurement and Assessment of Environmental Noise* and followed the methodology contained in *EPA NG4*. Specific details are set out below.

A noise monitor was installed at a height of c4m at the Noise Monitoring Location (NML) shown in Figure 2 with GPS co-ordinates in Table 6.

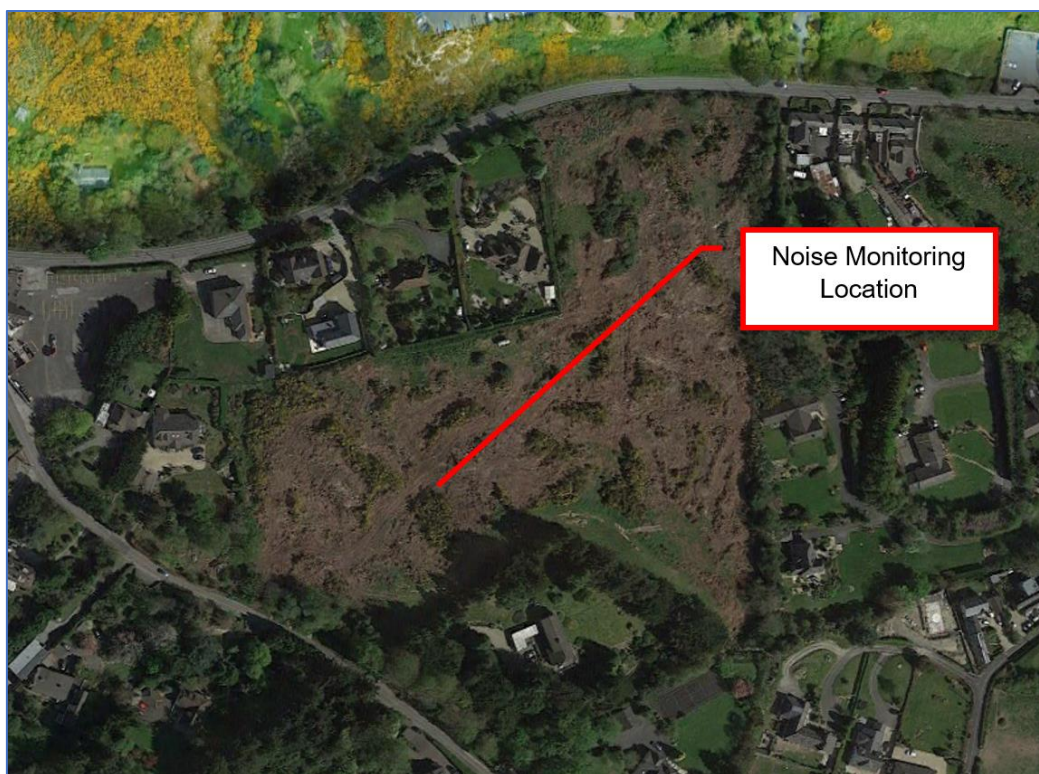


Figure 2. Noise Monitor Location

Table 6. GPS co-ordinates

Location	GPS co-ordinates
NML	53.263667, -6.237833

The monitor was set to record noise levels continuously from June 1-2, 2022.

4.3.1 Measurements Parameters

The noise survey results are presented in terms of the following parameters³:

- **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_{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.

4.3.2 Survey Results

The noise data was analysed and compiled into average values for Day (07:00-23:00) and Night (23:00-07:00) periods, the results of which are given in Table 7 below.

Table 7. Summary of unattended noise monitoring results.

Location	Period	L _{Aeq} (dB)	L _{A90} (dB)
NML	Daytime (07:00 – 23:00)	42	37

³ A full glossary of acoustic terminology can be found at: <https://www.acoustic-glossary.co.uk/>

Location	Period	L _{Aeq} (dB)	L _{A90} (dB)
	Night-time (23:00 – 07:00)	38	33

These periods are appropriate when assessing the acoustic design of the development's façade and also for setting construction noise limits.

4.3.3 Noise Sources

In addition to measuring the noise in terms of level, audio samples were recorded by the unattended monitor which later provided evidence as to the nature of the noise sources during the monitoring programme. It was found that the dominant noise source during the day and night periods was traffic which was confirmed by observations during the installation.

5.0 Impact Assessment

The potential noise and vibration impacts associated with the construction and operational phases of the proposed development are discussed in the following sections.

5.1 Construction Phase

In the absence of specific information regarding the construction schedule, construction noise impacts cannot be fully quantified at this point. Nevertheless, the applicable construction noise criteria has been derived and set out below.

In addition, to assess whether the construction noise criteria is likely to be met, a hypothetical impact assessment has been completed. This has been based on assumed typical phases of a construction site and associated plant.

The expected operational times of the construction sites are: 08:00 – 19:00 Mon-Fri.

5.1.1 Noise Limits at Noise Sensitive Locations

Following a review of the baseline noise survey results in Table 7 and the criteria detailed in Table 1, the day-time noise limit at the NSLs for construction noise are set out in Table 8.

Table 8. Defined Construction Noise Limits at Noise Sensitive Locations

Ambient Noise Level (Rounded to Nearest 5dB) L _{Aeq}	BS 5228-1 Category	Construction Noise Limit (L _{Aeq, 1hr})
45dB	A	65dB

The above limit should be included in the construction management plan and appropriate mitigation measures applied to ensure that the above criteria is not exceeded. Appropriate mitigation measures may include plant selection, times and phasing of the works, screening etc. The BS 5228-1 standard provides useful noise control techniques.

5.1.2 Construction Plan & Site Noise Limits

To assess if the above criteria can be achieved, a hypothetical impact assessment has been completed and the results set out below.

A variety of items of plant will be in use for site clearance and construction phases. There will also be vehicular movements to and from the site that will make use of existing roads.

The closest noise-sensitive locations identified in Figure 1 and their distance to the nearest likely construction works range between approximately 35m to 50m. Other works will take place across the site at greater distances.

BS 5228-1 gives a range of noise level for plant used for site clearance, building construction works, and landscaping works (excavators, loaders, dozers, concreting works, mobile cranes, generators). The noise levels range between 61dB to 86dB L_{Aeq} at distances of 10m for this type of construction.

For this hypothetical assessment, a combined sound power value of 119dB L_{AW} has been assumed. This is equivalent to 5no. items of construction plant with a sound pressure level of 80dB L_{Aeq} at 10m operating simultaneously. It is not considered likely that this scenario would occur at a single location, but it serves as a worse case for the purposes of the assessment.

Noise levels have been predicted using the noise levels from the scenario above to a range a distance which encompass the proximity of the NSLs to the site. It should be noted that a site hoarding of 2.4m height and a duty cycle of 66% i.e. equipment operating for 2/3 of the day period, have been assumed. The results are summarised in Table 9.

Table 9. Indicative construction noise levels at Noise Sensitive Locations

Construction Phase	Item of Plant (BS5228-1 references)	Calculated noise levels at distances L_{Aeq} dB			
		35m	50m	100m	150m
Site Clearance	Wheeled loader 170KW (C2.28) Tracked excavator 66KW (C2.25) Dozer 142KW (C2.13) Grader 205KW (C6.31) Tipper lorry (C8.20)	68	65	58	54
General Construction	Dump truck 306KW (C2.30) Tracked excavator 66KW C2.25 Compressor 45KW (C3.19) Telescopic handler 76KW (C4.54) Diesel generator 6.5KW (C4.76)	63	59	52	49
Road Works and Landscaping	Asphalt paver (+ tipper lorry) 112KW (C5.30) Electric water pump 15KW (C5.40) Vibratory roller 98KW (C5.20)	59	56	49	46

5.1.2.1 Discussion

The appropriate construction noise criterion has been set as 65dB $L_{Aeq, 1hr}$. The hypothetical assessment of the typical construction plan demonstrates that the criteria will be met at almost all of the nearby existing residential locations. However, the criterion may not be met for short periods during the site preparation phase at the few dwellings immediately adjacent to the site.

Following the EPA guidance, the significance of the noise impact therefore will be **negative, short-term** and range from **slight** to **moderate** depending on the proximity and nature of the construction activities during the course of the works.

Section 5.1.5 below gives example potential measures to mitigate the impact.

5.1.3 Construction Phase – Vibration

In the absence of specific information regarding the schedule, construction vibration impacts cannot be fully quantified at this point. The limits set out in Table 2 for Disturbance and Table 3 for Cosmetic Damage should be included in the construction management plan and an assessment made if there is a risk of them being exceeded e.g. by piling or rock-braking activities.

5.1.3.1 Discussion

The predicted vibration levels at the NSLs of the hypothetical assessment above indicates that levels are expected to be well below a threshold that would cause disturbance to building occupants and there is also no risk of building damage. This assumes that no pile-driving or other highly impulsive construction activities occur.

Therefore, the construction vibration impact associated with the proposed development is considered to be **neutral** and **imperceptible**.

5.1.4 Construction Phase – Traffic Noise

Consideration should also be given to the addition of construction traffic along the site access routes. Access to the development site for construction traffic will be via the adjoining roads.

It is possible to calculate the noise levels associated with passing vehicles using the following standard acoustic formula.

$$L_{Aeq,T} = L_{AX} + 10\log_{10}(N) - 10\log_{10}(T) + 10\log_{10}(r1/r2) \text{ dB}$$

Where:

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

L_{AX} is the "A-weighted" Sound Exposure Level of the event considered (dB).

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

r1 is the distance at which L_{AX} is expressed.

r2 is the distance to the assessment location

The mean value of L_{AX} for truck moving at low to moderate speeds (i.e., 15 to 45km/hr) is of the order of 82dB at a distance of 5 metres from the vehicle.

It has been calculated that a maximum of 15 trucks per hour will result in a noise level at or below the existing level which will result in an imperceptible increase in noise levels at the NSLs.

5.1.4.1 Discussion

The existing daytime noise environment is dominated by road traffic and the noise generated by construction traffic is not expected to change the character of the existing noise environment significantly.

Therefore, the construction traffic noise impact associated with the proposed development is expected to be **neutral** and **imperceptible**.

5.1.5 Ameliorative, Remedial or Reductive Measures

The hypothetical impact assessment conducted for the construction activity during the construction phase has highlighted that the predicted construction

noise levels are within the adopted criterion for almost all NSLs. However, the following mitigation measures may be considered during certain construction activities in order to further reduce the noise and vibration impact to nearby noise sensitive areas.

As part of these mitigation measures it is recommended that the Contractor should compile a Construction Noise and Vibration Management Plan (NVMP) which will deal specifically with management processes and strategic mitigation measures to remove or reduce significant noise and vibration impacts, and cumulative noise and vibration impacts from the construction works. The Plan will also define noise and vibration monitoring and reporting. The NVMP will also include method statements for each phase of the works, the associated specific measures to minimise noise and vibration in so far as is reasonably practicable for the specific works covered by each plan and a detailed appraisal of the resultant construction noise and vibration generated.

The contractor will provide proactive community relations and will notify the public and vibration sensitive premises before the commencement of any works forecast to generate appreciable levels of noise or vibration, explaining the nature and duration of the works.

The contractor will distribute information circulars informing people of the progress of works and any likely periods of significant noise and vibration.

Other suggested noise control measures set out in BS 5228 and include the following:

- selection of quiet plant;
- control of noise sources;
- screening;
- hours of work;
- liaison with the public, and;
- monitoring.

5.2 Operational Phase

Once operational, there may be some noise-generating items of building services plant however the plant schedule is unknown at this stage of the development. The location and treatment of the plant will be considered in the detailed design stage and the associated noise impact assessed following the procedures in BS4142:2014 to ensure no associated adverse impact.

There are no significant sources of vibration associated with the operational phase.

5.2.1 Associated Traffic Noise

It is appropriate to consider the increase in traffic noise that may arise as a result of additional vehicles on the local road network associated with the proposed development. Table 10 of the Traffic Impact Assessment sets this out for the AM and PM Peak hours (therefore representing a worse-case assessment). A 9%-11% increase in traffic has been assessed for Opening Year (2023) and Design Year (2038) and the resultant noise increases set out in Table 10 below.

Table 10. Summary of Traffic Increases for Opening and Design Year

No. of Vehicles	Opening Year (2023)		Increase		Design Year (2038)		Increase	
	Do Nothing	Do Something	%	dB	Do Nothing	Do Something	%	dB
AM Peak hr	836	925.7	11%	0.33	977	1066.7	9%	0.27
PM Peak Hr	907	1010.4	11%	0.33	1085	1188.4	10%	0.3

Referencing Table 5 above, the traffic noise impact associated with the proposed development is therefore **imperceptible** and **long-term**.

5.2.2 Creche

Noise levels from the operation of the proposed creche facility are not expected to result in any adverse impact at the NSLs. The reasons being that firstly the noise from the children ought to be contained within the fabric of the building and secondly, the facility will only operate during the daytime period.

6.0 Building Envelope Specification

The Acoustic Design Statement of the building envelope should consider the external noise levels with a view to achieving the internal design goals as set out in Table 4.

The façade of the building includes several critical elements including glazing, walls, ventilation and roof/ceiling. By calculating the combined effect of these it's possible to predict the internal noise level based on the known external levels for a given building design.

The acoustic performance of the individual building element is usually rated in terms of the Weighted Sound Reduction Index (R_w) which is a number used to rate the effectiveness of a soundproofing system or material. Increasing the R_w by one translated to a reduction of approximately 1dB in noise level. Therefore, the higher the R_w number, the better a sound insulator it will be.

The R_{w+Ctr} parameter is a variation which should be used when the incident noise on the building is primarily from road traffic. It is therefore appropriate to use it here.

6.1 Acoustic Design Statement

By applying the guidelines in ProPG and BS8223, an Acoustic Design Statement (ADS) will provide the predicted interior noise levels based on the proposed construction and inform the building design. It will also present options to achieve the attenuation required should the predicted internal noise level exceed the required criteria.

The ADS does not consider the sound attenuation of internal elements such as walls and floor/ceiling or other acoustic topics; these are covered by Building Regulations, Technical Guidance Document, Part E.

6.2 Windows open/closed

Opening a window will compromise the acoustic performance of the façade but it is a desirable feature or necessary to provide purge ventilation. Following the

ProPG/BS5228 guidelines, the performance of the façade with windows open should be first considered.

Typical reduction of a fully open window is assumed to be 15dB⁴.

6.2.1 BS 8233 criteria

A bedroom façade exposed to the external noise level of L_{night} 38dB from Table 7, results in an internal noise level of 23dB.

Therefore, the internal target noise criteria can be achieved with open windows in habitable rooms.

6.3 Glazing System

Following the *ProPG & BS 8233:2014* guidelines, the noise ingress levels were estimated using the predicted noise levels and the acoustic performance specification of various elements. It was found that the internal night-time noise limit of L_{night} 30dB from Table 4 is the most stringent.

In this instance, using the minimum sound insulation performance as set out in Table 11 below is deemed suitable windows to all habitable rooms to achieve an acceptable internal noise environment.

Table 11. Sound Insulation Performance Requirements for Glazing

Glazing Specification	Minimum Required	Performance Indicator	Description of Typical Construction
Standard IGU⁵	33dB	Rw	6/12/6
<i>Assumed:</i>			
<i>Room volume = 45m³, Window area = 2.4m², RT = 0.8s.</i>			

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

6.4 Ventilation

The specific room ventilation system has yet to be selected at this stage of the development. However, to ensure compliance with the design criteria, the selected design should not compromise the performance of the glazing system.

6.5 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 set out in Section 0. 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 51dB Rw for this construction.

⁴ The World Health Organisation (WHO) Environmental Noise Guidelines for European Region (WHO, 2018)

⁵ Standard Insulated Glazing Unit

6.6 Amenity areas

The amenity areas consist of outdoor spaces within the development. The maximum criteria of 55dB set out in ProPG will be satisfied.

7.0 Conclusion

The following has been demonstrated within this Noise Impact Assessment Report:

- a) The development shall not be exposed to levels in excess of target values for undesirable high sound levels as set out in the Dublin Agglomeration Noise Action Plan.
- b) The temporary noise and vibration impact on the local residents during the construction phase will be mitigated to ensure that it falls within appropriate criteria.
- c) The design of the associated mechanical and electrical plant will ensure no adverse impact at the local residences once the scheme is operational.
- d) There is no adverse impact as a result of the traffic associated with the scheme.
- e) A Good Acoustic Design methodology has been applied to ensure that appropriate internal noise criteria will be satisfied with appropriate glazing specification.