8 Noise and Vibration

8.1 Introduction

This section of the EIAR has been prepared by AWN Consulting Ltd (AWN) to assess the potential noise and vibration impact of the proposed development in the context of current relevant standards and guidance.

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 long-term 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. An assessment of noise from existing sources inward on the development has also been completed.

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.

8.2 Study Methodology

Overview

The assessment has been undertaken with reference to the most appropriate guidance documents relating to environmental noise and vibration which are set out in the following sections. In addition to specific noise and vibration guidance documents, the following guidelines were considered and consulted in the preparation of this Chapter:

- Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report (European Commission, 2017);
- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports – Draft (EPA, 2017); and
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (Department of Housing, Planning & Local Government, 2018);

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 operation 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; and
- An inward noise impact assessment from the existing noise sources on the proposed development.

Construction Phase – Noise 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. Dún Laoghaire-Rathdown County

Council (the planning authority) typically controls construction activities by imposing limits on the hours of operation and consider noise limits at their discretion. It is assumed that construction works in relation to this development are proposed during normal working hours only as set out below: -

- Monday to Friday: 07:00 to 19:30hrs
- Saturdays: 08:00 to 14:00hrs
- Sundays and Bank Holidays: No construction works.

British Standard BS 5228 – 1: 2009+A1:2014
Potential noise impacts during the construction stage of a project are often assessed in accordance with BS 5228-1:2009+A1:2014. Various mechanisms are presented as examples of determining if an impact is occurring, these are discussed in the following paragraphs.

ABC Method
The approach adopted here calls for the designation of a noise sensitive location into a specific category (A, B or C) based on existing ambient noise levels in the absence of construction noise. This then sets a threshold noise value that, if exceeded at this location, indicates a significant noise impact is associated with the construction activities, depending on context.

BS 5228-1:2009+A1:2014 sets out guidance on permissible noise levels relative to the existing noise environment. Table 8-1 sets out the values which, when exceeded, signify a significant effect at the facades of residential receptors.

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

Table 8-1: Example Threshold of Significant Effect at Dwellings

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.

For the appropriate assessment period (i.e. daytime in this instance) the ambient noise level is determined and rounded to the nearest 5 dB. If the construction noise exceeds the appropriate category value, then a significant effect is deemed to occur. It should be noted that this assessment method is only valid for residential properties and if applied to commercial premises without consideration of other factors may result in an excessively onerous thresholds being set.

A non-residential receptor has been identified in proximity to the proposed development, the Alzheimer's Ireland Society building is located to the west. Noise criteria for residential receptors do not apply to this location. Appropriate noise criteria are discussed in the following section.

Fixed Limits
When considering non-residential receptors, reference is made to BS 5228-1:2009+A1:2014, which gives several examples of acceptable limits for construction noise, the most simplistic being based upon the exceedance of fixed noise limits. For example, paragraph E.2 states:

> *"Noise from construction and demolition sites should not exceed the level at which conversation in the nearest building would be difficult with the windows shut."*

Paragraph E.2 goes on to state: -

> *"Noise levels, between say 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the site boundary should not exceed: -*
>
> > *70 decibels (dBA) in rural, suburban areas away from main road traffic and industrial noise;*
> >
> > *75 decibels (dBA) in urban areas near main roads in heavy industrial areas".*

The closest neighbouring noise sensitive properties to the proposed development are within a residential development, St Louise's Parkand the Alzheimer's Society of Ireland some 25m to the west of the site. Other residential receptors include a dwelling approximately 30m to the north west of the proposed development site and dwellings located above residential receptors approximately 35m to the east of the proposed development site.

Proposed Threshold Noise Levels

Taking into account the proposed documents outlined above and making reference to the baseline noise environment monitored around the development site (see Section 8.3), BS 5228-1:2009+A1:2014 has been used to inform the assessment approach for construction noise.

The following Construction Noise Threshold (CNT) levels are proposed for the construction stage of this development: -

- For residential NSLs it is considered appropriate to adopt 65 - 75 dB(A) CNT depending on location. Given the baseline monitoring carried out, it would indicate that Category A and C values are appropriate using the ABC method.
- For non-residential receptors it is considered appropriate to adopt the 70 dB(A) CNT, given the sub-urban environment.

Interpretation of the CNT

In order to assist with interpretation of CNTs, Table 8-2 includes guidance as to the likely magnitude of impact associated with construction activities, relative to the CNT. This guidance is derived from Table 3.16 of *DMRB: Noise and Vibration* and adapted to include the relevant significance effects from the *EPA Guidelines* (EPA 2017).

Guidelines for Noise Impact Assessment Significance (DMRB)	CNT per Period	EPA EIAR Significance Effects	Determination
Negligible	Below or equal to baseline noise level	Not Significant	Depending on CNT, duration & baseline noise level
Minor	Above baseline noise level and below or equal to CNT	Slight to Moderate	
Moderate	Above CNT and below or equal to CNT +5 dB	Moderate to Significant	
Major	Above CNT +5 to +15 dB	Significant, to Very Significant	

Guidelines for Noise Impact Assessment Significance (DMRB)	CNT per Period	EPA EIAR Significance Effects	Determination
	Above CNT +15 dB	Very Significant to Profound	

Table 8-2: Construction Noise Signifiance Rating

The adapted DMRB guidance outlined will be used to assess the predicted construction noise levels at NSLs in the absence of mitigation and comment on the likely impacts during the construction stages.

9.2.1.2 Construction Phase – Noise Impacts

In order to assist with the interpretation of construction traffic noise, Table 8-3 includes guidance as to the likely magnitude of impact associated with changes in traffic noise levels along an existing road. This is taken from Table 3.17 of the *DMRB Noise and Vibration* (UKHA 2020).

Magnitude of Impact	Increase in Traffic Noise Level (dB)
Negligible	Less than 1.0
Minor	Greater than or equal to 1.0 and less than 3.0
Moderate	Greater than or equal to 3.0 and less than 5.0
Major	Greater than or equal to 5.0

Table 8-3: Likely Effect Associated with Change in Traffic Noise Level – Construction Phase

In accordance with the *DMRB Noise and Vibration*, construction noise and construction traffic noise impacts shall constitute a significant effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding:

- Ten or more days or night in any 15 consecutive day or nights;
- A total number of days exceeding 40 in any six consecutive months.

Construction Phase – Vibration Criteria

Vibration standards address two aspects: those dealing with cosmetic or structural damage to buildings and those with human comfort. For the purpose of this scheme, the range of relevant criteria used for surface construction works for both building protection and human comfort are expressed in terms of Peak Particle Velocity (PPV) in mm/s.

Building Damage

With respect to vibration, *British Standard BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Vibration* 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 15mm/s at 4Hz increasing to 20mm/s at 15Hz and 50mm/s at 40Hz and above. The standard also notes that below 12.5 mm/s PPV the risk of damage tends to zero. It is therefore common, on a cautious basis to use this lower value. Taking the above into consideration the vibration criteria in **Table 8-4** are recommended.

Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of:		
Less than 15Hz	15 to 40Hz	40Hz and above
12 mm/s	20 mm/s	50 mm/s

Table 8-4: Recommended Vibration Criteria During Construction Phase

Expected vibration levels from the construction works will be discussed further in Section 8.5.

Human Perception

People are sensitive to vibration stimuli at levels orders of magnitude below those which have the potential to cause any cosmetic damage to buildings. There are no current standards which provide guidance on typical ranges of human response to vibration in terms of PPV for continuous or intermittent vibration sources.

BS5228-2:2009+A1:2014, provides a useful guide relating to the assessment of human response to vibration in terms of the PPV. Whilst the guide values are used to compare typical human response to construction works, they tend to relate closely to general levels of vibration perception from other general sources.

Table 8-5 below summarises the range of vibration values and the associated potential effects on humans.

Vibration Level, PPV	Effect
0.140mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies. At lower frequencies people are less sensitive to vibration.
0.3mm/s	Vibration might be just perceptible in residential environments.
1mm/s	It is likely that a vibration level of this magnitude in residential environments will cause complaint.

Table 8-5: Guidance on Effects of Human Response to PPV Magnitudes

Vibration typically becomes perceptible at around 0.15 to 0.3 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-term duration, particularly during construction projects and when the origin and or the duration of vibration is known. For example, ground breaking can typically be tolerated at vibration levels up to 2.5 mm/s if adequate public relations are in place and timeframes are known. These values refer to the day-time periods only.

During surface construction works (demolition and ground breaking etc.) the vibration limits set within **Table 8-5** would be perceptible to building occupants and have the potential to cause subjective effects. The level of effect is, however, greatly reduced when the origin and time frame of the works are known and limit values relating to structural integrity are adequately communicated. In this regard, the use of clear communication and information circulars relating to planned works, their duration and vibration monitoring can significantly reduce vibration effects to the neighbouring properties.

Interpretation of the Human Response to Vibration

In order to assist with interpretation of vibration thresholds, **Table 8-6** presents the significance table relating to potential impacts to building occupants during construction based on guidance from BS5228-2:2009+A1:2014.

Criteria	Impact Magnitude	Significance Rating
≥10 mm/s PPV	Very High	Very Significant
≥1 mm/s PPV	High	Moderate to Significant
≥0.3 mm/s PPV	Medium	Slight to Moderate
≥0.14 mm/s PPV	Low	Not significant to Slight
Less than 0.14 mm/s PPV	Very Low	Imperceptible to Not significant

Table 8-6: Human Response Vibration Significance Ratings

Operational Phase – Noise Criteria

Mechanical Plant

The most appropriate standard used to assess the impact of a new continuous source (i.e. plant items) to a residential environment 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*" $L_{Ar,Tr}$ is the specific noise level plus adjustments for the character features of the sound (if any), and;
- "*Background noise level*" is the 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 L_{A90} 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, and;
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 +10 dB or more is likely to be an indication of a significant adverse impact. A difference of around +5 dB 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.

Additional Vehicular 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 8-7 is taken from DMRB Design Manual for Roads and Bridges (DMRB), Highways England Company Limited, Transport Scotland, The Welsh Government and The Department for Regional Development Northern Ireland, (2020).

Change in Sound Level (dB)	Subjective Reaction	Magnitude of Impact	EPA Glossary of Effects[1]
10+	Over a doubling of loudness	Major	Significant
5 – 9.9	Up to a doubling of loudness	Moderate	Moderate
3 – 4.9	Perceptible	Minor	Slight
0.1 – 2.9	Imperceptible	Negligible	Imperceptible
0	None	No Change	Neutral

[1] EPA Guidelines on the Information to be contained in Environmental Impact Assessment Reports, (Draft August 2017)

Table 8-7: Significance in Change of Noise Level

The guidance outlined in Table 8-7 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.

Inward Noise – ProPG Planning & Noise

The Professional Practice 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 government document, since its adoption 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

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 8-1 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.

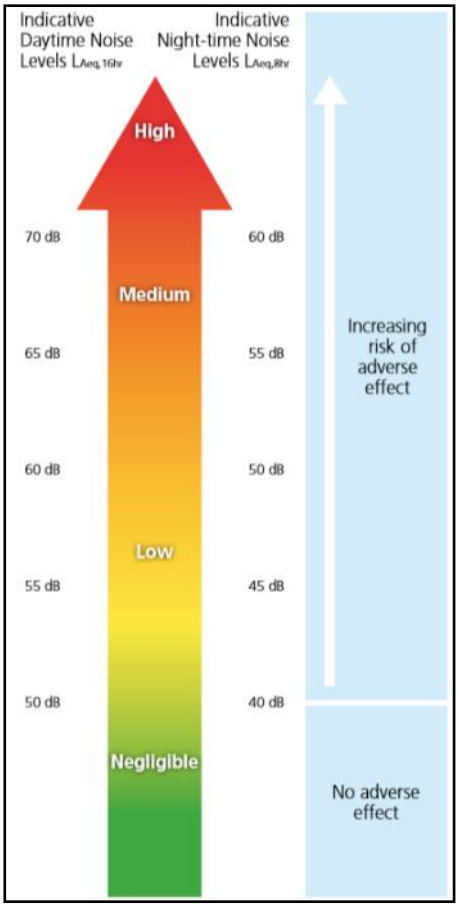


Figure 8-1: ProPG Stage 1 - Initial Noise Risk Assessment

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.

Element 2 of the ProPG document sets out recommended internal noise targets derived from BS 8233 (2014). The recommended indoor ambient noise levels are set out in **Table 8-8** and are based on annual average data, that is to say they omit occasional events where higher intermittent noisy events may occur.

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

Table 8-8: ProPG Internal Noise Levels

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

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

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

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

Operational Phase – Vibration Criteria

The development is residential in nature, therefore it is not anticipated that there will be any impact associated with vibration during the operational phase.

8.3 The Existing Receiving Environment (Baseline)

The subject site is located within the Blackrock area, bound to the north by the N31 Templehill Road, to the east by the existing Alzheimer's Society of Ireland Building, to the west by existing residential buildings within the St Vincent's Park and to south fields and Rockfield Park. The surrounding environment in the vicinity of the development site is mixed in nature with retail units and residential areas making up the majority of the surrounding building uses.

Baseline Noise Environment

An environmental noise survey was conducted on the 19th of May 2021 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.* Specific details are set out below.

Choice of Measurement Locations

The measurement locations are described below and shown in Figure 8.2 along with the approximate site boundary.

N1 located to the east of the site at the boundary of St Vincent's Park.
N2 located to the west of the site at the entrance of The Alheimer Society of Ireland and St Louis's Park
N3 located to the south west of the site in Barclay Ct.
N4 unattended noise monitor located inside the north site boundary adjacent to the N31 Templehill Rd.

Figure 8-2: Noise Monitoring Locations (Image Source: Google Maps)

Survey Periods

The noise survey was carried out over the following periods.

Aspect	Survey Position	Survey Period
Noise	N1	12:37hrs to 17:50hrs on 19 May 2021
	N2	
	N3	
	N4 (unattended)	12:25hrs to 15:40 on 19 May 2021

Table 8-9: Survey Periods

Instrumentation

The noise measurements were carried out using the equipment listed below. The instrument was calibrated before and after the survey with no significant drift noted.

Measurement	Manufacturer	Equipment Model	Serial Number	Calibration date
Sound Level Meter	Rion	NL-52	164426	19 May 2021
Sound Level Meter	Brüel & Kjær	2250	1076328	19 May 2021
Calibrator	Brüel & Kjær	Type 4231	3010369	19 May 2021

Table 8-10: Noise Monitoring Equipment Details

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_{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 report are expressed in terms of decibels (dB) relative to $2x10^{-5}$ Pa.

Survey Results and Discussion

The results of the noise survey at the four monitoring locations are summarised below.

Location N1

Date	Time	Measured Noise Levels (dB re. $2x10^{-5}$Pa)		
		L_{Aeq}	L_{Amax}	L_{A90}
19 May 2021	12:37	49	66	43
	14:42	50	74	42
	16:37	49	65	45
	23.23	42	58	36
	00.31	40	57	31
	01.36	37	58	27

Table 8-11: Measured Noise Levels at N1

At this location, the primary noise sources were observed to be vehicles passing on the Temple Hill Road and leaves rustling with occasional car pass-by, construction noise and birdsong. Traffic noise from junctions with the N31 and the R113 also contributed to measured noise levels. Ambient noise levels were in the range of 49 to 50 dB L_{Aeq}. Background noise levels were in the range of 42 to 45 dB L_{A90}. Night-time ambient noise levels ranged from 37 to 42 dB L_{Aeq}. Night-time background noise

levels ranged from 27 to 36 dB L_{A90}. Night-time maximum noise levels were in the range of 57 to 58 dB L_{Aeq}.

Location N2

Date	Time	Measured Noise Levels (dB re. $2x10^{-5}$Pa)		
		L_{Aeq}	L_{Amax}	L_{A90}
19 May 2021	13:26	60	71	48
	15:10	61	72	52
	17:02	62	74	53
	23:44	62	80	37
	00:52	59	76	36
	01:57	58	81	35

Table 8-12: Measured Noise Levels at N2

At this location the primary noise sources were observed to be traffic noise on the Temple Hill Road, with occasional reversing sirens and ducks quacking and car pass-by. Ambient noise levels were of the order of 60 to 62 dB L_{Aeq}. Background noise levels were in the range of 48 to 53 dB L_{A90}. Night-time ambient noise levels ranged from 58 to 62 dB L_{Aeq}. Night-time background noise levels ranged from 35 to 37 dB L_{A90}. Night-time maximum noise levels were in the range of 76 to 80 dB L_{Aeq} .

Location N3

Date	Time	Measured Noise Levels (dB re. $2x10^{-5}$Pa)		
		L_{Aeq}	L_{Amax}	L_{A90}
19 May 2021	14:04	46	59	43
	16:12	50	65	40
	17:26	46	62	41
	00:09	35	47	33
	01:14	34	56	31
	02:17	37	64	30

Table 8-13: Measured Noise Levels at N3

At this location the primary noise sources were observed to be birdsong, distant traffic noise and distant noise from children playing. Aircraft and birdcall were also noted to be contributing to measured noise levels with cackling raising the L_{Aeq} in the second measuement . Ambient noise levels were in the range of 46 to 50 dB L_{Aeq}. Background noise levels were in the range of 40 to 43 dB L_{A90}.
Night-time ambient noise levels ranged from 34 to 37 dB L_{Aeq}. Night-time background noise levels ranged from 30 to 33 dB L_{A90}. Night-time maximum noise levels were in the range of 47 to 64 dB L_{Aeq}.

Location N4

The unattended measurements collected over the survey period are summarised below.

Date	Period	Measured Noise Levels (dB re. $2x10^{-5}$ Pa)		
		L_{Aeq}	L_{Amax}	L_{A90}
19 May	Day	60	77	50

Table 8-14: Measured Noise Levels at N4

On installation and collection at this location the primary noise sources were observed to be traffic noise on the Temple Hill Road. Activities relating to the construction on the site also contributed to daytime measured noise. Daytime ambient noise levels ranged from 58 to 63 dB L_{Aeq} with an average

of 60 dB L_{Aeq}. Daytime background noise levels ranged from 49 to 52 dB L_{A90} with an average of 50 dB L_{A90}.

Survey Summary

The baseline noise levels were typical of an urban location. At Location N1 and N2 the noise environment was dominated by traffic on the Temple Hill Road. At N3 the noise environment was dictated more so by local sources such as recreation and bird activity around residential units, with traffic noise from the Temple Hill contributing to background noise levels.

Do Nothing Scenario

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.

8.4 Characteristics of the Proposed Development

General Characteristics

The proposed development comprises 493 residential units delivered in a combination of new apartment buildings (ranging in height from 3- 10 storeys overall in height) and a relocated St. Teresa's Lodge.

St. Teresa's House provides for 6 apartments, comprising 5 no. 2-bed units and 1 no. 3-bed unit. The new build element of 487 units is set out in 11 no. residential development blocks (Blocks A1-C2 and D1 – E2) ranging in height from 3-10 storeys over basement comprising:

- Block A1 (5 storeys) comprising 37 no. apartments (33 no. 1 bed units and 4 no. 2 bed units)
- Block B1 (10 storeys) comprising 55 no. apartments (37 no. 1 bed units, 10 no. 2 bed units and 8no. 3 bed units)
- Block B2 (8 storeys) comprising 42 no. apartments (28 no. 1 beds, 9 no. 2 beds and 5 no. 3 beds)
- Block B3 (8 storeys) comprising 42 no. apartments (28 no. 1 beds, 9 no. 2 beds and 5 no. 3 beds)
- Block B4 (5 storeys) comprising 41 no. apartments (4 no. studio units, 4 no. 1 bed units, 27 no. 2 bed units and 6 no. 3 bed units).
- Block C1 (3 storeys) comprising 10 no. apartments (1 no. studio unit, 3 no. 1 bed units and 6 no. 2 bed units).
- Block C2 (3 storeys) comprising 6 no. apartments (2 no. 1 bed units, 4 no. 2 bed units,) together with a creche facility of 392 sq. m at ground floor level and outdoor play area space of 302sq.m
- Block C3 (1 storey plus basement level) comprising residential amenity space of 451 sq. m.
- Block D1 (6 storeys) comprising 134 no. apartments (12 no. studio units, 22 no. 1 bed units, 90 no. 2 bed units and 10 no. 3 bed units).
- Block E1 (6 storeys) comprising 70 apartment units (34 no. 1 bed units, 26 no. 2 bed units and 10 no. 3 bed units).
- Block E2 (6 storeys) comprising 50 units (1 no. studio unit, 29 no. 1 bed units, 18 no. 2 bed units and 2 no. 3 bed units).

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

Resident amenity space c. 451 sq. m. accommodating a gym and studio space at basement level; residents' lounge/café, work booths/meeting room and reception/foyer/parcel store at ground floor.

Crèche facility of 392. sq. m.

252 no. residential car parking spaces (161 no. at basement level and 91 no. at surface level) and 20 motorcycle spaces at basement level are proposed. 8 no. car parking spaces for creche use are proposed at surface level.

1056 no. bicycle parking spaces (656 no. at basement level and 400 no. at surface level).

15,099.7 sq. m. public open space in the form of a central parkland, garden link, woodland parkland (incorporating an existing folly), a tree belt, entrance gardens, plazas, terraces, gardens, and roof terraces for Blocks B2 and B3.

When considering a development of this nature, the potential noise and vibration impact on the surroundings is considered for each of two distinct stages:

- Construction and demolition phase; and,
- Operational phase.

The construction phase will involve demolition, excavation over the development site, construction of foundations and buildings, landscaping, and vehicle movements to site using the local road network. This phase will generate the highest potential noise impact due to the works involved, however the time frame is short term in nature.
The primary sources of outward noise in the operational context are deemed to be long term in duration and will comprise traffic movements to the development site using the existing road network and plant noise emissions from the completed buildings. These issues are discussed in detailed in the following sections.

Inward noise incident on the development from existing noise sources, namely road traffic noise, has also been assessed.

8.5 Potential Impacts of the Proposed Development

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

Construction Phase

Noise

During the construction phase of the proposed development, a variety of items of plant will be in use, such as excavators, dumper trucks, compressors and generators. Site investigations indicate that piling will be not required during the construction of building foundations.
Due to the nature of daytime activities undertaken on a construction site of this nature, 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.

Taking into account the outline construction programme, it is possible to predict typical noise levels using guidance set out in BS 5228-1:2009+A1:2014. **Table 8-15** outlines typical plant items and associated noise levels that are anticipated for various phases of the construction programme. The values presented below assume no mitigation measures in place.

Activity	Item of Plant *(BS5228 Ref)*	L_{Aeq} at 10m
Site Clearance/Demolition	Tracked excavator (C2.21)	71
	Dump Truck (C2.30)	79
	Concrete Breaker (C1.4)	85
	Tracked Mobile Crane (C4.50)	71
	Tracked Crusher (C1.14)	82
General Construction	Dump Truck (C2.30)	79

Activity	Item of Plant *(BS5228 Ref)*	L_{Aeq} at 10m
	Tracked excavator (C2.21)	71
	Compressor (D7.8)	70
	Telescopic Handler (C4.54)	79
	Hand-Held Circular Saw (C4.72)	79
	Diesel Generator (C4.76)	61
	Internal Fit out	70
Road Works/Landscaping	Asphalt Paver & Tipping Lorry (C5.30)	75
	Electric Water Pump (C5.40)	68
	Vibratory Roller (C5.20)	75

Table 8-15 Reference Plant Noise Emissions

The calculations also assume that the equipment will operate for 66% of the 12-hour working day (i.e. 8 hours) and that a standard site hoarding, typically 2.4m height will be erected around the perimeter of the construction site for the duration of works. It is assumed that construction works will take place during normal working hours only.

The closest noise sensitive locations have been identified as shown in **Figure 8-3** along with approximate site boundary and described below.

NSL 1 Residential units east of the proposed site at Temple Hill Road some 10m from the nearest significant site works;

NSL 2 The Alzheimers Society of Ireland west of the proposed site at Temple Hill Road some 20m from the nearest significant site works;

NSL 3 Residential dwellings located to the north west of the proposed site some 10m from the nearest significant site works; and,

NSL4 Residential dwellings located to the west of the proposed site some 20m from the nearest significant site works.

Review of the baseline noise survey and the Construction Noise Thresholds detailed in Section 8.2.1.2 indicates that the appropriate daytime CNTs for construction noise at residential properties are as follows:

- NSL 1: 65 dB $L_{Aeq,T}$
- NSL 2: 70 dB $L_{Aeq,T}$
- NSL 3: 65 dB $L_{Aeq,T}$

The following CNT has been applied to NSL4:

- NSL 4: 65 dB $L_{Aeq,T}$

It is assumed that construction works will take place during normal working hours only.

Figure 8-3: Site Context & Noise Assessment Locations (Image Source: Google Maps)

Table 8-16 below presents the predicted daytime noise levels at these noise sensitive locations (NSLs) in the absence of mitigation.

Construction Phase	Item of Plant (BS 5228-1 Ref)	L_{Aeq} at distance (m)			
		NSL1 (35m)	NSL2 (25m)	NSL3 (30m)	NSL4 (25m)
Site Clearance and Demolition	Tracked excavator (C2.21)	51	54	52	54
	Dump Truck (D2.30)	59	62	60	62
	Concrete Breaker (C4.76)*	65	68	66	68
	Tracked Mobile Crane (C4.50)	51	54	52	54
	Tracked Crusher (C1.4)	62	65	63	65
	Cumulative Site Clearance and Demolition	**68**	**71**	**69**	**71**
General Construction	Dump Truck (C2.30)	59	62	60	**62**
	Tracked excavator (D2.21)	51	54	52	**54**
	Compressor (D7.08)	50	53	51	**53**
	Telescopic Handler (C4.54)	59	62	60	**62**

Construction Phase	Item of Plant (*BS 5228-1* Ref)	L_{Aeq} at distance (m)			
		NSL1 (35m)	NSL2 (25m)	NSL3 (30m)	NSL4 (25m)
	Hand Held Circular Saw (C4.72)	59	62	60	**62**
	Diesel Generator (C4.76)	41	44	42	**44**
	Internal Fit out	50	53	51	**53**
	Cumulative General Construction	**64**	**68**	**66**	**68**
Road Works/ Landscaping	Asphalt Paver & Tipping Lorry (C5.30)	55	58	56	**58**
	Electric Water Pump (C5.40)	48	51	49	**51**
	Vibratory Roller (C5.20)	55	58	56	**58**
	Cumulative Landscaping and Road Works	**58**	**62**	**60**	**62**

Table 8-16: Indicative Construction Noise Levels at Nearest Noise Sensitive Locations

****An on-time of 40% has been assumed for concrete breaking during demolition.***

At a distance of 25m from areas of major construction, representative of NSL2 and NSL4, the predicted construction noise levels associated with breaking and crusher activities are above the 65 dB(A) CNT. The impact of this, assuming breaking and crushing occurring at the same time is negative, significant to very significant and temporary. Other activities are predicted to be over the CNT and therefore with reference to Table 8-2, it is expected that there will be a negative, significant to very significant and short-term impact associated with general construction, and a negative, moderate to significant and temporary impact associated. These potential effects are presented in the absence of mitigation measures.

At a distance of 30m from areas of major construction, representative of NSL3, the predicted construction noise levels are above the 65 dB(A) CNT and therefore it is expected that there will be a negative, moderate and short-term impact at this location in the absence of mitigation.

At a distance of 35m from areas of major construction, representative of NSL1, the predicted construction noise levels associated with breaking and crusher activities are above the 65 dB(A) CNT. The impact of this, assuming breaking and crushing occurring at the same time is negative, moderate and temporary. Other activities noted in Table 8.16 are predicted to be in line or below the CNT. Considering a worst case scenario whereby several of these activities may occur at the same time, there is potential for a negative, moderate to significant and short-term impact, in the absence of mitigation.

At greater distances predicted construction noise levels are lower, therefore any impact is expected to be negative, moderate and short-term.

Construction Traffic

The noise levels associated with mobile plant items such as concrete dump trucks, loaders etc. operational on site have been included as part of the construction noise assessment and calculated noise levels in **Table 8-18.** 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 site entrance on Temple Hill Road to the west of the site.

It is possible to calculate the noise levels associated with the passing vehicle using the following formula.

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

where:

$L_{Aeq,T}$ is the equivalent continuous sound level over the time period T in 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;
r_1 is the distance at which L_{AX} is expressed;
r_2 is the distance to the assessment location.

A calculation distance of 5m from the road has been used to assess noise levels at the closest buildings along the construction routes. The mean value of Sound Exposure Level for truck moving at low to moderate speeds (i.e. 15 to 45km/hr) is of the order of 82dB L_{AX} at a distance of 5 metres from the vehicle. This figure is based on a series of measurements conducted under controlled conditions.

Reference has been made to the Construction Management Plan where details of construction traffic numbers have been set out. It is estimated that HGV movements will range from 5 no. per hour over the different construction phases. The construction vehicle numbers for the various construction phases are summarised below.

The construction vehicle numbers for the various construction phases are summarised below:

Construction Phase	No. of trucks/peak hour	Calculated Noise level at edge of road (5m), dB $L_{Aeq,1hr}$
Excavation	5	58
General Construction	5	58

Table 8-17: Calculated Construction Traffic Noise Levels at Edge of Road

The predicted noise level associated with construction vehicle traffic numbers above is in the range 61-65 dB $L_{Aeq,1hr}$. This level is below the construction noise threshold and the prevailing noise levels along the Temple Hill Road/ Newtown Avenue/ Temple Avenue junction, and would result in a negative, slight and short-term impact.

The traffic volumes above represent a negligible increase in traffic volumes on the surrounding road network. The predicted change in noise level associated with the introduction of construction traffic is less than 1 dB. Therefore, with reference to Table 8-3, the impact associated is not significant.

Further, the noise levels associated with these vehicle movements are predicted to be below the construction noise criteria.

Vibration

During demolition and ground-breaking in the excavation phase, there is potential for vibration to propagate through the ground. Empirical data for this activity is not provided in the BS 5228-2:2009+A1:2014 standard, however the likely levels of vibration from this activity is expected to be below the vibration threshold for building damage on experience from other sites.

AWN have previously conducted vibration measurements under controlled conditions, during trial construction works, on a sample site where concrete slab breaking was carried out. The trial construction works consisted of the use of the following plant and equipment when measured at various distances:

- 3 tonne hydraulic breaker on small CAT tracked excavator
- 6 tonne hydraulic breaker on large Liebherr tracked excavator

Vibration measurements were conducted during various staged activities and at various distances. Peak vibration levels during staged activities using the 3 Tonne Breaker ranged from 0.48 to 0.25 PPV (mm/s) at distances of 10 to 50m respectively from the breaking activities. Using a 6 Tonne Breaker, measured vibration levels ranged between 1.49 to 0.24 PPV (mm/s) at distances of 10 to 50m respectively.

The range of values recorded provides some context in relation typical ranges of vibration generated by construction breaking activity likely required on the proposed site. This range of vibration magnitudes indicate vibration levels at the closest neighbouring buildings are likely to be below the limits set out in Table 8-4 to avoid any cosmetic damage to buildings.

In terms of disturbance to building occupants, works undertaken within close proximity to the residential receptors on the site perimeter have the potential to emit perceptible vibration levels.

Notwithstanding the above, any construction activities undertaken on the site will be required to operate below the recommended vibration threshold set out in Table 8.4 during all activities. Further discussion on mitigation measures during this phase are discussed in Section 8.6.1.

It is anticipated that excavations will be made using standard excavation machinery, which typically do not generate appreciable levels of vibration close to the source. Taking this into account and considering the distance that these properties are from the works and the attenuation of vibration levels over distance, the resultant vibration levels are expected to be well below a level that would cause disturbance to building occupants or even be perceptible.

Operational Phase

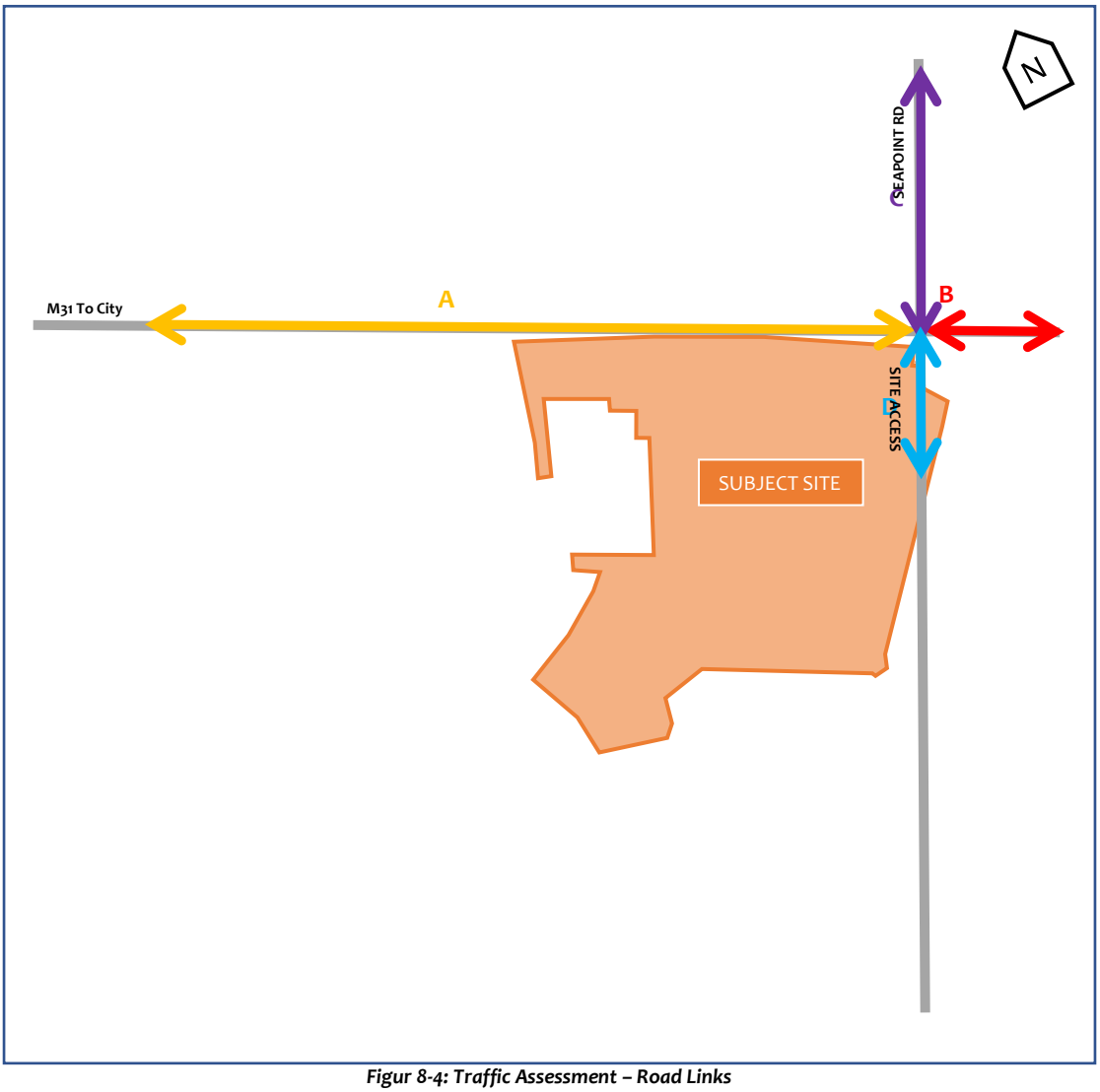
Noise

Additional Traffic on Adjacent Roads

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

A traffic impact assessment relating to the proposed development has been prepared by NRB Consulting Engineers, as part of this EIAR. Using this information, the related noise impacts along the relevant road links has been assessed.

Figur 8-4 below outlines the breakdown of sections of road and **Table 8-18** displays the predicted change in noise level at different road links around the site for the year of opening and the design year using the Annual Average Daily Traffic (AADT) flows along the road links under consideration.



Figur 8-4: Traffic Assessment – Road Links

Road Link	Opening Year (2025)		
	AADT Without Development	AADT With Development	Change in Noise Level (dB)
A	23550	25344	+ 0.3
B	22580	24198	+0.3
C	4179	4362	+ 0.2
D	607	1865	+ 4.9
Road Link	**Design Year (2040)**		
	AADT Without Development	**AADT With Development**	**Change in Noise Level (dB)**
A	28014	28641	+0.0
B	26908	27359	+0.1
C	4764	4947	+0.2
D	692	1950	+4.5

Table 8-18: Predicted Change in Noise Level associated with Vehicular Traffic

For the opening year (2025) traffic flows, the predicted changes in noise level along the road links range from +0.2 to +4.9 dB. For the design year (2040) traffic flows, the predicted changes in noise level along the road links also range from +0.0 to +4.5 dB.

With reference to Table 8-7, the predicted change in noise level associated with additional traffic on the existing road network, is minor in magnitude. The impact is therefore slight and long term.

Inward Noise Assessment

The development lands in question are bounded to the north and east by the Temple Hill Road. Noise from road traffic has the potential to impact on residential dwellings within the proposed development.

Reference has also been made to the noise maps prepared by Transport Infrastructure Ireland (TII). The following noise maps have been referred to when carrying out the desk-top assessment of the baseline noise environment:

- *Round 3 Noise Maps for Roads – Dublin Agglomeration.*

This noise map is 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 sourced from the EPA Mapping website.[2]

Figure 8-5 and Figure 8-6 present the predicted noise levels across the development site for road traffic in terms of L_{den} and L_{night}.

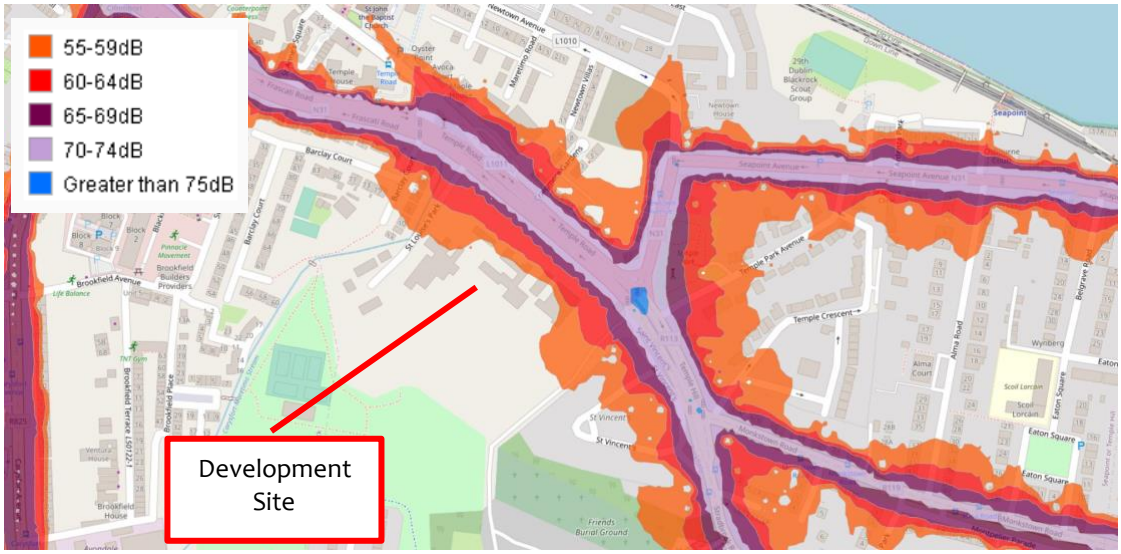


Figure 8-5 L_{den} Road Traffic Noise Levels

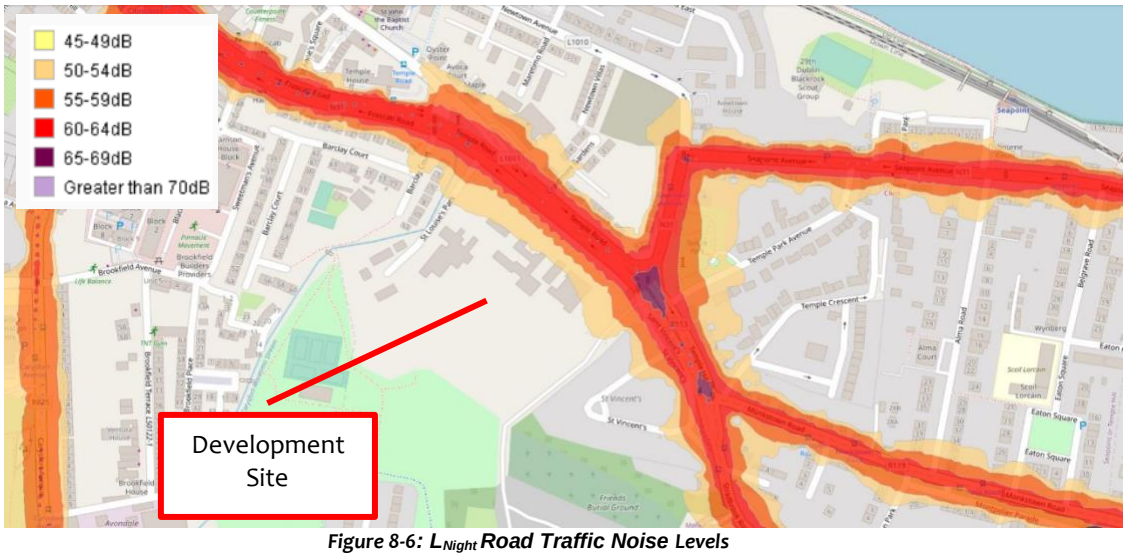


Figure 8-6: L_{Night} Road Traffic Noise Levels

[2] EPA Mapping website http://gis.epa.ie.

Giving consideration to the noise levels across the development site, the initial site noise risk assessment has concluded that the level of risk across the site lies within the low to medium noise risk, in line with the categories in Figure 8.1.

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

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

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

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

> *"2.12 It is important that the assessment of noise risk at a proposed residential development site is not the basis for the eventual recommendation to the decision maker. The recommended approach is intended to give the developer, the noise practitioner, and the decision maker an early indication of the likely initial suitability of the site for new residential development from a noise perspective and the extent of the acoustic issues that would be faced. Thus, a site considered to be high risk will be recognised as presenting more acoustic challenges than a site considered as low risk. A site considered as negligible risk is likely to be acceptable from a noise perspective and need not normally be delayed on noise grounds. A potentially problematical site will be flagged at the earliest possible stage, with an increasing risk indicating the increasing importance of good acoustic design."*

Following the guidance contained in ProPG, therefore, it does not preclude residential development on sites that are identified as having medium or high 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 suitably 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.

Acoustic Design Statement

Façade Noise Levels

Noise levels have been predicted across the proposed development site during day and night-time periods using the measured survey data from site and EPA noise maps.

Where façade noise levels are less than 55 dB $L_{Aeq,16hr}$ during the day and 50 dB $L_{Aeq,8hr}$ at night it is possible to achieve reasonable internal noise levels while also ventilating the dwellings with open windows. Therefore, for those properties where the façade noise levels are less than 55 dB $L_{Aeq,16hr}$ during the day and 50 dB $L_{Aeq,8hr}$ at night no further mitigation is required.

Where façade levels are above these levels the sound insulation performance of the building façade becomes important and a minimum sound insulation performance specification is required for windows to ensure that when windows are closed the internal noise criteria are achieved.

Facades identified as being exposed to higher levels of noise are:

- Block A1 – north western and north eastern façade;
- Block B1 – north western and north eastern façade;
- Block B2 – north western and north eastern façade;

- Block B3 – north western and north eastern façade; and,
- Block B4 – north western and north eastern façade.

As is the case in most buildings, the glazed elements and ventilation paths in the building envelope are typically the weakest element from a sound insulation perspective. In general, all wall constructions (i.e. block work or concrete and spandrel elements) 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.

In this instance, the facades highlighted in Figure 8-7 will be provided with glazing and ventilation that achieves the minimum sound insulation performances as set out in Table 8-19 and Table 8-20. Other facades in the development have no minimum requirement for sound insulation.

*Figure 8-7**: Façade Acoustic Requirements***

External Noise Levels

External noise levels within the vast majority of communal open spaces across the development site are within the recommended range of noise levels from ProPG of between 50 – 55 dB $L_{Aeq,16hr.}$ It is considered that the objectives of achieving suitable external noise levels is achieved within the overall site, therefore no further mitigation is required to control external noise levels across amenity areas.

8.6 Mitigation Measures

Mitigation measures for the construction phase are set out below in order to reduce potential impacts to within the adopted criteria for noise and vibration.

Construction Phase - Noise

During the construction phase, specific noise abatement measures will be implemented to comply with the recommendations of BS 5228-1:2009+A1:2014 *Code of Practice for Noise and Vibration Control on Construction and Open Sites – Noise* and the *European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001*. These measures will ensure that: -

- No plant used on site will be permitted to cause an ongoing public nuisance due to noise.
- The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations.
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract.
- Compressors will be attenuated models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers.
- Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use;
- Any plant, such as generators or pumps that is required to operate outside of normal permitted working hours will be surrounded by an acoustic enclosure or portable screen.

BS 5228 -1:2009+A1 2014 includes guidance on several aspects of construction site practices, which include, but are not limited to: -

- selection of quiet plant;
- noise control at source;
- screening;
- liaison with the public, and;
- monitoring.

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

Selection of Quiet Plant

This practice will be implemented in relation to static plant such as compressors and generators. It is recommended that these units be supplied with manufacturers' proprietary acoustic enclosures. 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. Should a particular item of plant already on the site be found to generate high noise levels, the first action should be to identify whether or not said item can be replaced with a quieter alternative.

Noise Control at Source

If replacing a noisy item of plant is not a viable or practical option, consideration will 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.

Referring to the potential noise generating sources for the works under consideration, the following best practice migration measures should be considered:

- Site compounds will be located in excess of 30m from noise sensitive receptors within the site constraints. The use lifting bulky items, dropping and loading of materials within these areas should be restricted to normal working hours.
- For mobile plant items, such as 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 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.
- For compressors, generators and pumps, these can be surrounded by acoustic lagging or enclosed within acoustic enclosures providing air ventilation.
- Demountable enclosures can also be used to screen operatives using hand tools 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

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. Construction site hoarding will be constructed around the site boundaries as standard. The hoarding will be constructed of a material with a mass per unit of surface area greater than 7 kg/m^2 to provide adequate sound insulation.

In addition, careful planning of the site layout will also be considered. The placement of site buildings such as offices and stores will be used, where feasible, to provide noise screening when placed between the source and the receiver.

Liaison with the Public

A designated environmental liaison officer will be appointed to site during construction works. Any noise complaints should be logged and followed up in a prompt fashion by the liaison officer. In addition, where a particularly noisy construction activity is planned or other works with the potential to generate high levels of noise, or where noisy works are expected to operate outside of normal working hours etc., the liaison officer will inform the nearest noise sensitive locations of the time and expected duration of the noisy works.

Monitoring

Where required, construction noise monitoring will be undertaken at periodic sample periods at the nearest noise sensitive locations to the development works to check compliance with the construction noise criterion.

Noise monitoring should be conducted in accordance with the International Standard ISO 1996: 2017: *Acoustics – Description, measurement and assessment of environmental noise*.

Project Programme

The phasing programme will be arranged so as to control the amount of disturbance in noise and vibration sensitive areas at times that are considered of greatest sensitivity. During excavation/ demolition or other high noise generating works are in progress on a site at the same time as other works of construction that themselves may generate significant noise and vibration, the working programme will be phased so as to prevent unacceptable disturbance at any time.

Construction Phase – Vibration

The vibration from construction activities will be limited to the values set out in Section 8.2. Magnitudes of vibration slightly greater than those in the table are normally unlikely to cause

cosmetic damage, but construction work creating such magnitudes should proceed with caution. Limit values have been provided for soundly constructed residential and commercial properties.

Operational Phase – Noise

Additional Traffic on Adjacent Roads

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

Mechanical Services Plant

Taking into account that sensitive receivers within the development are much closer than off-site sensitive receivers, once the relevant noise criteria is achieved within the development it is expected that there will be no negative impact at sensitive receivers off site, and therefore no further mitigation required.

Inward Noise

In this instance, the facades highlighted in Figure 8.7 will be provided with glazing and ventilation that achieves the minimum sound insulation performances as set out in Table 8-19 and Table 8-20. Other facades in the development have no minimum requirement for sound insulation.

Mark-up	Octave Band Centre Frequency (Hz)						R_w
	125	250	500	1000	2000	4000	
RED	20	19	29	38	36	45	**33**

*Table 8-19: **Sound Insulation Performance Requirements for Glazing, SRI (dB)***

The overall R_w and $D_{ne,w}$ outlined in this section are provided for information purposes only. The over-riding requirement is the Octave Band sound insulation performance values which may also be achieved using alternative glazing and ventilation configurations. Any selected system will be required to provide the same level of sound insulation performance set out in Table 8-19 and Table 8-20 or greater.

The following performance requirements apply to all ventilation paths from outside the building. This can be achieved by passive acoustic wall or window vents or via mechanical ventilation systems.

Ventilators in the facades of dual aspect living/dining spaces in areas designated 'red' should provide increased performance as outlined below.

Mark-up	Octave Band Centre Frequency (Hz)						$D_{n,e,w}$
	125	250	500	1000	2000	4000	
RED	22	24	30	36	33	38	**33**

*Table 8-20: **Sound Insulation Performance Requirements for Ventilation, $D_{n,e,w}$ (dB)***

It is important to note that the acoustic performance specifications detailed herein are minimum requirements which apply to the overall glazing and ventilation systems. 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.

The assessment has demonstrated that the recommended internal noise criteria can be achieved through consideration of the proposed façade elements at the design stage. The calculated glazing and ventilation specifications are preliminary and are intended to form the basis for noise mitigation at the detailed design stage. Consequently, these may be subject to change as the project progresses.

Vibration

No vibration mitigation measures are required applicable the operational phase.

8.7 Potential Cumulative Impacts

During the construction phase of the proposed development, construction noise on site will be localised and will therefore likely be the primary noise source at the nearest noise sensitive receivers.

The contractor will be required to control noise impacts associated with this development in line with the guidance levels included in Table 8-1 and follow the best practice control measures within BS 5228 -1.

Any large scale future projects that are not yet proposed or permitted would also need to be the subject of EIA in turn, to ensure that no significant impacts resulting from noise and vibration will occur as a result of those developments.

8.8 Risks to Human Health

The potential impacts on human beings in relation to the generation of noise and vibration during the construction phases are that high levels of noise and vibration could cause a degree of nuisance to people in nearby sensitive locations. Implementation of the mitigation measures set out and adherence to good practice noise reducing measures will ensure that the residual impact on human health will be lessened and impacts will be short-term, slight to moderate and negative in nature.

Similarly, during the operational phase, plant selections designed to achieve the relevant noise criteria will result in a residual impact that is long-term, imperceptible and neutral to people in nearby noise sensitive locations.

8.9 Residual Impacts of the Proposed Development

Construction Phase

During the site clearance phase of the project there is the potential for significant to very significant impacts on nearby noise sensitive properties due to noise emissions from site activities. The application of binding noise limits, hours of operation, along with implementation of the identified noise and vibration control measures will reduce these impacts, so that noise and vibration will have a ***negative***, ***moderate to significant*** and ***short-term*** impact on the surrounding environment.

Operational Phase

Additional Vehicular Traffic

The change in 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 contribution of induced traffic is considered to be of ***neutral***, ***imperceptible*** and ***long-term*** impact to nearby residential locations.

Mechanical Plant

Assuming the operational noise levels do not exceed the adopted design goals in line with the relevant noise criteria, the resultant residual noise impact from this source will be of ***neutral***, ***imperceptible***, ***long term*** impact.

8.10 Monitoring

Construction Phase

Where required, construction noise monitoring will be undertaken at periodic sample periods at the nearest noise sensitive locations to the development works to check compliance with the construction noise criterion.

Noise monitoring should be conducted in accordance with the International Standard ISO 1996: 2017: *Acoustics – Description, measurement and assessment of environmental noise*.

Operational Phase

No operational noise monitoring required applicable the operational phase.

8.11 Reinstatement

Not Applicable.

8.12 Interactions

General

In compiling this environmental impact assessment, reference has been made to the project description provided by the project co-ordinators, project drawings provided by the project architects and information relating to construction activities provided by the engineers. Noise emission sources from the proposed development during the construction and operational phases will be from construction plant and activity, building services and traffic accessing the development. The noise impact assessment has been prepared in consultation with the design team and traffic engineers. Reference can be made to the relevant chapters for additional information.

8.13 Difficulties Encountered

No difficulties were encountered during the preparation of the EIAR chapter.

8.14 References

- Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report (European Commission, 2017);
- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports – Draft (EPA, 2017);
- BSI (1993). BS 7385: 1993 Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration;
- BS 4142: 2014: Methods for Rating and Assessing Industrial and Commercial Sound;
- BSI (2014). BS 5228-1:2009 +A1:2014 Code of Practice for noise and vibration control of construction and open sites - Part 1: Noise;
- BSI (2014). BS 5228-2:2009+A:2014 Code of Practice for noise and vibration control of construction and open sites - Part 2: Vibration;
- DCC; FCC; SDCC; DLRCC (2018). Dublin Agglomeration Third Environmental Noise Action Plan December 2018 – July 2023;
- Fingal County Council (FCC) (2017). Fingal Development Plan Policy on Aircraft Noise.
- Fingal County Council (FCC) (2019). Noise Action Plan for Dublin Airport 2019-2023.
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