CHAPTER 10

NOISE & VIBRATION

10.0 NOISE AND VIBRATION

10.1 INTRODUCTION

This EIAR Chapter has been prepared by AWN Consulting Ltd (AWN) to assess the potential noise and vibration effects of the proposed development in the context of current relevant standards and guidance as detailed in relevant sections below.

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 effects on the surrounding environment have been considered in this chapter.

Mitigation and monitoring 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.

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

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

- EPA Advice Notes on Current Practice (in the preparation of Environmental Impact Statements), (EPA, 2003);
- EPA Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, 2022)
- EPA Advice Notes for Preparing Environmental Impact Statements, (Draft, September 2015)

10.2 STUDY METHODOLOGY

10.2.1 Assessment Overview

The following methodology has been prepared based on the requirements of the EPA document *Guidelines on the information to be contained in Environmental Impact Assessment Reports* May 2022 and on our experience of preparing the noise & vibration chapters for similar developments. The following approach has been used for this assessment:

- Baseline noise monitoring has been undertaken at the development site in order to characterise the existing noise environment;
- A review of the most applicable standards and guidelines has been reviewed in order to set a range of acceptable noise and vibration criteria for the construction and operational phases of the proposed development;
- Predictive calculations relating to construction phase impacts has been undertaken at the nearest sensitive locations to the development site;

- Potential noise impacts associated with the operational phase of the development at the most sensitive locations surrounding the proposed development have been determined as assessed, and;
- A schedule of mitigation measures has been included to reduce, where necessary, identified potential outward impacts relating to noise and vibration from the proposed development.

10.2.2 Criteria for Rating of Impacts

The significance of noise and vibration impacts has been assessed in accordance with the EPA *EIA Report Guidelines* (2022) *and EPA Draft Advice Notes for EIS 2015* (see Tables 10.1 to 10.3 below). As these guidelines do not quantify the impacts in decibel terms further reference has been made to the *'Guidelines for Noise Impact Assessment'* produced by the Institute of Acoustics/Institute of Environmental Management and Assessment Working Party.

With regard to the quality of the impact, ratings may have positive, neutral or negative applications where:

Quality of Effects	Definition
Negative	A change which reduces the quality of the environment
Neutral	No effects or effects that are imperceptible, within the normal bounds of variation or within the margin of forecasting error.
Positive	A change that improves the quality of the environment

Table 10.1: Quality of Potential Effects

The significance of an effect on the receiving environment are described as follows:

Significance of Effects on the Receiving Environment	Description of Potential Effects
Imperceptible	An effect capable of measurement but without significant consequences.
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
Significant	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters a sensitive aspect of the environment.
Profound	An effect which obliterates sensitive characteristics.

Table 10.2: Significance of Effects

The duration of effects as described in the Draft EPA Guidelines are:

Duration of Impact	Definition
Momentary	Effects lasting from seconds to minutes
Brief	Effects lasting less than a day
Temporary	Effects lasting one year or less
Short-term	Effects lasting one to seven years
Medium-term	Effects lasting seven to fifteen years
Long-term	Effects lasting fifteen to sixty years
Permanent	Effects lasting over sixty years
Reversible	Effects that can be undone, for example through remediation or restoration

Table 10.3: Duration of Effects

10.2.3 Construction Noise Criteria

There is no published statutory Irish guidance relating to the maximum permissible noise and vibration levels that may be generated during the construction phase of a project. It is common practice to use BS 5228:2009+A1:2014 *Code of Practice for Noise and Vibration Control on Construction and Open Sites* with respect to the controlling noise and vibration impacts. In this instance, appropriate criteria relating to permissible construction noise levels are taken from Part One of the standard, *Noise*.

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 exiting 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. Note that, in accordance with the BS 5228 guidance, this assessment criterion is only applicable to residential receptors.

BS 5228-1:2009+A1:2014 sets out guidance on permissible noise levels relative to the existing noise environment. Table 10.4 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 10.4: Example Threshold of Significant Effect at Dwellings

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

For the appropriate assessment period (i.e. daytime in this instance) the ambient noise level is determined and rounded to the nearest 5 dB. Baseline monitoring carried out as part of this assessment would indicate that noise sensitive receptors surrounding the development all lie within Category A (Refer to Section 10.3). If the construction noise exceeds the appropriate category value, then a significant effect is deemed to occur.

The closest neighbouring noise sensitive properties to the proposed development are the residential dwellings that bound the south and west of the 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 10.3), 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 dB(A) CNT based on the baseline monitoring carried out, i.e. Category A values using the ABC method.

Interpretation of the CNT

In order to assist with interpretation of CNTs, Table 10.5 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 2022).

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	
	Above CNT +15 dB	Very Significant to Profound	

Table 10.5*:* Construction Noise Significance Ratings

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

10.2.4 Construction Vibration Criteria

Building Response

Peak particle velocity (PPV) is commonly used to assess the structural response of buildings to vibration. Reference to the following documents has been made for the purposes of this assessment in order to discuss appropriate PPV limit values.

- British Standard BS7385: 1993: *Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration*, and;
- British Standard BS5228-2: 2009 + A1: 2014: *Code of practice for noise and vibration control on construction and open sites – Vibration*.

BS5228-2 and BS7385 advise that, for soundly constructed residential property and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak component particle velocity (in frequency range of predominant pulse) of 15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz and 50 mm/s at 40 Hz and above. The standard also notes that below 12.5 mm/s PPV the risk of damage tends to zero.

The recommended vibration limits in order to avoid cosmetic damage to buildings, as set out in both documents referred to above, are reproduced in Table 10.6. The documents note that minor structural damage can occur at vibration magnitudes which are greater than twice those presented in Table 10.6. Major damage to a building

structure is possible at vibration magnitudes greater than four times the values set out in the Table. It should be noted that these values refer to the vibration at the base of the building.

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**
15mm/s	20mm/s	50mm/s

Table 10.6: Recommended Construction Vibration Threshold for Control of Building Damage

Human Perception

Human response to vibration stimuli occurs at orders of magnitudes below those associated with any form of building damage, hence vibration levels lower than those indicated in Table 10.6 can lead to concern. BS5228-2 also provides a useful guide relating to the assessment of human response to vibration in terms of PPV. Table 10.7 summarises the range of vibration values and the associated potential effects on humans.

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

Table 10.7: Guidance on Effects of Human Response to PPV Magnitudes

The standard notes that single or infrequent occurrences of these levels do not necessarily correspond to the stated effect in every case. Where these values are routinely measured or expected then an assessment in accordance with BS 6472-1 might be more appropriate to determine whether time varying exposure is likely to give rise to any degree of adverse comment.

10.2.5 Operational Noise – Additional Vehicular Traffic Criteria

Given that traffic from the development will make use of existing roads already carrying traffic volumes, it is appropriate to consider the increase in traffic noise level that arises as a result of vehicular movements associated with the development.

In order to assist with the interpretation of the noise associated with vehicular traffic on public roads, Table 10.8 offers guidance as to the likely impact associated with any particular change in traffic noise level (Source: *Design Manual for Roads and Bridges* (DMRB Revision 2), 2020).

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

Table 10.8: Likely Impact Associated with Change in Traffic Noise Level

The criteria above reflect the key benchmarks that relate to human perception of sound. A change of 3 dB(A) is generally considered to be the smallest change in environmental noise that is perceptible to the human ear. A 10 dB(A) change in noise represents a doubling or halving of the noise level. The difference between the minimum perceptible change and the doubling or halving of the noise level is split to provide greater definition to the assessment of changes in noise level.

10.2.6 Operational Noise – Mechanical and Electrical Sources

Once a development of this nature becomes fully operational, a variety of electrical and mechanical plant will be required to service the development. Most of this plant will be capable of generating noise to some degree. Some of this plant may operate 24 hours a day, and hence would be most noticeable during quiet periods (i.e. overnight). Noisy plant with a direct line-of-sight to noise sensitive properties would potentially have the greatest impact. Plant contained within plantrooms has the least potential for impact once consideration is given to appropriate design of the space.

Good practice guidance on noise emissions from mechanical plant items would typically make reference to the British Standard BS 4142: 2014 + A1 2019: *Methods for Rating and Assessing Industrial and Commercial Sound*. This document is the industry standard method for analysing building services plant noise emissions to residential receptors and is the document used commonly by local authorities in their standard planning conditions and also in complaint investigations.

BS 4142 describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

For an appropriate BS 4142 assessment, it is necessary to compare the measured external background noise level (i.e. the $L_{A90,T}$ level measured in the absence of plant items) to the rating level ($L_{Ar,T}$) of the various plant items, when operational. Where noise emissions are found to be tonal, impulsive in nature or irregular enough to attract attention, BS 4142 also advises that a penalty be applied to the specific level to arrive at the rating level.

The subjective method for applying a penalty for tonal noise characteristics outlined in BS 4142 recommends the application of a 2 dB penalty for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.

The following definitions as discussed in BS 4142 are summarised below:

"ambient noise level, $L_{Aeq,T}$"	is the noise level produced by all sources including the sources of concern, i.e. the residual noise level plus the specific noise of mechanical plant, in terms of the equivalent continuous A-weighted sound pressure level over the reference time interval [T].
"residual noise level, $L_{Aeq,T}$"	is the noise level produced by all sources excluding the sources of concern, in terms of the equivalent continuous A-weighted sound pressure level over the reference time interval [T].
"specific noise level, $L_{Aeq,T}$"	is the sound level associated with the sources of concern, i.e. noise emissions solely from the mechanical plant, in terms of the equivalent continuous A-weighted sound pressure level over the reference time interval [T].
"rating level, $L_{Ar,T}$"	is the specific sound level plus any adjustments for the characteristic features of the sound (e.g. tonal, impulsive or irregular components);
"background noise level, $L_{A90,T}$"	is the sound pressure level of the residual noise that is exceeded for 90% of the time period T.

If the rated plant noise level is +10 dB or more above the pre-existing background noise level, then this indicates that complaints are likely to occur and that there will be a significant adverse impact. A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.

Vibration

There are no expected sources of vibration associated with the operational phase, therefore, vibration criteria have not been specified for this phase.

10.3 THE EXISTING RECEIVING ENVIRONMENT (BASELINE SITUATION)

The application site comprises a greenfield site located at Ballyoulster on the edge of the existing built-up area of Celbridge. The application site is bound by Dublin Road, Donaghcumper Cemetery and the Ballyoulster Park housing estate to the north, the Willow housing estate to the south, agricultural lands to the east and Shinkeen Road to the west.

The main noise source in the area is from road traffic.

10.3.1 Noise Survey

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

10.3.2 Choice of Measurement Positions

Four measurement locations were selected as shown in Figure 10.1 and as described below:

Location UN1	Unattended measurement location intended to capture the noise levels representative of section of the site nearest to the neighbouring manufacturing facility.
Location AT1	Attended measurement location to capture the noise level at the noise-sensitive locations at houses to the southeast of the proposed development
Location AT2	Attended measurement location to capture the noise level at the noise-sensitive locations at houses to the south of the proposed development
Location AT3	Attended measurement location to capture the noise level at proposed houses at the north of the site, closest to Dublin Road.

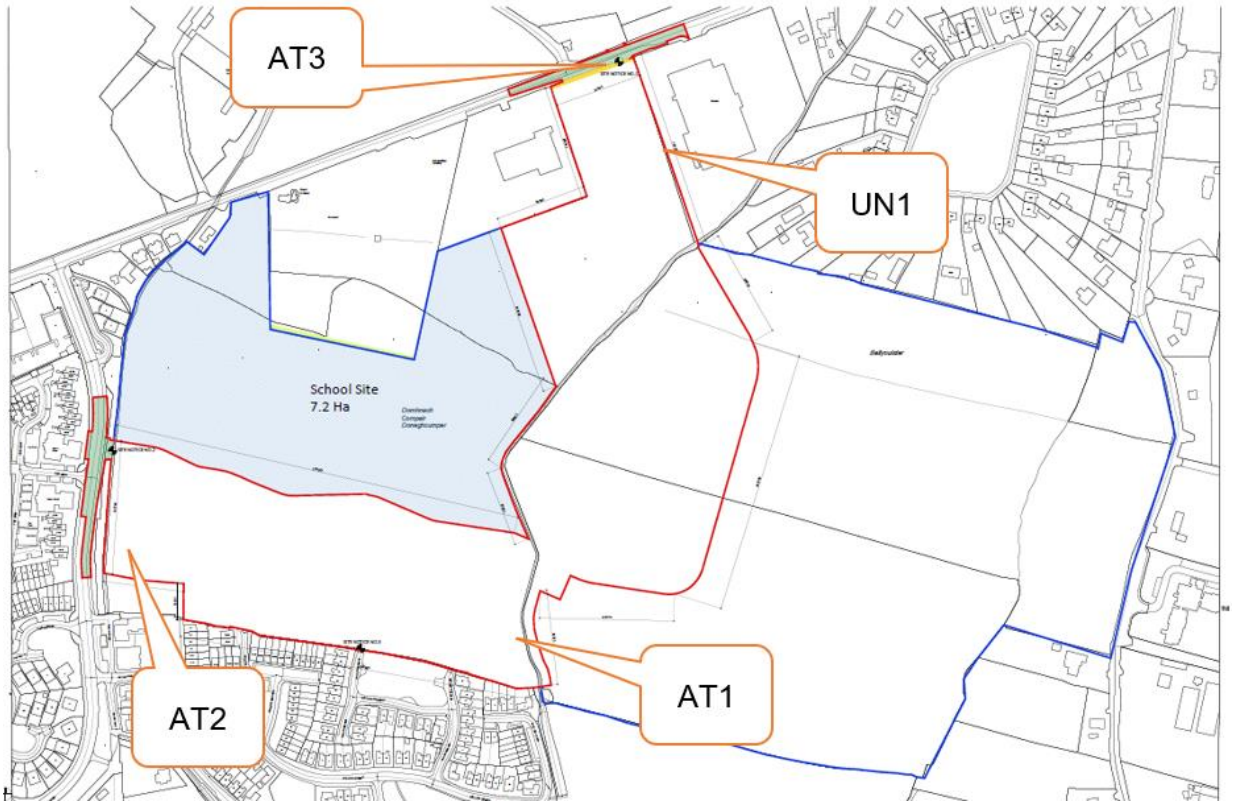

Figure 10.1: Noise Survey Locations

10.3.3 Survey Periods and Instrumentation

The unattended noise survey was conducted between the following periods:

- Unattended: from 13:00 hrs on Monday 16 August to 14:30 hrs on Wednesday 18 August 2021; and
- Attended: from 10:40 hrs to 14:30 on 17 August 2021.

The measurements cover a period that was selected in order to provide a typical snapshot of the existing noise climate, with the primary purpose being to ensure that the proposed noise criteria associated with the development are commensurate with the prevailing environment.

The measurements were made using a RION NL-52 Sound Level Meters. Sample periods were 15-minutes. Before and after the survey the measurement instruments were check calibrated using a Brüel & Kjær Type 4231 Sound Level Calibrator.

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

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

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.

10.3.5 Measurement Results

Location UN1

The results of the unattended monitoring survey at Location UN1 are summarised for daytime periods in Table 10.9 and for night-time periods in Table 10.10.

Monitoring Period	Average Measured Noise Levels (dB re. $2x10^{-5}$ Pa)	
	$L_{Aeq,16hr}$	L_{A90}
Monday 16 August	52	47
Tuesday 17 August	54	48
Wednesday 18 August	54	48

Table 10.9: Summary of Daytime Unattended Noise Measurements at UN1. L_{Aeq} Averages refer to logarithmic averages and L_{A90} averages refer to arithmetic averages.

Monitoring Period	Average Measured Noise Levels (dB re. $2x10^{-5}$ Pa)	
	$L_{Aeq,\ 8hr}$	L_{A90}
Monday 16 August to Tuesday 17 August	48	41
Tuesday 17 Aug. to Wednesday 18 Aug.	45	37

Table 10.10: Summary of Night-time Unattended Noise Measurements at UN1

During daytime periods, average noise levels were in the range 52 to 54 dB $L_{Aeq,16hr}$ and 47 to 48 dB $L_{A90,16hr}$. During night-time periods, average noise levels were in the range 45 to 48 dB $L_{Aeq,8hr}$ and 37 to 41 dB $L_{A90,8hr}$. These noise levels are considered representative of a semi-urban location.

Location AT1

The survey results for the attended monitoring at location AT1 are given in Table 10.11.

Start Time (hrs)	Subjective Impression of Noise Environment	Measured Noise Levels (dB re. $2x10^{-5}$ Pa)		
		$L_{Aeq.15min}$	L_{Amax}	L_{A90}
10:40	Road traffic on Sinkeen Road Dominant. Bird song. Wind noise in foliage,	43	65	41
12:00		48	62	43
13:20		45	66	43

Table 10.11: Attended Noise Measurement at Location AT1

Noise levels were in the range 43 to 48 dB L_{Aeq} and 41 to 43 dB L_{A90}.

Location AT2

The survey results for the attended monitoring at location AT2 are given in Table 10.12.

Start Time (hrs)	Subjective Impression of Noise Environment	Measured Noise Levels (dB re. $2x10^{-5}$ Pa)		
		$L_{Aeq.15min}$	L_{Amax}	L_{A90}
11:05		50	60	43

Start Time (hrs)	Subjective Impression of Noise Environment	Measured Noise Levels (dB re. $2x10^{-5}$ Pa)		
		$L_{Aeq.15min}$	L_{Amax}	L_{A90}
12:25	Road traffic on Dublin Road dominant. Shinkeen Road audible. Bird song. Wind noise in foliage.	51	62	45
13:45		51	64	43

Table 1.12: Attended Noise Measurement at Location AT2

Noise levels were in the range 50 to 51 dB L_{Aeq} and 43 to 45 dB L_{A90}.

Location AT3

The survey results for the attended monitoring at location AT3 are given in Table 10.13.

Start Time (hrs)	Subjective Impression of Noise Environment	Measured Noise Levels (dB re. $2x10^{-5}$ Pa)		
		$L_{Aeq.15min}$	L_{Amax}	L_{A90}
11:35	Road traffic on Dublin Road dominant. Bird song	62	73	49
12:55		62	72	53
14:15		61	70	53

Table 10.13: Attended Noise Measurement at Location AT3

Noise levels were in the range 61 to 62 dB L_{Aeq} and 49 to 53 dB L_{A90}.

10.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The proposed development comprises a Strategic Housing Development of 344 no. residential units (comprising 54 no. 1 beds, 30 no. 2 beds, 210 no. 3 beds and 50 no. 4 beds), a childcare facility with a GFA of c. 369 sq.m, public and communal open space, landscaping, car and cycle parking spaces, provision of an access road from Dublin Road and Shinkeen Road, associated vehicular accesses, internal roads, pedestrian and cycle paths, bin storage, ESB substations, pumping station and all associated site and infrastructural works. A full description of the development can be found in Chapter 2.

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

- the construction phase, and;
- the operational phase.

During the construction phase the main site activities likely to generate noise will include site clearance, building construction and landscaping works.

During the operational phase of the development, the key sources of noise will relate to building services plant and additional vehicular traffic on public roads.

These issues are discussed in the following sections.

10.5 POTENTIAL IMPACT OF THE PROPOSED DEVELOPMENT

10.5.1 Construction Noise

A variety of items of plant will be in use for the purposes site clearance and construction. The type and number of equipment will vary between the varying construction phases depending on the phasing of the works. There will be vehicular movements to and from the site that will make use of existing roads. Due to the nature of these activities, there is potential for the generation of elevated levels of noise.

The closest noise sensitive locations to the main building works will be the residential units to the east of the site which are at a distance of approximately 20m from the potential construction works. This distance relates to the closest boundary to the nearest residential noise sensitive locations. The remainder of works will take place across the site at varying distances of up to 250m. Reference to the noise baseline survey results (Section 10.3.5) and guidance contained in BS 5228 Part 1 for construction noise levels presented in Table 10.4, the threshold for significance from constriction activities is set as follows for the closest residential noise sensitive locations:

Significance Category – A:

- Daytime (08:00 – 19:00) Weekdays and Saturdays (08:00 – 14:00): 65 dB $L_{Aeq,1hr}$
- Evenings and Weekends: 55 dB $L_{Aeq,1hr}$

An appropriate construction noise limit at the nearest commercial buildings such as the Rye River Brewery is considered to be 75 dB $L_{Aeq,1hr}$.

For site clearance, building construction works and landscaping works (excavators, loaders, dozers, concreting works, mobile cranes, generators), noise source levels are quoted in the range of 70 to 80dB L_{Aeq} at distances of 10m within BS 5228-1. For the purposes of this assessment, a combined sound power value of 115dB $L_{w(A)}$ has been used for construction noise calculations. This would include, for example, 5 no. items of construction plant with a sound pressure level of 80dB L_{Aeq} at 10m operating simultaneously along the closest works boundary.

Given the type and number of construction equipment will vary over the course of the construction phase, noise levels have been calculated at the closest noise sensitive locations assuming the construction noise levels and distances noted above. For the purpose of the assessment, a standard site hoarding of 2.4m high has been included in the calculations for noise sensitive boundaries. The calculations also assume that the equipment will operate for 66% of the working time. Table 10.14 summarises the result of this assessment.

Activity	Sound Power at construction works, dB Lw(A)	Calculated noise levels at varying distances, dB $L_{Aeq,T}$					
		20m	30m	50m	60m	100m	200m
Site Clearance General Construction Landscaping	115	74	71	66	65	60	54

Table 10.14: Construction Noise Predictions at Various Distances

The predicted noise levels detailed in the Table 10.14 indicate that during the main construction phase including site clearance, building construction works etc. assuming up to 5 items of plant are operating simultaneously at the closest noise sensitive boundaries, there is potential for the residential significance threshold to be exceeded at distances of up to 50m. Considering the closest residential noise sensitive locations to the development lands are at 20m distance, and based on the predicted noise levels above, the associated construction noise impact has the

potential to be moderate to significant when construction works are undertaken at locations of the site closest to the nearby noise sensitive receptors.

However, it should be noted that at distances of 50m or greater from the receptors the construction works are not predicted to cause a significant impact. Given that the majority of construction works will take place at distances greater than 50m it is expected that for the majority of the construction period the nearest receptors will experience a moderate effect.

A schedule of best practice noise mitigation measures is included in Section 10.5.1.

In terms of noise associated with these construction activities the associated effect is stated to be:

Quality	*Significance*	*Duration*
Negative	Moderate - Significant	Short Term

10.5.2 Construction Vibration

Potential for vibration impacts during the demolition and construction phase programme are likely to be limited given the distances to the receptor locations. With respect to the potential vibration impact, the only significant source of vibration is expected to be due to excavations and foundation activities. However, the distance between the areas where these activities are to occur, and the nearest noise sensitive locations are such that all vibration transmission would be below recommended the significance criteria for human response and the orders of magnitude below those set for the avoidance of cosmetic damage to buildings.

In this instance, taking account of the distance to the nearest sensitive off-site buildings, vibration levels at the closest neighbouring buildings are expected to be orders of magnitude below the limits set out in Table 10.6 to avoid any cosmetic damage to buildings. Vibration levels are also expected to be below a level that would cause disturbance to building occupants, as set out in Table 10.7. The potential vibration impact during the construction phase if of short-term, neutral and imperceptible impact.

Quality	*Significance*	*Duration*
Neutral	Imperceptible	Short Term

10.5.3 Operational Phase – Additional Vehicular Traffic on Surrounding Roads

A Traffic Impact Assessment relating to the proposed development has been prepared as part of this application and is submitted under separate cover and is also addressed in Chapter 12- Traffic and Transport. Information from the TIA report has been used to determine the predicted change in noise levels in the vicinity of a number of roads in the area surrounding the proposed development, for the opening and design years.

For the purposes of assessing potential noise impact, it is appropriate to consider the relative increase in noise level associated with traffic movements on existing roads and junctions with and without the development. Traffic flow data in terms of the AADT traffic flow figures has been assessed for the opening year and the opening year +15. The calculated change in noise levels during these two periods are summarised in Table 10.15. The assessed roads/routes are indicated in Figure 10.2.

The impact for all other routes is considered to be neutral, negligible and long term.

Reference	Change in Noise Level (dB)	Impact
Year 2024		
A	+0.1	Not Significant
B	+0.1	Not Significant
C	-0.2	Not Significant
D	+0.1	Not Significant
E	+0.0	Not Significant
F	+0.0	Not Significant
G	+0.0	Not Significant
H	-0.4	Not Significant
I	+0.1	Not Significant
J	+0.1	Not Significant
Year 2039		
A	+0.2	Not Significant
B	+0.3	Not Significant
C	-0.2	Not Significant
D	+0.2	Not Significant
E	+0.1	Not Significant
F	+0.1	Not Significant
G	+0.1	Not Significant
H	-0.2	Not Significant
I	+0.3	Not Significant
J	+0.1	Not Significant

Table 10.15: Noise Level Changes Due to Increased Traffic on Public Roads

The effect of noise due to additional vehicular traffic on public roads is as follows:

Quality	*Significance*	*Duration*
Negative	Not Significant	Long - Term

Figure 10.2: Assessed Road Links (Background Imagery from Google Earth)

10.5.2 Operational Phase – Mechanical and Electrical Sources

Once operational, there will be building services plant items required to serve the development. These will typically be limited to heating and cooling plant and extract units, depending on the building design and user requirements. Given the use of these buildings, the majority of plant items are likely to be required during daytime hours only, however, there may be requirement for night-time operational plant, depending on specific requirements.

The location or type of building services plant has not yet been established; therefore, it is not possible to calculate noise levels to the surrounding environment. In this instance, is it best practice to set appropriate noise limits that will inform the detailed design during the selection and layout of building services for the development.

These items will be selected at a later stage, however, they will be designed and located so that there is no negative impact on sensitive receivers within the development itself. The cumulative operational noise level from building services plant at the nearest noise sensitive location within the development (e.g. apartments, etc.) will be designed/attenuated to meet the relevant BS 4142 noise criteria for day and night-time periods as set out in this assessment. Based on the baseline noise data collected for this assessment it is considered an appropriate design criterion is the order of 40 dB $L_{Aeq,15min}$. This limit is set in order to achieve acceptable internal noise levels within residential spaces based on prevailing noise levels in the area.

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.

In terms of noise associated with building services plant, the associated effect is stated to be as follows:

Quality	Significance	Duration
Negative	Not Significant	Long Term

10.5.3 Operational Phase – Vibration

There are no sources of vibration associated with development that will give rise to impacts at nearby noise sensitive locations. In terms of these the operational phase of the development the associated effect is stated to be:

Quality	Significance	Duration
Neutral	Imperceptible	Long Term

10.5.4 Operational Phase – Childcare Facility

Measurement of noise levels generated by children playing outdoors at several crèches and kindergartens indicate typical noise levels in the order of 56 dB $L_{Aeq,1hr}$ at distance of 5 metres. The nearest noise sensitive windows are located within the development at ground floor level, approximately 8m from the creche. Considering the usage of the creche area (e.g. external areas are only expected to be in use for a portion of the 16 hour daytime period) the resultant noise effect due to the creche is not significant and mitigation measures are not required.

10.6 POTENTIAL CUMULATIVE IMPACTS

A review of recent planning permissions for the area was conducted and it was found that there were 3 no. relevant sites for which cumulative impacts may occur should their construction phase and that of the proposed development overlap. These include a strategic housing development at Shackleton Road, Oldtown, Celbridge (ABP Ref: 303295-19), and two developments at Crodaun, Celbridge ((a) ABP ref 306504-20 amended by ABP Ref 309361-21 and (b) ABP Ref 307110-20).

In terms of construction noise, given the layout of the nearby receptors in comparison with the proposed construction sites, it is expected that the construction noise from the proposed development will dominate the noise levels at the local residential receptors to the west and south of the site and there is unlikely to be any significant cumulative construction noise effect given the distance to the other identified developments.

In terms of the additional vehicular traffic on public roads, once the development is constructed: the assessment in Section 10.5.3 includes flows due to the proposed development and the three other developments listed above. The cumulative effect remains:

Quality	Significance	Duration
Neutral	Not Significant	Long Term

10.7 'DO NOTHING' IMPACT

In the absence of the proposed development being constructed, the noise environment at the nearest noise sensitive locations and across the development site itself will remain largely unchanged. The noise and vibration levels measured/noted during the baseline studies are considered representative of the Do-Nothing scenario. The Do-Nothing scenario is therefore considered neutral impact.

10.8 AVOIDANCE, REMEDIAL & MITIGATION MEASURES

10.8.1 Construction Phase

The contract documents will clearly specify the construction noise criteria included in this chapter which the construction works must operate within.

N&V CONSTR 1: CEMP and Noise
The Contractor undertaking the construction of the works will be obliged to take specific noise abatement measures and 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, and these should be set out in the CEMP.

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
- Control of noise sources

- Screening
- Hours of work
- Liaison with the public

Specific control measures relating to construction activities undertaken by the contractor will be set out within the Construction Environmental Management Plan (CEMP) to be prepared in advance of the works. In relation to noise and vibration control the CEMP will include outline best practice measures from BS 5228 (2009 +A1 2014).

10.8.1 Operational Phase - Mechanical and Electrical Sources

N&V OPERA 1: Plant
As part of the detailed design of the development, plant items with appropriate noise ratings and, where necessary, appropriately selected remedial measures (e.g. enclosures, silencers etc.) will be specified in order that the adopted plant noise criteria is achieved at the façades of noise sensitive properties, including those within the development itself.

10.9 RESIDUAL IMPACTS

10.9.1 Construction Noise

It is predicted that when works take place at less than 50m distance to the receptors a moderate to significant impact will occur, hence the impacts are predicted to be:

Quality	Significance	Duration
Negative	Moderate - Significant	Short-Term

It should be noted that the assessment can be considered “worst case” and it is unlikely that all items of plant assessed will be in operational simultaneously.

For the majority of the construction period works are expected to take place at greater than 50m distance to the closest receptors for which the impacts are predicted to be:

Quality	*Significance*	*Duration*
Negative	Moderate	Short-Term

10.9.2 Construction Vibration

The effects are predicted as follows:

Quality	*Significance*	*Duration*
Neutral	Imperceptible	Short Term

10.9.3 Operational Phase – Additional Vehicular Traffic on Surrounding Roads

The effects are predicted to be:

Quality	*Significance*	*Duration*
Negative	Not Significant	Short Term

10.9.3 Operational Phase – Mechanical and Electrical Sources

The effects are predicted to be:

Quality	*Significance*	*Duration*
Negative	Not Significant	Long Term

10.10 MONITORING

The contractor will be required to ensure construction activities operate within the noise and vibration limits set out within this assessment. The contractor will be required to undertake regular noise and vibration monitoring at locations representative of the closest sensitive locations to ensure the relevant criteria are not exceeded.

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

Vibration monitoring should be conducted in accordance with BS 6472 for human disturbance and BS ISO 4866:2010 for building damage.

10.11 REINSTATEMENT

Not applicable to noise and vibration.

10.12 INTERACTIONS

In compiling this impact assessment, reference has been made to the project description provided by the project co-ordinators, project drawings provided by the project architects and traffic flow projections associated with the development provided by the traffic consultants. There is also an interaction with Human Health, which has informed Chapter 3- Population and Human Health of this EIAR.

10.13 DIFFICULTIES ENCOUNTERED IN COMPILING

No difficulty was encountered when compiling this assessment.

10.14 REFERENCES

British Standard BS 4142: 2014+A1:2019: Methods for Rating and Assessing Industrial and Commercial Sound.

Design Manual for Roads and Bridges LA 111 Sustainability & Environmental Appraisal. Noise and Vibration Rev 2 (2020).

British Standard BS 5228 (2009 +A1 2014): Code of Practice for Control of Noise and Vibration on Construction and Open Sites Part 1: Noise & Part 2: Vibration.

British Standard BS 7385 (1993): Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration.

Calculation of Road Traffic Noise, Department of Transport Welsh Office, HMSO, 1988.

ISO 1996: 2017: Acoustics – Description, measurement and assessment of environmental noise.

ISO 9613 (1996): Acoustics – Attenuation of sound during propagation outdoors, Part 2: General method of calculation.

EPA Advice Notes on Current Practice (in the preparation of Environmental Impact Statements), (EPA, 2003).

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

EPA Advice Notes for Preparing Environmental Impact Statements, (May 2021).