12.0 NOISE AND VIBRATION

12.1 Introduction

AWN Consulting Ltd. has been appointed to prepare the noise and vibration chapter of the EIAR supporting the proposed mixed-use development comprising residential, amenity areas, creche, café/restaurant as part of a Strategic Housing Development (SHD) on Scholarstown Road, Dublin 16. This section will provide information on the assessment of noise and vibration impacts on the surrounding environment during both the construction and operational phases. The principal objectives of the Noise and Vibration assessment will be to specify appropriate limit values and mitigation measures to ensure that the impact on the environment is minimised and complied with acceptable standards and guidelines.

This chapter was completed by Jennifer Harmon, Principal Acoustic Consultant with AWN Consulting Ltd. She holds an BSc. in Environmental Science and a Diploma in Acoustics and Noise Control from the Institute of Acoustics (IoA) of which she is a full member. Jennifer has over 18 years consulting experience specialising in Acoustics and Environmental Impact Assessment.

12.2 Study Methodology

12.2.1 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 DRAFT August 2017* and on our experience of preparing the noise & vibration chapters for similar developments.

This will be undertaken using the following methodology:

- 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.

12.2.2 Criteria for Rating of Impacts

Significance of Impacts

The significance of noise and vibration impacts has been assessed in accordance with the EPA Draft EIA Report Guidelines 2017 and EPA Draft Advice Notes for EIS 2015 (see Tables 12.1 to 12.3 below). As these guidelines do not quantify the impacts in decibel terms further reference has been made to the draft '*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:

Table 12.1 Quality of Potential Impacts

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

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

Table 12.2 Significance of Effects

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.

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

Table 12.3 Duration of Effects

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

Duration of Impact	Definition
Reversible	Effects that can be undone, for example through remediation or restoration

Relevant Criteria

Construction Phase – Noise

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. In lieu of statutory guidance, an assessment of significance has been undertaken as per British Standard *BS 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites - Noise*.

In this instance, appropriate criteria relating to permissible construction noise levels for the proposed development under consideration are taken from this standard.

This document suggests an absolute construction noise limit depending on the receiving environment. The documents states:

"Noise from construction and demolition sites should not exceed the level at which conversations in the nearest building would be difficult with windows shut…. Noise levels between 07:00 and 19:00hrs, outside the nearest window of the occupied room closest to the site boundary should not exceed:

- *70dB in rural, suburban and urban areas away from main road traffic and industrial noise;*
- *75dB in urban areas near main roads in heavy industrial areas.*

Given the suburban location of the facility, a limit value of 70dB $L_{Aeq,T}$ for construction is considered to be reasonable in order to avoid significant impacts.

The noise criteria referred to above are also in agreement with those set out in the Transport Infrastructure Ireland (TII) publication *Guidelines for the Treatment of Noise and Vibration in National Road Schemes*[1], which should not be exceeded at noise sensitive locations during the construction phase of the development. Table 12.2 sets out these levels.

Table 12.4 Maximum Permissible Noise Levels at the Facade of Dwellings during Construction

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

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

[1] *Guidelines for the Treatment of Noise and Vibration in National Road Schemes, Revision 1, 25 October 2004*, Transport Infrastructure Ireland

Construction Phase - Vibration

Building Response

In terms of vibration, BS 5228-2:2009+A1:2014 Part 2 *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 (PPV) (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.

The standard notes that important buildings that are difficult to repair might require special consideration on a case by case basis but building of historical importance should not (unless it is structurally unsound) be assumed to be more sensitive. If a building is in a very unstable state, then it will tend to be more vulnerable to the possibility of damage arising from vibration or any other groundborne disturbance. Where adjacent buildings with the potential to be more vulnerable than other adjacent modern structures, on a precautionary basis, the guidance values for structurally sound buildings are reduced by 50% in line with the guidance documents referred to above.

Taking the above into consideration the vibration criteria in Table 12.5 are recommended.

Table 12.5 Recommended Construction Vibration Threshold for Control of Building Damage

Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of:-			
Structurally Sound Buildings	**Less than 15Hz**	**15 to 40Hz**	**40Hz and above**
	15mm/s	20mm/s	50mm/s
Protected Buildings	6mm/s	10mm/s	25mm/s

Source: BS 5228-2 2009 + A1 2014

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. 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, piling can typically be tolerated at vibration levels up to 2.5mm/s if adequate public relations are in place and timeframes are known. These values refer to the day-time periods only.

Operational Phase - Noise

The main potential source of outward noise impact associated with the proposed development relates to additional traffic flows on the surrounding road network.

Potential noise impacts also relate to operational plant serving the apartment buildings, commercial, retail and creche facilities.

Road Traffic Noise Assessment 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 12.6 offers guidance as to the likely impact associated with any particular change in traffic noise level (Source: Design Manual for Roads and Bridges (DMRB), 2011).

Table 12.6 Likely Impact Associated with Change in Traffic Noise Level

Change in Sound Level (dB A)	Subjective Reaction	DMRB Magnitude of Impact	Impact Guidelines on the Information to be contained in EIAR (EPA)
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

Source: (DMRB, Volume 11, 2011)

Table 12.6 presents the DMRB (2011) likely impacts associated with change in traffic noise level. The corresponding significance of impact presented in the '*EPA Guidelines on the information to be contained in Environmental Impact Assessment Reports* (EIAR), Draft, August 2017 is presented for consistency in wording and terminology for the assessment of impact significance.

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.

Mechanical and Electrical Sources

In relation to external services plant noise, reference is made to BS 4142:2014 *Methods for Rating and Assessing Industrial and Commercial Sound*. This document describes methods for rating and assessing sound of an industrial and/or commercial nature to a residential receptor. The methods described in this 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. The results of baseline surveys will define the prevailing background sound level at the nearest noise sensitive locations. This will allow for the noise impact associated with proposed new external plant items to be assessed. With reference to BS 4142:2014, it is noted that, depending on context, adverse impacts are likely to occur when rated plant sound level exceeds the prevailing background sound level by +5dB, with a significant adverse impact occurring at +10dB or more. Where the rating level does not exceed the background sound level, BS 4142 comments that this is an indication of the specific sound source having a low impact, again depending on the context.

Noise Sources Generally

For other non-traffic related sources appropriate guidance on internal noise levels for dwellings is contained within BS 8233: 2014: *Guidance on Sound Insulation and Noise Reduction for Buildings.* This British Standard sets out recommended noise limits for indoor ambient noise levels in dwellings as summarised in Table 12.7.

Table 12.7 Recommended Indoor Ambient Noise Levels

Typical situations	**Design Range, $L_{Aeq,T}$ dB**	
	Daytime $L_{Aeq,16hr}$ (07:00 to 23:00hrs)	**Night-time $L_{Aeq,8hr}$ (23:00 to 07:00hrs)**
Living / Dining Rooms	35 / 40	n/a
Bedrooms	35	30

Source: (BS 8233 2014)

For the purposes of this study, it is appropriate to derive external limits based on the internal criteria noted in the paragraph above. This is done by factoring in the degree of noise reduction afforded by a partially open window and typical 15dB attenuation is noted in this British Standard. Using this correction value across an open window, the following external noise levels would achieve the internal noise levels noted in Table 12.7 above.

- Daytime / Evening (07:00 to 23:00 hours) 50 - 55dB $L_{Aeq,1hr}$
- Night-time (23:00 to 07:00 hours) 45dB $L_{Aeq,15min}$

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

Assessment of Significance

The draft '*Guidelines for Noise Impact Assessment*' produced by the Institute of Acoustics/Institute of Environmental Management and Assessment Working Party have been referenced in relation to the potential impact of changes in the ambient noise levels during the construction and the operational phases of the proposed development.

The findings of the Working Party are draft at present although they are of some assistance in this assessment. The draft guidelines state that for any assessment, the noise level threshold and significance should be determined by the assessor, based upon the specific evidence and likely subjective response to noise.

The draft 'Guidelines for Noise Impact Assessment' impact scale adopted in this assessment is shown in Table 12.8 below. The corresponding significance of impact presented in the EPA Draft Guidelines on Information to be contained in Environmental Impact Statements' (2017) is also presented.

Table 12.8 Noise Impact Scale

Noise Level Change dB(A)	Subjective Response	Impact Guidelines for Noise Impact Assessment Significance (Institute of Acoustics)	Impact Guidelines on the Information to be contained in EIA Report's (EPA)
0	No change	None	Imperceptible
0.1 – 2.9	Barely perceptible	Minor	Not Significant

Noise Level Change dB(A)	Subjective Response	Impact Guidelines for Noise Impact Assessment Significance (Institute of Acoustics)	Impact Guidelines on the Information to be contained in EIA Report's (EPA)
3.0 – 4.9	Noticeable	Moderate	Slight, Moderate
5.0 – 9.9	Up to a doubling or halving of loudness	Substantial	Significant
10.0 or more	More than a doubling or halving of loudness	Major	Very Significant, Profound

Source: (IoA IEMA Guidelines for Noise Impact Assessment)

The criteria above reflect the key benchmarks that relate to human perception of sound. A change of 3dB(A) is generally considered to be the smallest change in environmental noise that is perceptible to the human ear. A 10dB(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.

It is considered that the criteria specified in the above table provide a good indication as to the likely significance of changes on noise levels

12.3 Characteristics of Proposed Development

The application area is located at Scholarstown Road, Dublin 16. The proposed development is predominately residential and will also include an amenity block, retail, café / restaurant areas, gymnasium, creche, management suite in addition to external open space and road and junction upgrade 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 impacts on the surroundings are considered for each of two distinct stages, the short-term construction phase and the long term operational phase.

During the construction phase the main site activities will include, site clearance, demolition of existing buildings, building construction, road works, and landscaping. This phase has the greatest potential noise and vibration impacts on its surrounding environment; however, this phase will be of short- term impact.

During the operational phase of the development, no significant sources of noise or vibration are expected with the development. The primary source of outward noise in the operational context relates to any changes in traffic flows along the local road network, operational plant noise used to serve the ancillary elements within the development buildings and operational noise sources from retail, amenity and creche areas.

Each phase is discussed in turn in the following sections

12.4 Receiving Environment

The proposed development is located within a largely greenfield site located off Scholarstown Road, Dublin 16. The site is bound by residential dwellings to the north, east and western boundaries. Scholarstown Road bounds the south of the site with Knocklyon St Colmcilles Community School beyond. The residents along the perimeter boundaries and the school to the south are the closest noise sensitive locations to the development site.

12.4.1 Environmental 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.

Choice of Measurement Locations

Three attended and two unattended measurement locations were selected as shown in Figure 12.1 and described below.

Location ATT1 is located along the south eastern boundary of the development along a cul-de-sac area fronting residential properties within Scholarstown Park.

Location ATT2 is located north east of the development boundary, outside residential properties within Dargle Wood residential estate.

Location ATT3 is located north-west of the development boundary outside residential properties within Dargle Wood residential estate.

Location UN1 is located along the southern boundary of the development along the entrance laneway to the existing "Beechpark" residential property fronting Scholarstown Road.

Location UN2 is located along the mid-western boundary of the development along off set from Scholarstown Road, along the boundary of the Ros Mor View apartments.

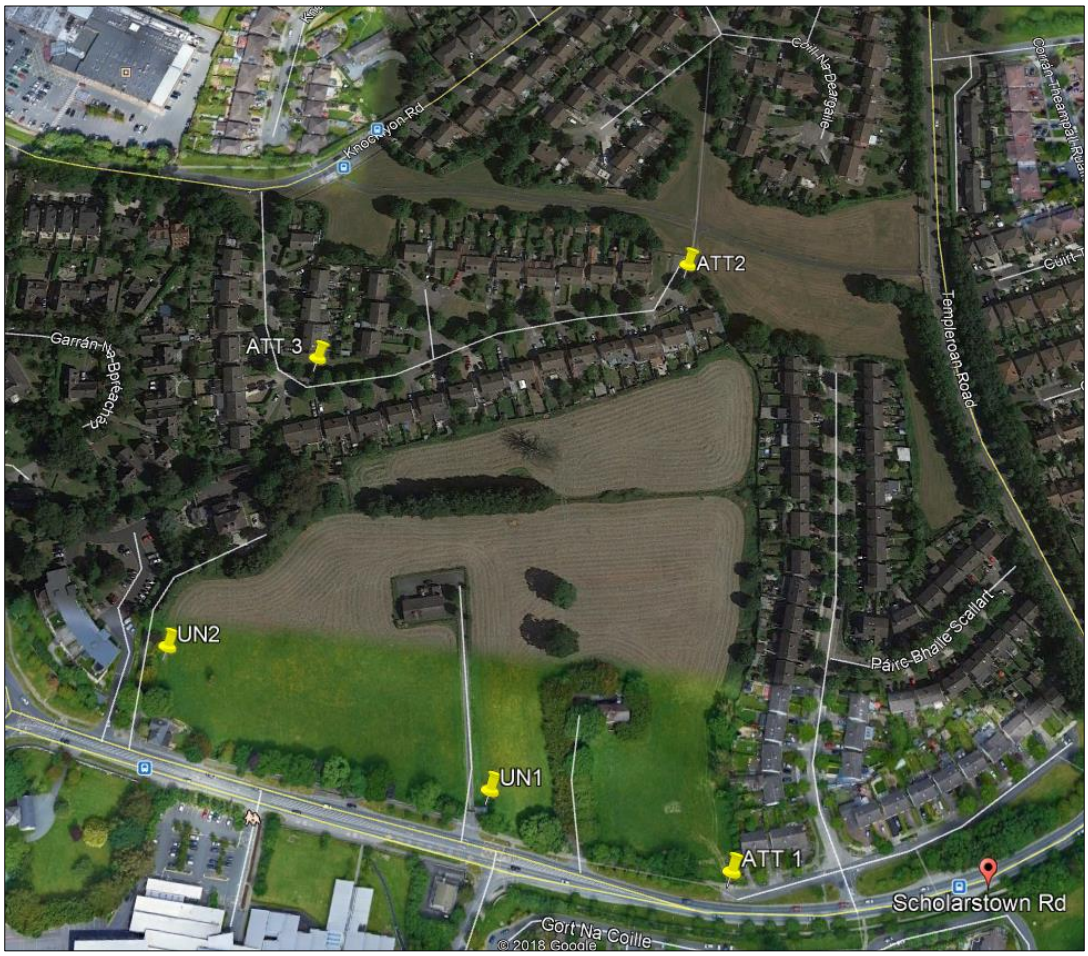

Figure 12.1 –Baseline Noise Monitoring Locations

Survey Periods and Instrumentation

Attended noise measurements were conducted at Locations ATT1 to ATT3 between 10:00 to 13:00hrs on 23 March 2019.

The measurements were made using a Brüel and Kjær Type 2250 Sound Level Meter. 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.

Unattended noise measurements were conducted at Locations UN1 and UN2 between the 8th and 13 May 2019.

The measurements were made using a Rion NL-42 Sound Level Meter. 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.

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

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

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.

Survey Results and Discussion

The results of the surveys at the three monitoring locations are summarised below.

Location ATT1

Table 12.9 below presents a summary of noise levels measured at Location ATT1.

Table 12.9 Baseline Noise Monitoring Results at Location ATT1

Start Time	Measured Noise Levels (dB re. $2x10^{-5}$ Pa)			
	L_{Aeq}	L_{AFmax}	L_{A10}	L_{A90}
10:02	68	87	71	57
11:08	67	80	70	57
12:06	67	82	71	56

During the noise survey, the dominant noise sources were noted to be from road traffic along Scholarstown Road due to the proximity of the monitoring position to the road edge. Ambient noise levels were measured in the range of 67 to 68dB L_{Aeq}. The background noise was measured in the range of 56 to 57dB L_{A90} with road traffic being the dominant source noted.

Location ATT2

Table 12.10 below presents a summary of noise levels measured at Location ATT2.

Table 12.10 Baseline Noise Monitoring Results at Location ATT2

Start Time	Measured Noise Levels (dB re. $2x10^{-5}$ Pa)			
	L_{Aeq}	L_{AFmax}	L_{A10}	L_{A90}
10:47	49	75	49	46
11:45	49	64	50	46
12:43	49	71	50	47

During the noise survey, the main noise sources were noted to be from road traffic along Scholarstown Road, local vehicular movements within the Dargle Wood residential area and general residential estate activities including pedestrians, cars parking etc in addition to an element of leaf rustle and bird song. Ambient noise levels measured 49dB L_{Aeq}. The

background noise was measured in the range of 46 to 47dB L_{A90} with distant road traffic being the main source noted.

Location ATT3

Table 12.11 below presents a summary of noise levels measured at Location ATT3.

Table 12.11 Baseline Noise Monitoring Results at Location ATT3

Start Time	Measured Noise Levels (dB re. 2x10^{-5} Pa)			
	L_{Aeq}	L_{AFmax}	L_{A10}	L_{A90}
10:30	53	68	56	47
11:28	51	64	54	46
12:25	49	64	52	45

During the noise survey, the main noise sources were noted to be from road traffic along Scholarstown Road, local vehicular movements within the Dargle Wood residential area and general residential estate activities including pedestrians, cars parking etc in addition to an element of leaf rustle and bird song. Ambient noise levels were measured in the range of 49 to 53dB L_{Aeq}. The background noise was measured in the range of 45 to 47dB L_{A90} with distant road traffic being the main source noted.

Location UN 1

Noise survey results for Location UN1 are summarised in Table 12.12 for the daytime period (07:00 to 23:00hrs) and night-time (23:00-07:00hrs).

Table 12.12 Baseline Noise Monitoring Results at Location UN1

Date	Measured Noise Levels $L_{Aeq,T}$, dB			
	Daytime $L_{Aeq,16hr}$		Night-time $L_{Aeq,8hr}$	
	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}
08/05/2019	65	57	-	-
09/05/2019	65	57	58	42
10/05/2019	64	57	60	44
11/05/2019	64	55	60	48
12/05/2019	63	54	61	46
12/05/2019	--	---	65	43
Average	64	56	62	45

Measured noise levels at UN1 were dominated by road traffic along Scholarstown Road with a small element of leaf rustle and bird song contributing to noise levels. Average ambient noise levels during daytime periods were 64dB L_{Aeq} with an average background noise level of 56dB L_{A90}. Average ambient noise levels during night-time periods were 62dB L_{Aeq} with an average background noise level of 45dB L_{A90}.

Location UN 2

Noise survey results for Location UN2 are summarised in Table 12.13 for the daytime period (07:00 to 23:00hrs) and night-time (23:00-07:00hrs).

Table 12.13 Baseline Noise Monitoring Results at Location UN2

Date	Measured Noise Levels $L_{Aeq,T}$, dB			
	Daytime $L_{Aeq,16hr}$		Night-time $L_{Aeq,8hr}$	
	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}
08/05/2019	57	53	-	-
09/05/2019	57	53	50	40
10/05/2019	57	53	51	43
11/05/2019	55	51	52	46
12/05/2019	56	51	52	45
13/05/2019	-	-	51	42
Average	57	52	51	43

Measured noise levels at UN2 were dominated by road traffic along Scholarstown Road with rustle and bird song contributing to noise levels. Average ambient noise levels during daytime periods were 57dB L_{Aeq} with an average background noise level of 52dB L_{A90}. Average ambient noise levels during night-time periods were 51dB L_{Aeq} with an average background noise level of 43dB L_{A90}.

Baseline Summary

The baseline environment in the vicinity of the development site is found to be typical of a suburban environment where road traffic, localised vehicle and pedestrian activities and environmental sources including bird song and leaf rustle are the main contributors to the prevailing noise environment. Highest noise levels were measured outside residential properties to the south east which are sited in close proximity to Scholarstown Road.

The survey is considered typical of the environment under consideration and the survey undertaken for the duration and periods are a reliable representation of the baseline environment.

12.5 Potential Impact of the Proposed Development

12.5.1 Construction Phase

Construction Noise

A variety of items of plant will be in use for the purposes of site clearance, demolition 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.

During demolition works of the two residential buildings within the site and related outhouses, the closest noise sensitive buildings are those within Dargle Wood and Scholarstown Park at a distance of approximately 35m and 65m respectively from the closest works. Reference to BS 5288-1 indicates that equipment types used for demolition works (breakers, crushers, excavators etc.) are typically in the range of 80 to 90dB L_{Aeq} at distances of 10m.

The closest noise sensitive locations to the site clearance and main building works are residential dwellings within Scholarstown Park to the east and Dargle Wood to the north and Ros Mor View apartments and individual dwellings to the west / north west and south-western boundaries of the site at distances of approximately 30m from the closest building works. The remainder of works will take place across the site at varying distances of up to 200m from these areas. 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 (2014 +A1 2014).

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 a range of operational plant items scenarios and reference noise levels at 10m detailed in Table 12.14. For the purpose of the assessment, a construction site hoarding of 2.4m in height has been included in the calculations. The calculations also assume that the equipment will operate for 66% of the working time on any given day.

Table 12.14 Indicative Construction Noise Levels at Nearest Noise Sensitive Locations

Construction Phase	Items of Construction Plant	L_{Aeq} at 35m	L_{Aeq} at 65m
Demolition Works	4 No (at 85dB L_{Aeq} at 10m)	73	68
	2 No (at 85dB L_{Aeq} at 10m)	70	65
Site Clearance General Construction Landscaping Road Works	Items of Construction Plant	L_{Aeq} at 30m	L_{Aeq} at 100m
	5 No (at 80dB L_{Aeq} at 10m)	69	58
	4 No (at 80dB L_{Aeq} at 10m)	68	57
	3 No (at 80dB L_{Aeq} at 10m)	67	56

The predicted noise levels detailed in the Table 12.14 above indicate that during the main construction phase including site clearance, building construction works etc. assuming between 3 to 5 items of plant with a sound pressure level of 80dB L_{Aeq} at 10m are operating simultaneously at the closest noise sensitive boundaries, the works can operate within the relevant noise criterion. The potential impact during this phase will be moderate, with negative short-term effects at the nearest noise sensitive locations.

Given the nature of any construction site, the level of activity will vary depending on the specific construction phase, however, the assessment has indicated that with typical levels of site activities during the main construction phases, the works can be undertaken within the recommended criterion.

Similarly during demolition works, predicted noise levels detailed in the Table 12.14 above indicate that assuming 2 items of plant with a sound pressure level of 85dB L_{Aeq} at 10m are operating simultaneously at the closest noise sensitive boundaries, the works can operate within the relevant noise criterion. In the event that up to 4 items of plant are operating simultaneously at a distances of up to 35m, there is potential for the daytime noise criterion to be exceeded. The potential impact during this phase will be moderate to significant, with negative short-term effects at the nearest noise sensitive locations.

Given the specific items of plant at any one time is not known in detail at this stage, the calculations above are indicative only of likely scenarios to occur. In the event that higher numbers of plant are operating at the closest boundaries, there is potential for higher noise

levels than those detailed in Table 12.14 to occur on an intermittent basis. In order to ensure noise levels are controlled and noise limits complied with, a schedule of best practice noise mitigation measures is included in Section 12.6.1.

Construction Vibration

Potential for vibration impacts during the construction phase programme will be limited given the minimal level of ground breaking and excavations required. Piling will to be used for building and basement foundations. For the purposes of this assessment the expected vibration levels during piling assuming augured or bored piles have been determined through reference to published empirical data. The British Standard BS 5228 – Part 2: Vibration, publishes the measured magnitude of vibration of rotary bored piling using a 600mm pile diameter for bored piling into soft ground over rock, (Table D.6, Ref. No. 106):

- 0.54mm/s at a distance of 5m, for auguring;
- 0.22mm/s at a distance of 5m, for twisting in casing;
- 0.42mm/s at a distance of 5m, for spinning off, and;
- 0.43mm/s at a distance of 5m, for boring with rock auger.

Considering the low vibration levels at very close distances to the piling rigs, vibration levels at the nearest buildings will not pose any significance in terms of cosmetic or structural damage. In addition, the range of vibration levels is below a level which would cause any disturbance to occupants of nearby buildings.

In this instance, taking account of the distance to the nearest sensitive off-site buildings, vibration levels at the closest neighbouring buildings will be orders of magnitude below the limits set out in Table 12.5 to avoid any cosmetic damage to buildings. The potential vibration impact during the construction phase is imperceptible, with short-term, neutral effects.

12.5.2 Operational Phase

Once the development is completed, the potential noise impacts to the surrounding environment are minimal. Given the nature of the development under consideration, the range of potential noise sources associated with the operational phase are similar to those which form part of the existing environment at neighbouring residential areas (estate vehicle movements, children playing etc.) and hence no significant impact are expected from this area of the development site.

The main potential noise impact associated with the proposed development will relate to the generation of additional traffic to and from the site as a result of the proposed development in addition to potential noise impacts relate to operational plant serving the on-site development apartment and commercial buildings and on-site activities.

Once operational, there are no vibration sources associated with the development site.

Additional Traffic Along Surrounding Roads

Traffic flows associated with the proposed development have been provided by DBFL Consulting Engineers in order to assess any potential noise impact on the surrounding road network. The site will be principally accessed and aggressed via one entrance point along

Scholarstown Road hence traffic flows onto the local road network will be highest along this road (with a second emergency access provided). This link has therefore been assessed as a worst case analysis.

Traffic flows have been provided for an opening year of 2021 and design year of 2026. Under both assessment years, a total flow of 1,000 vehicles per day are associated with the proposed development. This represents an increase of 6 to 7 % in traffic flows along Scholarstown Road during the design and opening years respectively. The calculated increase in noise levels along this road as a result of the additional traffic during both years is calculated as 0.3dB(A).

Reference to Table 12.6 in Section 12.2.2 confirms that a change in noise level of less than 1dB(A) is negligible and therefore not significant.

In summary, the predicted increase in noise levels associated with the addition of development related traffic along the surrounding road network is an imperceptible impact of long-term, neutral effect.

Mechanical and Electrical Sources

The principal items of building and mechanical services plant will be associated with the residential amenity block (Block D1), the commercial/ retail block including a restaurant/café (Block D2), creche area (Block C2), management suite/ café (Block C3) and within the central basement area serving Block B apartments.

The plant area for B blocks are located at basement level and are well screened from the external environment such that there is no expected breakout noise from this area. During the detailed design stage of the apartment buildings, the key noise control considerations from this area of the building will relate to controlling airborne and structure borne noise transfer within the residential apartments from plant areas. This will be undertaken as part of the building design.

The amenity block (Block D1) and creche area (Block C2), will be served with a heat recovery system located internally with minimal breakout to atmosphere. These areas may require ventilation to atmosphere via louvered areas and or ground or wall ventilation. These items have the potential to operate over day and night-time periods, depending on the operational phasing.

The specific requirements for mechanical and electrical plant items for the retail/restaurant areas in Block D2 has not yet been progressed at this stage of the design. It is likely, however, that there will be an element of plant required for air handling, extract and / or other ancillary requirements depending on the requirements of the unit. These items have the potential to operate over day and night-time periods, depending on the operational phasing of the specific units.

The closest off-site noise sensitive locations to potential operational plant noise sources are residential properties to the east of Block D2 within Scholarstown Park. Operational noise limits relating to fixed plant items at existing noise sensitive locations will be designed to ensure compliance with BS 4142 (2014) such that adverse impacts are avoided. The results of baseline surveys of the prevailing background sound level will be used to set appropriate operational limit values. Based on the survey results undertaken at Location UN2 (which

represents ambient noise levels at properties along the site boundary off set from the Scholarstown Road), cumulative noise levels associated with mechanical and electrical services at the nearest noise sensitive location will be controlled to not exceed a total noise level of 45dB $L_{Aeq,T}$ during daytime periods and 35dB $L_{Aeq,T}$ during night-time periods.

Operational plant noise levels at the residential dwellings within the development itself will be controlled to ensure the internal noise levels from BS8233 (2014) for residential dwellings are not exceeded (Refer to Table 12.7).

Taking account of the site layout, location of plant areas, and distance to nearest noise sensitive locations, the potential noise impact from these sources are expected to be well controlled and the adopted criteria readily achieved. The likely impact from these sources are not significant with long term, neutral effects.

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

Noise from General on-site Activities

A 2-storey amenity block within the central area of the development will house a gymnasium, kitchenette and lounge at ground floor level and lounge at first floor level. There is no expected noise impact associated with these areas to noise sensitive locations outside the development boundary given these areas are internally located within the development buildings, the low noise sources associated with these spaces and screening provided by development buildings to off-site noise sensitive locations. A roof terrace to serve Build-to-Rent residents will also be provided for this unit. The control of noise from this space to residential dwellings within the development will be the key consideration for this area. This will be controlled through on-site management controls. Due to the location of this building within the central area of the site and screening provided by perimeter development buildings, noise levels off-site from this area will be insignificant.

The key consideration relating to noise impacts from the amenity, gym, commercial and creche areas relates to controlling airborne and structure borne noise transfer to residential apartments located above. This will be undertaken as part of the detailed design of the building.

The nearest noise sensitive locations to the retail/café/restaurant areas in Block D2 are residential properties to the east within Scholarstown Park. There are no significant operational noise levels associated with these areas assuming typical day to day activities associated with a retail/restaurant/ café. Potential impacts are associated with noise breakout from any amplified music or external seating areas, particularly during late evening or night-time periods, where relevant. Music noise from within the units will be limited to achieve a level of inaudibility inside the nearest off-site residences, particularly during night time operational hours, where relevant. Noise breakout should typically be limited to an external level of 35dB $L_{Aeq,5min}$ at the façade of any nearby noise sensitive location. In addition there should be no clearly audible tonal or impulsive component to the noise build-up at nearby noise sensitive location.

An external play area associated with the creche area (Block C2) is located to the south of the building along Scholarstown Road. This area is located along the boundary of the site with highest ambient noise levels dominated by road traffic noise and is well separated from off-

site noise sensitive locations. There are no significant perceptible noise impacts associated with this area outside the development boundary.

Taking into account the above considerations, the likely impact associated with on site activities serving the proposed development will be not significant, with long term, neutral effects.

12.5.3 Do Nothing Impact

In the absence of the proposed development being constructed, the noise environment at the nearest noise sensitive locations and within the development site will remain unchanged. The noise levels recorded during the baseline noise environment are considered representative of the Do-Nothing scenario.

12.6 Avoidance, Remedial & Mitigation Measures

12.6.1 Construction Phase

Best practice noise and vibration control measures will be employed by the contractor during the construction phase in order to avoid significant impacts at the nearest sensitive buildings. The Construction Management Plan (CMP) will sets out the key control measures for noise and vibration during this phase. The best practice measures set out in BS 5228 (2009 + A1 2014) Parts 1 and 2 will be complied with which are set out below and also outlined in the CMP. This includes guidance on several aspects of construction site mitigation measures, including, but not limited to:

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

Noise control measures that will be considered include the selection of quiet plant, enclosures and screens around noise sources, limiting the hours of work and noise and vibration monitoring.

Selection of Quiet Plant

This practice is recommended 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 key noise generating sources during the construction phases, the following best practice migration measures should be considered:

- For mobile plant items such as cranes, dump trucks, excavators and loaders, maintaining enclosure panels closed during operation can reduce noise levels over normal operation. Mobile plant should be switched off when not in use and not left idling.
- For steady continuous noise, such as that generated by diesel engines, it may be possible to reduce the noise emitted by fitting a more effective exhaust silencer system.
- For percussive tools such as concrete breakers, a number of noise control measures include fitting muffler or sound reducing equipment to the breaker 'tool' and ensure any leaks in the air lines are sealed. Erect localised screens around breaker or drill bit when in operation in close proximity to noise sensitive boundaries.
- For concrete mixers, control measures should be employed during cleaning to ensure no impulsive hammering is undertaken at the mixer drum.
- For all materials handling ensure that materials are not dropped from excessive heights, lining drops chutes and dump trucks with resilient materials.
- For compressors, generators and pumps, these can be surrounded by acoustic lagging or enclosed within acoustic enclosures providing air ventilation.
- 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. Standard construction site hoarding with a mass per unit of surface area greater than 7 kg/m^2 has been assumed along all noise sensitive boundaries (2.4m high) as part of noise control measures during the construction phase.

Liaison with the Public

A designated noise 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, prior to particularly noisy construction activity, e.g. demolition, breaking, piling, etc., the liaison officer will inform the nearest noise sensitive locations of the time and expected duration of the noisy works.

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. If piling or breaking works are in progress on a site at the same time as other works of construction or demolition that themselves may generate significant noise and vibration, the working

programme will be phased so as to ensure noise limits are not exceeded due to cumulative activities.

12.6.2 Operational Phase

During the detailed design stage, external plant items and those venting to atmosphere will be designed and selected to ensure an operational noise limit of 45dB and 35dB $L_{Aeq,T}$ at the nearest off-site noise sensitive locations external to the development site are achieved during day and night-time periods respectively. The use of low noise operational plant items, siting items of plant away from noise sensitive boundaries, screening and acoustic attenuation measures will all be considered, where relevant during this stage.

The development will be designed to ensure that the design goals outlined in Table 12.7 are achieved for occupants of the dwelling units within the proposed development.

12.6.3 'Worst Case' Scenario

In terms of potential noise and vibration impacts, the assessment has considered a range of worst case scenarios to determine the potential impacts of the proposed development.

During the construction phase, a range of worst case scenarios have been assessed assuming all plant items are operating along the closest noise sensitive boundaries. The assessment has determined impacts associated with these scenarios can be controlled through the best practice measures outlined in Section 12.6.1.

During the operational phase, traffic noise calculations along the surrounding road network incorporate a range of worst case scenarios to include the full extent of the scheme is operational and maximum traffic volumes enter/ exist the site onto the Scholarstown Road. The assessment has determined the resultant impact is not significant.

12.7 Residual Impacts

12.7.1 Construction Phase

During the construction phase of the project there is the potential for moderate impacts on nearby noise sensitive properties due to noise emissions from site activities. The application of binding noise limits and hours of operation, along with implementation of appropriate best practice noise and vibration control measures, will ensure that noise and vibration impact is kept to a minimum.

The residual likely impact of the proposed development during the construction phase will be of short-term moderate impacts with short term negative effects.

12.7.2 Operational Phase

The predicted noise level associated with additional traffic is predicted to be of insignificant impact along the existing road network. In the context of the existing noise environment, the overall contribution of traffic is not considered to pose any significant impact to nearby

residential locations. It can be concluded that, once operational, noise levels associated with the proposed development will not contribute any significant noise impact to its surrounding environment. The resulting likely impact of traffic additional along the surrounding road network is not significant with long-term neutral effects.

The likely impact from mechanical and electrical services serving the proposed development will be not significant with long-term neutral effects.

The likely impact associated with on-site activities associated with the proposed development will be not-significant with long term neutral effects.

12.8 Monitoring

12.8.1 Construction Phase

The contractor will be required to ensure construction activities operate within the noise limits set out within Section 12.2.2. The contractor will be required to undertake regular noise monitoring at locations representative of the closest sensitive locations to ensure the relevant criteria are not exceeded. Any noise complaints will be logged and followed up in a prompt fashion by the liaison officer.

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

12.8.2 Operational Phase

Noise or vibration monitoring is not required once the development is operational

12.9 Reinstatement

12.9.1 Construction Phase

Not applicable

12.9.2 Operational Phase

Not applicable

12.10 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. Addition interactions relate to the land and soils chapter (chapter 9) associated with noise impacts during the development of the lands.

Chapter 4 'Population and Human Health' has considered the impacts of human health including noise taking into account the various potential sources and effects set out in this EIAR.

12.11 Difficulties Encountered in Compiling

No difficulties were encountered in the preparation of this chapter.

12.12 References

Dublin Agglomeration Noise Action Plan. December 2018 – July 2023 – Volume 4 South Dublin City Council.
EPA Guidelines on the Information to be contained in Environmental Impact Statements, (EPA, 2002);
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, (Draft August 2017);
EPA Advice Notes for Preparing Environmental Impact Statements, (Draft, September 2015);
BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1 – Noise.
BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2 – Vibration.
BS 7385-2:1993 Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration;
BS 8233: 2014: Guidance on Sound Insulation and Noise Reduction for Buildings
BS 4142: 2014: Methods for Rating and Assessing Industrial and Commercial Sound;
DMRB, volume 11 environmental assessment section 3 environmental assessment techniques Part 7 hD 213/11 – revision 1 noise and vibration
ISO 1996: 2017: Acoustics – Description, measurement and assessment of environmental noise.
ISO 9613-2: 1996: Acoustics – Attenuation of sound during propagation outdoors.
Transport Infrastructure Ireland. (TII). (2004) Guidelines for the Treatment of Noise and Vibration in National Road Schemes.
TII. (2014) Good Practice Guide for the Treatment of Noise during the Planning of National Road Schemes.
UK`s Department of Transport. (1988) Calculation of Road Traffic Noise (CRTN).