awnconsulting
A Trinity Consultants Company

The Tecpro Building,
Clonshaugh Business & Technology Park,
Dublin 17, Ireland.

T: + 353 1 847 4220
F: + 353 1 847 4257
E: info@awnconsulting.com
W: www.awnconsulting.com

CLONKEEN SHD RESIDENTIAL DEVELOPMENT

NOISE & VIBRATION IMPACT ASSESSMENT

Technical Report Prepared For

Clonkeen Investments DAC

Technical Report Prepared By

Mike Simms BE MEngSc MIOA MIET

Our Reference

MS/20/11911NR02

Date Of Issue

30 July 2021

Cork Office
Unit 5, ATS Building,
Carrigaline Industrial Estate,
Carrigaline, Co. Cork.
T: + 353 21 438 7400
F: + 353 21 483 4606

AWN Consulting Limited
Registered in Ireland No. 319812

Document History

Document Reference		Original Issue Date	
MS/20/11911NR02		30 July 2021	
Revision Level	Revision Date	Description	Sections Affected

Record of Approval

Details	Written by	Approved by
Signature		
Name	Mike Simms	Leo Williams
Title	Senior Acoustic Consultant	Acoustic Consultant
Date	30 July 2021	30 July 2021

EXECUTIVE SUMMARY

Planning Permission is currently being sought from Dún Laoghaire Rathdown City Council for the construction of a mixed-use development, located at Clonkeen College, Blackrock, County Dublin.

This report, prepared by AWN Consulting Limited (AWN), discusses the potential noise and vibration impacts of the proposed development works in the context of current relevant standards and guidance.

The existing noise climate has been surveyed during both daytime and night-time periods and have been found to be dominated by traffic on surrounding roads and other suburban noise sources within this suburban area.

The assessment has considered the impact of noise during both the construction and operational phases of the proposed development. A review has been undertaken of the most appropriate guidance and standards relating to both phases and appropriate criteria set for each. Noise and vibration criteria have been specified, which are used to assess the likely impacts.

The potential noise impact during the construction phase has been assessed at the nearest residential noise sensitive locations with reference to BS 5228 (2009 +A1 2014) - Part 1. The report has set out a range of predicted indicative construction noise levels associated with the varying construction phases in addition to best practice noise and vibration control measures to minimise the impact from this phase.

During the operational phase, potential sources of noise are considered to be limited to building services plant and additional traffic on surrounding roads. In respect of building services, plant selection at detailed design stage will ensure that the noise criteria set out in this report are met. Mitigation measures are not expected to be required for development-generated traffic.

CONTENTS

		Page
	Executive Summary	3
1.0	Introduction	5
2.0	Proposed Development	5
3.0	Methodology	7
	3.1 Construction Phase Assessment Criteria	7
	3.2 Operational Phase Assessment Criteria	11
4.0	Existing Receiving Environment	12
	4.1 Baseline Noise Survey Locations	12
	4.2 Survey Periods	13
	4.3 Personnel and Instrumentation	13
	4.4 Noise Measurement Parameters	15
	4.5 Survey Results	15
5.0	Potential Impact of the Proposed Development	18
	5.1 Construction Phase	18
	5.2 Operational Phase	20
6.0	Mitigation Measures	22
	6.1 Construction Phase	22
	6.2 Operational Phase	24
7.0	Description of Noise and Vibration Impact	25
	7.1 Construction Phase	25
	7.2 Operational Phase	25
8.0	Conclusion	26
	Appendix A – Glossary of Acoustic Terminology	27

1.0 INTRODUCTION

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

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

This report presents 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.

2.0 PROPOSED DEVELOPMENT

Clonkeen Investments DAC intend to apply to An Bord Pleanála (the Board) for permission for a Strategic Housing Development with a total application site area of c. 3.3 ha, on a site located at Lands Adjoining Clonkeen College, Clonkeen Road, Blackrock, Co. Dublin. The development, with a total gross floor area of c 33,851 sq m, will provide 299 no. residential units and a 1 no. storey 353 sq m childcare facility with dedicated play area 231 sq m. The development will consist of 18 no. ground floor 3 bedroom duplex apartments and 18 no. 2 bedroom apartments above and 12 no. ground floor 2 bedroom apartments with 12 no. 3 bedroom duplex apartments above. The 60 no. duplex units are arranged in 6 no. three storey blocks. The development will also consist of 239 no. apartment units (111 no. 1 bedroom apartments, 120 no. 2 bedroom apartments and 8 no. 3 bed apartments) arranged in 4 no. 6 storey blocks over 1 no. storey basement; public open space, communal open space and private open space (including all balconies, terraces and individual unit gardens at all levels); 614 sq m communal resident facilities including concierge and welcome area (195 sq m), residents' flexible work facility (219 sq m), residents' lounge (100 sq m) and residents' gym area (100 sq m).

The development will also provide for the demolition of the 2 no. storey office building ('St. Helen's', Meadow Vale - 470 sq m) to facilitate new vehicular, pedestrian and cyclist access to the site, to the north of the proposed development via Meadow Vale.

The development will also include the provision of 2 no. designated play areas; internal roads and pathways; bin stores; 248 no. car parking spaces, including 167 no. at basement level and 2 no. shared vehicle (GoCar) spaces, 388 no. bicycle parking spaces, and 10 no. motorcycle parking spaces at basement and surface level; hard and soft landscaping; plant; boundary treatments including the repair and replacement of some existing boundary treatments; the provision of new surface water and foul drainage pipes and any required pipe diversion works or build over works; internal foul pumping station; a new internal access road and paths; changes in level; services provision and related pipework, ducting and cabling; electric vehicle charging points; 4 no. stormwater attenuation tanks; 1 no. ESB substation; photovoltaic panels; SUDS including green roof provision; signage; provision for future pedestrian access to Monaloe Park to the east of the development, including the provision of a pedestrian bridge, extending over the drainage ditch; public lighting and all site development and excavation works above and below ground. The application contains a statement

setting out how the proposal will be consistent with the objectives of the Dún Laoghaire-Rathdown County Development Plan 2016-2022. The application contains a statement indicating why permission should be granted for the proposed development, having regard to a consideration specified in section 37(2)(b) of the Planning and Development Act 2000, notwithstanding that the proposed development materially contravenes a relevant development plan or local area plan other than in relation to the zoning of the land.

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

- Construction Phase and
- Operational Phase.

The construction phase will involve site clearing and excavations, services installations, construction of building frame and envelope, landscaping and construction of internal roads. This phase will generate the highest potential noise impact due to the works involved, however, the phase is short term and expected to be completed within 36 months.

The primary potential sources of outward noise in the operational context are long term and will comprise traffic movements to site using the existing road network and building services plant noise. These issues are discussed in detailed in the following sections.

3.0 METHODOLOGY

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

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

The study has been undertaken using the following methodology:

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

3.1 Construction Phase Assessment Criteria

3.1.1 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. Local authorities normally control construction activities by imposing limits on the hours of operation and may consider noise limits at their discretion.

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

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

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

Table 1 Example Threshold of Significant Effect at Dwellings

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

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

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

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

It should be noted that this assessment method is only valid for residential properties. For the appropriate period (e.g. daytime) the ambient noise level is determined and rounded to the nearest 5 dB. Based on review of baseline noise monitoring to hand the relevant BS5228-1 threshold values at the various assessment locations are discussed in the Table 2.

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

Table 2 Rounded Baseline Noise Levels and Associated Categories

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

- to determine the threshold value for construction noise according to the method from BS5228 described above and
- to compare the predicted construction noise level with the existing noise levels and the threshold value according to the criteria in the Table 2.

Typically, this procedure is to be followed separately for each noise-sensitive location, however in this instance as the existing noise levels at all survey locations correspond to Category A with reference to Table 1. In this way, all noise-sensitive locations are considered together.

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

The magnitude of the construction noise impact according the DMRB is mapped to the EPA significance terms as detailed in Table 3:

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

Predicted Construction Noise Level is	Magnitude of Impact (DMRB)	EPA Significance of Effect
Above threshold and below or equal to threshold + 5dB	Moderate	Moderate – Significant
Above threshold + 5dB	Major	Significant – Very Significant

Table 3 Description of the magnitude of impacts. Adapted from DMRB Table 3.16

This assessment process determines if a significant construction noise impact is likely. Notwithstanding the outcome of this assessment, the overall acceptable levels of construction noise are 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 4 sets out these levels.

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

Table 4 Maximum Permissible Noise Levels at the Facade of Dwellings during Construction
Note * Construction activity at these times, other than that required for emergency works, will normally require the explicit permission of the relevant local authority.

3.1.2 Vibration

Vibration standards come in two varieties: those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. For the purpose of this development, vibration values levels used for the purposes of evaluating building protection and human comfort are expressed in terms of Peak Particle Velocity (PPV) in mm/s.

Building Damage

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

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

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

BS 5228-2 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 particle velocity of 15 mm/s for transient vibration at frequencies below 15 Hz and 20 mm/s at frequencies above than 15 Hz. Below these vibration magnitudes minor damage is unlikely, although where there is

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

existing damage these limits may be reduced by up to 50%. In addition, where continuous vibration is such that resonances are excited within structures the limits discussed above may need to be reduced by 50%.

Line (see Figure 1)	Type of Building	Peak component particle velocity in frequency range of predominant pulse	
		4Hz to 15Hz	15Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings.	50 mm/s at 4Hz and above	
2	Unreinforced or light framed structures. Residential or light commercial building types.	15 mm/s at 4Hz increasing to 20 mm/s at 15Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above.

Table 5 Transient Vibration Guide Values for Cosmetic Building Damage

Note 1 Values referred to are at the base of the building.
Note 2 For Line 2, at frequencies below 4Hz, a maximum displacement of 0.6mm (zero to peak) should not be exceeded.

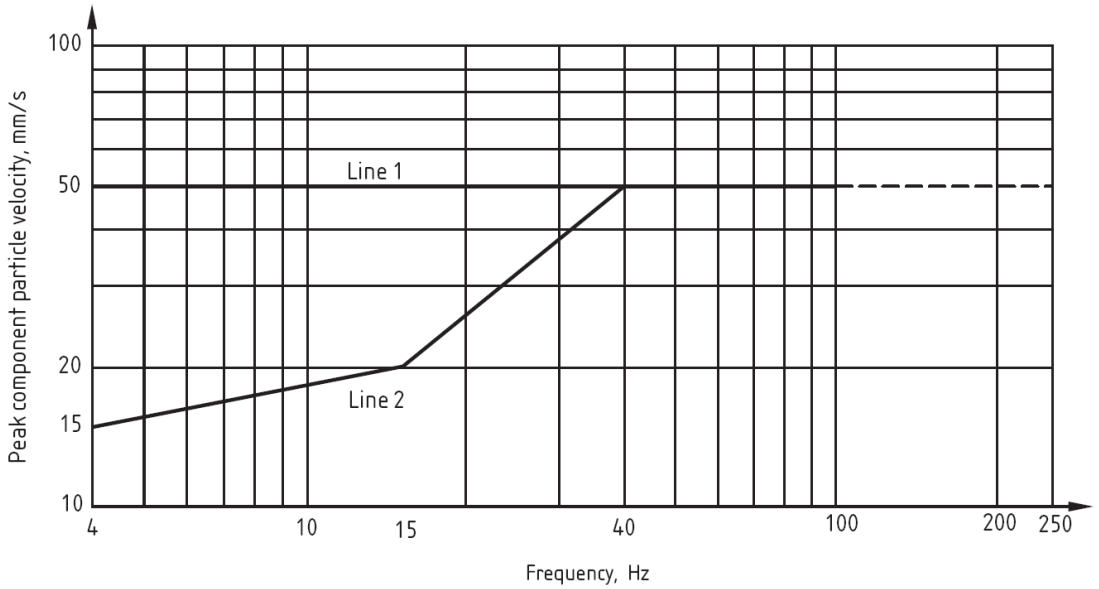

Figure 1 Transient Vibration Guide Values for Cosmetic Damage

The guide values contained in Table 5 relate to predominantly transient vibration which does not give rise to resonant responses in structures, and to low rise buildings.

Human Perception

It is acknowledged that humans are particularly sensitive to vibration stimuli and that any perception of vibration may lead to concern. In the case of traffic, vibration is perceptible at around 0.5mm/s and may become disturbing or annoying at higher magnitudes. Higher levels of vibration, however, are typically tolerated for single events or events of short duration. For example, during piling, one of the primary sources of vibration during construction, vibration levels may typically be tolerated at up to 2.5mm/s. This guidance is applicable to the daytime only; it is unreasonable to expect people to be tolerant to such activities during the night-time.

BS 5228-2 also provides a useful guide relating to the assessment of human response to vibration in terms of the peak particle velocity (PPV). Table 6 below 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.
10 mm/s	Vibration is likely to be intolerable for any more than a brief exposure to this level

Table 6 Guidance on effects of human response to PPV magnitudes

3.2 Operational Phase Assessment Criteria

3.2.1 Building Services Plant Noise

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

- "*Specific sound level,* $L_{Aeq,\ Tr}$" is equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, *T*. This level has been determined with reference to manufacturers information for specific plant items.

- "*Rating level*" $L_{Ar,Tr}$ is the specific noise level plus adjustments for the character features of the sound (if any), and;

- *"Background noise level"* is the sound A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, *T.* This level is expressed using the L_{A90} parameter. These levels were measured as part of the baseline survey.

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

1. determine the specific noise level;
2. determine the rating level as appropriate;
3. determine the background noise level, and;
4. subtract the background noise level from the specific noise level in order to calculate the assessment level.

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

3.2.2 Additional traffic on surrounding roads

There are no specific guidelines or limits relating to traffic related sources along the local or surrounding roads. Given that traffic from the development will make use of existing roads already carrying traffic volumes, it is appropriate to assess the calculated increase in traffic noise levels that will arise because of vehicular movements associated with the development. In order to assist with the interpretation of the noise associated with additional vehicular traffic on public roads, Table 5, taken from Design Manual for Roads and Bridges (DMRB) *Sustainability & Environment Appraisal LA 111 Noise and Vibration* Revision 2 (UK Highways Agency et al, 2020) offers guidance as to the likely degree of impact associated with any long-term change in traffic noise level.

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

Table 7 Significance in Change of Noise Level

The guidance outlined in Table 5 will be used to assess the predicted increases in traffic levels on public roads associated with the proposed development and comment on the likely long-term impacts during the operational phase.

3.2.3 Vibration

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

4.0 EXISTING RECEIVING ENVIRONMENT

The site is located in the grounds of Clonkeen College, which lies off Clonkeen Road between Meadow Vale and Monaloe Park Road. Figure 2 includes the approximate red line boundary of the site.

4.1 Baseline Noise Survey Locations

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 1996-1: 2017: *Acoustics – Description, measurement and assessment of environmental noise*.

The noise measurement locations were selected to represent the noise environment at noise sensitive locations (NSLs) surrounding the proposed development. The selected locations are shown in Figure 2 and described below:

- UN1 – Unattended measurement location near the northern corner of the site, representative of the noise sensitive locations at Meadow Vale;
- AT1 – Attended location to capture a snapshot of the daytime noise environment at Meadown Vale.

- AT2 – Attended location to capture a snapshot of the daytime noise environment at Monaloe Crescent.

- AT3 – Attended location to capture a snapshot of the daytime noise environment at the western site of the site.

4.2 Survey Periods

Unattended noise measurements were conducted between 14:00hrs on Friday 13 November and Tuesday 17 November 2020.

Attended noise measurements were carried out on Friday 13 November 2020 between 11:00hrs and 16:00hrs.

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

4.3 Personnel and Instrumentation

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

Equipment	Type	Serial Number	Calibration Date
Sound Level Meter	Rion NL-52	976162	August 2019
Sound Level Meter	Rion NL-52	SLM-38	August 2020
Sound Calibrator	Larson Davis CAL200	2371	June 2019

Table 8 Instrumentation Details

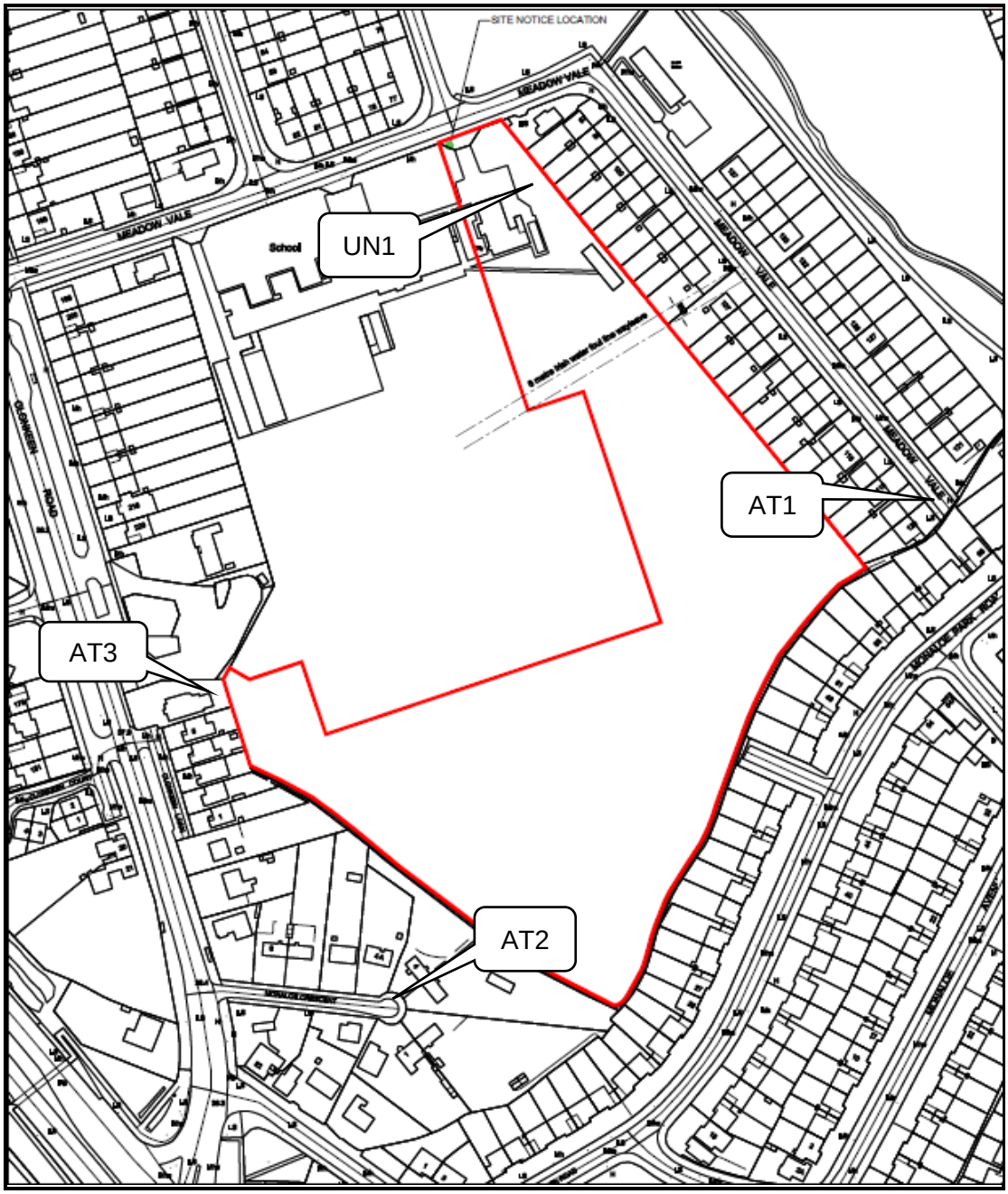

Figure 2 Baseline noise measurement locations

4.4 Noise Measurement Parameters

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

L_{Aeq} is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period.

L_{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 for the noise parameters 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.

4.5 Survey Results

4.5.1 Unattended Noise Measurements

The results of the unattended monitoring survey at Location UN1 are summarised for daytime periods in Table 9 and for night-time periods in Table 10.

Monitoring Period / Range		Measured Noise Levels (dB re. $2x10^{-5}$ Pa)			
		L_{Aeq}	L_{AFmax}	L_{A10}	L_{A90}
Fri. 13 Nov	Highest	55	84	54	49
	Lowest	40	49	42	37
	Average	49	59	49	45
Sat 14 Nov	Highest	60	82	63	53
	Lowest	41	50	44	37
	Average	53	65	53	47
Sun. 15 Nov	Highest	54	74	56	50
	Lowest	45	53	47	40
	Average	50	62	52	46
Mon. 16 Nov	Highest	58	75	62	51
	Lowest	46	57	49	41
	Average	51	63	52	47
Tues. 17 Nov (7h-10h)	Highest	54	73	56	50
	Lowest	50	61	51	46
	Average	52	65	53	48

Table 9 Summary of Daytime Unattended Noise Measurements at UN1

Monitoring Period / Range		Measured Noise Levels (dB re. $2x10^{-5}$ Pa)			
		L_{Aeq}	L_{AFmax}	L_{A10}	L_{A90}
Fri. 13 to Sat. 14 Nov.	Highest	47	62	50	43
	Lowest	36	45	39	31
	Average	41	52	42	35
Sat. 14 to Sun. 15 Nov.	Highest	54	61	57	51
	Lowest	35	48	38	31
	Average	45	53	44	36
Sun. 15 to Mon. 16 Nov.	Highest	56	81	60	47
	Lowest	38	48	41	34
	Average	49	59	49	41
Mon 16 to Tues. 17 Nov.	Highest	54	69	58	47
	Lowest	42	52	45	35
	Average	49	60	51	42

Table 10 Summary of Night-time Unattended Noise Measurements at UN1

During daytime periods, average noise levels were in the range 49 to 53dB $L_{Aeq,15min}$ and 45 to 48 dB $L_{A90,15min}$. During night-time periods, average noise levels were in the range 41 to 49dB $L_{Aeq,15min}$ and 35 to 42 dB $L_{A90,15min}$. These noise levels are considered representative of a suburban location.

4.5.2 Attended Noise Measurements

Location AT1

The survey results for the attended monitoring at location AT1 are given in Table 11.

Start Time (hrs)	Subjective Impression of Noise Environment	Measured Noise Levels (dB re. $2x10^{-5}$ Pa)			
		$L_{Aeq.15min}$	L_{Amax}	L_{A10}	L_{A90}
11:11	Birdsong, distant traffic	48	60	49	46
12:22	Birdsong, bin cleaning, distant traffic	53	78	52	46
13:20	Birdsong, distant traffic	48	68	50	45

Table 11 Attended Noise Measurement at Location AT1

Ambient noise levels were in the range 48 to 53 dB L_{Aeq} and background noise levels in the range 45 to 46 dB L_{A90}.

Location AT2

The survey results for the attended monitoring at location AT2 are given in Table 12.

Start Time (hrs)	Subjective Impression of Noise Environment	Measured Noise Levels (dB re. $2x10^{-5}$ Pa)			
		$L_{Aeq.15min}$	L_{Amax}	L_{A10}	L_{A90}
11:31	Traffic on R827	55	68	57	52
12:40	R827, local traffic movements	58	74	61	52
14:05	R827, local traffic movements	56	83	56	51

Table 12 Attended Noise Measurement at Location AT2

Ambient noise levels were in the range 55 to 58 dB L_{Aeq} and background noise levels in the range 51 to 52 dB L_{A90}.

Location AT3

The survey results for the attended monitoring at location AT3 are given in Table 13.

Start Time (hrs)	Subjective Impression of Noise Environment	Measured Noise Levels (dB re. $2x10^{-5}$ Pa)			
		$L_{Aeq.15min}$	L_{Amax}	L_{A10}	L_{A90}
12:03	Traffic on R827, car wash	53	68	55	47
12:59	No car wash	52	76	54	48
14:25	Traffic on R827, car wash	51	68	52	46

Table 13 Attended Noise Measurement at Location AT3

Ambient noise levels were in the range 51 to 53 dB L_{Aeq} and background noise levels in the range 46 to 58 dB L_{A90}.

5.0 POTENTIAL IMPACT OF THE PROPOSED DEVELOPMENT

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

5.1 Construction Phase

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

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

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

As the construction programme has been established in outline form only, it is difficult to calculate the actual magnitude of noise emissions to the local environment. However, it is possible to predict typical noise levels using guidance set out in BS 5228-1. Table 14 outlines typical plant items and associated noise levels that are anticipated for various phases of the construction programme.

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

Phase	Item of Plant (BS 5228-1 Ref.)	Construction Noise Level at 10m Distance, (dB LAeq,1hr)
1 – Site Preparation / Demolition	Hand-held pneumatic breaker (C1.6)	83
	Wheeled Loader Lorry (C2 28)	74
	Track Excavator (C2 22)	72
	Dozer (C2.13)	78
	Dump Truck (C4.2)	78
2 – Foundations	Tracked Excavator (C3.24)	74
	Concrete Pump (C3.25)	78
	Compressor (C3 19)	75
	Poker Vibrator (C4 33)	78
3 – General Construction	Mobile Telescopic Crane C4.39	77
	Hand tools	81
	Pneumatic Circular Saw (D7.79)	75

Phase	Item of Plant (BS 5228-1 Ref.)	Construction Noise Level at 10m Distance, (dB LAeq,1hr)
	Internal fit – out	70
4 - Landscaping	Dozer (C2.13)	78
	Dump Truck (C4.2)	78
	Surfacing (D8.25)	68

Table 14 Typical Noise Levels associated with Construction Plant Items (BS5228-1)

A number of representative noise sensitive locations have been considered in relation to the Proposed Development as illustrated in Figure 3 and described in Table 15.

Figure 3 Nearest noise-sensitive locations

Ref	Description
NSL1	House on Clonkeen Lawn
NSL2	House on Monaloe Ave
NSL3	House on Meadow Vale
NSL4	School Building

Table 15 Noise Assessment Locations

Table 16 sets out a range of construction noise levels relating to different construction activity at the various noise assessment location. It is assumed that the construction site is to be surrounded by a 2.4m high solid hoarding and that an 'on-time' of 66% applies to construction plant.

Ref.	Baseline Noise Level dB $L_{Aeq,1hr}$[1]	BS5228-1 Threshold	Predicted Construction Noise Level for Various Phases dB $L_{Aeq,1hr}$			
			Site Preparation	Foundations	General Construction	Landscaping
NSL1	52	65	71	71	72	69
NSL2	56	65	62	63	63	61
NSL3	49	65	64	64	65	63
NSL4	49	65	76	74	75	73

Table 16 Review of Potential Daytime Construction Noise Levels
Note 1: Based on Arithmetic Averages of L_{Aeq} values.

Predicted potential construction noise levels at distances of 30 m greater from the proposed development buildings, such as NSLs 2 and 3, are within the construction noise criterion of 70 dB $L_{Aeq, 1hr}$, whereas NSLs at closer distances are in excess of the criterion. Mitigation measures for construction noise are presented in Section 6.1.

Based on the above description of impacts presented in Table 3, and the predicted noise levels presented, the assigned impacts are summarised in Table 17 as follows:

Ref.	Predicted Construction Noise Impacts for Various Phases dB $L_{Aeq,1hr}$			
	Site Preparation	Foundations	General Construction	Landscaping
NSL1	Significant-Very Significant	Significant-Very Significant	Significant-Very Significant	Moderate-Significant
NSL2	Slight-Moderate	Slight-Moderate	Slight-Moderate	Slight-Moderate
NSL3	Slight-Moderate	Slight-Moderate	Slight-Moderate	Slight-Moderate
NSL4	Significant-Very Significant	Significant-Very Significant	Significant-Very Significant	Significant-Very Significant

Table 17 Review of Potential Daytime Construction Noise Impacts

For the NSLs at 30m distance from the proposed buildings, the construction noise impact is Slight to Moderate. At locations closer than these distances, the impact has the potential to be significant to very significant, though the duration of these predicted worst-case impacts will be temporary. Construction of the creche building is expected to last 1 month and that of Block 6 is expected to last 2 months.

5.2 Operational Phase

The main potential source of outward noise from the proposed development will relate to traffic flows to and from the development site onto the public roads, mechanical and electrical services used to service development buildings and deliveries to the site. The relevant guidance documents in Section 3.2 will be used to assess potential operational noise and vibration impacts.

5.2.1 Building Services Plant

The selection of building services plant will ensure that noise levels comply with the criteria described in Section 3.2.1. Review of the noise survey data shows that night-time noise criterion of 35 dB $L_{Aeq,T}$ due to building services noise is appropriate.

It is acknowledged that the selection of the specific plant items is subject to change during the detailed design stage and this is normal industry practice. However, noise from any new plant items will be designed and/or controlled so as not to give rise to any adverse effects at the nearest noise sensitive locations.

Furthermore, it is confirmed that no plant item will emit significant tonal or impulsive characteristics which may increase the potential for annoyance at the nearby noise sensitive locations.

5.2.2 Additional Traffic on surrounding roads

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

The predicted change in noise levels due to an increase in road traffic has been calculated for each of these roads. Projected traffic data used for the purpose of this assessment includes committed and planned developments in the vicinity of the project site as listed in the Traffic and Transport report.

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

The impact from the increase in traffic from the proposed development has been assessed for the year of 2024 and the year of 2039 relative to the Do Nothing scenario along the sections of road detailed in Table 18.

In terms of the overall traffic data as described by the AADT parameter, in order to increase traffic noise levels by 1dB, traffic volumes would need to increase by the order of 25% approximately. A review of the potential traffic level increases attributable to the proposed development indicates that the development will not give rise to increases of this magnitude on the surrounding road network.

Road Link	Noise level (dB L_{A10}) Increase between Do Nothing and Do Something based on AADT Traffic Data	
	2024	2039
A – Meadow Vale	2.1	1.9
B – R827 North of Meadow Vale	0.2	0.2
C – R827 South of Meadow Vale	0.2	0.2
D – N11 south of R827	0.0	0.0
E – N11 south of R827	0.0	0.0
F – Old Bray Road	0.1	0.1

Table 18 Predicted Change in Noise Level Associated with Vehicular Traffic

The predicted increase in traffic flows associated with the development in the years of 2024 and 2039 will result in an increase of less than 3dB along all roads receiving traffic from the proposed development. The effect is therefore negative, not significant and long-term.

6.0 MITGATION MEASURES

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

6.1 Construction Phase

With regard to construction activities, best practice operational and control measures for noise and vibration from construction sites are found within BS 5228 (2009 +A1 2014) Code of Practice for Noise and Vibration Control on Construction and Open Sites Parts 1 and 2.BS5228 includes guidance on several aspects of construction site practices, including, but not limited to:

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

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

6.1.1 Selection of Quiet Plant

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

6.1.2 Noise Control at Source

If replacing a noisy item of plant is not a viable or practical option, consideration should be given to noise control "at source". This refers to the modification of an item of plant or the application of improved sound reduction methods in consultation with the supplier. For example, resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can often be controlled by fixing resilient materials in between the surfaces in contact. BS5228 states that "as far as reasonably practicable sources of significant noise should be enclosed". In applying this guidance, constraints such as mobility, ventilation, access and safety must be taken into account. Items suitable for enclosure include pumps and generators.

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

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

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

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

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

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

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

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

6.1.3 Screening

Typically screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to all other forms of noise control. The effectiveness of a noise screen will depend on the height and length of the screen and its position relative to both the source and receiver.
Screening may be a useful form of noise control when works are taking place at basement and ground level to screen noise levels at ground floor adjacent buildings.
In addition, careful planning of the site layout should also be considered. The placement of site buildings such as offices and stores and in some instances materials such as aggregate can provide a degree of noise screening if placed between the source and the receiver. The use of localised mobile (mobile hoarding screens and / or acoustic quilts) to items of plant with the potential to generate high levels of noise

are an effective noise control measure. These options should be considered when percussive works are taking place in close proximity to the nearest sensitive perimeter buildings.

6.1.4 Liaison with the Public

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

6.1.5 Hours of Work

Construction works will be undertaken within the times below, taken from the Section 5.6 of the Draft Construction Management Plan:

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

6.2 Operational Phase

In order to ensure that acceptable operational noise levels at the nearest noise sensitive locations are achieved, the following mitigation measures should be considered during the detailed design stage.

6.2.1 Building Services Plant

During the detailed design of the development, the selection and location of mechanical and electrical plant will be undertaken in order to ensure the noise emission limits set out above are not exceeded. In addition to selecting plant with suitable noise levels, the following best practice measures are recommended for all plant items in order to minimise potential noise disturbance for adjacent buildings:

- where ventilation is required for plant rooms, consideration will be given to acoustic louvers or attenuated acoustic vents, where required to reduce noise breakout;
- ventilation plant serving plant rooms and car parks will be fitted with effective acoustic attenuators to reduce noise emissions to the external environment;
- the use of perimeter plant screens will be used, where required, for roof top plant areas to screen noise sources;
- the use of attenuators or silencers will be installed on external air handling plant;
- all mechanical plant items e.g. fans, pumps etc. shall be regularly maintained to ensure that excessive noise generated any worn or rattling components is minimised;
- any new or replacement mechanical plant items, including plant located inside new or existing buildings, shall be designed so that all noise emissions from site do not exceed the noise limits outlined in this document, and;
- Installed plant will have no tonal or impulsive characteristics when in operation.

6.2.2 Additional Traffic on Surrounding Roads

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

7.0 DESCRIPTION OF NOISE AND VIBRATION IMPACTS

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

7.1 Construction Phase

During the construction phase of the project there will be a short-term noise impact on nearby noise sensitive properties from site activities and the close proximity of adjacent buildings. The application of binding noise limits, hours of operation, along with implementation of appropriate noise and vibration control measures, will ensure that noise and vibration are kept to minimised. For nearby noise sensitive locations within 30 m potential negative, significant and short-term effects are likely.

7.2 Operational Phase

7.2.1 Building Services Plant

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

7.2.2 Additional Traffic on Surrounding Roads

The predicted change noise levels associated with additional traffic is not predicted to have a significant impact. In the context of the existing noise environment, the overall effects from noise contribution of increased traffic is considered to be negative, not significant and long-term effect at nearby noise sensitive locations.

8.0 CONCLUSION

A residential development including creche facilities is proposed in the grounds of Clonkeen College, Blackrock, Co. Dublin.

The existing noise environment has been quantified by way of an environmental noise survey consisting of attended and unattended measurements. Existing noise levels have been found to be typical of a suburban area.

When considering a development of this nature, the potential noise and vibration effects on the surroundings must be considered for two stages: the short-term construction phase and the permanent operational phase.

The assessment of construction noise and vibration and has been conducted in accordance best practice guidance contained in BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Noise* and BS 5228-2:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Vibration*. Subject to good working practice as recommended in the EIAR Chapter, noise associated with the construction phase is not expected to exceed the recommended limit values for noise-sensitive locations beyond 30m from the site boundary and therefore no significant effects are expected. At distances less than 30m from the boundary, construction noise has the potential to exceed the recommended limit values, however the duration of such works will be limited. A variety of standard proven best practice noise mitigation is proposed together with noise monitoring to ensure that limit values are adhered to.

This chapter demonstrates that the predicted noise levels associated with the operational phase of the proposed development will be within best practice noise limits recommended in Irish guidance, therefore it is not considered that a significant effect is associated with the development.

APPENDIX A

GLOSSARY OF NOISE/VIBRATION TERMINOLOGY

Ambient noise The totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, near and far.

Background noise The steady existing noise level present without contribution from any intermittent sources. The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 per cent of a given time interval, T ($L_{AF90,T}$).

dB Decibel - The scale in which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the RMS pressure of the sound field and the reference pressure of 20 micro-pascals (20 µPa).

dB(A) An 'A-weighted decibel' - a measure of the overall noise level of sound across the audible frequency range (20 Hz – 20 kHz) with A-frequency weighting (i.e. 'A'–weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.

Hertz (Hz) The unit of sound frequency in cycles per second.

$L_{Aeq,T}$ This 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 (T).The closer the L_{Aeq} value is to either the L_{AF10} or L_{AF90} value indicates the relative impact of the intermittent sources and their contribution. The relative spread between the values determines the impact of intermittent sources such as traffic on the background.

L_{AFN} The A-weighted noise level exceeded for N% of the sampling interval. Measured using the "Fast" time weighting.

L_{AF90} Refers to those A-weighted noise levels in the lower 90 percentile of the sampling interval; it is the level which is exceeded for 90% of the measurement period. It will therefore exclude the intermittent features of traffic and is used to estimate a background level. Measured using the "Fast" time weighting.

L_{AF10} Refers to those A-weighted noise levels in the upper 10 percentile of the sampling interval; it is the level which is exceeded for 10% of the measurement period. It is typically representative of traffic noise levels. Measured using the "Fast" time weighting.

L_{AFmax} is the instantaneous fast time weighted maximum sound level measured during the sample period.

L_{AFmin} is the instantaneous fast time weighted minimum sound level measured during the sample period.

APPENDIX A
GLOSSARY OF NOISE/VIBRATION TERMINOLOGY

Octave band

A frequency interval, the upper limit of which is twice that of the lower limit. For example, the 1,000Hz octave band contains acoustical energy between 707Hz and 1,414Hz. The centre frequencies used for the designation of octave bands are defined in ISO and ANSI standards.

VDV

Vibration Dose Value (VDV) is a cumulative measurement of vibration level over an 8-hour or 16-hour period. The fourth power vibration dose method is more sensitive to peaks than the basic evaluation method by using the fourth power instead of the second power of the acceleration time history as the basis for averaging. The fourth power vibration dose value (VDV) in metres per second to the power I,75 ($m/s^{1.75}$), or in radians per second to the power I,75 ($rad/s^{1,75}$), is defined as:

$$VDV = \left(\int_0^T a^4(t) dt \right)^{0.25}$$

Where:

$a_w^{(t)}$ is the instantaneous frequency-weighted acceleration;
T is the duration of measurement.

When the vibration exposure consists of two or more periods, *i*, of different magnitudes, the vibration dose value for the total exposure should be calculated from the fourth root of the sum of the fourth power of individual vibration dose values:

$$VDV_{total} = \left(\sum_i VDV_i^4 \right)^{\frac{1}{4}}$$