

Chapter 10:

Noise and Vibration

10.0 NOISE & VIBRATION

10.1 INTRODUCTION

This section of the EIAR has been prepared by Byrne Environmental Consulting Ltd to identify and assess the potential noise and vibrational impacts associated with a proposed Strategic Housing Development at Dunshaughlin East, Dublin Road, Dunshaughlin, Co. Meath during both the Construction and Operational Phases of the development.

The proposed development consists of a strategic housing development comprising of 913 no. residential units, a neighbourhood centre, including 2 no. retail units, a café / restaurant unit, a primary healthcare / gym, a community facility and a childcare facility, all associated open space, a section of the Outer Relief Road, internal roads, cycle and pedestrian infrastructure, services and all other associated development on a site of c. 28.3 hectares.

The 913 no. residential units proposed consist of 505 no. houses (single, two, and three storey), 186 no. duplex units (three storey), and 222 no. apartments (four and five storey).

The proposed neighbourhood centre facilities consist of a childcare facility with a GFA of 1,282 sq.m, a community facility with a GFA of 180 sq.m, 2 no. retail units with GFA of 1,000 sq.m and 190 sq.m, a café / restaurant unit with a GFA of 370 sq.m, and a primary healthcare / gym unit with a GFA of 1,040 sq.m.

The development also includes car and cycle parking, ESB substations, boundary treatment, foul and surface water drainage, attenuation tanks, other services and all other associated development.

This document includes a comprehensive description of the receiving ambient noise climate in the vicinity of the subject site; a description of how the construction and operational phases may impact the existing ambient noise climate, the mitigation measures that shall be implemented to control and minimise the impact that the development may have on ambient noise levels and the proposed acoustic design features required to minimise the impact of external noise sources on the residential units.

The mitigation measures designed for the development shall demonstrate how the development shall be constructed and operated in an environmentally sustainable manner in order to ensure its minimal impact on the receiving noise climate and to provide adequate sound insulation in residential units from external sound sources and adjoining residential properties.

Ian Byrne MSc. Environmental Protection, Dip Environmental & Planning Law, Member of the Institute of Acoustics, is the Principal Environmental Consultant of Byrne Environmental Consulting Ltd and prepared all aspects of this EIAR Chapter. Ian Byrne has over 22 years' experience in the monitoring and assessment of noise and vibration impacts that developments may have on the receiving environment.

Based on academic qualifications and professional experience, Ian Byrne is defined as a “*Competent Person*” as defined in the EPA's 2016 *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)*.

10.2 STUDY METHODOLOGY

The general assessment methodology of the potential noise and vibrational impacts that the proposed development will have on the receiving environment has been prepared in accordance with:

- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (DoHPLG, August 2018).
- 2017 EPA Draft Guidelines on information to be contained in Environmental Impact Assessment Reports.
- Guidelines on Information to be Contained in an Environmental Impact Statement (EPA 2002).
- Advice Notes on Current Practice (in preparation of Environmental Impact Statements) (EPA 2003).
- Environmental Protection Agency, 2015. Revised Guidelines on the Information to be Contained in Environmental Impact Statements
- Environmental Protection Agency, 2015. Draft Advice Notes for Preparation of Environmental Impact Statements
- Development Management Guidelines (DoEHLG, 2007).
- European Commission Guidance on the Preparation of Environmental Impact Assessment Reports (2017).
- European Union (Planning & Development)(Environmental Impact Assessment) Regulations 2018.

10.2.1 Noise Assessment Methodology

Baseline Environment

The baseline noise environment in the vicinity of the proposed development site has been defined by a field surveys conducted during February and March 2018 at site boundaries adjacent to existing residential and commercial development. Sound level measurements were conducted in favourable weather conditions when there was no precipitation and when mean windspeeds were <5m/sec.

The existing ambient noise climate in the vicinity of the site has been characterised with information obtained from site specific baseline noise surveys conducted in the vicinity of the closest noise sensitive receptors to the subject site. Baseline noise surveys were conducted in accordance with *ISO 1996-1: 2016: Acoustics – Description, measurement and assessment of environmental noise* and with regard to the EPA's 2016 *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4*

Impact Assessment Methodology

The impact of the proposed development has been determined through prediction of future noise levels associated with the scheme using established calculation techniques.

Construction noise and vibration impacts have been assessed in accordance with Transport Infrastructure Ireland's (TII) guidance document *Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes (March 2014)*. Indicative construction noise calculations have been undertaken using the methodology set out in *BS 5228 Code of Practice for noise and vibration control of construction and open sites - Part 1: Noise 2009+A1 2014*.

Impacts associated with road traffic movements on the development when operational have been assessed with regard to the NRA's *Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes (March 2014)*. *UK Department of Transport (Welsh Office) - Calculation of Road Traffic Noise [CRTN]* and the *Highways Agency Design Manual for Roads and Bridges Part 7 HD 213/11 – Revision 1 Noise and Vibration*.

The operational phase of the development has been assessed with regard the *Department of the Environment, Building Regulations 2014, Technical Guidance Document E – Sound*. Acoustic design of apartments refers to the

2018 Ministerial Guidelines “Sustainable Urban Housing – Design Standards for New Apartments. Paragraph 1.18 of the document refers specifically to the Building Regulations Technical Guidance Documents and states that the construction of the apartment building shall comply with all relevant requirements.

Construction Impact Assessment Criteria

The construction noise limits, which are presented in Table 10.1 represent a reasonable compromise between the practical limitations in a construction project, and the need to ensure an acceptable noise level for the nearby residents and other sensitive receptors including amenity space. Table 1 specifies the recommended Project Noise Limit Criteria in accordance with *BS 5228 – 1:2009+A1 2014 Code of practice for noise and vibration control on open sites: Part 1 Noise*. Noise limit criteria are based on the noise measured at the external façade of a receptor.

Table 10.1: BS5228-2014 Construction Phase Noise Limit Criteria

Construction Phase			Noise Limit Criteria
Location / Day	Assessment Period	External Noise Limit Criteria	
All Receptors Monday to Friday Morning	07:00hrs – 08:00hrs	70 dB(A), LAeq, 1hr	
All Receptors Monday to Friday Daytime	08:00hrs – 18:00hrs	75dB(A), LAeq, 10hr	
All Receptors Monday to Friday Early Evening	18:00 – 19:00hrs	70 dB(A), LAeq, 1hr	
All Receptors Monday to Friday Late Evening	19:00hrs – 22:00hrs	65 dB(A), LAeq, 3hr	
All Receptors Monday to Friday Nighttime	22:00hrs – 07:00hrs	55 dB(A), LAeq, 1hr	
All Receptors Saturday Morning	07:00hrs – 08:00hrs	70 dB(A), LAeq, 1hr	
All Receptors Saturday Daytime	08:00hrs – 13:00hrs	75dB(A), LAeq, 5hr	
All Receptors Saturday Midday	13:00 – 14:00hrs	70 dB(A), LAeq, 1hr	
All Receptors Saturday Afternoon-Evening	14:00 – 22:00hrs	65 dB(A), LAeq, 3hr	
All Receptors Monday to Friday Nighttime	22:00 – 07:00hrs	55 dB(A), LAeq, 1hr	
All Receptors Sundays and Public Holidays Daytime	07:00hrs – 21:00hrs	65 dB(A), LAeq, 1hr	
All Receptors Sundays and Public Holidays Nighttime	21:00 – 07:00hrs	55 dB(A), LAeq, 1hr	

Operational Impact Assessment Criteria

Relative impact assessment criteria associated with road traffic noise is set out in Table 10.2 below.

Table 10.2: Likely impact associated with change in traffic noise level

Change in sound level (L ₁₀)	Subjective reaction	Impact
<3	Inaudible	Imperceptible
3-5	Perceptible	Slight
6-10	Up to a doubling of loudness	Moderate
11-15	Over a doubling of loudness	Significant
>15		Profound

A change in traffic noise of less than 2dBA is generally not noticeable to the human ear whilst a change of 3dBA is generally considered to be just perceptible. Changes in noise levels of 3 to 5 dBA would however be noticeable and, depending on the final noise level, there may be a slight or moderate noise impact. Changes in noise level in excess of 6dBA would be clearly noticeable, and depending on the final noise level, the impact may be moderate or significant. However, a significant change in traffic volumes or traffic category i.e. increase in the use of a road by HGVs, would be required to result in such increases.

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

Traffic noise levels in excess of 60dBA (L_{DEN}) are considered to be potentially intrusive. L_{DEN} is the day-evening-night composite noise indicator for assessing overall noise annoyance. For new roads projects the National Roads Authority design goal is to mitigate when predicted levels exceed 60dB L_{den}. However, for existing roads the Dublin Agglomeration, within the Noise Action Plan, have set a level of 70dB (L_{Day}) and 55dB (L_{Night}) above which mitigation measures should be considered.

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

The operational phase of the development shall be assessed with regard to the WHO guidelines and appropriate acoustic design of residential units to ensure that they comply with the *Department of the Environment, Building Regulations 2014, Technical Guidance Document E – Sound*.

10.2.2 Vibration Assessment Methodology

Impact Assessment Methodology

Vibration standards come in two varieties: those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. In both instances, it is appropriate to consider the magnitude of vibration in terms of Peak Particle Velocity (PPV).

Construction impacts have been assessed in accordance with *BS 7385-2:1993 – Evaluation and Measurement for Vibration in Buildings: Part 2 – Guide to Damage Levels from Groundborne Vibration and BS 5228 Code of Practice for noise and vibration control of construction and open sites - Part 2: Vibration 2009+A1 2014*.

Operational impacts have been assessed in accordance with the Transport Infrastructure Ireland, TII (formerly NRA) Guidelines for the Treatment of Noise & Vibration in National Road Schemes.

Construction Impact Assessment Methodology

Table 10.3 details the limits above which cosmetic damage could occur for transient vibration. Minor damage is possible at vibration magnitudes which are greater than twice those shown in Table 10.3, and major damage to a building structure would only generally occur at values greater than four times the tabulated values. These values only relate to transient vibration. If there is a continuous vibration, the guide values shown in Table 10.3 shall be reduced by up to 50%.

This guidance is reproduced from *BS 5228-2:2009+A1 2014 – Code of Practice for Noise and Vibration Control on Construction and Open Sites: Part 2 – Vibration* and *BS 7385-2:1993 – Evaluation and Measurement for Vibration in Buildings: Part 2 – Guide to Damage Levels from Groundborne Vibration*.

Table 10.3: Transient vibration guide values for cosmetic damage

Type of building	PPV (mm/s) in frequency range of predominant pulse	
	4-15Hz	15Hz and above
Reinforced or framed structures. Industrial and heavy commercial buildings.	50mm/s at 4Hz and above.	50mm/s at 4Hz and above.
Unreinforced or light framed structures. Residential or light commercial buildings.	15mm/s at 4Hz increasing to 20mm/s at 15Hz.	20mm/s at 15Hz increasing to 50mm/s at 40Hz and above.

Table 10.4, reproduced from *BS 5228 Code of Practice for noise and vibration control of construction and open sites - Part 2: Vibration 2009+A1 2014* outlines the vibration levels (in terms of PPV) from construction activities and their likely effect on humans.

Table 10.4: Guidance on the effect of construction vibration levels on humans

Vibration Level (PPV)	Effect
0.14mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.30mm/s	Vibration might be just perceptible in residential environments.
1.0mm/s	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
10mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

Operational Impact Assessment Methodology

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 road traffic, vibration is perceptible at around 0.5mm/s and may become disturbing or annoying at higher magnitudes.

Ground vibrations produced by road traffic are unlikely to cause perceptible structural vibration in properties located near to well-maintained and smooth road surfaces. Vibration impacts associated with road traffic can therefore be largely avoided by good maintenance of the road surface.

10.3 EXISTING RECEIVING ENVIRONMENT

10.3.1 Description of the baseline environment - Environmental Noise Context

The subject site is located on the edge of Dunshaughlin town and is accessed off the R147 Regional Road between Dublin and Navan and is located approximately 1km east of the M3 Motorway. The Dunshaughlin Business Park is located to the west of the site boundary. Existing residential development borders the northern and north-western western site boundaries. The subject application site adjoins an under construction residential development site (The Willow's) to the south under the Applicant's land ownership.

The existing noise climate of the area in which the site is located is influenced primarily by road related noise from the R147 Dublin Road and by private and commercial vehicle movements in the Dunshaughlin Business Park and by private vehicle movements in the adjoining residential areas and on the Lagore Road north of the site. Noise from construction works on the current Willows development is also prevalent at times, however it is expected that these works shall be completed in 2019.

The Dunshaughlin Business Park does not currently include any large facilities that generate high noise levels however, consideration is also given to future commercial and industrial activities that may occur within the Dunshaughlin Business Park and on adjacent lands in the applicant's ownership which are zoned for employment uses (site to the west identified for a future education campus for the town).

10.3.2 Baseline environmental noise survey

Baseline noise data in the vicinity of the closest residential receptors to the proposed development site boundaries has been obtained from noise monitoring surveys conducted by Byrne Environmental Consulting Ltd during March 2017. The baseline monitoring locations were selected in accordance with *ISO 1996,2, 2017: Acoustics – Description, Measurement and Assessment of environmental noise* and the 2016 EPA publication, *“Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)”* and included locations in proximity to existing residential dwellings adjacent to the development areas and within the site itself to assess the impact of road traffic noise on the southern site boundary and noise from the Dunshaughlin Business Park along the western site boundary.

Measurement locations

Baseline noise measurements were conducted at four locations in the vicinity of the proposed site. Figure 10.1a and b below details the locations of the measurement positions. Noise monitoring surveys were conducted under free-field conditions at a height of approximately 1.5m above ground and approximately 3.5m away from reflecting surfaces for a period of 72 hours (3 days) at each location in order to obtain detailed noise data and assess the existing noise climate at the locations accurately.

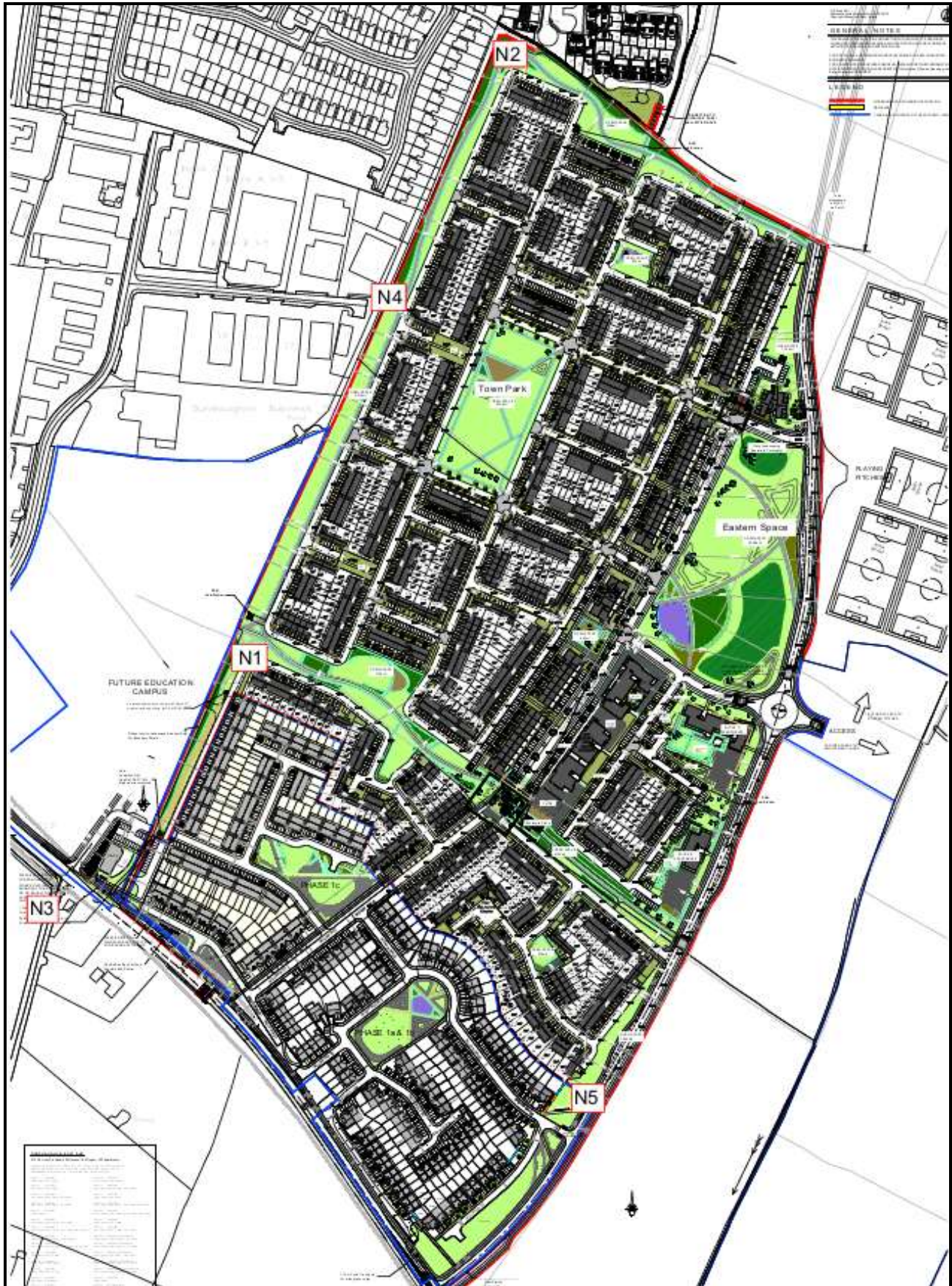
Table 10.5: Baseline noise measurement locations

Location N1	South western site boundary
Location N2	Northern site boundary location within the Maelduin residential estate
Location N3	Private house located opposite the South western corner of site adjacent to R147 Dublin Road
Location N4	Western site boundary adjacent to the Dunshaughlin Business Park
Location N5	South eastern site boundary

Figure 10.1a: Baseline Noise Monitoring Locations N1 – N5



Figure 10.1b: Baseline Noise Monitoring Locations N1 – N5 showing development



The noise parameters used to describe the existing ambient noise climate are described as follows:

L _{Aeq} :	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} :	The sound level that is exceeded for 10% of the sample period. It is typically used as a descriptor for traffic noise.
L _{A90} :	The sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise.
L _{Amax} :	The instantaneous maximum sound level measured during the sample period.
1/3 Octave band analysis	The frequency analysis of a sound such that the frequency spectrum is subdivided into bands of one-third of an octave each. Used to determine tonal components of a sound source
L _{DEN}	Day- Evening-Night indicator 24hours
L _{DAY}	Day indicator 07:00hrs – 19:00hrs
L _{EVENING}	Evening indicator 19:00hrs – 23:00hrs
L _{NIGHT}	Night indicator 23:00hrs – 07:00hrs

Noise levels are measured using a logarithmic noise scale (decibel) and are denoted dBA. The "A" indicates that a frequency weighting has been applied to allow for the variation in the sensitivity of the human ear.

Baseline noise measurement results

Table 10.6: Location N1 Southwestern site boundary

Period 19 th – 22 nd February 2018	Measured sound pressure levels dBA (re 20µPa)			
	L _{Aeq}	L _{A10}	L _{A90}	L _{AMax}
Daytime period 07:00 – 19:00hrs	66	68	58	81
Nighttime period 23:00 – 07:00hrs	54	57	38	74
L _{DEN}	65 (WHO 2018 recommended limit 53dB)			
L _{DAY}	63			
L _{EVENING}	60			
L _{NIGHT}	57 (WHO 2018 recommended limit 45dB)			

During the daytime, evening and nighttime periods the noise climate at N1 is dominated by road traffic noise from the R147 Dublin Road.

The L_{DEN} and L_{NIGHT} transport noise descriptors exceed the WHO 2018 recommended limits.

Vibration was not perceptible during the survey period at Location N1.

The impact of road traffic noise on the closest residential units to the R147 Dublin Road shall have enhanced acoustic insulation features integrated into the design of the units.

It is noted that lands adjacent N1 are zoned for employment uses and therefore the noise climate at this location will increase should the lands be developed in the future. Enhanced acoustic insulation of all residential units located along this boundary is required.

Table 10.7: Location N2 Northern site boundary adjoining Maelduin / Coldrick’s Pass / Kellett’s Grove residential estates

Period 19 th – 23 rd Feb 18	Measured sound pressure levels dBA (re 20µPa)			
	L _{Aeq}	L _{A10}	L _{A90}	L _{AMax}
Daytime period 07:00 – 19:00hrs	50	52	48	64
Nighttime period 23:00 – 07:00hrs	38	42	34	53
L _{DEN}	49 (WHO 2018 recommended limit 53dB)			
L _{DAY}	48			
L _{EVENING}	39			
L _{NIGHT}	41 (WHO 2018 recommended limit 45dB)			

Noise levels measured at Location N2 are consistent with a quiet residential area. Occasional vehicle movements by residents were noted during the daytime, evening and night-time periods.

The L_{DEN} and L_{NIGHT} transport noise descriptors were below the WHO 2018 recommended limits.

Vibration was not perceptible during the survey period at Location N2.

Table 10.8: Location N3 Private house located adjacent R147 opposite southwestern site boundary

Period 1 st – 3 rd March 2018	Measured sound pressure levels dBA (re 20µPa)			
	L _{Aeq}	L _{A10}	L _{A90}	L _{AMax}
Daytime period 07:00 – 19:00hrs	63	66	58	83
Nighttime period 23:00 – 07:00hrs	53	55	40	77
L _{DEN}	64 (WHO 2018 recommended limit 53dB)			
L _{DAY}	63			
L _{EVENING}	60			
L _{NIGHT}	56 (WHO 2018 recommended limit 45dB)			

During the daytime, evening and nighttime periods the noise climate at N3 is dominated by road traffic noise from the R147 Dublin Road.

The L_{DEN} and L_{NIGHT} transport noise descriptors exceed the WHO 2018 recommended limits.

Vibration was not perceptible during the survey period at Location N3.

Table 10.9: Location N4 Western site boundary adjoining Dunshaughlin Business Park

Period 23 rd – 26 th February 2018	Measured sound pressure levels dBA (re 20µPa)			
	L _{Aeq}	L _{A10}	L _{A90}	L _{AMax}
Daytime period 07:00 – 19:00hrs	57	59	42	93
Nighttime period 23:00 – 07:00hrs	42	46	35	80
L _{DEN}	51 (WHO 2018 recommended limit 53dB)			
L _{DAY}	46			
L _{EVENING}	44			
L _{NIGHT}	44 (WHO 2018 recommended limit 45dB)			

During the daytime the noise climate at N4 was influenced by traffic movements within the Dunshaughlin Business Park

During the evening night-time period It was observed that traffic noise had receded when compared to the daytime measurement period.

The L_{DEN} and L_{NIGHT} transport noise descriptors were below the WHO 2018 recommended limits.

Vibration was not perceptible during the survey period at Location N4.

It is noted that the nature of commercial / industrial activities within the Dunshaughlin Business Park may change over time and therefore consideration shall be given to the acoustic insulation of all residential units located along the boundary of the industrial estate.

Table 10.10: Location N5 Southeastern site boundary

Period 1 st – 3 rd March 2018	Measured sound pressure levels dBA (re 20µPa)			
	L_{Aeq}	L_{A10}	L_{A90}	L_{AMax}
Daytime period 07:00 – 19:00hrs	65	69	58	79
Nighttime period 23:00 – 07:00hrs	55	57	40	77
L_{DEN}	64 (WHO 2018 recommended limit 53dB)			
L_{DAY}	62			
$L_{EVENING}$	59			
L_{NIGHT}	56 (WHO 2018 recommended limit 45dB)			

During the daytime, evening and nighttime periods the noise climate at N5 is dominated by road traffic noise from the R147 Dublin Road.

The L_{DEN} and L_{NIGHT} transport noise descriptors exceed the WHO 2018 recommended limits.

Vibration was not perceptible during the survey period at Location N5.

The impact of road traffic noise on the closest residential units to the R147 Dublin Road shall have enhanced acoustic insulation features integrated into the design of the units.

10.3.3 Significance

Based on the recorded baseline noise surveys conducted in the vicinity of the proposed development site it may be concluded that the existing ambient noise levels are low to moderate at the closest existing and proposed receptors.

Road traffic noise on the R147 Dublin Road is a dominant noise source throughout the day, evening and nighttime periods which will adversely impact residential units located along the south western and south eastern boundaries of the development site. Acoustic mitigation measures are required to be integrated into the design of these units to reduce the traffic noise impact to acceptable levels.

10.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

When considering a development of this nature, the potential impacts of noise and vibration must be considered for each distinct stage: the medium term (3-10 years) impact of the construction phase and the ongoing long term

impact of the operational phase. It is important that there is no unacceptable increase in ambient noise levels during the construction phases and during the operational phase.

Short term noise exposure during the construction phase must be managed and controlled to acceptable levels. There are a number of existing residential noise sensitive receptors located in proximity to the development site boundaries. It is fundamental that the proposed development or any aspect of the proposed development must not adversely impact the existing noise levels experienced at these receptors over the long term.

It is also critical that adequate sound insulation is provided within the proposed residential units to mitigate the impact of existing noise sources and noise from the community, commercial and retail units proposed as part of the development.

10.5 POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT

10.5.1 Potential Impact

Various elements of both the construction and operational phases of the proposed development have the potential to impact on the receiving on the local receiving noise environment, on adjacent residential properties and on human health. The likely potential impacts for both construction and operation of the proposed scheme prior to mitigation are described in this section of the EIAR. The mitigation measures are described in Section 10.7 and the predicted impacts with the development in place and the mitigation measures incorporated in Section 10.9.

Construction Impacts

The development of the site will be conducted in the following phased stages:

- Archaeological site investigations (completed as of Q4 2018)
- Enabling works - Site set up and Site clearance
- Construction works including infrastructure and building construction and landscaping

Enabling works - Site Set Up and Clearance

Works activities associated with the 'Site set up' will be undertaken prior to construction works commencing. The setting up of the site shall involve the construction of site security hoarding and site compounds, site offices, materials and waste storage areas and staff welfare facilities. These short-term activities will have a minimal potential to generate excessive noise levels.

The proposed development involves the ground clearance of the existing site to facilitate the proposed development including buildings, internal roads and hard standing areas, services and landscaped areas.

Site clearance, levelling and an element of ground excavation shall also occur at this stage. A variety of items of plant will be in use during site clearance and ground excavation. These will include excavators, dump trucks, compressors and generators. The operation of these items of plant does have the potential to generate short term elevated noise levels.

During the site clearance works, Construction and Demolition (C&D) waste shall be segregated as per the requirements of the Construction, Demolition and Operational Waste Management Plan for the site and shall be exported off-site by an appropriately permitted waste contractor. The movement of these trucks to and from the site shall result in an increase in the volume HGV's within the immediate area and along the proposed haul routes which will generate additional noise levels.

Construction Works

The proposed development consists of a strategic housing development comprising of 913 no. residential units, a neighbourhood centre, including 2 no. retail units, a café / restaurant unit, a primary healthcare / gym, a community facility and a childcare facility, all associated open space, a section of the Outer Relief Road, internal roads, cycle and pedestrian infrastructure, services and all other associated development. The 913 no. residential units proposed consist of 505 no. houses (single, two, and three storey), 186 no. duplex units (three storey), and 222 no. apartments (four and five storey).

The development shall be constructed over an approximate but no more than a 10 year period in 3 phases as follows:

Phase 1-Zone 1	(c.10Ha)	455 Residential Units including creche, retail and community areas
Phase 2-Zone 2	(c.5.6 Ha)	220 Residential Units
Phase 3 Zone 3	(c.6 Ha)	239 Residential Units

During the construction phase there will be extensive site works, involving construction machinery, construction activities on site, and construction traffic, which will all generate noise. The highest noise levels will be generated during the general construction activities. The construction noise levels will be of relatively short term duration and will only occur during daytime hours which will serve to minimise the noise impacts at local existing receptors.

It is predicted that the construction phases shall result in a short term increase in noise levels in the area as well as introducing tonal and impulsive noise as a result of construction activities such as pneumatic breaking, cutting, excavating, vehicle movements and general manual construction activities.

Due to the phased nature of the development which will occur over an approximate 10 year period, there will be slight to moderate impacts on existing residents in the Maelduin, Coldrick's Pass and Kellett's Grove residential estates located to the northwest and north of the site and on the existing and future residents of the adjoining Willows residential development that is currently under construction and partially occupied.

The noise and vibrational impacts of construction works will only be prevalent when construction works are occurring in proximity to these residential receptor areas and as such the impacts will not extend over the entire duration of the total construction phase.

The proposed construction phase noise mitigation measures as detailed in Section 10.7 shall ensure that all construction activities are controlled and managed and audited by an independent acoustic consultant to confirm that the mitigation measures are implemented throughout the construction phase.

Construction noise predictions

The predicted construction noise levels that will be experienced at the nearest residential receptors as a result of construction activities have been calculated using the activity L_{Aeq} method outlined in *BS 5228 1:2009+A1 2014 – Code of Practice for noise and vibration control on construction and open sites – Part 1 Noise*.

Tables 10.11 to 10.12 detail assumed plant items during the key phases of construction with the associated source reference from *BS 5228: 2009+A1 2014*. The closest residential properties to the proposed development site are located at distances ranging from approximately 10-150m. Construction noise calculations have therefore been conducted at distances of 10 to 150m from the works for the Site Clearance and Main Construction phases, representing the nearest properties to the works.

Table 10.11: Indicative construction noise predictions associated with Site Enabling works

Plant Item	BS 5228 Reference	Calculated sound pressure levels L_{Aeq} dB at distances from receptors			
		10	50	100	150
Generator (enclosed)	C.4 Ref 84	68	54	48	44
Compressor (enclosed)	D.6 Ref 19	71	57	51	47
Tracked Excavator	C.2 Ref 3	76	62	56	52
Wheeled Excavator	C.2 Ref 26	77	63	57	53
HGV	C.4 Ref 19	75	61	55	51
Dozer	C.2 Ref 11	79	65	60	56
Combined $L_{Aeq,period}$		83	70	64	60

Table 10.12: Indicative construction noise predictions associated with building Construction works

Plant Item	BS 5228 Reference	Calculated sound pressure levels L_{Aeq} dB at distances from receptors			
		10	50	100	150
Generator (enclosed)	C.4 Ref 84	68	54	48	44
Compressor(enclosed)	D.6 Ref 19	71	57	51	47
Tracked Excavator	C.2 Ref 3	76	62	56	52
Wheeled Excavator	C.2 Ref 26	77	63	57	53
HGV	C.4 Ref 19	75	61	55	51
Concrete / Steel Cutting Equipment	Various	82	68	62	59
Dump truck	C.2 Ref 30	77	63	57	54
Combined $L_{Aeq,period}$		86	72	66	62

The results of the assessment has indicated that, in general, at distances of greater than 50m from the works sites, the construction day time noise limit of 75dB $L_{Aeq, 11hr}$ can typically be complied with for during both enabling and construction works. It is also important to note that the impact due to construction activities will be transient in nature and the noise levels detailed in Tables 10.9 and 10.10 represent worst case scenarios when all items of plant are operating simultaneously without noise mitigation measures in place.

The proposed construction phase noise mitigation measures as detailed in Section 10.9 shall ensure that all construction activities are controlled and managed and audited by an independent acoustic consultant to confirm that the mitigation measures are implemented throughout the construction phase.

Where works are occurring at distances of less than 50m from existing residential receptors, enhanced noise mitigation measures including the use of acoustic screens between the activities and the receptors will be required to reduce the impact of works. These measures are detailed in Section 10.9.

Construction Traffic Noise

Based on the assumption of up to 40 HGV movements per day on the haul routes to and from the site along public roads, the resulting average predicted traffic noise level at the closest receptors is calculated as follows:

The predicted noise levels at any receptor located within 5m of the haul route road has been calculated using a standard international acoustical formula as described below.

$$L_{Aeq, T} = SEL + 10\log_{10}(N) - 10\log_{10}(T) + 20\log_{10}(r_1/r_2) \text{ dB}$$

where $L_{Aeq, T}$ is the equivalent continuous sound level over time period (T) (3600 sec);

SEL is the A weighted Sound Exposure Level of the noise event (77dB);

N is the number of events over the time period T (40);

r1 is the distance at which SEL is assessed (5m)

r2 is the closest distance to the receptor from the road (10m)

The calculations assumed a maximum scenario of 4 truck movements per hour based on an 10 hour working day a maximum Sound Exposure Level of 77dBA for the trucks and the minimum distance between the local road passing by each of the nearest noise sensitive receptors to the public road (10m). No attenuation, above geometric spreading, has been considered within these calculations may be considered the worst case scenario.

The maximum predicted $L_{Aeq, period}$ values as a result of the HGV traffic movements at the nearest noise sensitive receptors located along the haul route roads is predicted to be 51 dBA, $L_{Aeq, period}$.

It is not expected that the predicted short-term increase in HGV movements associated with the construction phase of the development will have an adverse impact on the existing noise climate of the wider area or on local receptors and would not significantly increase the L_{den} at any receptor location in the area.

Vibration

The most significant potential sources of ground borne vibrations that may be generated during the construction phase of the development will be generated by the following practices:

Ground preparation excavation activities that require the use of pneumatic rock breakers
Movement of site vehicles bulldozers, tracked excavators and dump trucks on ground surfaces
Hard core surfaces and haul road compaction with vibro-rolling vehicles
Road construction surface vibro-rolling

Vibration impacts have been considered from any particular plant items that have the potential to generate perceptible levels of vibration.

The nearest off-site residential receptors are located at Maelduin, Coldrick's Pass and Kellett's Grove and the Willows residential estates which at the closest will be c. 10m from construction works. Depending on the methods of construction, there is the possibility of construction related vibration impacts on human beings as a result of ground preparation and concrete foundation excavation activities. However, such sources of vibration shall be temporary and intermittent. Based on experience from similar construction projects it is highly unlikely that any construction vibration impacts on humans would be either measurable or perceptible beyond a distance of 20m.

It is highly unlikely that any construction vibration impacts on buildings beyond a distance of 20m from the proposed development would result in cosmetic damage. Experience of similar construction projects has shown that beyond this distance there is no risk of cosmetic damage occurring within buildings.

A programme of structural vibration monitoring shall be conducted at residential receptors located within <20m of site activities as detailed in Section 10.9 below.

Operational Phase

The noise aspects to be considered for the completed development can be divided into two categories:

Noise impacts on neighbouring residential receptors during construction works

Inward noise impacts on the development from traffic and commercial activities

Noise impacts on neighbouring residential receptors

The main potential for altering the noise environment once the development is operational, and thus impacting neighbouring residential receptors, is road traffic noise associated with the development.

The Traffic and Transportation Report submitted with this application includes a detailed assessment of the traffic impact associated with the proposed development. As part of this assessment, detailed traffic flow information as Annual Average Daily Traffic (AADT) has been derived for the existing road network and the proposed spine road linking the R147 Dublin Road to the Lagore Road for the No development and With development scenarios. The TTA notes that the linking of the spine road to the Lagore Road is a future development scenario to be delivered by the Planning Authority through a Part 8 application or by the landowner to the north, however, it is appropriate in this chapter to consider this as a worst case future scenario in terms of noise impact on the Lagore Road.

The 2020 Opening year scenario details there will be a 27.4% increase along the R147.

The 2035 Design year scenario details there will be a c.24.7% increase along the R147.

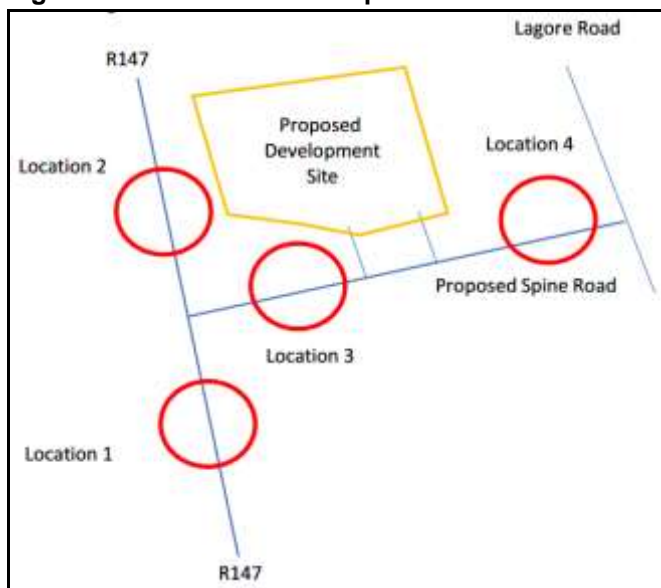
The 2020 Opening year scenario forecasts that the AADT will be 6805 movements on the proposed spine road to and from the R147.

The 2035 Design year scenario forecasts that the AADT will be 7353 movements on the proposed spine road to and from the R147.

The 2020 Opening year scenario forecasts that the AADT will be 3880 movements in a scenario where the remaining section of the spine road is delivered to the Lagore Road.

The 2035 Design year scenario forecasts that the AADT will be 4267 movements in a scenario where the remaining section of the spine road is delivered to the Lagore Road.

Figure 10.2: Traffic forecast plan



The UK Design Manual for Roads and Bridges (DMRB, Volume 11, Section 3, Part 7) states that it takes a 25% increase or a 20% decrease in traffic flows in order to get a 1dBA change in traffic noise levels. On this basis, the

traffic flow increases associated with the development for all year scenarios will result in a traffic noise increase of between 1dBA to 6dBA as follows:

Noise levels along the R147 will increase by up to 2dB(A).

Noise levels along the Lagore Road will increase by up to 4dB(A).

There will be an imperceptible to slight impact on existing ambient noise levels at the existing roads and junctions within the surrounding area as a result of road traffic alterations associated with the proposed development.

On-Site Neighbourhood Noise Sources

The subject development includes the provision of surface and undercroft car parking spaces for the residential units. Vehicles within the residential areas will generally travel at speeds <20kmph as a result of speed limit signage and speed reducing ramps throughout the development which result in relatively low noise levels being generated by internal vehicle movements.

Within the proposed development, sounds generated by everyday domestic activities including waste collection activities, pedestrians, children, and use of open spaces, are part of everyday living, and are not considered “noise” in the sense of a potential nuisance. These activity noises would not have any potential for impact beyond the boundaries of the site.

The location of the proposed neighbourhood centre to include a community facility, retail and commercial units and a childcare facility will contribute to noise both within the development and on the under construction Willow’s residential development located to the south of the neighbourhood centre.

The screening of the community centre area will be necessary to control and minimise the noise impact that the various activities will have on all residential developments that shall be located adjacent to the area. Noise mitigation measures for this aspect of the development are provided in Section 10.9.

Off-Site Noise Sources

It is noted that lands to the east of the development site and located off the proposed spine road are to be developed as playing pitches and sports grounds by the Dunshaughlin Youths Football Club and the Dunshaughlin Athletics Club. By its nature sound shall be generated when the facility is operational and consideration shall be given on how to minimise the noise impact on the existing and proposed residential developments that will face towards the facility.

As this local amenity develops into the future, it will become more populated by club members resulting in its regular use for training and matches and athletics throughout the daytime and evening periods 7 days per week.

It is recommended that an earthen bank would be constructed along the boundaries of the pitches to attenuate the propagation of activity noise from the facility.

The existing Dunshaughlin Business Park and the future development of lands zones for employment adjacent the eastern site boundary would introduce new commercial / industrial noise sources that would have a noise impact on the development. Consideration must be given to “future-proofing” the proposed residential units along the eastern boundary and enhanced acoustic glazing and acoustic mitigation by design details are necessary.

Potential Inward Noise impacts on the proposed development

Regarding noise aspects within the proposed development itself, the aspects to be considered are:

Suitability for residential development, in terms of the existing noise climate

Avoidance of potential conflict in terms of activity noise within the development itself

Residential units located along the southeastern and southwestern site boundaries, will be subjected to higher noise levels from the R147 Dublin Road than residential units located set further back in the development.

Residential units located along the western site boundary adjacent to the Dunshaughlin Business Park, will be subjected to higher noise levels than residential units located set further back in the development. Given the nature of the Business Park, future industrial and commercial activities may set up which may generate higher noise emissions than those currently in place at the Business Park. It is therefore important that the residential units along the western boundary are “future proofed” in terms of having additional acoustic insulation design details incorporated into the structures including acoustically rated window sets, acoustically insulated attics and acoustic trickle vents on external facades facing towards the Business Park.

Residential units located along the south western site boundary may be subject to increased noise levels in the future associated with the development of the adjoining zoned lands.

The main potential noise impact associated with the proposed development relates to additional traffic flows on the surrounding road network. Given that traffic from the development will make use of existing and new road infrastructure, it is appropriate to consider the increase in traffic noise level that arises as a result of vehicular movements associated with the development using the L_{A10} parameter which is typically used to describe traffic noise.

In order to assist with the interpretation of the noise associated with vehicular traffic on public roads, Table 10.13 offers guidance as to the likely impact associated with any particular change in traffic noise level.

Table 10.13: Likely Impact Associated with Change in Traffic Noise Level

Change in Sound Level dB L_{A10}	Subjective Reaction	Impact
<3	Inaudible	Imperceptable
3 - 5	Perceptible	Slight
6 - 10	Up to a doubling of loudness	Moderate
11 - 15	Up to a doubling of loudness	Significant
>15	Up to a doubling of loudness	Profound

A traffic impact assessment relating to the proposed development has been prepared as part of this SHD application by ILTP Consulting. Information from the traffic report has been used to determine the predicted change in noise levels in the vicinity of the area surrounding the proposed development, for the opening year 2020 and the 2035 scenarios.

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 internal roads and internal site junctions with and without the development. Traffic data has been assessed and the calculated change in noise levels associated with the development is predicted to be between 3dB – 6dB which is considered a slight to moderate impact.

Vibration

The only source of vibration predicted, once the development has been constructed and is operational, is vibration associated with road traffic movements.

As a vehicle travels along a road, vibration can be generated in the road and subsequently propagate towards nearby buildings. Such vibration is generated by the interaction of a vehicle’s wheels and the road surface and by direct transmission through the air of energy waves. Some of these waves arise as a function of the size, shape and

speed of the vehicle, and others from pressure fluctuations due to engine, exhaust and other noises generated by the vehicle.

Ground vibrations produced by residential road traffic are unlikely to cause perceptible structural vibration in properties located near to well-maintained and smooth road surfaces. Vibration impacts associated with road traffic in particular commercial van and trucks can therefore be largely avoided by good maintenance of the road surface.

It has been assessed that vibration levels related to road traffic movements, including those additional movements due to the proposed development would be significantly lower than those levels required to lead to disturbance of occupiers or to cause cosmetic or structural damage to buildings.

10.6 CUMULATIVE NOISE IMPACTS

In accordance with *Schedule 6, Part 2(c) of the Planning and Development Regulations 2001-2018*, this section has considered the cumulative impact of the proposed development in conjunction with existing adjacent development and future development in the vicinity of the subject site. This section relates to the cumulative impact on the subject site itself and on surrounding sites.

The European Commission's report of May 1999 'Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions' defines cumulative impact as follows:

"Impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project".

The potential and predicted impacts of the operational phases of the proposed development including the residential and community centre aspects, the currently under construction Willow's residential development, the Dunshaughlin Business Park and the proposed soccer pitches and sports facility have been individually assessed.

It is considered that there will be short to medium term moderate negative cumulative impacts associated with the construction phase of the project over all phases of the development. However, it is predicted that there will be a long term positive cumulative impact as a result of the proposed development, due to the modern residential buildings, significant public open spaces and amenity areas and facilities that are being provided for existing and new residents of the Dunshaughlin area.

Once the development is completed and operational, there will be no residual adverse noise impact on the receiving environment.

10.7 INWARD NOISE IMPACT ASSESSMENT

To mitigate the traffic noise impacts and noise from the operation of the proposed neighbourhood centre area, the Dunshaughlin Business Park and the proposed soccer and sports facility on the proposed residential units within the scheme, acoustic mitigation measures will be incorporated into the design of the proposed residential units.

External noise can enter rooms within dwellings through windows, passive ventilators, walls, roof and doors. In most cases, however, windows provide the main path and therefore, mitigation by design has focussed on this building element to ensure that their insulation is adequate.

All residential units along the western site boundary adjacent to the Dunshaughlin Business Park area shall have acoustically rated windows to prevent the breakthrough of external noise. There shall be no passive air vents on rear external walls to reduce the breakthrough of external noise into the units.

All residential units that front onto the neighbourhood Centre area shall have acoustically rated windows to prevent the breakthrough of external noise. There shall be no passive air vents on external walls facing towards the Community Centre to reduce the breakthrough of external noise into the units.

All apartments units shall have Mechanical Ventilation and Heat Recovery systems therefore passive air vents in external wall will not be included in the design. This will reduce the breakthrough of external noise into the apartment units.

At the earliest stage during the construction phase, residential test units shall be constructed to their finished level and shall be tested by a suitably qualified independent Acoustic Engineer to ensure that they comply with *Department of the Environment, Building Regulations 2014, Technical Guidance Document E – Sound*. Table 10.14 provides detail on the recommended sound insulation values that shall be achieved to ensure acoustic privacy between adjoin residential units.

Table 10.14: Recommended sound insulation values for internal party walls / floors

Dwellings	Airborne Sound Insulation D_{nTw} (dB)	Impact Sound Insulation L_{nTw} (dB)
Floors and Stairs	53	58
Walls	53	N/A

The main potential noise impact on existing receptors associated with the proposed development relates to additional traffic flows on the surrounding road network. Given that traffic from the development will make use of existing and new road infrastructure, it is appropriate to consider the increase in traffic noise level that arises as a result of vehicular movements associated with the development using the L_{A10} parameter which is typically used to describe traffic noise.

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 detailed in Table 10.15.

Table 10.15: Recommended Indoor Ambient Noise Levels from BS 8233: 2014

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

10.8 DO NOTHING IMPACT

If the site remains undeveloped it shall continue to have no noise or vibrational impact on the receiving environment. Based on the projected increase in traffic up to the reference year of 2035 the increase in traffic noise levels in the area without the subject development would be < 3dB. This increase above the existing situation would be minor and would not result in an imperceptible change in the existing noise climate at any local receptor.

10.9 REMEDIAL AND MITIGATION MEASURES

10.9.1 General Construction Site Management

The following noise management measures shall be implemented at the site from the outset of site activities to control and manage noise levels during the construction phase of the proposed development:

NV CONST 1 Noise Mitigation Measures

- An independent acoustic consultant shall be engaged by the contractor prior to the commencement of site activities to ensure that all noise mitigation measures as specified in this Section of the EIAR are implemented and to prepare a site specific *Construction Phase Noise Management Plan*. The Plan shall include all relevant noise and vibration control measures as specified in this Chapter of the EIAR. The Plan shall be submitted to Meath County Council for approval as required.
- The nominated contractor shall appoint a designated person to manage all environmental complaints including noise and vibration.
- A noise complaint procedure shall be implemented in which the details of any noise related complaint are logged, investigated and where required, measures are taken to ameliorate the source of the noise complaint.
- Appropriate signage shall be erected on all access roads in the vicinity of the site to inform HGV drivers that engines shall not be left idling for prolonged periods and that the use of horns shall be banned at all times.
- HGV's queuing on any local or public road shall not be permitted and it shall be the responsibility of site management to ensure this policy is enforced.
- The hours of operation for the site shall be limited to the following hours:
07:00hrs – 19:00hrs Monday to Friday
08:00hrs – 14:00hrs Saturday
Closed on Sundays and Bank/Public Holidays
- All onsite generator units (if required) used to supply electricity to the site shall be silenced models or enclosed and located away from any receptor.
- The site compound shall be located at a point on site furthest away from any residential development.
- Mains power shall be used to supply electricity to all site offices and site lighting at the earliest instance.
- The use of generators during the nighttime shall be avoided.

10.9.2 Construction Phase Noise Control & Mitigation

The following shall be implemented to mitigate construction noise impacts in order to ensure that the construction phase of the development does not have an unacceptable impact on sensitive receptors:

NV CONST 2 Construction Works Noise Mitigation Measures

- A strictly enforced noise management programme shall be implemented at the site from the outset of construction activities.
- The Developer shall appoint an acoustic consultant independent of the Contractor to conduct routine noise audit surveys which shall be conducted at the baseline noise monitoring locations throughout the construction phase of the development to assess compliance with the construction noise limit criteria detailed in this document and to assess the effectiveness and implementation of the specific Construction Phase noise mitigation measures detailed in this document.
- The principal of controlling noise at source shall be implemented at the site. Best practice mitigation techniques as specified in *BS 5228:2009+A1 2014 – Noise and Vibration Control on Construction and Open Sites* shall be implemented during the construction phase and are detailed in this Section.
- Acoustic screens 3m high shall be erected along the southern aspect of the site on the commencement of any site works in this area where the existing Willow's residential houses are located.
- Acoustic screens 3m high shall be erected along the western and north western site boundaries of the site on the commencement of any site works in this area where the existing Maelduin, Coldrick's Pass and Kellett's Grove residential estates are located.
- Noisy stationary equipment shall be sited away from sensitive site boundaries as far as practicable.
- Where reasonable practicable, noisy plant or activities shall be replaced by less noisy alternatives if noise breaches and/or complaints occur.
- Proper use of plant with respect to minimising noise emissions and regular maintenance will be required.
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and will be maintained in good efficient order
- Where noisy plant is required to operate in works areas next to residential houses low noise noise plant options will be used wherever practicable.
- Dumpers and any plant used for moving materials around the site will have high performance exhaust silencers.
- Selected use of rubber-tyred equipment over steel track equipment where practicable.
- The use of inherently quiet plant is required where appropriate – all compressors and generators will be "sound reduced" or "super silent" models fitted with properly lined and sealed acoustic covers, which will be kept closed whenever the machines are in use, and all ancillary pneumatic percussive tools will be fitted with mufflers or silencers of the type recommended by the manufacturers.
- All compressors, generators and pumps shall be silenced models fitted with properly lined and sealed acoustic covers or enclosures, which will be kept closed whenever the machines are in use.
- All pneumatic percussive tools such as pneumatic hammers shall be fitted with dampers, mufflers or silencers of the type recommended by the manufacturer.
- Fixed items of plant shall be electrically powered in preference to being diesel or petrol driven.

- Vehicles and mechanical plant utilised on site for any activity associated with the works shall be fitted with effective exhaust silencers and shall be maintained in good working order and operated in a manner such that noise emissions are controlled and limited as far as reasonably practicable.
- Any plant, equipment or items fitted with noise control equipment found to be defective in shall not be operated until repaired / replaced.
- Machines in intermittent use shall be shut down in the intervening periods between works or throttled down to a minimum during periods when not in use.
- Static noise emitting equipment operating continuously shall be housed within suitable acoustic enclosure, where appropriate.
- All excavator mounted pneumatic breakers used for demolition and ground breaking activities shall be fitted with effective dampeners and /or enclosed within a noise adsorbing blanket structure to minimise noise emissions.
- Site activities shall be staggered when working in proximity to any receptor, that is concrete cutting and rock breaking should where possible. This proposed method of working will provide effective noise management of site activities to ensure that any receptor is not exposed to unacceptably high levels of noise over extended periods.
- Excessive revving of all vehicles shall be avoided.
- Unnecessary dropping of heavy items onto ground surfaces shall be banned.
- The use of an excavator bucket to break up slabs of concrete or tarmacadam shall not be permitted.
- The dragging of materials such as steel covers, plant or excavated materials along ground surfaces shall not be permitted.
- The use of acoustic screens to attenuate noise at source shall be implemented as deemed necessary.
- Plant Reversing Alarms: Where reasonably practicable and deemed safe by risk assessment, taking into account onsite hazards and working environment, the tonal reversing alarms of mobile plant shall be replaced with broadband alarms.
- A nominated person from the Project Management team will be appointed to liase with local residents and businesses regarding noise nuisance events.
- In the event of the requirement for out of hours work to occur which will involve the generation of noise levels that are predicted to exceed out of hours noise limit criteria, Meath County Council shall be immediately notified prior to the works commencing.
- A nominated person from the Project Management team will be appointed to liaise with and inform local residents and Meath County Council regarding out of hours works.
- An independent acoustic consultant shall review the implementation of the recommended mitigation measures on a monthly basis.

The images below describe the use of noise screens for construction activities.

It is recommended that high performing acoustic barriers are utilised such as Echo Barrier products or Ventac products.

Double height acoustic blanket enclosure



Acoustic blankets screening piling and excavations



3 sided Acoustic enclosure for surrounding breaking, cutting works



10.9.3 Construction Phase Vibration Control & Mitigation

The following specific vibration mitigation and control measures shall be considered during the construction phase:

NV CONST 3 Vibration Mitigation Measures

- Breaking out concrete elements using low vibration tools
- Choosing alternative, lower-impact equipment or methods wherever possible
- Scheduling the use of vibration-causing equipment, such as jackhammers, at the least sensitive time of day

- Routing, operating or locating high vibration sources as far away from sensitive areas as possible
- Sequencing operations so that vibration causing activities do not occur simultaneously
- Isolating the equipment causing the vibration on resilient mounts
- Keeping equipment well maintained.
- Confining vibration-generating operations to the least vibration-sensitive part of the day which could be when the background disturbance is highest
- A nominated person from the Project Management team will be appointed to liaise with local residents and businesses regarding vibrational nuisance events.
- An independent acoustic consultant shall review the implementation of the recommended mitigation measures on a monthly basis.
- In order to ensure that site construction activities are conducted to minimise the vibration impacts on the receiving environment, structural vibration monitoring shall be conducted during the course of the project works if required.
- It is proposed that vibration monitoring will be conducted at adjacent properties (The Willows, Maelduin, Coldrick's Pass and Kellett's Grove estates) as required using calibrated vibration monitors and geophones and that audible and visual alarm units may be installed to ensure that if vibration levels approach or exceed specified warning and limit values, site personnel will be alerted to cease at the earliest instance and appropriate mitigation measures may then be implemented to minimise the vibrational impacts of protected structures.
- As detailed in Section 10.2.2 the transient vibration guide values for cosmetic damage as specified in British Standard BS 7385: Evaluation and measurement for vibration in buildings, Part 2 1993 Guide to damage levels arising from ground borne vibration is 15 mm/sec Peak Component Particle Velocity at 4 Hz increasing to 20 mm/sec at 15 Hz. This limit value rises to 50 mm/sec at frequencies of 40 Hz and greater. The applied conservative limit of 12.5 mm/sec PPV (peak particle velocity) applied for this assessment is significantly lower than these levels.

Having regard to the above we suggest the inclusion of the following mitigation measure for ease of reference:

N V CONST 4 : In order to protect the amenities enjoyed by nearby residents, premises and employees a full Construction Management Plan (including traffic management) shall be put in place prior to the commencement of development. This will have regard to the mitigation measures set out in Section 10.9 of the EIA Report.

10.9.4 Operational Phase Noise Mitigation

N&V OPERA 1: External noise can enter rooms within dwellings through windows, ventilators, walls, roof and doors. In most cases, however, windows provide the main path and therefore, mitigation by design has focussed on this building element to ensure that their insulation is adequate. All apartments shall have external windows shall have acoustically rated windows to prevent breakthrough of external noise. In addition, Heat Recovery and Mechanical Ventilation systems will be incorporated into the design thus there will be no requirement for passive air vents. All houses shall have acoustically rated double glazed windows.

Acoustic Design requirements for residential buildings

Windows

In order to ensure a sufficient level of sound insulation is provided for all dwellings within the development, the following lists the minimum sound insulation performance of windows and window frame sets in terms of the in-situ weighted sound reduction index (R_w):

40dB R_w for Living rooms & Bedrooms

37dB R_w for Kitchen – Dining Rooms.

The acoustic performance specifications detailed are the minimum requirements which shall apply to the overall glazing system when installed on site. In the context of the acoustic performance specification the 'glazing system' is understood to include any and all of the component parts that form part of the glazing element of the façade, i.e. glass, frames, seals, openable elements etc. All exterior wall and door frames should be sealed tight to the exterior wall construction.

Ventilation Systems

The ventilation strategy for the development will be in accordance with Part F of the Building Regulations. The apartment units shall include mechanical heat recovery ventilation systems which will negate the requirement for passive wall vents in bedrooms and living spaces which would otherwise allow the transfer of external noise into the building through the air gaps in the passive vents. However, windows may remain openable for rapid or purge ventilation, or at the occupant's choice. This design feature of the residential units will ensure that the building structure is acoustically insulated from the external environment.

Wall Constructions

The wall construction typically provides the highest level of sound insulation performance to a residential building. The residential dwellings will be built using either masonry or a timber framed construction. The minimum sound insulation performance of the chosen wall construction will be 55dB R_w .

Roof Construction

The insulated roof constructions proposed across the site will provide an adequate level of sound insulation to the properties within the development site. A minimum sound insulation value of 40dB R_w should be used for roof spaces. This can nominally be achieved using tiled pitched roof with 100mm acoustic insulation and 15mm soundbloc plasterboard ceiling.

At the earliest stage during the construction phase, residential test units shall be constructed to their finished level and shall be tested by a suitably qualified independent Acoustic Engineer to ensure that they comply with *Department of the Environment, Building Regulations 2014, Technical Guidance Document E – Sound*. Table 10.14 above provides detail on the recommended sound insulation values that shall be achieved to ensure acoustic privacy between adjoining residential units and to assess compliance with external noise intrusion criteria as defined in *BS 8233: 2014: Guidance on Sound Insulation and Noise Reduction for Buildings*.

As set out in Section 10.5.1 the operational phase of the development is predicted not to have an adverse noise impact on the receiving environment or on existing residential developments adjacent to the site during the operational phase of the scheme. Therefore, no mitigation measures additional to those set out above are proposed.

10.10 PREDICTED IMPACTS OF THE PROPOSED DEVELOPMENT

Outward Noise Impact

Construction phase

During the construction phase there is the potential for minor impacts on nearby noise sensitive properties due to noise generated by construction site activities. The implementation of the construction phase noise and vibration mitigation measures and a routine noise monitoring programme as detailed in Section 10.9 above and Section 10.11 below, will minimise the potential noise and vibration impact on the receiving environment including existing residential receptors.

Operational Phase

The noise impact generated by additional traffic movements associated with the development is predicted to be of imperceptible to slight impact on existing ambient noise levels along the R147 Dublin Road, and in a future potential development scenario on the Lagore Road respectively.

Inward Noise Impact

It may be concluded that during daytime and night-time periods, acceptable internal noise levels can be achieved in all residential units as defined in *BS 8233* with windows closed, using the acoustically rated glazing systems, mechanical ventilation systems and heat recovery systems in all apartments and wall and roof constructions as proposed in Section 10.9 above.

The installation of Heat Recovery and Mechanical Ventilation systems in the apartments will negate the requirement for external wall vents, thus maintaining the sound insulation integrity of external wall structures.

With regard to the recommended mitigation by design measures as specified above, it may be concluded that residential properties located within the proposed development can be appropriately designed and constructed to achieve acceptable internal noise levels and to ensure the required acoustic performance of adjoining residential units.

10.11 MONITORING

This section describes the noise and vibration monitoring methodologies that shall be implemented at the site to ensure that construction site activities do not cause excessive nuisance or cause cosmetic or structural damage to properties or structures in the vicinity of the site.

10.11.1 Proposed Noise Monitoring Programme During Site Construction

On commencement of the site construction activities, routine noise monitoring shall be conducted in the vicinity of the site to assess the impact that site activities may have on local external noise levels and on ambient noise levels on local receptors.

It is proposed to conduct quarterly noise monitoring surveys to establish the noise impacts of site activities at the closest receptors to the site, to assess compliance with the specified construction noise limit criteria and to ensure that mitigation and control measures are being implemented as required.

All noise monitoring data will be compiled into a technical monitoring report which will include a full assessment of the potential noise impacts arising from site construction activities.

The environmental noise measurements will be completed in accordance with the requirements of *ISO 1996-1: 2016: Acoustics – Description, measurement and assessment of environmental noise* and with regard to the EPA's 2016 *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)*. The measurement parameters to be recorded include wind speed, temperature, L_{Aeq} , L_{A90} , L_{A10} and L_{Amax} and 1/3 Octave Frequency analysis.

Noise Monitoring Locations

The monitoring locations selected for the noise monitoring survey will be at residential noise sensitive receptors adjacent to the site boundaries and as identified in the baseline noise assessment.

10.11.2 Proposed Vibration Monitoring Programme During Site Construction

In order to ensure that site construction activities are conducted to minimise the vibration impacts on the receiving environment, it is proposed that structural vibration monitoring may be implemented during the course of the construction phase if and as required. It is proposed that vibration monitoring will be conducted at adjacent properties opposite the site boundaries as required using calibrated vibration monitors and geophones and that audible and visual alarm units may be installed to ensure that if vibration levels approach or exceed specified warning and limit values, site personnel will be alerted to cease at the earliest instance and appropriate mitigation measures may then be implemented to minimise the vibrational impacts of protected structures.

Vibration Monitoring Locations

The monitoring points chosen for locating the geophone of the vibration measuring instrument will be chosen according to the guidelines in British Standard *BS 7385: Evaluation and measurement for vibration in buildings, Part 1 1990 Guide for measurement of vibrations and evaluation of their effects on buildings* and *Part 2 1993 Guide to damage levels arising from ground borne vibration*.

10.12 REINSTATEMENT

Reinstatement issues are not relevant to this Chapter of the EIAR.

10.13 INTERACTIONS

The principal interactions between Noise & Vibration impacts and Human Beings have been addressed in this chapter which describes in detail the mitigation measures that shall be implemented to ensure that human health and residential amenity are not adversely impacted by any aspect of the construction or operational phases of the development.

10.14 DIFFICULTIES ENCOUNTERED IN COMPILING

There were no difficulties encountered in compiling this Chapter of the EIAR.

10.15 REFERENCES

Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (DoHPLG, August 2018).

2017 EPA Draft Guidelines on information to be contained in Environmental Impact Assessment Reports. Guidelines on Information to be Contained in an Environmental Impact Statement (EPA 2002).

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

Environmental Protection Agency, 2015. Revised Guidelines on the Information to be Contained in Environmental Impact Statements

Environmental Protection Agency, 2015. Draft Advice Notes for Preparation of Environmental Impact Statements Development Management Guidelines (DoEHLG, 2007).

European Union (Planning & Development)(Environmental Impact Assessment) Regulations 2018.

2018 WHO Environmental Noise Guidelines for the European Region

ISO 1996: 2016: Acoustics – Description and measurement and assessment of environmental noise.

EPA's 2016 Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4).

NRA (TII) Guidance for the Treatment of Noise and Vibration in National Road Schemes (2014).

BS 5228 Code of Practice for noise and vibration control of construction and open sites - Part 1: Noise 2009+A1 2014.

UK Department of Transport (Welsh Office) - Calculation of Road Traffic Noise [CRTN]

UK Highways Agency Design Manual for Roads and Bridges Part 7 HD 213/11 – Revision 1 Noise and Vibration.

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