

## **9.0 NOISE AND VIBRATION**

### **9.1 Introduction**

This section of the EIAR has been prepared by AWN to assess the noise and vibration impact of the proposed development in the context of current relevant standards and guidance. This assessment has been prepared by Jennifer Harmon BSc, MIOA, Principal Acoustic Consultant at AWN Consulting.

This chapter includes a description of the receiving ambient noise and vibration climate in the vicinity of the subject site and an assessment of the potential noise and vibration impact associated with the proposed development during both the short-term construction phase and the long-term operational phase on its surrounding environment. The assessment of potential direct and cumulative noise and vibration impacts on the surrounding environment have been considered as part of the assessment.

Mitigation measures are included, where relevant, to ensure the proposed development is constructed and operated in an environmentally sustainable manner in order to ensure minimal impact on the receiving environment

### **9.2 Methodology**

#### **9.2.1 Assessment Overview**

The study has been undertaken using the following methodology:

- Baseline noise monitoring has been undertaken across the development site to determine the range of noise levels at varying locations across the site;
- 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, this is summarised in the following sections;
- Predictive calculations have been performed to estimate the likely noise emissions during the construction phase of the project at the nearest sensitive locations (NSL's) to the site;
- Predictive calculations have been performed to assess the potential impacts associated with the operation of the development at the most sensitive locations surrounding the development site;
- A schedule of mitigation measures has been proposed, where relevant, to control the noise and vibration emissions associated with both the construction and operational phases of the proposed development, and;
- The inward impact of noise in the surrounding environment into the proposed buildings has also been assessed to determine the requirements, for additional noise mitigation to provide suitable residential amenity.

## 9.2.2 Assessment Criteria

### 9.2.2.1 Construction Phase – Noise

There is no published statutory Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. Louth County Council typically controls construction activities by imposing limits on the hours of operation and consider noise limits at their discretion.

In order to set appropriate construction noise limits for the development site, reference has been made to BS 5228 2009 +A1 2014 *Code of practice for noise and vibration control on construction and open sites*. Part 1 of this document *Noise* provides guidance on selecting appropriate noise criteria relating construction works.

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

BS 5228-1:2009+A1:2014 sets out guidance on permissible noise levels relative to the existing noise environment. Table 9.1 sets out the values which, when exceeded, signify a significant effect at the facades of residential receptors.

Assessment category and threshold value period (L <sub>Aeq</sub> )	Threshold value, in decibels (dB)		
	Category A <sup>A</sup>	Category B <sup>B</sup>	Category C <sup>C</sup>
Daytime (08:00 – 19:00) and Saturdays (08:00 – 14:00)	65	70	75
Evenings and weekends <sup>D</sup>	55	60	65
Night-time (23:00 to 07:00hrs)	45	50	55

Table 9.1 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.

For the appropriate assessment period (i.e. daytime in this instance) the ambient noise level is determined and rounded to the nearest 5dB. If the construction noise exceeds the appropriate category value, then a significant effect is deemed to occur

The nearest noise sensitive locations to the proposed development are the individual residential properties along the south-western and south-eastern boundaries at distances of approximately 5 - 10m from the red line boundary of the site. Additional noise sensitive areas external to the site are residential properties to the north-west at a distance of approximately 130m. Specific construction significant noise thresholds are included in Section 9.6.1.1 making reference to the baseline noise surveys undertaken.

### 9.2.2.2 Construction Phase - Vibration

In terms of vibration, BS 5228 Part 2 (2009 +A1 2014) recommends that, for soundly constructed residential property and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak component particle velocity (in frequency range of predominant pulse) of 15mm/s at 4Hz increasing to 20mm/s at 15Hz and 50mm/s at 40Hz and above. The standard also notes that below 12.5 mm/s PPV the risk of damage tends to zero. It is therefore common, on a cautious basis to use this lower value. Taking the above into consideration the vibration criteria in Table 9.2 are recommended.

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

Table 9.2 Recommended Vibration Criteria During Construction Phase

Human response to vibration stimuli occurs at orders of magnitudes below those associated with any form of building damage, hence vibration levels lower than those indicated in Table 9.2 can lead to concern. BS5228-2 also provides a useful guide relating to the assessment of human response to vibration in terms of PPV. Whilst the guide values are commonly used to compare typical human response to construction works, they tend to relate closely to general levels of vibration perception from other general sources. Table 9.3 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.

Vibration Level, PPV	Effect
0.3 mm/s	Vibration might be just perceptible in residential environments.
1 mm/s	It is likely that a vibration level of this magnitude in residential environments will cause complaint.

Table 9.3 Guidance on effects of human response to PPV magnitudes

The standards notes that single or infrequent occurrences of these levels do not necessarily correspond to the stated effect in every case.

### 9.2.2.3 Operational Phase – Noise

The main potential source of outward noise impact associated with the proposed development relates to additional traffic flows on the surrounding road network. Given that traffic from the development will make use of existing roads already carrying traffic volumes, it is appropriate to consider the increase in traffic noise level that arises as a result of vehicular movements associated with the development.

In order to assist with the interpretation of the noise associated with vehicular traffic on public roads, Table 9.4 offers guidance as to the likely impact associated with any particular change in traffic noise level (Source DMRB, 2011).

Change in Sound Level, dB(A)	Subjective Reaction	Magnitude of Impact
0	Inaudible	Neutral
0.1 – 2.9	Barely Perceptible	Imperceptible
3 – 4.9	Perceptible	Slight
5 – 9.9	Up to a doubling of loudness	Moderate
10+	Doubling of loudness and above	Significant

Table 9.4 Likely Impact Associated with Change in Traffic Noise Level. Source: (DMRB 2011)

For other non-traffic related sources appropriate guidance on internal noise levels for dwellings is contained within BS 8233: 2014: *Guidance on Sound Insulation and Noise Reduction for Buildings*. This British Standard sets out recommended noise limits for indoor ambient noise levels in dwellings as summarised in Table 9.5.

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

Table 9.5 Recommended Indoor Ambient Noise Levels from BS 8233: 2014 Source: (BS 8233 2014)

For the purposes of this study, it is appropriate to derive external limits based on the internal criteria noted in the paragraph above. This is done by factoring in the degree of noise reduction afforded by a partially open window and typical 15dB attenuation is noted in this British Standard. Using this correction value across an open window, the following external noise levels would achieve the internal noise levels noted in Table 9.5 above.

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

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

### 9.3 Receiving Environment

The site is located off the Marsh Road, Drogheda in the townland of Newtown, Drogheda, Co. Louth. The site is greenfield land bounded by the Dublin Belfast Railway line to the south of the site, the Drogheda Waste Water Treatment Plant (WWTP) to the east, and greenfield lands and residential dwellings to the north and west. The nearest noise sensitive locations to the proposed development are the individual residential properties along the south-western and south-eastern boundaries at distances of approximately 5 - 10m from the red line boundary of the site. Additional noise sensitive areas external to the site are residential properties to the north-west at a distance of approximately 130m.

#### 9.3.1 Baseline Noise Survey

Baseline noise monitoring has been undertaken across the development site to determine the range of noise levels at varying locations across the site and to establish the existing noise climate the nearest noise sensitive locations.

The survey was conducted in general accordance with ISO 1996: 2017: *Acoustics – Description, measurement and assessment of environmental noise*. Specific details are set out below.

##### 9.3.1.1 **Choice of Measurement Locations**

Unattended noise monitoring was undertaken at two locations within the development site (N1 and N2). An additional three attended monitoring locations (N3 to N5) were undertaken within the site representative of the existing noise environment at the closest noise sensitive locations and the noise climate within the development site.

The locations are described below and illustrated in Figure 9.1.

- N1** Unattended noise monitoring was undertaken at the south-western site boundary in proximity to the closest residential dwelling to the west of the site. This monitoring location was also chosen to capture the ambient noise levels from the operation of the adjacent railway line and railway station.
- N2** Unattended noise monitoring was undertaken along the mid-eastern section of the site to establish noise levels within the site and to determine the contribution of the operational waste water treatment plant located to the east of the development site.
- N3** Attended daytime noise monitoring was undertaken within the middle section to establish the noise levels within this area of the site and establish the contribution of the railway line at locations set back within the site away from the southern site boundary.
- N4** Attended daytime noise monitoring was undertaken within the north west of the site to establish the noise levels in proximity to the closest residential properties at Weirhope.
- N5** Attended daytime noise monitoring was undertaken within south east of the site to establish noise levels in proximity to the closest residential dwelling to the south-east of the site.



Figure 9.1 Baseline Noise Monitoring Locations (Source Google Earth)

### 9.3.1.2 Survey Periods

The survey was undertaken over the following surveys periods:

- Unattended noise monitoring was undertaken at Locations N1 and N2 was undertaken between 12:46 14 January 2019 and 09:57hrs on 18 January 2019, and;
- Attended noise monitoring was undertaken at Locations N3 to N5 between 11:51 to 14:43 on 14 January 2019

### 9.3.1.3 Monitoring Equipment

The surveys were undertaken using the following monitoring equipment:

Location	Manufacturer	Model	Serial Number
N1	Larson Davis	831	0002823
N2	NTi	XL2	5879
N3 – N5	Bruel & Kjaer	2250	2446897

Table 9.6 Instrumentation Details

### 9.3.1.4 Measurement Parameters

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

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

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

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

The "A" suffix denotes the fact that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing. All sound levels in this report are expressed in terms of decibels (dB) relative to  $2 \times 10^{-5}$  Pa.

### 9.3.1.5 Survey Results

#### Location N1

The survey results for the daytime periods at Location N1 are summarised in Table 9.7. Noise monitoring results for the 15, 16 and 17 January are calculated over a full 16-hour daytime period between 07:00 and 23:00hrs. The daytime monitoring period on 14 January is between 12:15 and 23:00hrs. The daytime monitoring period on 18 January is between 07:00 and 09:33hrs.

Full survey data is graphed in Appendix 9.1

Date	Period / Scenario	Measured Noise Levels, dB		
		$L_{Aeq,16hr}$	$L_{AFmax,16hr}$	$L_{A90,16hr}$
14 January 2019	Highest	61	90	49
	Lowest	46	57	41
	<b>Average</b>	<b>53</b>	<b>69</b>	<b>46</b>
15 January 2019	Highest	59	88	50
	Lowest	47	60	43
	<b>Average</b>	<b>52</b>	<b>69</b>	<b>47</b>
	Highest	59	91	50



16 January 2019	Lowest	45	56	43
	<b>Average</b>	<b>52</b>	<b>67</b>	<b>46</b>
17 January 2019	Highest	57	82	54
	Lowest	41	48	40
	<b>Average</b>	<b>51</b>	<b>65</b>	<b>45</b>
18 January 2019	Highest	59	80	49
	Lowest	51	71	47
	<b>Average</b>	<b>55</b>	<b>76</b>	<b>48</b>

Table 9.7 Daytime Noise Monitoring Results at Location N1

The results of the noise survey undertaken at Location N1 indicate that average daytime ambient noise levels are in the range of 51 to 55dB  $L_{Aeq}$ . Maximum noise levels were in the range of 48 to 91dB  $L_{AFmax}$  with typical maximum noise levels in the range of 65 to 76dB  $L_{AFMax}$ .

The average background noise environment at this location was measured in the range of 45 to 48dB  $L_{A90}$ .

The key sources noted along this boundary were noted to be activities within the railway station, passing rail and birdsong.

The survey results for the night-time period at Location N1 are summarised in Table 9.8. Noise monitoring results for all dates are calculated over the 8hr night-time period of 23:00 to 07:00hrs.

Date	Period / Scenario	Measured Noise Levels, dB		
		$L_{Aeq,8hr}$	$L_{AFmax,8hr}$	$L_{A90,8hr}$
15 January 2019	Highest	55	79	51
	Lowest	40	48	37
	<b>Average</b>	<b>48</b>	<b>60</b>	<b>41</b>
16 January 2019	Highest	55	77	50
	Lowest	37	47	35
	<b>Average</b>	<b>50</b>	<b>66</b>	<b>43</b>

17 January 2019	Highest	57	76	51
	Lowest	37	45	34
	<b>Average</b>	<b>50</b>	<b>59</b>	<b>42</b>
18 January 2019	Highest	58	85	48
	Lowest	37	48	34
	<b>Average</b>	<b>50</b>	<b>66</b>	<b>40</b>

Table 9.8 Night-time Noise Monitoring Results at Location N1

The results of the noise survey undertaken at Location N1 indicate that average night-time ambient noise levels are in the range of 48 to 50dB  $L_{Aeq}$ . Maximum noise levels were in the range of 45 to 85dB  $L_{AFmax}$  with typical maximum noise levels in the range of 59 to 66dB  $L_{AFMax}$ .

The average background noise environment at this location was measured in the range of 40 to 43dB  $L_{A90}$ .

#### Location N2

The survey results for the daytime periods at Location N2 are summarised in Table 9.9. Noise monitoring results for the 15, 16 and 17 January are calculated over a full 16-hour daytime period between 07:00 and 23:00hrs. The daytime monitoring period on 14 January is between 12:46 and 23:00hrs. Full survey data is graphed in Appendix 9.1

Date	Period / Scenario	Measured Noise Levels, dB		
		$L_{Aeq,16hr}$	$L_{AFmax,16hr}$	$L_{A90,16hr}$
14 January 2019	Highest	50	72	47
	Lowest	42	50	40
	<b>Average</b>	<b>47</b>	<b>58</b>	<b>45</b>
15 January 2019	Highest	51	74	49
	Lowest	45	53	42
	<b>Average</b>	<b>48</b>	<b>60</b>	<b>46</b>

16 January 2019	Highest	51	71	49
	Lowest	44	52	42
	<b>Average</b>	<b>49</b>	<b>60</b>	<b>46</b>
17 January 2019	Highest	51	67	49
	Lowest	44	51	41
	<b>Average</b>	<b>48</b>	<b>58</b>	<b>46</b>

Table 9.9 Daytime Noise Monitoring Results at Location N2

The results of the noise survey undertaken at Location N2 indicate that average daytime ambient noise levels are in the range of 47 to 49dB  $L_{Aeq}$ . Maximum noise levels were in the range of 50 to 74dB  $L_{AFmax}$  with typical maximum noise levels in the range of 58 to 60dB  $L_{AFMax}$ .

The average background noise environment at this location was measured in the range of 45 to 46dB  $L_{A90}$ .

The key sources noted at this monitoring location were noted to be birdsong, occasional overhead aircraft and rustling foliage.

The survey results for the night-time period at Location N2 are summarised in Table 9.9 below. Noise monitoring results for all dates are calculated over the 8hr night-time period of 23:00 to 07:00hrs.

Date	Period / Scenario	Measured Noise Levels, dB		
		$L_{Aeq,8hr}$	$L_{AFmax,8hr}$	$L_{A90,8hr}$
15 January 2019	Highest	49	62	47
	Lowest	38	44	36
	<b>Average</b>	<b>43</b>	<b>51</b>	<b>39</b>
16 January 2019	Highest	50	69	47
	Lowest	39	48	36
	<b>Average</b>	<b>45</b>	<b>55</b>	<b>41</b>
	Highest	48	65	47

17 January 2019	Lowest	39	47	36
	<b>Average</b>	<b>44</b>	<b>54</b>	<b>40</b>
18 January 2019	Highest	50	67	45
	Lowest	38	47	36
	<b>Average</b>	<b>44</b>	<b>56</b>	<b>39</b>

Table 9.9 Night-time Noise Monitoring Results at Location N2

The results of the noise survey undertaken at Location N2 indicate that average night-time ambient noise levels are in the range of 43 to 45dB  $L_{Aeq}$ . Maximum noise levels were in the range of 44 to 69dB  $L_{AFmax}$  with typical maximum noise levels in the range of 51 to 56dB  $L_{AFMax}$ .

The average background noise environment at this location was measured in the range of 39 to 41dB  $L_{A90}$ .

#### Location N3

Daytime noise monitoring results for Location N3 are located in Table 9.10 below.

Time	Measured Noise Levels, dB		
	$L_{Aeq}$	$L_{AFmax}$	$L_{A90}$
11:51	48	61	45
12:55	46	60	44
13:52	45	58	43

Table 9.10 Daytime Noise Monitoring Results at Location N3

Measured ambient noise levels at Location N3 were in the range of 45 to 48dB  $L_{Aeq}$  the main noise sources noted during the survey were railway movements to the south, occasional aircraft overhead birdsong and rustling foliage. Maximum noise levels were measured in the range of 58 to 61dB  $L_{AFmax}$ .

Background noise level were measured between 43 and 45dB  $L_{A90}$ .

#### Location N4

Daytime noise monitoring results for Location N4 are located in Table 9.11 below.

Time	Measured Noise Levels, dB		
	L <sub>Aeq</sub>	L <sub>AFmax</sub>	L <sub>A90</sub>
12:11	48	72	45
13:14	47	58	45
14:10	49	67	45

Table 9.11 Daytime Noise Monitoring Results at Location N4

Measured ambient noise levels at Location N4 were in the range of 47 to 49dB L<sub>Aeq</sub> the main noise sources noted during the survey were road traffic movements along the R150, occasional aircraft overhead birdsong and rustling foliage. Maximum noise levels were measured in the range of 58 to 72dB L<sub>AFmax</sub>.

Background noise level were measured as a steady 45dB L<sub>A90</sub>.

#### Location N5

Daytime noise monitoring results for Location N5 are located in Table 9.12 below.

Time	Measured Noise Levels, dB		
	L <sub>Aeq</sub>	L <sub>AFmax</sub>	L <sub>A90</sub>
12:35	46	60	44
13:33	47	68	43
14:28	55	85	43

Table 9.12 Daytime Noise Monitoring Results at Location N5

Measured ambient noise levels at Location N5 were in the range of 46 to 55dB L<sub>Aeq</sub> the main noise sources noted during the survey were railway movements to the south, birdsong and rustling foliage. Maximum noise levels were measured in the range of 60 to 85dB L<sub>AFmax</sub>, the higher value being as a result of a train horn. Background noise level were measured between 43 and 44dB L<sub>A90</sub>.

### 9.3.1.6 Summary of Noise Climate

The noise environment at the development site and at the nearest noise sensitive locations is relatively low and representative of a suburban setting set back from busy road traffic. Activities along the railway line and railway station located to the south of the site are audible intermittently when in use, however the overall contribution of these sources to the measured noise climate at the monitoring locations is low.

A wastewater treatment plant located to the east of the site was not audible during the noise surveys undertaken. It is likely, however, the operation of this facility influenced the background noise levels during night-time periods, albeit at low level. The main noise sources were noted to be from birdsong, distant traffic and occasional overhead aircraft in line with a semi-rural setting.

## 9.3.2 Baseline Vibration Survey

### 9.3.2.1 Survey Details

A baseline vibration survey was conducted at Location V1 indicated in Figure 9.1 in order to establish vibration levels at the site and to determine the contribution of rail activities to vibration levels. The survey was undertaken over the same monitoring periods as Noise Monitoring Location N1 (See Section 9.3.1.2).

The survey was undertaken using an InstanTel *Minimate Plus* vibration meter (Serial No BE20175) with Tri-axial geophone. Mounting of the transducer was conducted in general accordance with *BS ISO 5348: 1998: Mechanical vibration and shock – Mechanical mounting of accelerometers*. The meter was set to record Peak Particle Velocity (PPV) in mm/s over 5 minute intervals.

### 9.3.2.2 Survey Results

Table 9.13 presents the measured ambient vibration levels (PPV) measured at Location V1 at the approximate location of the closest façade of the proposed buildings. The table presents the maximum value recorded over each day and night-time periods.

Date	Measured Ambient Vibration Level (PPV, mm/s)	
	Max value, daytime (07:00 – 23:00hrs)	Max value, daytime (23:00 – 07:00hrs)
	13/02/2019	0.11
14/02/2019	0.11	0.10

15/02/2019	0.11	0.10
16/02/2019	0.11	0.10
17/02/2019	0.08	0.08
Maximum Measured PPV	0.11	0.1

Table 9.13

Vibration Monitoring Results at Location N1

The monitoring results indicate vibration levels at the position closest to the proposed buildings within the development site are low and don't vary to any considerably level between day and night-time periods. Measured vibration levels are all below a threshold that would be typically subjectively perceptible in the most sensitive situations for (Refer to Table 9.3). The results of the assessment indicate a negligible contribution of vibration from the rail line and station to the south of the site.

#### 9.4 Characteristics of the Proposed Development

The proposed development comprises a mixed-use development of residential houses, duplex units and apartments, ground floor commercial units and creche in addition to an office block. The development also includes ancillary developments including car and bicycle parking areas, internal road layouts and landscaping. A full description of the development can be found in Chapter 3.

The potential noise and vibration impact on the surroundings are considered for both the construction and operational phases of this development.

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

During the operational phase of the development, the primary source of outward noise in the operational context relates to any changes in traffic flows along the local road network and building services noise associated with commercial and office spaces.

The potential associated with each phase is assessed in the following Sections.

## 9.5 Do Nothing Scenario

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

## 9.6 Potential Impact of Proposed Development

### 9.6.1 Construction Phase

#### 9.6.1.1 *Construction Phase – Noise*

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

The closest noise sensitive locations to the main building works are the individual residential properties immediately to the south-west and south-eastern boundaries which are at distances of approximately 20 to 30m from building construction works. Other sensitive receptors are located at distances of between 60 to 100m from closest building works. These distances relate to the closest boundaries to the noise sensitive locations. The remainder of works will take place across the site at varying distances of up to 250m. Reference to the noise baseline survey results (Section 9.3) and guidance contained in BS 5228 Part 1 for construction noise levels discussed in Section 9.2.2.1, the threshold for significance from construction activities is set as follows for the closest noise sensitive locations:

#### **Significance Category - A:**

Daytime (08:00 – 19:00hrs)/ Saturdays (08:00 – 14:00hrs)	<b>65dB LAeq</b>
Evening and Weekends	<b>55dB LAeq</b>

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

Given, the type and number of construction equipment will vary over the course of the construction phase, noise levels have been calculated at the closest noise sensitive locations assuming the construction noise levels and distances noted above. For the purpose of the assessment, a standard site hoarding of 2.4m high has been



included in the calculations for noise sensitive boundaries. The calculations also assume that the equipment will operate for 66% of the working time. Table 9.14 summarises the result of this assessment.

Construction Phase	Sound Power at construction works, Lw(A)	Calculated noise levels at varying distances, dB LAeq					
		20m	30m	50m	60m	100m	200m
Site Clearance	115						
General Construction		71	68	63	62	57	51
Landscaping							
Road Works							

Table 9.14 Indicative Construction Noise Levels at Nearest Noise Sensitive Locations.

The predicted noise levels detailed in the Table 9.14 above indicate that during the main construction phase including site clearance, building construction works etc. assuming up to 5 items of plant are operating simultaneously at the closest noise sensitive boundaries, there is potential for the significance threshold to be exceeded at distances of up to 50m. The calculated noise levels at 20 and 30m represent the closest residential properties to the south-west and south-east of the site. Construction noise levels at these properties are likely to exceed a construction noise limits of 65dB when works are occurring immediately along the adjacent boundaries to these properties assuming the level of construction activities. This scenario is highly worst case and will occur for limited periods of time. Construction works occurring within the remainder of the site will be at further distances from these properties and will result in reduced construction noise levels. The calculated results in Table 9.14 indicate that at distances of 50m and greater, construction noise levels are below the significance criteria. A schedule of best practice noise mitigation measures is included in Section 9.8.

#### 9.6.1.2 Construction Phase – Vibration

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

- 0.54mm/s at a distance of 5m, for auguring;
- 0.22mm/s at a distance of 5m, for twisting in casing;

- 0.42mm/s at a distance of 5m, for spinning off, and;
- 0.43mm/s at a distance of 5m, for boring with rock auger.

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

In this instance, taking account of the distance to the nearest sensitive off-site buildings, vibration levels at the closest neighbouring buildings are expected to be orders of magnitude below the limits set out in Table 9.2 to avoid any cosmetic damage to buildings. Vibration levels are also expected to be below a level that would cause disturbance to building occupants, as set out in Table 9.3. The potential vibration impact during the construction phase is of short-term, neutral and imperceptible impact

#### 9.6.2 Operational Phase

Once the development is operational, the potential noise impacts to the surrounding environment are minimal. The residential aspect of the development is not expected to generate any significant noise sources over and above those which form part of the existing environment at neighbouring residential areas (estate vehicle movements, children playing etc.) and hence no significant impact are expected from this area of the development site.

The main potential noise impact associated with the proposed development is considered therefore to relate to the generation of additional traffic to and from the site as a result of the new residential, commercial and office buildings. Potential noise impacts also relate to operational plant serving the commercial and apartment buildings, where relevant.

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

##### **9.6.2.1 *Additional Vehicular Traffic on Surrounding Roads***

A traffic impact assessment relating to the proposed development has been prepared by Moylan Consulting Engineers as part of this EIAR. Information from this report has been used to determine the predicted change in noise levels in the vicinity of a number of roads in the area surrounding the proposed development, for the opening year 2022 and the design year 2037. Future traffic flows used in the assessment take account of the proposed development under consideration here in addition to the approved residential development to the south-east of the site, which is not yet constructed (Planning Ref 17/387) in addition to future development associated with zoned lands.

For the purposes of assessing potential noise impact, it is appropriate to consider the relative increase in noise level associated with traffic movements on existing roads and junctions with and without the development given that traffic from the development will make use of the existing road network. Traffic flow data for the opening year of 2022 and the design year of 2037 in terms of the Annual Average Daily Traffic (AADT) has been assessed. The calculated change in noise levels during these two years are summarised in Table 9.15.

Link	2022 Opening Year		Change in noise levels, dB	2037 Design Year		Change in noise levels, dB
	Do Nothing	Do Something		Do Nothing	Do Something	
R167 (South)	16,366	18,361	+0.5	18,243	20,238	+0.5
Dublin Rd (R132 East)	19,701	20,700	+0.2	21,961	22,960	+0.2
Barrack Street	1,444	1,444	0.0	1,610	1,610	0.0
Dublin Rd (R132 West)	15,086	15,731	+0.2	16,816	17,461	+0.2
Left turn slip	3,571	3,939	+0.4	3,981	4,349	+0.4
Shop Street	17,567	18,025	+0.1	19,582	20,041	+0.1
South Quay (R150)	5,668	8,066	+1.5	6,318	8,716	+1.4
R167 (Bridge North)	16,366	18,359	+0.5	18,243	20,236	+0.5
Marsh Rd (West)	5,483	6,097	+0.5	6,112	6,726	+0.4
Marsh Rd (East)	4,136	4,288	+0.2	4,610	4,762	+0.1
Mill Rd	2,000	2,455	+0.9	2,229	2,684	+0.8
Marsh Rd (East)	5,191	5,765	+0.5	5,787	6,360	+0.4
Marsh Rd (West)	5,191	7,491	+1.6	5,787	8,086	+1.5

Table 9.10 Change in Traffic Noise Levels with Proposed Development.

The predicted increase in AADT traffic levels associated with the development is less than 1dB(A) in the vicinity of the majority of roads assessed for both the opening and design years. This is largely due to the existing volume of traffic along the surrounding road network onto which the development traffic will travel. Reference to Table 9.4 confirms that this increase is inaudible and of neutral effect. Highest increases in traffic and associated noise levels are along the South Quay (R150) link road and Marsh Road (West) where traffic noise levels are calculated to increase by up to 1.5dB. An increase of this magnitude is determined to be imperceptible.

In summary, the predicted increase in noise levels associated with vehicles at road junctions in the vicinity of the proposed development is of long-term imperceptible impact.

#### **9.6.2.2 Building Services Plant**

Once operational, there will be building services plant items required to serve the office building, creche and ground floor commercial units of Blocks 9 and 10. These will typically be limited to heating and cooling plant and extract units, depending on the building design and user requirements. Given the use of these buildings, the majority of plant items are likely to be required during daytime hours only, however, there may be requirement for night-time operational plant, depending on specific requirements.

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

These items will be selected at a later stage, however, they will be designed and located so that there is no negative impact on sensitive receivers within the development itself. The cumulative operational noise level from building services plant at the nearest noise sensitive location within the development (e.g. apartments, creche rooms etc.) will be designed/attenuated to meet the relevant external noise criteria for day and night-time periods as set out in Section 9.2.2.3. These limits are set in order to achieve acceptable internal noise levels within residential spaces.

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

### **9.7 Cumulative Impacts**

The proposed development combined with other permitted developments in the area have the potential to result in cumulative noise or vibration impacts at surrounding noise sensitive locations during the construction and operational phases of the development.

The baseline scenario as measured, takes into account existing road traffic, operational noise from the WWTP to the north east and the rail line and rail station to the south of the site.

Potential operational cumulative impacts relate to increased traffic flows resulting from other developments and any building services plant from other sources. The traffic noise assessment discussed in Section 9.6.2.1 considers the cumulative impact of this proposed development combined with existing flows and those associated with the residential development permitted under P.A 17/387 and future zoned lands. The noise impacts are determined to be long-term, imperceptible.

There are no expected cumulative noise impacts associated with building services plant from the proposed development and the permitted residential development to the south east at external noise sensitive locations. The operation of any mechanical or electrical services associated with the proposed development will be designed to ensure the overall impact is deemed to be long-term and not significant.

Should the construction phase of the proposed development coincide with the construction of permitted development P.A. Ref. 17/387, there is potential for cumulative construction noise levels at noise sensitive locations. The potential cumulative impacts are greatest at the noise sensitive location to the south-east which adjoins both development sites. In the event that construction works are occurring at both sites simultaneously, it is unlikely that the construction noise levels presented in Table 9.14 will increase due to the proximity of construction works assessed which is considered to be worst case.

## **9.8 Ameliorative, Remedial or Reductive Measures**

### **9.8.1 Construction Phase**

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

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

Further 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, where required.

### **9.8.1.1 Selection of Quiet Plant**

This practice is recommended in relation to static plant such as compressors and generators. It is recommended that these units be supplied with manufacturers' proprietary acoustic enclosures. The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item should be selected wherever possible. Should a particular item of plant already on the site be found to generate high noise levels, the first action should be to identify whether or not said item can be replaced with a quieter alternative.

### **9.8.1.2 Noise Control at Source**

If replacing a noisy item of plant is not a viable or practical option, consideration will be given to noise control "at source". This refers to the modification of an item of plant or the application of improved sound reduction methods in consultation with the supplier. For example, resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can often be controlled by fixing resilient materials in between the surfaces in contact.

The following best practice mitigation measures should be considered:

- Site compounds should be located away from noise sensitive boundaries within the site constraints. The use lifting bulky items, dropping and loading of materials within these areas should be restricted to normal working hours.
- For mobile plant items such as cranes, dump trucks, excavators and loaders, maintaining enclosure panels closed during operation can reduce noise levels over normal operation. Mobile plant should be switched off when not in use and not left idling.
- For steady continuous noise, such as that generated by diesel engines, it may be possible to reduce the noise emitted by fitting a more effective exhaust silencer system.
- For percussive tools such as pneumatic breakers, a number of noise control measures include fitting muffler or sound reducing equipment to the breaker 'tool' and ensure any leaks in the air lines are sealed. Erect localised screens around breaker or drill bit when in operation in close proximity to noise sensitive boundaries.
- For concrete mixers, control measures should be employed during cleaning to ensure no impulsive hammering is undertaken at the mixer drum.
- For all materials handling ensure that materials are not dropped from excessive heights, lining drops chutes and dump trucks with resilient materials.
- For compressors, generators and pumps, these can be surrounded by acoustic lagging or enclosed within acoustic enclosures providing air ventilation.
- All items of plant should be subject to regular maintenance. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures.

### **9.8.1.3 Screening**

Screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to all other forms of noise control. Standard construction site hoarding (2.4m in height) with a mass per unit of surface area greater than 7 kg/m<sup>2</sup> can provide adequate sound insulation. This is recommended, as a minimum around the south, south-east and south-west perimeters.

### **9.8.1.4 Liaison with the Public**

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

### **9.8.1.5 Project Programme**

The phasing programme will be arranged so as to control the amount of disturbance in noise and vibration sensitive areas at times that are considered of greatest sensitivity. If piling works are in progress on a site at the same time as other works of construction that themselves may generate significant noise and vibration, the working programme will be phased so as to ensure noise limits are not exceeded due to cumulative activities. This will be reviewed in relation to other potential cumulative works occurring on adjacent construction site in close proximity to noise sensitive properties which have the potential to lead to significant construction noise impacts.

## **9.8.2 Operational Phase**

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

### **9.8.2.1 Additional Traffic on Adjacent Roads**

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

### **9.8.2.2 Mechanical Services Plant**

Taking into account that sensitive receivers within the development are much closer than off-site sensitive receivers, once the relevant noise criteria included in Section 9.2.2.3. is achieved within the development it is expected that there will be no negative impact at sensitive receivers off site, and therefore no further mitigation required.

## **9.9 Monitoring**

### **9.9.1 Construction Phase**

The contractor will be required to ensure construction activities operate within the noise limits set out within Table 9.1. The contractor will be required to undertake regular noise monitoring at locations representative of the closest sensitive locations to ensure the relevant criteria are not exceeded.

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

### **9.9.2 Operational Phase**

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

## **9.10 Residual Impacts of Proposed Development**

### **9.10.1 Construction Phase**

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

During periods when construction works are occurring at distances of up to 30m from the nearest noise sensitive locations to the site boundary, there is potential for temporary, negative, moderate to significant noise impacts to occur.

For the remainder of construction periods, construction noise impacts will be short-term, negative, slight to moderate.

Vibration impacts during the construction phase will be short-term and negligible.

### **9.10.2 Operational Phase**

The predicted change noise levels associated with additional traffic is predicted to be of imperceptible impact along the existing road network. In the context of the existing noise environment, the overall contribution of induced traffic is considered to be of neutral, imperceptible and long-term impact to nearby residential locations.

Noise levels associated with building services plant are expected to be well within the adopted day and night-time noise limits at the nearest noise sensitive properties taking into account the site layout, the nature and type of units proposed and distances to nearest residences. Assuming the operational noise levels do not exceed the adopted design goals, the resultant residual noise impact from this source will be of neutral, imperceptible, long term impact



### **9.11 Interactions**

In compiling this impact assessment, reference has been made to the project description provided by the project co-ordinators, project drawings provided by the project architects and traffic flow projections associated with the development provided by the traffic consultants.

### **9.12 Inward Impact**

The development lands in question are in proximity to the Dublin to Belfast railway line located to the south of the site. A number of intercity and commuter trains operate along this line on a daily basis. In addition there is a train servicing facility at McBride Station. In addition to the existing rail line, a new local access road will form the eastern site boundary which will be used to provide access to the development in addition to the permitted development to the south of the site, developed by Louth County Council under the Local Infrastructure Housing Activation Fund, (LIHAF). The operation of both transport links are potential noise sources to the residential developments within the site.

#### **9.12.1 Existing Noise Climate**

The existing noise and vibration climate within the development lands was surveyed and the results summarised in Section 9.3 of this report. The results of the survey have indicated that the operation of the rail line and services facility does not contribute any significant noise levels at the measurement locations to the south of the site. In addition, vibration levels measured at the monitoring location are negligible in terms of human response to vibration in addition to cosmetic or structural damage to buildings.

In order to determine the inward noise impact for noise sensitive properties proposed as part of the development, it is necessary to determine the internal noise levels within the proposed buildings. These can then be compared against appropriate internal noise criteria from BS 8233, as summarised in Section 9.2.2.3 (Table 9.5).

It is possible to calculate internal noise levels within the residential properties proposed within the site, taking account of the existing and future potential noise environment, proposed constructions and the relevant sound insulation provided by the building elements (i.e. walls, roof, glazing etc.,).

As noted, whilst the existing rail line contributes to the noise environment across the site, noise levels measured during the baseline noise survey did not result in significant noise levels and the railway line operations were audible intermittently.

#### **9.12.2 Noise Model of Site**

In order to calculate noise levels across the site, an acoustic model was developed in order to initially calibrate against noise survey data recorded on site. Proprietary noise calculation software was used for the purposes of

establishing the prevailing noise levels on the proposed site. The selected software, Brüel & Kjær Type 7810 *Predictor*, calculates noise levels in accordance with the selected source. For rail traffic, the Dutch computation methodology for rail noise RMR 2012 was used. This is the recognised standard for rail noise within the Environmental Noise Regulations 2006 SI/140 2006.

The following information was included in the model:

- Site layout drawings of proposed development;
- OS mapping of surrounding environment;
- Ground contour data from site drawings, and;
- Information on rail movements to and From Drogheda were obtained from Irish rail website;

### 9.12.2.1 Calibration of Noise Model

Noise levels recorded during the unattended survey locations N1 and N2 were used to calibrate the noise model. Noise levels are calculated at the same locations using the rail noise model developments. The results are presented in Table 9.17 below for daytime periods, i.e. 07:00 to 23:00hrs and night-time periods, 23:00 to 07:00hrs and compared against those measured on site.

Location	Time Period	Measured Noise Level, dB	Calculated Noise Level, dB
N1	Daytime, $L_{Aeq,16hr}$	51 – 55	52
	Night-time, $L_{Aeq,16hr}$	48 - 50	49
N2	Daytime, $L_{Aeq,16hr}$	47 - 49	49
	Night-time, $L_{Aeq,16hr}$	43 - 45	43

Table 9.17 Calculated and Measured Rail Noise Levels at Development Site

The model results are considered an accurate representation of rail noise levels across the site, taking account other sources that contribute to the noise environment at the monitoring locations also.

Figures 9.2 and 9.3 display the calculated noise contours across the existing site for day and night-time periods at a height of 4m above ground. The results of the modelling exercise demonstrate that highest noise levels are experienced along the south to south east of the site in closest proximity to the rail line and reduce by the order of 20dB towards the north of the site.



Figure 9.2 Rail Noise Levels across development site – Daytime

Rail noise levels calculated across the site during daytime periods are highest along the immediate southern boundary as expected with noise levels reducing moving north within the site. Calculated noise levels are between 55 and 65dB  $L_{Aeq,16hr}$  along the immediate southern boundary reducing to <45dB  $L_{Aeq,16hr}$  further north.



Figure 9.3 Rail Noise Levels across development site – Night-time

Night-time noise levels across the site are in the range of 55 and 58dB  $L_{Aeq,8hr}$  along the south and south-eastern boundary reducing to <40 to 55  $L_{Aeq,8hr}$  with the majority of the site falling within the <45dB  $L_{Aeq,8hr}$  contour.

### 9.12.3 Assessment of Site

The Louth Noise Action Plan (NAP) 2018 – 2023 states the following with respect to assessing the noise impact on new residential development:

*“In order to successfully use the planning process to avoid, or minimise, noise exposure in a consistent manner it is considered necessary to issue guidance on noise exposure levels for proposed development. Such guidance will apply on a county wide basis and is not restricted solely to the area covered by the strategic noise mapping. There are two scenarios to consider when issuing guidance. Firstly, where new residential development or other noise sensitive development is proposed in an area with an existing climate of environmental noise. There is currently no clear national guidance on appropriate noise exposure levels in this scenario. Pending the introduction of such guidance the following UK Guidelines shall apply:*

*The Scottish Office, PAN 1/2011: March 2011 Planning Advice Note (PAN) provides advice on the role of the planning system in helping to prevent and limit the adverse effects of noise*

*In the second scenario, where new, or altered, sources of noise are introduced to existing residential or other noise sensitive locations, there are currently a number of guidance documents, which cover some of these situations as previously outlined. Where existing guidance does not cover the situation under consideration, the following UK Guidelines shall apply:*

- *The Scottish Office, PAN 1/2011: March 2011 Planning Advice Note (PAN) provides advice on the role of the planning system in helping to prevent and limit the adverse effects of noise*
- *BS 4142:2014 Method for Rating Industrial and Commercial Sound, British Standards Institution (BSI), London 2014*
- *ProPG Planning and Noise Guidance note (May 2017)*

The PAN 1/2011 document does not contain guidance for assessment of new residential developments into existing environments. The ProPG document is the most relevant and recent document used to assess new residential development in an area with an existing climate of environmental noise. This has therefore been used for the development site in question.

#### **9.12.3.1 ProPG (2017)**

The *Professional Guidance on Planning & Noise* (ProPG) document was published in May 2017. The document was prepared by a working group comprising members of the Association of Noise Consultants (ANC), the Institute of Acoustics (IOA) and the Chartered Institute of Environmental Health (CIEH). Although not a government document, since it's adoption it has been generally considered as a best practice guidance and has been widely adopted in the absence of equivalent Irish guidance.

The ProPG outlines a systematic risk based 2 stage approach for evaluating noise exposure on prospective sites for residential development. The two primary stages of the approach can be summarised as follows:

- Stage 1 - Comprises a high-level initial noise risk assessment of the proposed site considering either measured and or predicted noise levels, and;
- Stage 2 – Involves a full detailed appraisal of the proposed development covering four “key elements” that include:
  - Element 1 - Good Acoustic Design Process;
  - Element 2 - Noise Level Guidelines;
  - Element 3 - External Amenity Area Noise Assessment

A key component of the evaluation process is the preparation and delivery of an Acoustic Design Statement (ADS) which is intended for submission to the planning authority. This document is intended to clearly outline the methodology and findings of the Stage 1 and Stage 2 assessments, to illustrate overall compliance of the scheme with best practice guideline. ProPG outlines the following possible recommendations in relation to the findings of the ADS:

- A. *Planning consent may be granted without any need for noise conditions;*
- B. *Planning consent may be granted subject to the inclusion of suitable noise conditions;*
- C. *Planning consent should be refused on noise grounds in order to avoid significant adverse effects (“avoid”); or,*
- D. *Planning consent should be refused on noise grounds in order to prevent unacceptable adverse effects (“prevent”).*

Section 3.0 of the ProPG provides a more detailed guide on decision making to aid local authority planners on how to interpret the findings of an accompanying Acoustic Design Statement (ADS). A summary of the ProPG approach is illustrated in Figure 9.4.

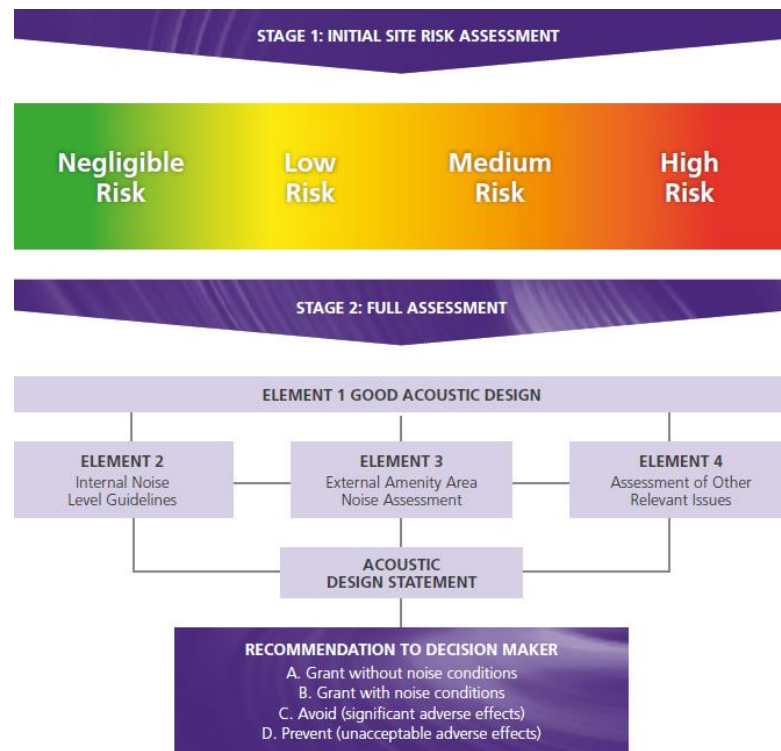


Figure 9.4 ProPG Approach (Source: ProPG)

Stage 1 – Noise Risk Assessment

The initial noise risk assessment is intended to provide an early indication of any acoustic issues that may be encountered. It calls for the categorisation of the site as a negligible, low, medium or high risk based on the pre-existing noise environment. Figure 9.5 presents the basis of the initial noise risk assessment, it provides appropriate risk categories for a range of continuous noise levels either measured and/or predicted on site. It should be noted that a site should not be considered a negligible risk if more than 10 L<sub>AFmax</sub> events exceed 60 dB during the night period and the site should be considered a high risk if the L<sub>AFmax</sub> events exceed 80 dB more than 20 times a night.

Paragraph 2.9 of ProPG states that:

*“The noise risk assessment may be based on measurements or prediction (or a combination of both) as appropriate and should aim to describe noise levels over a “typical worst case” 24 hour day either now or in the foreseeable future.”*

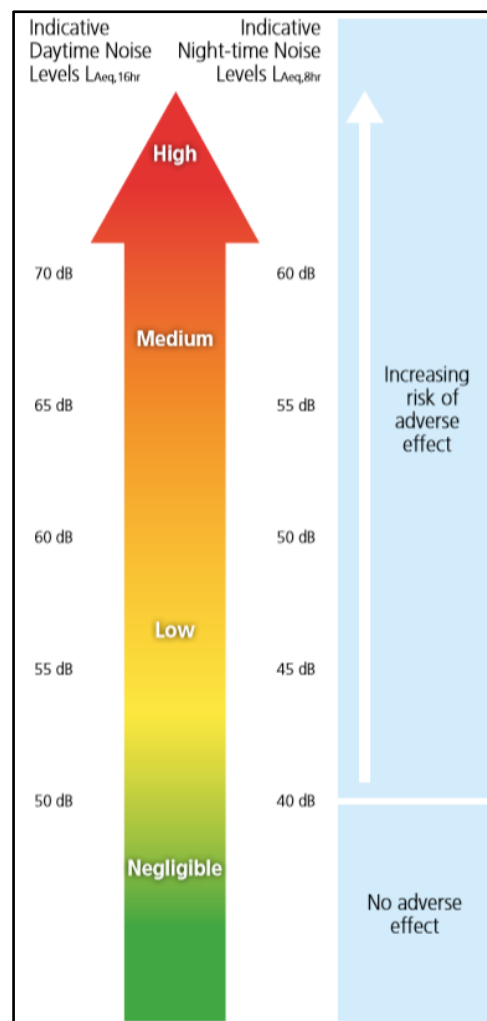


Figure 9.5 ProPG Stage 1 - Initial Noise Risk Assessment

In this instance reference is made to baseline noise surveys undertaken at the site and the noise contours calculated across the site for existing rail noise. ProPG states the following with respect to the initial risk assessment:

*“The risk assessment should not include the impact of any new or additional mitigation measures that may subsequently be included in development proposals for the site and proposed as part of a subsequent planning application. In other words, the risk assessment should include the acoustic effect of any existing site features that will remain (e.g. retained buildings, changes in ground level) and exclude the acoustic effect of any site features that will not remain (e.g. buildings to be demolished, fences and barriers to be removed) if development proceeds.”*

On reviews of noise levels at the site, it is concluded that the site lies within a low noise risk across the majority of the site for day and night-time periods. The south of the site immediately in proximity to the rail line is categorised as low to medium noise risk. ProPG states the following with respect to negligible to medium risks categories:



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

Following the guidance contained in ProPG, therefore, the site under consideration is predominately categorised as low noise risk.

#### 9.12.4 Proposed Development

The noise model was updated to incorporate the proposed buildings in order to determine noise levels across the site taking into account the screening effect of the new buildings and to determine specific noise levels at the most exposed residential facades. Figures 9.6 and 9.7 display the calculated noise contours across the site at a height of 4m for day and night-time periods respectively.



Figure 9.6 Rail Noise Levels with development buildings – Daytime



Figure 9.7 Rail Noise Levels with development buildings – Night-time

The results of the assessment indicate that during daytime periods, rail noise levels are highest along the immediate southern boundary of the site at the terrace houses and a portion of the apartment buildings. Calculated noise levels are between 58 and 63dB  $L_{Aeq,16hr}$  at these properties. At the remaining properties, calculated daytime noise levels are in the range of <35 to 57dB  $L_{Aeq,16hr}$  depending on the façade orientation.

During night-time periods, rail noise levels are similarly highest along the immediate southern boundary with calculated noise levels between 52 and 57dB  $L_{Aeq,8hr}$  at the most exposed properties. At the remaining properties, calculated daytime noise levels are in the range of <25 to 52dB  $L_{Aeq,8hr}$  depending on the façade orientation.

### 9.12.5 Future Noise Climate

The new local access road long the eastern site boundary will carry traffic volumes to serve the proposed development under consideration here in addition to the permitted development to the south-east of the site and other potential future zoned development lands. In order to assess potential traffic noise levels associated with this road in addition to the existing Marsh Road to the north of the site, the site model was updated to include traffic flows along these roads obtained from the traffic consultants for the project. The calculation methodology used is the Calculation of Road Traffic Noise (CRTN). An AADT traffic flow of 2,800 is projected along the new access road, 6,300 along the Marsh Road east of the site access and 8,000 along the Marsh Road to the west of the site for a future design year of 2037. The calculated traffic noise levels across the site for daytime periods are presented in Figures 9.8 at a height of 4m above ground.



Figure 9.8 Road traffic noise Levels with development buildings – Daytime



During daytime periods, road noise levels are highest along the eastern site boundary closest to the new access road. Daytime noise levels are typically of the order of 55 to 60dB LAeq,16hr at the eastern facades of the office building, creche and Block 7 apartment building. At the south-east of the site, residential dwellings closets to the new access road fall within the 55 to 60dB LAeq,16hr daytime noise contour. Across the remainder of the site, road traffic noise levels are typically below 50dB LAeq,16hr.

The calculated traffic noise levels across the site for night-time periods are presented in Figure 9.9 at a height of 4m above ground.



Figure 9.9 Road traffic noise Levels with development buildings – Night-time

During night-time periods, road noise levels are typically of the order of 48 to 52dB  $L_{Aeq,8hr}$  at the eastern facades of Block 7 apartment building and residential houses at the south-east of the site. Across the remainder of the site, road traffic noise levels are below 45dB  $L_{Aeq,8hr}$ .

#### 9.12.6 Stage 2 – Full Acoustic Assessment

##### **9.12.6.1 Element 1 – Good Acoustic Design Process**

###### *ProPG Guidance*

In practice, good acoustic design should deliver the optimum acoustic design for a particular site without adversely affecting residential amenity or the quality of life or occupants or compromising other sustainable design objectives. Section 2.23 of the ProPG outlines the following checklist for Good Acoustic Design:

- Check the feasibility of relocating, or reducing noise levels from relevant sources;
- Consider options for planning the site or building layout;
- Consider the orientation of proposed building(s);
- Select construction types and methods for meeting building performance requirements;
- Examine the effects of noise control measures on ventilation, fire regulation, health and safety, cost, CDM (construction, design and management) etc;
- Assess the viability of alternative solutions; and,
- Assess external amenity area noise.

In the context of the proposed development, each of the considerations listed above have been addressed in the following subsections.

###### *Relocation of Reduction of Noise from Source*

Noise sources incident upon the development site have been determined to be low to medium. With regards to rail noise, this source is located outside the redline boundary of the site and therefore it is beyond the scope of this development to introduce any noise mitigation at source. The alignment of the local access road provides noise screening through the lowered ground levels towards the north of the site. Traffic volumes along this road are sufficiently low such that operational noise levels are not significant at the most exposed buildings.

### *Planning, Layout and Orientation*

As part of the project design, the proposed buildings are set back from the rail line boundary in accordance with guidelines from Irish Rail. The layout of the site is such that the low rise buildings are predominately located along the southern site boundary to avoid upper floors overlooking the rail line. The orientation of Blocks 9 and 10 within the south of the site incorporate outdoor balcony and living spaces facing west and east, thus avoiding direct line of sight to the rail line.

### *Select Construction Types for meeting Building Regulations*

The design of all buildings are required to meet with all relevant parts of the Building Regulations. The specific detail of which will be completed at detailed design stage. In terms of the building sound insulation, the glazed elements and any required ventilation paths to achieve compliance with Part F of the Building Regulations will be the weakest elements in the façade.

Consideration will therefore be given to the provision of sound insulation performance for glazing and ventilation, where required to achieve suitable internal noise levels within the development. Achievement of acceptable internal ambient noise levels does not form part of building regulation requirements, however, this will be incorporated into the building design in line with best practice and compliance with the guidance set out in ProPG.

### *Impact of noise control measures on fire, health and safety etc.*

The good acoustic design measures that have been implemented on site, e.g. locating properties away from the road are considered to be cost neutral and do not have any significant impact on other issues.

### *Assess Viability of Alternative Solutions*

The main noise sources incident on the site are rail and road traffic. These sources are largely mitigated by the distance to the building, screening by the on-site building and orientation of building layouts to avoid overlooking of sensitive spaces to the main noise sources. All the measures listed above aid in the control of noise intrusion to the residential, office and creche building across the development site.

### *Assess External Amenity Area Noise*

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

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

Noise levels across external amenity areas is addressed in Section 9.12.6.2.

### Summary

Considering the constraints of the site, insofar as possible and without limiting the extent of the development area, the principles of Good Acoustic Design have been applied to the development.

#### 9.12.6.2 Element 2 – Internal Noise Levels

##### Internal Noise Criteria

Element 2 of the ProPG document sets out recommended internal noise targets derived from BS 8233 (2014). The recommended indoor ambient noise levels are set out in Table 9.18 and are based on annual average data.

Activity	Location	(07:00 to 23:00hrs)	(23:00 to 07:00hrs)
Resting	Living room	35 dB L <sub>Aeq,16hr</sub>	-
Dining	Dining room/area	40 dB L <sub>Aeq,16hr</sub>	-
Sleeping (daytime resting)	Bedroom	35 dB L <sub>Aeq,16hr</sub>	30 dB L <sub>Aeq,8h</sub>

Table 9.18 ProPG Internal Noise Levels

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

##### Façade Noise Levels

Noise levels have been predicted across the development site at the most exposed buildings to the south, adjacent to the rail line and those along the eastern boundary to determine the external façade noise level incident on the proposed buildings during day and night-time periods. The calculated levels are cumulative, taking account of rail and road sources, where relevant, at specific buildings. Noise levels are calculated across all floors of the buildings in question. Table 9.19 summarises the calculated noise level at the most exposed buildings. For houses and duplex buildings, results are presented for the highest floor level (2<sup>nd</sup> floor). For apartment buildings, the calculated levels from first to upper floors are included.



Assessment Building	Calculated Noise level, dB,	
	Daytime, L <sub>Aeq</sub> , 16hr	Night-time, L <sub>Aeq</sub> , 8hr
Terrace Houses 1 - 4 (upper levels)	56 - 61	48 - 53
Terrace Houses 9 - 12(upper levels)	57 - 60	51 - 52
Terrace Houses 13 -15 (upper levels)	61 - 62	55 - 56
Terrace Houses 16 -18 (upper levels)	60 - 61	54 - 55
Terrace Houses 19 -34 (upper levels)	60 - 63	54 - 57
Apartment Block 9 (Bedrooms South & South east)	57 - 58	50 - 52
Apartment Block 9 (Living Room & Balcony south-east)	57 - 58	50 - 52
Apartment Block 9 (Living Room & Balcony south-west)	46 - 52	41 - 48
Apartment Block 10 (Bedrooms South & South east)	53 - 56	49 - 52
Apartment Block 10 (Living Room & Balcony south-east)	52 - 56	47 - 51
Apartment Block 10 (Living Room & Balcony south-west)	47 - 50	44 - 47
Duplex 174 - 186 (West) - upper levels	47 - 50	44 - 47
Duplex 186 - 197 (West) - upper levels	42 - 45	39 - 42
Terrace Houses 52 - 55	52 - 53	45 - 46
Terrace Houses 56 - 60	54 - 57	47 - 50
Terrace Houses 61 - 64	58 - 60	50 - 52
Apartment Block 7 (East façade)	57 - 60	50 - 53
Office Block (east façade)	55 - 60	n/a
Creche (east façade)	58 - 60	n/a
Apartment Block 1 (east façade)	56 - 57	49 - 50

Table 9.19 External Noise Levels

Highest noise levels are calculated at the terrace houses along the south and south east of the development site, representing the southern façade of these houses facing towards the rail line, and the local access road, where relevant. Noise levels of between 57 and 63dB  $L_{Aeq,16hr}$  daytime and 50 to 57dB  $L_{Aeq,8hr}$  night-time are calculated at these properties.

At the remaining buildings, daytime noise levels are below 60dB  $L_{Aeq,16hr}$  and night-time noise levels are below ~52dB  $L_{Aeq,8hr}$ .

#### *Internal Noise Levels with Open / Closed Windows*

In the first instance, it is important to note the typical level of sound reduction offered by a partially open window is typically applied as 15dB<sup>1</sup> to 18dB.

Considering the design goals outlined in Table 9.18 and a sound reduction across an open window of 15dB, the free-field noise levels that would be required to ensure that internal noise levels do not exceed good (i.e. at or below the internal noise levels) or reasonable internal noise levels with windows open (i.e. 5 dB above the internal noise levels) have been summarised in Table 9.20.

Level Desired	Day 07:00 to 23:00hrs	Night 23:00 to 07:00hrs
Good (i.e. at or below the internal noise levels)	50 – 55dB $L_{Aeq,16hour}$	45dB $L_{Aeq,8hour}$
Reasonable (i.e. 5 dB above the internal noise levels)	55 – 60dB $L_{Aeq,16hour}$	50dB $L_{Aeq,8hour}$

*Table 9.20* External Noise Levels Required to Achieve Internal Noise Levels with windows open

Reference to the calculated noise levels within Table 9.19, is it possible to achieve good and reasonable internal daytime noise levels within the majority of the development buildings with an open window scenario. At the upper floors of terrace houses along the southern façade, daytime internal noise levels are likely to just exceed these levels.

During night-time periods, is it possible to achieve good and reasonable internal noise levels within the majority of the development buildings with an open window scenario. At the upper floors of terrace houses along the south boundaries and upper floors of apartment blocks facing the rail line and internal road, night-time internal noise levels will exceed these levels with a window open scenario.

<sup>1</sup> Section 2.33 of ProPG, additional information can be found in the DEFRA NANR116: 'Open/Closed Window Research' Sound Insulation Through Ventilated Domestic Windows'

In order to assess the requirements for achievement of acceptable internal noise levels, appropriate specifications to the site boundary treatment should be considered along with appropriate acoustic specifications to windows and passive vents will be provided to ensure the rooms are adequately ventilated and achieve the good internal noise levels detailed here.

#### *Recommend Boundary Treatment*

Review of calculated noise levels across the site indicate that mitigation should be included along the southern site boundary to provide screening to terrace houses overlooking the rail line. The inclusion of a 2.5m high boundary solid screen (wall, solid timber acoustic fence) is recommended to the south of the terrace properties 15 to 34 in order to reduce rail noise levels at ground to second floor windows. Figure 9.10 illustrates the location of the proposed boundary screening to the south of the site.



Figure 9.10 Proposed Boundary Screening to South of Site

#### *Recommend Façade Treatment*

The British Standard BS EN 12354-3: 2000: *Building acoustics – Estimation of acoustic performance of buildings from the performance of elements – Part 3: Airborne sound insulation against outdoor sound* provides a calculation methodology for determining the sound insulation performance of the external envelope of a building. The method is based on an elemental analysis of the building envelope and can take into account both the direct and flanking transmission paths.

The Standard allows the acoustic performance of the building to be assessed taking into account the following:

- Construction type of each element (i.e. windows, walls, etc.);
- Area of each element;
- Shape of the façade, and;
- Characteristics of the receiving room.

The principals outlined in BS EN 12354-3 are also referred to in BS8233 and Annex G of BS8233 provide a calculation method to determine the internal noise level within a building using the composite sound insulation performance calculated using the methods outlined in BS EN 12354-3. The methodology outlined in Annex G of BS8233 has been adopted here to determine the required performance of the building facades. This approach corrects the noise levels to account for the frequency content of the source in question. In this instance, rail and road traffic noise, depending on the buildings in question. For properties with cumulative impacts from both rail and road, the frequency content of the dominant source has been used for calculations.

### Glazing

As is the case in most buildings, the glazed elements of the building envelope are typically the weakest element from a sound insulation perspective. In this instance the facades will be provided with glazing that achieves the minimum sound insulation performance as set out in Table 9.21.

Glazing Specification	Octave Band Centre Frequency (Hz)						$R_w$	Vent
	125	250	500	1k	2k	4k		$D_{ne,w}$
Type A	25	22	33	40	43	44	36	37
Type B	20	19	29	38	36	45	32	34

Table 9.21 Sound Insulation Performance Requirements for Glazing, SRI (dB)

The acoustic specification for Glazing Type A is recommended for the south façade windows of terrace Houses 1 to 4 and 13 to 34, in addition to the east façade windows of bedrooms and living spaces of Apartment Block 7. The sound insulation performance of this glazing can be achieved using a double-glazed configuration with slightly thicker glass panes than standard double glazing. An example configuration includes 6 glass – 12mm cavity and 8mm. As summary of the façade treatment measures has been indicated in Figure 9.11.

Glazing Type B is recommended for the remainder of the site and can be achieved using a standard double glazed configuration (e.g. 4mm glass – 12mm cavity – 6mm glass).

The typical glazing configurations and overall  $R_w$  outlined above are provided for information purposes only. The over-riding requirement is the Octave Band sound insulation performance values which may also be achieved using alternative glazing configurations. Any alternative system will be required to provide the same level of sound insulation performance set out in Table 9.21 or greater.

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

It is advised that the window supplier provides laboratory tests confirming the sound insulation performance, (to British Standard 2750 Part 3:1980 and British Standard 5821, or British Standard EN ISO 140 Part 3 1995 and British Standard EN ISO 717, 1997). It is important to note that the acoustic performance specifications detailed herein are minimum requirements which apply to the overall glazing system when installed on site.



Figure 9.11 Enhanced Glazing Locations (Type A)

### *Wall Construction*

In general, all wall constructions (i.e. block work or concrete) offer a high degree of sound insulation, much greater than that offered by the glazing systems. Therefore, noise intrusion via the wall construction will be minimal. The calculated internal noise levels across the building façade have assumed a minimum sound reduction index of 50 dB  $R_w$  for this construction.

### *Ventilation*

The ventilation strategy for the development will be in accordance with Part F of the Building Regulations and will be finalised at the detail design stage. Options which will be considered to achieve compliance with background ventilation requirements will be adjustable hit and miss acoustic ventilators or trickle vents built into the façade or window frames respectively. It is recommended that the wall vents are specified to achieve a sound insulation performance of 37dB  $D_{n,e,w}$  for rooms with glazing Type A and a sound insulation performance of 34dB  $D_{n,e,w}$  for rooms with glazing Type B. This specification can be achieved by a range of proprietary acoustic trickle vents.

### *Internal Noise Levels*

Taking into account the external façade levels and the specified acoustic performance to the building envelope, the internal noise levels have been calculated.

Second floor level of terrace houses to the south and south east of the site, upper floors of east façade of Apartment Block 7 and upper floors south façade windows within Blocks 9 and 10 will achieve good internal noise levels with windows closed, but will likely exceed reasonable internal noise levels with windows open.

For all other buildings within the development site, the good to reasonable internal noise levels are achieved with both windows open and closed.

#### **9.12.6.3 Element 3 – External Amenity Areas**

External noise levels within the public open spaces and private gardens across the development site are within the recommended range of noise levels from ProPG of between 50 – 55 dB  $L_{Aeq,16hr}$ . A small portion of the public open space and playground located in proximity to the local access road within the south east area of the site falls within the range of 55 to 60dB  $L_{Aeq,16hr}$ . Given, however, this relates to a portion of this green space area in addition to the availability of other available spaces with lower noise levels across the site, the objectives of achieving suitable external noise levels is achieved within the overall site.

### 9.12.7 **Conclusion**

An initial site noise risk assessment has been carried out on the proposed mixed use development at Marsh Road, Drogheda in the townland of Newtown, Drogheda, Co. Louth. The initial site assessment has classified the development site as having a low to medium noise risk in accordance with ProPG guidance. This was determined through a review of baseline noise measurements, noise modelling of the site for existing rail noise and potential future traffic noise from existing roads the and proposed site access road.

The assessment concluded that overall environmental noise levels at the proposed residential buildings, office block and creche are not significant across the majority of the site and hence would not require any specific noise mitigation measures in order to achieve suitable internal noise levels with windows open and closed.

Highest noise levels are calculated at the terrace houses along the southern site boundary and along the east façade of Apartment Block 7 and terrace houses along the east and north-east of the site overlooking the new site access road.

Boundary treatment is recommended to the south of the site using a solid blockwork wall, or acoustic timber screen at a height of 2.5m to reduce noise levels external to terrace houses along this boundary. In addition to physical screening, enhanced acoustic glazing and vents are recommended at these properties and at windows to the east of Apartment Block 7. Specific details of boundary treatments and glazing requirements are set out in the relevant sections of this report.