REPORT

Trinity Consultants

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Noise & Vibration Assessment – Anglesea Terrace Cork

Project Title: Noise & Vibration Impact assessment for Proposed Residential Development, Anglesea Terrace, Co. Cork

CLIENT	DOCUMENT REFERENCE	DATE
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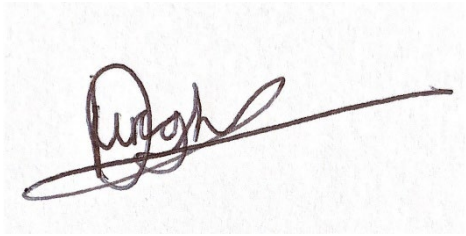
Signature		
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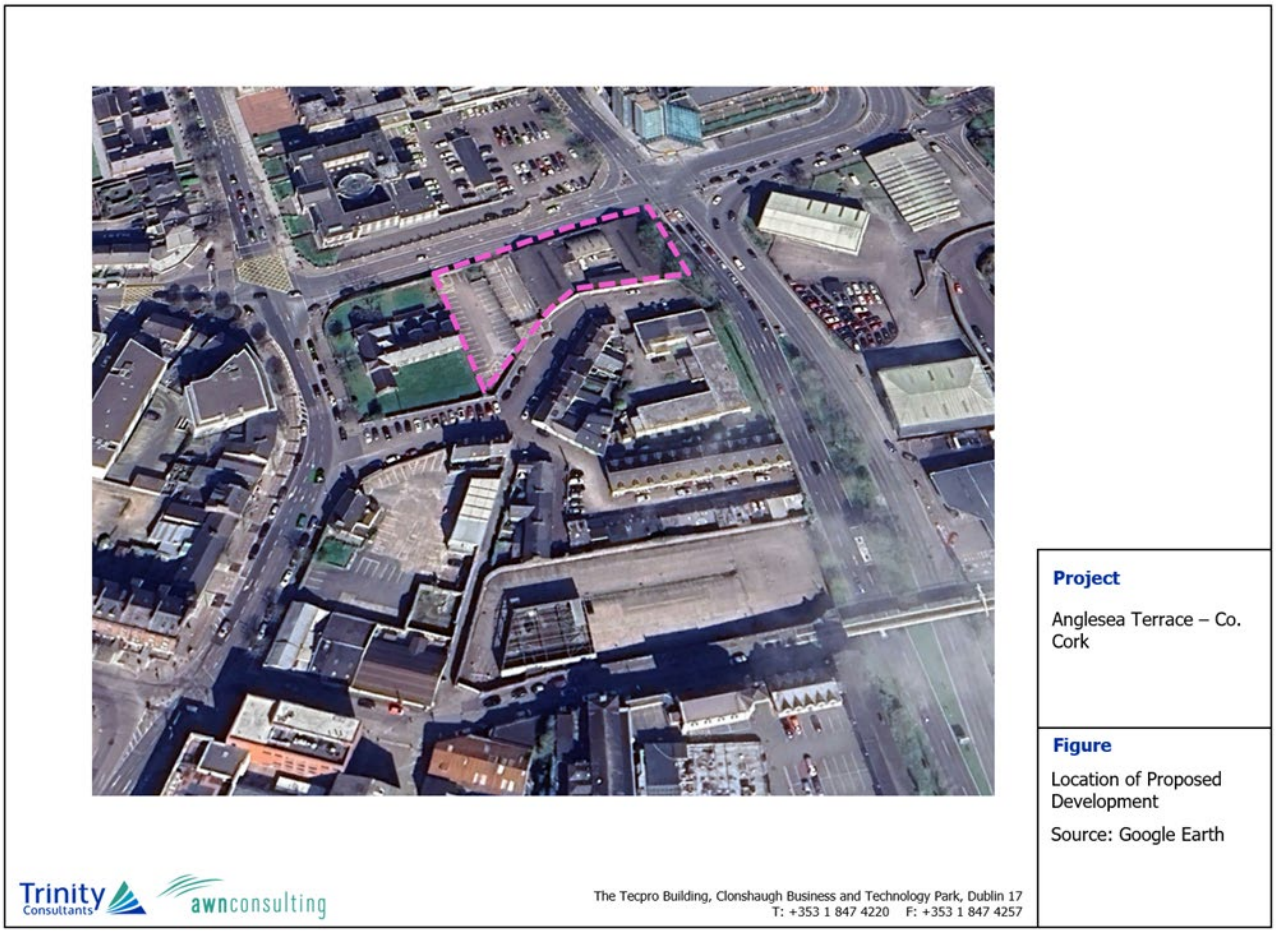
1. INTRODUCTION

AWN Consulting, a Trinity Consultants Company, has been commissioned to prepare a noise and vibration impact assessment relating to the proposed residential development at Anglesea Terrace, Co. Cork. The location of the proposed development is shown in Figure 1-1.

Figure 1-1. Location of Proposed Development



The proposed development comprises of the demolition and removal of 4 no. existing buildings on site and the construction of 147 no. apartments, and all ancillary site development works including access, bike/bin storage, plant and amenity areas. The proposed development site is bound by the South Link Road to the east and Old Station Road to the north. The site is accessed from Anglesea Terrace to the south of the site.

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

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

Noise and vibration are considered in terms of two aspects. The first is the outward effect of the proposed development on its surrounding environment, and the second is the inward effect of existing noise sources in the surrounding environment on the development itself.

2. METHODOLOGY

2.1 Assessment Overview

The following methodology has been prepared based on the requirements of the Environmental Protection Agency (EPA) *Guidelines the Information to be Contained in Environmental Impact Assessment Reports* (EPA 2022) and on AWN's experience of preparing the noise and vibration reports for similar developments. The following approach has been used for this assessment:

- Baseline noise monitoring has been undertaken at the development site in order to characterise the existing noise environment;
- A review of applicable standards and guidelines has been reviewed in order to set a range of acceptable noise and vibration criteria for the construction and operational phases of the proposed development;
- Predictive calculations have been performed to estimate the likely noise emissions during the construction phase of the proposed development at the nearest Noise sensitive Locations (NSLs) to the site;
- Predictive calculations have been performed to assess the potential effects associated with the operation of the proposed development at NSLs surrounding the site;
- An assessment has been completed of potential cumulative effects that may arise as a result of the proposed development and other existing or proposed plans and projects;
- 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 effect of noise from the surrounding environment into the proposed residential buildings has also been assessed to determine the requirements, for additional noise mitigation to ensure a suitable internal noise environment for residential amenity.

2.2 Criteria for Rating of Impacts

The assessment has been undertaken with reference to the most appropriate guidance documents relating to environmental noise and vibration which are set out in the following sections. There are no statutory standards in Ireland relating to noise and vibration limit values for construction works or for environmental noise relating to the operational phase. In the absence of specific statutory Irish guidelines, the assessment has made reference to non-statutory national guidelines, where available, in addition to international standards and guidelines relating to noise and / or vibration impact for environmental sources.

In addition to specific noise and vibration guidance documents, the following EPA *Guidelines the Information to be Contained in Environmental Impact Assessment Reports* (EPA 2022) were considered and consulted in the preparation of this report.

The significance of noise and vibration effects has been assessed in accordance with the EPA 2022 guidelines. With regard to the quality of the effect, ratings may have positive, neutral or negative applications.

2.2.1 Assessment of Criteria and Guidelines – Construction Phase

The local authority typically controls construction activities by imposing limits on the hours of construction and consider noise limits at their discretion. Construction noise sources include construction plant and machinery, and construction related traffic on surrounding roads. Reference is made to the following guidelines and standards to inform the most appropriate construction noise and vibration significance thresholds and assessment methodologies:

- British Standard Institute (BSI) British Standard (BS) 5228-1:2009 +A1 2014 *Code of Practice for noise and vibration control of construction and open sites - Part 1: Noise* (hereafter referred to as BS 5228–1) (BSI 2014a);
- BS 5228-2:2009+A1:2014 *Code of Practice for noise and vibration control of construction and open sites - Part 2: Vibration* (hereafter referred to as BS 5228 – 2) (BSI 2014b);
- BS 7385: 1993 *Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration* (hereafter referred to as BS 7385–2) (BSI 1993);
- BS 6472-1: 2008 *Guide to evaluation of human exposure to vibration in buildings, Part 1 Vibration sources other than blasting* (hereafter referred to as BS 6472–1) (BSI 2008), and
- UK Highways England (UKHE) *Design Manual for Roads and Bridges* (DMRB) *LA 111 Sustainability and Environmental Appraisal LA 111 Noise and Vibration Revision 2* (hereafter referred to as DMRB Noise and Vibration) (UKHE 2020).

2.2.1.1 Construction Noise

2.2.1.1.1 BS 5228

There is no published statutory Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. Local authorities normally control construction activities by imposing limits on the hours of operation and/or applying noise limits for construction noise at noise-sensitive locations.

In the absence of specific noise limits, criteria relating to permissible construction noise levels for a development of this scale are taken from BS 5228-1 Annex E Section E.3.2.

The approach adopted calls for the designation of a noise sensitive location into a specific category (A, B or C) based on existing ambient noise levels in the absence of construction noise. For the appropriate assessment period (i.e. daytime in this instance) the ambient noise level is determined and rounded to the nearest 5 dB. This then sets a threshold noise value that, if exceeded at this location, indicates a potential significant noise effect is associated with the construction activities, depending on context. Note that, in accordance with the BS5228-1 guidance, this assessment criterion is only applicable to residential receptors.

Table 2-1 sets out the values which, when exceeded, signify a potential significant effect at the facades of residential receptors. These are construction noise levels only and not the cumulative noise level due to construction plus existing ambient noise.

Table 2-1. Threshold of Potential Significant Effect at Dwellings

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

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

2.2.1.1.2 Proposed Threshold Noise Levels

Taking into account the proposed documents outlined above and making reference to the baseline noise environment monitored around the development site (see Section 3), BS 5228-1 has been used to inform the assessment approach for construction noise.

The following Construction Noise Threshold (CNT) levels are proposed for the construction stage of this development:

- For residential NSLs in proximity to the main site development works, Category B values are deemed appropriate using the ABC method.
- For commercial premises, the Category C value is considered an appropriate threshold value based on the development being within an urban area near a main road within an industrial area.
- There is no scheduled night-time construction work proposed as part of the proposed development.

2.2.1.1.3 Significance of Construction Noise Levels (CNL)

In order to assist with interpretation of significance relating a calculated construction noise level (CNL), Table 2-2 includes guidance as to the likely magnitude of impact associated with construction noise, relative to the CNT. This guidance is derived from DMRB: Noise and Vibration (UKHA 2020) and adapted to include the EPA EIAR Guidelines.

Table 2-2. Construction Noise Significance Ratings

Guidelines for Noise Impact Assessment Significance (DMRB)	Construction Noise Level per Period	EPA EIAR Significance Effects	Determination
Negligible	Below or equal to baseline noise level	Not Significant	Depending on CNT, duration & baseline noise level
Minor	Above baseline noise level and below or equal to CNT	Slight to Moderate	
Moderate	Above CNT and below or equal to CNT +5 dB	Moderate to Significant	
Major	Above CNT +5 dB	Significant, to Very Significant	

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

In accordance with the DMRB Noise and Vibration Guidance, construction noise and construction traffic noise effects shall constitute a significant effect where it is determined that a major or moderate magnitude of effect will occur for a duration exceeding:

- Ten or more days or night in any 15 consecutive day or nights, or
- A total number of days exceeding 40 in any six consecutive months.

2.2.1.2 Construction Vibration

Vibration standards come in two varieties: those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. For the purpose of the proposed development, the range of relevant criteria used for surface construction works for both building protection and human comfort are expressed in terms of Peak Particle Velocity (PPV) in mm/s.

Peak Particle Velocity (PPV) is a measure of the velocity of vibration displacement in terms of millimetres per second (mm/s). It is defined as follows within BS 7385-2 (BSI 1993) as 'the maximum instantaneous velocity of a particle at a point during a given time interval'.

2.2.1.2.1 Building Response

There is no published statutory Irish guidance relating to the maximum permissible vibration level. The following standards are the most widely accepted in this context and are referenced here in relation to cosmetic or structural damage to buildings:

- British Standard BS 5228-2 (BSI 2014b), and;
- British Standard BS 7385-2 (BSI 1993).

These standards differentiate between transient and continuous vibration. Surface construction activities are transient because they occur for a limited period at a given location. Both documents recommend that, for soundly constructed residential property and similar light framed structures that are generally in good repair, a threshold for minor or cosmetic damage (i.e. non-structural damage) should be taken as a PPV (in frequency range of predominant pulse) of 15mm/s at 4 Hertz (Hz) increasing to 20mm/s at 15Hz and 50mm/s at 40Hz and above. The standard also notes that below 12.5mm/s PPV, the risk of damage tends towards zero. Where the dynamic loading caused by continuous vibration is such as to give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values in BS 5228 – 2 Table B.2 might need to be reduced by up to 50%. On a cautious basis, therefore, continuous vibration limits are set as 50% of those for transient vibration across all frequency ranges. Historically important buildings that are difficult to repair might require special consideration on a case-by-case basis, but buildings of historical importance should not be assumed to be more sensitive unless they are structurally unsound.

If a building is in an unstable state, then it will tend to be more vulnerable to the possibility of damage arising from vibration or any other groundborne disturbance. The vibration limit range for protected and historical buildings is equal to or up to 50% of that for light framed buildings, depending on structural integrity. Where no structural defects are noted, the same limit to that for light framed buildings apply. For other structures and buildings that are determined to be potentially vulnerable to vibration due to significant structural defects, more stringent criteria have been applied for transient vibration. It is assumed that known buildings and structures of this kind, will be subject to condition surveys well in advance of any construction works, and any defects identified repaired. The results of conditions surveys will determine whether a building or structure is classed as "vulnerable".

Table 2-3 sets out the limits as they apply to vibration frequencies at 4Hz where the most conservative limits are required. At higher frequencies, the relevant limit values for transient vibration within Table B.2 and Figure B.1 of BS5228-2 (BS 5228-2, 2014) will apply, with similar reductions applied for continuous vibration and those for protected structures. For line 2 of Figure B.1. at frequencies below 4Hz, a maximum displacement of 0.6mm (zero to peak) should not be exceeded. Taking the above into consideration, the vibration criteria for building response are set out in Table 2-3.

Table 2-3. Recommended Construction Vibration Threshold for Control of Building Damage

Vibration Limits for Buildings (PPV) at the closest part of building to the source of vibration, at a frequency of 4Hz		
Building Type	Transient Vibration	Continuous Vibration
Reinforced or framed structures. Industrial and heavy commercial buildings	50 mm/s	25 mm/s

Vibration Limits for Buildings (PPV) at the closest part of building to the source of vibration, at a frequency of 4Hz		
Unreinforced or light framed structures. Residential or light commercial-type buildings	15 mm/s	7.5 mm/s
Protected and Historic Buildings *Note 1	6 mm/s – 15 mm/s	3 mm/s – 7 mm/s
Identified Potentially Vulnerable Structures and Buildings with Low Vibration Threshold	3 mm/s	

Note 1: The relevant threshold value to be determined on a case-by-case basis. Where sufficient structural information is unavailable at the time of assessment, the lower values within the range will be used, depending on the specific vibration frequency.

2.2.1.2.2 Human Response

Human response to vibration stimuli occurs at orders of magnitude below those associated with any form of building damage, hence vibration levels lower than those indicated in Table 2-3 can lead to concern. Table 2-4 presents the significance table relating to potential effects to building occupants during construction based on guidance from BS5228-2 (BSI 2014b), the DMRB Noise and Vibration (UKHA 2020) document and the associated EPA significant ratings.

Table 2-4. Guidance on Effects on Human Response to PPV Magnitudes

PPV Range	BS 5228-2 (Note A, B, C)	EPA Significance Ratings
≥10 mm/s PPV	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.	Very Significant
≥1 to <10 mm/s PPV	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	Significant to Very Significant
≥0.3 to <1 mm/s PPV	Vibration might be just perceptible in residential environments.	Slight to Moderate
<0.3 mm/s PPV	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.	Not significant

Notes from BS5228-2

A) The magnitudes of the values presented apply to a measurement position that is representative of the point of entry into the recipient.
B) A transfer function (which relates an external level to an internal level) needs to be applied if only external measurements are available.
C) Single or infrequent occurrences of these levels do not necessarily correspond to the stated effect in every case. The values are provided to give an initial indication of potential effects, and where these values are routinely measured or expected then an assessment in accordance with BS 6472 (BS1 2008), and/or other available guidance, might be appropriate to determine whether the time varying exposure is likely to give rise to any degree of adverse comment.

2.2.1.3 Construction Phase Traffic Noise

Vehicular movement to and from the construction site for the proposed development will make use of the existing road network. In order to assess the potential impact of additional traffic on the human perception of noise, the following two guidelines are referenced: DMRB Noise and Vibration (UKHA 2020) and the EPA Guidelines (EPA, 2022). For construction traffic, due to the short-term period over which this impact

occurs, the magnitude of impacts is assessed against the 'short term' period in accordance with the DMRB Noise and Vibration (UKHA 2020) document.

Table 2-5 sets out the classification of changes in noise level to impact on human perception based on the guidance contained in these documents.

Table 2-5. Classification of Magnitude of traffic noise changes for Construction Traffic

Change in Sound Level (dB)	Subjective Reaction	DMRB Impact Magnitude (Short - term)	EPA Significance Ratings
Less than 1 dB	Inaudible	Negligible	Imperceptible
1 – 2.9	Barely Perceptible	Minor	Not Significant
3 – 4.9	Perceptible	Moderate	Slight, Moderate
≥ 5	Up to a doubling of loudness	Major	Significant

2.2.2 Assessment of Criteria and Guidelines – Operational Phase

The main potential source of outward noise from the proposed development will be limited to traffic flows to and from the development site onto the public roads. There may also be an element of mechanical and electrical plant required to service the apartment buildings and any associated cafes, offices or retail space. The relevant guidance documents used to assess potential operational noise, and vibration impacts on the surrounding environment are summarised below.

- BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings* (hereafter referred to as BS 8233) (BSI 2014c);
- 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 (hereafter referred to as BS EN 12354-3)
- BS 4142: 2014 +A1 2019 *Methods for Rating and Assessing Industrial and Commercial Sound* (hereafter referred to as BS 4142) (BSI 2019);
- ISO 1996-1:2016 Acoustics - *Description, measurement and assessment of environmental noise. Part 1: Basic quantities and assessment procedures* (hereafter referred to as ISO 1996 – 1) (ISO 2016);
- ISO 1996-2:2016 Acoustics - *Description, measurement and assessment of environmental noise. Part 2: Determination of environmental noise levels* (hereafter referred to as ISO 1996 – 2) (ISO 2016);
- The UK Department of *Transport Calculation of Road Traffic Noise* (hereafter referred to as the CRTN) (UK Department of Transport 1988).
- UK Highways Agency (UKHA) *Design Manual for Roads and Bridges (DMRB) LA 111 Sustainability and Environmental Appraisal LA 111 Noise and Vibration Revision 2* (UKHA 2020);
- ISO 9613 – 2)
- ANC, IOA & CIEH (2017). *ProPG: Planning & Noise – Professional Practice Guidance on Planning & Noise – New Residential Development* (hereafter referred to as ProPG: Planning and Noise).

2.2.2.1 Operational Phase – Traffic Noise

Vehicular movement to and from the proposed development will make use of the existing road networks. Given that any traffic related 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 any additional vehicular movements associated with the development.

In order to assess the potential impact of additional traffic on the human perception of noise, the following two guidelines are referenced DMRB Noise and Vibration (UKHA 2020) and the EPA EIAR Guidelines (EPA, 2022) which categorise the magnitude of effect relating to changes in road traffic. For the operational phase, traffic noise impacts are assessed against the 'long term' magnitude ratings from the DMRB. These are discussed in Table 2-6.

Table 2-6. Likely Impact Associated with Change in Traffic Noise Level

Change in Sound Level (dB)	Subjective Reaction	DMRB Impact Magnitude (Long - term)	EPA Significance Ratings
0.0 – 0.9	Inaudible	Negligible	Imperceptible
1.0 – 2.9	Barely Perceptible		Not significant
3 – 4.9	Perceptible	Minor	Slight, Moderate
5 – 9.9	Up to a doubling of loudness	Moderate	Significant
10+	Doubling of loudness and above	Major	Very significant

2.2.2.2 Operational Phase – Mechanical and Electrical Services Criteria

2.2.2.2.1 Receptors Outside the Proposed Development

The most appropriate standard used to assess the impact of a new continuous source (i.e. plant items) to a residential environment is BS 4142.This standard describes a method for assessing the impact of a specific noise source at a specific location with respect to the increase in "background" noise level that the specific noise source generates. The standard provides the following definitions that are pertinent to this application:

- "Specific sound level, $L_{Aeq, Tr}$" is equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T. This level has been determined with reference to manufacturers information for specific plant items.
- "Rating level" $L_{Ar,Tr}$ is the specific noise level plus adjustments for the character features of the sound (if any), and;
- "Background noise level" is the A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T. This level is expressed using the L_{A90} parameter. These levels were measured as part of the baseline survey.

The assessment procedure in BS 4142: 2014 is outlined as follows:

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

2.2.2.2.2 Receptors Inside the Proposed Development

In order to determine an appropriate noise criterion for residential receptors within the proposed development that will be built in future, guidance is taken from BS 8233. Recommended internal noise levels for residential settings are set out in the standard as follows:

Table 2-7. BS 8233 Recommended Internal Noise Levels

Activity	Location	Day (07:00 to 23:00hrs) dB $L_{Aeq,16hr}$	Night (23:00 to 07:00hrs) dB $L_{Aeq,8hr}$
Resting	Living room	35 dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$

For the purposes of this assessment, it is appropriate to derive external limits based on the internal criteria noted in the above. This is done by factoring in the degree of noise reduction afforded by a partially open window and typical 15 dB 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 2-7 above.

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

2.2.2.3 Operational Phase – Vibration Criteria

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

2.2.3 Criteria for Assessing Inward Noise Impacts

2.2.3.1 Cork Agglomeration Noise Action Plan (NAP) 2024 – 2028

The proposed development site is within the boundaries of the prescribed Cork Agglomeration. Figure 1 within the Cork Agglomeration Noise Action Plan highlights the location of the boundaries of the agglomeration, the site in question falls within the centre of this figure and is within the boundaries of both the Cork Agglomeration and Cork City Council.

The Cork Agglomeration Noise Action Plan was revised in 2024. To assist local authorities and in the absence of Irish planning guidance the Draft Interim National Guidance for the Consideration of Transportation Noise in the Design of New Residential Development was compiled in 2021 by the NIECE Local Authority Noise Subgroup recommends:

> *"consideration is given to the potential impact of transportation noise in line with Professional Planning Guidance (ProPG) on Planning & Noise: New Residential Development (ProPG, 2017)."*

Section 7.5 of the NAP sets out the approach for minimising the adverse impacts of noise without placing unreasonable restrictions on development. For the scenario where new developments are developed close to existing noise sources, e.g. new housing, hospitals, school, nursing home etc developments near to existing road, rail, industry etc. The NAP notes:

> *"to effectively employ the planning process for consistent noise exposure avoidance or mitigation, it is deemed beneficial to incorporate guidelines on noise exposure levels during the initial proposal and design phase of planning applications. Descriptions of guidance adopted in the Agglomeration is set out below"*

The guidance documents referred to in 7.5.1 to 7.5.4 of the NAP relate to residential development to control noise levels both within internal noise sensitive areas and within external amenity areas. The

relevant standards and guidance for the consideration of noise where there is proposed new residential development near major transportation sources (roads and railways) include:

- the Professional Planning Guidance on Planning & Noise: New Residential Development (ProPG, 2017),
- Acoustic Ventilation and Overheating, Residential Design Guide (AVO, 2021),
- BS 8233:2014 Guidance on sound Insulation and Noise Reduction for Buildings and
- ISO 19488:2021 Acoustics: Acoustic classification of dwellings.

The NAP also states the following:

> *"Applications for new residential developments in the Agglomeration will be assessed in accordance with the policies and goals outlined in the relevant City and County Development Plans. Where applicable, these include adoption of the principles of Professional Planning Guidance (ProPG) on Planning & Noise: New Residential Development, as described in Section 7.5.1.*
> *Where the assessment outcome determines the likelihood of an adverse noise impact, planning applications should be supplemented by an Acoustic Design Statement carried out by appropriately qualified acousticians and competent persons. The Acoustic Design Statement should demonstrate that all facets of ProPG have been followed."*

In accordance with this NAP policy, a ProPG Acoustic Design Statement (ADS) and assessment has been included within this report. A full assessment of the inward noise impact is presented in Section 5.2.3 of this report.

2.2.3.2 Professional Practice Guidance on Planning and Noise (ProPG:2017)

The Professional Practice 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 its 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
  - Element 4 - Other Relevant Issues

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 2-1 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_{AFmax} events exceed 60 dB during the night period and the site should be considered a high risk if the L_{AFmax} events exceed 80 dB more than 20 times a night.

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 8.8 and are based on annual average data, that is to say they omit occasional events where higher intermittent noisy events may occur.

Figure 2-1. ProPG Stage 1 – Initial Noise Risk Assessment

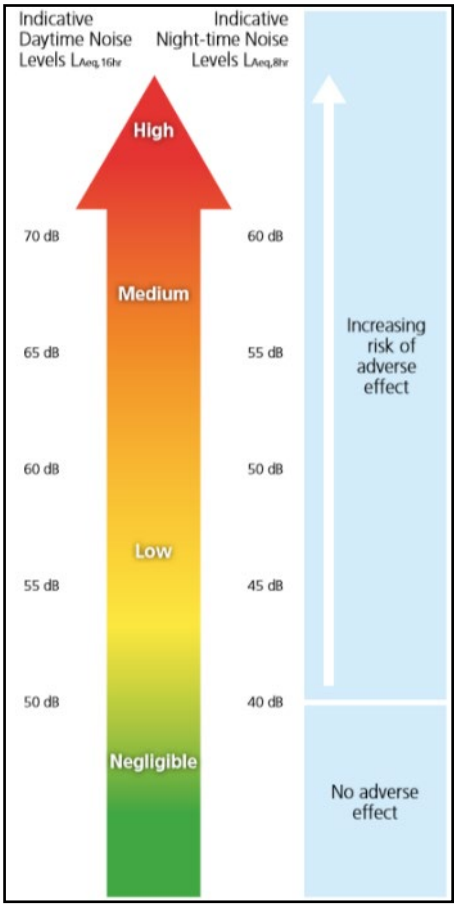


Table 2-8. ProPG Internal Noise Levels

Activity	Location	Day (07:00 to 23:00hrs) dB $L_{Aeq,16hr}$	Night (23:00 to 07:00hrs) dB $L_{Aeq,8hr}$
Resting	Living room	35 dB $L_{Aeq,16hr}$	--
Dining	Dining room/area	40 dB $L_{Aeq,16hr}$	--
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$ 45 dB $L_{Amax,T}$ [a.]

a. The document comments that the internal $L_{AFmax,T}$ noise level may be exceeded no more than 10 times per night without a significant impact occurring.

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 noise guidelines, then a relaxation of the internal L_{Aeq} values by up to 5 dB can still provide reasonable internal conditions.

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 $L_{Aeq,16hr}$."*

3. BASELINE ENVIRONMENT

The existing noise and vibration environments across the development site and in the vicinity of the nearest existing noise sensitive locations are dictated by road sources within the study area including the existing N27 road to the east, Old Station Road to the north, Anglesea Street to the west and Anglesea Terrace to the South of the proposed development. After the development of the proposed residential units, this is expected to remain to be the case. Figure 3-1 illustrates the Proposed Development in the context of its surrounding environment.

Figure 3-1. Indicative Site Location in the context of surrounding environment

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Project

Anglesea Terrace – Co. Cork

Figure

Indicative Site Location in the Context of the Surrounding Environment

Source: Google Earth

Environmental noise surveys have been conducted on the development site. Initial review of the noise survey data confirms the highest noise levels are experienced along the northern and western boundaries of the site which borders the N27 and Old Station Road. These recent noise survey findings are largely in line with the noise maps prepared by Transport Infrastructure Ireland (TII) - Round 4 Noise Maps for Roads –Agglomeration.

The following section outlines the results of the noise survey undertaken.

3.1 Environmental Noise Survey

An environmental noise survey has been conducted at the site in order to quantify the existing noise environment within the vicinity of the site. The survey was conducted in general accordance with ISO

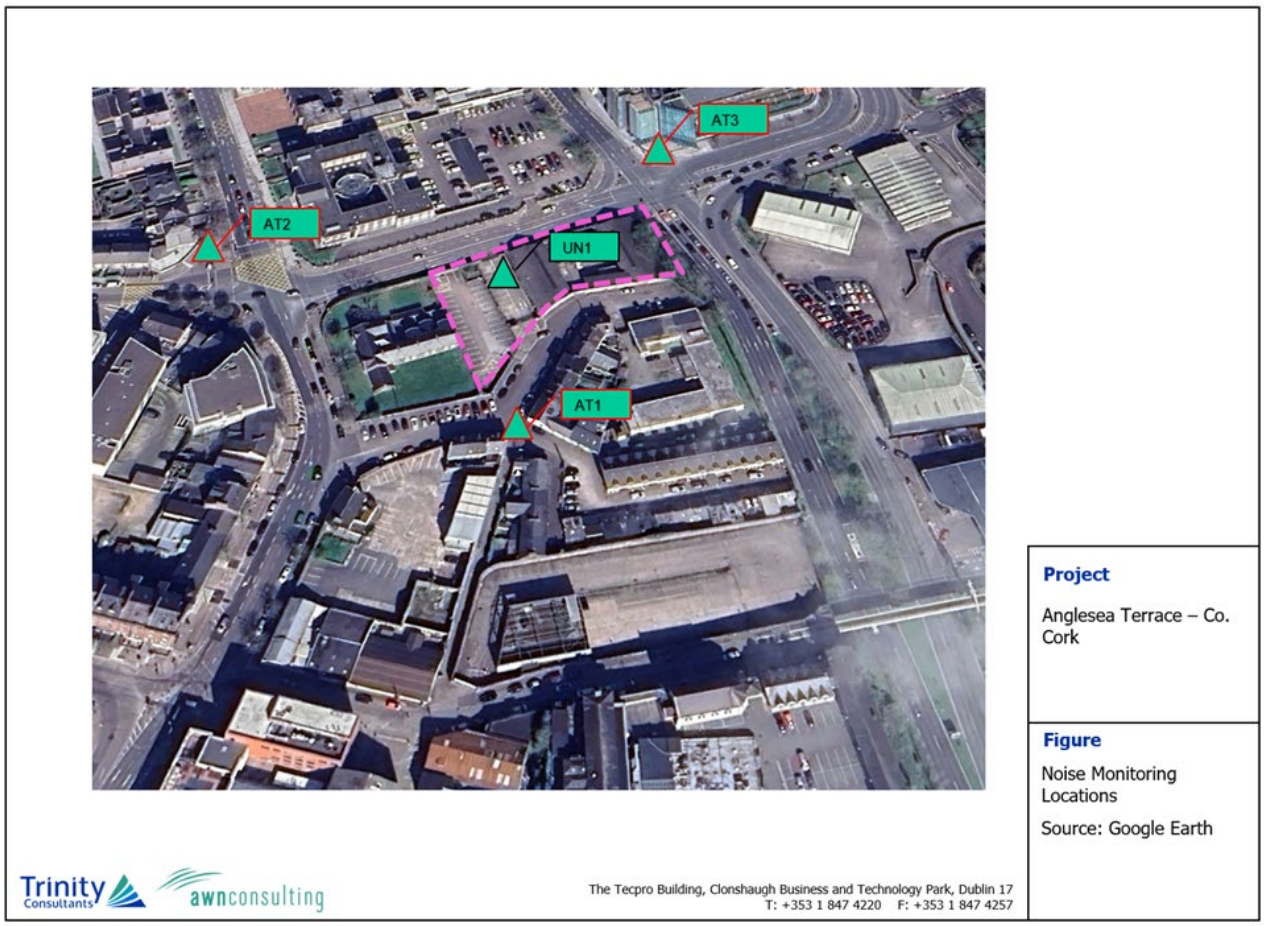
1996: 2017: Acoustics – Description, measurement and assessment of environmental noise. Specific details are set out below.

3.1.1 Choice of Measurement Locations

The monitoring locations for this survey are described below and illustrated in Figure 3-2 with the indicative site location indicated in green.

- AT1 – Attended measurement position representative of existing NSLs (Noise Sensitive Locations) to the south of the proposed development along Anglesea Terrace
- AT2 – Attended measurement position representative of daytime noise levels along R610 to the west of the proposed development
- AT3 – Attended measurement position representative of daytime noise levels along the N27 to the east of the proposed development
- UN1 – Unattended measurement position representative of noise levels at the proposed development site along Old Station Road.

Figure 3-2. Noise Monitoring Locations



3.1.2 Survey Periods

The noise survey was carried out over the following periods:

Table 3-1. Noise Survey Periods

Survey Position	Survey Period
AT1	Attended daytime surveys were conducted over the period of 09:37 to 11:44 on the 11th November 2024.
AT2	Attended daytime surveys were conducted over the period of 09:56 to 12:02 on the 11th November 2024.
AT3	Attended daytime surveys were conducted over the period of 10:15 to 12:23 on the 11th November 2024.
UN1	Unattended surveys were conducted from 13:15 on the 11th November 2024 to 13:30 on the 12th November 2024.

3.1.3 Instrumentation and Personnel

All measurements were undertaken by AWN Consulting using a Class 1 Precision Sound Level Meters and associated hardware that was appropriately calibrated.

3.1.4 Measurement Parameters

The following measurement parameters were measured and are discussed within this report.

$L_{Aeq,T}$ is the A-weighted equivalent continuous steady sound level during the sample period and effectively represents an average value over the defined measurement period, T.

L_{AFMax} is the maximum sound level that is exceeded during the survey period measured using fast weighting of 1 second.

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

$L_{A90,T}$ is the A-weighted sound level that is exceeded for 90% of the sample period; generally used to quantify background noise. The T is the sample period the parameter is measured over.

3.1.5 Survey Results

The survey results for the monitoring locations have been summarised for each of the periods discussed within Table 3-1 are discussed below. The daytime period is defined as the 16-hour period between 07:00 and 23:00hrs and the nighttime period is defined as the 8-hour period between 23:00 and 07:00hrs.

3.1.5.1 Location AT1

The survey results for AT1 are given in Table 3-2.

Table 3-2. AT1 Noise Monitoring Results

Date	Time	Measured Noise Levels (dB re.2x10-5Pa)			
		$L_{Aeq,15mins}$	L_{Amax}	$L_{A10,15mins}$	$L_{A90,15mins}$
11 November 2024	09:37	54	72	57	47
	10:34	55	73	59	46
	11:29	49	64	50	45

The noise environment at the measurement Location AT1 was typically dominated by noise from road traffic from the adjacent road networks including vehicle movements and emergency sirens, other noise sources noted included residential activity and bird song. Ambient daytime noise levels were in the range of 49 to 55 dB $L_{Aeq,15mins}$ while daytime background noise levels were in the range of 45 to 47 dB $L_{A90,15mins}$.

3.1.5.2 Location AT2

The survey results for AT2 are given in Table 3-3.

Table 3-3. AT2 Noise Monitoring Results

Date	Time	Measured Noise Levels (dB re.2x10-5Pa)			
		$L_{Aeq,15mins}$	L_{Amax}	$L_{A10,15mins}$	$L_{A90,15mins}$
11 November 2024	09:56	67	85	69	58
	10:52	72	95	69	57
	11:47	67	87	68	57

The noise environment at the measurement Location AT2 was typically dominated by road traffic noise from the R610, pedestrian movements and emergency sirens. Ambient daytime noise levels were in the range of 67 to 72 dB $L_{Aeq,15mins}$ while daytime background noise levels were in the range of 57 to 58 dB $L_{A90,15mins}$.

3.1.5.3 Location AT3

The survey results for AT3 are given in Table 3-4

Table 3-4. AT3 Noise Monitoring Results

Date	Time	Measured Noise Levels (dB re.2x10-5Pa)			
		$L_{Aeq,15mins}$	L_{Amax}	$L_{A10,15mins}$	$L_{A90,15mins}$
11 November 2024	10:15	70	86	73	64
	11:10	71	81	73	64
	12:08	71	92	73	65

The noise environment at the measurement Location AT3 was typically dominated by road traffic noise from then N27, pedestrian movements and traffic light noise. Ambient daytime noise levels were in the range of 70 to 71 dB $L_{Aeq,15mins}$ while daytime background noise levels were in the range of 64 to 65 dB $L_{A90,15mins}$.

3.1.5.4 Location UN1

The survey results for UN1 are given in Table 3-5. The 15-minute measurement intervals are averaged over hourly periods and the ranges given for the maximum values recorded within that period.

Table 3-5. UN1 Noise Monitoring Results

Date	Period	Hour	Measured Noise Levels (dB re.2x10-5Pa)		
			$L_{Aeq,15mins}$	$L_{A90,15mins}$	L_{AMax}
11/11/2024	Day	13:00 – 14:00	66	57	76 - 82

Date	Period	Hour	Measured Noise Levels (dB re.2x10-5Pa)		
			$L_{Aeq,15mins}$	$L_{A90,15mins}$	L_{AMax}
	Day	14:00 – 15:00	66	57	78 - 80
	Day	15:00 – 16:00	67	58	80 -85
	Day	16:00 – 17:00	66	58	78 - 86
	Day	17:00 – 18:00	66	58	78 - 82
	Day	18:00 – 19:00	65	56	76 - 81
	Day	19:00 – 20:00	66	56	77 - 83
	Day	20:00 – 21:00	65	54	78 - 90
	Day	21:00 – 22:00	64	51	78 - 82
	Day	22:00 – 23:00	62	48	74 - 80
	Night	23:00 – 00:00	60	45	72 - 74
12/11/2024	Night	00:00 – 01:00	58	41	74 - 76
	Night	01:00 – 02:00	54	38	70 - 74
	Night	02:00 – 03:00	55	39	72 - 73
	Night	03:00 – 04:00	55	39	74 - 77
	Night	04:00 – 05:00	57	41	77 - 83
	Night	05:00 – 06:00	60	45	77 - 84
	Night	06:00 – 07:00	64	53	74 - 80
	Day	07:00 – 08:00	66	58	76 - 82
	Day	08:00 – 09:00	68	58	77 - 92
	Day	09:00 – 10:00	67	59	79 - 82
	Day	10:00 – 11:00	66	58	78 - 84
	Day	11:00 – 12:00	66	57	76 - 88
	Day	12:00 – 13:00	65	57	75 - 80
	Day	13:00 – 14:00	66	57	75 - 76
11/11/2024 - 12/11/2024	**Day Average**		**66**	**59**	**74 - 92**
	Night Average		**59**	**42**	**70 - 84**

The main noise contributor noted on the installation and collection of the unattended meter was traffic noise. Ambient daytime noise levels were an average of 66 dB $L_{Aeq,16\ hour}$ while background noise levels were an average of 59 dB $L_{A90,16\ hour}$. Nighttime noise levels were an average of 59 dB $L_{Aeq,\ 8\ hour}$ whilst background noise levels were an average of 42 dB $L_{A90,\ 8\ hour}$.

3.2 Desktop Review of Noise Mapping

A desktop review of publicly available data has been undertaken to further characterise the baseline noise environment in the study area. Reference has been made to the most recent Round 4 noise maps published by the Environmental Protection Agency (EPA) (http://gis.epa.ie) for road traffic within the Cork Agglomeration using the agglomeration noise maps. The published noise maps are provided for the overall day-evening-night period in terms of L_{den} and the L_{night} parameters, defined below.

L_{den} is the 24-hour noise rating level determined by the averaging of the L_{day} with the $L_{evening}$ (plus a 5 dB penalty) and the L_{night} (plus a 10 dB penalty). L_{den} is calculated using the following formula, as defined within the Noise Regulations:

Where:

L_{day} is the A-weighted long-term average sound level as defined in ISO 1996-2, determined over all day periods of a year. The 12-hour daytime period is between 07:00hrs and 19:00hrs.

$L_{evening}$ is the A-weighted long-term average sound level as defined in ISO 1996-2, determined over all the evening periods of a year. The four-hour evening period is between 19:00hrs and 23:00hrs.

L_{night} is the A-weighted long-term average sound level as defined in ISO 1996-2, determined over all the night periods of a year. The eight-hour night-time period is between 23:00hrs and 07:00hrs.

The mapping available has been used to further inform the existing noise levels on the potential development site. This is discussed below.

3.2.1 Site Road Noise

The Proposed Development site is subject to noise from the N27 road to the east, Old Station Road to the north and Anglesea Street to the west of the proposed development.

Figure 3-3 and Figure 3-4 present the mapped road noise levels in the vicinity of the site in terms of the L_{den} and L_{night} parameters.

Figure 3-3. Mapped dB L_{den} Traffic Noise Level within vicinity of the proposed development (Source: http://gis.epa.ie)

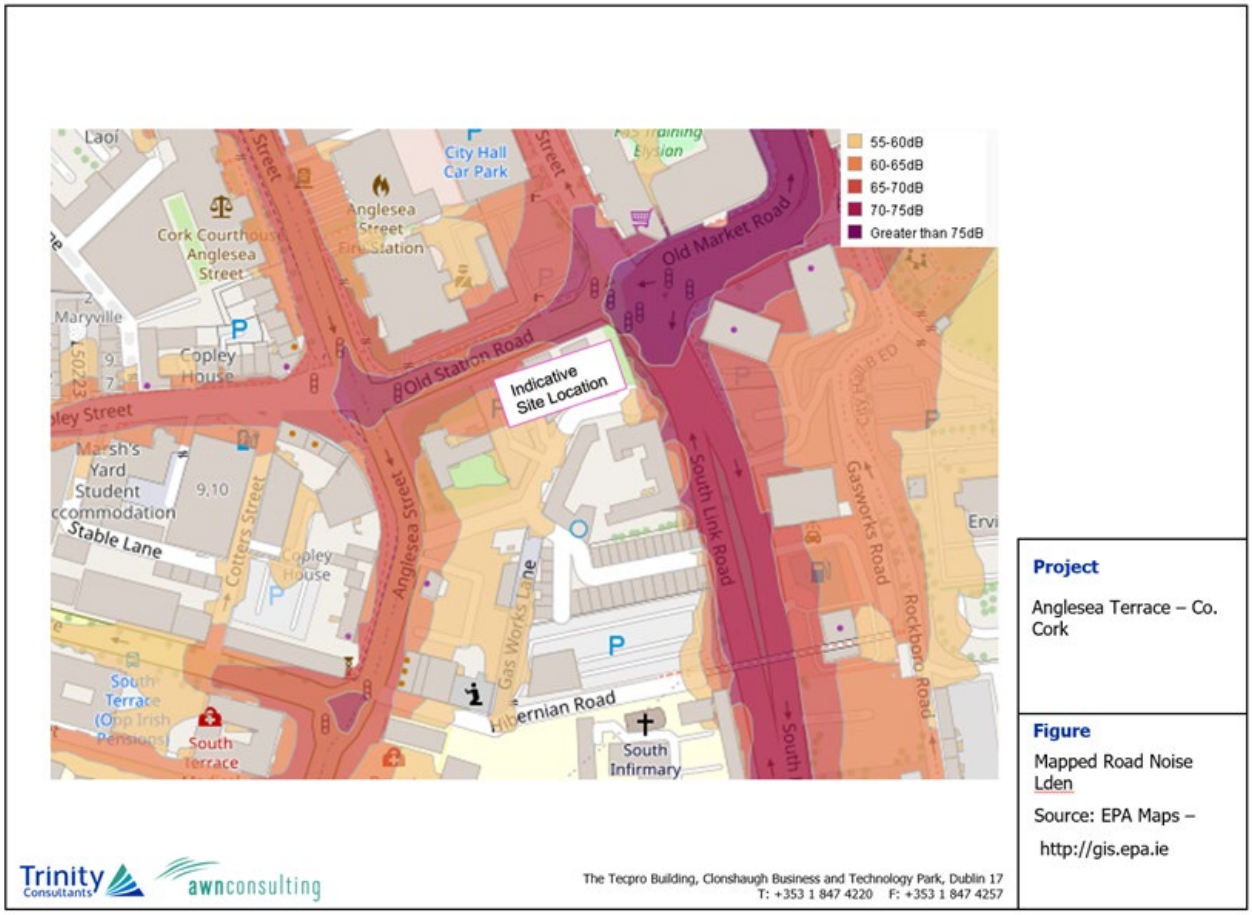
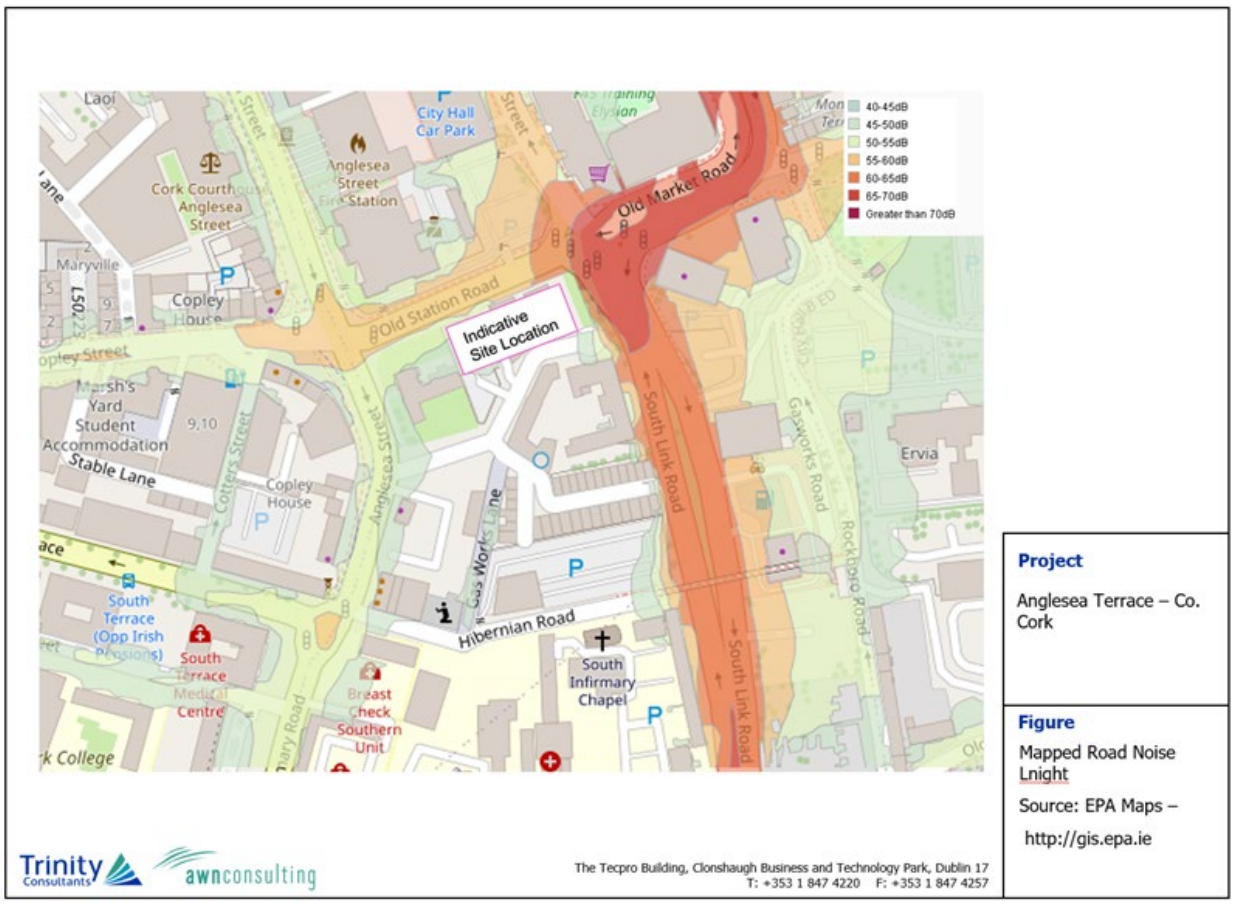


Figure 3-4. Mapped dB L_{night} Traffic Noise Level within vicinity of the proposed development (Source: http://gis.epa.ie)



Road traffic noise levels are mapped in the range of 65 – 70 dB L_{den} along the Old Station Road and Anglesea Terrace and in the worst case could potentially be in the order of 70 – 75 dB L_{den} along the N27 South Link Road. During the night-time period the EPA maps indicate that the prevailing noise levels during the night-time period are in the range of 55 – 60 dB L_{night} along Old Station Road and Anglesea terrace and 60 – 65 dB L_{night} along the N27 South Link Road.

4. CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The Anglesea Terrace Apartments proposed development comprises of the construction of 147 no. apartments and 1 no. café/restaurant and 2 no. offices/retail offices and all associated site development works at Anglesea Terrace, Cork.

The development site area measuring approximately 0.4552 hectare is bound by Old Station Road to the north, the South Link Road to the east, Anglesea Terrace to the south and St Jochaim and Annes which is a Protected Structure (PS Ref: 004) to the west. The site is accessed by Old Station Road an Anglesea Terrace.

The proposed development comprises:

- The demolition of all existing structures including 4 no. existing buildings, boundary walls, removal of an existing car park and all associated site clearance works;
- The construction of a 4 to 16 storey building comprising of 147 no. apartments (72 no. 1 bedroom and 75 no. 2 bedroom units) and 1 no. café/restaurant and 2 no. offices/retail offices and all associated signage, plant rooms and bin stores;
- The provision of communal open space for the residents to include an external courtyard, a linear western park and a rooftop terrace on the 7th floor;
- Ancillary bicycle parking;
- Upgrade works to the footpath at Old Station Road, an eastern pedestrian link which includes the provision of a new footpath along the South Link Road and a set down delivery area at Anglesea Terrace;
- All ancillary site development works include upgrade works including boundary treatments, public lighting and landscaping.

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

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

4.1 Construction Phase

The highest potential noise and vibration impact of the proposed development will occur during the construction phase due to the activity of mobile and construction plant items with high noise levels.

During the construction phase, activities will involve site clearance, demolition, excavation, and foundation works. Following on from demolition, site clearance and excavations, the structural and building works associated with the apartment buildings and associated infrastructure will then be undertaken. For each of these stages there will be on-site plant and equipment operating in addition to construction traffic including movement of machinery and materials within and to and from the construction site.

A variety of items of plant will be in use during these construction works, all of which have the potential to generate high levels of noise. These will include excavators, loaders, dozers, cranes and static plant such as generators, compressors and pumps.

Vibration associated with the proposed construction site activities will occur during construction activities related to demolition, piling and excavation.

The potential impact associated with these activities are discussed in Section 5.1.

4.2 Operational Phase

Once operational, there are no major noise sources associated with the proposed development which is largely residential in nature. The range of operational activities are in line with those in the surrounding environment at nearby existing and planned residential areas (e.g., local vehicle movements and amenity areas). None of these activities are associated with any significant noise impacts to the surrounding noise environment. There will be potential for an element of mechanical and electrical plant required to service apartment buildings and other spaces within the proposed development.

There is also the impact of Inward noise incident on the development from existing and future noise sources, namely road traffic noise; this has also been assessed in Section 5.2.3.

5. POTENTIAL IMPACT OF THE PROPOSED DEVELOPMENT

5.1 Construction Phase – Noise

5.1.1 Closest NSLs and Noise Thresholds

Figure 5-1 illustrates the location of the closest NSLs in the surrounding environment. These NSLs are also discussed below in Table 5-1 in relation to their position and distance to the proposed development site.

Figure 5-1. Nearest NSLs in Relation to the Proposed Development

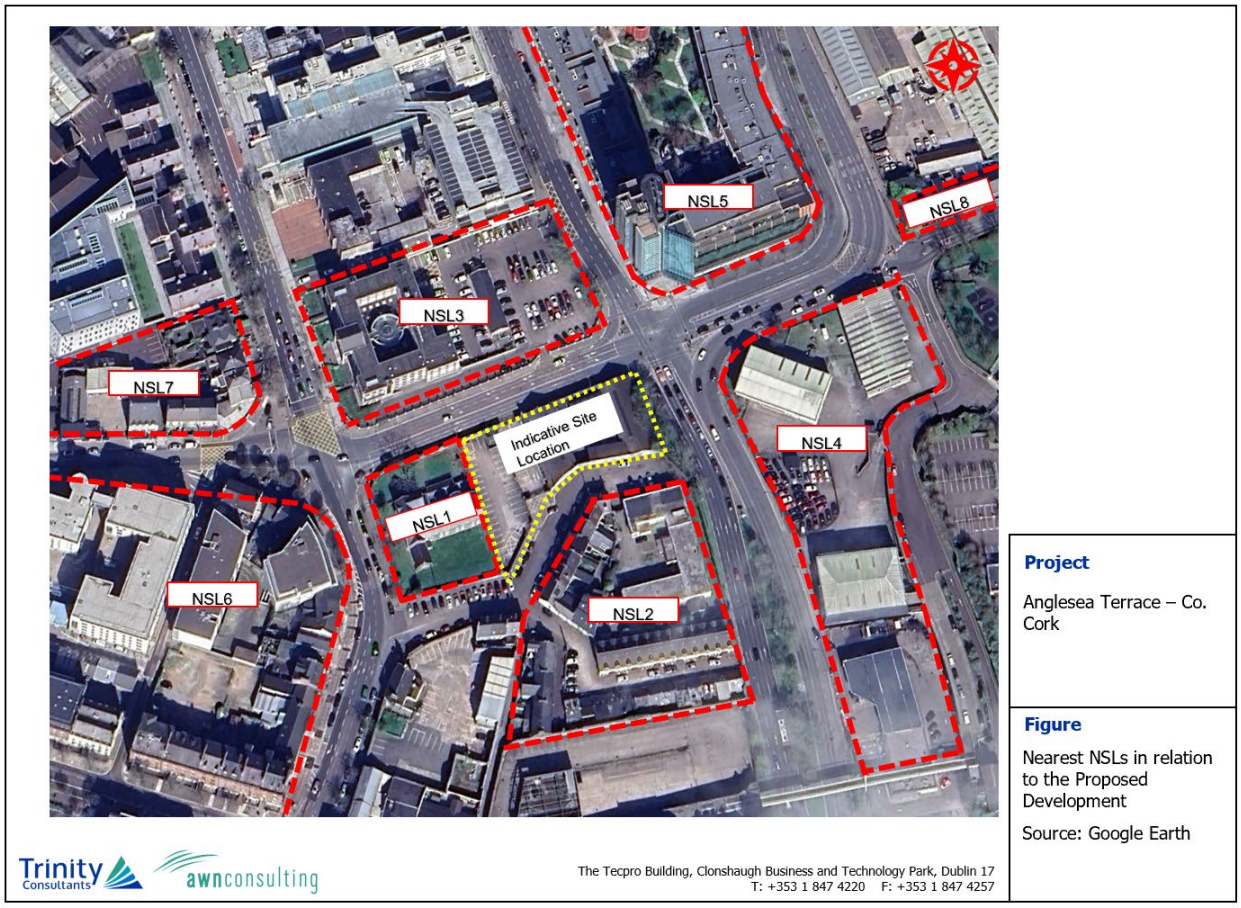


Table 5-1. Description of NSLs Closest to Proposed Development

NSLs	Description	Approximate distance from NSL to closest Proposed Development Construction Works	Construction Threshold Category
1	NSL1 is St. Joachim & Anne's House, which neighbours the proposed development to the west. This NSL is approximately 5m from any construction works associated with the proposed development.	5m	C
2	NSL2 is the group of residential NSLs and St. Vincent's Hospital situated to the south of the proposed development along Anglesea Terrace. The nearest of these NSLs is approximately 10m from any construction works associated with the proposed development.	10m	A
3	NSL3 is the Anglesea Street Garda Station situated to the north of the proposed development along Old Station Road. This NSL is approximately 25m from any construction works associated with the proposed development.	25m	C
4	NSL4 is the group of commercial receptors situated to the east of the proposed development. The closest of these NSLs is approximately 35m from the proposed development.	35m	C
5	NSL5 is a mix of residential and commercial NSLs situated to the north-east of the proposed development along the N27 / Eglinton Street. The closest of these NSLs is approximately 50m from the proposed development.	50m	C
6	NSL6 is a mix of residential and commercial NSLs situated to the west and south-west of the proposed development along Anglesea Street. The closest of these NSLs is approximately 60m from the proposed development.	60m	C

NSLs	Description	Approximate distance from NSL to closest Proposed Development Construction Works	Construction Threshold Category
7	NSL7 is a mix of residential and commercial NSLs situated to the north-west of the proposed development, along the R610 / Copley Street. The closest of these NSLs is approximately 80m from the proposed development.	80m	C
8	NSL8 is the group of residential NSLs situated to the north-east of the proposed development, along Monerea Terrace. The closest of these NSLs is approximately 120m from the proposed development.	120m	C

The construction noise threshold is determined by referring to Table 2-1 (BS 5228-1) and the baseline ambient noise levels (as referred to in Section 3), as outlined in the assessment criteria section.

Working hours for the proposed development site are set within the Construction Environmental Management Plan (CEMP). Sunday or Bank Holiday work will only take place periodically at the agreement with Cork City Council. Similarly, any other out of hours working will be only permitted by arrangement with site management and Cork City Council outlining the nature and reason for the work and their likely duration.

Based on the prevailing noise environment measured, the construction noise thresholds are defined from Category A for residential receptors along Anglesea Terrace to the south of the proposed development and Category C for all other residential receptors within the vicinity of the development site as defined within Table 2-1. All commercial receptors will fall within the Category C construction noise threshold.

The appropriate daytime noise criteria for construction noise are as follows:

- Residential Receptors along Anglesea Terrace: 65 dB $L_{Aeq,T}$ (NSL2)
- All other residential Receptors: 75 dB $L_{Aeq,T}$ (NSLs 1,5,6,7,8)
- Commercial Receptors: 75 dB $L_{Aeq,T}$ (NSLs 3,4)

A night-time threshold is not included as it is understood that construction work will not be taking place at night.

5.1.2 Source Noise Levels

Since the construction programme has been established in outline form, construction noise associated with activities on site during each construction phase are reviewed for the purposes of determining the likely significant effects. Indicative ranges of noise levels associated with construction may be calculated in accordance with the methodology set out in BS 5228-1. This standard sets out sound power and sound pressure levels for plant items normally encountered on construction sites, which in turn enables the prediction of noise levels.

Given that the construction stage is highly transient in nature and involves a number of various stages which will encompass a range of different activities on a day to day and week to week basis, it is not

possible to calculate with a high degree of accuracy the specific levels of noise associated with each stage. The construction stage will be undertaken over a number of stages from demolition and site preparation through to building construction and internal fit out. Expected typical levels of noise associated with the key stages of work are discussed below.

5.1.2.1 Demolition, Piling and Excavation

Reference to BS 5288-1 indicates that highest noise levels on the site are associated with activities associated with demolition of existing structures, and during any piling activities associated with assumed precast driven piles for building foundations. Noise levels from these activity types are typically in the range of 80 to 90 dB L_{Aeq} at 10m.

For construction activities associated with demolition, surface groundbreaking and excavation a total construction noise level of 92 dB $L_{Aeq,T}$ at 10m has been used for the purposes of indicative calculations. This would involve for example, one item of plant at 90 dB L_{Aeq} and two items of plant at 85 dB L_{Aeq} and one item of plant at 80 dB L_{Aeq} operating simultaneously within one work area which is considered a highly worst-case scenario.

5.1.2.2 General Construction

Once the ground preparation and foundation works have been completed, a large portion of the work will involve manual labour and cranes with lower overall noise levels. For the purpose of this assessment a combined sound pressure level of 78 dB $L_{Aeq,T}$ at 10m has been used for construction noise calculations during ongoing site works and compounds once site clearance and excavation works are completed. This would include, for example, one item of plant at 75 dB L_{Aeq} and three items of plant at 70 dB L_{Aeq} operating simultaneously within a work area resulting in a total noise level of 78 dB L_{Aeq} along the closest works boundary.

5.1.3 Construction Noise Calculations

Construction noise levels have been calculated at distances representative of the closest NSLs, assuming the construction noise levels discussed above. For the purpose of the assessment, partial site screening (5 dB) has been assumed from the use of a standard site hoarding of 2.4 m high for noise sensitive boundaries. The calculations also assume that the equipment will operate for 66% of the working time over a construction working day. Table 5-2 and Table 5-3 summarise the results of this assessment.

Table 5-2. Calculated Construction Noise Levels at Varying Distances (Demolition, Piling and Excavation)

Description	Cumulative Source Sound Pressure, dB $L_{Aeq,T}$ at 10m	Calculated Noise Levels at Varying Distances, dB $L_{Aeq,T}$							
		NSL1 (5m)	NSL2 (10m)	NSL3 (25m)	NSL4 (35m)	NSL5 (50m)	NSL6 (60m)	NSL7 (80m)	NSL8 (120m)
Demolition, Piling and Excavation	92	91	85	77	74	71	69	67	63
CNT -		C	A	C	C	C	C	C	C
Significance against CNT		Significant to Very Significant depending on construction durations outlined within Section 2.2.1.1.3		Moderate	Not Significant				

Table 5-3. Calculated Construction Noise Levels at Varying Distances (General Construction)

Description	Cumulative Source Sound Pressure, dB $L_{Aeq,T}$ at 10m	Calculated Noise Levels at Varying Distances, dB $L_{Aeq,T}$							
		NSL1 (5m)	NSL2 (10m)	NSL3 (25m)	NSL4 (35m)	NSL5 (50m)	NSL6 (60m)	NSL7 (80m)	NSL8 (120m)
General Construction	78	77	71	63	60	57	55	53	49
CNT -		C	A	C	C	C	C	C	C
Significance against CNT -		Significant to Very Significant		Not Significant					

The construction noise levels detailed in Table 5-2 indicate that construction activities associated with the demolition, piling and excavation can operate within the adopted CNT will be exceeded at NSLs 1,2 and 3 closest to the works. At all other identified NSLs the demolition, piling and excavation will be able to operate within the adopted CNT.

The nearest residential NSLs are NSL 1, located within St. Joachim & Anne's House approximately 5 m from the proposed development boundary; NSL 2, situated approximately 10 m south of the site along Anglesea Terrace; and NSL 3, at the Garda Station on Anglesea Street. As outlined in Table 5-2 demolition, piling, and excavation works are expected to result in temporary, negative impacts ranging from significant to very significant at NSL 1 and NSL 2, and moderate to significant at NSL 3. For all other NSLs, these activities are anticipated to remain within or below the adopted Construction Noise Threshold, resulting in temporary, negative effects ranging from slight to moderate or not significant.

During the general construction phase, noise levels are expected to exceed the CNT at NSL 1 and NSL 2, while remaining within or below the CNT at all other NSLs.

In summary, the most significant noise impacts are expected to be localised at the closest residential receptors during the early construction phases. However, these impacts reduce with distance and are generally less severe during the later stages of construction. Mitigation measures outlined within Section 6.1 will be utilised to further reduce any impacts associated with the construction of the proposed development. It is also important to note that the construction calculations within Table 5-2 and Table 5-3 are highly conservative and are based from the red line boundary of the proposed development. In reality the distance from the construction works will likely be greater resulting in a lesser effect at the identified NSLs.

5.1.4 Construction Phase – Vibration

The main potential source of vibration during the construction programme is associated with piling, demolition and any initial groundbreaking activities.

Piling may be used for construction of the building foundations. For the purposes of this assessment, the expected vibration levels during piling, assuming precast driven piles, have been determined through reference to published empirical data.

The British Standard BS 5228-2 publishes the measured magnitude of vibration using a 275 mm pile diameter for driven precast concrete piles into mixed ground. Reference to Table C.1 within BS 5228-2 states vibration levels of between 10.16 to 11.4 PPV at 5m, 6.41 PPV at 10m and 4.32 to 5.6 PPV at 20m.

Vibration magnitudes associated with this activity are well below those associated with any form of cosmetic damage to buildings on the basis that piling does not occur directly on the 5m boundary of the

site closest to the protected structure of St Joachims and Annes House. There is, however, potential for a temporary, negative and Moderate to Significant impact for building occupants within 20m of this activity.

During intermittent breaking and demolition activity at ground level, there is also potential for vibration to be generated. Empirical data for this activity is not provided in the BS 5228-2 standard, however the likely levels of vibration from this activity is expected to be significantly below the vibration criteria for building damage based on experience from other sites. AWN Consulting have previously conducted vibration measurements under controlled conditions, during trial construction works on a sample site where concrete slab breaking was carried out. The trial construction works consisted of the use of the following plant and equipment when measured at various distances:

- 3 tonne hydraulic breaker on small CAT tracked excavator
- 6 tonne hydraulic breaker on large Liebherr tracked excavator

Vibration measurements were conducted during various staged activities and at various distances. Peak vibration levels during staged activities using the 3 Tonne Breaker ranged from 0.48 to 0.25 PPV (mm/s) at distances of 10 to 50m respectively from the breaking activities. Using a 6 Tonne Breaker, measured vibration levels ranged between 1.49 to 0.24 PPV (mm/s) at distances of 10 to 50m respectively. Whilst these measurements relate to a solid concrete slab, the range of values recorded provides some context in relation typical ranges of vibration generated by construction breaking activity.

Vibration magnitudes associated with this activity are well below those associated with any form of cosmetic damage to buildings. There is potential for a brief, negative and moderate impact for building occupants within 20m of this activity using a 6 Tonne Breaker or equivalent.

During the construction phase it is expected that the potential effect due to vibration will be brief, negative and moderate to significant in the absence of mitigation at distances less than 20m. Mitigation will need to be deployed in order to mitigate the effects of vibration during the demolition, piling and excavation phases at NSLs 1 and 2 which are in the closest proximity to the proposed development.

5.1.5 Construction Phase – Traffic

During the construction phase, traffic associated with the Proposed Development will comprise a mix of Light Goods Vehicles (LGVs) and Heavy Goods Vehicles (HGVs) travelling to and from the site. A review of the available information indicates that the maximum number of trips generated during this phase will be 48 HGVs and 48 LGVs per day. This increase in vehicle movements has been assessed against baseline traffic data for the year 2025, with the results presented in Table 5-4.below.

Table 5-4. Potential Impact in relation to Construction Phase Traffic Do Nothing v Do Something 2025

Road Location	Do Nothing		Do Something		Calculated Change in Noise Levels, dB	Significance
	%HV	AADT	%HV	AADT		
Link A – Old Station Road	3%	10,405	3%	10,501	+0.4	Imperceptible
Link B – Anglesea Street (R610) North	4%	8,255	4%	8,351	+0.4	Imperceptible
Link B – Anglesea Street (R610) South	7%	8,999	7%	9,095	+0.3	Imperceptible

In terms of the additional construction traffic on local roads that will be generated as a result of the Proposed Development, the following comment is presented: As stated in the DMRB Noise and Vibration (UKHE 2020), Volume 11, Section 3, Part 7, in order to increase traffic noise levels by 1 dB traffic volumes

would need to increase by the order of 25% it is considered that additional traffic introduced onto the local road network due to the construction phase associated with various phases of the development will therefore not introduce a level of traffic that will result in a significant noise impact. The resulting effect is therefore negative, Imperceptible and short term. However, a series of mitigation measures within Section 6 will be implemented to ensure that noise from vehicle movements during construction are reduced to a minimum.

5.2 Operational Phase – Noise

5.2.1 Operational Phase – Mechanical Plant and Services

There are no anticipated significant sources of mechanical or electrical plant associated with the building types across the proposed development with potential to emit significant audible noise levels beyond the buildings themselves. (i.e., individual heat recovery systems serving the residential units where proposed). Any plant rooms required to serve the apartment blocks will likely be enclosed at basement level or at roof level. Any required plant items serving other areas of the proposed development will be designed and located so that there is no negative impact on sensitive receivers within the proposed development itself (e.g., within apartments above plant rooms etc.) or external to the proposed development.

In this instance, best practice is to set appropriate noise limits that will inform the detailed design during the selection and layout of building services for the proposed development. The operational noise level from any building services plant at the nearest residences within the proposed development will be designed/attenuated to not exceed the internal noise levels discussed in Section 2.2.2.2 to ensure no negative noise impacts occur within the proposed residential units.

Once noise emissions from any operational plant are designed to not exceeded the internal noise criteria at the new residential units within the proposed development, the related noise impact to existing NSLs offsite will be imperceptible. The overall outward noise impact of mechanical and electrical services on site to existing surrounding NSLs is determined to be Neutral, Imperceptible and Long Term.

5.2.2 Operational Phase – Additional Traffic on Public Roads

For the purposes of assessing the 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 proposed development, given that traffic from the development will make use of the existing road network.

Traffic flows along the surrounding road network in terms of Annual Average Daily Traffic (AADT) for the Do Minimum and Do Something scenarios have been reviewed to calculate the change in traffic noise.

The assessment years are based on the forecasted opening year of 2028 and the design year of 2043.

Table 5-5. Potential Impact in relation to Operational Phase Traffic Do Nothing v Do Something 2028

Road Location	Do Nothing		Do Something		Calculated Change in Noise Levels, dB	Significance
	%HV	AADT	%HV	AADT		
Link A – Old Station Road	3%	10,953	3%	10,969	+0.1	Not Significant
Link B – Anglesea Street (R610) North	4%	8,693	4%	8,701	0.0	Imperceptible
Link B – Anglesea Street (R610) South	7%	9,487	7%	9,518	+0.1	Not Significant

Table 5-6. Potential Impact in relation to Operational Phase Traffic Do Nothing v Do Something 2043

Road Location	Do Nothing		Do Something		Calculated Change in Noise Levels, dB	Significance
	%HV	AADT	%HV	AADT		
Link A – Old Station Road	3%	12,740	3%	12,756	+0.1	Not Significant
Link B – Anglesea Street (R610) North	4%	10,123	9%	10,549	+2.3	Not Significant
Link B – Anglesea Street (R610) South	8%	11,087	8%	11,118	+0.1	Not Significant

The resultant change in noise level in relation to operational traffic of the development is calculated to be between 0.0 and +2.3 dB. Therefore, the resulting impact of operational traffic is determined to be long term, negative and imperceptible to not significant.

5.2.3 Operational Phase – Inward Impact Assessment

The development lands in question are in proximity to existing road networks. Noise from the adjacent roads and the developments position within Cork City has the potential to impact the residential developments proposed for the site itself, particularly the residential units facing north onto Old Station Road and West onto the N27.

The following sections outline the inward impact of noise on the proposed development.

5.2.3.1 Stage 1 Noise Risk Classification of the Site

Noise levels across the proposed development have been identified through noise surveying and reference to published maps and have been categorised for both the 16 hour daytime (07:00 to 23:00hrs) $L_{Aeq,16hr}$ and the 8 hour night-time period (23:00 to 07:00hrs), $L_{Aeq,8hr}$. Considering the noise levels presented in the previous sections, the initial site noise risk assessment has concluded that the site is categorised as Medium to High Risk in accordance with the ProPG Initial Stage 1 Risk Assessment. This indicates that the prevailing external noise levels may result in elevated noise levels internally if appropriate mitigation measures are not implemented.

ProPG states the following with medium to high risk areas:

Medium Risk *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.*

High Risk *High noise levels indicate that there is an increased risk that development may be refused on noise grounds. This risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS. Applicants are strongly advised to seek expert advice.*

Given the above, it can be concluded that the development site may be categorised as Medium to High Risk. As such an Acoustic Design Strategy will be required to demonstrate that suitable care and attention has been applied in mitigating and minimising noise impact to such an extent that an adverse noise impact will be avoided in the final development.

It should be noted that ProPG: Planning and Noise states the following with regard to how the initial site noise risk is to be used,

> *"2.12 It is important that the assessment of noise risk at a proposed residential development site is not the basis for the eventual recommendation to the decision maker. The recommended approach is intended to give the developer, the noise practitioner, and the decision maker an early indication of the likely initial suitability of the site for new residential development from a noise perspective and the extent of the acoustic issues that would be faced. Thus, a site considered to be high risk will be recognised as presenting more acoustic challenges than a site considered as low risk. A site considered as negligible risk is likely to be acceptable from a noise perspective and need not normally be delayed on noise grounds. A potentially problematical site will be flagged at the earliest possible stage, with an increasing risk indicating the increasing importance of good acoustic design."*

Therefore, following the guidance contained in ProPG: Planning and Noise does not preclude residential development on sites that are identified as having medium risk noise levels. It merely identifies the fact that a more considered approach will be required to ensure the developments on the higher risk sites are suitable designed to mitigate the noise levels. The primary goal of the approach outlined in ProPG: Planning and Noise is to ensure that the best possible acoustic outcome is achieved for a particular site.

5.2.3.2 Stage 2: Noise Assessment

5.2.3.2.1 Noise Levels Across Development Buildings

As demonstrated in the previous section, current noise levels across the site are categorized as medium to high risk. Due to the site's position along the surrounding road networks, residential properties along the facades of the residential development facing onto the roads will experience the highest noise levels.

A noise model has been developed incorporating the measured noise levels and has been adapted within the following sections.

5.2.3.2.2 Element 1 – Good Acoustic Design Process

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 of occupants or compromising other sustainable design objectives. Section 2.23 of the ProPG: Planning and Noise 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 or Reduction of Noise from Source

Noise sources incident upon the development site have been determined to be medium to high risk. Control of noise at source from road traffic is outside of the site boundary and hence is outside of the scope of the proposed development.

Planning, Layout and Orientation

As part of the project design, the overall majority of residential units within the proposed development are set back from the road boundary. The closest properties facing onto the local road networks will experience highest potential noise levels with reduced noise levels further into the site. The properties along northern, eastern and western boundaries of the site are orientated such that they act as a barrier for the other noise sensitive locations to the south of the site along Anglesea Terrace, thus reducing the number of noise sensitive facades impacted by road noise. The development buildings themselves also screen the external resident's courtyard amenity area to the south of the site.

Select Construction Types for meeting Building Regulations

The design of all buildings is 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 systems, where required to achieve suitable internal noise levels within the development. This is specified within Table 5-8 and Figure 5-4. 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: Planning and Noise

Impact of Noise Control Measures on fire, health and safety

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

Assess External Amenity Area Noise

ProPG: Planning and Noise 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 all external amenity areas associated with the development are presented within section 5.2.3.2.4

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.

5.2.3.2.3 Element 2 – Internal Noise Levels

Internal Noise Criteria

Element 2 of the ProPG: Planning and Noise document sets out recommended internal noise targets derived from BS 8233 (2014). The recommended indoor ambient noise levels are set out in Table 2-7 and are based on annual average data.

ProPG: Planning and Noise and BS 8233 notes that where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal L_{Aeq} target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.

ProPG: Planning and Noise specifically noted that the more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5 dB, the more that most people are likely to regard them as "unreasonable".

Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal L_{Aeq} levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally.

In terms of the ventilation strategy, it is understood that the air supply will be via mechanical ventilation (MVHR) which typically provides a sound insulation performance substantially improved over passive in-frame or wall vents.

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 mechanical vents will be provided to ensure the rooms are adequately ventilated and achieve the good internal noise levels detailed here.

Noise Levels Across the Proposed Development

As demonstrated in section 5.2.3.1, the current or potential impact in relation to noise across the site is categorised as medium to high noise risk.

The proposed site layout has been modelled to determine the calculated noise levels at the facades of the development building taking account of the proposed site ground levels and screening from existing barriers and buildings across the site.

The model was calibrated against the measured noise levels outlined within section 3.1 and also compared to the EPA Round 4 noise maps outlined within Section 3.2. Where night time measurements for AT2 and AT3 the upper level from the EPA noise maps has been used for the measurement position. Table 5-7 compares the average measured survey noise levels for both the day and nighttime periods against the calibrated noise levels.

Table 5-7. Measured Noise Levels vs Calibration Noise Levels

Measurement Position	Measured Average Noise Levels Day Time L_{Aeq}	Calibration Noise Model Day Time L_{Aeq}	Measured Average Noise Levels Nighttime L_{Aeq}	Calibration Noise Model Nighttime L_{Aeq}
UN1	67	67	59	60
AT2	69	70	60[1]	64

[1] Upper night time level taken from EPA mapped levels within Figure 3-4 in the absence of measured noise levels at this location during the night time period.

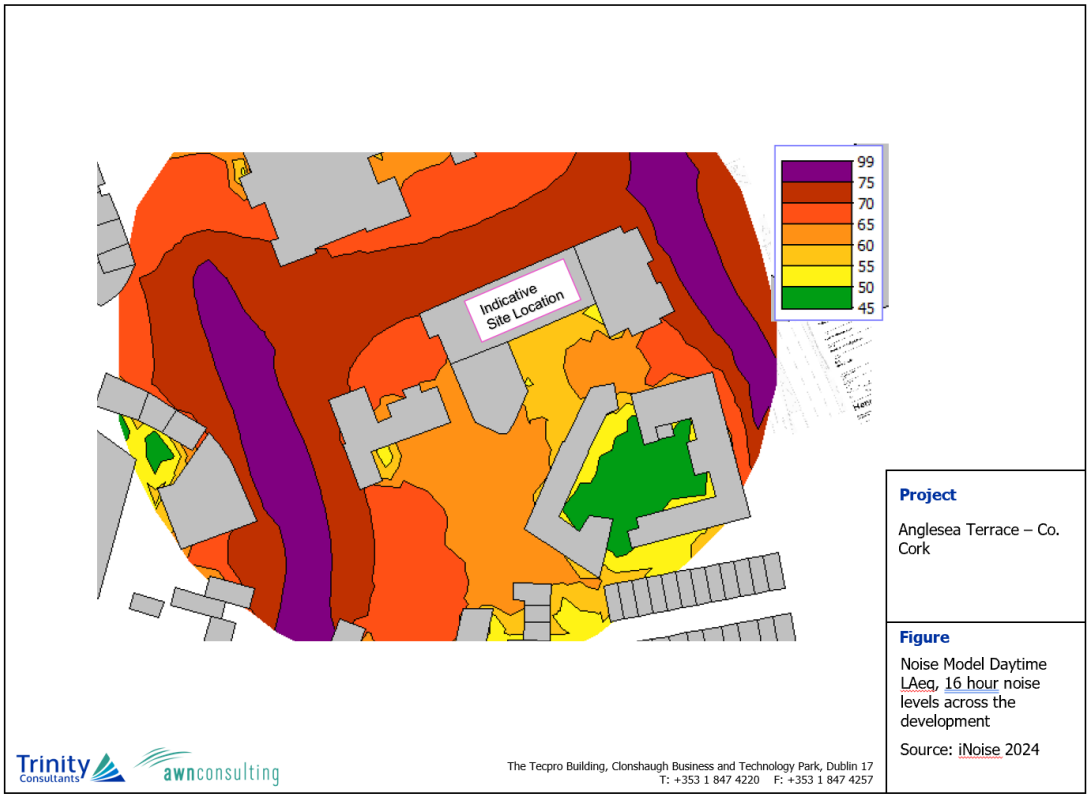
AT3	71	73	65[2]	66

The calibration model largely shows good agreement between the measured and calibrated noise levels.

Façade Noise Levels

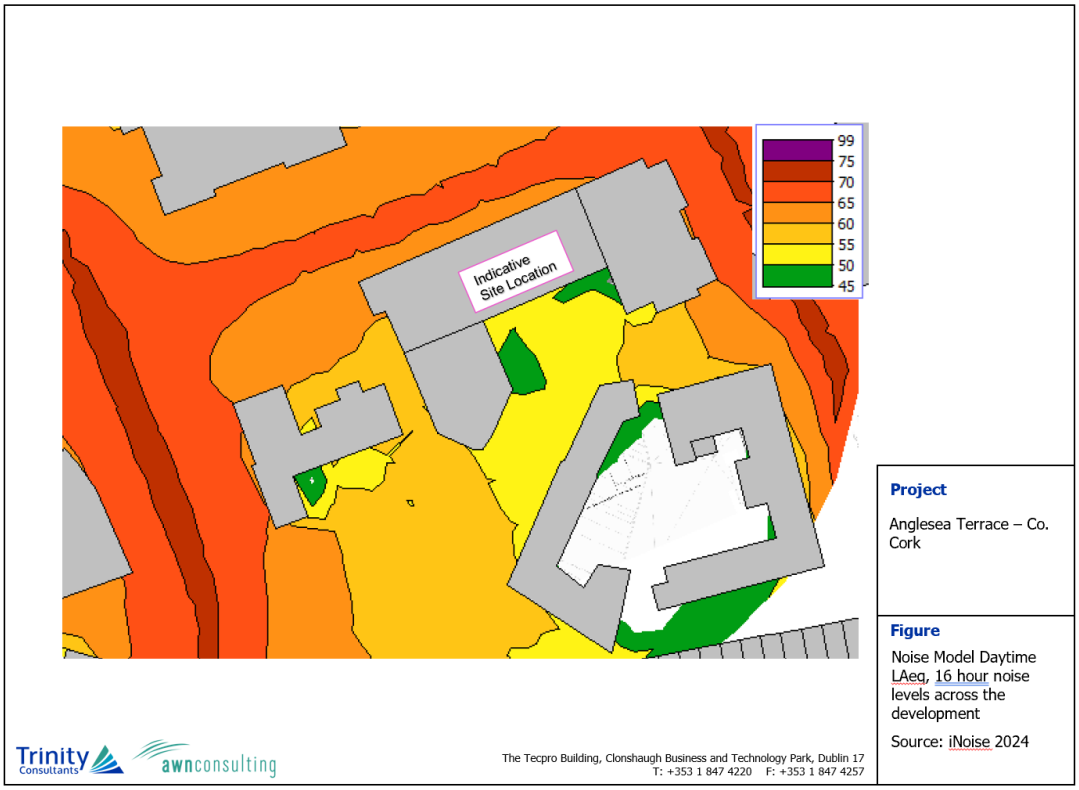
Once agreement between the calibrated noise model and measured noise levels was achieved, the noise model was developed to calculate the noise levels at the development taking account the proposed development buildings. Figure 5-2 and Figure 5-3 present the noise contours across the proposed development for the day and night-time periods. The daytime period relates to the 16 hour period between 07:00 and 23:00 whilst the nighttime period relates to the 8 hour period between 23:00 and 07:00. These periods are referenced within the adopted guidance of ProPG: Planning and Noise and BS 8233 and are used to assess the impact of noise across the proposed development.

Figure 5-2. Noise Model Daytime $L_{Aeq,\ 16\ hour}$ noise levels across the development



[2] Upper night time level taken from EPA mapped levels within Figure 3-4 in the absence of measured noise levels at this location during the night time period.

Figure 5-3. Noise Model Nighttime $L_{Aeq,\ 8\ hour}$ noise levels across the development



The noise model indicates that the façades facing the N27, located to the east of the proposed development, are exposed to the highest noise levels. Daytime noise levels at these façades range from 68 dB $L_{Aeq,16hr}$ to 75 dB $L_{Aeq,16hr}$ during the 16-hour assessment period. Night-time noise levels range from 61 dB $L_{Aeq,8hr}$ to 68 dB $L_{Aeq,8hr}$, with slight variations observed at different building heights.

At façades facing onto Old Station Road, the highest daytime noise levels range from 66 dB $L_{Aeq,16hr}$ to 73 dB $L_{Aeq,16hr}$ during the 16-hour assessment period, with night-time levels ranging from 59 dB $L_{Aeq,8hr}$ to 66 dB $L_{Aeq,8hr}$.

Façades on the western side of the proposed development, facing onto Old Station Road and the R610, are predicted to experience daytime noise levels of approximately 67 to 69 dB $L_{Aeq,16hr}$ during the 16-hour assessment period, and night-time levels of 60 to 62 dB $L_{Aeq,8hr}$.

Lower noise levels are expected at the more sheltered façades within the proposed development, particularly those to the south facing onto Anglesea Terrace, due to the screening effect provided by the development itself. The highest predicted levels at these façades are in the region of 60 to 62 dB $L_{Aeq,16hr}$ during the daytime period and 53 to 55 dB $L_{Aeq,8hr}$ during the night-time period.

Given the measured and predicted high external noise levels across various façades within the proposed development, it will be necessary to incorporate appropriate façade elements to achieve the recommended internal noise levels. This will be critical across all façades to ensure acceptable acoustic conditions within internal spaces.

Proposed Façade Treatment

The British Standard BS EN 12354-3 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.

Glazing

The principles outlined in BS EN 12354-3 are also referred to in BS 8233 and Annex G[3] of BS 8233 which provides 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 BS 8233 has been adopted here to determine the required performance of the building facades.

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 most effected facades will be provided with glazing that, when closed, achieve the minimum sound insulation performance as set out in Table 5-8. All facades that require upgraded glazing are identified within Figure 5-4.

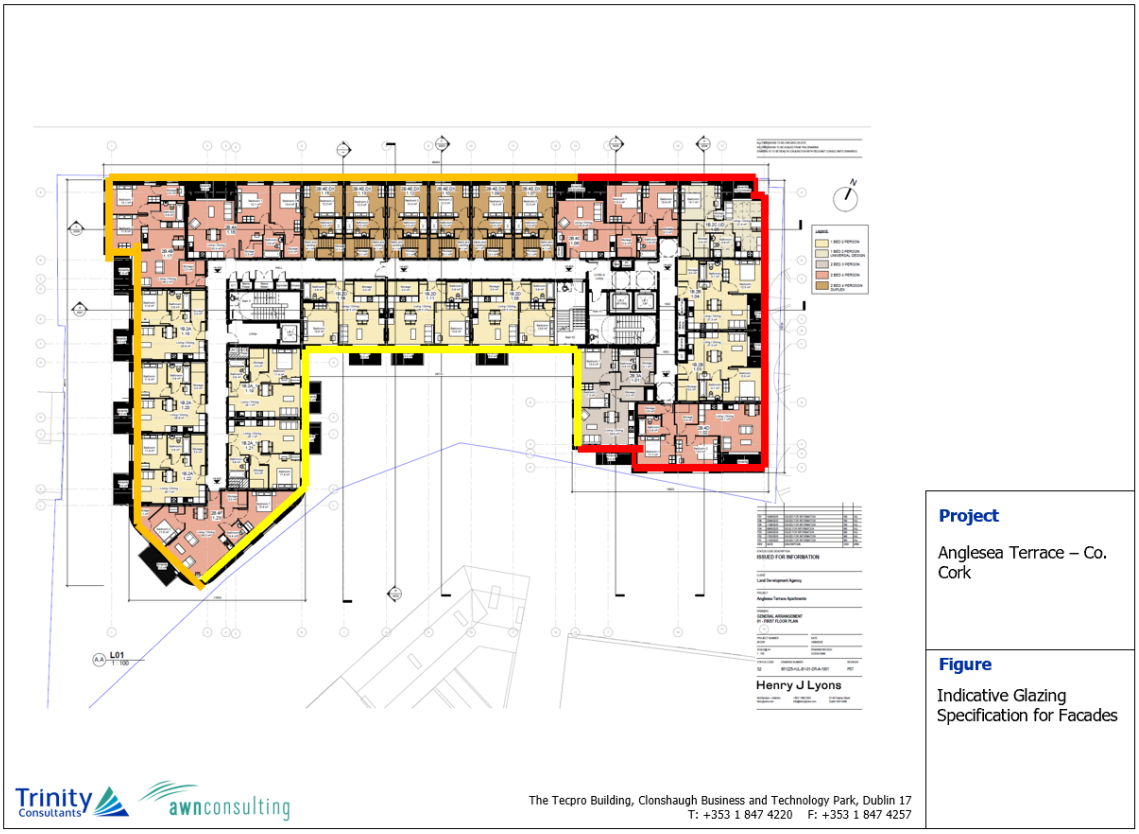
In this instance it has been calculated that the various facades are to be provided with glazing that, when closed, achieves the recommended internal noise criteria. The specifications provided in Table 5-8 are indicative and may be developed further during the detailed design stage. Alternative specifications will be acceptable provided the internal ambient noise criteria outlined in Table 2-7 can be achieved.

Table 5-8. Sound Insulation Performance Requirements for Glazing SRI (dB)

Glazing Specification	Octave Band Centre Frequency (Hz)						dB R_w
	125	250	500	1k	2k	4k	
A – Red (Facades indicated in Figure 5-4)	26	34	40	42	40	50	41
B – Orange (Facades indicated in Figure 5-4)	30	32	38	36	40	49	39
C – Yellow (Facades indicated in Figure 5-4)	20	19	29	38	36	45	32

[3] The methodology contained within Annex G of BS8233 is based on the assumption that the source is a line source (such as a road) and that the building facades are simple, i.e. do not have balconies. These assumptions are considered valid for the purposes of this assessment and have been adopted.

Figure 5-4. Indicative Glazing Markup for Facades



The acoustic specification for Glazing Type A and B will require a high performing acoustic double-glazed unit comprising laminated glass and thicker-glazed panes than standard double-glazing. The acoustic specification for Glazing Type C can be achieved using a double-glazed configuration.

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 5-8 or greater. However, the ultimate design criteria are the values set out in Table 2-7.

The performance specifications detailed in Table 5-8 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.

Wall Construction

In general, all wall constructions (i.e. block work, concrete and timber frame) 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 Rw for this construction.

Ventilation

Whilst the ventilation strategy for the development has been progressed, the final ventilation strategy will be in accordance with Part F of the Building Regulations and will be finalised at the detailed design stage.

It is understood that the ventilation strategy for the apartments will be mechanical, utilising independent ventilation fans within each apartment. Therefore, a minimum $D_{n,e,w}$ (element normalised level difference) is not provided for vents serving the proposed residential units. Should the ventilation strategy change, a minimum specification will need to be explored at the detailed design stage to minimise the effects of intrusive noise.

Any penetrations in the façade to facilitate the mechanical ventilation strategy will be suitably designed at the detailed design stage so as not to compromise the overall sound insulation performance of the façade.

5.2.3.2.4 Element 3– External Amenity Area Noise Assessment

There are a variety of external amenity areas within the proposed development. A roof top amenity area is proposed on the roof of the central block, with other external amenity areas situated at ground floor level to the rear of the development. Calculated noise levels across the communal amenity areas are not expected to exceed the upper guideline value of 55 dB $L_{Aeq,16hour}$ outlined within ProPG. These levels will range from approximately 46 dB $L_{Aeq,16hour}$ within the rooftop amenity space to within the range of 52 dB $L_{Aeq,16hour}$ in the communal courtyard to the rear of the development

Other amenity areas provided in the form of balconies along facades facing onto the local road networks are likely to be above the upper guideline value of 55 dB $L_{Aeq,16hour}$. However, areas of the development exposed to external noise levels that are likely to exceed the ProPG recommended range for external noise can be offset by the desirability of proximity to alternative amenity areas within the development, within the adopted criteria, as well as proximity to urban surroundings and accessibility to public transport and local amenities.

5.2.3.2.5 Element 4– Assessment of Other Relevant Issues

Element 4 gives consideration to other factors that may prove pertinent to the assessment, these are defined in the document as:

- 4(i) compliance with relevant national and local policy
- 4(ii) magnitude and extent of compliance with ProPG
- 4(iii) likely occupants of the development
- 4(iv) acoustic design v unintended adverse consequences
- 4(v) acoustic design v wider planning objectives

Each is discussed in turn.

Compliance with Relevant National and Local Policy

There are no National policy documents relating to the acoustic design of residential dwellings relating to internal noise levels. However, the *Cork Agglomeration Noise Action Plan 2024 – 2028* defines noise thresholds as discussed in Section 2.2.3.

This report has been prepared in compliance with the requirements of ProPG: Planning and Noise and therefore complies with the requirements of local policy.

Magnitude and Extent of Compliance with ProPG: Planning and Noise

As discussed within this report the following conclusions have been drawn with regards to the extent of compliance with ProPG: Planning and Noise:

- The majority of bedrooms and living areas within the development have been designed to achieve the good level of internal noise levels specified within ProPG: Planning and Noise with windows closed and vents open. Where there are slight exceedances of the good internal noise levels these are below 5dB and thus a reasonable internal noise level is achieved in all instances.
- The two external amenity areas achieve the recommended noise design criteria.

Based on the preceding it is concluded that the proposed development is in compliance with the requirements of ProPG: Planning and Noise.

Likely Occupants of the Development

The criteria adopted as part of this assessment are based on those recommended for permanent dwellings, therefore the adopted criteria is considered robust and appropriate for the likely occupants.

Acoustic Design v Unintended Adverse Consequences

Unintended adverse consequences did not occur on this project.

Acoustic Design v Wider Planning Objectives

With reference to the *Cork Agglomeration Noise Action Plan 2024 – 2028* the proposed development site is within an area where people are being brought to noise in the form of existing road networks.

Through modelling and assessment this report recommends mitigation through improved glazing which will ensure good internal noise levels are achieved.

This report has demonstrated the noise insulation measures required to ensure that the proposed dwelling units achieve a good internal noise environment.

6. MITIGATION MEASURES

6.1 Construction Phase

The assessment detailed in Section 5.1 has determined that construction activities can operate within the adopted construction noise threshold levels at off-site NSLs, specifically within the Category A threshold beyond 100 metres and within the Category C threshold beyond 30 metres. However, due to the proximity of certain NSLs to the works and the nature of the construction activities involved, there is potential for the Construction Noise Threshold values to be exceeded during demolition, piling, and excavation phases.

Vibration levels at the closest neighbouring buildings are expected to be orders of magnitude below the limits set out in section 2.2.1.2 to avoid any cosmetic damage to buildings there is the possibility of vibration levels that will cause some disturbance to occupants at the closest NSLs to the construction.

Best practice noise and vibration control measures will be employed by the contractor during the construction phase in order to avoid exceedance of the adopted construction noise threshold values at the nearest NSLs. 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, hours of work, and noise monitoring, where required.

6.1.1 Selection of Quiet Plant

The potential for any item of plant to result in exceedance of construction noise thresholds will be assessed prior to the item being brought onto the site. The least noisy item of plant will be selected wherever practicable (e.g. plant items with sound attenuation incorporated). Should a particular item of plant already on the site be found to exceed the construction noise thresholds, the first action will be to identify whether the item can be replaced with a quieter alternative.

The appointed contractor will evaluate the choice of excavation, breaking, piling or other working method taking into account various ground conditions and site constraints. Where alternative lower noise generating equipment are available that will provide equivalent structural / excavation results, these will be selected to control noise within the relevant thresholds, where it is practicable to do so.

6.1.2 Noise Control at Source

The following measures will be implemented, if required, by the appointed contractor to control noise at source. These measures relate to specific site considerations:

- For mobile plant items such as dump trucks, cranes, excavators and loaders, the installation of an acoustic exhaust, utilising an acoustic canopy to replace the normal engine cover and / or maintaining enclosure panels closed during operation can reduce noise levels by up to 10 dB. Mobile plant will be switched off when not in use and not left idling.

- For percussive tools such as pneumatic concrete breakers and tools a number of noise control measures include fitting a muffler or sound reducing equipment to the breaker "tool" and ensuring any leaks in the air lines are sealed.
- Where compressors, generators and pumps are located in proximity to NSLs and have the potential to exceed the construction noise thresholds, these will be surrounded by acoustic lagging or enclosed within acoustic enclosures providing air ventilation.
- Resonance effects in panel work or cover plates can be reduced through stiffening or the application of damping compounds, while other noise nuisance can be controlled by fixing resilient materials in between the surfaces in contact.
- For all materials handling, ensure that materials are not dropped from excessive heights, lining drops chutes and dump trucks with resilient materials.

6.1.3 Screening

Screening is an effective method of reducing CNLs at a receiver locations and can be used successfully as an additional measure to other forms of noise control. The effectiveness of a noise screen will depend on the height and length of the screen, its mass, and its position relative to both the source and receiver. Standard construction site hoarding (2.4 m in height) with a mass per unit of surface area greater than 7 kg/m2 can provide adequate sound insulation. This is recommended as a minimum around the northern site boundaries of the proposed development site.

Erection of localised demountable enclosures or screens will be used around piling rigs, breakers or drill bits, as required, when in operation in proximity to NSLs with the potential to exceed the construction noise thresholds. Annex B of BS 5228–1 (Figures B1, B2 and B3) provides typical details for temporary and mobile acoustic screens, sheds and enclosures that can be constructed on-site from standard materials. A well placed and designed mobile temporary screen around a pile, breaker or excavation can effectively reduce noise emissions by 10 dB(A).

In addition, careful planning of the construction site layout will also be considered. The placement of site buildings such as offices and stores between the site and sensitive locations can provide a good level of noise screening.

6.1.4 Hours of Work

Working hours for the proposed development site are set within the CEMP. Sunday or Bank Holiday work will only take place periodically at the agreement with Cork City Council. Similarly, any other out of hours working will be only permitted by arrangement with site management and Cork City Council.

6.1.5 Liaison with the Public

A designated Community Liaison Officer (CLO) will be appointed to site during construction works. Any noise complaints will be logged and followed up in a prompt fashion by the CLO. In addition, prior to particularly noisy construction activity or activity likely to give rise to vibration, the CLO will inform the nearest NSLs of the time and expected duration of the noisy works.

6.1.6 Monitoring

During the construction phase the contractor will carry out noise monitoring at representative NSLs to evaluate and inform the requirement and / or implementation of noise management measures. Noise monitoring will be conducted in accordance with ISO 1996–1 (ISO 2016) and ISO 1996–2 (ISO 2017).

6.1.7 Vibration Control

The likely vibration levels associated with construction activities associated with the proposed development are not expected to give rise to vibration that is either significantly intrusive or capable of giving rise to structural or cosmetic damage to buildings.

Vibration from construction activities will be limited to the values set out in Table 2-3 to avoid any form of potential cosmetic damage to buildings and structures. Monitoring will be undertaken at identified sensitive buildings, where proposed works have the potential to be at or exceed the vibration limit values in Table 2-3 and further mitigation and communication will be required if exceedances against these limits occur.

6.2 Operational Phase

6.2.1 Traffic Along Surrounding Road Network

Changes to traffic flows will result in a not significant increase in noise level in the surrounding environment. Therefore, no mitigation measures are necessary in this case.

6.2.2 Mechanical Plant and Services

With consideration at the detailed design stage, the selection and location of plant items within the proposed development and associated buildings will ensure that noise emissions from any mechanical and electrical building services plant do not exceed the relevant noise criteria within Section2.2.2.2; therefore no further mitigation is required. In addition, noise emissions should be broadband in nature and should not contain any tonal or impulsive elements.

Once operational noise emissions are controlled within the development site, there will be no perceptible noise impact at sensitive receivers off-site.

6.2.3 Inward Impact

Mitigation against inward noise from the local road networks is listed by the way of enhanced glazing treatments at the specified facades within Figure 5-4. Suitable sound insulation requirements for glazing are given within Table 5-8. Notwithstanding this, as part of the detailed design of all residential blocks, the specifics in terms of octave band SRI performances will be reanalysed to take account of the finalised boundary treatment, ventilation strategies, room layouts, room volumes and glazing dimensions.

7. RESIDUAL IMPACT OF THE PROPOSED DEVELOPMENT

7.1 Construction Phase

The use of best practice noise control measures, hours of operation, scheduling of works within appropriate time periods, and noise monitoring during this phase will be implemented. With the inclusion of the various noise and vibration control measures on site discussed in 6.1 , it is expected that calculated noise levels in Table 5-2 can be reduced by 5 dB. Table 7-1 and Table 7-2 present the construction noise levels after the implementation of mitigation.

Table 7-1. Residual Construction Noise Levels at Varying Distances (Demolition, Piling and Excavation)

Description	Cumulative Source Sound Pressure, dB $L_{Aeq,T}$ at 10m	Calculated Noise Levels at Varying Distances, dB $L_{Aeq,T}$							
		NSL1 (5m)	NSL2 (10m)	NSL3 (25m)	NSL4 (35m)	NSL5 (50m)	NSL6 (60m)	NSL7 (80m)	NSL8 (120m)
Demolition, Piling and Excavation	92	86	80	72	69	66	64	62	58
CNT -		C	A	C	C	C	C	C	C
Significance against CNT		Significant to Very Significant depending on construction durations outlined within Section 2.2.1.1.3		Not Significant					

Table 7-2. Residual Construction Noise Levels at Varying Distances (Demolition, Piling and Excavation)

Description	Cumulative Source Sound Pressure, dB $L_{Aeq,T}$ at 10m	Calculated Noise Levels at Varying Distances, dB $L_{Aeq,T}$							
		NSL1 (5m)	NSL2 (10m)	NSL3 (25m)	NSL4 (35m)	NSL5 (50m)	NSL6 (60m)	NSL7 (80m)	NSL 8 (120 m)
General Construction	78	72	66	58	55	52	50	48	44
CNT -		C	A	C	C	C	C	C	C
Significance against CNT		Not Significant	Moderate	Not Significant					

Following the implementation of mitigation measures, residual construction noise levels at NSL 1 and NSL 2 are expected to remain above the CNT during demolition, piling, and excavation phases, while remaining below the CNT at all other NSLs. During the general construction phase, noise levels are anticipated to fall within or below the CNT at all NSLs except NSL 2, where levels are predicted to be within +1 dB of the CNT.

With reference to Section 2.2.1.1.3, if the duration of the most noise-intrusive works does not exceed the thresholds for significance, the overall residual effect during these construction phases may be considered not significant.

Construction activities are inherently transient, with noise impacts affecting the nearest NSLs only for brief periods. The noise calculations are highly conservative and represent a worst-case scenario; in practice, actual noise levels and associated residual impacts are likely to be lower. The most significant effects are expected to be localised to the nearest NSLs, while at other identified NSLs, construction noise levels are likely to fall below measured ambient and background levels, resulting in a not significant impact.

The likely residual effect of construction vibration is short term, negative, and moderate to significant where piling or rock breaking occurs within 20m of NSLs and short term, negative, and not significant at all NSLs beyond these distances.

7.2 Operational Phase

Noise levels from any building services plant within the development site will be controlled to not exceed the internal noise levels within section 2-11 for residential dwellings within the proposed development.

Once operational noise emissions are controlled within the development site, noise emissions outside the site will be imperceptible. The residual noise effect is therefore neutral, imperceptible and long-term.

Traffic along the surrounding road network will not lead to a change in noise level that would pose any significant effect. The resultant impact is long-term, negative and not significant.

7.3 Inward Impact

Noise levels inwards on the proposed development have been measured, calculated and assessed. Mitigation measures in the way of higher enhanced glazing have been specified to ensure that good or reasonable internal noise levels are achieved across the proposed development. The resultant residual noise impact at residents within the development will be negative, not significant and long term.

7.4 Cumulative Impact

In the event that construction activities at nearby sites are taking place concurrently with the construction of the proposed development, there is potential for cumulative noise impacts to occur. Due to the nature of construction works associated with the proposed development, noise levels from this site will likely dominate the noise environment when occurring in proximity to the closest noise sensitive locations along its immediate boundary. The noise contribution from other construction sites would need be equal to those associated with the closest site in order to result in any cumulative effect. Only one planning application identified (Application Number:1838081) has the likelihood of increasing the predicted construction noise levels at the nearest NSLs. Should this application progress to construction at the same time as the proposed development the residual construction noise levels presented within section 7.1 may rise by the order of +3dB.

The operational noise limits set for on-site buildings are designed to avoid any significant increase in the prevailing background noise environment external to the site. Operational noise limits included in this report refer to cumulative noise from all fixed installations on site. The design of plant and other fixed installations will be progressed during the design stage to ensure the noise limits at off-site noise sensitive locations are not exceeded.

Traffic volumes assessed take account of the additional traffic from other permitted developments and therefore the traffic noise assessment presented is already assessing the cumulative impact. This assessment has concluded there will be no significant noise impact due to operational traffic.

In conclusion, there is potential for a temporary increase in cumulative construction noise if various stages of the construction works within the development take place concurrently, or other developments occur at the same time. Residual cumulative effects related to the construction phase, post-mitigation, are likely to be not significant. This is also true for the operational phase, provided that the operational noise levels outlined in section 2.2.2 are adhered to during the detailed design, and the mitigation measures specified in section 6 are followed.

8. MONITORING

8.1 Construction Phase

During the construction phase, the contractor for each site will carry out noise monitoring at representative NSLs to evaluate and inform the requirement and / or implementation of noise management measures. Noise monitoring will be conducted in accordance with ISO 1996–1 (ISO 2016) and ISO 1996–2 (ISO 2017).

8.2 Operational Phase

There are no proposed monitoring requirements associated with the operational phase of the proposed Development.

9. REFERENCES

- British Standard Institute (BSI) British Standard (BS) 5228-1:2009 +A1 2014 Code of Practice for noise and vibration control of construction and open sites - Part 1: Noise.
- BS 5228-2:2009+A1:2014 Code of Practice for noise and vibration control of construction and open sites - Part 2: Vibration (BSI 2014b).
- 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
- BS 7385: 1993 Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration (BSI 1993).
- BS 6472-1: 2008 Guide to evaluation of human exposure to vibration in buildings, Part 1 Vibration sources other than blasting (BSI 2008).
- BS 8233:2014 Guidance on sound insulation and noise reduction for buildings.
- BS 4142: 2014 +A1 2019 Methods for Rating and Assessing Industrial and Commercial Sound (BSI 2019).
- Cork Agglomeration Noise Action Plan 2024-2028.
- EPA (2022). Guidelines on the Information to be contained in Environmental Impact Assessment Reports.
- UK Highways England (UKHE) Design Manual for Roads and Bridges (DMRB) LA 111 Sustainability and Environmental Appraisal LA 111 Noise and Vibration Revision 2 (UKHE 2020).
- S.I. No. 549/2018 – European Communities (Environmental Noise) Regulations 2018.
- S.I. No. 241/2006 – European Communities Noise Emission by Equipment for Use Outdoors (Amendment) Regulations 2006.
- International Organization for Standardization (ISO) 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation (ISO 1996).
- ISO 1996-1: 2016 Acoustics – Description, measurement and assessment of environmental noise. Part 1: Basic quantities and assessment procedures (ISO 2016).
- ISO 1996-2:2017 – Description, measurement and assessment of environmental noise – Part 2: Determination of sound pressure levels (hereafter referred to as ISO 1996 – 2) (ISO 2017).
- The UK Department of Transport Calculation of Road Traffic Noise (UK Department of Transport 1998).
- The Professional Guidance on Planning & Noise (ProPG): New Residential Document and Supplementary Documents (2017).