



Arklow LRD Amendments

Acoustic Design Statement
30 September 2026

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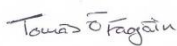
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Executive Summary

Wave Dynamics were engaged by Stephen Little & Associates as the acoustic consultants for the amended planning stage application for Arklow LRD Amendments, Tinahask Upper, Money Little & Money Big, Arklow, Co. Wicklow. The proposed development will consist of the following:

"The proposed development comprises amendments to the Large-scale Residential Development permitted under WCC Reg. Ref. 24/325 consisting 352no. residential units proposed in a mix of houses and apartment units comprising 334no. houses (44no. 2-bedroom, 241no. 3-bedroom and 49no. 4-bedroom) ranging from 2 to 3 storeys, 18no. apartments (6no. 1-bedroom and 12no. 2-bedroom) in 1no. 4 storey building, 1no. creche (c. 711 sqm) at ground floor of apartment Block A; and all associated and ancillary site development works including on site attenuation, hard and soft landscaping and boundary treatment works, including public open space; communal open space, public lighting; surface car parking; bicycle parking spaces/stores for houses and apartment units; 4no. ESB substations; bin stores; vehicular access via existing Northwood road and railway overbridge from Knockmore roundabout. The proposed development also includes road upgrade works to the existing railway overbridge and the western approach to same including the provision of a 2.5m footpath, 6m carriageway, safety barrier improvement works and other ancillary works required to facilitate these elements."

Noise Impact Assessment

A Stage 1 and Stage 2 ProPG assessment has been undertaken. As part of the stage one assessment to categorise the site a baseline noise survey was undertaken to measure the existing noise levels. Following a review of the noise levels on the site, including the L_{AFmax} and L_{Aeq} , the site has been characterised as low risk for the daytime and nighttime periods; irrespective of this, mitigation measures are recommended to control the onset noise levels.

Internal Noise Levels

Following the baseline survey, a noise impact assessment was undertaken, this included break-in noise calculations to predict the internal noise levels from road traffic noise and rail noise. Consideration has also been given to the future growth of roads and the railway line. Following the assessment, the building envelope performance requirements were determined. The performance specification for the building envelope, which includes the external walls, glazing, roof, and ventilation requirements, has been provided in this report. It is predicted that the internal noise levels will be achieved for both the L_{Aeq} and L_{AFmax} requirements outlined in ProPG.

External Amenity Noise Levels

The assessment has also considered the external amenity noise levels in accordance with ProPG 2017. All public external amenity spaces and the majority of all rear gardens and balconies are predicted to achieve suitable noise levels to meet the desirable levels without additional mitigation. Houses along the western and northwestern boundary of the site adjacent to the rail line are required to have rear garden boundary walls to a minimum height of 1.5m to achieve the external amenity noise levels in these rear gardens.

Based on the recommendations in this report it is predicted that the internal and external noise levels will achieve the targeted noise levels in line with BS 82233:2014 and ProPG 2017 guidance.

Vibration Impact Assessment

A vibration survey was undertaken on the site to measure the vibration levels from train passes in terms of VDV (Vibration Dose Value). The purpose of the survey was to measure the existing vibration levels and predict its impact on the amenity of the future residents.

The vibration impact on the resident's amenity has been assessed based on a worst-case scenario. Based on the measurements taken onsite, it is not predicted that the vibration impact from train passes will have any negative

impact on the amenity of the residents of the proposed development. The assessment found a low probability of adverse comment due to vibration from train passes.

Table of Contents

1	Introduction	1
1.1	Statement of Competence	1
2	Site Description	2
3	Project Criteria	3
3.1	Noise Assessment Criteria	3
3.2	Vibration Assessment Criteria	6
4	Baseline Noise Survey	7
4.1	Survey Details	7
4.1.1	Site Description and Measurement Locations	7
4.1.2	Survey Methodology and Personnel	7
4.1.3	Survey Period	8
4.1.4	Noise Measurement Equipment	8
4.1.5	Vibration Measurement Equipment	9
4.1.6	Weather Conditions for Monitoring Period	9
4.1.7	Subjective Noise Environment	9
4.2	Noise Measurement Results	9
4.3	Vibration Measurement Results	12
4.4	Future Noise Levels	12
5	ProPG Assessment	13
5.1	ProPG Stage 1 – Initial Risk Assessment (Predicted Levels Prior to Development)	13
5.1.1	ProPG Stage 1 – Initial Risk Assessment	14
5.2	ProPG Stage 2 – Full Assessment	15
5.3	Element 1: Good Acoustic Design Process	15
5.3.1	Discussion of Good Acoustic Design	15
5.4	Element 2 – Assessment of Internal Noise Levels	16
5.4.1	Road and Rail Noise Prediction Modelling	16
5.4.2	Predicted Façade Levels	16
5.4.3	Building Envelope Specification	20
5.5	Element 3- External Amenity Spaces	21
5.6	Element 4 - Assessment of Other Relevant Issues	23
5.6.1	Compliance with Relevant National and Local Policy	23
5.6.2	Magnitude and Extent of Compliance with ProPG	23
5.6.3	Likely Occupants of The Development	23
5.6.4	Acoustic Design v Unintended Adverse Consequences	23
5.6.5	Acoustic Design v Wider Planning Objective	23
5.7	Stage 2 Assessment Conclusion	23

6	Other Considerations	24
6.1	Proposed School	24
6.2	Link Road	24
7	Vibration Assessment	26
8	Conclusion	27

1 Introduction

Wave Dynamics were engaged by Stephen Little & Associates as the acoustic consultants on Arklow LRD Amendments, Tinahask Upper, Money Little & Money Big, Arklow, Co. Wicklow.

Amendments to the proposed development consist of the following:

"The proposed development comprises amendments to the Large-scale Residential Development permitted under WCC Reg. Ref. 24/325 consisting 352no. residential units proposed in a mix of houses and apartment units comprising 334no. houses (44no. 2-bedroom, 241no. 3-bedroom and 49no. 4-bedroom) ranging from 2 to 3 storeys, 18no. apartments (6no. 1-bedroom and 12no. 2-bedroom) in 1no. 4 storey building, 1no. creche (c. 711 sqm) at ground floor of apartment Block A; and all associated and ancillary site development works including on site attenuation, hard and soft landscaping and boundary treatment works, including public open space; communal open space, public lighting; surface car parking; bicycle parking spaces/stores for houses and apartment units; 4no. ESB substations; bin stores; vehicular access via existing Northwood road and railway overbridge from Knockmore roundabout. The proposed development also includes road upgrade works to the existing railway overbridge and the western approach to same including the provision of a 2.5m footpath, 6m carriageway, safety barrier improvement works and other ancillary works required to facilitate these elements."

A review of the existing noise environment is required to quantify the existing noise levels and establish the project's acoustic requirements to ensure the amenity of future residents.

A baseline noise survey was undertaken to measure the existing noise levels. This report outlines the project criteria, baseline survey results, assessment, and recommendations for;

- Building envelope sound insulation,
- Ventilation requirements and
- External amenity noise levels.

Appendix A outlines a glossary of the acoustic terminology used in this report.

1.1 Statement of Competence

This report was completed by Wave Dynamics, an acoustic consultancy that specialises in noise and vibration. Our consultants have completed numerous similar projects in Ireland, the UK, and Europe.

This assessment and report were completed by Tom Ó Faogáin | Acoustic Consultant. Tom has experience of numerous planning stage assessments. Tom's qualifications include; MPhil in Music & Media Technology.

The report was peer-reviewed by James Mangan, who is Director (Acoustics) with Wave Dynamics. James has extensive experience in assessing noise and vibration impacts across a variety of sectors, including residential, industrial, commercial and renewable development. James has over 25 years' experience as an acoustic consultant, holds a Pg Diploma in Acoustics and Noise Control (Institute of Acoustics), is a Member of the Institute of Acoustics (MIOA) and is a former Chairman of the Irish Branch of the Institute of Acoustics.

2 Site Description

The site is located at Tinahask Upper, Money Little & Money Big, Arklow, Co. Wicklow. The development is surrounded by greenfields and agricultural land to the south, residential dwellings to the north, Arklow Golf Club to the east and the Dublin-Wicklow railway line to the west. The site location and surrounding area are shown in Figure 1.

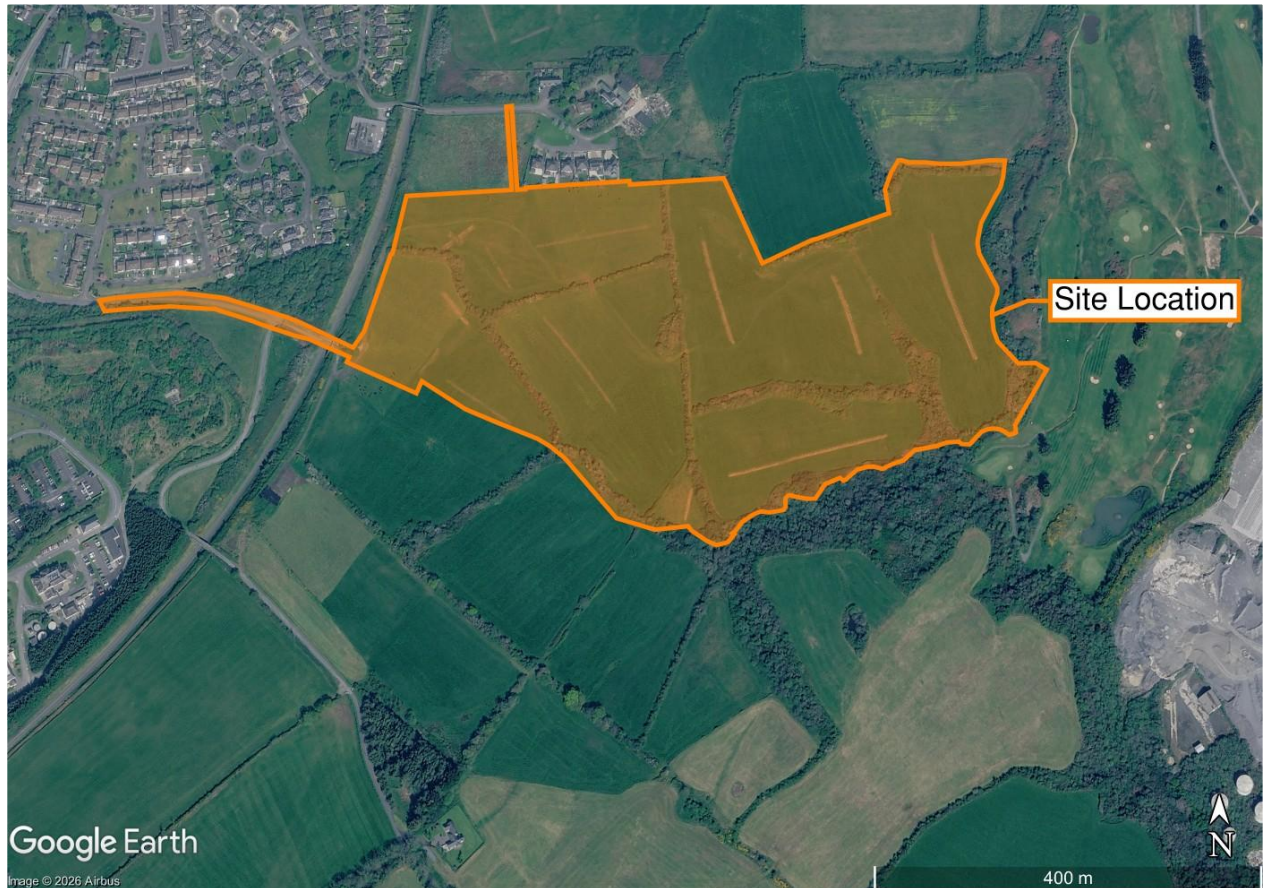


Figure 1: Site Location and the surrounding area.

3 Project Criteria

The acoustic criterion for the project is set out in this section, the purpose of the criteria is to ensure reasonable:

- Internal noise levels,
- Reasonable vibration from train passes and,
- External amenity noise levels.

To provide adequate conditions Wave Dynamics has developed the project criteria for:

- Façade sound insulation performance,
- Ventilation requirements,
- External amenity requirements and
- Vibration from train passes.

Assessment Standards

The criteria for the project have been developed based on the following industry standards:

- ✓ BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings*.
- ✓ ProPG Professional Practice Guidance on Planning & Noise.
- ✓ ISO 1996-1:2016 *Acoustics — Description, measurement, and assessment of environmental noise — Part 1: Basic quantities and assessment procedures*
- ✓ British Standard BS 6472-1:2008 *Guide to evaluation of human exposure to vibration in buildings*.
- ✓ BS 6472-1:2008 *Guide to evaluation of human exposure to vibration in buildings*.
- ✓ ISO 1996-1:2016 *Acoustics — Description, measurement, and assessment of environmental noise — Part 1: Basic quantities and assessment procedures*
- ✓ Previous experience on similar projects.

3.1 Noise Assessment Criteria

The internal ambient noise levels requirements have been developed from the following standards:

ProPG: Professional Practice Guidance on Planning & Noise

ProPg 2017 is used to assess airborne noise from transport sources including road, rail, and aircraft noise. The aim of the document is to provide a good design process which considers the internal acoustic environment at an early stage in the design process. The guidance was prepared by the Institute of Acoustics, the Association of Noise Consultants and the Chartered Institute of Environmental Health and is based on the findings by the World Health Organisation in relation to noise impact on humans. Its adoption is considered best practice for assessing the potential noise impact on the future occupants of residential developments.

The guidance is primarily designed for residential developments; however, it can be applied to other development types, including developments where people require appropriate noise levels for rest and sleep. This includes residential care homes, hospitals etc. The guidance advocates a holistic design process which considers the site, its location and likely suitability for the development at an early stage.

The two primary stages of the ProPg design approach are summarised as follows:

Stage 1 – The first stage is to undertake an initial high-level noise risk assessment of the proposed site considering the noise levels (measured and or predicted) to identify any noise risks. This would include consideration of the current noise environment, future use and future noise levels; and,

Stage 2 –The second stage is a full detailed assessment of the proposed development covering the “*Four Key Elements*”:

1. “*Good Acoustic Design Process,*
2. *Internal Noise Level Guidelines,*
3. *External Amenity Area Noise Assessment; and*
4. *Assessment of Other Relevant Issues.”*

As part of the process an Acoustic Design Statement is produced and submitted to the planning authority. This document sets out the design process used to come to the conclusions and recommendations in the report.

Following the ProPg the following conclusions are recommended by ProPG in relation to the findings of the Acoustic Design Statement based on the recommendations of the Acoustic Consultant:

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

Section 3 of the ProPG outlines the recommended approach decision makers should follow in coming to their conclusions based on the recommendations of the Acoustic Design Statement. Figure 2 illustrates the ProPG approach.

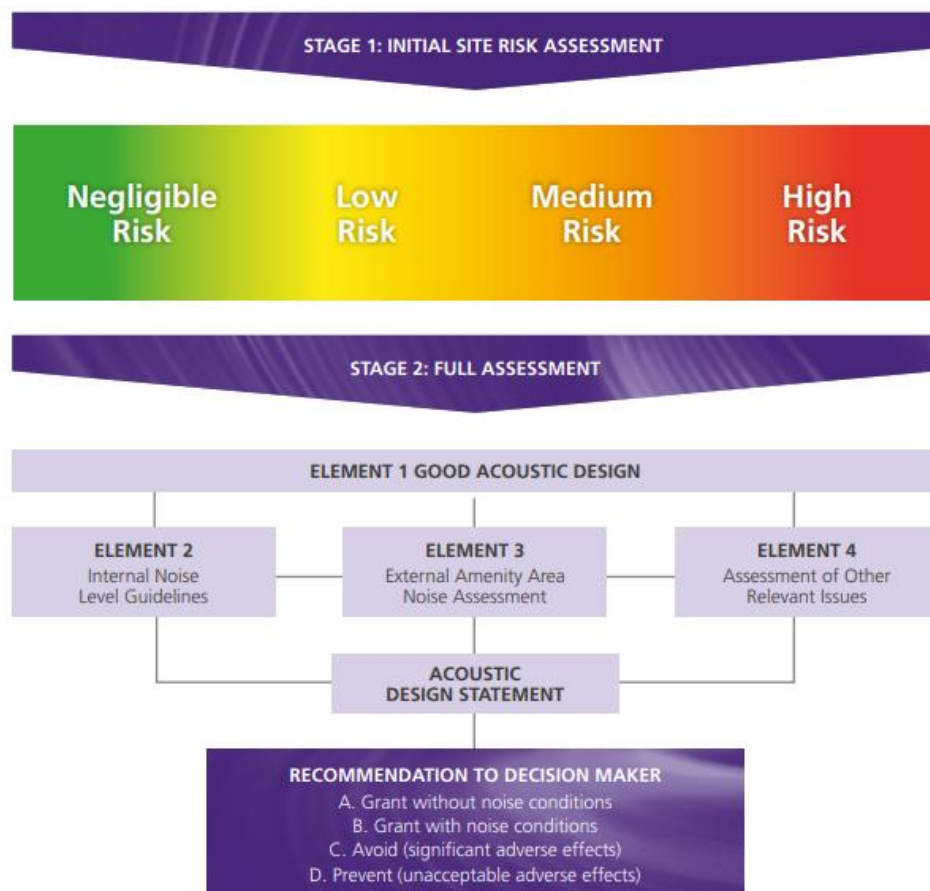


Figure 2: Summary of overall ProPG approach

Internal Noise Levels

Table 1 below are the recommended internal noise levels from BS 8233:2014 within living accommodation for residential buildings for dining, resting and sleeping. These limits are in line with the ProPG and the World Health Organisation Guidelines.

Table 1: BS 8233:2014 internal noise criteria –Residential Buildings.

Activity	Location	07:00 to 23:00 Hrs	23:00 to 07:00 Hrs
Resting	Living Room	35 dB $L_{Aeq, 16 \text{ hour}}$	-
Dining	Dining Room/Area	35 dB $L_{Aeq, 16 \text{ hour}}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq, 16 \text{ hour}}$	30 dB $L_{Aeq, 8 \text{ hour}}$ 45dB L_{AFmax} (See Note 1)

1: Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values. In most circumstances, in noise-sensitive rooms at night (e.g. bedrooms), good acoustic design can be used so that individual noise events do not normally exceed 45dB L_{AFmax} more than 10 times a night.

External Amenity Space Noise Levels

With regard to noise levels in external amenity spaces ProPG 2017 refers to the BS8233:2014 guidance which states that:

“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 $L_{Aeq, 16hr}$ ”.

It also states that:

“These guideline values may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces but should not be prohibited.”

After mitigation/with mitigation if the adverse noise impacts are still above the recommended noise levels they can be offset by providing an alternative amenity space to partially offset the noise impact by providing access to:

- *“a relatively quiet façade (containing openable windows to habitable rooms) or a relatively quiet externally ventilated space (i.e. an enclosed balcony) as part of their dwelling; and/or*
- *a relatively quiet alternative or additional external amenity space for sole use by a household, (e.g. a garden, roof garden or*
- *a relatively quiet, protected, nearby, external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or*
- *a relatively quiet, protected, publically accessible, external amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance). The local planning authority could link such provision to the definition and management of Quiet Areas under the Environmental Noise Regulations.”*

BS 8233:2014 elaborates on this further, it acknowledges that it may not always be necessary or feasible to ensure that noise levels remain within the guideline values. In respect of gardens and patios, BS 8233:2014 states:

“However it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development

needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited.”

Both BS8233:2014 and ProPG 2017 do not advise that development should be restricted in areas with undesirable noise levels. The standards recommend that mitigation measures are put in place where practicable to achieve the recommended noise levels for the external amenity spaces. It notes that this may not be practical in all situations and local or governmental policy should take precedence in these situations.

3.2 Vibration Assessment Criteria

There are no specific vibration criteria for buildings in Ireland. The vibration criteria for this project are based on BS 6472-1:2008 Guide to evaluation of human exposure to vibration in buildings.

The criteria are based on VDV (Vibration Dose Value) which is the appropriate measurement to measure/predict the impact of vibration on the occupants of the building. The standard offers vibration dose value ranges which might result in various probabilities of adverse comment within residential buildings as shown in Table 2.

Table 2: Project Vibration Criteria

Place and Time	Low probability of adverse Comment (m.s ^{-1.75})	Adverse Comment Possible (m.s ^{-1.75})	Adverse Comment Probable (m.s ^{-1.75})
Residential Buildings 16hr Day	0.2 - 0.4	0.4 - 0.8	0.8 - 1.6
Residential Buildings 8hr night	0.1 - 0.2	0.2 - 0.4	0.4 - 0.8

4 Baseline Noise Survey

A baseline noise survey was conducted at Tinahask Upper, Money Little & Money Big, Arklow, Co. Wicklow, to assess the impact of road and rail noise. The purpose of the survey was to quantify the existing noise environment to predict its impact on the future occupants of the development.

This section outlines the results of the survey, the measurement procedure and the equipment used. The attended noise measurements were undertaken on the 14th of November 2023. The noise logger was deployed on the 14th of November 2023 at 16:00 hrs and collected on the 18th of November 2023 at 13:15 hrs.

4.1 Survey Details

4.1.1 Site Description and Measurement Locations

The site is located at Tinahask Upper, Money Little & Money Big, Arklow, Co. Wicklow. The development is surrounded by greenfields and agricultural land to the south, residential dwellings to the north, Arklow Golf Club to the east and the Dublin-Wicklow railway line to the west. The site location, measurement positions used during the baseline noise survey and surrounding area are shown in Figure 3.

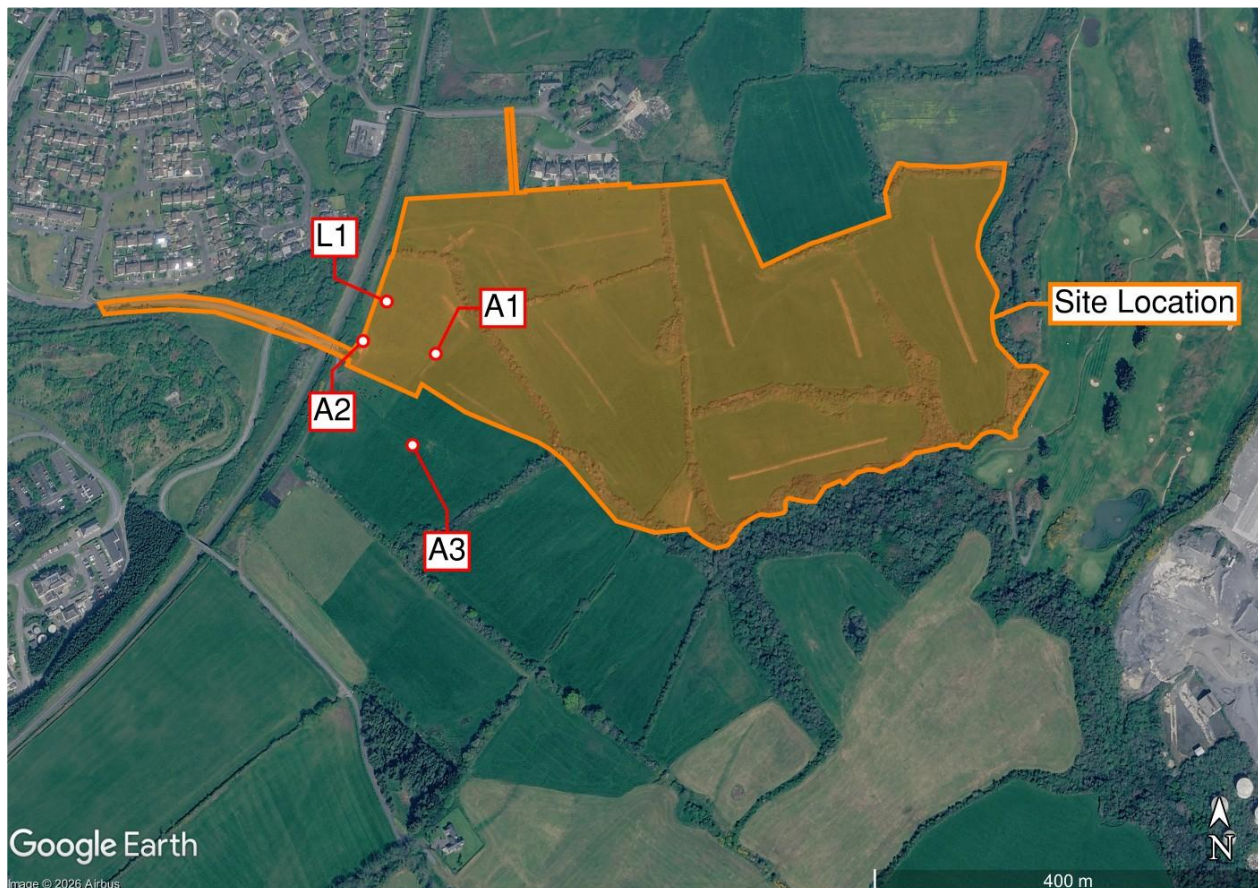


Figure 3: Site location and measurement positions L1 and A1-A3.

4.1.2 Survey Methodology and Personnel

The attended survey, logger deployment and collection were completed by James Cousins (Principal Consultant).

Attended Noise Measurements

Noise measurements were undertaken in general accordance with ISO 1996-1:2016 using an ISO Class 1 sound analyser. Attended measurements were taken for a duration of 15 minutes in the locations L1, A1, and A3, and sound exposure level measurements were taken over varying durations at A2 as shown in Figure 3.

Care was taken to avoid any effect on the measurement of extraneous noise, acoustic vibration, or interference. During the attended noise measurements, the sound level meter was positioned at approximately 1.5m above ground level. The weather conditions were calm (wind less than 5m/s) with no rain. A windshield was used for the duration of the attended survey. The noise logger was calibrated before and after the survey and no significant drift was noted.

Unattended Noise Measurements

An unattended noise logger was deployed in location L1 as per Figure 5. The logger was secured at a height of approximately 3 metres along the western boundary of the site. Measurements have been filtered for periods of unsuitable weather conditions where required. The noise logger was calibrated before and after the survey and no significant drift was noted.



Figure 4: Noise Logger Setup

4.1.3 Survey Period

The attended noise measurements were undertaken on the 14th of November 2023. The noise logger was deployed on the 14th of November 2023 at 14:00 hrs and collected on the 18th of November at 13:15 hrs.

4.1.4 Noise Measurement Equipment

A Class 1 sound level meter/noise logger, in general accordance with IEC 61672-1:2013, was used for the baseline noise survey. Table 3 below summarises the measurement equipment used.

Table 3: Noise Measurement Equipment

Description	WD Asset Number	Model	Serial No.	Calibration Certificate No.	Calibration Due Date
Calibrator	CAL1	Nor 1251	31056	UCRT25/2481	15/10/2026
Sound Level Meter	SLM2	Nor 140	1403082	UCRT25/2495	20/10/2027

4.1.5 Vibration Measurement Equipment

Table 4 below summarises the vibration measurement equipment used.

Table 4: Vibration Measurement Equipment

Description	WD Asset Number	Model	Serial No.	Calibration Certificate No.	Calibration Due Date
Vibration Logger	NVMV1	Vibrocock V9000	SN2151	04242151	01/04/2026

4.1.6 Weather Conditions for Monitoring Period

Good weather conditions were noted in general during the deployment and collection during the attended survey, with winds of less than 5 m/s and no rain.

The results of the unattended survey have been filtered for periods of adverse weather where required.

4.1.7 Subjective Noise Environment

During the attended noise survey and logger deployment, the following noise sources were identified:

- Road traffic noise,
- Train noise during passes,
- Low wind generated noise on foliage.

4.2 Noise Measurement Results

This section outlines the results of the baseline noise survey.

Attended Measurement Results

Table 5 outlines the results of attended measurements.

Table 5: Attended Noise Measurement Results

Measurement				Measured Noise Levels		
Location	Date	Time (hrs)	Duration (mins)	L _{Aeq} dB	L _{AFmax} dB	L _{A90} dB
L1	14/11/2023	16:00	15:00	57	88	49
A1	18/11/2023	13:44	15:00	52	61	50
A3	18/11/2023	14:22	15:00	52	68	50

Rail Noise Levels

Table 6 outlines the train passes noise levels. The train sound exposure levels have been calculated from the measured L_{Aeq} levels.

Table 6: Train Passes Noise Levels

Measurement				Train Direction	Measured Noise Levels	Sound Exposure Level
Location	Date	Time (hrs)	Duration (sec)		L _{Aeq} dB	L _{Ax} dB
L1	15/11/2023	15:18	12	South ¹	62	73

Measurement				Train Direction	Measured Noise Levels	Sound Exposure Level
Location	Date	Time (hrs)	Duration (sec)		L _{Aeq} dB	L _{AX} dB
L1	15/11/2023	19:34	11	South ¹	68	78
A2 ¹	18/11/2023	14:14	8	North	64	72

1) Assumed direction based on Iarnród Éireann timetables.

To calculate the impact of rail noise on the façade of the proposed building, it is possible to predict the noise impact using the measured L_{Aeq} from train passes and by calculating the sound exposure level using the following equation:

$$L_{Aeq} = L_{AX} - 10 \cdot \log_{10} (d1/d2) + 10 \cdot \log_{10}(N) - 10 \cdot \log_{10}(T)$$

Where:

L_{AX} measured SEL

N number of vehicle movements

T time (seconds)

d1 distance from the source to the receiver

d2 distance from the source to the measurement

Following a review of the information on the rail line regarding number of trains servicing Dublin – Wexford line as per Iarnród Éireann, there are 12 total trains carrying passengers per day. WD have allowed for an additional 10 trains on the line for goods as this line services Rosslare port.

Total Movements:

Day (07:00 -23:00hrs) : 18 movements (10 commuter and assumed 8 goods)

Night (23:00-07:00hrs): 4 movements (2 commuter and assumed 2 goods)

Table 7: Calculated noise levels from SELs and movements on the Dublin – Wexford rail line.

Activity	Period	Number of Passes	Façade Noise Level
Train Movements	Day	18	43 L _{Aeq} 16 hr
	Night	4	40 L _{Aeq} 8 hr

The predicted day and night noise levels show that the unattended noise monitoring results are dominated by road traffic noise rather than rail noise.

Unattended Monitoring Results

Table 8 outlines the results of unattended noise measurements at monitoring location L1.

Table 8: unattended Measurement Results

Start Date	$L_{Aeq,16hour}$ (07:00 – 23:00) dB	L_{night} ($L_{Aeq,8hour}$ 23:00 – 07:00) dB	L_{den} (00:00 - 00:00) dB	10th highest night-time L_{AFmax}	L_{A90} (23:00 - 07:00) dB
14/11/2023	52 ⁽¹⁾	46	N/A	56	38
15/11/2023	50	42	53	52	37
16/11/2023	51	47	51	57	40
17/11/2023	54	43	55	58	38
18/11/2023	50 ⁽¹⁾	N/A	N/A	N/A	N/A

- (1) Shortened measurement duration.
- (2) Where night-time period is referred to the date is the date the measurement commenced on at 23:00hrs and finished at 07:00hrs on the following calendar day.
- (3) Arithmetic average of L_{AF90} .

L_{AFmax} Noise Levels

Based on the project criteria outlined in Section 3, the internal L_{AFmax} 15min inside the dwelling bedrooms cannot exceed 45dBA more than 10 times per night. With regard to the maximum noise levels ProPg states:

“A site should not be regarded as negligible risk if the $L_{Amax,F}$ exceeds, or is likely to exceed 60 dB more than 10 times a night. A site should be regarded as high risk if the $L_{Amax,F}$ exceeds, or is likely to exceed 80 dB more than 20 times a night.”

Figure 5 below highlights the average number of L_{AFmax} events recorded on the noise logger per night based on a 15min measurement interval. Based on the ProPG risk assessment of the L_{AFmax} noise levels, the site is not considered high risk as there are not typically more than 20 occurrences exceeding 80dB L_{AFmax} . Overall the night time L_{AFmax} noise levels recorded at the monitoring location were generally low.

The façade specification outlined in Table 11 below has been determined in accordance with achieving the internal noise levels for both L_{Aeq} and the L_{AFmax} incident noise levels below.

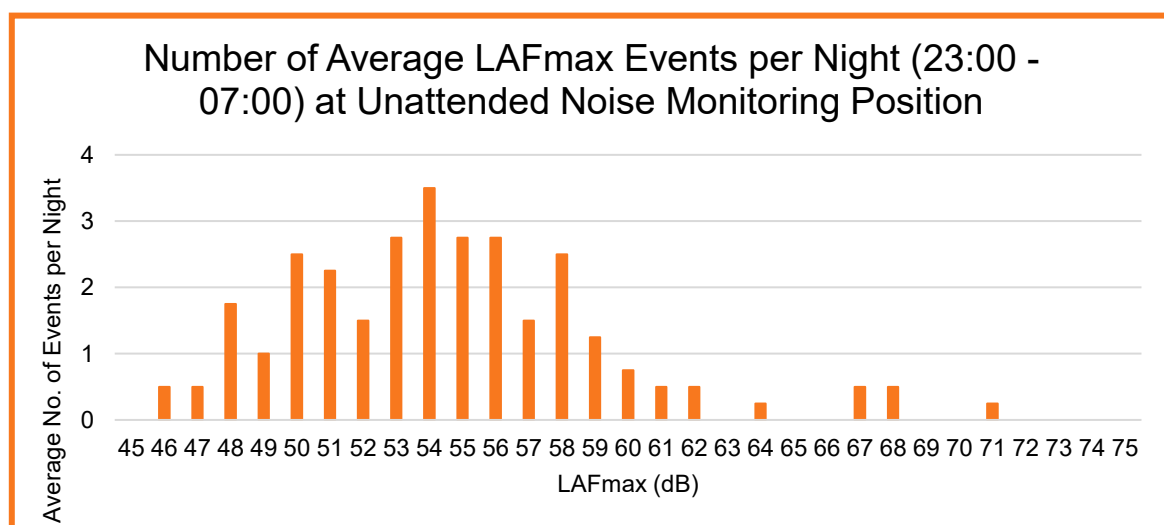


Figure 5: Average recorded L_{AFmax} events per night based on 15min measurement intervals.

Discussion of Measurement Results

The measurements were taken on weekdays to provide an understanding of the noise climate around the site at a typical time. From the noise levels recorded, it can be seen that the levels were steady for the duration of the survey.

The ambient noise consisted of traffic noise from Arklow, and rail noise when trains were passing. Other sources of noise that impacted on the noise climate was low wind generated noise on tree foliage.

Based on the ProPG risk assessment of the L_{AFmax} noise levels, the site is not considered high risk as there are not typically more than 20 occurrences exceeding 80dB L_{AFmax} .

4.3 Vibration Measurement Results

This section outlines the results of both the unattended and attended vibration measurements.

Unattended Measurement Results

Table 9 outlines the results of the vibration measurement results for the logger measurements at measurement position L1.

Table 9: Vibration Measurement Results

Date	16 Hour VDV $ms^{-1.75}$ (07:00 - 23:00)			8 ¹ Hour VDV $ms^{-1.75}$ (23:00 – 07:00)		
	Axis			Axis		
	X	Y	Z	X	Y	Z
14/11/2023	--	--	--	0.006	0.006	0.015
15/11/2023	0.006	0.006	0.019	0.006	0.007	0.016
16/11/2023	0.006	0.006	0.02	0.006	0.006	0.014
17/11/2023	0.005	0.006	0.019	0.005	0.005	0.005
18/11/2023	0.015 ⁽²⁾	0.012 ⁽²⁾	0.032 ⁽²⁾	--	--	--

(1) Where night-time period is referred to the date is the date the measurement commenced on at 23:00hrs and finished at 07:00hrs on the following calendar day.

(1) Shortened measurement duration.

Discussion of Measurement Results

The vibration levels were dominated by train passes. There were no other vibration sources noted onsite. The logger location was specifically chosen to ensure there was no interference with the vibration measurement survey. The logger location was selected as it was representative of the closest houses to the rail line.

4.4 Future Noise Levels

At the time of the assessment, we are not aware of any proposed plans to increase the operation of the Dublin – Wexford railway line, however Rosslare Europort is currently being redeveloped which may increase the volume of train movements on the railway line in the future. WDA have allowed for a 50% increase in rail traffic compared to current volume.

For roads and based on data from the TII (2017), the average rate of growth on Irish roads is a 3.9%. Assuming linear growth of 3.9% over the next 10 years an increase in noise levels from road traffic of 1-2 dB would be expected. This has been allowed for in our assessment.

5 ProPG Assessment

5.1 ProPG Stage 1 – Initial Risk Assessment (Predicted Levels Prior to Development)

The stage one risk assessment is used to assess the site for potential risks that may occur in terms of noise impact. The ProPG sets out four categories of risk: 1) negligible, 2) low, 3) medium or 4) high risk. Figure 2 below illustrates the ProPG risk assessment and the values associated with each risk category.

The risk assessment also considers the risk based on the number of L_{AFmax} events per night as follows;

- A site should not be considered a negligible risk if more than 10 L_{AFmax} events exceed 60 dB during the night period and;
- A site should be considered a high risk if the L_{AFmax} events exceed 80 dB more than 20 times per night.

Paragraph 2.9 of ProPG states that,

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

To assess the noise impact with the ProPG risk categories a baseline noise survey was undertaken on the site to quantify the existing noise environment.

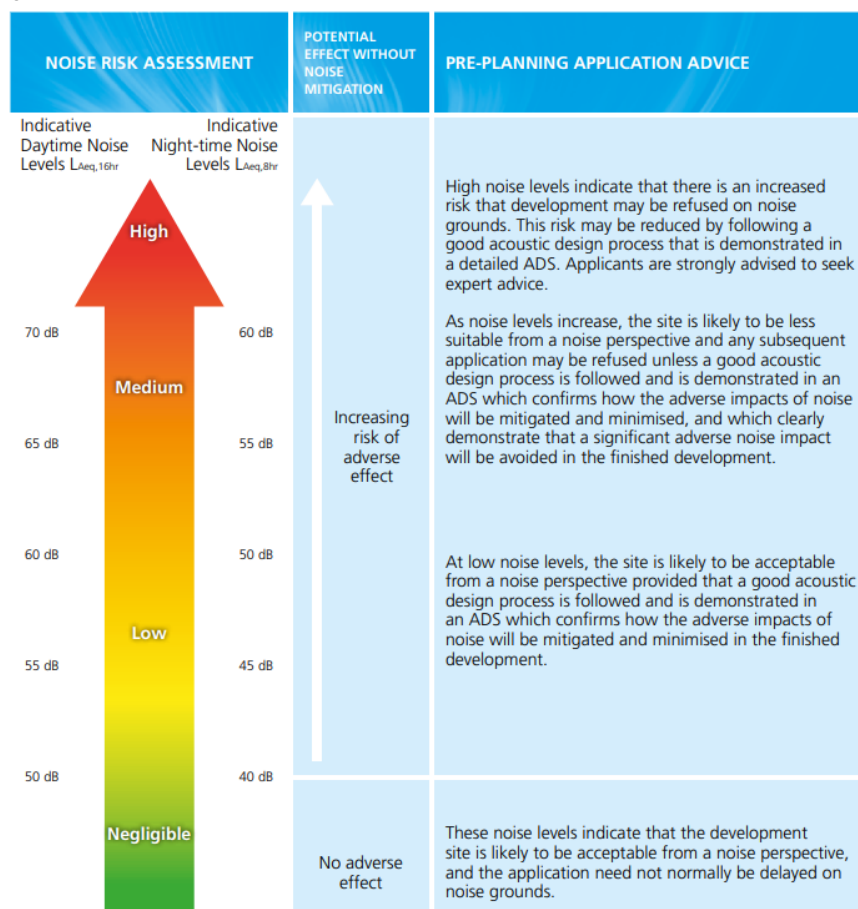


Figure 6: ProPG Risk Analysis

5.1.1 ProPG Stage 1 – Initial Risk Assessment

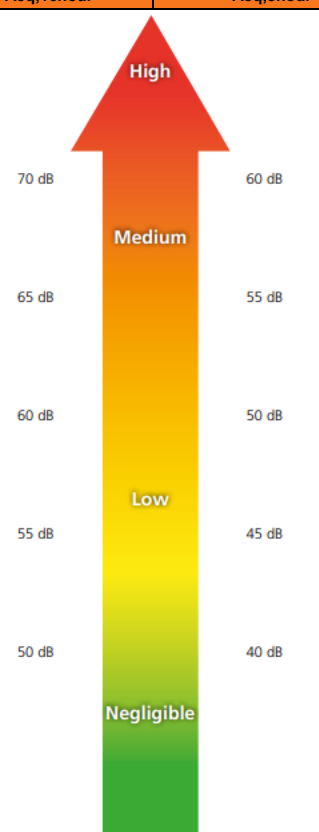
The measured noise levels on the site and future noise levels have been predicted for, road and railway noise.

Table 10 below identifies the Noise Risk Categorisation of the site based on the predicted free field façade noise levels. The site has been categorised as low to medium risk. Considering this risk categorisation of the development mitigation measures will be required to mitigate the noise risk in following with ProPG guidance and good acoustic design process.

It should be noted that the ProPG 2017 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.”

Table 10: ProPG Stage 1 Risk Assessment of Existing Noise Levels

Noise Risk Assessment		Risk Assessment Rating	
Indicative Daytime Noise Levels $L_{Aeq,16hour}$	Indicative Night-time Noise Levels $L_{Aeq,8hour}$	Daytime Noise Levels	Night-time Noise Levels
		High Risk	High Risk
		N/A	N/A
		Medium Risk	Medium Risk
		N/A	N/A
		Low Risk	Low Risk
		The full development is at low risk of noise in the daytime period.	The full development is at low risk of noise in the nighttime period.
		Negligible Risk	Negligible Risk
		N/A	N/A

5.2 ProPG Stage 2 – Full Assessment

This section outlines the full acoustic design assessment in line with ProPG guidance.

5.3 Element 1: Good Acoustic Design Process

ProPG States the following in relation to Good Acoustic Design Process:

“A good acoustic design process takes a multi-faceted and integrated approach to achieve optimal acoustic conditions, both internally (inside noise-sensitive parts of the building(s)) and externally (in spaces to be used for amenity purposes).”

“Good acoustic design should avoid “unreasonable” acoustic conditions and prevent “unacceptable” acoustic conditions (these terms are defined in Element 2). Good acoustic design does not mean overdesign or gold plating of all new development but seeking to deliver the optimum acoustic outcome for a particular site”

The following considerations are recommended by ProPG:

- *“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.*
- *Assess external amenity area noise.”*

5.3.1 Discussion of Good Acoustic Design

Mitigation of Sources

The development is located close to road and rail noise sources which are not on or part of the development, therefore it is not possible to reduce or relocate the relevant noise sources.

Site Layout and Orientation

The western and northwestern boundaries of the site will be the most exposed to the road and rail noise. The remainder of the site will benefit from screening from the dwellings on the western side of the development.

Construction Methods

Section 5.4.3 considers the construction methods required to meet the building performance control measures. The construction measures are in general robust, providing standard external wall and façade details to meet thermal, fire and weathertightness requirements and will in general provide adequate performance to achieve good levels of sound insulation.

Impact of Noise Control Measures

The effects for noise control measures on other building elements including ventilation are considered in Section 5.4.3. It is generally impractical to provide ventilation via openable windows in urban/built up areas. An open window will provide 10-15dB of attenuation which in build-up urban areas is not practical. In general, the good acoustic design process in these areas is to provide ventilation via attenuated natural vents or mechanical ventilation. This allows the occupants to have adequate ventilation with adequate noise levels.

External Amenity

ProPG states the following with regard to external amenity spaces:

“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 LAeq,16hr.”

The external amenity source noise levels are considered in section 5.5.

5.4 Element 2 – Assessment of Internal Noise Levels

This section outlines the assessment of the building envelope including the façade noise modelling, and specification of the glazing requirements.

A noise intrusion assessment for the proposed development has been completed in accordance with the methodology outlined in the International Standard *ISO EN 12354-3:2017 Building acoustics — Estimation of acoustic performance of buildings from the performance of elements — Part 3: Airborne sound insulation against outdoor sound*. The standard provides a method for calculating the indoor noise levels due to, for instance, Rail Traffic Noise.

The calculation method accounts for multiple factors including:

- The external noise level at the affected building façade.
- The frequency characteristics of the specific noise source (i.e. Railway Noise).
- The sound insulation performance of each façade element (i.e. Windows, Walls, Roof...).
- The area of each façade element.
- Direct and flanking transmission paths.

5.4.1 Road and Rail Noise Prediction Modelling

Following the survey, SoundPLAN 9.1 modelling software was used to build a noise model of the development. This was to establish the noise levels at the development in a worst-case scenario. The software implements the algorithms contained in ISO 9613-1 and ISO 9613-2. The noise model considers:

- Distance attenuation,
- Source and receptor locations,
- Barrier effects (buildings, walls etc)
- Topographical elevations,
- Ground effects and absorption,
- Source sound power levels,
- Directivity and orientation of the source,
- Atmospheric attenuation and meteorological effects,

The noise model has been calibrated against the attended and unattended noise measurements. SoundPLAN 9.1 software predicts road traffic noise levels in accordance with *Calculation of Road Traffic Noise* (UK Department for Transport, 1998). This is the recognised appropriate standard for road traffic noise prediction as per TII (Transport Infrastructure Ireland).

The following information was input into the model:

- Development layout provided in architectural drawings.
- Google Maps terrain and elevation data of the site and surrounding area.
- Traffic speed as per local signage of surrounding roads, varying from 30km/hr for residential estates to 50km/hr for main roads in Arklow.
- Percentage of HGV assumed at 4% based on assessment of similar local roads.
- Annual traffic growth rate of 3.9%.
 - This has been assessed based on pre-covid traffic growth data.
- Information including drawings, topography etc provided by the design team.

5.4.2 Predicted Façade Levels

Incident noise levels have been predicted across all façades of the development for both the daytime and nighttime periods.

Daytime Noise Levels

Figure 7, Figure 8 and Figure 9 below outline the predicted road and rail traffic noise levels across the proposed site for the daytime period at 1.5m, 4m and 6.5m heights respectively.

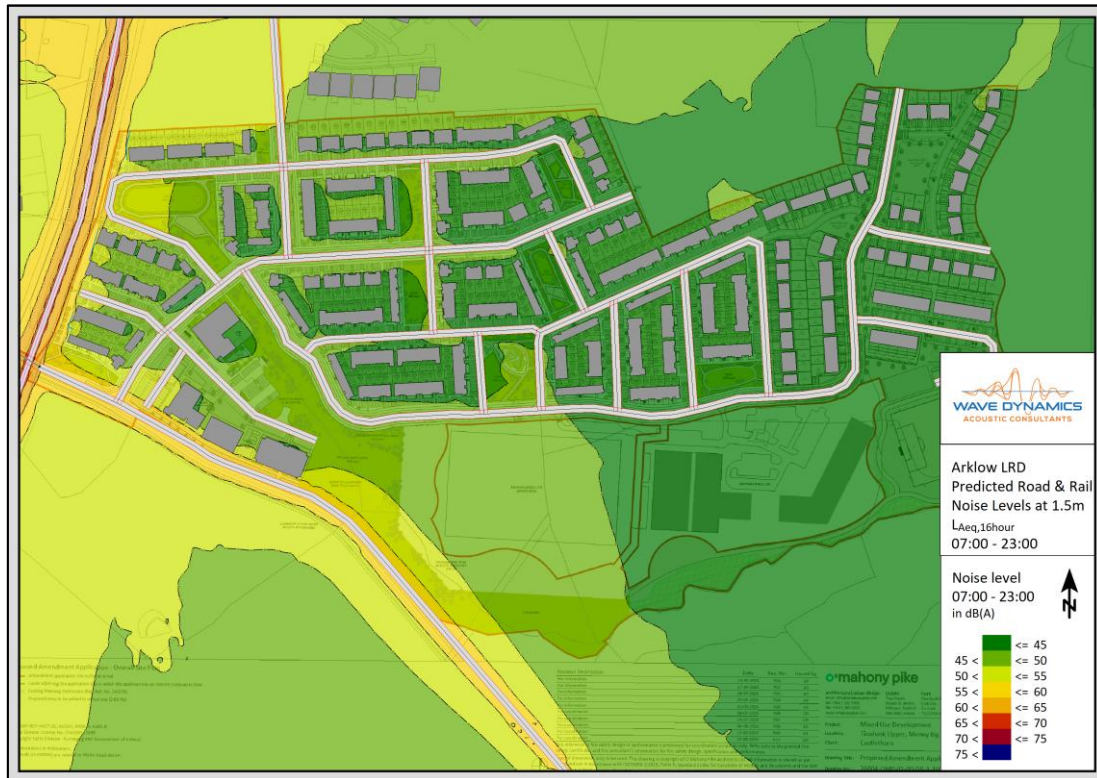


Figure 7: Predicted $L_{Aeq,16hour}$ (07:00Hrs – 23:00Hrs) contour at 1.5m height for the future development.



Figure 8: Predicted $L_{Aeq,16hour}$ (07:00Hrs – 23:00Hrs) contour at 4m height for the future development.



Figure 9: Predicted $L_{Aeq,16hour}$ (07:00Hrs – 23:00Hrs) contour at 6.5m height for the future development.

Nighttime Noise Levels

Figure 10, Figure 11 and Figure 12 below outline the predicted road and rail traffic noise levels across the proposed site for the nighttime period at 1.5m, 4m and 6.5m heights respectively.

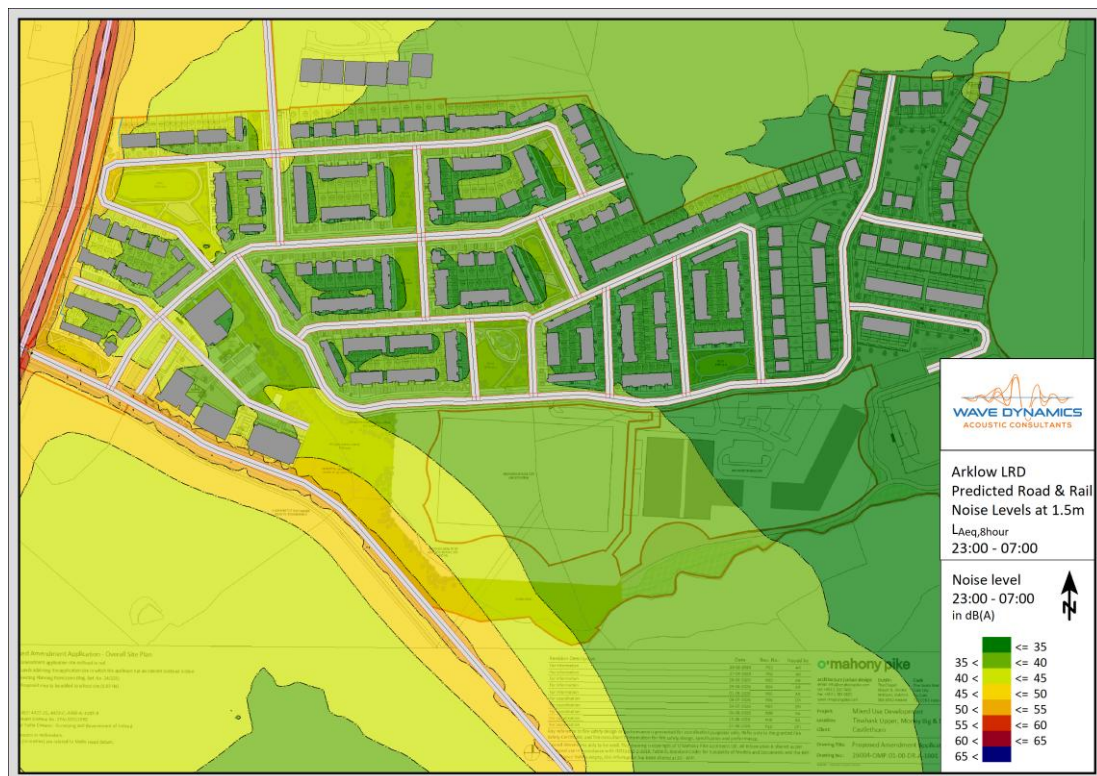


Figure 10: Predicted $L_{Aeq,8hour}$ (23:00Hrs – 07:00Hrs) contour at 1.5m height for the future development.



Figure 11: Predicted $L_{Aeq,8hour}$ (23:00Hrs – 07:00Hrs) contour at 4m height for the future development.

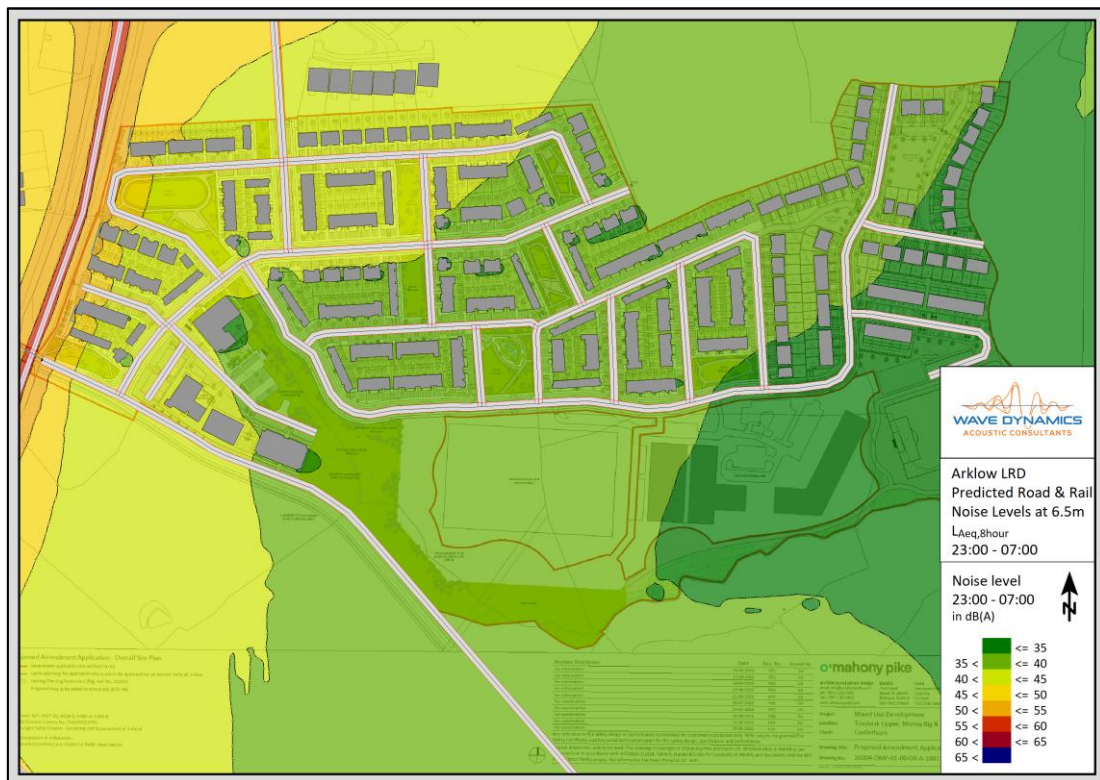


Figure 12: Predicted $L_{Aeq,8hour}$ (23:00Hrs – 07:00Hrs) contour at 6.5m height for the future development.

5.4.3 Building Envelope Specification

This section outlines the building envelope requirements based on the measurements outlined in Section 3. Façade, wall, glazing, roof and ventilation specifications have been determined to achieve the internal noise level criteria for the development. The specification has been determined in accordance with EN ISO 12354-3: 2017 based on the predicted façade day and night noise levels and the room and façade dimensions from the drawings provided.

The building envelope specification should be confirmed by the acoustic consultant at design stage once the internal layouts and design development have been confirmed. Any changes to the proposed ventilation strategy and glazing requirement should be considered as part of the review and should be based on the internal noise levels cited in this report.

Glazed Elements and Ventilation

The glazed elements and ventilation openings are typically the acoustically weakest elements of any façade. The required sound insulation performance of façade glazed elements and ventilation openings are outlined in Table 11 below.

It is required that the glazing, frame and seals as a whole achieve the performance when the window is in the closed position. The performance requirements outlined in Table 11 are considered to provide adequate sound insulation to achieve the relevant day and night internal design goals respectively. A markup outlining the performance requirements for each façade are included in Appendix B.

Table 11: Sound Insulation performance requirements for glazed elements and ventilation.

Façade	Glazed Elements (Frame & Glazing) Sound Insulation Requirements (Indicative requirements equal or approved)							Façade Ventilation Requirement ²
	Octave Band Frequency Requirements ¹ R dB						Glazing Acoustic Performance dB R _w	
	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz		
ORANGE	22	25	28	35	36	27	33dB R _w	36dB D _{n,e,w} ¹
BLUE	14	19	25	33	42	21	29dB R _w	Standard passive ventilation ³

- (1) Natural ventilation proposed throughout, the performance cited is for the ventilator in the open position. Should this change to mechanical ventilation, the above specification may be reduced. An acoustic consultant should be engaged to assess the level of reduction appropriate to maintain the internal noise level criteria should the ventilation strategy change.
- (2) The calculation assumes a maximum of 1 ventilation opening per bedroom at the above specification.
- (3) Standard passive ventilation assumed as per Table 12 below.

It is important to note that the requirements outlined above are minimum requirements for the glazed element as a whole. The octave band values are indicative and specific to the assessed glazing type, equal or approved to meet the minimum project requirements is acceptable.

We understand the ventilation strategy for the development is proposed as a natural ventilation system. Should the ventilation strategy change to mechanical ventilation, Wave Dynamics should be notified. Typically, the use of a natural ventilation strategy will lead to an enhanced glazing specification compared to a sealed mechanical ventilation system. This assessment is based on the windows in the closed position.

Based on the predicted noise levels across the site, all houses on the development marked up blue in Appendix B are predicted to have low enough façade noise levels that they will meet the internal ambient noise level criteria with the windows in the half-open or tilted position. The increased glazing performance specified in Table 11 above is focused on façades on the southern and western boundaries of the site adjacent to the proposed new link road and rail line respectively. Additionally, a placeholder has been put in place for elevations in proximity to the proposed soccer

pitches in the southeastern corner and midsection of the site to utilise the higher performing glazing specification outlined in Table 11.

It is recommended that the façade supplier provide laboratory tests confirming the airborne sound insulation performance. In the absence of suitable laboratory data, a composite sound reduction index calculation undertaken by a suitably qualified acoustic consultant can be used to demonstrate compliance.

The calculations for the glazing figures in Table 11 are based on the use of basic trickle vents. The performance value required and that used in the internal noise level calculations is outlined in Table 12 below.

Table 12: Recommended ventilation specification

Façade	Description	Octave Band Centre Frequency (Hz)					
		Sound Reduction Index $D_{n,e}$ dB					
		125	250	500	1k	2k	4k
ORANGE	36dB $D_{n,e,w}$ Trickle Vent	34	39	42	38	32	32
BLUE	Standard trickle ventilator typically $\geq D_{n,e,w}$ 30dB	30	30	30	30	30	28

External Wall Construction

The façade wall construction has been assumed to achieve a minimum sound insulation performance of 52dB R_w . Typical façade construction such as concrete, blockwork, timber frame and brick offer high levels of sound insulation and will meet this requirement.

Roof Construction

The roof construction has been assumed to achieve a minimum sound insulation performance of 50dB R_w . Any skylights and glazing in the roof system to corridor or communal areas should be of standard double-glazed construction to meet the same performance a minimum of 29 dB R_w . If there are any skylights to habitable bedrooms, Wave Dynamics should be informed to provide specific guidance in each case.

5.5 Element 3- External Amenity Spaces

There are a number of local parks, green spaces and two playing pitches proposed for the development in addition to private external amenity for all houses and apartments in the form of rear gardens and balconies.

Based on the measured noise levels at the site and the predicted future noise levels it is predicted that the external noise levels in all public external amenity spaces will achieve the ProPG recommendations for desirable external amenity noise levels of 50-55dB $L_{Aeq,16hour}$. It is predicted that the majority of rear gardens and balconies will achieve the recommended external amenity noise levels without mitigation. There are 22 houses along the western and northwestern boundaries of the site adjacent to the rail line which have external noise levels in the rear gardens predicted to marginally exceed recommended levels by 1-2 dB. The gardens of these 22 houses are predicted to achieve the external amenity noise level criteria provided a 1.5m high boundary wall is constructed at the boundary of the rear garden. Figure 13 and Figure 14 below highlight the proposed public external amenity spaces across the site.

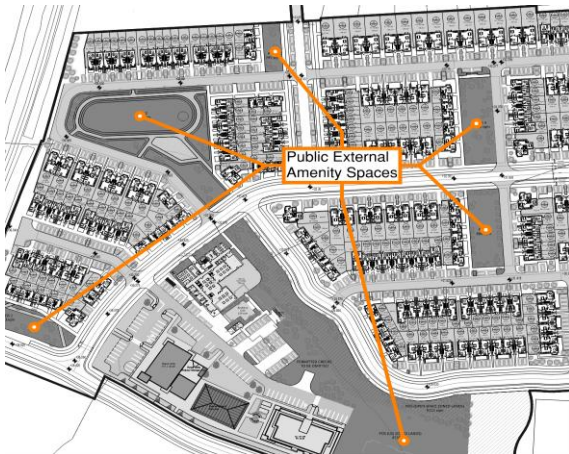


Figure 13: Public External Amenity Space



Figure 14: Public External Amenity Space

It is recommended that the rear boundary walls to the gardens of houses along the western and northwestern boundary of the site, as shown in Figure 15, are constructed to a minimum height of 1.5m below which will provide benefit to achieving the external amenity noise levels. It is vital that the wall is solid to its full extent and that there are no gaps/holes. Suitable materials for a noise barrier are listed below; other materials and products should be approved by an acoustic consultant prior to installation:

- Timber fencing to have surface density $>20\text{kg/m}^2$
- 100mm concrete block
- Sonant acoustic noise barrier

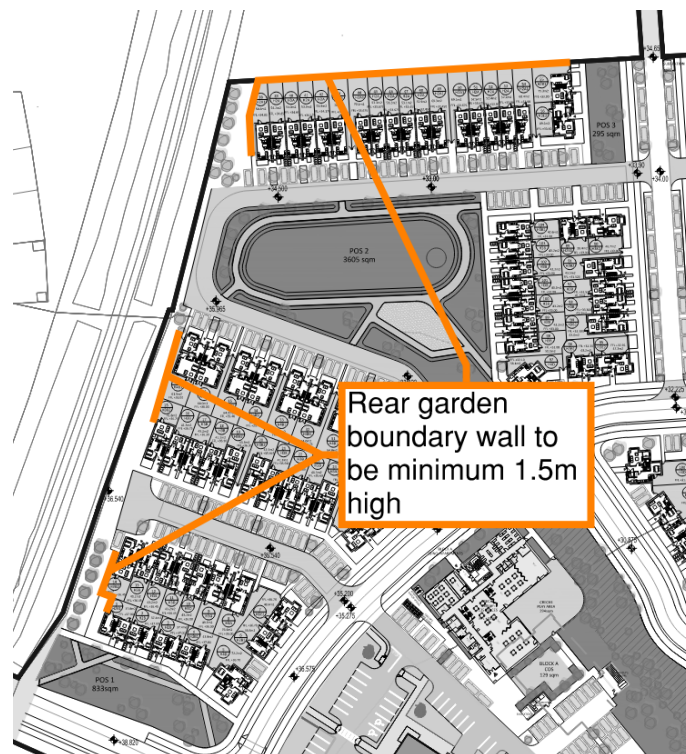


Figure 15: Extent of recommended boundary wall 1.5m above ground level

5.6 Element 4 - Assessment of Other Relevant Issues

This section of the acoustic design report considered the other relevant issues. Element 4 considers other issues which may remain relevant to the assessment, these issues are as follows:

- 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 and;
- 4(v) acoustic design v wider planning objectives.

5.6.1 Compliance with Relevant National and Local Policy

There are no specific noise guidance or policy documents for residential developments. The Wicklow Noise Action Plan refers to the ProPG as the relevant document for assessment of the noise impact on new residential developments as followed in this acoustic design statement.

5.6.2 Magnitude and Extent of Compliance with ProPG

This report demonstrates that all dwellings will meet the specified internal noise level requirements provided the guidance in this report is followed. External amenity spaces have been provided in line with the guidance set out in ProPG. Based on this the development is in general compliance with the ProPG requirements.

5.6.3 Likely Occupants of The Development

Additional needs of the future occupants are not known at this stage however the needs of all potential occupants have been considered with the assessment of adequate internal noise levels and provision of adequate external amenity spaces to meet the needs of potential occupants.

5.6.4 Acoustic Design v Unintended Adverse Consequences

The design has considered the impact of adverse consequences. Mitigation has been provided by specification of the sound insulation and ventilation requirements.

5.6.5 Acoustic Design v Wider Planning Objective

Where possible the wider planning objectives have been considered including the need for residential housing with good transport links. It is assumed that the wider planning objectives have been adhered to by following the ProPG guidance.

5.7 Stage 2 Assessment Conclusion

The stage 2 assessment considers all four (4) elements, the principals of good acoustic design have been followed.

The element 2 assessment has considered the measures required to provide an adequate acoustic environment with appropriate noise levels for internal spaces. The sound insulation and ventilation requirements have been specified based on the predicted façade noise levels.

The element 3 assessment of external amenity spaces has considered the noise impact on the development and the external amenity spaces. Appropriate provision of external amenity space has been provided in line with the ProPG guidance.

Other relevant issues have been considered including local policy, unintended consequences and the wider planning objectives.

6 Other Considerations

6.1 Proposed School

It is noted that there is an indicative layout provided for a new school for feasibility included in the planning application however this will not form part of the acoustic assessment as the grounds will be subject to a separate future planning application when the internal layouts etc. have been determined.

Noise resulting from the proposed soccer pitches has been considered and residences within reasonable proximity to either pitch has been specified the higher performing glazing specification outlined in Section 5.4.3. A markup of the glazing specification across the site is available in Appendix B of this report.

6.2 Link Road

Consideration has been given to the futureproofing of the development in the case of the potential new link road to the south of the proposed development. A version of the noise model has been conducted to investigate the future noise levels at façades of the development with the potential link road implemented. At this stage of the assessment there is no traffic data available for the road therefore for the sake of the assessment the following parameters have been assumed for the link road:

- Average daily traffic of 1000.
- Percentage of HGV assumed at 2%.
- Traffic speeds limited to 50km/hr.

The number of average daily vehicles has been assumed based on similar local access roads. It is predicted that this road is unlikely to meet the definition of a major road. Figure 16 and Figure 17 below highlight the combined noise levels at the façades of the development from both existing road and rail traffic noise and the proposed new link road.

Consideration has been given to the predicted façade noise levels with the potential link road realised. It is predicted that the proposed façade construction outlined in Section 5.4.3 will meet the internal noise level criteria of BS8233 and ProPG with the new link road.

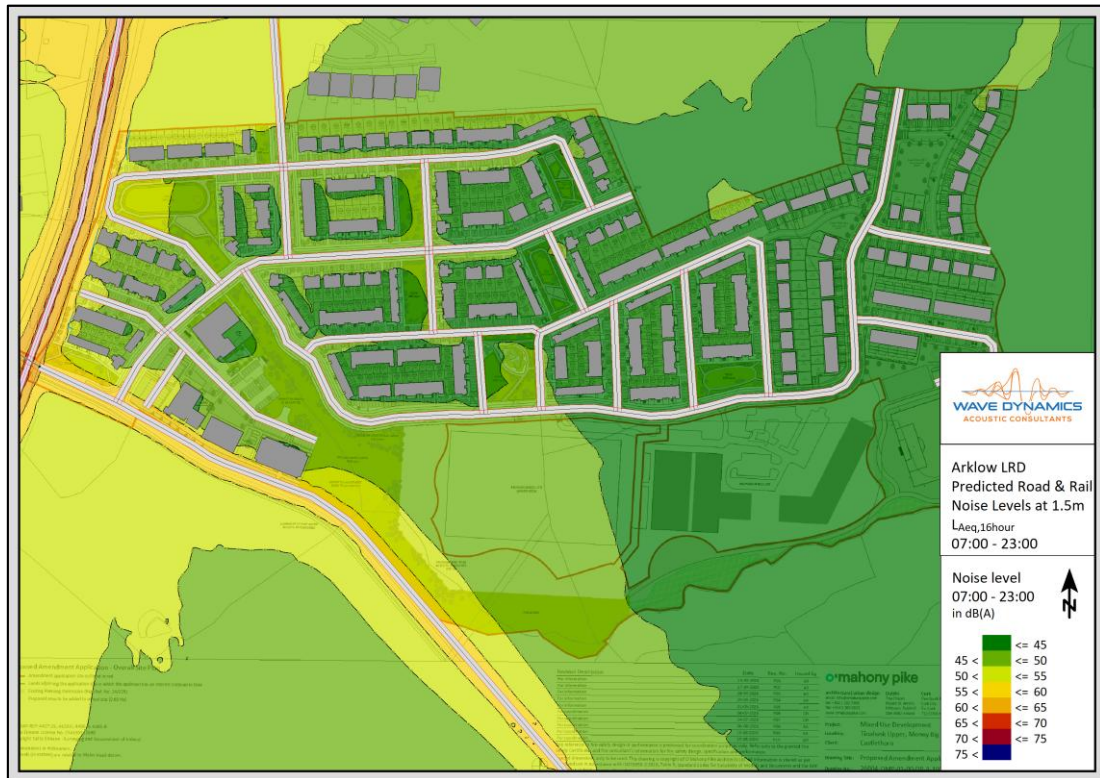


Figure 16: Predicted $L_{Aeq,16hour}$ (07:00Hrs – 23:00Hrs) contour at 1.5m height for the future development including the proposed link road.

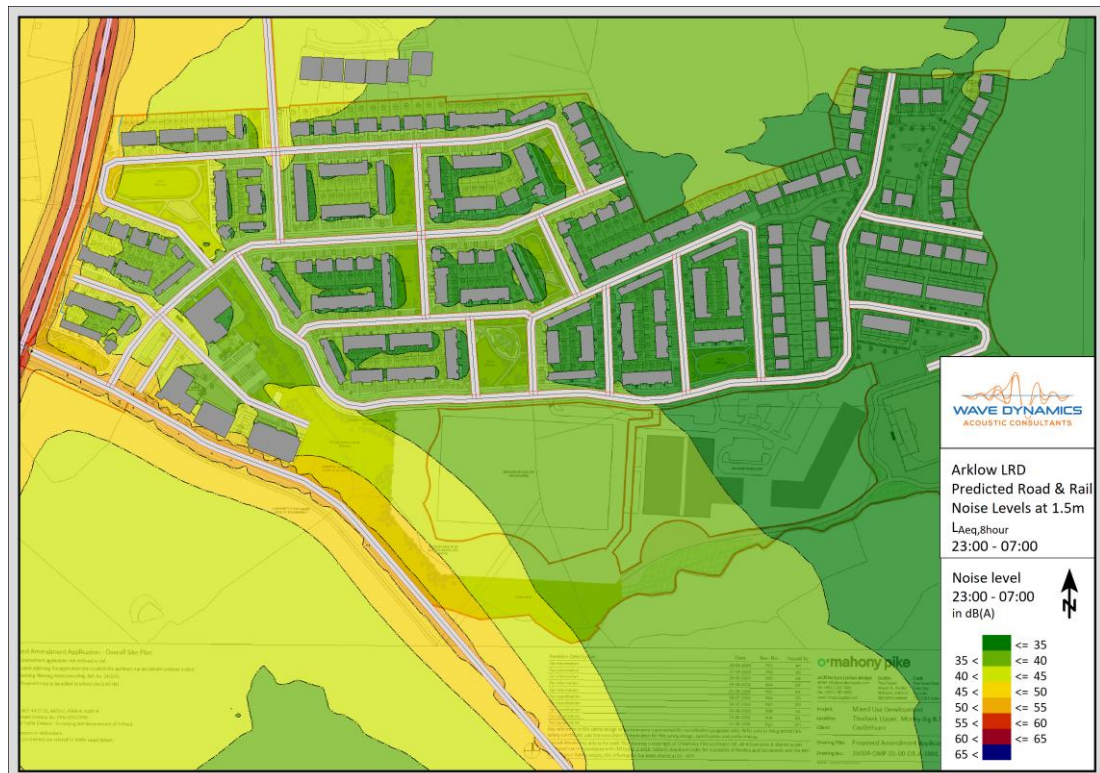


Figure 17: Predicted $L_{Aeq,8hour}$ (23:00Hrs – 07:00Hrs) contour at 1.5m height for the future development including the proposed link road.

7 Vibration Assessment

The vibration dose value levels (VDV) were measured onsite at approximately 2m closer to the rail line than the nearest façade of the proposed new extension. As can be seen from Table 13 below, the highest measured daytime VDV, 16 hour was $0.032 \text{ m/s}^{-1.75}$ and the highest night-time VDV, 8 hour was $0.016 \text{ m/s}^{-1.75}$. These results are significantly below the VDV value range for low probability of adverse comment when assessed under BS 6472:2008.

Table 13: Project Vibration Criteria vs the highest measured vibration levels

Place and Time	Low probability of adverse Comment ($\text{m.s}^{-1.75}$)	Adverse Comment Possible ($\text{m.s}^{-1.75}$)	Adverse Comment Probable ($\text{m.s}^{-1.75}$)	Highest measured level for each period ($\text{m.s}^{-1.75}$)
Residential Buildings 16hr Day	0.2 - 0.4	0.4 - 0.8	0.8 - 1.6	0.032 (Z Axis)
Residential buildings 8 hr night	0.1 - 0.2	0.2 - 0.4	0.4 - 0.8	0.016 (Z Axis)

Based on the measured vibration levels on the site vibration impacts on the development from rail movements are not expected to have a negative effect on the amenity of the residents of the development, as the measured values are significantly below the threshold where there would be “low probability of adverse comment”.

8 Conclusion

Wave Dynamics were engaged by Stephen Little & Associates as the acoustic consultants on Arklow LRD Amendments, Tinahask Upper, Money Little & Money Big, Arklow, Co. Wicklow. Amendments to the proposed development consist of the following:

"The proposed development comprises amendments to the Large-scale Residential Development permitted under WCC Reg. Ref. 24/325 consisting 352no. residential units proposed in a mix of houses and apartment units comprising 334no. houses (44no. 2-bedroom, 241no. 3-bedroom and 49no. 4-bedroom) ranging from 2 to 3 storeys, 18no. apartments (6no. 1-bedroom and 12no. 2-bedroom) in 1no. 4 storey building, 1no. creche (c. 711 sqm) at ground floor of apartment Block A; and all associated and ancillary site development works including on site attenuation, hard and soft landscaping and boundary treatment works, including public open space; communal open space, public lighting; surface car parking; bicycle parking spaces/stores for houses and apartment units; 4no. ESB substations; bin stores; vehicular access via existing Northwood road and railway overbridge from Knockmore roundabout. The proposed development also includes road upgrade works to the existing railway overbridge and the western approach to same including the provision of a 2.5m footpath, 6m carriageway, safety barrier improvement works and other ancillary works required to facilitate these elements."

Noise Impact Assessment

A Stage 1 and Stage 2 ProPG assessment has been undertaken. As part of the stage one assessment to categorise the site a baseline noise survey was undertaken to measure the existing noise levels. Following a review of the noise levels on the site, including the L_{AFmax} and L_{Aeq} , the site has been characterised as low risk for the daytime and nighttime periods; irrespective of this, mitigation measures are recommended to control the onset noise levels.

Internal Noise Levels

Following the baseline survey, a noise impact assessment was undertaken, this included break-in noise calculations to predict the internal noise levels from road traffic noise and rail noise. Consideration has also been given to the future growth of the roads and railway line. Following the assessment, the building envelope performance requirements were determined. The performance specification for the building envelope, which includes the external walls, glazing, roof, and ventilation requirements, has been provided in this report. It is predicted that the internal noise levels will be achieved for both the L_{Aeq} and L_{AFmax} requirements outlined in ProPG.

External Amenity Noise Levels

The assessment has also considered the external amenity noise levels in accordance with ProPG 2017. All public external amenity spaces and the majority of all rear gardens and balconies are predicted to achieve suitable noise levels to meet the desirable levels without additional mitigation. Houses along the western and northwestern boundary of the site adjacent to the rail line are required to have rear garden boundary walls to a minimum height of 1.5m to achieve the external amenity noise levels in these rear gardens.

Based on the recommendations in this report it is predicted that the internal and external noise levels will achieve the targeted internal noise levels in line with BS 82233:2014 and ProPG 2017 guidance.

Vibration Impact Assessment

A vibration survey was undertaken on the site to measure the vibration levels from train passes in terms of VDV (Vibration Dose Value). The purpose of the survey was to measure the existing vibration levels and predict its impact on the amenity of the future residents.

The vibration impact on the resident's amenity has been assessed based on a worst-case scenario. Based on the measurements taken onsite it is not predicted that the vibration impact from train passes will have any negative impact on the amenity of the residents of the proposed development. The assessment found a low probability of adverse comment due to vibration from train passes.

Appendix A- Glossary of Terms

Ambient Noise	The totally encompassing sound in a given situation at a given time, usually composed of sound from all the noise sources in the area.
Background Noise	The steady existing noise level present without contribution from any intermittent sources. The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 per cent of a given time interval, T ($L_{AF90,T}$).
dB	Decibel - The scale in which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the RMS pressure of the sound field and the reference pressure of 20 micro-pascals (20 μ Pa).
dB(A)	An 'A-weighted decibel' - a measure of the overall noise level of sound across the audible frequency range (20 Hz – 20 kHz) with A-frequency weighting (i.e. 'A'-weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
Hertz	The unit of sound frequency in cycles per second.
L_{A90}	A-weighted, sound level just exceeded for 90% of the measurement period and calculated by statistical analysis. See also the background noise level.
L_{Aeq}	A-weighted, equivalent continuous sound level.
L_{AFmax}	A-weighted, maximum, sound level measured with a fast time-constant - maximum is not peak
L_{den}	day-evening-night noise level, the A-weighted, L_{eq} (equivalent noise level) over a whole day, but with a penalty of 10 dB(A) for night-time noise (23:00-07:00) and 5 dB(A) for evening noise (19:00-23:00), also known as the day evening night noise indicator

Appendix B- Façade Sound Insulation Markup



Glazed Elements Specification

- 33 dB R_w
- 29 dB R_w



Project: Arklow LRD Amendments

Title: Facade Markup

Prepared By: Tom Ó Faogáin

Reviewed By: James Mangan

Date: 15/09/2026